Safety and Health Plan

Remediation of Soils Impacted by Petroleum Hydrocarbons

Tampa City –Fleet Maint #7-Jackson ST Parking Lot

405 E Kennedy Boulevard

Tampa, Florida

FDEP Facility ID#: 29/8625671

March 1, 2018

Terracon Project No. H4187072

Prepared for:
Florida Department of Environmental Protection
Tallahassee, Florida

Prepared by:
Terracon Consultants, Inc.
Tampa, Florida

INTRODUCTION

This Site Safety and Health Plan has been developed to keep Terracon personnel engaged in construction materials testing services on the Tampa City-Fleet Maint #7-Jackson ST Parking Lot (Facility ID# 29/8625671) Project site safe so that they leave the site uninjured at the conclusion of every work day. Safety expectations of Terracon personnel working on this site will be as follows:

- Follow the safety rules applicable to your job.
- If it is not safe, do not do it; do not have your co-worker do it either.
- If you see something that is unsafe, **speak up** immediately, there and then, to your supervisor, no matter who—no matter what.
- If you are not sure of something or do not understand something, **speak up and ask**.

All Terracon employees have the right to expect management cooperation in helping to keep them safe. Here is what you can expect from Terracon management while engaging in services at this project site:

- If you stop a task for a safety reason, we will back you up.
- If you bring up a safety concern, we will address it promptly. It will not go into a black hole.
- If there is an injury, we will conduct an incident investigation in a way that does not blame anyone—the person or people involved. The investigation will focus on learning, so that we can eliminate the next injury.

We want every employee to conduct field operations in accordance with our Incident and Injury-Free principals:

- Evaluate the hazards of the work you are getting into and control the hazards to the extent practical before engaging in site services.

- Be observant to people who are inexperienced anxious about their work and for those who are being complacent with safe work procedures. Speak up to both, out of care and concern, and help them see that doing their work safely is the right thing to do for both them and their families.

- Be open if someone speaks to you about potential unsafe behaviors or equipment, and cooperate in the spirit of getting the job done safely. Everybody deserves a future.

IIF® Incident and Injury-Free®

1.0 APPLICABILITY

This Site Safety and Health Plan has been developed for the safety of Terracon personnel engaged in excavation activities at the Tampa City-Fleet Maint #7-Jackson ST Parking Lot site in Tampa, Florida. The purpose of this plan is to help assure that personnel assigned to field activities during this remediation project leave uninjured at the conclusion of every work day. Safety expectations of Terracon personnel working on this site will be as follows:

- Follow the safety rules applicable to your job.
- If it is not safe, do not do it; do not have your co-worker do it either.
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2.0 SAFETY AND HEALTH ADMINISTRATION

The Project Manager is ultimately responsible for ensuring that work on this project is performed in accordance with the safety and health provisions contained in this Plan. The designated Site Safety and Health Officer (SSO) will monitor compliance with this Plan during field activities. All field team members engaged in project activities will be required to sign the "Acknowledgment of Instruction" form included with this Plan. The SSO will maintain a copy of this Plan on site for the duration of project activities.

Subcontractors engaged in project activity at this site will comply applicable provisions of the Occupational Safety and Health Act of 1970, the safety and health requirements set forth in Occupational Safety and Health Administration regulation 29 CFR 1910.120, where applicable, and any applicable state, city or local safety codes. Each subcontractor will be responsible for supplying and utilizing necessary equipment required for safety precautions for the subcontractor's employees engaged in this project.

In order to reduce the potential for accidents, subcontractors will maintain an orderly and safe work area. It will the responsibility of subcontractors to provide whatever safety barricades or warning devices are deemed necessary by Terracon to prevent accidents or injury to field personnel and the general public.

Subcontractors engaged on this project site may utilize this site Safety and Health Plan for their employees, or each subcontractor may develop and utilize their own site Safety and Health Plan provided the provisions of the subcontractor's site Safety and Health Plan are at least as stringent as the requirements contained in this Plan. Decisions regarding equivalence of safety and health requirements shall be made by Terracon Project Manager and Corporate Safety and Health Manager. Adoption of this Site Safety and Health Plan by subcontract employers shall not relieve any site subcontractor for the responsibility for the health and safety of its employees.

Terracon and subcontractor task leaders (if any) will be responsible for:

- Providing subordinate personnel a copy of this Plan, and briefing them on its content.
- Enforcing the applicable provisions of this Plan.
- Inspecting and maintaining equipment in compliance with applicable federal, state or local safety regulations.
- Enforcement of corrective actions.
- Investigation of accidents or injuries.

The following individuals will be responsible for implementation and enforcement of the Plan:

TITLE	NAME	PHONE
Project Manager	Rama Ruttala	813-804-7971
Safety and Health Director	Adam Maier	913-202-7529
Site Safety Officer	Paul Maxwell	813-321-0320
Senior Drill Crew Member		
Client Contact	Mr. Bobby Scarborough	850-245-8873

3.0 MEDICAL SURVEILLANCE REQUIREMENTS

All Terracon personnel participating in field operations on this project will be enrolled in a health monitoring program in accordance with the provisions of OSHA 29 CFR 1910.120 and 1910.134. Each project participant must be certified by a Doctor of Medicine as fit for respirator and semi-permeable/impermeable protective equipment use. The content and frequency of physical examinations will be determined by the Consulting physician in compliance with the requirements of 29 CFR 1910.120.

Follow-up medical examinations will also be provided in the event of illness or unprotected exposure to contaminants in excess of eight-hour time weighted average permissible exposure limits.

4.0 EMPLOYEE TRAINING REQUIREMENTS

All Terracon field personnel must have completed 40-hour Hazardous Waste Operations Training per the requirements of OSHA 29 CFR 1910.120. In addition, a current 8-hour annual refresher training certificate will be required for all field personnel.

Prior to the start of site activities, the SSO will conduct a pre-project safety and health briefing for all project participants. The personnel responsible for project safety and health will be addressed, as will site history, scope of work, site control measures, emergency procedures and site communications. The briefing will address site contaminants, air monitoring protocols and results and the level of personal protective equipment to be employed for each project task.

Daily "tailgate" safety and health briefings will be presented by the SSO at the start of each work day. In addition to a general review of the proposed daily activity and safety requirements, the results of previous air monitoring and any procedural changes will be addressed. A daily tailgate safety meeting documentation form is attached as an Appendix to this plan.

5.0 RESPIRATORY PROTECTION PROGRAM

All respirators employed by Terracon personnel will be NIOSH approved. Cartridges and filters for air purifying respirators will be appropriate for the contaminant(s) of concern. Cartridge/filter selection will be made by the Terracon Corporate Safety and Health Manager. Project personnel required to wear respiratory protection will be medically cleared for respirator use, trained and successfully fit tested in accordance with OSHA 29 CFR 1910.134. Personnel required to wear respirators will demonstrate competence in donning/doffing and inspecting the equipment prior to job assignment. All project tasks requiring the use of supplied air respirators will require properly equipped backup personnel.

At a minimum, air purifying respirator cartridges will be changed daily prior to use. More frequent change of respirator cartridges may be specified based on the results of site air monitoring. Under no circumstances will air purifying respirators be used in areas deficient in oxygen (<19.5%), in areas classified as immediately dangerous to life and health (IDLH) or in areas where contaminants have not been characterized.

Respirators will be inspected and required fit checks will be performed prior to use, and any necessary repairs will be made before proceeding to the project site. Respirators will be sanitized daily after use.

6.0 SITE HISTORY/SCOPE OF SERVICES

The Tampa City DPW Fleet Maintenance — Division #7 (Site), (FAC ID 29/8625671) was formally located at 310 N. Marion Street in Tampa. This facility has been changed by the City of Tampa to a parking lot and is now called Tampa City - Jackson Street Parking Lot with street address 405 East Kennedy Boulevard, Tampa, Florida.

The Tampa City-Jackson Street Parking Lot (block) consist of an approximate 1.01-acre parcel and currently developed with an asphalt paved parking lot, 100 ft^2 guard house constructed in 2005, landscaped areas, and municipal utilities. According to information presented in the Florida Department of Environmental Protection (FDEP) Storage Tank and Petroleum Contamination/Cleanup Monitoring (STCM/PCT) database, the Site formerly maintained four 3,000-gallon USTs containing unleaded gasoline, and three 550-gallon USTs containing leaded gasoline. The USTs are reported to be located on the northeast (four 3,000-gallon, & one- 550-gallon) and northwest (two 550-gallon) portions of the Site. The USTs are reported to be closed in place by filling the USTs with sand after USTs are cleaned out. Dispensers associated with the USTs are reported to be removed and disposed. A DRF was submitted to FDEP on January 22, 1988 in response to contamination discovered during manual testing of monitoring wells. The Site became eligible for state-administered cleanup in May 1988 under the EDI Program. Terracon has performed limited contamination assessment activities at the Tampa City-Fleet Maint #7-Jackson Street Parking Lot site. Based on findings of limited contamination assessment petroleum hydrocarbon groundwater impacts are in the east and northwest portions of the Site and impacts are limited to a depth of 25 feet below ground surface.

It is anticipated that soils and groundwater at this project site may be impacted by petroleum hydrocarbons. The personal protective equipment and direct-reading air monitoring protocols specified below are designed to prevent personnel exposure to contamination in excess of permissible exposure limits.

6.1 Scope of Services

Services to be conducted on this project site will perform excavation of soils impacted by petroleum hydrocarbons. Excavation to be conducted to a depth of 18 feet below ground surface (bgs) or to the top of the clay layer. Soils will either be stockpiled or loaded into dump trucks or roll-off containers for transport and appropriate disposal.

Additional services to be conducted on this project site will include the following:

__X__ Soil/Groundwater Sampling	__X__ Soil Boring (Hand Auger)
__X__ Tree removal	__X__ UST Removal *(requires tank removal addendum*)
__X__ Direct Push Injection (Drill Rig)	__X__ Monitoring Well Installation
__X__ other (__Well Abandonment__)	

7.0 HAZARD ASSESSMENT

7.1 Chemical Hazards

Soils at this project site may be contaminated with petroleum hydrocarbons. Benzene is the most significant health hazard contained in petroleum blends and typically comprises less than 1% of regular grade gasolines. Specific health hazard information on petroleum and its most volatile aromatic constituents are provided below. Additional health-hazard information can be found in the chemical information sheets attached to this Plan.

GASOLINE

Permissible Exposure Limit
300 ppm ACGIH TLV
Gasoline is irritating to the skin, eyes and mucous membranes. Dermatitis may result from prolonged contact with the liquid. Gasoline acts as a central nervous system depressant. Exposure may cause staggering gait, slurred speech and mental confusion. Gasoline exposure may affect the liver, kidneys and spleen. Absorption of alkyl lead antiknock compounds contained in many gasolines poses an additional health concern, especially where there is prolonged skin contact.

DIESEL FUEL (No. 2-D)
Permissible Exposure Limit
100 mg/m^3 ppm ACGIH TLV (As mist/vapor)
Diesel fuel is a skin and mucous membrane irritant and a central nervous system depressant. Poisoning may affect the liver and kidneys. Skin contact may result in drying and cracking of the skin.

FUEL OIL (No. 6)
Permissible Exposure Limit
400 ppm OSHA PEL (as petroleum distillates/naphtha)
0.2 mg/m^3 OSHA PEL (Coal Tar Pitch Volatiles, "PNA's")

Fuel oil No. 6, or "Bunker Fuel", is of low volatility. It can be irritating to the eyes and skin. This substance is likely to contain polynuclear aromatic hydrocarbons (PNA's), some of which are considered carcinogenic. PNA's present a skin contact hazard. Avoid skin contact with potentially contaminated site materials.

BENZENE
Permissible Exposure Limit
1 ppm OSHA PEL
5 ppm OSHA 15 min STEL
0.5 ppm OSHA Action Level

Benzene is a central nervous system depressant and an eye and skin irritant. Poisoning may cause hemorrhages and immunosuppression. A relationship has been discovered between benzene exposure and leukemia. Benzene is regulated as an occupational carcinogen. Acute exposure may cause dizziness, excitation, weakness, headache, giddiness, breathlessness and chest constriction.

TOLUENE
Permissible Exposure Limit
20 ppm ACGIH TLV
(Skin Absorbable)

Toluene is an eye, skin and mucous membrane irritant and a central nervous system depressant. Poisoning may affect the liver and kidneys. Prolonged exposure may affect the heart and blood. The ingestion of alcoholic beverages may enhance the toxic effects of toluene. Symptoms of exposure include respiratory tract irritation, headache, dizziness and eye irritation. Toluene may be absorbed to the bloodstream via skin contact.

ETHYL BENZENE
Permissible Exposure Limit
20 ppm ACGIH TLV

Ethyl benzene is a skin, eye and mucous membrane irritant. It is moderately toxic by ingestion and slightly toxic by skin absorption. Ethyl benzene is a central nervous system depressant. Poisoning may affect the liver. Symptoms of exposure may include a sense of chest constriction and nervous disorders. Skin contact may result in first and second degree burns. The odor can be detected at 140 ppm and irritation occurs at ~200 ppm.

XYLENE
Permissible Exposure Limit
100 ppm OSHA PEL

Xylene is a mild eye and mucous membrane irritant, primary skin irritant and a central nervous system depressant. Ingestion causes severe gastrointestinal upset and creates an aspiration hazard. Chronic inhalation results in symptoms that resemble acute poisoning, but are more severe systemically.

7.2 Drilling Safety Precautions

Activities to be performed on site involve powered excavating equipment and materials. Personnel should be aware that as personal protective equipment increases, dexterity and visibility may be impacted and performing some tasks may be more difficult. Tape all loose protective clothing to avoid entanglement in rotating equipment. ***Before excavation proceeds, underground utilities must be located and marked.*** Other safety precautions to be observed during this assessment include the following:

- No loose fitting clothing, jewelry or unsecured long hair is permitted near the rig.
- Ground personnel will remain upwind and outside the swing radius of backhoe buckets during excavation. Line-of-sight contact with the backhoe operator must be maintained.
- A first aid kit and fire extinguisher will be immediately available at all times.
- A 10 foot horizontal and vertical clearance will be maintained from all overhead power lines.

- Personnel will not enter excavations to collect samples. Samples will be obtained from backhoe buckets or with sampling devices of sufficient length to prevent the necessity for excavation entry.

7.3 Site Physical Hazards/Precautions

The physical hazards associated with intrusive site activities can include inclement weather, material handling, slips/falls etc. Some anticipated hazards and means for preventing injury from those hazards are as follows:

- **Back injuries due to improper lifting** - Use proper lifting techniques. Lift with the legs, not the back. Keep loads close to the body and avoid twisting. Loads heavier than 50 pounds (lbs.) require a second person or mechanical device for lifting. Use mechanical devices such as drum dollies, hand trucks, and tool hoists (for lifting augers) to lift or move heavy loads whenever possible.

- **Ergonomic Stress** - Lift carefully with load close to body with the legs taking most of the weight. Get help with lifts greater than 40 lbs. When working with a heavy tool or object, keep legs under the load and do not overreach or twist to the side. Reposition body to be more square to the load and work. Push loads, rather than pull, whenever feasible. Do not persist with lifting when the load is too heavy. Use a mechanical lifting aid or have a coworker assist with the lift. Rotate repetitive tasks to avoid soft-tissue fatigue.

- **Falls From Elevated Surfaces** - Protect employees from falling off surfaces that have a side or an edge that is 6 ft. or more above a lower level. Provide a safety harness and shock-absorbing lifeline or adequate fall protection where applicable. Employees must wear them when working 6 ft. or higher above the platform or main work deck. Install either a guardrail system or fall arrest system that conforms to 29 CFR 1926.502 (d) and is approved by the American National Standards Institute.

- **Vehicles** - Obey all site traffic signs and speed limits. Seat belts must be functional and in use during operation of any site vehicles (including rentals). Operator shall regularly inspect the vehicle for defective parts, such as brakes, controls, motor, chassis and drives. Always be aware and stay alert to traffic around the work area.

- **Inclement Weather** – The project may be shut down by the SSO during the following inclement weather conditions: poor visibility; precipitation severe enough to impair safe movement or travel; lightning in the immediate area; steady winds in excess of 40 mph; or, other conditions as determined by the SSO or Corporate Safety and Health Manager. Work will resume when the conditions are deemed safe by the SSO.

- **Noise** - Wear hearing protection when speech becomes difficult to understand at a distance of 10 ft. and while standing within 20 to 25 ft. from heavy equipment, pneumatic power tools, steam cleaners, and other equipment in operation that can generate more than 85 decibels (A-weighted scale) (dB).

- **Slips, Trips, and Falls** - Clear work area of obstructions and debris before setting up. Alter work areas as necessary to provide a safe, reasonably level area. All walking and working surfaces shall continually be inspected and maintained to be free of slip, trip, and fall hazards. Keep platforms, stairs, and immediate work areas clear. Do not allow oil,

grease, or excessive mud to accumulate in these areas. Eliminate slip, trip, and fall hazards or identify them clearly with caution tape, barricades, or equivalent means. Store loose or light material and debris in designated areas or containers. Secure tools, materials, and equipment subject to displacement or falling.

- **Traffic Control** - If site activities interrupt the normal flow of pedestrian or vehicular traffic, barricades and warning signs which comply with the Manual on Uniform Traffic Control Devices and/or State or local ordinances will be erected around affected equipment. Safety orange work vests will be worn by personnel working within 10 feet of any active roadway. All borings or partially completed groundwater monitoring wells will be adequately covered and/or barricaded if left unattended for any period of time.

- **Confined Spaces –** No work will be conducted within confined spaces without discussion with the Corporate Safety and Health Manager and development of a confined space safety plan and permit. Excavation at the Project site is considered to be non-permit required confined space. Please see attached Terracon Confined Space Policy.

7.4 Biological Hazards

Biological hazards may include ticks, fleas, mosquitoes, wasps, spiders or other pests; poisonous plants (poison ivy, poison oak); snakes; thorny bushes and trees; and medical waste.

West Nile virus is primarily spread through the bite of an infected mosquito (usually a Culex species). Mosquitoes pick up the virus when they feed on infected birds. The virus must then circulate in the mosquito for a few days before they are capable of transmitting the infection to animals or humans while biting. The virus is found in the salivary gland of the mosquito. During feeding, the virus may be injected into a human or animal where it may multiply and possibly cause disease.

Most persons who are infected with West Nile virus will have no noticeable symptoms, or have an illness syndrome called “West Nile Fever” lasting 2-10 days. Common symptoms of West Nile Fever include headache, fever, and extreme muscle weakness, occasionally accompanied by vomiting or skin rashes. In some cases, West Nile virus infection will cause severe neurologic disease such as meningitis, paralysis, or encephalitis (swelling and inflammation of the brain).

Symptoms of West Nile meningitis or encephalitis may be intense headache, dizziness, stiff neck, marked weakness, muscle tremors, disorientation, mental confusion, or convulsions.

Workers should protect themselves from mosquito bites by applying insect repellent to exposed skin. Generally, the more active ingredient a repellent contains, the longer it can protect from mosquito bites. A higher percentage of active ingredient in a repellent does not mean that protection is better—just that it will last longer. Choose a repellent that provides protection for the amount of time that you will be outdoors. Repellents may irritate the eyes and mouth. Whenever an insecticide or insect repellent is used, workers must read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

Insect repellent containing diethyltoluamide (DEET) can be sprayed on skin or clothing to provide protection from mosquitoes. A repellent containing permethrin can also be sprayed on clothing. Repellents containing permethrin should not be applied directly to exposed skin. Workers should wear long-sleeved shirts and long pants whenever outdoors.

Workers should consider staying indoors at dawn, dusk, and in the early evening, which are peak mosquito biting times. Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

Tick borne diseases
Lyme Disease, Ehrlichiosis, Tularemia, Southern Tick-Associated Rash Illness (STARI), and Rocky Mountain Spotted Fever (RMSF) are diseases transmitted by ticks and may occur throughout the United States during spring, summer, and fall.

Lyme Disease is a potentially serious disease caused by the bacteria Borrelia burgdorferi. Humans can become infected following the bite of an infected deer tick also called the black legged tick (see figure below). Persons bitten by ticks carrying Lyme Disease may have symptoms such as a rash or a peculiar red spot (Bulls Eye) that expands outward in a circular manner (see photo below). Headaches, weakness, fever, a stiff neck, swelling and pain in the joints, and eventually, arthritis may also occur. The primary symptom of RMSF is the sudden appearance of a moderate to high fever. The fever may persist for two to three weeks. A severe headache, deep muscle pain and chills may also occur. A rash will appear on the hands and feet on about the third day and eventually spread to all parts of the body (see photo on the following page). RMSF may cause death if untreated. Ehrlichiosis refers to a disease caused by the bacteria Ehrlichia from the bite of the Lone Star Tick (see figure below). Symptoms of ehrlichiosis will generally include a sudden onset of fever, chills, headache, myalgia, and fatigue within 10 to 15 days following a tick bite. The symptoms of ehrlichiosis are similar to RMSF; however, a rash occurs less often. Other symptoms include nausea, vomiting, abdominal pain, and loss of appetite.

Tularemia is a disease caused by the bacteria Francisella tuarensis. In Oklahomathe ticks commonly associated with Tularemia are the Dog Tick and the Lone Star Tick (see figures below). Symptoms of Tularemia are high fever, chills, fatigue, general body aches, headache, and nausea. Tularemia was once known as “Rabbit Fever”. Southern Tick-Associated Rash Illness (STARI) is an illness that is indistinguishable from the early stages of Lyme Disease. These symptoms include the “bull’s eye” rash commonly associated with Lyme Disease. The cause of the disease is not fully understood, but it appears to be associated with the bite of the Lone Star Tick. Lyme Disease is associated with the bite of the Deer Tick.

Early diagnosis of tick borne diseases is essential to treatment of the disease. The following photographs show common symptoms one may develop. Insect repellent, containing diethyltoluamide (DEET), should be used in tick infested areas, and pants legs should be tucked into boots. Another option is to spray clothing with a repellent containing permethrin. Repellents containing permethrin should not be applied directly to exposed skin. Additionally, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin.

Folklore remedies, such as the use of petroleum jelly or hot matches, do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva or regurgitate gut contents, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided. A number of tick removal devices have been marketed, but none are better than a plain set of fine tipped tweezers.

Tick Bite Prevention Tips

Avoiding tick bites is the best way to reduce your risk of developing a tick-borne illness. The following personal tick bite prevention tips are recommended when exposure to a wooded or tick infested area is likely:

- Wear light colored clothing to make ticks easier to see.
- Wear long-sleeved shirts and long pants tucked into socks to deprive ticks of attachment sites.
- Check for ticks every three to four hours; particularly along waistbands, in the armpits, and groin area. Don't forget the back and the scalp!
- Use a tick repellent with DEET on skin and clothing according to the directions.
- Use a tick repellent with permethrin ON CLOTHING ONLY as directed by the label.

Stinging Insects

To avoid stinging insects, it is important to learn what they look like and where they live. Most sting reactions are caused by five types of insects: yellow jackets, honeybees, paper wasps, hornets and fire ants. Yellow jackets are black with yellow markings, and are found in various climates. Their nests, which are made of a paper-Mache material, are usually located underground, but can sometimes be found in the walls of frame buildings, cracks in masonry or woodpiles.

Honeybees have a rounded, "fuzzy" body with dark brown coloring and yellow markings. Upon stinging, the honeybee usually leaves its barbed stinger in its victim; the bee dies as a result. Honeybees are non-aggressive and will only sting when provoked. However, Africanized honeybees, or so-called "killer bees" found in the southwestern United States and South and Central America, are more aggressive and may sting in swarms. Domesticated honeybees live in man-made hives, while wild honeybees live in colonies or "honeycombs" in hollow trees or cavities of buildings. Africanized honeybees may nest in holes in building frames, between fence posts, in old tires or holes in the ground, or other partially protected sites. Paper wasps' slender, elongated bodies are black, brown, or red with yellow markings. Their nests are also made of a paper-like material that forms a circular comb of cells which opens downward. The nests are often located under eaves, behind shutters, or in shrubs or woodpiles.

Hornets are black or brown with white, orange or yellow markings and are usually larger than yellow jackets. Their nests are gray or brown, football-shaped, and made of a paper material similar to that of yellow jackets' nests. Hornets' nests are usually found high above ground on branches of trees, in shrubbery, on gables or in tree hollows.

Fire ants are reddish brown to black stinging insects related to bees and wasps. They build nests of dirt in the ground that may be quite tall (18 inches) in the right kinds of soil. Fire ants may attack with little warning: after firmly grasping the victim's skin with its jaws, the fire ant arches its back as it inserts its rear stinger into the skin. It then pivots at the head and may inflict multiple stings in a circular pattern. Fire ant venom often causes an immediate burning sensation.

Preventing stings

Personnel should stay out of the "territory" of the stinging insects' nests as much as possible. These insects are most likely to sting if their homes are disturbed, so it is important to have hives and nests around work areas destroyed. Since this activity can be dangerous, a trained exterminator should be hired.

If any flying stinging insects are encountered, workers should remain calm and quiet, and move slowly away from them. Many stinging insects are foraging for food. It is important to not look or smell like a flower—avoid brightly colored clothing and perfume when outdoors. Because the smell of food attracts insects, be careful when eating, or drinking sweet drinks like soda or juice outdoors. Keep food and beverages covered until consumed. Workers should avoid loose-fitting garments that can trap insects between material and skin.

Treating stings
If stung by a honeybee that has left its stinger (and attached venom sac) in your skin, remove the stinger within 30 seconds to avoid receiving more venom. A quick scrape of a fingernail removes the stinger and sac. Squeezing the sac should be avoided—this forces more venom through the stinger and into the skin. Hornets, wasps, and yellow jackets do not usually leave their stingers. Try to remain calm, and brush these insects from the skin promptly with deliberate movements to prevent additional stings. Then, quietly and immediately leave the area.

If stung by fire ants, carefully brush them off to prevent repeated stings, and leave the area. Fire ant stings usually result in the development of a blister about 24 hours after the sting. The material in this will become cloudy and appear to be pustular. IT IS NOT! Fire ant venom kills bacteria, this is just dead tissue and should be left alone. It will dry and heal within the next 7 – 10 days. If the blister is opened it must be monitored for secondary bacterial infection. Diabetics and others with circulatory disorders, including varicose veins and phlebitis, can be particularly at risk for complications, and should see a physician to monitor their condition after being stung. Up to 50% of patients develop large local reactions at the site of fire ant stings—swelling may last for several days and may be accompanied by itching, redness and pain.

Use topical steroid ointments or oral antihistamines to relieve itching. See your doctor if swelling progresses or if the sting site seems infected.

Poisonous Plants
Poison ivy, poison oak or poison sumac may be present in the work area. Personnel should be alerted to the presence of these plants, and instructed on methods to prevent exposure.

The main control is to avoid contact with the plant, cover arms and hands, and use Ivy Block barrier cream on exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with Ivy Wipes or soap and water, and observed for signs of reddening.

Snakes
The possibility of encountering snakes exists, specifically for personnel working in heavily wooded/vegetated areas. Avoid walking in areas where snakes may nest or hide. When walking, always look ahead for signs of snakes. Employees should make as much noise as possible when approaching a possible snake area to give snakes time to leave. Use a long handled shovel, heavy equipment or other tools when moving or lifting objects that could be used by snakes as cover. Never reach under or behind objects or into other areas where snakes may hide. Look before placing your hands or feet anywhere, and do not put your hands or feet into places you cannot see. Avoid walking alone in snake-infested areas. Do not go out of your way to disturb or kill a snake. Avoid snakes – living and dead. Even dead snakes can bite reflexively.

If an employee is bitten by a snake the following actions are recommended: An attempt should be made to identify the snake. Do not try and capture or kill the snake.

The victim should be transported to the nearest hospital within 30 minutes. First aid consists of washing the area around the wound to remove any unabsorbed venom. Keep the victim calm and limit the victim's physical activity. While limiting movement of the bitten body part, keep the bitten area at the level of the heart.
Remove all constricting clothing or jewelry from the bite site because swelling may occur. Remove shoes if bitten on the leg.

- Do not apply a tourniquet.
- Clean the wound if possible.
- Do not pack wound in ice or apply heat.
- Do not give the victim a sedative or alcohol.
- Do not waste time capturing or killing the snake.
- Do not cut into the bite area; you might damage important nerves, tissues or muscles

8.0 EXCAVATION SAFETY PRECAUTIONS

The backhoe should be positioned such that the operator's back is on the UPWIND side of each proposed excavation. Excavated soil stockpiles will be placed in an area downwind from the back hoe operator. Terracon site personnel will position themselves at the UPWIND side of each excavation within sight of the backhoe operator and outside the swing radius of the backhoe bucket. The backhoe operator will set the backhoe bucket, power down the backhoe and stand-by at ground level before Terracon approach the excavated area to collect samples. Terracon personnel will NOT enter excavations for any reason. Other backhoe operations safety precautions are as follows:

- The backhoe loader controls should only be operated from the operator's position — for the operator's safety, controls should never be activated from the ground.
- While operating a backhoe loader, the operator must be aware of several safety procedures. During travel, the bucket or other attachments should be carried as low as possible, and the backhoe should be locked in the transport position. It is important to the stability of the unit that travel or turning is done with the lift arms down and that the operator is looking in the direction of travel.
- Loading, unloading and turning should be done on flat, level ground. The operator should slow down when turning or traveling with a full bucket. Other important safety tips include keeping the heavy end of the backhoe loader uphill with the loader bucket full. The backhoe loader should go directly up or down a slope or incline with the loader bucket empty and not drive across slopes.
- When picking up a load, the operator must be aware to not exceed the rated operating capacity of the machine. Operators should never use attachments that exceed the capacity of the backhoe loader or are not approved for use by the manufacturer. When lifting objects with the backhoe loader, it is important that the operator keeps the objects balanced and as close to the backhoe loader as possible. The operator should swing lifted objects slowly and always lower objects to the ground before leaving the machine. The stabilizers should be used for increased stability when lifting objects with the backhoe loader.

- Most important to ensuring others' safety, the operator should never swing loads over other personnel. Some backhoe loaders come with an emergency stop button so operators can quickly shut down the backhoe loader, if needed.
- Every operator should be aware of the environmental conditions surrounding the backhoe loader. Operators should never use a backhoe loader in an atmosphere with explosive dust or gases or where the backhoe loader exhaust can contact flammable materials — explosion or fire can result. Exhaust gases can kill, therefore, it is important to have adequate ventilation when using a backhoe loader in an enclosed area.
- Before leaving a backhoe loader, operators should lower the lift arms and backhoe boom (unless it is locked), place the attachment flat on the ground, put all the controls in neutral, engage the parking brake, stop the engine and remove the key.
- Operators should never use a backhoe loader without an operator cab that does not have Rollover Protective Structure (ROPS) or Falling Object Protective Structure (FOPS) approval — the cab should not be modified from the manufacturer's original design in order to best protect the operator. Some open cab models allow operators to enter and exit from both sides of the machine. However on backhoe loaders with curb-side exit only, operators should be aware of traffic when exiting the cab.

Safety of Ground Personnel

- Operators should not carry riders. Also, operators should not allow bystanders within the backhoe arm working area — workers should never enter a trench while the backhoe is working and should wait to enter the trench until it has been reinforced with proper shoring equipment after the excavation is complete.
- Bystanders should also be aware of the machine's operation at all time, keeping out of the backhoe swing area and away from the stabilizers. No one should ever reach under or stand under raised lift arms, unless an approved lift arm support device is employed. Accidental movement of a lift arm control lever can cause the lift arms to drop.

9.0 SITE CONTROL

An exclusion zone, contaminant reduction zone and a support zone will be established whenever project activities require Level C or Level B personal protective equipment. Defined access and egress points will be established and personnel will enter only through those points.

As permitted by site topography, the area within a 50 foot radius of a drill rig, prove unit or excavation equipment be considered the site exclusion zone. Only those personnel designated by the Project Manager/SSO are allowed to enter the Exclusion Zone. Where practical, or where their use will prevent public injury, temporary signs or barricade fencing will be established to define the Exclusion Zone. No smoking is permitted within 100 feet of any soil boring or probe location on petroleum contaminated project sites.

If unauthorized personnel attempt to enter the exclusion zone, the SSO will verbally inform the individual(s) to leave the project site. If unauthorized individuals refuse to leave the exclusion zone or are considered in danger or pose danger to project personnel, the SSO will cease project activities (i.e., shut down drill rigs, excavation equipment, etc.) and notify the client representative

or the local police of the situation. Site activities will not resume until unauthorized personnel have left the project site.

10.0 AIR MONITORING AND SITE ACTION LEVELS

This air monitoring protocol is designed to prevent personnel exposure to airborne contaminants in excess of established permissible exposure limits. The results of field air monitoring will be used to determine the adequacy of initial personal protective equipment selection. Air monitoring equipment required for petroleum contaminated sites will include the following:

- **Photoionization Detector**

Task Leader(s) will be knowledgeable in the operation of the photoionization detector. A manual on the operation of the PID and the appropriate calibration kit will be mobilized to the project site with the instrument. Photoionization detectors will be calibrated under field conditions *each day* prior to use. Task Leaders are instructed to consult the manufacturer's specifications for appropriate calibration gas and calibration techniques.

A photoionization detector (PID) will be used to determine approximate hydrocarbon vapor concentrations in the BREATHING ZONE of site personnel. Continuous breathing zone air monitoring will be conducted during initial phases of intrusive activities (i.e., boring, excavation). If PID readings are less than 10 ppm, monitoring may be conducted at intervals of 10 minutes. If initial PID readings exceed 10 ppm, or if hydrocarbon odors become evident upon during auger advancement, continuous breathing zone air monitoring will be conducted.
If sustained PID readings in the breathing zone exceed 25 ppm, personnel will upgrade to respiratory protection as outlined below. Personnel will remain in air purifying respirators until the photoionization detector readings in the breathing zone have fallen and stabilized below 25 ppm.

10.1 Site Action Levels

Level D/D Modified	**Level C**	**Site Evacuation**
< 25 ppm	> 25 ppm	> 300 ppm

The Action Levels indicated above are for air in the breathing zone and NOT applicable to vapor above containerized soil samples. The Action Levels are established to prevent exposure to airborne petroleum hydrocarbon vapors in excess of established exposure limits. Although the Action Levels indicated for Site Evacuation are within the protective capacity of the respirator cartridges specified below, personnel will evacuate to the UPWIND side of the site if the continuous breathing zone vapor concentrations exceed these limits. The SSO will contact the Corporate Safety and Health Manager for discussion and re-evaluation of personal protective equipment and air monitoring requirements if airborne contamination exceeds Site Evacuation Action Levels. In the event that site evacuation is required, a modification of this safety and health plan will be issued with contingencies for combustible gas monitoring and upgrading to Level B personal protective equipment.

11.0 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

The air monitoring regimen identified above will allow initial project activity to begin in LEVEL D personal protective equipment to include:

- **Hard Hat**
- **Safety Footwear (ASTM spec; Impermeable or with outer impermeable covers)**
- **Nitrile or Neoprene Rubber Outer Gloves**
- **Nitrile Glove Liners**
- **Safety Eye Wear (ANSI Z-87 specification)**
- **Hearing Protection (if within 10 feet of drill rigs, concrete coring or other equipment which impairs normal conversation at < 5 feet.)**

If petroleum saturated soils and potential splashing conditions develop during the course of the assessment, personnel will upgrade to LEVEL D MODIFIED personal protective equipment. Level D Modified personal protective equipment ensemble consists of the above, plus:

- **Laminated Tyvek Coveralls**
- **Tape Sleeves/Legs to Gloves and Boots**

If air monitoring exceeds Action Level specified for upgrade to LEVEL C personal protective equipment, personnel will don:

- **Full Face Air Purifying Respirator**
- **Equipped with Combination Organic Vapor/Acid Gas/HEPA Cartridges**

Respirator cartridges will be changed daily prior to start of site activity.

11.0 DECONTAMINATION

Equipment decontamination is required on all sites with petroleum hydrocarbon impact. Personnel decontamination for projects below personal protective Level C will consist of washing off safety footwear, proper cleaning or disposal of outer and inner gloves and thorough washing of face, arms and hands. For projects involving Level C personal protective equipment, a decontamination station will be established and the following procedures enforced.

11.1 Personal Decontamination

Personnel will establish a decontamination station on the interface of the Exclusion Zone. A Contaminant Reduction Zone will be established and will extend 10 feet beyond from the decontamination station.

- Two Wash Tubs
- Scrub Brush
- Plastic Bags
- Water and Alconox Detergent

The wash tub on the exclusion zone side of the site will contain a solution of water and Alconox detergent; the second wash tub will contain clean rinse water. Personnel decontamination will

consist primarily of detergent washing and rinsing of reusable exterior protective gear. Coveralls will be removed by turning the clothing inside out.

Personnel may not leave the contaminant reduction zone without proceeding through the decontamination sequence described below. The general decontamination sequence should be as follows:

- Wash work gloves, boots and polylaminated protective coveralls,
- Rinse work gloves, boots and coveralls,
- Remove tape at wrists and ankles,
- Remove protective coveralls,
- Remove respirator
- Dispose of spent cartridges; wash and rinse respirator
- Remove outer gloves
- Remove inner gloves

Expendable personal protective equipment will be placed in plastic trash bags, sealed and disposed of per client agreement. Decontamination solutions will be containerized or disposed of as arranged by Project Manager.

11.2 Equipment Decontamination

Decontamination of equipment will be performed to limit the migration of contaminants off-site. All equipment will be cleaned prior to site entry to remove grease, oil and encrusted soil.

Decontamination of large equipment will consist of physically removing gross contamination with shovels, brushes etc. followed by detergent and water high pressure wash with a clean water rinse. The Project Manager is responsible for determining if decontamination solutions must be containerized. If so, a decontamination sump or polyethylene sheeting and fluid containers will be mobilized and established in the decontamination area. Decontamination of hand samplers and similar small equipment will be performed at a designated location within the Contaminant Reduction Zone. Decontamination of such equipment will consist of detergent solution wash and clean water rinse.

11.3 Power Washer/Decontamination Safety

The operator should wear safety glasses or a face shield at all times during use of the power washer. Caution should be used while operating the washer to ensure that all Site personnel are out of the area.

12.0 SITE COMMUNICATIONS

Communication between personnel within the Exclusion Zone will be via verbal communication or hand signals. Visual contact between members of task teams should be possible throughout the course of project activities. Contact with the SSO will be through direct verbal communication. The following hand signals will be used by personnel wherever respiratory protection and/or equipment noise limit verbal communication.

Signal	Meaning
Thumbs Up	OK; all is well
Grab throat with both hands	Can't breathe
Shake head, thumbs down	NO, negative
Point right (when facing equipment operator)	Move/steer left
Point left (when facing equipment operator)	Move/steer right
Grab partner's wrist	Leave area immediately

13.0 EMERGENCY RESPONSE PROCEDURES

The Project Manager is responsible for obtaining and recording the following emergency information prior to site mobilization:

Location of Nearest Telephone: Cellular phone held by Terracon employee

Nearest Hospital/Clinic: Tampa General Hospital Phone: 813-844-7000

Estimated Drive Time: Approximately 10 min

Directions From Site: (Attach a Site Diagram as an Appendix to this Plan): see attached hospital route map

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Ambulance:	**911**
WorkCare (Managed Care Provider)	**888-449-7787**
Fire Department:	**911**
Police:	**911**
Poison Control Center:	**1-800-222-1222**
Project Manager: Rama Ruttala	**813-804-7971**
Safety and Health Manager: Adam Maier	**(913) 202-7529**
Client Contact: FDEP	**850-245-8873**

13.1 Personal Injury

The SSO and at least one other individual on site will be appropriately trained to administer first aid and CPR. A certificate issued by the American Red Cross, National Safety Council or equivalent will be considered appropriate.

In the event of non-life threatening injuries such as minor cuts, burns, exhaustion, heat cramps, insect stings, etc., the affected employee will be removed to a safe location and appropriate first

aid measures should be rendered. It is the responsibility of every employee to report all unsafe acts and incidents (equipment or facility damages as well as injury accidents) to their direct supervisor as soon as possible. Personnel who incur injuries not requiring immediate medical attention are instructed to call WorkCare at 888-449-7787. The affected supervisor will complete an Accident/Injury Investigation form within 48 hours of the incident, and forward it to their home office or enter it directly into Terracon's Automated Claims Management System. Details will be shared with the client and/or contractor as may be required by contractual agreement. A root cause analysis will be prepared by the affected Office Manager. All reports must include written recommendations of actions the office will take to prevent a recurrence of the incident.

For more serious injuries the Site Safety Officer or designee will summon an ambulance to the project site. No attempt will be made by Terracon personnel to move the victim, without the aid and/or instructions of qualified medical personnel.

Where air monitoring indicates the absence of toxic gases or vapors, the ambulance will be directed to the affected employee. If site conditions warrant and as time permits, the wheels of the ambulance will be decontaminated with high pressure wash. The SSO or designee will accompany the ambulance to the medical facility, and provide guidance concerning additional decontamination which may be required for the injured employee, ambulance or attendants.

Whenever an injury occurs on sites with contamination requiring personal protective equipment greater than Level D modified, a minimum of two employees will don appropriate equipment and proceed to the victim. An ambulance will be called immediately. If the extent of injuries permit, the injured employee will be removed to fresh air. Appropriate first aid will be administered.

If rescuer(s) assess that the victim cannot be removed without a stretcher or other specialized equipment, the victim will be removed at the earliest possible moment by appropriately attired Terracon personnel with the direction and/or assistance of qualified medical response personnel. The injured employee will be immediately decontaminated and transported to the nearest medical facility. A crew member designated by the SSO will inform the ambulance crew of contaminants of concern and provide assistance with additional decontamination if required.

13.2 Evacuation and Shutdown Procedures

The SSO will establish and notify site personnel of emergency "rally" points. In the event of a site emergency, personnel will immediately exit the site and assemble at the designated rally point. Evacuation routes will be dependent on site topography and wind conditions. The routes will be selected and presented by the SSO daily prior to site activity.

If emergency evacuation becomes necessary, the SSO will sound the emergency alarm (e.g. support vehicle horn or compressed air horn). Personnel will safely shutdown all electrical and mechanical equipment and quickly proceed to closest designated rally point. The SSO will then account for each crew member on site.

In the event that a Terracon employee does not report to the designated rally point within 5 minutes of the evacuation alarm, the SSO will perform an immediate assessment of site conditions. If site conditions do not pose an immediate hazard to life or health, the SSO will initiate search and rescue efforts utilizing two crew members attired in appropriate personal protective equipment.

14.0 THERMAL STRESS

14.1 Heat Stress

Whenever ambient temperature exceeds 70 degrees F and personal protective equipment requirements are Level D or Level D modified, the following heat stress monitoring and preventive measures will be implemented:

- Mobilize at least one gallon of water for each field employee during each day of site activity.
- Periodically observe personnel for signs of heat stress (excessive perspiration, flushed skin, nausea, etc.).
- Move affected workers out of contaminant zones,
- Loosen protective clothing and permit them to rest
- Have conscious, affected personnel drink at least one 8 oz. glass of cool water.
- Check pulse; personnel should not return to work until pulse rate is less than 90 beats/min.

14.2 Heat Stress in Level C/Level B PPE

In addition to the above precautions, the following procedures will be implemented whenever the ambient temperature exceeds 70^{o} F and personal protective equipment requirements are Level C or above. Ambient temperature will be measured with a dry bulb thermometer and percent cloud cover will be estimated:

1.0 = No Clouds
0.75 = 25% Clouds
0.5 = 50% Clouds
0.25 = 75% Clouds
0.0 = 100% Clouds).

Calculate the adjusted temperature using the following formula:

ADJUSTED TEMPERATURE = 13(% CLOUD COVER) + DRY TEMPERATURE

Rest regimens will be implemented at frequencies dependent upon adjusted temperature. Monitor pulse during each rest period.

Adjusted Temperature	Rest Period/Monitoring Frequency
90+	After 15 minutes
87.5-90	After 30 minutes
82.5-87.4	After 60 minutes
77.5-82.5	After 90 minutes
70.5-77.4	After 120 minutes

Employees will return to work only after their pulse rate is below 90. Fluid replacement will be encouraged during each rest period. The use of stimulants and alcoholic beverages in off hours should be discouraged to prevent heat related illnesses.

14.3 Cold Stress

Persons working outdoors in low temperatures are subject to cold stress, especially if the temperature is at or below freezing. Exposure to cold for a short period of time can cause severe injury to the surface of the body (frostbite), or result in profound general cooling, potentially resulting in clinical hypothermia and death. Areas of the body with high surface to volume area, such as fingers, toes, and ears are the most susceptible. In general, the body's response to cold stress progresses from frostbite to hypothermia. Recognition of the symptoms of cold stress is essential to worker protection when operating in low temperatures.

Utilize cold weather clothing available from Terracon's personal protective equipment vendor, including thermal hardhat liners, gloves, and footwear traction devices to prevent slips and falls on slick and icy walking surfaces.

15.0 TRAFFIC CONTROL

Worksites confront motorists with a situation they do not expect, cannot anticipate and find confusing. They also tend to create hazards with which the driver can collide. Worksites distract motorist's attention from the driving tasks and expose workers to oncoming traffic.

Some inadequate traffic control measures that have led to worksite traffic accidents include:

- Inadequate advance warning
- Inadequate and inappropriate signs and messages
- Confusing messages
- Inadequate guidance through the work zone
- Conflicting pavement markings
- Unprotected hazard such as shoulder drop offs

Whenever project sites under Terracon control will disrupt vehicle traffic or expose Terracon personnel to the hazards of vehicle traffic, (i.e., work on an active roadway, including shoulders) adequate traffic control measures must be implemented.

Terracon's preferred method for implementing traffic control is to request that clients assume this responsibility. Where clients refuse to assume responsibility, Terracon will attempt to sub-contract the service to a reputable traffic control firm. Terracon personnel with no training or experience in traffic flagging or the placement of traffic control devices such as signs, barricades or flashers are prohibited from engaging in traffic control operations unless directed by a trained and experienced individual.

Project-Specific Traffic Control Requirements

The Project Manager will be primarily responsible for assuring that traffic control measures utilized on the various compressor station project sites (where applicable) are in accordance with Department of Transportation requirements. All Terracon personnel working within 10 feet of an active roadway will wear ANSI Class III traffic safety vests as the outermost garment. All Terracon field personnel will participate in site traffic control briefings with affected field representatives where requested.

16.0 MOTOR VEHICLE SAFETY

Vehicles must be periodically inspected in accordance with Terracon motor vehicle operations policies. Any vehicle found to be unsafe shall not be operated and shall be removed from service until it can be repaired or serviced and rendered safe. Driving at the maximum posted speed limit can be too fast for safety in some situations.

Drivers shall use good judgment and proceed at a speed suitable for the conditions of the vehicle, road, traffic, and weather. Vehicles are not to be moved until all passengers are properly seated inside the vehicle. All operators and passengers must use seat belts and shoulder harnesses, if the vehicle is so equipped.

Before driving, all windows should be cleared of any materials such as frost, mud, or dew that may reduce visibility. Drivers should not engage in distracting activities while a vehicle is in motion. The vehicle should be pulled over to the side of the road and stopped when performing activities such as dialing or using a mobile telephone or taking notes. If the phone rings while driving, let the cellular voice mail service take the call and listen to the message later when you are parked.

Vehicles should be properly parked. When possible, they should be parked so that no backing is required when leaving, unless doing so creates a greater hazard. Where backing is required when leaving a location, the driver shall walk around the vehicle prior to backing and inspect the area for any potential obstructions, or use a spotter. Hazard lights shall be utilized when parking on a road shoulder. Bridge load limits should be reviewed and a pre-approved route established prior to transporting heavy equipment over county road bridges.

Items carried inside the vehicle should be secured to prevent them from being thrown about in event of emergency braking or sharp maneuvers. Items that cannot be secured must be carried in an enclosed trunk or luggage compartment that is physically separated from the passenger area.

All large tools should be carried outside the cab of the vehicle and be properly secured. All fittings, tools, supplies, equipment, and other cargo carried on cargo beds or in the back of trucks must be properly secured and restrained.

17.0 WORK AROUND OPEN WATER

Work around open water and boats presents an unstable surface that may lead to falls and potential for drowning or injury. The following safety precautions are required. The “buddy system” shall be used during all sampling tasks. Within 6 feet of unguarded water more than 3 feet deep, workers will don USCG Type III, V, or better personal floatation device (PFD) with retro reflective tape worn by all personnel aboard boat at all times. The maximum capacity (weight and passenger number) of the boat shall not be exceeded at any time (this number is listed on the boat tag). Workers should be cautious when boarding and keep weight toward center of boat Personnel will not stand in the boat when underway. All equipment must be secured to the boat or securely stowed during transit. Appropriate footwear should be worn when it is necessary to access the shoreline by wading, and nonskid footwear must be worn on board. Employees should dress appropriately for the weather (sunscreen must be worn when sunburn is a threat). The boat must always proceed at a safe speed, under control, and ready to stop within a safe distance. A ring

buoy with at least 90 feet of line shall be provided and readily available for emergency rescue operations. In open water areas, at least one life saving skiff shall be immediately available.

Hip waders shall be worn when sampling in shallow waters without a boat to safe guard against stepping on a deep hole or getting stuck in the mud. A PFD should be worn with the waders if you cannot always see to bottom. Use the “buddy system” but keep some distance apart when walking from point A to point B to reduce the risk of both people at the same time stepping in a deep hole. A ring buoy with at least 90 feet of line shall be provided and readily available for emergency rescue operations. If working in a small area close to shore, secure the worker with safety line and harness with the line tended by a second person on shore.

ACKNOWLEDGMENT OF INSTRUCTION

I understand this project involves the excavation of soils impacted by petroleum hydrocarbons. I have read this Safety and Health Plan and have received instructions for safe work practices, personal protective equipment and air monitoring requirements. I further understand that if I encounter unanticipated contamination or site conditions I am to leave the site and immediately notify the Project Manager and Corporate Safety and Health Manager of the conditions observed.

PROJECT NAME: Tampa City-Fleet Maint #7- Jackson ST Parking Lot

TERRACON JOB #: H4187072

Name (Please Print)	**Signature**	**Date**

PERSONAL PROTECTIVE EQUIPMENT UTILIZED:

_____ **LEVEL D** _____ **LEVEL D MOD.** ____ **LEVEL C**

Safety briefing performed by: _____ Date:_____

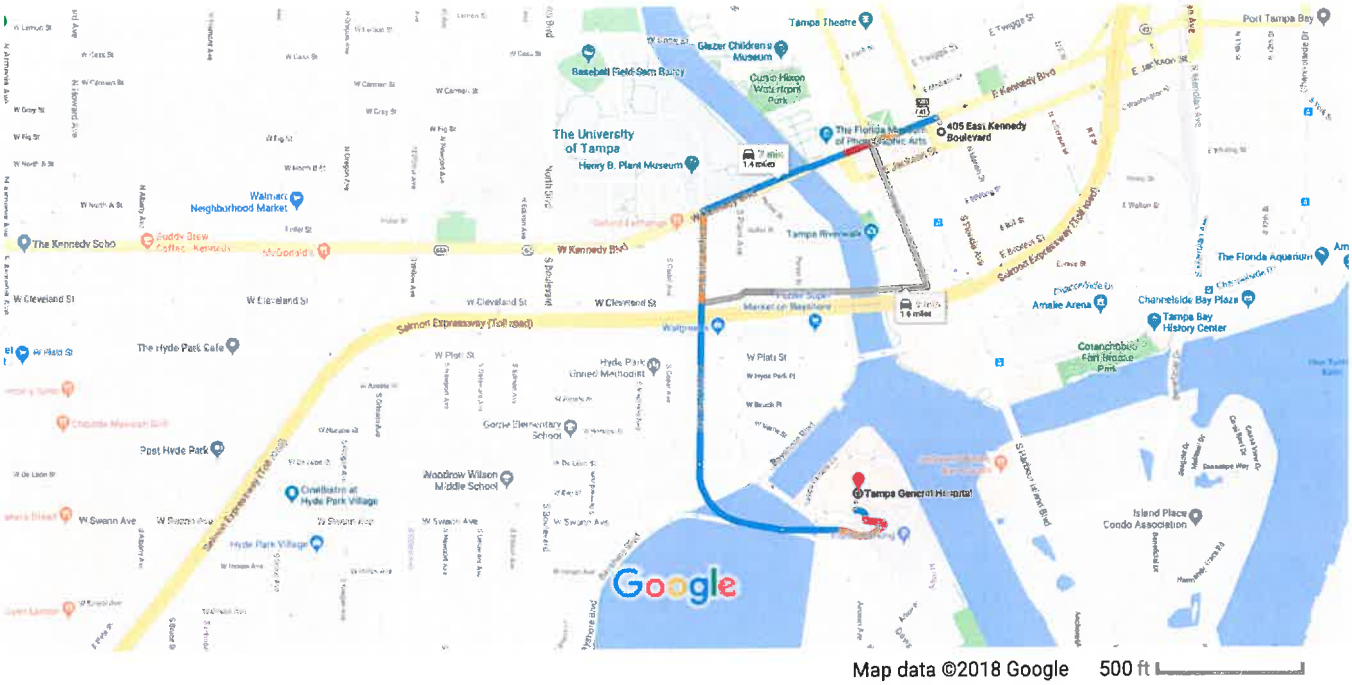
PETROLEUM CONTAMINANT(S):_____ _____ _____

AIR MONITORING RESULTS (Attach separate page if required.)

Google Maps

405 East Kennedy Boulevard, Tampa, FL to Tampa General Hospital

Drive 1.4 miles, 7 min



Map data ©2018 Google 500 ft

405 E Kennedy Blvd

Tampa, FL 33602

1. Head west on E Kennedy Blvd toward N Florida Ave — 0.5 mi
2. Turn left onto S Hyde Park Ave — 0.5 mi
3. Use the left lane to take the ramp to Tampa General Cir — 0.2 mi
4. Keep left, follow signs for Tampa General Hospital — 0.2 mi
5. At the traffic circle, take the 3rd exit onto Tampa General Cir — 249 ft
6. Turn right
   Destination will be on the right — 161 ft

Tampa General Hospital

1 Tampa General Cir, Tampa, FL 33606

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the

map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Certificate of Completion

This certifies that

Paul E. Maxwell

has successfully completed

8 Hour HAZWOPER Refresher Training

Refresher certification does NOT necessarily indicate initial 24 or 40 Hour HAZWOPER certification

In Accordance w/Federal OSHA Regulation 29 CFR 1910.120(e) & (p)

And all State OSHA/EPA Regulations as well including 29 CFR 1926.65 for Construction.

This course (Version 1) is approved for 8 Contact Hours (0.8 CEUs) of continuing education per the California Department of Public Health for Registered Environmental Health Specialist (REHS) (Accreditation # 044).

Julius P. Griggs
Julius P. Griggs
Instructor #892

1710275150910
Certificate Number

10/27/2017
Issue Date

SAFETY UNLIMITED, Inc.
OSHA Compliant Safety Training Since 1993

2139 Tapo St., Suite 228 Simi Valley,CA 93063
(888) 309-SAFE (7233) or 805 306-8027
https://www.safetyunlimited.com

Scan this code or visit www.safetyunlimited.com/v to verify certificate.

Proof of initial certification and subsequent refresher training is NOT required to take refresher training

Certificate of Completion

This certifies that

Vincent M. Carter

has successfully completed

OSHA 40 Hour HAZWOPER Training

In Accordance With Federal OSHA Regulation 29 CFR 1910.120(e)

And State OSHA/EPA Regulations as well including 29 CFR 1926.65(e)

This course is approved for 40 Contact Hours (4 CEUs) of continuing education per the California Department of Public Health for Registered Environmental Health Specialist (REHS) (Accreditation # 044)

Julius P. Griggs
Julius P. Griggs
Instructor #892

1711031216958
Certificate Number

11/3/2017
Issue Date

SAFETY UNLIMITED, Inc.
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CONFINED SPACE OPERATIONS POLICY

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Table of Contents

1.0 Scope

This policy sets out the requirements and procedures for tasks that may expose Terracon employees to permit and non-permit confined space entry hazards. These procedures will be used in all Terracon workplaces and are to be enforced among contractors. This written program shall be available for inspection by employees and their authorized representatives.

Clients may have their own policies, procedures and forms. Where it is a requirement that client procedures and forms are used, it will be in addition to those required by this section.

2.0 Definitions

- **"Attendant"** means an individual stationed outside and never enters the permit space who is trained in the procedures of this program. Duties include be familiar with and understands the hazards that may be faced during entry, signs or symptoms, and consequences of the exposure; aware of possible behavioral effects of hazard exposure in authorized entrants; continuously maintains an accurate count of authorized entrants in the permit space; means used to identify authorized entrants; remains outside the permit space during entry operations until relieved by another attendant; communicates with authorized entrants as necessary to assess entrant status and to alert entrants of the need to evacuate the space; assesses activities and conditions inside and outside the space to determine if it is safe for entrants to remain in the space; orders the authorized entrants to evacuate the permit space immediately if conditions warrant from inside or outside the entry space; if the attendant cannot effectively and safely perform all the duties required under this section; summons rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards; takes appropriate actions when unauthorized persons approach or attempt to enter a permit space; informs the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space; m) performs non-entry rescues as specified by the employer's rescue procedure; performs no duties that might interfere with the attendant's primary duty to assess and protect the authorized entrants.
- **"Authorized Entrant"** is an employee authorized by the employer to enter and perform required work in a permit-required confined space. Duties include be familiar with and understand the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure; proper use of required equipment and attendant communication; immediate exit of the space when required.
- **"Blanking or blinding"** means 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 that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.
- **"Double block and bleed"** means the closure of a line, duct or pipe by locking and tagging a drain or vent which is open to the atmosphere in the line between two locked-closed valves.
- **"Confined Space"** any space that is
  - large enough and configured that an employee can bodily enter and perform work,
  - has limited or restricted means for entry or exit (i.e., tanks, vessels, bins, silos);

- is not designed for continuous employee occupancy.

- **"Controlling Contractor"** is the company taking the lead on any confines space operations.
- **"Emergency"** means 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"** means the surrounding and effective capture of a person by a liquid or finely divided solid substances that can be aspirated to 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"** means the act by which a person intentionally passes through an opening into a permit- required confined space. Entry includes ensuing work activities in that space and is considered to have entered as soon as any part of the entrant's face breaks the plane of an opening into the space.
- **"Entry Permit (permit)"** means the written or printed document that is provided by the employer to allow and control entry into a permit space and as an attachment to this document.
- **"Entry Supervisor"** means the person 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 program. Duties also include be familiar with and understands the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure; b) verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin; c) verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin; d) terminates the entry and cancels or suspends the permit as required; e) verifies that rescue services are available and that the means for summoning them are operable, and that the employer will be notified as soon as the services become unavailable; f) removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; g) determines, whenever responsibility for a permit space entry operation is transferred, and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

  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 program for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

- **"Hazardous Atmosphere"** means an atmosphere which exposes employees to a risk of death, incapacitation, injury, acute illness or ability of self rescue (escape from the permit space) from one or more of the following causes:

- A flammable gas, vapor or mist in excess of 10% of it's lower flammable limit (LFL).
- An airborne combustible dust at a concentration that meets or exceeds it's LFL or obscures vision at a distance of five feet (1.52 M) or less.
- An atmospheric oxygen concentration below 19.5% or above 23%.
- An atmospheric concentration of any substance for which a dose is published in Group 14 for Radiation and Radioactivity or a permissible exposure limit is published in Title 8 CCR, Sect 5155 for airborne contaminants and which could result in employee exposure in excess of its dose or permissible exposure limit.

Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

- Any atmospheric condition recognized as immediately dangerous to life or health.

Note: For air contaminants for which a dose is not published in Group 14 for Radiation and Radioactivity or a permissible exposure limit is not published in CCR Title 8, Section 5155 for airborne contaminants, other sources of information such as: Material Safety Data Sheets that comply with CCR Title 8, Section 5194, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

- **"Host Employer"** is the company that 'owns' the confined space where Terracon is performing work.
- **"High Hazard Rating"** means
- **"Hot Work Permit"** means the employer's written authorization to perform operations (for example, riveting, welding, cutting, or burning) capable of providing a source of ignition.
- **"Immediately dangerous to life or health (IDLH)"** means any condition which poses an immediate threat of loss of life; may result in irreversible or immediate-severe health effects; may result in eye damage; irritation or other conditions which could impair escape from the permit space.

  Note: Some materials -- hydrogen fluoride gas and cadmium vapor, for example -- may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

- **"Inerting"** means rendering the atmosphere of a permit space non-flammable, non-explosive or otherwise chemically non-reactive by such means as displacing or diluting the original atmosphere with steam or a gas that is non-reactive with respect to that space.

  Note: This procedure produces an IDLH oxygen-deficient atmosphere.

- **"Isolation"** means the separation of a permit space from unwanted forms of energy or material into the space which could pose a serious hazard to entrants. Isolation is usually accomplished by blanking or blinding; removal or misalignment of pipe sections or spool pieces; double block and bleed; or lockout / tagout.

- **"Line Breaking"** means 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.
- **"Low-Hazard permit space or Non-permit space"** means a permit space where there is an extremely low likelihood that an IDLH or engulfment hazard could be present, and where all other serious hazards have been controlled.
- **"Low Hazard Rating"** means a permit required confined space that when entered contains limited hazards which would unlikely cause bodily injury or harm.
- **"Moderate Hazard Rating"** means a permit required confined space that when entered contains hazards that have the potential to cause bodily injuries and harm, but is unlikely to pose an IDLH atmosphere.
- **"Oxygen deficient atmosphere"** contains less than 19.5% oxygen by volume.
- **"Oxygen enriched atmosphere"** contains more than 23% oxygen by volume.
- **"Qualified Person"** means an individual who has been trained in and is knowledgeable of the task requested to be performed.
- **"Permit-required confined space (permit space)"** means a confined space that has one or more of the following characteristics:
  - Contains or has a potential to contain a hazardous atmosphere;
  - Contains a material that has the potential for engulfing an entrant;
  - Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
  - Contains any other recognized serious safety or health hazard.
- **"Permit-required confined space program (permit space program)"** means the employer's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.
- **"Permit System"** means the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.
- **"Prohibited condition"** means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.
- **"Rescue service"** means the personnel designated to rescue employees from permit spaces.
- **"Retrieval system"** means the equipment such as a line or rope secured at one end to the worker by a chest-waist or full-body harness and with the other end secured to either a lifting device, or to an anchor point located outside the entry portal used for non-entry rescue of persons from permit spaces.
- **"Testing"** means 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. If electronic or thermal equipment is used to perform such tests, and the possibility exists of an explosive substance or a hazardous atmosphere due to flammable gases and vapors, then the testing equipment must be approved for use in such explosive or flammable conditions as required by Title 8 CCR, Section 2540.2.

Note: Testing enables employers to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

3.0 Legislative Requirement

Under OSHA safety legislation procedures must be established to protect employees from confined space entry hazards. At a minimum, Terracon policies will meet the applicable reporting requirements of OSHA 29 CFR 1910.146, OSHA 29 CFR 1926.1201 - .1213 and Cal-OSHA T8 CCR 5156 / 5157. By implementing the procedures stated, Terracon personnel will ensure safe operations during confined space entry and compliance with OSHA regulations.

4.0 Policy

All Terracon employees will receive confined space training required by this policy and adhere to all requirements outlined under this policy. Employees will also participate in the development and implementation of this program.

Terracon does not allow contractors or subcontractors to perform confined space work in its operations.

5.0 Responsibility

All employees have the responsibility to adhere to this policy. They will also utilize all PPE provided by the Company. Failure to follow this policy will result in disciplinary action up to and including dismissal.

Supervisors are competent persons and have the responsibility to ensure confined spaces are identified to crews prior to mobilization and appropriate hazard controls are implemented. They must also ensure PPE is available as required by this policy. Supervisors will also have the responsibility for knowing and following all client-required procedures.

The *Terracon Safety* will schedule annual auditing of the program based on cancelled permits or other reports to ensure compliance by operations and identify needs for revision to ensure employee protection.

Management will review all reports. It is the responsibility of management to administer disciplinary action to any employee not adhering to the requirements of this program.

6.0 Procedures

6.1 Identifying Permit Spaces

In order determine which spaces are confined spaces, evaluation of each space by a competent person should be based on the definition of confined space as stated in the definitions section above. A confined space is any area that has one or more of the following criteria:

- Is large enough and configured so an employee can bodily enter and perform work;
- Has limited or restricted means for entry or exit (i.e. tanks, vessels, silos, storage bins, hoppers, vaults, pits and dike areas); or
- Is not designed for continuous employee occupancy.

Once a space has been classified as a confined space, further evaluation is required to determine if the space is a permit-required confined space. The regulation defines a permit-required confined space as a confined space that has one or more of the following characteristics:

- Contains or has a known potential to contain a hazardous atmosphere;
- Contains a material with the potential for engulfment of an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor which slopes down to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard.

If a space has been classified as a *permit required* space, a Permit Space Hazard Assessment / Entry Permit form must be completed and a copy of this program available near the permit site location.

When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, the supervisor shall reevaluate that space and, if necessary, reclassify it as a permit-required confined space. A space classified by the supervisor as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:

(1) If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space and the atmospheric hazards remain eliminated.

(2) If it is necessary to enter the permit space to eliminate hazards, such entry shall be performed as a permit space. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.

If hazards arise within a permit space that has been declassified to a non-permit space, all entrants shall exit the space. The supervisor shall then reevaluate the space and determine whether it must be reclassified as a permit space.

Permit- and non-permit required confined spaces common on Terracon job sites include but are not limited to:

- fluid storage (Baker type) tanks
- well vaults

- pump houses
- mud pit / tanks

Hazards associated with them will be addressed in the training program for all personnel.

Signs shall be posted near each permit-required confined spaces to notify employees of the hazards that may be present and that only authorized entrants may enter the permit space.

If an unauthorized person(s) approaches or attempts to enter a permit space take the following actions: (1) Warn the unauthorized persons that they must stay away from the permit space; (2) Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and (3) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

ALL Terracon employees shall be advised that unauthorized entry into a permit-required confined space is punishable with disciplinary action up to and including termination of employment!

In many cases, Terracon may perform confined space entry at 3rd party locations. In that case, the 'host employer' must provide details to the 'controlling contractor' regarding all permit space location(s), associated foreseeable hazards, and previous hazard controls implemented. This information will be provided to the entry contractor and/or any other entity who may enter or be affected by the confined space. Site specific entry procedures must be provided to the entry contractor by the controlling contractor. In return, the entry contractor must provide the controlling contractor specific permit entry procedures. Excellent coordination between the entry contractor and the controlling contractor is required to ensure safe operations during multi-entity entry operations or entry during foreseeable, potentially hazardous conditions. Please note that is against Terracon policy to perform confined space operations if either of these conditions are present. Upon completion of confined space operations, the controlling contractor must debrief the entry contractor and discuss any hazardous concerns noticed during entry.

6.2 Entry Procedures – Step by Step Guidelines

1. Ensure that all personnel have been trained in confined space entry operations in accordance with this policy.

2. For a permit-required confined space a "Confined Space Entry Permit" shall be completed by the entry supervisor per the requirements of this document.

3. Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed. When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects falling from above.

4. Assemble all necessary safety and monitoring equipment for atmospheric testing. Safety equipment may include full body harness for personnel retrieval, life lines, tripods, ladders, boundary markers and emergency information. Ensure all information is correct, equipment is in good condition and air monitoring equipment has been calibrated according to manufacturer's specifications.

5. Thoroughly and carefully test the confined space atmosphere inside the space and document results on the entry permit. Monitoring of the atmosphere inside the space must be performed by a qualified person using properly calibrated instruments and following established procedures. All entrants will have the opportunity to review the calibrated air monitoring data prior to entry. Three types of atmospheric hazards that will be monitored in confined spaces (in this order) are; oxygen deficiencies, combustible gases and the presence of toxic gases or vapors. Atmospheric testing should be conducted at two foot (2') intervals from the top of the confined space to the bottom. This is especially important if cutting, welding or any ignition source is present. Monitoring should take place prior to entering the confined space and ongoing throughout the work period. Monitoring should be performed on a continuous basis. Results of all atmosphere monitoring must be periodically recorded and maintained in a permanent file for inspection and reference purposes.

6. Ventilation and other engineering controls should be in-place and in good working condition prior to entering the space. Mechanical ventilation from a clean air source and/or purging devices are necessary engineering controls if atmospheric testing indicates oxygen deficiency, or the presence of flammable or toxic materials within the space. If the above conditions exist, entry into the space *will not* occur until air is purged and atmosphere is rendered free of atmospheric hazards. The atmosphere will be continually ventilated and monitored during confined space operations. If engineering controls are not capable of eliminating the atmospheric hazard, respiratory protection will be required. Implementation of a respiratory program is essential for compliance with this program. Reference Terracon Respiratory Protection Program.

7. Entry and exit equipment such as ladders should be installed and secured. Rescue equipment including but not limited to; tripods, lifelines, and harnesses should be in-place and ready to use. Needed work tools should be assembled so that the attendant does not have to leave the entry area. (NOTE: ladders are required if confined space is higher than the entrants shoulders).

8. Consideration of physical hazards and mechanical hazards in and around the confined space should be noted. All connecting pipes will be blanked off, physically separated, capped, sealed or otherwise secured. All pipelines carrying process materials must be flushed, drained and isolated using block and bleed connections. Mechanical hazards inside the space may include rotating equipment or equipment with moving parts (i.e. blenders, mixers, agitators, blades). Other physical hazards include thermal components or heated atmospheres (i.e. hot mixers in blending areas). Hot areas should be allowed to cool prior to entering the space. A comprehensive lockout / tagout program prepared in accordance with OSHA Standard for Control of Hazardous Energy (29 CFR 1910.47) will be implemented where necessary. Reference Terracon Control of Hazardous Energy Sources Policy.

9. When the confined space entry permit has been completed and after identified hazards have been discussed and the permit reviewed with involved employees, the authorizing entry supervisor, each entrant and the attendant will sign the permit. Work in the confined space may begin at that time.

10. Each permit space will require an attendant. An attendant will only monitor one permit space at a time. The attendant will be trained and immediately available to perform rescue and emergency services.

11. Once work has commenced and an entrant is inside the permit space the attendant *may not leave the entry area until entrant has exited the space!*

12. If a hazardous atmosphere or condition is detected during entry:

    Each employee shall leave the space immediately;

    - The space shall be evaluated to determine how the hazardous atmosphere / condition developed; and
    - Measures shall be implemented to protect employees from the hazardous atmosphere / condition before any subsequent entry occurs.

13. When the necessary work has been completed the authorizing entry supervisor will cancel the confined space entry permit.

6.3 Entry Permit

Prior to any permit space entry, an entry permit must be completed. The permit identifies all conditions that must be evaluated to ensure safe entry and is to be kept in the area of the entry, for reference by all persons involved. The Terracon Confined Space Entry Permit is attached to this document.

The entry permit shall include the following information:

1. The hazards of the permit space.
2. The measures for isolation of the permit space prior to entry.
3. The measures, such as lockout / tagout, equipment and procedures for purging, inerting, ventilating and flushing, used to remove or control potential hazards.
4. Acceptable entry conditions, quantified with regard to the hazards identified in the permit space, which must be maintained during entry.
5. Testing and monitoring equipment and procedures by which the employer will verify that acceptable environmental conditions are being maintained during entry.
6. The results of initial and periodic air monitoring tests performed accompanied by the names or initials of the testers and by an indication of when the tests were performed.
7. The rescue and other services which would be summoned in case of emergency and the means of communication with those services.
8. Rescue equipment to be provided on-site, if necessary; and / or procedures for summoning emergency services.
9. The communication procedures and equipment used by authorized entrants and attendants to maintain contact.
10. The personal protective equipment, such as respirators, clothing and retrieval lines, provided in order to ensure employee safety.
11. Any other information whose inclusion is necessary, given the circumstances of the particular permit space, in order to ensure employee safety.

In addition to the items listed above, the entry permit shall include as a minimum the following information:

1. The identity of the permit space.
2. The purpose of the entry.
3. The date of the entry and the authorized duration (a permit may be valid for up to 1 year, so long as all conditions under which the permit was issued are maintained).
4. A list of authorized entrants.
5. A list of eligible attendants.
6. A list of individuals' eligible entry supervisors.
7. The signatures, together with the name printed or otherwise legible, of the individual authorizing the entry, verifying that all actions and conditions necessary for safe entry have been performed.
8. If "hot work" is required inside the permit space, this information shall be noted on either the entry permit or on a separate hot work permit, which should be attached to the entry permit.

The entry supervisor shall sign or initial the permit before the entry begins, but not until all actions and conditions necessary for safe entry into the permit space have been performed. The completed permit shall be made available at the time of entry to all authorized entrants or their authorized representatives, by posting near the entry portal so that the entrants can confirm that pre-entry preparations have been met.

The duration of the permit may not exceed the time required to complete the assigned task of job identified on the permit.

The entry supervisor shall terminate entry and cancel the entry permit when the entry operations covered by the entry permit have been completed; or a condition that is not allowed under the entry permit arises in or near the permit space.

Canceled entry permits will be retained for at least 1 year to facilitate the review of the permit space program. Any problems encountered during an entry operation shall be noted on the pertinent permit so that appropriate revisions to the permit space program can be made.

6.4 Training

Training of personnel involved in various aspects of the confined space entry program is essential to its success. Prior to any entry into a permit space, all parties involved will be trained on the proper task specific procedures required for permit space work. The trained employees must acquire the understanding, knowledge and skills necessary for the safe performance of the duties which they will perform. The training program will be presented to all employees involved with permit space entry:

- Before the employee is first assigned permit space duties.
- Before there is a change in assigned duties that will require the employee to perform permit space work.
- Whenever there is a change in permit space operations that presents a hazard about which an employee has not been previously trained.
- Whenever the employer has reason to believe that proper permit space entry procedures are not being followed or if there are inadequacies in employee's knowledge or use of permit space procedures.

The training program will be in a language understandable to the employee and includes written examinations and skills test to ensure employees understand and comprehend course content. Documentation of the training shall include the names and signatures of the all trained employees, date of training, and the names and signatures of the trainer(s).

6.5 Special Permits

Certain permit spaces meet very detailed requirements, thus alternate special permit space entry procedures may be followed. All of the following conditions must apply to the permit space to be considered non-hazardous or special permit spaces:

- The only hazard posed by the permit space can be an actual or potential hazardous atmosphere. Thus, no mechanical hazards (blenders or mixers) or entrapment hazards may be present.
- It can be proved that continuous forced air ventilation alone is sufficient to maintain the permit space as safe for entry.
- Monitoring and inspection data must be developed that supports the aforementioned items (entry into the space to perform monitoring to satisfy this point must be completed in full accordance with the requirements of a standard permit space entry).
- The data to support the above sections must be documented, and made available to employees entering the permit space under the non-hazardous or special permit space entry procedures.

When all of the conditions above are met, entry into the permit space can be performed using the following procedures:

- Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed
- When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.
- Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument (observable by entrant), for the following conditions in the order given:

  - Oxygen content
  - Flammable gases and vapors
  - Potential toxic air contaminants

  Entrant may request additional monitoring if it is felt that assigned monitoring is not adequate.
- There may be no hazardous atmospheres within the space whenever any employee is inside the space.
- Continuous forced air ventilation shall be used, as follows:

- An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere.
- The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space.
- The air supply for the forced air ventilation shall be from a clean source so as to not increase the hazards in the space.

- The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere (i.e. dust generation, welding, painting).

- If a hazardous atmosphere / condition is detected during entry:

  - Each employee shall leave the space immediately.
  - The space shall be evaluated to determine how the hazards developed.
  - Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

- The employer shall verify that the space is safe for entry (including external hazards such as pedestrians or traffic) and that the measures required for special permit-required confined space entry have been taken, through use of a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification shall be made before any entry and shall be made available to each employee entering the space.

- Rescue services must be either:

  - Provided by the host facility, or
  - Provided by an outside service which is given an opportunity to examine the entry site, practice rescue, and decline as appropriate, or
  - Provided by the employer by selecting a rescue team that is equipped and trained to perform the needed rescue services.
  - Rescue service must be on-site for immediately dangerous to life and health (IDLH) conditions while work is being performed.

- Terracon does not allow entrants from multiple companies to enter confined spaces.

6.6 Permit Space Entry Equipment

To ensure the safety of employees who will be entering permit spaces, the facility must have necessary equipment for use in permit space entries. This equipment shall be provided at no cost to the employee and be maintained per manufacturer's recommendations. This equipment may include, but is not limited to the following:

- Testing and monitoring equipment for permit space atmosphere.
- Ventilation equipment needed to obtain acceptable entry conditions.
- Communications equipment to summon assistance i.e., cell phone or radio, as necessary.

- Personal protective equipment, for use where feasible engineering and work practice controls do not adequately protect employees.
- Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency.
- Barriers and shields, as needed, to protect permit space entrants from hazards from outside of the permit space.
- Equipment, such as ladders, needed for safe entry into and exit from permit spaces by authorized entrants.
- Rescue and emergency equipment including communication devices for emergency assistance notification.
- Safety Data Sheets (SDS) for any chemical substance introduced into or held within the permit space.

Atmospheric testing equipment should be acquired through Terracon Safety. All employees who will be performing permit space atmospheric testing shall receive training on the operation and calibration of the equipment required to be used. All direct reading instruments shall be calibrated in accordance with manufactures specification. Records of equipment service, maintenance and calibration are to be kept by Operations and will be available for inspection upon request.

6.7 Rescue and Emergency Services

Terracon shall utilize local emergency services to provide rescue, if required during a permit space emergency. These local services will be evaluated to ensure they can provide a timely response. If the client is providing emergency services, this must be stated and agreed to in the Terracon contract for services. Emergency services phone numbers shall be posted at each facility or site. The Confined Space Entry Permit contains spaces for this information. The Attendant will summon emergency services and must prevent unauthorized rescue attempts.

6.8 Record keeping

- Entry Permits – will be retained at the local Terracon office for 1 year.
- Training Records - All training records will be maintained indefinitely by Terracon.

Terracon will use canceled entry permits to review entry operations and re-evaluate the program when; safety measures may not protect employees, if unauthorized entry occurs, a previously unidentified permit space is identified, an incident or significant near miss occurs during entry, a change in use or configuration of the permit space, or there are employee complaints about the effectiveness of the program.

Terracon

Confined Space Entry Permit

Work Location:	Date:
	Time:
Entry Purpose:	Project #:

HAZARD POTENTIAL

	Yes	No		Yes	No
Oxygen Deficiency	☐	☐	Electrical	☐	☐
Combustible Atmosphere	☐	☐	Welding/Cutting	☐	☐
Toxic Material	☐	☐	Ventilation Needed	☐	☐
Liquids	☐	☐	Other	☐	☐

SAFETY PROCEDURES AND EQUIPMENT UTILIZED

Electrical Lockout/Tagout	☐	GFI Used	☐	Hot Work Permit	☐	First Aid	☐
Tripod/Lifeline/Harness	☐	Explosion Proof Lights	☐	Ventilation Equipment	☐	Barriers	☐
Personal Protective Equipment	☐	Respiratory Protection	☐	Communication Devices	☐	Hand Signals	☐

SPECIFY

ATMOSPHERIC GAS TESTING

INSTRUMENT	ACTION LEVEL	FREQUENCY OF TESTING

EMPLOYEES PERFORMING WORK

ATTENDENT(S)	ENTRANT(S)

AUTHORIZING SIGNATURES

Attendant(s) Signature:	Entrant(s) Signature:
Permit Authorized by:	Canceled by:
Canceled by:	Time:

REQUIRED TRAINING/RESPONSIBILITIES FOR AUTHORIZED ENTRANTS:

- *Hazard Recognition* - entrant should know all hazards, be capable of recognizing the sign and symptoms of exposure and should understand the consequences of exposure.
- *Communication* - entrant must maintain contact with the attendant for the purpose of the attendant monitoring entry and alerting entrant to evacuation. The entrant shall alert the attendant if a warning sign or exposure symptom is noted, or a hazardous situation is noted.
- *Safety and Personal Protective Equipment* - employer shall provide necessary equipment, and ensure training on its proper use and care. The employee should be capable of determining when to use the proper PPE.
- *Self-Rescue* - entrant must exit the permit space:
  - If attendant or entry supervisor orders evacuation.
  - An automatic alarm is activated for the ambient air monitoring equipment.
  - Entrant perceives a prohibited condition.
  - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.

REQUIRED TRAINING / RESPONSIBILITIES FOR ATTENDANTS:

- Remain outside the permit space during entry operations until relieved by another qualified attendant. The attendant shall perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.
- Number count of entrants must be continually maintained and accurate.
- *Hazard Recognition* - must be able to recognize hazards inside and outside the permit space. This includes any warning sign or symptom of exposure to dangerous situations and behavioral effects of hazardous exposure on entrants.
- *Communication* - Must maintain contact with entrant, keep unauthorized persons away from space, summon rescue services when needed, order entrant to evacuate the permit space immediately when attendant:
  - Observes conditions not allowed in confined spaces.
  - Detects behavioral effects of exposure on entrant(s).
  - Conditions outside the space could endanger the entrant.
  - Detects uncontrolled hazards inside the space.
  - Must leave the work station or can not continue the assigned duties.

- *Rescue* - employer shall ensure that attendants:

  - Do not enter the permit space to attempt rescue of entrants.
  - Initiate on-site rescue procedures and, if necessary, summon additional rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from the permit space.
  - Properly use any non-entry rescue equipment provided for their use and perform any other rescue and emergency duties.

- *Site Security* - attendant shall take the following actions when unauthorized person(s) approach or enter a permit space while entry is underway:

  - Warn the unauthorized persons that they must stay away from the permit space.
  - Advise the unauthorized persons that they must exit immediately if they have entered the permit space.
  - Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

REQUIRED TRAINING / RESPONSIBILITIES FOR AUTHORIZING ENTRY SUPERVISOR:

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure
- Verifies, that the appropriate entries have been made on the permit that all tests specified by the permit have been conducted and all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry.
- Verifies that rescue services are available and that the means for summoning additional services are operable.
- Determine, at appropriate intervals, that entry operations remain consistent with the terms of the entry permit, and that acceptable entry conditions are present.
- Cancel the entry authorization and terminate entry whenever acceptable entry conditions are not present.
- Take the necessary measures for concluding an entry operation, such as closing off a permit space and canceling the permit, once the work authorized by the permit has been completed.
- Individuals empowered to authorize entries may also serve as authorized entrants or attendants for an entry if they have the proper training.
- Individuals authorizing or in charge of entry shall take the appropriate measures to remove unauthorized personnel who are in or near entry permit spaces.
- Determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space,

which entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

REQUIRED TRAINING / RESPONSIBILITIES FOR RESCUE TEAM:
Terracon will utilize outside emergency rescue services. The rescue services involved will consist of the local fire department. Terracon is responsible for ensuring that the designated rescuers are aware of the hazards they may confront when called on to perform rescues. Access to all permit spaces from which rescue may be necessary will be available so that the rescue service can develop appropriate rescue plans and practice rescue operations. This enables the rescue team to be properly equipped, trained and knowledgeable of proper procedures to incorporate.

To support rescue operations, Terracon crews will be trained in *non-entry* rescue procedures using retrieval equipment. Also, at least one member of the site team shall be trained in basic first-aid and in cardiopulmonary resuscitation (CPR).

REQUIRED TRAINING / RESPONSIBILITIES FOR UNAUTHORIZED PERSONNEL:
This training is required for all personnel who will not participate in the permit-required confined space entries. The following topics shall be covered:

- *Confined Space Recognition:* definition of confined space and permit-required confined space.
- Who to contact if an entry is required.
- *Employee should be advised that unauthorized entry into a permit-required confined space is punishable by termination of employment!*

Confined Space Entry Quiz

Employees Name Printed:	
Employees Signature:	Date
Training Supervisor:	Signature:

Choose the most correct answer.

1. An example of a confined space would be:

   a. A sump collection vault.
   b. A railroad car.
   c. A 10,000 gallon tank.
   d. All of the above.

2. Choose the one thing not included on a Confined Space Entry permit:

   a. Describes levels of protection to be worn by personnel.
   b. Instructs the workers on how the entry should completed.
   c. Establishes confined space entry date and time.
   d. Describes known hazards and evaluates risks associated with the activities.

3. The majority of fatalities in confined spaces are:

   a. In spaces that were well ventilated.
   b. Are spaces where life lines and harnesses were used.
   c. Spaces where block and bleed procedures were used to prevent the flow of material into the confined space.
   d. Attendants who tried to rescue the entrant without proper PPE and rescue equipment.

4. Oxygen deficiency starts when oxygen in the air is:

   a. 21%
   b. 19.5%
   c. 25%
   d. 10%

5. The following statements are true for CSE work except:

   a. The entry personnel and the attendants must be identified on the permit.
   b. Rescue equipment can not be motorized.
   c. Attendants may enter the confined space to rescue a coworker.
   d. Permits identify the purpose of the entry.

Confined Space Entry Quiz

Employees Name Printed:		
Employees Signature:		Date
Training Supervisor:	Signature:	

Choose the most correct answer.

1. A confined space can be as large as a tank, vessel or silo.

   True False

2. A confined space always requires a permit to be entered

   True False

3. Employers must warn employees of the existence and location of permit required confined spaces via e-mails and word of mouth.

   True False

4. Employers must have a written program to cover permit required confined space entry.

   True False

5. Training is required for all employees working in / with Permit Required confined spaces.

   True False

6. Entry Supervisors must verify all tests, including atmospheric testing, are conducted before entry into a PRCS is allowed.

   True False

7. Attendants must maintain constant contact with entrants.

   True False

8. Attendants should always remove entrants from a confined space when a hazardous situation occurs.

   True False

9. At least one member of the rescue team must be certified in basic first aid and CPR.

   True False

10. Trained rescue workers should enter confined spaces only when absolutely necessary.

    True False

11. Confined space atmospheres must be tested for oxygen, flammability agents and any other toxic agents.

    True False

12. Oxygen content must be between 19.5% and 23.5%.

    True False

TRENCHING, EXCAVATION AND GROUND DISTURBANCE

Quality Control

Document Owner	Position	Signature

Change	Page	Mod.	Authorization		
			Name	Signature	Date
original	*all*	*0516*	*J. Wright*		*05-16*

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1.0 Scope

This policy sets out the requirements and procedures for eliminating the risk of trenching, excavation and ground disturbance activities for Terracon employees. These procedures will be used in all Terracon workplaces and are to be enforced among contractors.

Clients may have their own policies, procedures and forms. Where it is a requirement that client procedures and forms are used, it will be in addition to those required by this section.

2.0 Definitions

BENCHING - A method of protecting yourself from cave-ins by digging the sides of an excavation to form one or more steps.

COMPETENT PERSON - one who can identify existing and future hazards in the work area, and has the authority to take immediate actions to eliminate those hazards. Duties include: inspections prior to entry and throughout the shift, inspections after rain storms, atmospheric testing, or removal of workers if conditions dictate. A designated competent person must be on site at all times during trenching / excavation work.

CROSS-BRACE - A horizontal member of a shoring system installed at a 90° angle to the sides of the excavation. The ends are placed in contact with vertical rails or wales.

HAZARDOUS ATMOSPHERE - Any atmosphere that could cause death, illness or injury because it is explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic or otherwise harmful.

SHEETING - A plywood member of a shoring system that holds back the soil on the sides of an excavation and is supported by other members of a shoring system. Closed sheeting means the plywood sheets are butted together.

SOIL TYPES **-** soil is divided into three classes. They are listed here from most stable to least stable.

TYPE A - cohesive soil-clay, sandy clay, hardpan, caliche.

TYPE B - less-cohesive soil, crushed rock, silt, silt loam, sandy loam, previously disturbed soil, unstable rock.

TYPE C - non-cohesive soil-gravel, sand, loamy sand, soil from which water is seeping.

VERTICAL RAIL - Vertical member of a shoring system placed in contact with plywood sheeting and cross braces.

WALE - A horizontal member of a shoring system placed in contact with plywood sheeting and cross braces.

3.0 Legislative Requirement

OSHA safety legislation must be followed to protect employees from excavation related work activities. At a minimum, Terracon policies will meet the applicable requirements of OSHA 29 1926.651 and Cal OSHA T8 CCR 1541. By implementing the procedures stated, Terracon personnel will be able to work safely and ensure compliance with OSHA regulations. There is no OSHA regulation for general ground disturbance activities.

4.0 Policy

Terracon generally has no direct control of excavation activities. This responsibility is typically assumed by the general contractor or the excavation contractor. Terracon personnel assigned to trenching/excavation projects which are ***NOT under Terracon control*** will remain alert to potential site hazards and conduct their duties in compliance with the applicable provisions of this section. On those rare occasions where an excavation ***is under the direct control of Terracon***, the affected Terracon Project Manager/Office Manager will designate a competent person responsible for oversight of the excavation and for compliance with this policy and applicable provisions of the excavations standard. The designated competent person will be qualified to act in that capacity through formal instruction, on-the-job experience or a combination of both. This policy is established to prevent injury and potential property damage and to comply with applicable state and federal safety standards.

All contractors and subcontractors engaged by Terracon will be required (at a minimum) to comply with the requirements of this policy.

5.0 Responsibility

All employees have the responsibility to adhere to this policy. They will also utilize all safety equipment provided by Terracon. Failure to follow this policy will result in disciplinary action up to and including dismissal.

Field Supervisors have the responsibility to ensure excavation activities are identified to crews and appropriate controls are implemented. They must also ensure safety equipment is available as required by this policy. Field Supervisors will also have the responsibility for knowing and following all client-required procedures.

Terracon Safety Services (Terracon Safety) will schedule auditing of the program to ensure compliance by the Districts and identify needs for revision.

Management and the *Terracon President* will review all reports. It is the responsibility of management to administer disciplinary action to any employee not adhering to the requirements of this program.

6.0 Procedures

6.1 General Excavation Requirements

Terracon personnel are advised that the excavations standard requires sloping, shoring or shielding in all excavations greater than five (5) feet in depth unless the excavation is made entirely in stable rock. Therefore, Terracon employees will not enter unshored excavations with vertical sidewalls in excess of five (5) feet in depth unless the excavation is in stable rock or unless shielding such as a trench box is provided. Terracon personnel will not enter soil trenches with unshored vertical sidewalls more than five (5) feet in depth until an inspection has been performed by a Competent Person, and the Competent Person has approved personnel entry.

If Terracon technicians observe situations which could result in possible cave-ins, slides, failure of protective systems or other hazardous condition, they will not enter or will immediately evacuate the trench or excavation. Terracon technician-level personnel will immediately report site conditions to the Terracon Project Manager or their Supervisor. The Terracon Project Manager (or senior-level designee) is responsible for discussing site conditions with the excavation contractor and other personnel responsible for the site.

Senior Terracon technicians, engineers or other professionals who observe situations which could potentially result in cave-in, failure of protective systems or other hazardous conditions will immediately

report their concerns to the excavation contractor or other responsible party, and order all Terracon personnel out of the trench or excavation. Senior Terracon personnel will not permit Terracon employees to enter or re-enter the excavation until the hazardous condition has been eliminated.

The following general excavation requirements suggest what to look for and how to prepare for an excavation before you even start to dig. They must be observed in every excavation in order to eliminate potential danger to you and your coworkers.

- Locate underground utilities (sewer, telephone, fuel, electric, water or other subsurface installations before you dig – call 811. Check with utility companies to find out where cables and lines may be buried. Once uncovered, you must support, protect or remove the lines. The location of underground installations expected to be encountered shall be determined before excavation. When utility companies or clients cannot respond to a request to locate underground utility installations within 24 hours, or cannot establish exact location of these installations, the employer may proceed, provided the employer does so with caution and provided detection equipment or other acceptable means to locate utility installations are used.
- Test hazardous atmospheres. You must conduct tests in any excavation that could contain low oxygen levels, flammable gases or other dangerous conditions such as landfills or environmental projects. Ventilation will be provided if hazardous atmospheres are detected.
- Wear reflective vests or other highly visible material when near equipment, trucks and cars. Remember to post signs, barricades and flag persons as necessary.
- Avoid falling objects by never working under any load being lifted or digging equipment. Always wear your hard hat, safety shoes and safety glasses while on or near a job site.
- Construct temporary cross-overs where employees, pedestrians or equipment must cross over excavations. Guardrails will be provided where walkways are 6 feet or more above lower levels and wider than 30 inches. Cover or barricade all wells, pits and shafts when the down-hole job is finished.
- Store spoil piles, surface encumbrances or excavated material at least 2' from the edge of an excavation to protect employees. Don't let it collect near wall sides.
- Protect the excavation edge whenever mobile equipment is moving in the area, especially adjacent to an excavation, or when equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation. If possible, the grade should be away from the excavation. Use stop logs, barricades and employee spotters with hand or mechanical signals to protect from moving vehicles or falling loads.
- Provide access into and out of an excavation four or more feet deep with a ladder or ramp. You should be no more than 25' lateral travel from a ladder or ramp at all times in an excavation. Ladders must be secured from sliding or kickout, and ramps can be at an incline of no more than 30°.
- Perform daily inspections with a competent person who is qualified to identify potential hazards in an excavation. You may need more than one inspection in the same day if it rains or other conditions change. Competent persons should examine the possibility of cave-ins, failures or protective systems, etc. If problems are found, provisions should be made for immediate personnel removal.
- Employees must be protected from water accumulation, including the use of shields, and must be inspected by a competent person before work begins. Remove water accumulation from an excavation before entering.
- Where the stability of adjoining buildings, walls, or other structures is endangered by an excavation, a registered Professional Engineer with geotechnical experience in will be consulted and at a minimum support systems such as shoring, bracing, or underpinning shall be provided to ensure the structural stability and employee protection.
- Whenever internal combustion engine-driven equipment is operated inside a shaft, or is continually operated *near* a shaft or excavation, a ventilation system shall be provided.

- Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.
- Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a lifeline securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

6.2 Soil Classification

Classifying the stability of the soil you'll be excavating is an important part of all site evaluations. Soil must be classified by at least one visual analysis and one manual test. That classification will determine the degree of sloping and the type of shoring you must use to protect yourself and coworkers from an accident in the excavation.

6.2.1 Soil Types

Soil is divided into three classes. They are listed here from most stable to least stable.

TYPE A - cohesive soil-clay, sandy clay, hardpan, caliche.

TYPE B - less-cohesive soil, crushed rock, silt, silt loam, sandy loam, previously disturbed soil, unstable rock.

TYPE C - non-cohesive soil-gravel, sand, loamy sand, soil from which water is seeping.

6.2.2 Visual Analysis

You must examine...

- soil in the excavated material for particle size and cohesive appearance. A fine grain texture is more cohesive than a coarse grained texture.
- material as it is excavated for cohesive clumps or granular clumps that break up.
- open trenches for wall sloughing or tension cracks.
- area near the excavation for utilities that indicate disturbed soil.
- excavation and surrounding area for seeping water or high water table.
- excavation area for vibrating sources that can affect soil stability.

6.2.3 Manual Test

You must test the...

- *PLASTICITY* - Mold a damp sample of soil into a ball and try rolling it into threads as thin as 1/8" in diameter. Cohesive material can perform this test.
- *PENETRATION* - Press your thumb into undisturbed soil as soon as possible after it has been excavated. Type A soil can be indented, but with great effort. Type C soil can be indented easily and molded with light finger pressure. Type B soil is that which doesn't easily meet Type A or C requirements.
- *DRY STRENGTH* - Dry soil that crumbles under light pressure is granular. If it falls into clumps, and the smaller clumps break with difficulty, it may be clay.

6.3 Sloping and Shoring Guidelines

Unless you are excavating less than 4', you must use a protective support system for the walls of an excavation. Overlooking any of the following guidelines or conditions can cause a cave-in.

- Use ¾" plywood against excavation walls, leaving approximately 1' of plywood above the top of the hole or trench to keep rocks and debris from falling in on yourself or coworkers.
- There can be no soil showing between plywood sheeting when shoring an excavation.

- Use only hydraulic shoring or trench jacks (cross braces) when shoring any excavation. When using trench jacks, substitute a 2"x 6" for a vertical rail. When using hydraulic shoring, raise the pressure to 3000 PSI as shown on the hydraulic pump gage.

6.3.1 Spacing of Vertical Rails

- No more than 6' apart
- No more than 2' from the bottom of the excavation

6.3.2 Spacing of Cross Braces and Wales

- No more than 4' apart vertically
- No more than 3' from the bottom of the excavation
- No more than 1 1/2' from the top of the excavation

6.3.3 Sloping

When using sloping as the sole form of protection:

- Type A soil-maximum allowable slope 1:1 (45°)
- Type B soil-maximum allowable slope 1:1 (45°)
- Type C soil-maximum allowable slope 1 1/2:1 (34°)

6.4 Training

All employees and supervisors shall receive annual trenching, excavation and ground disturbance training prior to assignment on these types of projects. This training shall be conducted by a competent person capable of recognizing the hazards associated with the types of hazards likely to be encountered and procedures for controlling such hazards.

Employee retaining will be instituted under the following conditions:

- When the Excavation Program is revised due to changes in equipment, policy or regulatory compliance.
- When an employee exhibits a lack of understanding or skill required to safely complete the work.
- In the event retraining has not taken place due to any of above, a refresher course will be completed every three years.

6.5 Record keeping

Employee training records will be maintained indefinitely at Terracon Safety.

Excavation inspection records will be maintained for one year at the local Terracon office.

Drilled Pier Entry

I. Policy

The procedures outlined in this section have been developed to protect Terracon personnel from potential hazards which may be encountered when entering and working in drilled pier (caisson) shafts. The responsible Project Engineer will ensure that Terracon personnel assigned to enter shafts have been instructed in the requirements of this section.

II. Conditions Prohibiting Drilled Pier Entry

Terracon personnel *WILL NOT* enter:

A. ANY drilled shaft deeper than six (6) feet until atmosphere has been appropriately monitored (see below).

B. ANY uncased shaft deeper than five (5) feet unless drilled in solid rock.

C. ANY shaft containing a casing suspended from a hoist or crane.

D. ANY shaft in which water is accumulating at a rate greater than 6 inches per minute (6 inches/minute) unless dewatering equipment is in use. Terracon personnel will not enter shafts while ELECTRIC dewatering pumps are operating.

E. ANY cased shaft if mobile heavy equipment (concrete trucks, bulldozers, etc.) is being driven within 10 feet of shaft entrance.

III. Training

A. All Terracon personnel assigned drilled shaft observation duties will receive general training in safe shaft entry procedures. Records of safety training will be maintained at the location where the employee is assigned.

B. All Terracon drilled shaft observers will be instructed in the calibration, maintenance, and use of safety equipment required by this section.

C. Prior to the start of drilled shaft observation jobs, the responsible Project Engineer will discuss known or anticipated site hazards (i.e., chemical contamination, methane, unstable soils, etc.) with Terracon shaft observation personnel.

D. Where hazardous atmospheres are encountered, a safety plan documenting training, protective equipment, and project-specific instruction will be required for the project. The Project Engineer will contact the Corporate Safety and Health Manager to discuss site conditions and participate in the development of the drilled pier safety plan.

IV. Atmospheric Monitoring

A. The atmosphere of drilled shafts deeper than six (6) feet will be monitored for the presence of 1) oxygen, 2) combustible gases, and 3) any suspected site-specific contaminants (i.e., hydrocarbon vapors, hydrogen sulfide, etc.) prior to entry. The atmosphere of ALL shafts will be monitored prior to entry if contaminated soils or gas bearing strata are known to exist at the site.

B. Terracon personnel *WILL NOT ENTER* shafts which contain:

1. less than 19.5% oxygen,
2. combustible gases greater than 10% lower explosive limit,
3. other contaminant gases or vapors exceeding 50% of the OSHA permissible exposure limit (PEL).

V. Ventilation

A. If atmospheric readings in the drilled shaft fail entry criteria established in IV.B. above, the shaft will be ventilated with clean air until at least three (3) air changes have been achieved. Air will be introduced within 4 feet of bottom using a blower with a minimum capacity of 250 CFM.

B. After three (3) air changes have been achieved, discontinue ventilation and repeat atmospheric monitoring procedures.

C. If target levels are achieved (>19.5% oxygen, combustible gas of <10% LEL, organic vapors <50% of published permissible exposure limits), Terracon personnel may enter shaft provided continuous ventilation is supplied. Atmosphere in the shaft will be periodically monitored during occupancy.

D. If target levels are NOT achieved, continue ventilation and retest atmosphere after ten (10) air changes are achieved. If target levels are still not achieved, Terracon personnel will not enter shaft without respiratory protection as specified by the Corporate Safety and Health Director.

VI. Personal Protective Equipment and Stand-by Requirements

A. Personnel entering drilled shafts will wear a hard hat, leather-palm gloves, and safety footwear.

B. Personnel will wear a full-body safety harness which meets the requirements of ANSI A10.14-1975. A lifeline separate from any line used to handle materials will be securely attached.

C. Personnel will use a Boatswain's Chair affixed to the hoisting cable for entry and exit of drilled shafts. Riding cleanout buckets, hooks or balls is prohibited.

D. A surface crew member will tend the independent lifeline, supervise the lift, and remain in constant communication with personnel within the shaft.

VII. Suspended Loads

NO TERRACON EMPLOYEE WILL REMAIN IN SHAFTS WHILE LOADS ARE HOISTED OR LOWERED OVERHEAD.

Excavation Safety Inspection

Project Name/ Number:	Date/Time:
Job Description:	

WORK ANALYSIS/HAZARD POTENTIAL

	Yes	No
CalOSHA notified in past 48 hours (CA only)?	☐	☐
Underground Utilities Cleared?	☐	☐
Is excavation less than 5' with no potential cave-in?	☐	☐
Is a hazardous atmosphere anticipated?	☐	☐
Ventilation Required?	☐	☐
Hot Work (Welding, Cutting, etc.)	☐	☐
Groundwater Hazard?	☐	☐

Soil Type ☐ A ☐ B ☐ C

Anticipated excavation depth:

Specific Atmospheric Hazards:

SAFETY PROCEDURES AND EQUIPMENT UTILIZED

Trench Box (18" above wall)	☐	Access Ladder	☐
Ventilation Equipment	☐	Respiratory Protection	☐
Tripod/Lifeline/Harness	☐	Sloping or Benching	☐
Permit on site	☐	Timber Shoring	☐
Spoils 2' from trench wall	☐	Trench Box + Sloping	☐

Sloping Ratio
(Bottom Width to Total Depth)

Timber or hydraulic shoring requires outside assistance from a qualified shoring contractor.

EMPLOYEES PERFORMING WORK

EMPLOYEE S SIGNATURES

Inspection Performed By:	Job Complete:

Soil Classifications

Type A
Cohesive with unconfined, compressive strength of 1.5 tons/ft^2. Examples: clays, clay loam, caliche, hardpan. Can not be Type A if soil is fissured, subject to vibration, previously disturbed, part of a slope or layred system, or other factors that would make it less stable.

Type B
Cohesive with unconfined, compressive strength between 0.5 and 1.5 tons/ft^2. Examples: angular gravel, silts, sandy loam. Also materials that would be Type A but have been disturbed or subject to vibration, fissured or part of a slope or layered system.

Type C
Cohesive with unconfined, compressive strength less than 0.5 tons/ft^2. Examples: gravel, sand, loamy sand, submerged soil or soil where water is freely seeping, submerged unstable rock.

Thumb Penetration Test for Compressive Strength: In Type A soil you may dent the excavation wall, but not penetrate it with pressure from your thumb. Type C soil can be penetrated several inches with pressure and can be molded by light finger pressure. Type B soil is in between. This test should be performed on soil as soon as possible after excavation.

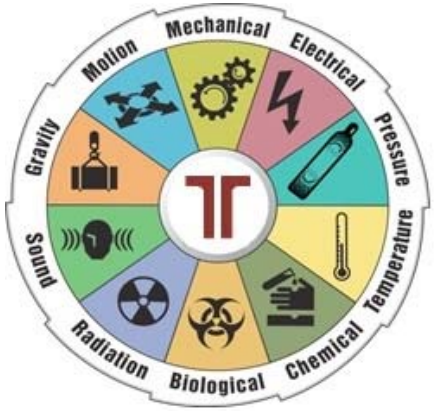
Cohesiveness: Cohesive soil can be molded and rolled into threads as thin as 2“. If a 2" length of soil thread can be held on one end without the soil tearing, the soil is cohesive. Cohesive soil will remain in clumps after excavation.

Working In and Around Excavations and Trenching

Task or Job:	Working In and Around Excavations and Trenching	Document No:	SRP TER 013

Analysis Conducted By:	Terracon Safety	Revision Mod:	0316

Notes
1. Work procedures quality procedures, client / site specific safety plans and safety data sheets (SDS) may all provide additional information and guidance.
2. No changes to the procedures or hazard controls are permitted without the approval of a Terracon supervisor. Terracon requires Pre-Task Planning in order to prevent incidents and address site specific hazards.
3. ALL EMPLOYEES HAVE **STOP WORK** AUTHORITY. If a hazard exists, stop work and eliminate the hazard.
4. This document contains information concerning Terracon strategies, personnel and systems. We regard such information as confidential and request that it is not disclosed in whole or in part to any third party without first seeking our consent.



Work Phase	Hazard	Control
Pre-Task Planning In Office	Training, Qualification *Gravity, Motion, Electrical, Pressure, Temperature, Chemical,*	Evaluate contractor excavation safety program to ensure knowledge of excavation procedures (R8). Ensure the task requires entering the contractor's excavation or if another option for access is available (P3). Ensure the job specific tasks discussed when entering excavations; qualified employee, competent employee inspection, shoring materials, and correct equipment for the task at hand (R8 / P1 / P4). Provide field staff with information to evaluate trench safety such as location of the water table and soil class (P1 / P3). Emergency numbers and hospital routes identified for crews working within the excavation. Rescue equipment is required on site (R3, R13). Clearly communicate daily operations to site foremen and other personnel in work area. Make sure there are no conflicts with operations (P6).
General Excavation Inspections	Possible collapse, causing injury or death *Gravity, Motion*	If the stability of adjoining buildings or walls is endangered by excavations, shoring, bracing, or underpinning designed by a qualified person shall be provided to ensure the stability of the structure and to protect employees (R3 / P1). If the excavation is deeper than 4 ft a competent person must test for hazardous atmospheres (R3 / R8 / P6). Protective system must be used in excavations less than 6 feet in depth when an examination of the ground by a competent person reveals indication of a potential cave-in (R3 / R8 / P6). Excavation that is greater than 20 ft deep, must include a protective system that is designed by a registered professional engineer (R8 / P6). For excavations >4 ft. stairway, ladders, or ramp access in and out of trench must be provided every 25 ft (R7 / R8 / P6). Ladders should extend 3 ft above the top of the excavation (R7 / R8). Trench box must rise above top or ground at least 18 inches to prevent materials from falling in trench (R3 / P1). When employees are required to cross over excavations which are 6 ft or more in depth, a walkway equipped with handrails and toeboards or equivalent safe access must be provided (R8 / P6). Protective system must be used in ALL excavations which are 6 ft deep or greater (R8, P6).

Work Phase	Hazard	Control
General Excavation Operations	Possible collapse, causing injury or death *Gravity, Motion, Electrical, Temperature, Chemical, Sound*	For excavations deeper than 4 ft some form of excavation protective system such as sloping, trench box or shield must be in place. Soil classification, depth of cut, water content of soil, changes due to weather and climate, or other operations in the vicinity must be considered before assigning the protective system. NEVER enter an excavation deeper than 4 ft without a protective system in place (R8 / P6). Ensure materials, equipment, spoil piles and vehicles that might fall or roll into an excavation at least 2 ft from the edge of excavations or have retaining devices to prevent them from falling into the excavation (R8 / P6). The competent person must perform a daily inspection of the excavation prior to the start of work to determine if changes in soil type, adjacent areas are clear and safe and protective systems adequate. Inspect the excavation following any rainstorm or other hazard increasing occurrence (R3 / P6). Be aware of mobile equipment operating near the excavation. When mobile equipment is operated adjacent to or approaches an excavation and the operator does not have a clear view of the edge; a warning system such as barricades, hand / mechanical signals or stop logs must be used to alert the operator of the danger. Be aware of equipment exhaust gathering in the excavation (R8 / P6 / P7). Scaling to remove loose rock or soil, or install protective barricades and other equivalent protection to protect employees from falling rocks, soil or materials must be provided (R8 / P6). Never enter excavations where water is or has accumulated, unless a competent person oversees water removal, extra and adequate support / shielding is installed (R8 / P6). Sidewalks, pavements, and related structures shall not be undermined unless a support system is provided to protect employees and the sidewalk, pavement, or related structure. Undermining of structures could signify a weak excavation (R8 / P6). Be wary of exposed underground utilities. When operations uncover unmarked underground utility, stop all excavation activities. Work cannot proceed until the source is placed out of service (R8 / P3 / P6). In dusty conditions use mechanical methods, hoses or sprinkler to moisten soil and keep dust under control (R8). Use a flagger when signs, signals and barricades are not enough protection (R8 / P3 / P6).
Performing Work In or Near Excavations	Falls or entrapment within trench, causing injury or death *Gravity, Motion, Electrical, Temperature, Chemical, Sound*	Be aware of your surroundings. Practice good situational awareness (P6). Stand clear of the excavation edge to avoid possible collapse. Ensure the vibration does not collapse the excavation (R8 / P3 / P6). Remain a safe distance away from trucks or other equipment that is being loaded / unloaded, to keep from being struck (R5 / P3). Excavation entrants must be protected from falling/loose soils, rocks, etc. (R1 / P3 / P6). Never work on excavation levels above other employees except when employees at lower levels are adequately protected (P3, P6). Routinely check excavation edges for potential sidewall collapse (R3, P1, P6). Equipment Operator must stop work and ground equipment attachments before other personnel approach equipment, and before exiting machine (P1, P7). Never position yourself under a suspended load or under active hoisting operations (R5, P3). Ensure good housekeeping in and around excavation. Secure loose items (P1). Get operator's attention, make eye contact with operator, and communicate with hand gestures. Remember that if you cannot see the equipment operator, the equipment operator cannot see you. If possible, ask for equipment to stop operation while heavy machinery is near your work/test area (P6 / P7). Monitor back-up alarms or nearby equipment (P6). See and be seen. Always wear appropriate PPE (min Class II HiVis) (R1). Avoid having your back to traffic or heavy equipment. Position yourself where you can be seen e.g. operators cab side, front side. Do not work directly behind equipment. Practice good situational awareness. (P6).

Work Phase	Hazard	Control
General Operations	Eye Hazards *Chemical*	Wear ANSI approved safety glasses at all times during operations. Always evaluate the need for additional eye protection (goggles / face shield) whenever there is a potential for flying debris or based on work activity. This includes, but is not limited to mixing chemicals, pressure washer operations and grinding (R1).
	Noise	Wear hearing protection with a noise reduction rating (NRR) of at least NRR 30 when working within five (5) feet of noise sources, such as the generator and compressor. Employees shall be enrolled in a hearing conservation program if noise level meet or exceed the OSHA action level of 85 dba for an 8-hour Time Weighted Average (R1).
	Portable Hand or Power Tools *Electrical, Motion*	HAND TOOLS: Use the correct tool for the task. Assure that tools are in good repair. Store out-of-use tools in their proper container (tool box). Impact tools such as hammers, wedges and chisels are kept free of mushroomed heads. Do not modify hand tools from their original design. Be aware of body position and line of fire (P6). POWER TOOLS: Inspect power tools prior to use. Report damaged tools to the supervisor. Any electrical equipment that is damaged or not functioning properly shall be immediately taken out of service and tagged or the cord cut and thrown away. Portable power tools shall be double insulated or grounded. Electrical equipment such as power tools, generators and extension cords (3 wire no less than 12-3) shall be inspected prior to each use. The user may test GFCIs using the test button provided by the manufacturer before each use. Use GFCIs in damp or wet work areas, outdoors, and for portable, electric hand tools with cord/plug connectors. Assure that generator-grounding cable is attached. No modification or additions that affect the safe operation of the tool shall be made. Guards shall be replaced upon completion of maintenance and shall not be used unless they are intact. Saws, grinders, and abrasive wheels shall use the proper rating and revolutions per minute for the tool (P6).
	Working at Heights *Gravity*	Fall protection (full body harness and restraint device) is required for any work or travel performed above six (6) feet or where there is a potential of falling (R6). Use only OSHA approved ladders, which are heavy-duty use. Inspect ladders prior to use. Remove from service any defective ladder and tag out of service. Freestanding ladders will not be used to install well materials (R6).
	Slips, Trips and Falls *Gravity*	Be aware of uneven or warped boards, tooling, cords and materials (P1). Keep work areas picked up of tools and equipment. Position cords and hoses away from high traffic areas (P6). Arrange materials in a stable manner so that they do not protrude into walking surfaces (P1).
	Manual Handling – Ergonomics *Gravity*	When lifting awkward loads or those greater than 50 lbs use the buddy system or mechanical means. Carefully evaluate awkward loads greater than 25 lbs. Warm up before work! (P2 / P8). Whenever possible use a dolly/cart to transport heavy equipment from location to location (P2 / P8). When lifting, wear leather or equivalent gloves to protect the hands from cuts and abrasions (P2 / P8). Use proper lifting techniques, keep head high, chin tucked in and back arched. Keep weight close to the body and stand up straight. Don't jerk as you lift, ensure your path is clear before travel. Always turn with your feet and don't twist the body while carrying a load (P2 / P8).
	Lockout / Tagout *Electrical, Mechanical, Gravity*	When maintenance is to be performed on equipment, it shall be locked and tagged out. Ensure all energy sources (electrical/pressure/fluids) are neutralized to a zero energy state prior to work (P1).
	Dust / Respiratory Protection *Chemical*	When required, employees shall wear the prescribed respiratory protection. Dust masks may be worn for comfort by the employee upon request during pouring of cement, bentonite, etc. Employees shall be trained and medically qualified as required by applicable policies and procedures if respiratory protection is required (R1 / P6). Consider a N95 or P100 particulate type dust mask when pouring cement, sand or bentonite (R1 / P6).

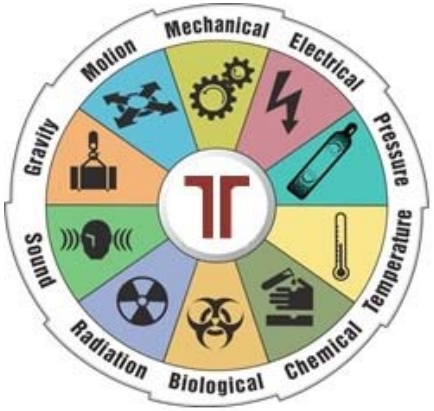
Work Phase	Hazard	Control
Site Specific Hazards	*Biological* – plants, snakes / insects	Snakes - do not reach into or under objects without using caution. Be careful when handling equipment that has rested on the ground. If snakes are encountered, do not attempt to handle or molest them. Monitor the snake's whereabouts until it is safely away from the work site. Consider snake chaps for areas where snakes are prevalent (P6). Insects - evaluate the need for treated clothing or repellants for mosquitoes and ticks. Personnel allergic to bee stings should notify supervision of the location of epinephrine medication. Use caution and watch for spiders when reaching into enclosed areas (P6). Plants – evaluate the site for poisonous plants (ivy, oak and sumac). Clear or flatten the site of vegetation. Wear gloves and long sleeve shirts. Be aware that poisonous plant matter is an oil that can stay on clothing, tools or cut plants for long periods (P6).
	Soil Samples, Groundwater *Chemical*	Site may contain hazardous materials. Reference SSHASP for site hazards and appropriate PPE. Always select appropriate PPE for site specific conditions (P6). If unanticipated levels of contaminants are encountered STOP WORK and notify your supervisor (P6).
	Weather	Lightning – stop work when lightning is visible or within 10 miles of the work area (P3). Rain / Floods – monitor work site, ground conditions and access for saturated soils. Never cross a flooded roadway (P6). Severe Storms (wind) – monitor work activities if they will be affected by high winds i.e., hoisting, work at height (P6). Use phone applications to set National Weather Service severe weather alerts (P1).
	Temperature Extremes	Wear appropriate clothing for weather conditions (P6). Heat Stress - monitor for signs of heat stress / stroke (nausea, cramping, no sweat, skin hot to touch). Schedule work and break times as necessary and drink plenty of fluids. Avoid caffeine and alcohol; eat a balanced diet. If you are overheating, move to a cool location and hydrate with water. Consider the need for sunscreen or personal cooling devices (P6). Cold Stress - monitor for signs of cold stress such as reduced mental alertness, reduction in decision-making, severe shivering or loss of consciousness as temperature and wind speeds increase above 5mph and drop below 30° F. Employees may take warming breaks as necessary (P6). Contact WorkCare if heat or cold stress is suspected (R13).

Working Around Active Construction Sites

Task or Job:	Working Around Active Construction Sites	Document No:	SRP TER 17

Analysis Conducted By:	Terracon Safety	Revision Mod:	0316

Notes
1. Work procedures quality procedures, client / site specific safety plans and safety data sheets (SDS) may all provide additional information and guidance.
2. No changes to the procedures or hazard controls are permitted without the approval of a Terracon supervisor. Terracon requires Pre-Task Planning in order to prevent incidents and address site specific hazards.
3. ALL EMPLOYEES HAVE **STOP WORK** AUTHORITY. If a hazard exists, stop work and eliminate the hazard.
4. This document contains information concerning Terracon strategies, personnel and systems. We regard such information as confidential and request that it is not disclosed in whole or in part to any third party without first seeking our consent.



Work Phase	Hazard	Control
Pre-Task Planning In Office	Training, Qualification, Proper Vehicle	When assigning vehicles, consideration should be given to the existing or planned road layout and conditions on site to ensure that the selected vehicles can operate within their design specifications and capabilities; the abilities and qualifications of the assigned drivers; and the design specifications and capabilities of the selected vehicles for load capacity and project expectations (P1 / P4). Clearly communicate daily operations to site foremen and other personnel in work area. Make sure there are no conflicts with operations (P6).
General Vehicle Operations on Construction Sites	Uneven terrain, possible rollovers, encountering unstable roadway *Mechanical, Motion*	Always wear seatbelt (R10). Ensure good housekeeping in vehicle cab. Secure loose items (P1). Turn on headlights, hazard flashers, strobes – see and be seen! Ensure all lights and windshields are cleared of dust and mud for increased visibility (P6). Do not operate vehicle within 5' of open trenches or slopes. Maintain clearance from road shoulders (P6). Check questionable terrain on foot, before travel with vehicle (P1 / P6). Use caution on unsealed (gravel/dirt) roads. Avoid driving through large pools of water which could hide deep holes and ruts (P6). Heavy equipment can enter a road from an unmarked road at any time. Carefully monitor blind corners (P6).
Sharing Roadway On-Site with Heavy Equipment	Being struck by large equipment *Mechanical, Motion*	Get operator's attention, make yourself noticed, make eye contact with operator, and communicate with hand gestures (P7). Does the site have 2-way radio communication available? Borrow a radio if available (P6). Turn lights on. Consider strobes or flashers in high traffic sites (P7). Large equipment always gets the right of way. Never attempt to cut in front of a piece of heavy equipment (P7). Loaded heavy equipment operators may drive in reverse when descending hills causing an increased in blind spot (P7).

Work Phase	Hazard	Control
Parking On-Site with Operating Heavy Equipment	Heavy equipment being involved in an accident with you *Mechanical, Motion*	Be aware of your surroundings. Practice good situational awareness. (P6). Never park in the right of ways Park only in areas where equipment is not traveling (P6). Never park behind heavy machinery, avoid blind spots, park only in safe, designated parking areas, and walk to work area (P9). Park to prevent the need for backing to exit the space or work area (P9). If changing conditions make backing necessary – use a spotter (P1). Use Terracon approved cone when parked (R12).
Performing Work (Pedestrian) While Heavy Equipment is Present or Operations are Active	Being struck or injured by equipment *Mechanical, Motion*	Clearly communicate daily operations to site foremen and other personnel in work area. Make sure there are no conflicts with operations (P6). Get operator's attention, make eye contact with operator, and communicate with hand gestures. Remember that if you cannot see the equipment operator, the equipment operator cannot see you (P7). If possible, ask for equipment to stop operation while heavy machinery is near your work/test area (P6 / P7). Always position yourself outside the equipment bucket/crane swing radius (R5). Monitor back-up alarms or nearby equipment (P6). Never position yourself where hoisting operations are lifted over your work area (P6). Always wear appropriate PPE (min Class II HiVis) (R1 / R2). In high traffic areas delineate work and parking areas using cones and tape. When possible, position support equipment between the traffic and the work area. While moving equipment, control traffic while maneuvering to the site (R12 / P9). Avoid having your back to traffic or heavy equipment. Position yourself where you can be seen e.g. operators cab side, front side. Do not work directly behind equipment. Practice good situational awareness. (P6). If night work or low light work is anticipated, carry a flashlight or glow stick for additional visibility. For extended periods in one area consider traffic control flashers and warning signs (P6).
Adverse Weather	Being struck by or in an accident with heavy equipment *Motion*	Be aware that heavy equipment can lose traction and stability during changing weather conditions e.g. snow, ice, rain. Give extra clearance in extreme weather conditions (P7). Ensure your vehicle has the capability to handle the weather conditions. Be aware the stopping distances are increased and visibility decreased (P1).

Work Phase	Hazard	Control
General Operations	Eye Hazards *Chemical*	Wear ANSI approved safety glasses at all times during operations. Always evaluate the need for additional eye protection (goggles / face shield) whenever there is a potential for flying debris or based on work activity. This includes, but is not limited to mixing chemicals, pressure washer operations and grinding (R1).
	Noise	Wear hearing protection with a noise reduction rating (NRR) of at least NRR 30 when working within five (5) feet of noise sources, such as the generator and compressor. Employees shall be enrolled in a hearing conservation program if noise level meet or exceed the OSHA action level of 85 dba for an 8-hour Time Weighted Average (R1).
	Portable Hand or Power Tools *Electrical, Motion*	ALL TOOLS: Use the correct tool for the task. Assure that tools are in good repair. Inspect all tools prior to use. Report damaged tools to the supervisor. Store out-of-use tools in their proper container (tool box). Be aware of body position and line of fire (P6). HAND TOOLS: Impact tools such as hammers, wedges and chisels are kept free of mushroomed heads. Do not modify hand tools from their original design. (P6). POWER TOOLS: Any electrical equipment that is damaged or not functioning properly shall be immediately taken out of service and tagged or the cord cut and thrown away. Portable power tools shall be double insulated or grounded. Electrical equipment such as power tools, generators and extension cords (3 wire no less than 12-3) shall be inspected prior to each use. The user may test GFCIs using the test button provided by the manufacturer before each use. Use GFCIs in damp or wet work areas, outdoors, and for portable, electric hand tools with cord/plug connectors. Assure that generator-grounding cable is attached. No modification or additions that affect the safe operation of the tool shall be made. Guards shall be replaced upon completion of maintenance and shall not be used unless they are intact. Saws, grinders, and abrasive wheels shall use the proper rating and revolutions per minute for the tool (P6).
	Working at Heights *Gravity*	Fall protection (full body harness and restraint device) is required for any work or travel performed above six (6) feet or where there is a potential of falling (R6). Use only OSHA approved ladders, which are heavy-duty use. Inspect ladders prior to use. Remove from service any defective ladder and tag out of service. Freestanding ladders will not be used to install well materials (R6).
	Slips, Trips and Falls *Gravity*	Be aware of uneven or warped boards, tooling, cords and materials (P1). Keep work areas picked up of tools and equipment. Position cords and hoses away from high traffic areas (P6). Arrange materials in a stable manner so that they do not protrude into walking surfaces (P1).
	Manual Handling – Ergonomics *Gravity*	When lifting awkward loads or those greater than 50 lbs use the buddy system or mechanical means. Carefully evaluate awkward loads greater than 25 lbs. Warm up before work! (P2 / P8). Whenever possible use a dolly/cart to transport heavy equipment from location to location (P2 / P8). When lifting, wear leather or equivalent gloves to protect the hands from cuts and abrasions (P2 / P8). Use proper lifting techniques, keep head high, chin tucked in and back arched. Keep weight close to the body and stand up straight. Don't jerk as you lift, ensure your path is clear before travel. Always turn with your feet and don't twist the body while carrying a load (P2 / P8).
	Lockout / Tagout *Electrical, Mechanical, Gravity*	When maintenance is to be performed on equipment, it shall be locked and tagged out. Ensure all energy sources (electrical/pressure/fluids) are neutralized to a zero energy state prior to work (P1).
	Dust / Respiratory Protection *Chemical*	When required, employees shall wear the prescribed respiratory protection. Dust masks may be worn for comfort by the employee upon request during pouring of cement, bentonite, etc. Employees shall be trained and medically qualified as required by applicable policies and procedures if respiratory protection is required (R1 / P6). Consider a N95 or P100 particulate type dust mask when pouring cement, sand or bentonite (R1 / P6).

Work Phase	Hazard	Control
Site Specific Hazards	*Biological* – plants, snakes / insects	Snakes - do not reach into or under objects without using caution. Be careful when handling equipment that has rested on the ground. If snakes are encountered, do not attempt to handle or molest them. Monitor the snake's whereabouts until it is safely away from the work site. Consider snake chaps for areas where snakes are prevalent (P6). Insects - evaluate the need for treated clothing or repellants for mosquitoes and ticks. Personnel allergic to bee stings should notify supervision of the location of epinephrine medication. Use caution and watch for spiders when reaching into enclosed areas (P6). Plants – evaluate the site for poisonous plants (ivy, oak and sumac). Clear or flatten the site of vegetation. Wear gloves and long sleeve shirts. Be aware that poisonous plant matter is an oil that can stay on clothing, tools or cut plants for long periods (P6).
	Soil Samples, Groundwater *Chemical*	Site may contain hazardous materials. Reference SSHASP for site hazards and appropriate PPE. Always select appropriate PPE for site specific conditions (P6). If unanticipated levels of contaminants are encountered STOP WORK and notify your supervisor (P6).
	Weather	Lightning – stop work when lightning is visible or within 10 miles of the work area (P3). Rain / Floods – monitor work site, ground conditions and access for saturated soils. Never cross a flooded roadway (P6). Severe Storms (wind) – monitor work activities if they will be affected by high winds i.e., hoisting, work at height (P6). Use phone applications to set National Weather Service severe weather alerts (P1).
	Temperature Extremes	Wear appropriate clothing for weather conditions (P6). Heat Stress - monitor for signs of heat stress / stroke (nausea, cramping, no sweat, skin hot to touch). Schedule work and break times as necessary and drink plenty of fluids. Avoid caffeine and alcohol; eat a balanced diet. If you are overheating, move to a cool location and hydrate with water. Consider the need for sunscreen or personal cooling devices (P6). Cold Stress - monitor for signs of cold stress such as reduced mental alertness, reduction in decision-making, severe shivering or loss of consciousness as temperature and wind speeds increase above 5mph and drop below 30° F. Employees may take warming breaks as necessary (P6). Contact WorkCare if heat or cold stress is suspected (R13).

Task or Job:	Drilling Operations	Document No:	SRP TER 01

Analysis Conducted By:	Terracon Safety	Revision Mod:	0817

Notes
1. Work procedures quality procedures, client / site specific safety plans and safety data sheets (SDS) may all provide additional information and guidance.
2. No changes to the procedures or hazard controls are permitted without the approval of a Terracon supervisor. Terracon requires Pre-Task Planning in order to prevent incidents and address site specific hazards.
3. ALL EMPLOYEES HAVE **STOP WORK** AUTHORITY. If a hazard exists, stop work and eliminate the hazard.
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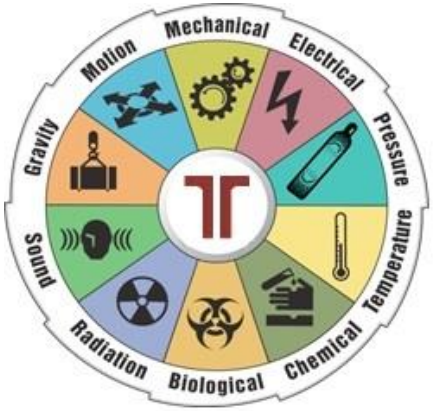

Work Phase	Hazard	Control
Pre-Task Planning In Office	Training, Qualification *Gravity, Motion, Electrical, Pressure, Temperature, Chemical,*	Evaluate contractor site specific requirements along with Geo Exploration project paperwork package (P1). Ensure the job specific tasks discussed when entering the site; qualified employee, competent employee inspection, type of work being conducted and correct equipment for the task (P1 / P4). Provide field staff with information to evaluate site conditions such as a Health and Safety Plan, area map and site address (P3 / P6). Emergency numbers and hospital routes identified for crews working within the site (R3 / R13). Clearly communicate daily operations to site foremen and other personnel in work area. Make sure there are no conflicts with operations (P6).

Work Phase	Hazard	Control
Drilling Operations – including drilling rotation, sampling procedures, well installation and well destruction (over drill)	Overhead Utilities *Electrical*	Before raising mast of rig, be sure there are no overhead power lines or obstructions nearby. The rig's mast must be a minimum of 10 feet away from power lines with 50 kV to ground or below. Contact your REM or Terracon Safety if power lines are greater than 50 kV (P6).
	Underground Utilities *Electrical, Pressure*	Ensure a utility clearance has been conducted prior to drilling. Double check ticket date and location(s) cleared. Sites should be cleared per Terracon Underground Clearance Procedure (P6).
	Rig Stability / Outriggers *Gravity, Mechanical*	Ensure the manufacturer's rated capacity is not exceeded. Jacks shall have a positive stop to prevent over travel. Blocking and cribbing are provided at the base of the jack when necessary to ensure a firm foundation. Use a wood block between the metal cap of the jack and load when there is a possibility of slipping. After load is raised use blocking and cribbing to secure. Inspect and maintain jacks according to the manufacturer's specifications (P6).
	Hoisting & Rigging *Gravity, Mechanical*	Look up and be aware of falling objects. Use proper PPE in work zones (e.g. hard hat, safety glasses, and safety toe boots). Always secure loose or unstable items. Stand clear and never under suspended loads (R5 / P6). A thorough inspection of rigging and hoisting equipment shall be conducted before commencing hoisting operations. Any questionable rigging should be repaired or replaced (R3).
	Crush Points / Rotating Hazards	When loading the vehicle, wear leather gloves to protect cuts or abrasions to the hands (R1). Watch where you place your hands to avoid pinching the hands between objects (P6). Never place your body or hands in a 'Line of Fire' (P6).
	Hydraulics *Chemical, Pressure*	Inspect lines daily for cracks, cuts, chafing. Have spill kit readily available to use (R3).
	High Pressure Systems (Air) *Pressure* High Pressure Systems (Fluids) *Pressure*	Compressed air shall not be used for cleaning purposes (equipment or personnel) (P6). Assure that pressure has been relieved prior to performing maintenance on pressurized systems and equipment (P6). Regulators shall be inspected to ensure that they are working correctly; any deficiencies shall be reported to the supervisor and taken out of service (P6). Ensure all hoses, fittings, valves and plumbing are rated to the highest pressure that can be generated by the equipment (R3 / R4 / P6). Pressure lines shall be secured with the proper sized whip checks to ensure that connections are secure if hose connections fail (P6). The following additional personal protective clothing is required during cement mixing operations to protect the skin: rubber or equivalent gloves, and after adding dry cement to the mixer, wear safety glasses and a face shield to protect against splashing in the neck/face area. Wash thoroughly after handling cement or grout
	Rotating Hazards (auger flights / drill rod) *Motion*	Do not remove until auger flight comes to a complete stop and driller signals approach (P6). Good communication between driller and assistant. Never approach rotating drill rods or augers. Driller never to move head or rotate string when assistant is near and without making eye contact / signal. Do not shovel cuttings while auger is under rotation (P6).

Work Phase	Hazard	Control
General Operations	Eye Hazards *Chemical*	Wear ANSI approved safety glasses at all times during operations. Always evaluate the need for additional eye protection (goggles / face shield) whenever there is a potential for flying debris or based on work activity. This includes, but is not limited to mixing chemicals, pressure washer operations and grinding (R1).
	Noise	Wear hearing protection with a noise reduction rating (NRR) of at least NRR 30 when working within five (5) feet of noise sources, such as the generator and compressor. Employees shall be enrolled in a hearing conservation program if noise level meet or exceed the OSHA action level of 85 dba for an 8-hour Time Weighted Average (R1).
	Portable Hand or Power Tools *Electrical, Motion*	ALL TOOLS: Use the correct tool for the task. Assure that tools are in good repair. Inspect all tools prior to use. Report damaged tools to the supervisor. Store out-of-use tools in their proper container (tool box). Be aware of body position and line of fire (P6). HAND TOOLS: Impact tools such as hammers, wedges and chisels are kept free of mushroomed heads. Do not modify hand tools from their original design. (P6). POWER TOOLS: Any electrical equipment that is damaged or not functioning properly shall be immediately taken out of service and tagged or the cord cut and thrown away. Portable power tools shall be double insulated or grounded. Electrical equipment such as power tools, generators and extension cords (3 wire no less than 12-3) shall be inspected prior to each use. The user may test GFCIs using the test button provided by the manufacturer before each use. Use GFCIs in damp or wet work areas, outdoors, and for portable, electric hand tools with cord/plug connectors. Assure that generator-grounding cable is attached. No modification or additions that affect the safe operation of the tool shall be made. Guards shall be replaced upon completion of maintenance and shall not be used unless they are intact. Saws, grinders, and abrasive wheels shall use the proper rating and revolutions per minute for the tool (P6).
	Hot Work *Temperature*	All hot work activities will be conducted in accordance with Terracon and client hot work permit procedures. The area must be clear of combustibles or protected using fireproof blankets, tarps, etc. Hot work activities shall include a designated fire watch. Employees shall wear the designated PPE as stated on the Hot Work Permit (P6).
	Working at Heights *Gravity*	Fall protection (full body harness and restraint device) is required for any work or travel performed above six (6) feet or where there is a potential of falling (R6). Use only OSHA approved ladders, which are heavy-duty use. Inspect ladders prior to use. Remove from service any defective ladder and tag out of service. Freestanding ladders will not be used to install well materials (R6).
	Slips, Trips and Falls *Gravity*	Be aware of uneven or warped boards, tooling, cords and materials (P1). Keep work areas picked up of tools and equipment. Position cords and hoses away from high traffic areas (P6). Arrange materials in a stable manner so that they do not protrude into walking surfaces (P1).
	Manual Handling – Ergonomics *Gravity*	When lifting awkward loads or those greater than 50 lbs use the buddy system or mechanical means. Carefully evaluate awkward loads greater than 25 lbs. Warm up before work! (P2 / P8). Whenever possible use a dolly/cart to transport heavy equipment from location to location (P2 / P8). When lifting, wear leather or equivalent gloves to protect the hands from cuts and abrasions (P2 / P8). Use proper lifting techniques, keep head high, chin tucked in and back arched. Keep weight close to the body and stand up straight. Don't jerk as you lift, ensure your path is clear before travel. Always turn with your feet and don't twist the body while carrying a load (P2 / P8).
	Lockout / Tagout *Electrical, Mechanical, Gravity*	When maintenance is to be performed on equipment, it shall be locked and tagged out. Ensure all energy sources (electrical/pressure/fluids) are neutralized to a zero energy state prior to work (P1).

Work Phase	Hazard	Control
General Drilling Operations (cont'd)	Dust / Respiratory Protection *Chemical*	When required, employees shall wear the prescribed respiratory protection. Dust masks (N95 / P100) may be worn for comfort by the employee upon request during pouring of cement, bentonite, etc. Employees shall be trained and medically qualified as required by applicable policies and procedures if respiratory protection is required (R1 / P6).
	Dust / Respiratory Protection (Silica) *Chemical*	Site geology and drilling method should be evaluated in pre-task planning. 'Dry' drilling methods like air rotary have the potential to generate dust. Water injection and/or wet drilling methods should be utilized to keep dust generation to a minimum. Auger and direct push drilling methods have the least dust generation. Geology professionals should be consulted to evaluate the geology for silica bearing materials. Well installation and mud rotary drilling procedures could generate silica bearing dust in the form of cement, sand, grout and bentonite completion / mud products. Consult the Safety Data Sheet (SDS) to evaluate silica content and assign protective measures. Do not clean up dust or cutting with air. Wet the area and use shovels to move cuttings.
Site Specific Hazards	*Biological* – plants, snakes / insects	Snakes - do not reach into or under objects without using caution. Be careful when handling equipment that has rested on the ground. If snakes are encountered, do not attempt to handle or molest them. Monitor the snake's whereabouts until it is safely away from the work site. Consider snake chaps for areas where snakes are prevalent (P6). Insects - evaluate the need for treated clothing or repellants for mosquitoes and ticks. Personnel allergic to bee stings should notify supervision of the location of epinephrine medication. Use caution and watch for spiders when reaching into enclosed areas (P6). Plants – evaluate the site for poisonous plants (ivy, oak and sumac). Clear or flatten the site of vegetation. Wear gloves and long sleeve shirts. Be aware that poisonous plant matter is an oil that can stay on clothing, tools or cut plants for long periods (P6).
	Soil Samples, Groundwater *Chemical*	Site may contain hazardous materials. Reference SSHASP for site hazards and appropriate PPE. Always select appropriate PPE for site specific conditions (P6). If unanticipated levels of contaminants are encountered STOP WORK and notify your supervisor (P6).
	Weather	Lightning – stop work when lightning is visible or within 10 miles of the work area (P3). Rain / Floods – monitor work site, ground conditions and access for saturated soils. Never cross a flooded roadway (P6). Severe Storms (wind) – monitor work activities if they will be affected by high winds i.e., hoisting, work at height (P6). Use phone applications to set National Weather Service severe weather alerts (P1).
	Temperature Extremes	Wear appropriate clothing for weather conditions (P6). Heat Stress - monitor for signs of heat stress / stroke (nausea, cramping, no sweat, skin hot to touch). Schedule work and break times as necessary and drink plenty of fluids. Avoid caffeine and alcohol; eat a balanced diet. If you are overheating, move to a cool location and hydrate with water. Consider the need for sunscreen or personal cooling devices (P6). Cold Stress - monitor for signs of cold stress such as reduced mental alertness, reduction in decision-making, severe shivering or loss of consciousness as temperature and wind speeds increase above 5mph and drop below 30° F. Employees may take warming breaks as necessary (P6). Contact WorkCare if heat or cold stress is suspected (R13).

Task or Job:	Hand Augering	Document No:	SRP Gen07
Analysis Conducted By:	**Terracon** Safety	Revision Mod:	0816

Task Requirements
Work Permits – none
Personal Protective Equipment (PPE) – Eye Protection, Safety Footwear, Gloves (Impact), Hard Hat, Hi Vis Shirt / Vest (min Class II)
Job Specific Resources – utility clearance

Specific Job Steps	Potential Hazards	Tools and Equipment	Risk Assessment			Employees Required	Hazard Control
			Low	Med	High		
1. Walk the job through.	crew members not focused on task, underground utilities		✔			all site	Pre-Task Planning will help prevent unforeseen hazardous conditions. Ensure utility clearances before beginning.
2. Employee assembles hand auger.	manual handling, hand tools, overhead hazards, pinch points		✔			1	Employee to wear impact gloves for hand protection. Hand augers are long – be aware of overhead clearances / hazards. Inspect tool for damage or wear. Ensure cutting head is sharp.
3. Begin turning auger to acquire soil samples.	underground utilities, ergonomics, repetitive motion.			✔		1 (+)	Confirm utility clearances before beginning. Cutting heads WILL DAMAGE underground utilities! Avoid twisting of hips / lower back when turning auger. Use arms and shoulders turn auger. Do not force the auger down. Let the cutting head do the work and use minimal down force. Add extensions as hole deepens. Keep handles around waist height. Consider two people for large numbers of samples. Employees can trade off augering or use a team effort to turn auger, one on each side pushing and pulling.
4. Take soil samples per client direction.	environmental, quality	chemical resistant gloves		✔		1	Avoid contact with environmental samples. Follow client instructions for sample collection.
5. House keeping	slips and trips			✔		all site	Return tools to storage area after use. Ensure work area is free of trip hazards. Proper maintenance and repair of tools.

Notes
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Working Near Overhead Electrical Hazards

Task or Job:	Working Near Overhead Electrical Hazards	Document No:	GEOX-01
Analysis Conducted By:	Terracon Exploration Services Group	Revision Mod:	05-2017

Task Requirements
Work Permits – possible utility notification
Personal Protective Equipment (PPE) – Eye Protection, Safety Footwear, Gloves, Hard Hat, Hi-Vis Shirt/Vest (min Class II)
Job Specific Resources – none

Specific Job Steps	Potential Hazards	Tools and Equipment	*Risk Assessment*			Employees Required	Hazard Control
			Low	Med	High		
1. Review the Exploration Package and/or pre-task planning documents prior to mobilizing to the site with the Project Manager and/or Local Exploration Manager.	crew members not aware of current or possible change in site conditions	all exploration tooling needed for the project	b			all ETMs	Pre-Task Planning will help prevent unforeseen hazardous conditions (P1). During the Exploration Package review, the anticipated schedule and general sequence of boring completion should be discussed with the Project Manager and/or Local Exploration Manager and the Exploration Team (P3).
2. Measure distance from equipment to overhead hazard (closest point). Distances should be measured laterally from the line. See *Figure 1.*	slips and trips	measuring tape or other measuring device		b		1	Do not climb mast or utility pole to measure. Ground distance is sufficient. Measure the closest distance the mast will reach, including distance during raising and lowering the mast. Know your equipment height. Do not guess! Be sure to account for the "drooping" of the overhead line. If it is necessary to work directly under a high line or inside the vertical clearance distance, notify your Local Exploration Manager or Project Manager (P3).
3. Use *Table 1* on page 3 of this SRP to evaluate the minimum safe clearance required.	contact with lines if distance is not followed	line voltage			b	all ETMs	Do not get closer to the lines than the allowed clearance. If there is a problem with the boring location or clearance, contact your Project Manager and/or Local Exploration Manager. To use *Table 1*, it is necessary to know the line voltage. If it is not noted on the utility pole, contact the utility. If the voltage can't be determined, use the maximum safe clearance of 45 feet.
4. When distances are clear, move equipment and raise mast up as necessary.	contact with lines if distance is not followed	spotter			b	2	Use spotter(s) during movement to ensure overhead clearances from all angles (P7). If you have to say, "I think you'll make it" – ***STOP WORK*** – you are too close! (P3). Never move a drill rig with the mast in the raised or partially raised position (R4, LSA 3 and LSA 8).
Precaution – If it is necessary to work within 2 feet of the minimum safe clearance limit of overhead lines, contact your Local Exploration Manager to discuss equipment grounding.	electrical shock	copper grounding rod and cable			b	1	Drive copper grounding rod into ground and connect to rig with cable ***prior to*** raising the mast. Notify your Local Exploration Manager if this precaution is necessary (P3).
Precaution – lines may be deactivated, shielded, or booted by the utility if close clearances are necessary. You may also ask the utility to come to the site and approve clearances. Contact your Local Exploration Manager to discuss if overhead line deactivation will be necessary.	electrical shock	utility notification			b	1	Notify the utility for their advice. Notify your Local Exploration Manager if this precaution is necessary.

Specific Job Steps	Potential Hazards	Tools and Equipment	*Risk Assessment*			Employees Required	Hazard Control
			Low	Med	High		
Precaution – Be aware of clearance distances for all site areas and equipment including articulating loaders, forklifts and backhoes. Be aware of distances during tripping and laying down rods to truck beds or ground. Be especially aware when laying down equipment next to the rig.	electrical shock	powder chalk, flour, or marking paint			b	1	Be well aware of, and maintain, minimum clearance distances for all equipment working and work activities on site (P7). If working close to the clearance limit of overhead lines, place a chalk line on the ground to show the danger line. Avoid working inside that line.
Precaution – Temporary power lines on construction sites may sag or be moved from day to day activities. Always know where lines are and avoid traveling under them if possible.	electrical shock				b	1	Notify the utility for their advice. Notify your supervisor if this precaution is necessary.
5. House keeping	slips and trips			b		all site	Return tools to their proper storage area after use. Ensure work area is free of trip hazards. Conduct proper maintenance and repairs of tools (R3).

Overhead electrical lines present a severe hazard that has the potential to cause equipment damage, severe injury or *DEATH*! Never become complacent around overhead lines. If you have questions or concerns about clearance distances or electrical hazards – *STOP WORK* and notify your supervisor or Terracon Safety.

Figure 1: Lateral vs. Vertical Clearance Measurement

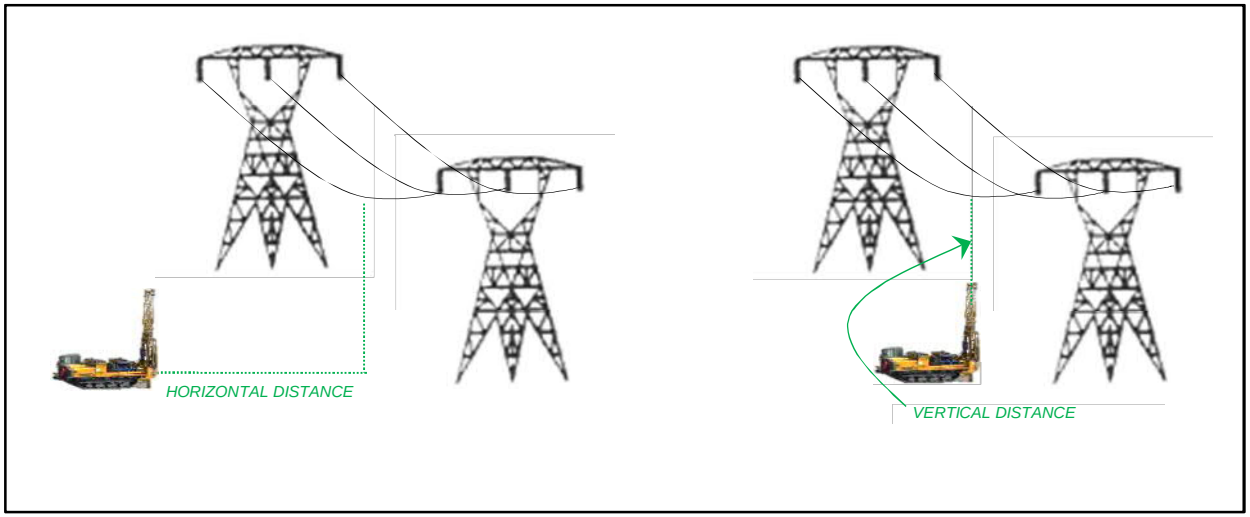


Table 1: Minimum Safe Clearances vs. Power Line Voltage

Power Line Voltage phase to phase (kV)	Minimum Safe Clearance (2) (line to closest point of rig mast)
< 50 (1)	10 feet
51 to 200	15 feet
201 to 350	20 feet
351 to 500	25 feet
501 to 750	35 feet
> 750	45 feet

[1] You may work closer than 10 feet to drop voltage (less than 220 volts, pole to house) with the permission of the utility company and Terracon Safety.
[2] **If the voltage is unknown and can't be determined, use the maximum safe clearance of 45 feet.**

Occupational Safety and Health Administration (OSHA) Regulations

29 CFR 1926.550(a)(15)(i) For lines rated 50kV or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.

29 CFR 1926.550(a)(15)(ii) For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than 10 feet.

Some options are available to contractors who have no choice but to work within the 10 ft zone:

1. Only after utility company or electrical system operator has de-energized the lines;
2. Relocated the lines; or
3. Installed protective coverings.

Notes
1. Work procedures, quality procedures, client / site specific safety plans and safety data sheets (SDS) may all provide additional information and guidance.
2. No changes to the procedures or hazard controls are permitted without the approval of Terracon Safety Director. Terracon requires Pre-Task Planning in order to prevent incidents and address site specific hazards.
3. ALL EMPLOYEES HAVE ***STOP WORK*** AUTHORITY. If a hazard exists, stop work and eliminate the hazard.
4. This document contains information concerning Terracon strategies, personnel and systems. We regard such information as confidential and request that it is not disclosed in whole or in part to any third party without first seeking our consent.

Underground Utility Location

EXPLORATION SERVICES SUPPLEMENTAL GUIDANCE DOCUMENT

As presented in the Safe Right Procedure *GEOX-06 SRP Underground Utility Locations 05-2017*, any exploration requires the performance of a utility location prior to work. It is against the law to proceed without a utility locate. Each state has specific requirements. This document is provided to specify the general need. Anyone exploring the subsurface by drilling, probing, performing a test pit, or penetrating the ground surface in any way should be completely familiar with and comply with state regulations.

Absolutely no subsurface excavation will be performed without a utility locate performed by a Terracon representative, regardless of whether we are using Terracon exploration equipment or subcontractors. This document will give further guidance on internal requirements for utility locate procedures for both in-house and subcontractor drilling.

Who Notifies the Public Utilities?

- Terracon does regardless of whether we are doing the exploration ourselves, using a subcontractor or performing the work as a subcontractor. By law, the excavator is required to contact the Nationwide One Call System at 811. However, Terracon will always perform their own utility locate even if a subcontract exploration crew is being used.
- It is the responsibility of the Project Manager (PM) to verify the utility locate has been completed in accordance with state laws. The Exploration Team Leader (ETL) should confirm that this has been accomplished prior to penetrating the subsurface.
- In the event that a subcontractor is performing the field work, we will offer to share the utility locate ticket to assist the subcontractor in performing their own utility locate.
- The subcontractor is required to show Terracon proof that the utility locate was performed and still active within the expiration date prior to performing the site work.
- In the event that we are the subcontractor, and the prime offers to complete the utility locate on the project site, we should thank them but explain that the law requires the excavator acquire and maintain utility locates.
- In some states, certain non-member utility owners (i.e. water, sewer, private utilities) are not notified by the state's one call system. It is the responsibility of Terracon to be aware of such situations and ensure these members are notified.

Pre-Task Planning

- The PM will confirm that the locate ticket and specific information pertaining to utilities are included in the Exploration Package provided to the Exploration Team Members. The PM will confirm that the expiration date of the public utility notification has not lapsed. If the expiration date has lapsed, the public utility must be updated prior to site exploration.
- The ETL will confirm that the appropriate documentation is included in the Exploration Package.
- Although public utility location services are required, they may not locate all utilities on the site. Private utilities on sites are not a part of the public utility location services. If private utilities are anticipated, in addition to performing the public utility locate, the PM should request the client or owner provide documentation or identification of the utilities on the site. If the information cannot be provided, the PM should include the cost of a private utility locate service in our proposal.
- It is the responsibility of the ETL to, upon arrival at the project site, assess the potential for private utilities that have not been located by the public utility location process. This is addressed more completely in "Situational Awareness" below.
- The ETL will make an assessment of the sufficiency of the public locate and (if conducted) the private locate upon their arrival at the site. If, in the opinion of the ETL, the potential remains for undetected utilities in the area of exploration, the ETL will contact the PM and determine a means to explore the site safely. Additional

methods such as Ground Penetrating Radar (GPR) and/or soft dig techniques such as air or hydro-excavation should be used.

Situational Awareness

- As noted in pre-task planning the ETL should confirm that the PM has accomplished a public utility locate in accordance with state law prior to mobilizing to the site.
- Upon arrival at the site, the ETL, with the assistance of the Exploration Team, should walk the project site prior to penetrating the ground surface. If there are any questions on the validity of the utility locate that was performed, they are to contact the PM to verify the accuracy of the markings on site prior to breaking ground.
- During the site walk, the ETL should confirm that the following is accomplished:
  - Confirm locate marks are still visible.
  - Scan the site for transformers, light poles, lighted signs, and drop cables from telephone poles.
  - Detect any gas vents or upright yellow PVC markers. These indicate underground gas lines.
  - Detect any visible trench lines, elevations or depressions, and uniform differences in vegetation that can indicate a buried utility line.
  - Detect any manholes (sewers, water lines, utility, communication tunnels, etc.).
- On campuses, or similar multi-building sites such as schools, hospitals, industrial complexes, power plants, etc., the ETL should contact the point of contact for the facility. The ETL should, with the point of contact:
  - Review the public and (if performed) private utility location work and results.
  - Review as-built drawings and all other available information that the point of contact may have related to private utility lines.

Color Code for Marking Underground Utility Lines

- **White:** Proposed excavation
- **Pink:** Temporary survey markings
- **Red:** Electric power lines, cables, conduit, and lighting cables
- **Yellow:** Gas, oil, steam, petroleum, or gaseous materials
- **Orange:** Communications, alarm, or signal lines, cables, or conduit
- **Blue:** Potable water
- **Purple:** Reclaimed water, irrigation, and slurry lines
- **Green:** Sewer and drain lines

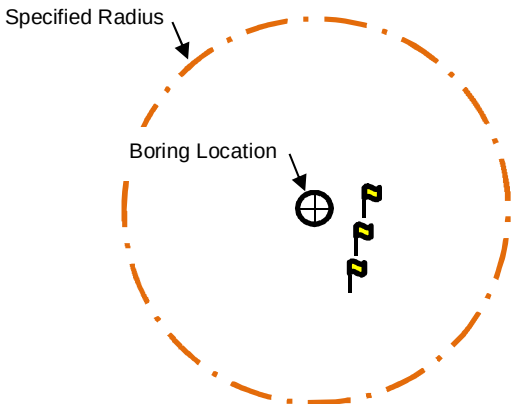
I Hit a Utility! What Now?

Even when all of the precautions are taken, utilities may still be encountered. It is important that the Exploration Team knows how to react when an underground utility is hit.

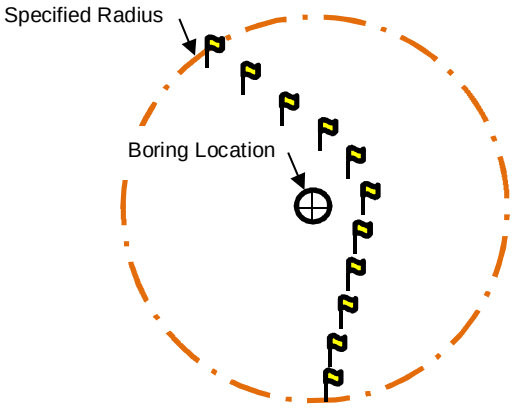
1. Don't panic.
2. If you have created a dangerous situation (hit a gas line, high voltage power, overhead power), evacuate everyone from the area and **call 911 immediately**. Do not attempt to retrieve augers/tooling or move the drill rig. After emergency responders are on the way, contact 811 and report damage to a utility referencing the locate ticket number provided in your Exploration Package. In the event of a waterline strike, lower tower and move rig immediately, if possible.
3. If it is not a dangerous situation, call 811 to report damage to a utility referencing your locate ticket number.
4. Contact the PM and notify them of the situation.

Marked Utilities within a Radius

If a radius is specified during the one call process, it is the responsibility of the ETL to confirm that the utilities are marked throughout the specified radius. The utilities present within the specified radius should be marked from where they enter the radius to where they exit the radius. If utilities are only marked near the pre-marked boring location, we cannot assume the entire radius is cleared. Accordingly, any modifications to the boring location will require additional utility locate services.



Example of an incomplete locate request. Not acceptable to move boring location.

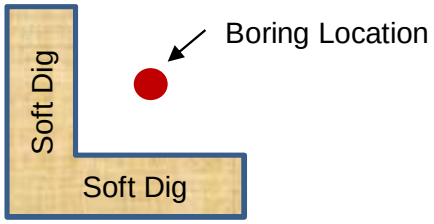


Example of a complete locate request. OK to move boring location within radius.

Exploration Within/Near Power Facility

Inside a power facility (substation, power plant, etc.) or within 100 feet of a power facility property line, an owner's representative must meet Terracon on-site to clear the boring location. If a boring location is moved at any time, even within a previously cleared radius, the owner's representative must be contacted to clear the new location.

Additionally, prior to excavating within an existing power facility or within 100 feet of a power facility property line, soft dig practices are required to clear the boring location to a depth of at least 5 feet. Soft dig techniques may include hydro- or air excavation. If near surface soil properties are necessary, the soft dig should be used to clear an "L" shaped area with the boring located near the inside intersection of the "L" as shown below:



SAFETY DATA SHEET

SDS ID NO.: 0127MAR019
Revision Date: 06/01/2016

1. IDENTIFICATION

Product Name: Marathon Petroleum Gasoline - All Grades

Synonym: Gasoline; Regular Unleaded Gasoline; Conventional Regular Unleaded Gasoline; Mid Grade Unleaded Gasoline; Conventional Mid Grade Unleaded Gasoline; Premium Unleaded Gasoline; Conventional Premium Unleaded Gasoline; Sub-Octane Gasoline; Regular RBOB; Super RBOB; Premium RBOB; RBOB; Reformulated Blend Stock For Oxygenated Blending; 84 Octane Gasoline; CBOB; Premium CBOB; Conventional Blend Stock for Oxygenate Blending; Recreational Gasoline; Recreational Gasoline; Recreational Unleaded Gasoline; 89 Recreational Gasoline; Brand 89 Recreational Gasoline; 7.0 Max RVP 89 Recreational Gasoline; BR 7.0 Max RVP 89 Recreational Gasoline; 90 Recreational Gasoline; 90 Marina Gasoline; Brand 91 Recreational Gasoline; 91 Recreational Gasoline; 91 Marina Gasoline; 90 Octane Midgrade Gasoline with No Ethanol; 0125MAR019; 0126MAR019; 0134MAR019; 0313MAR019; 0314MAR019

Chemical Family: Complex Hydrocarbon Substance

Recommended Use: Fuel.
Restrictions on Use: All others.

Manufacturer, Importer, or Responsible Party Name and Address:

MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 1
Skin corrosion/irritation	Category 2
Germ cell mutagenicity	Category 1B
Carcinogenicity	Category 1B
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Aspiration toxicity	Category 1
Acute aquatic toxicity	Category 2
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)

Static accumulating flammable liquid

Label elements

EMERGENCY OVERVIEW

Danger

EXTREMELY FLAMMABLE LIQUID AND VAPOR
May accumulate electrostatic charge and ignite or explode
May be fatal if swallowed and enters airways
Causes skin irritation
May cause respiratory irritation
May cause drowsiness or dizziness
May cause genetic defects
May cause cancer
Suspected of damaging fertility or the unborn child
Toxic to aquatic life with long lasting effects

Appearance Clear yellow liquid **Physical State** Liquid **Odor** Hydrocarbon

Precautionary Statements - 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
Avoid breathing mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Wash hands and any possibly exposed skin thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response
IF exposed or concerned: Get medical attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor if you feel unwell
IF SWALLOWED: Immediately call a POISON CENTER or doctor
Do NOT induce vomiting
In case of fire: Use water spray, fog or regular foam for extinction
Collect spillage

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Keep cool
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Gasoline is a complex combination of hydrocarbons consisting of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons having molecular chains ranging in length from four to ten carbons. May contain small amounts of dye and other additives (>0.02%) which are not considered hazardous at the concentrations used.

Composition Information:

Name	CAS Number	% Concentration
Gasoline	86290-81-5	100
Heptane (mixed isomers)	142-82-5	2.5-26
Pentane (mixed isomers)	78-78-4	6.5-19
Butane (mixed isomers)	106-97-8	0.5-14
Hexane Isomers (other than n-Hexane)	107-83-5	2-12
Toluene	108-88-3	3-9.5
Xylene (mixed isomers)	1330-20-7	3.5-9.5
n-Hexane	110-54-3	0.1-4.5
Cumene	98-82-8	0-4
1,2,4 Trimethylbenzene	95-63-6	1-4
Ethylbenzene	100-41-4	0.5-2.5
Benzene	71-43-2	0.1-1.5
Cyclohexane	110-82-7	0-1.5
Octane	111-65-9	0-1.5
1,2,3-trimethylbenzene	526-73-8	0-1
Naphthalene	91-20-3	0.1-0.5

All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

First Aid Measures

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. If symptoms occur get medical attention.

Skin Contact: Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. May be absorbed through the skin in harmful amounts. Get medical attention if irritation persists. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

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. Destroy contaminated, non-chemical resistant footwear.

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. Gently remove contacts while flushing. Get medical attention if irritation persists.

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, or if patient is lying down, turn body and head to side 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.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Indication of any immediate medical attention and special treatment needed

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.

SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES.

INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

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. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media
Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical
This product has been determined to be an extremely flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. 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 Emergency Response Guidebook 128.

Hazardous combustion products
Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data
Sensitivity to Mechanical Impact No.
Sensitivity to Static Discharge Yes.

Special protective equipment and precautions for firefighters
Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. 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.

Additional firefighting tactics
FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA	Health 1	Flammability 3	Instability 0	Special Hazard -

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.
Protective equipment:	Use personal protection measures as recommended in Section 8.
Emergency procedures:	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.
Environmental precautions:	Avoid release to the environment. Avoid subsoil penetration. Ethanol in gasoline phase seperates in contact with water. Monitor downstream for dissolved ethanol or other appropriate indicators.
Methods and materials for containment:	Contain liquid with sand or soil. Prevent spilled material from entering storm drains, sewers, and open waterways.
Methods and materials for cleaning up:	Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe Handling Precautions:

NEVER SIPHON THIS PRODUCT BY MOUTH. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Vapors may travel along the ground or be moved by ventilation. Flashback may occur along vapor trails. No smoking. Use only non-sparking tools. Avoid contact with skin, eyes and clothing. Avoid breathing fumes, gas, or vapors. Use only with adequate ventilation. Avoid repeated and prolonged skin contact. Use personal protection measures as recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

Hydrocarbons are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering, pumping at high flow rates or loading and transfer operations. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic chemical vapors or mists from process equipment operating under elevated temperature and pressure, or sudden ingress of air into vacuum equipment may result in ignition of vapors or mists without the presence of obvious ignition sources. Nozzle spouts must be kept in contact with the containers or tank during the entire filling operation.

Portable containers should never be filled while in or on a motor vehicle or marine craft. Containers should be placed on the ground. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. 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.

High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).

Storage Conditions:

Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Do not store near an open flame, heat or other sources of ignition.

Incompatible Materials

Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELS:	OSHA - Vacated PELs	NIOSH IDLH
Gasoline 86290-81-5	300 ppm TWA 500 ppm STEL	-	300 ppm TWA 900 mg/m^3 TWA 500 ppm STEL 1500 mg/m^3 STEL	-

Heptane (mixed isomers) 142-82-5	400 ppm TWA 500 ppm STEL	TWA: 500 ppm TWA: 2000 mg/m³	400 ppm TWA 1600 mg/m³ TWA 500 ppm STEL 2000 mg/m³ STEL	750 ppm
Pentane (mixed isomers) 78-78-4	1000 ppm TWA	-	-	-
Butane (mixed isomers) 106-97-8	1000 ppm STEL	-	800 ppm TWA 1900 mg/m³ TWA	-
Hexane Isomers (other than n-Hexane) 107-83-5	500 ppm TWA 1000 ppm STEL	-	500 ppm TWA 1800 mg/m³ TWA 1000 ppm STEL 3600 mg/m³ STEL	-
Toluene 108-88-3	20 ppm TWA	TWA: 200 ppm Ceiling: 300 ppm	100 ppm TWA 375 mg/m³ TWA 150 ppm STEL 560 mg/m³ STEL	500 ppm
Xylene (mixed isomers) 1330-20-7	100 ppm TWA 150 ppm STEL	TWA: 100 ppm TWA: 435 mg/m³	100 ppm TWA 435 mg/m³ TWA 150 ppm STEL 655 mg/m³ STEL	900 ppm
n-Hexane 110-54-3	50 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 500 ppm TWA: 1800 mg/m³	50 ppm TWA 180 mg/m³ TWA	1100 ppm
Cumene 98-82-8	50 ppm TWA	TWA: 50 ppm TWA: 245 mg/m³ Skin	50 ppm TWA 245 mg/m³ TWA Limit applies to skin	900 ppm
1,2,4 Trimethylbenzene 95-63-6	25 ppm TWA	-	25 ppm TWA 125 mg/m³ TWA	-
Ethylbenzene 100-41-4	20 ppm TWA	TWA: 100 ppm TWA: 435 mg/m³	100 ppm TWA 435 mg/m³ TWA 125 ppm STEL 545 mg/m³ STEL	800 ppm
Benzene 71-43-2	0.5 ppm TWA 2.5 ppm STEL Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm (applies to industry segments exempt from the benzene standard) TWA: 1 ppm STEL: 5 ppm (see 29 CFR 1910.1028)	25 ppm Ceiling 1 ppm TWA 5 ppm STEL	500 ppm
Cyclohexane 110-82-7	100 ppm TWA	TWA: 300 ppm TWA: 1050 mg/m³	300 ppm TWA 1050 mg/m³ TWA	1300 ppm
Octane 111-65-9	300 ppm TWA	TWA: 500 ppm TWA: 2350 mg/m³	300 ppm TWA 1450 mg/m³ TWA 375 ppm STEL 1800 mg/m³ STEL	1000 ppm
1,2,3-trimethylbenzene 526-73-8	25 ppm TWA	-	25 ppm TWA 125 mg/m³ TWA	-
Naphthalene 91-20-3	10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm TWA: 50 mg/m³	10 ppm TWA 50 mg/m³ TWA 15 ppm STEL 75 mg/m³ STEL	250 ppm

Notes: The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures: Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

Eye protection:	Use goggles or face-shield if the potential for splashing exists.
Skin and body protection:	Use nitrile rubber, Viton® or PVA gloves for repeated or prolonged skin exposure. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.
Respiratory protection:	Use a NIOSH approved organic vapor chemical cartridge or supplied air respirators when there is the potential for airborne exposures to exceed permissible exposure limits or if excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.
Hygiene measures:	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Clear yellow liquid
Color	Yellow
Odor	Hydrocarbon
Odor Threshold	No data available.

Property	**Values (Method)**
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	24-210 °C / 75-410 °F (ASTM D86)
Flash Point	-43 °C / -45 °F
Evaporation Rate	No data available.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%):	
Upper Flammability Limit:	7.6
Lower Flammability Limit:	1.4
Explosion limits:	No data available.
Vapor Pressure	5.5-15 psi (ASTM D4814)
Vapor Density	3-4
Specific Gravity / Relative Density	0.70-0.76
Water Solubility	No data available.
Solubility in other solvents	No data available.
Partition Coefficient	2.13-4.5
Decomposition temperature	No data available.
pH:	Not applicable
Autoignition Temperature	280 °C / 536 °F
Kinematic Viscosity	No data available.
Dynamic Viscosity	No data available.
Explosive Properties	No data available.
VOC Content (%)	100%
Density	No data available.
Bulk Density	Not applicable.

10. STABILITY AND REACTIVITY

Reactivity	The product is non-reactive under normal conditions.
Chemical stability	The material is stable at 70°F, 760 mmHg pressure.
Possibility of hazardous reactions	None under normal processing.
Hazardous polymerization	Will not occur.

Conditions to avoid Excessive heat, sources of ignition, open flame.

Incompatible Materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation May cause irritation of respiratory tract. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death.

Eye contact Exposure to vapor or contact with liquid may cause mild eye irritation, including tearing, stinging, and redness.

Skin contact Causes skin irritation. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts.

Ingestion May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Gasoline 86290-81-5	14000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
Heptane (mixed isomers) 142-82-5	-	3000 mg/kg (Rabbit)	103 g/m³ (Rat) 4 h
Pentane (mixed isomers) 78-78-4	-	-	450 mg/L (Mouse) 2 h
Butane (mixed isomers) 106-97-8	-	-	658 mg/L (Rat) 4 h
Hexane Isomers (other than n-Hexane) 107-83-5	> 5000 mg/kg (Rat)	-	-
Toluene 108-88-3	> 2000 mg/kg (Rat)	8390 mg/kg (Rabbit)	12.5 mg/L (Rat) 4 h
Xylene (mixed isomers) 1330-20-7	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.04 mg/L (Rat) 4 h
n-Hexane 110-54-3	15000 mg/kg (Rat)	3000 mg/kg (Rabbit)	48000 ppm (Rat) 4 h
Cumene 98-82-8	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 20 mg/L (Rat) 6 h
1,2,4 Trimethylbenzene 95-63-6	3280 mg/kg (Rat)	> 3160 mg/kg (Rabbit)	18,000 mg/m³ (Rat) 4 h
Ethylbenzene 100-41-4	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	17.2 mg/L (Rat) 4 h
Benzene 71-43-2	> 2000 mg/kg (Rat)	> 5000 mg/kg (Rabbit)	> 20 mg/l (Rat) 4 h
Cyclohexane 110-82-7	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	13.9 mg/L (Rat) 4 h
Octane 111-65-9	-	-	118 g/m³ (Rat) 4 h
1,2,3-trimethylbenzene 526-73-8	-	-	-
Naphthalene 91-20-3	490 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 340 mg/m³ (Rat) 1 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

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. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

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.

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.

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.

BUTANES: Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

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.

XYLENES, ALL ISOMERS: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, nervous system 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 with evidence of maternal toxicity. 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.

1,2,4-TRIMETHYLBENZENE: The following information pertains to a mixture of C9 aromatic hydrocarbons, over 40% of which was composed of 1,2,4-trimethylbenzene. 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. Embryotoxicity has been reported in studies of laboratory animals. Adverse effects included increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate.<n><n>

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.

CUMENE: Overexposure to cumene may cause upper respiratory tract irritation and CNS depression. Studies in laboratory animals indicate evidence of respiratory tract hyperplasia, and adverse effects on the liver, kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time. Findings from lifetime laboratory rodent inhalation studies were as follows: In F344/N rats: an increased incidence of renal carcinomas and adenomas, respiratory epithelial adenomas, and interstitial cell adenomas of the testes. In B6C3F1 mice: an increased incidence of carcinomas and adenomas of the bronchi and lung, liver neoplasms, hemangiosarcomas of the spleen, and adenomas of the thyroid.

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 with evidence of maternal toxicity. 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.

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.

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.

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 conciousness, 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.

WHOLLY-VAPORIZED UNLEADED GASOLINE: Lifetime exposure to wholly vaporized unleaded gasoline produced an increased incidence of liver tumors in female mice exposed to the highest exposure concentration (2056 ppm) and α-2 urinary globulin-mediated kidney tumors in male rats. No exposure-related tumors were observed in male mice or female rats. The male-specific rat kidney tumors are not considered relevant to human health. Mice receiving lifetime repeated skin application of various petroleum naphthas exhibited an irritation-dependent increased incidence of skin tumors. Additional studies suggest that these tumors occur through a mechanism that may not be relevant to human health. Epidemiological data from over 18,000 petroleum marketing and distribution workers

showed no increased risk of leukemia, multiple myeloma, or kidney cancer resulting from gasoline exposure. Unleaded gasoline has been identified as possibly carcinogenic to humans (2B) by the International Agency for Research on Cancer (IARC).

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. Gasoline exhaust has been classified as possibly carcinogenic to humans (2B) by the International Agency for Research on Cancer (IARC).

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and Symptoms Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects May cause genetic defects.

Carcinogenicity May cause cancer.

Cancer designations are listed in the table below

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Gasoline 86290-81-5	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Not Listed	Not Listed
Heptane (mixed isomers) 142-82-5	Not Listed	Not Listed	Not Listed	Not Listed
Pentane (mixed isomers) 78-78-4	Not Listed	Not Listed	Not Listed	Not Listed
Butane (mixed isomers) 106-97-8	Not Listed	Not Listed	Not Listed	Not Listed
Hexane Isomers (other than n-Hexane) 107-83-5	Not Listed	Not Listed	Not Listed	Not Listed
Toluene 108-88-3	Not Classifiable (A4)	Not Classifiable (3)	Not Listed	Not Listed
Xylene (mixed isomers) 1330-20-7	Not classifiable (A4)	Not classifiable (3)	Not Listed	Not Listed
n-Hexane 110-54-3	Not Listed	Not Listed	Not Listed	Not Listed
Cumene 98-82-8	Not listed	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not listed
1,2,4 Trimethylbenzene 95-63-6	Not Listed	Not Listed	Not Listed	Not Listed
Ethylbenzene 100-41-4	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Not Listed	Not Listed
Benzene 71-43-2	Confirmed human carcinogen (A1)	Carcinogenic to humans (1)	Known to be human carcinogen	Known carcinogen
Cyclohexane 110-82-7	Not Listed	Not Listed	Not Listed	Not Listed
Octane 111-65-9	Not Listed	Not Listed	Not Listed	Not Listed
1,2,3-trimethylbenzene 526-73-8	Not Listed	Not Listed	Not Listed	Not Listed
Naphthalene 91-20-3	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not Listed

Reproductive toxicity Suspected of damaging fertility or the unborn child.

Specific Target Organ Toxicity (STOT) - single exposure Respiratory system. Central nervous system.

Specific Target Organ Toxicity (STOT) - repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
Gasoline 86290-81-5	72-hr EC50 = 56 mg/l Algae	96-hr LC50 = 11 mg/l Rainbow trout (static)	-	48-hr LC50 = 7.6 mg/l Daphnia magna
Heptane (mixed isomers) 142-82-5	-	96-hr LC50 = 375 mg/L Tilapia	-	-
Pentane (mixed isomers) 78-78-4	-	96-hr LC50 = 3.1 mg/L Rainbow trout	-	48-hr EC50 = >1 - <10 mg/L Daphnia magna
Butane (mixed isomers) 106-97-8	-	-	-	-
Hexane Isomers (other than n-Hexane) 107-83-5	-	-	-	-
Toluene 108-88-3	72-hr EC50 = 12.5 mg/l Algae	96-hr LC50 <= 10 mg/l Rainbow trout	-	48-hr EC50 = 5.46-9.83 mg/l Daphnia magna 48-hr EC50 = 11.5 mg/l Daphnia magna (Static)
Xylene (mixed isomers) 1330-20-7	72-hr EC50 = 11 mg/l Algae	96-hr LC50 = 8 mg/l Rainbow trout	-	48-hr LC50 = 3.82 mg/l Daphnia magna
n-Hexane 110-54-3	-	96-hr LC50 = 2.5 mg/l Fathead minnow	-	-
Cumene 98-82-8	72-hr EC50 = 2.6 mg/l Algae	96-hr LC50 = 6.04-6.61 mg/l Fathead minnow (Flow-through) 96-hr LC50 = 2.7 mg/l Rainbow trout (semi-static)	-	48-hr EC50 = 7.9-14.1 mg/l Daphnia magna (static)
1,2,4 Trimethylbenzene 95-63-6	-	96-hr LC50 = 7.19-8.28 mg/l Fathead minnow (flow-through)	-	48-hr EC50 = 6.14 mg/L Daphnia magna
Ethylbenzene 100-41-4	72-hr EC50 = 1.7-7.6 mg/l Algae	96-hr LC50 = 4 mg/L Rainbow trout	-	48-hr EC50 = 1-4 mg/L Daphnia magna
Benzene 71-43-2	72-hr EC50 = 29 mg/l Algae	96-hr LC50 = 5.3 mg/l Rainbow trout (flow-through)	-	48-hr EC50 = 8.76-15.6 mg/l Daphnia magna (Static)
Cyclohexane 110-82-7	72-hr EC50 = 500 mg/l Algae	96-hr LC50 = 3.96-5.18 mg/l Fathead minnow	-	48-hr EC50 = 1.7-3.5 mg/L Bay shrimp
Octane 111-65-9	-	-	-	48-hr LC50 = 0.38 mg/l Daphnia magna
1,2,3-trimethylbenzene 526-73-8	-	96-hr LC50 = 7.72 mg/l Fathead Minnow (flow-through)	-	-
Naphthalene 91-20-3	-	96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static)	-	48-hr LC50 = 1.6 mg/l Daphnia magna

Persistence and degradability Expected to be inherently biodegradable. The presence of ethanol in this product may impede the biodegradation of benzene, toluene, ethylbenzene and xylene in groundwater, resulting in elongated plumes of these constituents.

Bioaccumulation Has the potential to bioaccumulate.

Mobility in soil May partition into air, soil and water.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues
This material may be a flammable liquid waste.

Safe Handling of Wastes
Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of Wastes / Methods of Disposal
The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal
Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper Shipping Name:	Gasoline
UN/Identification No:	UN 1203
Transport Hazard Class(es):	3
Packing Group:	II

TDG (Canada):

UN Proper Shipping Name:	Gasoline
UN/Identification No:	UN 1203
Transport Hazard Class(es):	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.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List.

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Gasoline	NA
Heptane (mixed isomers)	NA
Pentane (mixed isomers)	NA
Butane (mixed isomers)	NA
Hexane Isomers (other than n-Hexane)	NA
Toluene	NA
Xylene (mixed isomers)	NA

n-Hexane	NA
Cumene	NA
1,2,4 Trimethylbenzene	NA
Ethylbenzene	NA
Benzene	NA
Cyclohexane	NA
Octane	NA
1,2,3-trimethylbenzene	NA
Naphthalene	NA

SARA Section 304: This product may contain 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	Hazardous Substances RQs
Gasoline	NA
Heptane (mixed isomers)	NA
Pentane (mixed isomers)	NA
Butane (mixed isomers)	NA
Hexane Isomers (other than n-Hexane)	NA
Toluene	1000 lb final RQ 454 kg final RQ
Xylene (mixed isomers)	100 lb final RQ 45.4 kg final RQ
n-Hexane	5000 lb final RQ 2270 kg final RQ
Cumene	5000 lb final RQ 2270 kg final RQ
1,2,4 Trimethylbenzene	NA
Ethylbenzene	1000 lb final RQ 454 kg final RQ
Benzene	10 lb final RQ 4.54 kg final RQ
Cyclohexane	1000 lb final RQ 454 kg final RQ
Octane	NA
1,2,3-trimethylbenzene	NA
Naphthalene	100 lb final RQ 45.4 kg final RQ

SARA: The following EPA hazard categories apply to this product:

Acute Health Hazard
Chronic Health Hazard
Fire Hazard

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting:
Gasoline	None
Heptane (mixed isomers)	None
Pentane (mixed isomers)	None
Butane (mixed isomers)	None
Hexane Isomers (other than n-Hexane)	None
Toluene	1.0 % de minimis concentration
Xylene (mixed isomers)	1.0 % de minimis concentration
n-Hexane	1.0 % de minimis concentration
Cumene	1.0 % de minimis concentration

1,2,4 Trimethylbenzene	1.0 % de minimis concentration
Ethylbenzene	0.1 % de minimis concentration
Benzene	0.1 % de minimis concentration
Cyclohexane	1.0 % de minimis concentration
Octane	None
1,2,3-trimethylbenzene	None
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:

Gasoline

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0957
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
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:	Carcinogen; Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0957 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories)
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Heptane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1339
Pennsylvania Right-To-Know:	Present
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:	Flammable - third degree
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

Pentane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1064
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
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:	Flammable - fourth degree
New Jersey - Environmental Hazardous Substances List:	SN 1064 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Butane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0273
Pennsylvania Right-To-Know:	Present
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:	Flammable - fourth degree
New Jersey - Environmental Hazardous Substances List:	SN 0273 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Hexane Isomers (other than n-Hexane)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1285
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
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:	Flammable - third degree
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 Female reproductive toxicity, initial date 8/7/09
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:	1000 lb RQ (air); 1 lb RQ (land/water)

Xylene (mixed isomers)

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
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:	1000 lb RQ (air); 1 lb RQ (land/water)

n-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
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)

Cumene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 4/6/10
New Jersey Right-To-Know:	SN 0542
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:	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 0542 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present

New York - Reporting of Releases Part 597 - List of Hazardous Substances:	5000 lb RQ (air); 1 lb RQ (land/water)

1,2,4 Trimethylbenzene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1929
Pennsylvania Right-To-Know:	Present
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:	Not Listed
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Ethylbenzene

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:	1000 lb RQ (air); 1 lb RQ (land/water)

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
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:	10 lb RQ (air); 1 lb RQ (land/water)

Cyclohexane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0565
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:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0565 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)

Octane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1434
Pennsylvania Right-To-Know:	Present
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:	Flammable - third degree
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

1,2,3-trimethylbenzene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1929
Pennsylvania Right-To-Know:	Present
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:	Not Listed
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Naphthalene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 4/19/02
New Jersey Right-To-Know:	SN 1322 SN 3758

Pennsylvania Right-To-Know:	Environmental hazard Present (particulate)
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
New Jersey - Environmental Hazardous Substances List:	SN 1322 TPQ: 500 lb (Reportable at the de minimis quantity of >0.1%)
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	100 lb RQ (air); 1 lb RQ (land/water)

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
Gasoline	B2,D2A,D2B	0.1%
Heptane (mixed isomers)	B2,D2B	1%
Pentane (mixed isomers)	B2	1%
Butane (mixed isomers)	A,B1	1%
Hexane Isomers (other than n-Hexane)	B2	1%
Toluene	B2,D2A,D2B	0.1%
Xylene (mixed isomers)	B2,D2A,D2B	m-, o-isomers 1.0%; p-isomer 0.1%
n-Hexane	B2,D2A,D2B	1%
Cumene	B2,D2A	0.1%
1,2,4 Trimethylbenzene	B3,D2B	1%
Ethylbenzene	B2,D2A,D2B	0.1%
Benzene	B2,D2A,D2B	0.1%
Cyclohexane	B2,D2B	1%
Octane	B2,D2B	1%
1,2,3-trimethylbenzene	B3	1%
Naphthalene	B4,D2A	0.1%

Note: Not applicable.

16. OTHER INFORMATION

Prepared By Toxicology and Product Safety

Revision Date: 06/01/2016

Revision Note:

Revised Sections

The following sections (§) have been updated:
1. IDENTIFICATION
2. HAZARD IDENTIFICATION
3. COMPOSITION/INFORMATION ON INGREDIENTS
4. FIRST AID MEASURES
6. ACCIDENTAL RELEASE MEASURES
7. HANDLING AND STORAGE
8. EXPOSURE CONTROLS/PERSONAL PROTECTION
9. PHYSICAL AND CHEMICAL PROPERTIES
11. TOXICOLOGICAL INFORMATION
12. ECOLOGICAL INFORMATION
15. REGULATORY INFORMATION

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered 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 materials or in any process, unless specified in the text.

SAFETY DATA SHEET

CITGO No. 2 Diesel Fuel, Low Sulfur, All Grades

Section 1. Identification

GHS product identifier : CITGO No. 2 Diesel Fuel, Low Sulfur, All Grades

Chemical name : Fuels, diesel, No 2

Synonyms : No. 2-D Grade Diesel Fuel Oil (defined by ASTM D-975); Treated or Refined Diesel Fuel No. 2; Grade 2 Distillate Fuel; Hydrodesulfurized Middle Distillate; C9-C16 Petroleum Hydrocarbons

Code : Various

MSDS # : AG2DF

Supplier's details : CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210
sdsvend@citgo.com

Emergency telephone number : Technical Contact: (832) 486-4000
Medical Emergency: (832) 486-4700
CHEMTREC Emergency: (800) 424-9300
(United States Only)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY: INHALATION - Category 4
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2B
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) [central nervous system (CNS)] - Category 2
ASPIRATION HAZARD - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Flammable liquid and vapor.
Harmful if inhaled.
Causes skin and eye irritation.
Suspected of causing cancer.
May be fatal if swallowed and enters airways.
May cause damage to organs through prolonged or repeated exposure. (central nervous system (CNS))

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Wear protective gloves. Wear eye or face protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Do not breathe vapor. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. If skin irritation occurs: Get medical 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 attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Fuels, diesel, No 2

Other means of identification : No. 2-D Grade Diesel Fuel Oil (defined by ASTM D-975); Treated or Refined Diesel Fuel No. 2; Grade 2 Distillate Fuel; Hydrodesulfurized Middle Distillate; C9-C16 Petroleum Hydrocarbons

CAS number/other identifiers

CAS number : 68476-34-6

Ingredient name	%	CAS number
Ethyltoluene	<3	25550-14-5
Trimethylbenzene, all isomers	<2	25551-13-7
Naphthalene	<2	91-20-3
Biphenyl	<2	92-52-4
Cumene	<1	98-82-8
Xylenes, mixed isomers	<1	1330-20-7
Ethylbenzene	<1	100-41-4

* = Various ** = Mixture *** = Proprietary

Any concentration shown as a range is to protect confidentiality or is due to process variation.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that gas or vapor is still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Section 4. First aid measures

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute

Potential acute health effects

Eye contact : Causes eye irritation.

Inhalation : Harmful if inhaled. Long-term exposure to diesel engine exhaust may cause cancer.

Skin contact : Causes skin irritation.

Ingestion : May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : Adverse symptoms may include the following:
nausea or vomiting

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

Specific treatments : Treat symptomatically and supportively.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that gas or vapor is still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Specific hazards arising from the chemical : Flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Extinguishing media

Suitable extinguishing media : Use dry chemical, carbon dioxide (CO_2,) water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Section 5. Fire-fighting measures

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
Diesel engine exhaust

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not swallow. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container. Non equilibrium conditions may increase the fire hazard associated with this product. Always bond receiving containers to the fill pipe before and during loading. Always confirm that receiving container is properly grounded. Bonding and grounding alone

Section 7. Handling and storage

may be inadequate to eliminate fire and explosion hazards. Carefully review operations that may increase the risks such as tank and container filling, tank cleaning, sampling, gauging, loading, filtering, mixing, agitation, etc. In addition to bonding and grounding, efforts to mitigate the hazards may include, but are not limited to, ventilation, inerting and/or reduction of transfer velocities.
Always keep nozzle in contact with the container throughout the loading process. Do NOT fill any portable container in or on a vehicle.

Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained a dissimilar product).

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Bulk Storage Conditions: Maintain all storage tanks in accordance with applicable regulations. Use necessary controls to monitor tank inventories. Inspect all storage tanks on a periodic basis. Test tanks and associated piping for tightness. Maintain the automatic leak detection devices to assure proper working condition.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Trimethylbenzene, all isomers	**ACGIH TLV (United States, 4/2014).** TWA: 25 ppm 8 hours. TWA: 123 mg/m³ 8 hours.
Naphthalene	**ACGIH (United States). Absorbed through skin.** TWA: 10 ppm 8 hours. STEL: 15 ppm 15 minutes. **OSHA (United States).** TWA: 10 ppm 8 hours. **ACGIH TLV (United States, 4/2014). Absorbed through skin.** TWA: 10 ppm 8 hours. TWA: 52 mg/m³ 8 hours. **OSHA PEL (United States, 2/2013).** TWA: 10 ppm 8 hours. TWA: 50 mg/m³ 8 hours.
Biphenyl	**OSHA PEL Z2 (United States).** TWA: 0.2 ppm 8 hours. **ACGIH TLV (United States, 4/2014).** TWA: 0.2 ppm 8 hours. TWA: 1.3 mg/m³ 8 hours. **OSHA PEL (United States, 2/2013).** TWA: 0.2 ppm 8 hours. TWA: 1 mg/m³ 8 hours.
Cumene	**ACGIH TLV (United States, 4/2014).** TWA: 50 ppm 8 hours. **OSHA PEL (United States, 2/2013). Absorbed through**

Section 8. Exposure controls/personal protection

	skin. TWA: 50 ppm 8 hours. TWA: 245 mg/m³ 8 hours.
Xylenes, mixed isomers	**ACGIH TLV (United States, 4/2014).** TWA: 100 ppm 8 hours. TWA: 434 mg/m³ 8 hours. STEL: 150 ppm 15 minutes. STEL: 651 mg/m³ 15 minutes. **OSHA PEL (United States, 2/2013).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
Ethylbenzene	**ACGIH TLV (United States, 4/2014).** TWA: 20 ppm 8 hours. **OSHA PEL (United States, 2/2013).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, vapor controls, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: Splash goggles. Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. chemical splash goggles. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or supplied-air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Physical state	:	Liquid.
Color	:	Colorless to light yellow or red.
Odor	:	Characteristic.
pH	:	Not available.
Melting point	:	-30 to -18°C (-22 to -0.4°F)
Boiling point/boiling range	:	282 to 338°C (539.6 to 640.4°F)
Flash point	:	Closed cup: 52°C (125.6°F) [Pensky-Martens.]
Evaporation rate	:	<1 (butyl acetate = 1)
Lower and upper explosive (flammable) limits	:	Lower: 0.6% Upper: 6.5%
Vapor pressure	:	0.27 kPa (2 mm Hg) [room temperature]
Vapor density	:	5 [Air = 1]
Relative density	:	0.84
Density lbs/gal	:	Estimated 7 lbs/gal
Gravity, °API	:	Estimated 37 @ 60 F
Solubility	:	Very slightly soluble in the following materials: cold water.
Solubility in water	:	0.005 g/l
Partition coefficient: n-octanol/water	:	>3.3
Auto-ignition temperature	:	254 to 285°C (489.2 to 545°F)
Viscosity	:	Kinematic (room temperature): 0.03 cm^2/s (3 cSt)

Section 10. Stability and reactivity

Reactivity	:	Not expected to be Explosive, Self-Reactive, Self-Heating, or an Organic Peroxide under US GHS Definition(s).
Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.
Incompatible materials	:	Reactive or incompatible with the following materials: oxidizing materials
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Section 11. Toxicological information

Product/ingredient name	Result	Species	Dose	Exposure
Trimethylbenzene, all isomers	LD50 Oral	Rat	8970 mg/kg	-
Naphthalene	LD50 Oral	Rat	490 mg/kg	-
Biphenyl	LD50 Dermal	Rabbit	>5010 mg/kg	-
	LD50 Oral	Rat	2140 mg/kg	-
Cumene	LC50 Inhalation Vapor	Mouse	10 g/m³	7 hours
	LD50 Dermal	Rabbit	12300 uL/kg	-
	LD50 Oral	Rat	2.9 g/kg	-
	LD50 Oral	Rat	4000 mg/kg	-
Xylenes, mixed isomers	LC50 Inhalation Gas.	Cat	9500 ppm	2 hours
	LC50 Inhalation Gas.	Rat	5000 ppm	4 hours
	LC50 Inhalation Gas.	Rat	6700 ppm	4 hours
	LC50 Inhalation Gas.	Rat	6670 ppm	4 hours
	LD50 Oral	Mouse	2119 mg/kg	-
	LD50 Oral	Rat	4300 mg/kg	-
	LD50 Oral	Rat	4300 mg/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	3500 mg/kg	-

Conclusion/Summary : No additional information.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Trimethylbenzene, all isomers	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
Naphthalene	Skin - Mild irritant	Rabbit	-	495 milligrams	-
Biphenyl	Eyes - Mild irritant	Rabbit	-	100 milligrams	-
	Skin - Severe irritant	Rabbit	-	24 hours 500 microliters	-
Cumene	Eyes - Mild irritant	Rabbit	-	86 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 10 milligrams	-
Xylenes, mixed isomers	Skin - Mild irritant	Rat	-	8 hours 60 microliters	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	100 Percent	-
Ethylbenzene	Skin - Mild irritant	Rabbit	-	24 hours 15 milligrams	-

Skin : No additional information.

Eyes : No additional information.

Respiratory : No additional information.

Sensitization

Skin : No additional information.

Respiratory : No additional information.

Mutagenicity

Conclusion/Summary : No additional information.

Carcinogenicity

Conclusion/Summary :

Section 11. Toxicological information

Diesel exhaust particulate: Lung tumor and lymphomas were identified in rats and mice exposed to unflitered diesel fuel exhaust in chronic inhalation studies. Further, epidemiological studies have identified increase incidences of lung cancer in US railroad workers and bladder cancer in bus and truck drivers possibly associated with exposure to diesel engine exhaust. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen. In addition, NIOSH has identified complete diesel exhaust as a potential carcinogen.

Classification

Product/ingredient name	OSHA	IARC	NTP
Fuels, diesel, No 2	-	3	-
Diesel exhaust particulate	-	1	Reasonably anticipated to be a human carcinogen.
Naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.
Cumene	-	2B	Reasonably anticipated to be a human carcinogen.
Xylenes, mixed isomers	-	3	-
Ethylbenzene	-	2B	-

Reproductive toxicity

Conclusion/Summary : No additional information.

Teratogenicity

Conclusion/Summary : No additional information.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Trimethylbenzene, all isomers	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Biphenyl	Category 3	Not applicable.	Respiratory tract irritation
Cumene	Category 3	Not applicable.	Respiratory tract irritation
Ethylbenzene	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Fuels, diesel, No 2	Category 2	Not determined	central nervous system (CNS)
Trimethylbenzene, all isomers	Category 2	Not determined	central nervous system (CNS)
Xylenes, mixed isomers	Category 2	Not determined	ears

Aspiration hazard

Name	Result
Trimethylbenzene, all isomers	ASPIRATION HAZARD - Category 1
Cumene	ASPIRATION HAZARD - Category 1
Ethylbenzene	ASPIRATION HAZARD - Category 1
propylbenzene	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes eye irritation.

Inhalation : Harmful if inhaled. Long-term exposure to diesel engine exhaust may cause cancer.

Skin contact : Causes skin irritation.

Section 11. Toxicological information

Ingestion : May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : Adverse symptoms may include the following:
nausea or vomiting

Potential chronic health effects

General : May cause damage to organs through prolonged or repeated exposure.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Trimethylbenzene, all isomers	Acute LC50 5600 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
Naphthalene	Acute EC50 1600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2350 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 213 µg/l Fresh water	Fish - Melanotaenia fluviatilis - Larvae	96 hours
	Chronic NOEC 0.67 ppm Fresh water	Fish - Oncorhynchus kisutch	40 days
Biphenyl	Acute LC50 360 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 1450 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic NOEC 0.17 mg/l Fresh water	Daphnia - Daphnia magna - Neonate	21 days
	Chronic NOEC 0.229 mg/l Fresh water	Fish - Oncorhynchus mykiss	87 days
Cumene	Acute EC50 2600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 7400 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 10600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2700 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
Xylenes, mixed isomers	Acute EC50 90 mg/l Fresh water	Crustaceans - Cypris subglobosa	48 hours
	Acute LC50 8.5 ppm Marine water	Crustaceans - Palaemonetes pugio - Adult	48 hours
	Acute LC50 8500 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 15700 µg/l Fresh water	Fish - Lepomis macrochirus -	96 hours

Section 12. Ecological information

		Juvenile (Fledgling, Hatchling, Weanling)	
	Acute LC50 19000 µg/l Fresh water	Fish - Lepomis macrochirus	96 hours
	Acute LC50 13400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Acute LC50 16940 µg/l Fresh water	Fish - Carassius auratus	96 hours
Ethylbenzene	Acute EC50 4600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 3600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute EC50 2930 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 5200 µg/l Marine water	Crustaceans - Americamysis bahia	48 hours
	Acute LC50 4200 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours

Conclusion/Summary : Not available.

Persistence and degradability

Not available.

Conclusion/Summary : Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Fuels, diesel, No 2	>3.3	-	low
Trimethylbenzene, all isomers	3.4 to 3.8	-	low
Naphthalene	3.4	36.5 to 168	low
Biphenyl	4.008	1900	high
Cumene	3.55	94.69	low
Xylenes, mixed isomers	3.12	8.1 to 25.9	low
Ethylbenzene	3.6	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

RCRA classification : D001, D018

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	NA1993	UN 1202	UN 1202
UN proper shipping name	NA 1993, Diesel Fuel, 3, PG III	UN 1202, Diesel Fuel, 3, PG III	UN 1202, Diesel Fuel, 3, PG III
Transport hazard class(es)	3 	3 	3 
Packing group	III	III	III
Environmental hazards	No.	Yes.	No.
Additional information	**Packaging instruction** **Passenger aircraft** Quantity limitation: 60 L Packaging instructions: Y309 **Cargo aircraft** Quantity limitation: 220 L Packaging instructions: 310 **Remarks** 49 CFR 173.150 (f)(1) states that a flammable liquid with a flash point at or above 38ºC (100ºF) that does not meet the definition of any other hazard class may be reclassed as a combustible liquid. This provision does not apply to transportation by vessel or aircraft except where other means of transportaion is impracticable.	-	**Cargo Aircraft Only**Quantity limitation: 220 L Packaging instructions: 310 **Limited Quantities - Passenger Aircraft**Quantity limitation: 60 L Packaging instructions: 309Y

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory information

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

Clean Water Act (CWA) 307: Ethylbenzene; Naphthalene; Toluene; Benzene

Clean Water Act (CWA) 311: Ethylbenzene; Xylenes, mixed isomers; Naphthalene; Toluene; Benzene

This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.

Section 15. Regulatory information

SARA 302/304

Composition/information on ingredients

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Name	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Fuels, diesel, No 2	Yes.	No.	No.	Yes.	Yes.
Trimethylbenzene, all isomers	Yes.	No.	No.	Yes.	Yes.
Naphthalene	Yes.	No.	No.	Yes.	Yes.
Biphenyl	No.	No.	No.	Yes.	No.
Cumene	Yes.	No.	No.	Yes.	Yes.
Xylenes, mixed isomers	Yes.	No.	No.	Yes.	Yes.
Ethylbenzene	Yes.	No.	No.	Yes.	Yes.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Naphthalene Ethylbenzene	91-20-3 100-41-4	<1 <1
Supplier notification	Naphthalene Ethylbenzene	91-20-3 100-41-4	<1 <1

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: Trimethylbenzene, all isomers; Ethyltoluene

New York : The following components are listed: Ethylbenzene; Cumene; Benzene, 1-methylethyl-; Naphthalene

New Jersey : The following components are listed: Ethylbenzene; Cumene; NAPHTHALENE; TRIMETHYL BENZENE (mixed isomers); BENZENE, TRIMETHYL-; ETHYLTOLUENES; BENZENE, ETHYLMETHYL-

Pennsylvania : The following components are listed: Ethylbenzene; Cumene; NAPHTHALENE; Trimethylbenzene, all isomers; Ethyltoluene

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.
WARNING: This product contains less than 1% of a chemical known to the State of California to cause birth defects or other reproductive harm.

Ingredient name	%	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Naphthalene	<1	Yes.	No.	Yes.	No.
Cumene	<1	Yes.	No.	No.	No.
Ethylbenzene	<1	Yes.	No.	41 µg/day (ingestion) 54 µg/day (inhalation)	No.
Diesel exhaust particulate	<1	Yes.	No.	No.	No.
Toluene	<0.1	No.	Yes.	No.	7000 µg/day (ingestion)
Benzene	<0.1	Yes.	Yes.	6.4 µg/day (ingestion)	24 µg/day (ingestion) 49 µg/day

Section 15. Regulatory information

				13 µg/day (inhalation)	(inhalation)

International regulations

International lists : **Australia inventory (AICS)**: All components are listed or exempted.
China inventory (IECSC): All components are listed or exempted.
Japan inventory: All components are listed or exempted.
Korea inventory: All components are listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): All components are listed or exempted.
Philippines inventory (PICCS): All components are listed or exempted.
Taiwan inventory (CSNN): Not determined.

Canada inventory : All components are listed or exempted.

EU Inventory : All components are listed or exempted.

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).

Section 16. Other information

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of issue/Date of revision : 7/29/2015.

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

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Section 16. Other information

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