FOUR WINDS PLAZA

WESTERN AUTO
ST. THOMAS, USVI

ENSR

Removal/Closure Plan for Two Underground Storage Tanks

ENSR Environmental Consulting

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AT

FOUR WINDS PLAZA
Western Auto
Tank Removal and Closure Plan
for USVI DPNR

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1.0 INTRODUCTION

This closure plan includes a detailed description of the activities to be performed during the removal and closure of the two (2) tanks on the Four Winds Plaza Property (see Figure 1), behind the Western Auto Store, as identified in Figure 2. This removal/closure plan for the two underground storage tanks (USTs) is based on information provided to ENSR by Western Auto and other sources.

1.1 SITE DESCRIPTION

Four Winds Plaza is a private group that owns and operates the Four Winds Plaza and leases out store space to a large variety of clients including electronics stores, furniture stores, shoe stores, food stores, and drug stores among others. Western Auto, is a commercial enterprise that leases property on the Four Winds Plaza, in the business of selling automotive parts and accessories. In some cases these parts and accessories are installed in the Western Auto Store garage bays.

The two UST's of concern, Tank 1 and Tank 2, are located on the property of Four Winds Plaza in St. Thomas, United States Virgin Islands (USVI)(see Figures 1 & 2). The two USTs are classified as "out of service" underground storage tanks. All use of USTs, by any and all parties that have previously used the tanks have been discontinued. The date of discontinued use of the USTs is not known.

1.2 PURPOSE AND SCOPE

Four Winds Plaza and Western Auto desire to have these two USTs removed and the soil underneath them tested to determine what contamination, if any, has come from these tanks and most importantly to remove any future potential source of groundwater contamination.

This change will in effect, reduce the potential for environmental problems to its site the surrounding property, the people who work or visit the area and the surrounding community.

This closure plan was prepared by ENSR for Western Auto for the purpose of fulfilling the obligations of proper removal and closure of these two USTs. This includes the: determination of the tank contents by sampling and analysis; the proper handling, treatment, disposal of the contents; and determination of the final disposition of the tanks, the contents of each tank and/or any soil brought up with the tanks.

Proper closure of these two tanks consists of implementation of the procedures detailed in this removal and closure plan. In addition, the recording, documenting and reporting of our findings will assure compliance with the applicable Federal and local laws, regulations, and guidance (including NFPA), and provide protection of the human health and the environment.

2.0 DESCRIPTION OF CLOSURE PLAN ACTIVITIES

Following is a description of the activities to be carried out during the implementation of the closure of two USTs.

2.1 PIPING CLOSURE

Each of the USTs piping will be drained and flushed with water, if necessary, removed where possible, and then plugged and sealed to avoid any future use for any purpose. The removal, plugging and sealing of the piping will be documented in the closure report. A bucket will be placed at the end of any exposed pipe during flushing to catch any liquid used. Any piping adjacent to, sealed within, or underlying concrete or building walls will not be removed, but will be sealed with cement.

2.2 CONTENTS ANALYSIS

One (1) sample of the contents of each tank will be collected and analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) following 40 CFR 261, Appendix II, Method 1311. This sampling and analysis will determine if the contents of the tanks will be classified as hazardous or non-hazardous. This testing is important to determine the handling of the tank and its contents. If the contents are determined to be non-hazardous based on these results then the procedures outlined in Section 2.3 will be followed. If the contents are determined to be hazardous waste based on these results then the procedures outlined in Section 2.4 will be followed.

2.3 NON-HAZARDOUS WASTE CLOSURE ACTIVITIES

After the laboratory TCLP results are received and evaluated, confirming that the tank contents are classified as non-hazardous, the contents will be taken out and transported to an authorized facility for final disposal in St. Thomas or Puerto Rico. Prior to final disposal of the waste to an authorized facility, a letter of acceptance from such company will be submitted to Four Winds Plaza and Western Auto. When possible, a vacuum truck will be used to remove material from the tanks. The vacuum truck will be located upwind from the tank and outside the probable path of vapor dispersion, where possible. The area of operation of the vacuum truck will be maintained "vapor free" by the use of an appropriate (away and/or above roof lines) exhaust gas hose downwind of the truck and tank area. Explosion proof pumps will be used, if necessary, to remove any excess liquid remaining in the tanks. All hoses, motors or pumps will be grounded to prevent electrostatic ignition hazards.

2.4 HAZARDOUS WASTE CLOSURE ACTIVITIES

In case the contents of one or both of the tanks is classified as hazardous waste by the results of the TCLP analysis, the tanks contents will be handled as a hazardous waste. The contents of the tank will be removed, manifested and transported to an authorized hazardous waste facility for treatment and final disposal. The requirements established for the transportation, management, treatment and disposal of hazardous waste will be strictly adhered to.

2.5 GENERAL WASTE CLOSURE ACTIVITIES

A qualified contractor or its sub-contractor will perform the work necessary for the proper removal of the two tanks under ENSR oversight, specifically following this closure plan. The name of the qualified contractor selected and its OSHA training certifications will be presented to the DPNR and U.S. EPA 30 days before work will begin. The selected qualified contractor will in addition to following ENSR's Health & Safety Plan (Attachment B) will have a site specific contractor Health & Safety Plan.

2.5.1 Initial Activities

Before any tank removal activities are initiated, flammable or combustible vapor concentrations will be measured using a combustible gas indicator. When readings of the lower explosive limit (LEL) in the tanks are 10% or less, then the tank will be considered safe for removal. If the LEL is determined to be above 10%, after the tanks contents are removed the tanks headspace will be vented at a minimum of 12 feet above grade and 3 feet above any adjacent roof lines and purged with CO_2 using the dry ice procedure to prevent fires or explosions during removal operations. Crushed dry ice will be evenly distributed over the area to ensure rapid evaporation in the amount of 1.5 pounds per 100 gallons of tank capacity. The dry ice procedure used for this sites two tanks will be performed by the selected qualified contractor. The combustible gas measurements will be continually conducted of the tank removal area and the tanks atmosphere with readings at the "bottom, middle, and upper" portions before, during and after all removal phases, wherever possible, using a combination combustible gas indicator/oxygen meter.

The tanks will then be purged with high pressure water. The wash waters will be pumped out by the vacuum trucks and will be properly disposed of as non-hazardous waste to a local wastewater treatment plant (WWTP) or other appropriate alternative.

Before discharge of waste water to a local WWTP, the approval for discharge will be obtained from the USVI, Department of Public Works (DPW).

If the tank contents analysis determines that the contents are hazardous waste, then the wash waters are classified as hazardous waste and will then be handled, stored, transported,

treated and disposed off-site as hazardous waste in accordance with all applicable USVI and Federal hazardous waste regulations.

The contractor will, where necessary, plug any holes and leave a 1/8 inch vent hole located at the top of the tank before and during removal of the tank from the ground. The contractor will then place lifting lugs on the tanks and remove the tanks from their graves following ENSR and Contractor Site Specific Health and Safety Plans. While the tank is temporarily stored, it will be placed on plastic sheeting, chocked and labeled "Gas Free" and "Danger".

After removal from the ground and insurance that the LEL is consistently below 10% and inspection determines that there are no liquid, solid or vapor residues, each end of each tank will be punctured to prevent reuse. The 1/8 inch vent hole will remain at the top of the tank until final its disposition. The tanks will be secured to a tractor trailer bed for transportation. The tanks then will be removed, cut up to prevent re-use and the scrap metal will be sold and/or properly disposed of at an approved site depending upon the condition of the metal.

2.5.2 Health And Safety

A site specific Health and Safety Plan for the underground storage tank removal project is presented in Attachment B. Non-sparking tools will be used as discussed in the Health and Safety Plan. Combustion level action levels have been presented as discussed above and in the Health and Safety Plan. Assessment of the chemical and physical hazards, requirements for Personal Protective Equipment (PPE), action levels, decontamination procedures, and emergency information including safety training are included in the Health and Safety Plan. More specific details will be addressed in the Contractor Health and Safety Plan. In addition, weather parameters including temperature, rainfall, wind direction will be monitored and recorded in the field.

2.5.3 Soil Screening

Soil from the tank excavations will be continually screened with a HNu. Soil will be placed in a wide mouth jar and aluminum foil will be placed over each jar. After approximately 15 minutes, the HNu probe will be placed inside the jar to measure the headspace. Soil containing concentrations of VOC's higher than those allowable for on-site reuse will be stockpiled on top of 10 mil plastic sheeting (visqueen), on-site (as illustrated in Figure 2) and characterized for treatment/disposal options. The screening measurement (trigger) level to be used to determine whether the UST excavation areas can be immediately back-filled will be 25 units (equivalent to PPM) on the HNu.

No "background" soil sampling will be performed during this UST closure. Any additional sampling beyond that discussed in this closure plan would not facilitate the proper closure of these two tanks. The soil beneath each tank, and any soil above 25 units on the HNu will already be analyzed for organic compounds which are presumed not to be present in

background samples. If in the course of the UST removal, the field leader judges it necessary for additional sampling due to unusual circumstances, this additional sampling will be performed. Other additional analysis will be performed if necessary as mentioned in Sections 2.6 and 3.0 of this closure plan.

If stockpiling of soil with HNu measurements above 25 units is necessary, the stockpiled soil will be secured and left open for natural venting of organic compounds. The stockpiled soil will be analyzed, on a expedited basis, for the volatile organics: benzene, toluene, ethyl benzene and xylene (BTEX) isomers, and TPH. If the analytical results of this stockpiled soil are below the following proposed limits, the soil will be used as fill material.

BTEX < 10 ppm
TPH < 150 ppm

If the stockpiled soil is found to be above the proposed limits listed above, then the soil will be analyzed for TCLP analysis to determine final treatment/disposal options. Clean borrow fill, as necessary, will be brought onto the site as needed to immediately place clean fill, so as not to leave open holes on site.

After the tanks have been removed from the site and all analytical work completed, the tank area fill material will be brought up to final grade and compacted before the pavement is replaced.

2.5.4 Tank Tightness

Tightness testing will not be performed on the tanks. There is no apparent reason to test the tanks for "tightness" due to the fact that they are not being used, will not be used in the future. Tank tightness testing is usually performed on existing, in use tanks or tanks that were "mothballed" and plan to return to service. Tank testing can only be performed if all of the tanks existing valves and piping can be assured to be sealed. For this case, the tanks would have to be removed to assure this. Only after the tanks are removed from their graves could a tightness test be properly conducted. At this point there remains no reason to conduct this test because the soil beneath the tanks will be analyzed for constituents of concern.

2.6 SAMPLING PROCEDURES

Three (3) soil samples beneath each tank (for a total of six (6) samples, will be analyzed for Target Compound List (TCL) for Volatile Organic Compounds (which include BTEX), Semi-Volatile Organic Compounds, metals, and Total Petroleum Hydrocarbons (TPH) following the U.S. EPA methods and Contract Laboratory Procedures (CLP).

Three (3) soil borings will be taken in a triangular arrangement for each tank (see Figure 2) all beneath the tank, no more than 2 feet deep. An additional sample will be taken of any existing water if apparent during the tank removal process. This would be a maximum of two (2) additional water samples, one for each tank area. Any water samples(s) will be analyzed for TCL volatile, semi-volatile, metals and TPH.

To provide any regulatory agency or involved party a spilt sample, a request for a spilt sample must be presented five (5) days in advance of the sampling procedure. A split sample of any sample taken by ENSR shall then be made available.

ENSR will take the soil samples using a stainless steel auger from the surface to the bottom of the grave depending on the depth. If it is not possible to collect a sample from the surface, ENSR will enter the vacated tank area to sample the underlying soil. If discolored soil is apparent, one additional sample, for each tank, of this discolored soil will be sampled and sent to a laboratory for analysis.

3.0 ADDITIONAL SAMPLING PLAN

The laboratory analysis results will be evaluated and reported. If the results demonstrate contamination in the area, ENSR will propose additional sampling to identify the potential source and extent for proper closure of these USTs.

4.0 REPORTS

If the contents of the tank are determined to be hazardous, a preliminary closure activities report will be submitted to DPNR summarizing the conditions and evaluating the results of the laboratory analysis.

A report will be submitted to DPNR discussing all work performed, summarizing and evaluating the results of the laboratory analysis. This report will also document all of the tanks closure procedures and provide any other relevant information.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

A field logbook, photographs and a chain-of-custody record will be used to document the removal, sampling and tank closure activities at this site. The chain of custody record will be filled out to track the sample from the time of collection until completion of the analysis (see Attachment A). Photographs will be taken by ENSR to document that the procedures were followed and completed. Each sample container will have a legible label specifying the ID, date of sample and initials of collector. Samples will be sent, at 4°C for sample preservation, the same day that they are sampled to the laboratory for analysis. Sample seals will be used to protect the integrity of the sample while being transported to the laboratory.

All equipment used for sampling will be cleaned and decontaminated following standard procedures (see Attachment A) prior to the start of work and between each sampling event, when necessary.

6.0 SCHEDULE

The following schedule exhibits the estimated performance duration times, starting (at 0) on the date ENSR receives Western Auto's written authorization to proceed with this removal and closure plan. A 30 day advance notice of implementation of this removal/closure plan will be made to all regulatory agencies and other involved parties. This schedule assumes standard laboratory turnaround time of 3 weeks.

	ACTIVITIES	DURATION (Week)
1.	**Initial Closure Activities**	- 0 to 5
	a) Closure Plan & Earth Movement Application Approval by DPNR	
	b) Notice to all relevant agencies and parties	
	c) Pipe plugging & sealing	
2.	**Health & Safety Plan**	- 0 (Attachment B)
3.	**Tank Contents Sampling & Analysis**	- 0 to 5
4.	**Tank Removal & Closure Activities**	- 6 to 10
	a) removal of tank contents	
	b) tank contents and wash water disposal	
	c) soil (& water, if needed) sample analysis	
	d) tank area remedial action, if necessary	
	e) removal, cutting up and disposal of tanks	
5.	**Documentation Reports**	- 10 to 13

APPENDIX A

ENSR STANDARD OPERATING PROCEDURES

1.0 General Applicability

This SOP describes the methods to be used for the decontamination of all field equipment which may become contaminated or act as a contamination source during a sample collection task. The equipment may include split-spoon samplers, bailers, trowels, shipping coolers, drill rigs, backhoes, or any other type of equipment used during field activities.

Decontamination is performed as a quality assurance measure and a safety precaution. Improperly decontaminated sampling equipment can lead to misinterpretation of environmental data due to interference caused by cross-contamination. Decontamination protects field personnel from hazardous materials and protects the community by preventing uncontrolled transportation of contaminants from a site.

Decontamination is accomplished by manually scrubbing, washing, or spraying equipment with detergent solutions, tap water, distilled/deionized water, steam, or solvents. Equipment will be allowed to air dry after being decontaminated or may be wiped dry with chemical-free paper towels if immediate use is necessary. The decontamination method and agents are to be determined on a project-specific basis and must be stated in the Quality Assurance Project Plan (QAPP).

The frequency of equipment use dictates that most decontamination be accomplished at each sampling site between collection points. Decontamination waste products such as liquids, solids, rags, gloves, etc., will be collected and disposed of as specified in the QAPP. All cleaning materials and wastes should be stored in a central location so as to maintain control over the quantity of materials used or produced throughout the study.

2.0 Definitions

Not applicable

3.0 Health and Safety Considerations

Decontamination procedures may involve chemical exposure hazards associated with the medium being explored or solvents employed and may involve physical hazards associated with decontamination equipment. When decontamination is performed on equipment which has been in contact with hazardous materials or when the quality assurance objectives of the project require decontamination with chemical solvents, the measures necessary to protect personnel must be addressed

in the project Health and Safety Plan. This plan must be approved by the project Health and Safety Officer before work commences, must be distributed to all personnel performing equipment decontamination, and must be adhered to as field activities are performed.

4.0 Quality Assurance Planning Considerations

The decontamination method, solvent, frequency, location on site and the method of containment and disposal of decontamination wash solids and solutions are dependent on site logistics, site-specific chemistry, the nature of the contaminated media to be studied and the objectives of the study. In addition, some state and local agencies have specific requirements for decontamination. Each topic must be considered and addressed during the formulation of a decontamination strategy and should be outlined in the Quality Assurance Project Plan (QAPP).

The ideal situation would be to have all sampling equipment such as bailers, trowels and shovels laboratory decontaminated and dedicated to one sampling location for each day of sampling. Laboratory decontamination may not be a practical option, however, depending on the scope of the project. It may be to expensive to obtain laboratory decontaminated sampling devices for short-term projects or projects which have numerous sampling locations. Sampling equipment such as split-spoon samplers or hand augers are too large to have laboratory cleaned. Finally, it may be difficult to schedule the necessary laboratory procedures.

There are several factors which need to be considered when deciding upon a decontamination solvent. Obviously the solvent should not be an analyte of interest. It must be relatively stable so that it can be handled and stored in the field without special handling requirements. All sampling equipment must be resistant to the solvent. The solvent must be evaporative or water soluble or preferably both. State or local agencies may have specific requirements regarding decontamination solvents.

The analytical objectives of the study must also be considered when deciding upon a decontamination solvent. Methanol is the solvent of choice for general organic analyses. It is relatively safe and effective. A 10% nitric acid in deionized water solution is the solvent of choice for general metals analyses. Nitric acid can be used only on Teflon, plastics and glass. If used on metal equipment, nitric acid will eventually corrode the metal and lead to the introduction of metals to the collected samples. If it is necessary to use metal sampling equipment for metals sampling, the procedure for decontamination will be a non-phosphate detergent wash followed by a

tap water rinse and then a double distilled/deionized water rinse. State or local agencies may take exception to this procedure and require an acid wash. If this is the case, it must be recognized that the use of nitric acid on metal sampling equipment may lead to analytical interferences.

If it is determined that methanol or nitric acid are not adequate decontamination solvents for a particular project, it is strongly recommended that the local Regional QA Officer be consulted when selecting an alternative solvent.

Decontamination should be performed far enough away from the source of contamination so as not to be affected by the source but close enough to the sampling site to keep handling to a minimum. If heavy equipment such as drill rigs or backhoes are to be decontaminated, then a central decontamination station should be considered. Power may be required to run steam generators or high pressure water pumps. A source of water may also be necessary.

Depending on the nature of the contaminated media or the decontamination solvents utilized, it may be necessary to collect and dispose of all particulate matter and wash solutions. If containment is necessary it may be achieved by performing the decontamination in large galvanized tubs or over plastic sheeting. If heavy equipment is involved it may require the construction of a sealed concrete pad with drains and walls, or other suitable temporary structure, to contain sprays and splashes. Rinse and wash solutions should be collected and contained in 55 gallon metal or plastic drums. Upon review of the analytical data generated from the samples, the proper method of disposal of these waste products will be determined.

Procedures for Quality Control checks are outlined in Section 9.0.

5.0 Responsibilities

It is the responsibility of the project manager to ensure that the proper decontamination procedures are followed and that all waste products of decontamination are properly stored and disposed.

It is the responsibility of the project safety officer to design and effect safety measures which provide the best protection for all persons involved directly with sampling and/or decontamination.

It is the responsibility of any subcontractors (i.e., drilling contractors) to follow the proper, designated decontamination procedures that are stated in their contracts and outlined in the project QA and/or Health and Safety Plan.

It is the responsibility of all personnel involved with sample collection or decontamination to adhere to the decontamination requirements and procedures in this SOP and in project specific Health and Safety Plans and QA plans, to maintain a clean working environment and to ensure that contaminants are not negligently introduced to the environment.

6.0 Training/Qualifications

All field technicians performing decontamination procedures for an ENSR project must be properly trained in the decontamination procedures employed, the project data quality objectives, health and safety procedures and the project QA procedures. Specific training or orientation will be provided for each project to ensure that personnel understand the special circumstances and requirements of that project.

7.0 Required Materials

- Decontamination agents may include: LIQUI-NOX or other phosphate-free biodegradable detergent solutions, tap water, distilled/deionized water, nitric acid, methanol, isopropanol, acetone or other appropriate solvent as specified in the QAPP.
- Personal protective equipment (defined in project Health and Safety Plan)
- Chemical-free paper towels
- Disposable gloves
- Waste storage containers: drums, boxes, plastic bags
- Cleaning containers: plastic buckets, galvanized steel pans, plastic (nalgene or equivalent) upright cylinder
- Cleaning brushes
- High pressure water or steam generator (if necessary)
- Plastic sheeting
- Plastic water storage containers

8.0 Methods

8.1 General Procedures

8.1.1 The purpose of decontamination is three-fold. The first is to ensure that any compounds or contaminants which have been determined through chemical analyses to be present in a sample are in fact native to the sample. All sampling equipment such as bailers, trowels, shovels, tape measures, split-spoon samplers, dredges, sample containers, sample shipment coolers, etc., must be decontaminated before use to ensure that contaminants have not been introduced to the sample during the sampling process.

The second purpose of decontamination is to minimize the exposure of sampling personnel to hazardous materials.

The third purpose of decontamination is to prevent the introduction of new contaminants to a sampling site or prevent the transportation of compounds or contaminants from the site. Heavy equipment such as trucks, drilling rigs and backhoes should be decontaminated upon arrival at the site to prevent the introduction of road chemicals or contaminants from a previous site. Monitoring well riser pipes, screens and drilling augers must also be decontaminated to prevent the introduction of contaminants.

It should be assumed that all sampling equipment, including gloves, are contaminated until the proper decontamination procedures have been performed on them and that contaminated equipment can lead to invalid analytical results.

8.1.2 Unless the decontaminated equipment or construction materials are to be used immediately, they should be wrapped in aluminum foil, shiny side out, and stored in a designated "clean" area. Field equipment can also be stored in plastic bags to eliminate the potential for contamination. Field equipment should be inspected and decontaminated prior to use if the equipment has been stored for long periods of time. Unless customized procedures are stated in the QAPP (see Section 4.0), the standard procedures specified below shall be followed.

8.2 Decontamination for Organic Analyses

8.2.1 Determine from the QAPP the method of containment for the particulate and wash solution products of decontamination. Typically, smaller, more manageable equipment will be decontaminated in a plastic or galvanized tub. The brush and container used for the decontamination process should be treated in the same manner as sampling equipment in steps 8.2.2 through 8.2.10.

8.2.2 Decontamination is to be performed before sampling events and between sampling points.

8.2.3 Remove all solid particles from the equipment or material by brushing and then rinsing with available tap water. This initial step is performed to remove gross contamination. Depending on the size of the equipment being decontaminated, this may be preceded by a steam or high pressure water rinse to remove solids and/or residual oil or grease. See Section 8.5 for decontamination of heavy equipment.

8.2.4 Wash the equipment or sampler with LIQUI-NOX or other phosphate-free detergent solution.

8.2.5 Rinse with tap water or distilled/deionized water until all detergent and other residue is washed away. Rerinse if necessary or repeat previous steps as necessary.

8.2.6 Rinse with methanol or other appropriate solvent. The solvent to be used should be specified in the QAPP.

8.2.7 Rinse with deionized water to remove any residual solvent.

8.2.8 Allow the equipment or material to air-dry in a clean area or wipe with chemical-free paper towels before use.

8.2.9 Dispose of soiled materials and wash solutions in the designated disposal containers.

8.3 Decontamination for Metals Analyses

8.3.1 For plastic and glass, follow the procedures outlined in 8.2, however, use a 10% nitric acid solution as the solvent rinse in step 8.2.7.

8.3.2 For metal equipment, follow steps 8.2.1 through 8.2.6 and allow the equipment or material to air dry in a clean area or wipe with chemical-free paper towels before use.

8.4 Decontamination of Submersible Pumps

8.4.1 This procedure will be used to decontaminate submersible pumps before and between ground-water sample collection points as well as the end of each day of use. If different pumps are used, consult the QAPP for specific decontamination procedures.

8.4.2 During decontamination the submersible pump will be placed on a decontaminated surface, such as a plastic sheet.

8.4.3 When removing the submersible pump from each well the power cord and discharge line will be wiped dry using chemical-free disposable towels. Should the pump be fitted with a disposable discharge line, disconnect the line and dispose of it.

8.4.4 Clean an upright plastic-nalgene cylinder first with a methanol, 10% nitric acid or other specified solvent and then a distilled/deionized water rinse, wiping the free liquids after each.

8.4.5 For reversible pumps, reverse the pump to backwash all removable residual water present in the pump tubing. The pump should be shut off as soon as intermittent flow is observed from the reverse discharge.

8.4.6 Rinse the stainless steel submersible down hole pump section with a detergent solution followed by a water rinse and a liberal application of the specified solvent.

8.4.7 Place the submersible pump section upright in the cylinder and fill the cylinder with tap water, adding 50-100 ml of specified solvent for every one liter of water.

8.4.8 Activate the pump in the forward mode, withdrawing water from the cylinder.

8.4.9 Continue pumping until the water in the cylinder is pumped down and air is drawn through the pump. At this time air pockets will be observed in the discharge line. Shut off the pump immediately.

8.4.10 Remove the pump from the cylinder and place the pump in the reverse mode to discharge all removable water into a disposal container.

8.4.11 Using the water remaining in the cylinder, rinse the sealed portion of the power cord and discharge tube by pouring the water carefully over the coiled lines.

8.4.12 On reaching the next monitoring well, place the pump in the well casing and wipe dry both the power and discharge lines with a chemical-free paper towel as the pump is lowered.

8.5 Decontamination of Heavy Equipment

8.5.1 Upon arrival and prior to leaving a sampling site, all heavy equipment such as drill rigs, trucks, and backhoes should be thoroughly cleaned and then the parts of the equipment which come in contact or in close proximity to sampling activity should be decontaminated. This can be accomplished in two ways, steam cleaning or high pressure water wash and manual scrubbing. Following this initial cleaning, only those parts of the equipment which come in close proximity to the sampling activities must be decontaminated in between sampling events. This would include items such as the backhoe bucket and extension arm.

8.5.2 Consult the QAPP for instruction on the location of the decontamination station and the method of containment of the wash solutions. Depending on the scope of the project it may be necessary to construct a sealed cement pad with draining capabilities and walls, or other suitable temporary structure, to contain splashes and sprays. A water supply and power source would also be required.

9.0 Quality Control Checks and Acceptance Criteria

9.1 These decontamination procedures are to be executed as part of a project sampling plan. Necessary quality control checks and acceptance criteria are dependent on site specific chemistry, the nature of the media sampled and the objectives of the study. These checks shall be determined on a project specific basis and shall be outlined in the QAPP or project work plan.

General guidelines for the quality control checks for decontamination of field equipment shall be the collection of at least one field blank from the decontaminated equipment per day. For the sampling of soils and other solids, decontamination

rinsate samples should be collected as a substitute for field blanks. If the samples are to be analyzed for volatile organic constituents, then one shipping blank should accompany each shipping container. In this manner, a qualitative, and in the case of field blanks, quantitative assessment of potential contamination, and of effectiveness of the decontamination process is obtained.

9.2 Field blanks for water sampling are made by pouring laboratory supplied deionized water into or over the freshly decontaminated sampling equipment (bailer, water level measurement tape, etc.) and then transferring this water into a sample container. Field blanks should be collected in the same location that samples are collected to determine if ambient VOCs are impacting the samples. Sample containers should be filled to the same levels as the samples the blanks are intended to represent. Field blanks should then be labeled as a sample and submitted to the laboratory to be analyzed for the same parameters as the associated sample. Field blank sample numbers, as well as collection method, time and location should be recorded in the field notebook.

9.3 Field blanks should also be collected following the decontamination of submersible pumps. The pump should be used to withdraw laboratory supplied deionized water from the container and fill a sample container. Sample containers should be filled to the same levels as the samples the blanks are intended to represent. These field blanks should then be labeled as a sample and submitted to the laboratory to be analyzed for the same parameters as the associated samples. Field blank sample numbers, as well as collection method, time and location should be recorded in the field notebook.

9.4 For soil samples, a true field blank is generally not obtainable. Instead decontamination rinsate samples should be collected. Immediately following the decontamination of the soil sampling equipment (trowel, shovel, split-spoon samplers, dredge, etc.), laboratory supplied deionized water shall be applied to the entire sampler with a squirt bottle and then collected in a sample container. Sample containers should be filled to the same levels as the samples the rinsates are intended to represent. Decontamination rinsates should then be labeled as a sample and submitted to the laboratory to be analyzed for the same parameters as the associated samples. Decontamination rinsate sample numbers, as well as collection method, time and location should be recorded in the field notebook.

9.5 Shipping blanks are used to identify errors introduced by cross-contamination of samples during shipping, sample bottle preparation and blank water quality. Shipping blanks are sample containers which are filled with deionized water in the laboratory and placed in the sample shipping coolers when the sampling kits are assembled. They remain in the coolers in the field and are not opened. They are returned to the laboratory with the collected samples and analyzed. The volume of each shipping blank should be the same as the volume of the samples with which it is shipped and it should be in the same type of container as the samples. Analysis of shipping blanks is restricted to volatile compounds because these compounds demonstrate the greatest capacity for migration.

10.0 Documentation

Comprehensive documentation of decontamination is accomplished by completion of the following:

10.1 Field notebook entries

- Date, time and location of each decontamination event
- Equipment decontaminated
- Method
- Solvents
- Notable circumstances
- Identification of field blanks and decontamination rinsates
- Method of blank and rinsate collection
- Date, time and location of blank and rinsate collection

10.2 Field blank and decontamination rinsate sample labels

- Blanks and rinsates should be labeled as samples

10.3 Chain-of-custody forms

- Instructions for lab analyses of blanks and rinsates

Title: Packaging and Shipment of Samples

1.0 Applicability

This Standard Operating Procedure (SOP) is concerned with procedures associated with the packaging and shipment of samples. Two general categories of samples exist: environmental samples consisting of air, water and soil; and waste samples which include non-hazardous solid wastes and hazardous wastes as defined by 40 CFR Part 261.

2.0 Responsibilities

It is the responsibility of the project manager to assure that the proper packaging and shipping techniques are utilized for each project. The site operations manager shall be responsible for the enactment and completion of the packaging and shipping requirements outlined in the project specific sampling plan. The site operations manager shall be responsible to research, identify and follow all applicable U.S. Department of Transportation (DOT) regulations regarding shipment of materials classified as waste.

3.0 General Method

The objective of sample packaging and shipping protocol is to identify standard procedures which will minimize the potential for sample spillage or leakage and maintain field sampling program compliance with U.S. EPA and U.S. DOT regulations.

The extent and nature of sample containerization will be governed by the type of sample, and the most reasonable projection of the sample's hazardous nature and constituents. The EPA regulations (40 CFR Section 261.4(d)) specify that samples of solid waste, water, soil or air, collected for the sole purpose of testing, are exempt from regulation under the Resource Conservation and Recovery Act (RCRA) when all of the following conditions are applicable:

A. Samples are being transported to a laboratory for analysis;
B. Samples are being transported to the collector from the laboratory after analysis;
C. Samples are being stored (1) by the collector prior to shipment for analyses, (2) by the analytical laboratory prior to analyses, (3) by the analytical laboratory after testing but prior to return of sample to the collector or pending the conclusion of a court case.

Qualification for categories A and B above require that sample collectors comply with U.S. DOT and U.S. Postal Service (USPS) regulations or comply with the following items if U.S. DOT and USPS regulations are found not to apply:

The following information must accompany all samples and will be entered on a sample specific basis on chain of custody records:

- sample collector's name, mailing address and telephone number,
- analytical laboratory's name, mailing address and telephone number,
- quantity of sample,
- date of shipment,
- description of sample, and

in addition, all samples must be packaged so that they do not leak, spill or vaporize.

4.0 General Methods

4.1 Place plastic bubble wrap matting over the base and bottom corners of each cooler or shipping container as needed to manifest each sample.

4.2 Obtain a chain of custody record as shown in Figure 1 and enter all the appropriate information as discussed in Section 3.0 of this SOP. Chain of custody records will include complete information for each sample. One or more chain of custody records shall be completed for each cooler or shipping container as needed to manifest each sample.

4.3 Wrap each sample bottle individually and place standing upright on the base of the appropriate cooler, taking care to leave room for some packing material and ice or equivalent. Rubber bands or tape should be used to secure wrapping, completely around each sample bottle.

4.4 Place additional bubble wrap and/or styrofoam pellet packing material throughout the voids between sample containers within each cooler.

4.5 Place ice or cold packs in heavy duty zip-lock type plastic bags, close the bags, and distribute such packages over the top of the samples.

4.6 Add additional bubble wrap/styrofoam pellets or other packing materials to fill the balance of the cooler or container.

4.7 Obtain two pieces of chain of custody tape as shown in Figure 2 and enter the custody tape numbers in the appropriate place on the chain of custody form. Sign and date the chain of custody tape.

4.8 To complete the chain of custody form enter the type of analysis required for each sample, by container, under the "ANALYSES" section. Under the specific analysis enter the quantity/volume of sample collected for each corresponding analysis.

If shipping the samples where travel by air or other public transportation is to be undertaken, sign the chain of custody record thereby relinquishing custody of the samples. Relinquishing custody should only be performed when directly transmitting custody to a receiving party or when transmitting to a shipper for subsequent receipt by the analytical laboratory. Shippers should not be asked to sign chain of custody records.

4.9 Remove the last copy from the chain of custody record and retain with other field notes. Place the original and remaining copies in a zip-lock type plastic bag and place the bag on the top of the contents within the cooler or shipping container.

4.10 Close the top or lid of the cooler or shipping container and with another person rotate/shake the container to verify that the contents are packed so that they do not move. Improve the packaging if needed and reclose.

When transporting samples by automobile to the laboratory, and where periodic changes of ice are required, the cooler should only be temporarily closed so that reopening is simple. In these cases, chain of custody will be maintained by the person transporting the sample and chain of custody tape need not be used. If the cooler is to be left unattended, then chain of custody procedures should be enacted.

4.11 Place the chain of custody tape at two different locations on the cooler or container lid and overlap with transparent packaging tape. For coolers with hinged covers, if the hinges are attached with screws, chain of custody tape should also be used on the hinge side.

4.12 Packaging tape should be placed entirely around the sample shipment containers. A minimum of one to two full wraps of packaging tape will be placed at at least two places on the cooler. Shake the cooler again to verify that the sample containers are well packed.

4.13 If shipment is required, transport the cooler to an overnight express package terminal or arrange for pickup. Obtain copies of all shipment records as provided by the shipper.

4.14 If the samples are to travel as luggage, check with regular baggage.

4.15 Upon receipt of the samples, the analytical laboratory will open the cooler or shipping container and will sign "received by laboratory" on each chain of custody form. The laboratory will verify that the chain of custody tape has not been broken previously and that the chain of custody tape number corresponds with the number on the chain of custody record. The analytical laboratory will then forward the back copy of the chain of custody record to the sample collector to indicate that sample transmittal is complete.

5.0 Documentation

As discussed in Section 4.0 the documentation for supporting the sample packaging and shipping will consist of chain of custody records and shipper's records. In addition a description of sample packaging procedures will be written in the field log book. All documentation will be retained in the project files following project completion.

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location	ANALYSES
Project No.	Field Logbook No.	
Sampler: (*Signature*)	Chain of Custody Tape No.	

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample								REMARKS

Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received for Laboratory: (*Signature*)	Date	Time
Sample Disposal Method:	Disposed of by: (*Signature*)			Date	Time

SAMPLE COLLECTOR

ERT - A Resource Engineering Company
696 Virginia Road
Concord, MA 01742
617-369-8910

ANALYTICAL LABORATORY

ENSR

Nº 1663

1974-3-84

Figure 1

STANDARD OPERATING PROCEDURE

Sampling Liquid Waste Materials

Date: 1st Qtr 1984
Number: SOP 7150
Revision: 1

1.0 General Applicability

This SOP describes the methods used for obtaining liquid waste materials from buried and/or exposed tanks and from waste lagoons.

This SOP also describes the methods for proper use of the Coliwasa-type sampler, bailer type sampler or Alpha-type vertical sampler.

The Coliwasa-tube and bailer allow for collection in profile through a vertical section of the waste material. The Alpha-type vertical sampler allows that samples be collected at distinct depths within the liquid phase waste material. All three types of samplers are generally constructed of chemically inert materials.

2.0 Equipment Descriptions

2.1 Coliwasa-type sampler: The Coliwasa sampler consists of basically two parts a sample tube and a sample containment system. The tube itself is generally one(1) to two(2) inches in diameter and approximately five (5) feet in length. The containment system consists of a T-handle which is attached to a rod extending through the sample tube and is connected to a stopper at the opposite end. Verticle rotation of the T-handle against the sample tube itself causes the stopper to be drawn up flush against the tube effectively closing the bottom of the sampler.

2.2 Bailer-type sampler: The bailer consists of a hollow tube of approximately the same dimensions as the Coliwasa sampler but utilizes a flap or ball-type valve for sample containment. The valve is opened by fluid pressure when the sampler is inserted into the waste container. When the sampler is withdrawn, differential hydrostatic pressure closes the valve entrapping the sample within it.

2.3 Alpha-type vertical sampler: The Alpha vertical unit provides a sample from a distinct depth within a tank. The Alpha vertical sampler is lowered through the waste material to the desired depth and is then mechanically activated from the surface. When activated, the rubber seals spring closed and contain a sample from a distinct depth. The Alpha type is often used to collect samples from a few depths which are then subsequently composited to obtain one data point for chemical analyses.

STANDARD OPERATING PROCEDURE

>ling Liquid Waste Materials

esponsibilities

t .s the responsibility of the person performing the sampling to maintain the qu..pment so that it is in proper working order throughout the sampling phase. he field sampler shall also be responsible for the collection, labelling, a: lling and storage of all samples until further chain of custody procedures r: enacted. Decontamination procedures are also the responsibility of the :eld sampler. Specific documentation procedures can be found in SOP 7600, e:)ntamination.

upporting Materials

project specific sampling plan
weighted measuring tape
sample containers/labels
sample log sheets
chain of custody forms
decontamination materials
nylon rope or other material for lowering samplers
rags for wiping the sampler each time it is removed
deionozed water dispenser bottle.

e .s or Protocol for Use

.1 General Procedures

5.1.1 Check to make sure the type of waste material will not react chemically with the sampler. Choose the sampler that will be best suited for the type of sample that is to be collected.

5.1.2 Check to make sure that the sampler is in proper working condition and that the valve(s) or stoppers completely close.

5.1.3 Verify that the sampler has been properly decontaminated.

5.1.4 Maintain proper personal safety measures designated in the project specific health and safety plan.

.2 Standard Procedures

5.2.1 Measure the total depth to the bottom of the liquid phase waste material.

5.2.2 Place the sampler in the open position if it is the Coliwasa or Alpha type. The bailer opening is controlled by a ball check or flap valve which will have to be checked to see that it is not sticking.

5.2.2 Slowly lower the sampler into the container allowing for the collection of a representative sample.

5.2.3 When the desired depth is achieved activate the sample containerization system.

5.2.4 Slowly withdraw the sampler making sure the closure system is properly set. The exterior of the sampler should be wiped on removal to avoid the contamination of other materials.

5.2.5 Slowly discharge the sample into the appropriate waste container taking care to minimize spillage.

5.2.6 Cap the sample container; wipe clean the exterior of container, attach label and seal the container if necessary: record all observations in the field log book; complete sample logs, chain of custody records; and utilize the proper sample storage procedures.

5.2.7 Perform proper decontamination procedures as specified in SOP 7600, Decontamination.

5.2.8 Initiate proper procedures for delivery of the sample to the designated laboratory. This includes packaging, sealing shipping with appropriate forms such as chain of custody documents.

.0 Documentation

Various forms are required to ensure that adequate documentation of each sample is followed and will include:

- sample logs
- chain of custody forms
- shipping forms

In addition, a field log book will be kept to document all samples collected throughout the study. These documents will be retained in the project files.

7.0 References

7.1 EPA Samplers and Sampling Procedures for Hazardous Waste Streams 600/2-80-018

Sampling Liquid Waste Materials

WASTE-SAMPLING LOG

PROJECT NO. _____ PROJECT NAME _____

DATE _____

SITE TYPE _____
(Lagoon, Tank, Drum)

SITE LOCATION _____

SAMPLE COLLECTION:

EQUIPMENT USED _____

NO. OF SAMPLES COLLECTED _____ SHIPPING BOX NO. _____

SAMPLE NO.	DEPTH	TYPE OF MATERIAL	SIZE OF CONTAINER	FIELD ANALYSIS/ HNU, OVA RDNG.	ANALYSIS REQUEST

COMMENTS _____

LAB DESIGNATION _____

COLLECTOR'S NAME _____

1.0 Introduction

The HNU is primarily used by ERT personnel for safety and survey monitoring of ambient air, determining the presence of volatiles in soil and water, and detecting leakage of volatiles.

Personnel responsible for using the HNU should first read and thoroughly familiarize themselves with the factory operator instruction manual.

2.0 Principle of Operation

The HNU is a non-specific vapor/gas detector. The hand-held probe houses a photoionization detector (PID), consisting of an ultraviolet (UV) lamp and two electrodes, and a small fan which pulls ambient air into the probe inlet tube. All organic and inorganic vapor/gas compounds having ionization potentials (IP) lower than the energy output of the UV lamp are ionized; and the resulting potentiometric change is seen as a needle deflection, proportional to vapor concentration, on the potentiometer of the readout/control box.

3.0 Specifications

Detection range*:	0.1 to 2,000 ppm.
Linear range*:	0.1 to 400 ppm.
Response time:	3 seconds to 90% full scale deflection.
Operating temperature:	-10°C to 40°C.
Operating time on battery, continuous use, without recorder:	approximately 10 hours; at lower temperatures time is reduced.
Recharge from full discharge:	full recharge 12-14 hours.

* When equipped with 10.2 eV probe with SPAN set at 9.8 and measuring benzene. Values may vary for other compounds and conditions.

4.0 Required Materials

- Calibration Gas: Compressed gas cylinder of isobutylene in air or similar stable gas mixture of known concentration. The selected gas should have an ionization potential similar to that of the

vapors to be monitored, if known. The concentration should be at 50-75% of the range in which the instrument is to be calibrated.

- Regulator for calibration gas cylinder
- Approximately 3-4 feet of teflon tubing
- "Magic Marker"

5.0 Preliminary Steps

Preliminary steps (battery charging, check-out, calibration, maintenance) should be conducted in a controlled or non-hazardous environment.

The sensor probe is carried separately in the instrument carrying case. For most safety and survey work, the 10.2 eV probe is used, as it detects more compounds than the 9.5 eV probe and is more durable than the 11.7 eV probe. Unclamp the cover from the readout/control box and remove the inner lid from the cover. Screw the inlet tube onto the sensor probe. Attach the probe cable plug to the 12 pin keyed socket on the readout panel by matching the alignment slot in the plug to the key in the connector, and screwing down the probe connector until a distinct snap and lock is felt.

Turn the function switch to the BATT (battery check) position. The meter needle will deflect to the green zone if the battery is fully charged. If the needle is below the green arc or if the low battery indicator comes on, the battery must be recharged (Section 9.0) before the analyzer is used.

Turn the function switch to the STANDBY position and allow the electronics to warm up for five minutes. Next turn the ZERO adjustment knob until the meter needle is at zero.

6.0 Operation

Turn the function switch to the appropriate range. Check to see if the intake fan is functioning; if so, the probe will vibrate slightly and a distinct sound will be audible when holding the probe casing next to the ear. Also, verify that the UV lamp is on by briefly looking into the probe from a distance greater than six inches to observe a purple glow.

WARNING: Continued exposure to ultraviolet energy generated by the light source can be harmful to eyesight.

At the beginning of each day, check the calibration (Section 7.2) and make adjustments if necessary (Section 7.3). Record the calibration information in the field log book.

The instrument is now operational. Readings should be taken on the lowest possible scale and recorded in the field log book.

When the HNU is not being used or between monitoring intervals, the function switch should be set on the STANDBY position to conserve battery power and UV lamp life.

At the end of each day, recheck calibration (Section 7.2) and record the information in the field log book.

To shutdown the HNU, turn the function switch to OFF.

Recharge the battery after each use (Section 9.0).

When transporting, disconnect the probe cable connector from the control panel and return the instrument to its stored condition.

7.0 Calibration Procedures

7.1 Start-Up

Battery Check (Section 5.0).

Zero Set (Section 5.0).

For measurement on the 0-20 or 0-200 ranges only one calibration gas standard is required. Calibration on the 0-200 range will provide accurate values on the 0-20 range as well. Connect the probe tip to the gas cylinder regulator, observing safety precautions, in order that the gas is delivered to the probe at atmospheric pressure (Figure 7-1). A t-fitting and plastic tubing can be used. Adjust the regulator so that the gas is delivered at 150-200 cubic centimeters per minute. The fan inside the probe draws approximately 100 cc/min.

7.2 Calibration Check

Set the function switch to the proper range setting, based on the calibration gas used, and record the meter reading in the field log book. Also record the calibration gas composition and concentration, the date and the time.

7.3 Calibration Adjustment

If adjustment is necessary, turn the span as required to read the ppm concentration of the gas standard, or the equivalent concentration of benzene if the HNU is being calibrated to benzene.

Recheck the zero setting (Section 5.0)

If reajustment of the zero setting is necessary, repeat the span adjustment. Record the span setting and the new meter reading. Whenever the span is changed, the zeroing procedure should be repeated.

If calibration cannot be achieved or if the span setting resulting from calibration is 0.0, then the lamp must be cleaned (Section 10.0).

7.4 Alternate Calibration Technique

It may be more convenient in certain circumstances to employ the use of a Tedler bag filled with calibrant instead of a calibration cylinder. In that case, the bag (usually 3-10 liter capacity) should be filled with the appropriate calibrant and brought to the HNU. The HNU probe should be connected to the discharge fitting on the bag using a piece of flexible tubing. Allow the HNU to draw the calibrant from the bag and follow the instructions as indicated in 7.2, 7.3.

8.0 Troubleshooting Tips

One convenient method for periodically confirming instrument response is to hold the sensor probe next to the tip of a magic marker. A significant needle deflection should be observed within 3 seconds with the function switch set at 0-20 (after shave lotion or cologne also will make the needle deflect).

Air currents or drafts in the vicinity of the probe tip may cause fluctuations in readings.

A fogged or dirty lamp (Section 10.0), due to operation in a humid or dusty environment, may cause erratic or fluctuating readings.

Moving the instrument from a cool or air-conditioned area to a warmer area may cause moisture to condense on the UV lamp and produce unstable readings (Section 10.0).

A zero reading on the meter should not necessarily be interpreted as an absence of air contaminants. The detection capabilities of the HNU are limited to those compounds which will be ionized by the particular probe used.

Many volatile compounds have a low odor threshold. A lack of meter response in the presence of odors does not necessarily indicate instrument failure.

If a negative deflection of the HNU meter is noted the ion chamber is dirty and needs cleaning. The chamber may be soaked in a solvent such as methanol in a soil bath air dried and then baked for two to four hours at a temperature of 100°C and not exceeding 105°C.

When high concentrations of hydrocarbons enter the ionization chamber in the HNU a "quenching" effect takes place. Typically, it is noted by a sharp needle movement once the flow of gas is pierced by the HNU probe. Within one to two seconds the needle fades to zero point. To check whether or not the quenching effect is taking place, move the HNU probe to just outside the hole created in the foil. Get another reading after five to ten seconds. If quenching is taking place a very eradic needle movement will occur. Once an operator has seen this phenomena it is fairly easy to recognize.

9.0 Battery Charging

The battery charger is stored inside the instrument cover. To charge the battery, first insert the mini plug of the charger into the jack on the side of the meter, with the function switch in the OFF position. Next, insert the charger plug into a 120VAC single phase, 50-60 HZ outlet. To ensure that the charger is functioning, turn the function switch to BATT. The meter should deflect full scale. The sensor probe cable must be connected to the control panel for a battery check response. For normal battery charging, leave the function switch in the OFF position. The battery is fully charged after 14 hours of charging. The charger can be left on indefinitely without damage. Disconnect the charger from the electrical outlet before disconnecting the mini plug from the instrument.

With the function switch turned to the appropriate range setting, the HNU may be operated while recharging.

10.0 Probe Cleaning

During periods of operation, moisture, dust, or other foreign matter can be drawn into the probe and form deposits on the surface of the UV lamp and ion chamber. This causes interference with the ionization

process and produces erroneous readings. This condition is indicated by meter readings that are low, erratic, unstable, non-repeatable, or drifting. In most cases, the following field cleaning procedure is sufficient to correct this condition.

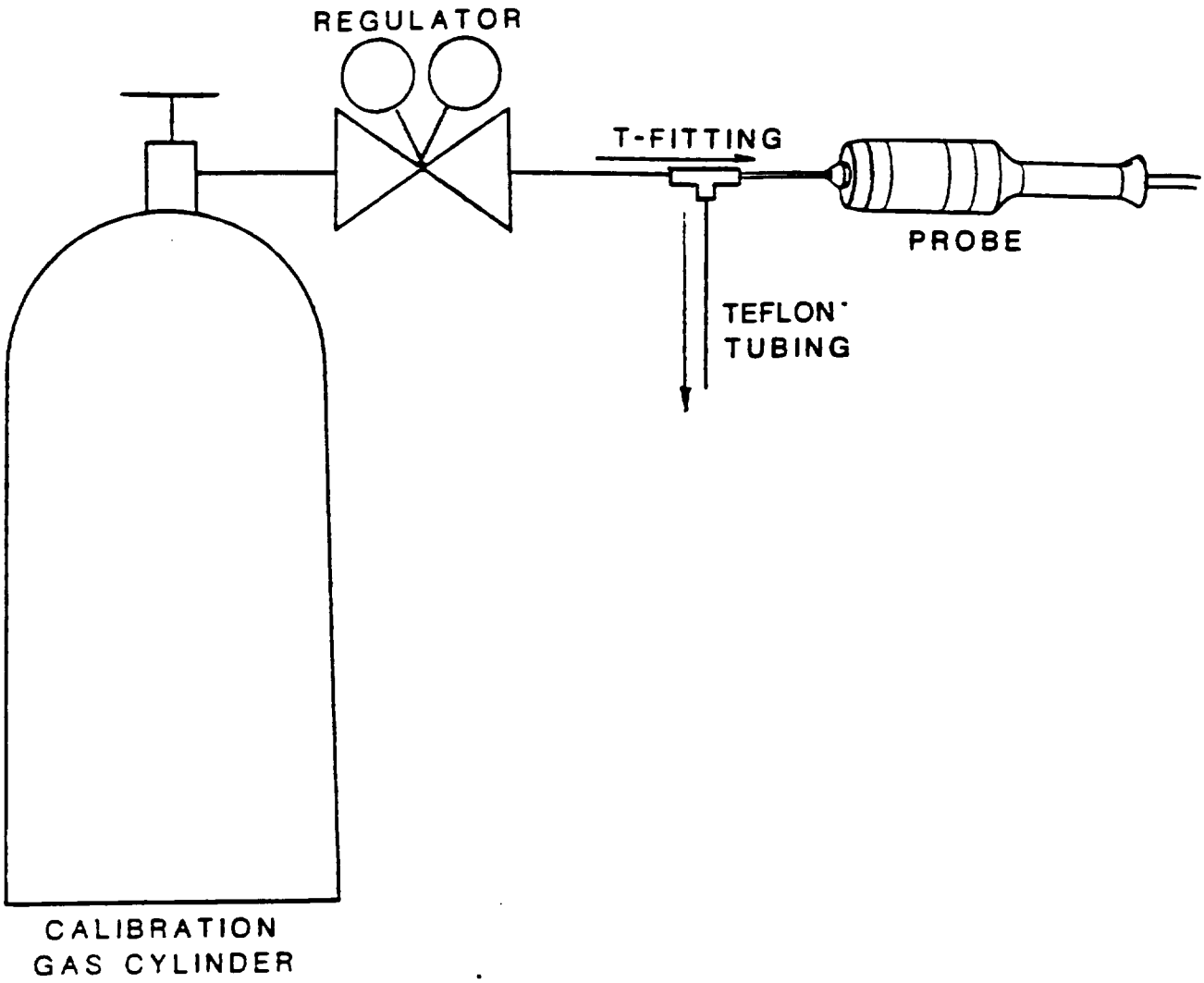
Turn the function switch to the OFF position. Disconnect the probe cable connector at the readout panel. Unscrew the probe inlet tube from the end cap and clean the inside of the tube making sure that the tube is dry and lint-free when finished. A pipe cleaner, or a kim-wipe and piece of wire, can be used. Keeping the probe upright, remove the two screws holding the end cap in place and remove the cap and ion chamber. Place one hand over the top of the lamp housing and tilt slightly. The light source will slide out of the housing. Take care not to lose or misplace o-rings or other parts. Do not touch the internal parts of the probe, particularly the UV lamp, with the bare hand during cleaning or reassembly. Surgical gloves are recommended. Clean the internal parts with a non-abrasive, lint-free paper towel (e.g., kim-wipe) and reassemble the probe.

11.0 Documentation

Safety and survey monitoring with the HNU will be documented in a bound field log book and retained in the project files. The following information is to be recorded:

- Project name and number.
- Operator's signature.
- Date and time of operation.
- Calibration gas used.
- Calibration check at beginning and end of day (meter readings before adjustment).
- Span setting after calibration adjustment.
- Meter readings (monitoring data obtained).
- Instances of erratic or questionable meter readings and corrective actions taken.
- Instrument response verifications - magic marker (Section 8.0) or similar test.

Figure 7-1


REGULATOR
T-FITTING
PROBE
TEFLON
TUBING
CALIBRATION
GAS CYLINDER

1.0 General Applicability

This SOP describes the methods for excavating and logging test pits or trenches dug for purposes of determining subsurface soil and rock conditions.

2.0 Responsibilities

It is the responsibility of the geologist or engineer to determine the location, total depth and overall size of each test pit/trench. It is also his or her responsibility to collect representative samples from the test pit/trench. It is the responsibility of subcontractors to construct test pits/trenches according to ERT project-specific requirements.

3.0 Supporting Materials

- stakes
- sample containers: bags, jars, boxes, labels
- measuring tape
- compass, Brunton type
- camera for photographing sections
- sample cutting/extracting equipment: knifes, trowels, shovels
- fluorescent flagging tape

4.0 Methods for Digging Test Pits/Trenches

4.1 General Procedure - Construction

4.1.1 Notify all utilities (electric, water, sewer, etc.) who may have equipment or transmission lines buried in the vicinity of proposed test pits. Many regions have organizations which represent all utilities for these notification purposes. Allow enough time after notification (typically 3 working days) for the utilities to respond and provide locations of any equipment which may be buried on-site.

4.1.2 General locations for test pits or trenches may be documented by survey or by using topographic maps and/or plans.

4.1.3 The elevation of the ground surface at the test pit or trench location shall be determined by a topographic survey. It may be necessary, as determined by geologist or engineer, to obtain elevations at several points where sloping surfaces are encountered. Topographic survey work will be performed by a survey subcontractor.

4.1.3 Test pits/trenches shall be excavated to the depth determined by the geologist or engineer. The test pits or trenches shall be excavated in compliance with applicable safety regulations. Walls should be cut as near vertical as possible to facilitate stratigraphic mapping. The size and depth of test pit/trench shall be receorded in the Test Pit Log shown in Figure 1.

4.1.4 When necessary to determine the boulder content of test pits or trenches, the boulders shall be separated from the soil matrix, measured and counted, and the data recorded by the project geologist or engineer on the approved log sheets.

4.1.5 For test pits, a preliminary log shall be prepared in the field by the geologist or engineer. A sketch may be necessary to depict the strata encountered.

4.1.6 Trenches shall be mapped by the geologist or engineer. All information shall be recorded in a log book designated for the trench, or directly on a sketch map of the trench. The data shall be transferred at a later date to profiles at a scale to be determined by the geologist or engineer.

4.1.7 Before measuring the depth to the ground-water table in test pits, if encountered, the geologist or engineer will allow sufficient time for stabilization of the ground-water table.

4.2 General Procedure - Collecting Samples

4.2.1 Requirements for sampling shall be determined by the geologist or engineer and specified in the project sampling plan.

4.2.2 Representative samples shall be collected by the geologist or engineer.

4.2.3 The samples shall be placed in wide-mouth, approximately 16-ounce jars with screw top. Each jar shall be labelled with the following information:

- client/project name
- project number
- test pit/trench number
- sample number/identification
- horizontal/vertical location
- date of collection

These data shall be similarly recorded onto the sample log sheets and field notebook. Each jar cap shall be similarly marked. A soil sample container label is shown in Figure 2.

4.2.4 All jars shall be placed into a marked box for their protection.

4.2.5 Larger bulk (disturbed) samples shall be placed in cloth bags with plastic liners. Sample bags shall be marked with client's name, project number, site number, test pit/trench number, sample number, horizontal/vertical location, and date.

4.2.6 Test pit locations shall be referenced onto the site map. Sample locations shall be referenced onto a plan view/vertical section of each test pit/trench.

4.2.7 Photographs of specific geologic features may be required for documentation purposes. A scale or an item providing a size perspective shall be placed in each photograph. Frame number/picture location shall also be documented in the field log book.

4.3 General Procedure - Backfilling

4.3.1 Prior to backfilling, the test pit/trench shall be inspected to ensure that all the appropriate and/or required data and samples have been collected.

4.3.2 After inspection, backfilling and compaction of test pit/trenches shall be accomplished according to contract specifications.

4.3.3 All test pits/trenches will be backfilled to original grade.

4.4 Specific procedures pertaining to the handling and shipment of samples shall be followed according to SOP 7510.

5.0 Documentation

- test pit log
- sample log sheets
- field log book
- chain of custody forms
- shipping receipts

All documentation shall be placed in the project files and retained following completion of the project.

TEST PIT

Project _____ Site _____ Sh ____ of ____

Date _____ Location _____ Ground Elevation _____

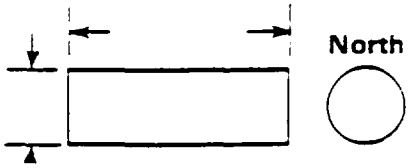
Total Depth _____ Contractor _____

Equipment Used _____ Logged by _____

Remarks _____

Elev. Feet	Depth Feet	Sample		Soil & Rock Description & Comments
		Type & No.	Depth Range	

Test Pit Plan



Groundwater		
Date	Time (Hours After Completion)	Depth (Feet)

Figure 1 Test Pit Log

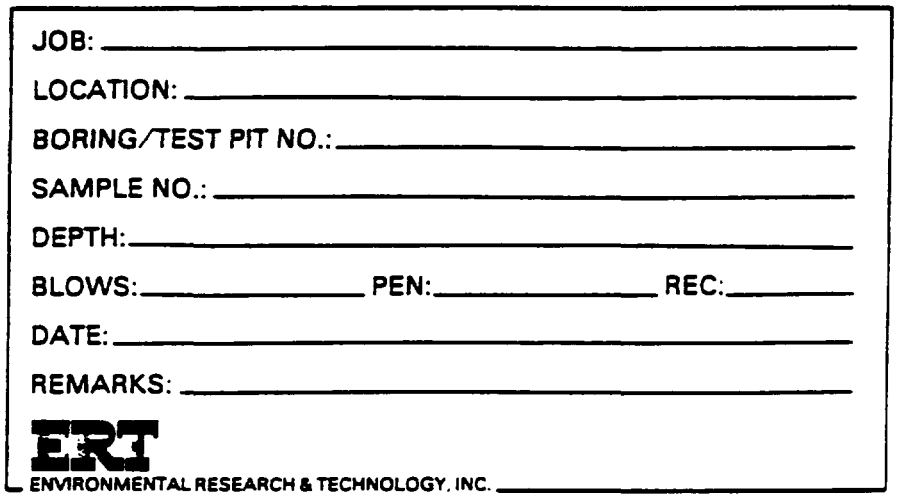


Figure 2 Soil Sample Lable

1.0 General Applicability

This SOP describes the methods used for obtaining surface soil samples for physical analysis or quality/chemical analysis. This SOP also describes the procedures for using the various types of sampling equipment, which include shovels, trowels, and hand augers. The equipment may be constructed of special materials (for example, stainless steel, inert plactics) according to specific project requirements.

2.0 Equipment Descriptions:

2.1 shovel - long or short handle type. Used for penetrating the upper surface and/or obtaining soil samples directly.

2.2 trowel - basic garden variety, which resembles a small shovel. Constructed of steel or polypropylene (plastic)*. The blade of a trowel is generally flat and 5 to 6 inches in length. A scoop (blade has curved edges versus flat) may be substituted if necessary. Both can be purchased with volume calibrations.*

2.3 Hand auger - This tool consists basically of a short spiral-bladed metal rod (Auger) attached to a handle. Clockwise rotation of the T handle initiates the cutting process. Most of the loose soil is discharged upwards as the auger moves downwards. However, if the soil is cohesive some of it will stick to the auger flight providing a collectable sample at a measurable depth. Samples of surface soil can also be collected using a tube sampler which will be attached to the end of the auger rods and advanced into the soil to extract a sample.

3.0 Responsibilities

The project geologist/engineer will be responsible for the proper use and maintenance of all types of equipment used for obtaining surface soil samples; and the collection, labelling, handling and storage of all samples until further chain of custody procedures are undertaken.

4.0 Supporting Materials

- Sample containers/Labels
- Sample Logs/Boring Logs
- Decontamination materials (if required)*
- Field notebook
- Six-foot folding rule or tape measure for depth measurement

*Requirements for inert materials, decontamination, or calibrated sampling tools may be required depending upon the purpose of the sampling. These requirements will be detailed in a project-specific sampling plan.

STANDARD OPERATING PROCEDURE

Title: Surface Soil Sampling

Date: 1st Qtr 1
Number: 7110
Revision: 1

5.0 Method or Protocol

5.1 General Procedures

Specific sampling equipment and methodology will be dictated by the characteristics of the soil to be sampled, the type of soil samples required by the project and the analytical procedures to be employed. Soil samples obtained at the surface may be collected using a shovel or trowel. The type of analysis requested (e.g., grain-size distribution, physical, chemical) may require specific soil amounts or the use of specialized sampling equipment. Sampling to obtain uniform coverage within a specified area will require the use of an area grid. These considerations will be followed based upon specific project requirements defined in the project sampling plan.

A hand auger can be used to extract shallow soil samples up to three (3) feet below the surface. Representative samples will be collected directly from the auger flight as it is withdrawn from the ground, or from the tube sampler attached to the end of the rods and advanced into the soil.

The location of sample points will be determined on a project specific basis.

5.2 Standard Procedures

5.2.1 Select the specific sampling location. Construct a sampling grid if necessary. Remove all surface materials that are not to be included samples, for example, rocks, twigs, leaves.

5.2.2 Select type of sampler required to obtain the correct sample. At the surface, use a shovel, trowel or tube sampler; below surface, use a hand auger or tube sampler.

5.2.3 Obtain a sufficient quantity of soil for the desired chemical or physical analyses.

5.2.4 When using the hand auger, auger the hole to the required depth, then slowly remove the auger and collect the soil sample from the auger flight itself at the point corresponding to the required depth. Reinsert and continue augering if deeper samples are required. In addition, a tube sampler can be attached to the auger rods after augering to the desired depth, inserted into the open bore, and then advanced into the deposits at the base of the boring. If sampling is needed in sandy or non-cohesive soil, a shovel may be necessary to obtain samples.

5.2.5 Cap the sample container; attach label; seal container (if analysis for volatile chemical species is anticipated). Record all observations such as visual soil description in a field book or on a surface soil sample log. Complete chain of custody records. Utilize proper storage procedures (see SOP 7510).

5.2.6 Decontaminate the sampler between collection points. Decontamination procedures will be performed as identified in SOP 7600 Decontamination unless otherwise specified.

5.2.7 Initiate proper procedures for delivery of the samples to the designated laboratory. This includes packaging, and shipping with chain of custody forms (see SOP 7510).

6.0 Documentation

Various forms are required to ensure that adequate documentation is made of the sample collection activities. These forms include:

- field log books
- sample logs
- chain of custody forms
- shipping forms

The field book will be maintained as an overall log of all samples collected throughout the study. These documents will be retained in the appropriate project files.

SURFACE SOIL SAMPLE LOG

PROJECT NO. _____ PROJECT LOCATION _____

SAMPLE POINT NO. _____

DATE _____ TIME _____

SAMPLE POINT DESCRIPTION/DESIGNATION _____

_____

SAMPLE COLLECTION:

EQUIPMENT USED _____

NO. OF SAMPLES COLLECTED _____ CONTAINER SIZE _____

SAMPLE NO.	DEPTH	TYPE OF MATERIAL	ANALYSIS REQUES.
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

COMMENTS _____

_____

_____

LAB DESIGNATION _____

SHIPPING BOX NO. _____

COLLECTOR'S NAME _____

0887J

APPENDIX B

HEALTH AND SAFETY PLAN

Health and Safety Plan
for
Tank Removal and Closure

Four Winds Plaza
Western Auto

United States Virgin Islands

Prepared by: Kathleen Harvey Date: July 1993

Approved by: Kathleen Harvey Date: August 3 1993
Regional H&S Manager

Approved by: Robert Fuhr Date: August 6, 1993
Project Manager

TJT 004 0096

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Attachment A	HASP Sign-Off Sheet
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1.0 INTRODUCTION

1.1 HASP Applicability

This site-specific Health and Safety Plan (HASP) has been developed by ENSR Consulting and Engineering (ENSR) to establish the health and safety procedures required to minimize any potential risk to personnel who will perform the tasks associated with the closure of two underground storage tanks (USTs) at the Four Winds Plaza behind the Western Auto store located in St. Thomas, United States Virgin Islands (USVI). The provisions of this plan apply to all ENSR personnel and ENSR subcontractor personnel who may potentially be exposed to safety and/or health hazards related to activities described in Section 3.0 of this document.

Although the proposed scope of work is not covered by the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120), this HASP has been written to comply with the requirements of that standard. All activities covered by this HASP must be conducted in complete compliance with this HASP and with all applicable federal, state and local health and safety regulations. Personnel covered by this HASP who cannot or will not comply will be excluded from site activities.

Subcontract personnel who choose to follow ENSR's plan must distribute a copy of this plan to each employee who will work at the site. Each employee must sign a copy of the attached health and safety plan sign-off sheet (see Attachment A). Subcontractors to ENSR may develop their own HASP related to their specific on-site activities. This HASP must minimally be as protective as ENSR's and must be submitted for ENSR review at least two weeks prior to the start of on-site activities.

Please note that this HASP only pertains to the proposed activities associated with the removal/closure of the two USTs and does not cover any extended soil and/or groundwater investigations that may be necessary. Tasks covered by this HASP are listed in Section 3.0 of this document. A task specific HASP or addenda to this HASP will be developed at a later date for any other subsequent investigative/remedial activities at the site.

1.2 Responsibilities

The implementation of health and safety at this site will be the shared responsibility of the ENSR Project Manager (PM), the ENSR Regional Health and Safety Manager (RHSM), the ENSR Project Site Safety Officer (SSO), and all other ENSR and ENSR subcontractor site personnel.

The ENSR PM (Robert Fuhrer) is, by designation, the individual who has the primary responsibility for ensuring the overall health and safety of this project. The PM therefore has the primary responsibility for ensuring the implementation of the requirements of this HASP. Some of the PM's specific responsibilities include:

- Assuring that all personnel to whom this HASP applies, including ENSR subcontractors, have received a copy and have submitted a completed copy of the HASP sign-off form;
- Assuring that all personnel to whom this HASP applies have attended a pre-entry briefing prior to entering a restricted area;
- Assuring that all ENSR subcontractor personnel submit documentation of the medical surveillance and training requirements specified in Sections 9.1 and 9.2 of this HASP;
- Maintaining a high level of health and safety consciousness among employees at the work site;
- Maintaining regular communications with the SSO and, if necessary, the RHSM; and,
- Contacting the RHSM as soon as the analytical data is received for the septic tank sludge.

The ENSR RHSM (Kathleen Harvey) is the individual responsible for the preparation, interpretation and modification of this HASP. Modifications to this HASP which may result in less stringent precautions cannot be undertaken by the PM or the SSO without the approval of the RHSM. Specific duties of the RHSM include:

- Writing, approving and amending the HASP for this project;
- Advising the PM and SSO on matters relating to health and safety on this site;
- Recommending appropriate personal protective equipment and air monitoring instrumentation to protect personnel from potential site hazards;
- Performing site audits to monitor the effectiveness of this HASP and to assure compliance with it;
- Conducting accident investigations; and,

- Maintaining regular contact with the PM and SSO to evaluate site conditions and new information which might require modifications to the HASP.

The ENSR SSO (to be appointed by the PM) will be on-site during all the investigative activities covered by this HASP. The SSO is responsible for enforcing the requirements of this HASP once on-site work begins. By design, the SSO has the authority, and the responsibility, to immediately correct all situations where noncompliance with this HASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the SSO's specific responsibilities include:

- Procuring and distributing the PPE needed for this project for ENSR personnel;
- Procuring the air monitoring instrumentation required and performing air monitoring;
- Verifying that all PPE and health and safety equipment is in good working order;
- Setting up and maintaining the contamination reduction zone within the restricted areas and assuring proper decontamination of all site personnel and equipment;
- Notifying the PM and RHSM of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of all personnel within the established restricted areas to ensure that required safety and health procedures are being followed and correcting any deficiencies;
- Conducting the required pre-entry briefing;
- Assisting with accident/incident investigations and preparing accident/incident investigation reports; and
- Initiating emergency response procedures in according with Section 10.0 of this HASP.

All ENSR and subcontractor field personnel covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP in its entirety prior to the start of on-site work;

- Submitting a completed HASP Acceptance Form and documentation of medical surveillance and training to the ENSR PM prior to the start of work;
- Attending the required pre-entry briefing prior to beginning on-site work;
- Bringing forth any questions or concerns regarding the content of the HASP to the PM or the RHSM prior to the start of work;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the ENSR SSO; and
- Complying with the requirements of this HASP and the requests of the SSO.

Additionally, subcontractors are responsible for:

- Providing ENSR with Standard Operating Procedures (SOP) for the specific tasks they will perform;
- Issueing hot work and/or confined space entry permits, if necessary, to their employees or procuring those permits from the facility,
- Providing ENSR with copies of material safety data sheets (MSDS) for all hazardous materials brought on-site; and,
- Providing all the required personal protective equipment for their employees

1.3 Modification to the HASP

The procedures in this HASP have been developed based on current knowledge regarding the specific potential chemical and physical hazards which are currently known or anticipated for the operations which are to be conducted at this site. All proposed modifications to this HASP must be reviewed and approved by the ENSR RHSM before such modifications are implemented.

Any significant modifications must be incorporated into the written document as addenda and the HASP must be reissued. The ENSR PM will ensure that all personnel covered by this HASP receive copies of all issued addenda. Sign-off forms will accompany each addendum and must be signed by all personnel covered by the addendum. Sign-off forms will be submitted to the ENSR PM. The HASP addenda should be distributed during the daily safety meeting so that they

can be reviewed and discussed. Attendance forms will be collected during the meeting.

2.0 SITE HISTORY

Four Winds Plaza is a private group that owns and operates the Four Winds Plaza and leases out store space to a large variety of clients including electronics stores, furniture stores, shoe stores, food stores and drug stores, among others. Western Auto is a commercial enterprise that leases property on the Four Winds Plaza (see Figure 2-1). Western Auto sells automotive materials and equipment. In some cases, this equipment is installed in the Western Auto Store.

The two USTs of concern, Tank 1 and Tank 2, are located behind the Western Auto Store. The tanks are classified as "out of service" (see Figure 2-2) All use of the USTs, by any and all parties that have previously used the tanks has been discontinued.

One tank is an approximately 200-gallon tank originally filled with diesel fuel and now contains a water and waste oil mixture. The other tank is an approximatley 2,000-gallon tank that originally held waste oil. The tank is now filled with sand.

Four Winds Plaza and Western Auto want to remove these two USTs and to test the soil underneath the tanks to determine what contamination, if any, has resulted from the tanks.

3.0 SCOPE OF WORK

The overall scope of work associated with the removal and closure of these tanks includes:

- determining the tank contents by sampling and analysis
- properly handling, treating and disposing of the tank contents
- determining the final disposition of the tanks, tank contents and any soils brought up with the tanks

The specific tasks associated with the proposed removal/closure of the two USTs includes the following:

- Drain and flush with water each of the USTs piping
- Plug and seal the piping
- Collect samples of tank contents for subsequent laboratory analysis
- Pump the contents of the tank for ultimate transport and disposal
- Clean the tank using high pressure water
- Pump out generated wash waters for ultimate disposal
- Sample wash waters if original analyses indicates that tank contents are hazardous
- Remove the tanks from their graves
- Puncture each end of the tank after removal and remove tank from the site
- Screen soils in tank excavation
- Stockpile soils with elevated HNu readings
- Sample and analyze stockpiled soils
- Advance three (3) soil borings beneath each tank to a depth of no more than two (2) feet
- Collect samples from borings
- Collect sample of any existing water if apparent during tank removal process

4.0 HAZARD ASSESSMENT

The following chemical and physical hazard assessment applies only to the proposed activities covered by this HASP.

Constituents of Potential Concern

4.1 Chemical Hazards

The following list of constituents of potential concern has been developed for this project.

- Waste Oil

Potential Routes of Exposure

Dermal contact with materials in the piping and tanks during the removal of piping/tank contents, cleaning of the piping/tanks and sampling of the tank contents

Dermal contact with residual contamination in soils and wash waters during sampling

Inhalation of particulates during tank removal and soil boring

Splash hazard during the removal of tank contents and/or wash waters

Other Chemicals

Material Safety Data Sheets for the solutions (methanol) that ENSR will use to decontaminate sampling equipment are presented in Attachment B. The most likely exposure route to the decon solutions is dermally, although a splash hazard does exist. The SSO must ensure that all bottles and containers of decon solutions brought on-site are properly labeled in accordance with the OSHA Hazard Communication Standard. Subcontractors are required to submit copies of MSDSs to ENSR for those hazardous materials they bring on-site.

4.2 Physical Hazards

4.2.1 Heat Stress

Heat related problems include heat fatigue, heat rash, fainting, heat cramps, heat exhaustion and heat stroke. Heat rash occurs because sweat isn't evaporating, making the skin wet most of the time. Standing erect and immobile in the heat allows blood to pool to lower parts of the body. As a result, blood does not return to the heart to be pumped to the brain. Fainting may then occur.

Heat cramps are painful spasms of the muscles due to excessive salt loss associated with profuse sweating. The loss of large amounts of fluid and excessive loss of salt results in heat exhaustion. The skin will be clammy and moist and persons exhibit extreme wetness, giddiness, nausea and headache.

Heat stroke occurs when the body's temperature regulatory system has failed. Skin is hot, dry, red and spotted. The affected person may be mentally confused and delirious. Convulsions could occur. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The person should be soaked with water to promote evaporation. Fan the person's body to increase cooling.

Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of potential hazardous tasks.

Early Symptoms of Heat-Related Health Problems:

- decline in task performance
- incoordination
- decline in alertness
- unsteady walk
- excessive fatigue
- vigilance
- muscle cramps
- dizziness

Susceptibility to Heat Stress Increases due to:

- lack of physical fitness
- lack of acclimation
- increased age
- dehydration
- obesity
- drug or alcohol use
- sunburn
- infection

People unaccustomed to heat are particularly susceptible to heat fatigue. First timers in PPE need to gradually adjust to the heat

Measures to Avoid Heat Stress:

- Establish work-rest cycles (short and frequent are more beneficial than long and seldom).
- Identify a shaded, cool rest area.
- Rotate personnel, alternative job functions.
- Water intake should be equal to the sweat produced. Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst. DO NOT DEPEND ON THIRST TO SIGNAL WHEN AND HOW MUCH TO DRINK. For an 8-hour work day, 50 ounces of fluids should be drunk.
- Eat lightly salted foods or drink salted drinks such as Gatorade to replace lost salt.
- Save most strenuous tasks for non-peak heat hours such as the early morning or at night.
- Avoid alcohol during prolonged periods of heat. Alcohol will cause additional dehydration.
- Avoid double shifts and/or overtime.

The implementation and enforcement of the above mentioned measures will be the joint responsibility of the project manager, on-site field coordinator, and health and safety officer. Potable water and fruit juice will be available each day for the field team.

Site personnel should monitor their heart rate as an indicator of heat strain by the following method:

Radial pulse rates should be checked by using fore and middle fingers and applying light pressure top the pulse in the wrist for one minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beats/minute, the next work cycle will be shortened by one-third and the rest period will be kept the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, the work cycle will be shortened again by one-third.

4.2.2 Back Safety

To avoid potential back injury, drums of pumped tank contents and/or rinsate water and drums of soil boring cuttings should not be moved or handled manually.

4.2.3 Operation of Drill Rig

Use of a drill rig to advance soil borings will require all personnel in the vicinity of the operating machinery to wear steel-toed footwear, hardhats, hearing protection and safety eyewear. Personnel should not remain in the vicinity of operating equipment unless it is required for their work responsibilities.

Additionally, the following safety requirements will be adhered to:

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and geologists must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller and helper shall not simultaneously handle augers or drill rods unless there is a standby person to activate the emergency stop.

- The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment.

- A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating tools. Hands and/or feet are not to be used for this purpose.

- A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools which could rotate, the driller must shut down the rig prior to initiating such work.

- Drillers, helpers and geologists must secure all loose clothing when in the vicinity of drilling operations.

- Only equipment which has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers shall not be allowed

- No person shall climb the drill mast while tools are rotating.

- No person shall climb the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder which meets the requirements of OSHA standards.

4.2.4 Utility Installations

The estimated location of utility installations, such as sewer, water, gas and process lines and other underground installations that may be encountered during drilling, will be confirmed with a representative of the facility prior to drilling.

Be particularly aware of overhead lines in the work area. Any vehicle or mechanical equipment capable of having parts of its structure elevated (drill rig, crane etc.) near energized overhead lines shall be operated so that a minimum clearance of 10 feet is maintained.

4.2.5 Hot Work

If the tank is cut up on-site, a hot work permit may be required. Issueing this permit and meeting the requirements of the permit is the responsibility of the subcontractor.

4.2.6 Confined Space Entry

ENSR personnel will not enter the tanks. If it is necessary for the subcontractor to enter the tank to clean it, the entry must be performed in strict accordance with OSHA's new confined space entry standard and their company's standard operating procedures for confined space entry. It is the sole responsibility of the subcontractor to meet the requirements for safe entry into a confined space, including the appropriate air monitoring.

4.2.7 Rigging

ENSR personnel are to remain clear of this activity until the tank has been set on the ground and securely blocked to prevent rolling. UNDER NO CIRCUMSTANCES ARE PERSONNEL TO PASS UNDER THE SUSPENDED TANK WHILE IT IS BEING RIGGED OUT OF THE EXCAVATION. While the tank is temporarily stored, it will be placed on plastic sheeting , chocked and labeled "Gas Free" and "Danger".

4.2.8 Open Excavations

After the tank is removed, the tank grave should be immediately backfilled. If the tank grave is left open overnight, the perimeter of the opening must be conspicuously identified with "Caution-Open Excavation" tape.

4.2.9 Static Electricity

When transferring, a metal-to-metal bond must be established between the tank being emptied and the drum being filled through the use of grounding cables to prevent discharge sparks of static electricity. Pump motors and suction hoses must also be bonded to the tank (or otherwise grounded) to prevent electrostatic ignition hazards.

4.2.10 Use of a Vac-Truck to Pump Tank Contents

If a vacuum truck is used to remove the tanks contents, it must be operated in a vapor-free area. The vac-truck should be lcoated upwind from the tank and outside of the path of vapor dispersion. The vacuum pump exhaust gases should be discharged through a hose of adequate size and length, downwind of the truck and tank area.

If it becomes necessary to remove residual liquids from the tank with a hand pump, the pump must be either air-driven or approved for use in Class 1, Division 1 atmospheres.

4.2.11 Flammability Concerns

Although not flammable, waste oils are combustible liquids (flash point greater than 100^{o}F). As a precautionary measure, the inside of the tank will be monitored using a combustible gas indicator (CGI) for the presence of explosive atmospheres (see Section 5.1). After the tank contents have been removed, the tank will be screened using the CGI. Since waste oil vapors are heavier than air, the tank must be screened at the top, middle and bottom portions. Readings of 10% or less of the lower explosive limit (LEL) must be obtained before the tank can be removed from the ground. If the atmosphere within the tank exceeds 10% of the LEL, dry ice will be introduced into the tank to inert it. Successful inertion is defined as an oxygen level of less than 10%. By displacing the oxygen with the carbon dioxide given off by the dry ice, the atmosphere becomes incapable of sustaining a flame. The atmosphere will be oxygen-deficient which is important to remember if employees plan to enter the tank after it is inerted. The CGI used on this project will be a combination unit that contains an oxygen meter to determine successful inertion. The tanks atmosphere will be monitored continuously for explosive concentrations.

All vapors must be vented at a minimum height of 12 feet above grade and 3 feet above any adjacent roof lines.

In addition to the monitoring, only spark-proof tools will be used during the removal of the piping

and the tanks.

4.2.12 Entry into a Tank Grave

If possible, ENSR will use remote sampling techniques or equipment (long-handled soil scooper) to collect samples from the bottom of the tank graves. If entry into a tank grave is necessary the following entry precautions must be implemented:

If entry into the tank grave that is greater than 4 feet in depth is required, a ladder or similar means of egress must be located in tank grave so as to require no more than 25 feet of lateral travel for employees. No person shall enter a tank grave greater than five feet in depth unless the walls of the excavation have been sloped back to an angle of 34 degrees, the excavation is free of accumulated water and the excavation has been tested for hazardous atmospheres (oxygen deficient, toxic and explosive atmospheres).

The tank grave can be entered only if the following criterion have been met:

O2 level	> 19.5%
LEL	< 10%
total organics	< 25 units on HNu

If the first two criterion are met but the total concentration of organic compounds exceeds 25 units, respiratory protection, as described in Section 6.2, can be donned. Under no circumstances will the tank grave be entered if an oxygen deficient atmosphere exists.

If personnel enter a tank grave, all materials shall be placed at least two feet from the edge of the excavation to prevent the material from rolling into the excavation. All personnel should remain two feet away from the edge of the excavation.

If the contractor chooses to use temporary shoring instead of sloping the sides of the excavation, the shoring must comply with the provisions of the new OSHA standard.

5.0 AIR MONITORING

Instrument 1: HNu Photoionization Detector with a 10.2 ev lamp

An HNu photoionization detector (PID) equipped with a 10.2 ev lamp will be used to screen the soils in the tank graves for the presence of total organic vapors.

If the instrument does detect the presence of organic vapors in the soils, the breathing zone of employees will be screened. If organic vapors are sustained (15 minutes) in the breathing zone of employees at levels of 25 units above background, Level C respiratory protection, as defined in Section 6.2 will be donned.

Instrument 2: Combustible Gas Indicator/Oxygen Meter

A combination combustible gas indicator/oxygen meter will be used to detect the presence of a potentially explosive atmosphere inside the tanks. If the lower explosive limit (LEL) measured in the tank is greater than 10%, the vapors must be allowed to dissipate before contents removal and cleaning can begin. If the vapors do not dissipate, the tank may need to be ventilated or an inert gas such as carbon dioxide (dry ice) or nitrogen may have to be pumped into the tank to displace the oxygen. Displacing the oxygen will prevent explosion hazards, but creates an oxygen deficient atmosphere that could only be entered by an employee equipped with supplied-air respiratory protection. Successful inertion is indicated by an O2 level of less than 10%.

It is important to monitor the top, middle and bottom portions of the tank, since the vapors of waste oils are heavier than air and are likely to settle in the bottom of the tank.

The atmosphere inside the tanks will be monitored with the CGI on a regular basis before removal and while the tank remains on-site.

If entry into the tanks is necessary, it is the responsibility of the subcontractor to provide and perform the necessary air monitoring to allow for safe entry into a confined space.

6.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) will be donned as described below for the tasks covered by this HASP to protect employees from coming in direct contact with septic tank contents.

It is the responsibility of the subcontractor to identify the necessary PPE if entry into the tanks is necessary.

6.1 Protective Clothing

1. Hard Hat
2. Safety Glasses or Faceshield
3. Steel-toed boots
4. Poly coated Tyvek coveralls (if product saturated materials are encountered)
5. Latex gloves
6. Nitrile gloves

Pumping of Tank Contents/Sampling Tank Contents/Cleaning of Tank Interior

Items: 2,3,4,5,6

Items 4,5, and 6 may not be necessary during the pumping of the tank if a closed-loop pumping system is used. In this case the potential to come into contact with the tank contents is greatly minimized. Any time there is a potential to come into direct contact with the tank contents (changing valves, hoses, etc), the above listed items should be worn.

A faceshield offers more protection from splash hazards than safety glasses.

Soil Boring/Sample Collection

Items: 1,2,3,5,6

Sample Equipment Decontamination

Items: 2,5,6

If operating equipment is steam cleaned, a rain suit, rubber boots or boot covers and faceshield

should be worn to protect from splashing.

6.2 Respiratory Protection

Level C: Half mask air purifying respirators with organic vapor cartridges

This level of protection will be worn when the following concentrations are sustained in the breathing zone of employees:

- 25 units on the HNu

Employees who are expected to wear respiratory protection must have successfully passed a qualitative or quantitative fit-test within the past year for the brand, model and size respirator they plan to wear on this project.

Respiratory protection can be donned at any time that odors become objectionable.

It is the responsibility of the subcontractor to define the level of respiratory protection required if entry into the tank is necessary.

6.3 Other Safety Equipment

ENSR will bring the following additional safety equipment to the site:

- First aid kits
- Portable, hand-held eyewash bottle (in the event of splashing during decontamination of sample equipment or foreign object gets into the eye)
- Type A-B-C fire extinguisher

7.0 SITE CONTROL

To prevent potential exposure of unprotected personnel to the physical hazards associated with the tank closure, work areas and associated personal protective equipment requirements will be clearly identified.

7.1 Work Zones

ENSR designates work areas or zones as suggested in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/USCG/EPA, November, 1985. They recommend the areas surrounding each of the work areas to be divided into three zones:

- o Exclusion or "Hot" Zone
- o Contamination Reduction Zone (CRZ)
- o Support Zone

Exclusion Zone

Each of the two tanbk removal areas will be considered exclusion zones. These areas will be demarcated with Caution tape or red traffic cones to alert employees and patrons of the plaza. All personnel entering the exclusion zones must wear the prescribed level of protective equipment for the task they are performing.

Contamination Reduction Zone

One CRZ will be established in an area that is central to both tank removal locations. Employees will remove contaminated, disposable clothing (if worn) in these areas before getting into field vehicles or leaving the site for lunch or the end of the day. Clothing will be placed in plastic bags and left in the CRZ until disposed of. A container of wash water and liquid soap will also be available in CRZ for clean-up by employees.

Support Zone

This area will be used to store extra sampling equipment and personal protective equipment. The zone shall be set up in an area of the plant that will not interfere with the normal operations of the facility.

7.2 Protective Measures

The following measures are designed to augment the specific health and safety guidelines provided in this plan.

- The "buddy system" will be used at all times by all field personnel. All sampling team members must be intimately familiar with the procedures for initiating an emergency response.

- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the exclusion and decontamination zones.

- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking or any other activities.

- Beards or other facial hair that interfere with respirator fit are prohibited.

- The use of alcohol or illicit drugs is prohibited during the conduct of field operations.

- All equipment must be decontaminated or properly discarded before leaving the site.

- Safety equipment described in Section 6.0 will be required for all field personnel unless otherwise approved by the Regional Health and Safety Manager (RHSM) or the Site Safety Officer (SSO).

- Ground fault circuit interrupters will be used in conjunction with all power cords on-site.

8.0 DECONTAMINATION

Proper decontamination is required of all personnel and equipment before leaving the site. Personnel decontamination will be accomplished by following a systematic procedure of removing personal protective clothing (PPE).

The central CRZ will be set up as described in Section 7.0. Disposable PPE, such as Tyvek coveralls, gloves, etc. will be disposed of in plastic-lined garbage cans and labeled "PPE". Bags will be disposed of in accordance with the work plan and client requirements.

A cooler of potable water will be available in the CRZ and will be dedicated for hand and face washing. Liquid soap and hand towelettes will be available. This water can also be used to rinse respirator facepieces. If worn, respirators will be cleaned after each use and stored in plastic bags after cleaning.

The decontamination procedure is as follows:

1. Remove hard hat, safety glasses and wipe clean
2. Remove Tyvek coverall (if worn)
3. Remove outer pair of gloves
4. Remove respirator (if worn)
5. Remove inner pair of gloves

9.0 MEDICAL MONITORING/TRAINING REQUIREMENTS

9.1 Medical Monitoring

All personnel performing activities on this site covered by this HASP must be active participants in ENSR's Medical Monitoring Program. Each ENSR individual must have completed an annual surveillance examination and/or an initial baseline examination within the last year prior to performing any work on the site covered by this HASP. All subcontract employees must minimally participate in a medical monitoring program that meets the requirements of OSHA's respiratory protection standard, 29 CFR 1910.134.

9.2 Training

Additionally, all personnel performing activities on this site covered by this HASP must have completed the appropriate training requirements specified in 29 CFR 1910.120(e). Each ENSR individual must have completed an annual 8-hour refresher training course and/or initial 40-hour training course within the last year prior to performing any work on the sites covered by this HASP. Also, onsite ENSR managers and supervisors directly responsible for supervising individuals engaged in hazardous waste operations must have completed the specified 8-hour managers training course. (Note that ENSR corporate policy requires that whenever three or more ENSR employees are performing work on the same site, at least one of these individuals must have completed the manager's training course.)

Although not required under 29 CFR 1910, it is recommended that one person qualified in First Aid and CPR be present during all site work.

If confined space entry is to be performed, the subcontractor must provide documentation indicating proper employee training.

Subcontractors to ENSR will be required to provide to the ENSR Project Manager (PM) specific written documentation that each individual assigned to this project has completed the medical monitoring and training requirements specified above. This information must be provided prior to their performing any work on site.

9.3 Pre-Entry Briefing

Prior to the commencement of closure activities, a site safety meeting will be conducted by the SSO to review the specific requirements of this HASP. HASP sign-off sheets will be collected at this meeting. Short safety refresher meetings will be conducted, as needed, throughout the duration of the project. Attendance of this meeting will be documented. An attendance sign-in form is presented in Attachment C.

10.0 EMERGENCY RESPONSE

OSHA defines **emergency response** as any "response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result in an **uncontrolled release of a hazardous substance.**" According to ENSR policy, ENSR personnel shall not participate in any emergency response where there are potential safety or health hazards (i.e., fire, explosion, or chemical exposure). ENSR response actions will be limited to evacuation and medical/first aid as described within this section below. As such this section is written to comply with the requirements of 29 CFR 1910.38 (a).

The basic elements of an emergency evacuation plan include employee training, alarm systems, escape routes, escape procedures, critical operations or equipment, rescue and medical duty assignments, designation of responsible parties, emergency reporting procedures and methods to account for all employees after evacuation.

Employee Training: General training regarding emergency evacuation procedures are included in the ENSR initial and refresher training as described above in Section 9.2 of this Health and Safety Plan (HASP). Also as described above in Section 9.3, employees must be instructed in the specific aspects of emergency evacuation applicable to the site as part of the site safety meeting prior to the commencement of all on-site activities. On-site refresher or update training is required anytime escape routes or procedures are modified or personnel assignments are changed.

Alarm Systems/Emergency Signals: An emergency communication system must be in effect at all sites. The most simple and effective emergency communication system in many situations will be **direct verbal communications**. Each site must be assessed at the time of initial site activity and periodically as the work progresses. Verbal communications must be supplemented anytime voices can not be clearly perceived above ambient noise levels (i.e., noise from heavy equipment; drilling rigs, backhoes, etc.) and anytime a clear-line-of-sight can not be easily maintained amongst all ENSR personnel because of distance, terrain or other obstructions.

Verbal communications will be adequate to warn employees of hazards associated with the immediate work area.

Escape Routes and Procedures: ENSR will confirm with facility representatives how ENSR personnel should evacuate from the property and where ENSR personnel should assemble after

evacuating the site.

Rescue and Medical Duty Assignments: The phone numbers of the police and fire departments, ambulance service, local hospital, and ENSR representatives are provided in the emergency reference sheet which will be posted in the site vehicle. In the event an injury or illness requires more than first aid treatment, the SSO will accompany the injured person to the medical facility and will remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the victim's supervisor and the RHSM.

If the injured employee can be moved from the accident area, he or she will be brought to the CRZ where their PPE will be removed. If the person is suffering from a back or neck injury the person will not be moved and the requirements for decontamination do not apply. The SSO must familiarize the responding emergency personnel about the nature of the site and the injury. If the responder feels that the PPE can be cut away from the injured persons body, this will be done on-site. If this not feasible, decontamination will be performed after the injured person has been stabilized.

Designation of Responsible Parties: The SSO is responsible for initiating emergency response. In the event the SSO can not fulfill this duty, the alternate SSO will take charge. All personnel onsite are responsible for knowing the escape route from the site.

Employee Accounting Method: The on-site project manager is responsible for identifying all ENSR personnel on-site at all times. On small, short duration jobs this can be done informally as long as accurate accounting is possible. On all other sites a formal log-in and log-out procedure must be implemented. In the event of a terminal emergency, the SSO shall report to the person in charge of evacuation that all ENSR and subcontract employees have left the work area.

Accident Investigation and Reporting: Any incident (other than minor first aid treatment) resulting in injury, illness or property damage requires an accident investigation and report. The investigation should be conducted as soon as emergency conditions are under control. The purpose of the investigation is not to attribute blame but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An ENSR accident investigation form is presented in Attachment D of this HASP. The injured employee's supervisor and the RHSM should be notified immediately of the injury.

EMERGENCY REFERENCE

Ambulance Rescue Service:	to be determined by PM
Fire:	to be determined by PM
Police:	to be determined by PM
Hospital:	809-774-1321
	St. Thomas Hospital and Community Health Service Hospital Line Charlotte Amalie, USVI
Directions to the Hospital:	To be determined upon arrival to the site
NATIONAL RESPONSE CENTER:	1-800-424-8802

ENSR REPRESENTATIVES:

ENSR/SAN JUAN, PUERTO RICO	809-753-9509
-Robert Fuhrer(PM)	
ENSR/ACTON, MA	508-635-9500
-Kathleen Harvey (RHSM)	x 3325

ATTACHMENT A
HASP SIGN-OFF SHEET

Health and Safety Plan
for
Removal/Closure of Two Underground Storage Tanks

Four Winds Plaza
Western Auto
St.Thomas, United States Virgin Islands

ENSR PROJECT NUMBER: 7218-001-200

I the undersigned have received a copy of the above referenced document. I have read this document and understand its contents and requirements. I agree to abide by the requirements of this health and safety plan.

_____
Signature

_____
Date

_____
Representing

ATTACHMENT B

MATERIAL SAFETY DATA SHEETS

ATTACHMENT C

PRE-ENTRY BRIEFING ATTENDANCE SHEET

ENSR HEALTH AND SAFETY PLAN PRE-ENTRY BRIEFING ATTENDANCE FORM
FOR THE

Tank Removal and Closure

Four Winds Plaza
Western Auto
United States Virgin Islands

Briefing Conducted By: _____

Date Performed: _____

Printed Name	Signature	Representing

ATTACHMENT D

ACCIDENT INVESTIGATION FORM

ATTACHMENT 8.1 - SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

Injured Employee _____ Job Title _____

Home Office _____ Division/Department _____

Date/Time of Accident _____

Location of Accident _____

Witnesses to the Accident _____

Injury Incurred? _____ Nature of Injury _____

_____

Engaged in What Task When Injured? _____

_____

Will Lost Time Occur? _____ How Long? _____ Date Lost Time Began _____

Were Other Persons Involved/Injured? _____

_____

How Did the Accident Occur? _____

_____

_____

_____

_____

What Could Be Done to Prevent Recurrence of the Accident? _____

_____

_____

What Actions Have You Taken Thus Far to Prevent Recurrence? _____

_____

_____

Supervisor's Signature _____ Title _____ Date _____

Reviewer's Signature _____ Title _____ Date _____

NOTE: IF THE SPACE PROVIDED ON THIS FORM IS INSUFFICIENT, PROVIDE ADDITIONAL INFORMATION ON SEPARATE PAPER AND ATTACH. THE COMPLETED ACCIDENT INVESTIGATION REPORT MUST SUBMITTED TO THE REGIONAL HEALTH AND SAFETY MANAGER WITHIN FIVE DAYS OF THE OCCURRENCE OF THE ACCIDENT.