

# UTAH

## Groundwater & Soil Sampling

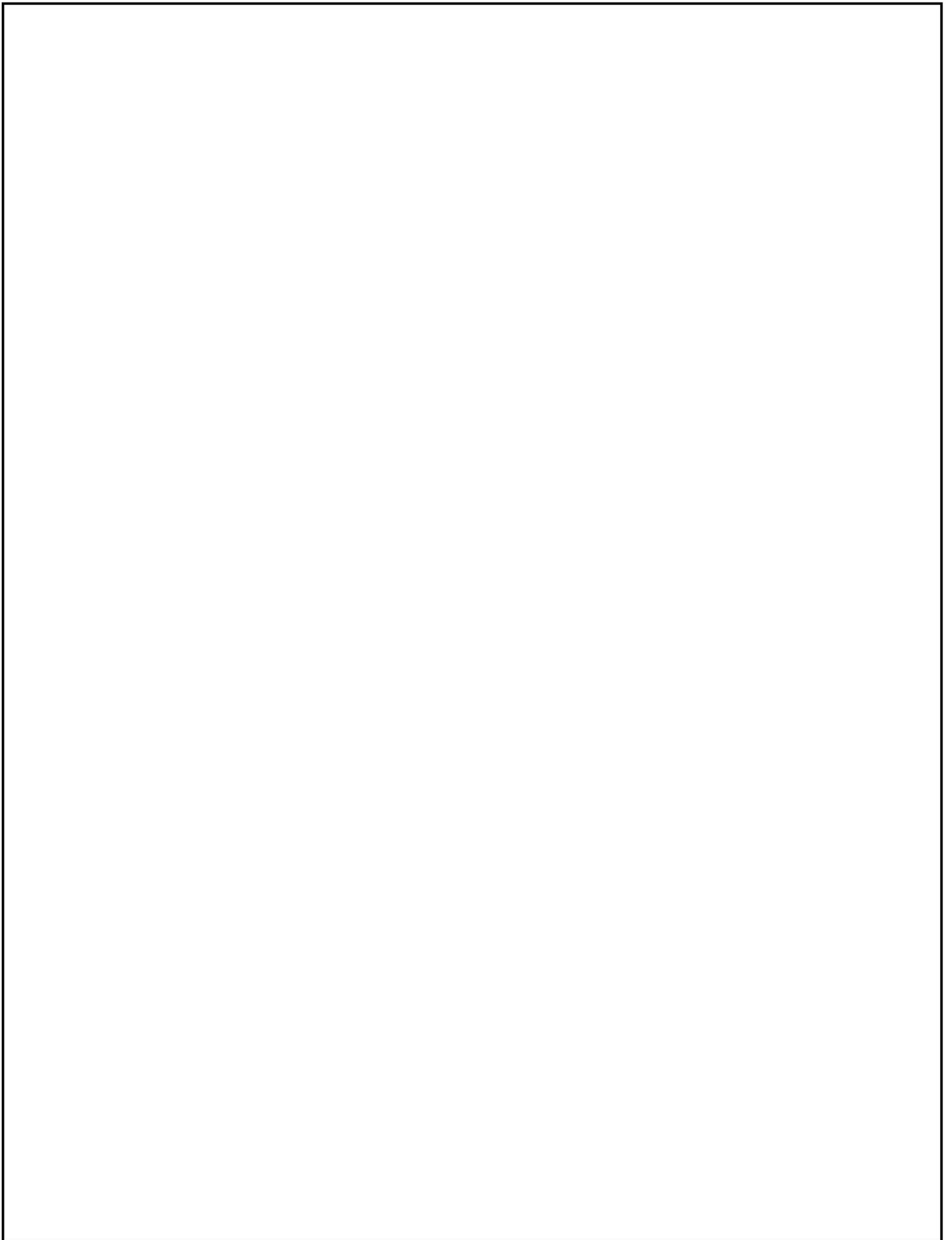
### Study Guide

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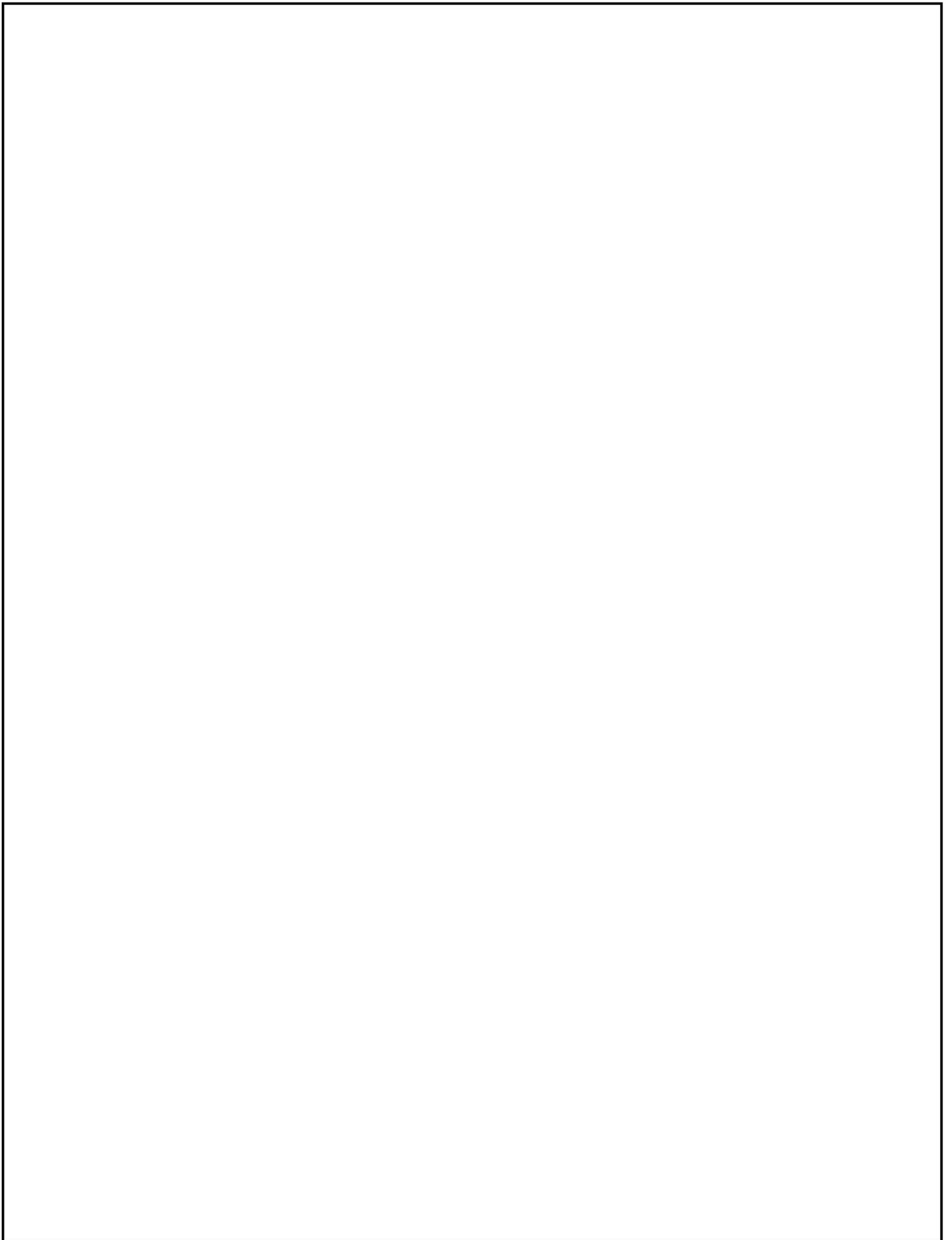
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**Note: Sections referencing Chapters 5,6,7. Come from the Underground Storage Tank Consultant Manual 2009.**



# General Tank Information

## UST Branch: Program Overview

The Utah State Underground Storage Tank (UST) program is a regulatory branch of the Department of Environmental Quality. Its primary goal is to protect human health and the environment from leaking underground storage tanks (USTs). The UST staff oversees: UST notification, installation, inspection, removal, and compliance with State and Federal UST regulations concerning release prevention and remediation.

## What are Underground Storage Tanks?

An UST is a tank system, including piping connected to the tank, that has at least 10 percent of its volume underground. Federal and state regulations apply only to those USTs containing petroleum products or certain hazardous chemicals.

USTs not regulated include:

- Farm or residential tanks 1,100 gallons or less, used non-commercially.
- Tanks storing heating oil, used on the premises.
- Flow-through process tanks.
- Emergency spill and overflow tanks.
- Tanks holding 110 gallons or less.
- Others as described in the federal register.

## Why Worry About An UST Release?

Utah obtains more than 50% of the population's drinking water from groundwater. Currently, there are more than 3,000 leaking UST sites in Utah. These sites have resulted in contaminated ground water and in some cases, explosive situations. Many more USTs in Utah could leak or have leaks yet to be discovered in the future adding to the existing problems.

## What Do the UST Regulations Accomplish?

The Environmental Protection Agency (EPA), with the help of the regulated industry, developed regulations concerning UST owners and operators. The goals of these regulations include:

- Prevent leaks and spills.
- Find leaks and spills.
- Correct the problems created by leaks and spills.
- Ensure the owners and operators can pay for clean-up associated with leaking USTs.
- Ensure that Utah has a regulatory program that complies with the Federal regulations.

The EPA phased-in many of the requirements over a ten year period beginning December 22, 1988. By December 22, 1998, all operating facilities were required to be upgraded with corrosion protection, spill and overfill equipment, and regularly monitored for a release. Any non-operational facilities must be properly closed.

## **The Utah UST Program**

As a result of the federal mandate, the State of Utah amended the Solid and Hazardous Waste Act in 1986 which established the Utah UST Program. UST owners and operators were required to register all USTs. In 1989, the Underground Storage Tank Act was enacted; it details the duties and responsibilities of the Executive Secretary (UST), the Solid and Hazardous Waste Control Board, and the Utah UST Program Authority. The act established the Petroleum Storage Tank (PST) Fund and provides certain requirements for UST owners and operators.

## **The UST Section**

The UST section of the Division of Environmental Response and Remediation (DERR) is a group of environmental scientists whose task is to oversee the regulated public in issues that concern the operational life of USTs to include proper closure of UST systems. The UST staff has tracked about 15,000

USTs and currently regulates approximately 4,300 active USTs at more than 1,500 different facilities. UST staff members perform compliance inspections, issue compliance notices, and serve as expert witnesses at administrative hearings. In addition, outreach classes and seminars are taught throughout the state by the UST staff.

## **The LUST Section**

The Leaking Underground Storage Tank (LUST) section of DERR oversees remediation of contamination from USTs. LUST scientists and engineers review and manage clean-up guidelines. When responsible parties are unwilling or unable to pay for investigation or remediation of a LUST site, the LUST staff is required to define the degree of hazard, possibly take action with LUST-TRUST money to abate the hazard and remediate the site, and recover costs incurred from responsible parties. Often, responsible parties seek the guidance of the LUST staff for assistance on LUST matters.

## **Administrative Support Section**

The administrative support section oversees collection of UST fees and monitors expenditures. Accountants and technicians answer questions concerning billings and distribute funds where appropriate.

## **What are the Requirements for Owner/Operators of UST Systems?**

- Notify the DERR of all regulated USTs with EPA Notification Form 7530-1.
- Pay any applicable fees.
- Obtain a Certificate of Compliance.
- Maintain compliance with regulations.
- Upgrade USTs when required.
- Report any UST release to the DERR.
- Remediate contamination.
- Remove UST appropriately.

## **R311-200-1. Definitions.**

### R311-200-1. Definitions.

- (a) Refer to Section 19-6-402 for definitions not found in this rule.
- (b) For purposes of underground storage tank rules:
  - (1) "Actively participated" for the purpose of the certification programs means that the individual applying for certification must have had operative experience for the entire project from start to finish, whether it be an installation or a removal.
  - (2) "Alternative Fuel" means a petroleum-based fuel containing:
    - (A) more than ten percent ethanol, or
    - (B) more than twenty percent biodiesel.
  - (3) "As-built drawing" for purpose of notification means a drawing to scale of newly constructed USTs. The USTs shall be referenced to buildings, streets and limits of the excavation. The drawing shall show the locations of tanks, product lines, dispensers, vent lines, cathodic protection systems, and monitoring wells. Drawing size shall be limited to 8-1/2" x 11" if possible, but shall in no case be larger than 11" x 17".
  - (4) "Automatic line leak detector test" means a test that simulates a leak, and causes the leak detector to restrict or shut off the flow of regulated substance through the piping or trigger an audible or visual alarm.
  - (5) "Backfill" means any foreign material, usually pea gravel or sand, which usually differs from the native soil and is used to support or cover the underground storage tank system.
  - (6) "Biodiesel" means a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100.
  - (7) "Burden" means the addition of the percentage of indirect costs which are added to raw labor costs.
  - (8) "Certificate" means a document that evidences certification.
  - (9) "Certification" means approval by the Executive Secretary or the Board to engage in the activity applied for by the individual.
  - (10) "Certified Environmental Laboratory" means a laboratory certified by the Utah Department of Health as outlined in Rule R444-14 to perform analyses according to the laboratory methods identified for UST sampling in Subsection R311-205-2(d).
  - (11) "Change-in-service" means the continued use of an UST to store a non-regulated substance.
  - (12) "Community Water System" means a public water system that serves at least fifteen service connections used by year-round residents or regularly serves at least 25 year-round residents.

(13) "Confirmation sample" means an environmental sample taken, excluding closure samples as outlined in Section R311-205-2, during soil overexcavation or any other remedial or investigation activities conducted for the purpose of determining the extent and degree of contamination.

(14) "Consultant" is a person who is a certified underground storage tank consultant according to Subsection 19-6-402(6).

(15) "Customary, reasonable and legitimate expenses" means costs incurred during the investigation, abatement and corrective actions that address a release which are normally charged according to accepted industry standards, and which must be justified in an audit as an appropriate cost. The costs must be directly related to the tasks performed.

(16) "Customary, reasonable and legitimate work" means work for investigation, abatement and corrective action that is required to reduce contamination at a site to levels that are protective of human health and the environment. Acceptable levels may be established by risk-based analysis and taking into account current or probable land use as determined by the Executive Secretary following the criteria in R311-211.

(17) "Department" means the Utah Department of Environmental Quality.

(18) "Eligible exempt underground storage tank" for the purpose of eligibility for the Utah Petroleum Storage Tank Trust Fund means a tank specified in 19-6-415(1).

(19) "Environmental sample" is a groundwater, surface water, air, or soil sample collected, using appropriate methods, for the purpose of evaluating environmental contamination.

(20) "EPA" means the United States Environmental Protection Agency.

(21) "Expediently disposed of" means disposed of as soon as practical so as not to become a potential threat to human health or safety or the environment, whether foreseen or unforeseen as determined by the Executive Secretary.

(22) "Fiscal year" means a period beginning July 1 and ending June 30 of the following year.

(23) "Full installation" for the purposes of 19-6-411(2) means the installation of an underground storage tank.

(24) "Groundwater sample" is a sample of water from below the surface of the ground collected according to protocol established in Rule R311-205.

(25) "Groundwater and soil sampler" is the person who performs environmental sampling for compliance with Utah underground storage tank rules.

(26) "Injury or Damages from a Release" means, for the purposes of Subsection 19-6-409(2)(e), any petroleum contamination that has migrated from the release onto or under a third party's property at concentrations exceeding Initial Screening Levels specified in R311-211-6(a).

(27) "In use" means that an operational, inactive or abandoned underground storage tank contains a regulated substance, sludge, dissolved fractions, or vapor which may pose a threat to human health, safety or the environment as determined by the Executive Secretary.

(28) "Lapse" in reference to the Certificate of Compliance and coverage under the Petroleum Storage Tank Trust Fund, means to terminate automatically.

(29) "Native soil" means any soil that is not backfill material, which is naturally occurring and is most representative of the localized subsurface lithology and geology.

(30) "No Further Action determination" means that the Executive Secretary has evaluated information provided by responsible parties or others about the site and determined detectable petroleum contamination from a particular release does not present an unacceptable risk to public health or the environment based upon Board established criteria in R311. If future evidence indicates contamination from that release may cause a threat, further corrective action may be required.

(31) "Notice of agency action" means any enforcement notice, notice of violation, notice of non-compliance, order, or letter issued to an individual for the purpose of obtaining compliance with underground storage tank rules and regulations.

(32) "Occurrence" in reference to Subsection R311-208-4 means a separate petroleum fuel delivery to a single tank.

(33) "Owners and operators" means either an owner or operator, or both owner and operator.

(34) "Overexcavation" means any soil removed in an effort to investigate or remediate in addition to the minimum amount required to remove the UST or take environmental samples during UST closure activities as outlined in Section R311-205-2.

(35) "Permanently closed" means underground storage tanks that are removed from service following guidelines in 40 CFR Part 280 Subpart G adopted by Section R311-202.

(36) "Petroleum storage tank" means a storage tank that contains petroleum as defined by Section 19-6-402(20).

(37) "Petroleum storage tank fee" means the fee which capitalizes the Petroleum Storage Tank Trust Fund as established in Section 19-6-409.

(38) "Petroleum storage tank trust fund" means the fund created by Section 19-6-409.

(39) "Potable Drinking Water Well" means any hole (dug, driven, drilled, or bored) that extends into the earth until it meets groundwater which supplies water for a non-community public water system, or otherwise supplies water for household use (consisting of drinking, bathing, and cooking, or other similar uses). Such well may provide water to entities such as a single-family residence, group of residences, businesses, schools, parks, campgrounds, and other permanent or seasonal communities.

(40) "Public Water System" means a system for the provision to the public of water for human consumption through pipes or, after August 5, 1998, other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. It includes any collection, treatment, storage, and distribution facilities under control of the operator of the system and used primarily in connection with the system; and, any collection or pretreatment storage facilities not under such control which are used primarily in connection with the system.

(41) "Registration fee" means underground storage tank registration fee.

(42) "Regulated substance" means any substance defined in section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act "CERCLA" of 1980, but not including any substance regulated as a hazardous waste under subtitle C, and petroleum, including crude oil or any fraction thereof that is liquid at standard conditions of temperature and pressure, 60 degrees

Fahrenheit and 14.7 pounds per square inch absolute. The term "regulated substance" includes petroleum and petroleum-based substances comprised of a complex blend of hydrocarbons derived from crude oil through processes of separation, conversion, upgrading, and finishing, and includes motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oils.

(43) "Secondary Containment" means a release prevention and detection system for a tank or piping that has an inner and outer barrier with an interstitial space between them for monitoring. The monitoring of the interstitial space shall meet the requirements of 40 CFR 280.43(g).

(44) "Site assessment" or "site check" is an evaluation of the level of contamination at a site which contains or has contained an UST.

(45) "Site assessment report" is a summary of relevant information describing the surface and subsurface conditions at a facility following any abatement, investigation or assessment, monitoring, remediation or corrective action activities as outlined in Rule R311-202, Subparts E and F.

(46) "Site investigation" is work performed by the owner or operator, or his designee, when gathering information for reports required for Utah underground storage tank rules.

(47) "Site plat" for purpose of notification, or reporting, refers to a drawing to scale of USTs in reference to the facility. The scale should be dimensioned appropriately. Drawing size shall be limited to 8-1/2" x 11" if possible, but shall in no case be larger than 11" x 17". The site plat should include the following: property boundaries; streets and orientation; buildings or adjacent structures surrounding the facility; present or former UST(s); extent of any excavation(s) and known contamination and location and volume of any stockpiled soil; locations and depths of all environmental samples collected; locations and total depths of monitoring wells, soil borings or other measurement or data points; type of ground-cover; utility conduits; local land use; surface water drainage; and other relevant features.

(48) "Site under control" means that the site of a release has been actively addressed by the owner or operator who has taken the following measures:

(A) Fire and explosion hazards have been abated.

(B) Free flow of the product out of the tank has been stopped.

(C) Free product is being removed from the soil, groundwater or surface water according to a work plan or corrective action plan approved by the Executive Secretary.

(D) Alternative water supplies have been provided to affected parties whose original water supply has been contaminated by the release.

(E) A soil or groundwater management plan or both have been submitted for approval by the Executive Secretary.

(49) "Soil sample" is a sample collected following the protocol established in Rule R311-205.

(50) "Surface water sample" is a sample of water, other than a groundwater sample, collected according to protocol established in Rule R311-205.

(51) "Tank" is a stationary device designed to contain an accumulation of regulated substances and constructed of non-earthen materials, such as concrete, steel, or plastic, that provide structural support.

(52) "Third-party Class B operator" is any individual who is not the facility owner/operator or an employee of the owner/operator and who, by contract, provides the services outlined in R311-201-12(e).

(53) "UAPA-exempt orders" are orders that are exempt from requirements of the Utah Administrative Procedures Act under Section 63G-4-102(2)(k), Utah Code Annot.

(54) "Under-Dispenser Containment" means containment underneath a dispenser that will prevent leaks from the dispenser or transitional components that connect the piping to the dispenser (check valves, shear valves, unburied risers or flex connectors, or other components that are beneath the dispenser) from reaching soil or groundwater.

(55) "Underground storage tank" or "UST" means any one or combination of tanks, including underground pipes connected thereto and any underground ancillary equipment and containment system, that is used to contain an accumulation of regulated substances, and the volume of which, including the volume of underground pipes connected thereto, is ten percent or more beneath the surface of the ground, regulated under Subtitle I, Resource Conservation and Recovery Act, 42 U.S.C., Section 6991c et seq.

(56) "Underground storage tank registration fee" means the fee assessed by Section 19-6-408 on tanks located in Utah.

(57) "UST inspection" is the inspection required by state and federal underground storage tank rules and regulations during the installation, testing, repairing, operation or maintenance, and removal of regulated underground storage tank.

(58) "UST inspector" is an individual who performs underground storage tank inspections for compliance with state and federal rules and regulations as authorized in Subsection 19-6-404(2)(c).

(59) "UST installation" means the installation of an underground storage tank, including construction, placing into operation, building or assembling an underground storage tank in the field. It includes any operation that is critical to the integrity of the system and to the protection of the environment, which includes:

(A) pre-installation tank testing, tank site preparation including anchoring, tank placement, and backfilling;

(B) vent and product piping assembly;

(C) cathodic protection installation, service, and repair;

(D) internal lining;

(E) secondary containment construction; and

(F) UST repair and service.

(60) "UST installation permit fee" means the fee established by Section 19-6-411(2)(a)(ii).

(61) "UST installer" means an individual who engages in underground storage tank installation.

(62) "UST removal" means the removal of an underground storage tank system, including permanently closing and taking out of service all or part of an underground storage tank.

(63) "UST remover" means an individual who engages in underground storage tank removal.

(64) "UST tester" means an individual who engages in UST testing.

(65) "UST testing" means a testing method which can detect leaks in an underground storage tank system, or testing for compliance with corrosion protection requirements. Testing methods must meet applicable performance standards of 40 CFR 280.40(a)(3), 280.43(c), and 280.44(b) for tank and product piping tightness testing, 280.44(a) for automatic line leak detector testing, and 280.31(b) for cathodic protection testing.

## **Additional Terms and Definitions**

**Capillary fringe:** the zone of a porous medium above the water table within which the porous medium is saturated by water under pressure that is less than atmospheric pressure

**Composite Sample:** A series of water samples taken over a given period of time and weighted by flow rate.

**Extraction well:** a well employed to extract fluids (either water, gas, free product, or a combination of these) from the subsurface. Extraction is usually accomplished by either a pump located within the well or suction created by a vacuum pump at the ground surface.

**Field blank:** Any sample submitted from the field identified as a blank.

**Grab Sample:** A single sample of soil or of water taken without regard to time or flow

**Headspace:** The vapor mixture trapped above a solid or liquid in a sealed vessel.

**ISL:** Initial Screening Levels

**MTBE:** Methyl tertiary butyl ether

**O&G:** Oil and Grease

**Release:** means any spilling, leaking, discharging or disposing or regulated substances into surface waters, groundwater, or soils.

**Tier I:** Is risk based closure levels for petroleum contaminated sites

**TPH:** Total Petroleum hydrocarbons

**TRPH:** Total recoverable petroleum Hydrocarbons

**USC:** Unified Soil Classification, means soil samples analyzed for soil type

**Vadose zone:** the zone between land surface and the water table within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. Soil pore spaces also typically contain air or other gases. The capillary fringe is included in the vadose zone.

**VOC:** Volatile Organic Compounds.

## **Eligibility for Certification (R311-201)**

Groundwater and soil sampler. After December 31, 1989, no person shall conduct groundwater or soil sampling for determining levels of contamination which may have occurred from regulated underground storage tanks without having certification to conduct these activities. After December 31, 1989, no owner or operator shall allow any groundwater or soil sampling for determining levels of contamination which may have occurred from regulated underground storage tanks to be conducted on a tank under their ownership or operation unless the person conducting the groundwater or soil sampling is certified according to Rule R311-201.

Training. For initial certification an applicant shall successfully complete an underground storage tank groundwater and soil sampler training course or equivalent within the six month period prior to application. The training course shall be approved by the Executive Secretary and shall include instruction in the following areas: chain of custody, decontamination, EPA testing methods, groundwater and soil sampling protocol, preservation of samples during transportation, coordination with Utah certified labs, state and federal statutes, rules and regulations. Renewal certification training will be determined by the Executive Secretary. The applicant shall provide documentation of training with the application.

### **R311-201-3. Application for Certification.**

- (a) Any individual may apply for certification by paying any applicable fees and by submitting an application to the Executive Secretary to demonstrate that the applicant
- (1) meets applicable eligibility requirements specified in Subsection R311-201-4 and
  - (2) will maintain the applicable performance standards specified in Subsection R311-201-6 after receiving a certificate.
- (b) Applications submitted under Subsection R311-201-3(a) shall be reviewed by the Executive Secretary for determination of eligibility for certification. If the Executive Secretary determines that the applicant meets the applicable eligibility requirements described in Subsection R311-201-4 and meets the standards described in Subsection R311-201-6, the Executive Secretary shall issue to the applicant a certificate.
- (c) Certification for all certificate holders shall be effective for a period of two years from the date of issuance, unless revoked before the expiration date pursuant to Section R311-201-9 or inactivated pursuant to Section R311-201-8. Certificates shall be subject to periodic renewal pursuant to Subsection R311-201-5.

### **R311-201-5. Renewal.**

- (a) A certificate holder may apply for certificate renewal not more than six months prior to the expiration date of the certificate by:
- (1) submitting a completed application form to demonstrate that the applicant meets the applicable eligibility requirements described in R311-201-4 and meets the applicable performance standards specified in R311-201-6;
  - (2) paying any applicable fees, and
  - (3) passing a certification renewal examination.
- (b) If the Executive Secretary determines that the applicant meets the applicable eligibility requirements of R311-201-4 and the applicable performance standards of R311-201-6, the Executive Secretary shall reissue the certificate to the applicant.

(c) Renewal certificates shall be issued for a period equal to the initial certification period, and shall be subject to inactivation under R311-201-8 and revocation under R311-201-9.

(d) Any applicant who has a certification which has been revoked or expired for more than two years prior to submitting a renewal application shall successfully satisfy the training and certification examination requirements for initial certification under R311-201-4 for the applicable certificate before receiving the renewal certification, except as provided in R311-201-4(a)(6) for certified UST consultants.

#### R311-201-7. Denial of Certification and Appeal of Denial.

Any individual whose application or renewal application for certification or certification renewal is denied shall be provided with a written documentation by the Executive Secretary specifying the reason or reasons for denial. An applicant may appeal that determination to the Solid and Hazardous Waste Control Board using the procedures specified in Section 63G-4-102, et seq., and Rule R311-210.

#### R311-201-8. Inactivation of Certification.

If an applicant was certified based upon his employer's financial assurance, certification is contingent upon the applicant's continued employment by that employer. If the employer loses his financial assurance or the applicant leaves the employer, his certificate shall automatically be deemed inactive and he shall no longer be certified for purposes of this Rule. Inactive certificates may be reactivated by submitting a supplemental application with new financial assurances and payment of any applicable fees. Reactivated certificates shall be effective for the remainder of their original term unless subsequently revoked or inactivated before the end of that term.

#### R311-201-9. Revocation of Certification.

Upon receipt of evidence that a certificate holder does not meet one or more of the eligibility requirements specified in Section R311-201-4 or does not meet one or more of the performance standards specified in Section R311-201-6, the individual's certification may be revoked. Procedures for revocation are specified in Rule R305-6.

#### R311-201-10. Reciprocity.

If the Executive Secretary determines that another state's certification program is equivalent to the certification program provided in this rule, the applicant successfully passes the Utah certification examination, and payment of any fees associated with this rule are made, he may issue a Utah certificate. The certificate will be valid until the expiration date of the previous state's certificate or the expiration of the certification period described in Section R311-201-3(c), as appropriate, whichever is first.

#### R311-201-6. Standards of Performance

(d) Groundwater and soil sampler. An individual who performs environmental sampling for compliance with Utah underground storage tank rules:

- (1) shall display his certificate upon request;
- (2) shall comply with all local, state and federal laws, rules and regulations regarding underground storage tank sampling in this state;
- (3) shall report the discovery of any release caused by or encountered in the course of performing groundwater or soil sampling or report the results indicating that a release may have occurred to the local health district, local public safety office and the Executive Secretary within twenty-four hours;

(4) shall not participate in fraudulent, unethical, deceitful or dishonest activity with respect to any certificate application;

(5) shall not participate in fraudulent, unethical, deceitful or dishonest activity with respect to performance of work for which certification is granted; and,

(6) shall not participate in any other regulated certification program activities without meeting all requirements of that certification program.

# **Section I**

## **Sample Procedures and Rules**

- **Environmental Sampling**
- **Site Assessment Protocol, R 311, for UST Closures**
- **Well Sampling**
- **Laboratory Analytical Requirements**
- **Preservation, hold times, documentation, chain of custody, QA/QC**
- **UST Branch, Closure Plan Requirements**
- **Closure Plan**
- **Closure Notice**
- **Decontamination**

# **Environmental Sampling**

## **Introduction**

Investigations at UST sites require chemical and physical analyses of soil and groundwater samples collected. The data obtained serves as the basis for decisions regarding impacts to soil and potential drinking water supplies, and assessing actual and potential impacts to human health and the environment. Data obtained on soil and groundwater quality at UST sites must, to the greatest extent possible, be accurate and representative of site conditions.

## **Regulations**

Field operations involving environmental sampling at UST sites in the state of Utah shall conform to all rules and regulations set forth in 40 CFR Part 280 Subparts: A,B,C,D,E,F and G; and in State of Utah Administrative Code (UAC): R311, Parts 200-208. Additionally, a State of Utah Closure Plan conforming to UAC R311-204 must be submitted outlining details of the UST system closure. Soil and groundwater samples must be collected by a State of Utah Certified Soil and Groundwater Sampler during closure operations and during subsequent field investigations. Following the UST closure, the Owner/Operator must submit a completed "Closure Notice" to the DERR UST section to document that the closure was performed as outlined in the Closure Plan.

## **Sampling Equipment and techniques**

Sampling equipment and techniques must conform to the State's Site Assessment Protocol.

### **Soil Sampling**

Clean and decontaminated stainless steel spoons, trowels, hand augers, or split-spoon sampler should be used to collect soil samples. Excavate, or hand auger, the natural soil until the correct location and depth are reached as required in the State Site Assessment Protocol. The sample container should be full with no air or head space between the soil and the cap. All samples should be shipped to the laboratory as soon as possible to ensure quality. The maximum time between sample collection and analysis is 14 days.

### **Groundwater Sampling**

Groundwater samples are typically collected with a bailer. The bailer should be lowered into the water slowly allowing only the top portion of the water, near the surface, to be sampled. The sample should be sufficient to fill the sampling container. No air should be allowed between the liquid surface and the lid of the container. It is important not to shake or agitate the sample in the bailer as this might cause the loss of volatiles (BTEX).

Prior to water being sampled from a monitoring well, the depth to groundwater must be measured and the total water volume calculated. A minimum of 3 well volumes of water should be removed to ensure that all stagnant water has been replaced by fresh formation water. If free

product is suspected or verified during water level measurements, an interface probe, or hydrocarbon sensitive paste should be used to measure the apparent thickness of the free product.

## **Sample Types**

In addition to the environmental and USC samples required at UST sites, as discussed above, state regulations stipulate that grab samples be collected rather than composite samples. If groundwater is encountered at a site, water samples are to be collected in the same sampling locations as soil samples, but 6-inches below the top of the water level. State of Utah regulations require that two types of samples be collected during closure at all UST sites in the State:

1. Environmental samples, (soil and/or groundwater samples) which are analyzed for petroleum constituents. Environmental samples must be analyzed by a State of Utah certified laboratory.
2. Uniform soil classification (USC) samples which are analyzed for soil type. Environmental samples must be collected during subsurface investigations and after corrective actions at LUST sites. USC samples are not required during these phases, if USC samples were collected during UST closure.

USC samples must be analyzed according to ASTM D2488 Standard Practice for Description and Identification of Soils, and DERR USC guidelines which include any geotechnical method which defines soil types.

**PID/FID** Photoionization detector (PID) and Flame ionization detector(FID) instruments are the most common hydrocarbon vapor analyzers in use. Their use serves two purposes: protection of worker health; and screening of environmental samples to determine which samples to analyze and the relative concentrations of hydrocarbons.

### **Soil sampling results shall include:**

- A description and documentation of the subsurface geology of the site, both soil type and stratigraphy. As part of the documentation, you should include boring logs, excavation or cross-section drawings, test pit information, and any other data you collected.
- Include any field screening results. Be sure dates, locations, depths and method(s) for soil screening or sampling are clearly identified.
- A summary of the analytical results obtained from laboratory analysis reports should be provided in tabular format. The table should include sample location or other identification number, methods of analyses, depth of sample collection (feet below grade) and results. Copies of the original laboratory analysis reports and chain-of-custody forms must be included in the appendices of the report.

### **Groundwater sampling results shall include:**

- A groundwater gradient map showing groundwater elevations and flow direction.
- A summary of the analytical results obtained from laboratory analysis reports should be provided in tabular format. The table should include sample location or other identification number, methods of analyses, depth to water (feet below grade) and results. Copies of the original laboratory analysis reports and chain-of-custody forms must be included in the appendices of the report.
- Dissolved oxygen and any other field parameters (e.g., pH, temperature, redox potential, nitrate, sulfate, etc.) or readings collected in the field, if applicable.
- Site maps showing current chemical concentration results (e.g., iso-concentration maps) for benzene, naphthalene, etc. Show sampling locations and depths using the same sample ID from the laboratory analytical results table.

### **Sampling Procedures and Requirements**

Follow the guidelines and items in this section to ensure that all types of samples collected are of good integrity, are representative of environmental conditions and contaminant levels. Remember that all samples must be collected by an Utah UST Certified Soil and Groundwater Sampler.

- Describe or document any necessary property access and other permitting requirements.
- All soil, groundwater, surface water, or other types of environmental samples must be collected by a Utah certified sampler and analyzed by a Utah certified laboratory. The name and certification number of the sampler and laboratory must be clearly identified.
- Native soil type can be evaluated using Unified Soil Classification methods. Other detailed lithological descriptions may also be necessary.
- Describe subsurface stratigraphy and continuity of strata beneath the site, such as clay, silt or sand lenses, interbedded strata and other features.
- Chain-of-custody protocols and documentation must be maintained and provided for all environmental samples collected.
- All sample identifications, names and numbers should be consistent throughout the chain-of-custody protocol and documentation, laboratory analytical results, site map, data tables and report text.
- Describe sampling methodology, equipment and decontamination procedures.
- Describe the rationale for selecting sample locations and sampled intervals in excavations, test pits, soil/well borings, soil land farms, soil stockpiles or other sample locations. Describe whether sample location determination was based on field instrument measurements, pre-selected intervals or other rationale.
- Describe and/or illustrate depths at which all soil & groundwater samples were collected, show sample locations on a properly scaled and oriented map.
- Identify the sample type(s) collected such as confirmation, grab, composite, headspace, blanks, duplicates, etc., and rationale for their selection.
- Specify the following sampled features and the applicable media sampled, including but not limited to; excavations, test pits, soil borings, soil stockpiles, soil land farms or aeration piles,

groundwater monitoring wells, groundwater injection or extraction wells or other types of water wells.

- Provide descriptions of field screening methods and devices used including organic vapor meters or other test methods for detecting the presence of contamination.
- Sampling procedures must be conducted in a manner which minimizes the loss of volatile organic compounds. Describe the methods used to minimize the loss of volatiles and maintain sample integrity, such as zero headspace in sample containers and preserving the sample at 4 degrees Celsius.
- Samples should be immediately delivered to the laboratory. If not, describe the methods use preserve samples and maintain sample integrity within the applicable holding times.

Following these sampling guidelines will help minimize the need to resample. It's important to do it right the first time, so call the DERR with any sampling questions.

Don't forget to take confirmation samples. Consult this table to determine the right testing methods to use during your investigation and other sampling events. Other fuel types such as kerosene, aviation fuel, etc., may be able to be determined by some of these analytical methods.

- Laboratory analytical detection limits must be sufficiently low in order to detect contaminant concentrations at or below their applicable maximum contaminant levels (MCL) or state-established clean-up levels.
- Describe the volume removed (gallons), the method used for purging groundwater wells, and location or method used for the disposal of purge water.
- Groundwater well installation and abandonment must be conducted in accordance with the Utah Division of Water Rights specifications if the wells are deeper than 30 feet below grade.
- If soil borings or wells are emplaced, the following information if required:
  - Type of drilling equipment used, and detailed geologic boring logs with an appropriate vertical scale shown.
  - As-built drawings showing: number of wells and/or borings; total depth of well or boring; well construction materials including casing screen type, length, slot size, filter pack material and particle size;
  - Sample locations for soil or groundwater; and, any organic vapor meter measurements.
  - Type and placement of extraction pumps, if applicable.
  - Identify the depth of groundwater (feet below grade) encountered at the site during sampling or investigations.
  - Describe the volume generated and the procedures used to dispose of drill cuttings, purge water or other waste materials generated during any phase of the work at the release site.
- Confirmation environmental samples (soil, groundwater, etc.) are required any time contaminant is treated in-place or removed from the subsurface or release site area.
- Stockpiled contaminated soils, should be placed on, and covered with, and impermeable liner, and the site should be secured from the general public.
- UST samplers should use a remote sampling device when taking samples from an excavation. Never enter the excavation. Soil samples may be taken from the bucket of a backhoe; soils taken from a specific location with in the excavation.

Other appropriate analytical methods may be used as approved by the Executive Secretary (UST) for any of the methods outlined below. The analysis of additional constituents may be required as determined by the Executive Secretary (UST).

### **Quality Control and Quality Assurance QA/QC**

The object of quality assurance and control (QA/QC) in groundwater sampling is to produce data that is appropriately accurate and representative, and which is credible and defensible. As part of the QA/QC program, a trip blank should be submitted with all environmental samples. In addition, a blind duplicate should be submitted every 20-25 samples. Sampling must be conducted in a manner that minimizes loss of volatile organic compounds.

#### **Proper QA/QC sample collection methods and equipment used include:**

- Describe sample containers for each sample type and media, and identify the source or supplier of the sample containers.
- Describe decontamination procedures for all sampling equipment, containers, water and product level measuring devices, drilling equipment, or other devices that contact and affect the sample.
- Sampling procedures must be conducted in a manner that minimizes the loss of volatile organic compounds. Describe the methods used to minimize the loss of volatiles and maintain sample integrity, including but not limited to the following:  
Zero headspace in sample container, methods used to preserve the sample at 4 degrees Celsius (approximately 39.2 degrees Fahrenheit).
- Describe methods used to transport environmental samples to the laboratory.
- If samples are not immediately delivered to the laboratory, describe the methods used to preserve samples and maintain sample integrity.
- Describe how groundwater wells were purged and the calculations that support the reported number of casing or borehole volumes removed. Purging is complete when the pH, electrical conductivity, and temperature stabilize. If following this procedure is not possible, remove a minimum of three volumes.

# Site Assessment Protocol for UST Closure.

## (a) General Requirements. R311-205

(1) When a site assessment or site check is required, pursuant to 40 CFR 280 or Subsection 19-6- 428(3), owners or operators shall perform or commission to be performed a site assessment or a site check according to the protocol outlined in Rule R311-205 or equivalent, as approved by the Executive Secretary. Additional environmental samples must be collected when contamination is found, suspected, or as requested by the Executive Secretary.

(2) This Subsection incorporates by reference the documents referenced in Subsections R311-205-2(a)(2)(A) through (C). These documents contain guidance and methodologies for collecting soil and groundwater samples.

(A) Groundwater samples shall be collected in accordance with "RCKA Ground-Water Monitoring Technical Enforcement Guidance Document" ("SWER Directive 9950.1), published by EPA and dated September 1986, or as determined by the Executive Secretary.

(B) Surface water samples shall be collected in accordance with protocol established in "Compendium of ERT Surface Water and Sediment Sampling Procedures", Published by EPA and dated January 1991, or as determined by the Executive Secretary.

(C) Soil samples shall be collected in accordance with "Description and Sampling of Contaminated Soils, A Field Pocket Guide", Published by EPA and dated November 1991, or as determined by the Executive Secretary.

(3) Owners and operators must document and report to the Executive Secretary sample types, sample locations and depths, field and sampling measurement methods, the nature of the stored substance, the type of backfill and native soil, the depth to groundwater, and other factors appropriate for identifying the source area and the degree and extent of subsurface soil and groundwater contamination.

(4) The owner or operator shall report the discovery of any release or suspected release to the Executive Secretary within twenty-four hours. Owners or operators shall begin release investigation and confirmation steps in accordance with 40 CFR 280, Subpart E upon suspecting a release. Owners or operators shall begin release response and corrective action in accordance with 40 CFR 280, Subpart F upon confirming a release.

(5) All environmental samples shall be collected by a certified groundwater and soil sampler who meets the requirements of Rule R311-201. The certified groundwater and soil sampler shall record the depth below grade and location of each sample collected to within one foot.

(6) All environmental samples shall be analyzed within the time frame allowed, in accordance with Table 4.1 of "RCKA Ground-Water Monitoring Technical Enforcement Guidance Document" ("SWER Directive 9950.1), by a Certified Environmental Laboratory. Soil samples must be corrected for moisture, if necessary, with percent moisture reported to accurately represent the level of contamination.

(7) Environmental samples for UST permanent closure or change in service shall be collected according to the protocol outlined in Subsection R311-205-2(b), after the UST system is emptied and cleaned and after the closure plan has been approved.

(8) Environmental confirmation samples are required following overexcavation of soils. Confirmation samples shall be taken at locations and depths sufficient to detect the presence, extent and degree of a release from any portion of the UST in accordance with 40 CFR 280, Subparts E, F and G. Additional confirmation samples may be required as determined by the Executive Secretary.

(9) Upon confirming a release, a site assessment report, an updated site plat, analytical laboratory results, chain of custody forms, and all other applicable documentation required by 40 CFR 280, Subparts E and F, following any abatement, investigation or assessment, monitoring, remediation or corrective action activities, shall be submitted to the Executive Secretary within the specified time frames as outlined in compliance schedules.

(10) When conducting environmental sampling to satisfy the requirements of 40 CFR 280, subparts E and F, soil classification samples to determine native soil type shall be collected at locations and depths as outlined in compliance schedules, or as determined by the Executive Secretary. Techniques of the Unified Soil Classification such as a sieve analysis or laboratory classification, or a field description from a qualified individual as determined by the Executive Secretary, may be used to satisfy requirements of determining native soil type.

(11) Other types of environmental or quality assurance samples may be required as determined by the Executive Secretary.

(b) Site Assessment Protocol for UST Closure.

(1) The appropriate number of environmental samples, as described in Subsection R311-205-2(b)(4) shall be collected in native soils, below the backfill material, and as close as technically feasible to the tank, piping or dispenser island. Any other samples required by Subsection R311-205-2(a) must also be collected. Soil samples shall be collected from a depth of zero to two feet below the backfill and native soil interface. If groundwater is contacted in the process of collecting the soil samples, the soil samples required by Subsection R311-205-2(b)(4) shall be collected from the unsaturated zone immediately above the capillary fringe. Groundwater samples shall be collected using proper surface water collection techniques, from a properly installed groundwater monitoring well, or as determined by the Executive Secretary. All environmental samples shall be analyzed using the appropriate analytical methods outlined in Subsection R311-205-2(d).

(2) One soil classification sample to determine native soil type shall be collected at the same depth as indicated for environmental samples, at each tank and product piping area. For all dispenser islands, only one representative sample to determine native soil type is required. Techniques of the Unified Soil Classification such as a sieve analysis or laboratory classification shall be used to satisfy requirements of determining native soil type when taking samples for UST closure.

(3) For purposes of complying with Rule R311-205, for tanks or piping to be removed, closed in-place or that undergo a change in service, a tank or product piping area is considered to be an excavation zone or equivalent volume of material containing one, or more than one immediately adjacent, UST or piping run.

(4) Environmental Sampling Protocol for UST closures:

(A) For a tank area containing one UST, one soil sample shall be collected at each end of the tank. If groundwater is contacted during the process of collecting soil samples, a minimum of one groundwater and one soil sample shall be collected from each end of the tank.

(B) For a tank area containing more than one UST, one soil sample shall be collected from each corner of the tank area. If groundwater is contacted during the process of collecting soil samples, a minimum of one groundwater and one soil sample shall be collected from each end of the tank area.

(C) Product piping samples shall be collected from each product piping area, at locations where leaking is most likely to occur, such as joints, connections and fittings, at intervals which do not allow more than 50 linear feet of piping in a single piping area to go unsampled. If groundwater is contacted during the process of collecting soil samples, a minimum of one groundwater and one soil sample shall be collected from each piping area where groundwater was encountered.

(D) For dispenser islands, environmental samples shall be collected from the middle of each dispenser island. Additional environmental samples shall be collected at intervals which do not allow more than 25 linear feet of dispenser island piping to go unsampled. If groundwater is contacted during the process of collecting soil samples, a minimum of one groundwater and one soil sample shall be collected from each dispenser island where groundwater was encountered.

(d) Laboratory Analyses of Environmental Samples.

(1) Environmental samples which have been collected to determine levels of contamination from underground storage tanks shall be analyzed by a Certified Environmental Laboratory. Unless otherwise approved by the Executive Secretary, the required analytes and corresponding analytical methods shall be:

(A) Gasoline contamination-

(i) total petroleum hydrocarbons (purgeable TPH as gasoline range organics C6 - C-0) by either EPA 8015 or EPA 8260; and

(ii) benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN), and methyl tertiary butyl ether (MTBE) by either EPA 8021 or EPA 8260.

(B) Diesel fuel contamination-

(i) total petroleum hydrocarbons (extractable TPH as diesel range organics C10 - C-8) by EPA 8015; and

(ii) benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN) by either EPA 8021 or EPA 8260.

(C) Used oil contamination-

(i) oil and grease (O and G) or total recoverable petroleum hydrocarbons (TRPH) by EPA 1664; and

(ii) benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN), methyl tertiary butyl ether (MTBE), and halogenated volatile organic compounds (VOX) by EPA 8021 or EPA 8260.

(D) New oil contamination- oil and grease (O and G) or total recoverable petroleum hydrocarbons (TRPH) by EPA 1664.

(E) Contamination from underground storage tanks which contain substances other than or in addition to petroleum shall be analyzed for appropriate constituents as determined by the Executive Secretary.

(F) Contamination for an unknown petroleum product type-

(i) total petroleum hydrocarbons (purgeable TPH as gasoline range organics C6 - C-0) by either EPA 8015 or EPA 8260;

(ii) total petroleum hydrocarbons (extractable TPH as diesel range organics C10 - C-8) by EPA 8015;

(iii) oil and grease (O and G) or total recoverable petroleum hydrocarbons (TRPH) by EPA 1664; and

(iv) benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN), methyl tertiary butyl ether (MTBE), and halogenated volatile organic compounds (VOX) by either EPA 8021 or EPA 8260.

(2) All original laboratory sample results must be returned to the certified groundwater and soil sampler or certified UST consultant to verify all chain of custody protocols, including holding times and analytical procedures, were properly followed. Environmental samples shall be collected and transported under chain of custody according to EPA methods as approved by the Executive Secretary.

(3) Reporting limits used by laboratories analyzing environmental samples taken under this rule shall be below initial screening levels for the contaminated media under study. Environmental samples shall be analyzed with the least possible dilution to ensure reporting limits are below initial screening levels to the extent possible. If more than one determinative analysis is performed on any given environmental sample, the final dilution factor used and the reporting limit must be reported by the laboratory. As an alternative to diluting environmental samples, the laboratory shall consider using appropriate analytical cleanup methods and describe which analytical cleanup methods were used to eliminate or minimize matrix interference. Any analytical cleanup method used must not eliminate the contaminant of concern or target analyte.

## Well Sampling

Ref: 6.38 GROUNDWATER SAMPLING AND HANDLING PROCEDURES, from the Consultants Manual 2009.

This section provides an overview of groundwater sampling and handling procedures, which generally are applicable to any groundwater monitoring program. This section is not intended to provide specific guidance on sampling for a specific situation, but provides information on the major activities that are required for sample collection and handling.

The starting point for any groundwater sampling program is the quality assurance/quality control (QA/QC) plan. Groundwater sampling protocols appropriate to the data quality objectives and the site conditions will define the specific procedures that will be followed for individual sampling events. Well purging typically has been an important element of sampling procedures, the specific procedures of which will vary with site conditions. Specific sample handling and preservation procedures are likely to vary somewhat, depending on the analyte of interest at a site, as will decontamination procedures.

Prior to collecting groundwater samples from a monitoring well, stagnant water must be removed from the well. This is called “**well purging.**” A minimum of three well volumes of water should be removed to ensure that all stagnant water has been replaced by representative formation water.

If free product is detected during water level measurements, an interface probe of hydrocarbon sensitive paste should be used to measure the apparent thickness of the Light non-aqueous phase liquid, LNAPL. The LNAPL may migrate below the groundwater table due to a fluctuation of the groundwater table, or a large LNAPL that depresses the groundwater table.

Following purging, groundwater samples are typically collected from monitoring wells with a bailer. The bailer should be lowered into the water slowly, allowing only the top portion of the water nearest the air-water interface to be sampled. For volatile petroleum hydrocarbon compounds, such as TPH, BTEX, and MTBE, the groundwater sample should be poured from the bailer into volatile organic analysis (VOA) vials. After filling, no air bubbles (no headspace) should be present in the VOA vials. Groundwater may also be collected with a low-flow pump to minimize aeration of the sample.

## **GROUNDWATER MONITORING WELL PERMITTING REQUIREMENTS**

The Utah Division of Water Rights (DWR) requires that all groundwater monitoring wells in the state of Utah constructed to a depth of 30-feet or greater below natural ground surface shall be properly permitted, and properly installed by a well driller currently licensed in the State of Utah. The DWR must be contacted for well installation procedures and any other permit requirements contained in the Division's administrative Rules for Water Well Drillers. Any documentation of the notification and any permits or approvals obtained must be submitted to DERR. Applicable sections in Administrative Rules for Water Well Drillers include: R655-4-4 General Procedural Requirements; and R655-4-7 Minimum Construction Requirements.

## **GROUNDWATER MONITORING WELL ABANDONMENT PROCEDURES**

The Utah Division of Water Rights must be notified at (801) 538-7240 for well installation, abandonment procedures, and any other permit requirements contained in Administrative Rules for Water Well Drillers. Documentation of the notification and any permits or approvals obtained must be submitted to the DERR. Well abandonment requirements are contained in State Regulation R655-4-12, Administrative Rules for Water Well Drillers.

### **Free Product**

Samplers should follow the procedures below for detecting the presence of light and/or dense phase immiscible organic layers, (free product) These procedures should be undertaken before the well is evacuated for conventional sampling.

1. Remove the locking and protective caps
2. Sample the air in the well head for organic vapors using either a photoionization analyzer or an organic vapor analyzer, and record measurements.
3. Determine the static liquid level using a manometer and record the depth
4. Lower an interface probe into the well to determine the existence of any free product, or use a hydrocarbon sensitive paste.

# Laboratory Analytical Requirements.

## **Sample Containers and Preservation** Ref: 6.43.1

The type and number of sample containers and the sample preservation method depends on the analysis required, the media sampled (soil or water), and the laboratory used. Check with the Utah-certified analytical laboratory that you will be using for specific information on sample containers and preservation.

No headspace should exist in the sample containers to minimize the possibility of volatilization of organics. RCRA p. 114.

Based on the requirements for detection monitoring, the owner/operator must collect a sufficient volume of ground water to allow for the analysis of four separate replicates.

Shipping containers (cooling chest with ice or ice pack) should be certified as to the 4degrees C temperature at time of sample placement into these containers. Preservation of samples requires that the temperature of collected samples be adjusted to the 4 degrees C immediately after collection. Shipping coolers must be at 4 degrees C and maintained at 4 degrees C upon placement of sample and during shipment.

Do not allow any head space in the container.

## **Sample Holding Times** Ref: 6.43.2

Check with the Utah-certified analytical laboratory in advance of sampling to determine if they can perform the analyses within the specified sample holding time. For example, the holding time for analysis of volatile petroleum hydrocarbon compounds (TPH, BTEX, and MTBE) is 14 calendar days (groundwater samples must be acidified with HCl for the 14-day holding time, otherwise the holding time is 7 days). For TRPH and Oil & Grease analyses, the holding times are 28 calendar days.

## **Sample Documentation** Ref: 6.43.3 Chain of custody

Sample documentation materials include **chain-of-custody** forms and sample labels. The chain of-custody form is used to track the possession of a sample from the time the sample is collected until the time the sample is analyzed. Samples must remain in the control of the individual in custody of the samples at all times (or in a secured location) until the sample is released to the next chain-of-custody recipient or to the analytical laboratory. The chain-of-custody form must include the sample identification number, date/time of collection, place of collection (borehole/well number), type of material (soil or water), sample container type (VOA vial, 1-liter bottle, etc.), preservation method (acidified, cooled, etc.), signature/printed name and company of the sample collector, and signatures/printed names and dates/times of persons involved in the transportation and handling of the sample. An example chain-of-custody form is included at the end of this chapter.

The Chain of custody must include: the correct number of samples were taken from the site, the sampling locations are correct and that the samples were taken, and holding times and analytical procedures were followed.

## **Subsurface Investigations, Sampling, and Analytical Requirements**

Each sample container should be labeled with a permanent label that includes the sample identification number, date and time of collection, place of collection, and name of person/company collecting the sample. The sample number on the sample container should be the same as the sample number on the chain-of-custody form and the laboratory report.

### **Sampling to Delineate Contamination.** Ref:P. 5-12

Subsurface sample locations should be guided by the underlying geology, contaminant characteristics, and field conditions to determine the extent and magnitude of contamination. Discrete samples are required to demonstrate delineation of contamination; composite samples will not be accepted. Delineation is generally complete when successive non-detectable levels of contaminants are observed.

Samples have historically been collected at intervals of 5 feet. However, since thin distinct layers of contaminated soil may exist, or changes in lithology that affect contaminant distribution may occur within a 5-foot interval, soil and rock samples should be collected at significant changes in lithology and other locations as necessary, based on field observations of contamination.

Within the capillary fringe and the saturated zone, samples should generally be collected at 1- to 2-foot intervals in order to delineate the "smear zone." For the purpose of this manual, the "smear zone" is defined as soil or rock in the vicinity of the capillary fringe, and below the water table, which contains contaminants in a sorbed or free product phase (light non-aqueous phase liquid or LNAPL). The smear zone develops when the water table fluctuates or is depressed by NAPL. The smear zone will provide a continuing source of groundwater contamination and must be delineated for an effective remediation program to be designed.

### **Utah Certified Laboratories** Ref: 6.43.4

The Utah Department of Health has a program that establishes and enforces standards for laboratories that provide test results for compliance purposes to the Utah Department of Environmental Quality. A laboratory requesting certification is required to complete an application, participate in a proficiency testing program, and meet state laboratory standards.

The certification process requires an on-site survey of the laboratory by state certification officers to assess the laboratory's compliance with state standards. All analytical test results submitted to the DERR for an UST site in Utah must be performed by a Utah Certified laboratory. A list of Utah Certified laboratories is located at: [http://health.utah.gov/lab/labimp/labcert/LabsCertified\\_RCRA.xls](http://health.utah.gov/lab/labimp/labcert/LabsCertified_RCRA.xls).

### **Approved Analytical Methods** Ref: 6.43.5

Specific analytical methods must be used when sampling for petroleum constituents at UST sites in Utah. Refer to the following table in section II for the correct analytical methods: Analytical Methods for Environmental Sampling at Underground Storage Tank Sites in Utah (July 2004).

# UST Branch: Closure Plan Requirements

R311-204, Utah Administrative Code (U.A.C.), requires Underground Storage Tank (UST) owners/operators to submit a Closure Plan outlining the details of the UST closure to the Executive Secretary (UST), Utah Solid and Hazardous Waste Control Board.

1. The Owner(s)/Operator(s) (O/O) must submit to the Division of Environmental Response and Remediation (DERR) a completed "CL" "SURE PLAN" which must be approved before commencing closure of the UST. A contractor may complete the closure plan, however the O/O is responsible for compliance with the UST rules and regulations.
2. For closure in-place or change in service, the Closure Plan must now be submitted and approved prior to completing the site assessment. Samples may be taken during the closure and the results submitted with the Closure Notice.
3. The approved Closure Plan is valid for one year from the approval date. If closure does not take place within one year the O/O must submit a new Closure Plan for approval. The O/O must obtain approval from the DERR or Local Health Department for changes made to the Closure Plan, in writing.
4. The O/O must notify the Local Health and Fire Departments and the DERR/UST at least 72 hours prior to starting closure activities.
5. The certified UST remover and sampler performing the closure must have a current Utah certification and follow the approved Closure Plan. Changes to an approved plan must be submitted in writing to the Executive Secretary and approved before closure.
6. The O/O must have a copy of the approved Closure Plan on-site during closure activities.
7. The O/O must ensure the completion of a site assessment in accordance with 40CFR 280.72 and R311-205, U.A.C. Indicate the proposed sample locations on the Facility Site Plat of the Closure Plan and complete the Sample Information Table. If contamination is encountered or suspected at locations other than the approved sample locations, additional samples must be collected at the location(s) where contamination is most likely to be present. If groundwater is encountered a soil sample must be collected, in the unsaturated zone, in addition to each groundwater sample.
8. The O/O must report suspected or confirmed contamination (any amount) to the Executive Secretary by reporting to the DERR/Leaking Underground Storage Tanks (LUST) section at (801)536-4100 within 24 hours of discovery.
9. The O/O must submit to the DERR a Closure Notice within 90 days after the tank closure. The Closure Notice should include:
  - a. A properly completed Closure Notice form signed by the owner and certified groundwater and soil sampler.
  - b. An updated Site Plat and a Sample Information Table with actual depths and locations of all samples, including depth of ground water.

c. Analytical results of samples

d. A Chain of Custody Form

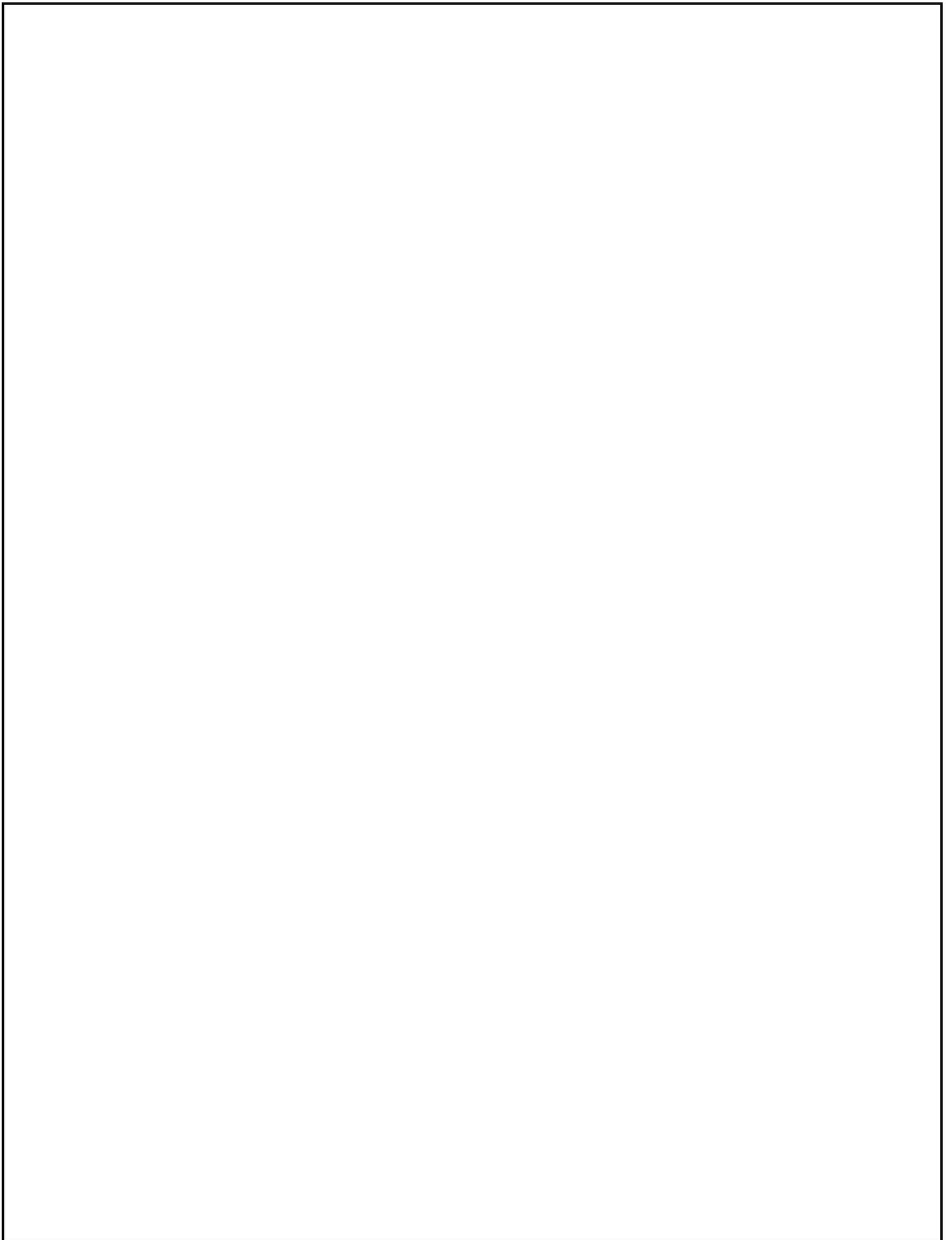
10. The O/O must pay Registration and PST Fund fees for the assessment period in which the tank is closed and all other unpaid fees.

11. If contamination is suspected or confirmed during UST closure activities, or is based on analytical results, the O/O may receive a reporting and remediation schedule from the DERR/LUST section, outlining their obligation to characterize and possibly remediate the release. Any person providing remedial assistance for a fee, including over-excavation (of more than 50 yd<sup>3</sup>) and aeration, must be a Certified UST Consultant (a list is available from the DERR). Expenses to be applied toward the Petroleum Storage Tank (PST) Fund deductible must meet the same test of reasonable, customary and legitimate as expenses submitted for reimbursement. For expenses above the \$10,000 deductible to be eligible for reimbursement from the PST Fund, all work plans and budgets must be approved the State Project Manager before any work begins.

**Note: Closure Plans and Closure Notice forms may be found at [undergroundtanks.utah.gov](http://undergroundtanks.utah.gov)**

## **Decontamination of Equipment**

Small sampling equipment should be washed with a non-phosphatic detergent in hot water, followed by a rinse in distilled water. Repeat if necessary until the equipment is completely decontaminated. If possible, disposable bailers should be used for sampling purposes. Larger equipment such as bits, augers, core barrels, etc. should be steam cleaned on-site if possible, but away from the sampling area.



## **Section II**

# **Cleanup Standards**

- **Introduction**
- **Cleanup Standards R 311-5**
- **Screening/Cleanup Levels for LUST Sites**
- **Fate and Transport of Petroleum Hydrocarbons**
- **Determination of RBSL and SSCL**
- **Sample Collection**
- **Laboratory Analysis**
- **Confirmation Samples**
- **Initial Screening Levels**
- **Tier I Screening Levels**
- **Analytical Methods**
- **Reporting a Release**

## Introduction

The question: “How clean is clean?” is not easily answered. In a perfect world, the answer would be “non-detectable” or “pristine” or “the way it was before you spilled chemicals on it.” In the real world, however, the answer is complex and depends on several factors:

- Contaminant type,
- Contaminant location,
- Contaminant migration potential (fate and transport),
- Threat or risk to human health and the environment,
- Current and future use of property, and
- Economics.

Utah's Department of Environmental Quality, Division of Environmental Response and Remediation (DERR), Leaking Underground Storage Tank (LUST) Section has developed an assessment process to evaluate risks to human health and the environment resulting from petroleum contamination from LUSTs. This process is intended to address cleanup when Maximum Contaminant Levels (MCLs), Initial Screening Levels (ISLs), or other applicable cleanup standards cannot reasonably be achieved and is based on Utah Administrative Code

R311-211, Corrective Action Cleanup Standards Policy-UST and CERCLA Sites, referred to as Cleanup Standards Policy (2006). A copy of the Cleanup Standards Policy is provided in this Chapter. A table summarizing MCLs, ISLs, and other applicable standards is included in this Chapter.

A summary of Utah's cleanup levels for petroleum contaminated soil and groundwater can be found on the DERR's website at [ww.undergroundtanks.utah.gov/docs/cleanuplevels.pdf](http://ww.undergroundtanks.utah.gov/docs/cleanuplevels.pdf). Utah's risk assessment process is derived from, and is consistent with, the United States Environmental Protection Agency's (EPA) Office of Solid Waste and Emergency Response (OSWER) Directive 9610.17 (February 24, 1994) (“EPA Directive” entitled Use of Risk-based Decision-Making in UST Corrective Action Programs). The EPA Directive references the American Society for Testing Materials (ASTM) Standard Guide for Risk-Based Corrective Action (RBCA) Applied at Petroleum Release Sites (ASTM, 1995) which identifies and describes one method of evaluating the risk to human health and the environment posed by multiple constituents in petroleum-contaminated soil, groundwater and air.

The ASTM (1995) document provides guidance for evaluating risks at petroleum release sites using a three-tiered approach. The first tier (Tier 1) is a screening process that uses only general hydrogeologic information and conservative assumptions to ensure protection of potential receptors. The second and third tiers require increasingly more accurate site-specific data, as well as increasingly sophisticated contaminant fate and transport modeling, to achieve greater accuracy and certainty in evaluating risks to receptors. The 1995 ASTM document contains the mathematical exposure equations for calculating risk-based screening levels (RBSLs) for a specified target excess risk (TER) limit.

## R311-211-5. Cleanup Standards.

(a) The following shall be the minimum standards to be met for any cleanup of regulated substances, hazardous material, and hazardous substances at a UST or CERCLA facility in Utah:

(1) for water-related corrective action, the Maximum Contaminant Limits (MCLs) established under the federal Safe Drinking Water Act or other applicable water classifications and standards; and

(2) for air-related corrective action, the appropriate air quality standards established under the Federal Clean Air Act.

(3) Other standards as determined applicable by the Board may be utilized.

(b) Cleanup levels below the MCLs or other applicable water, soil, or air quality standards may be established by the Board on a case-by-case basis taking into consideration R311-211-3 and R311-211-4.

(c) In the case of contamination above the MCL or other applicable water, soil, or air quality standards, if, after evaluation of all alternatives, it is determined that applicable minimum standards cannot reasonably be achieved, cleanup levels above these minimum standards may be established on a case-by-case basis utilizing R311-211-3 and R311-211-4. In assessing the evaluation criteria, the following factors shall be considered:

(1) quantity of materials released;

(2) mobility, persistence, and toxicity of materials released;

(3) exposure pathways;

(4) extent of contamination and its relationship to present and potential surface and ground water locations and uses;

(5) type and levels of background contamination; and

(6) other relevant standards and factors as determined appropriate by the Board.

**Initial Screening Levels.** (ISL) is the maximum level of contamination allowed to exist on site without requiring corrective action. All laboratory reporting limits for all LUST related environmental samples must be below ISL. See appendix.

Current DERR guidelines generally require a minimum of two consecutive quarterly monitoring episodes confirming compliance with cleanup standards. However, on a case-by-case basis, the DERR may require that the minimum compliance monitoring period be extended to ensure measurements of stable plume conditions.

**Initial Screening Levels  
November 1, 2005**

<b>Contaminants*</b>	<b>Groundwater (mg/L)</b>	<b>Soil (mg/kg)</b>
Benzene	0.005	0.2
Toluene	1.0	9
Ethylbenzene	0.7	5
Xylenes	10.0	142
Naphthalene	0.7	51
Methyl t-butyl ether (MTBE)	0.2	0.3
Total Petroleum Hydrocarbons (TPH) as gasoline	1	150
Total Petroleum Hydrocarbons (TPH) as diesel	1	500
Oil and Grease or Total Recoverable Petroleum Hydrocarbons (TRPH)	10	1000

**Tier 1 Screening Criteria  
November 1, 2005**

*Tier 1 Screening Levels are applicable only when the following site conditions are met:*

- 1.) No buildings, property boundaries or utility lines within 30 feet of the highest measured concentration of any contaminant that is greater than the initial screening levels but less than or equal to the Tier 1 screening levels AND,*
- 2.) No water wells or surface water within 500 feet of highest measured concentration of any contaminant that is greater than the initial screening levels but less than or equal to the Tier 1 screening levels.*

<b>Contaminants *</b>	<b>Groundwater (mg/L)</b>	<b>Soil (mg/kg)</b>
Benzene	0.3	0.9
Toluene	3	25
Ethylbenzene	4	23
Xylenes	10	142
Naphthalene	0.7	51
Methyl t-butyl ether (MTBE)	0.2	0.3
Total Petroleum Hydrocarbons (TPH) as gasoline	10	1500
Total Petroleum Hydrocarbons (TPH) as diesel	10	5000
Oil and Grease or Total Recoverable Petroleum Hydrocarbons (TRPH)	10	10000

**SITE ASSESSMENT**

A site assessment must be performed for all UST closures and change-in-service. Site assessments must be performed as outlined in 40 CFF 280.72 and R311-205 (U.A.C.). If contamination is suspected, additional samples must be collected at the location where contamination is most likely to be present. If groundwater is encountered, a soil sample must be collected, in the unsaturated zone, in addition to each groundwater sample. Soil and groundwater samples must be analyzed for the compounds shown in the following table, using appropriate lab methods.

Substance or Product Type	Contaminant Compounds to be Analyzed for Each Substance or Product Type	ANALYTICAL METHODS <sup>1</sup>
		Soil, Groundwater or Surface Water
Gasoline	Total Petroleum Hydrocarbons ( <u>purgeable</u> TPH as gasoline range organics C <sub>6</sub> - C <sub>10</sub> )	EPA 8015B <u>or</u> EPA 8260B
	Benzene, Toluene, Ethyl benzene, Xylenes, Naphthalene, (BTEXN) and MTBE	EPA 8021B <u>or</u> EPA 8260B
Diesel	Total Petroleum Hydrocarbons ( <u>extractable</u> TPH as diesel range organics C <sub>10</sub> - C <sub>28</sub> )	EPA 8015B
	Benzene, Toluene, Ethyl benzene, Xylenes, and Naphthalene (BTEXN)	EPA 8021B <u>or</u> EPA 8260B
Used Oil	Oil and Grease (O&G) or Total Recoverable Petroleum Hydrocarbons (TRPH)	EPA 1664A <u>or</u> EPA 1664A (SGT*)
	Benzene, Toluene, Ethyl benzene, Xylenes, Naphthalene (BTEXN) & MTBE; <u>and</u> Halogenated Volatile Organic Compounds (VOX)	EPA 8021B <u>or</u> EPA 8260B
New Oil	Oil and Grease (O&G) or Total Recoverable Petroleum Hydrocarbons (TRPH)	EPA 1664A <u>or</u> EPA 1664A (SGT*)
Other	Type of analyses will be based upon the substance or product stored, and as approved by the Executive Secretary (UST)	Method will be based upon the substance or product type
Unknown	Total Petroleum Hydrocarbons ( <u>purgeable</u> TPH as gasoline range organics C <sub>6</sub> - C <sub>10</sub> )	EPA 8015B <u>or</u> EPA 8260B
	Total Petroleum Hydrocarbons ( <u>extractable</u> TPH as diesel range organics C <sub>10</sub> - C <sub>28</sub> )	EPA 8015B
	Oil and Grease (O&G) or Total Recoverable Petroleum Hydrocarbons (TRPH)	EPA 1664A <u>or</u> EPA 1664A (SGT*)
	Benzene, Toluene, Ethyl benzene, Xylenes, and Naphthalene (BTEXN) and MTBE; <u>and</u> Halogenated Volatile Organic Compounds (VOX)	EPA 8021B <u>or</u> EPA 8260B

<sup>1</sup> The following modifications to these certified methods are considered acceptable by the Executive Secretary (UST):

- Dual column confirmation may not be required for TPH and BTEXN/MTBE analysis.
- A micro-extraction or scale-down technique may be used for aqueous samples, but only for the determination of extractable TPH as diesel range organics (C<sub>10</sub> - C<sub>28</sub>).
- Hexane may be used as an extraction solvent.
- \*Silica Gel Treatment (SGT) may be used in the determination of Total Recoverable Petroleum Hydrocarbons.

NOTE: The sample preparation method and any modification(s) to a certified method must be reported by the laboratory.

## Screening/Cleanup Levels for LUST Sites Ref: 7.2

Utah has generally adopted the 1995 ASTM method but has modified it into a two-tiered approach for performing risk assessments. Utah's method is designed to provide systematic and consistent determinations of risk to potential receptors in accordance with the Cleanup Standards Policy. Like the ASTM (1995) approach, Utah's two-tiered approach requires increasingly more accurate site-specific data and increasingly complex transient contaminant fate and transport modeling with each option upgrade in order to achieve greater accuracy and certainty in evaluating risks to receptors.

Utah's Tier 1 Screening Levels (SLs) are contaminant concentrations in soil and groundwater that are considered "safe to leave in the subsurface" at any site if all of the Tier 1 distance criteria are met. Tier 1 SLs were developed by the DERR using conservative formulas and general Utah-specific (not site-specific) input parameters. Tier 1 distance criteria are distances from contaminated subsurface soil or groundwater to "receptors".

Receptors include wells (municipal, domestic, and irrigation), surface water bodies (lakes, rivers, streams, and canals), utilities (water supply lines, storm drain pipes, and sewer lines), and property lines. In order to use Tier 1 SLs, the contaminated soil and groundwater at the site must be located over 30 feet from utilities and property lines, and over 500 feet from wells and surface water bodies. In most cases, if subsurface contamination is below Tier 1 Screening Levels and the site meets all Tier 1 criteria, then no additional cleanup work is required at the site and the case is closed.

A summary of the Tier 1 Screening Process can be found in the DERR's Guidelines for Utah's Corrective Action Process for Leaking Underground Storage Tank Sites, October 30, 2005. This guide is available on the DERR's website at: <http://www.undergroundtanks.utah.gov/rbca.htm>.

Utah's Tier 2 SLs are developed using site specific input parameters from the site and more realistic (less conservative) formulas than those used to develop the Tier 1 SLs. Details on determining Tier 2 site-specific screening levels (SSCLs) can be found in DERR's Guidelines for Utah's Corrective Action Process for Leaking Underground Storage Tank Sites, October 30, 2005. This guide is available on the DERR's website at: <http://www.undergroundtanks.utah.gov/rbca.htm>. 7-3

An understanding of contaminant fate and transport processes in the subsurface is fundamental to making informed decisions at leaking underground storage tank (LUST) sites. The behavior of petroleum hydrocarbons in the subsurface is governed by the physical and chemical properties of the contaminants, as well as the site-specific characteristics of the media (soil, groundwater, soil gas) through which the contaminants migrate. Fate and transport mechanisms are complex and the discipline is rapidly evolving.

Numerous computer software packages are available to assist in simulating fate and transport processes. In most cases, the objective of computer simulations is to generate numerical models that predict concentrations of petroleum contaminants in soil or groundwater over time. Their success in predicting actual site conditions depends on the availability and reliability of site

specific data including (but not limited to) input parameters which represent soil sorption, dispersion, and biodegradation processes.

Computer models are only as reliable as the input parameters on which they are based. Whenever possible, site-specific parameters should be utilized, and a discussion of model assumptions and limitations should always accompany the computer simulations. When valid assumptions are made, computer fate and transport modeling can be a valuable tool for planning subsurface investigations, screening remedial options, or designing corrective action systems.

## **Determination of RBSL and SSCL Values for total Petroleum Hydrocarbons (TPH)** Ref: 7.2

TPH fractionation is only required when a LUST site has been approved to conduct a risk assessment following RBCA protocols as outlined in Guidelines for Utah's Corrective Action Process for Leaking Underground Storage Tank Sites. Utah's Guidelines for TPH Fractionation at Leaking Underground Storage Tank Sites document can be found on the DERR's website at <http://www.undergroundtanks.utah.gov/docs/fractionation.pdf>.

### **Sample Collection** Ref: 7.3

Collect a minimum of one environmental sample which is representative of each contaminated medium (e.g., soil and groundwater) and the maximum concentration and composition of the petroleum contamination at the site. For sites where TPH contamination is highly variable in concentration or composition, the user should collect multiple TPH samples at representative locations to ensure a representative analysis by the laboratory.

### **Laboratory Analysis** Ref: 7.4

Analyze the sample(s) using EPA Methods 8260B and 8270B. Specify "Utah TPH Fractionation" on the chain-of-custody forms to ensure that the laboratory uses the reporting format specific for TPH fractionation, which differs from a typical 8260B and/or 8270B chemical parameter listing. The laboratory should report concentrations for each of the 10 different TPH fractions shown on the following flowchart. In addition, on the 8260B report, the laboratory should list values for any detectable BTEXN and MTBE. For fractions where the measured concentration is below the method reporting limit, a value of half of the method reporting limit should be used as the representative source area concentration in deriving SSCLs.

## **Confirmation sampling for TPH Fractions following TPH Driven Cleanup Activities** Ref: 7.7

After completing cleanup activities that are driven by the exceedence of the SSCLs for the TPH fraction(s), the user should obtain an appropriate number of environmental samples at representative locations and depths in order to verify the effectiveness of the cleanup at the release site. The same procedures described herein would again be employed for comparison with representative source area TPH fractionation values obtained. During cleanup, the user may elect to obtain samples for TPH fractionation, and BTEXN and MTBE (EPA Method 8020) if applicable, to measure the relative progress of the cleanup activities and to estimate the cleanup duration. Confirmation samples are required to determine the number and location of samples based on consultation with the DERR project manager and site specific information.

# Reporting a Release from Underground Storage Tanks

## Information Requested

Some of the information may not be known, this is common. The person taking the phone call at the Division of Environmental Response and Remediation (DERR) will assist you with any questions you have. DERR 801-536-4100.

## Information Needed as Complete as Possible

- Facility ID (7 digit numbers that may begin with a zero used to identify facilities with UST's).
- The name and address of the facility where the UST release is being reported.
- The name, company, and telephone of the person reporting the release of the UST (anonymous is acceptable, but a name is helpful if further information is needed).

## Information Needed as Much as Possible or Pertinent

- Have fumes been noticed in homes, businesses, utilities, outdoors, soils, and/or water?
- Has any damage occurred to soils, ground water, surface water, drinking water, utilities, land surface, plants/wildlife, or a 3<sup>rd</sup> party?
- Is free product (any petroleum product that is not dissolved in water or soil) present?
- What other agencies have been notified (Health Dept., Fire Dept., Department of Environmental Quality, etc.)?
- What has been done to clean-up this release already?
- Where did the release come from (i.e., piping, tank itself, spill/overflow, the pump island)?
- What is the age of the tank and pipe, along with what they are made of (steel or fiberglass for example)?
- When did the release occur?
- How much was released (estimate)?
- How was the release detected (tank tightness test, line tightness test, leak detector, inventory, field instruments, analytical, etc.)?
- What was the substance released (gasoline, diesel, waste oil, new oil, solvents, other)?
- What type of soil is present (sand, clay, etc.), and the depth to contaminated soil?
- How deep is ground water in the area, and its flow direction?
- What is the slope direction of the land in this area?

- What is the distance and direction to the nearest water well, underground utilities, surface water, buildings, and property boundaries?
- What is the current and surrounding land use where the release occurred (commercial, industrial, residential, agricultural)?
- How much annual precipitation is received in this city?
- What is the ground cover at the site (lawn, asphalt, gravel, etc.)?

## **Section III**

### **Health and Safety**

- **General Safety**
- **Health and Safety Regulations**
- **Medical and Safety Requirements, training**
- **PPE**
- **Medical Surveillance**
- **UST Site Health and Safety Plan**
- **Evacuation/Emergency Response Plan**
- **Incident Investigation**

**General**, Ref: Consultants Manual chapter 5

Personal safety is paramount at UST sites. Petroleum products are toxic and present fire and explosion hazards. Personal safety in the collection of soil and groundwater samples at UST facilities must meet the standards required by federal and state regulatory agencies. Extreme care should be used when it becomes necessary to enter an excavation for sampling purposes. If this is the case, the excavation side walls should be sloped or shored to prevent slumping or cave-in.

## **General Site Health and Safety**

Health and safety on a LUST site is of paramount importance for numerous reasons including:

- Prevents of work-related injuries, illnesses, and property damage.
- Prevents of exposure of the public to harmful substances.
- Increases overall productivity and maintains project schedules.

Petroleum products are toxic, carcinogenic and flammable. Therefore, these products should be handled with a great deal of care. Petroleum products can enter the body through the typical four routes of exposure:

- Inhalation
- Ingestion
- Injection
- Skin or eye absorption

Maintaining a safe work environment is essential whether the tasks be soil and groundwater sampling, UST removal, or remediation. All tasks need to be assessed in light of the degree of potential hazard and the possible routes of exposure. This hazard assessment should form the basis of the health and safety plan to be discussed later.

Whereas petroleum products may pose a significant health hazard due to chronic health effects, the general safety hazards associated with LUST sites frequently pose much greater risk of acute health effects.

Signs and symptoms of exposure are often vague and easily missed. The onset of symptoms may even be delayed up to 8 days after exposure and include weakness, fatigue, headache, nausea, vomiting, diarrhea, anorexia, insomnia, and weight loss.

## **Types of Exposures**

An inspector can face either **chronic or acute** exposure at a site. Chronic is defined as long-term, low-level exposure, while acute is defined as short-term, high-level exposure. Both are dangerous and have immediate and long-term health implications. UST-associated work can also expose workers to multiple chemicals which may have synergistic effects. This means that the effect of two chemicals together may be greater than the sum of their separate effects. All exposures should be kept as low as reasonably achievable.

Many materials store in USTs are very common, and many have very low acute toxicity. However, the exposures of the UST inspector are more frequent, of longer duration, and higher than those of the average person. It is this repeated, low-level exposure that is so dangerous, as effects may not be seen for many years. Avoiding unnecessary exposure now can help you enjoy your later years, instead of combatting a chronic illness.

## **Explosions**

Explosions are rapid chemical reactions that produce large quantities of gas and heat, a shock wave, and noise. Explosivity is expressed as a percentage of a given material in a volume of air. The lower explosivity limit (LEL) is the lowest concentration of a product that is explosive. The upper explosivity limit (UEL) is the highest concentration of a product that is explosive. For USTs a reading below 10% LEL on a combustible Gas Indicator is considered safe from explosion.

## **Health and Safety Regulations**

It is important to realize that LUST work is covered by various regulations at the federal level, including the OSHA Hazardous Waste Site Operations and Emergency Response (HAZWOPER) Standard, 29 CFR 1910.120. The work may also be covered by various state and local regulations. These regulations may be triggered depending upon the degree of hazard posed, for example if the UST leaked and there is a significant exposure to airborne contaminants, respiratory protection may be required.

Exposure to airborne contaminants is covered by the OSHA Respiratory Protection Standard, 29 CFR 1910.134. If entry into a tank is required, or if the excavation is considered a confined space, the work may be covered by the OSHA Confined Space Entry Standard, 29 CFR 1910.146. Most standards require that the employer:

- Develop a written program to address the hazards in a general manner as part of an employer program, and also site-specific procedures.
- Conduct a hazard assessment to identify the site-specific hazards and then respond to them appropriately.
- Provide employee training.
- Provide appropriate personal protective equipment.
- Establish emergency response procedures.

## Specific Health and Safety Requirements Ref: p. 5.2

The following section describes how to reduce the hazards on a UST site. These are also issues that are covered as requirements under the OSHA HAZWOPER Standard, 29 CFR 1910.120.

### Training

Employees cannot be expected to perform site work properly if they are not properly trained. The HAZWOPER standard requires employers to provide 40 hours of hazard training at the time of initial assignment, 8 hours of refresher training annually, and a minimum of 3 days actual field experience under the direct supervision of a trained, experienced supervisor

[29 CFR 1910.120 (e)(3) and (4)(i)]. This training must cover items such as:

- Components of the Standard
- Medical surveillance
- Hazard assessment
- Personal protective equipment
- Site control
- Site characterization
- Air quality monitoring
- Excavation and trenching
- Hazard communication
- Decontamination
- Drum handling
- Illumination
- Emergency response procedures

This training must then be supplemented by site-specific training at the time of assignment to a project. This is essential to provide employees with the actual hazards to be encountered and the exposure control strategies to be followed.

Although the content of the annual refresher training can vary, it should provide a meaningful update of the initial training. Items that might be included:

- OSHA news.
- The previous year's injuries and illnesses and steps taken to minimize recurrence.
- Changes in monitoring equipment.
- Review of hazard assessment.
- Addressing contractor issues.

Additional initial training is required for employees who may perform management or supervisory roles, or emergency response activities. The supervisory worker must attend a least 8 additional hours of specialized training at the time of job assignment.

[29 CFR 1910.120(e)(4)]. Emergency response workers shall be trained in how to respond to expected emergencies [29 CFR 1910.120(e)(7)].

# PPE

## Personal Protective Equipment

Vapors, gases, and particulates from hazardous substance response activities place response personnel at risk. For this reason, response personnel must wear appropriate personal protective clothing and equipment whenever they are near the site. The more that is known about the hazards at a release site, the easier it becomes to select personal protective equipment. There are basically four levels of personal protective equipment:

**Level A** protection is required when the greatest potential for exposure to hazards exists, and when the greatest level of skin, respiratory, and eye protection is required. Examples of Level A clothing and equipment include positive-pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, totally encapsulated chemical- and vapor-protective suit, inner and outer chemical-resistant gloves, and disposable protective suit, gloves, and boots.

**Level B** protection is required under circumstances requiring the highest level of respiratory protection, with lesser level of skin protection. At most abandoned outdoor hazardous waste sites, ambient atmospheric vapors or gas levels have not approached sufficiently high concentrations to warrant level A protection – Level B protection is often adequate. Examples of Level B protection include positive-pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, inner and outer chemical-resistant gloves, face shield, hooded chemical resistant clothing, coveralls, and outer chemical-resistant boots.

**Level C** protection is required when the concentration and type of airborne substances is known and the criteria for using air purifying respirators is met. Typical Level C equipment includes full-face air purifying respirators, inner and outer chemical-resistant gloves, hard hat, escape mask, and disposable chemical-resistant outer boots. The difference between Level C and Level B protection is the type of equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main criterion for Level C is that atmospheric concentrations and other selection criteria permit wearing an air-purifying respirator.

**Level D** protection is the minimum protection required. Level D protection may be sufficient when no contaminants are present or work operations preclude splashes, immersion, or the potential for unexpected inhalation or contact with hazardous levels of chemicals. Appropriate Level D protective equipment may include gloves, coveralls, safety glasses, face shield, and chemical-resistant, steel-toe boots or shoes.

## **Medical Surveillance**

The HAZWOPER Standard requires that certain categories of employees receive physical examinations at a minimum of three milestones: at initial assignment, annually (unless an occupational physician working closely with the company believes that the physical examination could be performed every other year and still sufficiently monitor employee health status), and at termination. The physical examination must be at no cost to the employee.

Firms should work closely with an occupational physician that understands the firm's area of work and the hazards that employees are likely to face. The physical examination should then be tailored to address those exposures. If the firm's work involves potential silica exposure such as during drilling, then a chest X-ray should be included. Other items to be considered include spirometry for lung function, blood tests, urine screening, hearing testing, and perhaps drug and alcohol screening, as may be required by the US Department of Transportation. Other tests for "wellness" such as cholesterol may be also included by conscientious employers.

There are basically three determinations the physician may provide to the employer: pass, fail, or pass with limitations. As the responses imply, a "pass" response means that the employee may perform the work outlined by the employer to the physician without limitations on activity. A "fail" response indicates that the employee's condition does not allow him/her to perform the assigned duties. "Pass with limitation(s)" indicates that the physician believes that the employee's duties should be limited in some way. It is essential that the employer understand these limitations to be sure that the employee is not directed to overstep these limitations (or overstep them on his or her own). Other professionals such as safety or industrial hygienists may need to be involved in determining permissible activities. Of course, employee relations or human resources professionals may also need to be involved to ensure that the employee's rights are not compromised.

## **UST Site Health and Safety Plan**

The HAZWOPER Standard requires employers working on sites with hazardous substances and wastes to develop site-specific health and safety plans (HASPs). The HASP is composed of various sections that outline the work and the address the associated hazards. The following paragraphs briefly explain the sections of the HASP. An UST HASP should include a discussion of the following topics:

### **General Information**

General Information should include the name and location of the facility, work plan objectives, and proposed date(s) of work. This section lists the names of all the main project participants. This is a most important reference page in times of emergency as well as during routine business.

## **Planned Site Activities**

A brief description of planned activities should be included in this section. The HASP should be revised if significant changes in these activities occur. In this section the general scope of work should be briefly described. This should explain the purpose of the work. The tasks to be performed during the work should be listed in the order in which they will occur. This section forms the basis of the hazard assessment. Next to each task, list the hazard and proposed means of avoiding the hazard. This section should be expanded if needed. Site workers should be aware of the possible dangers associated with drilling, excavation, free-product recovery, and groundwater sampling.

## **Contaminant Characteristics**

List contaminants of concern, type of contaminant, physical and chemical properties, and the hazards it poses to human health and the environment. It is important to consider contaminants that might be emitted by facilities adjacent to the work site. Previous sampling media, e.g., soil, groundwater, air, and the results should be noted.

## **Site Description**

A site description should include the current and historical use of the site and surrounding area. In this section, issues adjacent to the work site should be described. Keep in mind that these aspects may not only be influenced by the work on the work site; they may also influence the work site. The sites that could be impacted by the work site include receptors, such as neighborhoods, schools, lakes, etc. Potential sources, such as adjacent factories or leaking tanks from other sites might impact the work site. These should not be overlooked because they may influence the ambient conditions being monitored on the work site.

## **Hazard Evaluation and Mitigation**

This section should include a listing of known visible hazards, man-made or natural, and any unseen-but-suspected hazards. Site workers should be aware of the possible dangers associated with LNAPL recovery and groundwater sampling. All aspects of hazard mitigation pertinent to the site should be addressed. These may include fire and personal exposure to petroleum hydrocarbons or other organic vapors; heat and cold stress; noise; and heavy equipment use. As noted earlier, these hazards may pose the greatest hazards to workers on the site. They should be very carefully considered and precautions to be taken should be described. This section should be expanded as necessary. Also include fire suppression procedures.

## **Site Safety Work Plan**

The site safety work plan should include a discussion of general safety, worker training, and medical surveillance requirements; and relevant documentation.

## **Excavations and Trenching**

Excavation and trenching are integral to much of the UST work. Excavations and trenches can pose confined space and fall hazards. Confined space and fall restraint procedures should be included. Shoring regulations must also be addressed to avoid collapsing of the sides. Shoring should be considered even when individuals will not enter the excavation. Depending upon the types of soils, sidewalls can collapse at distances of 5 to 10 feet or more from the edge of the excavation. Competent persons must design shoring plans and in some jurisdictions these plans must be approved and stamped by licensed Professional Engineers. The OSHA informational booklet entitled Excavations, OSHA Publication 2226, (2002), explains ways to protect workers from excavation hazards. The publication on excavations can be located on OSHA's website at: <http://www.osha.gov/SLTC/trenchingexcavation/recognition.html>.

## **Personal Protection Equipment**

A listing and description of the personal level of protection required for each activity or work. The level and types of personal protective equipment (PPE) which will be used to address personal exposures must be described. This section should be specific with respect to makes and model numbers of PPE should be included in this section. A change in on-site conditions may also dictate a change in PPE.

## **Monitoring/Surveillance Equipment**

This section should include a listing of all monitoring and surveillance equipment to be used at the site with a discussion of exposure and explosive concerns. This portion of the plan should explain how airborne contaminants will be monitored at the site. There are a number of aspects to be considered when developing the air monitoring plan. These include:

- Employee exposures within the work (exclusion) zone.
- Potential contaminants leaving the exclusion zone or site that could impact adjacent sites.
- Airborne contaminants that might enter the site from adjacent facilities.
- Note recognized exposure limits and action levels. Describe what will happen if either the action level or exposure limits are surpassed, e.g., upgrade PPE, evacuate the site, notify regulators, etc.
- The types of instruments that will be used and their limitations.
- Confined space monitoring issues, if applicable.
- Note also the measurement of percent lower explosive limit (LEL) to avoid fire hazards.

# **Evacuation/Emergency Response Plan**

This section should be clearly labeled to allow for quick reference in the event of an emergency. One should be very clear about how evacuation would take place. Written as well as pictorial directions must be included. These directions must be tested prior to starting the project to be sure they “work.” The locations of hospitals, shelters, and barriers to evacuation such as fences, security stops, one-way streets all should be shown and discussed in the HASP.

## **Attachments**

The health and safety plan should include a map to the nearest medical facility. Forms and other relevant information should be attached to the HASP. This may include material safety data sheets (MSDSs), injury investigation, air and groundwater sampling forms, site audit checklists, site equipment checklists, daily safety meeting agenda and minutes forms, etc.

## **Safety Meetings**

Several meetings should be planned to discuss safety. These need not necessarily be stand-alone meetings. These may be incorporated into other job meetings. In fact, this is encouraged so that workers see safety as an integral part of production and not something extra to be discussed if there is time. These meetings are described below:

### **Pre-Start-up Meeting**

This meeting should be used to discuss all aspects of the project well in advance of the start. This allows time for details to be worked out and additional safety equipment to be obtained if necessary. Special attention should be given to working out the personnel who will be responsible for enforcing safety and attending to health and safety issues at the site. Note who will be contacted in the event of an emergency.

### **Start-up Meeting**

This meeting, often held on the day the job starts or day before, discusses the final safety staff and contacts, describes the emergency response procedures, lays out the PPE, air monitoring and other relevant issues.

### **Daily Meetings**

A safety meeting should be held at the beginning of every day the project continues. The scope of the day’s work should be described along with the associated hazards and safety precautions. This offers workers the opportunity to ask questions before proceeding with work.

## **Project Close-out Meeting Site Safety**

Projects that last several weeks should have a project close-out meeting to discuss issues that have occurred during the course of the job. This meeting gives participants the opportunity to discuss how to improve safety and general work performance on future jobs.

## **INCIDENT INVESTIGATION**

All companies should have a program to avoid work-related injuries and illnesses. This program should include the writing of standard operating procedures and job safety analyses. These documents should be used as training tools to teach employees the hazards of doing work and how to avoid them. Employees should be encouraged by training to stop before they begin each task in the field and consider potential hazards and how to avoid them. Companies should investigate “near misses” with the same intensity as actual incidents because the next time the “near miss” might in fact be an incident. This approach tends to improve procedures and practices so that “near misses” are prevented. If all “near misses” were eliminated, then actual incidents would be all but avoided in their entirety.

In the event of an incident, whether property damage or personal injury, the investigation must focus on establishing the route cause of the incident. It should not focus on placing blame as this is usually an ineffective means of avoiding similar incidents in the future. Nearly all incidents occur as a result of insufficient training, tools, time management, motivation, or in rare situations.

# References

1. Utah Consultant Certification Manual 2009
2. EPA – RCRA Ground Water Monitoring Technical Enforcement Guidance Document
3. Compendium of ERT Surface Water and Sediment Sampling Procedures (Jan 1991)
4. Utah Rules R311-204 and 205
5. Leaking Underground Storage Tank (LUST) Subsurface Investigation Report Guide