

**GUIDANCE DOCUMENT**

**UNDERGROUND STORAGE TANK RELEASE:**

**CORRECTIVE ACTION PLAN (CAP) PART A**

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## GUIDANCE DOCUMENT

### UNDERGROUND STORAGE TANK RELEASE: CORRECTIVE ACTION PLAN (CAP) PART A

#### INTRODUCTION

**GENERAL:** The CAP-Part A shall be used for documenting completed release response activities, reporting magnitude of impacted environmental media, and summarizing proposed site investigation plans (if further investigation and/or corrective action is warranted for the release) including a schedule for additional site investigation activities and submittal of a CAP-Part A. The CAP-Part A shall be submitted in lieu of the initial abatement report, the initial site characterization report, and the free product removal report, as referenced by 40 CFR §§ 280.62(b), 280.63(b), and 280.64(d) (1993), respectively. The CAP-Part A must be submitted to EPD Underground Storage Tank Management Program within 60 days after release confirmation. For USTs removed or closed in place, also reference the UST Closure Guidance Document (GUST-9).

PLEASE SEE APPENDIX D OF THIS GUIDANCE DOCUMENT FOR A LIST OF THE MINIMUM STANDARDS FOR ENVIRONMENTAL REPORTS SUBMITTED TO THE USTMP BY PROFESSIONAL GEOLOGISTS (PG's) AND PROFESSIONAL ENGINEERS (PE's). Flagrant or persistent failure to adhere to these standards may result in the filing of a complaint with the appropriate professional registration board for the geologist or engineer certifying the CAP-Part A. These standards were compiled by representatives from those Boards, the consulting community, and the USTMP so that the USTMP can effectively protect human health and the environment through timely approval of CAP-A's and other reports.

**ORGANIZATION:** The CAP-Part A must be completed in strict accordance with the CAP-Part A template included in Appendix E of this guidance document. The following sections of this Guidance Document provide explanations and guidelines for the respective sections in the CAP-Part A template. All attachments to a CAP-Part A template must be organized and contain the information as described in this Guidance Document. All text, figures, and tables requested in their respective sections on the CAP-Part A template should be prepared strictly in accordance with this Guidance Document. Include Figures in Appendix I in the CAP-Part A template and Tables in Appendix II of the CAP-Part A template. The Cost Proposal, GUST Trust Fund application and claim for reimbursement, if applicable, should be submitted simultaneously with CAP-Part A. Submit all CAPs with pages three-hole punched. Failure to adhere to the following guidelines may result in an extended review period or return of your CAP-Part A for completion.

## I PLAN CERTIFICATION:

### A. UST Owner/Operator:

The Corrective Action Plan-Part A must include the following certification (verbatim) signed by the owner or operator.

#### Corrective Action Plan (CAP)-Part A Certification:

*I hereby certify that the information, contained in this plan and all attachments, is true, accurate, and complete, and the plan satisfies all the criteria and requirements of Rule 391-3-15-.09 of the GUST Rules.*

\_\_\_\_\_  
Printed Name (Owner/Operator)

\_\_\_\_\_  
Signature(Owner/Operator)

### B. Professional Engineer or Professional Geologist:

The Corrective Action Plan-Part A must bear the stamp or seal of a Professional Geologist (PG) or a Professional Engineer (PE) registered in Georgia. In addition, the PG or PE must certify that he/she directed and supervised the work and the preparation of the CAP-Part A; that all of the information, and laboratory data in this plan and on all of the attachments, are true, accurate, complete, and in accordance with State Rules and Regulations; and that the PG or PE is a qualified groundwater professional, as defined by the Georgia State Board of Professional Geologists.

## II INITIAL RESPONSE REPORT:

### A. Initial Abatement:

This section serves to record the immediate actions taken within 60 days of the confirmed release, to identify and mitigate hazards. This includes contaminant migration and further release prevention, fire and vapor mitigation, and emergency free product removal. Human health, safety, and environmental protection are the focus and objective for this section.

1. No Action Required

No actions were needed to abate imminent hazards and/or emergency conditions. If no actions are needed, explain how you arrived at this conclusion.

2. Further Release or Migration of Contaminants Prevented:

Report immediate actions taken to prevent any further release or migration of contaminants into surrounding soils and groundwater, such as removing the product from the tank, taking the UST system out of service, and/or stopping the flow of product from leaking pipes, dispensers, or tanks.

3. Fire and Safety Hazards From Vapors And/Or Free Product Monitored and Mitigated:

Report actions taken to identify and mitigate any hazard or potential hazard of fire, explosion, and vapor migration, including contact with the local fire marshall to supervise and/or direct the hazard mitigation, as necessary.

**B. Free Product Removal:**

If free phase petroleum product (i.e., gasoline, diesel fuel, waste oil, and any other regulated substance(s) that is not dissolved in water) is identified exceeding one-eighth inch (0.01 feet) in thickness, begin free product removal immediately. If manual bailing or passive skimming is determined to be an appropriate method for free product removal on the site, it can be used for no more than 60 days. Record measurements in feet, to the nearest one-hundredth. In this section describe the manner in which free phase petroleum product has been removed. Report actions taken to recover the maximum amount of free product, and those taken to minimize the spread of contamination into previously uncontaminated zones. The presence of free product, including a sheen, must be reported to EPD in accordance with 40 CFR Part 280.62 (b). In Table 1, "Summary of Free Product Removed", provide a tabulated history of free product recovery including, but not limited to: the location, product thickness, groundwater elevation and corrected elevation, free product removed, dates of measurement and removal (with manifests of disposal if removed from the site). In addition, propose a plan for continued free product recovery that includes the method and frequency of removal. The method of continual removal and disposal of free product must be appropriate for the site's hydrogeologic conditions, as per 40 CFR Part 280.64 (a), and must be in compliance with all applicable local, state, and federal regulations. If a free product recovery system is to be installed, you must include the proposal for the system in the CAP-Part A. This proposal is necessary to document that the method conforms with 40 CFR Part 280.64 (a), and if reimbursement is sought, that the system is the most efficient and cost effective. Prolonged bailing or passive skimming usually does not "minimize the spread of contamination into previously uncontaminated zones" (40 CFR Part 280.64(a)) nor is it usually the most cost effective option to comply with 40 CFR Part 280.64. Therefore, if manual bailing and/or passive skimming are used for free product recovery, an explanation and determination of the efficiency of such a removal system will be required for prolonged use (more than 3 months after discovery of free product).

NOTE: In the event that free product is not identified during release response activities but is later discovered during the site investigation or corrective action activities, removal of free product must commence immediately and continue in the most effective manner, in accordance with 40 CFR Part 280.64 (a) Over-excavation of more than 500 cubic yards of

contaminated soil may not be an effective method of free product removal and may not be reimbursable by the GUST Trust Fund.

**C. Tank History:**

1) UST Status: List current and former USTs operated at the site based on owner/operator knowledge including Tank ID numbers, capacity, substance stored, and whether the USTs have met 1998 Upgrade Standards or have been closed (Tank ID numbers should be consistent with those listed on the 7530-1 form). Illustrate all UST systems (closed and existing) on Figure 2 (Site Plan), as described in Section D below.

**D. Initial Site Characterization:**

The purpose of this section is to document the type of product released, source of contamination, environmental media (soil and/or groundwater) impacted, drinking water resources and surface water bodies which may be potentially impacted. This section must also describe any corrective action measures already taken. Figure 1: Vicinity/Location Map and Figure 2: Site Plan are required for this section. Include all relevant man-made and natural physical features (e.g., sampling locations, monitoring wells, tanks, pump islands, product lines, buildings, roads, overhead and underground utilities, drains, and streams) on site maps. Draw the site maps to scale and include a scale line and a north arrow.

1. Regulated Substance Released:

The type of petroleum product (gasoline, diesel, used oil, etc.) and/or other regulated substance released must be documented. Discuss how this determination was made and circumstances of discovery.

2. Source of Contamination:

Identify existing and former UST system(s) (closed in place or removed) on Figure 2 and document the source of contamination such as a leaking pipe, faulty valve, contaminated soil, etc., in the narrative.

3. Local Water Resources:

This section serves to identify and document local water resources used to reference and support the determination of applicable corrective action objectives, per GUST Rule 391-3-15-.09(4)(a)-(d). The documentation must include, but is not limited to, United States Geological Survey (USGS) database search, communication log, and field survey summary and should be included in Appendix III. Figure 3: Topographic Quadrangle Map displaying the location(s) of all water resources within radii of concern, must be to scale and include a north arrow and a bar scale, and is preferred to be in color. Both water supply and surface water surveys should be verified by a field reconnaissance.

(a) Water Supplies Located In:

- (i) High or average groundwater pollution susceptibility area: Document the survey of public and non-public drinking water systems within two (2) miles and one half (½) mile, respectively, if the plume is located in an area of average or higher groundwater pollution susceptibility, as defined by the Groundwater Pollution Susceptibility Map of Georgia (Georgia Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey, 1992). Any site bordering on more than one susceptibility area is considered to be located in the area of highest susceptibility, unless demonstrated otherwise and approved by EPD.
  
- (ii) Low groundwater pollution susceptibility area: Document the survey of public and non-public drinking water systems within one (1) mile and one-quarter (1/4) mile, respectively, if the plume is located in an area of lower groundwater pollution susceptibility, as defined by the Groundwater Pollution Susceptibility Map of Georgia (Georgia Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey, 1992).

**NOTE:** *A public drinking water system, as defined by the Georgia Rules for Safe Drinking Water (Chapter 391-3-5, as amended), is one that provides piped water for human consumption to at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. The water system survey includes the identification of all water wells (domestic, commercial, industrial and irrigation), surface water withdrawal points and springs. Identify public/non-public drinking water systems by reviewing federal, state, county, and/or city records as well as conducting a field reconnaissance. Examples of public agencies that may have public and private well information include the USGS, Georgia Geologic Survey, local health departments, and local water and sewer authorities. All adjacent property owners should be contacted via telephone, personal visit, or certified mail. Please include telephone logs, interview forms, and certified mail receipts in Appendix III of the CAP-A document. In addition, a detailed field reconnaissance should be conducted to verify the presence or absence of water wells within ½ mile of the site in a high or average susceptibility area and 1/4 mile within a low groundwater pollution susceptibility area. Also, document whether the identified public/non-public water systems are downgradient from the contaminant plume or whether they are hydraulically interconnected with the contaminant plume. Include construction details of water wells, depth to aquifer, pumping rates and drawdown. Well depths, casing depths,*

and screen depths may be available for non-public wells from owner or from the driller who installed the well. Construction details, pumping rates and drawdown may be available from the city or county water system engineer.

(b) Surface Water Bodies:

Surface water bodies, as established by the Georgia Rules for Water Quality Control (Chapter 391-3-6, as amended), within one (1) mile of the site and storm and sanitary sewers adjacent to the site, in accordance with 40 CFR Part 280.63 (2), must be identified and located on Figure 3 as described above.

If the nearest surface water body is more than one mile away, demonstrate that preferential pathways do not exist between the source and the nearest surface water body.

**NOTE:** Because of the relatively high rate of rainfall across the state (approximately 51 in./yr.) and other factors, infiltration of rainfall into the groundwater generally results in surface water bodies developing less than 2 miles apart. Therefore, it is rare that surface water bodies lie more than a mile from a UST site, as observed by the UST Program in over 6,000 UST releases. When exceptions occur, it is typically because the previously existing surface water bodies have been routed through culverts and combined with storm drains. Culverts and drains that receive a portion of their flow from groundwater become preferential pathways for groundwater contamination transport.

Indicate whether the surface water bodies are perennial or intermittent, enclosed in a culvert or other manmade structure. The information on surface water bodies should also be documented in Appendix III of the CAP-Part A document. This information should include, but is not limited to field notes, survey data of the storm sewer invert elevation, copies of storm sewer maps (if available from the city engineer), and interview forms with the city engineer or other parties who have credible knowledge of the storm sewer and culvert construction details.

4. Impacted Environmental Media:

The purpose of this section is to document the magnitude of soil and/or groundwater contamination. It should be understood that if a CAP-Part A is submitted that does not meet the criteria outlined

below, the GUST Trust Fund may only reimburse the revised submission and not the original.

The installation of monitor wells may not be required if soil borings are installed in the area of **worst-case contamination** and analyses of soil and/or groundwater samples indicate that (1) soil contamination is vertically delineated to below laboratory detection limits (BDL) for benzene, toluene, ethylbenzene and xylenes (BTEX), Polynuclear Aromatic Hydrocarbons (PAHs), and total petroleum hydrocarbon (TPH) above the water table in the worst-case area(s); or (2) BTEX and PAHs in a groundwater sample taken from the area of highest soil contamination are below the applicable drinking water or in-stream water quality standards. (If a groundwater sample is collected, TPH analysis is not required for soil).

However, if soil contamination is not vertically delineated to below the applicable levels addressed above, or if groundwater contamination is present above the applicable drinking water or in-stream water quality standards, the installation of a minimum of three (3) soil borings subsequently converted to monitor wells is required. The three monitor wells must be installed in a triangular formation on the site to determine groundwater flow direction, the hydraulic gradient, and to insure that the area of the most contaminated soil/groundwater is sampled. The most important requirement for locating the monitor wells is to install at least one monitor well in the suspected release source area so that the area of highest contamination (i.e. the source concentration) is sampled. The areas routinely determined to be the most obvious sources of release include the tank pits, dispenser islands and piping joints. While a minimum of three monitor wells is required, a fourth monitor well is recommended, configured with at least one in the suspected release source area, one upgradient and two down gradient. If more than one release area is suspected, the monitor wells should be placed to provide samples from all suspected release areas. All wells must be installed in such a way that the top of the well screen lies above the water table and the bottom of the well screen lies below the water table. All wells must conform to the Water Well Standards Act.

(a) Soils:

- (i) Depict all sampling locations and corresponding concentrations on Figure 4, "Soil Quality Map" for each sampling event. Soil boring logs are to be presented in Appendix IV. Summarize concentrations of contaminants in soil as determined by appropriate laboratory analysis in Table 2, "Soil Analysis Results", with all soil analytical results reported in mg/kg and documented with copies of laboratory analytical results in Appendix V. Refer to Tables 1 and 2 in

Appendix A of this Guidance Document for analytical methods and laboratory detection limits. Address all results exceeding threshold levels, as defined in GUST Rule 391-3-15.09(3) Table A or Table B, in the narrative in sufficient detail to support conclusions and recommendations in Appendix II. (Tables A and B are included in this guidance document in Appendix G.) If points of groundwater withdrawal exist within the specified radii and surface water bodies are located less than 500 feet from the area of contamination, refer to Table A footnote (f) for guidance.

- (ii) In most cases it is advantageous to calculate Alternate Threshold Levels (ATLs). Because ATLs are more site specific, they are usually less stringent than the Threshold Levels in Tables A and B of the Rules of UST Management. If reimbursement is being sought, calculation of ATLs may be necessary to demonstrate that cleanup costs are reasonable. Document any proposed soil ATLs by including the vadose zone transport model provided in Appendix C of this guidance document. Any proposal of ATLs will be evaluated by EPD to assure adequate protection of groundwater quality, human health and the environment. In this model, utilize site specific data collected during the initial site characterization and/or utilize the values estimated in the Guidance For Calculating Alternate Threshold Levels For Contaminated Soils provided in Appendix C of this Guidance Document. If site specific data is to be used, total organic carbon and grain-size analysis will be required to calculate the ATLs, as discussed in Sections II.C.5 (d)-(f). If calculated ATLs are less than the applicable Table A or Table B threshold levels, then use the applicable values in Table A or Table B, use more site-specific data, or perform more complex soil modeling in CAP-Part B. ATLs are subject to EPD approval. Document ATL calculations in Appendix VI.
- (b) Groundwater:
- (i) Document the locations and thickness of any and all free product (including a sheen) in contact with the water table for each date of measurement and volumes removed (reference II.B). Depict the location of the monitor wells which contained free product and document the thickness of the product in each well on Figure 5, "Groundwater Quality Map", which includes the dissolved contamination concentrations, for each sampling event. Provide as-built monitor well details in Appendix VII.

- (ii) Collect the groundwater samples from the monitor wells installed on site. Summarize concentrations of all contaminants in groundwater identified by the appropriate laboratory analysis in Table 3, "Groundwater Analysis Results" with all results reported in **ug/l** and document with laboratory analytical results in Appendix VIII. Submit the original (not copies) with the analyst's signature and the original chains-of-custody in Appendix III. Depict all sampling locations and corresponding concentrations on Figure 5. Refer to Tables 1 and 2 of this Guidance Document for appropriate analytical methods for groundwater samples and laboratory detection limits. If these detection limits cannot be achieved, include a written explanation from the laboratory. Address all results exceeding federal Maximum Contaminant Levels (MCLs) for Safe Drinking Water or state in-stream water quality standards established by the Georgia Rules for Water Quality Control (Chapter 391-3-6, as amended), whichever is applicable, in the narrative in sufficient detail to support conclusions and recommendations.
  
- (c) **Surface Water Impacted:**  
Document the impact to any surface water body which intersects the dissolved contaminant plume by providing tabulated data and depicting this information on a site map.
  
- (d) **Point of Withdrawal Impacted:**  
Report immediate actions taken to protect human health and safety, such as providing alternative drinking water supplies to those affected. If possible, safe water should be provided immediately where drinking water supplies have been impacted by a release.

**NOTE:** (1) All determinations of petroleum contaminants in soil or groundwater must be performed in conformity with Test Methods for Evaluating Solid Waste (United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, SW-846, Third Edition, as revised) or with an alternate method, as approved by EPD. A vapor monitoring instrument, such as a photoionization detector or organic vapor analyzer, may be used for field screening; however, it **cannot** be used to determine if contaminants identified require corrective action. (Be advised that some heavier petroleum products do not give off sufficient vapors to register on field instruments.) (2) Analysis of soil and groundwater samples for PAHs is not required if affidavits are signed by current and former owners of the facility, or authorized agents thereof, who are familiar with the complete

history of the site's petroleum operations, verifying that, to the best of their knowledge, only gasoline has been stored on that site. A sample affidavit is attached.

5. Other Geologic/Hydrogeologic Data:

The purpose of this section is to document the depth, flow direction, hydraulic gradient of groundwater and any unique geologic/hydrogeologic conditions, so that the most likely path for contaminant transport may be identified early in the project.

(a) Depth to Groundwater:

Document the depth to groundwater in accordance with the Georgia Environmental Protection Division Manual for Groundwater Monitoring, for each monitor or observation well, after the well has stabilized and present the data in Table 4. Include at least the following in Table 4: date and static water level measurement collected, land surface and top of casing elevations, depth of screened interval, free product depth, groundwater depth, free product thickness, and corrected groundwater elevation.

(b) Groundwater Flow Direction:

Flow direction must be determined by gathering site-specific data, and depicted on Figure 6. On the map, show the water table elevations at each monitor well, water table (equipotential) contours, and the inferred direction of groundwater flow.

(c) Hydraulic Gradient:

Document the hydraulic gradient (slope of the water table) from a minimum of two (2) or more groundwater elevations located along the direction of groundwater flow. The hydraulic gradient value is the difference in groundwater elevation per unit of distance between the two (2) elevations. If no well is directly downgradient of another, calculate the hydraulic gradient between contours, as identified on the potentiometric contour map.

\*Potentiometric contour map: a water level map which is a graphical representation of a hydraulic gradient and can be prepared by plotting water-level measurements on a base map and then drawing contours.

$$i = \frac{(\text{gw elev}_1) - (\text{gw elev}_2)}{\text{distance between gw elev}_1 \text{ \& \text{gw elev}_2}}$$

Groundwater elevation measurements used to calculate the hydraulic gradient and compose the potentiometric contour maps should be collected on the same dates.

- (d) Geophysical Province:  
Indicate in what geophysical province the site is located.
- (e) Unique geological/hydrogeological conditions:  
If applicable, indicate (1) whether bedrock was encountered and, if encountered, the bedrock type and the depth of bedrock/soil interface, (2) whether the site is located in a fault zone. If it is, describe the geologic features of the fault, and (3) any other unique geologic/hydrogeological conditions that might change the groundwater flow pathway(s) or direction(s).

**NOTE:** Well installations must be accomplished under the supervision of a Professional Engineer or Professional Geologist registered in Georgia, in accordance with the Water Well Standards Act of 1985, as reenacted. Monitor well installation must be in accordance with the Georgia Environmental Protection Division Manual for Groundwater Monitoring.

6. Corrective Action Completed or In-Progress:

The purpose of this section is to document cleanup measures begun or already completed **after the release has been confirmed**, but before the preparation and submittal of CAP-Part A. These steps may have been initiated to minimize environmental contamination and/or to promote more effective cleanup by removing the source of contamination.

- (a) UST System Closure:  
Document that UST closures were done in accordance with the "So You Want to Close an UST" (GUST-9).

**NOTE:** The Closure Activity Form (GUST-29) must be completed and submitted at least 30 days prior to commencing permanent closure. Amended notification form (EPA-7530-1)/(GUST-42) marked closure, must be completed and submitted in its entirety within 30 days of completing closure activities.

- (b) Excavation and Treatment/Disposal of Backfill Material and Native Soils:  
"Over-excavated material(s)" includes backfill and native soil. Document excavation, volume and destination of excavated materials related to closure activities or site investigation activities. Excavation is the removal of material after the UST

system backfill is removed and it should be limited to a total of 500 cubic yards. Sites that require over-excavation in excess of 500 cubic yards should be evaluated for alternative corrective action methods which may be considered more feasible and economical.

If the excavated material is contaminated below the applicable Threshold Levels or ATLS, it may be returned to the excavation. However, the vertical extent of soil contamination must either be determined to non-detectable levels for BTEX and TPH (and PAHs if products other than gasoline were stored), or a groundwater sample from the contaminated area must be collected and analyzed in order to comply with 40 CFR Part 280.65 (3) and 280.72 (b).

If the excavated materials are contaminated above applicable Threshold Levels or ATLS, do one of the following: 1) have the soils treated or disposed off-site at an EPD-approved facility, in accordance with the guidance document on Petroleum Contaminated Soil Disposal/Treatment (GUST-39), and submit manifests for soil disposition in Appendix IX of the CAP-A document or 2) place the contaminated excavated material back into the excavation and treat it in place in accordance with an approved CAP-Part A and CAP-Part B, and document the activities in Appendix IX of the CAP-A document.

Document satisfactory remediation of contaminated soil by over-excavation with laboratory analytical results of confirmatory sampling (one grab sample per approximately 200 square feet in the bottom of the excavation and one per 30 linear feet along the base of the side walls) in the sides and bottom of the excavation, preferably prior to backfilling with clean soil or soil contaminated below applicable Threshold Levels. Identify sampling locations on a site map, and discuss the sampling procedures that were used. Document proper disposition of contaminated soils by collecting and analyzing one composite sample per approximately 200 cubic yards of excavated soils and submit the laboratory analytical results. Depict the areas and dimensions of the soil excavation on a site map and show the location and concentrations of confirmatory samples.

7. Site Ranking:  
Using site-specific data, rank the site by completing the attached Site Ranking Form in Appendix II of this Guidance Document.

Rank all sites by filling out the Site Ranking Form completely and include it in Appendix X. Present the environmental site sensitivity

score derived for each site on the CAP-A report form, in the appropriate blank provided. Please note that public/non-public water systems or surface water bodies which have been conclusively demonstrated to be either upgradient or not hydraulically interconnected with the contaminant plume should not be included in the environmental sensitivity score calculation. Bedrock wells may not be considered upgradient of the site based on the groundwater flow direction in the surficial aquifer above the bedrock aquifer.

8. Conclusions and Recommendations:

Provide a concluding summary for documentation of activities completed and data collected to either substantiate a recommendation for “No Further Action Required” or a recommendation for a Corrective Action Plan (CAP) Part B. Specify which Threshold Levels apply, by referring to the applicable table and column. If a CAP-Part B is appropriate, a Site Investigation Plan (SIP) will need to be prepared as described in Section IV below.

### III MONITORING ONLY

**A. “Monitoring only” criteria:**

If a score over 1,000 is calculated, the project will require a CAP-B to be prepared. If a score of 1,000 or less is calculated, then a “monitoring only” option may be appropriate and CAP-Part B preparation may be deferred. However, a CAP-Part B may be required for some sites with scores less than 1,000 if deemed necessary by EPD. A site is eligible for Monitoring Only in a CAP-Part A, only if

1. No free product exists; and
2. No water supplies are impacted; and
3. No surface waters are impacted; and
4. No underground utility trenches or vaults are impacted; and
5. Environmental Sensitivity Score of site ranking is less than 1,000.

**B. Monitoring Only Plan Guidelines:**

If “monitoring only” is proposed, submit a Monitoring Only Plan as part of CAP-Part A. The USTMP will not be able to evaluate the “monitoring only” proposal without this plan. A Monitoring Only Plan should include monitor points, period and frequency and reporting, monitoring parameters, and a milestone schedule.

1. Monitor Points:

Gauge and sample all groundwater monitor wells on-site, including

existing monitor wells and any additional monitor wells necessary to be installed. If it is necessary to install any additional monitor well(s), indicate the proposed locations(s) of the well(s) on a site map in CAP-Part A.

2. Period and Frequency of Monitoring and Reporting:  
In order to observe the trend of natural biodegradation effects and any unexpected increase in dissolved contaminant concentration, a minimum of two years of monitoring is necessary. Sample the wells twice per year (semi-annually), and submit a report within 45 days after each monitoring event.
3. Monitoring Parameters:  
Monitoring parameters must include BTEX if the released substance was gasoline, and PAHs if PAHs were detected above applicable standards for drinking water or surface water in the initial site investigation in the CAP-Part A.
4. Milestone Schedule:  
Submit a milestone schedule in the Monitoring Only Plan in a CAP-Part A, listing the major events and a timetable to implement and complete the monitoring plan.
5. Monitoring Report Format:  
Submit a monitoring report using Monitoring- Only Template, including: (1) a brief project summary with a site history and a brief chronology of environmental events leading up to the report; (2) a brief summary of findings including current and historical groundwater potentiometric surface data and laboratory analytical data; (3) a current site ranking based on new data; (4) conclusions and recommendations; and (5) if applicable, a claim for reimbursement.
6. Scenarios for site closure or CAP-Part B:  
1) No-Further-Action-Required (NFAR) may be proposed for the release if soil concentrations have always been measured below alternate threshold levels and if groundwater contamination has always been measured below applicable water quality standards. OR  
2) If soil and/or groundwater contamination is above applicable thresholds and water quality standards, but the site meets the criteria for “monitor only”, the site may eventually qualify for “No Further Action” after monitoring for two years. This is conditioned on the evaluation of future ranking and monitoring data for several sites, which may indicate that a change in the Rules for UST Management is advisable to allow “No Further Action” in some cases where a CAP-B is now required by the Rules. Ranking data and monitoring data submitted through CAP-A’s under this new format will be used to evaluate possible Rule changes regarding site closure. If the environmental sensitivity score is above 1,000 for two consecutive

monitoring events, CAP-Part B preparation should be recommended and a Site Investigation Plan (SIP) must be submitted substituting a monitoring report. If the environmental sensitivity score exceeds 1,000 for more than two non-consecutive monitoring events, the USTMP will evaluate whether such releases will require preparation of the CAP-Part B, on a site-by-site basis.

#### IV SITE INVESTIGATION PLAN

This section serves to propose a site investigation plan to delineate the full extent of soils and/or groundwater contaminated by the release and to furnish information on relevant aquifer parameters needed to design the proposed soil and/or groundwater remediation system(s). A milestone schedule listing specific events and a timetable to implement the SIP and prepare a CAP-Part B must be submitted in this section. Subsequent to CAP-Part A approval, implement the Site Investigation Plan (SIP) and submit the data obtained during the site investigation in the form of tables, a site map showing the extent of contamination, contaminant concentrations, and the direction of groundwater flow in a Site Investigation Summary. In addition, provide a brief cover letter summarizing significant findings and recommendations. This data should be the minimal amount of information needed to support invoices for reimbursement of the site investigation activities, if applicable. **This information will be discussed with the involved parties at the Site Investigation Review Meeting unless the meeting is determined unnecessary by EPD.** Only the costs associated with the implementation of the SIP and the preparation of the Site Investigation Summary are reimbursable as part of the CAP-Part A, per GUST-91. The costs of preparation of the CAP-Part B report are reimbursable only under a CAP-Part B Corrective Action Agreement. The EPD will direct in writing the preparation of a CAP-Part B.

**NOTE:** The information obtained during the implementation of the SIP will later be incorporated into the Site Investigation Report (SIR), which is submitted to EPD as part of CAP-Part B. The SIR includes the data discussed during the Site Investigation Review Meeting, topographic, potentiometric and site maps showing the extent of contamination, a narrative summarizing the site history, source(s) of contamination, results of the investigation and recommendations. The costs associated with the SIR preparation are reimbursable as part of CAP-Part B, and should **not** be included in the cost estimates to complete CAP-Part A.

The SIP is a proposal for determining the following site-specific information:

**A. Horizontal and Vertical Extent of Contamination:**

Propose activities to determine and display the extent of contamination, including contaminant concentrations at the confirmed source, in soils, groundwater, and surface water on site maps. In addition, summarize all analytical data in tabular format.

1. Soils:

Propose activities to horizontally delineate soil contamination for each BTEX and PAH constituent, until laboratory test results indicate contaminant concentrations are below applicable Table A or B Threshold Levels or Alternate Threshold Levels if applicable. Also propose activities to vertically delineate the soil contamination for each BTEX and PAH constituent, until laboratory test results indicate that contaminant concentrations are below laboratory detection limits, including soil at and below the groundwater table. If the maximum soil contamination is identified below threshold levels (Applicable Table A or Table B Threshold Levels or calculated site-specific Alternate Threshold Levels) or if the soil contamination has been delineated below the applicable threshold levels, no additional soil sampling is required.

Field screening devices should be utilized to determine which samples should be submitted for laboratory analysis, but cannot be used to determine if identified contamination requires corrective action. (Be advised that vapors from some heavier petroleum products are not present at concentrations high enough to register on field instruments.)

Propose the preparation of figures that depict the soil contaminant concentrations for each sampling location, in mg/kg, including the sample's depth, on a site map, as well as on cross sections. Multiple soil contamination maps may be necessary.

2. Groundwater:

Propose activities to delineate the plume(s) of free product and dissolved contamination both vertically and horizontally, as applicable, beginning at the source of contamination or worst-case location, until laboratory test results indicate contaminant concentrations are less than the Federal and State Maximum Concentration Levels (MCLs) for Safe Drinking Water or In Stream Water Quality Standards, as applicable, and the plume is defined. Be advised that this may require off-site access to adjacent properties.

(a) Identify the horizontal and vertical extent of free product on a site map and cross sections, respectively. Plot free product thickness in feet, to the nearest one-hundredth.

(b) Identify the horizontal and vertical extent of dissolved contamination on a site map and cross sections, respectively. Plot isoconcentration contours and reference the concentration of each constituent (BTEX/PAH) for each sampling location in  $\mu\text{g/l}$ .

3. Surface Water:  
Propose activities to assess the impact to surface water bodies that intersect the dissolved contaminant plume. Plot the sampling location(s) and concentration(s) on a site map.

**B. Vadose Zone and Aquifer Characteristics:**

Propose activities to determine site specific vadose zone and aquifer characteristics needed to design a remedial system(s) or conduct a risk assessment, while considering whether corrective action is necessary for soil, groundwater, or both. Document results in a tabular format. Provide supporting documentation that includes, but is not limited to, references, documentation, measurement locations, basis for assumptions and methodology for the following characteristics:

1. Vertical Soil Permeability (Optional):  
Defined as the soil's capacity to transmit fluids from the surface to the water table. This value is used to perform vadose zone modeling, for example. Field conditions will dictate whether the unsaturated or saturated permeability is necessary. Obtain data from site specific laboratory analysis. Laboratory analysis in accordance with American Society for Testing & Materials (ASTM) Methods may be used, as appropriate, to determine soil permeability. For example:
  - (a) ASTM Method D 2434-68 may be utilized with natural deposits as placed in fill sections, or when used with base courses under pavements. This procedure is limited to disturbed granular soils containing not more than 10% soil passing the 75  $\mu\text{m}$  (No. 200) sieve.
  - (b) ASTM Method D 5126 may be used to measure vertical unsaturated hydraulic conductivity in a soil sample.
  - (c) ASTM Method D 5084-90 may be used to measure vertical saturated hydraulic conductivity in an undisturbed sample of soil with a hydraulic conductivity equal to or less than  $1 \times 10^{-3}$  cm/s.
  - (d) ASTM Method D 1587 may be used to collect an undisturbed soil sample which may be analyzed by Section 2.8 or Section 2.9 of Method 9100 of SW-846 to determine vertical soil permeability.

**NOTE:** Contact ASTM at (215) 299-5400 to receive copies of ASTM Methods.
2. Infiltration Rate (Optional):  
This is defined as the rate in which a liquid can enter the soil under specified conditions and it has the dimensions of velocity (e.g., cm/s). This value is necessary to design systems for the disposal of treated groundwater and any other treatment systems through the application

of fluid to the land surface or to an infiltration gallery or trench system. This value is necessary to determine whether such a system will result in surface runoff of treated groundwater and unpermitted discharges into nearby drainage features and surface waters. The following ASTM Methods may be used to determine infiltration rates:

- (a) ASTM Method D 5093-90 may be utilized as a field measurement of infiltration rate using a double-ring infiltrometer test with a sealed inner ring. This test method may be used for soils with an infiltration rate between  $1 \times 10^{-5}$  cm/s and  $1 \times 10^{-8}$  cm/s. This method states which soils with an infiltration rate less than  $1 \times 10^{-5}$  cm/s shall be analyzed by ASTM Method D 3385-88 rather than by ASTM Method D 5093-90.
- (b) ASTM Method D 3385-88 may be used to determine the infiltration rate of soils with infiltration rates between  $1 \times 10^{-2}$  cm/s and  $1 \times 10^{-6}$  cm/s.

- 3. Saturated Horizontal Hydraulic Conductivity ( $K_s$ ):  
Defined as the proportional rate at which water can move through the subsurface. This data, obtained from site specific field analysis, is used to design groundwater remediation systems and perform risk assessments for groundwater contamination. Utilize raw data and interpretive analysis of slug tests or pump tests and/or tracer studies to support calculations. EPD recommends the use of a data logger to obtain accurate slug test results from three independent slug tests, which should be analyzed using the Bouwer and Rice Method (Water Resources Research, V.12, pp.423-428, 1976 and Update).
- 4. Total Organic Carbon (Optional):  
Amount of naturally occurring organic carbon contained in soil, which can be determined from one uncontaminated sample. This data is used to design groundwater remediation systems and perform risk assessments for groundwater contamination. Utilizing SW-846 test methods, provide laboratory analytical data with results expressed in mg/kg.
- 5. Dissolved Iron (Optional):  
Amount of iron dissolved in groundwater. This data is used to design groundwater remediation systems. Provide laboratory analytical data with results expressed in mg/l.
- 6. Effective porosity ( $n_e$ ):  
Defined as the ratio of the void space through which flow can occur to the total volume of a soil sample. This data is used to design groundwater remediation systems and perform risk assessments for groundwater contamination. The effective porosity is approximately equal to specific yield and is generally measured by pumping tests. If

typical values are utilized, document literature from which the values were obtained. Note that effective porosity is not the same parameter as total porosity and cannot be determined by the same methods used to calculate total porosity.

7. Seepage Velocity ( $v_s$ ):

Defined as the speed groundwater moves through the soil, relative to hydraulic gradient ( $i$ ), hydraulic conductivity ( $K$ ) and effective porosity ( $n_e$ ). This data is used to design groundwater remediation systems and perform risk assessments for groundwater contamination. The following equation may be used:

$$V_s = \frac{(K) \times (i)}{n_e}$$

8. Grain-size Distribution (Optional):

This data is used for determining Alternate Threshold Levels for soil, if you are proposing to calculate them after the CAP-Part A has been submitted. Grain-size distribution is determined by laboratory analysis of soil collected from the depth interval between the contaminated soil and the water table. ASTM Method D 422-63 may be used to determine grain-size distribution of all grain sizes. ASTM Method D 1140-92 may be used to more accurately determine the amount of material in soils that are finer than the No. 200 sieve.

9. Total Petroleum Hydrocarbons (TPH) (Optional):

This data can be used in the calculation of Alternative Concentration Limits (ACLs) for soil, if not using EPD assumed values, and if you are proposing to calculate ACLs in the CAP-B using the model included in Appendix C of the CAP-Part A guidelines. In order to more accurately calculate the total organic carbon of the contaminated soil and the contaminant concentration in the soil pore water, you may determine the TPH concentration in the contaminated soil in mg/kg. Refer to Table 1 for TPH analytical methods.

10. Pilot Test(s):

Pilot testing is a treatability study designed to provide the detailed cost and design data required to optimize a treatment technology's performance and to provide information in support of remediation implementation. Submit all results and permit applications as a part of CAP-Part B, Section III.C for review, approval and processing. One or more of the following pilot tests are required in most cases where treatment is determined to be necessary in order to select the most cost-effective method of treatment and to design the most effective system:

- (a) Pump-and-Treat System Pilot Tests: Perform pilot tests to determine the effectiveness of the system and to support the proposed number of extraction wells.
- (b) Soil Vapor Extraction Pilot Tests: Perform pilot tests to determine the radius of influence and to support the proposed number of extraction wells.

**NOTE:** Permits for discharges/injections to the subsurface must be obtained from the Geologic Survey Branch of EPD.

The Underground Storage Tank Management Program (USTMP) will coordinate the approval for any discharges to the air or surface water that are generated during the site investigation. Contact the USTMP prior to selecting corrective action alternatives to determine if emission controls are required and to facilitate the timely issuance of consent agreements and permits, as appropriate. Approval for any wastewater discharges to public sewers must be coordinated with local wastewater treatment authorities.

## V PUBLIC NOTICE:

Public notification must be by certified mail (return receipt requested) unless another form of notice, in compliance with the intent of public participation, **is approved by EPD**, such as an announcement in a newspaper. If a newspaper announcement is used, the newspaper must be the one of general circulation in the area. Newspaper announcements must be pre-approved by EPD and must effectively notify potentially affected parties. EPD will compare the effectiveness of such an announcement to that of certified letters, and will approve it when deemed as effective. Newspaper announcements must be published two times, once per week during the public notice period, and must include a Sunday edition, if available. Post a copy of the newspaper notice contents on the subject site, adjacent to the public right of way or public approach to the property with a minimum sign size of 8 ½ inches by 14 inches with lettering that covers not less than 2/3 of the posted notice.

- A. Complete the public notice **simultaneously with or prior to the submittal of CAP-Part A** for EPD review. The CAP-Part A will not be reviewed until the return receipts are received by the EPD, if public notice was performed using certified letters.
- B. As a minimum, notify the following members of the public by certified mail that a CAP-Part A has been submitted:
  - 1. The property owner of the UST site, if not the CAP-Part A proponent.
  - 2. All owners of property contiguous to the UST site, including local, county or state officials responsible for public rights-of-ways. In addition, other property owners whose property is potentially affected by the release and/or the proposed CAP-Part A. Send the public notices to each property owner of record for tax purposes as shown in the local property tax records.
  - 3. The elected head of the municipal or county government where the UST site is located.
- C. Use the sample notice letter attached in Appendix B so that the information content and format of the public notice letter conform to the sample. If a newspaper announcement has been approved by the EPD, use the sample newspaper announcement included in Appendix B so that the notice conforms with the sample. Additional information may be included at the discretion of the CAP-Part A proponent. As stated in the sample notices, a public display copy must be made available at a nearby location that is identified in the letter. A copy should be made available at the nearest city hall, regional public library, or county courthouse, in addition to the copy for EPD's files.

- D. Provide the following supporting documentation in this section of CAP-Part A:
1. A property tax map keyed to identify the UST site and the ownership of each parcel included in the public notification.
  2. A copy of each notification letter; attach a copy (both sides) of the signed return receipt.
  3. A copy of the newspaper page in which the announcement appeared, if applicable. Document the frequency and duration of the announcement's display.

**VI CLAIM FOR REIMBURSEMENT (CAP-Part A): GEORGIA UNDERGROUND STORAGE TANK (GUST) TRUST FUND:**

**A. GUST Trust Fund Application (GUST-36):**

Revised 7/95: This section is included, if applicable, as a separate volume to CAP-Part A if the UST owner or operator is filing a claim for reimbursement of reasonable cleanup expenses, in excess of \$10,000, from the GUST Trust Fund. If GUST Trust Fund reimbursement is being sought, a completed GUST-36 and demonstration that Environmental Assurance Fees (EAFs) have been paid must be submitted with CAP-Part A.

1. The UST owner or operator **must** state in the CAP-Part A transmittal letter that submission of the CAP-Part A also constitutes a claim for reimbursement in accordance with paragraph 391-3-15-.13(1)(e)2 of the GUST Rules.
2. To support the claim, the information listed below must be included in this section or appendices, as appropriate, with pages three-hole punched.
  - (a) Demonstration that the EAF was paid on each gallon of petroleum product purchased after July 1, 1988, for storage at the location where the leak occurred. There are three (3) generally acceptable methods used to demonstrate EAF payment requirements: Owner/Operator Certification, Certified Public Accountant (CPA) Certification, or copies of paid invoices and appropriate inventory methods. **Records/invoices must be maintained when using the Owner/Operator Certification, or CPA Certification methods.** When necessary, a combination of these methods may be used on a case-by-case basis.
    - (i) **Owner/Operator Certification** method should be used when the owner and/or operator submits an affidavit certifying that he has personally examined the EAF payment records for the facility, which show that all EAFs were paid to the petroleum supplier identified in the

affidavit, as required for participation in the GUST Trust Fund. In addition, the supplier(s) as identified in the Owner/Operator affidavit must certify that the EAFs were collected for that facility and paid into the GUST Trust Fund. If the owner/operator and supplier are one and the same, then only the Owner/Operator Certification needs to be submitted with adequate explanation. Sample affidavits are attached to the GUST-36 Document. (A copy with original signatures must be submitted.)

**OR**

- (ii) **CPA Certification** method may be used when a CPA has maintained the financial records for the facility in the regular course of business. The CPA is certifying that through his/her review of appropriate documents, the EAFs have been paid as required by the Act for participation in the GUST Trust Fund. The CPA's registration number must be included in the certification.

**OR**

- (iii) **Actual Invoices for Purchases** method requires all invoices for petroleum purchases from July 1988 through the present. The bulk inventory records will also need to be submitted for the same period of time.
- (b) **Compliance Certification:** Demonstration of compliance can be achieved by using the "COMPLIANCE CERTIFICATION" form, attachment B-1 through B-3. This form is a part of the GUST-36 application. Through accurate completion and signing of this form, the owner or operator CERTIFIES that the facility was being operated in compliance with major statutory and rule requirements at the time the release occurred. Once the certification form is completed, signed and returned to EPD, the application will be processed and eligibility for GUST Trust Fund coverage will be determined.
  - (c) **Copies of paid invoices**, or other records acceptable to EPD, with adequate backup and proof-of-payment documentation must be provided as part of the Claim for Reimbursement to verify expenses already incurred by the UST owner or operator that qualify as necessary and reasonable corrective action costs eligible for reimbursement, including the initial \$10,000 deductible. Costs submitted for payment on the GUST Trust Fund Application for Reimbursement (AFR) must be submitted in the attached GUST-91 format. Also include a summary page itemizing each invoice, indicating the reimbursable costs

incurred, and those costs for which reimbursement is not being sought.

**B. Cost Proposal:**

This section is only applicable to sites eligible for Georgia Underground Storage Tank (GUST) Trust Fund coverage, based on payments of Environmental Assurance Fees (EAF) and completed Compliance Certification or satisfactory compliance evaluation of the USTs in accordance with the GUST Rules. A claim must be included simultaneously with CAP-Part A as a separate volume if the UST owner or operator is filing a claim for reimbursement of reasonable, eligible cleanup expenses, **in excess of the \$10,000 deductible**, from the GUST Trust Fund.

1. Non-Reimbursable Costs: Costs incurred prior to release confirmation are not eligible for reimbursement and can not be applied towards the \$10,000 deductible. Costs not related to corrective action tasks are also not covered by the GUST Trust Fund. Non-reimbursable costs are outlined in the GUST-59 guidance document for GUST Trust Fund reimbursable and non-reimbursable costs.
2. Reimbursable Costs: Costs reimbursable from the GUST Trust Fund are for tasks directly associated with release response and corrective action related to a confirmed release. Tasks completed and anticipated must be outlined individually showing the costs incurred to date as well as those estimated. Reimbursable costs are outlined in the GUST-59 guidance document for GUST Trust Fund reimbursable and non-reimbursable costs.
  - (a) Invoices and Proofs-of-Payment: The claim for reimbursement of expenditures to date must detail actual expenses already incurred, up to the time of CAP-Part A submittal, including the \$10,000 deductible, per GUST-91. It must be subdivided into these descriptive headings, as applicable: Initial Response-abatement and free product removal; Initial Site Characterization; and Site Investigation Plan. Copies of **paid** invoices for costs incurred to date must be submitted.
  - (b) Total Project Costs: Submit an estimate of the total projected costs, per GUST-91, to complete the CAP-Part A. These include implementation of the SIP and preparation of the data tables and site map to discuss at the Site Investigation Review Meeting, per GUST-91.
  - (c) Reimbursement: Payment for approved and eligible reimbursements will be made after a properly certified Application for Reimbursement, GUST-4A, has been received, and EPD considers the costs to be reasonable. Two party checks will not be issued for CAP-Part A reimbursement.

- (d) Proposed Schedule for Reimbursement: Include a schedule of planned reimbursement application submittals, including the total number of applications, which will be submitted for CAP-Part A reimbursement. This schedule should not propose reimbursements more frequently than quarterly for SIP implementation and CAP-Part A completion. If an acceptable schedule is not proposed, then only **two** lump sum reimbursements will be processed: when the CAP-Part A Corrective Action Agreement (CAA) has been executed and after the Site Investigation Review Meeting, provided that additional field work is not required prior to CAP-Part B submittal.

**APPENDIX A**

**TABLES**

TABLE 1

**LABORATORY METHODS FOR SOIL AND GROUNDWATER ANALYSIS**

*Make sure your laboratory is familiar with the requirements of this table and this document*

SUBSTANCE STORED	CONSTITUENT	SOIL SAMPLING & ANALYSIS METHODS	GROUNDWATER SAMPLING & ANALYSIS METHODS
Gasoline or Aviation Gas Only (Affidavit Required)	BTEX TPH-GRO	5035-8021B <sup>1</sup> OR 5035-8260B <sup>1</sup> ; AND 5035-8015B-GRO	5030-8021B <sup>1</sup> OR 5030-8260B <sup>1</sup>
Jet Fuel A, Jet Fuel B, Mineral Spirits or Unknown Petroleum Contents, Diesel, Kerosene, Fuel Oil (#2, #4, #5, or #6), Motor Oil, Used Oil, Hydraulic Oil <sup>3</sup>	BTEX PAHs TPH-GRO TPH-DRO	5035-8021B <sup>1</sup> OR 5035-8260B <sup>1</sup> ; AND 8270C/8310/8100 <sup>2</sup> AND 5035-8015B-GRO AND 8015-DRO	5030-8021B <sup>1</sup> OR 5030-8260B <sup>1</sup> AND 8270C/8310/8100 <sup>2</sup>

- 1) For Methods 8021B, 8260B, and 8015B-GRO (i.e. methods used to test for organic volatiles), use preparation and sampling Method 5035 for soil samples. Consult your analytical laboratory for required field equipment and field procedures. **Method 8260B is usually preferred over Method 8021B because Method 8260B is better able to identify regulated and interfering compounds and MTBE, whereas Method 8021B may misidentify some compounds as being regulated when they are not, may not be able to identify interfering compounds, and may provide false-positive results for MTBE.** Please request your laboratory to provide MTBE data if Method 8260 is used.
- 2) Be aware that if PAHs are detected using Method 8100, you must use Method 8270C or 8310 to determine the concentrations of the individual PAHs.
- 3) For example, hydraulic oil stored in USTs not connected to hydraulic equipment. Refer to the GUST Rules for details (391-3-15-.02.2(l)).
- 4) TPH-GRO and TPH-DRO analysis of confirmation soil samples is not required if groundwater samples are collected at the worst-case locations (see Section II.A.1.)
- 5) If Aviation Gasoline was stored, also analyze soil samples for Lead.

TABLE 2

**LABORATORY ESTIMATED QUANTITATION LIMITS FOR SOIL AND GROUNDWATER SAMPLES**

*Make sure your laboratory is familiar with the requirements of this table and this document*

METHOD	5035-8021B	5030-8021B	5035-8260B	5030-8260B
SAMPLE TYPE	Soil	Groundwater	Soil	Groundwater
Benzene	1-5 ug/kg	1-5 ug/l	5 ug/kg	5 ug/l
Toluene	1-5 ug/kg	1-5 ug/l	5 ug/kg	5 ug/l
Ethylbenzene	1-5 ug/kg	1-5 ug/l	5 ug/kg	5 ug/l
Xylenes (for each isomer)	1-5 ug/kg	1-5 ug/l	5 ug/kg	5 ug/l
METHOD	8100 <sup>1</sup> , 8270, or 8310	8100 <sup>1</sup> , 8270, or 8310		
Each PAH Constituent	660 ug/kg	10 ug/l		
METHOD	8015B-GRO OR 8015B-DRO			
TPH GRO & DRO	10 mg/kg	N/A		

- 1) Be aware that if PAHs are detected using Method 8100, you must use Method 8270C or 8310 to determine the concentrations of the individual PAHs.
- 2) See Section II.A. of these guidelines for a more detailed explanation of expected estimated quantitation limits.

Note: the above information was obtained from the EPA SW-846 analytical guidelines. Further information on estimated quantitation limits (EQLs), commonly reported as "detection limits" by laboratories, is available in SW-846 on EPA's website at [www.epa.gov/epaoswer/hazwaste/test/sw846.htm](http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm).

**APPENDIX B**

**SAMPLE PUBLIC NOTICES AND AFFIDAVIT**

# OWNER/OPERATOR AFFIDAVIT OF CONTENTS OF USTS

## State of Georgia

County

Personally appeared before me, the undersigned attesting Authority in and for said State and County, the following deponent, who being first duly sworn, on oath deposes and says as follows:

- 1) That I am the (previous) owner/operator, or authorized agent thereof, of the following facility:

Facility Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Facility ID: \_\_\_\_\_

**--CHOOSE ONE--**

- 2) That as the owner/operator, or authorized agent thereof, of the facility from (month) of 20\_\_, when the facility was constructed, until the present time, I have knowledge that only gasoline has been stored in and sold from the current or prior Underground Storage Tank(s) (USTs) on site. I also have knowledge that diesel fuel, fuel oil, used oil, or other petroleum hydrocarbons, other than gasoline have never been stored in or sold from the current or prior UST(s) on site.

**OR**

- 2) That as the previous owner/operator, or authorized agent thereof, of the facility from (month) of 19\_\_ when the facility was constructed until (month) of 20\_\_ when the facility was sold to (current owner), I have knowledge that, during my ownership, only gasoline has been stored in and sold from the Underground Storage Tank(s) (USTs) on site. I also have knowledge that (during my ownership) diesel fuel, fuel oil, used oil or other petroleum hydrocarbons, other than gasoline, have never been stored in or sold from the UST(s) on site.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

(Title) \_\_\_\_\_ (Company) \_\_\_\_\_

Sworn to and subscribed before me this

(day) day of (month), (year).

Notary Public

Public Notification Letter

**[I. M. Tankowner Company Letterhead]**

Date  
**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

U. R. Landowner  
123 Main Street  
Anywhere, Georgia 09876

SUBJECT: Notification of Corrective Action Plan  
Underground Storage Tank Release:  
I. M. Tankowner Store No. 3  
135 Main Street  
Anywhere, GA; Some County  
EPD Facility ID:

Dear Ms. Landowner:

This is to inform you that the Georgia Environmental Protection Division (EPD) has required the I. M. Tankowner Company to prepare a plan to investigate and/or remediate contamination of soil and/or groundwater caused by a release from underground storage tanks at the subject location. This plan will be submitted to the Georgia Environmental Protection Division for review on or before \_\_\_\_\_, 20\_\_.

The Georgia Rules for Underground Storage Tank Management require that we notify members of the public most directly affected by our plans. As the owner of property near the release site, you may be one of these persons.

If you want a copy of the plan to examine, please contact **[personal contact for corrective action plan proponent]** at **[phone number with area code]**; a copy will be mailed promptly at a nominal fee. Or you may review the public display copy at **[name of local public facility, address and phone number]**.

If you desire to make **comments** on our plan, or to examine the Georgia EPD's files, you should contact the Corrective Action Unit, Underground Storage Tank Management Program at (404)362-2687. The Underground Storage Tank Management Program will accept comments on this plan until **[specific date at least 30 days after corrective action plan submittal]**. Their mailing address is:

Underground Storage Tank Management Program  
4244 International Parkway, Suite 104  
Atlanta, Georgia 30354.

Should you have questions of I. M. Tankowner Company, please contact the undersigned at **[phone number with area code]**.

Sincerely,

I. M. Tankowner  
President

IMT:  
cc: Georgia EPD, USTMP

NEWSPAPER NOTICE SAMPLE

The Georgia EPD (GEPD) has required the I.M. Tankowner Co. to prepare a Corrective Action Plan Part-A to investigate and/or clean up contamination at the I.M. Tankowner Store No. 3 located at 135 Main St., Anywhere, GA. This plan will be submitted to the GEPD on or before \_\_\_\_\_, 20\_\_\_. If you want to examine a copy of the plan, a public display copy is available for review at the \_\_\_\_\_ library at 234 E. Main St., Anywhere, GA, (\_\_\_\_) \_\_\_\_ - \_\_\_\_\_, of if you contact **[personal contact for responsible party]** at (\_\_\_\_) \_\_\_\_ - \_\_\_\_\_, a copy will be mailed at a nominal fee. Comments to the plan will be accepted until **[specific date at least 30 days after corrective action plan submittal to the EPD]**. And should be directed to the GEPD at (404) 362-2687. Mailing address: GEPD USTMP, 4244 International Parkway, Suite 104, Atlanta, GA 30354. Any questions for I.M. Tankowner Co. Should be directed to **[contact name]** at **[phone number]**.

**APPENDIX C**

**GUIDELINES FOR CALCULATING ALTERNATE THRESHOLD  
LEVELS FOR CONTAMINATED SOILS**

**GUIDELINES FOR CALCULATING ALTERNATE THRESHOLD LEVELS  
FOR CONTAMINATED SOILS**

**EPD ADVISES THAT YOU READ THIS BEFORE YOU START THE ASSESSMENT**

**INTRODUCTION**

This is the method for calculating Alternate Threshold Levels (ATLs). The parameter value assumed by the EPD may be used in calculating ATLs when site-specific data is unavailable for that parameter. However, unless each parameter is directly measured by laboratory analysis of samples collected from the site and by field measurements, a grain-size distribution analysis (sieve analysis and hydrometer analysis) of soil samples collected from the vadose zone is required to calculate ATLs unless the EPD assumed “worse case” values for soil parameters, listed on pages C-13 through C-16, are used. Estimation of soil parameters from Figures 1 through 5 using boring log descriptions is not acceptable, in light of the subjective nature of those descriptions. As mentioned, some parameters (e.g., soil moisture content) may be measured through laboratory analysis instead of estimated through grain-size distribution results and Figures 1 through 5. A geotechnical laboratory should be able to provide additional information on soil parameter measurement methods. However, since the method of direct field measurement of the Green-Ampt wetting front suction is unfamiliar to most, alternatively, it must be estimated by grain-size distribution analysis of soil samples or the EPD-assumed “worse case” values must be used for this parameter. Comparison of the relative low cost of performing grain-size distribution analysis to the higher cost of soil remediation suggests that the owner/operator should have a soil sample collected prior to preparation of a CAP-Part A and have a grain-size analysis performed on it if soil exceeds applicable Table A/Table B Thresholds.

The following method of evaluating the risk for contaminated soils is intended to provide a preliminary determination of the concentration of petroleum constituents which could be allowed to remain in the soil without impacting groundwater above levels which could endanger human health and the environment. The primary goal of this cursory risk evaluation is to prevent the groundwater directly beneath the contaminated soil from exceeding Federal Drinking Water maximum contaminant levels (MCLs) at sites with points of withdrawal within the radii of concern and to prevent the groundwater directly beneath the contaminated soil from exceeding Georgia In-Stream Water Quality Standards in areas where no points of withdrawal lie within the radii of concern. Exposure via vapors from soil contamination will be dealt with on a case-by-case basis.

This method was selected because it is based on well-known, peer-reviewed published literature and includes relatively simple one-dimensional equations for transport in the unsaturated zone. These equations were used by John A. Menatti, et al., (1994) to model the fate and transport of hydrocarbons in the vadose zone. The method of estimating soil parameters from grain-size analysis is based on peer-reviewed published work performed by the US Department of Agriculture (USDA) by W.J. Rawls and D.L. Brakensiek (1989).

The assumptions used by the EPD to calculate the soil threshold levels are also attached in pages C-13 through C-16. Using this method will reduce the amount of time required to review and approve this portion of CAP-Part A.

ATLs for contaminated soil may be calculated under a variety of circumstances, as outlined below:

- 1) If groundwater has not been impacted above applicable water quality standards.
- 2) If groundwater has been impacted above applicable water quality standards.
- 3) If impacted soils are above the water table.

**Note:** ATLs may be calculated for impacted soils submerged below the water table using only Equation Set I (the fractional organic carbon content and the fugacity (partitioning) equations). Since the contaminated pore water ( $C_w$ ) has no distance to travel to the water table, the concentration in the pore water will be equal to the concentration in the groundwater ( $C_f$ ), under the assumptions of this one-dimensional method. Therefore, use only Equation Set I for this circumstance, and  $C_f = C_w$ .

Calculation of Alternate Concentration Limits for soil may be performed in CAP-Part B utilizing the ATL equations in conjunction with a groundwater flow model to predict the groundwater impact at the point of compliance or potential receptor of contaminated soil, or by using an alternate verified soil transport model and groundwater model.

Because asphalt and concrete are not permanent, and the EPD does not have the regulatory authority to place deed restrictions on land to enforce the upkeep of an impermeable cover above contaminated soil, the EPD does not consider a currently paved site to be impermeable to rainfall. Asphalt and concrete usually contain cracks and imperfections which result in some infiltration of surface runoff. Therefore,  $H_w$  should not be set to zero based on the fact that the site is paved.

## **DEFINITIONS**

- $f_{cs}$  Fractional organic carbon content ( $f_{cs}$ ) of contaminated soil in decimal percent (calculated)
- TPH Total Petroleum Hydrocarbons in mg/kg (laboratory analyzed)
- TOC Total Organic Carbon content (natural) of uncontaminated soil in mg/kg (field measured)
- $C_w$  Concentration of each contaminant in soil pore water in mg/l (calculated)
- $C_s$  Worst case soil concentration for each contaminant which exceeds applicable threshold levels (provided in GUST Rule 391-3-15-.09 Tables A and B) in mg/kg (laboratory analyzed)
- $K_{oc}$  Soil/water partitioning coefficient of the contaminant in ml/g (from Table 1, "Soil Water Partitioning Coefficients")
- $\phi$  **Total** porosity in decimal percent (from Figure 2, "Porosity")
- $\theta_r$  Residual water content in decimal percent (from Figure 3, "Brooks and Corey Residual Water Content")
- $f$  Air-filled porosity of soil in decimal percent (calculated)
- $t$  Time in seconds required for water to travel distance  $L$  (calculated)
- $K_u$  Unsaturated soil hydraulic conductivity in cm/sec (approximately 1/2 of the  $K$  value obtained from Figure 5, "Saturated Hydraulic Conductivity")
- $K_{sat}$  Saturated hydraulic conductivity in cm/sec (from Figure 5)
- $L$  Distance in cm from the depth of the soil exhibiting the highest concentrations to the water table (field measured)
- $H_w$  Average annual recharge in cm (from published literature or use 25 cm)
- $H_f$  Wetting front suction in cm (from Figure 1, "Green and Ampt Wetting Front Suction")
- $V_w$  Downward velocity of water in feet per year (calculated)
- $K_d$  Soil-water distribution coefficient for uncontaminated soil in ml/g (calculated)
- $V_c$  Contamination percolation rate in ft/year (calculated)
- $B_d$  Bulk Density in  $g/cm^3$  (from Figure 4, "Mineral Bulk Density")
- $T_c$  Time in days required for contaminant to reach groundwater (calculated)

## DEFINITIONS (continued)

$C_f$  Final contaminant concentration in  $\mu\text{g/l}$  in soil pore water at the water table (calculated)

$t_{1/2}$  Biodegradation 1/2-life of contaminant in days (from Table 2)

$dh/dl$  Hydraulic gradient (dimensionless - calculated from field measurements)

$N_e$  Effective porosity (dimensionless - estimated from specific yield from peer-reviewed published literature)

$R$  Retardation (dimensionless - calculated)

ATL Alternate Threshold Level concentration in  $\text{mg/kg}$

$C_{\text{STD}}$  Applicable water quality standard concentration in  $\mu\text{g/l}$

## CALCULATIONS

These calculations predict the contaminant concentration in groundwater from leaching of contaminated soil and may provide an Alternate Threshold Level (ATL) for contaminated soil.

This method of evaluating the risk for contaminated soils employs a combination of vadose-zone transport equations (based on peer-reviewed published work by Menatti et al.) and methods of estimating hydraulic properties from grain-size distribution data (based on research by Rawls and Brakensiek). The equations include the Green-Ampt equation, the fugacity (partitioning) equation, the retardation equation, and a biodegradation function. The vadose-zone transport equations may be programmed into a spreadsheet, or performed using a calculator.

### **Equation Set I - Determines soil pore water concentration resulting from physical partitioning ( $C_w$ ):**

#### **Step 1:**

Calculate the fractional organic carbon content ( $f_{cs}$ ) of the contaminated soil using the following equation:

$$f_{cs} = \left( TOC + \frac{TPH}{1.724} \right) \times (1 \times 10^{-6})$$

**Step 2:**

Determine contaminant concentration in soil pore water directly in contact with contaminated soil. Equilibrium contaminant partitioning between sorbed and aqueous phases can be described by the following equation:

$$C_w = \frac{C_s}{(K_{oc} \times f_{cs})}$$

Because the most conservative situation is assumed (only physical partitioning of the contaminant), the value for  $C_w$  is most likely to exceed the MCL of concern. The remaining equations are utilized to account for infiltration velocities, attenuation and biological degradation effects and will be applied to  $C_w$  to determine the risk to groundwater.

**Equation Set II - Determines the velocity of the soil pore water ( $V_w$ ):****Step 1:**

The air filled porosity ( $f$ ) in decimal percent can be approximated using the following equation:

$$f = \phi - \Theta_r$$

**Step 2:**

Determine the infiltration rate of water through soil under constant head conditions (Green & Ampt equation as discussed in Bouwer, 1978). The result provides the time it should take water to percolate through the vadose zone soil (from the depth of the worst case soil sample to the water table at the site).

$$t = \frac{f}{K_u} \times \left\{ L - \left[ (H_w - H_f) \times \ln \left( \frac{H_w + L - H_f}{H_w - H_f} \right) \right] \right\}$$

**Step 3:**

Take the value calculated for ( $t$ ) in seconds and use the following equation to calculate the velocity of the water ( $V_w$ ) in feet per year:

$$V_w = \frac{L/30.48}{t / 3.15 \times 10^7 \text{ sec/year}}$$

**Equation Set III - Determines the organic retardation effect ( $V_c$ ):****Step 1:**

Calculate the soil/water distribution coefficient ( $K_d$  in ml/g) for uncontaminated soil using the following equation:

$$K_d = K_{oc} \times TOC \times (1 \times 10^{-6})$$

**Step 2:**

Calculate the retardation effect of natural soil organic matter on contaminant migration using the following equation:

$$V_c = \frac{V_w}{1 + (B_d \times K_d / \phi)}$$

**Equation Set IV - Determines biodegradation rates and provides final predicted contaminant concentration at depth of concern ( $C_f$ ):**

**Step 1:**

Calculate the time in days required for the contaminant to reach groundwater using the following equation:

$$T_c = \frac{(365 \times L)}{(30.48 \times V_c)}$$

**Step 2:**

Vadose zone contaminants are subject to several degradation and attenuation processes. The final equation considers biodegradation in addition to the parameters of the previous equation and calculates the final groundwater concentration beneath the contaminated soil in  $\mu\text{g/l}$ :

$$\log(C_f) = \log(C_w \times 1000 \mu\text{g/mg}) - \left[ \frac{T_c}{2.3} \times \frac{0.693}{t_{1/2}} \right]$$
$$C_f = 10 \left[ \log(C_w \times 1000 \mu\text{g/mg}) - \left[ \frac{T_c}{2.3} \times \frac{0.693}{t_{1/2}} \right] \right]$$

**Equation Set V - Determines the allowable Alternate Threshold Level of a contaminant in soil (ATL):**

**Step 1:**

If the final site-specific contaminant concentration ( $C_f$ ) value is below the applicable water quality standard, no soil treatment should be necessary. If the value of  $C_f$  is above the applicable water quality standard, the existing applicable threshold value may be used as a concentration limit, or an Alternate Threshold Level (ATL) may be calculated for each contaminant in soil using the equation below:

$$ATL = \left[ 10^{\log\left(\frac{C_{STD}}{1000 \mu\text{g/mg}}\right) + \left(\frac{T_c}{2.3} \times \frac{0.693}{t_{1/2}}\right)} \right] \times (K_{oc})(f_{cs})$$

If deemed economically feasible, a more detailed risk assessment of the soil and groundwater contamination may be conducted and submitted in CAP Part B in order to assess whether less stringent concentration limits than the Alternate Threshold Levels may be allowed.

**Table 1**  
**Soil-Water Partitioning Coefficients ( $K_{oc}$ )**

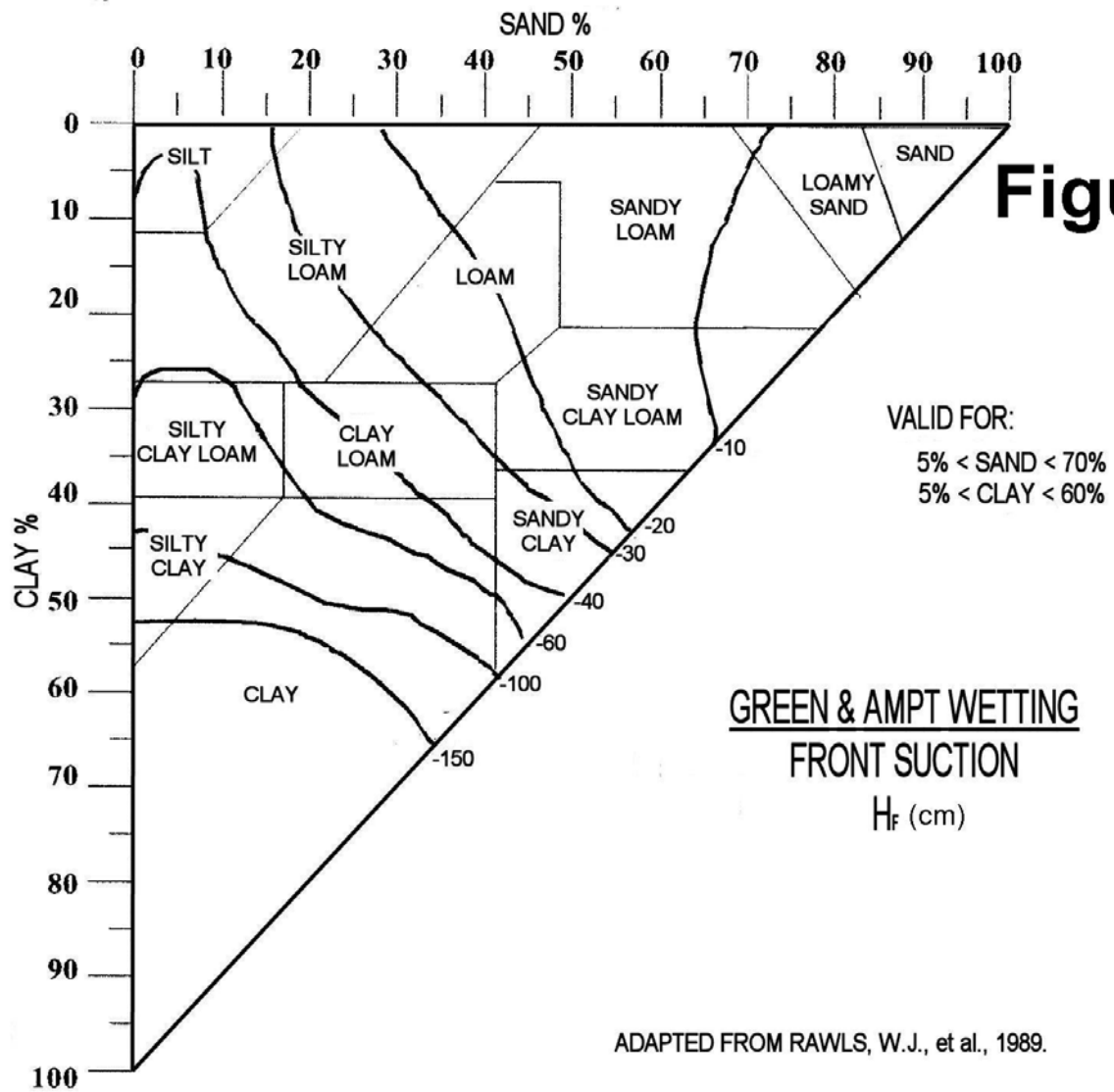
CONSTITUENT	SOIL-WATER PARTITIONING COEFFICIENT ( $K_{oc}$ )
Benzene	81
Toluene	133
Ethylbenzene	176
Xylenes	639
Benz(a)anthracene	125,719
Benzo(a)pyrene	282,185
Benzo(b)fluoranthene	1,148,497
Benzo(g,h,i)perylene	1,488,389
Benzo(k)fluoranthene	2,020,971
Chrysene	426,108
Dibenz(a,h)anthracene	1,668,800
Indeno(1,2,3-c,d)pyrene	6310

From Fetter, C.W., 1993. Contaminant Transport and Montgomery, J.H. et al., 1991. Groundwater Chemicals Desk Reference.

**Table 2**  
**Contaminant Biodegradation Half-Life in Unsaturated Soils**

CONSTITUENT	HALF-LIFE
Benzene	16 days
Ethylbenzene	10 days
Toluene	22 days
Xylenes	28 days
Benz(a)anthracene	679 days
Benzo(a)pyrene	529 days
Benzo(b)fluoranthene	610 days
Benzo(g,h,i)perylene	650 days
Benzo(k)fluoranthene	2139 days
Chrysene	829 days
Dibenz(a,h)anthracene	942 days
Indeno(1,2,3-c,d)pyrene	730 days

From Howard, P.H. et al., 1991. Environmental Degradation Rates, Lewis Publishers.



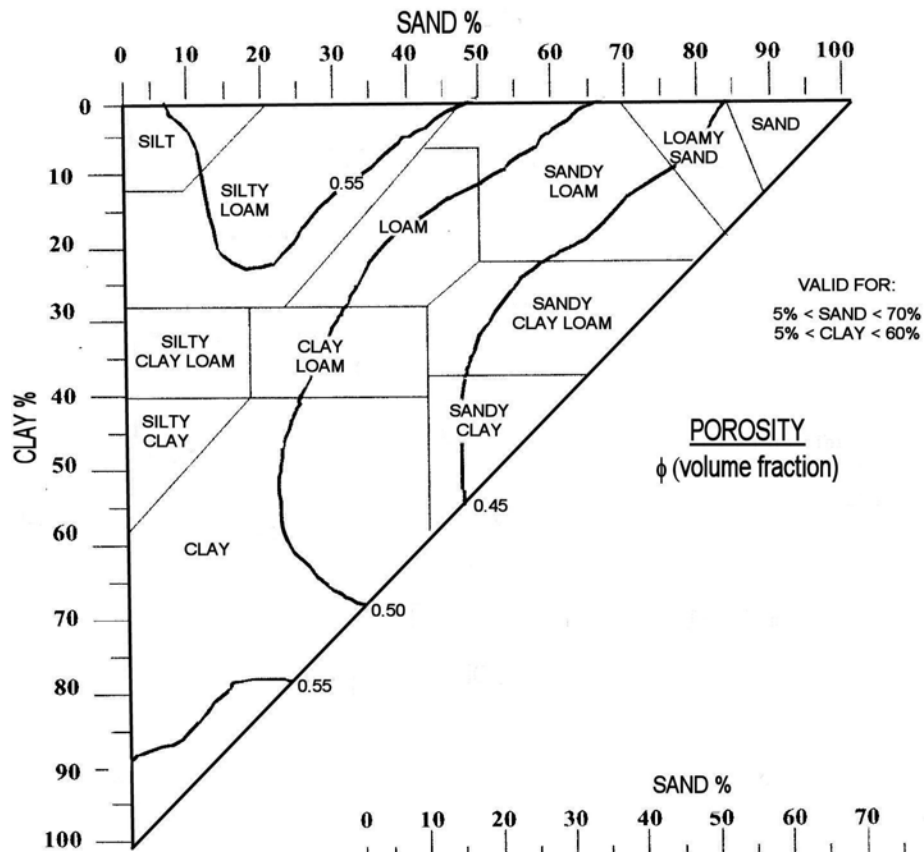


Figure 2

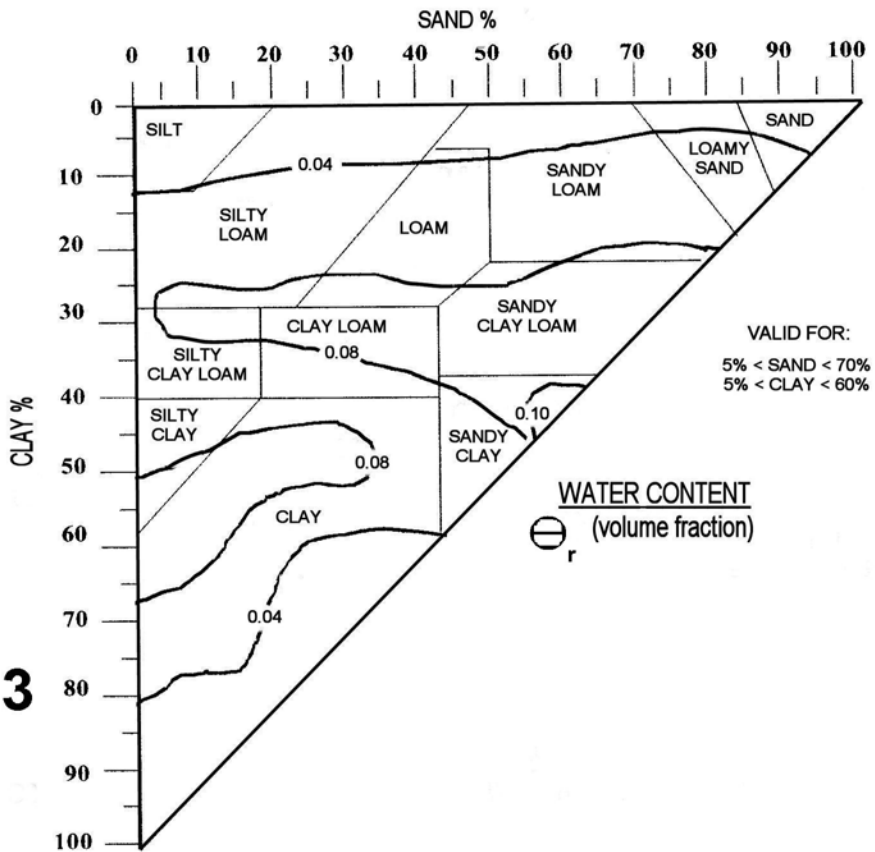


Figure 3

ADAPTED FROM RAWLS, W.J., et al., 1989.

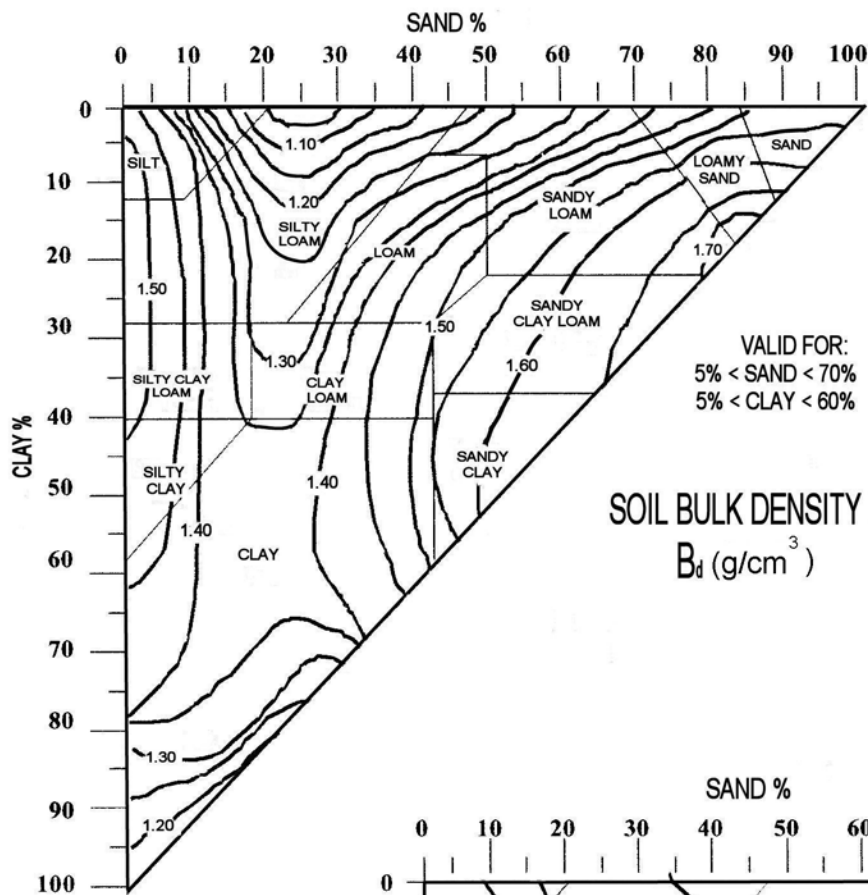


Figure 4

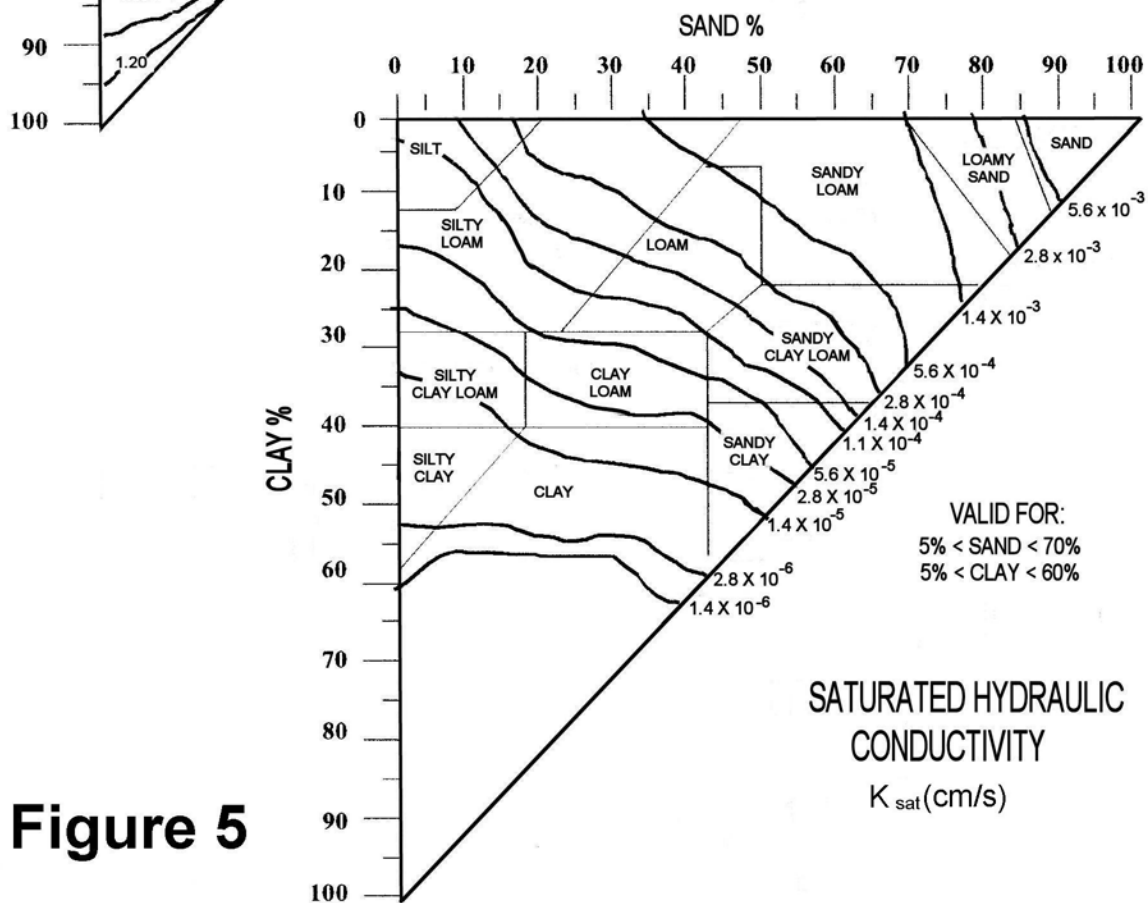


Figure 5

ADAPTED FROM RAWLS, W.J., et al., 1989.

**ASSUMPTIONS FOR TABLE A AND TABLE B  
SOIL THRESHOLD LEVEL CALCULATIONS**

**POINTS OF WITHDRAWAL FOR PUBLIC OR NON-PUBLIC WATER SUPPLIES  
EXIST WITHIN THE DISTANCES DEFINED IN GUST RULE 391-3-15-.09(3) HIGH TO  
AVERAGE SUSCEPTIBILITY AREAS**

Point of Withdrawal < 500 FT from Contaminated Soil

Groundwater contamination beneath contaminated soils should not exceed drinking water standards

TOC = 3000 mg/kg (0.3%)

$K_u = 0.000694 \text{ cm/s}$

$H_w = 25 \text{ cm}$

$H_f = -10 \text{ cm}$

$K_{oc}$  - See Table 1, "Soil-Water Partitioning Coefficients"

$B_d = 1.55$

$\phi = 0.475$

$\theta_r = 0.06$

$L = 15.24 \text{ cm}$

$t_{1/2}$  = See Table 2, "Contaminant Biodegradation Half-Life in Unsaturated Soils."

$K_{sat} = 0.001 \text{ cm/sec}$

$dh/dl = 0.05$

$N_e = 15\%$

Transport time = 20 years

Retardation in the saturated zone = 2.2

Contaminant Biodegradation in half-life in Saturated zone = 1 year.

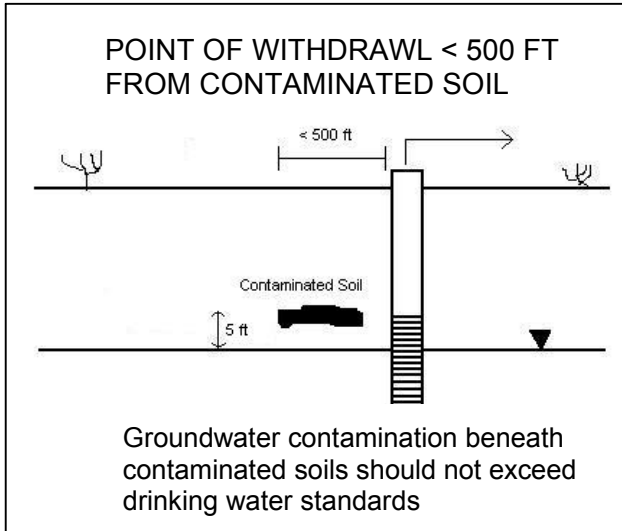
Point of Withdrawal > 500 FT from Contaminated Soil

Groundwater contamination beneath contaminated soils should not exceed drinking water standards

TPH was calculated as a function of each compound's concentration in soil by using the estimated percentage of each regulated compound in the product spilled. This usually resulted in relatively low TPH concentrations.

Assumed Grain Size Distribution: 10 % clay, 75 % sand, 10 % silt.

**POINTS OF WITHDRAWAL FOR PUBLIC OR NON-PUBLIC WATER SUPPLIES  
EXIST WITHIN  
THE DISTANCES DEFINED IN GUST RULE 391-3-15-.09(3)  
LOW SUSCEPTIBILITY AREAS**



TOC = 3,000 mg/kg (0.3%)

$K_u = 0.000278 \text{ cm/s}$

$H_w = 25 \text{ cm}$

$H_f = -12.5 \text{ cm}$

$K_{oc}$  - See Table 1

$B_d = 1.65$

$\phi = 0.47$

$\theta_r = 0.07$

$L = 152.4 \text{ cm}$

$t_{1/2}$  - See Table 2

$K_{sat} = 0.0001 \text{ cm/sec}$

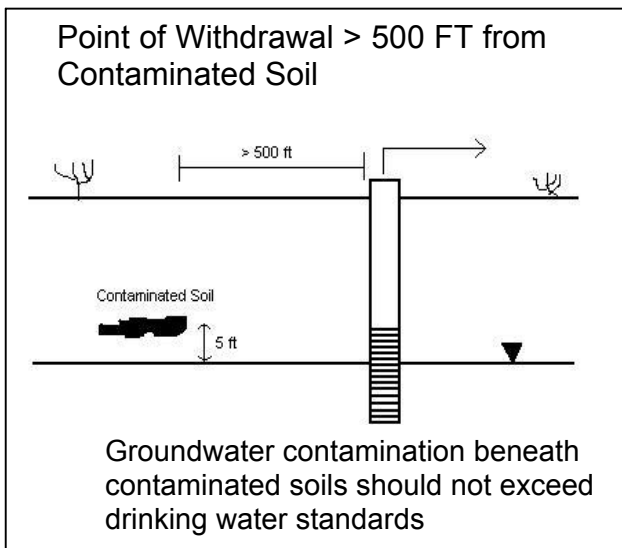
$dh/dl = 0.075$

$N_e = 13\%$

Transport time = 20 years

Retardation in the saturated zone = 2.3

Contaminant Biodegradation half-life in  
saturated zone = 1 year.

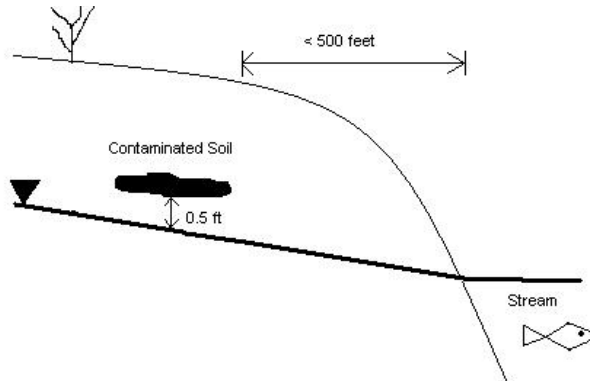


TPH was calculated as a function of each compound's concentration in soil by using the estimated percentage of each regulated compound in the product spilled. This usually resulted in relatively low TPH concentrations.

Assumed Grain Size Distribution: 15 % clay, 60 % sand, 25 % silt.

**NO POINTS OF WITHDRAWAL FOR PUBLIC OR NON-PUBLIC WATER SUPPLIES EXIST  
WITHIN THE DISTANCES DEFINED IN GUST RULE 391-3-15-.09(3)  
HIGH TO AVERAGE SUSCEPTIBILITY AREAS**

**SURFACE WATER BODY < 500 FT FROM  
CONTAMINATED SOIL**



Groundwater contamination beneath contaminated soils should not exceed in-stream water quality standards

TOC = 3.00 mg/kg (0.3%)

$K_d = 0.000694 \text{ cm/s}$

$H_w = 25 \text{ cm}$

$H_f = -10 \text{ cm}$

$K_{oc} = \text{See Table 1}$

$B_d = 1.55$

$\phi = 0.475$

$\theta_r = 0.06$

$L = 15.24 \text{ cm}$

$t_{1/2} = \text{See Table 2.}$

$K_{sat} = 0.001 \text{ cm/sec}$

$dh/dl = 0.05$

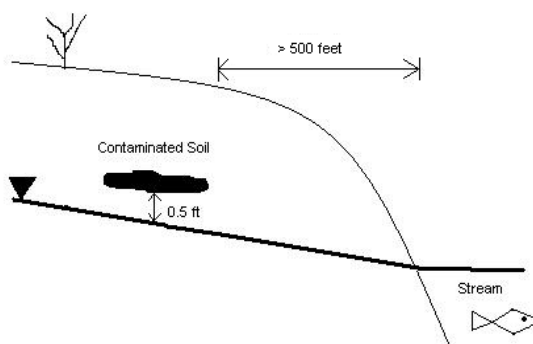
$n_e = 15\%$

Transport time = 20 years

Retardation in the saturated zone = 2.2

Contaminant Biodegradation half life in saturated zone = 1 year

**SURFACE WATER BODY > 500 FT  
FROM CONTAMINATED SOIL**

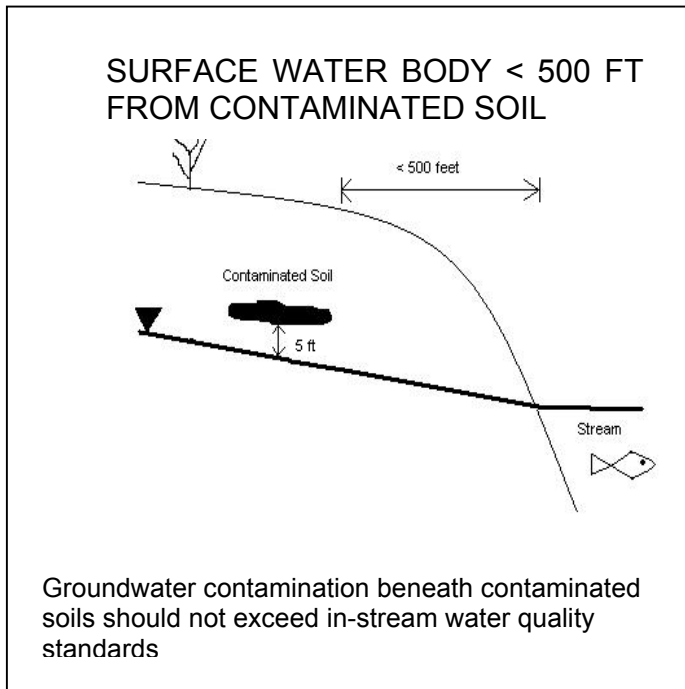


Groundwater contamination beneath contaminated soils should not exceed in-stream water quality standards

TPH was calculated as a function of each compound's concentration in soil by using the estimated percentage of each regulated compound in the product spilled. This usually resulted in relatively low TPH concentrations.

Assumed Grain Size Distribution: 10 % clay, 75 % sand, 10 % silt.

**NO POINTS OF WITHDRAWAL FOR PUBLIC OR NON-PUBLIC WATER SUPPLIES EXIST  
WITHIN THE DISTANCES DEFINED IN GUST RULE 391-3-15-.09(3)  
LOW SUSCEPTIBILITY AREAS**



TOC = 3.00 mg/kg (0.3%)

$K_d = 0.000278 \text{ cm/s}$

$H_w = 25 \text{ cm}$

$H_f = -12.5 \text{ cm}$

$K_{oc} = \text{See Table 1}$

$B_d = 1.65$

$\phi = 0.47$

$\theta_r = 0.07$

$L = 152.4 \text{ cm}$

$t_{1/2} = \text{See Table 2.}$

$K_{sat} = 0.0001 \text{ cm/sec}$

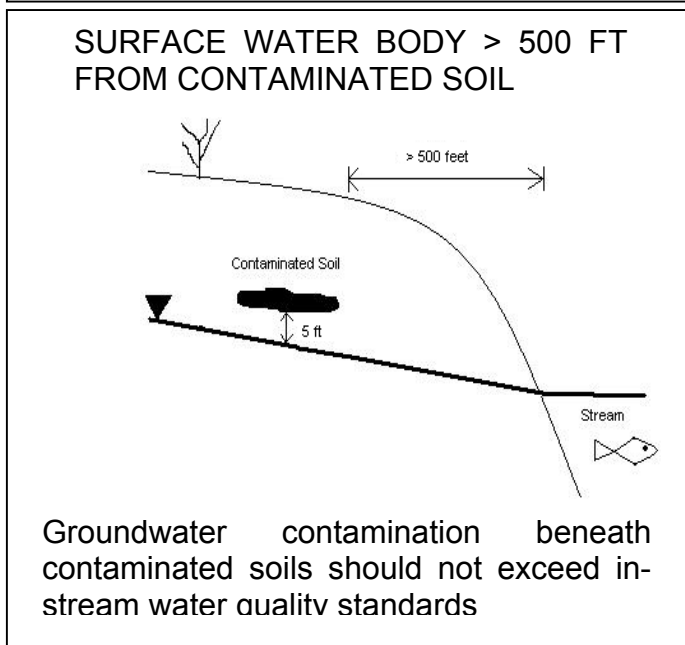
$dh/dl = 0.075$

$n_e = 13\%$

Transport time = 20 years

Retardation in the saturated zone = 2.3

Contaminant Biodegradation half life in saturated zone = 1 year



TPH was calculated as a function of each compound's concentration in soil by using the estimated percentage of each regulated compound in the product spilled. This usually resulted in relatively low TPH concentrations.

Assumed Grain Size Distribution: 15 % clay, 60 % sand, 25 % silt.

## METHODOLOGY

For situations in which the potential receptor (point of withdrawal for water supply or surface water body) was less than or equal to 500 feet from the contaminated soil, the concentration of each contaminant in soil ( $C_s$ ) was varied in the vadose zone transport equations until the final concentration ( $C_f$ ) in the groundwater met applicable water quality standards (drinking water MCLs or in-stream water quality standards).

For situations in which the potential receptor was more than 500 feet from the contaminated soil, a one-dimensional groundwater contaminant transport equation was used to predict the concentration of each contaminant in groundwater, 500 feet downgradient of the contaminant source. The concentration in the groundwater at the source beneath the contaminated soil was varied in the groundwater contaminant transport calculations until the concentration 500 feet downgradient of the source was equal to, or just within, applicable water quality standards.

The concentration of each contaminant in soil ( $C_s$ ) was then varied in the vadose zone transport calculations until the final contaminant concentration ( $C_f$ ) in the groundwater equalled the allowable contaminant concentration in the groundwater beneath the source.

## EXAMPLE CALCULATION

An UST that reportedly contained gasoline and possibly other unknown petroleum products was removed from the ground. After the obviously contaminated soil was removed and stockpiled pending proper disposal, soil samples were collected from the bottom of the excavation for laboratory analysis for BTEX and PAHs. The UST pit was backfilled with clean backfill and compacted. It was not possible to delineate the vertical extent of the contaminated soil with the trackhoe because laboratory analysis of BTEX in the confirmation samples, collected from the deepest point the trackhoe could reach, contained contaminants above detection limits. The deepest soil sample also contained BTEX concentrations above applicable threshold levels. Analysis of the soil samples for PAHs indicated that the soil did not contain detectable concentrations of PAHs. Therefore no further analysis for PAHs was required for this site.

A drill rig was mobilized to the site to install monitor wells (for subsequent water sample collection and measurements) and collect additional soil samples to determine the location and concentration of the most contaminated soil left in place. A boring was placed over the position of the most contaminated sample collected from the excavation, and split spoon samples were collected at five-foot intervals and screened with a field-screening device (e.g., PID, FID or "OVA"). Readings indicated that the most contaminated sample was about 20 feet below the land surface - the depth at which excavation stopped. A soil sample was collected from this depth in the former UST pit with a split-spoon sampler and submitted to a laboratory for analysis of BTEX and TPH. TPH analysis is optional for calculating alternate threshold levels (ATLs), but was performed in this case in order to raise the allowable level of BTEX which could be left in the soil. If no TPH analysis is conducted on contaminated soil samples, then the TPH concentration to be used in Equation Set 1 should be set to zero. A vadose-zone soil sample was also collected away from the presumably contaminated area and analyzed for BTEX and Total Organic Carbon (TOC). The soil sample to be analyzed for TOC was collected away from the presumably contaminated area in order to prevent petroleum contamination from being included in the Total Organic Carbon results.

The site is located in the average or higher groundwater pollution susceptibility area. A private water supply source lies within 1/2 mile of the site, but it is more than 500 feet from the site. The measured depth to groundwater in the monitor wells was 40 feet below land surface. The most contaminated soil sample contained the following constituents above Threshold Levels in Table A for this type of site. It had: 3 mg/kg benzene and 50 mg/kg ethylbenzene. Although the sample also contained 3 mg/kg toluene and 280 mg/kg xylenes, these compounds are below the applicable threshold levels and will not require remediation. The contaminated sample also contained 2,000 mg/kg TPH. Laboratory analysis also showed that the clean soil sample contained 4000 mg/kg TOC. In order to determine whether the soil exceeding threshold levels for benzene and ethylbenzene would require further assessment and/or remediation, the following calculations were performed to quickly determine the risk posed to the groundwater by leaving the contaminated soil in place. Calculations for the ethylbenzene are not shown due to space considerations.

**Equation Set I - Determine soil pore water concentration resulting from physical partitioning ( $C_w$ ):**

**Step 1:**

Calculate the fractional organic carbon content ( $f_{cs}$ ) of the contaminated soil using the following equation:

$$f_{cs} = \left( TOC + \frac{TPH}{1.724} \right) \times (1 \times 10^{-6})$$

TOC = 4,000 mg/kg (can be obtained from lab analysis or from attached EPD assumptions)

TPH = 2,000 mg/kg (This should be set to 0 if TPH is not analyzed.)

$$f_{cs} = (4000 \text{ mg/kg}) \times (1 \times 10^{-6})$$

$$f_{cs} = 0.00516 \text{ (unitless)}$$

**Step 2:**

Determine contaminant concentration in soil pore water directly in contact with contaminated soil. Equilibrium contaminant partitioning between sorbed and aqueous phases can be described by the following equation:

$$C_w = \frac{C_s}{(K_{oc} \times f_{cs})}$$

$C_s$  = 3 mg/kg benzene (from lab analysis)

$K_{oc}$  = 81 ml/g (from Table 1)

$f_{cs}$  = 0.00516 (from calculation above)

$$C_w = \frac{3 \text{ mg/kg}}{(81 \text{ ml/g} \times 0.00516)}$$

$$C_w = 7.178 \text{ mg/l}$$

**Equation Set II - Determines the velocity of the soil pore water ( $V_w$ ):**

**Step 1:**

The air filled porosity ( $f$ ) in decimal percent can be approximated using the following equation:

$$f = \phi - \Theta_r$$

$\phi = 0.43$  (obtained from grain-size analysis and Fig. 2)

$\Theta_r = 0.08$  (obtained from grain-size analysis and Fig. 3)

$$f = 0.43 - 0.08$$

$$f = 0.35$$

**Step 2:**

Determine the infiltration rate of water through soil under constant head conditions (Green & Ampt equation as discussed in Bouwer, 1978). The result provides the time it should take water to percolate through the vadose zone soil (from the depth of the worst case soil sample to the water table at the site).

$$t = \frac{f}{K_u} \times \left\{ L - \left[ (H_w - H_f) \times \ln \left( \frac{H_w + L - H_f}{H_w - H_f} \right) \right] \right\}$$

$f = 0.35$  (from Step 1, above)

$K_u = 5 \times 10^{-5}$  cm/sec (from grain-size analysis and 1/2 of the value from Fig.3)

$L = 20$  feet = 609.6 cm (The difference between the depth of the most contaminated sample and the water table)

$H_w = 25$  cm (from attached EPD assumptions or can be obtained from published literature)

$H_f = -30$  cm (from grain-size analysis and Fig. 1)

$$t = \frac{0.35}{5 \times 10^{-5}} \times \left\{ 609.6 \text{ cm} - \left[ (25 - (-30)) \times \ln \left( \frac{25 + 609.6 - (-30)}{25 - (-30)} \right) \right] \right\}$$

$$t = 3.3078 \times 10^6 \text{ secs}$$

**Step 3:**

Take the value calculated for (t) in seconds and use the following equation to calculate the velocity of the water ( $V_w$ ) in feet per year:

$$V_w = \frac{L/30.48}{t / 3.15 \times 10^7 \text{ sec/year}}$$

$$L = 609.6 \text{ cm}$$

$$t = 3.3078 \times 10^6 \text{ sec}$$

$$V_w = \frac{609.6/30.48}{3.3078 \times 10^6 \text{ sec} / 3.15 \times 10^7 \text{ sec/year}}$$

$$V_w = 190.457 \text{ feet/year}$$

**Equation Set III - Determines the organic retardation effect ( $V_c$ ):****Step 1:**

Calculate the soil/water distribution coefficient ( $K_d$  in ml/g) for uncontaminated soil using the following equation:

$$K_d = K_{oc} \times TOC \times (1 \times 10^{-6})$$

$$K_{oc} = 81 \text{ ml/g (From Table 1)}$$

$$TOC = 4,000 \text{ mg/kg (From laboratory analysis; do not use } f_{cs})$$

$$K_d = 81 \text{ ml/g} \times 4000 \text{ mg/kg} \times (1 \times 10^{-6})$$

$$K_d = 0.324 \text{ ml/g}$$

**Step 2:**

Calculate the retardation effect of natural soil organic matter on contaminant migration using the following equation:

$$V_c = \frac{V_w}{1 + (B_d \times K_d / \phi)}$$

$V_w = 190.457$  feet/year (From Eq. Set II, Step 3)  
 $B_d = 1.66$  g/cc (From grain-size analysis and Figure 4)  
 $K_d = 0.324$  ml/g  
 $\phi = 0.43$  (obtained from grain-size analysis and Fig. 2)

$$V_c = \frac{190.457 \text{ feet/year}}{1 + (1.66 \text{ g/cc} \times 0.324 \text{ ml/g} / 0.43)}$$

$$V_c = 84.62 \text{ feet/year}$$

**Equation Set IV - Determines biodegradation rates and provides final predicted contaminant concentration in groundwater ( $C_f$ ):**

**Step 1:**

Calculate the time in days required for the contaminant to reach groundwater using the following equation:

$$T_c = \frac{(365 \times L)}{(30.48 \times V_c)}$$

$L = 609.6$  cm  
 $V_c = 84.62$  feet/year

$$T_c = \frac{(365 \times 609.6 \text{ cm})}{(30.48 \times 84.62 \text{ feet/year})}$$

$$T_c = 86.27 \text{ days}$$

**Step 2:**

Vadose zone contaminants are subject to several degradation and attenuation processes. The final equation considers biodegradation in addition to the parameters of the previous equation and calculates the final groundwater concentration beneath the contaminated soil in  $\mu\text{g/l}$ :

$$\log(C_f) = \log(C_w \times 1000 \mu\text{g/mg}) - \left[ \frac{T_c}{2.3} \times \frac{0.693}{t_{1/2}} \right]$$

$$C_f = 10 \left[ \log(C_w \times 1000 \mu\text{g/mg}) - \left[ \frac{T_c}{2.3} \times \left( \frac{0.693}{t_{1/2}} \right) \right] \right]$$

$C_w = 7.178 \text{ mg/l}$  (From Eq. Set 1, Step 2)  
 $T_c = 86.27 \text{ days}$  (from calculations in Step 1 above)  
 $t_{1/2} = 16 \text{ days}$  (From Table 2)

$$C_f = 10 \left[ \log(7.178 \text{ mg/l} \times 1000 \text{ mg/mg}) - \left[ \left( \frac{86.27 \text{ days}}{2.3} \right) \times \left( \frac{0.693}{16 \text{ days}} \right) \right] \right]$$

$$C_f = 170.36 \text{ } \mu\text{g/l}$$

**Equation Set V - Determines the allowable Alternate Threshold Level of a contaminant in soil (ATL):**

**Step 1:**

If the final site-specific contaminant concentration ( $C_f$ ) value were below the applicable water quality standard, no soil treatment would be necessary. Since the value of  $C_f$  is above the applicable water quality standard (5  $\mu\text{g/l}$  benzene), the existing applicable threshold value may be used as a concentration limit, or an Alternate Threshold Level for each contaminant in soil (ATL) may be calculated using the equation below:

$$ATL = \left[ 10^{\log\left(\frac{C_{STD}}{1000 \text{ } \mu\text{g/mg}}\right) + \left(\frac{T_c \times 0.693}{2.3 \times t_{1/2}}\right)} \right] \times (K_{oc})(f_{cs})$$

$C_{STD} = 5 \text{ } \mu\text{g/l}$  benzene (Federal Drinking Water mcls)  
 $T_c = 86 \text{ days}$  (from calculations in Step 1 above)  
 $t_{1/2} = 16 \text{ days}$  (From Table 2)  
 $K_{oc} = 81 \text{ ml/g}$

$$ATL = \left[ 10^{\log\left(\frac{5 \text{ } \mu\text{g/l}}{1000 \text{ } \mu\text{g/mg}}\right) + \left(\frac{86.27 \text{ days}}{2.3} \times \frac{0.693}{16 \text{ days}}\right)} \right] \times (81 \text{ ml/g})(0.00516)$$

$$f_{cs} = 0.00516$$

$$ATL = 0.088 \text{ mg/kg}$$

## **CONCLUSION:**

In the example above, the calculations predict that the remaining soil contamination will impact groundwater above drinking water standards for benzene. An Alternate Threshold Level of 0.088 mg/kg benzene was also calculated. If results of the laboratory analysis of groundwater samples collected from the site (including the UST excavation area) indicate that groundwater has not yet been impacted above drinking water standards, then corrective action may be limited to remediation of the soil to the ATL (0.088 mg/kg). A more complex risk assessment using detailed, site-specific data may also be conducted and presented in CAP Part B to determine whether less stringent Alternate Concentration Limits (ACLs) will be protective of human health and the environment.

## REFERENCES

Fetter, C.W. 1993. Contaminant Hydrogeology. Macmillan Publishing Company, New York.

Howard, P.H. et al. 1991. Environmental Degradation Rates. Lewis Publishers.

Menatti, John A. 1994. Fate and Transport Modeling of Diesel Fuel Contamination in the Vadose Zone. In: Proceeding of the 4th Annual West Coast Conference on Hydrocarbon Contaminated Soils and Groundwater (in press).

Montgomery, J.H. 1991. Groundwater Chemicals Desk Reference. Lewis Publishers.

Rawls, W.J. and D.L. Brakensiek. 1989. Estimation of Soil Water Retention and Hydrologic Properties. In: Unsaturated Flow in Hydrologic Modeling Theory and Practice. Morel-Seytoux, H.J. (ed.). Kluwer Academic Publishers.

**APPENDIX D**

**MINIMUM STANDARDS FOR GEOLOGIC AND ENGINEERING  
WORK  
PERFORMED FOR A CAP-PART A**

## **MINIMUM STANDARDS FOR GEOLOGIC AND ENGINEERING WORK PERFORMED FOR A CAP-PART A**

Accurately prepared corrective action plans are critical for protection of human health and the environment. Flagrant or persistent failure to adhere to the standards below may result in the filing of a complaint with the appropriate professional registration board for the geologist or engineer certifying the CAP-Part A.

- 1) Shallow monitor wells (Type II) must be installed in accordance with the Water Well Standards Act and the Georgia DNR Manual for Groundwater Monitoring. The wells must be installed so that the well screen brackets the water table if the contaminant has a specific gravity lower than water; i.e., the top of the well screen must lie above the water table in such a way that groundwater will be available for sampling and measurement during all seasons.
- 2) At least 3 wells must be used to determine the direction of groundwater flow and the wells used must be placed in a triangular formation.
- 3) Soil samples must be collected from the suspected source locations. If soil sample analysis indicates that contaminated soil extends to groundwater, or if other evidence indicates that groundwater may be impacted, groundwater samples must be collected from the source locations.
- 4) Units and values on tables and figures must be accurate.
- 5) Data must not be omitted entirely from reports. If data points are omitted from contour interpretation on maps and are not interpolated with the other data on maps, the reason must be stated on the map.
- 6) Recommendations must be consistent with EPD Rules and Guidelines.
- 7) The locations of potential receptors must be complete, accurate, and field verified.
- 8) Maps must be to scale and features on the maps must be accurately located and depicted.
- 9) Concentration data or groundwater elevation data from two different sampling or measurement dates must not be contoured as one sampling or measurement event.
- 10) Water table elevation and contaminant concentration data from Type III (deep telescoping) and deep Type II monitor wells, which are screened only in the lower portions of the surficial and other aquifers, must not be contoured on an aerial map with water table elevation and contaminant concentration data from shallow type II monitor wells which bracket only the upper portion of the surficial aquifer.
- 11) No misleading statements should be included in the report. For example, if no measurement of free product was performed, then the absence of free product at a site cannot be asserted. Additionally, if a boring in which free product was observed

on previous occasions was abandoned, a statement that “free product was not observed after this date” would be considered misleading, unless the reason for its non-observation (e.g., the borehole was abandoned) was stated clearly and in the same context.

- 12) Calculations must be accurate and correct.
- 13) Values used in calculations and computer models must be derived from field measurements or must be assumed from peer-reviewed, published data.
- 14) Computer model assumptions must be either compatible with field-measured data and observed conditions, or more conservative than field-observed conditions.
- 15) Calculations of alternate concentration limits must consider current and probable future use of the target area.
- 16) Proposed remedial system designs must be supported by field data and mathematical calculations which corroborate any predicted zones of influence, groundwater drawdown, and cleanup duration. This information must be presented clearly and concisely.

**APPENDIX E**

**CORRECTIVE ACTION PLAN PART A TEMPLATE**

**CORRECTIVE ACTION PLAN PART A FORM**

Facility Name: \_\_\_\_\_ Street Address: \_\_\_\_\_  
Facility ID: \_\_\_\_\_ City: \_\_\_\_\_ County: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_

**Submitted by UST Owner/Operator:**

Name: \_\_\_\_\_  
Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_  
Zip Code: \_\_\_\_\_  
Telephone: \_\_\_\_\_

**Prepared by Consultant (same person who signed and sealed report):**

Name: \_\_\_\_\_  
Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_  
Zip Code: \_\_\_\_\_  
Telephone: \_\_\_\_\_

**I. PLAN CERTIFICATION:**

**A. UST Owner/Operator Certification**

I hereby certify that the information contained in this plan and in all the attachments is true, accurate, and the plan satisfies all criteria and requirements of rule 391-3-15-09 of the Georgia Rules for Underground Storage Tank Management.

Name: \_\_\_\_\_  
Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**B. Registered Professional Engineer or Professional Geologist Certification**

I hereby certify that I have directed and supervised the field work and preparation of this plan, in accordance with State Rules and Regulations. As a registered professional geologist and/or professional engineer, I certify that I am a qualified groundwater professional, as defined by the Georgia State Board of Professional Geologists. All of the information and laboratory data in this plan and in all of the attachments are true, accurate, complete, and in accordance with applicable State Rules and Regulations.

Name(printed): \_\_\_\_\_  
Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

\_\_\_\_\_  
Georgia Stamp or Seal

**SUMMARY SHEET**

TO BE COMPLETED BY CONSULTANT

Environmental Site Rank \_\_\_\_\_

Applicable water quality standards (check one): Drinking water standards \_\_\_\_ In-Stream Water Quality Stds. \_\_\_\_

Has free product ever been observed in a monitor well at the site? \_\_\_\_\_ (Y/N)

What was the maximum free product thickness observed during the history of this release? \_\_\_\_\_ (ft)

Is groundwater impacted above applicable water quality standards? \_\_\_\_\_ (Y/N)

If groundwater is impacted:

Maximum most recent Benzene concentration in groundwater \_\_\_\_\_ ug/L

Maximum Benzene concentration observed in groundwater during history of this release \_\_\_\_\_ ug/L

Maximum MTBE concentration in groundwater during history of this release \_\_\_\_\_ ug/L

Have points of withdrawal for water supply been impacted by this release? \_\_\_\_\_ (Y/N)

If points of withdrawal for water supply have been impacted:

Was free product observed at a point of withdrawal during the history of this release? \_\_\_\_\_ (Y/N)

Maximum benzene concentration in water supply during history of this release \_\_\_\_\_ ug/L

Maximum MTBE concentration in water supply during history of this release \_\_\_\_\_ ug/L

How many public points of withdrawal were impacted? \_\_\_\_\_

How many private points of withdrawal were impacted? \_\_\_\_\_

Have any surface water bodies been impacted by this release? \_\_\_\_\_ (Y/N)

If surface water bodies have been impacted:

How many surface water bodies have been impacted? \_\_\_\_\_

Was free product ever observed in the impacted surface water body? \_\_\_\_\_ (Y/N)

Maximum benzene concentration in surface water during history of this release \_\_\_\_\_ ug/L

Maximum MTBE concentration in surface water during history of this release \_\_\_\_\_ ug/L

Have petroleum vapors from this release ever been observed in any structures? \_\_\_\_\_ (Y/N)

How many public points of withdrawal for water supply are located within 500 feet of the plume edge? \_\_\_\_\_

What are their distances from the plume edge? \_\_\_\_\_ ft. \_\_\_\_\_ ft. \_\_\_\_\_ ft. \_\_\_\_\_ ft.

How many non-public points of withdrawal for water supply are located within 500 feet of the plume edge? \_\_\_\_\_

What are their distances from the plume edge? \_\_\_\_\_ ft. \_\_\_\_\_ ft. \_\_\_\_\_ ft. \_\_\_\_\_ ft.

How many surface water bodies are located within 500 feet of the plume edge? \_\_\_\_\_

How far are they from the plume? \_\_\_\_\_ ft. \_\_\_\_\_ ft. \_\_\_\_\_ ft.

**GENERAL: Read the guidance document for CAP Part A before completing this form. Failure to read the guidance document will most likely result in preparation of an unacceptable report.** All text, figures, and tables requested in their respective sections should be prepared strictly in accordance with the Georgia EPD CAP-A guidance document. Please fill out this form as provided. Do not change the size of the fields or alter the placement of each section on each page.

*(Appendix I: All Report Figures)*

*(Appendix II: All Report Tables)*

## **II. INITIAL RESPONSE REPORT**

### **A. Initial Abatement**

*Were initial abatement actions initiated?*

YES \_\_\_ NO \_\_\_

*If Yes, please summarize. If No, please explain why not.*

### **B. Free Product Removal**

*(Table 1: Summary of Free Product Removal - must include Free Product thickness in each well in which it was detected, and volume of product removed)*

*Free Product Detected?*

YES \_\_\_ NO \_\_\_

*If Yes, please summarize free product recovery efforts.*

*Continuing free product recovery proposed?*

YES \_\_\_ NO \_\_\_

*If yes, please indicate the method and frequency of removal.*

### **C. Tank History**

*List current and former UST's operated at site based on owner/operator knowledge (consistent with EPA 7530-1 Form). Systems must be illustrated on Figure 2 (Site Plan), as described in section D below.*

#### CURRENT UST SYSTEMS (if applicable)

<u>Tank ID Number</u>	<u>Capacity (gal)</u>	<u>Substance Stored</u>	<u>Age (yrs)</u>	<u>Meets 1998 Upgrade</u>	<u>Standards? (Yes/No)</u>
-----------------------	-----------------------	-------------------------	------------------	---------------------------	----------------------------

FORMER UST SYSTEMS (if applicable)

<u>Tank ID Number</u>	<u>Capacity (gal)</u>	<u>Substance Stored</u>	<u>Date Removed</u>
-----------------------	-----------------------	-------------------------	---------------------

**D. Initial Site Characterization**

*(Figure 1: Vicinity/Location Map from USGS 7.5 minute topographic. quad.)*

*(Figure 2: Site Plan)*

1. Regulated Substance Released (gasoline, diesel, used oil, etc.): \_\_\_\_\_  
*Discuss how this determination was made and circumstances of discovery.*

2. Source(s) of Contamination: \_\_\_\_\_  
*Discuss how this determination was made.*

3. Local Water Resources  
*(Figure 3: Quadrangle Map - Public and Private drinking water and surface water)*  
*(Appendix III: Water resources survey documentation, including, but not limited to: USGS database search, interview forms, and documentation of field survey)*

a. Site located in high/average \_\_\_ OR low \_\_\_ groundwater pollution susceptibility area?

b. Water Supplies within applicable radii? YES \_\_\_ NO \_\_\_  
*If yes,*

i. Nearest public water supply located within: \_\_\_\_\_ feet

ii. Nearest down-gradient public water supply located within: \_\_\_\_\_ feet

iii. Nearest non-public water supply located within: \_\_\_\_\_ feet

iv. Nearest down-gradient non-public water supply located within: \_\_\_\_\_ feet

c. Surface Water Bodies and sewers:

i. Nearest surface water located within: \_\_\_\_\_ feet

ii. Nearest down-gradient surface water located within: \_\_\_\_\_ feet

iii. Nearest storm or sanitary sewer located within \_\_\_\_\_ feet

iv. Depth to bottom of sewer at a point nearest the plume: \_\_\_\_\_ feet

4. Impacted Environmental Media

- a. *Soil Impacted*  
(Table 2: Soil Analysis Results)  
(Figure 4: Soil Quality Map)  
(Appendix IV: Soil Boring Logs)  
(Appendix V: Soil Laboratory Reports)  
(Appendix VI: ATL Calculations, if applicable)

*Provide a brief discussion of soil sampling.*

i. Soil contamination above applicable threshold levels? YES \_\_\_ NO \_\_\_  
*If yes, indicate highest concentrations in soil along with locations and depths detected.*

ii. ATLs calculated? YES \_\_\_ NO \_\_\_  
*If yes, state what the Alternate Threshold Levels are:*

iii. If ATL's calculated, is soil contamination above ATL's? YES \_\_\_ NO \_\_\_ N/A \_\_\_

- b. *Groundwater Impacted*  
 (Table 3: Groundwater Analysis Results)  
 (Figure 5: Groundwater Quality Map)  
 (Appendix VII: Monitoring Well Details)  
 (Appendix VIII: Groundwater Laboratory Results)

*Provide a brief discussion of groundwater sampling.*

i. *Groundwater contamination above MCLs?* YES \_\_\_ NO \_\_\_

ii. *Groundwater contamination above In-Stream Water Quality Standards?* YES \_\_\_ NO \_\_\_  
*If yes, indicate highest concentrations in groundwater along with the locations.*

- c. *Surface Water Impacted?* YES \_\_\_ NO \_\_\_  
*If Yes, indicate concentration(s) of surface water sample(s) taken from the surface water body/bodies impacted.*

- d. *Point of Withdrawal Impacted?* YES \_\_\_ NO \_\_\_ N/A \_\_\_  
*If Yes, indicate concentration(s) of water sample(s) taken from withdrawal point(s).*

5. Other Geologic/Hydrogeologic Data

- a. *Depth to Groundwater:* \_\_\_\_\_ (Table 4: Groundwater Elevations)
- b. *Groundwater Flow Direction:* \_\_\_\_\_ (Figure 6: Potentiometric Surface Map)
- c. *Hydraulic Gradient:* \_\_\_\_\_
- d. *Geophysical Province:* \_\_\_\_\_
- e. *Unique geologic/hydrogeological conditions:* \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

6. Corrective Action Completed or In-Progress (if applicable)  
 (Table 5: UST System Closure Sampling)  
 (Figure 7: UST System Closure Sampling)  
 (Appendix IX: UST Closure Form, Closure Figures, Closure Documentation)  
 (Appendix X: Contaminated Soil Disposal Manifests)

a. *Underground Storage Tank (UST) System Closure:* N/A\_\_\_\_  
*If applicable, summarize UST system closure activities conducted.*

b. *Excavation and Treatment/Disposal of Backfill Materials and Native Soils*  
*Check one: No UST removal performed* \_\_\_\_\_  
*Returned to UST excavation* \_\_\_\_\_  
*Excavated soils treated or disposed off site* \_\_\_\_\_  
*If soils were excavated, summarize excavation and treatment/disposal activities:*

7. Site Ranking:  
*Environmental Site Sensitivity Score:* \_\_\_\_\_  
 (Appendix XI: Site Ranking Form)

8. Conclusions and Recommendations  
 Complete applicable section below, one section only

a. No Further Action Required (if applicable) N/A\_\_\_\_  
 (provide justification)

b. Monitoring Only (if applicable) N/A\_\_\_\_  
 (provide justification)

c. CAP-B (if applicable) N/A\_\_\_\_  
 (provide justification)

**III. MONITORING ONLY PLAN** (if applicable): N/A\_\_\_\_

**A. Monitoring points**

**B. Period/Frequency of monitoring and reporting**

**C. Monitoring Parameters**

**D. Milestone Schedule**

**E. Scenarios for site closure or CAP-Part B**

**IV. SITE INVESTIGATION PLAN** (if applicable): N/A\_\_\_\_  
(*Figure 8: Proposed additional boring/monitoring well location*)

**A. Proposed Investigation of Horizontal and Vertical Extent of Contamination In:**

1. Soil N/A\_\_\_\_

2. Groundwater

a. Free Product N/A\_\_\_\_

b. Dissolved phase N/A\_\_\_\_

3. Surface Water N/A\_\_\_\_

B. Proposed Investigation of Vadose Zone And Aquifer Characteristics:

**V. PUBLIC NOTICE**

*(Figure 9. Tax Map)*

*(Appendix XI: Copies of public notification letters & certified return receipts or newspaper notice if approved)*

**VI. CLAIM FOR REIMBURSEMENT** (for GUST Trust Fund sites only): N/A \_\_\_\_\_

*(Appendix XII: GUST Trust Fund Reimbursement Application and Claim for Reimbursement)*

Facility Name  
 Facility Address  
 County, Facility ID Number

**TABLE 1: FREE PRODUCT REMOVAL**

[monitoring well number]				
Date of Measurement	Groundwater Elev. (ft)	Product Thickness* (ft)	Corrected Water Elev. (ft)	Product Removed (gal)
TOTAL				

[monitoring well number]				
Date of Measurement	Groundwater Elev. (ft)	Product Thickness* (ft)	Corrected Water Elev. (ft)	Product Removed (gal)
TOTAL				

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

\*Free product thickness prior to initiating recovery on the day of measurement

Facility Name  
 Facility Address  
 County, Facility ID Number

**TABLE 2a: SOIL ANALYTICAL RESULTS**  
 (VOLATILE ORGANIC COMPOUNDS)

Sample Location	Depth (ft)	Date Sampled	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Xylenes (mg/kg)	Total BTEX (mg/kg)	MTBE (mg/kg)	TPH (mg/kg)
Applicable Standards									

**TABLE 2b: SOIL ANALYTICAL RESULTS**  
 (POLYNUCLEAR AROMATIC HYDROCARBON)

Sample Location	Depth (ft)	Date Sampled	Detected PAH Compounds (mg/kg)					Total PAHs (mg/kg)
Applicable Standards								

NOTE:

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

Facility Name  
 Facility Address  
 County, Facility ID Number

**TABLE 3a: GROUNDWATER ANALYTICAL RESULTS**  
 (VOLATILE ORGANIC COMPOUNDS)

Well Number	Date Sampled	MTBE (ug/l)	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Total BTEX (ug/l)
Applicable Standards							

**TABLE 3b: GROUNDWATER ANALYTICAL RESULTS**  
 (POLYNUCLEAR AROMATIC HYDROCARBON)

Sample Location	Depth (ft)	Date Sampled	Detected PAH Compounds (ug/l)						Total PAHs (ug/l)
Applicable Standards									

NOTES:

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

Facility Name  
 Facility Address  
 County, Facility ID Number

**TABLE 4: GROUNDWATER ELEVATIONS**

Well Number	Date Measured	Ground Surface Elev. (ft)	Top of Casing Elev. (ft)	Depth of Screened Interval (Range in ft - ft)	Depth of Free Product (ft)	Water Depth (ft)	Product Thickness (ft)	Spec. Grav. Adjustment	Corrected Groundwater Elev. (ft)

NOTES:

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

Facility Name  
 Facility Address  
 County, Facility ID Number

**TABLE 5a: UST SYSTEM CLOSURE - SOIL ANALYTICAL RESULTS**  
 (VOLATILE ORGANIC COMPOUNDS)

Sample Location	Depth (ft)	Date Sampled	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Xylenes (mg/kg)	Total BTEX (mg/kg)	MTBE (mk/kg)	TPH (mg/kg)
Applicable Standards									

**TABLE 5b: UST SYSTEM CLOSURE - SOIL ANALYTICAL RESULTS**  
 (POLYNUCLEAR AROMATIC HYDROCARBON)

Sample Location	Depth (ft)	Date Sampled	Detected PAH Compounds (mg/kg)					Total PAHs (mg/kg)
Applicable Standards								

NOTES:

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

Facility Name  
 Facility Address  
 County, Facility ID Number

**TABLE 6a: UST SYSTEM CLOSURE - GROUNDWATER ANALYTICAL RESULTS**  
 (VOLATILE ORGANIC COMPOUNDS)

Well Number	Date Sampled	MTBE (ug/l)	Benzene (ug/l)	Toluene (ug/l)	Ethyl-benzene (ug/l)	Xylenes (ug/l)	Total BTEX (ug/l)
Applicable Standards							

**TABLE 6b: UST SYSTEM CLOSURE - GROUNDWATER ANALYTICAL RESULTS**  
 (POLYNUCLEAR AROMATIC HYDROCARBON)

Sample Location	Depth (ft)	Date Sampled	Detected PAH Compounds (ug/l)					
Applicable Standards								

NOTES:

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

**APPENDIX F**

**SITE RANKING FORM**

Facility ID: \_\_\_\_\_

County: \_\_\_\_\_

Ranked By: \_\_\_\_\_

Date Ranked: \_\_\_\_\_

### SITE RANKING FORM

#### SOIL CONTAMINATION

A. Total Regulated PAHs – Maximum concentration at the site (Assume < 0.660 mg/kg if only gasoline was stored on site)

\_\_\_\_\_  $\leq 0.0660 = 0$

\_\_\_\_\_  $.066-0.99 \text{ mg/kg} = 10$

\_\_\_\_\_  $1-10 \text{ mg/kg} = 25$

\_\_\_\_\_  $>10 \text{ mg/kg} = 50$

B. Total Benzene – Maximum Concentration found on the site

\_\_\_\_\_  $\leq 0.005 \text{ mg/kg} = 0$

\_\_\_\_\_  $>0.005 - .05 \text{ mg/kg} = 1$

\_\_\_\_\_  $.05 - .99 = 10$

\_\_\_\_\_  $1 - 9.9 = 25$

\_\_\_\_\_  $10 - 49.9 \text{ mg/kg} = 40$

\_\_\_\_\_  $\geq 50 \text{ mg/kg} = 50$

C. DEPTH TO GROUNDWATER – (Shallowest)  
(bls = below land surface)

\_\_\_\_\_  $> 50' \text{ bls} = 1$

\_\_\_\_\_  $> 25' \text{ bls} = 2$

\_\_\_\_\_  $> 10' \text{ bls} = 5$

\_\_\_\_\_  $\leq 10' \text{ bls} = 10$

Fill in the blanks: (A. \_\_\_\_\_ + B. \_\_\_\_\_) x C. \_\_\_\_\_ = D. \_\_\_\_\_

#### GROUNDWATER CONTAMINATION

E. Free Product (Nonaqueous-phase liquid hydrocarbons: See Guidelines for definition of "sheen").

\_\_\_\_\_ No free product = 0

\_\_\_\_\_ Sheen – 1/8" = 250

\_\_\_\_\_  $> 1/8" - 6" = 500$

\_\_\_\_\_  $> 6" - 1\text{ft.} = 1,000$

\_\_\_\_\_ For every additional inch above a foot, add 100 more points = 1,000+

F. Dissolved Benzene – Maximum Concentration at the site (One well must be located at the source of the release.)

\_\_\_\_\_  $\leq 5 \text{ ug/L} = 0$

\_\_\_\_\_  $>5 - 100 \text{ ug/L} = 5$

\_\_\_\_\_  $>100 - 1,000 \text{ ug/L} = 50$

\_\_\_\_\_  $>1,000 - 5,000 \text{ ug/L} = 250$

\_\_\_\_\_  $>5,000 - 10,000 \text{ ug/L} = 500$

\_\_\_\_\_  $> 10,000 \text{ ug/L} = 1,500$

Fill in the blanks: (E. \_\_\_\_\_ + F. \_\_\_\_\_) = G. \_\_\_\_\_

Facility ID: \_\_\_\_\_

County: \_\_\_\_\_

POTENTIAL RECEPTORS

Distance from nearest contaminant plume boundary to the nearest hydraulically connected Point of Withdrawal for water supply. This distance must be field-verified. **If the point of withdrawal is not hydraulically connected, evidence as outlined in the CAP-A guidance document MUST be presented to substantiate this claim.**

H. Public

- \_\_\_\_\_ Impacted = 2,000
- \_\_\_\_\_ ≤ 500' = 500
- \_\_\_\_\_ > 500' – 1/4 mi = 25
- \_\_\_\_\_ > 1/4 mi – 1 mi = 10
- \_\_\_\_\_ > 1 mi – 2 mi = 2
- \_\_\_\_\_ > 2 mi = 0

I. Non-Public

- \_\_\_\_\_ Impacted = 1,000
- \_\_\_\_\_ ≤ 100' = 500
- \_\_\_\_\_ > 100' - 500' = 25
- \_\_\_\_\_ > 500' – 1/4 mi = 5
- \_\_\_\_\_ > 1/4 mi – 1/2 mi = 2
- \_\_\_\_\_ > 1/2 mi = 0

For lower susceptibility areas only:

- \_\_\_\_\_ > 1 mi = 0

For lower susceptibility areas only:

- \_\_\_\_\_ > 1/4 mi = 0

**Note: If site is in lower susceptibility area do not use the shaded areas.**

J Distance from nearest contaminant Pulum boundary to downgradient Surface Waters **OR UTILITY TRENCHES & VAULTS** (Must be field \_verified)

- \_\_\_\_\_ Impacted = 500
- \_\_\_\_\_ ≤ 500' = 50
- \_\_\_\_\_ > 500'- 1,000' = 5
- \_\_\_\_\_ > 1,000' = 2

K. Distance from any Free Product to basements and crawl spaces

- \_\_\_\_\_ Impacted = 500
- \_\_\_\_\_ ≤ 500' = 50
- \_\_\_\_\_ > 500'- 1,000' = 5
- \_\_\_\_\_ > 1,000' = 2

Fill in the blanks:

(H. \_\_\_\_\_ + I. \_\_\_\_\_ + J. \_\_\_\_\_ + K. \_\_\_\_\_ ) = L. \_\_\_\_\_

(G. \_\_\_\_\_ x L. \_\_\_\_\_) = M. \_\_\_\_\_

(M. \_\_\_\_\_ + D. \_\_\_\_\_) = N. \_\_\_\_\_

P. SUSCEPTIBILITY AREA MULTIPLIER

- \_\_\_\_\_ If site is located in a Low Groundwater Pollution Susceptibility Area = 0.5
- \_\_\_\_\_ All other sites = 1

Q. EXPLOSION HAZARD

Have any explosive petroleum vapors, possibly originating from this release, been detected in any subsurface structure (e.g., utility trenches, basements, vaults, crawl space, etc.)

- \_\_\_\_\_ Yes = 200,000
- \_\_\_\_\_ No = 0

(N. \_\_\_\_\_ x P. \_\_\_\_\_)+ Q. \_\_\_\_\_ = \_\_\_\_\_

ENVIRONMENTAL SENSITIVITY SCORE

**APPENDIX G**

**TABLE A AND TABLE B SOIL THRESHOLD LEVELS**  
**FROM GUST RULE 391-3-15-.09**

**Table A Soil Threshold Levels**  
Petroleum Constituents and Soil Threshold Levels<sup>a</sup>

At UST corrective action sites where withdrawal points for public and non-public water supplies exist within distances defined in GUST Rule 391-3-15-.09(3)

CONSTITUENT	AVERAGE OR HIGHER GROUNDWATER POLLUTION SUSCEPTIBILITY AREA <sup>b</sup> (Where public water supplies exist within 2.0 miles or non-public supplies exist within 0.5 miles)		LOWER GROUNDWATER POLLUTION SUSCEPTIBILITY AREA <sup>c</sup> (Where public water supplies exist within 1.0 mile or non-public supplies exist within 0.25 miles)	
	≤500 feet to withdrawal point	>500 feet to withdrawal point	≤500 feet to withdrawal point	>500 feet to withdrawal point
VOLATILE ORGANIC COMPOUNDS				
Benzene	0.005 mg/kg <sup>d</sup>	0.008 mg/kg	0.005 mg/kg <sup>d</sup>	0.71 mg/kg
Toluene	0.400 mg/kg	6.00 mg/kg	0.400 mg/kg	500.00 mg/kg
Ethylbenzene	0.370 mg/kg	10.00 mg/kg	0.500 mg/kg	140.00 mg/kg
Xylenes	20.00 mg/kg	700.00 mg/kg	27.00 mg/kg	700.00 mg/kg
POLYNUCLEAR AROMATIC HYDROCARBONS				
Acenaphthene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Anthracene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benz(a)anthracene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benzo(a)pyrene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benzo(b)fluoranthene	0.820 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benzo(g,h,i)perylene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benzo(k)fluoranthene	1.60 mg/kg	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Chrysene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Dibenz(a,h)anthracene	1.50 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Fluoranthene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Fluorene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Indeno(1,2,3-c,d)pyrene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>
Naphthalene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Phenanthrene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Pyrene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>

a - Based on worst-case assumptions for one-dimensional vadose zone and groundwater contaminant fate and transport models.

b - Based on an assumed distance of 0.5 feet between contaminated soils and the water table

c - Based on an assumed distance of 5.0 feet between contaminated soils and the water table.

d - Estimated Quantitation Limit. The health-based threshold level is less than the laboratory method limit of detection.

e - Not applicable. The health-based threshold level exceeds the expected soil concentration under free product conditions

**Table B Soil Threshold Levels**  
Petroleum Constituents and Soil Threshold Levels<sup>a</sup>

At UST corrective action sites where withdrawal points for public and non-public water supplies do not exist within distances defined in GUST Rule 391-3-15-.09(3)

CONSTITUENT	AVERAGE OR HIGHER GROUNDWATER POLLUTION SUSCEPTIBILITY AREA <sup>b</sup>		LOWER GROUNDWATER POLLUTION SUSCEPTIBILITY AREA <sup>c</sup>	
	≤500 feet to surface water body	>500 feet to surface water body	≤ 500 feet to surface water body	>500 feet to surface water body
VOLATILE ORGANIC COMPOUNDS				
Benzene	0.017 mg/kg	0.120 mg/kg	0.020 mg/kg	11.30 mg/kg
Toluene	115.00 mg/kg	500.00 mg/kg	135.00 mg/kg	500.00 mg/kg
Ethylbenzene	18.00 mg/kg	140.00 mg/kg	28.00 mg/kg	140.00 mg/kg
Xylenes	700.00 mg/kg	700.00 mg/kg	700.00 mg/kg	700.00 mg/kg
POLYNUCLEAR AROMATIC HYDROCARBONS				
Acenaphthene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Anthracene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benz(a)anthracene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benzo(a)pyrene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benzo(b)fluoranthene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benzo(g,h,i)perylene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Benzo(k)fluoranthene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Chrysene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Dibenz(a,h)anthracene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Fluoranthene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Fluorene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Indeno(1,2,3-c,d)pyrene	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>	0.660 mg/kg <sup>d</sup>	N/A <sup>e</sup>
Naphthalene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Phenanthrene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>
Pyrene	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>

a - Based on worst-case assumptions for one-dimensional vadose zone and groundwater contaminant fate and transport models.

b - Based on an assumed distance of 0.5 feet between contaminated soils and the water table

c - Based on an assumed distance of 5.0 feet between contaminated soils and the water table.

d - Estimated Quantitation Limit. The health-based threshold level is less than the laboratory method limit of detection.

e - Not applicable. The health-based threshold level exceeds the expected soil concentration under free product conditions