WEST VIRGINIA GUIDANCE DOCUMENT

FOR

LEAKING UNDERGROUND STORAGE TANK (LUST)

SITE ASSESSMENTS AND CORRECTIVE ACTIONS

PREPARED BY:
West Virginia Department of Environmental Protection
Office of Environmental Remediation
1356 Hansford Street
Charleston, WV 25301
(304) 558-2508

August 2001

DISCLAIMER

The “West Virginia Corrective Action Guidance Document” (CAGD) presents recommended data collection, data analysis, and data presentation methods to meet the requirements of the West Virginia Department of Environmental Protection’s (WVDEP) Office of Environmental Remediation (OER). The WVDEP Office of Environmental Remediation acknowledges that the UST consulting and contracting community may have established and accepted technical methods for conducting the activities addressed in this guidance. Hence, this document is designed to serve as an educational aid and, with the exception of the reporting requirements, analytical methods, and formats presented herein, the guidance provided will not preclude the use of proven or accepted methods to quickly and accurately “diagnose and treat” environmental contamination at Leaking Underground Storage Tank (LUST) sites. References made to copyrighted materials or trade names do not necessarily reflect the endorsement of the WVDEP and United States Environmental Protection Agency (USEPA). WVDEP OER staff will periodically update this document to incorporate useful suggestions or changes that will undoubtedly need to be addressed as West Virginia’s LUST program evolves.

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PURPOSE AND BACKGROUND

The overall purpose of the CAGD is to streamline the LUST site corrective action process in West Virginia. The EPA's Office of Underground Storage Tanks (OUST) has set goals to streamline State UST/LUST processes using Total Quality Management (TQM) techniques. To this end, USEPA has worked with West Virginia to:

- Identify steps in the WV Corrective Action process;
- Identify bottlenecks or sources of delay, waste and rework in the process;
- Develop creative ideas to improve the process;
- Implement some of those solutions.

Streamlining the process as a whole is a long-term undertaking, and one that will require "continuous improvement" as prescribed by TQM methods. The purpose of the CAGD is to better articulate West Virginia's LUST program requirements, clarify what data should be collected, and improve the consistency and quality of required reports. Among the specific improvement goals of the guidance are:

- Improving the percentage of submittals for often overlooked reporting requirements (i.e. 40 CFR 280.62, 280.63 and 280.64 reports);
- Reducing the number of re-submittals (particularly for 40 CFR 280.65 reports);
- Reducing time frames for report submittals;
- Reducing State staff time in report review and response;
- Simplifying the review process by standardizing report formats;
- Improving State staff consistency and speed in drafting response letters;
- Reducing the time State staff spend answering and re-answering frequently asked questions;
- Improving site assessment quality so that better selected and designed corrective actions will be undertaken, thus expediting cleanups and reducing long term costs;
- Increasing sensible use of interim measures to mitigate contaminant migration while full-extent site assessment and long-term corrective action efforts occur.

This guidance should not be considered a remedy for all issues related to the LUST process. Instead, this guidance should be considered a starting point for further refining and streamlining the corrective action process. The key to continuously improving the process will be incorporating feedback from the users of the document whenever a faster, better, or cheaper approach to LUST site corrective action can be identified and consistently applied.

IMPORTANT CONTACTS AND PHONE NUMBERS

1. West Virginia Department of Environmental Protection (WVDEP)
   (After hours emergency number) 1-800-642-3074

   Office of Water Resources:
   Groundwater Section
   (Monitoring Well Regulations, UIC, etc.) (304) 558-2108
   Industrial Permits Section
   (NPDES, etc.) (304) 558-8855
   Municipal Permits Section
   (Sanitary Sewer discharges) (304) 558-0375

   Office of Air Quality:
   (Air discharge permits) (304) 558-4022

   Office of Waste Management:
   (Hazardous Waste Section) (304) 558-5393
   (Solid Waste Section) (304) 558-6350
   (Enforcement Unit) (304) 558-2505
   (UST Section) (304) 558-6371

   Office of Environmental Enforcement:
   (NPDES Enforcement) (304) 558-2497

   Public Information Office (304) 759-0515

   Environmental Advocate (304) 759-0570

2. Other State Agencies

   State Fire Marshall's Office (304) 558-2191

   Division of Highways (304) 558-2822

   Public Service Commission
   (Waste Disposal labeling, transportation, documentation) (304) 340-0320

   Department of Labor (304) 558-7890

3. Spill Hotline (In State) 1-800-642-3074
   (Out of State) 1-800-424-8802

4. Miss Utility of West Virginia 1-800-245-4848

5. State Lab Certification (304) 558-2108

Office of Environmental Remediation
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Telephone: (304) 558-2508
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Donald Martin, Project Manager Supervisor--- email: dwmartin@dep.state.wv.us
WVDEP OER
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French Creek, WV 26218

Office Phone: (304) 924-6211
Fax: (304) 924-6781
e-Fax: (425) 696-8502

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DEFINITIONS

API – American Petroleum Institute **http://www.api.org/**
ASTM – American Society for Testing Methods **http://www.astm.org/**
BTEX – Benzene, Toluene, Ethylbenzene, Xylene
CAGD – Corrective Action Guidance Document
CAP – Corrective Action Plan
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CFR – Code of Federal Regulations
COC – Chain of Custody
CSR – Code of State Regulations
DEP – Department of Environmental Protection **http://www.dep.state.wv.us**
DOT – Department of Transportation
DRO – Diesel Range Organics
EI – Environmental Inspector
FID – Flame Ionization Detector
FOIA – Freedom of Information Act
FP – Free Product
GAC – Granular Activated Carbon
GC – Gas Chromatograph
GRO – Gasoline Range Organics
ID – Identification
LEL – Lower Explosive Level
LP – Leaching Potential
LUST – Leaking Underground Storage Tank
MCL – Maximum Contaminant Level
MDL – Minimum Detection Limits
MG/KG – Milligram per Kilogram
MG/L – Milligram per Liter
MS – Mass Spectrophotometer
MTBE – Methyl Tertiary Butyl Ether
NFA – No Further Action
NPDES – National Pollutant Discharge Elimination System
OAQ – Office of Air Quality
OEE – Office of Environmental Enforcement
OER – Office of Environmental Remediation
ORO – Oil Range Organics
OSHA – Occupational Safety and Health **http://www.osha.gov/**
OUST – EPA's Office of Underground Storage Tanks **http://www.epa.gov/swerust1/**
OVA – Organic Vapor Analyzer
OWM – Office of Waste Management
OWR – Office of Water Resources
PAH – Polynuclear Aromatic Hydrocarbons
PEL – Permissible Exposure Limits
PID – Photo Ionization Detector
PM – Project Manager
PPB – Parts Per Billion
PPM – Parts Per Million

PQL – Practical Quantitation Limits
PSC – Public Service Commission **http://www.psc.state.wv.us/**
QA/QC – Quality Assurance/Quality Control
QMR – Quarterly Monitoring Report
RCRA – Resource Conservation Reduction Act
RP – Responsible Party
SAR – Site Assessment Report
SOP – Standard Operating Procedures
SW – Solid Waste
TBA – Tert Butyl Alcohol
TC – Toxic Characteristics
TCLP – Toxic Characteristic Leaching Procedure
TEGD – Technical Enforcement Guidance Document
TEL – Toxic Equivalent Level
TPH – Total Petroleum Hydrocarbons
TQM – Total Quality Management
UEL – Upper Explosive Level
USEPA – United States Environmental Protection Agency **http://www.epa.gov**
USGS – United States Geologic Survey **http://www.usgs.org/**
UST – Underground Storage Tank
VOC – Volatile Organic Compound
VRRA – Voluntary Remediation and Redevelopment Act
WV – West Virginia
WVPUG -- West Virginia Petroleum User's Guide (or User Guide for Risk Assessment of Petroleum Releases accompanying the West Virginia Voluntary Remediation and Redevelopment Act Guidance Manual

WV REPORTING REQUIREMENTS AND SUBMITTAL TIME FRAMES

When a release is confirmed at a UST facility, the owner/operator must initiate investigations and submit reports as required by the WVDEP Office of Environmental Remediation. Required time frames for the reports are as follows:

a) The Initial Abatement Report (Section 40 CFR 280.62) must be submitted within 20 days after a release is confirmed.

b) The Initial site Characterization Report (Section 40 CFR 280.63) must be submitted within 45 days after a release is confirmed.

c) If free product recovery is necessary, a Free Product Removal Report (Section 40 CFR 280.64) must be submitted within 45 days after a release is confirmed and monthly thereafter until measurable free product is not present. If measurable quantities return, recovery and reporting must continue (see Chapter 1).

d) The Primary Site Assessment Report shall be submitted within 90 days after a release is confirmed, and the WV OER expects that in many cases the report can and should be submitted in a more expeditious time frame.

e) Any Supplemental/Final site Assessment Report shall be submitted in accordance with a compliance time frame negotiated with WV OER staff.

f) The Corrective Action Plan shall be submitted within 120 days after a release is confirmed and the WV OER office expects that in many cases the report and should be submitted in a more expeditious time frame.

NOTE: Not all reports may be required for every site. Contact the Project Manager (PM) if there are questions about what reports are required for a given site or refer to the Confirmed Release Notice to Comply and/or the Site Assessment Report/Corrective Action Plan (SARCAP) letter for site-specific dates.

If any of the deadlines cannot be met due to uncontrolled circumstances, a written request for an extension must be submitted to the PM in the appropriate district office. The owner/operator must document the “extenuating circumstances” which make compliance by the original deadline out of its control. All required reports must be submitted in duplicate. One copy is to be sent to the attention of the PM at the district office for the county in which the leak site is located and the second copy is to be submitted to the Charleston Office. (See WVDEP OER personnel roster).

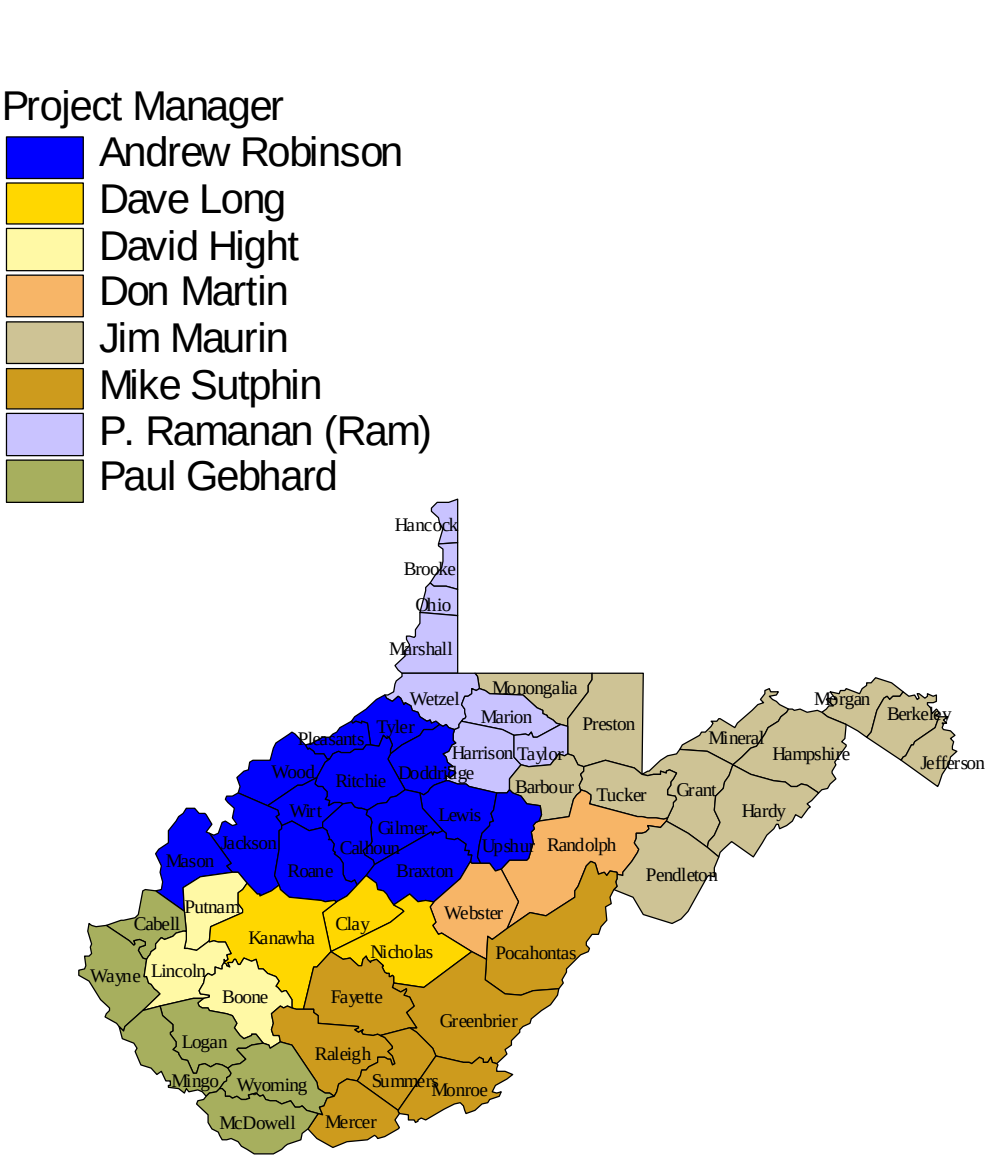
WEST VIRGINIA CORRECTIVE ACTION NOTES

A. Emergencies may include free product or vapor in buildings or sub surface utilities, drinking water wells or groundwater impacted, free product or sheens on surface water, etc.

B. To determine the source(s) of contamination, an Environmental Inspector or Project Manager has the right by regulation to require tank tightness testing, site investigations, or both.

C. Receipt of the “Confirmed Release Notice to Comply” is formal notice of responsibility to the Responsible Party (RP).

D. The State reserves the right to take over the site lead and/or take enforcement action anytime the RP is recalcitrant.



LUST Counties By Project Managers

April 2, 2001

CHAPTER 1 -- FREE PRODUCT RECOVERY

The WVDEP LUST regulations and Federal LUST regulations at 40 CFR 280.50(a) requires that the discovery of free product be reported within twenty-four (24) hours and that free product recovery begin as soon as possible. The following guidance focuses on free product recovery by addressing frequently asked questions, identifying reporting requirements, providing a report format, and discussing free product response measures.

1.1 General Information – Frequently Asked Questions on Free Product Recovery

a) What is free product?

Free product is any regulated liquid material found open in the environment. For example, oil floating on top of surface water, or on the top of groundwater, is considered free product. Materials of concern in free product situations are liquid petroleum, such as gasoline, kerosene, diesel fuel, oil, and any hazardous substance either listed in Section 101(14) of CERCLA or defined as such under RCRA.

b) Why must free product be recovered?

The primary reason to recover free product is to prevent its spread and minimize its change from liquid to other phases (i.e. free product may dissolve into ground or surface waters, become adsorbed onto soils, and volatilize into a vapor). Once free product changes to these other phases, cleanup becomes much more difficult. In preventing free product from spreading, one minimizes future recovery costs and danger to human health and the environment (groundwater, fisheries, vegetation, etc.) Human health and safety are threatened by the spread of free product because of the potential for vapors in confined spaces, explosions, and contamination of drinking water. These concerns are heightened by the fact that most petroleum products contain carcinogenic substances.

The presence of free product contamination at a site may prevent future construction or expansion, impact the sale of the property to a prospective buyer, or prevent the owner from obtaining bank financing. Also, if allowed to spread to other phases, the remediation of free product and its “daughter products” will become more complex and more costly. In addition to the reasons cited here, one must recover free product because it is a Federal and State requirement by law.

c) What evidence will indicate that free product removal is necessary?

Situations in which free product removal is necessary include, but are not limited to:

- The discovery of free product in a pit during an UST closure activity;
- The discovery of free product in public or private drinking water, monitoring, and/or observation wells;
- The discovery of free product in springs, seeps, surface water bodies, utility lines and vaults, catchment basins, or manholes;
- The discovery of free product during subsurface investigations and/or site assessments;
- A spill of free product on a surface or in surface water.

Situations that require free product removal are further addressed in Section 1.2.

d) What permits are required to initiate free product removal?

No permits are required to remove free product from subsurface soils, groundwater, or surface water bodies. The recovered product and water, if any, may be stored on site without a permit for a limited time prior to disposal. Storage and disposal of free product and/or water must be conducted according to appropriate regulations. Refer to the Important Contacts and Phone Numbers page for more information regarding Hazardous Waste Section Rules and Regulations on specific time frames.

In situations where water recovered as part of the free product removal operation is discharged, a West Virginia National Pollutant Discharge Elimination System (WV NPDES) permit is required. Recovered water may, in some cases after treatment, be discharged to a sanitary sewer, storm sewer, ground surface, or surface water body. If the discharge is made to a sanitary sewer, a permit will be required through the WVDEP Water Resources Municipal Permits Section or, in some cases, through a city sewage treatment facility. Please contact OWR at (304) 558-0375 for more information.

If the recovered water discharge is made to a storm sewer, surface water, or the ground surface, a permit is required through the WVDEP OWR Industrial Permits Section. Please call (304) 558-8855 for more information. **Note that in no situation is free product discharge allowed to a sanitary sewer, storm sewer, surface water body, or the ground surface.**

e) Who do I call when I find free product?

The discovery of free product should be reported immediately, but must be reported within 24 hours by contacting either:

- WVDEP, Office of Environmental Remediation, French Creek, WV Office at (304) 924-6211, or by fax (304) 924-6781 or

- WVDEP Spill Hotline 1 (800) 642-3074

NOTE: A report may also be made to local fire departments, emergency response units, etc., if necessary. OER also recommends that you should contact your insurance carrier as required by your policy.

f) What safety considerations are there during free product removal?

There are several safety factors to keep in mind during free product removal operations. First, there should be no smoking or open flames in the vicinity of the operation. Second, personnel should minimize the potential for injury and avoid climbing into tanks (during off-loading, especially). Finally, the actual free product removal process should be conducted cautiously. This is especially true when product is pumped into vacuum trucks. Always be aware of the potentially explosive vapor conditions that may exist when dealing with free product. Also, inhaling vapors may cause dizziness, headaches, burning in the nose and throat, and other health problems.

g) Is my free product recovery technique adequate for my site?

Federal and State regulations require that free product removal be conducted in a manner that minimizes the spread of contamination into previously uncontaminated zones by using recovery and disposal techniques appropriate to the hydro-geologic conditions at the site. Also, abatement of free product migration must be the minimum objective for the design of the free product removal system. Several factors influence the rate at which free product will migrate from the source of the release including the type and permeability of soils, the amount of product lost and/or thickness of product on the water table, and the groundwater gradient. Free product removal should be initiated as soon as possible and continue until virtually all product is removed. Manual bailing may be used to initiate free product recovery (until a more permanent system may be installed) or in very low permeability soil conditions when the recharge rate of free product into a well or other collection point is very slow. Filter canisters are a fairly new free product recovery technique that can remove more free product with less effort than manual bailing. However, depending on the

groundwater gradient and volume of the release, separate groundwater control may be required to prevent further migration. Nearly all large- volume release will require automated free product removal.

1.2 Reporting Procedures

The discovery of measurable free product (thickness greater than 1/8 inch or .01 feet in a monitoring well) or a free product release should be reported immediately to the proper authorities. In all cases, reporting must occur within 24 hours. Incidents that must be reported are identified in 40 CFR 280.41, 280.50, and 280.61, and include, but may not be limited to, free product discovered:

- during monthly monitoring (40 CFR 280.41);
- during closure activities (40 CFR 280.72, 280.73);
- during site assessment activities (40 CFR 280.62, 280.63, 280.65);
- as a suspected release (40 CFR 280.50);
- during release confirmation (40 CFR 280.52).

The 24-hour reporting shall be directed, via fax or telephone, to the French Creek office. The office is open from Monday to Friday during regular business hours. Alternatively, the Emergency Spill Response Hotline can be contacted at (800) 642-3074 from within West Virginia at any time. If the Spill Hotline is used, a follow-up confirmation call should be made to the assigned PM as soon as possible.

Within 45 days of the discovery or release of free product, an initial written report shall be submitted to the assigned PM. In addition, on or before the 10th day of the month following the release, a monthly report shall be submitted. These reports are to be submitted and distributed as follows. One copy will go to the assigned PM and the second will go to the Charleston Office. The suggested format of the reports are discussed below.

1.3 Reporting Formats

The preferred reporting formats for initial and monthly reports are presented below. The formats contain components that are needed to meet Section 40 CFR 280.64 requirements. Free product recovery reports shall include all of the following components in the order presented.

a) Initial Report

Within 45 days of the discovery or release of free product, two copies of a written report must be submitted. One copy to the assigned PM and one copy to the Charleston Office. This initial report should contain, at a minimum, the following items in the order presented (if

the information is not applicable or not available, provide a brief explanation):

I. Administrative Information (this may all be shown on the report cover)

- Site name and location
- Owner's name, address, and phone number
- Operator's name, address, and phone number
- WV identification number
- LEAK number
- Closure number (if applicable)
- Date

II. Recovery Plan (a brief, bulleted format is preferred)

- Type of free product
- Description of release
- Estimate of quantity released
- Thickness measured or observed in wells, boreholes, excavations, or any other location where free product is observed. NOTE: All locations (on-and off-site) associated with the release investigation with potential for free product accumulation must be checked/gauged for water and free product levels.
- Identification of any permit requirements and the time frame for securing them
- Name, address, and phone number of firm(s) involved in the free product recovery plan
- Description of planned free product recovery method
- Description of how recovered product/water/soils will be stored and how they will ultimately be disposed (final disposal documentation will be required)
- Description of any future planned activities
- A detailed site map that includes:
  - Location(s) where free product was discovered
  - Location(s) for free product recovery
  - Groundwater elevations, gradients, and flow direction (on contour map)
  - Recovered product/water/soil locations

III. Monitoring Requirements

The following information should be provided in tabular form for each well:

- Quantity of product (gal) recovered during the month should be provided in tabular from for each well associated with site.
- Quantity of product (gal) recovered to date
- The current depth to the product in feet
- The thickness of the product in feet
- The depth to water in feet
- Measurement frequency
- Number of days of recovery during the month (see Appendix FP-1)

The frequency of site visits to monitor free product recovery will vary with the removal technique in use. Manual bailing may require daily visits for some period of time to reduce free product thickness. Likewise, filter canisters may also require frequent visits, although depending on the storage capacity and/or the type of product removal (manual vs. automated), these should not require visits as frequent as manual bailing. Many filter canisters must be manually adjusted to be sure the free product layer contacts the screened portion of the canister. Automated recovery systems may only require monthly visits to ensure proper operation. However, on-site personnel should be available to ensure the system is operational (see Section 4.2.3.1, Paragraph 2).

At a minimum, measurements of depth to product, depth to water, and thickness of product should be made at least twice a month. Measurements should be made to the nearest 1/8 inch or 0.01 foot. Also, a graph depicting the change in the free product thickness over time by day should be included. Appendix FP-1 provides an abbreviated example of the suggested Free Product Report format, monitoring data table, and plot of product thickness change over time.

b) Monthly Report

On or before the 10th day of the month following the discovery of a release, two copies of a monthly report shall be submitted with the distribution to follow the format listed in Section (a). The monthly report should include the same administrative and monitoring requirements (Sections I on page 1-5 and III on Page 1-6) as outlined for the initial report. The monitoring information can be reported in tabular form. The graph of product thickness over time should also be included. Monthly reports must continue to be submitted until free product recovery is complete, or a remediation system is installed and operational.

Along with the measurements, the monthly report should contain any comments on unusual conditions (i.e., recovery wells being pumped dry, suspicion of additional sources of free product, etc.). Also, if the planned future activities differ from those laid out in the initial report, this should be clearly stated. Any changes to the initial recovery plan should be brought to the attention of the assigned PM, as well as being outlined in the monthly report.

1.4 Example of Free Product Recovery Operation

A free product recovery operation is triggered by the discovery of free product and involves the notification of the proper authorities, initial response measures, actual free product recovery, and required reporting. The following paragraphs provide an example of the recovery actions that may be taken during a typical free product release.

a) Discovery of a Release

In many cases, the occurrence of free product will be obvious. Petroleum may be floating on top of surface water in a pit or groundwater in a well. In the case of an active UST, a release may not be as obvious. Instances that may indicate a release from an UST include a tightness test failure, significant loss of inventory, and product in adjacent monitoring or observation wells. As previously stated in Section 1.2, once a release is discovered, the appropriate authorities should be contacted immediately, and must be contacted no later than 24 hours following the discovery. Also, if product is discovered in a water supply well or a well located in close proximity to such a well, the well's owner should be contacted.

b) Initial Response Measures

The first thing to do once a release has been discovered is eliminate the source, if possible. In the case of a UST or any subsurface release, one could do the following:

- Drain the associated lines into the UST(s).
- Off-load the suspected tank(s) as soon as possible into a fuel truck that is equipped to pump out the product. If in doubt, off-load all tanks until a determination can be made as to which tank is the source.
- If there are wells adjacent to the tank (either monitoring or water supply wells), check for product using a hand bailer or interface probe.
- Check utility trenches, storm and sanitary sewers, telephone vaults, basements, pits, sumps, etc.

Caution should be exercised in checking subsurface locations. Vapors may be present, thus enhancing the potential for explosion. No open flames or sparks should be in the area.

If the free product release is from a dispensing operation, the electrical power to the operation should be shut off. If the free product is from a product carrier (e.g. due to overfill or a hose rupture) discontinue flow from the truck. After initial response measures have been taken, free product recovery should begin to prevent the spread of contamination.

c) Free Product Recovery

Free product recovery procedures depend on the size and location of the release and the type of product released. In the case of product discovered in a well, the well could be hand bailed to remove product and water from the well. The recovered product and water should be stored in appropriate containers (clearly labeled 55-gallon drums, at a minimum) until disposal.

In the case of spills to the ground surface, small spills may be contained using pads, booms, or other absorbent materials that are suitable for use with petroleum products. These materials should not normally be used for water. Special containment booms should be used for spills or releases to surface water. Releases to navigable waters should involve response by the US Coast Guard. Absorbent materials should be disposed of in accordance with their classification as hazardous or solid waste. Absorbent materials are inadequate for large-scale spills. In the case of a large spill, a trench filled with stone may be used as a free product collection point. Product may then be pumped or hand bailed from the trench, stored in appropriate containers, and disposed of properly. In pumping product from a trench, pit, or other subsurface collection point, one should use fire-and explosion-proof pumps that have been deemed suitable by the manufacturer for such an operation. If available, a vacuum truck may be used. Such trucks provide truck mounted suction systems with self-contained storage. It may be preferable to remove free product slowly from a well or trench. In cases where rapid pumping occurs, it may smear the product and create a bigger problem by allowing product to reach lower into an aquifer.

Free product recovery and reporting should continue until the sheen disappears from surface water or the thickness of free product is less than 1/8 inch in a well or pit. Free product recovery may have to be sustained until the full-scale Corrective Action Plan is initiated (see Chapter 4). <u>In conducting free product recovery, it is important to keep in mind that, even if the situation appears stabilized, free product may return at any time</u>.

For more information on Free Product Recovery Methods, see:
http://www.epa.gov/swerust1/pubs/index.htm#fprg

APPENDIX FP-1
FORMAT FOR INITIAL FREE PRODUCT REMOVAL AND SUBSEQUENT MONTHLY REPORTS

I. Administrative Information

Site Name:_____ WV ID No:_____
Site Location:_____ LEAK No:_____
Closure No:_____ Contact Person:_____

Owners Name:_____
Owners Address:_____
Owners Phone No:_____

Operators Name:_____
Operators Address:_____
Operators Phone No:_____

II. Recovery Plan

The recovery plan is required for the initial report only and should contain the material outlined in the text under Section 1.3(a).

III. Monitoring Requirements

This section of the report should contain the information required under Section 1.3(a) III and 1.3(b). Tabular format is recommended for presentation of the data. Below is a Sample Monitoring Data Table.

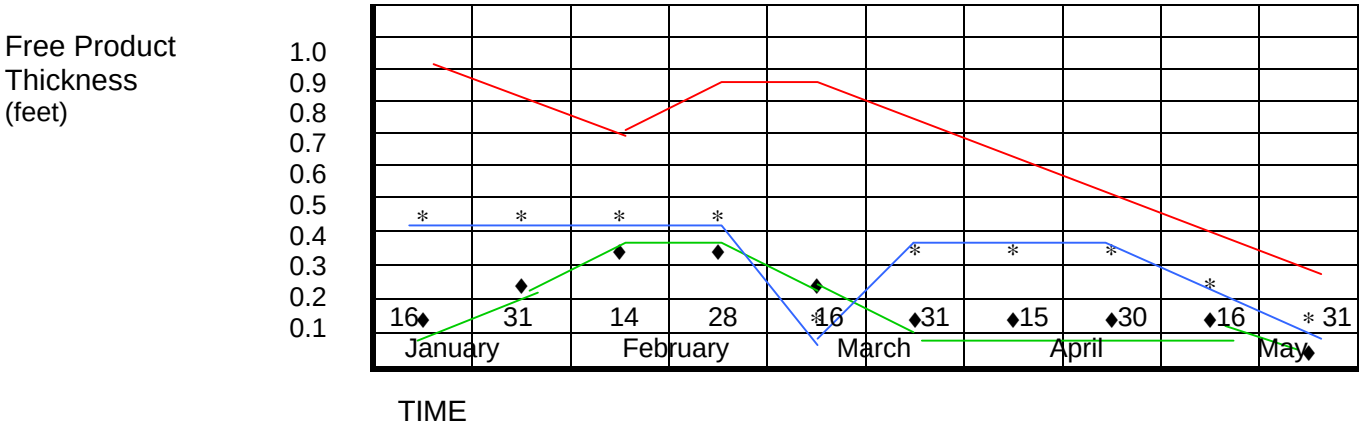
MW-7
Total Depth of Well = 24.50 ft.

MW-10
Total Depth of Well = 14.61ft.

Date 2000	Depth to Water (feet)	Depth to Product (feet)	Thickness of Product (feet)	Total Volume Recovered (GW & FP) (gallons)	Depth to Water (feet)	Depth to Product (feet)	Thickness of Product (feet)	Total Volume Recovered (GW & FP) (gallons)
12-1	14.75	14.24	0.51	0.50	11.05	---------	0.00	0.00
12-8	14.34	14.20	0.14	0.25	11.01	---------	0.00	0.00
12-15	14.31	--------	Sheen	----------	12.05	12.02	0.03	0.25
12-22	14.44	--------	Sheen	----------	13.83	12.65	1.18	1.5
12-29	14.52	14.50	0.02	0.20	Dry	---------	----------	----------
Volume recovered this month				0.95	Volume recovered this month			1.75
Total volume recovered to date				5.00	Total volume recovered to date			9.87

APPENDIX FP-1 (continued)
FORMAT FOR INITIAL FREE PRODUCT REMOVAL AND SUBSEQUENT MONTHLY REPORTS

Sample Graph of Free Product Thickness Change Over Time



MW-1-- *
MW-2--
MW-3--

CHAPTER 2 – SITE ASSESSMENT

The WVDEP LUST regulations direct responsible parties or owner/operators to determine the full extent and magnitude of contamination in soils and groundwater at LUST sites (Section 40 CFR 280.65). West Virginia has previously recommended and endorsed the site assessment guidance developed by the American Petroleum Institute, "A guide to the Assessment and Remediation of Underground Petroleum Releases," (API Document #1628). The following guidance is offered to further assist the regulated community in properly investigating releases and consistently presenting LUST site assessment methods, findings, and conclusions to the state. For more information: http://www.api.org/cat/catalg01.pdf.

2.1 Conditions that Require a Site Assessment

The WVDEP OER may require a site assessment for any reason that includes, but is not limited to:

- Changes in service of an UST
- Closures of USTs
- Discoveries of leaking USTs
- Spills, overfills at UST sites

The following conditions or scenarios will require a site assessment to determine the full extent of contamination at LUST sites:

a) If evidence of environmental contamination and/or risk to public health exists that includes but is not limited to:

- Evidence that groundwater wells (including, but not limited to, public or private drinking water, industrial supply, or monitoring/observation wells) have been affected by a release
- Evidence that free product has been discovered and needs recovery per section 40 CFR 280.64 (i.e. in monitoring or supply wells, catchment basins, utilities, etc.)
- Evidence that vapors from a petroleum release are present or migrating into basements, conduits, utilities, etc.)
- Evidence that contaminated soils may be in contact with groundwater, or providing a source for groundwater contamination

b) If tank closure observations reveal:

- Groundwater contamination in the excavation or tank pit
- Free product in the excavation or tank pit
- Excavation activities are unable to excavate soils to the extent needed to meet clean up standards

- Contaminated soil is in contact with groundwater
- Off-site contamination is observed (i.e., in adjacent utilities, etc.)

Under any of the above conditions, the full extent of contamination must be determined by conducting a site assessment(s) and submitting the findings and conclusions of the assessment(s) to the WVDEP OER. Any of the above listed conditions should trigger an owner/operator to immediately notify the Office of Environmental Remediation and begin the site assessment process. The OER staff will issue a "Confirmed Release – Notice to Comply" either during on-site interactions or via the mail. Within 90 days of the issuance date of the Confirmed Release Notice to Comply, the owner/operator must submit a Primary Site Assessment Report that strives to determine the on-site extent of contamination. A minimum of three borings/groundwater monitoring wells will be required. Should the extent of contamination be defined during the Primary Site Assessment, only the Primary Site Assessment Report will need to be submitted to meet Section 40 CFR 280.65 requirements. If additional investigation off-site is required to determine the full extent of contamination, this must be stated in the Recommendations Section of the Primary Site Assessment Report. Compliance time frames for Supplemental/Final Site Assessment Report(s) must be negotiated with the PM and will be determined on a site-by-site basis. Also, the owner/operator may need to submit:

- An Initial Abatement Report (Section 40 CFR 280.62)
- An Initial Site Characterization Report (Section 40 CFR 280.63)
- A Free Product Recovery Report (Section 40 CFR 280.64)

These reports will be in addition to:

- A Primary Site Assessment Report that strives to determine the extent of on-site contamination (Section 40 CFR 280.65)
- A Supplemental/Final Site Assessment Report that provides the full extent of contamination from the release (Section 40 CFR 280.65)
- A Corrective Action Plan (CAP) (Section 40 CFR 280.66)

If an owner/operator does not take immediate steps to initiate the site assessment, enforcement action may be taken.

2.2 Site Assessment Methodology

The following guidance is a brief overview of selected key assessment methods considered by WVDEP OER. This guidance is not intended to replace guidance provided in API 1628 or fully developed SOPs currently in use by contractors or consultants in West Virginia. However, where noted, the WVDEP OER expects specific guidance to be followed:

A. Soil Sampling

1. Field Screening

a) Screening for the presence of volatile organic compounds (VOCs) must be performed by using a properly calibrated Photo Ionization Detector or Flame Ionization Detector (PID/FID) or other approved device.

b) Screening soils at the uppermost water-bearing zone is considered critical, and in general, the WVDEP OER fully expects assessment soil screening to occur where "contamination is most likely to occur" as in strata directly below UST's, leaking piping, or at the water table.

As AP 1628 and RCRA Technical Enforcement Guidance Document (TEGD) direct, split spoon samples must be collected at 5-foot intervals in soil borings and monitoring well drill holes at a minimum. The sample showing the highest field screening concentration will be submitted for laboratory analysis. If no one sample appears to be more concentrated than another in a particular borehole, submit a sample from the soil/bedrock or soil/groundwater interface. Continuous split-spoon sampling may be warranted to more carefully define vertical extent of contamination in selected areas of either high risk, or complex subsurface conditions (and also to improve interpretation in areas with complex stratigraphy.) For more information: http://www.epa.gov/oeca/ore/rcra/cmp/090086.pdf.

c) Should field screening in all borings indicate non-detectable VOCs, the soil sample closest to the source of contamination and the soil sample taken at the soil/bedrock or soil/water interface immediately adjacent to the suspected source will be submitted for laboratory analysis.

2. Sample Collection for Laboratory Analysis

Sample container, preservation, and holding times are specified for each analytical method in EPA SW-846. For more information: http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm.

a) Other general Quality Assurance/Quality Control (QA/QC) information is available in the RCRA TEGD or in 40 CFR 136.

b) To ensure that VOCs are not lost during the sampling process, the soil samples must be exposed to the atmosphere for the shortest time possible and immediately placed on ice (i.e.

stored at less than 4°C); a separate portion of the split-spoon sample should be utilized for field screening.

c) Soil samples should be collected and screened from borings or drill holes until bedrock is encountered or until horizons that show no evidence of contamination are encountered; drilling should continue far enough into the upper most water-bearing zone to evaluate potential "smear" zones, however, care must be taken not to breach confining layers and allow vertical migration of contamination.

d) TCLP lead samples should be taken at sites where the release source is an UST system that historically stored leaded gasoline. If TCLP lead analysis is performed as a waste characterization parameter for soil disposal (for instance during tank closure) and results are below regulatory levels, no further TCLP lead analysis will be required. Otherwise, TCLP lead analysis will be required during the Primary Site Assessment. One sample from each borehole shall be submitted for analysis and the sample showing the highest field screening result should be used.

NOTE: USEPA has proposed to exempt media and debris (e.g., soils and groundwater) contaminated with petroleum from USTs from the Toxicity Characteristics (TC) rule for identifying hazardous wastes. The TC rule, effective September 25, 1990, replaced the Extraction Procedure (EP) leach test with the Toxicity Characteristic Leaching Procedure (TCLP); added 25 organic chemicals (including Benzene) to the list of toxic constituents of concern, and established regulatory levels for these organic chemicals. The WVDEP OER will continue to require TCLP testing for lead at sites with releases from UST systems known to have contained leaded gasoline. Other TCLP metals analysis may also be required associated with releases from used oil tanks (see Analytical Methods in Appendix SA-3).

3. Consideration must be given to previous soil sampling results (i.e., 40 CFR 280.63 findings or other investigations) when deciding test parameters.

B. Monitoring Well Installation and Documentation

Monitoring well construction in West Virginia must follow the State Monitoring Well Regulations found in 47 CSR 59 & 60. Guidance for well drilling may be found in 47 CSR 59 & 60 and in other documents. (See API 1628 and TEGD). All monitoring wells must be installed by a

Certified Monitor Well Driller according to 47 CSR 59. The following provides items that the WVDEP OER considers important during monitoring well drilling and installation:

1) Monitoring well location

   a) Well locations should take into account anticipated groundwater flow direction (i.e. typically reflected in surface slope or directed toward the nearest surface water body for shallow water tables in unconsolidated materials) Specifically, at least one well should be located up gradient from the suspected or known source of contamination with at least two additional wells located down gradient from the source.

   b) Rationale for well locations should be documented in the report and should be consistent with other guidance (e.g. API 1628 and the TEGD).

2) Split-spoon soil samples and drill cuttings should be evaluated for composition, texture, color and evidence of contamination or change in lithology (which may also be noted by change in rate, “chatter”, or ease of drilling).

3) The well screen interval should be such that the water table is encountered even during the highest water table conditions (i.e. typically in spring).

4) A minimum of three monitoring wells must be installed for all sites requiring a groundwater investigation. The wells must be installed in a pattern that allows for determination of the site-specific groundwater flow direction.

5) Vertical components of groundwater flow will be examined if water quality tests indicate that more than the uppermost aquifer has been impacted. This will require installation of monitoring wells in both the shallow and deeper aquifers at the site and may require placement of piezometers in closely spaced well clusters.

6) There must be no cross-contamination of deeper aquifers. Double cased wells with a surface casing sealing off upper saturated zones will be required if drilling proceeds below a surficial aquifer.

7) Drilling must continue until split-spoon samples indicate non-detectable levels of contamination or until bedrock or

groundwater are encountered. Guidance on bedrock wells will be provided on a site-specific basis – particularly given the diversity of bedrock aquifers across West Virginia (including those areas of rapid groundwater flow in limestone/carbonate (karst) aquifers in the southeast and eastern panhandle.)

8) Vertically extensive drilling may be warranted in some unconsolidated settings (i.e. areas of the Ohio River floodplain), where contaminants have been found at depths of up to 60 feet while little or no indication of their presence was suggested in shallower horizons.

9) West Virginia may allow the use of dyes or tracers in karst in lieu of wells on a site-by-site basis. However, unless prior approval is obtained from the PM, wells are still required in those environments.

10) Drill cuttings may either be land farmed on-site according to the requirements of Section 3.2.4 on Page 56 or analytical results may be obtained to determine final disposal. Under no conditions should cuttings be placed in the annular space of a monitoring well.

11) Incomplete borings, destroyed wells, or decommissioned monitoring wells must be permanently abandoned in accordance with 47 CSR 60 to prevent any future conduit for contaminants to reach an aquifer. Copies of the monitoring well abandonment forms must be included in the site assessment report and documentation of any plugging activities should be included in the boring logs.

C. Groundwater Sampling

1) Groundwater sample collection, preservation, and handling are covered in many other technical guidance documents (e.g. SW-846, API 1628 and TEGD).

2) Dedicated or disposable bailers are recommended for all wells to prevent cross-contamination. (If bailers must be reused, thorough documentation of specific decontamination procedures should be provided).

3) Once groundwater contamination has been confirmed at a leaking UST site, quarterly groundwater sampling must continue until site closure. All contaminated wells (non free-

phase) must be sampled along with those wells defining the perimeter of the plume. Results of the sampling must be sent in duplicate, in accordance with the requirements of the NOTE on Page 8, within 60 days of the sampling date. A brief summary of the sampling procedures and significant findings must also be included. All reports must reference the WV ID Number and Leak Number.

NOTE: The WVDEP OER requires using monitoring wells to obtain hydro-geologic and contaminant information for site assessments – but encourages the use of other innovative technologies that can augment monitoring well information where appropriate (including "real-time" groundwater sample collection tools such as the Geoprobe or Hydropunch). If wells are unable to be sampled, a reason must be given as a footnote to the table.

D. Other Sampling and Testing

1) Off-site groundwater monitoring may be required when contamination is evident in on-site monitoring wells. In situations where an uppermost drinking water zone has been impacted, all potential receptors within a ¼ mile radius must be sampled, at a minimum. (Up gradient wells should be sampled also wherever large volume pumping is possible, known or suspected). Down gradient wells must be monitored quarterly and up gradient wells should be gauged monthly to check on draw down.

2) Soil vapor surveying is not considered a stand-alone assessment of contaminant extent. Soil vapor surveying is recommended when conditions favor its use (such as sandy or higher permeability soils, wherever vapor migration has occurred into basements or utility vaults, or particularly with freshly released product where "light-end" volatile constituents may be migrating in the vapor phase). If soil vapor surveys are conducted, the rationale for using them, their results and limitations should be clearly described in the report.

3) Free product sampling

a) Free product thickness should be measured with an interface probe, or if not available, a clear bailer. If an interface probe is used, rigorous decontamination procedures should be employed between wells. If a clear bailer is used, it should be eased into the product interface very gently to minimize splash or disturbance of

the floating product and care should be taken not to overfill the bailer. Dedicated or disposable bailers are also recommended for free product measurements.

b) Measurements of free product thickness in a monitoring well can be misleading. Fluctuating groundwater levels can result in measurements that do not reflect the thickness in the surrounding formation. Therefore, recent or suspected fluctuations in water table levels should be noted with the free product measurement data if the investigator considers them to be significant.

c) Free product fingerprinting via G.C. or G.C./M.S. is encouraged wherever the potential exists for multiple sources of contamination. This information should be evaluated against product specific standards in suspected releases.

d) If free product is present in a well, the well need not be sampled for dissolved-phase contamination in the groundwater. Wells with a sheen on the groundwater surface must be sampled after proper purging.

4. Geophysical Testing

Geophysical methods may be used to indirectly determine the extent and nature of both unconsolidated and consolidated materials. Thickness of specific units, depth to water, location of faults, etc., may all be determined by various methods. This data may then be correlated with well logs or test boring data to verify results.

5. Aquifer Testing

Aquifer tests may be conducted to determine specific aquifer characteristics. This information may be very useful in determining groundwater flow conditions, fate and transport modeling, and in designing Corrective Action Plans.

E. Laboratory Selection

West Virginia currently has a laboratory certification program. Regulations governing environmental laboratories certification and standards of performance may be found in 47 CSR 32. The laboratory that is used to analyze soil or groundwater samples should provide a copy of their current certification. The analytical data presented in Appendix D should also include the phone number of

the laboratory QA/QC officer. In addition, the chain-of-custody must be provided in Appendix E of the report. Units for analytical results must be clearly specified and consistent.

F. Test or Analytical Parameters

Specific test and analytical methods required to characterize soil and groundwater contamination are shown in Appendix SA-3. The table specifies the Minimum Detection Limits (MDL's) for each method of analysis.

2.3 Site Assessment Report Format

To streamline site assessment report review and to ensure easier reference and use of these reports, the WVDEP OER is specifying a required site assessment report format. This format will be used for both Primary Site Assessment Reports and Supplemental/Final Site Assessment Reports. The standardized report format is intended to ensure that:

- Reports are complete, requiring fewer or no re-submittals thereby saving costs associated with the leak investigation
- Reports allow easier review and future reference
- Corrective actions are more quickly undertaken, when required
- The regulated community understands what the WVDEP OER expects.

The format presented below contains components that are needed to meet Section 40 CFR 280.65 requirements. Site assessment reports will include most, if not all of the following information, in the order indicated:

I Title Page
ii Table of Contents
iii List of Figures
iv List of Tables
I. Introduction/Executive Summary
II. Site Description
III. Assessment Methodology
IV. Data Presentation and Documentation
V. Summary of Findings
VI. Conclusions
VII. Recommendations
VIII. Appendices

NOTE: The WVDEP OER recognizes that very few conclusions or recommendations may be derived from a situation where contamination has gone off-site and further investigative work is needed. Some

conclusions may be reached concerning the extent of on-site contamination and a recommendation made for further work. It is understood that recommendations regarding Corrective Actions may not be provided at this point. However, interim measures are strongly recommended in this situation and should be documented in the Primary Assessment Report.

For any Supplemental/Final Site Assessment Report submitted, Section II – Site Description need not be included. The Introduction/Executive Summary must include a short summary of the results of the Primary Site Assessment. The Data Presentation and Documentation Section must include data from the Primary Site Assessment. When gauging and sampling groundwater monitoring wells installed during a Supplemental/Final Site assessment, all wells installed during the Primary Site Assessment must be included also. The Conclusions and Recommendations Sections in the Supplemental/Final Site Assessment Report must consider all investigations undertaken to meet Section 40 CFR 280.65 requirements.

The following outline and discussion provides details of the content required for the Site Assessment Report.

i. Title Page

Provide the Leak Number, WV ID number, name and address of site, Closure Number (if applicable), the owner/operator and consultant/contractor names, addresses, and phone numbers, date of report and person to contact regarding questions or additional information (Appendix SA-1 provides a Sample Title Page).

ii. Table of Contents

Include Chapter or Section headings. Page number by Chapter or Section is preferred (i.e., Introduction – page 1-1, Site Description – page 2-1, etc.). List Appendices with their titles and alphanumeric page numbers (e.g. Appendix A – Photo documentation – page A-1).

iii. List of Figures

Figure numbering scheme should correlate with Chapters (i.e., Figure 2(a) – Site Location Map, Figure 2(b) – Site Plan, Figure 3(a) – Monitoring Well and Sampling Location Map, etc.).

iv. List of Tables

Table numbering scheme should correlate with Chapters (i.e., table 3(a) – Multi-Media Sampling and Analysis Plan, Table 4(a) Contaminant Source Characterization, etc.)

I. Introduction / Executive Summary

Summary material should be provided identifying the following:

- Release notification and confirmation dates
- Tank closure or soil excavation/disposal activities
- Source of release, product type and estimated volume of release
- Media affected (e.g. soil, groundwater, etc.) and form of contamination (e.g. dissolved, vapor, free product)
- Exposure Pathways and migration routes and rates
- Sensitive receptors
- Any mitigation or interim measures to cleanup or contain contamination
- Recommended additional investigation areas, if warranted (Primary Site Assessment Reports)
- Corrective Action(s) under consideration for soil and groundwater (Supplemental/Final Site Assessment Reports)

The Executive Summary should not exceed one type written page in length.

II. Site Description

The Site Description should, at a minimum, identify the type of facility at the site, site features and use of adjacent property, describe the product storage and distribution systems (e.g. pump/tank locations), and provide site history including a summary of previous investigations, related findings, or UST/LUST program compliance issues. The Site Description should use the most abbreviated format possible to convey the facts or observations of the site; use of informational bullets, clear figures, or simple, easy-to-read tables in an outline form rather than text is highly preferred. The WVDEP OER recognizes that obtaining historic site information may be very time consuming, however a “good faith” effort will be required.

A. Background / Site History

1) Current site owner, operator, and responsible party with addresses and phone numbers.

2) Facility contacts and use
   a) Site contact person and telephone number

b) Alternate site contact person and telephone number
c) Current use and duration of that use

3) Previous site owner/operators (the following information may be most easily presented and referenced in Table format)
   a) Addresses and phone numbers (current data if available)
   b) Dates of ownership/occupancy
   c) Property use for each
   d) Hazardous materials used, stored, or disposed (if any)
   e) Any historical releases (pertinent documents or reports should be cited within Appendix C containing references)

4) Current release – discovery, nature, characterization (the following information may be presented in a list, bullet format, or table)
   a) Date of release
   b) Type of product released
   c) Estimated or known volume released
   d) How release was discovered (i.e., inventory discrepancy, failed tank or line tightness test, spill, overfill, sudden product loss, visible evidence at tank closure, vapors in area and location, water well impacts, leak detection equipment, or other)
   e) Source of release (tank, line, island, offloading, overfill, etc.)
   f) Who discovered the release and the date of notification and to whom
   g) Initial observation of any free product
   h) Method of stopping the release
   i) Any surface impacts and mitigation efforts
   j) Any interim measures to mitigate vapors, explosion hazards, or to initiate free product recovery
   k) Any tank closure or excavation related activity including current and/or final soil disposition

A chronology may be useful to convey the above information in the order in which these activities or observations occurred. Any chronology should include the notification/submittal dates of Initial Response (Section 40 CFR 280.61), the Initial Abatement Measures Reports (Section 40 CFR 280.62), the initial Site Characterization Report (Section 40 CFR 280.63), and, if free product is present, the Free Product Removal Report (Section 40 CFR 280.64).

B. Facility Description

Maps or figures should convey much of the facility information. The following figures (Nos. 1, 2, and 3) are considered necessary, and

each should have a title block with the figure number, figure description, date it was drawn, and indicate who drew the figure.

1) Location on a USGS topographic map:
   a) Preferably a color map
   b) Site located centrally on the map and circled
   c) Quadrangle listed
   d) Contour interval noted
   e) North oriented upward on the page
   f) Scale of 1:24,000 (1" = 2000')
   g) Highlights of any large scale or other significant features are encouraged on topographic map (i.e.,flow direction of nearby surface water, any discrete recharge or discharge areas for groundwater such as seeps, springs, wetlands, etc.)

2) Location within a vicinity map:
   a) To assist in finding the site via local roadways
   b) To identify surrounding land use
   c) To locate all active or abandoned water wells (any known private, municipal, commercial, or monitoring wells), buildings with basements, or sensitive receptors including surface waters within ¼ mileof the site – Again, a "good faith" effort will be required
   d) North arrows and appropriate scale (preferably 1"=250') should be provided

3) Site map:
   a) Show site boundary or area of investigation and surface water gradient
   b) Show legend, north arrow, and scale, preferably 1"=10' to 1"=25'
   c) Identify streets, buildings
   d) Current (solid lines) and previous (dashed lines) tank/piping/pump island locations
   e) Abutting properties
   f) <u>All</u> underground utilities and conduits (including electrical, gas, water, sanitary and storm sewers, telephone, cable television) – provide depth below surface (dbs) for utilities and conduits
   g) Any easements or rights of way
   h) Any septic systems
   i) Old excavation areas, pits, soil stockpiles
   j) Any bedrock outcrops, faults, anticlines and/or synclines.
   k) Other observed features noted during site visits or previous investigations
   l) This figure should also show any existing or previous monitoring well or soil boring locations

Appendix SA-2 shows a sample site map. The site map shall show the longitude and latitude, and a description of the method used to obtain the coordinates, as this information will be required to determine groundwater certification or process any required permit applications.

Figure numbers 1, 2, and 3 must be included under Section II of the Primary Site Assessment Report.

4) Accompanying text should briefly (possibly in outline form) convey observations regarding the site pertaining to potential sources of contamination, pathways for contaminant transport, and sensitive receptors. The general setting should identify zoning (i.e., residential, light commercial, heavy commercial, industrial, etc.), and should note any significant man-made or natural features adjacent to the site. These "features" might include surface water bodies, any slopes, ditches, and/or gullies that could influence drainage from the site, areas of cut or fill, bedrock outcrops, homes, buildings, parks, schools, hospitals, or other observations that relate to pathways or receptors.

C) Potential (or Actual) Sensitive Receptors and Migration Pathways

All potential and/or actual receptors and exposure/migration pathways must be noted. The impacts of any release to these receptors must be determined during the site assessment. Any known impacts and potential impacts should be discussed in the report's conclusion section.

1. Identify (list) area drinking supplies and water use (refer to figures for well locations).
   a) Specify surface or groundwater supplies
   b) Specify private versus public/municipal supplies
2. Identify basements, utilities, storm and sanitary sewers or sumps that might be affected.
3. Identify streams, ponds, surface water, or drainage pathways that might be affected.
4. Identify the presence and depth of utilities and any septic systems (critical in areas where shallow water tables are known or suspected). Cross-sectional drawings may be required in special cases.
5. Identify if site is located on native material or on disturbed, reworked or filled areas.

D) Adjacent Properties

1. Identify any other UST's or potential off-site sources of contamination.

   The following list of Federal, State, local, commercial, and private sources may be useful in obtaining the information noted above: Assessors, Tax Collectors, County Clerks, Health Departments, City Planners, Engineering Departments, Water Departments, Sanitary Boards, Public Works Departments, Utility Companies, County Emergency Service Departments, City or Volunteer Fire Departments, Urban Renewal authorities, City Soil Conservation or Agricultural Extension Agents, State Department of Environmental Protection Waste Management and Water Resources Offices, West Virginia Geologic Survey or USGS, Miss Utility, site owners/operators and their inventory or leak detection records, and local residents.

   Any personal interviews should be documented noting:
   1. Name of the person interviewed
   2. Their association with the site and/or occupation
   3. Date of interview
   4. Bulleted summary of the information obtained

   Interview records should be provided in Appendix C of the Primary Site Assessment Report.

III. Assessment Methodology

This section of the Site Assessment Report should summarize the methods used to obtain and analyze the field data gathered during the assessment of soils and groundwater. Reference is made to Section 2.2 of this document for guidance. A narrative should be provided which presents the following information in the order given:

- Justification for the soil boring and/or monitoring well locations
- Dates drilling/augering commenced and ceased and on-site personnel
- Generic type of drilling rig or auger utilized (hollow stem auger, air rotary drilling rig, etc)
- Type of soil sampling, sampling interval, field screening procedures, sample containers, decontamination procedures and sample preservation
- Monitoring well installation procedures: determination of screened interval, length of screen and slot size, length of riser, type of

annular material (sand pack); type of annular sealant, surface completion, and total depth

- Monitoring well development procedures: type of development, date, and volume of water removed
- Product/water level gauging procedures: field surveying methods; method of product/water elevation measurement
- Groundwater sampling method, purging method, determination of and volume of water removed, static water levels, screening for pH and specific conductivity, sample containers, QA/QC documentation, sample preservation
- Method of waste disposal: soil/rock cuttings, development water, purge water, aquifer test water, and free product (if applicable)
- Chain-of-custody procedures
- Geophysical test procedures (if applicable)
- Aquifer test procedures (if applicable)
- Analytical procedures: name and address of laboratory, analytical methods, and trip and equipment blanks

Note: The WVDEP OER recognizes that not all assessments/actions will require geophysical tests and/or aquifer tests.

IV. Data Presentation and Documentation

The following guidance is provided to standardize the format in which field data generated during a site assessment is presented. This will facilitate quicker review by WVDEP OER staff.

A. Tables

1. Field screening results of soil samples must be submitted in tabular (table) form with specific borings (wells) in rows and depth of sample in columns. The table must also identify the type of PID/FID used and the calibration date. Units must be clearly indicated.

2. Analytical results of soil samples must be submitted in tabular form with specific borings (wells) and depth of sample in rows and analytical parameters in columns. Any abbreviations used must be explained. Units and Minimum Detection Limits must be clearly indicated.

3. Analytical results of groundwater samples must be submitted in tabular form with specific wells in rows and analytical parameters in columns. Any abbreviations used must be explained. Units and minimum detection limits must be clearly indicated.

4. Groundwater gauging information must be provided in tabular form with specific wells in rows and the following columns (in the order

presented with all measurements to the nearest 0.01 foot): top of casing elevation, depth to hydrocarbon, depth to water, hydrocarbon surface elevation, water surface elevation, hydrocarbon thickness and corrected water surface elevation. Type of measurement method used must be indicated along with corrected water surface conversion formula. Elevation reference point must also be indicated.

NOTE: Any preliminary data generated during the release investigation (UST system closure samples, tank pit observation well samples, etc.) should be reported in the same tables (or at a minimum, on the same page) with sampling data generated during the current full extent investigation for ease of comparison.

5. Aquifer test data must be provided in tabular form with specific wells in rows and aquifer parameters (hydraulic conductivity, hydraulic gradient, transmissivity, storativity) in columns. Units must be clearly indicated and any abbreviations must be explained.

6. The results of any geophysical tests performed must be presented in tabular form with specific testing points in rows and test parameters in columns. Units must be clearly indicated and any abbreviations must be explained.

All tables must be included in Section IV of the Site Assessment Report.

B. Maps

All maps must have a title block with the figure number, the date it was drawn, indicate who drew the figure, and who prepared any revisions.

1. At a minimum, soil sample analytical results must be plotted on a site map relative to boring (well) and/or sampling locations. When possible, analytical results should be contoured (isoconcentration contours) to identify “hot spots”, sources, and migration paths. When contouring, separate maps must be prepared for Benzene, Total BTEX, TPH (GRO/DRO), MTBE and any other analytical parameter, which may be required on a site-by-site basis. A table or key must be provided to explain all symbols.

2. Groundwater sample analytical results must be plotted on a site map relative to well locations. In addition, groundwater analytical results must also be contoured (isoconcentration contours) to identify “hot spots”, sources and migration pathways. Separate maps

must be prepared for Benzene, Total BTEX, TPH (GRO/DRO), MTBE and any other parameter that may be required on a site-by-site basis. A table or key must be provided to explain all symbols.

3. At a minimum, free product thickness must be plotted on a site map relative to well or other locations. When possible, free product thickness should be contoured (free product isopach) to indicate significant accumulations of free product, source areas and migration pathways. A table or key must be provided to explain symbols.

4. Groundwater elevations must be plotted on a base map and groundwater contours must be prepared showing the horizontal flow direction for the groundwater in the uppermost water-bearing zone on-site. Any recharge or discharge areas must also be noted. A table or key must be provided to explain all symbols.

Regarding groundwater maps, if more than one water zone has been impacted (for example, a perched system and the regional water table), separate maps must be prepared for each zone.

C. Boring Logs/Monitoring Well Construction Diagrams

All reports must be in compliance with 47 CSR 59 & 60 of the Monitoring Well Regulations. Any report must supply the following minimum information for boring logs/monitoring well construction diagrams:

- A heading at the top of the log with:
  - Site name and location
  - Drilling company, type of drilling rig, name of driller
  - Consulting firm, Geologist/Hydrologist logging the boring
  - Boring/well number
  - Date drilled, time to complete (days), weather conditions
- Soil descriptions, utilizing ASTM – Unified Soil Classification Scheme or other nationally recognized method. Observations should be included in writing and in a vertical graphic strat column with depths of significant changes
- Surface elevation, total depth of boring and reason for termination
- Sampling method, depth of samples, blow counts (if Standard Penetration Test is utilized)
- Depth of water table and any unique subsurface features, if encountered
- Field screening data, odors encountered and any evidence of product staining
- As-built construction diagram of the monitoring well corresponding to the lithologic/strat column and screening results
- Bore hole diameter, casing diameter, length, and material of construction

- Screen materials and design, slot size and length
- Filter pack material, height in annulus
- Sealant material, height in annulus
- Surface completion and top of casing elevation
- Well development method, date, volume of water removed
- Depth to water after well development and recharge

Separate logs may be prepared for soil borings and monitoring well construction diagrams, however, all of the information above must be included. If separate logs are prepared, the logs for a specific boring/well must be included consecutively (i.e., SB-1, MW-1, SB-2, MW-2, etc.) for ease of reference.

Soil borings/monitoring well construction diagrams must be provided in Appendix B.

D. Photo documentation

Photo documentation of soil sample collection is recommended to demonstrate the appropriateness of sampling location (e.g., photos of collection of a sample from below an UST or in stained soils beneath a piping run). Other photos may include station orientation, location of potential receptors, condition of tank/piping upon removal, etc.

Photos should be included in Appendix A.

E. Chain-of-Custody

Chain-of-custody records must be completely and properly filled out to assure sample integrity. Items that must be included on all chain-of-custody forms include:

- Sample site name with WV Leak Number and WV ID number
- Name of sampler
- Date of sample shipment to laboratory and how shipped
- Specific sample identification
- Sample containers
- Date and time each specific sample was taken
- Matrix or media sampled
- Type of sample (grab vs. composite)
- Specific analysis requested
- Remarks (this should include any preservatives added, temperature of sample, etc.)
- Signatures, dates and times are required for each person receiving and relinquishing the sample

- The person receiving the sample at the laboratory must provide signature, date, time, temperature, and condition of sample upon arrival. (See 47 CSR 32-5.1.1.f and g)
- The sampler should note any possible interfering compounds for the specific sample analysis
- Liquid VOC samples should state that no air bubbles are present in the 40 ml vial.

Chain-of-custody records must be included in Appendix E of the Site Assessment Report.

F. Laboratory Sample Results

Originals or legible copies of laboratory samples analysis results must be included in Appendix D of the Site Assessment Report.

V. Summary of Findings

A. Site Geology

A brief description of site geology is required. This should include a general description of soil or bedrock types encountered. Additional graphics are highly recommended, including cross-sections with clear depictions of contaminant source locations, water table levels, soil or bedrock contacts, and appropriate scales and plan view location maps.

B. Site Hydrogeology

A brief description of the site hydrogeology is required. Additionally, any suggested or known influence on groundwater level fluctuations should be noted and discussed. Calculations of estimated groundwater flow rates should be provided. At a minimum, basic equations (i.e., Darcy's Law velocity, etc.) should be used, and all flow rate units should be converted to feet per year. Any aquifer test data should be included in Appendix form, as well as clear calculations of storativity, transmissivity, or other aquifer properties. Any discrete areas of recharge or discharge, and their proximity to contaminant sources and monitoring points should be graphically identified and discussed. Any influence of subsurface utilities, conduits, or fill areas on groundwater flow and occurrence should be discussed.

VI. Conclusions

A. Delineation of Contamination

The degree or magnitude and extent of contamination in the following media attributable to phases of contamination must be addressed. Tables or

bulleted summary statements are recommended for presenting information.

1. Soils (vapor and adsorbed)
2. Groundwater (and Free Product)
3. Surface water

B. Exposure Assessment

An exposure assessment should be offered, based on the above conclusions, and specific to the following:

1. Each media or contaminant phase

2. Actual and potential migration routes. Factors to be considered include:
   a) The volume released
   b) The adsorptive capacity of the earth materials
   c) The presence of perching horizons and interconnected void spaces
   d) The relative ability of the earth materials to conduct water and vapor and free liquid hydrocarbon fluids
   e) The rates and directions of groundwater movement
   f) All processes that dilute concentrations and limit the area of the contaminated zones.

3. Exposure points (surface or subsurface structure capable of collecting liquid, vapor, or dissolved-phase hydrocarbons)

4. Relative threat or impact on human health and the environment the actual or potential contaminant exposure poses. Factors to be considered include:
   a) The physical and chemical characteristics of the regulated substance, including its toxicity, persistence and potential for migration
   b) The hydro geologic characteristics of the facility and the surrounding area
   c) The proximity, quality, and current and future uses of nearby surface water and groundwater
   d) The potential effects of residual contamination on nearby surface water and groundwater
   e) The potential for both immediate and long-term health impacts

VII. Recommendations

Recommendations of clear actions relative to any contamination on site shall be included for each of the following possible corrective action areas:

a. Soil cleanup

b. Free product cleanup (if any)
c. Groundwater cleanup
d. Other actions (to mitigate threats to potential receptors) or Interim Measures
e. Future monitoring

The recommendations should reflect a clear understanding of the contents of Chapters 1, 3, and 4 of this Guidance Document.

VIII. Appendices

The following appendices, in the order presented, are needed for Site Assessment Reports to be considered complete.

A. Photo documentation (if applicable)
B. Well/boring logs
    1. Soil strat columns (written and graphic)
    2. Visually corresponding soil screening data (PID, FID)
    3. Visually corresponding well construction details
        a) Water level at drilling and at completion
        b) Screen setting
        c) Annular completion
        d) Total depth (given in relative elevation)
C. Interview records (if applicable)
D. Laboratory results
    1. Soil analytical data
    2. Groundwater analytical data
E. Chain-of-custody
F. Laboratory certification documentation
G. Other compliance submittals (if not already submitted)
    1. 40 CFR 280.62
    2. 40 CFR 280.63
    3. 40 CFR 280.64

APPENDIX SA-1
SAMPLE TITLE PAGE FOR LUST SITE ASSESSMENT REPORTS

Facility ID# _____
Leak # _____
Closure # _____

(Document Title)

Primary Site Assessment Report or Supplemental/Final
Site Assessment Report
Site Name
Site Address

Owner Name
Owner Address
Owner Phone

Operator Name
Operator Address
Operator Phone

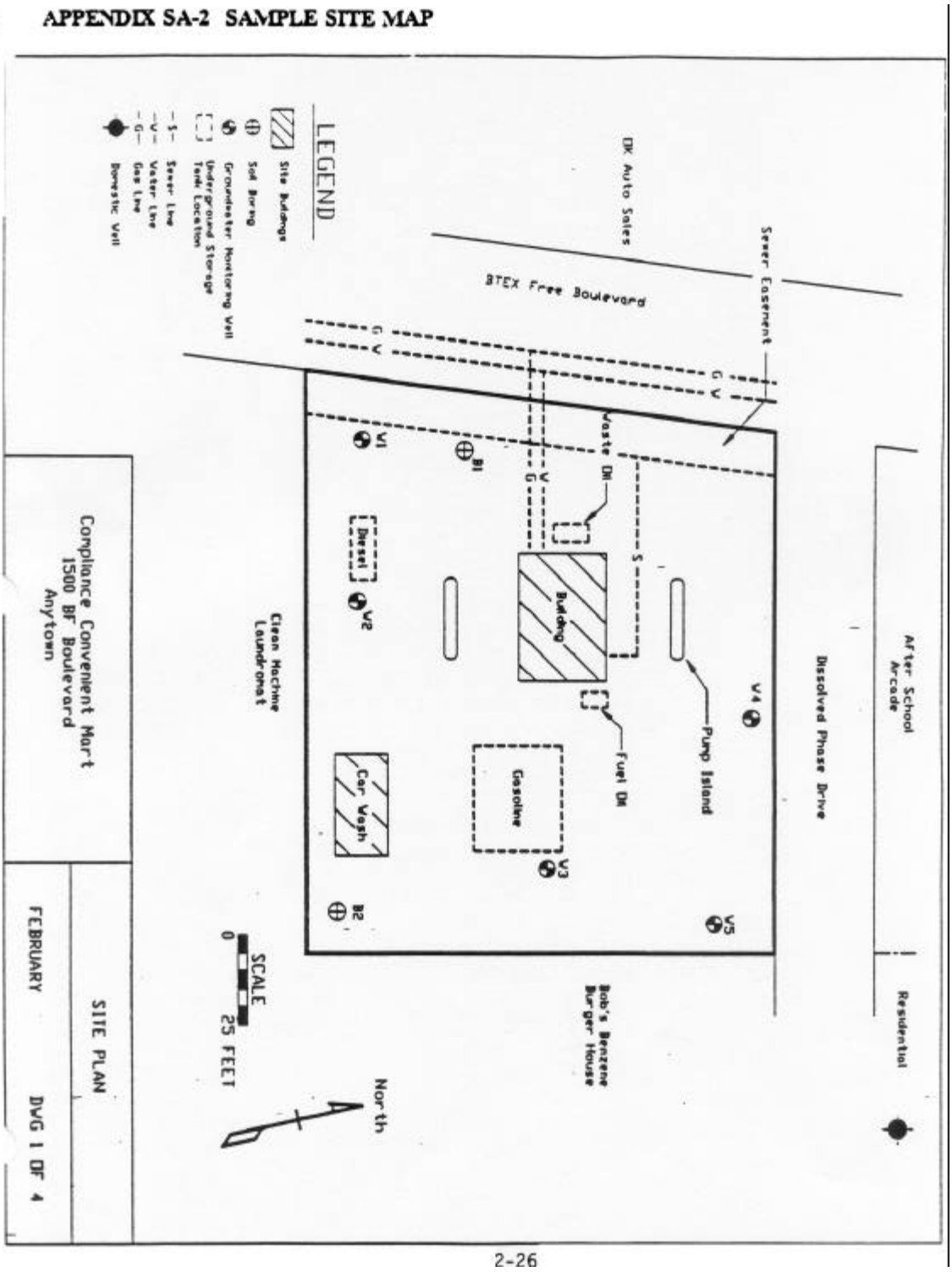
Report Prepared By:

Consultant/Contractor Name
Consultant/Contractor Address
Consultant/Contractor Phone

Person to Whom Questions or Responses are to be addressed

Date Report Completed

APPENDIX SA-2 SAMPLE SITE MAP



APPENDIX SA-3
SOIL AND GROUNDWATER ANALYTICAL METHODS AND MINIMUM DETECTION LIMITS (MDL'S)

GASOLINE

	Soil	Water
BTEX	8021B ** 0.025	8021B ** 0.002
TPH	8015B * 10	8015B * 0.5
MTBE & TBA	8021B ** 0.020	8021B ** 0.002
LEAD (TCLP)	1311/7420 0.5	Not Required

Test Method
MDL

Soil units = mg/kg = ppm
Water units = mg/L = ppm

** **NOTE:** MTBE ANALYSIS IS REQUIRED ON ALL RELEASE INVESTIGATIONS REGARDLESS OF THE TYPE OF PETROLEUM PRODUCT. IF ANALYSIS BY 8021B INDICATES THE PRESENCE OF MTBE OR TBA, CONFIRMATION ANALYSIS BY 8260 IS REQUIRED. SAMPLING PROTOCOL MUST FOLLOW THE REQUIREMENTS OF METHOD 5035 FOR SOILS AND 5030 FOR WATER. ANALYSIS FOR OTHER FUEL ADDITIVES MAY BE REQUIRED ON A SITE SPECIFIC BASIS.

* Specify Gasoline Range Organics (alkane range C6 to C10)

DIESEL

(Also includes other middle distillates such as kerosene, jet A, JP-8, etc.)

	Soil	Water
BTEX	8021B ** 0.025	8021B ** 0.002
TPH	8015B * 10	8015B * 0.5
PAH	8270C 1.0	8270C 0.05

Test Method
MDL

Soil units = mg/kg = ppm
Water units = mg/L = ppm

* Specify Gasoline Range Organics (alkane range C6 to C10) and Diesel Range Organics (alkane range C10-C28)

HEAVIER FUEL OILS, LUBRICATING OILS, ETC.

	Soil	Water
BTEX	8021B ** 0.025	8021B ** 0.002
TPH	8015B * 10	8015B * 0.5
PAH	8270C 1.0	8270C 0.05

Test Method
MDL

Soil units = mg/kg = ppm
water units = mg/L = ppm

* Specify Gasoline Range Organics (alkane range C6 to C10), Diesel Range Organics (alkane range C10-C28), and Oil Range Organics (C28-C35)

USED OILS

	Soil	Water
BTEX	8021B **	8021B **
TPH	8015B * 10	8015B * 0.5
PAH	8270C 1.0	8270C 0.05

Test Method
MDL

Soil units = mg/kg = ppm
Water units = mg/L = ppm

Requests for specific compounds may be made on a site-by-site basis. This could include Chlorinated Compounds (Solvent Scan by 8260B), Ethylene Glycol (8015B), and RCRA Metals [(Pb: 1311/7420), (Cd: 1311/7130), (Cr-III: 1311/7190), & (Cr-VI: 1311/7196A), as in WVPUG]

* Specify Gasoline Range Organics (alkane range C6-C10), Diesel Range Organics (alkane range C-10-C28), and Oil Range Organics (C28-C35)

For more information on analytical methods see:
http://www.epa.gov/swerust1/cat/samb-1.htm

Also refer to the SW-846 manual for specifics regarding any test method. Follow the protocols required under Method 5035 AND 5030.

http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm

APPENDIX SA-4
WEST VIRGINIA CHECKLIST FOR SITE ASSESSMENT REPORTS

The West Virginia Checklist for Site Assessment Reports is provided to assist owners/operators and/or their consultants in submitting a complete Site Assessment Report (the checklist may be used for both Primary Site Assessment Reports and Supplemental/Final Site Assessment Reports). An "X" should be placed in the box next to each applicable item contained in the report and the section and page number for that item provided in the left hand column. Optional items are indicated as such. If the information for a particular item requested is not applicable to the site or not available, the preparer must indicate this with an NA – number on the checklist. Then, with a "numbered N/A" (for example: N/A-3) provide an explanation on the back of the checklist (with corresponding "numbered N/A") as to why the information is unavailable or does not apply to the site. West Virginia OER personnel will also use this checklist as a quick reference guide when reviewing the Site Assessment Report. The checklist must be attached to each Site Assessment Report submitted for review.

WEST VIRGINIA CHECKLIST FOR SITE ASSESSMENT REPORTS

OWNER NAME		PHONE NO.	
SITE NAME			
LEAK NO.		WV ID NO.	
LOCATION			
CONSULTANT		PHONE NO.	
SIGNATURE		DATE	

SECTION PAGE

_____	[ ]	i.	TITLE PAGE
_____	[ ]	ii.	TABLE OF CONTENTS
_____	[ ]	iii	LIST OF FIGURES
_____	[ ]	iv	LIST OF TABLES

_____ [ ] **I. INTRODUCTION / EXECUTIVE SUMMARY**

II. SITE DESCRIPTION

BACKGROUND / SITE HISTORY

_____ [ ] Owner/Operator/Responsible Party: Addresses, Phone Numbers
_____ [ ] Facility Contacts and Use
_____ [ ] Previous Site Owner/Operator Information
_____ [ ] Current Release: Discovery, Nature and Characterization

FACILITY DESCRIPTION

_____ [ ] USGS Topographic Map
_____ [ ] Site Vicinity Map
_____ [ ] Site Map
_____ [ ] Descriptive Text
_____ [ ] Product Storage Information

RECEPTORS AND MIGRATION PATHWAYS

_____ [ ] Drinking Water Supplies and Other Water Use
_____ [ ] Basements, Utilities, Sewers, Sumps, Etc.
_____ [ ] Surface Water: Streams, Ponds, Drainage Paths, Etc.
_____ [ ] Depth of Utilities, Septic Systems, Etc.
_____ [ ] Type of Unconsolidated Material: Native Soils vs. Disturbed, Reworked or Filled Areas

ADJACENT PROPERTIES

_____ [ ] Other UST Systems
[ ] Other Potential Sources of Contamination

III. ASSESSMENT METHODOLOGY

_____ [ ] Justification for Boring/Monitoring Well Locations
_____ [ ] Soil Boring Equipment and Procedures
_____ [ ] Soil Sampling Equipment and Procedures
_____ [ ] Monitoring Well Installation/Completion Procedures
_____ [ ] Monitoring Well Development Procedures
_____ [ ] Product/Water Level Gauging Procedures

_____
_____ [ ] Method(s) of Waste Disposal
_____ [ ] Chain-of-Custody Procedures
_____ [ ] Geophysical Test Equipment and Procedures (Optional)
_____ [ ] Aquifer Test Equipment and Procedures
_____ [ ] Name of Laboratory and Analytical Tests

IV. DATA PRESENTATION AND DOCUMENTATION

TABLES

_____ [ ] Soil Sample Field Screening Results
_____ [ ] Soil Sample Analytical Results
_____ [ ] Groundwater Sample Analytical Results
_____ [ ] Product / Water Gauging Information
_____ [ ] Aquifer Test Data
_____ [ ] Geophysical Test Data (Optional)

MAPS

_____ [ ] Soil Sample Analytical Results
_____ [ ] Groundwater Sample Analytical Results
_____ [ ] Free Product Isopach
_____ [ ] Groundwater Contours

BORING LOGS / MONITORING WELL CONSTRUCTION DIAGRAMS
(to be included in appendix of report)

_____ [ ] Heading
_____ [ ] Soil Descriptions: Verbal and Graphic
_____ [ ] Surface Elevation, Total Depth, Reason for Termination
_____ [ ] Sampling Method, Sample Depth, Blow Counts
_____ [ ] Depth of Water and any Unique Subsurface Features
_____ [ ] Field Screening Data, Odors Encountered, Evidence of Staining
_____ [ ] As-Built Construction Diagram of Monitoring Well
_____ [ ] Bore Hole Diameter, Casing Diameter and Material
_____ [ ] Screen Material, Slot Size, and Length
_____ [ ] Filter Pack Material, Height in Annulus
_____ [ ] Sealant Material, Height in Annulus
_____ [ ] Surface Completion, Top of Casing Elevation
_____ [ ] Well Development Method, Date, Volume of Water Removed
_____ [ ] Static Water Level (After Development and Recharge)
_____ [ ] Photo documentation (Optional)
_____ [ ] Chain-Of-Custody Record
_____ [ ] Laboratory Report Of Sample Results

V. SUMMARY OF FINDINGS

SITE GEOLOGY

_____ [ ] General Description of Soil / Bedrock Types Encountered
_____ [ ] Contaminant Source Locations
_____ [ ] Water Table Levels
_____ [ ] Soil / Bedrock Contacts

SITE HYDROGEOLOGY

_____ [ ] Influences on Groundwater Level Fluctuations
_____ [ ] Estimated Groundwater Flow Rates
_____ [ ] Calculations of Aquifer Properties
_____ [ ] Recharge / Discharge Areas and their Proximity to Contaminant Sources and Monitoring Points
_____ [ ] Influence of Subsurface Utilities, Conduits, or Fill Areas on Groundwater Flow and Occurrence

VI. CONCLUSIONS

DELINEATION OF CONTAMINATION

_____ [ ] Soils (Vapor and Adsorbed)
_____ [ ] Groundwater (and Free Product)
_____ [ ] Surface Water

EXPOSURE ASSESSMENT

_____ [ ] Specific to Each Media or Contaminant Phase
_____ [ ] Migration Routes
_____ [ ] Exposure Points
_____ [ ] Threat or Impact on Human Health and the Environment

VII. RECOMMENDATIONS

_____ [ ] Soil Cleanup
_____ [ ] Free Product Cleanup (if any)
_____ [ ] Groundwater Cleanup
_____ [ ] Other Actions (to mitigate threats to potential receptors)
_____ [ ] Interim Measures
_____ [ ] Future Monitoring

VIII. APPENDICES

_____ [ ] Photo documentation (optional)
_____ [ ] Well / Boring Logs
_____ [ ] Interview Records (optional)
_____ [ ] Laboratory Results
_____ [ ] Laboratory Certification Documentation

Other Compliance Submittals:

_____ [ ] 40 CFR 280.62
_____ [ ] 40 CFR 280.63
_____ [ ] 40 CFR 280.64

CHAPTER 3 – INTERIM MEASURES

Interim measures are actions, efforts, or responses to spills or releases that are undertaken after the initial emergency response, but before long-term corrective action. Interim measures, which usually overlap with emergency response actions, are initiated:

- After emergency response (or as a continuation of an emergency response)
- During the initial site characterization
- During a full-extent site investigation, prior to implementation of a long-term Corrective Action Plan (discussed in Chapter 4).

Interim measures are conducted to achieve one or more of the following goals:

- To mitigate the threat of contaminant migration to potential receptors
- To reduce risk to the environment and the public
- To reduce the amount of contamination and long-term liability (with pending long-term corrective action)
- To contain the contamination

This chapter discusses issues associated with interim measures such as health and safety, source removal, monitoring of receptors, vapor threats, and surface impacts. Various remediation techniques including interceptor trenches, horizontal wells, passive wells, and disposal are also briefly discussed. For greater detail on free product recovery, which may be an interim measure, see Chapter 1.

3.1 Health and Safety

There is always the danger of fire or explosion when dealing with a release of gasoline or other petroleum products. Therefore, health and safety measures are appropriate for all phases of release remediation: free product recovery, site characterization, and long-term corrective action. During any of these phases, the health and safety regulations outlined under OSHA requirements in 29 CFR Part 1910 apply. In addition to those measures, the following measures are suggested for fire and explosion prevention.

The implementation of health and safety procedures is a continuous process, which must be addressed throughout site remediation. OSHA requires documentation of the health and safety guidelines and posting or distributing them to site personnel so there is no confusion concerning the health and safety policy.

Timing is essential in implementing health and safety procedures while interim measures are carried out. The first step to take in the health and safety program is to notify the local fire department and make them aware

of the on-site activities. If the health and safety plan is written, as is suggested, a copy should be made available to the fire department.

Prior to beginning any LUST response actions, certain zones should be designated on-site. The work zone, where interim measures will be conducted, should be established and clearly marked. Exclusion zones away from the work area should also be set up for non-essential personnel. To prevent smoking and open flames in the work area, set up smoking and non-smoking areas for LUST response personnel. All areas should be clearly marked, made obvious to affected personnel, and included in the written health and safety plan, if applicable. Fire extinguishers should be maintained on-site, especially in the work zone. The number of fire extinguishers will depend on the size of the work zone and the nature of the interim measures being carried out.

Other elements of health and safety expected of LUST response personnel include:

- The use of explosion proof equipment
- Barricading trenching or excavation holes and/or clearly marking such areas with yellow tape
- Having available field LEL and VOC screening meters
- Having the appropriate OSHA training
- Setting up traffic control patterns
- Having personal safety equipment available

As previously stated, in addition to the above guidelines, all provisions in OSHA 1910 must be followed.

3.2 Source Removal

Source removal procedures are implemented to eliminate a “continuing source” and further migration of the spilled or released product. Source removal should take place upon identification of the source, i.e., the point, location or vessel from which the contaminant that is actually causing the threat to the environment and the health and safety of the public was or is being released. Source removal is mandated under the West Virginia Groundwater Protection Act, Section 22-12 of the State Code. Source removal typically takes place before any other response action and is usually of short duration. Source removal may involve free product recovery by interceptor trenches, underflow dams, or booms, or may involve tank removal. Possible sources and associated removal actions may include:

- Piping – inspect piping (and adjacent soil) for leaks, weeps, or seepage of product and drain any suspect piping back to tanks; remove and store or drum any contaminated soils in the affected area

- Tanks – remove product from tanks known or suspected to be leaking
- Fuel pumps – dispensers should be checked and the filter drained
- Other offsite sources – document any suspected or known sources and notify WVDEP UST or OER personnel
- Active on-site UST systems. If uncertain of the possibility that other parts of the UST system could be providing a continuing source of contamination, an owner/operator should conduct a UST system tightness test.

In the case of a leaking UST addressed by the typical excavation and tank removal activities, source removal can generally be described as occurring in the following five stages:

a) Offloading of tanks prior to initiating excavation
b) Removing free product from tank pit
c) Excavating gross soil contamination during and after tank removal
d) Stockpiling excavated soils
e) Monitoring contaminants in the tank pit

Each of the five stages is discussed in more detail in the following sections. This guidance is not intended to replace or supercede established guidance and proper procedures, such as those detailed in API Publication 1604 for tank removals. Rather, the following guidance is offered simply to emphasize selected points in better assuring source removal. WVDEP OER staff has developed an “Important Notice to all UST Owners Closing Tanks” document. The most recent version of this document is dated November 1998. (Refer to Appendix IM-1)

For UST system closure information, refer to the Important Contacts and Phone Numbers page, and contact the UST/CAER Office.

3.2.1 Offloading of Tanks and Initial Excavation

Draining product from the piping back to the tanks and then offloading the tank(s) typically precedes excavation activities. In the initial excavation of overburden or cover overlying the tank, soil is scraped from the surface until the tank is exposed. A second check for any remaining product or sludge should be made to determine if there is any remaining source of contamination in the tank(s). If free product is found, it should be pumped out using explosion-proof equipment. In removing the tank(s), caution should be exercised so as not to allow any remaining free product to spill

out of ancillary piping and fittings. If possible, ancillary piping should be secured and covered to prevent further contamination in the tank pit. API publication 1604 provides additional guidance for tank removals.

3.2.2 Removal of Free Product

After tank removal, any free product in the excavation should be removed via pumping or vacuum truck and stored properly (i.e. drummed in approved DOT 17C barrels or in a proper storage vessel). All applicable state and federal regulations must be followed for removal and disposal. In order to minimize the quantity of waste collected, an attempt should be made to remove only the free product, not the water beneath it, if any. Free product recovery and reporting requirements are discussed in greater detail in Chapter 1.

During free product removal, all safety procedures pertaining to operation of vacuum trucks and skimmers that are outlined by OSHA and API should be followed. Also, the work zone should be routinely monitored using an LEL meter. Upon removal and disposal of the free product, copies of disposal records must be submitted to the WVDEP OER Project Manager and the Charleston Office.

3.2.3 Excavating Gross Soil Contamination

NOTE: OER has placed specific restrictions on the amount of contaminated soil that may be excavated without a site specific Corrective Action Plan (CAP). This document also contains guidance on the information needed for a site-specific soil removal CAP and proper on-site and off-site biopile construction. Refer to Appendix IM-1 for more information.

If significant surface water or groundwater is present in the tank pit after excavation, attempted further removal of soils is not recommended until the water has been pumped out or is no longer present. Once the pit is dry, the soils to target for excavation may be apparent due to visual contamination or can be identified through field screening devices. Among the many considerations in excavating contaminated soils, the following items are recommended:

a) Targeting specific “hot spots” instead of excavating the entire length of the pit may reduce the volume of soil for treatment or disposal. Careful segregation of

soils may take more time during excavation activities, but may reduce long-term treatment or disposal costs significantly.

b) During excavation, proceed with caution so as not to undermine structures such as buildings, utilities, canopy footers, etc.

c) If soil contamination is found to be extensive and large quantities of soil are being excavated, it may be necessary to evaluate the situation to determine if further excavation is practical and to identify other remedial alternatives (i.e. in-situ or in place treatment or a long term Biopile which is discussed briefly in the following section). Such considerations should be discussed with the WVDEP OER personnel who are either on-site or overseeing site actions.

d) Excavated soils must be properly stockpiled on and covered with plastic (minimum 6 mil. thickness) to prevent rain infiltration and possible runoff. Soils saturated with free product should be stockpiled in a manner that allows free product to seep into a contained area or “pool” for later removal.

3.2.4 Stockpiling Excavated Soil

As part of the excavation, it is very important to properly store soils to prevent further migration of contaminants from this, now above-ground source. During the initial phase of excavation, a temporary storage pile is adequate. The temporary storage pile should consist of a plastic liner between the ground and the stockpiled soil and a plastic cover over the soil. If soil will be stored on the temporary storage pile for more than 24 hours, the following requirements should be met:

a) Prior to beginning excavation, confirm that a sufficient supply of plastic liner is on-site.

b) Identify the most reasonable location for stockpiling (i.e. where least potential for exposure to humans exists and where there will be minimal impacts on continuing site activities).

c) A berm should be constructed around the stockpile to prevent surface migration (with the underlying plastic secured to the top of the berm).

d) If excavation is expected to be extensive, a long-term soil pile may be constructed. Prior to this occurring, the OER PM for the site must be contacted and approval received. If contact is made by phone, a follow up letter should be submitted to the appropriate PM. (See Appendix IM-1) One such pile is commonly referred to as a "Biopile", which is an above ground treatment pile underlined with a 6 millimeter thick plastic liner. Any such soil pile should be constructed incorporating the following considerations:

- The containment berm may consist of hay bales that the plastic liner covers or a soil berm covered with a plastic liner
- The soil pile must be located away from the flood plain if site constraints allow
- The contractor should have adequate supplies of plastic on-site and ready for use during excavation and stockpiling (including any appropriate perforated piping)
- Vapor vent pipes may be configured in the soil to facilitate aeration or the pile should be manually mixed
- Upon approval by the WVDEP PM, lime, fertilizer, or other materials should be added to enhance the bioactivity (e.g. to provide a more conducive pH or to provide additional "dietary" nutrients to stimulate microbial population growth)
- Unlike the temporary storage pile, a Biopile must be firmly secured and left covered at all times to maintain an appropriate moisture content and allow the microbial population to thrive. The Biopile will need to be "watered" to maintain the appropriate moisture content.

Other common sense stockpiling practices may be employed as approved by the WVDEP Project Manager or other oversight staff.

3.2.5 Utilization of Open Excavation for Monitoring/Recovery Equipment Installation

Once the tank(s) and gross soil contamination removal is completed, the open excavation offers a unique opportunity for installation of monitoring, interim cleanup, or recovery equipment. Accessibility of the open excavation and on-site field screening of contaminant "hot spots" can allow for discretely placed recovery or observation wells, with the wells capable of addressing either soil vapors above the water table or groundwater, if present in the excavation. Backfilling of the tank excavation or pit should be done in coordination with installation of such wells. These wells must comply with the Monitoring Well Regulations 47 CSR 59 & 60.

If wells are to be installed in the tank or excavation pit for observation or monitoring purposes, the backfill material should be sufficiently porous to allow for free flow of liquid product or vapors. Examples of sufficiently porous materials may include coarse sand, fine-crushed rock, shot rock, and pea gravel.

If groundwater and/or free product are encountered in the tank or excavation pit, free product recovery and observation wells should be installed. The bottom of the well(s) must be at least one foot below the lowermost tank or excavation bottom elevation (so that flow to the recovery well is facilitated). One well should be in the center of the pit, unless new tank installation precludes such a design. Six-inch diameter, Schedule 40 piping with 0.02-inch slots are recommended for this type of recovery well. If this material is unavailable, four-inch diameter Schedule 40 piping with 0.02-inch slots is acceptable.

If groundwater is not present in the excavation, the exposed horizon or vadose zone may still need interim monitoring or cleanup. Installation of soil venting or vapor extraction wells in the backfilled pit may allow for easier characterization of contaminants during the full extent investigation or to recover or vent vapor phase contaminants under interim cleanup efforts.

In either groundwater or vadose zone well installations, more than one recovery/vent well may be used. Manifolding the wells together near surface may be advantageous to tie the system into either a single storage or treatment unit. Vapor extraction or soil vent wells should be constructed so that the

discharge point extends to a minimum height of ten feet above the ground surface, where practical. To attain such a height, piping should be threaded or collars and glue should be utilized. Additional considerations for vapor extraction wells are discussed in Section 3.6.3, with documentation of well locations and construction described in Section 3.4.

3.3 Receptor Monitoring

Potential receptors of a spill or release of free product may be people, plants, streams, and surface or groundwater. Potential pathways to receptors may be sewers, pipes, and ditches, the backfill around utility lines or any other mode of gravity or water flow. Product or vapors may accumulate in basements, wells, etc., which may increase the potential for exposure by various receptors. In the event of a spill or release, potential or actual receptors and migration pathways should be monitored to determine if, or to what degree, they have been affected.

Receptor monitoring can be done with PID, FID, or LEL instruments to assess threats from vapors, by visual (e.g. sheen on standing or open water) and/or lab analytical methods to assess impacts to waterways or groundwater. Periodic receptor monitoring should continue until the source and its associated impacts have been mitigated. Additional monitoring and interim response activities relative to vapor threats are discussed in the following section.

3.4 Venting to Address Vapor Threats

Vent or vapor extraction wells may be necessary at locations adjacent to structures, basements, or sewer lines if field screening instruments indicate explosive or dangerous levels. To adequately vent these areas, explosion proof fans should be used in the affected structures or in the case of sewer lines, at sewer drops and access points. Venting should continue until acceptable vapor levels are attained at the affected structure. These may include, but are not limited to LEL's, TEL's, and PEL's. (to be determined by the OER PM or other oversight staff). If venting/vapor extraction wells are installed, the WVDEP OER personnel will require the following documentation:

- A location map showing where wells have been installed
- As-built diagrams of the wells showing how they were installed
- A listing of the equipment used (or as-built of the surface hardware)
- Compliance with Monitoring Well Regulations

Note that vapor extraction is not always feasible. It is not recommended if the groundwater table is high. Information obtained during the Initial Site

Assessment will indicate average groundwater levels. Additional details regarding the use of Vapor Extraction Wells are provided in Section 3.6, Selected Remediation Technologies.

3.5 Surface and Surface Water Impacts

While implementing interim response measures, it may be necessary to mitigate surface or surface water impacts. Absorbent pads and quick-dry booms may be used to quickly contain or recover product released to the surface or surface waters. These materials may also prevent additional product from entering a tank excavation. Absorbent materials may continue to be necessary until, or in addition to, an alternative, long-term corrective action measure is in place to prevent the spread of product to the surface and surface waters.

Under no condition should free product be “burned-off” on paved asphalt or concrete surfaces.

3.6 Selected Remediation Technologies for Interim Cleanup Efforts

Selected remediation or cleanup technologies may be employed as interim measures to prevent the spread of contamination (remedial technologies are discussed further in Chapter 4 as part of the long-term corrective action phase). The remedial technologies reviewed in this chapter are those that are likely to be employed during the interim measure phase. These include interceptor trenches, horizontal wells, passive venting, and disposal of wastes. The brief discussion of remedial technologies that follows is intended to highlight some of the considerations for the use of these technologies, not to comprehensively educate an audience about when to use, how to select, or how to implement the technologies.

3.6.1 Interceptor Trench

An interceptor trench may be necessary if product or vapor is present in the tank pit after tank excavation or if free product threatens to migrate off site through soils, and thus poses an immediate threat to streams or other sensitive receptors. Even if the threat is not imminent, free product should be removed from the pit via pumping or vacuum truck (see Chapter 1). As an interim measure to intercept or contain free product migration or even highly contaminated groundwater migration, an interceptor trench may be employed.

An interceptor trench is commonly dug using a backhoe or in the case of an open excavation, it may be the down-gradient

sidewall of the excavation. Primary considerations of the location include the assumed or known direction of contaminant migration and the relative position of potential receptors, which may need to be protected. In addition, the depth of the horizon where contaminants (either vapor or liquid) are targeted is a key consideration, in that practical limits do exist for excavation depth. As in any other excavation, soils from the trench may need to be stockpiled. However, soils may be suitable for placement back into the trench, with the approval of the WVDEP OER Project Manager or other oversight staff.

Once the trench is excavated to the desired depth (and if necessary, the desired grade is achieved at the trench base), perforated horizontal piping may be installed with the appropriate screen or slot size and sufficiently porous backfill material, if the excavated soil is not suitable**.** **NOTE:** WVDEP OER staff rarely considers excavated soil to be suitable backfill, with sand or pea gravel commonly preferred.

3.6.2 Horizontal Wells

Horizontal wells may be situated in the tank pit to facilitate soil venting/vapor extraction or groundwater/free product recovery. A perforated pipe is laid in the trench adjacent to contaminated soils and surrounded with appropriate porous backfill. Coupling or manifolding the horizontal piping to vertical wells may be employed to complete a venting system. A sump constructed along the length of the horizontal well provides a means for free product and/or groundwater collection and recovery.

3.6.3 Venting With Vapor Extraction Wells

Vapor extraction wells are generally used as an interim measure in one of the three following situations:

a) In the first situation, vapor extraction wells are used to mitigate vapors in structures and utilities, as discussed in Section 3.4. The wells can be installed immediately upon realization of a vapor threat and can be operated throughout any long-term Corrective Action.

b) In the second situation, vapor extraction wells are installed in the tank excavation pit. These wells may

also be operated throughout long-term corrective action (pursuant to Corrective Action Plan review and approval discussed in Chapter 4).

c) In the third situation, vapor extraction wells may be installed in the excavated soils stockpile to enhance volatilization and bioremediation, as discussed briefly in Section 3.2.4 above.

Vapor extraction wells should be four-inch (minimum) diameter, Schedule 40 piping with 0.02-inch slots, and screened in the target (vadose) zone. The annular space around the screened interval should be filled with a porous filter material (e.g. washed sand), topped with a minimum of one foot of properly hydrated bentonite, and finished to the surface with a minimum of one foot of Portland cement. The hydrated bentonite may briefly interrupt well backfilling and completion. Vapor Extraction/Recovery wells must also be constructed in accordance with the Monitoring Well Construction regulations (47 CSR 59 & 60)

Caution should be exercised in operating a vapor extraction system. The discharged vapors may contain high levels of VOC's and require treatment. Discharged vapors must be routinely monitored using an LEL meter to evaluate potential fire or explosion hazards.

NOTE: In operating the vapor extraction wells, vacuum pressure may be lost along the well casing and "short circuiting" could occur. "Short circuiting" is described as occurring when vacuum intended to draw in vapors from the surrounding soils is lost through cracks or pathways inadvertently created in the annular materials. This will significantly reduce the effectiveness of the vapor extraction wells.

3.6.5 Disposal of Wastes

Wastes generated at a UST/LUST site include solid and liquid wastes as well as any free product recovered. Typical wastes are boring/well cuttings generated during the site assessment, used absorbent materials, contaminated water, and contaminated soil. All wastes generated during site activities must be properly stored and disposed.

As discussed in Section 3.2.4, excavated or contaminated soil may be stockpiled on-site on plastic liners surrounded by

a berm. Soil or cuttings may also be placed in DOT-17C approved drums. DOT-approved drums should also be used to store contaminated water. All drums should be stored in an area designated specifically for this use. All federal, state, and local regulations must be followed regarding proper storage, handling, and disposal of site generated wastes. Information on labeling, transportation, and documentation requirements can be obtained through the Public Service Commission, Motor Carrier Section at (304) 340-0320.

APPENDIX IM-1

Office of Environmental Remediation
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Charleston, WV 25304-1401
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West Virginia Department of Environmental Protection

Bob Wise
Governor

Michael O. Callaghan
Secretary

November 7, 2000

Location of Tanks:

WV ID #
Closure #

Important Notice to all UST Owners Closing Tanks

Since the possibility of encountering contamination at a closure is high, UST owners/operators should develop plans for handling contaminated soils and/or water prior to the actual closure beginning.

If evidence of a petroleum release is found in the form of contaminated soils, contaminated ground water, or free product as a liquid or vapor, it is the responsibility of the tank owner and operator (or their representative) to report the release within 24 hours of discovery. **The release must be reported to Lois Lake or Don Martin at the District III Office at (304) 924-6211, or if it is discovered after regular DEP office hours, it should be reported to the DEP hotline at 1-800-642-3074 (from within the state).** *Failure to report a release within 24 hours is a violation of Federal & State Regulations and may result in penalties against the owner and operator.*

When **minor** soil contamination is found, **an amount that does not exceed 10 cubic yards** (or cover an area of 13ft.X 13 ft. X 1.5-2ft.) may be over-excavated and treated **on-site** in an above-ground bio-pile treatment cell, so long as the following requirements are strictly adhered to:

1. The bio-pile shall be constructed and located in an area that will prevent impacts to surface and ground water resources, and not cause nuisance complaints from neighbors,
2. The soils shall be placed on a minimum of 6 mil black plastic to prevent infiltration into the existing ground,
3. The soils shall be placed such that no area exceeds 1.5 - 2 feet in depth,
4. The soils shall be **securely covered at all times** with a minimum of 6 mil black plastic, to prevent precipitation infiltration and to maintain an appropriate moisture content,
5. After six (6) months from the date of the release, the bio-pile shall be evaluated and if the soil does not exhibit obvious petroleum contamination as determined through olfactory or other screening methods, a representative sample shall be obtained from near the bottom of the center area of the bio-pile, and submitted to a West Virginia certified laboratory for analysis for BTEX by Method 8021a, and TPH, GRO & DRO. If the bio-pile still shows evidence of contamination through the screening or sample analysis, then the treatment cell should remain in effect. At the end of the second six month period, the soils must be evaluated and analyzed as noted above.
6. Two copies of the results of the soil analyses shall be forwarded to the OER Project Manager for the county where the facility is located. The submitted analyses reports shall be identified by: the name of the facility, the tank owner and operator, the "LUST #", the "WV ID #", and the "Closure #".

No additional excavation of contaminated soils may proceed,

if space cannot be found on-site to treat the 10 cubic yards of soil or when the quantity of contaminated soils exceeds 10 cubic yards, **until a site-specific plan detailing the proposed Corrective Action work is submitted to OER**, in accordance with 40 CFR 280.66 (d). The proposed Corrective Action Plan (CAP) for additional excavation of contaminated soils must be submitted to the appropriate OER Project Manager and Geologist (see roster).

If ground water is encountered, all further excavation must be discontinued until the appropriate OER Project Manager is contacted, and a ground water investigation will be required.

The minimum information to be included in the proposed soils CAP is:

1. The estimated volume of soil to be removed,
2. The proposed method of soils treatment (e.g., landfill disposal, on-site bio-pile, off-site bio-pile, thermal treatment, pug-mill, etc.),
3. A representative sampling plan to confirm successful over-excavation of contaminated soils,
4. The ultimate planned disposition of the excavated soils.

If aboveground bio-pile treatment is proposed, the previously detailed bio-pile construction requirements must be met, and the CAP must also include:

1. A copy of a topographic map specifying the bio-pile location,
2. A diagram of the soils treatment area,
3. An acknowledgement and agreement signed by the property owner on which the bio-pile is proposed to be located.

The Office of Environmental Remediation strongly recommends that owners/operators submit their proposed aboveground bio-pile treatment plans prior to beginning the tank closure activities. Good pre-planning should minimize delays and work stoppages if contamination is encountered.

40 CFR 280.66 (d) -""Owners and operators may, in the interest of minimizing environmental contamination and promoting more effective cleanup, begin cleanup of soil and ground water before the corrective action plan is approved provided that they:

(1) Notify the implementing agency of their intention to begin cleanup;
(2) Comply with any conditions imposed by the implementing agency, including halting cleanup, or mitigating adverse consequences from cleanup activities; and
(3) Incorporate these self-initiated cleanup measures in the corrective action plan that is submitted to the implementing agency for approval""

Failure to abide by these instructions may result in the initiation of enforcement actions against the owner, operator and/or contractor, and may be grounds for the suspension or revocation of a contracto''s license.

Should you have any questions regarding this correspondence, feel free to contact Jim Maurin at (304) 368-3950, or Don Martin at (304) 924-6211 as noted on the enclosed roster.

CHAPTER 4 – CORRECTIVE ACTION PLAN

The ultimate action regarding a spill or release at a UST site entails developing and implementing a Corrective Action Plan to ensure site remediation. This chapter begins by discussing the target cleanup levels to which sites should be remediated through Corrective Action. It then discusses the information that should be included in the Corrective Action Plans (CAPs) to make them approvable by the WVDEP Office of Environmental Remediation.

4.1 Contamination From UST Releases and Site Cleanup Goals

The determination of whether a UST release investigation / cleanup is considered completed or a release adequately remediated is based on contaminant levels in soil and/or water. This section identifies the target cleanup levels for:

- Free product
- Soil vapors
- Soils
- Groundwater

The target cleanup levels identified in this section pertain specifically to petroleum sites. Acceptable cleanup levels at non-petroleum sites will be determined on a case-by-case basis, but will most likely be dealt with through the Voluntary Remediation Program.

4.1.1 Free Product

The short-term goal in any free product recovery operation is for removal to occur until the thickness of the product is less than 1/8 inch. The long-term goal in free product recovery is to remove product until there is no noticeable sheen. Any soil or groundwater that was in contact with the free product will need to be remediated to the levels identified in Section 4.1.3 and 4.1.4, respectively.

4.1.2 Soil Vapors

During site remediation activities the short-term goal concerning soil vapors is to eliminate the vapor threat in sensitive areas. Sensitive areas may include but are not limited to: basements, structures, sewers, etc. Procedures to eliminate the vapor threat in these situations were discussed in Chapter 3.

4.1.3 Soil

The following target cleanup levels for petroleum-contaminated soil are provided as guidelines only. Site-specific conditions may warrant deviation from these target levels. For gasoline contaminated soils, the following target cleanup levels and corresponding analytical methods apply:

Contaminant	Cleanup Level	Analytical Method
BTEX	10 ppm (total) Benzene <0.05 ppm	EPA 8021B (Refer to Appendix SA-3)
TPH (GRO&DRO individually)	100 ppm	EPA 8015B
MTBE	0.04 ppm (guideline)	EPA 8021B (confirm with EPA 8260B)

For diesel, hydraulic oil, and used oil contaminated soils, the following target cleanup levels apply:

Contaminant	Cleanup Level	Analytical Method
BTEX	10 ppm (total) Benzene < 0.05 ppm	EPA 8021B (Refer to Appendix SA-3)
TPH (GRO&DRO individually)	100 ppm	EPA 8015B
PAH's	1.0 ppm	EPA 8270C

Additional information on analytical methods may be found in Appendix SA-3 on Pages 46 and 47.

The level specified for PAH is for any one parameter. No individual compound should exceed the 1.0-ppm level. This is especially true in the case of known carcinogens such as benzo(a)anthracene and benzo(a)pyrene.

Soils characterization, in addition to what is identified here, may be required to dispose of soil in a landfill, etc. Analytical and other requirements for landfilling petroleum-contaminated soil are discussed in Section 4.2.4.

4.1.4 Groundwater

The cleanup levels identified for groundwater will be specific to the source of contamination. In general, though, groundwater levels will be required to meet the Federal Drinking Water Standards in accordance with the "West Virginia Groundwater Protection Act", Section 22-12 of the West Virginia Code. These standards are provided in Appendix CA-1. The maximum contaminant levels (MCL) will apply. In cases where current drinking water supplies have been contaminated, groundwater must be restored to Federal Drinking Water Standards. Post remediation sampling is required to meet a minimum of four (4) quarters at or below MCL's, to meet this requirement.

If after remediation, groundwater concentrations remain above the drinking water standards, contact the WVDEP OER PM to determine what other actions should be taken, or to determine what other options are available. If groundwater levels cannot be reduced to the MCL's, the owner/operator has the option of making application to the Voluntary Remediation program for Risk Based Standards. The remediation system must remain in operation while the WVDEP Office of Environmental Remediation reviews the request.

Once concentrations have fallen below the State groundwater standards for four consecutive quarters, the owner/operator may request that a "No Further Action" (NFA) status be granted regarding the remediation of the site. For this request to be granted, the owner/operator must demonstrate that asymptotic levels have been obtained (i.e. no rebound in contaminant concentrations). Quarterly sampling collected over one year will be the minimum acceptable data to be included in the proposal to the WVDEP OER PM.

4.2 Corrective Action Plan Requirements

The CAP requirements for a given site will differ depending on the remediation technology that is selected. Appendix CA-2 is a checklist of generic requirements for any CAP. The following checklists, Appendix CA-3 through CA-6, identify the additional minimum requirements of a CAP for the following treatment technologies:

- Pump and treat
- Landfarming

- Soil vapor extraction
- In-situ bioremediation

These checklists are provided to assist preparers of CAPs in submitting a complete and thorough plan in accordance with WVDEP OER guidelines. Completion of the items on the checklists will ensure that most, if not all, of the necessary information will be included and will aid in the eventual approval of the CAP by the PM. All appropriate checklists must be completed and submitted with the CAP.

Where more than one technology is proposed or required, checklist items will need to be addressed for each technology. For instance, a site may require soils excavation and treatment/disposal in combination with free product recovery and possibly even a dissolved phase pump and treat system. In such cases, checklists for each technology should be used to ensure complete information submittal.

Regardless of the remediation technology selected, most CAPs will contain a discussion of the rationale for technology selection, an engineering design plan, monitoring plan, waste management strategy, and schedule. Therefore, these requirements are discussed in more detail in the following paragraphs.

4.2.1 Rational for Technology Selection

In selecting a remediation technology or technologies, it is important that the technology be compatible with site conditions and contaminants. The WVDEP OER recommends that three feasible corrective action alternatives be proposed and evaluated for a site. The owner/operator must then present his rationale for selecting one of these alternatives. The technology selected should be designed to facilitate environmental cleanup, not for ease of logistics. If the Corrective Action selected is not included in the checklists, documentation of its effectiveness and applicability to the site must be provided.

One possible Corrective Action alternative is Monitored Natural Attenuation, which would require the owner/operator to apply for participation in the Voluntary Remediation Program. Detailed guidance for using Monitored Natural Attenuation as a site remedy is discussed in Chapter 7 of the Voluntary Remediation and Redevelopment Act (VRRA) Guidance Manual.

If an owner/operator thinks that the use of monitored natural attenuation is technically justified, an explanation should also be included in Chapter 6 (Recommendations) of the Site Assessment Report, noting the intent to make application to the Voluntary Remediation Program.

4.2.2 Engineering Design Plan

A detailed description and proposed design of the remediation technology system(s) must include:

- Complete design criteria such as expected contaminant concentrations; total contaminant volumes; projected flow rates and volumes; temperatures, pressures, etc., under varying conditions (seasonal and project phases); methods for all onsite collection, treatment, storage, and disposal of product and/or wastes
- Alarm and safety features to respond to malfunctions, potential overflows, etc., including the name and phone number of a site contact
- Type and location of utility services (submit utility location figure)
- General layout and process flow diagrams depicting the location of all collection, treatment, storage, and disposal activities (schematics or plans are acceptable)
- Measures to protect the system(s) from damage resulting from tampering and inclement weather (cold, floods, etc.)

In addition to the above information, the checklist for a particular remediation technology will identify design information that may be necessary for that technology. Any modifications made to the engineering design plan upon system installation must be submitted to the appropriate district office within 30 days of system start-up.

4.2.3 Monitoring Plan

The remediation-monitoring plan should consist of four main sections.

- Section 1 should describe the treatment system monitoring (the monitoring plan to document the system's performance and any modification to optimize that performance).

- Section 2 should describe influent and effluent monitoring (typically, the monitoring conducted to meet conditions of permits, or establish treatment effectiveness).
- Section 3 should describe monitoring associated with the environmental cleanup (the monitoring of soils, groundwater, and vapors that identify progress toward cleaning up the environment to the target soil levels and groundwater standards noted above).
- Section 4 should describe the monitoring report format (for the submittals that will be made to the WVDEP OER during system operation).

The recommended information to be included in each section is described below.

4.2.3.1 System Performance (and Modification) Monitoring

This section of the monitoring plan should identify that the following items will be monitored, data collected and retained or managed throughout the site cleanup and submitted in monitoring reports as needed:

- Hours of operation
- Hours of downtime (anytime when the system is unintentionally shut down)
- Any major equipment failure
- Specific problems with equipment efficiency
- Frequency of system monitoring (and reason for changing the frequency, if changed)

If possible, the treatment system should be checked daily by on-site personnel (e.g., cashier, store manager, mechanic, etc.) simply to ensure it is operating. A phone number should be provided so that responsible personnel may be notified when something needs corrected. Repairs/modifications must be documented and submitted with monitoring reports. If there will not routinely be on-site personnel available for monitoring, a telemetry system should be included in the design and this should be noted in this section of the monitoring plan. At a minimum, the system must be checked twice per month for the first two months, then monthly thereafter, for proper operation and

maintenance. If a telemetry system is utilized, site visits must be made quarterly after the first two months of operation.

Examples of additional system monitoring items might include (but not be limited to) technology-specific information such as:

- Flow rate/blower rate, vacuum pressure (for groundwater recovery of soil vapor extraction)
- Volume of treated water
- The changing of system packing (i.e. in air stripper towers) or stripper tray cleaning
- Water levels in all wells (to ensure pumps do not “burn up” from well dewatering)
- The product thickness in the well(s) (if present)
- Effectiveness/flow-through time of water in oil/water separator
- Volume of product recovered in a separate tank and the fate of the product (disposed/recycled)
- Amount of granular activated carbon (GAC) used (if any) and when the GAC is disposed or recycled
- Flow-through time of water through the GAC (or other treatment system component) and the flow-through time to filter water upstream of the treatment system
- Volume of any re-injection and re-infiltration air or water
- Information on any type of dissolved metals or biofouling treatment

Unless otherwise determined by WVDEP OER staff, system parameter monitoring should occur monthly, with reports provided quarterly.

4.2.3.2 Influent/Effluent Monitoring

For influent monitoring, specific influent parameters that may affect system performance should be monitored (e.g., iron in water). The monitoring plan should include a table of parameters and the monitoring results. Unless otherwise required by WVDEP OER staff or by

permit conditions, contaminant influent sampling should occur once per month.

Effluent sampling is typically a requirement of permitting authorities (i.e. discharge permit requirements). For water effluent, a West Virginia National Pollutant Discharge Elimination System (WV NPDES) permit may be required (see Section 1.1.d on Page 1-2 for information regarding WV NPDES permits). Even if a municipality does not require effluent water monitoring, the WVDEP OER will require it. Unless otherwise required by permit, effluent sampling should occur once per month. For air discharges, stripper monitoring and vapor extraction monitoring will be required to calculate the mass removal rate. Monitoring may be done with an LEL, PID, or FID monitor. Post-treatment soil monitoring will also be required for in-situ or stockpiled soils. Sampling must be conducted to ensure reduction in contamination levels.

4.2.3.3 Environmental Cleanup Monitoring

Environmental cleanup monitoring will require graphs of the quantity of contaminant removed (pounds or gallons) over time. This graph will show the progress of the remediation system. Graphs must be prepared to show progress in groundwater, vapor, soil, and miscellaneous source cleanup. When possible, total BTEX (for gasoline) and TPH (for other petroleum products) iso-concentration contour maps should be submitted to identify “hot spots” and document reduction of contamination. At a minimum, values should be plotted on site maps relative to well/boring or other sampling location.

For groundwater, the concentration levels in monitoring and extraction wells must be determined analytically. For vapor, at a minimum, all efforts should be made to comply with OAQ standards and prevention of “nuisance complaints” from the system effluent. If the readings suggest high vapor concentrations, specific analytical testing of individual vapor extraction wells or the vapor effluent stack may be required.

Contaminant concentrations in soils must be determined analytically to calculate the amount removed over time. Finally, miscellaneous sources must be monitored to ensure no secondary or off-site contamination is occurring.

In order to verify the progress of a given treatment system, baseline data must be available to document the starting point prior to treatment.

4.2.3.4 Monitoring Reporting

The monitoring report should be complete and concise. It is only expected to consist of approximately four to six pages, including tables and figures, which document analytical results, monitoring well gauging, free product thickness, etc. All of the general system operating information identified under 4.2.3.1 should also be included, in abbreviated fashion.

Tables and figures should present both current and cumulative data, with current data highlighted. The graphs described in Section 4.2.3.3 showing cumulative contaminant removal over time should also be included.

NOTE: Information identified in the preceding monitoring sections must be gathered monthly at a minimum. Reports will be required quarterly. Two copies of the monitoring report must be submitted, one to the attention of the OER Project Manager at the district office for the county in which the leak site is located and the second to the Charleston Office.

4.2.4 Waste Management Strategy

Corrective actions often result in the generation of wastes including:

- Tanks and containers
- Contaminated soil
- Contaminated water
- Liquid hydrocarbons from tanks or free product recovery
- Sludges
- Solid wastes
- Cuttings from soil borings

These wastes may be considered hazardous or special wastes according to State and Federal regulations. The CAP should include a discussion of the types and amounts of waste expected from the cleanup and the plans for their disposal. For specific guidance refer to the Important Contacts and Phone Numbers page.

The soil must contain no free liquids. A minimum of one composite sample analysis must be completed for each 100 tons of soil. Any sludge must be dewatered and is subject to the same analyses as the soil.

To minimize analytical costs, field hydrocarbon vapor analyzers may be used as a screening tool to determine in-place total vapor concentrations. These shall be measured using a properly calibrated HNU or similar field-monitoring device. Screening shall be done by sampling the headspace in a half-filled glass jar or Ziploc baggie approximately five minutes after introduction of the soil sample. Soils found to contain in excess of 100-ppm total hydrocarbon concentration must be aerated on site or at a landfill with an approved liner system where disposal will take place. Soils found to contain 100 ppm or less total hydrocarbon concentration may be disposed of at any of the lined landfills without aerating.

If the field screening of the soil, results in a total hydrocarbon concentration of 10 ppm or more, then the above mentioned USEPA test methods may be used to determine the TPH, BTEX, and lead content. If the total of BTEX is 10 ppm or less and the TPH level is 100 ppm or less, then the WVDEP may grant approval for the disposal of these contaminated soils at an unlined landfill provided that a lined facility is not within reasonable proximity,

NOTE: Landfilling petroleum contaminated soils is one of several options available to responsible parties. The above policy developed by the Solid Waste Management Section should not be misinterpreted to mean all petroleum-contaminated soils must be landfilled. For more information on landfills, analytical requirements, etc., contact the Solid Waste Management Section at (304) 558-6850.

4.2.5 Schedule

Each CAP should include a schedule with actual and projected dates for the following activities:

- Cleanup activities to date (actual dates, where applicable)
  - Tank excavation
  - Soil excavation
  - Free product recovery
  - Interim measures
- Planned cleanup activities (projected dates, including other associated site activities projected to occur during cleanup
  - Upgrade existing or new tanks to conform to Federal and State Regulations
  - Completion of health and safety plan
  - Implementation of initial construction
  - Drilling and well construction (if any)
  - Excavation (soil and tanks)
  - Installation of remediation system
  - Initiating operation of remediation system
  - Initial progress report (including baseline data and summary of system optimization) – due one month after initiating operation of remediation system
  - Quarterly progress report

In preparing the schedule, account for any review time that will be required for permits. Also, if the schedule changes, the WVDEP OER PM should be notified and the changes included in the quarterly report.

APPENDIX CA-1
WEST VIRGINIA GROUNDWATER STANDARDS
(EPA Maximum Contaminant Levels [MCL's] for Public Water Supplies Under the Safe Drinking Water Act)

Constituent	Not to Exceed (In mg/L, except where noted)
Alachlor	0.002
Antimony	0.006
Asbestos (fibers/1 less than 10 ug/1)	7 MFL*
Atrazine	0.003
Barium	2.0
Benzene	0.005
Benzo(a)pyrene (PAH)	0.0002
Beryllium	0.004
Cadmium	0.005
Carbofuran	0.04
Carbon tetrachloride	0.005
Chlordane	0.002
Chromium (total)	0.1
Cyanide	0.2
2,4-D	0.07
Dalapon	0.2
Di[2-ethylhexyl]adipate	0.4
Di[2-ethylhexy]phthlate	0.006
Dibromochloropropane	0.0002
Dichlorobenzene p-	0.075
Dichlorobenzene o-	0.6
Dichlorobenzene n-	0.6
Dichloroethane (1,2)	0.005
Dichloroethylene (1,1-)	0.007

Constituent	Not to Exceed (In mg/L, except where noted)
Dichloroethylene (cis-1,2-)	0.07
Dichloroethylene (trans-1,2-)	0.1
Dichloromethane	0.05
Dichloropropane (1,2-)	0.005
Dinoseb	0.007
Diquat	0.02
Endothall	0.1
Endrin	0.002
Ethylbenzene	0.7
Ethylene dibromide (EDB)	0.00005
Fluoride	4.0
Glyphosate	0.7
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Hexachlorobenzene	0.001
Hexachlorocyclopentadiene	0.05
Lead	0.015
Lindane	0.0002
Mercury (inorganic)	0.002
Methoxychlor	0.04
Monochlorobenzene	0.1
Nickel	0.1
Nitrate (as N)	10.0
Nitrite (as N)	1.0
Total Nitrate and Nitrite (both as N)	10.0
Oxamyl (vydate)	0.2
Pentachlorophenol	0.001
Picloram	0.5

Constituent	Not to Exceed (In mg/L, except where noted)
Polychlorinated biphenyls	0.0005
Selenium	0.05
Simazine	0.004
Styrene	0.1
2,3,7,8-TCDD (Dioxin)	0.000000005
Tetrachloroethylene	0.005
Thallium	0.002
Toluene	1.0
Toxaphene	0.003
2,4,5-TP (silvex)	0.05
Trichlorobenzene (1,2,4-)	0.07
Trichloroethane (1,1,1-)	0.2
Trichloroethane (1,1,2-)	0.005
Trichloroethylene	0.005
Vinyl Chloride	0.002
Xylenes	10.0
Radionuclides	
Beta particle and photon activity	4 mrem **
Gross alpha particle activity	15 pCi/L***

* MFL = million fibers per liter
** mrem = millirem (rem=roentgen-equivalent-man)
*** pCi = picocurie

WEST VIRGINIA CORRECTIVE ACTION PLAN (CAP) CHECKLISTS

As stated earlier, the West Virginia CAP checklists are provided to assist preparers of CAPs in submitting complete and thorough plans in accordance with WVDEP OER guidelines. WV OER staff recognizes that not all items on each checklist will be applicable to each site. Therefore, items that may not apply to a particular site/technology or may not be available should be indicated with an N/A in the Section/Page column. The "N/A" must be numbered and corresponding explanation provided on the back of the checklist. Also, if the information for a particular item has already been submitted in a previous report and the item requested is longer than one page, the preparer may provide the section, pages and date of the report where the information may be found. Some examples are included below:

1) Appendix CA-2, West Virginia CAP Checklist – Generic Requirements, requests a "Summary of the Final Site Assessment Report". This information should be included as the Executive Summary of that report and should be no greater than one page in length. Therefore, this page must be included with the CAP submitted for approval.

2) Appendix CA-6, West Virginia CAP Checklist – In-Situ Bioremediation, requests "All available information from tank closure or soil excavation reports, test pits, and boring logs". This information should be available (for example) in the Tank Closure Report and in Appendix B of the Primary or Final Site Assessment Report. However, this information may cover many pages. Therefore, the preparer should reference the section, pages, and date of the Tank Closure Report and Appendix B, pages and date of the Assessment Report where this information may be found (for example: Sec. 4-2, 17-21, 7/93; App. B, 44-49, 10/93)

3) Appendix CA-3, West Virginia CAP Checklist – Pump and Treat, requests "Biotreatment cell design, monitoring points, nutrient, temperature and pH controls, re-injection points or galleries. However (for example), a particular pump and treat system may be using a low-profile air stripper to treat contaminated water. Therefore, the biotreatment cell does not apply to this particular system and the preparer should place an N/A (for example NA-3) in the blank for the page number and on the back of the checklist, provide an explanation (for example N/A-3: System using low-profile air stripper to treat contaminated water).

APPENDIX CA-2 -- GENERIC REQUIREMENTS
WEST VIRGINIA CORRECTIVE ACTION PLAN CHECKLIST

Date of submittal of CAP _____
Site Name _____
ID Number _____ Leak Number _____
Location _____
Owner/Operator _____ Phone _____
Contractor _____ Phone _____

Page	Topic
_____	Incorporation of previous corrective action activities or interim measures into Plan (e.g., free product recovery, vapor reduction in basements)
_____	Summary of Final Site Assessment Report (Executive Summary)
_____	sampling results
_____	pathways and receptors
_____	release characteristics
_____	Detailed site plan provided
_____	Three corrective action alternatives discussed
_____	Justification for selection of corrective action
_____	Engineering design provided
_____	process flow diagram of equipment
_____	narrative description of process
_____	Operation and maintenance plan provided
_____	Environmental monitoring plan provided
_____	QA/QC plan for sampling and analysis
_____	Waste management/disposal plan provided, including estimated volumes
_____	soil
_____	process water
_____	tank
_____	sludges
_____	free product
_____	Complete list of permits to be obtained and discussion
_____	Estimated time schedule for all corrective action activities
_____	Conclusion

APPENDIX CA-3 -- PUMP AND TREAT
WEST VIRGINIA CORRECTIVE ACTION PLAN CHECKLIST

Date of submittal of CAP _____
Site Name _____
ID Number _____ Leak Number _____
Location _____
Owner/Operator _____ Phone _____
Contractor _____ Phone _____

Page	Pump and Treat Topic
_____	Estimated total extent of groundwater contamination to be extracted and treated, or contained
_____	plan view/isoconcentration contour map
_____	cross-sections of depth of contaminant occurrence
_____	Baseline groundwater contamination analytical data
_____	type of contaminant and degree of weathering
_____	multiple source delineation, if any
_____	general water quality (iron, bacteria, etc.)
_____	Baseline soil properties and available boring logs
_____	soil (or bedrock) type, texture, grain size
_____	hydrogeologic cross-sections
_____	soil permeability, slug or pump test data
_____	depth to water table and contour map
_____	groundwater flow direction and rate
_____	seasonal groundwater level fluctuations
_____	System design components, diagrams, and site map showing:
_____	extraction and monitoring well locations
_____	drawdown and pump rates and aquifer tests
_____	expected influent concentrations
_____	estimated system removal/recovery rate
_____	engineering plans and specifications for all wells, trenches, pumps, lines, piping, silt control, oil/water separation, effluent system treatment units, treated discharge and monitoring points
_____	Treatment unit specifications
_____	Air stripper air and water flow rate, column height, diameter, and packing
_____	Activated carbon type, volume, configuration, bed life, replacement plans, monitoring ports
_____	Biotreatment cell design, monitoring points, nutrient, temperature and pH controls, reinjection points or galleries
_____	Monitoring and maintenance plan
_____	system monitoring, trial run and full scale measurements
_____	influent and effluent analytical data
_____	discharge rates and points
_____	sampling frequency, analyses, and reporting
_____	Permits

APPENDIX CA-4 -- SOIL VAPOR EXTRACTION
WEST VIRGINIA CORRECTIVE ACTION PLAN CHECKLIST

Date of submittal of CAP _____
Site Name _____
ID Number _____ Leak Number _____
Location _____
Owner/Operator _____ Phone _____
Contractor _____ Phone _____

Page	Soil Vapor Extraction Topics
_____	Estimated total extent of unsaturated zone contamination
_____	plan and cross-sectional views
_____	Baseline soils contamination data
_____	soil vapor survey
_____	soil boring, sampling, and analytical data
_____	estimated total volume of contaminants
_____	relative weathering, percent “light” ends
_____	estimated/calculated treatment vapor concentrations
_____	Baseline soil permeability field tests/data
_____	System design components
_____	extraction well(s) location and specifications
_____	diagrams of piping, manifolding, and components including vacuum pumps/ blowers, trenches, treatment systems, and system control
_____	expected vacuum pressure/flow rate
_____	calculated radius of influence
_____	expected removal rate
_____	surface seal and explosion proof equipment
_____	automatic emergency pump/blower shut off
_____	security/system protection
_____	effluent treatment (if required)
_____	all equipment design calculations, specifications including vapor flow path discussions
_____	System performance monitoring
_____	extraction well(s) vacuum gauging
_____	groundwater level monitoring
_____	monitoring/observation well vacuum gauging
_____	influent and effluent vapor sampling and analysis
_____	soil vapor sampling and analysis
_____	monitoring schedule, sampling frequency
_____	confirmatory soil sampling/analysis plan
_____	Permits

APPENDIX CA-5 -- LANDFARMING
WEST VIRGINIA CORRECTIVE ACTION PLAN CHECKLIST

Date of submittal of CAP _____
Site Name _____
ID Number _____ Leak Number _____
Location _____
Owner/Operator _____ Phone _____
Contractor _____ Phone _____

Page	Landfarming Topic
_____	Estimated total volume of soils to be treated
_____	Baseline soils contamination analytical data
_____	Soil type, texture, or grain size analysis
_____	All available information from tank closure or soil excavation reports
_____	Site map where landfarming is to be performed
_____	property boundaries, scale, north arrow
_____	abutters, sensitive receptors
_____	topography, surface water bodies, wetlands
_____	existing surface water runoff controls, berms, diversion drainage, collection basins
_____	planned runoff controls
_____	100 year floodplain level shown
_____	slopes less than 5%
_____	letter of consent from property owner (if other than o/o)
_____	Sampling/monitoring plan
_____	sampling locations
_____	sampling type (groundwater, soil composite or grab)
_____	analyses to be performed
_____	frequency of sampling
_____	Soil application plan
_____	Substrate soil properties (sand, clay, etc.)
_____	substrate preparation (e.g., clay soil compaction)
_____	underliner material and placement
_____	lift thickness (8 inches or less)
_____	tilling frequency, depth, and method
_____	Bioenhancement, if any
_____	types of nutrients to be used, rates of application
_____	soil chemistry buffering, if any
_____	System performance monitoring
_____	sampling and analysis plan
_____	Stockpile containment and cover
_____	Estimated schedule for completion

APPENDIX CA-6 -- IN SITU BIOREMEDIATION
WEST VIRGINIA CORRECTIVE ACTION PLAN CHECKLIST

Date of submittal of CAP _____
Site Name _____
ID Number _____ Leak Number _____
Location _____
Owner/Operator _____ Phone _____
Contractor _____ Phone _____

Page	Bioremediation Topics
_____	Estimated total extent of soil contamination to be treated
_____	plan view/isoconcentration contour map of area
_____	cross-sections of depth and contaminant occurrence or stratification
_____	Baseline soils contamination analytical data
_____	type of contaminant and degree of weathering
_____	identification of any potentially “toxic” contaminants, i.e., waste oils with chlorinated organic
_____	Soil type, texture, or grain size analysis
_____	All available information from tank closure or soil excavation reports, test pits, and boring logs
_____	Baseline soil properties
_____	permeability for air or water
_____	vertical infiltration rates (for infiltration galleries)
_____	soil moisture and pH
_____	Hydrogeologic constraints
_____	depth to the water table and seasonal fluctuations
_____	Bioassay of types and populations of microbes
_____	Biofeasibility or bench scale studies
_____	System design components, diagrams, and site map showing extraction and/or injection points, trenches
_____	any infiltration gallery design
_____	any bioreactor components (aerators, pH, nutrients, temperature, biomass filtration controls, etc.
_____	construction details, influent/effluent monitoring points, flow or injection rates, etc
_____	Sampling/monitoring plan
_____	sampling locations
_____	sampling type (soil, groundwater, infiltration gallery water levels, effluent discharge)
_____	analyses to be performed
_____	frequency of sampling
_____	Bioaugmentation, if any
_____	System performance monitoring
_____	sampling, analysis, and reporting plan
_____	Groundwater permit if reinjecting or introducing nutrients
_____	Estimated schedule for completion