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I. INTRODUCTION

**County of Ventura
Environmental Health Division
LUFT Program**

**VENTURA COUNTY
LEAKING UNDERGROUND FUEL TANK
(LUFT)
GUIDANCE MANUAL**

Fourth Edition
April 2001

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I. INTRODUCTION

A. BACKGROUND

In the early 1980s, the threat posed by releases from leaking underground storage tanks (USTs) to groundwater quality was recognized. The discovery of soil and groundwater pollution from leaking USTs prompted local, state, and federal lawmakers to enact laws governing USTs.

In 1983, the California State Legislature enacted the UST Law (Chapter 6.7 of the Health and Safety Code) authorizing local agencies to regulate UST design, construction, monitoring, repair, leak reporting and response, and closure. The Ventura County Environmental Health Division's (VCEHD) Leaking Underground Fuel Tank (LUFT) Program was developed and continues to exist under a broad and complex legal framework. The laws and policies most applicable for UST cleanups are listed below:

- *California Code of Regulations, Title 23, (Waters)*, Division 3 (State Water Resources Control Board), Chapter 16
- *Porter-Cologne Water Quality Control Act (Water Code)* Division 7, Section 13000 et seq.
- *Health and Safety Code*, Division 20, Chapter 6.7 (commencing with Section 25280) and Chapter 6.75 (commencing with Chapter 25299.10)
- *Ventura County Ordinance Code*, Chapter 5, Article 2, Section 4527, et seq. (Appendix A)
- *Water Quality Control Plan - Los Angeles Region*, Adopted by RWQCB on June 13, 1994

B. LUFT PROGRAM

The LUFT Program is the local oversight program and lead agency that regulates soil and groundwater cases involving releases from USTs that contain gasoline, diesel, waste oil, and other petroleum hydrocarbons within Ventura County. The LUFT Program does not regulate the cleanup of home heating oil or farm tanks with capacities of 1,100 gallons or less, or non-tank sources such as sumps or flow-through clarifiers.

The cleanup and closure of sites with home heating oil, farm tanks, or non-tank sources may, however, be locally overseen by the VCEHD's Voluntary Cleanup Program; otherwise, these types of sites will be overseen by another State agency such as the Regional Water Quality Control Board – Los Angeles (RWQCB), the Department of Toxic Substances Control (DTSC), or the Department of Health Services (DHS).

I. INTRODUCTION

The purpose of having a local oversight program is to increase the efficiency, timeliness of response, and cost-effectiveness of corrective action while protecting human health, safety, the environment, and water resources in accordance with State requirements.

C. LUFT PROGRAM OBJECTIVES

The primary objectives of the LUFT Program are to protect groundwater supplies, public health, and the environment from petroleum products leaked from USTs. These objectives are accomplished by implementing State and Federal laws and regulations. The County of Ventura has entered a contract with the State of California to be the lead agency that regulates cleanup of unauthorized releases from USTs within Ventura County. In addition, the LUFT Program enforces other specific requirements at the local level.

Recent findings about the nature of the risk of releases from USTs have initiated numerous changes in the UST regulatory process since the inception of the LUFT Program. Additional changes are anticipated in the future. The LUFT Project Managers will continue to provide technical guidance that reflects both improved scientific knowledge and the new investigation and corrective action strategies and requirements.

D. PURPOSE OF LUFT GUIDANCE MANUAL

The purpose of this LUFT Guidance Manual is to provide Responsible Parties and their environmental consultants with written guidance and requirements for the assessment, corrective action, and closure of LUFT sites in Ventura County.

Specific instructions are included in this Guidance Manual for obtaining the necessary field data and background information to complete assessment of the contamination. The Guidance Manual also provides information on the development of effective assessment and corrective action strategies, implementation of remedial design plans, and the execution of verification sampling and monitoring to ensure that the corrective action has been effective. The required content and format of workplans and reports documenting site assessment work, remedial design, corrective action, verification monitoring, and health-based risk assessment are described in detail. The reports generated by the environmental consultant for the Responsible Party are used by the LUFT Program to evaluate the progress toward achieving successful corrective action at LUFT sites.

Work conducted on LUFT sites in Ventura County must meet the guidelines described in this Guidance Manual. Variations from the requirements stated herein may be made on a case-by-case basis but must be approved, in writing, by the LUFT Project Manager prior to their implementation.

I. INTRODUCTION

This is the third revision of the Guidance Manual since July 1988, and reflects the recent changes in state regulations and refinements in assessment and corrective action procedures. The Guidance Manual is intended to serve as a co-document to the *California State Leaking Underground Fuel Tank (LUFT) Field Manual*, dated October 1989.

E. DISCLAIMER

The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency or the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

II. GETTING STARTED

A. HOW THE LUFT PROGRAM GETS INVOLVED

Underground storage tank (UST) removals or in-place closures in the County are overseen by the Ventura County Certified Unified Program Agency (CUPA), the City of Ventura, or the City of Oxnard CUPA. The Ventura and Oxnard fire departments have jurisdiction over tank removals or in-place closures at sites within their designated city boundaries. The VCEHD's UST Program has jurisdiction over the UST sites in the remaining cities and the unincorporated county areas.

When a tank is removed or closed in-place, an inspector from the agency with jurisdiction will require oversight and sampling according to the current protocols. In general, the inspector will observe the removal or closure of the tank and its piping, and direct the collection of soil and/or groundwater samples from below the tanks for laboratory analysis. The analytical results, along with the inspector's observations of the tanks, piping, and tank excavation, are used by the inspector to determine if an unauthorized release (a reportable fuel leak) has occurred from the tank system.

If evidence of an unauthorized release is present, the Responsible Party (generally the property or tank owner or operator) must prepare a UST unauthorized release report form. Copies of that report form must be submitted to the local oversight agency and the RWQCB as required by Articles 5 and 11 of the California UST regulations.

Once an unauthorized release has been identified, the case is transferred to the LUFT Program and a LUFT Project Manager is assigned to the case. The LUFT Project Manager lists the site on the LUFT Program database as a local oversight program LUFT case and notifies the Responsible Party. The LUFT Project Manager then provides technical and regulatory guidance to the Responsible Party and their environmental consultant.

To obtain LUFT case closure, the Responsible Party must, after receipt of workplan approval, provide evidence that the release has been adequately investigated and that the extent, both laterally and vertically, of contaminated soil and groundwater, if any, has been delineated. If corrective action is required, the Responsible Party must provide evidence that the contaminated soil and/or groundwater has been adequately assessed and remediated. Fuel leak investigation and corrective action is closely monitored by the LUFT Project Manager, and the case is closed when cleanup has reached the predetermined site-specific cleanup levels, and the unauthorized release does not pose a threat to human health and safety, the environment, or water resources.

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B. HOW RESPONSIBLE PARTIES ARE IDENTIFIED

Pursuant to the California UST regulations (Article 11, Chapter 16, Title 23, Section 2720, California Code of Regulations), a "Responsible Party" is defined as one or more of the following:

- Any person who owns or operates a UST used for the storage of any hazardous substance;
- In the case of a UST no longer in use, any person who owned or operated the UST immediately before discontinuation of its use;
- Any owner of property where an unauthorized release of a hazardous substance from a UST has occurred; and
- Any person who had or has control over a UST at the time of or following an unauthorized release of a hazardous substance.

These definitions are derived from the Federal Resource Conservation and Recovery Act and the State Health and Safety Code (Section 25281).

C. INTERACTING WITH THE LUFT PROJECT MANAGER

The goal of the Project Manager is to provide a review and response to submitted documents, to review reports and corrective actions to ensure that adequate assessment and corrective action is being taken, and to facilitate progress toward case closure.

A LUFT Project Manager is assigned to work on each LUFT case. The initial letter and all subsequent letters that are sent to the responsible party will state the name and telephone number of the LUFT Project Manager. Contact the Project Manager if you have questions about the LUFT program.

To determine who the Project Manager is for a specific site, call our office at (805) 654-3518.

D. SELECTING A CONSULTANT

Responsible Parties typically hire professional consultants and contractors to prepare the appropriate technical workplans and reports, and to perform required assessment and corrective action work. The consultant should be familiar with corrective action requirements and the soil and groundwater conditions in the county. The Business &

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Professions Act of the State of California requires consultants to be licensed civil engineers, geotechnical engineers, registered geologists, certified hydrogeologists, or certified engineering geologists. The Responsible Party should make certain that the consultant that is eventually selected has the appropriate licensing.

The UST Cleanup Fund requires that the Responsible Party obtain three bids from qualified, appropriately licensed consultants for the initial phase of work. In addition, the LUFT Program strongly recommends that the Responsible Party obtain at least three bids from qualified, appropriately licensed consultants for the initial phase of work. Each bid should be in response to the same well-defined scope of work for comparison purposes. Obtaining multiple bids will assist in selecting an appropriate consultant for the work to be performed, reduce corrective action costs, and help the Responsible Party to receive the maximum reimbursement from the UST Cleanup Fund for which they are eligible.

Additional information on hiring consultants is available from the UST Cleanup Fund and the Department of Consumer Affairs. Call or write the LUFT Project Manager for your case for additional information.

E. INITIAL WORKPLAN

The Responsible Party is required to initiate and coordinate phased, systematic investigation and corrective action at LUFT sites under California UST regulations. The initial workplan must be submitted within 30 days of written notification of the Responsible Party. Requests for time extensions may be approved by the LUFT Project Manager provided adequate justification for the delay is provided in the request.

The LUFT Project Manager will review the initial workplan and provide a written letter stating whether the workplan has been approved, pursuant to Section 25299.37(c)(3) of the Health and Safety Code. The LUFT Project Manager will approve or disapprove the workplan and identify the actions or elements of the workplan that meet agency requirements and/or the elements or actions which are disapproved. If a workplan is disapproved, the LUFT Program shall state the reason(s) for disapproval. Additional guidance or requirements may also be included.

F. SITE AND COST MANAGEMENT

The LUFT Program understands that the Responsible Party will wish to conduct the necessary site investigation and corrective actions in as timely, cost-effective, and safe a manner as possible. The LUFT Program has the following recommendations to reduce and/or control time and costs:

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1. Interim Remediation

Performing prompt interim remediation following tank removal, including source reduction (such as removing free product or significantly polluted soil) and control of pollution migration (such as pumping and treating polluted groundwater), can help prevent the spread of pollution in soil and groundwater, thereby possibly reducing the overall corrective action costs. The agency that oversees UST removals does not allow any investigation or cleanup, other than required sampling, until a site has become a LUFT case. Therefore, a workplan for interim remediation must be approved, in writing, by the LUFT Project Manager prior to the performance of any interim remediation, except as described in Section IV, Subsection A.

2. Prompt Investigation

Because pollution in soil and groundwater tends to spread over time, prompt investigation to determine a corrective action strategy is generally very cost-effective.

3. Risk-Based Decision Making

The risk-based decision making approach uses risk assessment methods to focus on the risk associated with residual pollution in soil and groundwater. An appropriate risk assessment can assist in the determination of site-specific corrective action levels that are based on exposure pathways to humans and other receptors from soil, air, and water. Risk assessments provide a technically and scientifically defensible decision framework to streamline the selection of a practical, appropriate, and cost-effective corrective action approach.

Since the risk-based decision making approach acts to reduce risks as well as costs, the Project Manager may recommend such an approach for determining a corrective action strategy at the fuel leak site. Call or write the Project Manager for up-to-date information about the risk-based decision making approach.

4. UST Cleanup Fund Reimbursement

The UST Cleanup Fund reimburses money to eligible claimants for assessment, corrective action, and regulatory oversight costs. The LUFT site must comply with the LUFT Program requirements to be eligible for reimbursement of expenses. Eligible claimants interested in prompt and maximum reimbursement should submit claims as soon as possible. Pre-

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approval of the costs of the proposed assessment or corrective action may be obtained from the UST Cleanup Fund staff before initiating the action.

The UST Cleanup Fund requires that the assessment or corrective action workplan be approved by the LUFT Program for the work to be eligible for reimbursement from the UST Cleanup Fund.

For more information about claimant eligibility and obtaining reimbursement for corrective action and regulatory oversight costs, call the UST Cleanup Fund at (800) 813-3863.

5. Consistent Communication

Consistent communication with the Project Manager will help speed up the regulatory process and may reduce the overall assessment and corrective action costs. The LUFT Program strongly encourages a close working relationship and open communication between the Responsible Party, the consultant, and the LUFT Project Manager.

6. Appropriate Conclusions and Recommendations

Technical reports should present appropriate conclusions based on the interpretation and analysis of site-specific data, and propose appropriate recommendations for the next phase of work. Adequate supportive information shall be provided to justify the conclusions and recommendations presented.

III. DECISION-MAKING FRAMEWORK

A. DESCRIPTION OF DECISION-MAKING FRAMEWORK

In general, the LUFT Program's decision-making framework is as follows:

1. Initial investigation and preliminary site assessment
2. Interim remedial action, if warranted and approved
3. Development of initial site conceptual model
4. Prioritization of site from higher to lower risk (Class A, B, C, or D)
5. Site investigation, assessment, and characterization of contamination in soil and groundwater, if required
6. Update site conceptual model
7. Corrective action and/or remediation
 - a. Health-Based Corrective Action (HBCA)
 - b. Monitored Natural Attenuation (MNA)
 - c. Active remediation
 - d. Other
8. Verification sampling and/or monitoring
9. Site closure

A flowchart showing the basic steps in the LUFT Program's decision-making framework is included in Appendix B.

B. TARGET COMPOUNDS

The initial investigation must analyze for the full range of total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and xylenes (BTEX), the full suite of volatile organic compounds (VOCs), and the ether and alcohol based fuel oxygenates. Once the actual types of contaminants have been identified, the analytical program can be tailored to the target compounds.

These target compounds have been selected in accordance with the State's minimum testing requirements and are generally based on the relative percentage of the compound in the given fuel mixture, toxicity data, and regulatory and environmental sensitivity. The specific U.S. EPA testing methods and laboratory reporting limits are described in the RWQCB's *General Laboratory Testing Requirements for Petroleum Hydrocarbon Impacted Sites*, dated June 5, 2000. A copy of this document is provided in Appendix C. A list of technical references is provided in Appendix D.

Testing for target compounds for multiple fuel ranges may be required at any given release site contingent on the availability of site specific background information and/or site specific analytical data.

III. DECISION-MAKING FRAMEWORK

Section 25299.37.1 of the Health & Safety Code mandates testing for the fuel oxygenate MTBE at all release sites. Specifically, soil, groundwater, or both, where applicable, must be analyzed for MTBE. This requirement does not apply if the LUFT Project Manager determines that the tank(s) have only contained diesel or jet fuel. Sufficient site-specific analytical data must be obtained before the LUFT Program's consideration of requests to eliminate testing for any target compound(s) from assessment work.

C. TYPES OF RELEASES AND ANALYTICAL REQUIREMENTS

Once an approved analytical method is used at a site, the method must be used for the duration of the project, unless updated or declared to be no longer required by the Project Manager. If a site-specific comparability study is performed or if site-specific conditions indicate a different method should be used, the method may be changed. However, prior written approval by the LUFT Project Manager is required.

1. Gasoline Fuel Release

- a. Total Petroleum Hydrocarbons as gasoline (TPHg) (C4 to C12) – The reported TPHg concentration must include the concentrations of all compounds identified within the fuel range, including the fuel oxygenates, regardless of any additional compound-specific analyses that are performed. (EPA Method 8015 Modified)
- b. Fuel components benzene, toluene, ethylbenzene, and total xylenes (BTEX). (EPA Methods 8020, 8021B, or 8260B)
- c. Fuel oxygenates methyl tert butyl ether (MTBE), di-isopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), tertiary butyl alcohol (TBA). A description of the fuel oxygenates is included in Appendix E. A table of the physical and chemical properties of BTEX and the fuel oxygenates is included in Appendix F. (EPA Method 8260B)
- d. Fuel oxygenates methanol and ethanol. (EPA Method 8015M)
- e. Total lead - Due to the historic use of organic lead as an additive in gasoline, total lead is included as a target compound in the assessment of impacts at gasoline fuel release site. (EPA Methods 6010, 6020, 7420, or 7421)
- f. Soluble lead – If a concentration of total lead greater than 10 times the SSTL is detected in a soil or groundwater sample, the sample must also be analyzed for soluble lead. (The extraction methods are the WET or STLC methods; the analytical methods are the same as those for total lead.)

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2. Diesel Fuel Release

- a. Total Petroleum Hydrocarbons as diesel (TPHd) (C₁₀ to C₂₂) - The total concentration of all hydrocarbons present that are characteristic of a diesel fuel mixture. (EPA Method 8015 Modified)
- b. BTEX (EPA Methods 8020, 8021B, or 8260B)
- c. Fuel oxygenates (MTBE, DIPE, ETBE, TAME, and TBA) (EPA Method 8260B)
- d. Fuel oxygenates ethanol and methanol (EPA Method 8015M)

3. Waste Oil Release

- a. Total Petroleum Hydrocarbons as waste oil (TPHo) (C₁₈ to C₃₅₊) - The total concentration of all hydrocarbons present that are characteristic of a waste oil mixture. The LUFT Program requires an initial fuel fingerprint during the preliminary assessment phase to quantify the specific fuel ranges present (TPHg, TPHd, TPHo) as waste oil tanks may be repositories for waste fuels as well as waste oil. (EPA Method 8015 Modified)
- b. BTEX. (EPA Methods 8020, 8021B, or 8260B)
- c. Fuel oxygenates. (MTBE, DIPE, TAME, ETBE, and TBA)
- d. Fuel oxygenates ethanol and methanol. (EPA Method 8015M)
- e. Volatile and semi-volatile organic compounds, including solvents (EPA Method 8260B)
- f. Total lead - Testing for the presence of various other metals is optional. (EPA Methods 6010, 6020, 7420, or 7421)
- g. Soluble lead – If a concentration of total lead greater than 10 times the SSTL is detected in a soil or groundwater sample, the sample must also be analyzed for soluble lead. (The extraction methods are the WET or STLC methods; the analytical methods are the same as those for total lead.)

4. Other Types of Petroleum Hydrocarbon Releases

The LUFT Program generally cannot work on non-fuel or non-waste oil sites.

The VCEHD Voluntary Cleanup Program (VCP) should be contacted for sites with other types of releases, including jet fuel, JP-4, mineral spirits, Stoddard solvent, aviation gas, or other similar petroleum products. The VCP Project Managers are Erin O'Connell at (805) 662-6511 and David Salter at (805) 662-6512. Acceptance of other non-fuel sites into the VCP will be determined on a case-by-case basis, depending upon the type and extent of contamination and the site-specific conditions.

IV. PRELIMINARY SITE ASSESSMENT

A. DETERMINATION OF IMMEDIATE HAZARD AND INTERIM REMEDIAL ACTION

The first step in the initial site assessment is to determine if an immediate hazard is present. Immediate hazards include free product and represent an acute threat to public health and safety and the environment. If an immediate hazard is present, Interim Remedial Action must be implemented.

Interim remedial action and mitigation of an immediate hazard can be implemented within 24 hours of discovery without LUFT approval. However, the LUFT Project Manager must be informed of the hazard and the remedial action work within 24 hours of discovery. The interim remedial action must only target the area requiring immediate mitigation and cannot impede the progress of site assessment.

A written report detailing the initial site assessment, the immediate hazard that was discovered, and all mitigation work that was conducted must be submitted to the LUFT Program within ten (10) working days of completion of the field work.

B. PRELIMINARY SITE INVESTIGATION AND ASSESSMENT

If no immediate hazard is identified, preliminary site investigation and assessment must be initiated. Site background information must be collected during this phase including, but not limited to, past and present site uses and past and present tank system information. Maps showing aboveground and belowground structures, utilities, surrounding structures, sample locations, and other items of concern must be included in the workplan.

During the preliminary site assessment, limited remedial action may be performed if a workplan is submitted to the LUFT Program and approved, in writing, by the LUFT Project Manager. For example, if contamination was detected under a leaking underground fuel tank, but the field and laboratory information indicate a limited plume, a proposal to excavate a specific small amount (generally up to 10 cubic yards) of material may be approved during the preliminary site assessment phase.

V. SOIL AND GROUNDWATER ASSESSMENT

A. GENERAL REQUIREMENTS FOR ALL WORKPLANS AND TECHNICAL REPORTS

Workplans and technical reports are the documents that show what work is proposed to be conducted at the site and what is accomplished. These reports include, but are not limited to, site assessment and investigation workplans and corrective action plans, as well as site assessment, risk assessment, quarterly monitoring, verification, progress, and request-for-closure reports. These documents are used to determine the direction of the project and provide verification of the various phases of investigation, assessment, remediation, monitoring, and closure. All documents related to a LUFT case are a matter of public record.

The installation and accurate logging of borings and monitoring wells is a highly technical aspect of adequately assessing a site. Appendix G contains a description of the minimum well construction and destruction requirements.

The LUFT Program requires that the following basic items are included in the workplans and technical reports.

1. Site Information

- a. Name and address of the Responsible Party, their representative, or other contact person.
- b. Site name and address.
- c. LUFT Program file number.

2. Site History

- a. Current and previous type or types of business activities on site.
- b. Spill, leak, and accident history at the site, with identity and quantity of materials released.
- c. Location, number, capacity, contents, and construction material of existing and former tank systems.

3. Vicinity Map

- a. An index map showing the regional area. A U.S. Geological Survey topographic map or a street guide map is preferred.
- b. Geographic features such as site location and sensitive receptors such as surface waters, schools, hospitals, water wells, etc.
- c. Topographic features such as surface water, ephemeral streambeds, depressions, slopes, cliffs, and terraces.
- d. All maps must be drawn to scale and the use of a bar scale is required.
- e. Compass direction. North is customarily toward the top of the map.
- f. A title, map number, and explanation of all symbols used.

V. SOIL AND GROUNDWATER ASSESSMENT

4. Site Plan

- a. The location of all previous sample points, boring locations, well locations, etc. The point or sample identification must match the identification on the data tables, other maps, and the text.
- b. The location of surface and subsurface features, structures (buildings, pump islands, canopies, and planters), and former and existing USTs and product pipelines.
- c. The location of utilities – onsite, offsite, aboveground, and underground. Utilities include, but are not limited to, sewers, water lines, gas lines, storm drains, telephone lines, television cables, power lines, and other conduits.
- d. Excavations – former, existing, and proposed.
- e. Sampling points – former, existing, and proposed excavation samples, surface samples, piping samples, and background samples, and boring and well locations.
- f. All maps must be drawn to scale and use of a bar scale is required.
- g. Compass direction. North is customarily toward the top of the map.
- h. A title, map number, and explanation of all symbols used.

5. Soil Contamination Map(s)

- a. Maps must illustrate the extent of soil contamination, at different depths, if appropriate.

6. Groundwater Contamination Map(s)

- a. Maps must illustrate the areal extent of the groundwater contamination.
- b. Maps must illustrate the extent of the groundwater contamination within different aquifers, if present.
- c. Maps must show the groundwater gradient and the direction of groundwater flow.
- d. If significant variability is characteristic for the site, maps illustrating the historical gradient and flow direction must be provided.

7. Cross-Section(s)

- a. Cross-sections must be provided to illustrate soil and/or groundwater contamination, if required.
- b. Cross-sections must be drawn from and match the soil and/or groundwater contamination maps.
- c. Cross-sections must reflect the site lithology, contaminant distribution, historical high and low ground water table elevations, and current groundwater table elevations.

V. SOIL AND GROUNDWATER ASSESSMENT

8. Regional and Site-Specific Geology

- a. Detailed logs of all borings and wells.
- b. Lithology described using the Unified Soil Classification System, including color, grain distribution, and general characteristics of the subsurface soil and/or bedrock.
- c. A geologist, engineering geologist, or civil engineer, registered or certified by the State of California, shall complete all boring or well logs. A trained technician working under the supervision of one of the above professionals shall be deemed qualified to log the drilling provided the professional assumes responsibility for the accuracy and completeness of the boring and well logs.

9. Regional and Site-Specific Hydrogeology

- a. Historic high, low, and current groundwater levels must be provided, with references.
- b. Groundwater basin, and known and potential beneficial uses must be provided, with references.
- c. The names and locations of the municipal and domestic water supply wells within 1,000-feet of the site must be provided.

10. Summary of All Previous Assessment Work

- a. Description of all previous investigations, sampling, laboratory analyses, soil vapor studies, remedial actions, etc.

11. Tables of Soil and Groundwater Analytical Results

- a. All soil results must be presented in milligrams per kilogram (mg/kg). These units are standard industry practice and are required by the LUFT Program.
- b. All groundwater results must be presented in micrograms per liter (ug/L).
- c. All analytical results, including the historical and the most recent, must be tabulated by sampling point name and number.
- d. All analytical results, including the historical and the most recent, must be presented in chronological order.
- e. Non-detectable concentrations must be reported in the tables as “ND<DL”, with DL being the detection limit reported by the laboratory.

B. WORKPLANS

The LUFT Program requires that a workplan be submitted and approved before any site work is conducted. Site work includes, but is not limited to, investigation, assessment, characterization, migration control, interim remediation, risk assessment, corrective action, etc. The workplan must contain site-specific information and clearly describe and justify all the activities that are proposed.

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The workplan must be implemented as approved. The LUFT Project Manager must approve, in writing, any changes made to the scope of work. Changes made to the scope of work without the LUFT Project Manager's approval may not be accepted by the LUFT Program or the RWQCB, and may not qualify for reimbursement by the UST Cleanup Fund.

Amended workplans must be prepared and submitted for approval before starting each new round of work. Additional workplans can reference the previous workplans, if appropriate, but must include updates and all proposed revisions.

In addition to the basic requirements listed in the previous section, the following additional items are required to be included in all workplans:

1. Site Plan

The location and extent of all proposed work must be illustrated on a site plan.

2. Discussion and Justification of the Proposed Work

Provide the rationale for the placement of all proposed borings, wells, or other sampling points or procedures.

3. Description of proposed work

- a. Type(s) of drilling and/or sampling equipment.
- b. Soil and/or groundwater sampling procedures.
- c. Analytical methods for soil and/or groundwater.
- d. Decontamination procedures.
- e. Waste disposal procedures.
- f. Schedule of work, including start dates and anticipated length of project.
- g. Description of required permits and/or access agreements.

4. Health and Safety Plan (HASP)

The requirements for a complete HASP are included in Appendix H.

C. TECHNICAL REPORTS

Technical reports include all site assessment or other investigation reports, quarterly monitoring, verification, progress, test result, remediation, risk assessment, summary or request-for-closure reports. These technical reports present information to the LUFT Project Manager about the status of investigation and corrective action at the LUFT site. The main elements of a technical report are data, analysis of the data, conclusions, and recommendations.

V. SOIL AND GROUNDWATER ASSESSMENT

Technical reports must present site-specific data, including borehole logs that show soil types and stratigraphy, the results of soil and groundwater sample analyses by the laboratory, and cumulative groundwater level measurements. Technical reports should also include, as applicable, geologic cross-sections, a potentiometric surface (groundwater gradient) map, maps indicating the distribution of pollution in soil and groundwater, and graphs containing plots of groundwater levels against chemical concentrations in groundwater.

The technical report should present analysis of site-specific data and must be prepared by licensed consultants. The report must include the signature, professional registration stamp, and statement of the professional certification (licensing) of the consultant.

A laboratory certified by the Department of Health Services must perform all chemical analysis. The laboratory must follow recommended and generally accepted analytical methods. The entire analytical report must be included in the technical report, including cover page with the laboratory director's signature, all sample analytical results, all quality assurance/quality control (QA/QC) pages, and all pages of the chain-of-custody.

The technical report must present the pertinent conclusions based on the interpretation and analysis of the site-specific data by the consultant. The technical report should also propose recommendations for the next phase of work at the site or, if appropriate, present a request for case closure.

Omission of the main elements of the technical report may result in the report being returned to the Responsible Party for correction and resubmittal. Unacceptable technical reports can cause the Responsible Party to be noncompliant with the California UST regulations and the UST Cleanup Fund. The Responsible Party is ultimately responsible for the information contained in the technical report.

Technical reports must be submitted to the LUFT Project Manager by the required due date. If the report cannot be submitted by the required due date, a written request for extension must be submitted citing the specific reason for the extension request and an anticipated date by which the report can be submitted.

In addition to the basic report requirements listed in Section V-A, the following additional items must be included in all technical reports:

- 1. Description of the most-recent site assessment work**
 - a. Drilling and sampling procedures used.
 - b. Analytical methods used.
 - c. Changes, if any, to the approved scope-of-work, and rationale for any such changes.
 - d. Decontamination procedures.

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- e. Waste disposal procedures.

2. Presentation of historical and recent site data

- a. Site plan with updated locations of all borings, wells, and other sampling points.
- b. Maps and cross-section(s) showing the soil and bedrock characteristics, and the distribution of contaminants in both soil and groundwater.
- c. Table(s) of soil results (in mg/kg), with both the recent results and the historical data in chronological order.
- d. Table(s) of groundwater results (in ug/L), both the recent results and the historical data in chronological order and tabulated by well number.
- e. Boring logs and well logs of the most-recent site assessment work.
- f. Description of the site-specific geology and hydrogeology, updated with the most-recent investigative results.

3. Copies of Documentation

- a. Signature page of the Health and Safety Plan.
- b. Permits and/or access agreements.
- c. Complete laboratory report of analytical results, signed and dated, with an unbroken chain-of-custody.
- d. Legible copies of shipping manifests and receipts.

4. Interpretation of Data

5. Conclusions

6. Recommendations

D. LUFT PROGRAM APPROVAL OF WORKPLANS AND TECHNICAL REPORTS

The LUFT Project Manager must review and approve all workplans and may direct the Responsible Party to do additional work, as warranted. The LUFT Program does not provide verbal approval or authorization of any workplans. The Responsible Party must obtain written approval of the workplan from the LUFT Project Manager. Site work conducted without the written approval of the LUFT Project Manager may not be accepted by the LUFT Program, and may not receive reimbursement by the UST Cleanup Fund.

The LUFT Project Manager will review technical reports to determine whether the site assessment or other corrective action work has been conducted and completed as proposed in the approved workplan. The scope and execution of the site work must have

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been conducted as approved or modified in the LUFT Program approval letter. The LUFT Project Manager will review and consider the conclusions and recommendations within the report and will direct the next phase of work to be completed.

E. LUFT PROGRAM OVERSIGHT OF FIELDWORK

An inspector from the LUFT Program must be present during all site work, including routine quarterly monitoring, unless prior approval to proceed without an inspector present has been obtained. Results may not be accepted if an inspector is not present.

Contact the LUFT inspector at (805) 654-3520 a minimum of three business days before the proposed site work to schedule an inspection. Results may not be accepted if an inspector is not present. If either the date or the field time is changed from that which was scheduled, the field work must be rescheduled with the LUFT inspector.

F. ASSESSMENT AND SAMPLING PROTOCOLS

The LUFT Program requires that the lateral and vertical extent of the contamination in both soil and groundwater be adequately delineated. In addition to the area of the initial release, the LUFT Project Manager may require that other potential source areas be investigated. These source areas include all former and existing USTs, piping, waste oil tanks, dispenser islands, or other potential sources.

The procedures listed below are general requirements for adequate delineation of contamination. These procedures may be modified by the LUFT Project Manager to accommodate conditions at a specific site, e.g., multiple aquifers, confined aquifers, etc. Any requested modifications to these procedures must be made in advance of the field work, and approval must be made in writing by the LUFT Project Manager.

1. Soil Assessment

- a. In general, borings are to be advanced until five feet of uncontaminated soil have been penetrated or until five feet of saturated soil (soil below groundwater) have been encountered, whichever is deeper. In areas of deep groundwater, if the anticipated depth and extent of contamination has been adequately assessed and at least five feet of clean soil have been penetrated, the boring need not be advanced farther. This contingency must be approved by the LUFT Project Manager in writing during the Workplan review process.
- b. Soil samples are to be collected, evaluated, and logged at intervals no greater than 5 feet in all borings. All samples are to be submitted to the

V. SOIL AND GROUNDWATER ASSESSMENT

laboratory for analysis unless the LUFT Project Manager has approved, in advance and in writing, a reduced analytical program. If the boring is expected to penetrate into the saturated zone, a sample from the capillary fringe is required.

- c. Some Responsible Parties require that borings be cleared manually to a depth and diameter necessary to protect utility or product lines, usually 5 feet bgs and a diameter at least the size of the auger to be used. In those cases, the 5-foot sample can be obtained by probing the periphery of the boring to assure that no lines or conduits cross the intended path and then collecting the sample from the approximate center of the cleared hole using a slide-hammer sampler. Samples collected from a hand auger bit and packed into a sample sleeve are not acceptable.
- d. If soil contamination is apparent, a sample from the total depth of the boring must be analyzed to verify that the vertical extent of contamination has been delineated.
- e. Soil samples must be sub-sampled and preserved according to EPA Method 5035. The LUFT Program recommends that the original cylinder from which the Method 5035 sub-samples have been removed be delivered to the laboratory along with the Method 5035 sample(s). EPA Method 5030 may be used if the consultant determines that Method 5035 cannot be utilized because of verifiable site-specific conditions. Once the consultant makes this determination, the LUFT Project Manager or inspector must be notified and provide written concurrence with the decision.
- f. Sample cylinders submitted for analysis are to be full, capped, sealed with inert tape, labeled, and chilled as quickly as possible to minimize volatilization and possible loss of contaminants. Samples are not to be sealed with duct or electrical tape as the adhesive on those products may contaminate the sample with toluene.

2. Groundwater Assessment and Monitoring

Groundwater monitoring is a critical component of LUFT site management. Information obtained during groundwater monitoring includes depth to groundwater, thickness of separate phase hydrocarbons (SPH) (“free product”) if present, and concentrations of contaminants of concern. To be useful, data collected during different monitoring episodes must be comparable. Thus, effective groundwater monitoring requires consistent gauging, sampling, and sample handling. General guidelines for those activities are presented in

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Appendix I. General guidelines for determining whether the no-purge method may be used are included in Appendix J. These guidelines may be modified by the individual LUFT Project Manager to accommodate site specific conditions.

3. Background Sampling

If the establishment of naturally-occurring background levels of specific constituents is required, at least three background samples must be collected. Samples should be obtained from depths of interest, and from different sampling points. To prevent unnaturally elevated results, samples must be obtained from at least three feet below ground surface and must avoid areas of past pesticide and herbicide use (e.g. planters). The sample points should not show any signs of contamination and should be as far as possible from any contamination source.

4. Soil-Gas Sampling

The LUFT Program requirements for soil-gas (vapor) sampling are in accordance with the RWQCB's Interim Guidance for Active Soil Gas Investigation, dated February 25, 1997. All soil-gas investigations conducted at LUFT sites must comply with the RWQCB's requirements, and the LUFT Program's workplan, oversight, and reporting requirements.

G. ANALYTICAL REQUIREMENTS

The LUFT Program has adopted the June 5, 2000 *General Laboratory Testing Requirements for Petroleum Hydrocarbon Impacted Sites* published by the Regional Water Quality Control Board – Los Angeles Region (RWQCB) under a cover letter dated June 22, 2000. A copy of this document is provided in Appendix C.

In cases where the RWQCB specifies a range for the Method Detection Limit (MDL), the LUFT Program requires that the lower end of the range be used. For example, the MDLs for TPHg in soil and groundwater are 250 µg/kg and 50 µg/L, respectively. All laboratories are required to meet the revised detection limits. The same detection limits must be used for all samples from all sampling events to assure consistency.

If or when the cited document is modified or replaced, the LUFT Program will adopt the modified or replacement requirements.

V. SOIL AND GROUNDWATER ASSESSMENT

H. DECONTAMINATION PROCEDURES

The equipment decontamination procedures used during the fieldwork must be described in the site assessment report. The following procedures, at a minimum, must be used for both soil and groundwater sampling equipment:

1. Drilling or Other Equipment

The drilling bits and augers must be steam cleaned between each boring and after each use.

2. Sampling Equipment

a. Reusable bailers must be steam cleaned or one-time-use disposable bailers must be used.

b. The cord used with the bailers must be discarded after each use.

c. Sampling equipment that is not steam cleaned must be initially washed with a non-phosphate detergent, rinsed twice with tap water, and final rinsed with deionized or distilled water.

3. Rinseate

The soil and water from washing, rinsing, and steam cleaning must be properly containerized and labeled for disposal.

I. WASTE DISPOSAL PROCEDURES

Soil, groundwater, rinseate, and other waste materials must be properly containerized, labeled, and analyzed for legal disposal. Waste materials containing hazardous concentrations of contaminants must be classified as hazardous waste and be appropriately and legally containerized, labeled, analyzed, and disposed of in accordance with all applicable hazardous waste requirements. All waste materials must be removed offsite within the appropriate legal timeframe. Copies of the appropriate waste manifests must be included within the technical report.

VI. CORRECTIVE ACTION

Once the contamination at a site has been adequately assessed and delineated, the LUFT Project Manager will require corrective action to be taken at the site. Corrective action can consist of many items, including risk assessment, feasibility and treatability studies, monitored natural attenuation, or active remediation.

Using the site data collected to date, the Responsible Party and their consultant will submit a corrective action workplan to the LUFT Project Manager. The corrective action workplan must include all of the items previously cited within this Manual. Review and approval by the LUFT Project Manager are required as previously discussed in this Manual.

Some of the various corrective action options are discussed below.

A. CORRECTIVE ACTION LEVELS

The LUFT Program corrective action objective uses the RWQCB's policy of reduction of contaminants to levels at which human health and sources of groundwater are protected. The RWQCB currently maintains that all waters in Ventura County have a potential beneficial use and may not be degraded (State Water Board Resolution 68-16). However, site-specific cleanup levels greater than the Maximum Contaminant Levels (MCLs) may be established from information provided in the site-specific assessment reports, corrective action workplans, feasibility studies, health-based risk assessments (HBRAs), etc.

If the initial method of remediation cannot reduce the contamination to the established site-specific cleanup levels, a different remedial action may be required. A risk assessment or other engineering methods may also be developed that determine alternative cleanup levels that support leaving some portion of the contamination in place.

B. HEALTH BASED RISK ASSESSMENTS

The LUFT Program may consider a health based risk assessment (HBRA) when reviewing a case for corrective action or closure. HBRAs may also be referred to as risk-based corrective actions (RBCAs). The LUFT Program only accepts HBRAs derived from the ASTM model. Other models are not accepted at this time. General LUFT Program guidelines for such assessments are:

1. Calculations must be performed according to established procedures. Results from computer software or from hand calculations are acceptable. The computer software name, type, and version must be referenced. For hand calculations, all procedures and equations used must be provided and the document(s) from which

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the procedures and equations were obtained must be submitted along with the results.

2. California Slope Factors and/or Reference Doses must be used. For benzene, both oral and dermal slope factors are 0.1 and the oral reference dose is 0.003 mg/kg/day. If the RBCA Tool Kit for Chemical Releases developed by Groundwater Solutions, Inc., is being used, the inhalation slope factor (Sfi) has been replaced by an Inhalation Unit Risk Factor (URF). The URFi for benzene is 2.86E-5. The URF is calculated using the formula:

$$\text{URFi} = \text{Sfi} \times 2.86 \text{ E-4.}$$

3. All parameters used must be fully documented, i.e., the source of the value and the rationale for the value chosen must be shown. If estimates are used for hydrologic parameters or physical characteristics of soil, those estimates must be in accord with the soil type(s) encountered and the references must be cited in the HBRA.
4. For determining average or Upper Confidence Level (UCL) concentrations used for the areal distribution of contamination, the highest concentrations detected within the area are to be included. Inclusion of non-detects is not acceptable unless the non-detect value is at a well, boring, or other sample point surrounded by detected concentrations. This exception applies only if the sampling at the non-detect point is equivalent to the sampling at the other points and the samples have not been diluted so that the non-detect may mask concentrations identifiable at normal detection limits. If the sample has been diluted, the value of the actual detection limit (normal detection limit multiplied by the dilution factor) is to be used in calculating the average or UCL. A UCL concentration determined from fewer than 10 values is not statistically reliable and may not be accepted.
5. Soil samples from depths greater than the deepest groundwater level in the vicinity of the sample need not be included when calculating risk related to indoor or outdoor air. Only the portion of the plume underlying the building, and the average or UCL concentration for that portion of the plume, should be used when determining the risk to persons breathing indoor air.
6. Averages or UCLs obtained by including multiple concentrations from a single well or boring (vertically stacked samples) are not acceptable. Except for samples from below groundwater, the highest concentration of each constituent of concern obtained from each boring, well, or sample point must be used to define the contaminant mass. The thickness of the contaminant mass is the interval from the shallowest to the deepest concentration detected or, if contamination extends into

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the saturated zone, from the shallowest detected concentration to the groundwater level.

7. Each HBRA must be accompanied by a site conceptual model (SCM) that identifies the contaminants of concern and potential receptors, defines the areal and vertical extent of contamination, and identifies the general directions of air and groundwater flow. The SCM is to include maps and cross-sections that define the magnitude and extent of contamination for each contaminant of concern. On cross-sections, individual sampling points may be annotated to show all the concentrations of all constituents of concern (such as 2500/15/1650 for TPHg/benzene/MTBE), but the plume configuration for each constituent must be defined individually. For areal distribution, each constituent of concern must be mapped individually.
8. If the generally-accepted HBRA calculation procedures and/or parameter default values are modified in the future, the LUFT Program will adopt the modified procedures and/or default values.

C. FEASIBILITY STUDIES

A Feasibility Study presents an evaluation of the corrective action alternatives for remediating or mitigating a LUFT site. Each feasible alternative must be described in detail. The following elements must be adequately addressed for each option:

1. Cost Effectiveness

Compare corrective action cost, including design, permitting, installation, operation, maintenance, shut down, verification studies, removal, and labor.

2. Time Required for Completion

Provide remedial action timelines including permitting, installation, and operation estimates.

3. Potential Risk to the Public and Environment

The California Code of Regulations, Title 23, Section 2725(f), requires all feasible alternatives to be designed to mitigate nuisance conditions and risk of fire or explosion. List any hazardous materials to be used. List all probable waste streams.

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4. Permitting

List all necessary permits and approvals that must be obtained prior to starting work. List the agencies to be contacted.

5. Effectiveness

Discuss the expected effectiveness of the various options with regard to reducing the concentrations of contamination to acceptable levels within a reasonable and acceptable timeframe.

Based on the findings of the feasibility study, the most appropriate remedial alternative for the site must be selected and justification for the selected methodology must be presented.

D. TREATABILITY STUDIES

Treatability studies are physical, chemical, or biological tests that evaluate the feasible remediation options on a bench or reduced scale. Pump tests, vapor extraction pilot tests, and biological bench tests are examples of treatability studies. The studies and the data produced should reflect actual site conditions and the information must be incorporated into the corrective action plan for the site.

Workplans to conduct treatability studies must conform to and include the items previously discussed in the Workplans section of this Manual. Written approval by the LUFT Project Manager must be obtained before initiating the work.

A complete discussion of the work conducted, findings, analytical results, conclusions, and recommendations must be included in a technical report. This report must be submitted to the LUFT Project Manager for review.

E. CORRECTIVE ACTION WORKPLAN

The LUFT Program requires submittal of a corrective action workplan. This plan must provide the remedial design (i.e., details, plans, and specifications) of the implementation, operation, maintenance, and monitoring of the chosen corrective action option. The corrective action workplan and remedial design plan must address all the items required in the Workplan section of this Manual, as well as the following:

VI. CORRECTIVE ACTION

1. Treatability study results

- a. The results and data obtained from the treatability study (pilot study) must be included as the basis for the remedial design and demonstrate the effectiveness of the proposed remediation system(s).
- b. The results of the treatability study must be used to predict cleanup levels and anticipated remediation timeframes.

2. Contaminant information

- a. An estimate of the total volume of the contaminated soil and/or groundwater.
- b. An estimate of the total volume of the contaminated soil and/or groundwater to be treated.
- c. The plume configuration must be shown in plan view and in cross-section.

3. Permits

- a. Ventura County Air Pollution Control District (VCAPCD) – authority to construct, permit to operate, or other.
- b. Ventura County Public Works Agency (VCPWA) – groundwater well permits and groundwater well abandonment permits, boring permits.
- c. RWQCB – National Pollution Discharge and Elimination Systems Permit (NPDES) and Waste Discharge Requirement permit (WDR).
- d. Local government agencies – encroachment permits, grading permits, planning approval, and electrical permits.
- e. Permission to enter private off-site locations.

4. Specifications

- a. Engineering calculations for the system (e.g. flow rates, pipe sizes, etc.).
- b. Blueprints of the proposed system (required).
- c. Flow charts for the proposed treatment system.
- d. Equipment specifications.

5. Disposal Methods

- a. Treated soil.
- b. Untreated soil.
- c. Groundwater.
- d. Treatment media, such as carbon.

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F. CORRECTIVE ACTION AND ACTIVE REMEDIATION METHODS

A number of corrective action and active remediation methods may be submitted to the LUFT Program for approval and subsequent use at a site. As required for effective corrective action or remediation at a site, these methods can be used in sequence or in combination. The methods are generally categorized as follows:

- Health Based Risk Assessment
- Bioremediation
- Excavation
- Vapor Extraction
- Groundwater Extraction
- Air Sparging

Other in-situ and ex-situ methods or variations on existing methods may be used in the future, depending on acceptance by the RWQCB and site-specific approval by the VCEHD.

G. MONITORED NATURAL ATTENUATION

Some sites with soil and/or groundwater contamination that has been completely assessed, and the plume demonstrated as stable, may be candidates for monitored natural attenuation (MNA). If an RP would like the site to be considered for MNA, the groundwater samples must be analyzed for secondary natural attenuation parameters for two quarterly sampling events and an analysis of the results with regard to MNA must be submitted.

The secondary natural attenuation parameters include pH, dissolved oxygen, redox potential, sulfate, nitrate, ferrous iron, and methane. The required test methods and method detection limits are stated in the RWQCB's *General Laboratory Testing Requirements for Petroleum Hydrocarbon Impacted Sites*, dated June 5, 2000. This document is included in Attachment D.

Once a site is approved for MNA, the groundwater monitoring program may be reduced with the approval of the LUFT Project Manager.

H. PROGRESS REPORTING

Quarterly monitoring of the remedial system(s) is required as a minimum. A quarterly report must be submitted and must include information on system status and operation, monitoring records, and progress evaluation, including volumes treated and amount of hydrocarbons removed. Any changes, modifications, or other significant information which may affect the Remedial Design must also be reported. More frequent monitoring

VI. CORRECTIVE ACTION

and reporting intervals may be required by the LUFT Project Manager or other permitting agency.

Until cleanup is completed, California Code of Regulations 2652(d) requires submittal of status reports every three months updating the previously submitted information and discussing plans for future work.

VII. VERIFICATION ASSESSMENT

A workplan proposing verification assessment must be submitted to determine the effectiveness of the corrective action or active remediation work. Generally, this workplan must be included within the Corrective Action Plan prior to initiation of the corrective action. This workplan is subject to all of the requirements of workplans as previously discussed in this Manual. Implementation of the proposed verification assessment must be conducted with the written approval of the LUFT Project Manager at the completion of the corrective action activities.

Reporting of the results of the verification assessment is subject to all of the requirements of technical reports as previously discussed in this Manual.

VIII. CASE CLOSURE

The LUFT Program will consider case closure proposals in accordance with RWQCB guidelines. The LUFT Project Manager will consider closure of LUFT cases when the appropriate investigation and corrective action efforts have been undertaken; residual contamination at the site does not pose a significant threat to human health and safety, the environment, or water resources; or when all significant risks can be appropriately managed or mitigated.

A. DESCRIPTION OF CASE CLOSURE

Consideration for case closure is contingent on various site specific factors. Case closure may be considered with or without completion of remedial action at the site providing that residual impacts to soil or groundwater are acceptable, and the risks to human health and the environment are below normally accepted limits.

LUFT case closure indicates that no additional work is required for the site at that time. LUFT cases that have received closure can be reopened due to additional site-specific information, a change of site use, a change in regulatory requirements, or other grounds.

B. SITE REQUIREMENTS FOR CASE CLOSURE

Current guidance from the RWQCB details the requirements for both non-MTBE impacted sites and MTBE impacted sites to be considered for closure. No specific regulatory guidance for closure eligibility for sites impacted by other fuel oxygenates (ethers and alcohols) is currently available.

The LUFT Program will generally require a complete health-based risk assessment prior to considering a case for closure.

The following sections summarize case closure eligibility criteria.

1. Soil Only Case (No MTBE)

Soil only contamination sites may be eligible for closure under the following conditions:

- a. The leak has been stopped and ongoing sources including fuel saturated soil, and soil which contains mobile fuel components have been removed or remediated.
- b. The site has been adequately characterized (vertically and horizontally) and the soil contamination is stable.

VIII. CASE CLOSURE

- c. An assessment has been made of specific site conditions using common sense considerations in arriving at a decision that incorporates risks posed to water resources as well as to public health.

2. Groundwater Case (No MTBE)

Groundwater contamination sites may be eligible for closure under the following conditions:

- a. The leak has been stopped and ongoing sources, including free-floating product, have been removed or remediated.
- b. The site has been adequately characterized (vertically and horizontally) and the groundwater contamination plume is stable. Potential pathways for the vertical or horizontal migration of contaminants in groundwater should be included in the evaluation. A stable groundwater plume is characterized by decreasing or stable concentrations of hydrocarbons in groundwater as evidenced by groundwater monitoring results.
- c. No drinking water well or surface water body has been affected by the discharge and either of the following are met:
 - The maximum concentration of benzene in groundwater does not exceed 1 ug/L,

Or

 - No surface water body or drinking water supply well is within 1-mile of the source of the discharge and the maximum concentration of benzene in groundwater affected by the discharge does not exceed minimum health-based risk levels.

The presence of MTBE may preclude a site's eligibility for consideration for closure. The following additional criteria must be met for sites affected by MTBE.

3. Soil Sites with MTBE

- a. The soil is not saturated with petroleum hydrocarbons, and
- b. No detectable petroleum hydrocarbons are present in the soil within 20 vertical feet of groundwater.

4. Groundwater Sites with MTBE

- a. MTBE concentrations do not exceed 13 ug/L;
- b. Contaminated soils providing a source of petroleum hydrocarbons are not in contact with groundwater.

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For details regarding the RWQCB closure guidance, refer to the RWQCB's *Common Sense Closure Guidance Document* dated August 12, 1996; the *Draft Policy for the Investigation and Cleanup of Petroleum Discharges to Soil and Groundwater*, dated January 21, 1997; and the *Review Procedure for UST Sites with MTBE*, dated April 29, 1997.

C. REQUEST FOR CASE CLOSURE

Prior to requesting case closure, the consultant should determine whether the residual contamination in soil and/or groundwater is adequately defined and whether the case is low risk. If the LUFT Project Manager concurs with the consultant's opinion, the Responsible Party or their consultant or other representative may be required to submit a technical report that summarizes all corrective action performed at the site and presents a request for case closure. The request for closure report must include the following:

1. A history of the site, including present status and discussions of assessment, remediation and monitoring in chronological order.
2. Conclusions that justify file closure, derived from data collected through assessment, remediation, and monitoring activities, and an assessment of the impacts of any contamination left in place.
3. A chronological tabulation of all soil analysis results.
4. A tabulation of all groundwater analyses in chronological order by well, i.e., all data for a given well must be together in chronological order so that trends can be readily discerned.
5. A tabulation of all groundwater monitoring data in chronological order by well. These data are to include gauging point elevation, depth to water, groundwater elevation, thickness of separate phase hydrocarbons, etc.
6. Estimates of the volumes of soil and water contaminants removed and remaining in place.
7. Map(s) showing the locations of all monitoring wells, soil borings, excavations, and soil sampling locations related to the site. The locations of former and existing underground storage tanks are also to be shown.
8. All wells, borings, and sample points must be identified on the maps so that they can be related to the tables of analytical results.

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9. Maps and cross-sections showing the original and present areal and vertical extent of contamination in soil, and maps showing the contamination plume in groundwater, as interpreted from all available data. The TPH, benzene, and MTBE plumes must be mapped. For multi-phase assessment or remediation, individual maps for each phase are preferable to a single map attempting to show all data.
10. The most recent groundwater gradient map.
11. All maps are to be at a rational scale and are to include a bar scale and a north arrow. The scale must be such that all pertinent information is shown clearly and contaminant plumes can be mapped accurately. North is generally toward the top of the maps.
12. Information regarding the results of any in-situ or ex-situ treatment of soil or groundwater on site.
13. A table showing the disposition of all waste and contaminated substances removed from the site (former underground tanks and piping, contaminated or remediated soil, separate phase product, contaminated water, etc). The quantities removed, dates removed, and ultimate disposal locations must be provided. Legible copies of shipping manifests and receipts issued by the receiving agency are required.

In addition, any request for site closure must consider and discuss the following:

- The extent and character of any residual soil and/or groundwater contamination at the site.
- The potential impacts to groundwater.
- Existing or potential beneficial uses of impacted or threatened groundwater.
- The location of any potential groundwater receptors (water supply wells or surface waters).
- The risk to each identified groundwater receptor.
- The potential risk to human health and the environment.

D. NOTIFICATION REQUIREMENTS

The Responsible Party must notify all current record fee titleholders (property owners) of the closure proposal and provide the LUFT Program with written certification that the notification requirements have been fulfilled. The Responsible Party must provide the LUFT Program with a complete mailing list of all record fee titleholders. This requirement is in accordance with Chapter 6.7, §25297.15(a) of the Health & Safety Code.

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Upon receipt of the listing of record fee title holders and written certification that all appropriate notifications have been made, the LUFT Project Manager may wait thirty days before making a final determination or issuing a closure letter to allow the fee title holders the opportunity to comment.

E. CLOSURE PROCESS

1. Soil-Only Sites

After the thirty day period for comments by the property owner(s) has elapsed, and any comments received have been considered, the LUFT case will be reviewed for closure eligibility and a closure determination will be made. Once the LUFT Project Manager and Director determine that a soil-only LUFT site can be closed, the written certificate for file closure will be issued.

2. Groundwater Sites

Once the LUFT Project Manager determines that a site with residual groundwater contamination can be closed, a recommendation for site closure, documentation, and justification will be forwarded to the RWQCB for concurrence. Upon receipt of RWQCB concurrence for closure, abandonment of all monitoring, vapor extraction, water recovery, air sparge, or other wells, and compliance with any other RWQCB conditions of approval, the LUFT Program can issue file closure.

If either the LUFT Project Manager or the RWQCB determines that the site does not qualify for closure, a written response will be prepared citing the reasons for disqualification and/or requirements for additional work.

Closure of the LUFT case will be confirmed by a written Certificate of Remedial Action Completion, in accordance with subdivision (h) of Section 25299.37 of the Health & Safety Code.

IX. REGULATORY ACTION AND ENFORCEMENT

A. REGULATORY ACTION AND ENFORCEMENT

If delays in technical report submittals or substandard work may be causing a threat to human health and safety, the environment, or water resources, the LUFT Project Manager will initially discuss the situation with the Responsible Party or their consultant by telephone. If verbal contact cannot be made or the problem cannot be resolved, the LUFT Project Manager will follow through with a letter notifying the Responsible Party of the situation and requesting that the Responsible Party come into compliance with California UST regulations.

If the threat continues, the LUFT Project Manager may refer the case to the RWQCB or the Ventura County District Attorney for enforcement.

Enforcement may include administrative action and/or significant monetary penalties for violation of California Health and Safety Code, Division 20, Chapter 6.7. Substandard, illegal, or unethical work performed by the Responsible Party and/or their consultant may result in referral to the appropriate enforcement agency or licensing board.

Enforcement actions may be taken against a Responsible Party and/or their consultant for any of the following reasons:

- Failure to obtain approval from the LUFT Program before performing work;
- Failure to submit workplans or technical reports by the due dates established by the regulatory agency;
- Failure to respond to significant migration of pollution in soil and/or groundwater;
- Failure to perform a level of work consistent with work performed by other professionals in the industry (substandard work).

B. APPEALS PROCESS

Responsible parties are encouraged to resolve disputes by working directly with the LUFT Project Manager. If this is not possible, an appeals process is available to Responsible Parties to resolve disputes between the Responsible Party and the LUFT Project Manager. Responsible parties can discuss disputes with the Director of the LUFT Program or with the RWQCB contact.

To appeal a decision by the LUFT Program or the RWQCB, a petition must be submitted in writing and received by the State Water Resources Control Board within 30 days of the decision or directive. Contact the LUFT Project Manager for information regarding the appeals processes.

X. APPENDICES

**APPENDIX A – VENTURA COUNTY ORDINANCE CODE, DIVISION 4,
CHAPTER 8, ARTICLE 1, SECTION 4811, ET SEQ.**

APPENDIX B – FLOWCHART OF DECISION MAKING PROCESS

**APPENDIX C – RWQCB'S GENERAL LABORATORY TESTING
REQUIREMENTS FOR PETROLEUM HYDROCARBON
IMPACTED SITES, DATED JUNE 5, 2000**

APPENDIX D - TECHNICAL REFERENCES

APPENDIX E – MTBE AND THE OTHER OXYGENATES

**APPENDIX F – PHYSICAL/CHEMICAL PROPERTIES OF BTEX AND
OXYGENATES**

APPENDIX G – WELL CONSTRUCTION AND DESTRUCTION REQUIREMENTS

APPENDIX H – HEALTH AND SAFETY PLAN (HASP) REQUIREMENTS

**APPENDIX I – GROUNDWATER MONITORING, GAUGING, AND SAMPLING
PROCEDURES**

**APPENDIX J – CONDITIONS AND REQUIREMENTS FOR PURGE/NON-
PURGE OF GROUNDWATER MONITORING WELLS**

**APPENDIX A – VENTURA COUNTY ORDINANCE CODE,
CHAPTER 5, ARTICLE 2, SECTION 4527,
ET SEQ.**

VENTURA COUNTY WELL ORDINANCE NO. 4184

AN ORDINANCE OF THE COUNTY OF VENTURA REPEALING AND
REENACTING VENTURA COUNTY ORDINANCE CODE SECTION 4811 ET SEQ.
RELATING TO GROUNDWATER CONSERVATION

DIVISION 4 - PUBLIC HEALTH
CHAPTER 8 - WATER
ARTICLE 1 - GROUNDWATER CONSERVATION

REENACTED BY ORD. NO. 3476 - FEBRUARY 12, 1980
REPEALED/REENACTED BY ORD. NO. 3698 - JULY 24, 1984
REPEALED/REENACTED BY ORD. NO. 3739 - AUGUST 20, 1985
REPEALED/REENACTED BY ORD. NO. 3809 - APRIL 28, 1987
AMENDED BY ORD. NO. 3991 - DECEMBER 17, 1991
REPEALED/REENACTED BY ORD. NO. 4171 - AUGUST 11, 1998
REVISED BY ORD. NO. 4184 - MAY 18, 1999

The Board of Supervisors of the County of Ventura ordains as follows:

1. Ventura County Ordinance Nos. 3809 and 3991 are hereby repealed.
1. Ventura County Ordinance Code Sections 4811 et seq. are hereby repealed and reenacted as follows:

Sec. 4811 – PURPOSE

It is the purpose of this Article to provide for the construction, maintenance, operation, use, repair, modification, and destruction of wells in such a manner that the groundwater of the County will not be contaminated or polluted, and that water obtained from wells will be suitable for beneficial use and will not jeopardize the health, safety or welfare of the people of this County.

Sec. 4812 – DEFINITIONS

For the purposes of this Article, unless the context otherwise requires:

- A. "Abandoned well" means any of the following:

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1. A water well used less than 8-hours in any twelve month period. Failure to submit annual reports of well usage pursuant to Section 4826 will result in the well(s) being classified as abandoned.
 2. A monitoring well from which no monitoring data has been taken for a period of two years.
 3. A well which is in such a state of disrepair that it cannot be made functional for its original use or any other use regulated by this Article.
 4. An engineering test hole after 24 hours has elapsed after construction and testing work has been completed on the site.
 5. A cathodic protection well which is no longer used for its intended purpose.
- B. "Cathodic protection well" means any excavation constructed by any method for the purpose of installing electrical equipment or facilities for the protection of metallic equipment in contact with the ground.
- C. "Community water supply well" means any water well which provides water for community or public water systems as defined in Section 116275, subdivision (h), of the Health and Safety Code.
- D. "Completion operation" means any of the following work conducted after excavation:
1. Placement of a well casing.
 2. Gravel packing.
 3. Sealing.
 4. Perforation of a well casing.
 5. Any other work listed on a permit issued pursuant to this Article as being a required part of a completion operation.
- E. "Confined aquifer" is an aquifer separated from the surface by an aquiclude or an aquitard to the extent that pressure can be created in the lower reaches of the aquifer. The confined aquifers in Ventura County include; the aquifers comprising the Oxnard Plain Pressure Basin, the aquifers of the East and West Las Posas Basin, the Pleasant Valley Basin, and the aquifers comprising part of the following Basins; South Las Posas, Simi, Ojai, and Upper Ojai.
- F. "Contamination" means alteration of waters by waste, salt-water intrusion or other material to a degree which creates a hazard to the public health through actual or potential poisoning or through actual or potential spreading of disease.
- G. "County inspector" means a person authorized by the Department to inspect all permitted work.
- H. "Department" means the Water Resources and Engineering Department of the Ventura County Public Works Agency.
- I. "Destroy" means to fill a well (including both interior and annular spaces if the well is cased) completely in such a manner that it will not produce water or act as a

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conduit for the transmission of water between any water-bearing formations penetrated.

- J. "Director" means the Director of the Ventura County Public Works Agency or his or her duly authorized representative.
- K. "Engineering test hole" means an uncased excavation used to determine the engineering or geological properties of subsurface materials by seismic investigation, direct observation, or any other means.
- L. "Good State of Repair" means a well whose condition is adequate to perform its intended function without allowing cross-contamination between zones of water bearing sediments where one or more zones contain water of different quality and where the well has a physical barrier that prevents contamination of any zone by surface water.
- M. "Individual domestic well" means any water well used to supply water for domestic needs of an individual residence, or to systems having four or less service connections.
- N. "Inspect" means to personally witness, record, and certify work pursuant to a condition or conditions of a valid permit.
- O. "Modify or repair" means to replace a well's casing in a manner which involves removal or partial removal of the old casing, to re-perforate the well, to install a seal, to change the depth of the well, or to install a liner.
- P. "Monitoring well" means a well constructed exclusively for monitoring or sampling conditions of a water-bearing aquifer such as water pressure, depth, movement or quality.
- Q. "Owner of a well" is the owner of the land on which the well is located.
- R. "Person" includes any individual or entity included in the definition of "person" set forth in Section 10 of this Code and any governmental agency.
- S. "Pollution" means a substance that when introduced into waters will alter those waters to a degree which adversely affects either the suitability of such waters for beneficial uses or the facilities employed in conjunction with such beneficial uses.
- T. "Possesses" means to be in actual possession of the well or to have a legal right to the possession thereof.
- U. "Registered inspector" means a Civil Engineer, a Registered Geologist, or a Certified Engineering Geologist possessing a current license or registration in the State of California and approved by the Department. Registered inspectors are required to inspect drilling and sealing operations for engineering test holes and monitoring wells and for the determinations in connection with a Certificate of Exemption. A technician trained and experienced in drilling and sealing operations who is working under the direct supervision of one of the aforementioned professionals may be deemed qualified to perform required inspection(s) provided one of the aforementioned professionals reviews the well inspection record and assumes

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responsibility for the accuracy and completeness of the work by signing the well inspection record.

- V. "Water well" means any excavation constructed by any method for the purpose of determining the availability of water, extracting water from or injecting water into the underground, except the following:
1. Oil wells, gas wells, and geothermal wells subject to regulation under the provisions of Division 3 (commencing with Section 3000) of the Public Resources Code;
 2. Wells used exclusively to dewater excavations during construction or for stabilizing hillsides or earth embankments; and
 3. Seepage pits approved for use under permit from the Environmental Health Division.
- W. "Well" includes a cathodic protection well, engineering test hole, monitoring well or water well.

Sec. 4813 - PERMITS

- A. No person shall, within the unincorporated area of Ventura County, construct, repair, modify or destroy any cathodic protection well which is over 50 feet deep, any engineering test hole which is over 50 feet deep, any monitoring well, or any water well unless such work is done pursuant to and in compliance with an unexpired written permit for such work issued by the Department as provided in this Article.

In Sealing Zone III, as described in the California Department of Water Resources Bulletin No. 74-9, no permit shall be issued pursuant to this Article for the replacement of an existing well or construction of a new well unless it is consistent with the then current Fox Canyon Groundwater Management Agency (GMA), Groundwater Management Plan, as determined by the GMA. In making this determination, the GMA shall also consider the suitability of the water quality for the intended use of the well.

Alterations, repairs, modification, and rehabilitation of an existing well within Sealing Zone III which do not involve a change of the aquifer in which the well is perforated do not require approval of the GMA, provided the original production capacity of the well is not increased.

- B. Types of Permits:
1. Permits for construction, modification, and repair of all wells.

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2. Permits for destruction of all wells, except engineering test holes which shall be destroyed immediately after completion of testing in compliance with Section 4814 E.
 3. Annual permits for one or more engineering test holes which are over 50 feet deep and which are inspected by registered inspectors.
- C. Application for a permit shall be made to the Department, and shall include the following:
1. A vicinity map showing the location of the property on which the well is located.
 2. A plot plan suitable for inclusion as part of the well record and indicating the location of the well with respect to the following items within a radius of 500 feet of the well:
 - (a) Property lines.
 - (b) Sewage disposal systems or works carrying or containing sewage.
 - (c) All intermittent or perennial, natural or artificial water bodies or water courses.
 - (d) Drainage pattern of the property.
 - (e) Existing wells of all types, regardless of whether they are subject to regulation under this Article.
 - (f) Access roads.
 3. Name of the person, or firm who will perform the work on the well.
 4. Name and affiliation of the Registered Inspector, when a Registered Inspector will be utilized.
 5. Proposed depth of well.
 6. Proposed use of well.
 7. Proof satisfactory to the Department that the person who will construct the well is in possession of a valid license appropriate to such work which has been issued in accordance with the Contractor's License Law (Chapter 9, commencing with Section 7000, of Division 3 of the Business and Professions Code).
 8. A certificate satisfying the requirements of Section 3800 of the Labor Code (Worker's Compensation).
 9. Such other information as the Department may deem necessary in order to determine whether underground waters will be protected.
- D. Permits shall be issued or denied within 15 days after the day on which the completed application is received by the Department.
- E. Permit requirements and expiration:
1. Permits shall require compliance with all applicable standards set forth in Section 4814.

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2. A permit shall expire six months from the date of issuance unless it is extended by the Department. The Department may grant one or more extensions of a permit, each for a period not to exceed six months provided the permittee proves to the satisfaction of the Department that circumstances beyond the control of the permittee make it infeasible to complete the permitted work prior to the expiration date. Annual permits for engineering test holes shall expire one year from the date of issuance.
 3. The permittee shall complete work authorized by the permit and satisfy all the requirements of the permit prior to the expiration date of the permit or any extension.
- F. Prior to the issuance of a permit or any extension thereof, the applicant may be required to post with the Department a cash deposit or bond to guarantee compliance with the provisions of this Article and the applicable permit, such cash or bond to be in an amount deemed necessary by the Department to remedy improper work, but not in excess of the total estimated cost of the permitted work.
- G. No person shall perform any work, either on such person's own property or on the property of another, for which a permit is required by this Article unless such person is in possession of a valid license appropriate to such work which has been issued in accordance with the Contractors License Law (Chapter 9, commencing with Section 7000, of Division 3 of the Business and Professions Code) and is registered with the Department to perform work permitted by this Article. Licensed water well contractors (Class C-57) registered with the Department may perform all types of permitted work, while licensed engineering contractors (Class A) and limited specialty contractors (Class C-61) registered with the Department may only perform the work permitted by their license. An application for registration with the Department shall include a copy of the applicable license and a copy of a certificate of Worker's compensation insurance. The registration shall expire automatically on the expiration date indicated on the copy of the license or the expiration date indicated on the copy of the certificate of Worker's Compensation insurance submitted with the application, whichever expiration date is earlier. Geological determinations pertaining to a recommendation for a certificate of exemption of a water well shall be performed by a Registered Inspector.
- H. Suspension or termination of a permit.
1. Any permit issued pursuant to this Article is subject to suspension or termination prior to expiration as provided in this Section.
 - (a) Grounds - Any of the following occurrences constitutes grounds for termination of a permit:
 - (i) Suspension, revocation or termination of the license, required by Section 4813 G, of the person who is to perform the work.

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- (ii) Failure of permittee to comply with any provision of Section 3800 of the Labor Code.
 - (iii) Failure of a permittee or of any person who owns or possesses the well to comply with any provision of this Article, or any condition of a permit issued pursuant to this Article.
 - (b) Notice - To initiate proceedings to terminate a permit, the Director shall send written notice to the person to whom the permit was issued. The notice shall briefly describe the proposed grounds for termination, shall specify a time and a place for a hearing at which such person shall be afforded an opportunity to present evidence showing the proposed grounds for termination do not exist, and shall state that failure to appear and present such evidence may result in termination of the permit.
 - (c) Hearing - The Director shall conduct the hearing specified in the notice. The hearing shall be informal and shall not be governed by rules of evidence applicable to courts of law. The person to whom the permit was issued and/or the owner of the well shall have the right to present relevant evidence at the hearing. The Director may, but need not, permit other persons to present relevant evidence. At the conclusion of the hearing, or within 30 calendar days thereafter, the Director shall determine, based upon the preponderance of the evidence presented at the hearing, whether there are grounds for suspension and shall note the findings of fact upon which the determination is based. If it is determined there are grounds for termination, the Director shall terminate the permit; provided, however, that the Director shall have the discretion not to terminate the permit if the Director determines that the occurrence which gave rise to the grounds for termination was not willful, is not ongoing and is not likely to recur.
2. The Director may suspend a permit prior to the hearing when the Director determines that such action is necessary to protect the public health and safety or the environment from imminent danger. The Director shall notify the person to whom the permit was issued of such suspension. The suspension shall remain in effect until the Director makes a final determination based upon the hearing; provided, however, that the Director may rescind the suspension at any earlier time at which the Director determines it is no longer necessary.
 3. This Section shall not deprive the Director, or the County, of the authority to pursue any other action or remedy otherwise available to them under the law.

Sec. 4814 - STANDARDS

- A. Standards for the construction, relocation, repair, modification or destruction of wells shall be those set forth in the California Department of Water Resources Bulletin No.

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74-1 entitled "Cathodic Protection Well Standards," Bulletin No. 74-9, Chapter IV, entitled "Water Well Standards - Ventura County" and Bulletin No. 74-81, Bulletin No. 74-90, Chapter II, entitled "Water Well Standards - State of California," as supplemented or revised from time to time by the California Department of Water Resources, with the following exceptions:

- B. The Department may adopt additional or more stringent standards to be applicable in any or all zones of the County as delineated in aforementioned Bulletins.
- C. All community water supply wells and individual domestic wells shall be provided with a pipe or other effective means through which chlorine or other disinfecting agents may be introduced directly into the well. If a pipe is provided, it shall be installed at a height at or above the pump slab, shall be kept sealed, and shall be provided with a threaded or other secure cap. Equivalent protection for preventing contamination of the well shall be provided for subsurface pump discharge installations. If an air relief vent is used, it shall terminate downward and be screened with 16 mesh screen to prevent contaminating material from entering the vent.
- D. Every new, repaired or modified community water supply well or individual domestic water well, after construction, modification or repair, and before being placed into service, shall be thoroughly cleaned of all foreign substances and shall be thoroughly disinfected utilizing the procedures set forth in Appendix C of the aforementioned Bulletin 74-81.
- E. Engineering test holes deeper than 50 feet shall be destroyed immediately upon completion of testing by completely filling and/or sealing of the borehole in accordance with criteria established by the Department. The Department may waive complete sealing if the permittee demonstrates to the Director's satisfaction that the purpose of this Article as set forth in Section 4811 will be satisfied.
- F. No well, regardless of status, shall be left unattended without a cap that has been constructed to prevent the accidental access to the well by a person or animal, or have an opening that allows the well to be susceptible to contamination/pollution.

Sec. 4815 - LOG OF WELL

- A. Any person who has performed any work for which a permit is required by this Article and which involves drilling, digging, excavating or boring of a well, except for an engineering test hole, shall, within 30 days of completion of such work, submit to the Department an accurate and complete well log on forms satisfactory to the Department. New water wells in Sealing Zone III shall have a geophysical log performed by resistivity. New water wells in Sealing Zone II shall either have a geophysical log performed by resistivity, or soil samples shall be collected and recorded for every ten feet of depth within potential sealing zones. All abandoned water wells to be destroyed in Sealing Zones II and III shall have a geophysical log

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by Gamma Ray if no existing electric log or satisfactory drilling report is available for that well, unless it is determined by the Department that a log is not warranted. Any permittee failing to comply with this provision shall be in violation of this Article and shall not be granted any new permits until the violation has been corrected. This shall not preclude the application of other penalties for violation of this Article. A well log shall include all of the following:

1. A detailed record of the boundaries, character, size, distribution and color of all lithologic units penetrated.
2. The type and size of well casing.
3. The location of perforations, sealing zones and existing seals.
4. Report on the quantity and quality of groundwater.
5. Any other data required by the Department as a condition of the permit.

Sec. 4816 - FLOW PREVENTION DEVICE

All wells having a history of flowing located in Sealing Zone III, or any other confined aquifer, shall be maintained and equipped to prevent flowing due to pressure in the aquifer system. Wells without any history of flowing that begin to flow shall be repaired, or retrofitted as necessary to prevent flowing. Such repair or retrofit shall be completed within a period of thirty (30) days. This includes flowing as a result of a failed casing or other deteriorated component, or the absence of a surface seal.

Sec. 4817 - WELL INSPECTION REPORTS

A. WATER WELL CONSTRUCTION SEALING REPORT. A County Inspector will prepare a Well Inspection Sealing Report for water supply wells and cathodic protection wells constructed pursuant to and in compliance with an unexpired permit issued under this Article, to include:

1. Permit number.
2. Date of sealing work.
3. Diameter and depth of bore hole, diameter and depth of casing installed, depth to top and bottom of perforated interval(s), and depth to top of annular gravel pack.
4. Type and volume of sealing material delivered to well site.
5. Copy of invoice for sealing material delivered to well site.
6. Depth to water.
7. Method of placement of sealing material (if by grout pipe, include the number and length of pipe sections).
8. Volume of surplus sealing material remaining after seal placement.
9. Photographs of well site and of well sealing activity.

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10. Remarks by County Inspector describing any variance from adherence to permit conditions.
11. Opinion of County Inspector that seal placement was satisfactory or unsatisfactory.
12. Signature by the County Inspector.

B. WATER WELL DESTRUCTION SEALING REPORT. A County Inspector will prepare a Well Inspection Report for water supply wells and cathodic protection wells destroyed pursuant to and in compliance with an unexpired permit issued under this Article, to include:

1. Permit number.
2. Date of casing perforating work (if required by a permit condition).
3. Diameter and (sounded) depth of well casing.
4. Depth to top and bottom of zone(s) perforated for destruction seal placement (if required by a permit condition).
5. Type of casing perforator used (if required by a permit condition).
6. Photographs of well site and (if required by a permit condition photos of casing perforating activity and seal placement activity).
7. Depth to top of casing filler material (if required by a permit condition).
8. Opinion of County Inspector that casing perforating work (if required by a permit condition) was satisfactory or unsatisfactory.
9. Date of placement of sealing material.
10. Type and volume of sealing material delivered to well site.
11. Copy of invoice for sealing material delivered to well site.
12. Depth to water.
13. Method of placement of sealing material (if by grout pipe, include the number and length of pipe sections).
14. Volume of surplus sealing material remaining after seal placement.
15. Remarks by County Inspector describing any variance from adherence to permit sealing conditions.
16. Opinion of County Inspector that seal placement was satisfactory or unsatisfactory.
17. Signature of County Inspector.

C. MONITORING WELL/ENGINEERING TEST HOLE CONSTRUCTION SEALING REPORT. The Well Inspection Sealing Report for monitoring wells and engineering test holes constructed pursuant to and in compliance with an unexpired permit issued under this Article shall be submitted by a Registered Inspector within 30 days of sealing on a form* satisfactory to the Department, and shall include:

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1. Permit number.
2. Date(s) of sealing work.
3. Number of wells constructed under this permit.
4. Diameter and depth of bore hole(s), diameter and depth of casing(s) installed, depth to top and bottom of perforated interval(s), and depth(s) to top of annular filter pack.
5. Depth to water.
6. Depth and type of sealing material(s).
7. Method of placement of sealing material(s).
8. Method of protection of wellhead or open (engineering test) bore hole.**
9. Signature of Registered Inspector.

*Bulletin 74-90 (DWR) requires that monitoring well construction, alteration, and destruction reports be completed on forms provided by the California Department of Water Resources.

**Section 4814E requires that all engineering test holes be destroyed immediately after completion of testing.

D. **MONITORING WELL DESTRUCTION SEALING REPORT.** The Well Inspection Sealing Report for monitoring wells and engineering test holes destroyed pursuant to and in compliance with an unexpired permit issued under Section 4813 shall be submitted by a Registered Inspector within 30 days of sealing on a form* satisfactory to the Department, and shall include:

1. Permit number.
2. Date(s) of sealing work.
3. Number of wells destroyed under this permit.
4. Diameter and depth of borehole(s) and diameter and depth of casing(s) installed (monitoring wells).
5. Depth to water.
6. Depth and type of sealing material(s).
7. Method of placement of sealing material.
8. Method of restoration of site area.
9. Signature of Registered Inspector

*Bulletin 74-90 (DWR) requires that monitoring well construction, alteration, and destruction reports be completed on forms provided by the California Department of Water Resources.

E. **WATER WELL CONDITION INSPECTION REPORT FOR CERTIFICATE OF EXEMPTION.** Any person who owns, or who possesses a water well that is

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abandoned or about to become abandoned due to lack of use, but who does not desire to destroy the well may submit to the Department a Well Condition Inspection Report signed by a Registered Inspector pursuant to Section 4820. The report shall include:

1. State Well Number.
2. Driller's report.
3. Assessor Parcel Number of the property on which the well is located.
4. An accurate location description with respect to nearby wells, septic systems, animal enclosures, roads, and property boundaries.
5. Photographs of the well site, taken not more than six months prior to application for a Certificate of Exemption.
6. Video log of well casing, conducted not more than six months prior to application for a Certificate of Exemption.
7. A description of the well casing condition based upon a review of the most recent video log of the well.
8. An opinion that the well is, or is not, equipped with an annular seal or seals to prevent the interchange of waters between water-bearing strata penetrated by the well.
9. A statement that the well is, or is not, protected from artesian flow and from entry by surface waters.
10. A description of any work necessary to assure the safety of local groundwater supplies due to the continued existence of the well.
11. A description of any repair work necessary to allow the well to function for its intended purpose.

Sec. 4818 - CORRECTIVE ACTION

- A. Any person who owns a well, or any person who is in possession of a well, may be required to take corrective action with respect to the well as provided in this Section.
- B. Any of the following occurrences constitutes grounds for ordering corrective action:
 1. Maintenance, operation, or use of the well in a manner that causes or contributes to, or may result in a substantial risk of causing or contributing to, the pollution or contamination of the groundwater, or allowing water to be wasted as a result of a flowing well.
 2. Construction, maintenance, repair, modification or destruction of the well in a manner that violates any provision of this Article.
- C. To initiate proceedings to order corrective action, the Director shall send written notice to the person who owns the well, and/or the person in possession of the well. The notice shall briefly describe the grounds for ordering corrective action, shall describe the proposed corrective action, shall specify a time and place for a hearing at

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which such person will be afforded an opportunity to present evidence showing that the grounds for corrective action do not exist, or that the proposed corrective action is inappropriate. The notice shall also state that failure to appear and present such evidence may result in an order requiring such person to take some or all of the proposed corrective action.

- D. The Director shall conduct the hearing specified in the notice. The hearing shall be informal and shall not be governed by rules of evidence applicable to courts of law. The person who owns the well or the person in possession of the well shall have the right to present relevant evidence at the hearing. The Director may, but need not, permit other persons to present relevant evidence. At the conclusion of the hearing, or within 30 calendar days thereafter, the Director will determine, based upon the preponderance of the evidence presented at the hearing, whether there are grounds for ordering corrective action, and, if so, whether the proposed corrective action is appropriate. Such determination shall be in writing and shall contain a brief statement of the findings of fact upon which the determination is based.
- E. If the determination is that there are grounds for ordering corrective action and that some or all of the proposed corrective action is appropriate, the Director may issue and serve upon the person or persons who were served with the notice of the hearing, a written order requiring such appropriate corrective action. The order shall contain a deadline for commencing the corrective action if such action is to be ongoing or shall contain a deadline for completing the corrective action if such corrective action is not to be ongoing. The order shall further state that, if the corrective action is not taken in compliance with the order, such action may be taken by the County at the expense of the person served with the order and, in addition, such person may be subject to criminal prosecution.
- F. Any person who owns or is in possession of a well who is served with such an order shall, on or before the deadline stated therein, commence every corrective action described therein as being ongoing and complete every corrective action described therein as not being ongoing. Any person who owns or is in possession of a well served with such an order, and any person who thereafter acquires ownership or possession of the well with actual or constructive notice of the order, shall, for so long as such person owns or is in possession of the well, continue to take every corrective action described in the order as ongoing, until such time as the well is destroyed pursuant to this Article, or the Director states in writing that such ongoing corrective action is no longer necessary.

Sec. 4819 - DESTRUCTION OF ABANDONED WELLS

- A. No person shall own or be in possession of an abandoned cathodic protection well which is over 50 feet deep, an abandoned monitoring well, an abandoned engineering

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test hole which is over 50 feet deep, or an abandoned water well unless either such well has been destroyed pursuant to this Article, or a current Certificate of Exemption has been issued for such well pursuant to Section 4820.

- B. Any downhole explosive work shall be performed by a state licensed blaster who has obtained all appropriate city and county permits.

Sec. 4820 - CERTIFICATE OF EXEMPTION

Any person who owns or possesses a water well or monitoring well that is abandoned or about to become abandoned, but who does not desire to destroy the well may submit to the Department a report prepared and signed by a Registered Inspector as required by Section 4817(E). Recommendations for repair must be submitted for review and approval of the Department. If the Department determines based on such application that exemption from the requirement that the well be destroyed would not result in pollution or contamination of groundwater and would not create a hazard to health or safety, the Department may issue such a Certificate of Exemption. A certificate of exemption shall expire five years after issuance and may be terminated by the Department at any time prior to expiration upon a determination that destruction of the well is necessary to prevent pollution or contamination of groundwater or to avoid a hazard to health or safety. Successive Certificates of Exemption may be issued with respect to a well in the same manner as the original certificate was issued.

Sec. 4821 - FEES

The Board of Supervisors may, by resolution, establish fees for issuance of a permit, extension of a permit, a certificate of exemption, or an appeal pursuant to this Article. The payment of such fee, if any, established by such resolution, shall accompany the application to which it pertains. If the application is withdrawn before issuance of the permit, the Department shall compute the cost to the County of processing the application up to that point in accordance with the County's standard cost accounting procedures, and if such cost is less than the amount of the fee paid, the difference remaining shall be refunded to the applicant.

Sec. 4822 - INSPECTION

The Department and the County's inspector may, at any and all reasonable times, enter any and all places, property, enclosures and structures for the purpose of making examinations and investigations to determine whether any provision of this Article is being violated. The Department may require that any work for which a permit is required by this Article be completed in stages and that each such completed stage be inspected

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prior to any further work. Registered inspectors shall inspect drilling and sealing operations for engineering test holes and monitoring wells when required by conditions of any permit.

Sec. 4823 - MISDEMEANOR/ INFRACTION

Any person who violates any provision of this Article shall be guilty of a misdemeanor/infraction, and shall be guilty of a separate offense for each and every day or portion thereof during which such violation is committed, continued or permitted, and shall be subject to the same punishment for each such separate offense as for the original offense. The provisions of this section are in addition to and independent of any other sanctions which are or may be imposed under this Article or any other provision of law.

Sec. 4824 - ABATEMENT

If any corrective action required by an order issued pursuant to Section 4818 is not taken in full compliance with such order, the Director may cause the corrective action to be taken by the County and all persons required by Section 4818 to take such corrective action shall be jointly and severally liable to the County for the cost of such action. In cases where the public health and safety require emergency corrective action, the Director may cause the emergency corrective action to be taken by the County without a prior order or notice and all persons who own or are in possession of a well shall be jointly and severally liable to the County for the cost of such action.

Sec. 4825 - EXEMPTION

- A. Leak Detection System. The foregoing provisions of this Article do not apply to any leak detection system installed or destroyed pursuant to the provisions of Chapter 6.7 (commencing with Section 25280) of Division 20 of the Health and Safety Code or of Article 2 (commencing with Section 4521) of Chapter 5 of Division 4 of this Code.
- B. Monitoring and Recovery Wells. The Department may waive permit requirements for installation or destruction of monitoring and recovery wells which are less than 50 feet deep and which are constructed to determine the extent of, or remove, underground tank contamination, pursuant to requirements of the Environmental Health Division, provided the Director determines that the purpose of this Article as set forth in Section 4811 will be satisfied.
- C. Natural Gas Monitoring and Recovery Wells. The Department may waive permit requirements for installation or destruction of natural gas monitoring and recovery wells which are less than 50 feet deep pursuant to requirements of the Environmental

**APPENDIX A – VENTURA COUNTY ORDINANCE CODE,
CHAPTER 5, ARTICLE 2, SECTION 4527,
ET SEQ.**

Health Division, provided the Department determines that the purpose of this Article as set forth in Section 4811 will be satisfied.

Sec. 4826 - AQUIFER PROTECTION PROGRAM

The purpose of this program is to allow retention of those wells that are being used and are in good condition, and require either repair or destruction of those wells that are not usable and are causing damage to groundwater.

A. Water Wells.

1. Beginning on January 1, 1999, and on each January first thereafter, any person who owns a water well, or any person who is in possession of a water well, except those wells for which a valid Certificate of Exemption is in effect, shall submit to the Department a report of the amount of groundwater extracted and the total time the well was operated within the preceding 12 months. This report shall be submitted to the Department prior to February 1st of each year on a form approved by the Department. Owners of wells located in the following agencies may utilize the same forms already approved by such agencies:
 - (a) United Water Conservation District
 - (b) Fox Canyon Groundwater Management Agency
 - (c) Ojai Basin Groundwater Management Agency
2. If a well is classified as abandoned, as defined in Section 4812, a Certificate of Exemption shall be obtained in the manner provided in Section 4820, or the well shall be destroyed as required by Section 4819.

B. Based upon the above information, all wells in the unincorporated area of Ventura County shall be classified as:

1. Active; or
2. Abandoned with a valid Certificate of Exemption; or
3. Abandoned and requiring destruction.

C. No applications for new, or replacement wells, or any land use entitlement will be processed until all violations of this Article are corrected.

Sec. 4827 - LIENS APPLIED

Failure to comply with any section of this Article may result in the County placing a lien on the affected property to cover the costs of managing and performing work deemed necessary, as well as other remedies prescribed by this Article.

**APPENDIX A – VENTURA COUNTY ORDINANCE CODE,
CHAPTER 5, ARTICLE 2, SECTION 4527,
ET SEQ.**

Sec. 4828 - APPEALS

Any person shall have the right to appeal the decision of the Director to the Board of Supervisors, provided such appeal is made in writing within twenty-one days of the date of the Director's decision and the applicable appeal fee is paid.

PASSED AND ADOPTED this 18th day of May, 1999, by the following vote:

AYES: Supervisors Schillo, Long, Mikels and Lacey

NOES: None

ABSENT: Supervisor Flynn

(s/s Susan K. Lacey)

CHAIR, BOARD OF SUPERVISORS

ATTEST:

RICHARD D. DEAN, County Clerk,

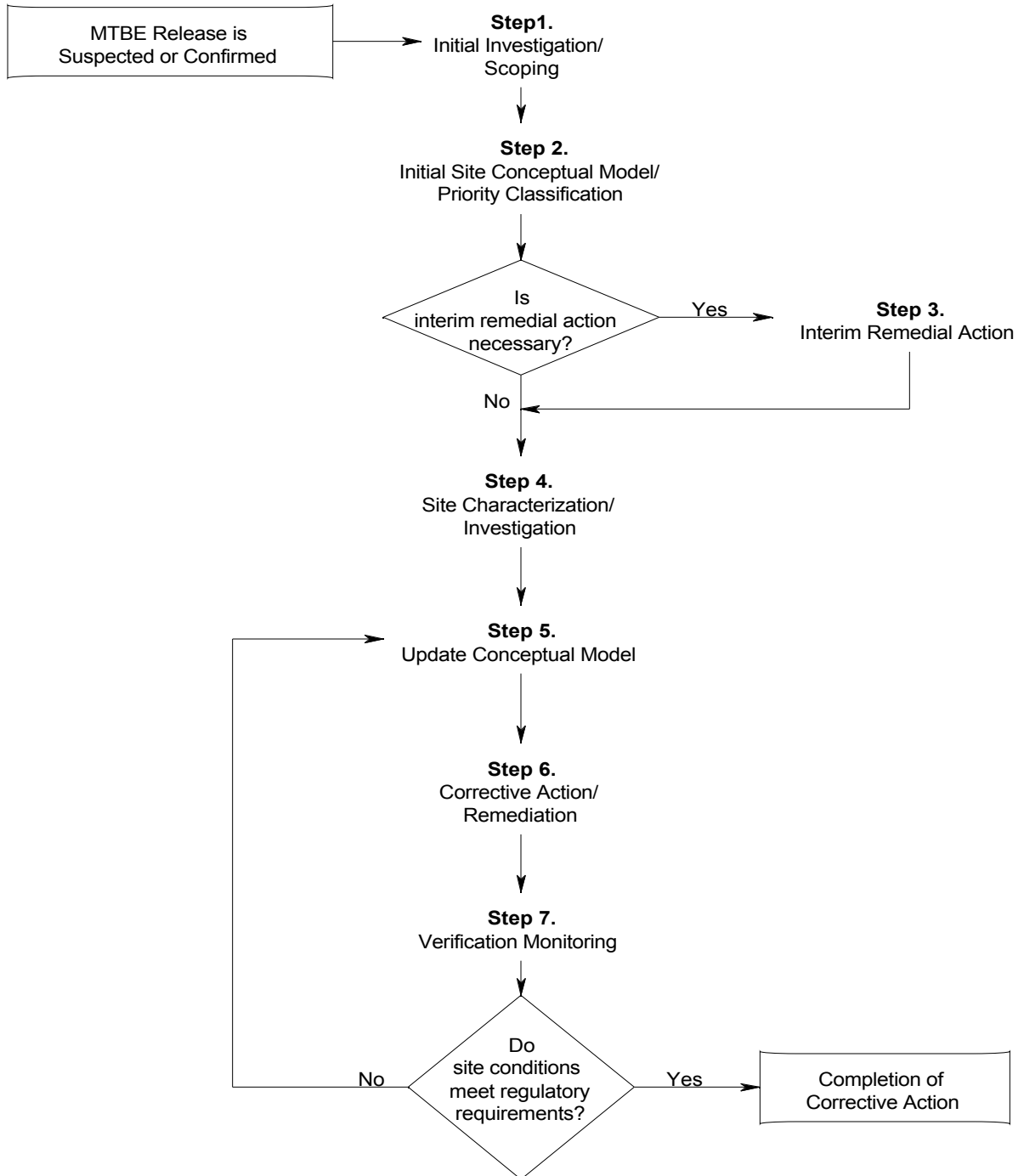
County of Ventura, State of California, and ex officio Clerk of the Board of Supervisors thereof.

By: s/s Richard D. Dean

Deputy Clerk

Fees Pursuant To Ventura County Ordinance Code Section 4821

APPENDIX B - FLOWCHART OF DECISION MAKING FRAMEWORK



**APPENDIX C – RWQCB’S GENERAL LABORATORY
TESTING REQUIREMENTS FOR
PETROLEUM HYDROCARBON
IMPACTED SITES, DATED JUNE 5, 2000**

See the following three-page document.

**APPENDIX C – RWQCB’S GENERAL LABORATORY
TESTING REQUIREMENTS FOR
PETROLEUM HYDROCARBON
IMPACTED SITES, DATED JUNE 5, 2000**

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APPENDIX D - TECHNICAL REFERENCES

Site Investigation / Conceptual Model

1. Expedited Site Assessment Tools For Underground Storage Tank Sites – A Guide For Regulators (USEPA, Office of Underground Storage Tanks, March 1997)
2. MTBE Site Characterization Technical Bulletin, American Petroleum Institute, (pending)
3. Course manual “Assessment and Management of MtBE Impacted Sites”, SWRCB & USEPA, 1999
4. Guidelines for Hydrogeologic Characterization of Hazardous Substance Release Sites, CalEPA, 1995
5. Standard Guide for Accelerated Site Characterization for Confirmed or Suspected Petroleum Release Sites, ASTM E1912-98

Remediation

6. How to Evaluate Alternative Cleanup Technologies For Underground Storage Tank Sites, USEPA, EPA 510-B-94-003, 1994
7. Pump-and-Treat Ground-Water Remediation, A Guide for Decision Makers and Practitioners, USEPA – Office of Research and Development, EPA/625/R-95/005
8. The Performance and Cost of MTBE Remediation Technologies, Proceedings of the 1998 Petroleum Hydrocarbons and Organic Chemicals in Water conference, D.N. Creek, J.M. Davidson
9. Treatment Technologies for Removal of Methyl Tertiary Butyl Ether (MTBE) from Drinking Water, MTBE Research Partnership: Western States Petroleum Association, Association of California Water Agencies, Oxygenated Fuels Association, 1998

MTBE Properties

10. Fuel Oxygenates and Water Quality: Current Understanding of Sources, Occurrence in Natural Waters, Environmental Behavior, Fate, and Significance. Chapter 2 in *Interagency Assessment of Oxygenated Fuel*, Office of Science & Technology Policy, Executive Office of the President, Washington, D.C., Zogorski, J.S., A. Morduchowitz, A.L. Baehr, B.J. Bauman, D.L. Conrad, R.T. Drew, N.E. Korte, W. W. Lapham, J. F. Pankow, and E.R Washington., 1997

APPENDIX E – MTBE AND THE OTHER OXYGENATES

1. METHYL TERTIARY-BUTYL ETHER (MTBE)

MTBE has been added to gasoline to enhance octane and to comply with Clean Air Act mandates. MTBE was approved by the U.S. EPA for use in 1979 and was added to gasoline during the 1980s at approximately 2-5% by volume as an octane booster. In 1992, it was blended at 10-15% by volume for use in some areas in the wintertime oxygenated fuel program. In 1986, it began to be used widely in California. In 1996, MTBE began to be used year round in California at 11% by volume in the statewide reformulated gasoline program.

When released into the environment, MTBE has high solubility in water, low retardation in soil, and is slow to biodegrade. These properties, combined with the high percentage of MTBE in gasoline, cause the potential for high source area concentrations, long plumes in groundwater, and long residence times in the subsurface. MTBE also has taste and odor characteristics that can impair water supplies at low concentrations.

The California Department of Health Services (DHS) proposed a primary Maximum Contaminant Level (MCL) of 13 micrograms per liter (mg/L) in September 1999. The secondary MCL of 5 mg/L was adopted in January 1999. Until a primary MCL is adopted, the DHS will use its advisory action level of 13 mg/L to protect against health risks associated with exposures to MTBE in drinking water.

The currently accepted analytical protocol for groundwater samples suspected of containing ether oxygenates and TBA is EPA Method 8260. EPA Method 8020 may be used for MTBE analysis if EPA Method 8260 is used to confirm positive detections. Significant interference and false detections can occur when MTBE is analyzed in the presence of petroleum hydrocarbons using EPA Method 8020. When other hydrocarbons are present in the sample, EPA Method 8260 is the preferred method.

Existing law prohibits the issuance of a closure letter for a LUFT site unless the site, including both soil and groundwater, if applicable, has been tested for MTBE. There is no exception for sites that are unlikely to be contaminated by MTBE. (Health and Safety Code 25299.37.1)

The use of the non-purge method for sampling of groundwater monitoring wells containing MTBE is not approved.

2. TERTIARY BUTYL ALCOHOL (TBA)

TBA is often present as a by-product of MTBE production and is suspected to be a primary breakdown product of MTBE in the environment. EPA Method 8260B must be used to detect TBA in both soil and groundwater.

APPENDIX E – MTBE AND THE OTHER OXYGENATES

3. TERTIARY-AMYL METHYL ETHER (TAME)

TAME has also been used as an oxygenate in gasoline. Because the use of TAME has not been as widespread as MTBE, TAME is unlikely to prove to be as great a threat as MTBE at most sites. However, the LUFT Program has determined that it is prudent to analyze for this additional compound during the initial investigation to determine if it is present. EPA Method 8260B must be used to detect TAME in both soil and groundwater.

4. ETHYL TERTIARY-BUTYL ETHER (ETBE)

ETBE has also been used as an oxygenate in gasoline. Because the use of ETBE has not been as widespread as MTBE, it is unlikely that ETBE will prove to be as great a threat as MTBE at most sites. However, it is prudent to analyze for this additional compound during the initial investigation to determine if it is present. EPA Method 8260B must be used to detect ETBE in both soil and groundwater.

5. DI-ISOPROPYL ETHER (DIPE)

DIPE has also been used as an oxygenate in gasoline. Because the use of DIPE has not been as widespread as MTBE, it is unlikely that DIPE will prove to be as great a threat as MTBE at most sites. However, it is prudent to analyze for this additional compound during the initial investigation to determine if it is present. EPA Method 8260B must be used to detect DIPE in both soil and groundwater.

6. METHANOL AND ETHANOL

If other oxygenates are determined to be present in sufficient quantities to adversely affect beneficial uses, these compounds should be included in the remediation plan for the site. If the other oxygenates present have similar properties to MTBE, the concentrations of the other oxygenates must be added to the concentration of MTBE and the sum treated as “MTBE equivalents” when determining remedial actions at the site. EPA Method 8015M must be used to detect both methanol and ethanol in both soil and groundwater.

APPENDIX F - PHYSICAL PROPERTIES OF BTEX AND OXYGENATES

	Pure Phase Solubility ¹	log K _{oc} ²	Vapor Pressure ³	Henry's Law Constant ⁴	Retardation Factor ⁵	
	mg/L	log l/kg	mm Hg	Dimensionless	Soil Condition A ⁶	Soil Condition B ⁷
Benzene	1,780	1.5 - 2.2	76 - 95.2	0.22	1.59	3.38
Toluene	535	1.6 - 2.3	28.4	0.24	1.75	3.99
Ethylbenzene	161	2.0 - 3.0	9.5	0.35	3.66	11.6
m-Xylene	146	2.0 - 3.2	8.3	0.31	4.34	14.4
Ethanol	Miscible	0.20 - 1.21	49 - 56.5	0.00021 - 0.00026	1.04	1.17
Methanol	Miscible	0.44 - 0.92	121.6	0.00011	1.04	1.16
TBA	Miscible	1.57	40 - 42	0.00048 - 0.00059	1.31	2.25
MTBE	43,000 - 54,300	1.0 - 1.1	245 - 256	0.023 - 0.12	1.09	1.38
ETBE	26,000	1.0 - 2.2	152	0.11	1.33	2.34
TAME	20,000	1.3 - 2.2	68.3	0.052	1.47	2.89
DIPE	2,039 - 9,000	1.46 - 1.82	149 - 151	0.195 - 0.41	1.37	2.47

Notes: Data from Zogorski et al. (1997). Values at 20 or 25 °C

TBA: tertiary butyl alcohol; MTBE: methyl tertiary butyl ether; ETBE: ethyl tertiary butyl ether; DIPE: di-isopropyl ether

1 = The propensity of a chemical to dissolve into water, expressed in milligrams of chemical per liter of water.

2 = The propensity of a chemical to adsorb to soil. Defined as the ratio of the concentration of the chemical adsorbed onto organic carbon to the concentration of the chemical dissolved in water

3 = The propensity of a chemical to migrate from NAPL to the gas phase. The vapor pressure of a chemical is the pressure exerted by the gas phase when it is in equilibrium with the liquid phase.

4 = The propensity of a chemical to partition between the dissolved phase and the gas phase. The Henry's Law Constant is defined as the ratio of the equilibrium concentration of the chemical in the gas phase to the equilibrium concentration of the chemical in water.

5 = The average velocity of plume migration for a chemical will typically be lower than the average velocity of the associated groundwater. The retardation factor is the ratio of the velocity of the chemical plume to the velocity of the associated groundwater. This factor is calculated; a function of soil bulk density, soil effective porosity, soil organic carbon content, and the organic carbon partitioning coefficient of the chemical.

6 = Soil Condition A: $f_{oc}=0.001$ mg/mg, bulk density=1.75 kg/L, porosity=0.25

7 = Soil Condition B: $f_{oc}=0.004$ mg/mg, bulk density=1.75 kg/L, porosity=0.25

APPENDIX G – WELL CONSTRUCTION AND DESTRUCTION REQUIREMENTS

A. PERMITTING

The VCEHD requires that permits be obtained before any well is installed or when any permitted well is destroyed (Ordinance Code §4813 and §4830). Standards for well construction and destruction are set forth in California Department of Water Resources Bulletins 74-81 and 74-91. Specific requirements of the permitting agencies will be stated on the permit.

For wells installed within the incorporated City of Oxnard, the permitting agency is the City of Oxnard Department of Public Works, which can be contacted at (805) 385-7896. For the remainder of Ventura County, the permitting agency is the Ventura County Public Works Agency, Department of Water Resources, which can be contacted at (805) 654-2904.

B. MONITORING WELL DESIGN AND CONSTRUCTION

The screened interval in groundwater monitoring wells should extend from a minimum of 20-feet below the lowest known water level to a minimum of 10-feet above the highest known water level. Those parameters may be adjusted to account for groundwater less than 12-feet below ground surface or refusal due to bedrock. An impermeable seal extending from ground surface to at least 2-feet below grade is the minimum acceptable.

Generally, well casing and screen are to be at least two inches in diameter. Under certain circumstances, VCEHD project managers may permit smaller diameter wells to be installed. However, all monitoring wells must be constructed so they can be accurately gauged and representative samples can be obtained.

The borehole must be at least 4-inches greater in diameter than the casing to be installed. The sand pack must be installed from the base of the screen to approximately 2-feet above the top of the screen, space permitting. Casing and screen are to be in suspension and centralized when the sand pack is installed. Centralizers are not required for casing and screen installed through hollow stem augers. The well is to be surged before the seals are installed to assure that the sand pack is continuous and compacted to the degree possible. A bentonite seal at least 3-feet thick must be installed above the sand pack and the annulus from the top of the seal to ground surface must be grouted with bentonite, cement, or a mixture of the two. Bentonite seals are to be thoroughly hydrated, especially if set above the water table.

Wells installed for remediation purposes must be designed according to site-specific requirements and are not discussed in this section. However, the design of such wells must be approved by the LUFT Project Manager before the wells may be installed.

APPENDIX G – WELL CONSTRUCTION AND DESTRUCTION REQUIREMENTS

C. WELL DEVELOPMENT

Wells are not to be developed for at least 24 hours after installation to allow the seals and grout to set. Development with a surge block is preferable to development with a pump or a bailer. The surging action will remove more fine material from the sand pack and will serve to break down the low permeability “skin” that forms on the surface of the borehole during drilling due to the smearing of clays. Development is to continue until physical parameters of the water, i.e., temperature, pH, conductivity, and turbidity, have stabilized.

D. WELL SURVEY

A permanent gauging point is to be marked on the top of the well casing and the elevation of that point is to be determined relative to a known datum referenced to mean sea level. All wells associated with a specific LUFT site must be surveyed relative to the same datum. The elevation survey is to be to the nearest 0.01 foot. The locations of the wells are to be determined with respect to permanent features on the site.

E. WELL LOGS

All wells and soil borings, whether advanced with hollow-stem augers, rotary bits, percussion bits, hand augers, direct push, or other equipment must be logged. The log must provide the site and well identification, name of the responsible party, name of the consulting company overseeing the work, date(s) drilled, name of the logger, name of the drilling contractor and the driller, drilling equipment used, borehole diameter, total depth, and depth to water.

Lithologies penetrated, all evidence of contamination (e.g., stain, odor, cut, PID/OVA reading, etc.), blow counts, sample points, and groundwater depth(s) must be noted on the log relative to depth. Lithologies are to be described according to the Unified Soil Classification System. Well construction details may be provided on the boring log. All logs are to be at a scale that permits lithologic descriptions and other comments to be read and all logs are to be approved by a California Registered Geologist, Certified Engineering Geologist, Certified Hydrogeologist, or Professional Engineer.

F. DESTRUCTION OF WELLS

The VCEHD requires that permits be obtained before any permitted well is destroyed (Ventura County Ordinance - Appendix A). Standards for well destruction are set forth

APPENDIX G – WELL CONSTRUCTION AND DESTRUCTION REQUIREMENTS

in California Department of Water Resources Bulletins 74-81 and 74-91. Specific requirements of the permitting agencies will be stated on the permit.

For wells installed within the incorporated City of Oxnard, the permitting agency is the City of Oxnard Department of Public Works, which can be contacted at (805) 385-7896. For the remainder of Ventura County, the permitting agency is the Ventura County Public Works Agency, Department of Water Resources, which can be contacted at (805) 654-2904.

G. RESPONSIBILITY FOR CORRECT DRILLING OF BOREHOLES AND INSTALLATION OF WELLS

The Responsible Party and their consultant have the responsibility to ensure that the borings and the wells do not provide a pathway for the movement of contaminated fluids or poor quality water, or present a public nuisance or hazard, while adequately performing the desired function

APPENDIX H – MINIMUM HEALTH AND SAFETY PLAN (HASP) REQUIREMENTS

A site specific Health and Safety Plan (HASP) is required for all work conducted within the LUFT Program. The HASP must be appropriate for the proposed work. If the scope of work changes, a revised HASP may be required before work is allowed to proceed.

All individuals working on the site or visiting the site in an official capacity are to be familiar with the HASP, particularly the hazards that may be encountered and the emergency procedures to be followed. A copy of the HASP must be on-site during all work. Each person involved in the work must attest, by signing the HASP, to the fact that they understand the hazards that may be involved, are familiar with the emergency procedures to be followed in case of an accident, and have the proper training for the tasks they are to perform.

Site-safety meetings, reviewing the scope of the scheduled work, the pertinent safety concerns, and the emergency procedures are to be held each day before work begins.

The following are the minimum requirements for a HASP acceptable to the LUFT Program:

1. A list of the hazardous materials that may be encountered and decontamination procedures and/or required emergency treatment for each material listed. A Material Safety Data Sheet for each material listed is required.
2. Name and job function (e.g., site geologist, driller, etc.) of the Site Safety Officer.
3. Name and job function of the alternate Site Safety Officer.
4. Name and job function of other responsible site personnel and their alternates.
5. Addresses and phone numbers for the nearest emergency response facilities:
 - Fire Station
 - Ambulance Service
 - Police
 - Emergency Health Facility
 - Poison Control
6. A map showing the most direct route to the nearest emergency health facility. This map is to be at a scale that is easily read and the route should be clearly identified such that a person not familiar with the area will be able to locate it with minimum delay.

APPENDIX H – MINIMUM HEALTH AND SAFETY PLAN (HASP) REQUIREMENTS

7. A narrative direction to the nearest emergency health facility, i.e., specify roads, turns, and directions (left or right on which roads) to be taken.
8. Addresses and telephone numbers for responsible parties and agencies to which accident reports must be provided:
 - Federal Government; EPA, OSHA, CDC, USCG, etc.
 - State Government; CalEPA, DTSC, Regional Water Board, etc.
 - County/City Government; Environmental Health Agency, APCD, etc.
9. Work-zone delineation, e.g., work zone, support zone, decontamination zone, restricted access zone, etc.
10. Level of Personal Protection Equipment (PPE) required. If different work activities require different levels of protection, the requirements for each must be specified. For cases where Level A or B is appropriate, workers must be trained in the use of the PPE required. No worker with facial hair that might prevent the tight fit of a respirator mask is to be assigned to tasks requiring Level A or B PPE.
11. Decontamination procedures for each possible hazardous exposure.
12. Traffic control and site access control procedures.
13. Air monitoring procedures and safety limits.
14. Procedures for managing weather related problems, e.g., lightning, heavy rain, etc.
15. Location of all emergency equipment, such as fire extinguishers, vapor suppressant applicators, etc. The individuals trained in and assigned to their use must be named and must be aware of their responsibilities.

All individuals working on LUFT sites must have the level of OSHA training that their assigned duties require and must be prepared to verify that training upon request by a LUFT inspector.

No work can be conducted under LUFT Program until the appropriate permits have been obtained. Copies of all required permits must be available on site.

APPENDIX I – GROUNDWATER MONITORING AND SAMPLING PROCEDURES

A. GAUGING

The depth to water and the thickness of free product in wells may be measured using electronic devices or a graduated tape treated with water or hydrocarbon-sensitive paste. Depths are to be recorded to the nearest 0.01-foot relative to a surveyed reference point. Generally, all wells associated with a site should be gauged during every monitoring event. If SPH is present, the measured depth to water is to be corrected using the following formula:

$$DTW_c = DTW_m - (T_{SPH} \times SG_{SPH})$$

where: DTW_c = Corrected Depth to Water
 DTW_m = Measured Depth to Water
 T_{SPH} = Thickness of Separate Phase Hydrocarbons
 SG_{SPH} = Specific Gravity of Separate Phase Hydrocarbons

The specific gravities for some fuels are:

Gasoline	0.75 g/cm ³
Diesel	0.81 g/cm ³
Jet Fuel (JP-4)	0.79 g/cm ³
#2 Fuel Oil	0.91 g/cm ³
#6 Fuel Oil	0.96 g/cm ³

NOTE: If blank casing was installed beneath the screened interval when a well was constructed, that well is not to be monitored unless the water level is at least 2-feet above the base of the screened interval. Otherwise, the gauged depth to water may be incorrect and any samples collected will include the stagnant water inside the blank casing or water that has cascaded into the blank casing after it has been purged.

B. PURGING

Purging involves removal of sufficient water from a well to assure that the samples are representative of the groundwater in the impacted aquifer rather than the water from within the well. The protocols to determine whether the no-purge option is valid for a particular well or site are presented in Appendix J. Once the determination has been made that a well or wells must be purged, the following are required:

1. Purging must proceed from the least contaminated well to the most contaminated well to minimize the possibility of cross-contamination.
2. Purging must be done with a submersible pump, bladder pump, vacuum pump, or bailer. Use of airlift devices for purging is not acceptable.

APPENDIX I – GROUNDWATER MONITORING AND SAMPLING PROCEDURES

3. In general, removal of ± 3 boring volumes of water is adequate. However, pH, temperature, turbidity, and conductivity of the extracted water are to be monitored throughout the purging process and purging is to continue until conditions are stable (i.e., the variance between sequential measurements is 10% or less). The purged volumes at which measurements were collected, the measured values, the total volume of water removed, any anomalies noted (odor, color, high sediment content, etc.), and the time purging began and ended are to be reported for each well.
4. Boring volume in gallons is calculated using the standard equation provided below. Note that simply using the casing volume rather than the boring volume will cause a well to be significantly underpurged.

$$B_v = 7.48 * [\{ (C_d/2)^2 + P[(B_d/2)^2 - (C_d/2)^2] \} * (D_w - DTW)]$$

where: B_v = Boring volume in gallons
7.48 = Gallons/cubic-foot
 C_d = Casing diameter in feet
P = Porosity of the sand/gravel pack
 B_d = Boring diameter in feet
 D_w = Depth of well in feet (relative to reference point)
DTW = Depth to water (relative to reference point)

5. After purging, a well generally must be allowed to recover to at least 80% of its static condition before samples are collected. The depth to water at which a well has recovered to 80% of static condition is calculated using the following equation:

$$R_{DTW} = D_w - (WC_L \times 0.8)$$

where: R_{DTW} = Recharge DTW (maximum for 80% recovery)
 D_w = Depth of well, in feet (relative to reference point)
DTW = Depth to water, in feet, before purging
 WC_L = Water column length = ($TD_w - DTW$)

6. Wells that do not recover to 80% of static conditions within two hours after purging may be sampled when there is sufficient water to obtain valid samples. Care should be taken not to purge slow-recharge wells dry. If that is done, water may cascade into the well from unknown intervals and the samples obtained may not be representative of groundwater conditions. Therefore, the rate of purging and/or the volume of water removed from wells that are historically slow to recharge must be adjusted accordingly.

APPENDIX I – GROUNDWATER MONITORING AND SAMPLING PROCEDURES

C. Sampling

Water samples must be collected using equipment that minimizes the chance of losing volatile constituents from the sample. Dedicated submersible pumps, bladder pumps, and bailers (preferably single-use) are acceptable. Peristaltic or airlift pumps may not be used. If reusable bailers are used, the bailer must be thoroughly decontaminated and a new cord must be attached before each sample is collected.

To minimize the possibility of cross-contamination, sampling should proceed from the least contaminated to the most contaminated wells. All non-dedicated sampling equipment must be decontaminated thoroughly between sampling events. Decontamination requires thoroughly washing the equipment with an appropriate cleaning solution, two rinses with clean tap water, and a final rinse with deionized or distilled water.

Samples are to be transferred from the sampling equipment to the appropriate containers with care to minimize mixing with ambient air. For samples to be analyzed for volatile or semi-volatile compounds, the container must be filled completely so that no headspace is present. The presence of headspace can be checked by inverting the sealed container, tapping it lightly, and looking for bubbles. If bubbles are present, another sample must be collected. If the water or the sediment in the water contains calcium carbonate, bubbles will be generated. In that case, the usual hydrogen chloride preservative should not be added to the sample containers.

At least one duplicate sample and one trip blank are to be submitted to the laboratory along with the other samples. If more than one aquifer is being evaluated, a duplicate sample from each is required. The purpose of duplicates is to check the consistency of the laboratory results. Duplicate samples should be labeled with a fictitious well name and submitted for the same analyses as the other samples rather than being identified as a duplicate.

Samples are to be obtained in the containers and quantities appropriate for the requested analyses. All samples are to be labeled, properly sealed, and preserved according to laboratory requirements. Proper chain-of-custody procedures are to be followed. No time gaps between sampler, courier, laboratory, or other handlers will be accepted. The appropriate holding times for the sample medium, analytical method, and preservative must be strictly observed.

APPENDIX J – CONDITIONS AND REQUIREMENTS FOR PURGE-NON-PURGE OF GROUNDWATER MONITORING WELLS

BACKGROUND

RWQCB staff completed the review of the report entitled "The California Groundwater Purging Study for Petroleum Hydrocarbons", prepared by SECOR International Incorporated, dated October 28, 1996, and commissioned by the Western States Petroleum Association (WSPA) and a report entitled "Groundwater Sampling-A Pilot Study of the Effects of Well Purging" by Ken Williams et al. (1996). The RWQCB staff concluded that for groundwater monitoring wells screened in unconfined zones at leaking UST gasoline sites, purging is not routinely required under certain conditions.

The State Water Resources Control Board UST Program Manager issued a guidance letter to Local Oversight Programs and Local Implementing Agencies on March 26, 1997, regarding "The California Groundwater Purging Study For Petroleum Hydrocarbons." The letter acknowledged the results of the WSPA report, stated that there were limitations to the non-purge method, and concluded that non-purge methods, where applicable, could be implemented. The discussion which follows describes the conditions under which purging is and is not necessary.

Whichever method is chosen for a particular site, that method must be used for all of the groundwater monitoring wells associated with that site. Individual wells may not be purged while other wells are not.

PURGING NOT REQUIRED

Under the following conditions, the groundwater monitoring wells are not required to be purged prior to sampling.

1. The groundwater monitoring well must be screened in an unconfined aquifer. UST sites located in the Oxnard Coastal Plain and other groundwater basins documented as unconfined aquifers can qualify as leaking UST gasoline sites overlying unconfined aquifers.
2. The top of the screened interval of the groundwater monitoring well must be located above the water table at all times during the monitoring period; the well must be permitted, and boring logs and well construction details must have been previously submitted for review.
3. Monitoring wells must be completed in moderate to high recovery aquifers and formations consisting predominantly of coarse grained sediments (sands and gravels).

APPENDIX J – CONDITIONS AND REQUIREMENTS FOR PURGE-NON-PURGE OF GROUNDWATER MONITORING WELLS

4. A site-specific pre-purged and non-purged groundwater monitoring study may be used to evaluate sites not meeting the above minimum criteria. On a case by case basis, should the results of pre-purge/non-purge study indicate that no significant variance in petroleum hydrocarbon concentrations (TPHg, BTEX, and MTBE) is present, the groundwater monitoring wells at the site are not required to be purged prior to sampling for routine groundwater monitoring programs.
5. Prior to implementation of the non-purge sampling method at a site, the LUFT Project Manager must be notified in writing of the intent to implement the non-purge sampling method.

PURGING REQUIRED

Under the following conditions, the groundwater monitoring wells must be purged prior to sampling:

1. All newly installed groundwater monitoring wells must be rigorously developed and purged for the initial two sampling events. This practice is to ensure removal of any entrained, fine-grained material remaining from well construction and development procedures, as well as to provide data for comparison to non-purge testing. Data on turbidity, pH, specific conductance, temperature, and recharge rate must be recorded and provided with groundwater monitoring reports.
2. The groundwater sampling and testing program includes analysis for chlorinated hydrocarbons, metals, polycyclic aromatic hydrocarbons, or diesel.
3. In fine grained sediments (predominately clayey/silty materials) where the groundwater gradient is relatively flat and wells are slow to recover (i.e., groundwater monitoring wells routinely become dry prior to evacuating minimum purge volumes). These wells can be sampled after groundwater in the monitoring well recovers to a minimum of 80% of the original groundwater elevation or 24 hours, whichever is less.
4. The groundwater monitoring well is in use for air sparging and/or vapor extraction.
5. If a LUFT case is evaluated for closure as a low-risk site, the LUFT Project Manager may require that a final purged groundwater sample be collected from all of the monitoring wells.

APPENDIX J – CONDITIONS AND REQUIREMENTS FOR PURGE-NON-PURGE OF GROUNDWATER MONITORING WELLS

6. In areas where municipal supply wells have been impacted by gasoline and/or gasoline additives, purging of groundwater monitoring wells may be required.
7. Groundwater wells with measurable free product should be on a regular program of free product removal. If a monitoring well is determined to contain free product, the well must be bailed to remove any standing free product, purged to remove minimum well volumes (4-10 boring volumes), and allowed to equilibrate back to pre-purged levels. At that point, the free product thickness must be measured and reported.

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