

## Memorandum

# Florida Department of Environmental Protection

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TO: Bureau of Petroleum Storage Systems Site Managers  
Bureau of Petroleum Storage Systems Technical Reviewers  
Interested Parties

FROM: Thomas W. Conrardy, Chief Engineer  
Bureau of Petroleum Storage Systems

DATE: May 21, 2003

SUBJECT: Procedures for Evaluating the Cleanup Strategy on Complex, Difficult, or Costly Petroleum Remediation Sites in the Preapproval Program. To Be Used on Sites Where Post-Assessment Costs are Projected to Exceed \$500,000.

This guidance has been developed to establish procedures for evaluation of the strategy for remediation of the most challenging of our petroleum contaminated site cleanup projects. There are a variety of factors that may affect the relative difficulty of achieving cleanup target levels (CTLs) in soil and groundwater at a reasonable cost and in a reasonable timeframe. These factors include the extent and degree of contamination, structural impediments such as the petroleum storage system, buildings, and roadways, and hydrogeological and lithological conditions. Any of these factors, or a combination of these factors, may result in a general sense that the probability of complete success of an initial attempt at a remediation strategy is doubtful, and therefore the time to complete the site cleanup and the ultimate cost are largely unknown.

Such sites require special considerations in developing cleanup strategies. This guidance has been created to address such circumstances and shall be considered applicable to any contaminated site cleanup in which the projected cleanup cost (post site assessment) is expected to exceed \$500,000. Although this guidance has been developed with state-funded sites in mind, it is also considered potentially applicable to any site cleanup regardless of whether it is eligible for cleanup program funding, and therefore may be used to develop cleanup strategies for non-program sites. As a means to provide assurance that we have thoroughly considered options to control cleanup costs at state-funded cleanup sites, these evaluation procedures shall be considered mandatory for developing remedial strategies for sites with cleanups expected to exceed \$500,000. Due to the existence of a program funding cap for PLRIP and PCPP sites, the FDEP's financial contribution to the cleanup cost may be limited even though the total cleanup cost will exceed \$500,000; therefore, the responsible party, who will pay for the balance of the cleanup cost of an eligible site once the funding cap is reached, should be informed of these procedures so that they may be considered in developing a cleanup strategy.

Although the procedures described below must be considered for program sites for which the cleanup cost is expected to surpass \$500,000, some aspects of these procedures have potential applicability to sites with lower projected cleanup costs. This memo's focus on the more costly cleanup sites is not meant to imply that some of the strategies described below may not be given consideration when evaluating strategies for those other less costly cleanup projects (<\$500,000). Collection of supplemental soil samples for laboratory analyses and consideration of alternative closure options for establishing soil CTLs are strategies that cost relatively little compared to the potential savings and should be given some consideration regardless of the anticipated cleanup cost for the site.

Other strategies described in this guidance, such as using a phased approach to remediation and long-term natural attenuation monitoring as an alternative to active remediation, generally are of greater value on high cost cleanup projects and decrease in the return on the investment for sites with lower cleanup costs; and may pass the point of diminishing returns and could increase the cleanup cost on smaller scale and cost cleanups. Therefore, these options should generally be reserved for the more costly remediation projects. With the exception of performing a phase consisting of source removal followed by a period of monitoring before implementing additional remediation, using a phased approach to remediation is generally not appropriate for sites for which the projected cleanup cost will be less than \$500,000.

The PE of record that will review the Remedial Action Plan (RAP) for the FDEP is responsible for ensuring that the provisions of this memo are considered in the development of the cleanup strategy for applicable sites. Attachment A is a form for the PE to complete to verify for the file record that consideration has been given to the strategies described below. PEs performing reviews of sites in the Preapproval Program for which the cleanup cost is expected to surpass \$500,000 are expected to complete the Attachment A form and file the form with the RAP Approval Order as a permanent record.

### **Identification of Candidate Sites**

The Department's Remedial Action Initiative requires that all preapproval program sites for which a RAP or major RAP modification will be prepared to have a pre-RAP conference to discuss and conceptualize certain aspects of the remediation strategy prior to preparation of a RAP. In preparation for the pre-RAP meeting, the PE representing the DEP as well as the PE representing the preapproval contractor should review the site assessment to make a tentative determination as to whether the cleanup may exceed \$500,000. If the cleanup is expected to exceed \$500,000 this memo and the checklist attached to this memo (Attachment A) should be used to identify elements of this guidance which may have applicability to the development of a cleanup strategy for the site. These concepts should be discussed at the pre-RAP meeting and a consensus should be reached at the pre-RAP meeting between the design engineer and the Department staff as to whether the cleanup will in fact likely exceed \$500,000 and which elements of this memo, if any, will be applied to the remedial strategy. A determination should also be made as to whether supplemental assessment may be necessary for implementing those elements.

**Alternative Closure Options (Part 1 of Checklist)**

The NFA provisions of Chapter 62-770, FAC, allow for a number of procedures or methods to establish alternative CTLs for soil, or to demonstrate that other means of soil contamination analysis may be used in lieu of cleaning up to the default CTLs. Some of these procedures (Level I Risk Management Options) do not result in the need for institutional controls on the property when the cleanup is complete. These techniques can be considered for any site cleanup but it is particularly important that they be given thorough consideration for the difficult and costly cleanup sites that are the subject of this memo. Generally, consideration of these techniques will require a greater frequency of soil samples to be collected for laboratory analyses and additional analysis techniques such as TRPH "fractionation" (AKA - speciation), Synthetic Precipitation Leaching Procedure (SPLP), and determination of site-specific soil properties to calculate site-specific soil CTLs. The options and strategies to be considered are identified in the draft Level I Risk Management Options flow chart of Chapter 62-770, FAC, and in Part 1 of the Attachment A checklist.

**Phased Approach to Remediation (Part 2 of Checklist)**

Sites with extensive areas of contamination and difficult cleanup challenges may benefit substantially from a phased approach to remediation. Reevaluation of the cleanup strategy between phases may allow for a more efficient overall approach to remediation, resulting in substantial savings when compared with the immediate implementation of an attempt at a comprehensive cleanup. For high-cost cleanups, the costs for preparation of RAPs, RAP Modifications, and other reports, as well as remobilization for implementation of different phases of remediation or supplemental assessment, may be relatively small compared to the overall cost of the cleanup activities. As a result, the iterative approach to remediation with periodic reconsideration of the overall strategy may ultimately result in substantial savings. For less costly remediation projects the administrative costs for additional site evaluation, supplemental assessment mobilizations and remedial design events under a phased approach are more difficult to recoup in cleanup cost savings. As stated in the introduction to this guidance, except for phases consisting of source removal followed by monitoring to assess effectiveness of the initial phase, a phased approach to remediation should generally only be proposed in situations in which the projected cleanup cost for the site will surpass \$500,000.

There is a mistaken belief that a RAP must propose the immediate implementation of a comprehensive strategy that will result in complete cleanup of the site to the CTLs for soil and groundwater. It is acceptable instead for the initial RAP to propose a phased approach with contingencies to evaluate the measured benefits of the previous phase(s) and reconsider the course of remediation after each phase. In such a RAP, detailed design information is only necessary for the initial phase that will be implemented. Subsequent phases may be proposed to the FDEP as RAP Modifications to be approved separately. The consultant submitting the RAP, and the FDEP PE conducting the review and approval, should modify the professional certification and the introductory paragraph of the RAP Approval Order to reflect the phased strategy and the limited cleanup objectives of the initial phase of remediation.

**Source Removal (Excavation) Considerations (Part 3 of Checklist)**

Commonly the first phase of remediation, which should be considered at sites for which this guidance is applicable, may be a soil source removal (excavation) followed by a limited monitoring period to evaluate the effectiveness of the initial phase. This may be an appropriate proposition on site cleanups projected to be less than \$500,000 as well as the more costly cleanups. The following clarifications are intended to dispel misconceptions regarding such a remediation strategy:

- Soil source removals are not necessarily all or nothing propositions. Substantial benefits may be gained by limited removal of the most highly contaminated soil in the location where the discharge occurred. Such source removal may allow reduction of contaminant concentrations by natural attenuation of **both soil and groundwater** in other areas of the site. Therefore, a proposal to excavate only a portion of the soil that exceeds soil CTLs is an acceptable component of a phased approach to remediation. A combination of lines of evidence should be examined to develop the most effective scope of source removal of the initial phase, including soil OVA screening results, laboratory soil analyses results, the location of the original source of the discharge, the existence of a smear zone at the groundwater interface, and the extent and degree of groundwater contamination relative to the soil contamination. The objective of the initial phase of soil source removal should be to maximize the mass of petroleum contamination removed per unit volume of soil removed, and thus optimize the effectiveness of the source removal.
  
- Soil source removal, or other remediation method, does not need to be implemented immediately if logistical impediments to implementing a cost-effective cleanup strategy exist that will be removed at an established future date. The most notable example is the instance of substantial source soil contamination located beneath an existing petroleum storage system. The most effective strategy may be to remove the storage system to perform a source removal; however, such a strategy may rely on the party responsible for the storage system to agree to upgrade the system ahead of schedule. The option and possible advantages of upgrading the system early should be evaluated in the RAP and this alternative presented to the responsible party for consideration. (See Attachment B form letter to present option to responsible party for consideration.) A misconception exists that if the responsible party declines the opportunity to upgrade the system early it is necessary to design and install an in-situ remediation system immediately to attempt to clean up the site regardless of how inefficient or costly compared with an alternative that involves a source removal. If the facility will be upgraded at a future known date, and the plume is stable and no receptors are being affected, a reasonable strategy may be to monitor the site until the time of system upgrade. A RAP with the primary source area beneath an existing petroleum storage system should therefore present costs for at least the following three alternatives:

- 1) Perform soil source removal in conjunction with early system upgrade followed by monitoring of natural attenuation. The cost breakdown should identify costs to the responsible party as well as costs to the FDEP to implement this alternative.
- 2) Monitor the site (usually quarterly the first year and semiannually thereafter) until the time of the scheduled system upgrade, at which time a soil source removal in conjunction with the system upgrade will be performed. The FDEP allowable costs under this alternative are limited to the source (soil) removal, and dewatering (including treatment or disposal of recovered water) if it is demonstrated a larger scope of dewatering is necessary for the source removal than would otherwise be necessary for the system upgrade.
- 3) Install and operate an in situ remediation system immediately in an attempt to remediate the site without first removing the source material beneath the storage system.

#### **Long Term Natural Attenuation Monitoring (Part 4 of Checklist)**

For sites with difficult cleanup challenges due to lithology and/or depth to groundwater, which limit the probability of success with in situ remediation technologies, consideration needs to be given to inclusion of long term natural attenuation monitoring as a remediation option in the RAP evaluation. After an initial period of operation of a treatment system at such sites, the site limitations may result in the continued operation of the in situ remediation system removing a relatively small amount of contaminant mass per unit expenditure of cleanup funds. Because the annual cost of long term natural attenuation monitoring is significantly less than operating an in situ remediation system, and natural attenuation also eliminates contaminant mass and reduces concentrations in groundwater, natural attenuation monitoring may be a more cost-effective solution at these sites after an initial attempt at strategic removal of source mass. An objective of the initial phase of the remediation strategy should be to optimize the removal of source mass and to reduce or eliminate the off-site portion of the contamination plume, if present. A variation of this strategy for sites with extensive areas of contamination is to proceed with cleanup of the more highly contaminated area of the site while performing natural attenuation monitoring of less contaminated areas of the site. This approach may be especially beneficial if a downgradient plume extends beneath structural impediments such as buildings or roadways that will necessitate installation of a separate remediation system or costly horizontal drilling for installation of remediation system recovery wells or transmission lines. Cleanup technologies and remediation closure options continue to evolve and there are good prospects that new and more effective techniques to accomplish site closure may be available in the future to sites that are undergoing longer term natural attenuation monitoring if the natural attenuation monitoring proves to be ineffective.

BPSS-11, Natural Attenuation Evaluation Procedures, includes two evaluation levels which may be conducted to justify natural attenuation as a feasible and cost-effective remediation strategy. The Level 2 evaluation is for sites with concentrations above the Natural Attenuation Default

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Concentrations of Chapter 62-777, FAC, Table V, and/or is expected to take greater than 5 years to achieve CTLs, and therefore a Level 2 natural attenuation evaluation is applicable to these sites. RAPs for sites that falls under the provisions of this memo should include a Level 2 natural attenuation evaluation, either as part of the initial remedial action strategy or as a phase 2 evaluation after an initial remediation phase of source removal and/or reduction of off-site contaminant levels.

Even if long term monitoring is not initially identified as part of the remediation strategy for a site at the time of RAP approval, it may become evident over the course of remediation that in situ remediation has reached diminishing returns of cleanup progress at some point short of achieving CTLs. The FDEP has developed a guidance document titled "Supplement to Milestone Policy - Time to Switch Evaluation Procedures" that may be used to determine when it is appropriate to discontinue active remediation efforts and begin long term natural attenuation monitoring.

Once it is established by a period of monitoring that the groundwater plume is confined to the property boundary, an alternative to continued natural attenuation monitoring that can be considered is No Further Action (NFA) with Conditions. Once a site cleanup is completed by NFA with Conditions, most or all of the site monitoring wells can be abandoned and continued visits to the site to sample monitoring wells can be discontinued. Site owners that agree to such closures do not lose eligibility for program funding. The responsible party for a site that is closed with conditions may request the FDEP to perform supplemental assessment at reasonable frequencies to determine the degree of residual contamination. When it is confirmed that no contamination remains above CTLs the site restrictions may be eliminated and the FDEP will issue a Site Rehabilitation Completion Order without conditions.

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Use of the strategies described above should result in an optimization of limited cleanup funds on the more challenging of the cleanup sites in the petroleum cleanup program, and as a result will allow more effective utilization of funds for other sites waiting for cleanup in priority order.

Please contact me at (850)245-8899 if you have any questions.