



TNRCC REGULATORY GUIDANCE

Petroleum Storage Tank Division

RG - 261

October 1996

SUBJECT: **Operation, Monitoring and Performance of Remedial Systems at LPST Sites**

INTRODUCTION

Remedial systems should be operated in a manner that optimizes both efficiency and effectiveness so that the greatest amount of contamination is removed in the shortest time period at the lowest cost. Therefore, an integral component of any Corrective Action Plan (CAP) is an Operation, Monitoring and Performance (OMP) Plan (please note that OMP replaces the term "Operation and Maintenance (O&M)" that was used in previous guidance documents; O&M and OMP are interchangeable; however, the TNRCC has switched to OMP to incorporate progress monitoring). The OMP Plan is essential for determining remedial system success and attainment of cleanup goals. As of November 8, 1995, the effective date of revised 30TAC Chapter 334, Subchapter D rules, all CAPs submitted to the TNRCC for review and approval **must** include an operation and maintenance plan and a remedial progress monitoring plan to qualify as a complete CAP submittal. For streamlining purposes, these two plans have been combined into one plan, the OMP Plan.

Once the system is approved, installed and operational, the OMP Plan should be implemented and data collected as specified in the plan. At a minimum, **once a year**, the monitoring results and performance evaluation for the system should be submitted to the TNRCC in the reporting format specified in this document.

OMP PLAN

The OMP Plan should be included in a complete CAP (note: the OMP Plan is not a separate document, it is considered a part of the CAP) submitted to the TNRCC for review and should, at a minimum, include the following components:

- M** A monitoring plan for the startup phase, that specifies the type of media to be monitored, monitoring locations and frequencies, constituents to be analyzed, and how samples will be collected.

- M** A monitoring plan for long-term operation, that specifies the type of media to be monitored, monitoring locations and frequencies, constituents to be analyzed, and how samples will be collected.

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- M** A description and schedule of any routine maintenance or equipment replacement/upgrades that may be required.
- M** A description of the steps that will be taken to prevent any discharge excursions and any steps that will be taken in the event that there are any discharge excursions.
- M** A description of how the monitoring data will be used on a frequent and routine basis to evaluate the system's performance.
- M** A description of the steps that will be taken if the monitoring data indicates that the system is not meeting the designed performance criteria as specified in the CAP.
- M** A discussion of how it will be determined if the target goals have been met or optimum mass removal has been achieved with this particular system.
- M** A description of the monitoring and reporting requirements for any discharge permits.

The startup monitoring requirements for selected technologies are presented in Table 1, and the long-term monitoring requirements are presented in Table 2. The monitoring requirements specified in these tables represent the maximum level of effort that will be considered eligible for reimbursement, without further justification. The monitoring requirements specified in these tables are largely based on Environmental Protection Agency (EPA) guidance regarding corrective action plans (see TNRCC document, *Corrective Action Plans*, RG-41) and represent the monitoring believed necessary to adequately evaluate system operation and performance. Therefore, it is recommended that the parameters in Tables 1 and 2 are monitored; however, depending on the size and type of system, it may be appropriate to reduce the monitoring frequencies or number of sampling locations if this information will not directly impact the ability to properly evaluate system performance. The TNRCC will rely on the expertise of the registered corrective action specialist (CAS)/registered corrective action project manager (CAPM) to develop an appropriate OMP Plan for the specific system that will be installed. If the monitoring frequencies in the OMP Plan will be reduced or revised (from the requirements in tables 1 and 2), adequate justification should be presented and the plan will be evaluated on a site-by-site basis.

Routine monitoring of certain parameters should be performed using the appropriate field instruments, such as PIDs, FIDs, and OVAs, wherever possible. Laboratory analyses should be performed as necessary to meet any required operating permits. Additionally, laboratory analyses may be performed no more frequently than once every three months to verify field measurements, except for groundwater treatment systems without specific justification. For groundwater treatment systems, influent and effluent samples may be submitted for laboratory analyses no more frequently than once per month unless more frequent sampling is required under an operating permit.

Monitoring requirements for groundwater extraction and/or treatment systems are not included in tables 1 and 2. The CAS/CAPM should develop appropriate startup and long-term monitoring requirements for the particular site and system, taking into account any site specific operating permit requirements. The Petroleum Storage Tank (PST) Division staff is encouraging groundwater extraction to be used only as an interim containment measure or to enhance the effectiveness and efficiency of an alternative remedial method (i.e. soil vapor extraction, air sparging, bioventing).

Therefore, the use of groundwater extraction and/or treatment and the associated monitoring activities will be evaluated on a site-by-site basis.

If additional monitoring is required beyond what is specified in table 1 or 2 and reimbursement is desired, adequate justification must be provided. If a technology other than those listed in tables 1 or 2 will be proposed, please contact a case coordinator to discuss the proposed monitoring plan. It is important to keep in mind is that both the startup and long-term monitoring plans should be designed to specifically evaluate the success of the remedial system. It is the responsibility of the CAS/CAPM to keep track of the system, to ensure optimum performance, or to shut the system down when not receiving cost-effective or beneficial results.

The costs for the development of the OMP Plan are included in the reimbursable costs for the CAP development and should not be listed separately.

Be advised that groundwater monitoring, when conducted during the remedial action phase, will now be considered part of the OMP activities associated with the remedial system and should be included in the OMP Plan and any work plans and cost proposals for OMP activities. In the past, groundwater monitoring was considered a separate activity from other remedial monitoring even though these activities are all related. Once in the remedial phase, groundwater monitoring should be integrated into the overall OMP Plan and be used to evaluate the system's performance. Therefore, if a remedial system is currently operating at a site, please incorporate the groundwater monitoring activities into the next work plan and/or cost proposal (if reimbursement is desired) for OMP activities. The results of groundwater monitoring will be reported in the annual OMP activities report; therefore, no annual groundwater monitoring report is required once a case reaches the remedial phase.

OMP REPORT

A new reporting form, *Operation, Monitoring and Performance Report (OMPR)* (TNRCC-0696) has been developed for submitting information regarding the implementation of the OMP Plan. The *OMPR* form should be used to document the monitoring results and performance evaluation of the system. The *OMPR* form and supporting documentation (required attachments) must be submitted to the TNRCC, at a minimum, annually for any active remedial system or ongoing remedial actions. An *OMPR* form must be accompanied by a work plan and cost proposal (if reimbursement is desired) for continued system operation or the next appropriate action (i.e. system shutdown, modification, or other action). An *OMPR* form submitted without an attached work plan and cost proposal will be returned to the responsible party without review (unless the site is not eligible for reimbursement or the responsible party indicates that cost preapproval is not desired). If continued operation is proposed, the *OMPR* form should be submitted at least 60 days prior to the expiration of any current span of approved activities to allow the TNRCC adequate time to review the proposed activities. There will be no post-approval of activities. If the system continues to operate or activities are performed without preapproval, any reimbursement claims filed for those costs will only be processed and paid after all other claims for preapproved activities are processed and paid.

When monitoring information is collected for a remedial system, whether it is bi-weekly, quarterly, or annually, the performance of the system should be evaluated to determine if the progress goals and standards of the design criteria are being met. If the monitoring indicates that the goals are not

being met, then adjustments or modifications of the system may be necessary. Modifications may also be necessary if one portion of the contaminant plume meets the cleanup goals or when portions of the plume are not showing the desired progress. Additionally, if monitoring reveals that the cleanup goals have been met or the optimum mass removal has been achieved with this particular system, the system should be shut down in most circumstances, and the overall remedial strategy should be evaluated and revised if necessary or post-remedial verification monitoring should be implemented. The system should be evaluated on a frequent and routine basis, not only when the annual *OMPR* form is prepared. If an *OMPR* form is submitted that indicates that the system did not meet the design criteria or the system did not operate effectively or efficiently for more than three monitoring events, and the system continued to operate under these conditions without modification, adjustment, or reevaluation, then reimbursement of any activities that occurred after those three monitoring events, may be compromised in part or in total. The TNRCC will not reimburse continued ineffective system operation. Therefore, upon evaluation of the monitoring data, at any time during the remedial system's operation, if system modification (repairs, equipment replacement or modifications exceeding \$1,000) or termination is indicated, an *OMPR* form should be submitted with all supporting documentation and a work plan and cost proposal (if reimbursement is desired) for the next appropriate action. If the system is operating effectively and efficiently or repairs, equipment replacement, or modifications less than \$1,000 are performed, the *OMPR* form should be submitted annually.

The *OMPR* form is designed to be used for any type of remedial system. Therefore, **only the appropriate sections of the form should be completed for a particular site.** For example, if no phase-separated hydrocarbons (PSH) are present, the section on PSH recovery data should not be completed. Keep in mind that the entire form may not need to be completed for each site. Additionally, although some of the information requested on the *OMPR* form may also be reported on other TNRCC forms, please provide it again on the *OMPR* form in order to provide the TNRCC with a summary of remedial actions.

The *OMPR* form must be submitted with all supporting documentation. A list of attachments is provided with the *OMPR* form. Be advised that some of the attachments may not be necessary for each particular site, based on the type of technology in use. Submit only the information that applies to the type of system in use at the site. For example, if only soil vapor extraction (SVE) is in use at the site, there will be no groundwater extraction information.

EXISTING REMEDIAL SYSTEMS

Many existing remedial systems, that were designed or installed before the effective date of this guidance, were not designed or constructed with the proper monitoring equipment necessary to meet the requirements set forth in this document. Therefore, if additional equipment or system modifications are necessary to meet the requirements in this document, a work plan and cost proposal should be submitted to the TNRCC to retrofit the existing system. Additionally, an OMP Plan should also be prepared for these existing systems. For sites that are eligible for reimbursement, a maximum of \$500 will be preapproved for the preparation of the OMP Plan for existing remedial systems. (Note: under these circumstances only, the OMP Plan will be a separate document, and will not be included in the CAP. For new remedial systems, the cost for preparing the OMP Plan is included in the preapproved costs for CAP preparation.)

Existing remedial systems with a current preapproval for OMP activities should complete the scheduled activities that were preapproved. However, if it is possible to collect the monitoring data as specified in this document from the existing remedial system, this information should be collected effective immediately. Be advised that additional costs may not be preapproved for monitoring activities that can be incorporated into the regularly scheduled site visits that have already been preapproved. The previously preapproved OMP costs for existing systems includes monitoring that is necessary to determine whether the system is operating effectively and efficiently. The TNRCC believes that many of the monitoring requirements outlined in this document are standard parameters that are covered under the previously preapproved costs for OMP activities. However, the monitoring frequency specified in this document may be more frequent than previously required. Therefore, if additional visits to the site are necessary to perform the required monitoring, an addendum to the previously preapproved OMP activities (that covers only the additional costs that will be incurred) should be prepared and submitted to the TNRCC.

The next scheduled annual report for the OMP activities on an existing system should be completed on the *OMPR* form. The TNRCC realizes that it may not be possible to complete all of the information requested on the *OMPR* form the first time it is submitted for an existing system due to the change in monitoring requirements outlined in this document. Therefore, check the box at the top of the *OMPR* form that asks if this is the first *OMPR* form submitted for this site. This will allow the TNRCC to consider the change to this reporting format. However, an attempt should be made to provide as much of the information as possible.

Many existing systems are currently receiving automatic preapproval for previously approved OMP activities by submitting the *Notice of Continuation of Operation & Maintenance* form (TNRCC-0467). This approach may still be used for existing systems if there will be no increase in OMP costs after implementing any monitoring changes outlined in this document. If the costs associated with the revised OMP activities (based upon this guidance document) exceed the previously approved OMP costs, a work plan and cost preapproval form in accordance with *Preapproval for Corrective Action Activities* (RG-111), should be submitted instead of a *Notice of Continuation of Operation & Maintenance* form (TNRCC-0467).

GROUNDWATER MONITORING AT EXISTING SITES

When a remedial system is operating at a site, the groundwater monitoring activities are now considered a part of the OMP activities. Currently, most sites will have two separate preapprovals that cover two different time periods, one for groundwater monitoring and one for OMP activities. In order to transition these two activities into one (only OMP activities), the following approach should be followed.

The current preapproval for OMP activities will dictate the preapproval time period. When the current OMP preapproval expires, the new preapproval request should include the groundwater monitoring activities. Additionally, an annual groundwater monitoring report (if more than one monitoring event has been conducted) should be submitted to document groundwater monitoring activities conducted up to the date of the new OMP preapproval request. If only one groundwater monitoring event has been conducted up to the date of the new OMP preapproval request, then a *Monitoring Event Summary and Status Report Form* (TNRCC-0013) should be submitted instead of an annual groundwater monitoring report. When the new OMP preapproval request is processed

and approved, the outstanding groundwater monitoring activities that may have been previously approved will be considered void. For example, if a current site with an existing remedial system has received preapproval for OMP activities from January 1996 through December 1996, and another preapproval for groundwater monitoring activities from March 1996 through February 1997, then prior to the expiration of the preapproved OMP activities (preferably at least 60 days), a new OMP work plan and cost preapproval should be submitted that includes groundwater monitoring activities. An annual groundwater monitoring report would be prepared for any monitoring activities conducted from March 1996 up to the date of the new OMP preapproval request. For this example, assuming that the new OMP preapproval request is approved in December 1996, the remaining preapproval for groundwater monitoring activities from December 1996 through February 1997 would be discontinued and considered void.

ADDITIONAL INFORMATION

A copy of the *OMPR* form may be downloaded from the Internet at <http://www.tnrcc.waste/pst/rpr> or may be obtained by calling TNRCC Publications at (512)239-0028 and requesting form TNRCC-0696.

For assistance in preparing OMP Plans and the *OMPR* form, you may obtain a copy of the EPA document, *How to Evaluate Alternative Cleanup Technologies for UST Sites* (EPA 510-B-95-007, May 1995). The TNRCC intends to use this manual as the principle guidance document for CAP and OMP Plan reviews. The forms and guidance developed for CAP and OMP Plan preparation and requirements are based largely upon the information presented in this publication. To obtain the information that you will need to order a copy of this publication, please call the EPA's RCRA/Superfund hot line at 800-424-9346 Monday through Friday from 7:30am to 6:30pm CST.

TABLE 1: STARTUP PHASE MONITORING REQUIREMENTS

<u>Type of System</u>	<u>Monitoring Frequency</u>	<u>What to Monitor</u>	<u>Where to Monitor</u>
Soil Vapor Extraction	Daily (up to 7 days)	! flow	! extraction wells
		! vacuum	! manifold
		! vapor concentrations	! effluent stack
Air Sparging	Daily (up to 7 days)	! sparge pressure	! sparging wellhead
		! flow	! sparge & extraction wells
		! vacuum readings (SVE)	! manifold
		! vapor concentrations (SVE)	! effluent stack
Bioventing	Daily (up to 7 days)	! flow	! extraction wells
		! vacuum	! manifold
		! VOCs, CO ₂ , O ₂	! effluent stack
Biopiles	once a month for first 3 months	! VOCs, CO ₂ , O ₂	! air extracted or collected from the biopile
		! H ₂ S, CH ₄	
Biosparging	Daily (up to 7 days)	! sparge pressure	! sparging wellheads
		! flow	! sparge & extraction wells (if used)
			! manifold
			! extraction wells (if SVE used)
		! vacuum readings	! groundwater & soil vapor monitoring points
		! D.O., CO ₂ , pH	
		! depth to groundwater	! groundwater monitoring wells

TABLE 1: STARTUP PHASE MONITORING REQUIREMENTS - continued

<u>Type of System</u>	<u>Monitoring Frequency</u>	<u>What to Monitor</u>	<u>Where to Monitor</u>
In Situ Bioremediation	Daily (up to 10 days)	! extraction volume	! extraction and injection wellheads or manifolds
		! injection volume	
		! electron acceptor concentration	! monitoring wells
	Every 2 days (up to 10 days total)	! groundwater levels	! monitoring wells
Dual-phase Extraction	Daily (up to 7 days)	! flow	! extraction vents
		! vacuum readings	! manifold
		! vacuum concentrations	! effluent stack
		! CO ₂ , O ₂	! effluent stack

TABLE 2: LONG TERM MONITORING REQUIREMENTS

<u>Type of System</u>	<u>Monitoring Frequency</u>	<u>What to Monitor</u>	<u>Where to Monitor</u>
Soil Vapor Extraction	Once every 2 weeks or once a month	! flow ! vacuum ! vapor concentrations	! extraction vents ! manifold ! effluent stack
	As per guidance	! dissolved constituents of concern	! groundwater monitoring wells
Air Sparging	Once every 2 weeks or once a month	! sparge pressure ! flow ! vacuum readings (SVE) ! vapor concentrations (SVE)	! sparging wellhead ! sparge & extraction wells ! manifold ! effluent stack
	As per guidance	! dissolved constituents of concern	! groundwater monitoring wells
Bioventing	Once every 2 weeks or once a month	! flow ! vacuum ! VOCs, CO ₂ , O ₂	! extraction vents ! manifold ! effluent stack
	As per guidance	! dissolved constituents of concern	! groundwater monitoring wells
Biopiles	Quarterly	! constituents of concern ! bacterial population ! pH, ammonia, phosphorus ! moisture content ! other rate limiting factors	! soil in biopile

TABLE 2: LONG TERM MONITORING REQUIREMENTS - continued

<u>Type of System</u>	<u>Monitoring Frequency</u>	<u>What to Monitor</u>	<u>Where to Monitor</u>
Biopiles (continued)	Quarterly	! VOCs, CO ₂ , O ₂ ! CH ₄ , H ₂ S	! air extracted or collected from the biopile
	Quarterly	! VOCs, particulates	! ambient air around biopiles
	As required for permit	! as specified for permit	! runoff water
	Quarterly	! constituents of concern	! soil beneath biopile
	Annually	! constituents of concern	! groundwater downgradient of biopile
Biosparging	Once every 2 weeks or once a month	! vacuum readings	! extraction wells (if SVE used)
		! vapor concentrations	! effluent stack (if SVE used) ! manifold (if SVE used)
		! sparge pressure and flow	! air sparging wellheads
		! D.O., CO ₂ , pH	! groundwater and soil vapor monitoring points
In Situ Bioremediation	Weekly or once every 2 weeks	! groundwater levels	! monitoring wells
		! extraction & injection flow rates	! extraction & injection wellheads or manifolds
		! electron acceptor concentration, ammonia, phosphate, nitrate, pH & conductivity	! monitoring wells
	Quarterly	! constituent concentrations in soil and groundwater	! extraction, injection & monitor wells ! soil borings

TABLE 2: LONG TERM MONITORING REQUIREMENTS - continued

<u>Type of System</u>	<u>Monitoring Frequency</u>	<u>What to Monitor</u>	<u>Where to Monitor</u>
Dual-phase Extraction	Once every 2 weeks or once a month	! flow-balancing	! extraction vents
		! flow	! manifold
		! vacuum readings	! effluent stack
		! vapor concentrations	
		! CO ₂ , O ₂	
Thermal Desorption	Once at time of excavation	! constituents of concern, TPH	! excavation walls & floor at proposed limit of excavation
	Every 100 cy of feed soil & treated soil	! feed & treated soil	! constituents of concern, TPH
Natural Attenuation	Soil - annually	! representative samples throughout area of concern	! constituents of concern, CO ₂ , O ₂ , temperature, pH
	Groundwater - as per guidance	! minimum 4 wells; 1 upgradient, 3 downgradient. Wells along plume centerline & outside plume boundaries.	! constituents of concern, D.O., CO ₂ , pH, alkalinity, hardness, soluble Fe, redox potential



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