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OFFICE OF
SOLID WASTE AND
EMERGENCY RESPONSE

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MEMORANDUM

SUBJECT: Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions

FROM: James E. Woolford, Director
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TO: Superfund National Policy Managers, Regions 1 – 10
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Purpose

The purpose of this document is to provide guidance for EPA Regions on how to determine when a groundwater restoration remedial action is complete. This guidance recommends evaluating contaminant of concern (COC) concentration levels on a well-by-well basis to assess whether aquifer restoration is complete. In general, to determine that a groundwater restoration remedial action is complete, EPA Regions should use monitoring well-specific conclusions to provide a technical and scientific basis supporting the Agency's conclusion that the groundwater has met and will continue to meet cleanup levels for all COCs in the future.

This document provides guidance to Regional staff regarding how the Agency intends to interpret and implement the National Contingency Plan (NCP) which provides the blueprint for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) implementation. However, this document does not substitute for those provisions or regulations, nor is it a regulation itself. Thus it cannot impose legally binding requirements on EPA, states, or the regulated community, and may not apply to a particular situation based upon the circumstances. Any decisions regarding a particular situation will be made based on the statute and the regulations, and EPA decision-makers retain the discretion to adopt approaches on a case-by-case basis that differ from the guidance where appropriate.

Background

The completion of groundwater response actions under CERCLA is governed in part by the following mandate established by Congress in CERCLA 121 (d)(2)(A):

> ... Such remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act and water quality criteria established under section 304 or 303 of the Clean Water Act, where such goals or criteria are relevant and appropriate under the circumstances of the release or potential release.

The NCP preamble uses both "area of attainment" and "point of compliance"[1] in discussing where groundwater cleanup levels are to be achieved. The NCP preamble sets forth the Agency's policy that for groundwater, "remediation levels generally should be attained throughout the contaminated plume, or at and beyond the edge of the waste management area when waste is left in place."[2]

This guidance is intended to supplement the following existing guidance documents:

- OSWER 9283.1-33, *Summary of Key Existing CERCLA Policies for Groundwater Restoration*, June 2009.
- OSWER 9283.1-34, *Groundwater Road Map: Recommended Process for Restoring Contaminated Groundwater at Superfund Sites*, July 2011.
- EPA/600/R-94/123, *Methods for Evaluating Pump and Treat Performance*, June 1994.

For other groundwater guidances, please refer to the Superfund groundwater website (http://www.epa.gov/superfund/health/conmedia/gwdocs/).

In working with other federal agencies to make groundwater cleanup decisions at sites where the other federal agency is lead for cleanup, EPA regional offices should use the principles highlighted in this document to the same extent as at non-federal facility sites. Section 120(a)(2) of CERCLA provides that all guidelines, rules, regulations, and criteria for preliminary assessments, site investigations, National Priorities List (NPL) listing, and remedial actions are applicable to federal facilities to the same extent as they are applicable to other facilities. It states the following: "No department, agency, or instrumentality of the United States may adopt or utilize any such guidelines, rules, regulations, or criteria which are inconsistent with the guidelines, rules, regulations, and criteria established by the Administrator under this Act."

This guidance should be considered at all CERCLA sites where the Record of Decision (ROD) includes a remedial action objective (RAO) and selects cleanup levels to restore all or part of a contaminated aquifer. This guidance should be considered at sites where groundwater monitoring data indicates that the groundwater restoration remedial action has reached or is close to reaching the RAOs and groundwater cleanup levels selected in the ROD. If groundwater monitoring indicates that the groundwater restoration remedial action has not reached or is not close to reaching the selected cleanup levels, consideration of this guidance may be premature. If analysis of monitoring data indicates that the groundwater restoration remedial action will not achieve the RAOs and associated cleanup levels selected in the ROD, this guidance recommends considering a modification to the selected restoration remedy (e.g., use of a different cleanup technology or an alternative remedial strategy).[3] If a modification to the selected remedy is necessary, this process is discussed in more detail in the

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[1] See 55 FR 8753-8754 (March 8, 1990).

[2] See 55 FR 8753 (March 8, 1990).

[3] Such a modification should be done consistent with the NCP Section 300.430 and OSWER 9200.1-23P, ***Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents***, July 1999. It may be appropriate to include site monitoring reports in the Administrative Record to support the remedy modification or final Agency decision that the remedial action to restore groundwater is complete.

Groundwater Road Map[4] and in the *Groundwater Remedy Completion Strategy* which is under development.

Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions

Groundwater restoration can be a long-term and dynamic process. As a remedial action progresses and site conditions change, the lateral and vertical extent of the contaminated aquifer may change. The groundwater monitoring network normally should be evaluated at an appropriate frequency and spatial density during the remedial action to ensure adequate and accurate evaluation of contaminant concentrations and contaminated aquifer boundary changes over time. In analyzing whether the aquifer has been remediated to cleanup levels selected in the ROD, EPA generally should first consider evaluating contaminant concentrations levels for each COC on a well-by-well basis. The results of the individual well analyses generally will inform a decision on remedial action completion for the contaminated aquifer.

Well-by-well analysis

EPA generally will consider whether a groundwater restoration remedial action is complete by evaluating groundwater data and information gathered during the following two phases at each monitoring well: 1) the remediation monitoring phase; and 2) the attainment monitoring phase. If wells are constructed to sample from multiple discrete depths, data collected from each interval generally should be evaluated separately (i.e., data from different intervals typically should not be analyzed together). These well-specific evaluations generally should be made throughout the lifetime of the remedial action.

For purposes of this guidance:

- The remediation monitoring phase refers to the phase of the remedy where remedial activities are being implemented to reach groundwater cleanup levels selected in a remedy decision document. During this phase, groundwater sampling and monitoring data typically are collected to evaluate contaminant migration and changes in COC concentrations over time. The completion of this phase at a monitoring well typically occurs when the data collected and evaluated demonstrate that the groundwater has reached the cleanup levels for all COCs, as they are stated in the ROD.

- The attainment monitoring phase typically occurs after EPA makes a determination that the remediation monitoring phase is complete. When the attainment phase begins, data typically are collected to evaluate if the well has reached post remediation conditions (i.e., steady state conditions) where remediation activities, if employed, are no longer influencing the groundwater in the well. In general, once the groundwater is observed to have reached post remediation conditions, data are collected and evaluated to confirm completion of the attainment monitoring phase.

The completion of the attainment monitoring phase at a monitoring well typically occurs when contaminant-specific data provide a technical and scientific basis that:

1) The contaminant cleanup level for each COC has been met; and

[4] OSWER 9283.1-34, *Groundwater Road Map: Recommended Process for Restoring Contaminated Groundwater at Superfund Sites*, July 2011.

2) The groundwater will continue to meet the contaminant cleanup level for each COC in the future.

After the attainment monitoring phase is completed for all COCs at a well, EPA should consider the potential future use of the well. In some instances, it may be appropriate to continue monitoring the well, at appropriate intervals, for compliance purposes and ensure the groundwater remedy continues to address the contaminated groundwater. In other circumstances, it may be appropriate to continue the monitoring of the well, for the foreseeable future, to verify the performance of a groundwater or source containment remedy. If the well is no longer needed for monitoring purposes, groundwater sampling typically may be terminated; in these situations, it also may be appropriate to decommission the well.

It is recommended that the conclusions (and basis for these conclusions) for each monitoring well be documented in groundwater monitoring reports. In general, the conclusions in these reports should provide the factual and scientific basis for demonstrating completion of a groundwater restoration remedial action. Groundwater monitoring reports should be maintained in the site file.

Completion Analysis for a Groundwater Restoration Remedial Action

In general, to demonstrate completion of a restoration remedial action, data from each monitoring well should be analyzed independently to determine that cleanup levels for all COCs have been met and that the groundwater will continue to meet cleanup levels for all COCs in the future, in accordance with the CERCLA decision document. Well-specific conclusions should provide a technical and scientific basis supporting the Agency's conclusion that the groundwater has met and will continue to meet cleanup levels for all COCs in the future. To provide a complete restoration evaluation of the lateral and vertical extent of the contaminated aquifer, we do not recommend the use of data analysis tools to compare or aggregate conclusions between wells. For the same reason, if the well is constructed to sample from multiple discrete depths (i.e., intervals), we do not recommend the use of data analysis tools to compare or aggregate conclusions between intervals.

The fate and transport of the contaminants in the subsurface normally are influenced by site-specific factors such as geology, hydrology, contaminant properties, and other site factors that may include outside pumping influences, source control activities, and overlying land use. Therefore, it is also recommended that the well-specific conclusions be evaluated in conjunction with the current conceptual site model to ensure the monitoring well network was sufficient to characterize the lateral and vertical extent of the contaminated aquifer throughout the remedial process.

If the monitoring well-specific conclusions and other site information support a conclusion that the groundwater restoration remedial action is complete in accordance with the decision document(s), this determination typically is documented in the final close out report for the site[5].

As is the case at any site, if at any point in time, the EPA regional office determines that a release or threat of release of a hazardous substance, pollutant or contaminant may pose an unacceptable risk to human health and the environment based on new, previously unknown or other site/contaminant-specific information, it may be appropriate to use CERCLA's broad response authority to address that risk.

[5] OSWER 03210.2-22, *Close Out Procedures for National Priorities List Sites*, May 2011.

Implementation

This memorandum provides guidance for evaluating completion of groundwater restoration remedial actions. For questions related to this guidance, please contact Kate Garufi at garufi.katherine@epa.gov, (703) 603-8827. For questions specific to Federal facilities, please contact Tim Mott at mott.timothy@epa.gov, (703) 603-8807.

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