United States Environmental Protection Agency

Office of Emergency and Remedial Response (5204G)

EPA 540-R-01-007
OSWER No. 9355.7-03B-P
June 2001

Superfund

Comprehensive Five-Year Review Guidance

Office of Emergency and Remedial Response
U.S. Environmental Protection Agency
Washington, D.C. 20460

URL: http://www.epa.gov/superfund/pubs.htm
Superfund Information 1-800-424-9346

Preface

The U.S. Environmental Protection Agency (EPA) is issuing this "Comprehensive Five-Year Review Guidance" to assist EPA Headquarters (HQ), Regional staff, and support agencies responsible for conducting five-year reviews under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This guidance generally is intended to promote consistent implementation of the five-year review process.

Section 121 of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), requires that remedial actions which result in any hazardous substances, pollutants, or contaminants remaining at the site be subject to a five-year review. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) further provides that remedial actions which result in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years to ensure protection of human health and the environment.

The Five-Year Review requirement applies to all remedial actions selected under CERCLA §121. Therefore, sites with CERCLA remedial actions may be subject to a five-year review. Consistent with Executive Order (EO) 12580, other Federal agencies are responsible for ensuring that five-year reviews are conducted at sites where five-year reviews are required or appropriate.

This guidance is designed and intended to:

- Provide an approach for conducting five-year reviews;
- Facilitate consistency across the ten EPA Regions;
- Clarify current policy; and
- Discuss roles and responsibilities of various entities in conducting or supporting five-year reviews.

This guidance supersedes the following directives on five-year reviews:

- Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-02 (May 23, 1991), *Structure and Components of Five-Year Reviews*;
- OSWER Directive 9355.7-02FS1 (August 1991), Factsheet: *Structure and Components of Five-Year Reviews;*

- OSWER Directive 9355.7-02A (July 26, 1994), *Supplemental Five-Year Review Guidance;* and

- OSWER Directive 9355.7-03A (December 21, 1995), *Second Supplemental Five-Year Review Guidance.*

In addition, this guidance updates and supersedes the text regarding five-year reviews in:

- OSWER 9200.1-23P (July 1999), *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents.*

Questions or comments concerning this guidance should be directed to the appropriate EPA Headquarters Regional Center.

The policies and procedures established in this document are intended solely for the guidance of government personnel. They are not intended, and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. The Agency reserves the right to act at variance with these policies and procedures and to change them at any time without public notice.

This document provides guidance to EPA Regions concerning how the Agency intends to exercise its discretion in implementing one aspect of the CERCLA remedy selection process. The guidance is designed to implement national policy on these issues.

Some of the statutory provisions described in this document contain legally binding requirements. However, this document is not a 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 remedy selection decision will be made based on the statute and regulations, and EPA decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. EPA may change this guidance in the future.

Table of Contents

List of Acronyms vii

1.0 OVERVIEW 1-1
1.1 What is the purpose of a five-year review? 1-1
1.2 When are five-year reviews required or appropriate? 1-1
1.2.1 When is a statutory review required? 1-2
1.2.2 When is a policy review appropriate? 1-3
1.2.3 When should five-year reviews be completed? 1-4
1.2.4 When can five-year reviews be discontinued? 1-4
1.3 When does the five-year review period begin? 1-4
1.3.1 What actions first trigger a statutory review? 1-4
1.3.2 What actions first trigger a policy review? 1-5
1.3.3 What are triggers for subsequent statutory and policy reviews? 1-5
1.4 How do five-year reviews apply to a site with multiple operable units? 1-5
1.4.1 How is a multiple operable unit site categorized? 1-5
1.4.2 When is it appropriate to conduct a separate five-year review for different areas of a large and complex site? 1-6
1.4.3 How is a site with pre- and post-SARA RODs categorized? 1-6
1.5 What are some other considerations for five-year reviews? 1-6
1.5.1 Are five-year reviews required for a site that has been deleted or partially deleted from the NPL? 1-7
1.5.2 Are five-year reviews required for a site with a RCRA response? 1-7
1.5.3 How is a site that has an interim or early remedial action handled? . . 1-7
1.5.4 How is a site that has a no action or a no further action ROD handled? 1-8
1.5.5 How is a ROD that includes monitored natural attenuation handled? . 1-8
1.5.6 How is a ROD that includes institutional controls handled? 1-8

2.0 ROLES AND RESPONSIBILITIES FOR EPA, STATES, TRIBES, AND OTHER FEDERAL AGENCIES 2-1
2.1 What are the roles of the lead and support agencies? 2-1
2.1.1 What are the roles of the lead agency? 2-2
2.1.2 What are the roles of the support agency? 2-2
2.2 Who conducts the review at a Fund-financed site? 2-3
2.3 What if a site is an Enforcement-lead site? 2-3
2.4 What if site activities are led by a State or Tribe? 2-3
2.5 What if site activities are led by another Federal agency or department? 2-4
2.5.1 What is the purpose of FFAs at other Federal agency NPL sites? 2-7
2.5.2 What is EPA's role at NPL sites under the jurisdiction of another Federal agency or department? 2-8
2.5.3 What is EPA's role at a non-NPL site under the jurisdiction of another Federal agency or department? 2-8

2.5.4 What are States' roles at non-NPL sites under the jurisdiction of a Federal agency or department? 2-9
2.5.5 What happens when Federal agencies or departments transfer real property? 2-9

3.0 COMPONENTS OF THE FIVE-YEAR REVIEW PROCESS 3-1
3.1 Who is notified when planning the five-year review? 3-1
3.2 How should I develop a review schedule? 3-1
3.3 How should I establish a review team? 3-1
3.4 How should I involve the community? 3-2
3.5 What data do I need to evaluate the remedy? 3-3
3.5.1 How are documents reviewed? 3-4
3.5.2 How should I conduct interviews? 3-4
3.5.3 How should I conduct site inspections? 3-5
3.6 What should I include in Five-Year Review reports? 3-5
3.7 How should I submit a Five-Year Review report? 3-8
3.7.1 How is an EPA-lead report submitted? 3-8
3.7.2 How is a Federal facility-lead report submitted? 3-8
3.7.3 How is a State or Tribal-lead report submitted? 3-8
3.8 What are the annual reporting requirements to EPA Headquarters? . . . 3-9

4.0 ASSESSING THE PROTECTIVENESS OF THE REMEDY 4-1
4.1 Question A: Is the remedy functioning as intended by the decision documents? 4-2
4.1.1 How do I answer Question A for a remedial action that is under construction? 4-3
4.1.2 How do I answer Question A for a remedial action that is operating or completed? 4-3
4.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid? 4-4
4.2.1 How should I check the impact of changes in standards and TBCs? . . 4-6
4.2.2 How should I check the impact of changes in exposure pathways? . . . 4-7
4.2.3 How should I check the impact of changes in toxicity and other contaminant characteristics? 4-7
4.2.4 How should I review RAOs and evaluate their impact? 4-8
4.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy? 4-9
4.4 How should I develop the conclusions of my five-year review? 4-10
4.4.1 How should I identify issues? 4-10
4.4.2 When and how should I develop recommendations? 4-11
4.5 How do I determine protectiveness? 4-13
4.5.1 How do I formulate protectiveness statements? 4-21

Exhibits

Exhibit 1-1: Types of Actions Subject to Five-Year Reviews 1-3
Exhibit 2-1: Typical Roles in the Five-Year Review Process 2-4
Exhibit 2-2: Federal Responsibilities Under Executive Order 12580 2-6
Exhibit 2-3: Federal Facility Agreements and Five-Year Reviews 2-7
Exhibit 3-1: Potential Members of the Five-Year Review Team 3-2
Exhibit 3-2: Notification Requirements for Five-Year Reviews 3-3
Exhibit 3-3: Contents of a Five-Year Review Report 3-6
Exhibit 4-1: Three Questions Used to Determine Whether a Remedy is Protective 4-1
Exhibit 4-2: Example Questions to Determine if Assumptions Upon Which the Remedy was Based Have Changed 4-5
Exhibit 4-3: Example Table for Listing Issues 4-11
Exhibit 4-4: Example Table for Listing Recommendations and Follow-up Actions 4-13
Exhibit 4-5: Examples of Protectiveness Determinations 4-15
Exhibit 4-6: Protectiveness Statements 4-21
Exhibit 4-7: Comprehensive Protectiveness Statements for Sites that Have Reached Construction Completion 4-22

Appendices

Appendix A: Community Involvement A-1
Appendix B: Document Review B-1
Appendix C: Five-Year Review Interviews C-1
Appendix D: Five-Year Review Site Inspection Checklist D-1
Appendix E: Five-Year Review Report Template E-1
Appendix F: Sample Five-Year Review Report F-1
Appendix G: Methods and Examples for Evaluating Changes in Standards and Toxicity . . G-1

[This page intentionally left blank.]

List of Acronyms

AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CA	Cooperative Agreement
CAG	Community Advisory Group
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
CIP	Community Involvement Plan
DOD	Department of Defense
DOE	Department of Energy
EO	Executive Order
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FCOR	Final Close Out Report
FFA	Federal Facility Agreement
FFRRO	Federal Facilities Restoration and Reuse Office
FR	Federal Register
HASP	Health and Safety Plan
IAG	Interagency Agreement
IC	Institutional Control
IRIS	Integrated Risk Information System
LOAEL	Lowest Observed Adverse Effect Level
MCLs	Maximum Contaminant Levels
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
O&M	Operation and Maintenance
OECA	Office of Enforcement and Compliance Assurance
OERR	Office of Emergency and Remedial Response
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PCOR	Preliminary Close Out Report
PRP	Potentially Responsible Party
RA	Remedial Action
RAGS	Risk Assessment Guidance for Superfund

RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
SMOA	Superfund Memorandum of Agreement
SPIM	Superfund Program Implementation Manual
SSC	Superfund State Contract
TAG	Technical Assistance Grant
TBCs	To Be Considereds
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UU/UE	Unlimited Use/Unrestricted Exposure
WasteLan	The Regional database related to CERCLIS

1.0 OVERVIEW

This chapter covers the purpose of five-year reviews, when are reviews required or appropriate, discontinuation of five-year reviews, and triggering actions for five-year reviews. This chapter also discusses the application of the Five-Year Review policy to sites with multiple operable units (OUs), division of large complex sites, pre- and post-Superfund Amendments and Reauthorization Act of 1986 (SARA) sites, Records of Decision (RODs), and deleted or partially deleted sites. You will also find information on Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial actions (RAs), CERCLA remedial actions at sites with Resource Conservation and Recovery Act (RCRA) response, and interim/early remedial actions. Finally, the chapter discusses how no action or no further action RODs, monitored natural attenuation (MNA), and institutional controls (ICs) impact five-year reviews.

1.1 What is the purpose of a five-year review?

The purpose of a five-year review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is or will be protective of human health and the environment. Protectiveness is generally defined in the National Contingency Plan (NCP) by the risk range and the hazard index (HI). Evaluation of the remedy and the determination of protectiveness should be based on and sufficiently supported by data and observations.

1.2 When are five-year reviews required or appropriate?

Five-year reviews should be conducted either to meet the statutory mandate under CERCLA §121(c) or as a matter of EPA policy. Consequently, five-year reviews are classified in this guidance as either "statutory" or "policy." The Five-Year Review requirement applies to all remedial actions selected under CERCLA §121. Regions may also conduct other five-year reviews at their discretion.

You should consider a number of factors when determining whether to conduct a five-year review, as discussed in the following two sections (see Sections 1.2.1 and 1.2.2). In general, five-year reviews are required whenever a remedial action results in hazardous substances, pollutants, or contaminants remaining on site. Under the Agency's interpretation contained in the NCP, the requirement in CERCLA §121(c) is triggered when remaining on-site hazardous substances, pollutants, or contaminants are above levels that allow for "unlimited use and unrestricted exposure." See 40 CFR §300.430(f)(4)(ii).

CERCLA §121(c) states the following:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation*

of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the National Contingency Plan (NCP) (40 CFR §300.430(f)(4)(ii)) which states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

"Unlimited use and unrestricted exposure" (UU/UE) means that the selected remedy will place no restrictions on the potential use of land or other natural resources. In general, if the selected remedy relies on restrictions of land and/or groundwater use by humans and/or ecological populations to be protective, then the use has been limited and a five-year review should be conducted. For example, if a site is cleaned up to an industrial-use level, and/or other types of uses are restricted (*e.g.*, residential use), then, generally, UU/UE is not met. Exhibit 1-1, "Types of Actions Subject to Five-Year Reviews," provides examples of the types of remedial actions subject to statutory and policy reviews.

1.2.1 When is a statutory review required?

CERCLA requires five-year reviews if both of the following conditions are true:

- Upon completion of the remedial action, hazardous substances, pollutants, or contaminants will remain on site[1]; and
- The ROD for the site was signed on or after October 17, 1986 (the effective date of SARA[2]) and the remedial action was selected under CERCLA §121.

---

[1] The general response authority of CERCLA §104(c)(4) applies to both removal and remedial actions. 104(c)(4). Also see 40 CFR §300.430(f)(4)(ii).

[2] Generally, SARA became effective the date it was passed (October 17, 1986). See Pub. L. 99-499, Oct. 17, 1986, 100 Stat. 1672.

Exhibit 1-1: Types of Actions Subject to Five-Year Reviews

If the action/site is . . .	then a review is . . .	and examples of actions or components of actions include . . .
a ***post-SARA*** remedial action that, upon completion, will leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure	required by ***statute***	– waste stabilization, fixation, or encapsulation on site – landfill cap or covers and slurry walls – institutional controls – sediment capping
a ***pre- or post-SARA*** remedial action that, upon completion, will not leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure, **but requires five or more years to complete**	conducted as a matter of EPA ***policy***, until cleanup levels are achieved, allowing unlimited use and unrestricted exposure	– long-term monitored natural attenuation – long-term groundwater pump and treatment – long-term bioremediation of groundwater or soil – other long-term remedies, such as soil washing and land farming – monitored natural recovery (sediments)
a ***pre-SARA*** remedial action that will leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure	conducted as a matter of EPA ***policy***	– waste stabilization, fixation, or encapsulation on site – landfill cap or covers and slurry walls – institutional controls
a ***removal*** **action that takes place at a site on *the NPL*** that leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure and **where no *remedial action has or will take* place**	conducted as a matter of EPA ***policy***	– excavation and treatment where hazardous substances, pollutants, or contaminants remain on site above levels that allow for unlimited use and unrestricted exposure

1.2.2 When is a policy review appropriate?

Five-year reviews generally should be conducted as a matter of policy for the following types of actions:

- A pre- or post-SARA remedial action that, upon completion, will not leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure, but requires five years or more to complete;
- A pre-SARA remedial action that leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure; or

- A removal-only site on the NPL where a removal action leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure and where no remedial action has or will take place.

1.2.3 When should five-year reviews be completed?

The first five-year review generally should be completed and signed by the EPA Region within five years of the initial trigger date (see Sections 1.3.1 and 1.3.2). As a matter of policy, you should complete subsequent statutory or policy five-year reviews no later than five years following the signature date of the previous Five-Year Review report. Five-year reviews may be conducted earlier or more frequently than every five years, if needed, to ensure the protection of human health and the environment.

1.2.4 When can five-year reviews be discontinued?

Five-year reviews may no longer be needed when no hazardous substances, pollutants, or contaminants remain on site above levels that allow for unlimited use and unrestricted exposure. The basis for this finding should be documented in your final Five-Year Review report. When you make this determination prior to the first five-year review, you should record it in a document subject to public comment, such as a Proposed Plan or a Notice of Intent to Delete. When notice of five-year review discontinuation is given in a document other than a Five-Year Review report, the Region should submit a memorandum, signed by the Regional Administrator or his/her designee, to Headquarters. The memorandum should provide the reason for not conducting five-year reviews and cite the document in which this decision was made and supported.

1.3 When does the five-year review period begin?

The initiation or trigger date that starts the five-year review period depends upon whether the review is categorized as statutory or policy. However, the review should be completed within 5 years of its trigger date regardless of its category. Lead agencies may choose to conduct a five-year review earlier, or more frequently, than every five years to ensure the protection of human health and the environment. A discussion of the first and subsequent triggers for both statutory and policy review is provided below.

1.3.1 What actions first trigger a statutory review?

In accordance with CERCLA §121 and the NCP, a statutory review is triggered by the initiation of the first remedial action that leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. In cases where there are multiple remedial actions, the earliest remedial action that leaves hazardous

substances, pollutants, or contaminants on site should trigger the initial review, even if it is an interim remedial action.

For the purpose of a five-year review, a remedial action typically is initiated on the date of "actual RA on-site construction" or the "actual RA start" date for Federal facilities. The date of actual RA on-site construction generally corresponds to the date the contractor begins work at a site for the remedial action, typically the date of on-site mobilization. The definition of the "actual RA start" varies as outlined in the Superfund/Oil Program Implementation Manual (SPIM). For remedies where on-site mobilization may not occur, as a matter of policy, the date of the first monitoring event following ROD signature or the ROD signature itself should be used to trigger the five-year review period.

1.3.2 What actions first trigger a policy review?

A policy review initially should be triggered by the date that construction is completed at a site. The date of construction completion is generally the date of the Preliminary Close Out Report (PCOR) or the date of the Final Close Out Report (FCOR) for sites that do not have a PCOR. The PCOR or FCOR date also triggers the initial five-year review at NPL removal-only sites.

1.3.3 What are triggers for subsequent statutory and policy reviews?

After completion of the first statutory or policy five-year review, the trigger for subsequent reviews is the signature date of the previous Five-Year Review report. For reviews led by other Federal agencies, States, or Tribes, and where EPA has a concurrence role, the trigger for subsequent reviews corresponds to EPA's concurrence signature date of the preceding Five-Year Review report (see Sections 3.7.2 and 3.7.3).

1.4 How do five-year reviews apply to a site with multiple operable units?

Five-year reviews for sites with multiple OUs, as a matter of policy, should address all OUs and remedial actions that have been initiated at the time of the review, except for situations as described in Section 1.4.2. At the Regions' discretion, the five-year review may also include and consider areas of a site where no remedial action has been selected or initiated.

1.4.1 How is a multiple operable unit site categorized?

Five-year reviews for multiple OU sites can be categorized as either statutory or policy. As a matter of policy, a site is subject to a statutory review if any one of its initiated remedial actions is subject to a statutory review. A site is subject to a policy review if no initiated actions are subject to a statutory review and at least one action is subject to a policy review.

1.4.2 When is it appropriate to conduct a separate five-year review for different areas of a large and complex site?

At some large and complex sites, individual OUs, or groups of OUs, may have been treated as separate sites throughout the remedial process. Under these circumstances, Regions may continue to treat these areas separately and conduct individual five-year reviews for each area. Each five-year review should include the status and protectiveness determination of the five-year reviews conducted for the other areas of the entire site. Regions may choose to combine the separate reviews of different areas into a single five-year review prior to, or following, construction completion for the entire site. However, no area should be reviewed later than five years after its trigger date or previous review.

Actions within each area may trigger its respective statutory or policy review. However, in cases where site-wide construction completion will not be achieved for an extended period of time, the initial trigger date for a policy review should correspond to the date that physical construction is complete at the area under consideration. The Region should establish this date on a site-specific basis which should be based on the signature date of the Interim or Final RA Report.

1.4.3 How is a site with pre- and post-SARA RODs categorized?

At sites where there are both pre- and post-SARA RODs, the pre-SARA remedial actions are subject under this policy to post-SARA Five-Year Review procedures. For example, suppose a pre-SARA remedial action initially is subject to a policy review because hazardous substances, pollutants, or contaminants are permanently left on site above levels that allow for unrestricted use and unlimited exposure. If a post-SARA ROD is signed for that same site, a five-year review should be conducted, unless the post-SARA ROD selects a remedy that removes all on site hazardous substances, pollutants, or contaminants including the hazardous substances, pollutants, or contaminants left on site by the pre-SARA action. In such cases, the original five-year review schedule should be maintained as a matter of policy. If no schedule has been established, the post-SARA trigger should be utilized.

1.5 What are some other considerations for five-year reviews?

This section discusses other considerations (*i.e.*, deletions, RCRA responses, interim and early remedial actions, no action or no further action RODs, monitored natural attenuation, and institutional controls) that may affect the need for and conduct of five-year reviews.

1.5.1 Are five-year reviews required for a site that has been deleted or partially deleted from the NPL?

It is EPA's policy that the Five-Year Review requirement is independent of and unaffected by the deletion process.[3] Consistent with the NCP, a site can be deleted or partially deleted from the NPL once the deletion criteria have been satisfied. If a site has been deleted or is in the process of being deleted, your Five-Year Review report should address the status of any deletion action. Five-year reviews continue as needed after deletion.

1.5.2 Are five-year reviews required for a site with a RCRA response?

In 1996, EPA established a policy to defer some CERCLA cleanup activities to the RCRA program. The policy is outlined in the memorandum "Coordination Between RCRA Corrective Action and Closure and CERCLA Site Activities."[4] This policy allows site managers to defer cleanup activities for all or part of a site from CERCLA to RCRA (or vice versa). If a site is deferred to RCRA prior to being placed on the NPL, or is deleted from the NPL prior to the selection of the remedy and deferred to RCRA for corrective action, you do not need to conduct a five-year review.

In cases where full deferral is not appropriate, it is possible that both RCRA and CERCLA authorities will be used to address a site. When a RCRA action is included as a part of a CERCLA action, the RCRA action should be included in the five-year review as a matter of policy, if a five-year review is required or appropriate.

1.5.3 How is a site that has an interim or early remedial action handled?

Regions should conduct five-year reviews for interim or early actions selected under CERCLA §121 consistent with Section 1.2 of this guidance.[5] For instance, Regions should conduct a review if an alternate water supply is installed and hazardous substances, pollutants, or contaminants remain on site above levels that allow for unlimited use and unrestricted exposure. If a subsequent action reduces the hazardous substances, pollutants, or contaminants on site to

---

[3] In 1991, EPA clarified its policy on whether a site deleted from the NPL is subject to a five-year review. See "Notice of Policy Change," 56 FR 66601 (December 24, 1991). In appropriate circumstances, a site does not need to be kept on the NPL solely for the purposes of conducting five-year reviews (See 55 Fed Reg at p. 8699).

[4] The memorandum "Coordination Between RCRA Corrective Action and Closure and CERCLA Site Activities" was issued by Steven A. Herman, Assistant Administrator, Office of Enforcement and Compliance Assurance, and Elliott P. Laws, Assistant Administrator, OSWER (September 24, 1996).

[5] Interim and Early actions are defined in Chapter 8 in *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and other Remedy Selection Decision Documents*. EPA 540-R-98-031, OSWER 9200.1-23P (July 1999)

levels that allow unlimited use and unrestricted exposure, then reviews may be discontinued (see Section 1.2.4).

1.5.4 How is a site that has a no action or a no further action ROD handled?

Consistent with Section 1.2, Regions should conduct a five-year review for a remedy where a no action or no further action ROD leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. For example, as a matter of policy Regions should conduct a review for an NPL site with a no action ROD where a removal-only action leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure, or where groundwater monitoring or other types of monitoring of contamination above action levels is the only remedial action selected. However, no five-year review may be needed when monitoring is used only to verify absence of contamination.

1.5.5 How is a ROD that includes monitored natural attenuation handled?

CERCLA §121 remedies relying on monitored natural attenuation or natural attenuation may be subject to five-year reviews consistent with Section 1.2. If monitored natural attenuation is included in a no action or a no further action ROD, then that ROD is not considered to be no action or no further action and therefore, Regions may need to conduct a five-year review, consistent with this guidance.

1.5.6 How is a ROD that includes institutional controls handled?

Institutional controls may be part of remedies selected under CERCLA §121 and consistent with Section 1.2 of this guidance may be subject to five-year reviews.[6] If institutional controls are included in a no action or a no further action ROD, and protectiveness relies on the institutional control, then that ROD is not considered to be no action or no further action and therefore, Regions may need to conduct a five-year review.

---

[6] Regions should refer to OSWER 9355.0-74FS-P, dated September 2000, entitled *Institutional Controls: A Site Manager's Guide to identifying, evaluating and selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups* for further information on institutional controls and remedy selection.

2.0 ROLES AND RESPONSIBILITIES FOR EPA, STATES, TRIBES, AND OTHER FEDERAL AGENCIES

This chapter discusses the roles and responsibilities of U.S. Environmental Protection Agency (EPA), other Federal agencies, State agencies, and Tribes, in conducting five-year reviews. As a general matter, for remedies selected under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121, except at non-NPL Federal facility sites, EPA has the ultimate authority for determining whether a remedy subject to the Five-Year Review requirements in CERCLA §121(c) is protective. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) addresses, in general, the involvement of State agencies and Tribes in CERCLA actions in 40 CFR §300.515 and §300.520. Finally, CERCLA §120 and Executive Order (EO) 12580[7] address the responsibilities of Federal agencies in carrying out CERCLA cleanups.[8]

2.1 What are the roles of the lead and support agencies?

Under the NCP, the lead agency provides for the remedial project manager (RPM) "to plan and implement [the] response action;"[9] a response action would include conducting a five-year review. A support agency "furnish[es] necessary data to the lead agency, reviews response data and documents, and provides other assistance."[10] The NCP also encourages appropriate State and Tribal involvement for Fund-financed and Enforcement-lead remedial actions (see 40 CFR §300.515 and §300.520). Where the State or Tribe is the lead agency, the NCP provides that EPA concurrence is needed on remedy selection decisions (see 40 CFR §300.515(e) and §300.520).

The relative roles and responsibilities for lead and support agencies can vary significantly depending on ability, resources, and legal authorities. There are a number of documents that can be used to specify roles and responsibilities of lead and support agencies. Some of these are general in scope, while others are more narrow in scope and apply solely to a specific site. General instruments include Superfund Memoranda of Agreement (SMOAs), Cooperative Agreements (CAs), and Superfund State Contracts (SSCs). Normally, SMOAs are general, non-site-specific agreements that EPA uses to define roles and interactions in conducting a response action. EPA uses CAs to transfer Superfund monies to States or Tribes for response activities. SSCs are used to identify EPA and State or Tribal roles and responsibilities required under

---

[7]Executive Order No. 12580 of January 23, 1987, as amended on August 28, 1996.

[8]As discussed in section 2.4, State enforcement-lead cleanups are not subject to this guidance.

[9]See 40 CFR §300.5.

[10]Id.

CERCLA §104. Site-specific agreements include Consent Decrees, Administrative Orders on Consent, and Federal Facility Agreements (FFAs). If no SMOA, SSC, or CA is available, a letter of agreement should be written to define roles and responsibilities for the five-year review, consistent with the NCP (see 40 CFR §300.515). Wherever possible, the specific roles and responsibilities regarding the conduct of a five-year review should be detailed in a single document to avoid confusion and disputes at a later date.

2.1.1 What are the roles of the lead agency?

The lead agency conducts the five-year review, prepares the Five-Year Review report, and submits the report to the support agency for review and comment. The lead agency is also responsible for conducting community involvement activities and for ensuring that recommendations and follow-up actions identified during five-year reviews are completed. Generally, funding for five-year reviews is provided by EPA for Fund-financed sites, Potentially Responsible Parties (PRPs) for Enforcement-lead sites (through appropriate mechanisms), and by other Federal agencies or departments for Federal facility sites.

Where EPA is the lead agency pursuant to 40 CFR §300.515, the Region should submit a copy of its final Five-Year Review report to EPA Headquarters (HQ) within 10 days of signature, and provide copies to the support agency and site information repositories. Where the State or Tribe is the lead agency, pursuant to 40 CFR §300.515, the State should submit a copy of the final Five-Year Review report to the Region; once the Region has concurred, the Region should provide a copy to EPA HQ within 10 days of signature, to any other support agencies, and to site information repositories. Where another Federal agency or department is the lead agency, pursuant to CERCLA §120 and EO 12580, the Federal agency or department should submit a copy of the final Five-Year Review report to the Region; once the Region has concurred, the Region should provide a copy to HQ within 10 days of signature, to any other support agencies, and to site information repositories.

2.1.2 What are the roles of the support agency?

The role of the support agency is to participate in the review process, if requested, and review and comment on the Five-Year Review report. Where the State or Tribe is the lead agency for a response action (such as conducting a five-year review), the NCP provides that it must obtain EPA's concurrence (see 40 CFR §300.515(e)).

The lead agency should give the support agency an adequate opportunity to participate in the five-year review process and to review and comment on the draft Five-Year Review report before it is finalized. When there is more than one support agency involved, time allowances for review and comment should be the same for all support agencies who choose to participate in the review process. The amount of time that a support agency will have to review the Five-Year Review report should be documented in the SMOA, SSC, CA, or other agreement documents,

but should not be less than review times for other remedy decision documents (see 40 CFR §300.515(h)(3)). The goal should be to resolve any concerns of support agencies before drafting the final report. In any case, the support agency or agencies may provide written comments on the Five-Year Review report. Lead and support agencies should work together throughout the five-year review process to ensure that concerns are resolved in a timely manner, and to the extent practicable, prior to finalizing the Five-Year Review report.

2.2 Who conducts the review at a Fund-financed site?

At Fund-financed sites, the ultimate responsibility for the protectiveness determination rests with EPA. As described in Section 2.1, EPA may be the lead or support agency.

Regions may acquire the services of a contractor or establish agreements with other agencies (*e.g.*, the U.S. Army Corps of Engineers) to perform studies, conduct investigations, and/or develop draft Five-Year Review reports. In all cases, Regions should ensure the quality and completeness of review activities and the content of the final Five-Year Review report.

2.3 What if a site is an Enforcement-lead site?

At CERCLA Enforcement-lead sites, the ultimate responsibility for the quality and completeness of review activities and the content and protectiveness determinations of the Five-Year Review report rests with EPA. As described in Section 2.1, EPA may be the lead or support agency.

At sites in which EPA is the lead agency Regions may acquire the services of a contractor or establish agreements with other agencies (*e.g.*, the U.S. Army Corps of Engineers) to perform studies, conduct investigations, and/or develop draft Five-Year Review reports.

PRPs or PRP-hired contractors may perform certain support activities (*e.g.*, data collection, studies or analysis) according to provisions of an enforceable agreement.

2.4 What if site activities are led by a State or Tribe?

As described in Section 2.1, States and Tribes can be the lead agency in carrying out a five-year review. In those cases, States or Tribes should ensure the quality and completeness of review activities and the content of the final Five-Year Review report, prior to submitting the report to the Region for EPA's concurrence. When a State or Tribe provides EPA with a Five-Year Review report, EPA can choose to concur with the report and protectiveness statements or make its own protectiveness determinations.

Where a State or Tribe conducts a cleanup using its own legal authorities (*e.g.*, State enforcement action under a CERCLA-equivalent State law), the remedy is not selected pursuant to CERCLA §121 and is not subject to the Five-Year Review requirement.

Exhibit 2-1 provides an overview of the typical roles of different parties for each type of response action.

Exhibit 2-1: Typical Roles in the Five-Year Review Process*

If the response action is...	at...	under...	then conducting the review is the responsibility of...	with funding by...	and with the EPA Region...
Fund-financed	a site	CERCLA §121,and CERCLA §104	the lead agency; when the lead agency is a State or Tribe, EPA concurs;	Superfund	making or concurring with the protectiveness determination.
Enforcement -lead	a site	CERCLA §104 and §121, along with a Consent Decree or other enforcement document	the lead agency; when the lead agency is a State or Tribe, EPA concurs. (PRPs may be allowed to provide certain support for five-year reviews);	PRPs	making or concurring with the protectiveness determination.
Other Federal agency or department (*e.g.*, led by Department of Defense, Department of Energy or Department of the Interior)	a Federal facility NPL site	CERCLA §104, §120 and §121, Executive Order 12580, and a Federal Facility Agreement	the respective Federal agency or department	the respective Federal agency or department	making or concurring with the protectiveness determination.
Other Federal agency	a Federal facility non-NPL site	CERCLA §104 and §121, and Executive Order 12580	the respective Federal agency or department	the respective Federal agency or department	commenting on the protectiveness determination (if requested).

Note: * The scenarios presented in the exhibit are not all inclusive. Regions should determine the respective roles in the five-year review process when other circumstances exist. EPA does not have a role in five-year reviews at non-NPL Federal facility sites; however, EPA Regions may comment or be asked to comment on a site-specific basis.

2.5 What if site activities are led by another Federal agency or department?

CERCLA §104, §120, and §121 identify functions and responsibilities vested in the President for undertaking response efforts and coordinating all other efforts at the scene of a

release on or from Federally-owned property (or vessels). The President, in EO 12580, delegates some of these responsibilities to the respective Federal agencies and departments for Federally-owned or Federally-operated facilities over which these lead agencies have jurisdiction, custody, or control.

Therefore, at sites where activities are led by another Federal agency or department, the Federal agency or department has responsibilities for selecting remedies and implementing the remedial actions, and for conducting all required five-year reviews. The Federal agency or department is responsible for planning, coordinating, funding, and conducting five-year reviews and for making protectiveness determinations upon conclusion of each five-year review. Federal agencies or departments are encouraged to have EPA, States, and Tribes participate and comment throughout the five-year review process, as appropriate. Federal agencies or departments are also responsible for initiating resolutions to issues and following up on all recommendations that result from these five-year reviews. Federal agencies or departments may not adopt or utilize guidelines that are inconsistent with EPA's Five-Year Review guidance or certain other EPA guidance, as specified in CERCLA §120(a)(2).

- ***Federal facility sites that are listed on the NPL*** – EO 12580 paragraphs 2(d) and (g) delegate remedial responsibilities to the Department of Defense (DOD) and the Department of Energy (DOE), and to EPA, respectively. In addition, at all Federal facility NPL sites, CERCLA §120 requires Federal agencies or departments to perform remedial investigation and feasability studies (RI/FS) (see CERCLA §120(e)(1)), to enter into Inter-Agency Agreements (IAGs) (frequently called Federal Facility Agreements), and to initiate remedial actions, subject to EPA concurrence. Therefore, five-year reviews are conducted by the Federal agency or department that has jurisdiction, custody, or control, but EPA retains final authority over whether the five-year reviews adequately address the protectiveness of remedies. EPA will either concur with the final Federal agency or department protectiveness determination, or EPA may provide independent findings. Disputes which arise related to protectiveness determinations or independent findings by EPA may be resolved on a site-specific basis through formal dispute resolution procedures, typically established in FFAs. Exhibits 2-2 and 2-3 and Sections 2.5.1 and 2.5.2 discuss Federal facility NPL sites and FFAs in more detail.

- ***Non-NPL Federal facilities*** – EO 12580, paragraphs 2(d) and (e), give remedial responsibilities, and therefore five-year review responsibilities, to the Federal agency or department having jurisdiction, custody, or control. EPA may also be asked to comment, to the extent practical, on five-year reviews or protectiveness determinations at non-NPL Federal facilities. Section 2.5.3 discusses non-NPL Federal facilities in more detail.

Exhibit 2-2 below provides an overview of relevant EO 12580 sections and their applicability.

Exhibit 2-2: Federal Responsibilities Under Executive Order 12580

In EO 12580 section(s)...	the President delegates to...	certain remedial functions and responsibilities in CERCLA section(s)...	and those remedial functions and responsibilities at Federal facilities generally pertaining to...
2(b)	***EPA*** (in consultation with the National Response Team)	121(f)(1)	promulgation of regulations assuring substantial and meaningful State involvement (in initiation, development, and selection of remedial actions to be undertaken in the State).
2(d)	***DOD, DOE,*** (subject to the requirements described in CERCLA §120)	104(a), 104(b), 104(c)(4), and 121	selecting and taking NPL and non-NPL[(1)(2)] remedial actions, which includes both conducting five-year reviews and making protectiveness determinations (with EPA concurrence at NPL sites).
2(e)	***Federal Departments/ Agencies*** (for non-NPL Federal facility sites.)	104(a), 104(b), 104(c)(4), and 121	selecting and taking non-NPL remedial actions, which includes both conducting five-year reviews and making protectiveness determinations.
2(g)	***EPA*** (subject to the above delegations)	104(a), 104(b), 104(c)(4), and 121	selecting and taking NPL remedial actions, which includes conducting five-year reviews and making protectiveness determinations at Fund-lead and Enforcement-lead NPL sites.

Note: [(1)] EPA does not have a role in five-year reviews at non-NPL Federal facility sites; however, EPA Regions may be asked to comment on a site-specific basis.

[(2)] In addition to the EO 12580 delegation of remedy selection and remedial action responsibilities to all Federal agencies and departments for non-NPL Federal facility sites, CERCLA §120(e) establishes remedy selection and remedial action responsibilities for Federal agencies and departments for all Federal facility NPL sites, as well. For example, CERCLA §120(e)(2) requires Federal agencies and departments to enter into NPL IAGs (frequently called FFAs) with EPA (States may participate.) CERCLA §120(e)(4) requires FFAs to address selection of remedies and completion of remedial actions at Federal facility NPL sites. FFAs, where applicable, should specify the procedures to be followed with respect to conducting five-year reviews at Federal facility NPL sites.

The following subsections detail responsibilities for conducting five-year reviews at sites led by other Federal departments and agencies.

2.5.1 What is the purpose of FFAs at other Federal agency NPL sites?

CERCLA §120(e)(2) requires that EPA sign an IAG (frequently called an FFA) with responsible Federal agencies or departments to detail respective roles and responsibilities for remedial actions at NPL sites. CERCLA §120(e)(1) requires Federal agencies or departments to conduct remedial investigations in consultation with EPA and appropriate State authorities at Federal facility NPL sites. Most Federal facility NPL sites will have site-specific roles and responsibilities specified in the FFA. CERCLA §120(e)(4) requires FFAs to include selection of remedies, completion of remedial actions, and arrangements for long-term operation and maintenance of the facility. Therefore, the procedures for conducting five-year reviews and making protectiveness determinations fall within the scope of FFAs. FFAs should specify in detail the procedures governing five-year reviews at Federal facility NPL sites.

OSWER Directive 9320.0-75 (November 29, 1996), "Federal Facilities Streamlined Oversight Directive" reiterates EPA's responsibility for oversight of remedial activities at Federal facility NPL sites. States and Tribes, as regulators, may also have an oversight role, defined in the FFA, at a facility. Exhibit 2-3 describes the topics to be addressed in an FFA.

Exhibit 2-3: Federal Facility Agreements and Five-Year Reviews

CERCLA § 120(e)(2) requires that the relevant Federal agency or department must enter into an FFA (IAG in the statute) with EPA within six months after EPA's review of the Remedial Investigation/Feasibility Study (RI/FS) is completed. States may be signatories to the FFA and under CERCLA §120 (f) must be included in the decision-making process at Federal facility NPL sites. Whenever a Federal facility is located on Tribal lands, the appropriate Tribal government should be involved.

CERCLA §120(e)(4), in the case of schedules, requires that the EPA/DOD and EPA/DOE Model FFA contain procedures for the submission and review of documents, schedules of cleanup activities, and provisions for dispute resolution. Regions should examine FFAs with respect to the performance of five-year reviews to clarify:

- Roles, responsibilities, and milestones;
- Arrangements for long-term operation and maintenance of the facility; and
- Opportunities for public involvement.

For Federal facilities only, EPA considers Five-Year Review reports to be stand-alone primary documents or part of another related primary document that should have an enforceable schedule within the framework of the FFA. Where EPA enters into an FFA, the agreement should include all site-specific Five-Year Review requirements, such as provisions for reviews, public participation, and addressing or resolving issues.

Where the roles and responsibilities for conducting five-year reviews and making protectiveness determinations are not specified in an FFA (for example, the FFA may not have been signed, or it may be silent or unclear with respect to five-year reviews), then the parties should rely on this guidance for fulfilling EPA's obligations under CERCLA §120 and §121, including making protectiveness determinations. Five-year review requirements should be

identified early in the FFA process, so that the parties to the Agreement have clearly defined roles and responsibilities for implementing CERCLA §121(c) with respect to five-year reviews. However, consistent with CERCLA §120(g), FFAs cannot re-delegate EPA's final authority over whether the five-year reviews adequately address the protectiveness of remedies.

2.5.2 What is EPA's role at NPL sites under the jurisdiction of another Federal agency or department?

CERCLA §120 and EO 12580 provide the basis for EPA's oversight role at other Federal agency NPL sites. This role includes the following:

- Assisting in the determination of cleanup remedies or potentially selecting the remedies, in consultation with the lead agency and appropriate State authorities, beginning at the commencement of remedial investigations and feasibility studies;
- Ensuring that Federal agencies or departments appropriately consider all relevant guidance and policies that EPA determines are appropriate;
- Ensuring compliance with signed FFAs; and
- Determining that decisions protect human health and the environment and that such decisions are adequately supported in the Five-Year Review report (whether as a stand-alone primary document or part of a related primary document).

EPA is not responsible for conducting five-year reviews at Federal facility NPL sites. However, EPA's final remedy selection authority at Federal facility NPL sites requires that EPA retain final authority to make protectiveness determinations. Accordingly, EPA will either concur with any protectiveness determinations to ensure protection of human health and the environment, consistent with EPA's statutory and regulatory authorities or EPA may provide independent findings. EPA Regions should review Federal facility NPL Five-Year Review reports (whether as a stand-alone primary document or part of a related primary document) and protectiveness determinations for consistency with this guidance and adequacy of the supporting basis, and should participate or comment throughout the five-year review process, as appropriate.

2.5.3 What is EPA's role at a non-NPL site under the jurisdiction of another Federal agency or department?

EO 12580 paragraphs 2(d) and (e)(1) delegates the authority in CERCLA §104 and §121 to the Federal agencies or departments for selecting and conducting remedial actions addressing releases or threatened releases at sites that are not on the NPL. Consistent with CERCLA §121 and this guidance, Federal agencies or departments should conduct five-year reviews for all CERCLA non-NPL remedial actions that require a review (discussed in Section 1.2.1 of this

guidance). It is EPA's expectation that Federal agencies or departments will also conduct five-year reviews as a matter of policy at sites that would be subject to policy reviews if they were on the NPL (see Section 1.2.2). EPA does not have a statutorily defined role in five-year reviews at non-NPL Federal facility sites. However, where EPA has had active and substantial involvement at a non-NPL Federal facility, or where agencies, States, Tribes, or citizens seek EPA comment on five-year reviews conducted at a non-NPL Federal facility, EPA may, to the extent practicable on a site-specific basis, comment on five-year reviews and protectiveness determinations made by other Federal agencies or departments at non-NPL Federal facilities, and/or provide independent findings, where applicable.

2.5.4 What are States' roles at non-NPL sites under the jurisdiction of a Federal agency or department?

Consistent with CERCLA §120(a)(4), at non-NPL Federal facilities sites, States generally have remedial oversight responsibilities and should be provided with adequate opportunity to participate in the five-year review process and to review the draft Five-Year Review document before it is finalized.

2.5.5 What happens when Federal agencies or departments transfer real property?

In instances of Federal-to-Federal transfer of jurisdiction, custody, or control of real property, the Federal agency or department having initiated CERCLA remedial actions generally should conduct any required or appropriate five-year reviews. Alternatively, the lead agency may assure that reviews are conducted by entering into reliable site-specific agreements with the Federal agency or department gaining control of the property, where those arrangements remain consistent with CERCLA and EO 12580. In instances of deed transfer of Federal property to third parties, the Federal agency or department having initiated CERCLA remedial actions generally should conduct any required or appropriate five-year reviews, unless other reliable site-specific procedures are arranged with the transferee (or others), and those arrangements remain consistent with CERCLA and EO 12580. Generally, however, the ultimate responsibility for conducting five-year reviews should remain with the Federal agency or department that initiated the CERCLA remedial actions.

[This page intentionally left blank.]

3.0 COMPONENTS OF THE FIVE-YEAR REVIEW PROCESS

This chapter discusses components of the five-year review process, including notifying potentially interested parties, developing a review schedule, establishing a review team, involving the community, and signing and submitting the Five-Year Review report. Data and other site-specific information that form the foundation for the technical assessment of the remedy at the time of the five-year review are discussed in this chapter, including data and document review, site interview, site inspection, and components of a Five-Year Review report.

3.1 Who is notified when planning the five-year review?

In the initial planning stages of the five-year review, all potentially interested parties should be notified that the five-year review will be conducted. This notification may include States and/or Tribes, appropriate representatives of the community, local officials, Federal and/or State Trustees for Natural Resources (Trustees)[11], appropriate EPA offices, and the Community Involvement Coordinator (CIC) for the site. Potentially responsible parties should be notified for Enforcement-lead sites.

3.2 How should I develop a review schedule?

You should develop a review schedule to meet the appropriate five-year review date of completion. The review schedule should allow sufficient time for each component of the five-year review process, including document review, site inspection, interviews, the assessment of the protectiveness of the remedy (see Chapter 4), and report development and final submission. You should incorporate into the five-year review schedule appropriate time for internal and inter-agency review and comment periods, community involvement activities, if needed, and finalizing the report with all required signatures.

3.3 How should I establish a review team?

You should determine the appropriate level of assistance and team structure. For some reviews, the project manager may be the only member of the team, consulting with technical experts as necessary. For other reviews, a multi-disciplinary team may be needed to adequately review the protectiveness of the remedy. Once team members are identified their roles should be clearly defined. Communication among team members, agencies, and organizations is critical to ensure that all parties remain informed throughout the entire five-year review process.

---

[11] OSWER Directive 9200.4-22A *CERCLA Coordination with Natural Resource Trustees*, dated July 31, 1997.

Exhibit 3-1 below provides examples of potential team members for a five-year review.

Exhibit 3-1: Potential Members of the Five-Year Review Team

- Project Manager (EPA, State, Tribal, DOD, DOI)
- Regional Biological Technical Assistance Groups (BTAGs)
- Federal and State Natural Resource Trustees
- Community Involvement Coordinator (CIC)
- State and/or local regulatory agency representatives
- Tribal representatives
- TAG representatives and/or community representatives
- Other Federal agency representatives (*e.g.*, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Agency for Toxic Substances and Disease Registry, U.S. Geological Survey, National Oceanic and Atmospheric Administration)
- Technical Experts
  - Construction representative
  - Engineers (*e.g.*, civil, geo-technical, structural, chemical, process)
  - Hydrogeologist
  - Chemist
  - Risk assessor
  - Biologist
  - Ecologist/ecological risk assessor
  - Attorney/legal advisor
  - Environmental regulatory specialist

3.4 How should I involve the community?

You should begin working with the site's CIC during the initial planning stages of your five-year review to determine the appropriate level of community involvement. At a minimum, your community involvement activities during the five-year review should include notifying the community that the five-year review will be conducted, notifying the community that the five-year review has been completed, and providing the results of the review to the local site repository (see Exhibit 3-2).

Together with the CIC, you should consider conducting additional community involvement activities at high profile sites, those with significant public interest, and any other sites for which the Region determines a need for additional community involvement activities. This may include notifying local public officials, including the primary local health agency, and the leadership of any relevant neighborhood and civic groups. (For ideas on notifying the public see *Publishing Effective Public Notices*, which is part of the CIC Toolkit (Web address: http://www.epa.gov/superfund/action/community/index.htm).)

In addition to this notification, you may also wish to interview several community members, at least some of whom live or work near the site, to get their views about current site conditions, problems, or related concerns. If there was or is a Community Advisory Group or a

Technical Assistance Grant related to the site, representatives of these groups should be briefed at the outset of the five-year review process, and, if requested, at other appropriate points. You may also want to consider appropriate ways, such as public meetings or an opportunity for submitting written comments, to get broader public involvement. For further information on community involvement during the five-year review process, see Appendix A, "Community Involvement."

Exhibit 3-2: Notification Requirements for Five-Year Reviews

At the beginning: Your notice to the community that a five-year review will be conducted should identify:

- The site name, its location and web address (if available);
- The lead agency conducting the review;
- A brief description of the selected remedy;
- A summary of contamination addressed by the selected remedy;
- How the community can contribute during the review process;
- A contact name and telephone number for further information; and
- The scheduled completion date of the five-year review.

At the end: Your notice to the community that a five-year review has been completed should include:

- The site name, its location and web address (if available);
- The lead agency conducting the review;
- A brief description of the selected remedy;
- A summary of contamination addressed by the selected remedy as provided in the initial notice;
- A brief summary of the results of the five-year review;
- The protectiveness statement(s);
- A brief summary of data and information that provided the basis for determining protectiveness, issues, recommendations, and follow-up actions directly related to the protectiveness of the remedy;
- Location(s) where a copy of the five-year review can be obtained or viewed (including site repositories);
- A contact name and telephone number where community members can obtain more information or ask questions about the results; and
- The date of the next five-year review or a statement and supporting rationale that five-year reviews will no longer be required.

3.5 What data do I need to evaluate the remedy?

Data and other pertinent site specific information that you should review include sampling and monitoring plans and results from monitoring activities, operation and maintenance (O&M) reports or other documentation of remedy performance, including previous Five-Year Review reports. These are the primary bases of the technical analyses and subsequent protectiveness determination(s). The type and quality of data are essential to your five-year review and its findings and conclusions. You may collect these types of data through a variety of means, including document review, interviews, and a site inspection. You also may need to conduct supplemental sampling or collect other data.

3.5.1 How are documents reviewed?

A review of documents is one of the first steps in the five-year review process. You are responsible for gathering all relevant documents, data, and other information in support of the five-year review. Generally, for an initial five-year review, this may require you to evaluate record keeping and the location of pertinent data and information. In cases where records are difficult to obtain, you should establish appropriate record keeping procedures to minimize future efforts needed to gather all necessary documents for subsequent five-year reviews.

Documents should be reviewed to obtain relevant information and data concerning a response action from which to base an assessment of its performance. The scope of the review is dependent on the complexity of the remedy(s) and the stage of remedy construction. You may need to review various documents to obtain the necessary information, including those for remedy decisions (*e.g.*, Records of Decision (RODs), Explanation of Significant Differences (ESDs)), enforcement (*e.g.*, Consent Decrees (CDs), Administrative Orders on Consent (AOCs)), site investigations (*e.g.*, remedial investigation/feasibility study (RI/FS)), design (*e.g.*, remedial design (RD)) and construction (*e.g.*, Preliminary Closeout Reports (PCOR), remedial action (RA) reports), and remedy performance and post-closure. (See Appendix B, "Document Review," for a more complete discussion of document review for the five-year review).

Your review team should be familiar with appropriate site-specific data and information including the items listed below:

- Remedial action objectives and cleanup levels, as specified in the ROD and other decision documents;
- Remedial action design and remedial action construction;
- O&M status;
- Implementation of institutional controls;
- Changes that affect the validity of cleanup levels (*e.g.*, standards identified as Applicable or Relevant and Appropriate Requirements (ARARs), "to be considereds" (TBCs), assumptions about contaminant characteristics and potential exposure); and
- Data supporting the effectiveness of the remedy in meeting cleanup levels and remedial action objectives.

3.5.2 How should I conduct interviews?

Interviews should be conducted, if necessary, to provide additional information about a site's status. The scope of interviews should be tailored to the remedy evaluation on a site-specific basis. Those interviewed may include the site manager; site personnel; Federal, State, and Tribal regulatory authorities; local officials; community action groups or associations;

residents and businesses located near the site; and other pertinent organizations or individuals. At an Enforcement-lead site, the lead agency should conduct the interviews. A Potentially Responsible Party (PRP) generally should not conduct interviews because there is a potential for a conflict of interest (see Appendix C, "Five-Year Review Interviews," for additional information). For Federal facility sites, a State and/or EPA representative may wish to be present at and/or participate in conducting interviews.

3.5.3 How should I conduct site inspections?

Your five-year review should include a recent site inspection. For purposes of conducting site inspections for five-year reviews, "recent" generally means no more than nine months from the expected signature date of the review. The review should be performed by objective parties without bias or preconceived views or conclusions about the remedy and conditions at the site. Site inspections are conducted to provide information about a site's status and to visually confirm and document the conditions of the remedy, the site, and the surrounding area.

At an Enforcement-lead site, the lead agency should conduct the site inspection. A PRP generally should not conduct the site inspection because of the potential for a conflict of interest. At Federal facility sites, a State and/or EPA representative may wish to be present and/or participate in conducting site inspections.

Appendix D, "Five-Year Review Site Inspection Checklist," may serve as your guide for planning and documenting a site inspection for containment, groundwater, and surface water remedies. Using this checklist should aid you in the planning and documentation of the site inspection. Therefore, you may adapt this checklist for other types of remedies or use other site inspection tools and checklists that have been developed by others for this purpose. You can find other checklists by accessing the web site: http://www.frtr.gov/optimization/general/ and clicking on " USACE Remediation System Evaluation Checklists."

3.6 What should I include in Five-Year Review reports?

In your Five-Year Review report, you should present the findings and conclusions of the review, including recommendations, follow-up actions to issues, and protectiveness determination(s). The report should also contain the data and information necessary to support all findings and conclusions.

Where your review only addresses a portion of a site, the report should provide a summary of the status of other operable units (OUs) and/or the remainder of the site. Similarly, for sites where you conduct a separate five-year review for different areas of a large or complex site (see Section 1.4.2), you should provide a summary of the status of the other areas of the site in your Five-Year Review report. Additionally, if you receive written comments on the Five-Year Review report from support agencies and/or the community (*e.g.*, States, Tribes, other

Federal agencies or departments, local governments, citizens, PRPs, other interested parties), you should attach a copy of these comments to the report.

A suggested "Five-Year Review Report Template" and "A Sample Five-Year Review Report" are provided in Appendices E and F, respectively. Exhibit 3-3 summarizes the recommended contents of a Five-Year Review report.

Exhibit 3-3: Contents of a Five-Year Review Report

The following report sections...	should include these topics when appropriate:
I. Introduction	– the purpose of the review – who conducted the review – when the review was initiated and completed – whether it is the first review or a subsequent review at the site – status of other five-year reviews, OUs, and/or areas of the entire site
II. Site Chronology	– dates of major events (such as the initial discovery of contamination, NPL listing, decision and enforcement documents, start and completion of remedial and removal actions, construction completion, and prior five-year reviews)
III. Background	– physical characteristics – land and resource use – history of contamination – initial response – summary of basis for taking action
IV. Remedial Actions	– remedy selection – remedy implementation – system operations/O&M
V. Progress Since Last Review (as applicable)	– protectiveness statements from last review – status of recommendations and follow-up actions from last review – results of implemented actions, including whether they achieved the intended purpose – status of any other prior issues
VI. Five-Year Review Process	– notification of potentially interested parties of start of review – identification of five-year review team members – components and schedule of your five-year review – document review – data review and evaluation – community notification – other community involvement activities – site inspection – site interviews

Exhibit 3-3: Contents of a Five-Year Review Report

The following report sections...	should include these topics when appropriate:
VII. Technical Assessment	*Question A: Is the remedy functioning as intended by the decision documents?* – remedial action performance and monitoring results – system operations/O&M – costs of system operations/O&M – opportunities for optimization – early indicators of potential remedy problems – implementation of institutional controls and other measures *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?* – changes in exposure pathways – changes in land use – new contaminants and/or contaminant sources – remedy byproducts – changes in standards, newly promulgated standards, and TBCs – changes in toxicity and other contaminant characteristics – expected progress towards meeting RAOs – risk recalculation/assessment (as applicable) *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?* – ecological risks – natural disaster impacts – any other information that could call into question the protectiveness of the remedy Summary of Technical Assessment – summary of findings and conclusions related to Questions A, B, and C
VIII. Issues	– issues that were identified during the technical assessment and other five-year review activities (*e.g.*, site inspection) – a determination of whether issues affect current or future protectiveness – a discussion of unresolved concerns or items raised by support agencies and the community (States, Tribes, other Federal agencies or departments, local governments, citizens, PRPs, other interested parties)
IX. Recommendations and Follow-up Actions	– list of any recommendations, including follow-up actions to ensure protectiveness – parties responsible for implementation – agencies with oversight authority – schedule for completion
X. Protectiveness Statement(s)	– protectiveness statement(s) developed at the OU level – protectiveness statement developed for the site as a whole at construction complete sites
XI. Next Review	– statement of when the next review is to be completed, or explanation of why no further five-year reviews are needed

3.7 How should I submit a Five-Year Review report?

The procedures for submitting reports to EPA Regions and Headquarters are described below. This process takes place after all reviews of draft reports, and other interagency reviews are completed, appropriate concurrences and signatures are obtained, and, to the extent practicable, issues are resolved.

3.7.1 How is an EPA-lead report submitted?

A report prepared by EPA is complete when it is signed by the EPA Regional Administrator or his/her designee. The Region should submit one copy of the signed Five-Year Review report to EPA Headquarters within ten days of the signature date. The Region should also place a copy of the report in each site information repository.

3.7.2 How is a Federal facility-lead report submitted?

When a Federal agency or department other than EPA conducts a five-year review, the report should be submitted to the Region for review pursuant to the terms of the Federal Facility Agreement or other authorized agreement. The Region should review the report for accuracy, protectiveness determination/statement, and the basis/support for such determination and consistency with this guidance. The EPA Regional Administrator or his/her designee should issue a memorandum that documents any unresolved items or concerns and either concurs with the report findings or provides EPA's own independent findings and protectiveness determination. Within ten days of the signature date of the memorandum, the Region should forward a copy of the report, with the memorandum attached, to EPA Headquarters, and a copy should be placed in each site information repository.

In some cases, EPA may have minimal involvement at the site or in the development of the Five-Year Review report or protectiveness statements. In such cases, Regions should determine whether to rely solely on the information presented by the other Federal agency or department without independent verification. When the Region relies solely on the representations of another Federal agency or department, the Regional Administrator or his/her designee should note this in the memorandum. It is important to consider who signed the Five-Year Review report at the other Federal agency or department. EPA expects that a Five-Year Review report generally will be signed by the other Federal agency or department at the senior management level.

3.7.3 How is a State or Tribal-lead report submitted?

When a State or Tribe conducts a five-year review, the report should be submitted to the respective Region for review of accuracy, protectiveness determination/statement and the basis/support for such determination and consistency with this guidance. The EPA Regional Administrator or his/her designee should issue a memorandum that documents any unresolved

items or concerns and either concurs with the report findings and protectiveness statement(s) or provides EPA's own independent findings and protectiveness determination. Within ten days after the memorandum is signed, the Region should forward a copy of the report, with the memorandum attached, to EPA Headquarters and a copy should be placed in each site information repository.

3.8 What are the annual reporting requirements to EPA Headquarters?

Each EPA Region should report annually to EPA Headquarters on the progress of the five-year reviews for each of their sites. At a minimum, at the end of each fiscal year each Region should provide to EPA Headquarters the following:

- A list of sites that had five-year reviews due for that fiscal year;
- If a five-year review due date changes for any site, or a site no longer needs a five-year review, identify the sites and the basis for the change or discontinuation;
- A list of those sites where five-year reviews were completed;
- For each completed five-year review, a summary of the protectiveness determination(s), issues that impact protectiveness, follow-up actions, and the schedule and entity responsible for implementing such actions;
- Status of protectiveness when Five-Year Review reports from previous fiscal years made a "not protective" determination or "needed further information" before making a protectiveness determination, or deferred protectiveness; and
- Status of follow-up actions identified in Five-Year Review reports from previous fiscal years.

The exact date for submitting the annual report should be provided at the work planning sessions at the beginning of each fiscal year or through your Headquarters Regional Center contact.

[This page intentionally left blank.]

4.0 ASSESSING THE PROTECTIVENESS OF THE REMEDY

A five-year review should determine whether the remedy at a site is or upon completion will be protective of human health and the environment. The level of effort necessary to conduct a five-year review is site-specific and should be tailored appropriately for the remedial action and its stage of implementation. In general, five-year reviews of remedial actions under construction are narrower in scope than five-year reviews of remedies that have been constructed.

Your technical assessment of a remedy should examine the following three questions, which provide a framework for organizing and evaluating data and information and ensure that all relevant issues are considered when determining the protectiveness of the remedy:

- ***Question A*** – Is the remedy functioning as intended by the decision documents?
- ***Question B*** – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
- ***Question C*** – Has any other information come to light that could call into question the protectiveness of the remedy?

The following sections present Questions A, B, and C in more detail. Exhibit 4-1 summarizes a number of items that you should consider in answering questions A, B, and C in your evaluation of a remedial action.

Exhibit 4-1: Three Questions Used to Determine Whether a Remedy is Protective

When you ask...	you should consider whether...
Question A: Is the remedy functioning as intended by the decision documents?	• performance standards (*e.g.*, cleanup levels, plume containment, pumping rates) are or will likely be met; • there are problems with the remedy that could ultimately lead to the remedy not being protective or suggest protectiveness is at risk (*e.g.*, shrubs or bushes growing on a landfill cap that was designed to have a grass vegetative cover, extent of plume not fully delineated); • access (*e.g.*, fencing, security guards) and institutional controls needed at the particular stage of the remediation are in place and prevent exposure; • other actions (*e.g.*, removals) necessary to ensure that there are no exposure pathways that could result in unacceptable risks have been implemented; and • maintenance activities (*e.g.*, pumping and treating, monitoring slurry walls, mowing cap), as implemented, will maintain the effectiveness of response actions.

Exhibit 4-1: Three Questions Used to Determine Whether a Remedy is Protective

When you ask...	you should consider whether...
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?	• there are changes in standards identified as Applicable or Relevant and Appropriate Requirements (ARARs) in the ROD, newly promulgated standards, and/or changes in TBCs identified in the ROD, that could call into question the protectiveness of the remedy; • there are changes in land use or the anticipated land use on or near the site; • new human health or ecological exposure pathways or receptors have been identified; • new contaminants or contaminant sources have been identified; • there are unanticipated toxic byproducts of the remedy not previously addressed by the decision documents; • there are changes in the physical site conditions; and • there are changes in the toxicity factors for contaminants of concern.
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?	• ecological risks have been adequately addressed at the site, and/or there is a plan to address them through a future action; and • the site is/was subject to natural disasters, such as a 100-year flood.

4.1 Question A: Is the remedy functioning as intended by the decision documents?

In general, to determine if the remedy is functioning as described in the decision documents, you should first consider its implementation status, (*e.g.*, whether the remedy is under construction, operating, or completed). You should also look for available information about the remedy and compare it to the requirements in the decision documents and remedial design/construction specifications. For purposes of this guidance, definitions of remedial actions under construction, operating remedial actions, and completed remedial actions are as follows:

- ***Remedial actions under construction*** are those actions where physical construction has been initiated, but is not yet complete.

- ***Operating remedial actions*** are those actions that are ongoing, but where cleanup levels have not yet been achieved. Such actions typically have remedial components requiring several years to reach cleanup levels (*e.g.*, groundwater and surface water restoration, monitored natural attenuation, soil vapor extraction, and bioremediation).

- ***Completed remedial actions*** are those actions where construction is complete and cleanup levels have been achieved.

4.1.1 How do I answer Question A for a remedial action that is under construction?

In the case where a remedy is under construction, the focus of your review should be to determine if the remedy is being constructed in accordance with the requirements of the decision documents and design specifications, and if the remedy is expected to be protective when it is completed. In addition, you should confirm that access controls (*e.g.*, fencing, security guards) necessary at this stage of the remediation are in place and successfully prevent exposure. If the remedial action includes institutional controls (ICs), then your five-year review should also consider the implementation status of those controls. For example, answer the following questions: Have specific ICs been identified? Are there ICs needed at this stage of remediation to prevent exposure? Who is responsible for implementing ICs? What is the plan, schedule, and current status for IC implementation?

4.1.2 How do I answer Question A for a remedial action that is operating or completed?

Your review of an operating or completed remedial action generally will address more aspects of the remedy implementation than a review of a remedial action under construction. In general, you should assess the following:

- ***Remedial action performance*** – Determine whether the remedial action continues to operate and function as designed (*e.g.*, extent of groundwater plume is well defined and updated plume maps confirm containment), and has achieved, or is expected to achieve, cleanup levels.

- ***System operations/operation and maintenance (O&M)*** – Determine whether maintenance procedures, as implemented, will maintain the effectiveness of response actions. This evaluation might include, but is not limited to, visual inspection of the system and the review and evaluation of monitoring reports (*e.g.*, groundwater data from extraction and monitoring wells, biological monitoring data, discharge requirements, wetland monitoring data, leachate monitoring for containment remedies).

- ***Costs of system operations/O&M*** – Review and consider system operations/O&M costs if they are available. Compare actual/current annual O&M costs to the original cost estimate; large variances from the original cost estimate might indicate potential remedy problems. (Note: This information may not be readily available at Enforcement-lead sites, but should be requested.)

- ***Implementation of institutional controls and other measures*** – Determine whether access controls (*e.g.*, fencing, security guards) and ICs that are needed at this stage of the remediation are in place and successfully prevent exposure. If

ICs are not in place, determine why not, and obtain the schedule for implementation; determine whether other actions (*e.g.*, removals) necessary to ensure that exposure pathways that could result in unacceptable risks have been implemented.

- ***Monitoring activities*** – Determine whether monitoring activities required to ensure the effectiveness of the remedy (*e.g.*, performance and environmental data collected and results evaluated) are being conducted and whether they are adequate to determine the protectiveness and effectiveness of the remedy.

- ***Opportunities for optimization*** – If readily apparent during the course of conducting five-year review activities, identify any opportunities to improve the performance and/or reduce the costs of sampling and monitoring activities and operating treatment systems. If changes in these activities are recommended in the Five-Year Review report, you should also provide the rationale/basis for such changes. If appropriate, your report can also recommend that an optimization study be conducted.

- ***Early indicators of potential remedy problems*** – Investigate and identify problems that could lead to the remedy being not protective or suggest protectiveness is at risk unless changes are made. Problems could include frequent equipment breakdowns or replacement, or large variances in operating costs (if cost data are available). Some examples of indicators of potential remedy problems could include erosion and/or subsidence of a cap, trend analysis of sampling data showing no decrease in contaminant levels, monitoring data showing evidence of leachate migration, or that the extent of the groundwater contamination plume exceeds the outer reaches of the monitoring network.

4.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?

In conducting your five-year review, you should evaluate the effects of significant changes in standards and assumptions that were used at the time of remedy selection. Changes in the promulgated standards or "to be considereds" (TBCs) may impact the protectiveness of the remedy. Similarly, you should investigate the effect of significant changes in the risk parameters that were used to support the remedy selection, such as reference doses, cancer potency factors[12], and exposure pathways of concern. Finally, you should evaluate whether the original assumptions regarding current and future land/groundwater uses and contaminants of concern are

[12] Note that risk parameters in EPA publications such as the Integrated Risk Information System (IRIS) (see http://www.epa.gov/IRIS) are guidance only, and should be applied only as appropriate for the remedy being reviewed.

still valid, and whether any physical features (or understanding of physical sites conditions) have changed (*e.g.*, changes in anticipated direction or rate of groundwater or identification of a new groundwater divide). All of these factors may have a bearing on the validity of the remedial action objectives and may affect the protectiveness of the remedy.

Exhibit 4-2 presents a series of example questions that you should consider in determining whether the exposure assumptions and toxicity data used at the time of remedy selection are still valid and, if you determine that they are no longer valid, whether they call into question the protectiveness of the remedy. Exhibit 4-2 also groups the questions according to the type of assumption.

Exhibit 4-2: Example Questions to Determine if Assumptions Upon Which the Remedy was Based Have Changed

For an assumption based on ...	an example question may be...
standards and TBCs	Are there changes in the standards identified as ARARs in the ROD that bear on the protectiveness of the remedy? Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy? Are there changes in TBCs identified in the ROD that bear on the protectiveness of the remedy?
cleanup levels	What is the basis for each cleanup level identified in the ROD (*e.g.*, risk-based or promulgated standards as ARARs)? Have there been changes to the basis of the cleanup levels? (See sample questions for "standards or TBCs" above, and for "toxicity and other contaminants characteristics" below.)
exposure pathways	Has land use or expected land use on or near the site changed (*e.g.*, industrial to residential, commercial to residential)?
exposure pathways	Have any human health or ecological routes of exposure or receptors changed or been newly identified (*e.g.*, dermal contact where none previously existed, new populations or species identified on site or near the site)?
exposure pathways	Are there newly identified contaminants or contaminant sources?
exposure pathways	Are there unanticipated toxic byproducts of the remedy not previously addressed by the decision documents (*e.g.*, byproducts not evaluated at the time of remedy selection)?
exposure pathways	Have physical site conditions changed such that protectiveness may be affected (*e.g.*, changes in anticipated direction or rate of groundwater flow)? Has understanding of physical site conditions changed (*e.g.*, identification of a new groundwater divide)?
toxicity and other contaminant characteristics	Have toxicity factors for contaminants of concern at the site changed (*e.g.*, Integrated Risk Information System (IRIS) evaluations? (See http://www.epa.gov/IRIS) Have other contaminant characteristics changed? Have ecological toxicity reference values and/or ecological "no observed adverse effect levels/lowest observed adverse effect" (NOAELs/LOAELs) levels changed.

4.2.1 How should I check the impact of changes in standards and TBCs?

Cleanup levels or actions may be based on ARARs identified in the Record of Decision (ROD) (as opposed to calculated site-specific risk, as discussed in Section 4.2.3). For example, the cleanup levels for a groundwater remedy may be based on the Safe Drinking Water Act maximum contaminant levels (MCLs) if these were identified as ARARs in the ROD.

In the preamble to the final National Contingency Plan (NCP), EPA states its policy that it will not reopen remedy selection decisions contained in RODs (*i.e.*, ARARs are normally frozen at the time of ROD signature) unless a "new or modified requirement calls into question the protectiveness of the selected remedy." 55 FR 8757 (March 8, 1990). The preamble goes on to state that "a policy of freezing ARARs at the time of ROD signing will not sacrifice protection of human health and the environment because the remedy will be reviewed for protectiveness every five years, considering new or modified requirements at that point, or more frequently, if there is reason to believe that the remedy is no longer protective of health and environment." 55 FR 8758 (March 8, 1990). The preamble also states that a remedy would not necessarily need to "be modified solely to attain a newly promulgated or modified requirement," but that "newly promulgated or modified requirements contribute to [the] evaluation of protectiveness." 55 FR 8758 (March 8, 1990).

Therefore, although ARARs generally are "frozen" at the time of ROD signature, in conducting a five-year review, you should determine the effect of a newly promulgated or modified standard on the protectiveness of the remedy originally selected in the ROD. You should evaluate the newly promulgated or modified requirement to determine if the cleanup level established in the ROD remains protective. TBCs may also have been used to select cleanup levels. Therefore, you should also review any new or modified TBCs to ensure that any changes will not impact the protectiveness of the remedy.

Generally, you should only consider changes in standards that were identified as ARARs in the ROD, newly promulgated standards for chemicals of potential concern, and TBCs identified in the ROD that bear on the protectiveness of the remedy. As such, you should review any newly promulgated standards, including revised chemical-specific requirements (such as MCLs, ambient water quality criteria), revised action and location-specific requirements, and State standards if they were considered ARARs in the ROD.

In evaluating a change in a standard that was identified as an ARAR in the ROD, or a newly promulgated standard or TBC, you should establish whether the new requirement indicates that the remedy is no longer protective. You should recommend a follow-up action when the remedy is not protective. For example, based on revised risk information for a specific chemical, a new standard (*e.g.*, more stringent MCL for a chemical) may result in a situation where the cleanup level to be achieved by the original remedy would pose a 10^{-3} cancer risk. In that circumstance, the five-year review could recommend that a new cleanup level based on the new

standard be adopted and, if necessary, that the remedy be modified. However, a change in a standard may not necessarily result in a change in the resulting risk and therefore may not always impact protectiveness. An illustration of a method and an example for evaluating changes in standards is provided in Appendix G, "Methods and Examples for Evaluating Changes in Standards and Toxicity," Exhibit G-1, "Evaluating Changes in Standards," Exhibit G-2, "Hypothetical Scenario for a Change in a Standard," and Exhibit G-3, "Decision Process for a Hypothetical Change in Standard."

4.2.2 How should I check the impact of changes in exposure pathways?

You should consider changes in site conditions that could result in increased exposure. These changes could include changed or new land uses, including zoning changes, changed or new routes of exposure or receptors, changed physical site conditions that may affect the protectiveness of the remedy, new contaminants, or a new understanding of geological conditions. In evaluating this information, you should work closely with a risk assessor to establish the impact that such changes may have on the estimated risk associated with your site. Depending on the significance of the changes, it may be necessary for you to recalculate human health risk and re-examine ecological risks. Generally, your human health determination should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects.

In some cases, it may be necessary to revise or expand the previous risk assessment as part of your five-year review. For example, you may need to revise the risk assessment when there is a new exposure pathway, a new potential contaminant of concern, or an unanticipated toxic byproduct of the remedy. In all cases, you should evaluate whether the remedy can mitigate any unacceptable risk or whether additional actions may need to be taken. Your five-year review can also recommend further investigation to determine whether an additional response action is needed.

4.2.3 How should I check the impact of changes in toxicity and other contaminant characteristics?

Cleanup levels at a site may be based on the calculated risk for chemicals and/or media where there are no promulgated standards (*e.g.*, site-specific soil and sediment action levels) or existing standards are not sufficiently protective for site-specific conditions. If the remedy is intended to meet a site-specific, risk-based cleanup level, you should check to see whether toxicity or other contaminant characteristics used to determine the original cleanup level have changed. In addition to toxicity, you should examine other contaminant characteristics that determine the nature and extent of contaminant migration and effects on receptors (*e.g.* sorption characteristics, ability to bioaccumulate, bioavailability). If there have been changes in the understanding or in our knowledge of these physical/chemical characteristics, you may need to recalculate risk using the original cleanup level or using the current concentration if it has not been identified as a contaminant of concern. An increase in the cancer slope factor, for example,

may suggest that the risk from a chemical concentration is above the generally acceptable cancer risk range (10^{-4} to 10^{-6}). You should also consider changes in toxicity and other contaminant characteristics relating to ecological receptors.

You may work with your Region's risk assessor to determine whether there have been changes in toxicity or other contaminant characteristics and whether further investigation is needed. The risk assessor is also familiar with efficient use of the Superfund Technical Support Center and its hotline. One preferred resource for checking changes in toxicity information is EPA's Integrated Risk Information System (IRIS) (http://www.epa.gov/IRIS). However, many contaminants found at Superfund sites are not found in IRIS. You may find it useful to refer to the Superfund Risk Assessment Tools of the Trade page for databases and additional links and pointers (http://www.epa.gov/superfund/programs/risk/tooltrad.htm#gp). Beginning in the summer of 2001, this page should link risk-based concentration tables which provide screening levels for specific exposure scenarios, a risk calculation tool, and should identify recent toxicity data and their sources.

The flowchart presented in Appendix G, Exhibit G-4, "Evaluating Changes in Toxicity and Other Contaminant Characteristics," shows the process you should use to evaluate the significance of changes in toxicity values and other contaminant characteristics when conducting a five-year review. You should first identify any site-specific, risk-based, cleanup levels and investigate relevant changes in contaminant characteristics. If the estimated risk for a contaminant has not changed, your analysis on this point should be complete.

If the estimated risk has increased, then you should determine whether the new estimated risk is acceptable. In most cases, you should base this determination on whether the risk is within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard index is below 1 for non-carcinogenic effects. If the estimated risk is not protective, you should determine what actions need to be taken to achieve an acceptable level of risk. Appendix G, Exhibit G-5, "Hypothetical Scenario for a Change in Toxicity," and Exhibit G-6, "Decision Process for a Hypothetical Change in Toxicity," provide an example of the evaluation process when there are changes in toxicity and other characteristics. Note: Future guidance will address the appropriateness of using various statistical methods in making the determination about when remedial action objectives (RAOs) have been attained.

4.2.4 How should I review RAOs and evaluate their impact?

As part of the five-year review, you should conduct an evaluation of the RAOs stated in the ROD to determine whether the remedy is meeting or will meet RAOs. Depending on the outcome of the evaluation, you may find it necessary to modify the RAOs, modify the remedy, or conduct further response actions. For example, an RAO phrased in terms of "achieving the drinking water standard in ten years" may be significantly affected by a new MCL that establishes a more stringent standard. Conversely, an RAO may be general enough to accommodate a new or modified requirement.

If your evaluation of data indicates that the remedy is not meeting and will not be able to meet the RAO stated in the ROD, then you may need to determine if the remedy is protective and, if not protective, what additional actions are needed. For example, if the risk associated with the cleanup levels currently being achieved by the remedy are within EPA's acceptable risk range, the remedy generally should be considered protective. However, if the remedy will not be able to meet the RAOs, further actions may be needed, depending on the specificity of the original RAOs in the ROD. Your Five-Year Review report should identify such further actions as recommendations and/or follow-up actions.

New site conditions, such as discovery of new contaminants, can also impact the RAOs and remedy protectiveness. During your five-year review, you should evaluate whether the RAOs in the ROD are sufficiently comprehensive to cover any new or changed conditions at a site. If a new condition at the site is not covered by the RAOs, you should recommend further investigation in the Five-Year Review report to determine whether additional response actions are needed.

Further response actions may not necessarily involve additional physical construction activities but could include sampling, studies, and/or investigations. For example, modifying RAOs will require a ROD Amendment, but does not require a physical site activity.

4.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

You should consider any other information that comes to light that could call into question the protectiveness of the remedy. It is expected that most considerations related to the protectiveness of the remedy will be covered by Questions A and B. However, in some instances, there may be other factors about the remedy or the site that you should consider during the review.

Situations to watch for include the following:

- Ecological risks have not been adequately addressed at a site, and there is not a plan to address them through a future action;
- The site, although located entirely above the 500-year flood boundary, was partially inundated by a 100-year flood (which now may require a flood plain redesignation of the region); and
- Land use changes that are being considered by local officials.

If ecological risks have not been adequately addressed at a site, and there is not a plan to address them through a future action, then you may need to address them by conducting a screening ecological risk assessment as part of the Five-Year Review using *Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites*, OSWER

Directive 9285.7-28P (October 7, 1999). The ecological risk assessor on your team can help streamline the process appropriately.

4.4 How should I develop the conclusions of my five-year review?

The conclusions of your five-year review should include: 1) an identification of issues; 2) recommendations and follow-up actions; and 3) a determination of whether the remedy is, or is expected to be, protective of human health and the environment. You should arrive at these conclusions through a technical assessment of the information collected during the document review, data collection, interviews, site inspection, and other activities. Your evaluation should focus on the information collected through answering the three questions shown in Exhibit 4-1. (See Sections 4.1, 4.2, and 4.3, above, for a detailed discussion of how to assess the remedy by answering these three questions.) These conclusions should be documented in the Five-Year Review report as a technical assessment summary.

4.4.1 How should I identify issues?

You should identify all issues that currently prevent the response action from being protective, or may do so in the future. You should document all such issues and follow-up actions needed to ensure the proper management of the remedy in your Five-Year Review report. You should also identify early indicators of potential remedy problems. Early indicators of remedy problems may include operating costs that are greater than originally anticipated. For instance, excessive replacement of pumps or other equipment may indicate the need to reconsider system design or re-evaluate aquifer conditions.

Examples of issues that may be identified in a Five-Year Review report include the following:

- Inadequate access controls (*e.g.*, fencing has been breached, or fencing is not adequate to restrict access);
- Incomplete response action, including ICs (*e.g.*, environmental easements or well restrictions are not in place);
- Inadequate ICs (*e.g.*, well restrictions are in place but are not preventing exposure);
- Response action is not expected to achieve cleanup levels; plume containment has not been confirmed or achieved;
- Cleanup levels are not protective due to changes in chemical characteristics;
- Discharge requirements are exceeded;
- Inadequate operation and maintenance of physical remedial structures (*e.g.*, vegetative cover of cap mowed infrequently);

- Differences found in actual or proposed land use other than those assumed in the selection of the response action;
- RAOs will not be achieved;
- Monitoring is not being completed in a timely manner; and
- Inadequate monitoring activities to determine the protectiveness of the remedy (*e.g.*, the number and location of monitoring wells are not appropriate for monitoring remediation progress of the groundwater contamination plume).

You should describe each issue in sufficient detail so that EPA can appropriately track the progress to resolution. For each issue, you should determine if it currently affects the protectiveness of the remedy or may do so in the future.

Exhibit 4-3 provides an example of a tabular format that you can use to list issues in your Five-Year Review report.

Exhibit 4-3: Example Table for Listing Issues

Issues	Affects Protectiveness (Y/N)	
	Current	Future

4.4.2 When and how should I develop recommendations?

For each issue identified, the Region should document and ensure implementation of recommendations to resolve those issues. These recommendations should be identified along with follow-up actions in your Five-Year Review report. Follow-up actions should be completed to ensure long-term protectiveness of the remedy, or to bring about protectiveness of a remedy that is currently not protective. You may also have follow-up actions where a protectiveness determination cannot be made at the time of the five-year review. In addition, you may wish to make additional recommendations that do not directly relate to achieving or maintaining the protectiveness of the remedy, such as activities related to O&M of the remedy and coordination with other public and government authorities.

The following are types of recommendations that generally are considered appropriate as part of a five-year review:

- ***Provide additional response actions*** – For example, additional response actions may be necessary to ensure protectiveness if new risk information indicates that a remedy is not protective (*e.g.*, a treatment process will not be able to achieve soil cleanup levels). EPA may implement such further response any time pursuant to CERCLA §104 or §106 authority. In your Five-Year Review report, you can recommend further investigation and the implementation of further response actions.

- ***Improve O&M activities*** – For example, when a cap's vegetative cover is not mowed on a regular basis and/or vegetation other than that specified in the remedial construction contract specifications is present, you may recommend that actions be taken to improve compliance with the O&M Manual/Plan. The lack of O&M activities can lead to more serious remedy problems if not addressed. Your Five-Year Review report should recommend that O&M activities be conducted if they currently are not being performed or inadequately conducted and, if needed, expanded, reduced, or terminated. The report should also provide the rationale/basis for any of these recommendations.

- ***Optimize remedy*** – For example, when the limits of a groundwater plume have contracted due to pumping, and some monitoring wells no longer register contamination levels above cleanup levels, it may be appropriate to revise the sampling plan to eliminate these wells from the sampling routine or reduce the frequency of their sampling. It may also be possible to remove specific groundwater extraction wells from service and increase or reduce the pumping rate on others to optimize groundwater remediation. Similarly, it may be possible to remove treatment units that no longer contribute to the achievement of remedial goals.

- ***Enforce access controls and ICs*** – For example, when repeated site trespassing has been observed, you could recommend repair of the fence and an evaluation of the need for additional security measures. When you have evidence that groundwater wells continue to be installed despite well restrictions that are currently in place, you can recommend an evaluation of the need for further enforcement of institutional controls (*e.g.*, prohibit well drilling).

- ***Conduct additional studies or investigations*** – For example, after reviewing and evaluating all available data and information it is apparent that contaminant levels have not decreased as expected in the estimated time frame. Additional information will be needed to determine if the remedy, as is, will be able to achieve remediation goals within the estimated time frame. Other studies may include, but are not limited to, site characterization, ecological assessment,

focused feasibility studies, groundwater modeling, treatability studies, and/or sampling.

For each recommendation, you should identify the party responsible for implementation, the agency with oversight authority, a recommended schedule for implementation and completion, and the impact, if any, on current or future protectiveness. Exhibit 4-4 provides an example of a table that you can use in your Five-Year Review report for documenting both recommendations and follow-up actions.

Exhibit 4-4: Example Table for Listing Recommendations and Follow-up Actions

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
				Current	Future

Regions should track the progress and completion of recommendations and/or followup actions with documentation in the site file, and upon completion update the administrative record in the site information repository. See Section 3.8 for annual reporting responsibilities to EPA Headquarters.

4.5 How do I determine protectiveness?

After addressing Questions A, B, and C, you should be ready to determine the protectiveness of the remedy or remedies at a site and to document the rationale for your determination(s). You should make a protectiveness statement for each OU and an additional, comprehensive site-wide protectiveness statement for those sites that have reached construction completion.

Your determination of whether the remedy remains protective of human health and the environment generally should be based on the answers to Questions A, B, and C and the information obtained in the process of answering them. Although protectiveness generally is defined by the risk range and hazard index (HI), your answers to Questions A, B, and C may identify other factors and issues that may impact the protectiveness of a remedy.

At the end of your technical analysis and evaluation, if the answers to Questions A, B, and C are *yes, yes, and no*, respectively, then your remedy normally should be considered

protective. However, if the answers to the three questions are other than *yes, yes, no,* depending on the elements that affect each question, your remedy may be one of the following:

- Protective;
- Will be protective once the remedy is completed;
- Protective in the short-term; however, in order for the remedy to be protective in the long-term, follow-up actions need to be taken;
- Not protective, unless the following action(s) are taken in order to ensure protectiveness; or
- Protectiveness cannot be determined until further information is obtained. (A time frame should be provided when a protectiveness determination will be made. This should be done through an addendum. If this is the case, your next five-year review should be due five years from the date this report is signed, not the signature date of the addendum).

Even if there is a need to conduct further actions, it does not mean that the remedy is not protective. Normally, the remedy should be considered as not protective when the following occur:

- An immediate threat is present (*e.g.* exposure pathways that could result in unacceptable risks are not being controlled);
- Migration of contaminants is uncontrolled and poses an unacceptable risk to human health or the environment;
- Potential or actual exposure is clearly present or there is evidence of exposure (*e.g.*, institutional controls are not in place or not enforced and exposure is occurring); or
- The remedy cannot meet a new cleanup level and the previous cleanup level is outside of the risk range.

Exhibit 4-5 presents examples of protectiveness determinations. These examples cover only some of the possible situations you may observe at your site but should serve to guide your decision-making.

Exhibit 4-5: Examples of Protectiveness Determinations

1. Remedies Under Construction			
If the remedy involves...	**and you observe in your five-year review that...**	**then your answers to Questions A, B and C should be...**	**and...**
any remedial action under construction	• no changes to site conditions or any other parameters would impact protectiveness	A - Yes B - Yes C - No	the remedy will be protective.
a groundwater pump-and-treat system expected to operate for 30 years with institutional controls to restrict well drilling of groundwater wells	• an MCL for one of the contaminants of concern (COCs) has become more stringent since the ROD was signed; and the risk associated with the previous MCL is now outside of the risk range; • the remedy cannot meet the new standard (even with design modifications); and • ICs are in place,	A - Yes B - No C - No	the remedy is not protective because the remedy is not able to meet the new standard (ARAR) and the previous MCL is outside of the risk range. However, since ICs are in place there are no current exposures. Recommend that follow-up actions be taken to address the new MCL (ARAR) issue.
rerouting of contaminated surface runoff from tailings	• remedy in the ROD did not address ecological risks; • sediment sampling data from adjacent wetlands indicate high levels of heavy metals; • there were dead fish, and land animals with physical abnormalities; or • an ecological risk assessment was not previously conducted,	A - Yes B - Yes C - Yes	defer protectiveness because more information is needed to make a protectiveness determination. Recommend that follow-up actions be taken to address inadequate ecological risk data.

Question A – Is the remedy functioning as intended by the decision documents?
Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

Exhibit 4-5: Examples of Protectiveness Determinations

2. Operating Remedies			
If the remedy involves...	**and you observe in your five-year review that...**	**then your answers to questions A, B and C should be...**	**and...**
any operating remedy	• no changes to site conditions or any parameters under Questions A, B, and C occurred,	A - Yes B - Yes C - No	the remedy is protective.
groundwater pump-and-treat system expected to operate for 15 years with ICs to restrict well drilling	• no well drilling restriction in place as required by ROD; • there is no known current exposure to groundwater, based on site visits, interviews with local officials and residents,	A - No B - Yes C - No	the remedy is considered protective in the short-term, because there is no evidence that there is current exposure. However, in order for the remedy to remain protective in the long-term, ICs restricting well drilling must be put in place.
groundwater pump-and-treat for 20 years; ICs restricting well drilling; RAO: restore groundwater to drinking water standards	• based on data and current groundwater modeling, the RAOs will not be met; • ICs are in place; • the system has been operating for ten years; • there are no changes in standards or contaminant characteristics for COCs; • there are no new standards; • contaminant levels of COCs have leveled off in the last five years; • optimization efforts have not been effective in further decreasing COC levels; • current levels of contamination are within EPA's risk range, however, RAOs have not yet been achieved,	A - No B - No C - No	the remedy is considered protective in the short-term because ICs are in place, and therefore, there is no current or potential exposure. Follow-up actions are necessary to address long-term protectiveness because RAOs are not expected to be met. Recommend that the remedial action objectives may need to be reevaluated and other potential actions be further evaluated.

Question A – Is the remedy functioning as intended by the decision documents?
Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

Exhibit 4-5: Examples of Protectiveness Determinations

If the remedy involves...	and you observe in your five-year review that...	then your answers to questions A, B and C should be...	and...
groundwater pump-and-treat for 10 years; ICs on well drilling; RAO: groundwater restoration to beneficial use	• ICs are in place; • there is a new State MCL for one of the COCs; • the standard (ARAR) in the original ROD is still protective because it is within the same order of magnitude as the new State MCL and remains within EPA's risk range; • there is no current exposure - residents with private wells in the area are on alternate water supply; • the State considers all groundwater to be a potential source of drinking water (However, there is no Comprehensive State Groundwater Protection Plan [CSGWPP]); and • the existing remedy (system) can achieve the new MCL,	A - Yes B - No C - No	the remedy is considered protective because the cleanup levels are still within EPA's risk range and there is no current or potential exposure.

Question A – Is the remedy functioning as intended by the decision documents?
Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

Exhibit 4-5: Examples of Protectiveness Determinations

If the remedy involves...	and you observe in your five-year review that...	then your answers to questions A, B and C should be...	and...
groundwater pump-and-treat for 20 years; ICs restricting well drilling; RAO: groundwater restoration to drinking water standards	• ICs are in place; • new Federal standard for one of the COCs; • the standard (ARAR) in the original ROD is still protective, within EPA's risk range; • no current or potential exposure to groundwater; and • existing remedy can remediate groundwater to the new standard,	A - Yes B - No C - No	the remedy is considered protective because cleanup levels are still within the risk range and there is no current or potential exposure. However, if the new MCL is not met, the groundwater will not meet the RAO of restoration to drinking water standards. Recommend consideration of follow-up actions to address the new standard and the issue of not achieving the RAO. However, in this case, the remedy can meet the new standard, and therefore, another option is to recommend that the new standard be adopted as the new cleanup level, which would then allow you to achieve the original RAOs. Adopting a new cleanup level would have to be done through the remedy decision process with a ROD Amendment or Explanation of Significant Differences (ESD).

Question A – Is the remedy functioning as intended by the decision documents?
Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

Exhibit 4-5: Examples of Protectiveness Determinations

3. Completed Remedies			
If the remedy involves...	**and you observe in your five-year review that...**	**then your answers to questions A, B and C should be...**	**and...**
any remedy that is complete with a five-year review requirement	• there were no changes to site conditions or parameters under questions A, B, and C,	A - Yes B - Yes C - No	the remedy is protective.
capping of 30-acre landfill with ICs to prevent disturbance of cap	• ICs were never put in place; • mowing and cap maintenance activities are ongoing and adequate; • there is no cracking, sliding, settlement of cap or other indicators of cap breaches; and • there is no evidence of an exposure (human or ecological),	A - No B - Yes C - No	the remedy is considered protective in the short-term because there is no evidence of a cap breach and thus no current exposure. However, in order for the remedy to remain protective in the long-term, ICs must be put in place.
groundwater pump-and-treat for 10 years; ICs restricting well drilling; RAO: restore groundwater to drinking water standards; cleanup goals were achieved and RAOs were met (third five-year review is being conducted as a matter of policy in order to facilitate the deletion process)	• there is a new standard for one of the COCs; • Standard in original ROD (ARAR) is now outside of the risk range (due to a change in toxicity); and • ICs are no longer in place because RAOs were met last year,	A - Yes B - No C - No	the remedy is not protective because the standard in the ROD is no longer within the risk range and therefore no longer protective. In addition, the RAO is no longer being met. Recommend follow-up actions necessary to make remedy protective and deletion should not occur until this issue is resolved.

Question A – Is the remedy functioning as intended by the decision documents?
Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

Exhibit 4-5: Examples of Protectiveness Determinations

If the remedy involves...	and you observe in your five-year review that...	then your answers to questions A, B and C should be...	and...
excavation and disposal of top two feet of contaminated soil; ICs prohibiting residential and recreational use of the property; RAO: cleanup site to allow for industrial use; site was deleted three years ago	• ICs are still in place; • the remedy is intact, no physical disturbances, top two feet of clean soil remain undisturbed; and • the local government is considering changing the zoning of the property to allow for recreational use,	A - Yes B - Yes C - No	the remedy is considered to be currently protective. However, should the zoning of the property change to recreational use, the remedy may no longer be protective. Recommend follow-up actions with local officials to ensure that in the event that zoning changes the remedy will remain protective.

Question A – Is the remedy functioning as intended by the decision documents?
Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

4.5.1 How do I formulate protectiveness statements?

You should develop a protectiveness statement for each OU at which a remedial action has been initiated. For sites that have reached construction completion and have more than one OU, you should develop an additional comprehensive site-wide protectiveness statement covering all of the remedies at the site. You should not include this additional protectiveness statement until construction completion because, until then, all remedies at the site may not necessarily have been selected and constructed.

In order to promote consistency, you are strongly encouraged to model your protectiveness statements on the sample protectiveness statements provided in Exhibits 4-6 and 4-7. Your Five-Year Review report should present the protectiveness statements at the beginning of a discussion that should explain and provide the supporting rationale of the protectiveness determination.

Exhibit 4-6: Protectiveness Statements

If the remedial action at the OU is:	then use this statement ...
under construction and...	
protective or will be protective	"The remedy at OU X is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled."
not protective	"The remedy at OU X is not protective because of the following issue(s) (describe each issue). The following actions need to be taken (describe the actions needed) to ensure protectiveness."
protectiveness deferred	" A protectiveness determination of the remedy at OU X cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions (describe the actions). It is expected that these actions will take approximately (insert time frame) to complete, at which time a protectiveness determination will be made."

Exhibit 4-6: Protectiveness Statements

If the remedial action at the OU is:	then use this statement ...
operating or completed and...	
protective	"The remedy at OU X is expected to be protective upon completion or is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled."
protective in the short-term	"The remedy at OU X currently protects human health and the environment because (describe the elements of the remedy that protect human health and the environment in the short term). However, in order for the remedy to be protective in the long-term, the following actions need to be taken (describe the actions needed) to ensure long-term protectiveness."
not protective	"The remedy at OU X is not protective because of the following issue(s) (describe each issue). The following actions need to be taken (describe the actions needed) to ensure protectiveness.
protectiveness deferred	" A protectiveness determination of the remedy at OU X cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions (describe the actions). It is expected that these actions will take approximately (insert time frame) to complete, at which time a protectiveness determination will be made."

Exhibit 4-7: Comprehensive Protectiveness Statements for Sites That Have Reached Construction Completion

If the remedy(ies) is/are ...	then use this statement:
protective	"Because the remedial actions at all OUs are protective, the site is protective of human health and the environment."
not protective	"The remedial actions at OUs X and Y are protective. However, because the remedial action at OU Z is not protective, the site is not protective of human health and the environment at this time. The remedial action at OU Z is not protective because of the following issue(s) (describe each issue). The following actions need to be taken (describe the actions needed) to ensure protectiveness."

Appendix A
Community Involvement

[This page intentionally left blank.]

Community Involvement

This appendix provides a brief discussion about community involvement during the five-year review with a focus on the role of the 40 CFR §300 Community Involvement Coordinator (CIC), community involvement activities, notifying the community, additional recommended activities at high visibility sites, elements of a communications strategy, interviewing members of the community, an example timeline of communication activities, and sources for additional information on community involvement.

What is the role of the Community Involvement Coordinator (CIC)?

The Community Involvement Coordinator (CIC) serves as a public participation and communications advisor. It is his/her job to ensure effective communications with the community. You should consult with the CIC about the most appropriate methods for notifying and involving the community in the five-year review process. The CIC may advise, develop and implement activities designed to notify the community and to involve the community. Part of the community involvement process should involve reviewing the existing Community Involvement Plan (CIP) for the site. The CIP typically describes the history of the site, including any community involvement activities conducted in the past or special needs of the community. Many changes may have taken place in the community since the CIP was last revised or since the last five-year review. For example, the demographics of the community may have changed and new businesses and residents may live in the area. Some residents may speak a language other than English. The CIC can arrange for an interpreter and written materials can be translated into the appropriate language.

When should I begin community involvement activities?

You should begin working with the site's Regional CIC during the initial planning stages of the five-year review to determine the appropriate level of community involvement for the five-year review.

What points should be covered in notifying the community?

At a minimum, community involvement activities during the five-year review should include notifying the community that the five-year review will be conducted and notifying the community when the five-year review is completed. The CIC can recommend appropriate communication vehicles for notifying the public (*e.g.*, publishing a public notice in the newspaper, radio announcement, etc).

The site team should determine the best means for notifying the community that the five-year review process is underway. In some communities, holding an open house or public meeting where community members may stop by and ask questions or pick up fact sheets, brochures, etc., may work effectively. Other activities may include broadcasting a public service

announcement on radio or television and mailing, posting, or handing out a fact sheet. Depending on the nature of the site and the interest in the community, another option for involving the public is to provide a public comment period on the findings of the five-year review.

Notice to the community that a five-year review will be conducted should at a minimum provide:

- The site name, its location and web address (if available);
- The lead agency conducting the review;
- A brief description of the selected remedy;
- A summary of contamination addressed by the selected remedy;
- How the community can contribute during the review process;
- A contact point and phone number for further information; and
- The scheduled date of completion of the five-year review.

Notice to the community that a five-year review has been completed should include some of the information given in the initial notice plus additional information. At a minimum, the notice that a five-year review has been completed should include:

- The site name, its location, and web address (if available);
- The lead agency conducting the review;
- A brief description of the selected remedy;
- A summary of contamination addressed by the selected remedy as provided in the initial notice;
- A brief summary of the results of the five-year review;
- The protectiveness statement(s);
- A brief summary of data and information that provided the basis for determining protectiveness, issues, recommendations, and follow-up actions directly related to the protectiveness of the remedy;
- Location(s) where a copy of the five-year review can be obtained or viewed (including site repositories);
- A contact name and telephone number where community members can obtain more information or ask questions about the results; and
- The date of the next five-year review or a statement and supporting rationale that five-year reviews will no longer be required.

Are there any additional recommended activities that I should consider at high visibility sites?

At high profile sites or those with significant public interest, you should carefully consider methods for informing the community about the review. You should determine if additional or enhanced community involvement activities are appropriate. During the five-year review, active community members may be interested in some or all of the following topics:

- The five-year review process;
- How community members or groups can contribute information about site activities;
- Where to find written documentation about the review;
- What the protectiveness statements mean; and
- What happens after the review is complete, especially if the remedy is found to be not protective.

The CIC and other review team members that have knowledge of the community's needs and interests should be involved in decisions about the level of community involvement and appropriate activities.

What elements should I include when developing a communication strategy?

It is always a good idea to develop a communication strategy for high profile sites. This strategy should:

- Describe the public's concerns and communication needs;
- Identify specific communication activities that you plan to conduct;
- Outline a proposed schedule for these activities, and assign responsibilities for carrying them out; and
- Present expected results.

Consult Section V of the *Superfund Community Involvement Handbook (OSWER Directive 9230.0-94) and Toolkit (OSWER Directive 9230.0-95)* for an example of a communication strategy. This strategy does not need to be added to the official record, and can be as informal or detailed as community needs demand.

How should I approach interviewing members of the community?

In addition to notifying the community about the five-year review, you and the CIC, in conjunction with the site team, should consider interviewing community members (especially those living near the site) to get their views about site conditions and related concerns. If there is a Community Advisory Group or a group with a Technical Assistance Grant related to the site, they should be briefed at the outset of the five-year review process in addition to other interviews you may conduct.

You, the CIC, and other team members should review the community profile in the CIP to obtain useful information about the community, such as business owners or residents living near the site, and the past level of interest from individuals and groups in the community. The CIP can also be a source for identifying other stakeholders who have been active in site activities in the past and who could provide additional information about site conditions.

Other important sources of information are local officials. In many cases, the CIC may be the best person to consult local officials, because they may have met or spoken with them previously and established rapport.

See Appendix C, "Five-Year Review Interviews," for additional information about conducting interviews as part of a five-year review.

What is the timeline for communication activities during a five-year review?

Table 1, "Major Communication Milestones During a Five-Year Review," outlines the major communication milestones during a five-year review and a suggested time frame for conducting communication activities, especially at high profile sites or those with a strong public interest. Consult the *Superfund Community Involvement Handbook and Toolkit* to determine which activities may be best suited for your community at each stage, and for details on the time frame and effort needed for each activity. Activities may be conducted before or at the outset of your five-year review and during or close to the time of the site inspection, depending on the community needs. Activities that you should conduct for all five-year reviews are identified in Table 1 with bolded text.

Table 1: Major Communication Milestones During a Five-Year Review

When you or the CIC...		you should...
Planning the Review and Notifying the Community		
1.	review the existing CIP for potentially helpful information (the CIC should lead this effort),	begin planning immediately, so that if interaction with the community is needed, it is provided up-front.
2.	develop a communication strategy,	prepare a communication strategy before notifying the community. Circumstances and the level of public interest may change throughout the process, so refer to and update the strategy regularly.
3.	**notify the community that the five-year review will begin, using a communication activity appropriate to the specific community,**	notify the community that the five-year review process is beginning before the site inspection.
Consulting the Community		
4.	interview community members to gather additional information about the site,	plan for about one month of coordination and gathering of information, depending on whether contact with the community is via telephone, in person, etc.
Communicating the Results of the Five-Year Review		
When you or the CIC...		**you should...**
5.	plan and conduct additional communication activities tailored to community needs at each site,	plan your activities before releasing the results of the five-year review to the public. Try to complete these activities before the release of the report or within six months after the Five-Year Review report is complete.
6.	**notify the community that the Five-Year Review report is complete, prepare and distribute a brief summary of the results, and place the report in the site information repositories,**	provide this information as quickly as possible after the Five-Year Review report is completed. Consult with the CIC before preparing the summary to determine which communication mechanism is most appropriate to the community's needs.

Note: Bolded activities are required

More Information on Community Involvement

For more information on community involvement activities, please consult the following sources:

- ***The Superfund Community Involvement Handbook (OSWER Directive 9230.0-94) and Toolkit (OSWER Directive 9230.0-95).*** This two-volume handbook and toolkit includes guidance on community involvement policy throughout the Superfund pipeline, including special chapters on working at Federal facilities, risk communication, and multimedia sites. The toolkit components describe and provide over 100 tools that CICs can use to make their jobs easier, such as electronic and hard copy templates for public notices, press releases, fact sheets, communication strategies, etc.

- ***The Superfund Community Tools Home Page.*** There are a number of information resources available on the EPA Web Site. Point your Web browser to http://www.epa.gov/superfund/action/community/index.htm to access the Superfund Community Tools Home Page.

Appendix B
Document Review

[This page intentionally left blank.]

Document Review

The following six sections provide examples of potential documents to be reviewed as part of a five-year review. Each section addresses a different aspect of the document review. Documents commonly reviewed are displayed in a table in each section. Every site is different, so it may be necessary to review additional documents, such as relevant Memoranda of Understanding, to fully understand the remedial actions at a site. The tables and text below should be used as a guide.

- Basis for the Response Action;
- Implementation of the Response;
- Operation and Maintenance;
- Remedy Performance;
- Legal Documentation; and
- Community Involvement.

Basis for the Response Action

Remedy decision documents, and Federal and State laws and regulations, provide the basis upon which the remedy was selected or modified. The documents in the table below identify the background and goals of the remedy and any changes in laws and regulations that may affect the remedy. Other sources of remedy decision information are the Remedial Investigation/Feasibility Study (RI/FS) Report, toxicological and chemical characteristics databases, and transcripts of public meetings.

Non-remedial responses have other types of documentation. For instance, removal actions frequently are documented through an Action Memorandum. You should adapt your review of those documents to the circumstances at your site.

Document	Purpose of Document	Use During the Five-Year Review
Decision Documents – RODs – ROD Amendments – Explanations of Significant Differences – Action Memoranda	– records remedial decision or other actions, and significant changes from the original remedy	– goals of the remedy – background information on the site – basis for action – cleanup levels and applicable or relevant and appropriate requirements (ARARs) – community concerns and preferences

Document	Purpose of Document	Use During the Five-Year Review
Federal Environmental Laws and Regulations	– statutory and regulatory requirements that may affect the judgement as to whether the remedy protects human health and the environment	– changes in standards identified as ARARs in the ROD that provide a basis for cleanup levels/protectiveness of the remedy (only ARARs related to protectiveness need be reviewed) – pertinent laws and regulations promulgated since the signing of the ROD that are potentially applicable or relevant and appropriate and that potentially bear on the protectiveness of the remedy
State Environmental Laws and Regulations	– statutory and regulatory requirements that may affect the judgement as to whether the remedy protects human health and the environment	– more stringent State environmental laws and regulations have the same standing under the National Contingency Plan (NCP) as Federal laws and regulations, and should be reviewed in the same manner when they may call into question whether the remedy protects human health and the environment (the State typically should perform this component of the review)

Implementation of the Response

Implementation documents furnish information about design assumptions, design plans or modifications, and documentation of the completion of construction at operable units (OUs) and the site. Design reports, plans, and specifications are other documents that provide further information.

Document	Purpose of Document	Use During the Five-Year Review
Remedial Action Reports (both interim and final)	– documents that for a single operable unit all construction activities are complete, the remedy is operational and functional, and that cleanup levels have been achieved – Interim Remedial Action Reports are used for long-term actions where cleanup levels have not yet been achieved	– detailed history and status of remedial actions
As-built drawings	– documents changes/modifications to the original design which occurred during the construction	– documentation of completed action and/or implemented remedy

Document	Purpose of Document	Use During the Five-Year Review
Close Out Reports (Preliminary and Final)	– the preliminary report documents that all physical construction for all operable units at a site is complete – the final report documents cleanup levels have been met	– background information and the status of the remedial actions at the site

Remedy Performance

Monitoring data, progress reports, and performance evaluation reports provide information that can be used to determine whether the remedial action continues to operate and function as designed (*e.g.*, extent of groundwater plume is well defined and update plume maps confirm containment), and has achieved, or is expected to achieve, cleanup levels. The data presented in these documents can also provide trend analysis which can be used to determine how well the remedy is performing and how long it will take to achieve remediation goals. These reports can also indicate whether monitoring activities are adequate to ensure the effectiveness of the remedy (*e.g.*, wells in locations that can show contaminant plume is contained and not migrating) and whether these activities are being conducted.

Document	Purpose of Document	Use During the Five-Year Review
Monitoring Information/Records/Progress Reports (information could include air sampling, groundwater monitoring data, survey/settlement monument records, and gas generation records data/performance evaluation)	– records monitoring data and other information, including contaminant levels – trend analysis – containment evaluation	– to check whether contaminant levels are within established criteria – whether cleanup levels will be achieved – (for containment remedies) contaminant plumes are being contained

Operation and Maintenance (O&M)

O&M documents describe the ongoing measures at a site to ensure the remedy remains protective. (Long-term response actions to restore groundwater and surface water during the remedial phase are referred to as "system operations" in this guidance. Although this section refers to O&M documents, similar documents should be reviewed to assess system operations.) They provide the structure for O&M at the site and confirm that O&M is proceeding as planned. O&M documents that may be helpful are the O&M Manual, O&M Plan, the O&M Contract, O&M and Occupational Safety and Health Administration (OSHA) Training Records, permits and service agreements, and access and security logs. Other types of O&M data to be reviewed include permit compliance data such as air or water discharge sampling results, facilities operation data such as treatment train operational records, gas monitoring and leachate collection data, maintenance records and logs, and O&M cost data. These data demonstrate the proper O&M of the remedy.

Document	Purpose of Document	Use During the Five-Year Review
O&M Manual	– contains technical information necessary to operate and maintain the remedy	– purpose and function of the equipment and systems which comprise the overall facility
O&M Reports	– documents O&M activities, data, and costs	– to check whether O&M is proceeding as planned
Discharge Permits and Deviations*	– notes contaminant levels for the discharge permits – notes contaminant levels for deviations	– to check whether the remedy is operating within design parameters

* Permits are not required for actions taken on site. Reviewer should focus on ensuring compliance with substantive requirements of otherwise permitted activities.

Legal Documentation

Legal documentation pertinent to the site may specify responsibilities for conducting remedial actions, implementing institutional and access controls, O&M activities, and performing elements of the five-year reviews.

Document	Purpose of Document	Use During the Five-Year Review
Enforcement Documents – Consent Decrees – Unilateral Administrative Orders – Administrative Orders on Consent	– commitments/ agreements regarding implementation and operation of the remedy, and conduct of studies – access agreements that are needed	– responsibilities of the PRP for conducting remedial activities at various stages of site cleanup – O&M requirements (when these documents are used to enforce the performance of O&M, they may incorporate O&M documents, such as the O&M Manual)
Institutional Controls (deed notices, easements, other conditions, covenants or restrictions on deeds, and groundwater and land use restriction documents)	– means to restrict the use of a parcel or an associated resource, such as groundwater	– status of institutional controls
Superfund State Contracts and Cooperative Agreements	– State assurance letters to conduct O&M – State authorities responsible for O&M – specific O&M requirements – agreements with Indian Tribes	– O&M implementation and reporting requirements – roles of different agencies
Interagency Agreements and Federal Facility Agreements	– responsibilities of other agencies	– O&M guidelines and rules in effect (sometimes other agencies adopt their own guidelines and rules, which must be consistent with those established by EPA)

Community Involvement

The Community Involvement Plan (CIP) may give you a better understanding of the history of community involvement, and of other activities at the site. In addition, the CIP may help you identify community members who would be valuable resources during the interview process.

Document	Purpose of Document	Use During the Five-Year Review
Community Involvement Plan	– site communication strategy that specifies outreach activities	– community concerns/issues and identification of appropriate community members for interviews

[This page intentionally left blank.]

Appendix C
Five-Year Review Interviews

[This page intentionally left blank.]

Five-Year Review Interviews

Information gathered from interviews during the site inspection may be key to understanding site status. Interviews should be conducted with various individuals or groups, including the operation and maintenance (O&M) site manager, O&M staff, local regulatory authorities and response agencies, community action groups or associations, site neighbors, and other stakeholders.

When conducting an interview, the interviewer should note the date of the interview, and the name, title, and affiliation of the person interviewed. The interviewer should also indicate whether the interview was conducted at the site, the office, or by phone. Written documentation of the interview should briefly summarize the discussion, address any problems or successes with the implementation of the remedy, and provide suggestions for future reference. Forms to use during interviews are provided at the end of this appendix.

The following tables provide lists of potential individuals to interview and the type of information which may be obtained during the interviews. The potential individuals to be interviewed are categorized by their ability to provide the following types of information:

- Background information;
- State and local considerations;
- Construction considerations; and
- Performance, Operation and maintenance problems.

All of these individuals may be contacted during the five-year review. In most cases interviewing only a few key individuals will provide sufficient information for the review.

Background Information

The individuals listed below may provide information concerning previous and current concerns about the site, influences that affected the remedy decision, and further clarification on decisions made during remedy selection.

Interview	Information Sought
Previous EPA Staff/Management	– staff members may offer insight and clarification on decisions made during remedy selection and implementation
Nearest Neighbors	– neighbors may provide insight into the enforcement of institutional controls, changes in land use, trespassing, and unusual or unexpected activity at the site

Interview	Information Sought
Community Representatives*	– members of the community may provide a broader view of site activities and issues than can be obtained during the site inspection

* Several types of individuals may be interviewed: residents/businesses adjacent to or on the site; residents/businesses within the path of migration; local civic leaders, local officials, Community Advisory Group (CAG), Technical Assistance Grant (TAG) group, and local environmental groups; and other audiences listed in the community profile in the Community Involvement Plan.

Some example interview questions are given below.

1. What is your overall impression of the project? (general sentiment)

2. What effects have site operations had on the surrounding community?

3. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

5. Do you feel well informed about the site's activities and progress?

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

State and Local Considerations

State and local authorities may provide you with information about changes in State laws and regulations and present and prospective land uses and restrictions.

Interview	Information Sought
State Contacts (including those responsible for State water quality, hazardous waste, and environmental health issues)	– changes in State laws and regulations that may impact protectiveness – whether the site has been in compliance with permitting or reporting requirements – information on site activities, status, and issues
Local Authorities (such as police, emergency response or fire departments, and local environmental or planning offices)	– status of institutional controls, site access controls, new ordinances in place, changes in actual or projected land use, complaints being filed, and unusual activities at the site

Some example interview questions are given below.

1. What is your overall impression of the project? (general sentiment)

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

4. Do you feel well informed about the site's activities and progress?

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Construction Considerations

It is important for you to determine the status of construction at the site and to ensure that health and safety concerns are addressed.

Interview	Information Sought
Construction Contractor	– progress of project and changes in design due to field conditions – revisions to the O&M Manual, implementation of the Health and Safety Plan/Contingency Plan – insight into potential O&M problems
Construction Manager	– overview of all contractor construction activities at the site, health and safety issues, site protectiveness during construction, and the quality of the construction
Local Emergency Response Officials	– adequacy of contractor's Health and Safety Plan and the contractor's implementation of the Plan – adequacy of contractor's emergency response duties as outlined in the Contingency Plan or Emergency Response Plan of the Health and Safety Plan

Some example interview questions for remedial actions still under construction are given below.

1. What is your overall impression of the project? (general sentiment)

2. What is the current status of construction (*e.g.*, budget and schedule)?

3. Have any problems been encountered which required, or will require, changes to this remedial design or this ROD?

4. Have any problems or difficulties been encountered which have impacted construction progress or implementability?

5. Do you have any comments, suggestions, or recommendations regarding the project (i.e., design, construction documents, constructability, management, regulatory agencies, etc.)?

Performance, Operation And Maintenance Problems

The following individuals may provide information to you regarding the performance of the remedy and status of O&M at the site so that the team can assess the progress of the implementation and effectiveness of the remedy, and any O&M problems.

Interview	Information Sought
O&M Manager/Operating Contractor	– O&M status of the remedy, compliance with permit and reporting requirements, and complaints filed – effectiveness of the O&M Plan – information about any potential causes for concern about the remedy – progress and performance of the remedy
O&M Staff	– effectiveness of the O&M Manual – information about any potential causes for concern about the remedy – Recommendations for adjusting the mode of operation or optimizing the operations protocol
Remedial Design/Remedial Action Consultant	– original concepts behind the O&M of the remedy – questions about remedial design parameters, expected performance and cost, and changes that have occurred during implementation

Some example interview questions are given below.

1. What is your overall impression of the project? (general sentiment)

2. Is the remedy functioning as expected? How well is the remedy performing?

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

8. Do you have any comments, suggestions, or recommendations regarding the project?

INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date

INTERVIEW RECORD

Site Name:		**EPA ID No.:**	
Subject:		**Time:**	**Date:**
Type: ☐ Telephone ☐ Visit ☐ Other **Location of Visit:**		☐ Incoming ☐ Outgoing	
Contact Made By:			
Name:	**Title:**	**Organization:**	
Individual Contacted:			
Name:	**Title:**	**Organization:**	
Telephone No: **Fax No:** **E-Mail Address:**		**Street Address:** **City, State, Zip:**	
Summary Of Conversation			

Page 1 of _____

[This page intentionally left blank.]

Appendix D
Five-Year Review Site Inspection Checklist

[This page intentionally left blank.]

Five-Year Review Site Inspection Checklist

Purpose of the Checklist

The site inspection checklist provides a useful method for collecting important information during the site inspection portion of the five-year review. The checklist serves as a reminder of what information should to be gathered and provides the means of checking off information obtained and reviewed, or information not available or applicable. The checklist is divided into sections as follows:

I. Site Information
II. Interviews
III. On-site Documents & Records Verified
IV. O&M Costs
V. Access and Institutional Controls
VI. General Site Conditions
VII. Landfill Covers
VIII. Vertical Barrier Walls
IX. Groundwater/Surface Water Remedies
X. Other Remedies
XI. Overall Observations

Some data and information identified in the checklist may or may not be available at the site depending on how the site is managed. Sampling results, costs, and maintenance reports may be kept on site or may be kept in the offices of the contractor or at State offices. In cases where the information is not kept at the site, the item should not be checked as "not applicable," but rather it should be obtained from the office or agency where it is maintained. If this is known in advance, it may be possible to obtain the information before the site inspection.

This checklist was developed by EPA and the U.S. Army Corps of Engineers (USACE). It focuses on the two most common types of remedies that are subject to five-year reviews: landfill covers, and groundwater pump and treat remedies. Sections of the checklist are also provided for some other remedies. The sections on general site conditions would be applicable to a wider variety of remedies. The checklist should be modified to suit your needs when inspecting other types of remedies, as appropriate.

The checklist may be completed and attached to the Five-Year Review report to document site status. Please note that the checklist is not meant to be completely definitive or restrictive; additional information may be supplemented if the reviewer deems necessary. Also note that actual site conditions should be documented with photographs whenever possible.

Using the Checklist for Types of Remedies

The checklist has sections designed to capture information concerning the main types of remedies which are found at sites requiring five-year reviews. These remedies are landfill covers (Section VII of the checklist) and groundwater and surface water remedies (Section IX of the checklist). The primary elements and appurtenances for these remedies are listed in sections which can be checked off as the facility is inspected. The opportunity is also provided to note site conditions, write comments on the facilities, and attach any additional pertinent information. If a site includes remedies beyond these, such as soil vapor extraction or soil landfarming, the information should be gathered in a similar manner and attached to the checklist.

Considering Operation and Maintenance Costs

Unexpectedly widely varying or unexpectedly high O&M costs may be early indicators of remedy problems. For this reason, it is important to obtain a record of the original O&M cost estimate and of annual O&M costs during the years for which costs incurred are available. Section IV of the checklist provides a place for documenting annual costs and for commenting on unanticipated or unusually high O&M costs. A more detailed categorization of costs may be attached to the checklist if available. Examples of categories of O&M costs are listed below.

Operating Labor - This includes all wages, salaries, training, overhead, and fringe benefits associated with the labor needed for operation of the facilities and equipment associated with the remedial actions.

Maintenance Equipment and Materials - This includes the costs for equipment, parts, and other materials required to perform routine maintenance of facilities and equipment associated with a remedial action.

Maintenance Labor - This includes the costs for labor required to perform routine maintenance of facilities and for equipment associated with a remedial action.

Auxiliary Materials and Energy - This includes items such as chemicals and utilities which can include electricity, telephone, natural gas, water, and fuel. Auxiliary materials include other expendable materials such as chemicals used during plant operations.

Purchased Services - This includes items such as sampling costs, laboratory fees, and other professional services for which the need can be predicted.

Administrative Costs - This includes all costs associated with administration of O&M not included under other categories, such as labor overhead.

Insurance, Taxes and Licenses - This includes items such as liability and sudden and accidental insurance, real estate taxes on purchased land or right-of-way, licensing fees for certain technologies, and permit renewal and reporting costs.

Other Costs - This includes all other items which do not fit into any of the above categories.

[This page intentionally left blank.]

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name:	**Date of inspection:**
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature:**

Remedy Includes: (Check all that apply)

G Landfill cover/containment
G Access controls
G Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Other_____

G Monitored natural attenuation
G Groundwater containment
G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — G Readily available — G Up to date — G N/A
   - G As-built drawings — G Readily available — G Up to date — G N/A
   - G Maintenance logs — G Readily available — G Up to date — G N/A

   Remarks_____

2. **Site-Specific Health and Safety Plan** — G Readily available — G Up to date — G N/A
   - G Contingency plan/emergency response plan — G Readily available — G Up to date — G N/A

   Remarks_____

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A

   Remarks_____

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — G N/A
   - G Effluent discharge — G Readily available — G Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — G N/A
   - G Other permits_____ — G Readily available — G Up to date — G N/A

   Remarks_____

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A

   Remarks_____

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A

   Remarks_____

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — G N/A

   Remarks_____

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A

   Remarks_____

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks_____

10. **Daily Access/Security Logs** — G Readily available — G Up to date — G N/A

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

G State in-house G Contractor for State
G PRP in-house G Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other_____

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A

Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A

Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes G No G N/A
Site conditions imply ICs not being fully enforced G Yes G No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date G Yes G No G N/A
Reports are verified by the lead agency G Yes G No G N/A

Specific requirements in deed or decision documents have been met G Yes G No G N/A
Violations have been reported G Yes G No G N/A
Other problems or suggestions: G Report attached

_____
_____
_____
_____

2. **Adequacy** G ICs are adequate G ICs are inadequate G N/A
Remarks_____
_____
_____

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident
Remarks_____
_____

2. **Land use changes on site** G N/A
Remarks_____
_____

3. **Land use changes off site** G N/A
Remarks_____
_____

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
Remarks_____
_____

B. Other Site Conditions

Remarks_____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable G N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable G N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable G N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A
1. **Pumps, Wellhead Plumbing, and Electrical** G Good condition G All required wells properly operating G Needs Maintenance G N/A Remarks_____
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** G Good condition G Needs Maintenance Remarks_____
3. **Spare Parts and Equipment** G Readily available G Good condition G Requires upgrade G Needs to be provided Remarks_____
B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable G N/A
1. **Collection Structures, Pumps, and Electrical** G Good condition G Needs Maintenance Remarks_____
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** G Good condition G Needs Maintenance Remarks_____
3. **Spare Parts and Equipment** G Readily available G Good condition G Requires upgrade G Needs to be provided Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____
   _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____
   _____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____
   _____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____
   _____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/lockedG Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____
   _____

D. Monitoring Data

1. Monitoring Data
   G Is routinely submitted on time G Is of acceptable quality

2. Monitoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

_____

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

_____

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Appendix E
Five-Year Review Report Template

[This page intentionally left blank.]

Five-Year Review Report Template

This appendix provides a suggested checklist and a format for Five-Year Review reports. The checklist appears first, followed by the report template. You are encouraged to follow the template to ensure national consistency in the structure of Five-Year Review reports. However, each report should take into account site-specific circumstances, and you should modify the report format and content accordingly. For example, in some cases the report may be clearer if organized by operable unit (OU), or you may need to include site-specific questions that do not appear in this appendix.

The suggested format for Five-Year Review reports includes three main components: cover material, summary information, and the report body. Templates for each of these components follow. These templates provide suggested standard formats, boilerplate text, subheadings, checklists, example tables, and protectiveness statements. Suggested boilerplate text is presented in text boxes. Within the boilerplate section, text enclosed in brackets ("[ ]") should be added as appropriate, and *italicized* text denotes discussions that the reviewer should add.

You should use both the checklist and report template as guides for the types of information that should appear in the different sections of your Five-Year Review report. You should include information that is relevant to your site and needed to ensure that the rationale behind the protectiveness determination is adequately documented.

[This page intentionally left blank.]

Content Checklist For Five-Year Review Reports

This checklist may be used by you, your managers, etc., to verify that you have included all of the appropriate information in your Five-Year Review report. Depending on site-specific circumstances, some items may not be applicable. For example, a report for a site just beginning construction will generally contain less data than for a site that has reached construction completion.

General Report Format

- ☐ Signed concurrence memorandum (as appropriate)
- ☐ Title page with signature and date
- ☐ Completed five-year review summary form (page E-15)
- ☐ List of documents reviewed
- ☐ Site maps (as appropriate)
- ☐ List of tables and figures
- ☐ Interview report (as appropriate)
- ☐ Site inspection checklist
- ☐ Photos documenting site conditions (as appropriate)

Introduction

- ☐ The purpose of the five-year review
- ☐ Authority for conducting the five-year review
- ☐ Who conducted the five-year review (lead agency) and when
  - ☐ Organizations providing analyses in support of the review (*e.g.*, the contractor supporting the lead agency)
  - ☐ Other review participants or support agencies
- ☐ Review number (*e.g.*, first, second)
- ☐ Trigger action and date
- ☐ Number, description, and status of all operable units at the site
- ☐ If review covers only part of a site, explain approach
  - ☐ Define which areas are covered in the five-year review
  - ☐ Summarize the status of other areas of the site that are not covered in the present five-year

Site Chronology

- ☐ List all important site events and relevant dates (*e.g.*, date of initial discovery of problem, dates of pre-NPL responses, date of NPL listing, etc.)

Background

- ☐ General site description (*e.g.*, size, topography, and geology)
- ☐ Former, current, and future land use(s) of the site and surrounding areas
- ☐ History of contamination
- ☐ Initial response (*e.g.*, removals)
- ☐ Basis for taking remedial action (*e.g.*, contaminants)

Remedial Actions

- G Regulatory actions (*e.g.*, date and description of Records of Decision, Explanations of Significant Difference, Administrative Orders on Consent, Consent Decrees and Action Memorandum)
- ☐ Remedial action objectives
- ☐ Remedy description
- ☐ Remedy implementation (*e.g.*, status, history, enforcement actions, performance)
- ☐ Systems operations/Operations & Maintenance
  - ☐ Systems operations/O&M requirements
  - ☐ Systems operations/O&M operational summary (*e.g.*, history, modifications, problems, and successes)
  - ☐ Summary of costs of system operations/O&M effectiveness (*i.e.*, are requirements being met and are activities effective in maintaining the remedy?)

Progress Since Last Five-Year Review (if applicable)

- ☐ Protectiveness statements from last review
- ☐ Status of recommendations and follow-up actions from last review
- ☐ Results of implemented actions, including whether they achieved the intended effect
- ☐ Status of any other prior issues

Five-Year Review Process

- ☐ Administrative Components
  - ☐ Notification of potentially interested parties of initiation of review process
  - ☐ Identification of five-year review team members (as appropriate)
  - ☐ Outline of components and schedule of your five-year review
- ☐ Community Involvement
  - ☐ Community notification (prior and post review)
  - ☐ Other community involvement activities (*e.g.*, notices, fact sheets, etc., as appropriate)
- ☐ Document review
- ☐ Data review
- ☐ Site inspection
  - ☐ Inspection date
  - ☐ Inspection participants

Five-Year Review Process, cont'd.

- ☐ Site inspection scope and procedures
- ☐ Site inspection results, conclusions
- ☐ Inspection checklist

☐ Interviews
- ☐ Interview date(s) and location(s)
- ☐ Interview participants (name, title, etc.)
- ☐ Interview documentation
- ☐ Interview summary

Technical Assessment

☐ Answer Question A: Is the remedy functioning as intended by the decision documents?
- ☐ remedial action performance (*i.e.*, is the remedy operating as designed?)
- ☐ system operations/O&M
- ☐ cost of system operations/O&M
- ☐ opportunities for optimization
- ☐ early indicators of potential issues
- ☐ implementation of institutional controls and other measures

☐ Answer Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
- ☐ changes in standards, newly promulgated standards, TBCs
- ☐ expected progress towards meeting RAOs
- ☐ changes in exposure pathways
- ☐ changes in land use
- ☐ new contaminants and/or contaminant sources
- ☐ remedy byproducts
- ☐ changes in toxicity and other contaminant characteristics
- ☐ risk recalculation/assessment (as applicable)

☐ Answer Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
- ☐ new or previously unidentified ecological risks
- ☐ natural disaster impacts
- ☐ any other information that could call into question the protectiveness of the remedy

☐ Technical Assessment Summary

Issues

- ☐ Issues identified during the technical assessment and other five-year review activities
- ☐ Determination of whether issues affect current or future protectiveness

Issues, cont'd.

- ☐ A discussion of unresolved issues raised by support agencies and the community (States, Tribes, other Federal agencies, local governments, citizens, PRPs, other interested parties), if applicable

Recommendations and Follow-up Actions

- ☐ Required/suggested improvements to identified issues or to current site operations
- ☐ Note parties responsible for actions
- ☐ Note agency with oversight authority
- ☐ Schedule for completion of actions related to resolution of issues

Protectiveness Statements

- ☐ Protective statement(s) for each OU (If the remedy is not protective of human health and/or the environment, have you provided supporting discussion and information in the report to make this determination, such as current threats or level of risk?)
- ☐ Comprehensive protectiveness statement covering all of the remedies at the site (if applicable)

Next Review

- ☐ Expected date of next review
- ☐ If five-year reviews will no longer be done, provide a summary of that portion of the technical analysis presented in the report that provides the rationale for discontinuation of five-year reviews

Five-Year Review Report

(First, Second, etc.) Five-Year Review Report

for

Site Name

City

County, State

Month, Year

PREPARED BY:

Lead Agency
Name and
Location

Approved by: Date:

_____ _____

[Name]
[Title]
[Affiliation]

[This page intentionally left blank.]

Five-Year Review Report

The following Table of Contents notes typical major divisions and subheadings for Five-Year Review reports. Subheadings can be included as appropriate for a given review report. This is only a general example.

Table of Contents

List of Acronyms E-13

Executive Summary E-15

Five-Year Review Summary Form E-17

I. Introduction E-19

II. Site Chronology E-21

III. Background E-22
Physical Characteristics E-22
Land and Resource Use E-22
History of Contamination E-23
Initial Response E-23
Basis for Taking Action E-23

IV. Remedial Actions E-23
Remedy Selection E-23
Remedy Implementation E-23
System Operations/Operation and Maintenance (O&M) E-23

V. Progress Since the Last Five-Year Review E-25

VI. Five-Year Review Process E-25
Administrative Components E-25
Community Notification and Involvement E-26
Document Review E-26
Data Review E-26
Site Inspection E-26
Interviews E-26

VII. Technical Assessment **E-26**
Question A: Is the remedy functioning as intended by the decision documents? E-27
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid? E-28
Question C: Has any other information come to light that could call into question the protectiveness of the remedy? E-29
Technical Assessment Summary E-29

VIII. Issues **E-30**

IX. Recommendations and Follow-up Actions **E-30**

X. Protectiveness Statement(s) **E-30**

XI. Next Review **E-32**

Tables

Table 1 - Chronology of Site Events
Table 2 - Annual System Operations/O&M Costs
Table 3 - Actions Taken Since the Last Five-Year Review
Table 4 - Changes in Chemical-Specific Standards
Table 5 - Changes in Action-Specific Requirements
Table 6 - Changes in Location-Specific Requirements
Table 7 - Issues
Table 8 - Recommendations and Follow-up Actions

Attachments

Site Maps (if not included in the body of the report)
List of Documents Reviewed
Tables and Figures documenting Remedy Performance and Changes in Standards (if not included in the body of the report)
Interview Report (as appropriate)
Photos Documenting Site Conditions

Appendix

Comments received from Support Agencies and/or the Community

List of Acronyms

You should include a list of acronyms used in the report here.

[This page intentionally left blank.]

Executive Summary

You should include an Executive Summary at the beginning of the report. The Executive Summary should be brief, and should include a reiteration of the protectiveness statements included in Section X of the Five-Year Review report.

[This page intentionally left blank.]

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*:		
EPA ID *(from WasteLAN)*:		
Region:	**State:**	**City/County:**

SITE STATUS	
NPL status: G Final G Deleted G Other (specify) _____	
Remediation status (choose all that apply): G Under Construction G Operating G Complete	
Multiple OUs?* G YES G NO	**Construction completion date:** ___ / ___ / _____
Has site been put into reuse? G YES G NO	

REVIEW STATUS	
Lead agency: G EPA G State G Tribe G Other Federal Agency _____	
Author name:	
Author title:	**Author affiliation:**
Review period:** ___ / ___ / _____ to ___ / ___ / _____	
Date(s) of site inspection: ___ / ___ / _____	
Type of review: G Post-SARA G Pre-SARA G NPL-Removal only G Non-NPL Remedial Action Site G NPL State/Tribe-lead G Regional Discretion	
Review number: G 1 (first) G 2 (second) G 3 (third) G Other (specify) _____	
Triggering action: G Actual RA Onsite Construction at OU #____ G Actual RA Start at OU#____ G Construction Completion G Previous Five-Year Review Report G Other (specify) _____	
Triggering action date *(from WasteLAN)*: ___ / ___ / _____	
Due date *(five years after triggering action date)*: ___ / ___ / _____	

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

Summarize issues (see Chapter 3).

Recommendations and Follow-up Actions:

Summarize recommendations and follow-up actions (see Chapter 3).

Protectiveness Statement(s):

Include individual operable unit protectiveness statements. For sites that have reached construction completion and have more than one OU, include an additional and comprehensive protectiveness statement covering all of the remedies at the site (see Chapter 4).

Other Comments:

Make any other comments here.

Five-Year Review Report

I. Introduction

Provide a synopsis of "who, what, where, when, and why." Detail the following:

- *The purpose of the review;*
- *The authority for conducting the five-year review;*
- *Who conducted the review, when, and for what site or portion of the site;*
- *Whether it is the first review or a subsequent review at the site;*
- *What action triggered the review; and*
- *A brief status of areas of a site not addressed in the current review and/or the status of five-year reviews for other areas of the entire site.*

Further explanation and boilerplate text are provided below. Additional explanation on the following topics is provided in Chapter 1.

The Purpose of the Review

State the purpose of the five-year review specific to the site or portion of the site addressed in the review.

The purpose of five-year reviews is to determine whether the remedy at a site [is/is expected to be] protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

Authority for Conducting the Five-Year Review

The Agency is preparing this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states: *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104]*

or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

Who Conducted the Five-Year Review

If the U.S. Army Corps of Engineers (USACE) or a contractor has conducted an analysis in support of a five-year review, you should include their name and the date of the analysis. When a contractor for a potentially responsible party (PRP) conducts analyses or provides information in support of a five-year review, you should identify the a contractor and their affiliation with the PRP in the Five-Year Review report. You should also identify who conducted the site inspection.

Boilerplate text for the explanation of who conducted the review is provided in the box below. This text is written as though EPA is the lead agency and should be adapted when another agency or department serves as the lead agency.

The United States Environmental Protection Agency (EPA) Region [number] has conducted a five-year review of the remedial actions implemented at the [name] site in [location]. This review was conducted from [month, year] through [month, year]. This report documents the results of the review. [Please identify any party providing an analysis in support of the five-year review; also indicate the contractual arrangements under which this was done.]

Other Review Characteristics

State whether the review is the first or a subsequent five-year review for the site, what action or event "triggered" the review, and the date of this action. See Chapter 1, Section 1.2 of this guidance for a discussion of triggering events for the five-year review and indicate in your report whether the trigger for the current five-year review has been met.

Boilerplate text for the explanation of other review characteristics is provided in the box below. Select text from brackets as appropriate.

This is the [first/second/etc.] five-year review for the [name] site. The triggering action for this review is the date of the [triggering action], as shown in EPA's WasteLAN database: [date]. [This discussion should also mention what is specifically activating the review, *i.e.*, that hazardous substances, pollutants, or contaminants are or will be left on site above levels that allow for unlimited use and unrestricted exposure.]

In addition, if separate five-year reviews are conducted for different areas of a site, you should include the following in this section:

- *An explanation of this approach;*
- *A description of which areas are covered by this five-year review; and*
- *A brief synopsis of the remedial activities and the status of remedial measures and/or five-year reviews for other areas.*

II. Site Chronology

List all important site events and relevant dates in the site chronology, such as those shown in Table 1. The identified events are illustrative, not comprehensive.

Table 1: Chronology of Site Events

Event	Date
Initial discovery of problem or contamination	
Pre-NPL responses	
NPL listing	
Removal actions	
Remedial Investigation/Feasibility Study complete	
ROD signature	
ROD Amendments or ESDs	
Enforcement documents (CD, AOC, Unilateral Administrative Order)	
Remedial design start	
Remedial design complete	

Table 1: Chronology of Site Events

Event	Date
Superfund State Contract, Cooperative Agreement, or Federal Facility Agreement signature	
Actual remedial action start	
Construction dates (start, finish)	
Construction completion date	
Final Close-out Report	
Deletion from NPL	
Previous five-year reviews	

III. Background

Describe the fundamental aspects of the site, providing a clear, succinct description of site characteristics. The purpose of this section is to identify the threat posed to the public and environment at the time of the ROD, so that the performance of the remedy can be easily compared with the site conditions the remedy was intended to address. Include all major site activities prior to the signing of the ROD. In addition to text, you may use site maps to help clarify the discussion. The following checklist may assist you in developing the text for this section.

	Background Checklist
Physical Characteristics *Present the site's location and characteristics, including the following:*	
	Area of site, relation to parcel(s), extent and location of sources
	Whether site is located in a populated area or is near populated areas
	Whether site is located in an environmentally sensitive area or is near environmentally sensitive areas, where applicable
Land and Resource Use *Discuss the following:*	
	Former, current and projected land uses for the site, as identified in the ROD or other decision document
	Current and projected land uses for the area surrounding the site, at the time of the five-year review
	Human and ecological past, present and known future use of resources (*e.g.*, groundwater or surface water as a drinking water supply) and any other current uses of the site not already addressed, as applicable

	Background Checklist
History of Contamination *Discuss the following:*	
	The historical activities that caused contamination, including the type of activity or process, when it took place, the specific type of hazardous substances, and their volumes/proportions, if known
	How contamination was discovered and problems resulting from contamination
Initial Response *Describe any pre-ROD cleanup activities at the site:*	
	CERCLA removal actions, non-CERCLA removals/responses, closures, the ceasing of operations, as well as governing agreements and parties involved in these activities
Basis for Taking Action *Describe the contaminants found at the site by appropriate media type (soil, groundwater, surface water, air). Note the effect or potential effect of the contamination on people, resources they use, or the environment. Examples of elements of this discussion include the following:*	
	Contaminated media and structures (summary of remedial investigation)
	Resources/targets that have been or could potentially be affected, results of risk assessments, determination of primary health threat

IV. Remedial Actions

Discuss initial plans, implementation history, and current status of the remedy. Explain events identified in the chronology, and generally include discussions of remedy selection, remedy implementation, remedy performance, and system operations/O&M. Present – accurately, adequately, and concisely – relevant site activities from the signing of the ROD to the present. You should delineate all remedial measures, for instance, include monitoring, fencing, and institutional controls. Discuss any changes to or problems with remedial components. The following checklist may assist you in developing the text for this section.

	Remedial Actions Checklist
Remedy Selection *Describe the remedial action objectives and the selected remedy. This discussion should explain the following:*	
	Scope and role of actions including definition of OUs related to each ROD and how they relate to each other
	Source documents listing remedial action objectives and the remedy (*e.g.*, RODs, ESDs), including signature/filing date
	Statement of remedial action objectives, related to each OU or ROD
	Description of remedial actions/remedy, related to each OU or ROD, noting media addressed; all components of the remedy, including engineering controls, access controls, institutional controls, cleanup measures, treatment types, and required monitoring should be described

	Remedial Actions Checklist
Remedy Implementation *Discuss the history of and plans for implementation of the remedy. Discuss enforcement actions if applicable. The text may be presented either chronologically or by OU, and should include the following:*	
	Dates when remedial designs were started and completed
	Difficulties or changes that occurred during remedial design
	Dates when remedial actions were started and completed
	The performance of each remedial action since implementation
	Enforcement agreements, and parties involved in these agreements
	CERCLA removal actions or non-CERCLA removals/responses since the ROD
System Operations/O&M *Describe system operations/O&M requirements, activities to date, any problems that have arisen, and costs:*	
	System operations/O&M requirements, as noted in the system operations/O&M plan, system operations/O&M manual, enforcement documents, and monitoring plans
	System operations/O&M activities to date
	Problems in the implementation of system operations/O&M
	Originally estimated annual O&M costs
	Actual annual O&M costs over the review period
	Reasons for any unanticipated or unusually high O&M costs

A table, such as Table 2, should be used to document total annual system operations/O&M costs during the period preceding the current five-year review. In the text, you should discuss significant variations from anticipated costs or between operating years.

Table 2: Annual System Operations/O&M Costs

Dates		Total Cost rounded to nearest $1,000
From	To	

At the end of the remedial actions section, it is sometimes helpful for you to add a brief discussion of the current status of each of the components of the remedy. This discussion can be particularly helpful for large, complex sites.

V. Progress Since the Last Review

Progress since the last review should be discussed when follow-up actions which impact protectiveness were noted in the previous Five-Year Review report. The following checklist may assist you in developing the text for this section.

	Progress Since the Last Review Checklist
Describe progress toward accomplishing recommendations and follow-up actions since the last five-year review was completed. Include the following:	
	Protectiveness statements from the last review
	Status of recommendations and follow-up actions from last review
	Results of implemented actions, including whether they achieved the intended effect
	Status of any other prior issues

Table 3 below presents one approach for providing information on the recommendations and follow-up actions stated in the past review and subsequent actions. The accompanying text should also discuss why any recommendations and follow-up actions have not been implemented if that is the case, and whether implemented actions achieved desired results.

Table 3: Actions Taken Since the Last Five-Year Review

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action

VI. Five-Year Review Process

Describe activities performed during the five-year review process and provide a summary of findings when appropriate. The following checklist may assist you in developing the text for this section.

	Five-Year Review Process Checklist
Administrative Components of the Five-Year Review Process	
	Notify potentially interested parties of start of five-year review
	Identify members of the review team
	Develop a review schedule

	Five-Year Review Process Checklist
Community Notification and Involvement	
	Community notification
	Other community involvement activities
Document Review See Appendix B for a full discussion of the document review	
	What documents were reviewed
	Identify document source of RAOs, ARARs and cleanup levels
Data Review *Discuss and present the following:*	
	What data were reviewed
	Relevant trends and levels, noting levels which are not currently compliant and whether future compliance can be expected without additional action
	Tables summarizing monitoring and sampling data
	Increase and/or decrease or non-presence of specific chemical compounds and recommended changes for future monitoring programs
Site Inspection *Summarize the site inspection and site conditions:*	
	Date of site inspection (if more than one inspection was conducted to allow for monitoring or further inspection, list all inspections and activities conducted, and the reasons for conducting each inspection)
	Who conducted and/or attended the inspection
	Activities conducted (scope and procedures)
	Summary of site conditions, inspection results, conclusions
Interviews *Discuss the following:*	
	Interviews conducted (name, title, organization, date, location(S))
	Interview documentation
	Interview summary
	Successes/problems in the implementation of access and institutional controls
	Successes/problems with the construction of the remedy
	Successes/problems with system operations/O&M
	Unusual situations or problems at the site

VII. Technical Assessment

Discuss how each of the three questions asked in the technical assessment were answered (e.g., yes, yes, no or a variation of this) and provide the information that presents the basis for each answer as a framework for your protectiveness determination(s). Explain the conclusions of

your review, based on the information presented in the previous section. As explained in Chapter 4, the assessment should focus on answering three key questions:

- *Question A: Is the remedy functioning as intended by the decision documents?*
- *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?*
- *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

Each question, and the associated information to be discussed, is presented in its own checklist which may assist you in developing the text for this section. Checklist items shown may be supplemented or modified based on site-specific circumstances.

	Checklist for Question A: Is the remedy functioning as intended by the decision documents?
Remedial Action Performance *Discuss the following:*	
	Whether the remedial action continues to be operating and functioning as designed
	Whether the remedial action is performing as expected and cleanup levels are being achieved
	Whether containment is effective
System Operations/O&M *Discuss the following:*	
	Whether operating procedures, as implemented, will maintain the effectiveness of response actions
	Whether large variances in O&M costs could indicate a potential remedy problems or remedy issues
Opportunities for Optimization *Discuss the following:*	
	Whether opportunities exist to improve the performance and/or reduce costs of monitoring, sampling, and treatment systems
Early Indicators of Potential Issues *Discuss the following:*	
	Whether frequent equipment breakdowns or changes indicate a potential issue
	Whether issues or problems could place protectiveness at risk
Implementation of Institutional Controls and Other Measures *Discuss the following:*	
	Whether access controls are in place and prevent exposure (*e.g.*, fencing and warning signs)
	Whether institutional controls are in place and prevent exposure
	Whether other actions (*e.g.*, removals) necessary to ensure that immediate threats have been addressed are complete

	Checklist for Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?
Changes in Standards and TBCs *Discuss the following:*	
	Whether standards identified in the ROD have been revised and call into question the protectiveness of the remedy
	Whether newly promulgated standards call into question the protectiveness of the remedy
	Whether TBCs used in selecting cleanup levels at the site have changed and could affect the protectiveness of the remedy
Changes in Exposure Pathways *Discuss the following:*	
	Whether land use or expected land use on or near the site changed
	Whether human health or ecological routes of exposure or receptors have been newly identified or changed in a way that could affect the protectiveness of the remedy
	Whether there are newly identified contaminants or contaminant sources
	Whether there are unanticipated toxic byproducts of the remedy not previously addressed by the decision documents
	Whether physical site conditions or the understanding of these conditions have changed in a way that could affect the protectiveness of the remedy
Changes in Toxicity and Other Contaminant Characteristics *Discuss the following:*	
	Whether toxicity factors for contaminants of concern at the site have changed in a way that could affect the protectiveness of the remedy
	Whether other contaminant characteristics have changed in a way that could affect the protectiveness of the remedy
Changes in Risk Assessment Methods *Discuss the following:*	
	Whether standardized risk assessment methodologies have changed in a way that could affect the protectiveness of the remedy
Expected Progress Towards Meeting RAOs	
	Whether the remedy is progressing as expected

When a standard or requirement has changed, a table can be used to record the nature of the change. Tables 4, 5, and 6 below demonstrate potential ways for you to note changes in chemical-specific, action-specific, or location-specific requirements, respectively.

Table 4: Changes in Chemical-Specific Standards

Contaminant	Media	Cleanup Level	Standard		Citation/Year
Chemical A	*e.g.*, groundwater	*e.g.*, 0.XX mg/L	Previous	*e.g.*, 0.XX mg/L	*e.g.*, SDWA 1988
			New	*e.g.*, 0.YY mg/L	*e.g.*, SDWA 1995
Chemical B			Previous		
			New		

Table 5: Changes in Action-Specific Requirements

Action	Requirement		Prerequisite	Citation/Year
Action A (*e.g.*, landfill)	Previous	Include original ARAR here; if none applies, state "None"		
	New			

Table 6: Changes in Location-Specific Requirements

Location	Requirement		Prerequisite	Citation/Year
Location A (*e.g.*, critical habitat upon which endangered or threatened species depend)	Previous	Include original ARAR here; if none applies, state "None"		
	New			

	Checklist for Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
Other Information *Discuss the following:*	
	Whether newly identified ecological risks been found
	Whether there are impacts from natural disasters
	Whether any other information has come to light which could affect the protectiveness of the remedy

Technical Assessment Summary

Discuss how each of the three questions were answered and provide the information that presents the basis for each answer as a framework for your protectiveness determination(s).

VIII. Issues

Detail issues related to current site operations, conditions, or activities, noting which issue, if any, currently prevent the remedy from being protective. You may use a table such as Table 7 to note the issues identified.

Table 7: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)

IX. Recommendations and Follow-up Actions

Specify the required and suggested improvements to current site operations, activities, remedy, or conditions. Note the parties responsible for actions, milestone dates, and which agencies have oversight authority. At a minimum, address all issues that currently affect current and/or future protectiveness. Table 8 illustrates one way to include the necessary information.

Table 8: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future

X. Protectiveness Statement(s)

Include a protectiveness statement for each OU at which a remedial action has begun. For sites that have reached construction completion and have more than one OU, you should develop and include an additional comprehensive site-wide protectiveness statement covering all of the remedies at the site. You should not include this additional protectiveness statement until construction completion because, until then, all remedies at the site have not necessarily been selected and constructed.

In order to promote consistency, you are strongly encouraged to model your protectiveness statements on the sample protectiveness statements provided in Chapter 4, Exhibits 4-6 and 4-7. Your Five-Year Review report should present the protectiveness statements at the beginning of a

discussion that should explain and provide the supporting rationale of the protectiveness determination.

Suggested statements are as follows:

<u>If the remedial action at the OU is under construction, then use this statement</u>:

Protective or will be protective:

"The remedy at OU X is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled."

Not protective:

"The remedy at OU X is not protective because of the following issues [describe the issue(s)]. The following actions need to be taken [describe the actions needed to ensure protectiveness]."

Protectiveness deferred:

"A protectiveness determination of the remedy at OU X cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions [describe the actions]. It is expected that these actions will take approximately [insert time frame] to complete, at which time a protectiveness determination will be made."

<u>If the remedial action at the OU is operating or completed</u>:

Protective:

"The remedy at OU X is expected to be or is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled."

Protective in the short-term:

"The remedy at OU X currently protects human health and the environment because [describe the elements of the remedy that protect human health and the environment in the short term]. However, in order for the remedy to be protective in the long-term, the following actions need to be taken [describe the actions needed to ensure long-term protectiveness]."

Not protective:

"The remedy at OU X is not protective because of the following issue(s) [describe the issue(s)]. The following actions need to be taken [describe the actions needed to ensure protectiveness].

Protectiveness deferred:

"A protectiveness determination of the remedy at OU X cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions [describe the actions]. It is expected that these actions will take approximately [insert time frame] to complete, at which time a protectiveness determination will be made."

For Sites That Have Reached Construction Completion:

If the remedy(s) is/are protective then use:

"Because the remedial actions at all OUs are protective, the site is protective of human health and the environment."

If the remedy is not protective then use:

"The remedial actions at OUs X and Y are protective. However, because the remedial action at OU Z is not protective, the site is not protective of human health and the environment at this time. The remedial action at OU Z is not protective because of the following issue(s) [describe the issue(s)]. The following actions need to be taken [describe the actions needed to ensure protectiveness]."

XI. Next Review

Discuss whether another five-year review will be conducted and the date on which that report will be due. If no additional five-year reviews are to be conducted, explain why and provide a justification for discontinuation of reviews.

Attachments

Site Maps (if not included in the body of the report)
List of Documents Reviewed
Tables and Figures Documenting Remedy Performance and Changes in Standards
(If not included in the body of the report)
Interview Report (as appropriate)
Photos Documenting Site Conditions

Appendix

Comments received from Support Agencies and/or the community

Appendix F
Sample Five-Year Review Report

[This page intentionally left blank.]

Five-Year Review Report

First Five-Year Review Report
for
Acme Superfund Site
Town of Riverside
Waters County, Massachusetts

September 2000

PREPARED BY:

United States Environmental Protection Agency
Region 1
Boston, Massachusetts

(This is a hypothetical site. However, the site characteristics were taken from an actual site in the Superfund program.)

Approved by: Date:

Robert Webster September 11, 2000

Robert Webster
Superfund Division Director
U.S. EPA, Region 1

[This page intentionally left blank.]

Table of Contents

List of Acronyms F-7
Executive Summary F-9
Five-Year Review Summary Form F-11

I. Introduction F-13

II. Site Chronology F-14

III. Background F-15
Physical Characteristics F-15
Land and Resource Use F-15
History of Contamination F-15
Initial Response F-15
Basis for Taking Action F-16

IV. Remedial Actions F-17
Remedy Selection F-17
Remedy Implementation F-18
System Operations/Operation and Maintenance (O&M) F-19

V. Progress Since the Last Five-Year Review F-21

VI. Five-Year Review Process F-21
Administrative Components F-21
Community Involvement F-21
Document Review F-22
Data Review F-22
Site Inspection F-24
Interviews F-24

VII. Technical Assessment F-24
Question A: Is the remedy functioning as intended by the decision documents? F-24
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid? F-25
Question C: Has any other information come to light that could call into question the protectiveness of the remedy? F-26
Technical Assessment Summary F-26

VIII. Issues F-26

IX. Recommendations and Follow-up Actions F-27

X. Protectiveness Statement(s) F-28

XI. Next Review F-28

Tables

Table 1 - Chronology of Site Events F-14
Table 2 - Annual System Operations/O&M Costs F-21
Table 3 - Quarterly Comparison of Groundwater Concentrations F-23
Table 4 - Issues F-26
Table 5 - Recommendations and Follow-Up Actions F-27

Attachments

Attachment 1 - Site Location Map
Attachment 2 - Site Plan
Attachment 3 - List of Documents Reviewed
Attachment 4 - Applicable or Relevant and Appropriate Requirements (ARARs)

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CAMU	Corrective Action Management Unit
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
CFR	Code of Federal Regulations
DEQE	Massachusetts Department of Environmental Quality Engineering
ESD	Explanation of Significant Difference
MADEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PRP	Potentially Responsible Party
PSD	Performing Settling Defendant
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SDWA	Safe Drinking Water Act
VOC	Volatile Organic Compound

[This page intentionally left blank.]

Executive Summary

The remedy for the Acme Superfund site in Riverside, Massachusetts included stabilization and capping of contaminated soils and sediments on site, institutional controls, and monitored natural attenuation of contaminated groundwater. The site achieved construction completion with the signing of the Preliminary Close Out Report on August 28, 1998. The trigger for this five-year review was the actual start of construction on September 12, 1995.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements of the Record of Decision (ROD). One Explanation of Significant Difference (ESD) was issued to change the cap design and the treatment approach of soils and sediments. The remedy is functioning as designed. The immediate threats have been addressed and the remedy is expected to be protective when groundwater cleanup goals are achieved through monitored natural attenuation, which is expected to require 10 years.

[This page intentionally left blank.]

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Acme Superfund Site		
EPA ID *(from WasteLAN)*: MADXXXXXXX		
Region: 1	**State:** MA	**City/County:** Riverside/Waters
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☐ Operating ☒ Complete		
Multiple OUs?* ☐ YES ☒ NO	**Construction completion date:** 8 / 28 / 1998	
Has site been put into reuse? ☐ YES ☒ NO		
REVIEW STATUS		
Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____		
Author name: Mary Jones		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA, Region 1	
Review period:** 3 / 1 / 2000 to 8 / 31 / 2000		
Date(s) of site inspection: 3 / 12 / 2000 & 5 / 23 / 2000		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion)		
Review number: ☒ 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action: ☐ Actual RA On-site Construction at OU #___ ☐ Construction Completion ☐ Other (specify) ☒ Actual RA Start at OU# NA ☐ Previous Five-Year Review Report		
Triggering action date *(from WasteLAN)*: 9 / 12 / 1995		
Due date *(five years after triggering action date)*: 9 / 12 / 2000		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

Burrowing animals were observed to have left minor tunnels in cap soil, and a portion of the constructed wetlands have not been properly maintained.

Failure to maintain a portion of the constructed wetlands due to restricted access to the property.

Inadequate monitoring to verify that the plume is not migrating.

Recommendations and Follow-up Actions:

The burrows are scheduled to be repaired. The State and Potentially Settling Defendants (PSDs) are actively seeking an alternate location for wetlands development.

Identify an alternate location for wetlands development.

Increase monitoring frequency for MW-103; Investigate groundwater discharge to river; sample sediments and groundwater at discharge points.

Protectiveness Statement(s):

All immediate threats at the site have been addressed, and the remedy is expected to be protective of human health and the environment after the groundwater cleanup goals are achieved through MNA in an estimated 10 years.

Long-term Protectiveness:

Long-term protectiveness of the remedial action will be verified by obtaining additional groundwater samples to fully evaluate potential migration of the contaminant plume downgradient from the treatment area and towards the river. Current data indicate that the plume remains on site. Additional sampling and analysis will be completed within the next six months. Current monitoring data indicate that the remedy is functioning as required to achieve groundwater cleanup goals.

Other Comments:

The problems encountered in maintaining the wetlands result from access issues that will be resolved once an alternative location for development of wetlands is identified. This issue does not impact protectiveness and is expected to be resolved within the current year.

Acme Superfund Site
Riverside, Massachusetts
First Five-Year Review Report

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The United States Environmental Protection Agency (EPA), Region 1, conducted the five-year review of the remedy implemented at the Acme Superfund Site in Riverside, Massachusetts. This review was conducted by the Remedial Project Manager (RPM) for the entire site from March 2000 through August 2000. This report documents the results of the review.

This is the first five-year review for the Acme Site. The triggering action for this statutory review is the initiation of the remedial action on September 12, 1995. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1 - Chronology of Site Events

Event	Date
Waste oil and solvent recovery activities at the site	1974 - 1978
Massachusetts Department of Environmental Quality Engineering (DEQE) (now Massachusetts Department of Environmental Protection or MADEP), initiates actions against facility owners resulting in closing of facility	1978
Removal activities - removing drums, liquids and sludge from tanks	1978 - 1984
Final listing on EPA National Priorities List	9/1983
Interim removal activities - Demolition and removal of remaining storage tanks and waste material contained in tanks	1986
Remedial Investigation/Feasibility Study (RI/FS) made available to public	1/1992
Proposed plan identifying EPA's preferred remedy presented to public; start of public comment period.	3/1992
ROD selecting the remedy is signed	9/30/1992
Consent Decree finalizing settlement for responsible party performance of remedy entered by Federal Court	9/18/1994
Start of on-site construction for building/structures demolition and decontamination (1st phase of site Remedial Action and date that triggers a five-year review).	9/12/1995
Completion of on-site construction for building/structures demolition and decontamination	12/28/1995
ESD issued by EPA, primarily changing soil and sediment stabilization from "in-situ" to "ex-situ", and changing cap design	11/26/1996
PRP Remedial Design approved by EPA	3/5/1997
Start of on-site construction for stabilization remedy (2nd phase of site Remedial Action)	3/11/1997
Pre-final inspection of Phase II remedial action	11/19/1997
Preliminary Close Out Report signed	8/28/1998
O & M Plan approved by EPA	9/18/1998

III. Background

Physical Characteristics

The Acme Site property includes a four-acre facility located on Canal Street adjacent to and upgradient of the Green River in Riverside, Massachusetts. Riverside is a community of approximately 12,000 residents, located in Waters County. In addition to the facility, the site includes the adjacent wetlands, wooded area, and the immediately adjacent portion of the river. The facility is located 200 feet northeast of the Green River and is within the river's 100-year flood zone. The site is bordered by Canal Street, wetlands and woodlands, the Green River, and a soccer field. Residential and commercial properties are located across Canal Street from the site (See Attachment 1).

Land and Resource Use

The historic land use of the site has involved some petroleum- or solvent-related industry since at least 1900. From at least 1974 until operations ceased in 1978, activities at the site included waste oil and solvent recovery and disposal. Since 1978, the facility has been inactive.

The current land use for the surrounding area is residential, commercial and recreational (the adjacent soccer field). The Green River is used for swimming and fishing. Although there have been a number of zoning changes over the years, it is anticipated that a mix of land uses similar to that described will continue into the future. In establishing cleanup requirements for the site, EPA considered the theoretical possibility of residential development at the site. The site itself is currently fenced and the treated, stabilized soils and sediments are contained within the fenced area under an impermeable cap.

The groundwater aquifer underlying the site is currently not used as a drinking water source. The dominant groundwater flow direction is to the southwest toward the Green River.

History of Contamination

The Acme facility reclaimed used oils and solvents from State collection points, treated them with a heat process, and sold them as lube oil and heavy fuel mixtures. In the course of these operations, spills occurred causing contamination of soils, sediments, and groundwater. Contamination in groundwater at the site consists primarily of volatile organic compounds (VOCs), including benzene and methylene chloride. Contaminants in soils and sediments include polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), VOCs, and other organics and lead. Contamination at the site was discovered in the course of several property inspections conducted by the State which documented improper maintenance, as well as waste oil and hazardous materials spills. Millions of gallons of waste were left behind in tanks and lagoons when the owner abandoned the facility in 1978.

Initial Response

From 1978 to 1984, as a result of State enforcement efforts, approximately 1.5 million gallons of waste material were removed from the site during a number of separate events. In 1982, the State requested assistance from EPA's Superfund program. EPA discovered several leaking tanks and contaminated ditches, as well as saturated soils. The site was proposed for the National Priorities List

(NPL) on December 30, 1982, and finalized on the NPL in March 1983. In 1986, interim measures were taken to establish complete fencing of the site, demolish and dispose of 19 storage tanks, dispose of the oil and water contained in the tanks, and dispose of sludge generated during the cleaning of tanks. In January 1992, the Remedial Investigation/Feasibility Study was made available to the public. In March 1992, the Proposal Plan identifying EPA's preferred remedy was presented to the public, starting the period for public comment.

Basis for Taking Action

Contaminants

Hazardous substances that have been released at the site in each media include:

Soil

PCBs
PAHs
1,1-Dichloroethane
Cis-1,2-Dichloroethylene
Trans-1,2-Dichloroethylene
1,1,1-Trichlorethane
Trichloroethylene
Tetrachloroethylene
Benzene
Lead

Groundwater

Bis (2-ethylhexyl) Phthalate
Vinyl Chloride
1,1-Dichloroethane
Cis-1,2-Dichloroethylene
Trans-1,2-Dichloroethylene
1,1,1-Trichlorethane
Methylene Chloride
Trichloroethylene
Tetrachloroethylene
Benzene
2-Butanone (MEK)
Acetone
Lead

Lagoon Sediment

Bis (2-ethylhexyl) Phthalate
PAHs
1,1-Dichlorethane
1,1,1-Trichloroethane
Trichloroethylene
Tetrachloroethylene
Methylene Chloride
Benzene
Acetone
Lead

Wetland Sediment

PCBs
PAHs
Arsenic
Lead
Zinc

Exposures to soil, groundwater, wetland sediment, and lagoon sediment are associated with significant human health risks, due to exceedance of EPA's risk management criteria for either the average or the reasonable maximum exposure scenarios. The carcinogenic risks were highest for exposures to lagoon sediments due to the high concentrations of carcinogenic polyaromatic hydrocarbons (PAHs). Non-

carcinogenic hazards were highest for exposure to wetland sediment due to the high concentrations of lead detected in the medium. Risks from exposure to soil were significant due to the presence of TCE, PCE, and PCBs. Potential risks associated with exposure to groundwater are attributed to the presence of a variety of VOC contaminants that exist at concentrations that exceed State and Federal MCLs.

IV. Remedial Actions

Remedy Selection

The ROD for the Acme Site was signed on September 30, 1992. Remedial Action Objectives (RAOs) were developed as a result of data collected during the Remedial Investigation to aid in the development and screening of remedial alternatives to be considered for the ROD. The RAOs for Acme were divided into the following groups:

Source Control Response Objectives

- Minimize the migration of contaminants from the property soils and lagoon sediment that could degrade groundwater quality;
- Reduce risks to human health by preventing direct contact with, and ingestion of, contaminants in the property soils, wetland sediments, and lagoon sediments, and by preventing potential ingestion of contaminated groundwater;
- Reduce risks to the environment by preventing direct contact with, and ingestion of, contaminants in the wetland sediments; and
- Minimize the migration of contaminants (*i.e.*, from property soils, lagoon sediments, and wetland sediments) that could result in surface water concentrations in excess of Ambient Water Quality Criteria.

Management of Migration Response Objectives

- Eliminate or minimize the threat posed to human health and the environment by preventing exposure to groundwater contaminants;
- Prevent further migration of groundwater contamination beyond its current extent; and
- Restore contaminated groundwater to Federal and State applicable or relevant and appropriate requirements (ARARs), including drinking water standards, and to a level that is protective of human health and the environment within a reasonable period of time.

The major components of the source control remedy selected in the ROD include the following:

1. Decontamination, demolition, and off-site disposal of property structures; treatment and discharge of lagoon surface water;
2. Consolidation of contaminated property soils with lagoon and wetland sediments on site property;
3. In-situ mixing and stabilization of property soils/sediments with treatment agents to bind

contaminants into a stable matrix;

4. Construction of a permeable cap over stabilized property soils and sediments, and grading and planting of the cap's surface;
5. Restoration of wetlands;
6. Implementation of institutional controls on groundwater use and land development; and
7. Long-term monitoring of groundwater, wetland sediments, and Green River water and sediments.

The major components of the management of migration remedy selected in the ROD include:

1. Use of monitored natural attenuation (MNA) to achieve groundwater cleanup levels;
2. Groundwater monitoring of existing wells on the Acme property and of monitoring wells adjacent to the property;
3. Sediment sampling of portions of the wetland and the Green River, and where groundwater discharges to the wetland and the Green River;
4. Surface water sampling in areas adjacent to the wetland and in the Green River; and
5. Five-year site reviews to assess site conditions, contaminant distributions, and any associated site hazards.

An ESD was issued on November 26, 1996. Subsurface conditions including the existence of building foundations and low soil workability rendered in-situ stabilization impracticable. Additionally, Potentially Responsible Parties (PRPs) suggested adding a geosynthetic layer to the cap that would make it an impermeable cap rather than a soil cap. EPA approved the recommended change. The primary changes documented in the ESD were:

- Ex-situ stabilization instead of in-situ; and
- Construction of an impermeable cap instead of a permeable cap.

The change to ex-situ stabilization led to the necessity of designating a Corrective Action Management Unit (CAMU) at the site concurrent with the ESD. This designation allowed the handling and temporary storage of contaminated soils and sediments.

Institutional controls are required for the Acme property as well as for the adjacent Town-owned property, the only properties on or near the site requiring institutional controls. These institutional controls are established through the Access and Institutional Controls Agreement between the Performing Settling Defendants (PSDs) and the Town of Riverside, dated October 20, 1994, and recorded on June 19, 1997 in the Waters County Registry of Deeds.

Remedy Implementation

In a Consent Decree (CD) signed with EPA on September 18, 1994, 112 PSDs agreed to perform the remedial design/remedial action (RD/RA) and pay past costs for cleaning up the site. The Remedial Design (RD) was conducted in conformance with the ROD as modified by the ESD. The RD was approved by EPA on March 5, 1997.

The Remedial Action (RA) took place in two phases. The first phase entailed the decontamination, demolition and off-site disposal at a non-hazardous waste landfill of property structures. The activities for this phase were initiated on September 12, 1995 and were completed on December 28, 1995. The major

components of this phase of the RA were the following:

- Decontamination of the buildings and structures on the property;
- Removal, treatment, and discharge to the Green River of water from the basement of one building and water collected from decontamination;
- Collection and analyses of composite samples of buildings and structures;
- Demolition and off-site disposal as non-hazardous waste of property buildings and structures and off-site disposal of miscellaneous debris from the property;
- Removal and off-site disposal of two underground storage tanks and their contents; and
- Restoration of demolition areas to match existing grade.

The second phase entailed all other remedial activities. Components 2 through 7 of the Source Control Remedy constituted the primary activities performed as the second phase of the RA. The activities for the second phase of the RA were formally initiated on March 11, 1997 when the PSDs awarded the RA contract. The contractor conducted remedial activities as planned and EPA and the State conducted a pre-final inspection on November 19, 1997. During this period, 1,606 cubic yards of lagoon sediment, 1,187 cubic yards of wetland sediment, and 8,000 cubic yards of soil were treated, stabilized, and placed under the impermeable cap. In addition, a fence with warning signs and surface water drainage structures were built. At this time, the preparation for the wetland restoration (grading and backfilling of clean sediment material) and the planting of new replacement wetland species was accomplished. The pre-final inspection concluded that construction had been completed in accordance with the remedial design plans and specifications and did not result in the development of a punch list.

The site achieved construction completion status when the Preliminary Close Out Report was signed on August 28, 1998.

EPA and the State have determined that all RA construction activities, including the implementation of institutional controls, were performed according to specifications. It is expected that cleanup levels for all groundwater contaminants will have been reached within approximately ten years. After groundwater cleanup levels have been met, EPA will issue a Final Close Out Report.

System Operation/Operation and Maintenance

The PSDs are conducting long-term monitoring and maintenance activities according to the operation and maintenance (O&M) plan that was approved by EPA on September 8, 1998. The primary activities associated with O&M include the following:

- Visual inspection of the cap with regard to vegetative cover, settlement, stability, and any need for corrective action. In addition, the cap is scheduled to be mowed semi-annually;
- Inspection of the drainage swale for blockage, erosion and instability, and any need for corrective action;

- Inspection of the condition of groundwater monitoring wells;
- Environmental monitoring: Quarterly monitoring of groundwater, wetland surface water and sediment, and Green River surface water and sediment; and
- Engineered wetlands inspection and assessment: Inspections are conducted primarily for the purposes of assessing both weed control needs and the survival of plantings. Assessments are performed specifically to determine if the engineered wetlands are meeting the performance standards regarding the survival and density of desired wetland species.

The primary cleanup of the Acme Site took place during the construction phase of the Remedial Action (*i.e.* the stabilization of contaminated soil and sediments). The other remaining component of cleanup is the natural attenuation of groundwater, as the source of groundwater contamination in soil and sediment has been removed. Therefore, as indicated in the planned elements above, the primary O&M activities have been geared towards monitoring groundwater, surface water, sediments, wetlands, inspections, and maintenance of the cap.

A currently evolving issue exists with regard to the engineered wetlands. The total area of engineered wetlands at the Acme Site is 0.7 acres. This area encompasses wetland habitats that were replanted with appropriate wetland plant species following the removal of contaminated sediments during the RA. As previously mentioned, there are performance standards with regard to density of desired plant species and to minimization of weeds and other undesirable species. The PSDs are obligated to meet these standards. During the course of the O&M period, there have been repeated access issues involving the property abutting the southern border of the Acme property. During the RA, contaminated sediments were removed from this property, clean sediment was backfilled, and wetland plants were planted. Since completion of the RA, the owner of this property has prevented PSD contractors from performing maintenance (weeding and replanting, as necessary) in an area that is highly at risk from invasive species. The area affected by this issue is 0.32 acres. EPA, the Riverside Conservation Commission, and the PSDs are working together to determine if there is additional wetland acreage at the site which may be amenable to restoration or enhancement. If an appropriate area is found, it may be substituted for the 0.32 acre area that is not accessible for maintenance. The failure to provide proper maintenance for the wetlands does not impact the protectiveness of the site.

O&M costs include cap and drainage structure maintenance, sampling and monitoring efforts, monitoring well maintenance, and wetlands maintenance. In the first year, costs were higher due to an extra effort required to establish the vegetative cover on the cap and to establish wetlands. Less effort was required the second year and the PSDs were denied access by a property owner and were not able to maintain all of the wetlands. Costs are expected to rise when additional wetlands are identified and developed. The O&M costs for the first two years are consistent with the originally estimated annual costs of $20,000 per year.

Table 2 - Annual System Operations/O&M Costs

Dates		Total Cost rounded to nearest $1,000
From	To	
9/1998	9/1999	$22,000.00
9/1999	9/2000	$17,000.00

V. Progress Since the Last Five-Year Review

This was the first five-year review for the site.

VI. Five-Year Review Process

Administrative Components

Members of the PSDs and the MADEP were notified of the initiation of the five-year review on February 1, 2000. The Acme Five-Year Review team was led by Mary Jones of EPA, Remedial Project Manager (RPM) for the Acme Site, and included members from the Regional Technical Advisory staff with expertise in hydrology, biology, and risk assessment. Tom McDuff of the State assisted in the review as the representative for the support agency.

From March 1 to March 15, 2000, the review team established the review schedule whose components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

The schedule extended through August 31, 2000.

Community Involvement

Activities to involve the community in the five-year review were initiated with a meeting in early January 2000 between the RPM and the Community Involvement Coordinator (CIC) for the Acme Superfund site. A notice was sent to two local newspapers that a five-year review was to be conducted and that there would be a public meeting on April 20, 2000. A letter stating the same was sent to the Community Advisory Group (CAG), the Waters County Department of Health, the Fire and Rescue Department of Riverside, the County Commissioner's office, and the residents of properties adjacent to the Acme Superfund site. The letter invited the recipients to submit any comments to EPA.

During the public meeting, representatives of the CAG and local residents expressed concerns that work be completed as soon as possible at the site as they were concerned about the stigma that may be

attached to the property in the future, limiting its availability for redevelopment. None of the attendees expressed any concerns over the protectiveness of the remedy.

On September 11, 2000, a notice was sent to the same local newspapers that announced that the Five-Year Review report for the Acme Superfund site was complete, and that the results of the review and the report were available to the public at the Riverside Town Library and the EPA Region 1 office.

Document Review

This five-year review consisted of a review of relevant documents including O&M records and monitoring data (See Attachment 3). Applicable groundwater cleanup standards, as listed in the 1992 Record of Decision, were reviewed (See Attachment 4).

Data Review

Groundwater Monitoring

Groundwater monitoring has been conducted at the Acme Site since the late 1980s. In general, most contaminants were detected at their highest levels early in the Removal/Remedial history of the site (1989 to 1990). This high level followed by a drop in contaminant levels may well have been the result of removal activities eliminating significant source material.

The evaluation of the natural attenuation processes at the site was achieved by evaluating four indicators that are recommended in the *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (OSWER Directive No. 9200.4-17P, April 21, 1999) for evaluating the performance of an MNA remedy. The four indicators are:

- Demonstrate that natural attenuation is occurring according to expectations;
- Detect changes in environmental conditions that may reduce the efficacy of the natural attenuation processes;
- Identify any potentially toxic or mobile transformation products; and
- Verify that the plume is not expanding either downgradient, laterally, or vertically.

Since construction completion in 1997, 8 of the 13 contaminants for which groundwater cleanup levels have been established, remained below their respective cleanup goals in all sampling events. Furthermore, for the five contaminants that have exceeded their cleanup goals in recent sampling events, there is a marked trend downward in concentrations. Recent monitoring results for the five contaminants are shown in Table 3. MW-104b, MW-104c, and MW-105b are located on the southern end of the treatment area which is the downgradient side. Therefore, trends in contaminant levels in these wells are good indicators of the fate of contaminants remaining in the groundwater near to the original source areas. In MW-104b and MW-104c, there is a clear downward trend in benzene concentrations, although concentrations remain above the cleanup goals. There is a clear indication that concentrations of TCE and the daughter products, cis 1,2-DCE and vinyl chloride are trending downward in MW-105b and MW-104c. This monitoring record indicates that the groundwater attenuation process conceptualized in the ROD is proceeding essentially as expected.

Table 3 - Quarterly Comparison of Groundwater Concentrations

Contaminant	Well No.	MCL (ppb)	Concentration in ppb				
			3/1999	6/1999	9/1999	12/1999	3/2000
Benzene	104b	5	110*	130*	310 (est)*	120*	58*
Benzene	104c	5	2,300*	4,900*	530*	190*	39*
Benzene	103c	5	100*	130*	130*	100*	NS
Trichlorethene	105b	5	15 (est)*	5.5*	ND	0.29 (est)	0.014 (est)
Vinyl chloride	105b	2	13*	5.2*	ND	ND	5.9 (est)*
cis-1,2,-Dicloroethene	104c	70	ND	78*	7.4 (est)	5.8	0.88
Lead	104c	0.015	0.005 (est)	0.004 (est)	0.017*	ND	0.003 (est)

* = Exceeds Cleanup Level
(est) = Estimated Value
ND = Not Detected
NS = Not Sampled

No monitoring of environmental conditions that may affect the efficacy of the MNA remedy is being conducted at this time. Given that contaminant concentrations continue to decline, such monitoring may not be necessary, as attenuation processes appear to be functioning as expected.

No potentially toxic or mobile transformation products have been identified during sampling events that were not already present at the time of the ROD, and therefore have cleanup goals specified in the ROD.

Regarding plume migration, there is some concern that the plume may be migrating downgradient toward the Green River. Concentrations of benzene in MW-103c have remained relatively stable since March 1999, lacking the downward trend in concentrations for this contaminant seen in other wells. This well is located downgradient from the treatment area and is closest to the river. This may be an indication that the plume is being pulled toward the river. The lack of a sampling point for the March 2000 event, due to the area of the well being flooded, gives rise to further concern. In the future, if it is not possible to obtain a sample during a scheduled monitoring event, provisions have been made to return to the site at a later date to obtain the sample and ensure that the monitoring record is complete.

Surface Water and Sediment Monitoring

Quarterly analysis of surface water samples taken in areas adjacent to the wetland and in the Green River found that all levels of contaminants of concern were below detection. Analysis of sediment samples taken in portions of the wetland and the Green River where groundwater discharges to the surface found contaminant levels also below detection limits.

Site Inspection

Inspections at the site were conducted on March 12, and May 23, 2000, by the RPM and an EPA biologist (See Attachment 5). The purpose of the inspections was to assess the protectiveness of the remedy, including the presence of fencing to restrict access, the integrity of the cap and the condition of the restored wetlands. Institutional controls were evaluated by visiting the County Planning Office to review zoning maps and by visiting the County Department of Health to review information on the site. A visit to the County Office of Public Records to review the property deed confirmed that a deed covenant had been filed.

No significant issues have been identified at any time regarding the cap, the drainage structures, or the fence. Examination of the cap revealed that there had been some slight burrowing of small animals. Another minor issue was trespassing and its effect on plantings within restored wetlands. As noted, a joint effort between the governments and the PSDs is being made to potentially change some of the wetland areas which are subject to restoration. In addition, the use of additional fencing is being considered within the site property boundaries to inhibit trespassing and better protect restored wetland plantings.

The institutional controls that are in place include prohibitions on the use or disturbance of groundwater until cleanup levels are achieved, excavation activities, disturbance of the cap, and any other activities or actions that might interfere with the implemented remedy. No activities were observed that would have violated the institutional controls. The cap and the surrounding area were undisturbed, and no new uses of groundwater were observed.

Interviews

Interviews were conducted with various parties connected to the site. Marjorie Edwards, owner of nearby Pliny Products, was interviewed on June 17, 2000. Two nearby residents, Alice Parsons and Michael Smith, were interviewed on July 18, 2000. No significant problems regarding the site were identified during the interviews. However, Mr. Smith and Ms. Parsons did note that occasional passers by have walked through the site. Paul Wainwright, a representative of the Riverside Conservation Commission, was interviewed on July 18, 2000, and expressed concern that requirements for wetland mitigation were not being observed. Mr. Wainwright was, however, confident that the problem would be resolved when a parcel of neighboring land would be selected for the establishment of new wetlands. During the May inspection, EPA interviewed the staff of the Fire and Rescue Department of Riverside, MA. None of the staff were able to identify any concerns regarding the site and there had not been any emergency responses at the site since the end of remedial construction.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD, as modified by the ESD. The stabilization and capping of contaminated soils and sediments has achieved the remedial objectives to minimize the migration of contaminants to groundwater and surface water and prevent direct contact with, or ingestion

of, contaminants in soil and sediments. The effective implementation of institutional controls has prevented exposure to, or ingestion of, contaminated groundwater.

Operation and maintenance of the cap and drainage structures has, on the whole, been effective. A few small areas showed evidence of burrowing of small animals. The burrows did not penetrate beyond the soil layer, and so did not affect protectiveness. The PSDs were arranging for filling of the burrows and will include the task of inspection and repair of small animal burrows in future O&M routines. O&M annual costs are consistent with original estimates and there are no indications of any difficulties with the remedy.

Where the PSDs have had access to wetlands, the maintenance of the wetlands has been good. A 0.32-acre portion of the wetlands has not been maintained because the property owner where the wetlands are located has denied access to the PSDs. EPA, the Riverside Conservation Commission, and the PSDs are currently working to identify an alternate location where wetlands can be developed. The failure to meet the wetlands mitigation requirements for the site does not affect the potential for release of contaminants and does not affect protectiveness for the site.

There were no opportunities for system optimization observed during this review. The monitoring well network provides sufficient data to assess the progress of natural attenuation within the plume, and maintenance on the cap is sufficient to maintain it's integrity. There is some concern that the plume may be migrating downgradient toward the Green River. Concentrations of benzene in MW-103c have remained relatively stable since March 1999, lacking the downward trend in concentrations for this contaminant seen in other wells. This well is located downgradient from the treatment area and is closest to the river. This may be an indication that the plume is being pulled toward the river. The lack of a sampling point for the March 2000 event, due to the area of the well being flooded, gives rise to further concern.

The institutional controls that are in place include prohibitions on the use or disturbance of groundwater until cleanup levels are achieved, and prohibitions on excavation activities, disturbance of the cap, and any other activities or actions that might interfere with the implemented remedy. No activities were observed that would have violated the institutional controls. The cap and the surrounding area were undisturbed, and no new uses of groundwater were observed. The fence around the site is intact and in good repair.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

Changes in Standards and To Be Considereds

As the remedial work has been completed, most ARARs for soil contamination cited in the ROD have been met. ARARs that still must be met at this time and that have been evaluated include: the Safe Drinking Water Act (SDWA) (40 CFR 141.11-141.16) from which many of the groundwater cleanup levels were derived - [Maximum Contaminant Levels (MCLs), and MCL Goals (MCLGs)]; ARARs related

to wetland protection; and ARARs related to post-closure monitoring. A list of ARARs is included in Attachment 3. There have been no changes in these ARARs and no new standards or TBCs affecting the protectiveness of the remedy.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the Human Health Risk Assessment included both current exposures (older child trespasser, adult trespasser) and potential future exposures (young and older future child resident, future adult resident and future adult worker). There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment. These assumptions are considered to be conservative and reasonable in evaluating risk and developing risk-based cleanup levels. No change to these assumptions, or the cleanup levels developed from them is warranted. There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. The remedy is progressing as expected and it is expected that all groundwater cleanup levels will be met within approximately 10 years.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No ecological targets were identified during the baseline risk assessment and none were identified during the five-year review, and therefore monitoring of ecological targets is not necessary. All sediment and surface water samples analyzed found no contamination of wetlands or surface water. No weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD, as modified by the ESD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Most ARARs for soil contamination cited in the ROD have been met. There has been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

VIII. Issues

Table 4 - Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Evidence of small animal burrows at a few locations on the southwest corner of the cap.	N	N

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Failure to maintain 0.32 acres of the total 0.7 acres of wetlands constructed to comply with wetlands mitigation requirements for the site.	N	N
Inadequate monitoring data to verify that the plume is not migrating	N	Y

IX. Recommendations and Follow-Up Actions

Table 5 - Recommendations and Follow-Up Actions

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Animal burrows in cap	Repair current burrows; establish O&M task to ensure future burrows are identified and repaired	PSDs	State/EPA	6/30/2001	N	N
0.32 acres of wetlands not maintained due to access problems	Identify alternate location at or near the site for wetlands development	PSD, Riverside Conservation Commission	State/EPA	9/30/2001	N	N
Inadequate monitoring data	1) Increase monitoring frequency for MW-103 cluster; 2) Investigate groundwater recharge to river; and 3) Sample sediments and groundwater flux at recharge points.	PSDs	State/EPA	9/30/2001	N	Y

X. Protectiveness Statement

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals, through natural attenuation, which is expected to require 10 years to achieve. In the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater. All threats at the site have been addressed through stabilization and capping of contaminated soil and sediments, the installation of fencing and warning signs, and the implementation of institutional controls.

Long-term protectiveness of the remedial action will be verified by obtaining additional groundwater samples to fully evaluate potential migration of the contaminant plume downgradient from the treatment area and towards the river. Current data indicate that the plume remains on site. Additional sampling and analysis will be completed within the next six months. Current monitoring data indicate that the remedy is functioning as required to achieve groundwater cleanup goals.

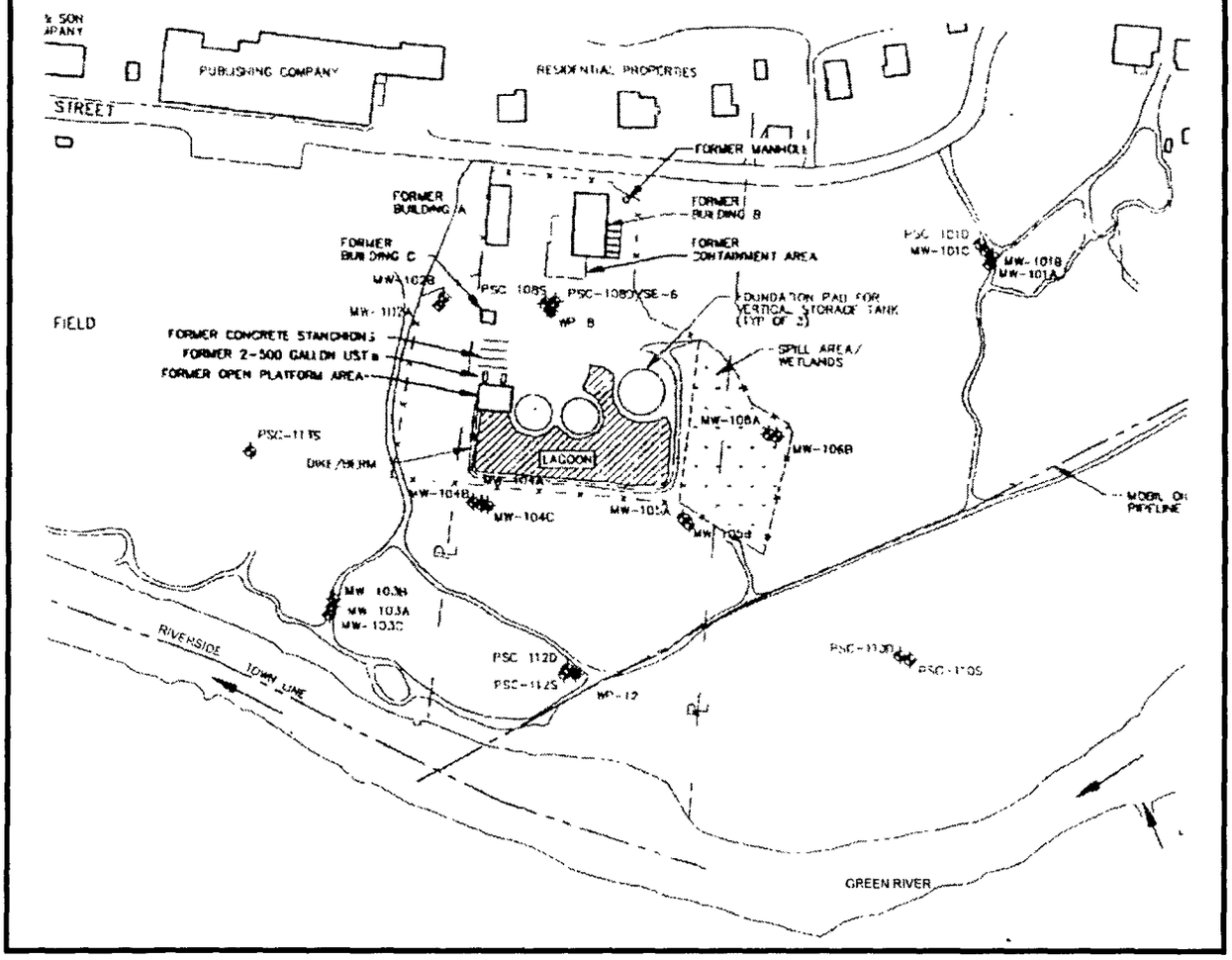
XI. Next Review

The next five-year review for the Acme Superfund Site is required by September 2005, five years from the date of this review.

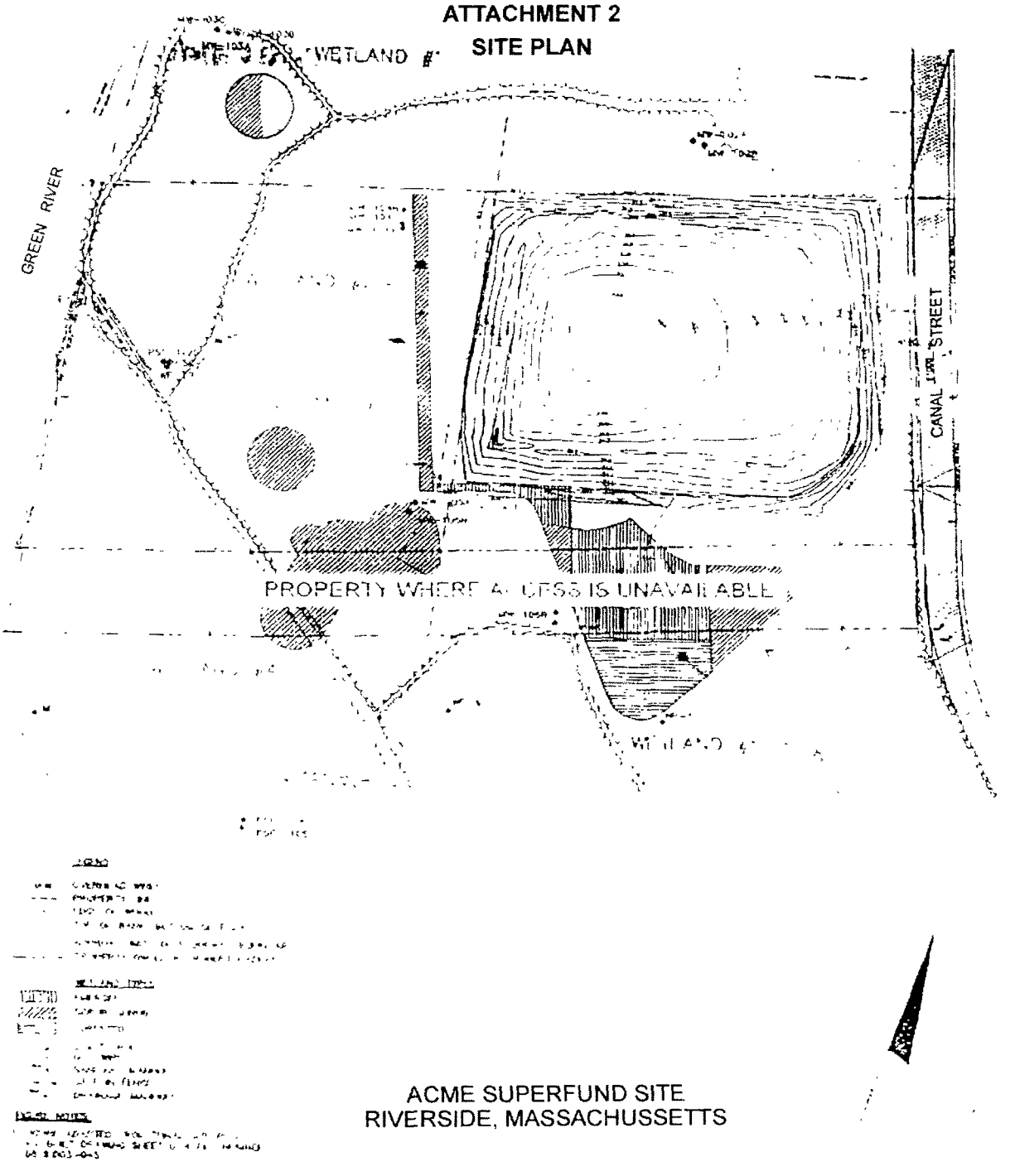
ATTACHMENTS

[This page intentionally left blank.]

ATTACHMENT 1
SITE LOCATION MAP



ATTACHMENT 2
SITE PLAN



ACME SUPERFUND SITE
RIVERSIDE, MASSACHUSSETTS

SITE PLAN

5819005-008
NOVEMBER 1999

100 0 100
SCALE IN FEET

ATTACHMENT 3

List of Documents Reviewed

Acme Remedial Design for Stabilization and Containment of Contaminated Soils and Sediments, Riverside, MA, March 5, 1997

Acme Superfund Site Operations & Maintenance Plan, September 18, 1998

Acme Superfund Site PSDs/EPA Settlement Agreement, September 18, 1994

Acme Superfund Site Quarterly Groundwater Monitoring Reports, 1998 and 1999

Acme Superfund Site Record of Decision, September 30, 1992

Explanation of Significant Difference, Remedial Design, Acme Superfund Site, November 26, 1996

Riverside Wetlands Mitigation Plan, Riverside Conservation Commission, Riverside, MA, March 31, 1997

ATTACHMENT 4

Applicable or Relevant and Appropriate Requirements (ARARs)

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Groundwater/ SDWA	Federal - SDWA - Maximum Contaminant Levels (MCLs) (40 CFR Part 141.11-141.16) and non-zero Maximum Contaminant Level Goals (MCLGs)	Relevant and Appropriate	Standards (MCLs) have been adopted as enforceable standards for public drinking water systems: goals (MCLGs) are non-enforceable levels for such systems.	Remediation of contaminated material in soils and sediment will eliminate ongoing discharges of contaminants to groundwater. MCLs and non-zero MCLGs will be attained in groundwater at the point of compliance.

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Surface Water/CWA	Federal - CWA - Ambient Water Quality Criteria (AWQC)- Protection of Freshwater Aquatic Life, Human Health, Fish Consumption	Relevant and Appropriate	AWQC are developed under the Clean Water Act (CWA) as guidelines from which states develop water quality standards. CERCLA §121(d)(2) requires compliance with such guidelines when they are relevant and appropriate. A more stringent AWQC for aquatic life may be found relevant and appropriate rather than an MCL, when protection of aquatic organisms is being considered at a site. Federal AWQC are health-based criteria which have been developed for 95 carcinogenic compounds; these criteria consider exposure to chemicals from drinking water and/or fish consumption. Acute and chronic exposure levels are established.	The selected remedy will attain AWQC in the wetland surface waters and river water after completion of remedial activities.
Groundwater/ CWA	State Department of Environmental Protection (DEP) - Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Applicable	State groundwater quality standards have been promulgated for a number of contaminants. When the state levels are more stringent than federal levels, the state levels will be used.	The selected remedy will attain State standards in the groundwater at the point of compliance after completion of remedial activities.

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Groundwater/ SDWA	State - 310 CMR 22.06 Maximum Contaminant Levels for Inorganic Chemicals in Drinking Water	Relevant and Appropriate	Maximum contaminant levels are established for inorganic chemical contaminants under 310 CMR 22.06. All public water systems must comply with the levels of inorganic contaminants which are listed in Table 1 of 310 CMR 22.06.	The selected remedy will attain State MCLs for inorganics in the groundwater at the point of compliance.
Groundwater/ SDWA	State - 310 CMR 22.07 Maximum Organic Chemical Contaminant Levels in Drinking Water	Relevant and Appropriate	310 CMR 22.07 establishes maximum contaminant levels for selected chlorinated hydrocarbons, pesticides and herbicides.	The selected remedy will attain State MCLs for organic contaminants in the groundwater at the point of compliance.
Air/CAA	Federal - CAA - National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 61)	Applicable	NESHAP standards have been promulgated for two organic compounds present at the site, benzene and vinyl chloride.	Remediation technologies which emit air contaminants regulated under NESHAPs will attain the appropriate standard during operation.
Soil/ Sediments/ RCRA	Federal - Resource Conservation and Recovery Act (RCRA) - Criteria for Classification of Solid Waste Disposal and Practices (40 CFR Part 257)	Relevant and Appropriate	Solid wastes containing PCBs greater than 10 ppm must not be incorporated into the soil (or mixed with surface soil) applied to land used for food chain or pasture crop production.	Any debris, soil, or sediment which contains greater than 10 ppm PCBs will be excavated and stabilized. Institutional controls will prohibit the use of the site for agriculture.

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Air/CAA	Federal - CAA - National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50)	Applicable	NAAQS define levels of primary and secondary levels for six common air contaminants [sulfur dioxide, particulate matter (PM_{10}), carbon monoxide, ozone, nitrogen dioxide and lead].	The levels established for these six air contaminants will be used as target levels which may not be exceeded by air release from on-site activities.
Surface Water/CWA	State Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharge (314 CMR 12.00)	Applicable	Regulations to ensure proper operation and maintenance of wastewater treatment facilities and sewer systems within the State.	Remedial activities will comply with all provisions of this regulation.
Air/OSHA	Federal - Occupational Health and Safety Act (OSHA) (29 CFR Part 1910.1000 - Air Contaminants)	To be Considered	Acceptable employee exposure levels have been promulgated for an extensive list of materials to control air quality in workplace environments.	Action levels for volatile and semi-volatile air contaminants will be established for implementation during on-site remedial actions. Exposure levels will also be used in the risk assessment to determine overall site risk.

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Groundwater/ CWA	Federal - (Guidance) Groundwater Classification Guidelines	To be Considered	Classifies groundwater by its potential beneficial uses such as special groundwater (Class 1) which is "highly vulnerable to contamination because of the hydrological characteristics of the areas in which it occurs and characterized by either of the following factors: – The groundwater is irreplaceable; no reasonable alternative source of drinking water is available to substantial populations. – The groundwater is ecologically vital; the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat. Class 2 groundwater is classified as a current and potential source of drinking water and waters having other beneficial uses. All groundwater which does not fit under Class 1 and which is not heavily saline (total dissolved solids (TDS) > 10,000 mg/l) are considered Class 2 groundwater.	The groundwater aquifer will meet the standards under the SDWA for the appropriate classification of groundwater after completion of remedial activities.

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Sediments/ CWA	Federal - NOAA Technical Memorandum NOS OMA 52	To be Considered	The memorandum identifies reference doses for various contaminants in sediments and their potential biological effects on biota exposed to the contaminants.	Contaminated sediments will be remediated.
Wetlands/ CWA	Federal - CWA Section 404(b)(1); 40 CFR Part 230, 33 CFR Parts 320 - 330	Applicable	Requirements under these codes prohibit the discharge of dredged or fill material into wetlands unless those actions comply with the substantive requirements which are identified under these regulations.	Discharges to wetlands around the site will comply with these requirements.
Wetlands/ CWA	Federal Executive Orders 11990 Protection of Wetlands	Applicable	Under this regulation, Federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands.	Wetlands protection considerations will be incorporated into the planning and implementation of this selected remedy.

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Floodplains/ RCRA	Federal 40 CFR Part 264.18 Location Standards	Relevant and Appropriate	This regulation identifies geological features that a proposed location for a RCRA hazardous waste treatment and/or disposal facility must avoid. Three specific geological features are identified of which two apply to the site. These features and the significance are: – Floodplain - A facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste unless the owner or operator can demonstrate to the EPA Regional Administrator that he can meet the criteria established under this subpart which exempts him from complying with this requirement.	This site is located within a 100-year floodplain and a portion of the site may be within 200 feet of a fault. On-site remediation activities will comply with the requirements of 40 CFR Parts 264.18(a) and (b).

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Rivers/CWA	Federal - 16 USC 661 et. seq. Fish and Wildlife Coordination Act	Applicable	Mitigative actions must be taken to minimize potential adverse impacts to natural sources such as wetlands. Restoration of damaged natural features are required.	Relevant federal agencies will be contacted to help analyze impacts of the implementation of remedial alternatives on wildlife in wetlands and rivers. Restoration of impacted wetlands will occur once all excavation and stabilization activities are completed.
Wetlands/ CWA	State - Department of Environmental Protection - Wetlands Protection (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, altering or polluting inland wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation types and requires that effects on wetlands be mitigated.	The selected remedy will include measures to mitigate and/or replace loss of habitat or hydraulic capacity in accordance with 310 CMR 10.00.

[This page intentionally left blank.]

Appendix G
Methods and Examples for Evaluating Changes in Standards and Toxicity

[This page intentionally left blank.]

Methods and Examples for Evaluating Changes in Standards and Toxicity

This appendix provides a series of flowcharts and examples that you can use to aid in evaluating changes in promulgated standards and chemical toxicity characteristics. The following tables are arranged in two sets, with a generic decision flowchart first. A hypothetical example follows with an example of the flowchart filled in according to the information in the hypothetical example.

Exhibit G-1: Evaluating Changes in Standards

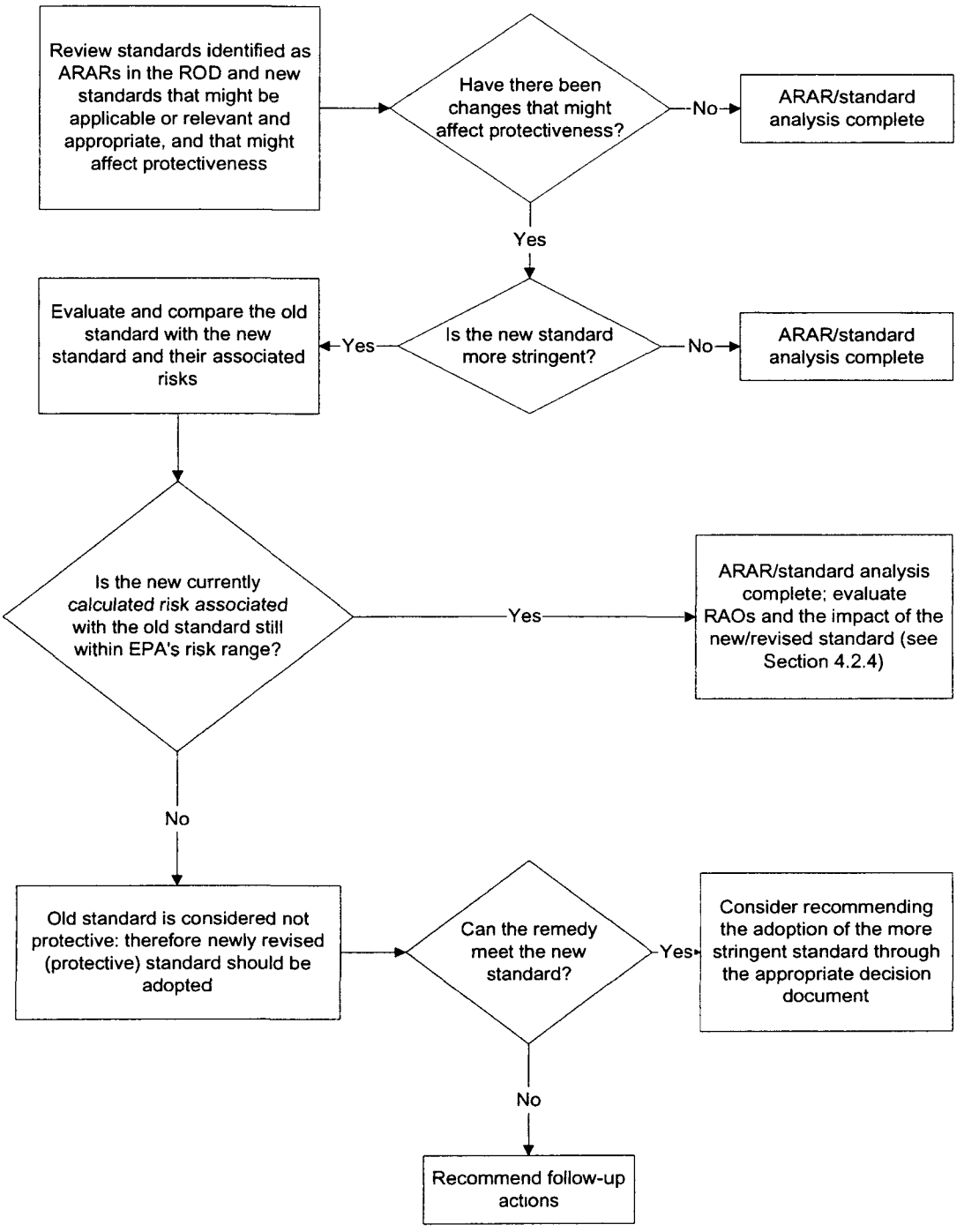


Exhibit G-2: Hypothetical Scenario for a Change in a Standard

During the 1998 Five-Year Review for the Flower Dye site in the State of Franklin, the review team learned that the State drinking water standard for 2,4-Dinitrochickenwire changed from 20 parts per billion (ppb) to 2 ppb. The Record of Decision (ROD), signed in 1988, identified the state standard for 2,4-Dinitrochickenwire as an ARAR and established a cleanup level for 2,4-Dinitrochickenwire at 20 ppb. The ROD also specified that the remedial action objective (RAO) for groundwater is to restore groundwater to drinking water standards. The remedy is to pump-and-treat groundwater using extraction and reinjection wells with air stripping.

In the ARAR/standard analysis (See Exhibit G-1) it was identified that the standard (ARAR) of 20 ppb at the time the ROD was signed had an associated risk of $5x10^{-5}$, which was within EPA's risk range. However, the current risk associated with the same level (20 ppb) now is $5x10^{-4}$ due to changes in the toxicity information that is the basis for the standard. This is generally considered outside of EPA's risk range and therefore, generally considered not protective. As part of the evaluation it was determined that the new standard (2 ppb) has an associated risk of $5x10^{-5}$, which is within EPA's risk range.

In examining the treatment records, monitoring reports, and existing groundwater modeling information, it was determined that the system can treat to 2 ppb, and potentially the remedy can achieve that level in the groundwater. Since the old standard (20 ppb) is no longer considered protective, further actions needed to be taken to ensure that the remedy achieves protectiveness. These actions included the adoption of a protective cleanup level. Therefore, the Five-Year Review report recommended that the new standard (2 ppb) be adopted through an Explanation of Significant Difference. The physical remedy did not have to be modified because it was determined that it could achieve the 2 ppb level. In addition, the RAOs would also be achieved and would not require any modification.

Exhibit G-3: Decision Process for a Hypothetical Change in Standard

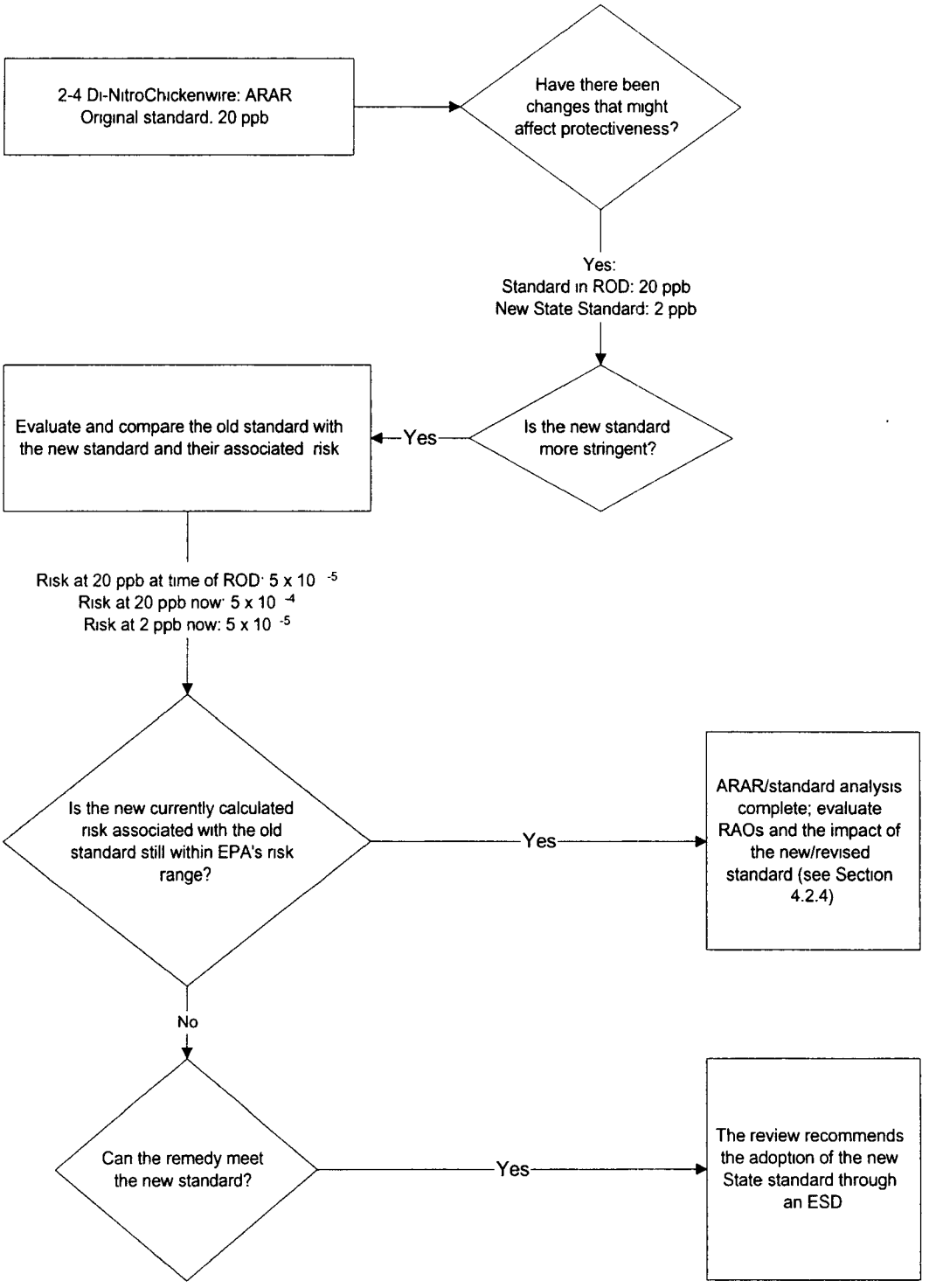


Exhibit G-4: Evaluating Changes in Toxicity and Other Contaminant Characteristics

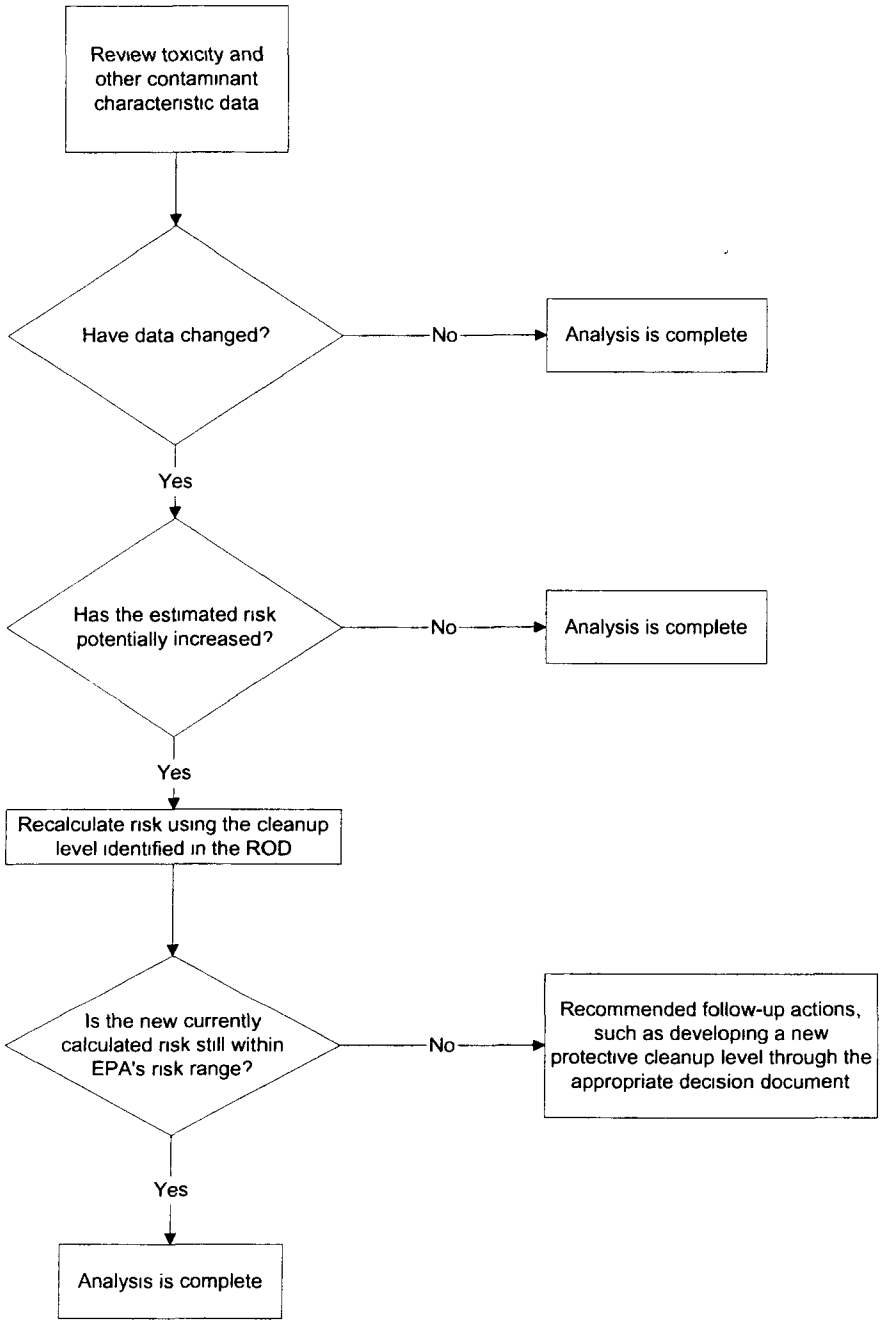


Exhibit G-5: Hypothetical Scenario for a Change in Toxicity

During the 1998 Five-Year Review at the Old Pesticide Disposal site in the State of Franklin, the review team determined that the Cancer Slope Factor (CSF) for the pesticide "Hypochem" had been increased in 1996 from 0.05 $(mg/kg\text{-}day)^{-1}$ to 20.00 $(mg/kg\text{-}day)^{-1}$. Hypochem, among other contaminants, had been found in the water supply well across the street from the Old Pesticide Disposal facility at a concentration of 0.001 mg/L. When the ROD was signed in 1986, this level was associated with a risk level less than one in one million excess cancer cases based on the following equations and site-specific exposure parameters:

$$\text{Average Daily Intake (mg/kg-day)} = (C_{Water} * IR*EF*ED)/(BW*AT) \quad (1)$$

where:

Parameter			Site Scenario
C_{Water}	=	Contaminant concentration in water (mg/L)	
IR	=	Drinking water intake (ingestion) rate (L/day)	2 L/day
EF	=	Exposure frequency (days/year)	350 days/year
ED	=	Exposure duration (years)	30 years
BW	=	Body weight (kg)	70 kg
AT	=	Average time (days)	25,550 days

$$\text{Target Risk (R)} = \text{Average Daily Intake} * \text{Cancer Slope Factor} \quad (2)$$

When equations (1) and (2) are combined, the allowable concentration of Hypochem (C_{Water}) that corresponds to a given risk level "R," can be determined by inserting the site-specific parameters into the following equation:

$$C_{water}\ (mg/L) = (R*BW*AT)\ /(CSF*IR*EF*ED) \quad (3)$$

The Old Pesticide Disposal site's original one in one million risk level R = $1x10^{-6}$) was based on the original CSF of 0.05. Thus, equation (3) yielded a health-based screening level for Hypochem of:

$$C_{Water} \text{ for R of } 1x10^{-6} = 0.001704 \text{ mg/L}$$

Since the actual concentration of Hypochem in the water in 1986 was 0.001 mg/L, and thus fell within acceptable limits, there was no need to reduce its levels. (The risk corresponded to 0.6 new cases per million people.) However, using the new CSF of 20.00 to achieve a one in one million risk level R = $1x10^{-6}$), the new health-based screening level for Hypochem becomes:

$$C_{Water} \text{ for R of } 1x10^{-6} = 0.00000426 \text{ mg/L}$$

and using the new CSF of 20.00 to achieve one in a ten thousand risk level R = $1x10^{-4}$), equation (3) yields a C_{Water} value of:

$$C_{Water} \text{ for R of } 1x10^{-4} = 0.000426 \text{ mg/L}$$

Exhibit G-5: Hypothetical Scenario for a Change in Toxicity, cont'd.

The 1986 ROD selected pumping and air stripping of the groundwater to remove solvents also found in the groundwater, and groundwater recharge. Based on sampling records of the recharge water, the stripping unit did not significantly reduce Hypochem concentrations. In fact the current concentration of Hypochem in groundwater is 0.0008 mg/L. Given the new cancer risk factor, the levels of Hypochem are not acceptable because the risk based on this new factor is greater than one in ten thousand (1×10^{-4}).

Based on this result, the Five-Year Review report recommended that a protective cleanup level be developed through the appropriate decision document. In addition, the physical remedy would have to be evaluated to determine whether the current system would be able to reduce the level of Hypochem to protective/acceptable concentrations.

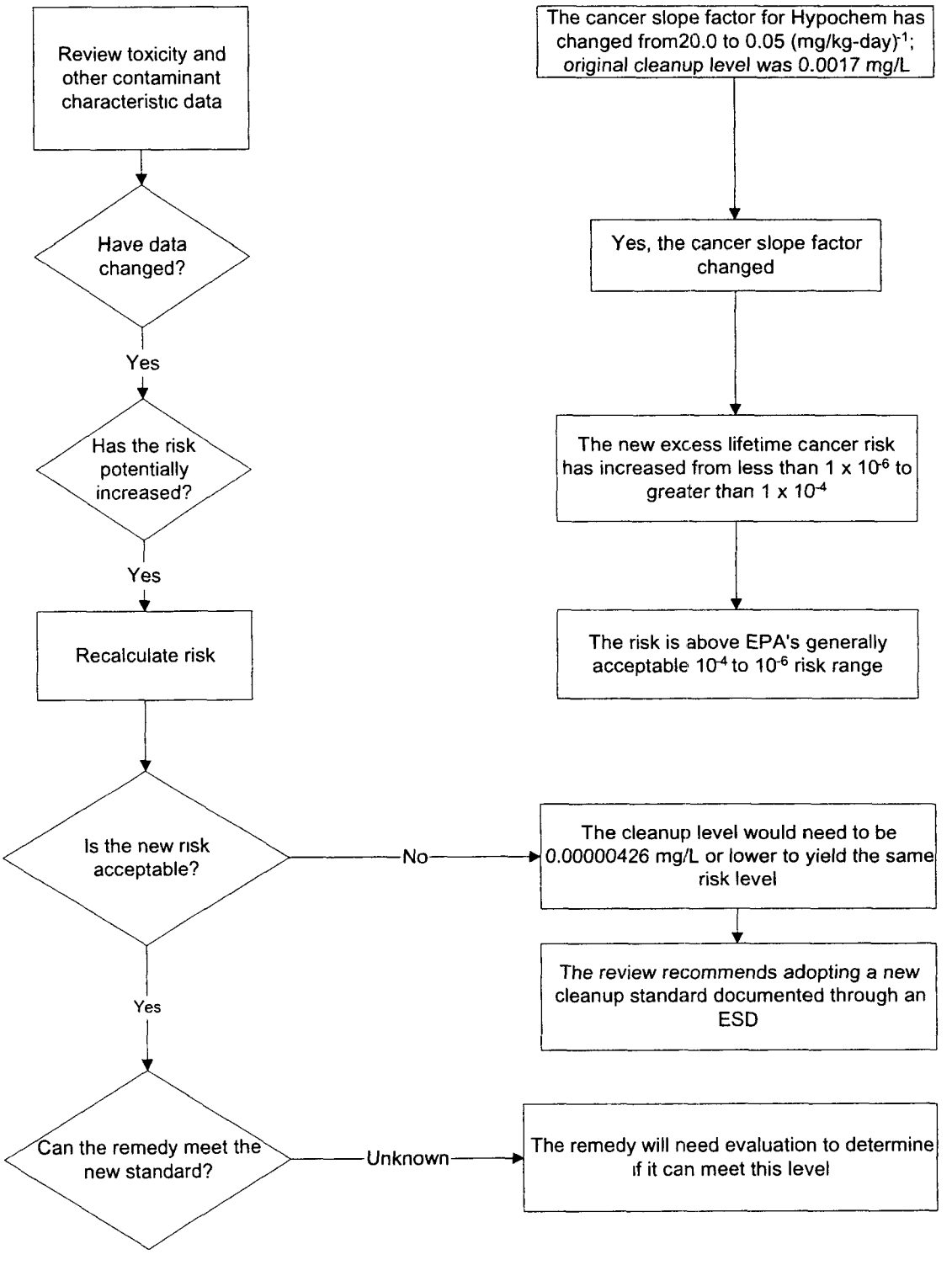



Exhibit G-6: Decision Process for a Hypothetical Change in Toxicity