

Appendix F
Sample Five-Year Review Report

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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

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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

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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.

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Five-Year Review Summary Form

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

* ["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 (1 st 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 (2 nd 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,-Dichloroethene	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 its 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.

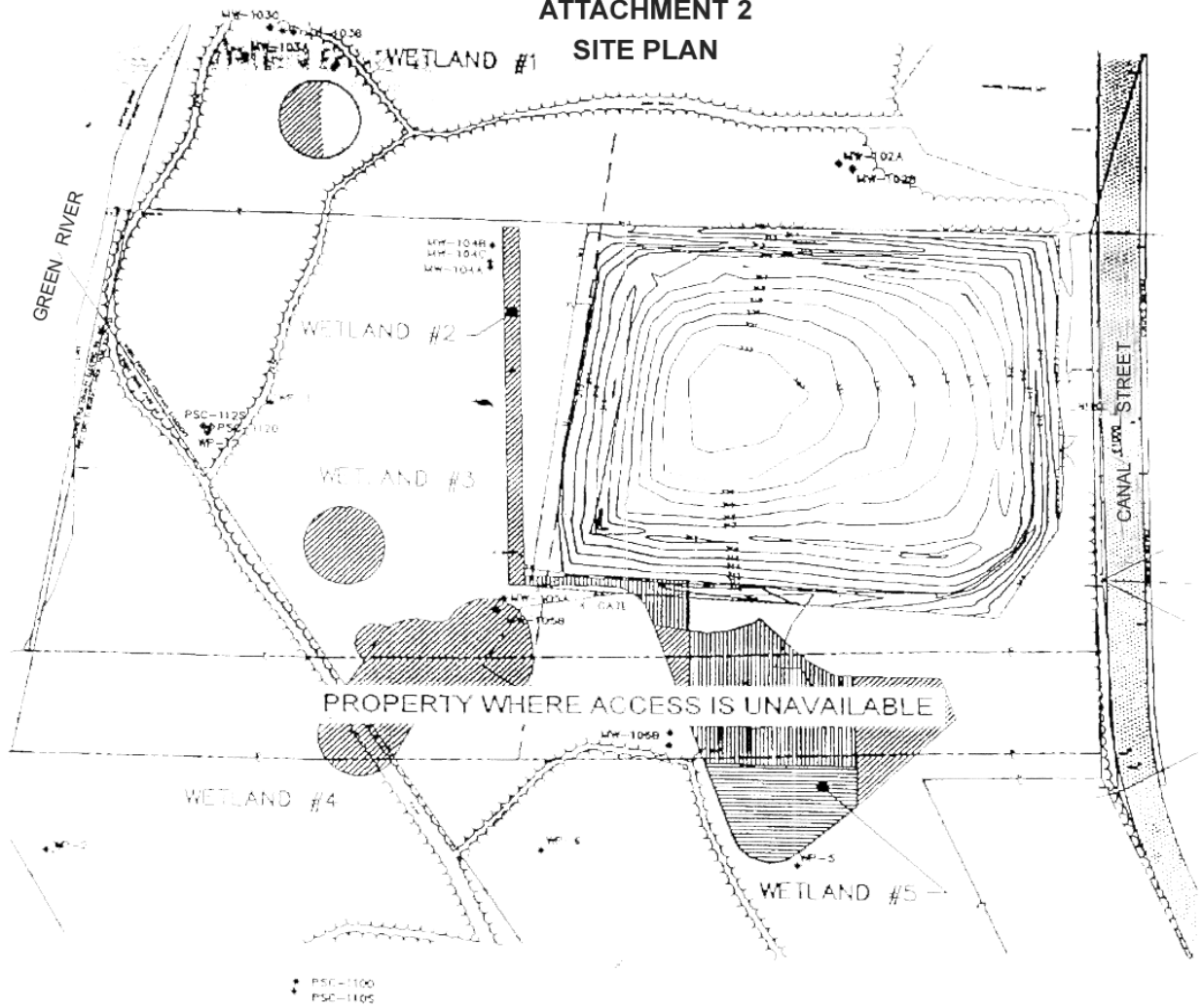
XI. Next Review

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

ATTACHMENTS

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**ATTACHMENT 2
SITE PLAN**



- LEGEND**
- OVERHEAD WIRES
 - PROPERTY LINE
 - EDGE OF WOODS
 - TOP OF BANK, BOTTOM OF BANK
 - APPROX. LIMITS OF FLOODWAY BOUNDARY
 - PROPERTY OWNED BY RIVERSIDE HAZARDOUS
- WETLAND TYPES**
- [Hatched pattern] EMERGENT
 - [Diagonal hatched pattern] SCUMB/SPRUG
 - [Horizontal hatched pattern] FORESTED
 - [Star symbol] UTILITY POLE
 - [Circle with cross symbol] GATE
 - [Circle with dot symbol] SUSTAINABLE MANHOLE
 - [Line with cross symbol] GATE IN FENCE
 - [Circle with dot symbol] DRAINAGE MANHOLE

NOTES
 1. THIS PLAN ADAPTED FROM FINAL SITE PLAN AS BUILT DRAWING SHEET C-4 FILE NUMBER 5819005-045.

**ACME SUPERFUND SITE
RIVERSIDE, MASSACHUSETTS**



5819005-008
NOVEMBER 1999

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	<p>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:</p> <ul style="list-style-type: none"> <li data-bbox="1037 688 1461 857">– The groundwater is irreplaceable; no reasonable alternative source of drinking water is available to substantial populations. <li data-bbox="1037 894 1472 1097">– 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. <p>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.</p>	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	<p>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:</p> <ul style="list-style-type: none"> - 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.

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

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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

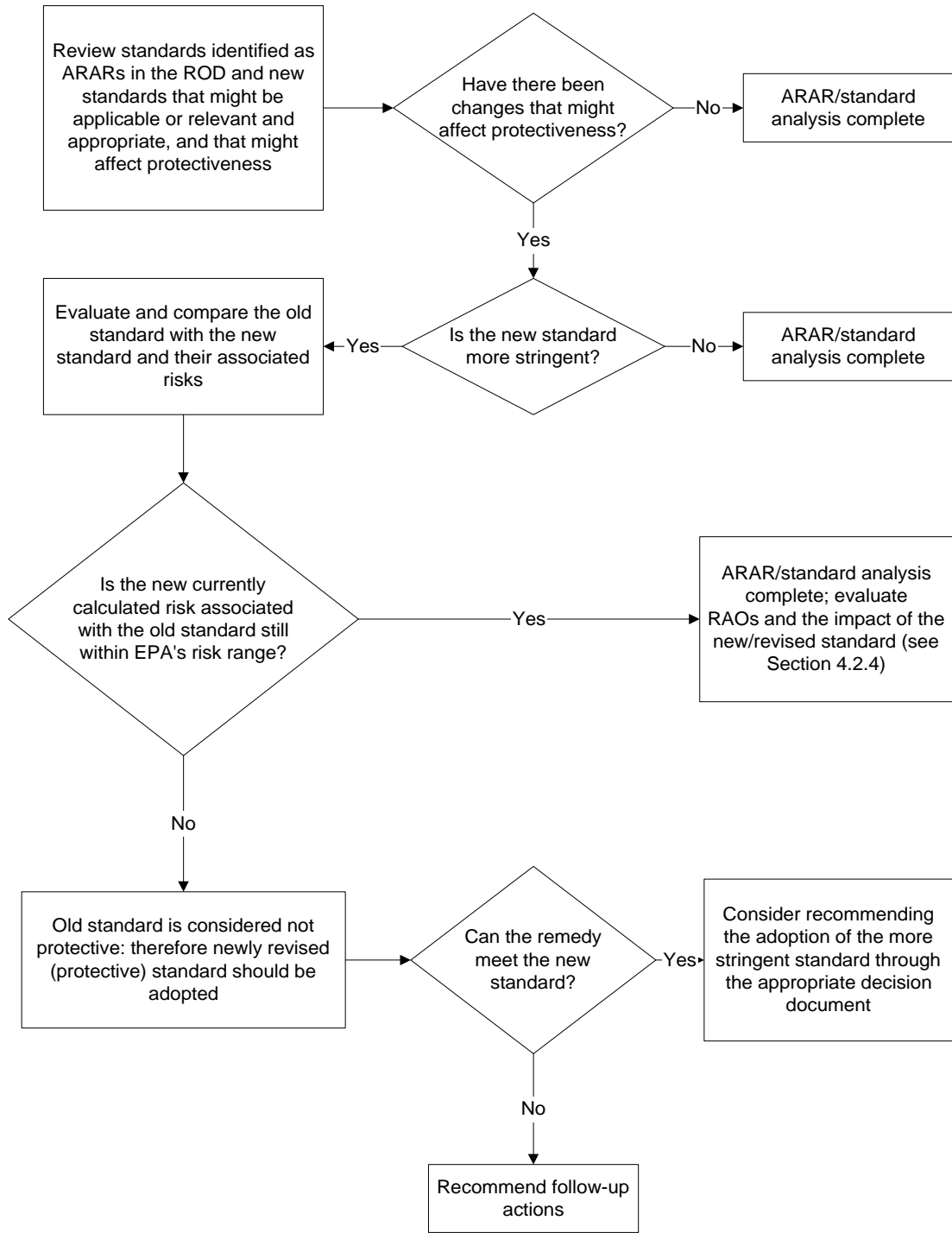


Exhibit G-2: Hypothetical Scenario for a Change in a Standard

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 5×10^{-5} , which was within EPA's risk range. However, the current risk associated with the same level (20 ppb) now is 5×10^{-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 5×10^{-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

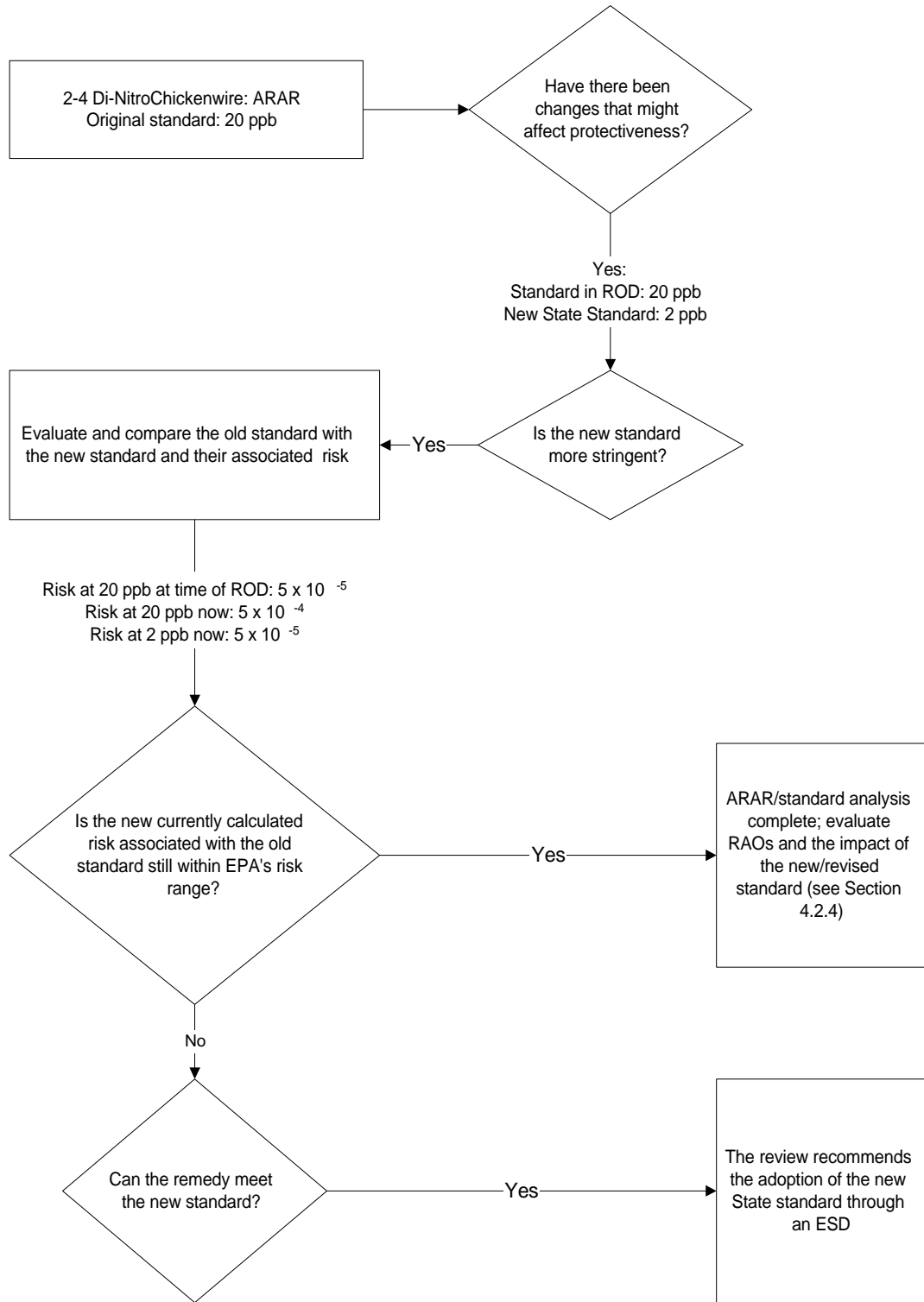


Exhibit G-4: Evaluating Changes in Toxicity and Other Contaminant Characteristics

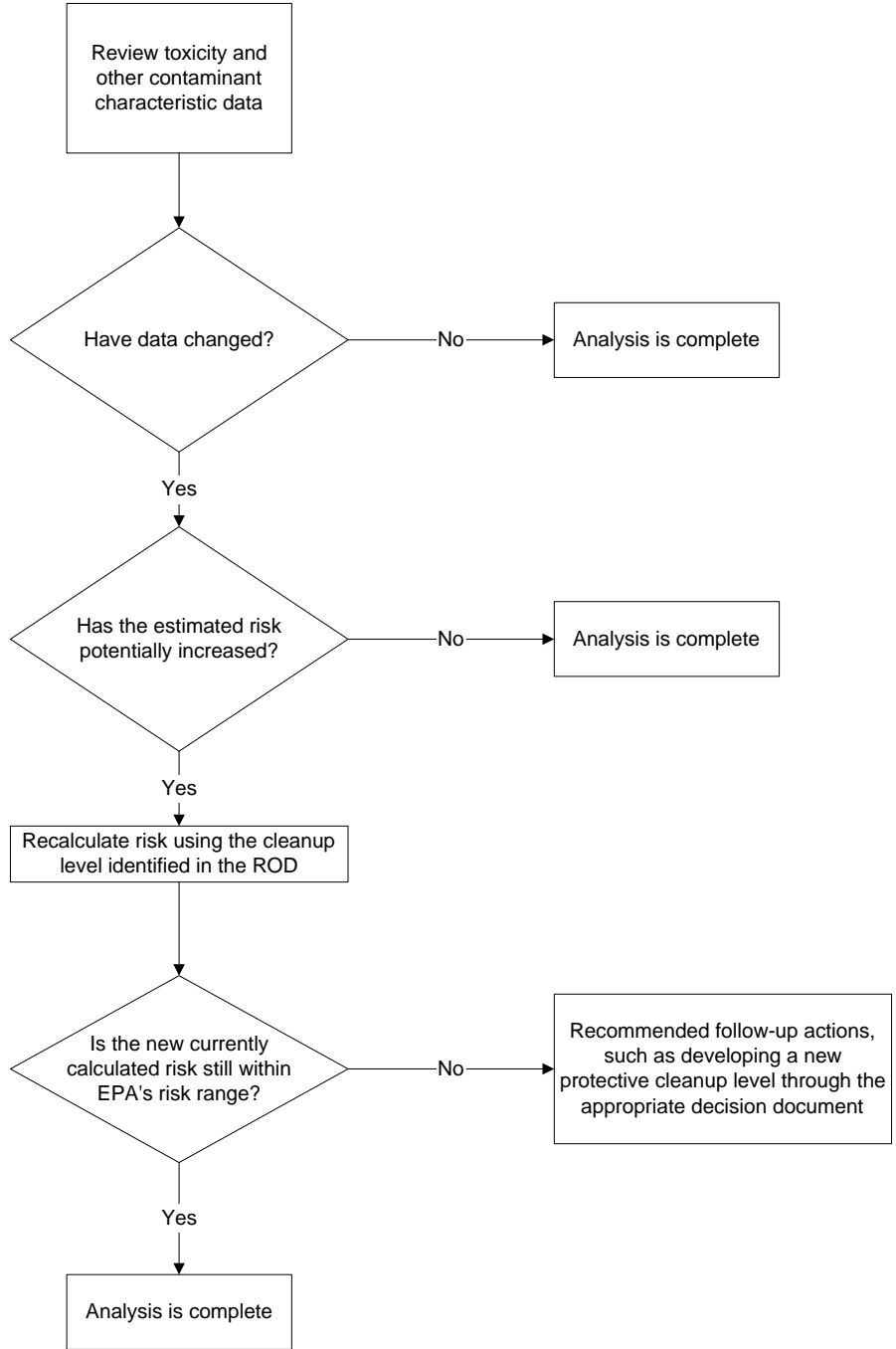


Exhibit G-5: Hypothetical Scenario for a Change in Toxicity

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 $0.05 \text{ (mg/kg-day)}^{-1}$ to $20.00 \text{ (mg/kg-day)}^{-1}$. 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:

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

where:

<u>Parameter</u>		<u>Site Scenario</u>
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:

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

The Old Pesticide Disposal site's original one in one million risk level $R = 1 \times 10^{-6}$ was based on the original CSF of 0.05. Thus, equation (3) yielded a health-based screening level for Hypochem of:

$$C_{\text{Water}} \text{ for } R \text{ of } 1 \times 10^{-6} = 0.001704 \text{ mg/L}$$

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 $R = 1 \times 10^{-6}$, the new health-based screening level for Hypochem becomes:

$$C_{\text{Water}} \text{ for } R \text{ of } 1 \times 10^{-6} = 0.00000426 \text{ mg/L}$$

and using the new CSF of 20.00 to achieve one in a ten thousand risk level $R = 1 \times 10^{-4}$, equation (3) yields a C_{Water} value of:

$$C_{\text{Water}} \text{ for } R \text{ of } 1 \times 10^{-4} = 0.000426 \text{ mg/L}$$

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

