

Five-year Review Report

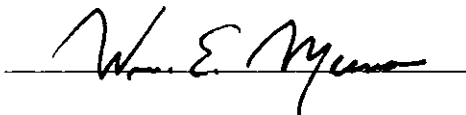
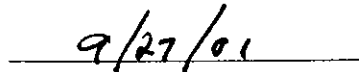
**First Five-Year Review Report
For
Zanesville Well Field Site
City of Zanesville
Muskingum County, Ohio**

September 2001

**PREPARED BY:
United States Environmental Protection Agency
Region 5
Chicago, Illinois**

Approved by:

Date:

A handwritten signature in black ink, appearing to read "William E. Muno", is written over a horizontal line.A handwritten date "9/27/01" in black ink is written over a horizontal line.

William Muno
Superfund Division Director
U.S. EPA Region 5

List of Acronyms

ARAR Applicable or Relevant and Appropriate Requirement
AS Air Sparging
CD Consent Decree
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
CFR Code of Federal Regulations
DCE 1,2-dichlorethylene
EPA United States Environmental Protection Agency
ISVE insitu vapor extraction
MCL Maximum Contaminant Level
NCP National Contingency Plan
NPL National Priorities List
O&M Operation and Maintenance
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
TCE Trichloroethylene
UTC United Technologies Corporation facility
VOC Volatile Organic Compound

Executive Summary

The remedy for Zanesville Well Field Superfund Site in Zanesville, Ohio includes removing contaminated soils, groundwater monitoring, active groundwater restoration involving groundwater pump and treat, air sparging and insitu vapor extraction (ISVE). The site achieved construction completion with the signing of the Preliminary Close out Report (PCOR) on September 20, 1996. The trigger for this five-year review was the PCOR signed September 20, 1996.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements of the Record of Decision (ROD). The remedy is functioning as designed. The immediate threats have been addressed and the remedy is expected to be protective when the groundwater cleanup goals are achieved. A rapid restoration time frame was required in the ROD, because of the close proximity of active City of Zanesville's water supply wells to groundwater contamination. The Feasibility Study estimated five-year time frame to reach a rapid restoration of the groundwater could not be achieved. An enhanced recovery plan was started on June 8, 2001 and is expected to be completed by October 30, 2001. This enhanced recovery plan will determine a better estimate of the timeframe to reach the cleanup goals, determine any necessary enhancements to the remedy system by performing an optimization study of the remedy system, and review and optimize the groundwater monitoring system.

Five Year Review Summary Form

SITE IDENTIFICATION

Site name (from WasteLAN): Zanesville Well Field Site

EPA ID (from WasteLAN): OHD980794598

Region: 5 **State:** OH **City/County:** Muskingum

NPL status:: Final

Remediation status: Complete

Multiple OUs: NO

Construction completion date: 9/ 30 / 1996

Has site been put into reuse? YES

Lead agency: EPA

Author name: David Wilson

Author title: Remedial Project Manager **Author affiliation:** U.S. EPA, Region 5

Review period: 8 / 1 / 2000 to 8 / 31 / 2001

Date(s) of site inspection: 8 / 29 / 2000

Type of review: Post-SARA

Review number: 1 (first)

Triggering action: PCOR

Triggering action date (from WasteLAN): 9 / 20 / 1996

Due date (five years after triggering action date): 9 / 20 / 2001

Issues:

The Feasibility Study estimated time frame to reach a rapid restoration of the groundwater could not be achieved.

Optimization of the extraction system and additional groundwater extraction wells may be required to achieve a rapid restoration.

Groundwater monitoring reports are not clearly demonstrating that the target levels are being contained by the remediation system

Recommendations and Follow-up Actions:

An enhanced recovery plan will be performed to determine a better estimate of the timeframe to reach the cleanup goals under current conditions

The enhanced recovery plan will determine any necessary enhancements to the remedy system by performing an optimization study of the remedy system, to reach the cleanup goals within a rapid restoration time frame.

The enhanced recovery plan will review and optimize the groundwater monitoring system. Groundwater monitoring data will be used to clearly demonstrate that the target cleanup levels are being contained.

Protectiveness Statement:

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 cleanup goals are achieved through Air Sparging, ISVE and groundwater pump and treatment within a rapid restoration timeframe.

Long-term Protectiveness:

Long-term protectiveness of the remedial action will be achieved by remediating the groundwater to concentrations below cleanup levels. The groundwater monitoring system will be used to verify that the target concentrations above cleanup standards are being contained and eventually remedied to concentrations below cleanup levels.

**Zanesville Well Field Site
City of Zanesville
Muskingum County, Ohio
First Five-Year Review Report**

I. Introduction

The purpose of this five-year review is to determine whether the remedy at this site is protective of human health and the environment. The methods, findings and conclusions of reviews redocumented 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 (NCP). CERCLA § 121 states:

If the President selects a remedy that results in any hazardous substance, 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 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; 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 than every five years after the initiation of the selected remedial action.

The United States Environmental Protection Agency (EPA), Region 5, conducted the five-year review of the remedy implemented at the Zanesville Well Field Superfund Site in Zanesville Ohio. This review was conducted by the Remedial Project Manager (RPM) for the entire site from May 2001 through September 2001. This report documents the results of the review.

This is the first five-year review for the Zanesville Well Field Site. The triggering action for the policy review is the signing of the PCOR on September 30, 1996. 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
Site used for manufacturing purposes	1893-Present
Up to 121 drums containing TCE solvent were placed inside the site dug well	Early 1970s
Evidence of TCE contamination at the City of Zanesville's water supply Well Field	1981
Interim Remedial Measure to address inspected groundwater	1983
Site placed on the National Priorities List	1983
U.S. EPA, the Ohio EPA and UTC entered an Administrative Order by consent to perform an Remedial Investigation/Feasibility Study (RI/FS)	8/1988
RI/FS approved	7/1991
ROD selecting the remedy signed	9/1991
Consent Decree to perform the Remedial Design/Remedial Action (RD/RA) at the Site was executed between UTC and U.S. EPA	9/1992
Final RD Design Document approved	10/1995
Construction commenced	10/1995
Preliminary Close Out Report signed	9/1996

III. Background

Physical Characteristics

The Zanesville Well Field Site is located on both sides of the Muskingum River in the center of the City of Zanesville, Ohio (see Attachment 1). The Site contains the affected portion of the water well field for the City of Zanesville and the United Technologies Corporation facility (UTC), the source of the contamination (see Attachment 2). The City of Zanesville municipal well field covers approximately 72 acres and is on a narrow strip of flood plain on the east bank of the river (see Attachment 3). The city currently pumps 5.5 to 6.0 million of gallons of water per day from 10 of the uncontaminated wells in the well field. Four of the city's wells are no longer used for the water supply. Two of the wells are still contaminated and are being pumped as part of the remediation effort. The other two wells are no longer contaminated. These wells are no longer being pumped to prevent contamination migrating to the clean wells. The UTC facility lies on the west bank of the river directly across from the southern portion of the Zanesville Municipal Well Field. The UTC facility and grounds cover an area of approximately 28 acres between the river and Linden Avenue.

Land and Resource Use

The property now occupied by UTC, has been used for manufacturing purposes since 1893, when American Encaustic Tiling Company, a ceramic products manufacturer, constructed the original buildings. The site has gone through several ownerships until in 1974 UTC acquired Essex Corporation.

History of Contamination

Due to the long history and varied usage of the site, many details of past waste storage and disposal practices are not available. However, it has been established that during American Encaustic's ownership of the site, a dug well 10 feet in diameter and 40 feet deep was installed. Over the years the dug well fell into disuse, and in the early 1970's the well was backfilled. Rubble from the demolition of the pump house, as well as up to 121 drums containing TCE solvents were placed inside the well.

Evidence of the TCE contamination at the City of Zanesville's water supply Well Field was first observed in July 1981, during a random spot check for volatile organic compounds (VOCs) by the U.S. EPA. At that time TCE was detected in the plant tap at the water treatment plant. Three wells in the southern end of the well field were found to be contaminated with trichloroethylene (TCE) and 1,2-dichloroethylene (DCE). In late 1981, the City of Zanesville was anonymously notified of the existence of the abandoned dug well on the UTC site, which reportedly contained drums of TCE based solvents. The abandoned well is approximately 900 feet west of the river and directly across the river from the southern portion of the City well field.

Initial Response

In July 1983 UTC installed a groundwater extraction and treatment system at the site consisting of four groundwater extraction wells and an air stripper for treatment as an Interim Remedial Measure to address impacted groundwater. At the same time UTC removed over 121 drums and contaminated debris from the old well and closed it. An initial soil vapor extraction system was later implemented in 1985 to supplement the groundwater remediation system.

In September 1983 the site was placed on the National Priorities List (NPL). In August 1988 U.S. EPA, the Ohio EPA and UTC entered into an Administrative Order by consent to perform a Remedial Investigation/Feasibility Study (RI/FS). The RI was completed in September 1990 and the FS approved in July 1991. A September 30, 1991, Record of Decision documented the remedial actions for the Zanesville Well field Site

Basis for Taking Action

Contaminants

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

Soil

Aluminum
Antimony
Barium
Cadmium

Chromium
Copper
1,2-dichlorethylene (DCE)
Lead
Manganese
Mercury
Trichloroethylene (TCE)
Vanadium
Zinc

Groundwater

Trichloroethylene (TCE)
1,2-dichlorethylene (DCE)

Exposure to soil and groundwater are associated with significant human health risks, due to exceedances of EPA's risk management criteria for either the average or the reasonable maximum exposure scenarios. The risk was highest for exposures to groundwater due to the high concentrations of carcinogenic Trichloroethylene (TCE) and 1,2-dichlorethylene (DCE) that exceed State and Federal MCLs. Risks from exposure to soils were significant due to the presences of carcinogenic TCE, DCE and noncarcinogenic hazards due to high concentrations of lead and mercury.

IV. Remedial Actions

Remedy Selection

A September 30, 1991, Record of Decision documented the remedial actions for the Zanesville Well field Site. 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 Zanesville Well Field Site were divided into the following groups:

Source Control Responses Objectives

Prevent migration from source areas, which causes groundwater to be contaminated above cleanup levels.

Prevent contaminated soils migration to groundwater, direct contact, ingestion, or inhalation above cleanup levels.

Management of Migration Response Objectives

Restore the aquifer by remediating the contaminated groundwater to achieve groundwater cleanup levels throughout the plume.

Remediate source areas or prevent migration from source areas that cause groundwater to be contaminated in concentrations above clean up levels.

Remediate soils to prevent migration from source areas that cause groundwater to be contaminated in concentrations above clean up levels.

Prevent inhalation of air which contains contaminant concentrations that exceed ARARs or risk based levels.

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

1. Installation and operation of a groundwater hydraulic control system;
2. Installation and operation of a groundwater treatment system;
3. Installation and operation of an in situ soil vapor extraction system; and
4. Inorganic soil remediation.

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

1. Installation and operation of a ground water monitoring program for remedial action, installation and operation of a groundwater interceptor well system; and
2. Control of air emissions from the treatment of groundwater and soils to concentrations below ARARs or risk levels.

The remedial action components included fence installation and pre-design studies.

Remedy Implementation

On September 4, 1992, a Consent Decree to perform the Remedial Design/Remedial Action (RD/RA) at the Site was executed between UTC and U.S. EPA. The RD Work Plan was approved on March 12, 1993. A series of Pre-Design Studies which included groundwater and soil sampling, pilot tests and contaminant transport modeling, were completed from May 1993 until November 1994. The Final Design Document was approved on October 18, 1995. Construction commenced on October 30, 1995.

The Inorganic Soil Removal Work Plan portion of the design presented the methodology for completing the inorganic soil remediation. The remediation activities were completed in accordance with the specifications and methods outlined in the plan. The volume of soil to be excavated was estimated to be approximately 304 cubic yards. The actual volume of soil excavated to achieve the inorganic soil clean-up criteria was approximately 1,880 cubic yards. Confirmation soil samples indicated that removal of inorganic impacted soils in excess of the soil clean-up criteria had been achieved.

The results of the “Preliminary Pre-Design Data Report for the Organic Impacted Soils Investigation” did not identify any new source area of VOCs. The only source areas identified were the Drum Storage Area and the northeast corner of the main building. As a result of this conclusion, a shallow SVE system was designed to focus on the Drum Storage Area and the northeast corner of the main building. The deep SVE system was designed to provide soil vapor extraction from the area of suspected deeper zone impacted soil and to provide for the extraction of vapors produced through operations of the air sparging system. Although not required in the ROD, the PRPs proposed air sparging (AS) as an enhancement to the required ISVE system. An AS/SVE system was designed to remediate the organic impacted soils and groundwater. A total of 16 in-situ soil vapor extraction wells, five nested air sparging wells, 5500 linear feet of conveyance piping and the AS/SVE equipment and equipment enclosure were constructed. The AS/SVE system was completed according to the technical specifications and design drawings presented in the Final Design. Based on the results of the AS/SVE Pilot Testing, the SVE system is expected to achieve the clean-up standards specified in the ROD.

The groundwater remediation system design was based on the results of groundwater modeling, groundwater sampling and analysis, the historical performance of the Interim Groundwater Extraction and Treatment System, and the results of the AS/SVE pilot test that were performed. The four existing groundwater extraction wells were incorporated into the final groundwater remediation system. The groundwater remediation is a long-term response action. The groundwater remediation system is expected to achieve the clean-up standard specified in the ROD.

Construction Activities at the site were consistent with the ROD and all work plans. A Quality Assurance Project Plan was approved on March 12, 1993, for all Pre-Design Studies. All sample collection and analytical activities were conducted in accordance with the approved QAPP. The Construction Quality Assurance Plan (CQAP) was approved on October 12, 1995. Remedial Action work was conducted with U.S. EPA oversight. All construction activities were conducted in accordance with the approved CQAP.

V. System Operation/Operation and Maintenance

The Performing Settling Defendant (PSD) are conducting long-term monitoring and maintenance activities according to the operation and maintenance (O&M) plan.

The primary activities associated with the O&M include the following:

- Inspection of conditions of groundwater monitoring wells, air sparging, ISVE wells and groundwater extraction wells
- Environmental monitoring: biennial and yearly monitoring of the groundwater conditions

- Maintenance on remediation systems: air sparge system, ISVE system, and groundwater pump and treat system

The O&M plan will be updated following the completion of the enhanced recovery plan.

VI. Progress Since Last Five-Year Review

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

VII. Five-Year Review Process

Administrative Components

The Zanesville Well Field Five-Year Review was performed by David Wilson, Remedial Project Manager (RPM) for the site. The Ohio EPA has been given a copy of this Five-Year Report.

Document Review

This five-year review considered relevant documents including O&M Records and monitoring data (see Attachment 5). Applicable groundwater cleanup standards, as listed in the ROD were reviewed.

Data Review

Groundwater Monitoring

Groundwater monitoring has been conducted at the Zanesville Well Field Site since the early 1980s. In general the highest concentrations of contamination were during the first few years of the initial response (1983 to 1986). The TCE plume is located in the upper and middle portions of the aquifer. On the UTC Facility side, the highest concentration of TCE are in the upper aquifer, while in the Zanesville City Well Field Side, the highest concentrations of TCE are in the middle portion of the aquifer (see Attachment 4).

The PSD's groundwater monitoring reports do not demonstrate the current capture of target contaminant plume. Groundwater conditions change throughout the long remediation. The size of the current target plume and the size of the current capture zone can dramatically change from the sizes determined during the Remedial Design.

An example of the typical groundwater data presented in the PSD's monitoring reports is shown in Attachment 4. The target plume is the 5 ppb TCE plume, since the TCE cleanup level is 5 ppb. The report should clearly show the aerial extent of the target 5 ppb TCE concentration plume using the current monitoring data. The reports should also clearly show the current capture zone created by the groundwater remediation wells based on the current pumping rates of the remediation wells.

The reports do not show the size of the current target plume, or the current size of the capture zone. Containment of the plume can only be verified by demonstrating that the current capture zone exceeds the size of the current target plume.

Site Inspection

A site inspection was conducted on August 29, 2000. The purpose of the inspection was to assess the protectiveness of the Remedy. No significant issues have been identified at any time regarding the condition of the groundwater extraction wells, groundwater monitoring wells, air sparging wells, the ISVE wells or the fence.

Interviews

Interviews were conducted with parties connected with the site including: Larry Merry, Executive Director, Zanesville-Muskingum County Port Authority, and various personnel from SECOR Inc., UTC's environmental O&M contactor.

VIII. Technical Assessments

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. The removal of contaminated soils 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.

The ROD required a rapid restoration time frame to achieve cleanup standards. The five year time frame for achieving rapid restoration as required in the SOW for RD/RA will not be met. An enhanced recovery plan will be performed to determine a better estimate of the timeframe to reach the cleanup goals. The enhanced recovery plan will determine any necessary enhancements to the remedy system by performing an optimization study of the remedy system, to reach the cleanup goals within a rapid restoration time frame. The enhanced recovery plan will review and optimize the groundwater monitoring system. Groundwater monitoring data will be used to clearly demonstrate that the target cleanup levels are being contained.

System optimization will be occurring during the Enhanced Recovery Plan

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 Considered

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)], Ohio State water quality standards (OCR Section 6111.041) for wastewater discharges, and Ohio State air standards (OCA 3745-31-05) for all air emissions, and ARARs related to post-closure monitoring. There have been no changes in these ARARs and no new standards or TBCs affecting the protectiveness of the remedy.

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

No new contaminants have been detected in the groundwater. 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 surface water samples analyzed found no contamination of 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. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. The five year time frame for achieving rapid restoration as required in the SOW for RD/RA will not be met. Most ARARs for soil contamination cited in the ROD have been met. There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there has 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.

IX. Issues

Table 4 - Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The five-year time frame for achieving rapid restoration will not be met.	N	Y
Optimization of the extraction system and additional groundwater extraction wells may be required to achieve rapid restoration	N	Y
Groundwater monitoring reports do not clearly show capture of target contaminant zones	N	Y

X. 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
The five-year time frame	Enhanced Recovery Plan will be performed	RAO	EPA/State	10/2001	N	Y
Optimization of the extraction system	Enhanced Recovery Plan will be performed	RAO	EPA/State	10/2001	N	Y
Groundwater monitoring reports	Enhanced Recovery Plan will be performed	RAO	EPA/State	10/2001	N	N

XI. Protectiveness Statement

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through groundwater pump and treat with ISVE and air sparging. An enhanced recovery plan will be performed to determine a better estimate of the timeframe to reach the cleanup goals. In the interim, exposure pathways

that could result in unacceptable risks are being controlled and exposure to or the ingestion of contaminated groundwater is being prevented.

Long-term protectiveness of the remedial action will be achieved by continued groundwater pump and treat and verified by obtaining additional groundwater samples to fully evaluate the achievement of groundwater contaminant cleanup concentration levels. An enhanced recovery plan will provide for an optimization of the extraction well system for better performance and achieve cleanup levels in a shorter timeframe.

XII. Next Review

The next review for the Zanesville Well Field Site is required by September 2006, five years from the date of this review.