

Five-Year Review Report

**First Five-Year Review Report
For
Potter's Septic Tank Service Pits
Sandy Creek
Brunswick County, North Carolina**

August 2002

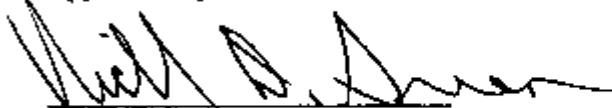
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10 SEP 02

Five-Year Review Report

Table of Contents

List of Acronyms	iii
Executive Summary	iv
Five-Year Review Summary Form	vi
I. Introduction	1
II. Site Chronology	2
III. Background	3
A. Physical Characteristics	3
B. Land and Resource Use	3
C. History of Contamination	4
D. Initial Response	6
IV. Remedial Actions	6
A. Remedy Selection	6
B. Remedy Implementation	9
C. Progress Since the Last Five-Year Review	13
V. Five-Year Review Process	13
VI. Five-Year Review Findings	13
A. Interviews	13
B. Site Inspection	14
C. ARAR Review	16
D. Changes in Exposure Pathways, Toxicity and Other Contaminant Characteristics	16
E. Data Review	16
VII. Assessment	20
Question A: Is the remedy functioning as intended by the decision documents?	20
Question B: Are the assumptions used at the time of the remedy selection still valid?	20
Question C: Has any information come to light that could call into question the protectiveness of the remedy?	20
VIII. Issues	21
IX. Recommendations and Follow-up Actions	21
X. Protectiveness Statements	22
XI. Next Review	22

List of Figures

Figure 1. General Location	4
Figure 2. Specific Site Location	5
Figure 3. Monitoring Well Locations	11
Figure 4. New Monitoring Well Locations	12
Figure 5. Maximum Benzene and Ethylbenzene Concentrations in all Potter's Pits Groundwater Monitoring Wells 1984 - 1993	19
Figure 6. Maximum Benzene and Ethylbenzene Concentrations in all Potter's Pits Groundwater Monitoring Wells 1996 - 2002	19

List of Tables

Table 1. Chronology of Events	2
Table 2. Soil Clean-up Standards	8
Table 3. Groundwater Clean-up Standards	8
Table 4. Revised Groundwater Clean-up Standards (AROD)	9
Table 5. Pre- and Post-Excavation Soil Concentration Data	17
Table 6. Sampling Efforts by Well Number	18
Table 7. Recommendations and Follow-up Actions	21

List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
AROD	Addendum to the Record of Decision
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CENWHO-HX-G	Corps of Engineers Hazardous, Toxic and Radioactive Waste Center of Expertise
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CESAW-TS-PE	Wilmington District, Corps of Engineers Environmental Resources Section
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FS	Feasibility Study
IAG	Interagency Agreement
IDW	Investigation Derived Waste
Kg	Kilogram
L	Liter
LTTD	Low Temperature Thermal Desorption
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
PAHs	Polynuclear Aromatic Hydrocarbons
ppb	Parts Per Billion
ppm	Parts Per Million
PRP	Potentially Responsible Party
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
SESD	Science and Ecosystems Support Division
µg	Microgram
USACE	United States Army Corps of Engineers
VOC	Volatile Organic Compound
WasteLAN	The Regional database related to CERCLIS

Executive Summary

This report documents the first five-year statutory review of the National Priorities List (NPL) site NCD981023260. The site, referred to as Potter's Septic Tank Service Pits, is a former septic sludge disposal pit site located in Sandy Creek, Brunswick County, North Carolina. The site is approximately five acres in size. Contaminants of concern associated with groundwater at the site are volatile organic compounds (VOCs) including benzene and xylene, phenols and petroleum compounds. There was also soil contamination involving heavy metals, chloroform, phenols, VOCs and other petroleum compounds. These contaminants are the result of disposal of waste oil, creosote, and septic sludge in unlined pits by Potter's Septic Tank Service from 1969 to 1976.

Contamination was traced back to the pits as the result of investigation by the U.S. Coast Guard into an oil spill in 1976. As a result of the spill, the Coast Guard cleaned up approximately 20,000 gallons of oil from the Chinnis and Rattlesnake Branches. Mr. Otto Skipper subsequently pumped an additional 20,000 gallons of oil from the pits and transported the waste to Fort Bragg Military Reservation in Fayetteville, North Carolina. During the same time frame, about 150 dump truck loads of oil sludge and oil stained soil were removed from the site and disposed of in the Brunswick County Landfill in Leland, North Carolina.

Between 1982 and 1983, the property surrounding the site was developed and subdivided into one and two acre residential lots. In July 1983, the owner of a portion of the site property found waste materials buried in their yard. The State of North Carolina sampled soil and groundwater, analysis of which confirmed the presence of contamination, resulting in the condemnation of the property owner's potable water well. Subsequent soil and groundwater sampling identified the following organic contaminants at the Site: Benzene, toluene, ethylbenzene, xylenes (BTEX), and polynuclear aromatic hydrocarbons (PAH's). From soils data, BTEX levels were in excess of 1,600,000 parts per billion (ppb), PAH concentrations exceeded 43,000 ppb, and naphthalene levels were as high as 58,000 ppb. Inorganic contaminants of concern were lead, chromium and zinc. Maximum soil lead, chromium, and zinc concentrations were 1250 parts per million (ppm), 170 ppm and 3,300 ppm, respectively.

In March 1984, EPA conducted an emergency removal action to remove the soil source of contamination. Approximately 1,770 tons of contaminated soil were removed from the site and hauled to a hazardous waste landfill in Pinewood, South Carolina. Nine groundwater-monitoring wells were installed and sampled as an adjunct to the removal action.

After conducting the Remedial Investigation and Feasibility Study, EPA signed a Record of Decision (ROD) for remediation of contaminated soils and groundwater on August 5, 1992. The ROD selected Low Temperature Thermal Desorption as the preferred source remediation and Pump-and-Treat for the groundwater remediation. Soil source remediation activities took place between March 1995 and June 1996. Following source remediation, the EPA Region 4 Science and Ecosystems Support Division (SESD) conducted additional site investigations during 1999 and June 2000. Based on those investigations, an evaluation report, and a Feasibility Study Addendum, an Amended Record of Decision (AROD) selecting monitored natural attenuation (MNA) for remediation of groundwater contamination was signed September

27, 2000. The clean-up standards for the AROD are as follow: Benzene – 1 µg/L; Ethylbenzene – 29 µg/L; Naphthalene – 21 µg/L; 1,2,4 and 1,3,5 Trimethylbenzene – 60 µg/L (total).

Since implementation of the monitored natural attenuation remediation of groundwater contaminants at the site, there have been two sampling events of monitoring wells on the site – one in October of 2001 and the other in March of 2002. The March sampling coincided with installation of additional monitoring wells suggested in the September 2000, *Supplemental Evaluation of Monitored Natural Attenuation at the Potter's Pits Site, Sandy Creek, North Carolina*.

Two issues were identified during the review process. None of these issues affect the assessment of the performance of the remedy. However, each should be addressed before the next five-year review. The issues are described as follows:

1. Institutional controls for the site as proposed in the documents of record have not been implemented. The EPA should coordinate with the site property owner(s) and the State of North Carolina to implement the proposed institutional controls.

2. Monitoring wells need to be properly secured and locked to prevent tampering and damage.

The remedial actions at the Potter's Pits site currently protect human health and the environment. The soil remediation for the site has been completed, and the monitored natural attenuation remediation of the groundwater contamination including monitoring is continuing. The 1996 soil remediation clearly had the effect of reducing groundwater contaminant concentrations. The groundwater contamination trends attributable to the MNA remedy cannot presently be determined. The trends of contaminant concentrations in groundwater are difficult to discern because of frequent changes in the sampling program. To ensure long-term protectiveness of the selected site remedy, implementation of institutional controls should occur.

Five-Year Review Summary Form

Five-Year Review Summary Form			
Site Identification			
Site Name: Potter's Septic Tank Service Pits			
EPA ID: NCD981023260			
Region: 4	State: NC	City/County: Sandy Creek/Brunswick	
SITE STATUS			
NPL status: ☒ Final ☐ Deleted ☐ Other:			
Remediation Status: ☐ Under Construction ☒ Operating ☐ Complete			
Multiple OUs?* ☐ YES ☒ NO		Construction Completion Date: September 27, 2000	
Has site been put into reuse? ☒ NO			
REVIEW STATUS			
Reviewing agency: ☒ EPA ☐ State ☐ Other:			
Author name: Stacy Samuelson			
Author title: Biologist		Author affiliation: USACE, Wilmington District	
Review period:** 4/02 – 4/07			
Date(s) of site inspection: April 12, 2002			
Type of review:*** ☒ Statutory ☐ Policy ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion)			
Review number: ☒ 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify)			
Triggering action:**** ☐ Actual RA On-site initiation by PRP ☒ Actual RA start at OU# <u>1</u> ☐ Construction completion ☐ Previous Five-Year Review Report ☐ Other (specify)_____			
Triggering action date: September 27, 2000			
Due date (five years after triggering action date): September 27, 2005			

* “OU” refers to operable unit.

** Review period should correspond to the actual start and end dates of the five-year review in WasteLAN.

*** See Chapter 1, Section 1.2 of EPA 540-R-01-007, Final June 2001 for further explanation.

**** See Chapter 1, Section 1.3 of EPA 540-R-01-007, Final June 2001 for further explanation.

Five-Year Review Summary Form
Issues: 1. Institutional controls for the site as proposed in the documents of record have not been implemented. 2. Monitoring wells need to be properly secured to prevent tampering.
Recommendations and Follow-up Actions: 1. The EPA needs to coordinate with the landowner and the State of North Carolina to emplace the Institutional Controls proposed in the ROD and AROD. 2. Ensure that all monitoring wells are secured and locked to prevent tampering and damage.
Protectiveness Statement(s): The remedy at the Potter's Pits Site currently protects human health and the environment because the soil remedy is complete and the monitored natural attenuation remediation of groundwater is continuing. However, in order for the remedy to be protective in the long-term, implementation of institutional controls should occur.

FIVE-YEAR REVIEW REPORT

I. INTRODUCTION

The United States Environmental Protection Agency (EPA) Region 4 has completed a five-year review of remedial actions implemented at the Potter's Septic Tank Service Pits site in Sandy Creek, Brunswick County, North Carolina. The United States Army Corps of Engineers (USACE) conducted and provided technical assistance and analysis for the five-year review. The Environmental Resources Section, Planning and Environmental Branch, Technical Services Division of the Wilmington District, Wilmington, North Carolina provided the USACE lead for this review. The review was accomplished under EPA Work Authorization Form for Interagency Agreement (IAG) Number DW96945884. The Wilmington District was supported in the conduct of the review by the USACE Hazardous, Toxic and Radioactive Waste Center of Expertise (CENWO-HX-G) located at the Omaha District, Nebraska. This review was conducted from March 2002 through August 2002. The report documents the results of that review.

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

This review is a statutory review. EPA must implement five-year review consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substance Contingency Plan (NCP). CERCLA §121(c), as amended 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.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) 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.

This is the first five-year review of the Potter's Septic Tank Service Pits site. The Site was originally identified as requiring a "policy" five-year review, which must occur within 5 years after completion of construction. Completion of construction, as designated by signature of the Preliminary Close-Out Report occurred on September 27, 2000.

However, also in fiscal year 2000, EPA amended the Record of Decision for this Site, and concluded that they would likely leave some contamination on the Site at levels that exceeded unrestricted uses. The EPA also concluded that institutional controls would be needed.

With this decision, the five-year review became a “statutory” review, required within 5 years of start of on-site remedial action (the Remedial Action Start date is September 30, 1994). Therefore the five-year review report became technically overdue on the date of the fiscal year 2000 ROD amendment. The next five-year review will be due 5 years after completion of this five-year review.

This review will be placed in the EPA site files and local repository for the Potter’s Septic Tank Service Pits site. The local repository is located at the Leland Public Library, 487 Village Road, Leland, North Carolina 28451.

II. SITE CHRONOLOGY

Table 1 lists the chronology for selected events for the Potter’s Septic Tank Service Pits site, as shown below.

Table 1: Chronology of Events

EVENT	DATE
Skipper Family used the site for disposal of waste petroleum waste and septic tank sludge in unlined pits.	1969 to 1976
Unlined pit failure allowed 20,000 gallons of oil to flow into the Chinnis Branch and Rattlesnake Branch.	1976
Removal of 20,000 gallons of oil from site to Fort Bragg Military Reservation in Fayetteville, North Carolina.	1976
Site purchased for residential development by Investment Management Corporation.	1980
Site owners discovered waste materials in their yard.	1983
State of North Carolina investigation of soil and groundwater confirming presence of contaminants resulting in condemnation of the site owners well.	July, 1983
EPA and Region IV Field Investigation Team conducted surveys to delineate extent of contamination.	September, 1983
EPA Office of Emergency and Remedial Response initiated an immediate Removal Action, removing 1,770 tons of oily sludge and contaminated soils to a hazardous waste landfill in Pinewood, South Carolina.	March 21, 1984 to April 2, 1984
EPA-Region IV proposes a groundwater monitoring plan to determine threats to groundwater sources.	May, 1984
Preliminary Assessment of site conducted revealing soil and water contamination.	September, 1987
Site added to National Priorities List (NPL).	March 31, 1989
Remedial Investigation (RI) Report completed.	December, 1991
Feasibility Study (FS) completed	August 5, 1992
Record of Decision (ROD) signature.	August 5, 1992
Contract award for soil source remediation.	November, 1994
Mobilization for soil treatment.	March, 1995
Explanation of Significant Difference (ESD) changing lead remedial level goal from 25 ppm to 400 ppm.	February 9, 1996
Soil excavation and treatment complete.	April, 1996
Pre-final inspection of soil remediation by Bechtel.	June, 1996
Final inspection of soil remediation by EPA and State of North Carolina.	June 11, 1999
Feasibility Study Addendum to evaluate Monitored Natural Attenuation and Institutional Controls as a remedy for groundwater contamination.	August 11, 2000
Amended Record of Decision (AROD) signature.	September 27, 2000
Preliminary Close-Out Report	September 27, 2000
Field investigation including potable water well sampling.	October 29, 2001
Follow-up potable water well sampling	December 17, 2001
Additional monitoring well installation and sampling.	March, 2002
Site inspection for the first five-year review.	April 12, 2002

III. BACKGROUND

A. Physical Characteristics

The Potter's Septic Tank Service Pits Site is located in a rural, but developing section of Brunswick County, North Carolina, in a residential development known as the Town of Sandy Creek. The town is located off of U.S. Highway 74/76 to the west of Maco, North Carolina (Figure 1). Sandy Creek consists of one to two acre lots, each with an individual domestic water well. The site consists mainly of Lots 85, 86 and 87 of the Sandy Creek development located to the east of Grainger Circle and north of Joe Baldwin Drive. In 2000, approximately 70 of 150 residential lots were occupied within the Sandy Creek area.

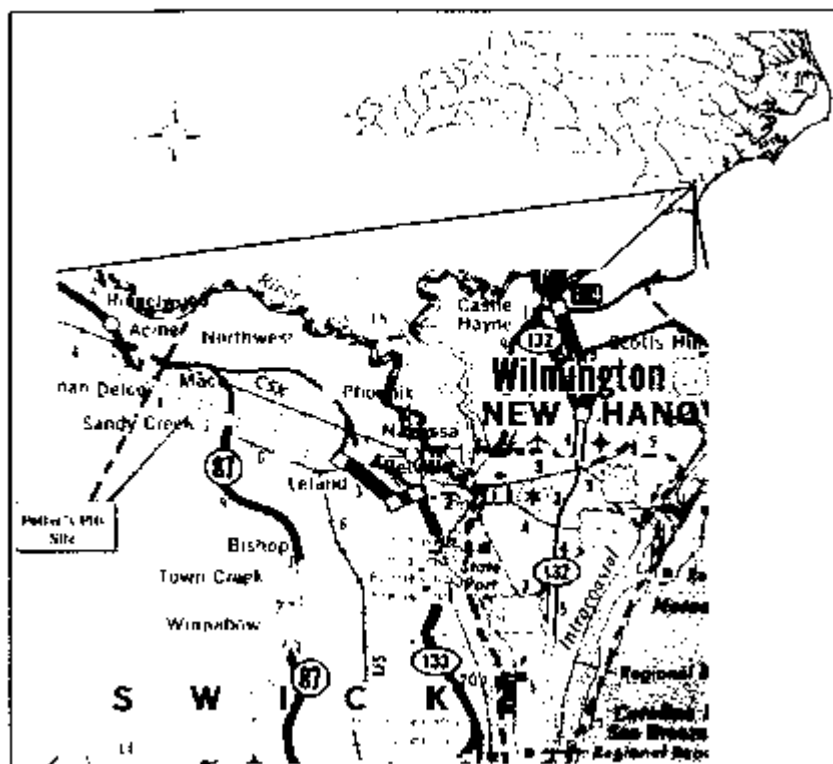
The Potter's Pits Site was originally divided by EPA into three study areas, Areas 1 and 3 are located in the Sandy Creek residential area, and Area 2 was located about 1.5 miles to the north across U.S. Highway 74/76 (Figure 2). Area 1 consists of the Potter's Pits Site, whereas Areas 2 and 3 were identified during preliminary investigations as having potentially been waste disposal areas. Area 3 was removed from consideration during the Remedial Investigation (RI) phase, and Area 2 was removed when investigation revealed no information or evidence of disposal activities.

The Potter's Pits Site extends from an upland area to a low-lying wetland bordering Chinnis Branch on the east. The site has topology typical of the Atlantic coastal plain physiographic region, with shallow water tables and low topographic relief. Soils in the area are classified as Baymeade fine sand and Foreston loamy fine sand types that overlay a limestone or calcareous sandstone basement member. There is also an intermittent clay zone at a level of 30 to 40 feet that tends to divide the shallow groundwater aquifer from the deeper aquifer in the area. Drainage from the site is to the northeast toward the Chinnis Branch, which flows into Rattlesnake Branch.

B. Land and Resource Use

Current land use of the area is rural residential in nature. Development of the area by Investment Management Corporation created one and two acre lots, each supplied by its own well for potable water. In 2000, approximately 70 of 150 lots were inhabited with single-family dwellings. Based on current levels of development of the area, it is not foreseen that there will be any major change in land-use in the future.

Figure 1. General Location

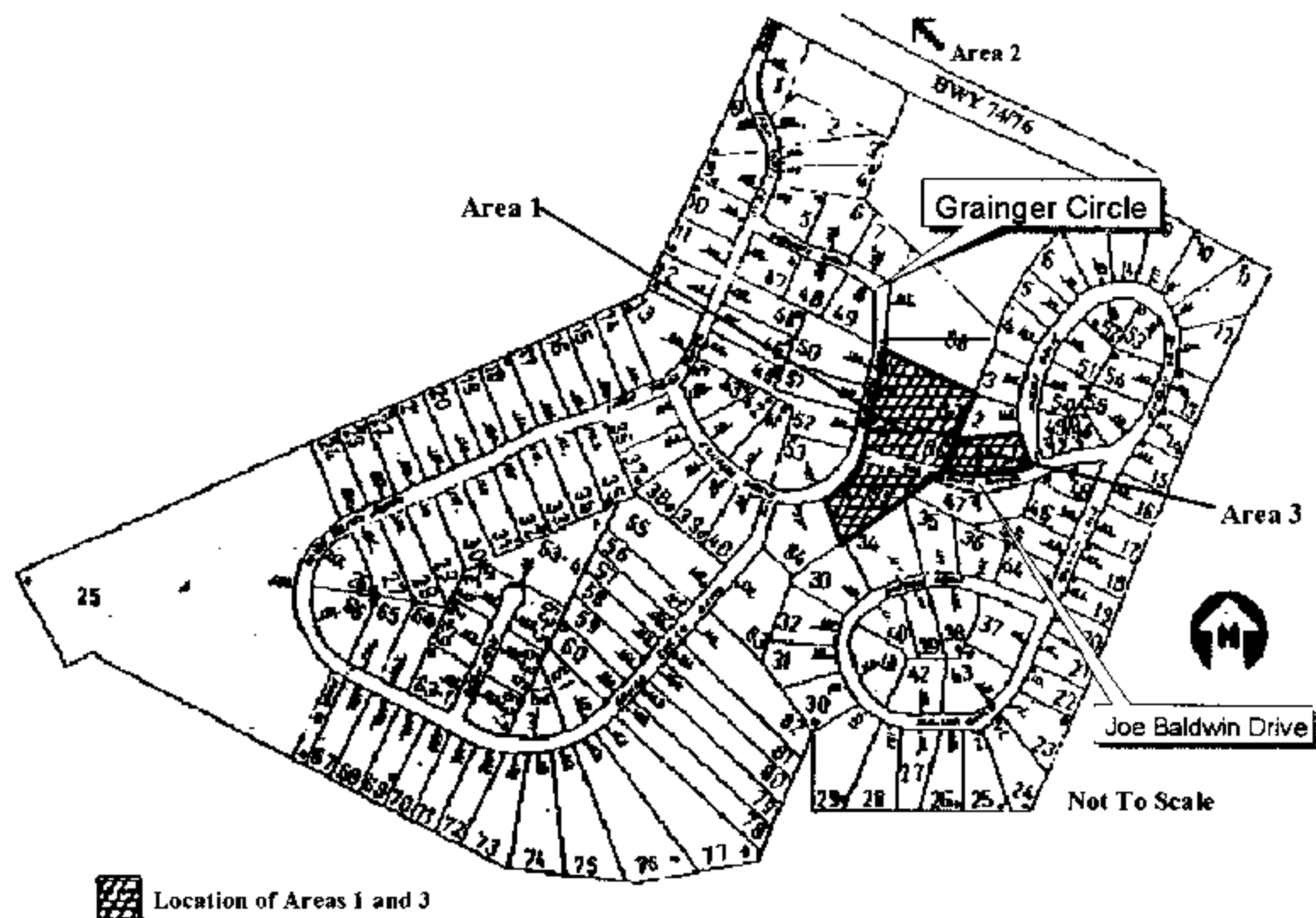


C. History of Contamination

From 1969 to 1976, the Skipper family owned the property and operated sludge hauling and oil spill cleanup companies in the area. Waste disposal pits were developed in and around the Sandy Creek area. Waste petroleum and septic tank sludge was disposed of in shallow unlined pits or by spreading material directly on the land surface. Records do not show the composition of the materials disposed of at the site.

In August of 1976, an unlined pit in the site area failed allowing approximately 20,000 gallons of oil to escape. The spill flowed into Chinnis Branch and then into Rattlesnake Branch. The United States Coast Guard, responding pursuant to Section 311 of the Clean Water Act, as amended, cleaned up the spilled oil from Rattlesnake Branch and traced the source back to the Potter's Pits Site.

After the August 1976 spill, Mr. Otto Skipper pumped approximately 20,000 gallons of oil from the pits and transported the waste to Fort Bragg Military Reservation in Fayetteville, North Carolina. At the same time, about 150 dump truck loads of oil sludge and oil stained dirt were removed and disposed of in the Brunswick County Landfill in Leland, North Carolina. Additional oil sludge that could not be pumped was mixed with sand and buried on site. Documentation of the actual amounts or composition of the material disposed of in the landfill has not been found in records related to the site.



The property surrounding the site was developed and subdivided into one and two acre residential lots between 1982 and 1983. In July 1983, the owners of the property found waste materials buried in their yard. The State of North Carolina sampled soil and groundwater, analysis of which confirmed presence of contamination, resulting in the condemnation of the Site owner's water well. Subsequent soil and groundwater sampling identified the following organic contaminants at the Site: Benzene, toluene, ethylbenzene, xylenes (BTEX), and polynuclear aromatic hydrocarbons (PAH's). From soils data, BTEX levels were in excess of 1,600,000 parts per billion (ppb), PAH concentrations exceeded 43,000 ppb, and naphthalene levels ranged as high as 58,000 ppb. Inorganic contaminants of concern were lead, chromium and zinc. Maximum soil lead, chromium and zinc concentrations were 1,250 parts per million (ppm), 170 ppm and 3,300 ppm, respectively.

D. Initial Response

After the spill event in August of 1976, the Skippers were fined for un-permitted waste disposal, but no further action was taken by the State of North Carolina or Brunswick County officials.

In July 1983, a property owner living on the primary site area discovered contaminated materials in his yard. As a result of the discovery, environmental investigations of the site began. Initial soil and groundwater testing by the State resulted in the condemnation of the site owner's potable water well due to unacceptable levels of benzene. Further groundwater and soil sampling was conducted by EPA to delineate the extent of contamination and also to test water wells of residences throughout the area.

In March 1984, EPA conducted an emergency removal action to remove the soil source of contamination. Approximately 1,770 tons of contaminated soil were removed from the site and hauled to a hazardous waste landfill in Pinewood, South Carolina. Nine groundwater monitoring wells were installed and sampled as an adjunct to the removal action.

IV. REMEDIAL ACTIONS

A. Remedy Selection

The remedial actions in the Record of Decision (ROD) dated August 5, 1992, provided for remediation of contaminated soils and groundwater. The remedial actions identified in the ROD were as follows:

Groundwater

The groundwater remedy was targeted at removal of site-related contaminants in the groundwater through groundwater extraction and on-site treatment by chemical means and air stripping. The following activities were identified as being associated with this alternative:

- ◆ Contaminated groundwater would be extracted from within the plume via extraction well(s) and piped to an on-site, aboveground treatment facility.

- ◆ Treatment would consist of air stripping and chemical treatment configured in a “treatment train” where the air stripping will be used to remove the VOC’s and the chemical treatment (precipitation, flocculation, and filtration) would be used to remove heavy metals.
- ◆ Final discharge of the effluent would be to Chinnis Branch, with parameters meeting the substantive requirements of the National Pollutant Discharge Elimination System.
- ◆ Continued analytical monitoring of contaminants in groundwater.

Soils

The remedy for contaminated soils had the intent of permanently removing contamination in the soil through treatment. The selected alternative involves Low Temperature Thermal Desorption (LTTD). The following activities were identified as being associated with this alternative:

- ◆ The current residents of the site would be relocated before remedial actions proceeded.
- ◆ Excavation of all soils exceeding cleanup standards identified in the ROD.
- ◆ Treatment of the excavated soils on-site using the *ex-situ* thermal desorption process.
- ◆ Treatment of the concentrated organic contaminants, a by-product of thermal desorption, which would be vendor dependent.
- ◆ Sampling and analysis of the treated soils to insure efficacy of the treatment process.
- ◆ Appropriate disposal of soils not adequately treated by the LTTD process.
- ◆ Backfill of excavated areas with treated soils, regrading of site and revegetation with native grasses.

For each of the selected remedies, there were contingency measures to respond to the potential of failure of the remedy to attain stated clean-up goals. Briefly, the contingency measures for groundwater included long-term low level pumping and institutional controls for restriction of access to portions of the aquifer remaining above health-based standards. For soils, the contingency measure consisted of off-site disposal of contaminated materials. The contingency measures are fully elaborated in the ROD (EPA, 1992). Contingency measures were not implemented during the remedial action or after conclusion of the soil remediation.

Tables 2 and 3 show the clean-up standards for soil and groundwater under the ROD.

Table 2. Soil Clean-Up Standards

Soil Clean-Up Standards	
Contaminant	Clean-up Standard
Benzene	.010 ppm
Toluene	3.4 ppm
Ethylbenzene	.235 ppm
Xylenes	3.5 ppm
Naphthalene	1.8 ppm
* Carcinogenic PAHs	.011 ppm
Lead	25 ppm
Chromium	97.2 ppm
* Zinc	122 ppm

* Note: These standards will be applied to the top foot of soil only.

Table 3. Groundwater Clean-Up Standards

Groundwater Clean-Up Standards	
Contaminant	Clean-Up Standard
Benzene	5 ppb
Toluene	1,000 ppb
Ethylbenzene	29 ppb
Xylenes	400 ppb
Naphthalene	30 ppb
Chromium	50 ppb
Lead	15 ppb

The LTTD soils remediation was completed in June 1996. Site restoration was conducted from 1996 to 1999. A final inspection by EPA and the State of North Carolina Division of Superfund occurred on June 11, 1999. The EPA Science and Ecosystems Support Division (SESD) conducted additional site investigations during 1999 and June of 2000. These studies supported the finding that soil removal and treatment has reduced the contaminant source.

Based on results of the additional sampling and a feasibility study completed in June 2000, to evaluate monitored natural attenuation (MNA) of groundwater contamination and a supplemental report dated September 5, 2000, EPA issued an Amended Record of Decision (AROD) September 27, 2000. The AROD addresses implementation of MNA and Institutional Controls as the preferred alternative for remediation of groundwater contamination. The components of the monitored natural attenuation and institutional controls alternative included the following:

- ◆ Groundwater monitoring program to monitor Volatile Organic Compound (VOC) concentration and migration pathways.

- ◆ Periodic (short and long-term) sampling and analysis of groundwater to determine if contaminants have degraded or migrated.
- ◆ Installation of seven deep zone and five shallow zone monitoring wells to aid in monitoring efforts.
- ◆ Implementation of Institutional Controls via deed recordation and restriction of use of specific areas of properties overlying impacted groundwater.

The MNA alternative was selected due to its comparable effectiveness to the pump and treat method selected in the original ROD for an overall reduced cost for the life of the remedial action. Table 4 shows the groundwater cleanup standards of the AROD. Metals of concern (lead and chromium), in the original ROD have been retained, although evidence shows that the groundwater concentrations of these metals have decreased over time to levels below the ROD groundwater clean-up goals or were not actually present as significant concentrations of mobile phase contamination when they were detected.

Table 4. Revised Groundwater Clean-Up Standards (AROD)

Groundwater Clean-Up Standards (AROD)	
Contaminant	Clean-Up Standard
Benzene	1 µg/L
Ethylbenzene	29 µg/L
Naphthalene	21 µg/L
1,2,4 and 1,3,5 Trimethylbenzene	60 µg/L (total)
Toluene	1,000 µg/L
Xylenes	400 µg/L
Chromium	50 µg/L
Lead	15 µg/L

The changes in the clean-up standards for benzene and naphthalene reflect changes in drinking water standards in North Carolina. The Federal standard for benzene is 5 µg/L and the change represented in Table 4 reflects the more stringent North Carolina standard. For naphthalene, the original clean-up standard was 30 µg/L with the change reflected in Table 4 occurring due to a change in the State Standard. The standard for 1,2,4 and 1,3,5 Trimethylbenzene was determined by risk analysis in the Supplemental Evaluation of Monitored Natural Attenuation at the Potter's Pits Site, Sandy Creek, North Carolina (EPA, 2000).

B. Remedy Implementation

In May 1984, following the Removal Action conducted from March 21, 1984 to April 2, 1984, EPA Region 4 implemented a groundwater monitoring plan to determine whether the site presented a danger to groundwater resources or not. Subsequent installation and sampling of nine monitoring wells showed high concentrations of benzene, toluene, and xylenes (BETX) in some of the samples. The State of North Carolina re-sampled the wells in 1988, with analysis for volatile organics, phenols, priority metals, and several nutrients. Phenols and BETX were the primary contaminants found. Additionally, the 1988 data indicated that one of the "deep" wells

had low-level benzene, ethylbenzene, and xylenes contamination, which would indicate that the “deep” aquifer had been affected.

As a result of the site investigation, the site was placed on the National Priorities List (NPL) and a Remedial Investigation and Feasibility Study were begun under Superfund authorities. The Remedial Investigation was completed by Ebasco Services under contract to EPA Region 4 between 1989 and 1991. The Feasibility Study process coincided with the Remedial Investigation and was completed on August 5, 1992 with the signing of the ROD. Figure 3, developed by Weston as part of the Remedial Investigation Addendum, displays monitoring well locations for wells installed through 1991. Additional wells were installed in March of 2002 as partial implementation of the recommendations of the Supplemental Evaluation of Monitored Natural Attenuation at the Potter's Pit s Site, Sandy Creek, North Carolina (EPA, 2000). The approximate locations for the new wells are shown on Figure 4.

Figure 3. Monitoring Well Locations

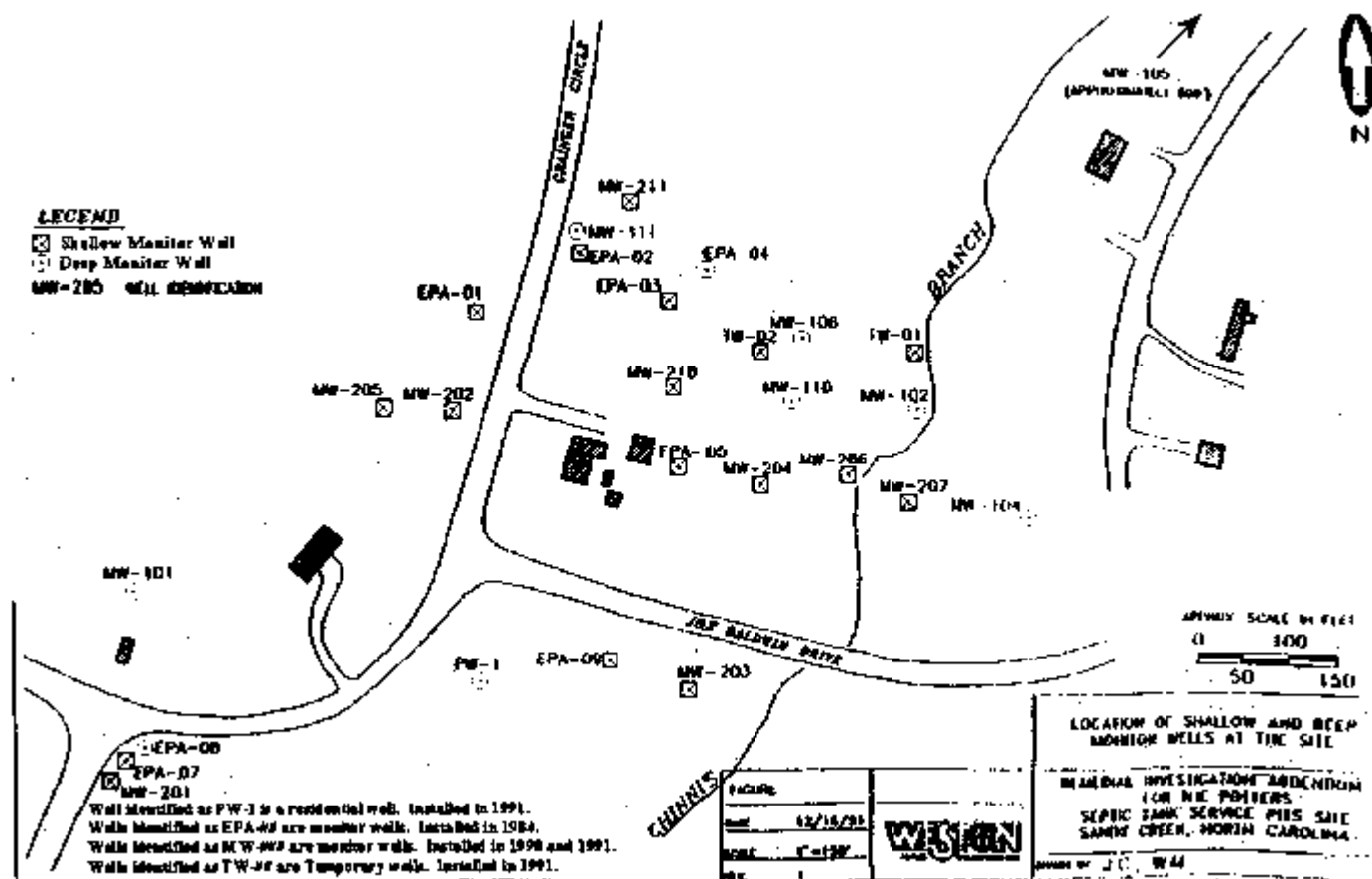
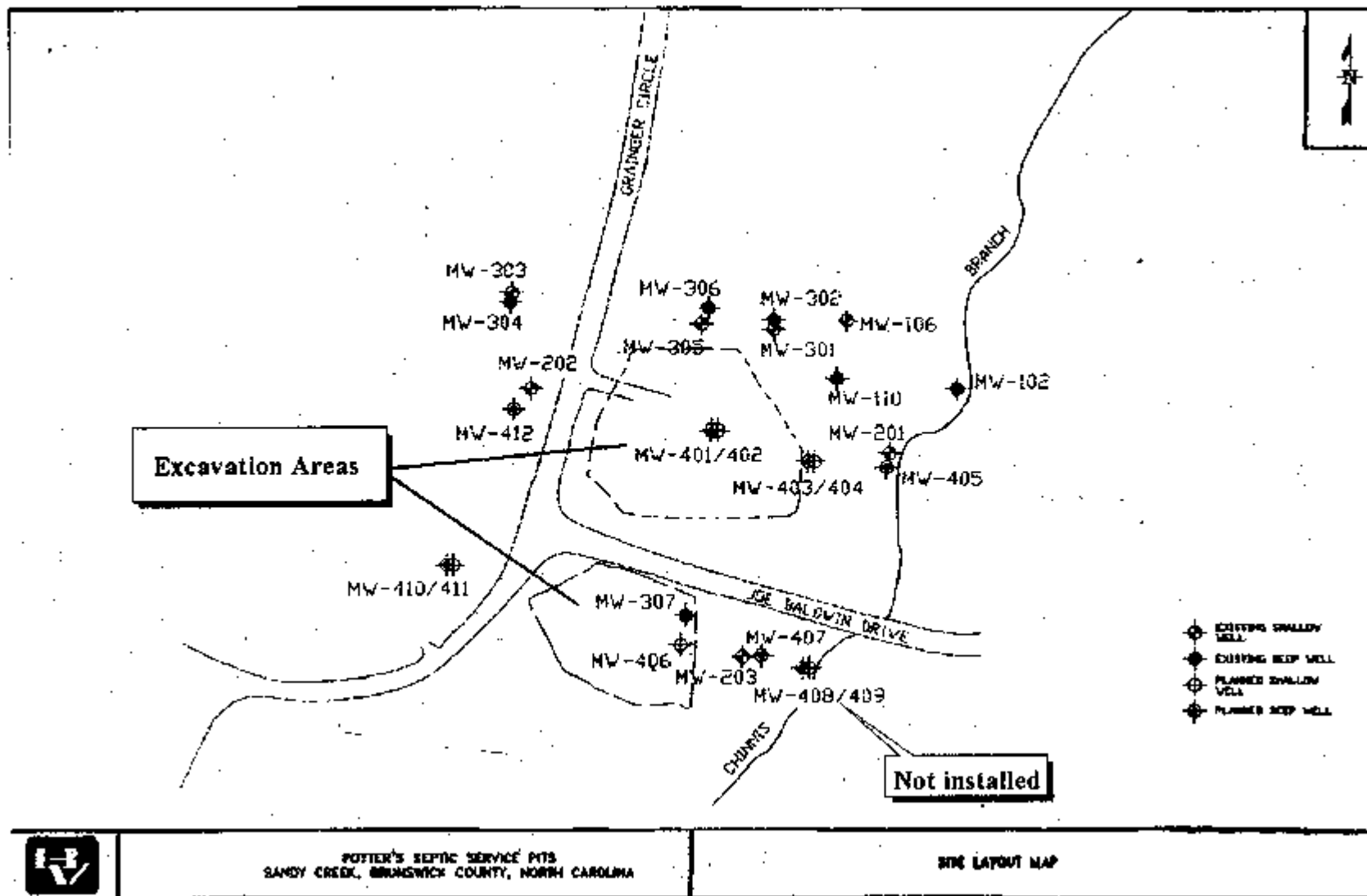


Figure 4. New Monitoring Well Locations



C. Progress Since the Last Five-Year Review:

Since this is the first Five-Year Review Report, no other report is available and thus no progress is reportable.

V. FIVE-YEAR REVIEW PROCESS

The five-year review process for the Potter's Septic Tank Service Pits site included telephone discussion/interviews with the EPA Remedial Project Manager (RPM), and the lead State agency. Also included, were several visits to the Leland Public Library, the public repository for the remedial action documents, and a visit to EPA Region IV offices in Atlanta, Georgia to obtain copies of relevant documents for review. A list of pertinent materials from the Leland Public Library, the EPA Region IV offices, and other sources is provided in Attachment 1 .

The following persons were members of the five-year review team:

- ◆ Greg Mellema, Hazardous, Toxic, and Radioactive Waste Center of Expertise (CENWO-HX-G), Omaha, NE
- ◆ Steve White, Hazardous, Toxic, and Radioactive Waste Center of Expertise (CENWO-HX-G), Omaha, NE
- ◆ Phil Payonk, Wilmington District, Environmental Resources Section (CESAW-TS-PE)
- ◆ Stacy Samuelson, CESAW-TS-PE

VI. FIVE-YEAR REVIEW FINDINGS

A. Interviews

The following persons were interviewed regarding the activities and implementation of the remedial actions at the Potter's Pits Site:

Ms. Beverly Hudson, Remedial Project Manager, EPA Region IV:

In several telephone conversations between Stacy Samuelson and Ms. Hudson, two issues pertaining to the Potter's Pits Site were identified. The timing of sampling events of the groundwater monitoring wells was discussed as well as implementation of a sampling protocol for the new wells installed in March of 2002. The second issue, implementation of Institutional Controls, was addressed as well. Ms. Hudson indicated that the monitoring protocol was under development and the Institutional Controls were in the coordination stage with the property owner and the State of North Carolina. Additional discussion of these issues are provided in Sections VIII, Issues, and IX, Recommendations and Follow-up Actions.

Mr. Nile Testerman, Environmental Engineer, North Carolina Department of Environment and Natural Resources, Division of Waste Management, Superfund Federal Remediation Branch:

Stacy Samuelson, Wilmington District, made initial contact with Mr. Testerman through a telephone conversation. Mr. Testerman indicated that the State has some concerns about the Institutional Controls proposed in the AROD. The implementation of Institutional Controls for the site is a major goal for the State. Mr. Testerman feels that coordination between EPA and the State Attorney General's office is a necessity.

The Natural Attenuation remedy allows for additional groundwater monitoring wells. These additional wells were installed as part of the remedial action for the site. An initial quarterly monitoring frequency was conducted for the site. This monitoring frequency will be changed to either once or twice per year after the initial year of data have been obtained.

B. Site Inspection

A site inspection of the Potter's Pits Site was conducted on April 12, 2002. Attending the site visit were:

- ◆ Nile Testerman, Environmental Engineer, North Carolina Department of Environment and Natural Resources, Division of Waste Management, SF Federal Remediation Branch.
- ◆ Phil Payonk, U.S. Army Corps of Engineers, Wilmington District.
- ◆ Stacy Samuelson, U.S. Army Corps of Engineers, Wilmington District.

Local community members who had expressed interest in the site at previous public meetings were informed of the site visit by Ms. Hudson, RPM of the site. Ms. Hudson contacted the following persons about the site visit:

- ◆ Mr. Ronnie Gore
- ◆ Ms. Grainger
- ◆ Ms. Etta Minnis
- ◆ Mr. Bob Newlow
- ◆ Mr. Samuel Caines
- ◆ Mr. Patrick McDonagh
- ◆ M/M. James Britt
- ◆ M/M. Glenn Richardson
- ◆ Mrs. Gaye Mitchell
- ◆ M/M. Earl Gurkin

The following persons attended the site visit to ask questions and express concerns:

- ◆ Mr. Ronnie Gore
- ◆ Mrs. Gaye Mitchell
- ◆ Mr. Bob Newlow

For documentation of the site visit, photos of the main excavation area were taken and are attached as Attachment 2.

The site area has not been re-developed since the source remedial action was completed in 1996. The area is currently vegetated with grasses and has been mowed. Mr. Testerman gave a brief historical overview of the activities and locations of facilities during the source remedial action. He stated that the main excavation area was the area shown in the photos (Attachment 2), and the lots across Grainger Drive were where the LTTD equipment had been staged.

The only items of immediate note at the site were two monitoring wells toward the center of the site that are not flush with the ground surface, and staged barrels of waste from the recent monitoring well installation and sampling effort. There were 38 55-gallon barrels and several plastic bags of Investigative Derived Waste (IDW). The IDW will be removed prior to completion of fieldwork. Upon further investigation of the site area, it was noted that several of the older monitoring wells located on the northern periphery of the site were not locked and therefore prone to tampering.

While on site, Mr. Gore, the owner of the lot comprising the southern portion of the site stopped by to express some concerns. Mr. Gore contends that he is not able to replace a septic system that was damaged during the source remediation activities. His claim is that at the time of the damage, he was told that the septic system could be replaced without a new permit, but now he cannot get a contractor to install a new system without a permit. Mr. Gore would also like to receive the results of the recent groundwater sampling when they become available. This information was passed on to Ms. Hudson during Mr. Samuelson's visit to EPA in Atlanta.

Mrs. Mitchell had several questions pertaining to future use of the site and some questions about dying vegetation along the Chinnis Branch. On further discussion, Mrs. Mitchell noted that there had been quite a bit of vegetative mortality resulting from storm damage caused by recent hurricane events since 1996.

Mr. Newlow, the property owner on the east side of Chinnis Branch adjacent to the site discussed his concerns about the potential for groundwater contamination occurring under his property. Additionally, Mr. Newlow is concerned that he could be displaced from his property as a result of activities related to remedial actions at the site.

After walking the site area and noting the locations of the newly installed monitoring wells, the site visit was concluded. The removal of the barrels of IDW left on the site was discussed with Ms. Hudson by Mr. Samuelson during a visit to EPA in Atlanta. The work plan submitted by Black & Veatch calls for removal of all materials by November 2002, but it seems that earlier removal would be possible.

A final walkthrough inspection of the site was conducted the week of July 22, 2002 by Ms. Hudson, RPM. Community members who had concerns at the April 12, 2002 site visit were contacted during the inspection.

C. ARAR Review

In performing the five-year review for compliance with applicable or relevant and appropriate requirements (ARARs), only those ARARs addressing risk posed to human health or the environment (i.e., addressing the protectiveness of the remedy) were reviewed. This is in keeping with current EPA guidance on five-year reviews.

Federal ARARs

- ◆ Federal Groundwater Classification – 55 Federal Register (FR) Part 8733.
- ◆ Safe Drinking Water Act of 1986, as amended (40 USC §§ 300) – 40 CFR Part 141.
- ◆ Solid Waste Disposal Act (40 USC § 6901 – 6987) – 40 CFR Part 261.
- ◆ EPA Regulations on Sole-Source Aquifers – 40 CFR 149.

State ARARs

- ◆ Identification and Listing of Hazardous Waste – 15A NCAC 13A.0006.
- ◆ North Carolina Drinking Water Act – General Statutes, Chapter 130A, Article 10.
- ◆ North Carolina Water Quality Standards – 15A NCAC 2B.
- ◆ North Carolina Groundwater Quality Standards – 15A NCAC 2L.0100, 2L.0200, 2L.0300.

The site appears to be in compliance with the ARARs identified in the ROD. There were no changes in the reviewed statutes and standards that would require changes in the remedy or management of the site.

D. Changes in Exposure Pathways, Toxicity and Other Contaminant Characteristics

No changes in the site conditions that affect exposure pathways were identified as part of the five-year review. There are no current or known changes planned in the land use and it is likely to remain rural residential immediately adjacent to the site. No new contaminants, sources, or routes of exposure were identified as part of this five-year review. There is no indication that hydrologic/hydrogeologic conditions are not adequately characterized. The rate of decrease of contaminant levels in groundwater is consistent with expectations, and the groundwater plume appears to be contained. Toxicity and other factors for contaminants of concern have not changed.

E. Data Review

As a result of issues identified in the document review, interviews and site inspection, the principal data reviewed related to soil and groundwater contaminant levels of the site. The main resource for review of data was the Evaluation of Monitored Natural Attenuation at the Potter's Pits Site, Sandy Creek, North Carolina report (Evaluation Report) and associated appendices (June 2000).

Soil Data

Soil contamination data have not been collected since the completion of the Remedial Action. Table 5 summarizes pre-excavation and post-excavation soil contaminant concentrations from Appendix 6 of the Evaluation Report.

Table 5. Pre- and Post-Excavation Soil Concentration Data

Contaminant of Concern	Pre-Remedial Action (mean)	Post-Remedial Action (mean)
Benzene μg/Kg	8560	260
Toluene μg/Kg	21377	1176
Ethylbenzene μg/Kg	64228	516
Xylenes μg/Kg	157390	3801
Naphthalene μg/Kg	18248	3364
Chromium mg/Kg	6	NS*
Lead mg/Kg	29	NS

*NS = Not Sampled

Data from samples with at least one contaminant above non-detect do not include non-detects in the calculations.

Source: Evaluation Report (EPA, 2000), Appendix 6

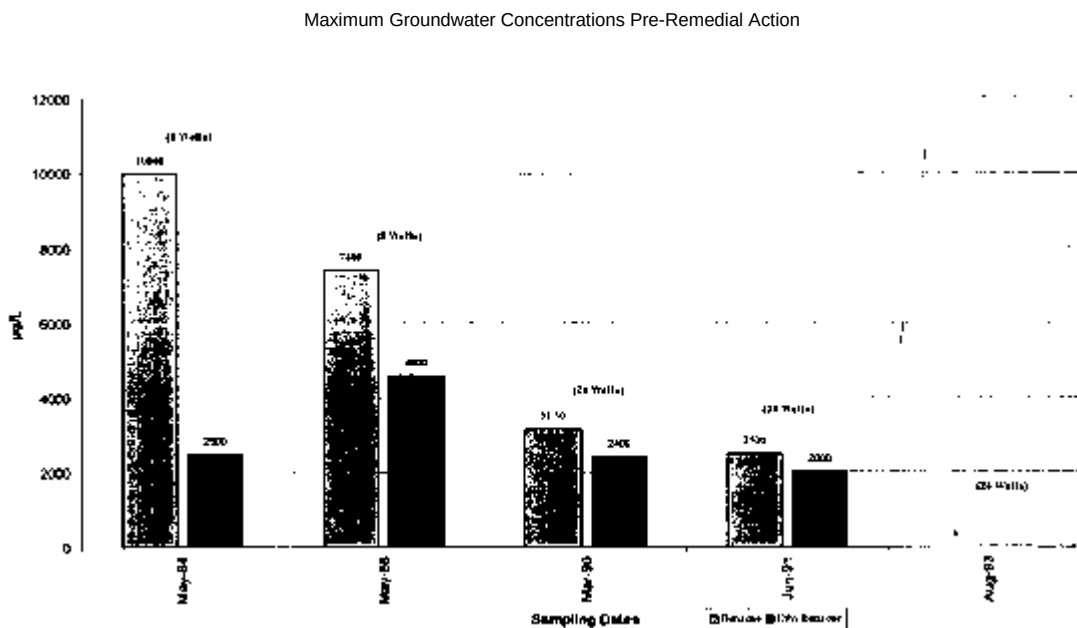
Groundwater Data

Groundwater sampling data was reviewed for sampling events occurring from May 1984 to the present. Table 6 lists sampling dates, wells sampled and source of the data. Gaps in the data are due to wells not being installed at the time of sampling, or just not being sampled. The only two wells sampled consistently over the history of the data reviewed were EPA-02 and EPA-04. Figures 5 and 6 show the maximum detected values for benzene and ethylbenzene. Those compounds were the most consistently detected over the sampling period.

Table 6. Sampling Efforts by Well Number

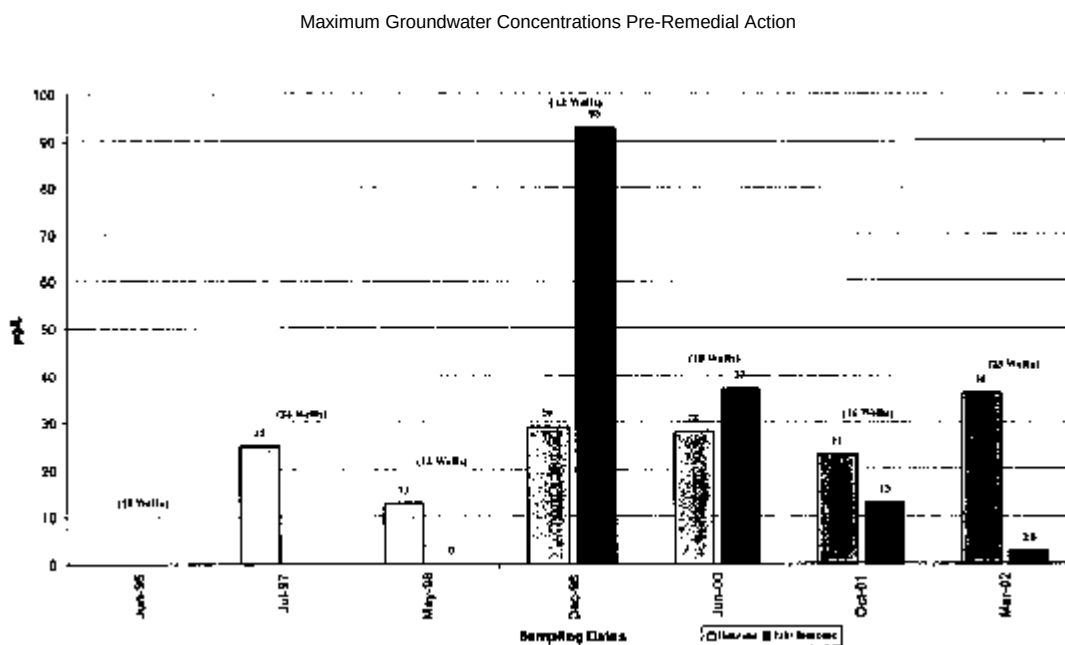
	Sampling Date											
	May-84	May-88	Mar-90	Jun-91	Aug-93	Jun-96	Jul-97	18-May-98	7-Dec-98	19-Jun-00	29-Oct-01	26-Mar-02
Date Source	(EPA June 2000)	(EPA June 2000)	(EPA June 2000)	(EPA June 2000)	(EPA June 2000)	(EPA June 2000)	(EPA June 2000)	EPA August 1998	EPA February 1999	EPA July 2000	EPA December 2001	EPA May 2002
Well Number												
EPA-02	X	X	X	X	X	X	X	X	X	X	X	
EPA-03	X	X	X	X	X	X	X	X				
EPA-04	X	X	X	X	X	X	X	X	X	X	X	
EPA-05	X	X	X	X	X	X	X					
EPA-06	X	X	X	X	X	X	X					
EPA-07	X	X	X	X	X	X	X	X	X			
EPA-08	X	X	X	X	X	X	X	X	X			
EPA-09	X	X	X	X	X	X	X					
MW-101			X	X	X	X	X	X	X			
MW-102			X	X	X	X	X			X		X
MW-104			X	X	X	X	X	X	X			
MW-105			X	X	X	X	X					
MW-106			X	X	X	X	X	X	X	X	X	X
MW-106D										X	X	
MW-110			X	X	X	X	X	X	X	X	X	X
MW-111			X	X	X	X	X	X	X			
MW-201			X	X	X		X	X	X			
MW-202			X	X	X		X	X	X	X	X	X
MW-203			X	X	X		X	X	X	X	X	X
MW-204			X	X	X		X					
MW-205			X	X	X		X					
MW-206			X	X	X		X			X		X
MW-207			X	X	X		X			X	X	
MW-210			X	X	X		X					
MW-211			X	X	X		X			X	X	
MW-301										X	X	X
MW-302										X	X	X
MW-303										X	X	X
MW-304										X	X	X
MW-305										X	X	X
MW-306										X	X	X
MW-307										X	X	X
MW-401												X
MW-402												X
MW-403												X
MW-404												X
MW-405												X
MW-406												X
MW-407												X
MW-410												X
MW-411												X
MW-412												X

Figure 5. Maximum Benzene and Ethylbenzene Concentrations in all Potter's Pits Groundwater Monitoring Wells 1984 - 1993



Note: 6 µg/L August 93 is benzene, ethylbenzene was not sampled August 93.

Figure 6. Maximum Benzene and Ethylbenzene Concentrations in all Potter's Pits Groundwater Monitoring Wells 1996 - 2002



Note: May 98 – ethylbenzene was sampled but not detected. July 97 ethylbenzene was not analyzed for.

Concentrations illustrated are maximum concentrations from all wells sampled on the specified sample date. Number of wells sampled is in parentheses. Note that the contaminant concentration scale on Figure 5 (Pre-Remedial Action) is ten times greater than that of Figure 6 (Post-Remedial Action), demonstrating an overall reduction of contaminant levels at the site.

VII. ASSESSMENT

To assess the effectiveness of the remedy at the Potter's Septic Tank Service site, three basic questions are answered and discussed below:

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

For the Potter's Septic Tank Service Pits Site, the remedy for soil (source) contamination was completed in 1996, with the conclusion of LTTD soil treatment. Based on a final inspection of the site by EPA and the State of North Carolina Division of Superfund in 1999, the soil contaminant level goals established in the ROD and RD have been met and no further soil remediation is required.

The 1996 soil remediation clearly had the effect of reducing groundwater contaminant concentrations. The groundwater contamination trends attributable to the MNA remedy cannot be determined. The trends of contaminant concentrations in groundwater are difficult to discern because of frequent changes in the sampling program.

Implementation of the Institutional Controls recommended by the AROD has not occurred to date. Coordination between the EPA, State of North Carolina, and the landowner is underway. This matter is discussed further in the Issues and Recommendations section of this review.

Question B: Are the assumptions used at the time of the remedy selection still valid?

The assumptions used for the remedy selection remain valid. The selection of monitored natural attenuation as the remedy is still valid as there have not been any changes to the assumptions made originally. Based on the review, all appropriate measures and procedures were utilized at the time of the remedial action and continue to be in effect.

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

Based on validated information provided in the documentation that was reviewed, there is no information to date that significantly questions the protectiveness of the remedy. Data collected since the conclusion of the source remedial action support the selection of monitored natural attenuation (MNA) as the preferred method for groundwater remediation in the AROD. The trends of contaminant concentrations in groundwater are difficult to discern because of frequent changes in the sampling program. Remedy implementation data to date provide no validated early indication of potential remedy failure.

VIII. ISSUES

There are two problems or issues that have been identified during this review. Each is further discussed in the recommendations section of this report.

1. Institutional controls for the site as proposed in the documents of record have not been implemented.
2. Monitoring wells need to be checked to ensure all are properly secured to prevent tampering.

IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The recommendations and follow-up actions associated with the issues found in this review are described below and are summarized in Table 7.

Implementation of the Institutional Controls as proposed in the Record of Decision and Amended Record of Decision should be pursued. The controls as proposed consist of restrictive covenants and deed recordation for the site lots as related to groundwater. The proposed controls consist of restriction of ground disturbing activities to no deeper than 25 feet below the ground surface, and prohibition of installation of potable water wells in the site area. It is recommended that EPA continue to coordinate the implementation of the proposed controls with the property owners (Mr. Gurkin and Mr. Gore) and the North Carolina Attorney General's office. Once implemented, the Institutional Controls should be reviewed for applicability during the next five-year review, as the Sandy Creek area may be developing a community-wide water supply system in the near future.

The installed monitoring wells need to be properly secured to insure integrity. Proper installation of locks will prevent tampering and potential destruction of monitoring wells around the site.

Table 7. Recommendations and Follow-up Actions

Issue(s)	Recommendations/Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)
Institutional controls for the site as proposed in the documents of record have not been implemented.	Implement Institutional Controls and review implementation in next five-year review.	EPA and State	EPA and State	Before next five-year review as required	N
Monitoring wells need to be properly secured.	Properly secure all installed monitoring wells to prevent tampering.	EPA	EPA	Before next five-year as required	N

X. PROTECTIVENESS STATEMENTS

The remedy at the Potter's Septic Tank Service Pits Site currently protects human health and the environment because the main source of contamination has been remediated through the LTDD treatment of the contaminated soils. However, in order for the groundwater remedy to be effective in the long-term, the following actions need to be taken to ensure long-term protectiveness: Implementation of the Institutional Controls delineated in the AROD.

XI. NEXT REVIEW

This is a site that requires five-year statutory reviews. EPA will conduct the next review within five years of the completion of this first five-year review report. The completion of this review as shown on the signature cover to this report is the trigger for the next five-year review.

ATTACHMENT 1

**List of Documents Reviewed
Potter's Septic Tank Service Pits Five-Year Review**

Ebasco Services, Inc. September 1990. Final Remedial Investigation, Potter's Pits Septic Tank Pits Site, Sandy Creek, North Carolina.

Roy F. Weston, Inc. April 1992. Revision I; Remedial Investigation Addendum Report, Potter's Pits Site, Sandy Creek, North Carolina; Work Assignment No. 07-4LC4.

Roy F. Weston, Inc. April 1992. Revision I; Remedial Investigation Addendum Report, Appendix A and Appendix B, Potter's Pits Site, Sandy Creek, North Carolina; Work Assignment No. 07-4LC4.

Roy F. Weston, Inc. April 1992. Feasibility Study, Potter's Pits Septic Tank Pits Site, Sandy Creek, North Carolina, Revision 1.

April 16, 1992. Memorandum: Additional Information for the Feasibility Report, Potter's Septic Tank Service Pits, Sandy Creek, North Carolina; Attachment 1: Memorandum on development of soil cleanup levels; Attachment 2: Additional Soil Alternative: Low Temperature Thermal Desorption; Attachment 3: Information on Thermal Desorption.

May 12, 1992. Transcript of EPA Superfund Proposed Plan Meeting, Sandy Creek, North Carolina.

U.S. Environmental Protection Agency, Region IV. August 5, 1992. Record of Decision; Summary of Remedial Alternative Selection; Potter's Septic Tank Service Pits, Sandy Creek, Brunswick County, North Carolina.

U.S. Environmental Protection Agency, Region IV. February 1993. Superfund Remedial Action Amended Community Relations Plan for Potter's Septic Tank Service Pits, Sandy Creek, Brunswick County, North Carolina.

U.S. Environmental Protection Agency, Region IV. January, 1995. Remedial Design Fact Sheet Phase I – Soil Remediation; Potters Septic Tank Service Pits Site, Sandy Creek, North Carolina.

U.S. Environmental Protection Agency, Region IV. February 9, 1996. Superfund Program Explanation of Significant Difference Potter's Septic Tank Service Pits Site, Sandy Creek, Brunswick County, North Carolina.

U.S. Environmental Protection Agency, Region IV. February 28, 1996. Potter's Septic Tank Service Pits [ESD] NPL Site Administrative Record, Index and Volume I.

U.S. Environmental Protection Agency, Science and Ecosystems Support Division. August 5, 1998. Potters Pits, Sandy Creek, North Carolina, Field Investigation Report. SEDS Project No. 98-429.

U.S. Environmental Protection Agency, Science and Ecosystems Support Division. February 18, 1999. Potters Pits, Sandy Creek, North Carolina, Field Investigation Report. SEDS Project No. 99-0068.

U.S. Environmental Protection Agency, Science and Ecosystems Support Division. July 28, 2000. Report of Findings for the Installation and Sampling of Monitoring Wells at the Potter's Pits Site.

U.S. Environmental Protection Agency, Region 4. June 2000. Evaluation of Monitored Natural Attenuation at the Potter's Pits Site, Sandy Creek, North Carolina.

U.S. Environmental Protection Agency, Region 4. July 30, 2000. Statement of Work for Feasibility Study Amendment, Potter's Pits, Sandy Creek, Brunswick County, North Carolina.

U.S. Environmental Protection Agency, Office of Technical Services, Waste Management Division. September 5, 2000. Supplemental Evaluation of Monitored Natural Attenuation at the Potter's Pits Site, Sandy Creek, North Carolina. William N. O'Steen, principal preparer.

Black & Veatch Special Projects Corporation. August 11, 2000. Draft Work Plan, Feasibility Study Amendment, Potter's Pits, Leland, Brunswick County, North Carolina.

U.S. Environmental Protection Agency, Science and Ecosystems Support Division. December 19, 2001. Potter's Septic Tank Services Pits Site, Sandy Creek, North Carolina, Field Investigation Report. SEDS Project No. 02-0038.

Black & Veatch Special Projects Corporation. February 1, 2002. Task Health and Safety Plan, Potters Pits Site, Monitoring Well Installation Oversight, Groundwater Sampling, and IDW Disposal Oversight.

Black & Veatch Special Projects Corporation. February 1, 2002. Site Health and Safety Program (Site HASP), Potter's Pits Site.

ATTACHMENT 2



Northwest Corner looking Southeast.



Northeast Corner looking South.



Southwest corner looking North.



Southwest corner looking East.



Southeast corner looking North.



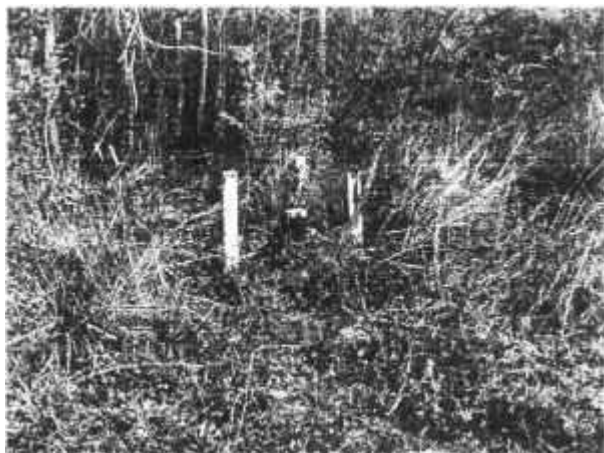
South of Joe Baldwin Dr. looking Southeast.



Monitoring Well.



Monitoring Well.



Old monitoring well.



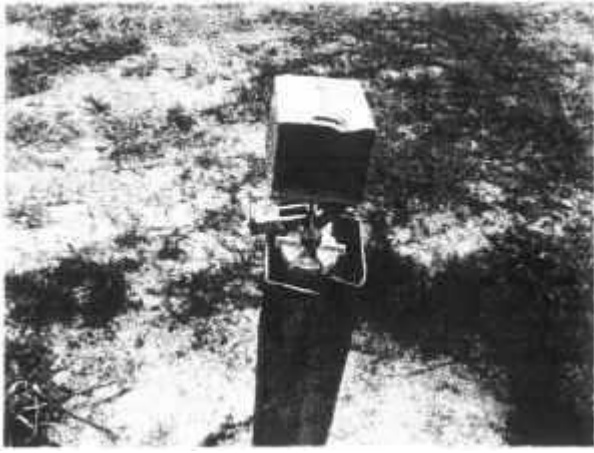
Old monitoring well - note missing lock.



Northeast corner looking South.



Northeast corner looking Southwest.



Detail of existing well.



Well #MW-110.



Southeast corner looking Northwest.



Mr. Gore's gates on south side of Joe Baldwin Dr.



New well and old well on south side of Joe Baldwin Dr.



Southeast corner of Mr. Gore's lot looking west.



Southeast corner of Mr. Gore's lot looking northwest.