

Five-Year Review Report

First Five-Year Review Report
for
Sherwood Medical Company Superfund Site
Norfolk
Madison County, Nebraska

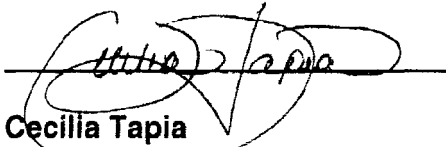
September 2003

PREPARED BY:

United States Environmental Protection Agency
Region VII
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Approved by:

Date:



A handwritten signature in black ink, appearing to read 'Cecilia Tapia', is written over a horizontal line.

Cecilia Tapia
Acting Director
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A handwritten date '9/25/03' is written in black ink over a horizontal line.

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SUPERFUND RECORDS

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- Site Maps
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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CD	Consent Decree
CS/CN	Designation of a specific area of the site
DCA	Dichloroethane
DCE	Dichloroethylene
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
et Seq	A legal term to reference more than one page of a document
GETS	Groundwater Extraction and Treatment System
GWEX	Groundwater Extraction Well
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NDEQ	Nebraska Department of Environmental Quality
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
OU	Operable Unit
O&M	Operation and Maintenance
PMHC	Park Mobile Home Court
PCE	Perchloroethylene or Tetra-Chloroethylene
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
Sherwood	Sherwood Medical Company
SVE	Soil Vapor Extraction
TBC	To Be Considered
TCA	Trichloroethane
TCE	Trichloroethylene
U.S.C.	United States Code
UST	Underground Storage Tank
VOC(s)	Volatile Organic Compound(s)
WasteLAN	A computer database used by EPA to manage sites
§	symbol for "subsection"

Executive Summary

The remedy for the Sherwood Medical Company Superfund site in Norfolk, Nebraska, included soil source removal, active groundwater extraction and treatment, provision of a potable water source to offsite users, and institutional controls to prevent use of contaminated groundwater. Construction completion for the site was achieved with the signing of the Preliminary Close Out Report on September 24, 1999.

This is the first five-year review for the Sherwood site and was conducted as a policy review. The triggering action for this review is the date of the construction completion for the site, which is the date for the Preliminary Close Out Report for operable unit two (OU2) - the groundwater remediation - on September 24, 1999. The EPA decided to conduct this review early due to the long period of time since the Record of Decision (ROD) (1995).

The assessment of the five-year review found that the remedy was constructed in accordance with the requirements of the ROD. One Explanation of Significant Differences was issued to change the type of soil treatment method. The remedy is functioning as designed:

- Two soil sources removed involving a septic system and 2500 cubic yards of contaminated soil.
- Over 900,000 gallons of contaminated groundwater extracted, thereby removing over 800 pounds of volatile organic contaminants from the aquifer.

The immediate threats to human health and the environment have been addressed, and the remedy is expected to be protective when groundwater cleanup goals are achieved through active groundwater extraction and treatment, which is expected to take more than five years, but less than ten years from the initiation of the remedy.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): Sherwood Medical Company Site		
EPA ID (from WasteLAN): NED084626100		
Region: VII	State: NE	City/County: Norfolk, Madison
SITE STATUS		
NPL Status: XX Final <input type="checkbox"/> Deleted <input type="checkbox"/> Other (specify) _____		
Remediation Status (choose all that apply): <input type="checkbox"/> Under Construction XX Operating <input type="checkbox"/> Complete		
Multiple OUs?* XX YES <input type="checkbox"/> NO	Construction completion date: _09 / _24 / _1999_	
Has site been put into reuse? <input checked="" type="checkbox"/> YES <input type="checkbox"/> No (Site has always been in use)		
REVIEW STATUS		
Lead agency: XX EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency _____		
Author name: Steve Auchterlonie		
Author title: Remedial Project Manager	Author affiliation: U.S. EPA, Region VII	
Review period: _02_ / _06_ / _2003_ to _09_ / _26_ / _2003_		
Date(s) of site inspection: _07 / _16 / _2003_		
Type of review:		
<input 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 checked="" type="checkbox"/> Regional Discretion		
Review number: XX 1 (first) <input type="checkbox"/> 2 (second) <input type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify) _____		
Triggering action:		
<input checked="" type="checkbox"/> Actual RA Onsite Construction at OU # _2_ XX Actual RA Start at OU# ____ <input type="checkbox"/> Construction Completion (PCOR) <input type="checkbox"/> Previous Five-Year Review Report <input type="checkbox"/> Other (specify) _____		
Triggering action date: (from WasteLAN): _09 / _24 / _1999_		
Due date (five years after triggering action date): _09 / _24 / _2004_		

* ["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:

Achieving safe drinking water standards in the contaminated aquifer may not be met within five years of startup of the groundwater extraction and treatment system, as specified in the ROD. Although groundwater contaminant levels have decreased dramatically, it is doubtful that this goal will be achieved since only one year remains in the schedule.

Recommendations and Follow-up Actions:

By September 2004, the Environmental Protection Agency (EPA), Nebraska Department of Environmental Quality (NDEQ), and Sherwood Medical Company representatives will meet to review the operational data and to determine if additional actions are required to accelerate the groundwater cleanup.

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 groundwater extraction and treatment in an estimated time period of more than five years, but less than ten years from initiation of the groundwater treatment system.

Long-term Protectiveness:

Long-term protectiveness of the remedial action will be verified by monitoring both the groundwater extraction and treatment system (GETS), and the potable water provided to offsite users. Current data indicate that the plume is controlled and being extracted by the GETS. Current monitoring data indicate that the remedy is functioning effectively and produced significant (at least 70 percent) reductions in contaminant levels in the aquifer. The potable water supplied by Sherwood has met safe drinking water standards.

Other Comments:

None

Sherwood Medical Company Site Norfolk, Nebraska First Five-Year Review Report

I. Introduction

The purpose of five-year reviews 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 recommendations to address them.

The Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

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

The EPA 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 EPA, Region VII, has conducted this five-year review of the remedial actions implemented at the Sherwood Medical Company (Sherwood) site in Norfolk, Nebraska. This review was conducted from February 2003 through September 2003. This report documents the results of the review.

This is the first five-year review for the Sherwood site and was conducted as a policy review. The triggering action for this review is the date of the construction completion for the site, which is the date for the Preliminary Close Out Report for

operable unit two (OU2) - the groundwater remediation - on September 24, 1999. The EPA decided to conduct this review early due to the long period of time since the Record of Decision (ROD) (1995). The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site in the groundwater, above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
Initial discovery of problem: Drinking Water Contamination at Park Mobile Home Court (PMHC)	10/1987
EPA initially Provided Potable Water Supply to PMHC	1988
Sherwood Decommissioned Septic System pursuant to EPA Order	9/6/1989 – 12/1990
Sherwood Provided Potable Water Supply to PMHC, pursuant to EPA Order	9/1989
Site Proposed and Placed on National Priorities List (NPL)	Proposed: 7/29/1991 Placed: 10/14/1992
Sherwood Conducted Remedial Investigation/Feasibility Study (RI/FS), Pursuant to EPA Order	3/21/1991 - 9/28/1993
EPA Record of Decision (ROD)	9/28/1993
EPA ROD Explanation of Significant Differences (ESD)	9/5/1995
Consent Decree Entered by Court, Requiring Sherwood to Conduct Cleanup	11/7/1996
Remedial Designs - Operable Unit 1 (Soils) - OU1, and Operable Unit 2 (Groundwater) - OU2	11/1996 – 7/1998
Actual remedial action starts - OU1 and OU2	7/10/1998
Preliminary Close Out Report	9/24/1999
Operation and Maintenance (O&M) for OU2	Since 10/1/1999
Final Remedial Action Report for OU1 - Soils	9/25/2000
Interim Remedial Action Report for OU2 - Groundwater	9/26/2000

III. Background

Physical Characteristics

The site is located in Madison County, Nebraska, approximately 1.5 miles south of Norfolk, adjacent to U.S. Highway 81 (see Attachment 1 for a site location map). The southern part of the site, about 40 acres, consists of the Sherwood property which includes the Sherwood manufacturing building and Sherwood Lake. The northern/northeastern part of the site consists of the Park Mobile Home Court (PMHC) property. Commercial and residential properties are located north, east, and south of the site. Medelman's Lake and the Elkhorn River are located to the north, within one mile of the site. The Karl Stefan Airport is located to the west across U.S. Highway 81. Groundwater flow is to the north toward the Elkhorn River.

Land and Resource Use

The historic land use of the site has involved both residential and commercial activities. In addition to the Sherwood plant, commercial operations have been active north of the site - primarily a sand and gravel operation, west of the site - the airport, and east of the site - various types. In addition to the PMHC, additional private residences exist immediately south of the Sherwood property.

The projected future land use for the area will be the same as the historic uses. For cleanup purposes, the requirements for soil and groundwater are based upon residential protection.

The groundwater aquifer underlying the site is currently used as the only source of commercial and residential water south of the Elkhorn River. The dominant groundwater flow direction is to the north toward the Elkhorn River.

History of Contamination and Initial Responses

Sherwood started its operation at the site in 1961. Sherwood manufactures medical syringes and other medical products using injection molding processes. Operations at Sherwood formerly used chlorinated solvents.

In 1987, a sample collected by the State Health Department from the PMHC water system was found to contain volatile organic compounds (VOCs). In 1988, the EPA supplied the PMHC residents with potable water first by providing bottled water and then by installing an activated carbon water treatment system on the water supply well. Investigations identified Sherwood as the source for the VOCs which resulted in Sherwood decommissioning their septic system and installing a permanent potable water supply for PMHC by 1989.

The Sherwood site was proposed for the National Priorities List (NPL) on July 29, 1991. The site was placed on the NPL on October 14, 1992.

Following the early actions described above, Sherwood conducted a remedial investigation and feasibility study (RI/FS) which resulted in EPA's 1993 ROD. The RI/FS identified: 1) two soil sources contaminated with VOCs and located on the Sherwood property; and 2) two corresponding groundwater plumes contaminated with VOCs and located both on and extending north of the Sherwood property.

Basis for Taking Action

Contaminants

Hazardous substances that have been released at the site in soils and groundwater include:

Chlorinated VOCs including primarily, perchloroethylene (PCE), trichloroethane (TCA), dichloroethylene (DCE), and dichloroethane (DCA).

Toluene and gasoline compounds were detected at low levels, below health-based standards, in subsurface soils.

Potentially, unacceptable risks were calculated based on ingestion, inhalation, and dermal contact to contaminants through exposure to contaminated groundwater.

IV. Remedial Actions

Remedy Selection

The ROD for the Sherwood site was signed on September 28, 1993. Remedial Action Objectives (RAOs) were developed as a result of the data collected during the RI to aid in the development and screening of remedial alternatives that were considered for the ROD. The RAOs for the site were identified as follows.

Three principal threats, current and potential, were identified: 1) the contaminated groundwater originating on the Sherwood property and extending toward Medelmans Lake; 2) the contaminated subsurface clay unit located in the CS/CN area; and 3) the subsurface residual contamination in the underground storage tank (UST) area. The RAO for this site is to eliminate the current, and to prevent future, unacceptable exposures due to these three principal threats.

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

- A deed restriction prohibiting land disturbance in the two soil source areas and the use of groundwater supply wells in the contaminated portion of the aquifer.
- A permanent supply of potable water to the PMHC and other affected properties.
- A groundwater monitoring well system to monitor and evaluate changes in the groundwater quality.
- The removal of the septic system.
- The excavation and low-temperature thermal treatment of contaminated soils which exceed soil performance standards from the two source areas. The treated soils would be replaced into the onsite excavation after achieving the performance standards.
- The extraction and treatment of the contaminated groundwater. The treatment would involve air stripping the groundwater, and the treated water would be discharged to the Elkhorn River via a pipeline and pursuant to a State National Pollutant Discharge Elimination System (NPDES) permit. Also, the extraction system would be designed to achieve potable standards within five years from startup.

An Explanation of Significant Differences (ESD) was issued on September 5, 1995. Following a preliminary design effort on soil contamination, Sherwood proposed changing the soil treatment method to ex-situ soil vapor extraction (SVE) and developed the actual soils, VOC performance standards. The EPA approved the recommended change.

Remedy Implementation

In a Consent Decree (CD) entered by the court on November 7, 1996, Sherwood agreed to perform the remedial design/remedial action (RD/RA) and pay the government's future costs incurred in connection with the site; all past cost had already been paid by Sherwood. The RD/RA was conducted in conformance with the ROD as modified by the ESD.

Sherwood managed the design and construction of the remedy as two OUs - soils (OU1) and groundwater (OU2). Both designs were approved by EPA on July 10, 1998. Sherwood had entered into a design and build contract with its consultant. Thus, approval of the designs automatically initiated work on the remedy construction activities.

The construction of the GETS was completed first so that the groundwater treatment system would be available to process any contaminated water produced during the soil excavation activities. On April 21, 1999, EPA notified Sherwood that the construction of the groundwater system was completed in accordance with the approved design. The major components of this OU RA were the following:

- Installation of two new extraction wells as part of an extraction system utilizing a total of four extraction wells.
- Installation of two new monitoring well locations as part of a monitoring system utilizing a total of over forty monitoring wells.
- Construction of a groundwater treatment system based upon air stripping as the primary removal process.
- Construction of a pipeline designed to carry the treatment system discharge from the Sherwood property to the Elkhorn River, pursuant to a NPDES permit.

The second and final OU involved the remediation of the two soil source areas - the CS/CN and UST areas. In September 1999, the EPA notified Sherwood that the construction activities were completed in accordance with the approved design and ESD. The major components of this OU RA were the following:

- A deed restriction prohibiting land disturbance in the two soil source areas and the use of groundwater supply wells in the contaminated portion of the aquifer.
- The removal of the septic system.
- The excavation and ex-situ SVE of contaminated soils which exceeded soil performance standards from the two source areas. The treated soils were replaced into the onsite excavation, after achieving the performance standards.

There were no soils found contaminated above the performance standards in the UST source area. Apparently, several decades of groundwater flushing due to the high water table and to the sandy soils had completely transferred the VOCs from the soils to the groundwater. The former septic system was removed and the UST area closed according to the design.

Approximately 2500 cubic yards of contaminated soils were excavated from the CS/CN source area, located in the northern section of the Sherwood property. Notably, the origin of the contamination in the CS/CN area was finally found during the excavation. Wastes from Sherwood's manufacturing processes were found disposed in the subsurface soils. During the excavation, these wastes were segregated and disposed in an appropriate landfill. The contaminated soils were processed through a shredding device which mixed sand with the clay soils in order to enhance the effectiveness of the ex-situ SVE process. Following the soil preparation process, Sherwood collected samples of the soils for chemical analysis to develop a baseline prior to treatment. Results from the chemical analyses identified that the soil preparation process removed the VOCs sufficiently to achieve the soil performance standards. As a result, the ex-situ SVE process was unnecessary, and this phase was completed by August 1999, approximately one year ahead of schedule.

The site achieved construction completion status when the Preliminary Close Out Report was signed on September 24, 1999.

The EPA and the State have determined that all RA construction activities, including the implementation of institutional controls, were performed according to specifications. The goal for the GETS is to achieve cleanup levels for all groundwater contaminants within five years from startup. After groundwater cleanup levels have been met, EPA will issue a Final Close Out Report.

System Operation/Operation and Maintenance

Sherwood is conducting the long-term operation and maintenance (O&M) activities according to the O&M Plan that was approved by EPA on December 15, 1999. The primary activities associated with the O&M include the following:

- O&M of the GETS components - wells, air strippers, etc.
- Chemical monitoring and reporting of the progress of the groundwater cleanup to the EPA and State Superfund programs.
- Chemical monitoring and reporting of the GETS discharge to the State's NPDES program, to the EPA Superfund program, and to the State's Remediation/Groundwater Standards Program.

- Operation of the drinking water supply to the PMHC.
- Chemical monitoring and reporting of the drinking water supply to the State's Drinking Water Program and to the EPA and State Superfund programs.

The cleanup of the CS/CN and UST soil sources achieved cleanup standards which are protective of groundwater. As a result, the remaining contamination is in the groundwater and based upon computer modeling conducted during the RI/FS, the goal for the GETS is to achieve groundwater standards within an estimated five years of operation. Therefore, the primary O&M activities involve operating the GETS and monitoring the results.

Table 2: Annual System Operations/O&M Costs

Dates		Cost rounded to nearest \$1,000
From	To	
12/99	12/02	\$240,000 (estimated)

V. Progress Since the Last Review

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

VI. Five-Year Review Process

Administrative Components

The public was notified of the initiation of the five-year review on July 25, 2003, through a public notice placed in the Norfolk newspaper. In addition, representatives of Sherwood and NDEQ were notified through electronic mail. The five-year review was conducted by Steve Auchterlonie of EPA, Remedial Project Manager (RPM). Wade Gregson, of the NDEQ Remediation Section, assisted in the review as the representative for the support agency.

The review included the following components:

- Community Involvement
- Document Review
- Data Review

- Site Inspection
- Local Interviews
- Five-Year Review Report Development and Review

The schedule extended through September 2003.

Community Involvement

On July 25, 2003, a notice was placed in the Norfolk Daily News, announcing that a five-year review was to be conducted and inviting public participation. To date, no comments were received. Upon completion of the five-year review report, a second notice will be placed announcing the completion of the review and the availability of the report. A copy of the report will be made available in the site's administrative record, which is located in the Norfolk Public Library.

Document Review

This five-year review consisted of a review of relevant documents, including O&M records and monitoring data. Applicable groundwater cleanup standards, as listed in the 1993 ROD, were reviewed.

Data Review

Groundwater monitoring has been conducted since the startup of the GETS, in 1999. In general, all contaminants were detected at their highest levels during the first two years of operation. These high levels have significantly decreased during the subsequent years. On average, the reductions in contaminant levels have been approximately 85 percent. Attachments 2 through 6 are figures providing the influent concentrations for each of the four groundwater extraction wells (GWEX) and the treatment plant. These figures document the reduction in contaminant concentrations in the groundwater. To date, over 900,000 gallons of contaminated groundwater have been extracted, thereby removing over 800 pounds of contaminants from the aquifer (Attachments 7 and 8).

Even with significant reductions, the contaminant levels, notably for PCE, are still greater than drinking water standards in five monitoring wells (4A, 6B, 7B, 13A, and 15) and all four extraction wells. Refer to Attachment 9 for a map showing the locations. One objective of the cleanup, as specified in the ROD, specified that the GETS will achieve drinking water cleanup standards throughout the aquifer, within five years of startup. October 1999 was the official start of operation for the GETS, following the design, construction and operational and functional phases. As a result, one year remains for the GETS to achieve the five-year goal. Otherwise, pursuant to the CD,

Sherwood may be required by EPA to implement modifications to the GETS to accelerate reaching the cleanup goals for the aquifer.

During the RI/FS, two groundwater plumes were identified with two source areas - the UST area and the CS/CN area. In addition, a third area was prioritized during the design process - the offsite groundwater contamination north of Sherwood's property. Groundwater results for each of the three areas will be summarized.

Offsite Area

The Offsite Area is identified as contamination which migrated in the groundwater from Sherwood's two sources - CS/CN and UST - north of the Sherwood property.

As shown in Attachment 9, the GETS utilizes two extraction wells - GWEX-1 and GWEX-2 - which are hydraulically controlling the offsite groundwater in the area of concern. Monitoring well locations 10, 11, 14, and 15 document significant reductions in the groundwater contaminant levels, most notably wells 14B and 15 (Attachments 10 and 11). In addition, the influent contaminant levels in GWEX - 1 and 2, as shown in Attachments 2 and 3, document reductions of at least 70 percent. Combining the monitoring well and extraction well results makes a strong case in support of the conclusions that the CS/CN source was effectively removed during the soils cleanup, and that the GETS is effectively controlling and removing the groundwater plume.

Bottled water is supplied by Sherwood to several businesses north of the Sherwood property in an attempt to eliminate use of private wells for drinking water use. In addition, Sherwood provides the potable water source to the PMHC. Sherwood submits quarterly reports to EPA and NDEQ documenting the volume and quality of the supplied water. To date, the supplied water meets drinking water standards.

CS/CN Area

The CS/CN Area is approximately 5000 square feet and it is located immediately southeast of GWEX-3, on the northern boundary of the Sherwood property (Attachment 9).

The GETS utilizes GWEX-3 to hydraulically control the groundwater in the CS/CN area. Influent contamination levels have decreased by 85 percent since the 1999 startup (Attachment 4). In addition, downgradient monitoring wells, most notably wells 14B and 15, document significant reductions in contamination (Attachments 10 and 11). Thus, the CS/CN soil removal effort appears to have effectively eliminated the source, and the GETS appears to effectively remove the groundwater contamination.

UST Area

The UST Area is located at the southwest corner of the Sherwood building and includes monitoring well locations 4 and 13.

The GETS utilizes GWEX-4 to hydraulically control the groundwater contamination migrating from the UST source area (Attachment 9). Influent contamination levels have decreased by 90 percent since the 1999 startup (Attachment 5). In addition, monitoring wells located downgradient from GWEX-4 and in the UST area document the groundwater cleanup progress. Locations 2, 3, 4, 5, 6, 7, 9, and 13 are the monitoring wells used for this purpose. Most notably, the data for wells 6A, 6B, 7B, and 13A document significant reduction in contamination levels (Attachments 12, 13, 14, and 15).

Data for wells 4A, 7R, and 13A indicate contamination levels which are either decreasing at a rate unable to meet the five-year cleanup goal, or actually increasing in the case of 4A (Attachments 16, 17, and 15). These trends will require attention from EPA, NDEQ, and Sherwood in the next year if the five-year cleanup goal is not achieved.

Site Inspection

An inspection of the site was conducted on July 16, 2003, by the RPM (see Appendix A). The purpose of the inspection was to assess the protectiveness of the remedy, including the operation of the GETS. No significant issues have been identified at any time regarding the supply of potable water to offsite parties and the operation of the GETS. Sherwood identified an ongoing maintenance problem with iron build-up on well screens and in the air stripper packing material. To this point, Sherwood has managed the problem through implementing maintenance procedures which includes periodic cleaning of the air stripper and extraction wells, and continuously adding a biocide to the extracted water prior to air stripping.

Sherwood completed the institutional control requiring a deed restriction prohibiting land disturbance in the two soil source areas and the use of groundwater supply wells in the contaminated portion of the aquifer. The fact that Sherwood is supplying potable water to offsite users effectively eliminates the potential use of contaminated groundwater for drinking water needs.

Local Interviews

Interviews were conducted during the site visit with several key employees of Sherwood: 1) Larry Belz, Plant Manager; 2) Jim David, Maintenance Manager; and, 3) Rick Tomjack, GETS Technical Manager. These Sherwood personnel discussed the maintenance problems related to the iron buildup and the potential consequences if the five-year cleanup goal is not met for the groundwater.

The EPA RPM also coordinated with the Director of the Norfolk Public Library, Ted Smith, regarding the status and condition of the site's administrative record.

VII. Technical Assessment

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

The review of documents, applicant or relevant and appropriate regulations (ARARs), risk assumptions, and the results of the site inspection indicate that the remedy is functioning as intended by the ROD, as modified by the ESD:

- A. The source removal actions conducted in the UST and CS/CN areas achieved specified cleanup standards.
- B. Groundwater extraction and monitoring data indicate that the contaminants' migration is controlled by the extraction wells.
- C. Provision of potable water to PMHC and other offsite users effectively eliminates use of the contaminated groundwater as a drinking water source.

The O&M of the GETS has been effective and without incident. The O&M annual costs are consistent with estimates. There were no opportunities for system optimization during this review. Essentially, the first four years of operation created a database upon which to make future decisions, as needed. One example pertains to the upcoming five-year cleanup goal. During the next year, the groundwater and operational database will be instrumental in determining if any changes are required to meet the objective of achieving drinking water standards.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and 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 (TBC)

As the remedial work was completed, the ARARs for soil contamination cited in the ROD were met.

The ARARs that still must be met at this time pertain to groundwater cleanup standards and treatment standards. As specified in the ROD and ESD, there have been no changes in those ARARs and no new standards or TBCs affecting the protectiveness of the remedy. The main ARARs are listed below:

- Safe Drinking Water Act (SDWA) non-zero maximum contaminant levels (MCLs), 40 CFR 141.50 - 141.62, 40 CFR 141.11-141.16, and Nebraska Title 118.
- Federal Clean Water Act, 33 U.S.C. 1251 *et Seq.*, criteria for surface water discharges, including but not limited to sections 301, 303, 402 and 502, and Nebraska Title 117.
- Nebraska Title 129 establishes air quality standards.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the Human Health Risk Assessment included both current exposures and potential future exposures. 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 developing risk-based cleanup levels. No change to these assumptions or the cleanup levels developed from them is warranted. No changes were identified pertaining to the exposure pathway assumptions made during the risk analysis. 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. The EPA does not expect the groundwater cleanup levels to be met in the projected five-year timetable, but as timely as practicable thereafter.

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

There is no other information that calls into question the protectiveness of the remedy.

VIII. Issues

Table 3: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Groundwater contaminant levels may not meet safe drinking water standards within five years of startup of the GETS	N	N

IX. Recommendations and Follow-up Actions

Table 4: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestones Date	Affects Protectiveness (Y/N)	
					Current	Future
Meet Groundwater Cleanup Standards	Review operational data to determine if additional actions are required to accelerate cleanup	Sherwood	EPA and NDEQ	9/2004	N	N

X. Protectiveness Statement(s)

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through operation of the GETS, which is expected to require more than five years, but less than ten years. In the interim, exposure pathways that could result in unacceptable risks are being controlled by preventing exposure to, or ingestion of, contaminated groundwater.

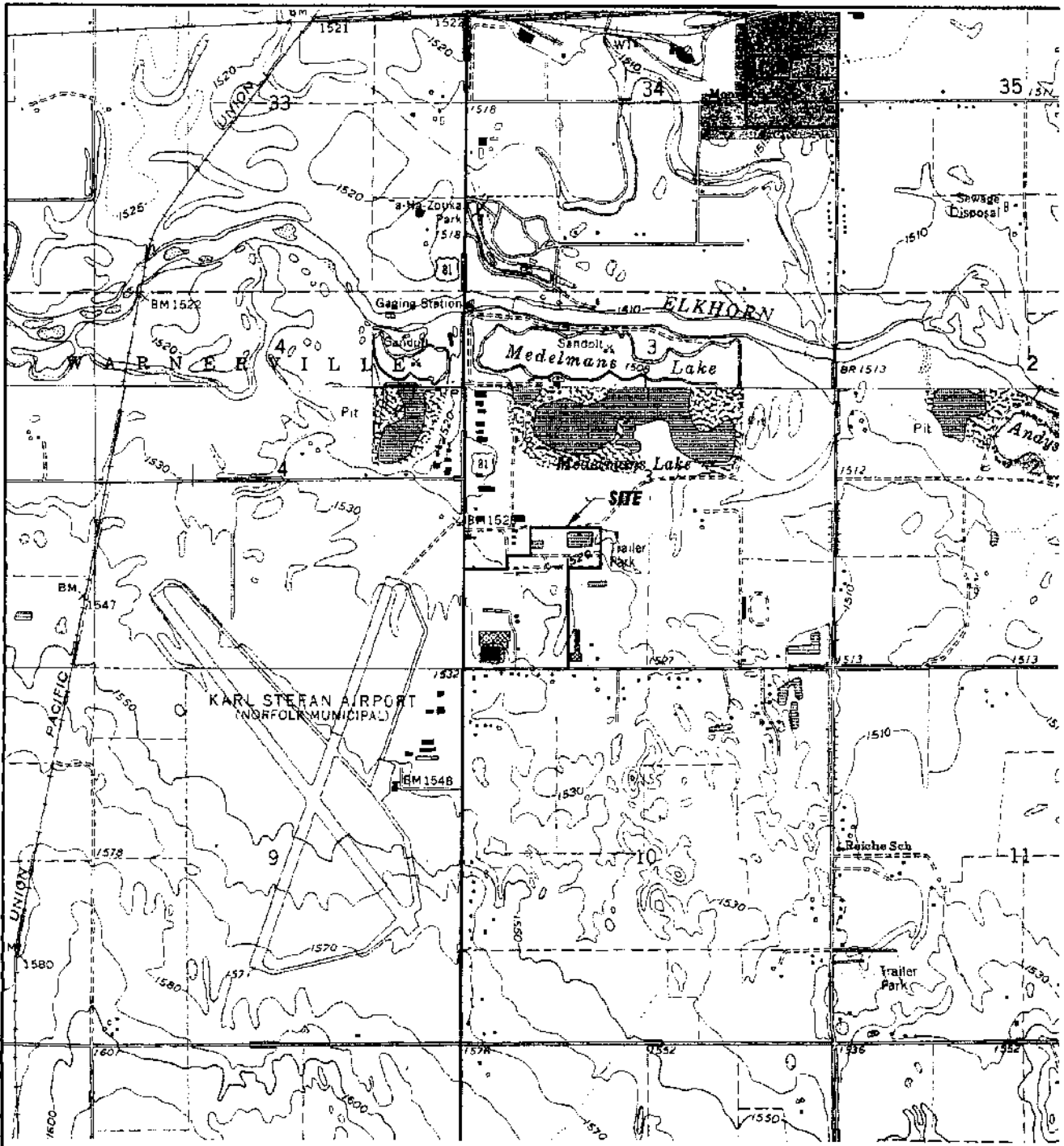
Long-term protectiveness of the remedial action will be verified by monitoring both the GETS and the potable water provided to offsite users. Current data indicate that the plume is controlled and being extracted by the GETS. Current monitoring data indicate that the remedy is functioning effectively and produced significant (at least 70 percent) reductions in contaminant levels in the aquifer.

XI. Next Review

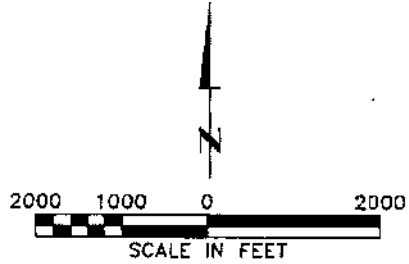
The next five-year review for the Sherwood Superfund site is required by September 2008, five years from the date of this review.

ATTACHMENTS

These Maps, Figures and Tables were produced by URS Corporation, a consulting firm working on behalf of Sherwood Medical Company, as part of the standard reporting required by the Consent Decree.

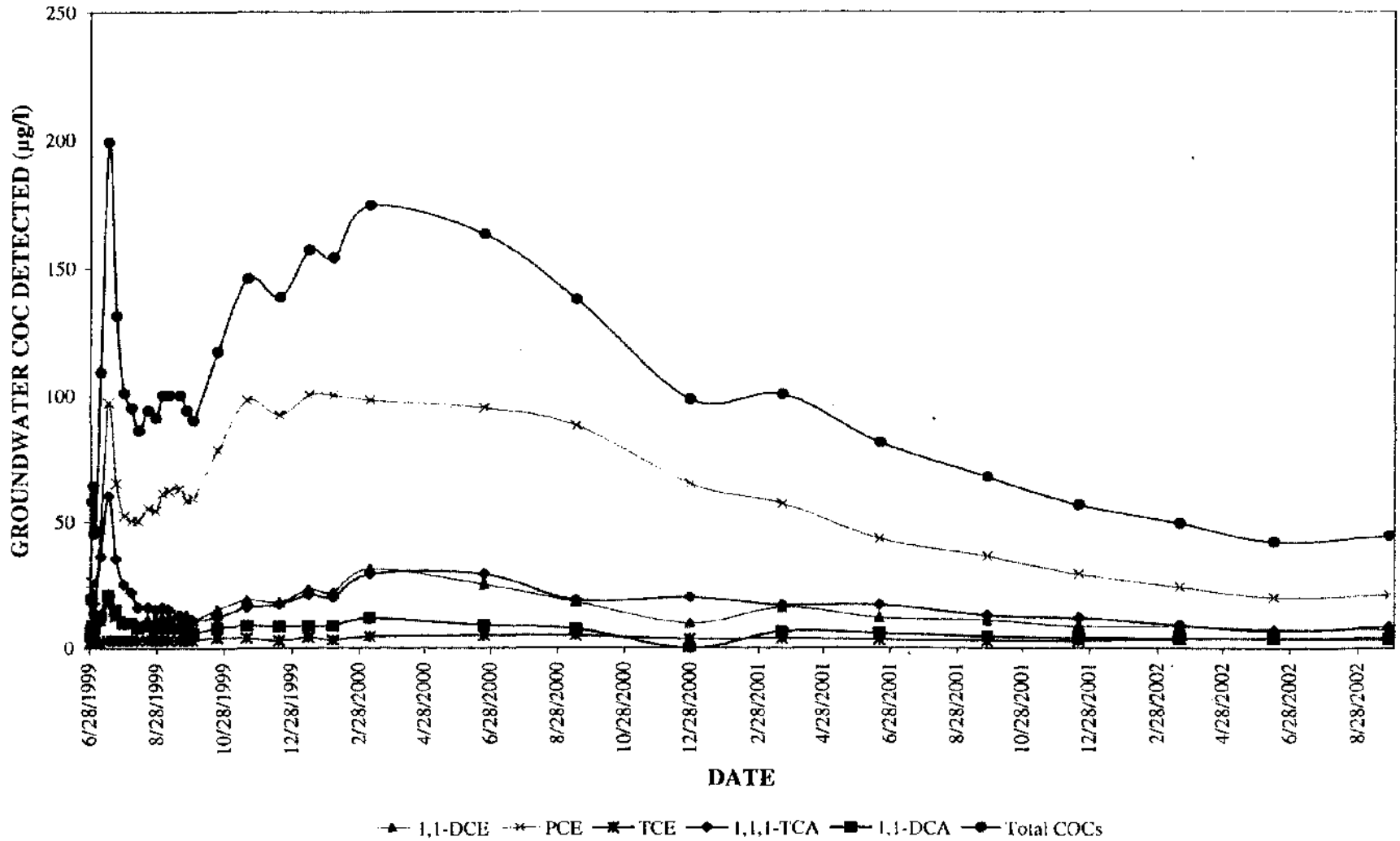


ATTACHMENT 1 SITE LOCATION MAP



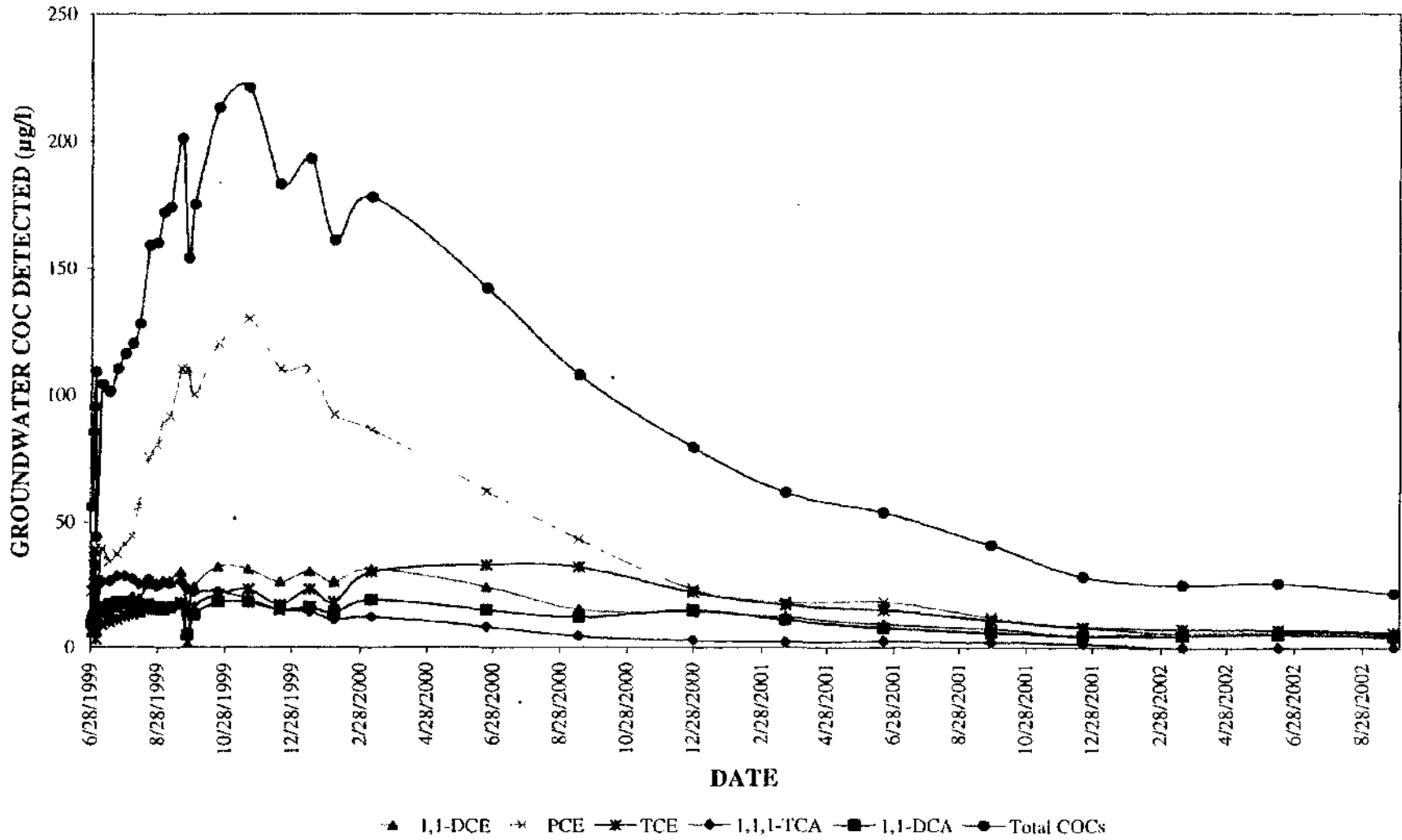
ATTACHMENT 2 GWEX - 1 INFLUENT

SHERWOOD MEDICAL COMPANY – SUPERFUND SITE NORFOLK, NEBRASKA



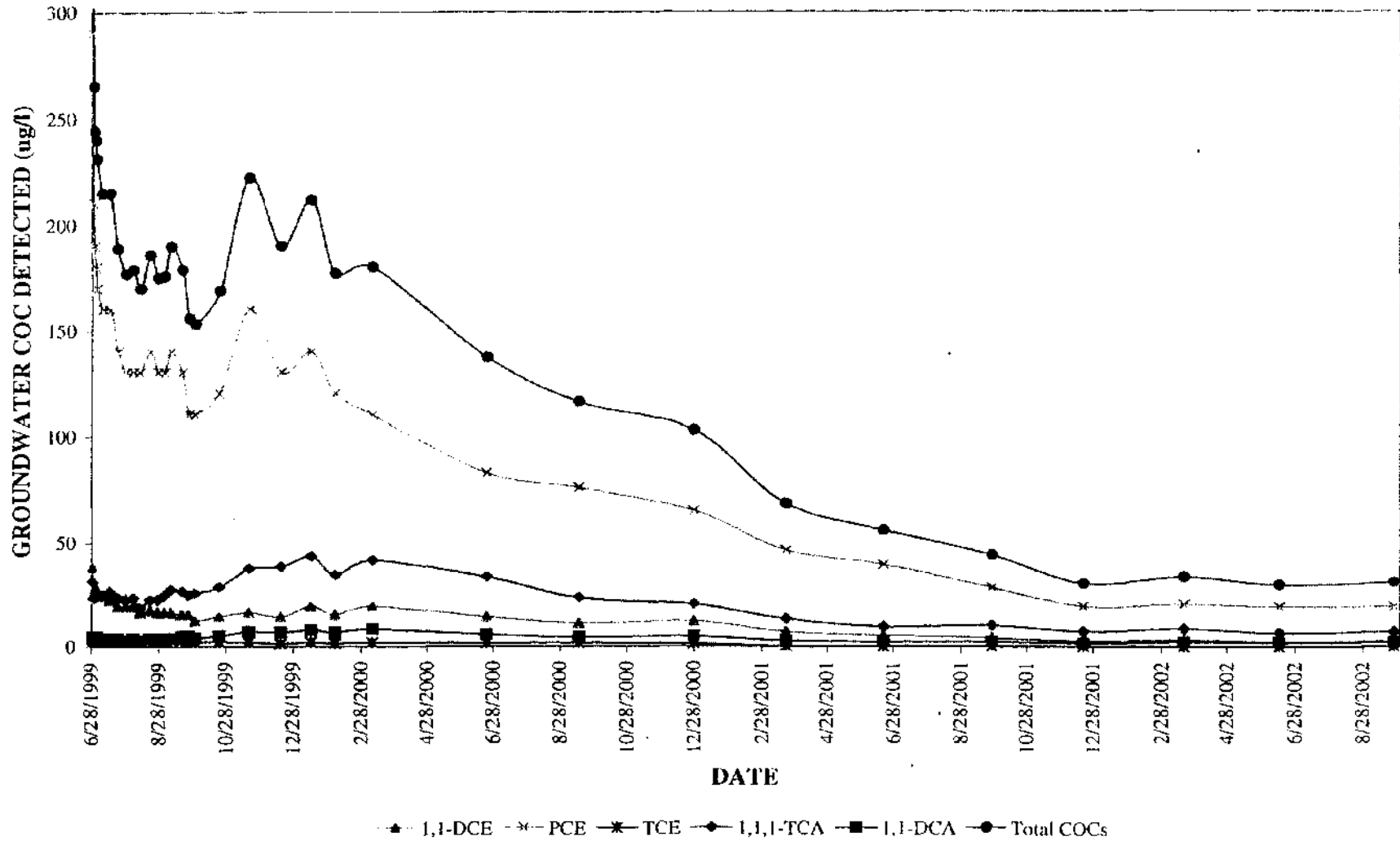
ATTACHMENT 3 GWEX - 2 INFLUENT

SHERWOOD MEDICAL COMPANY – SUPERFUND SITE NORFOLK, NEBRASKA



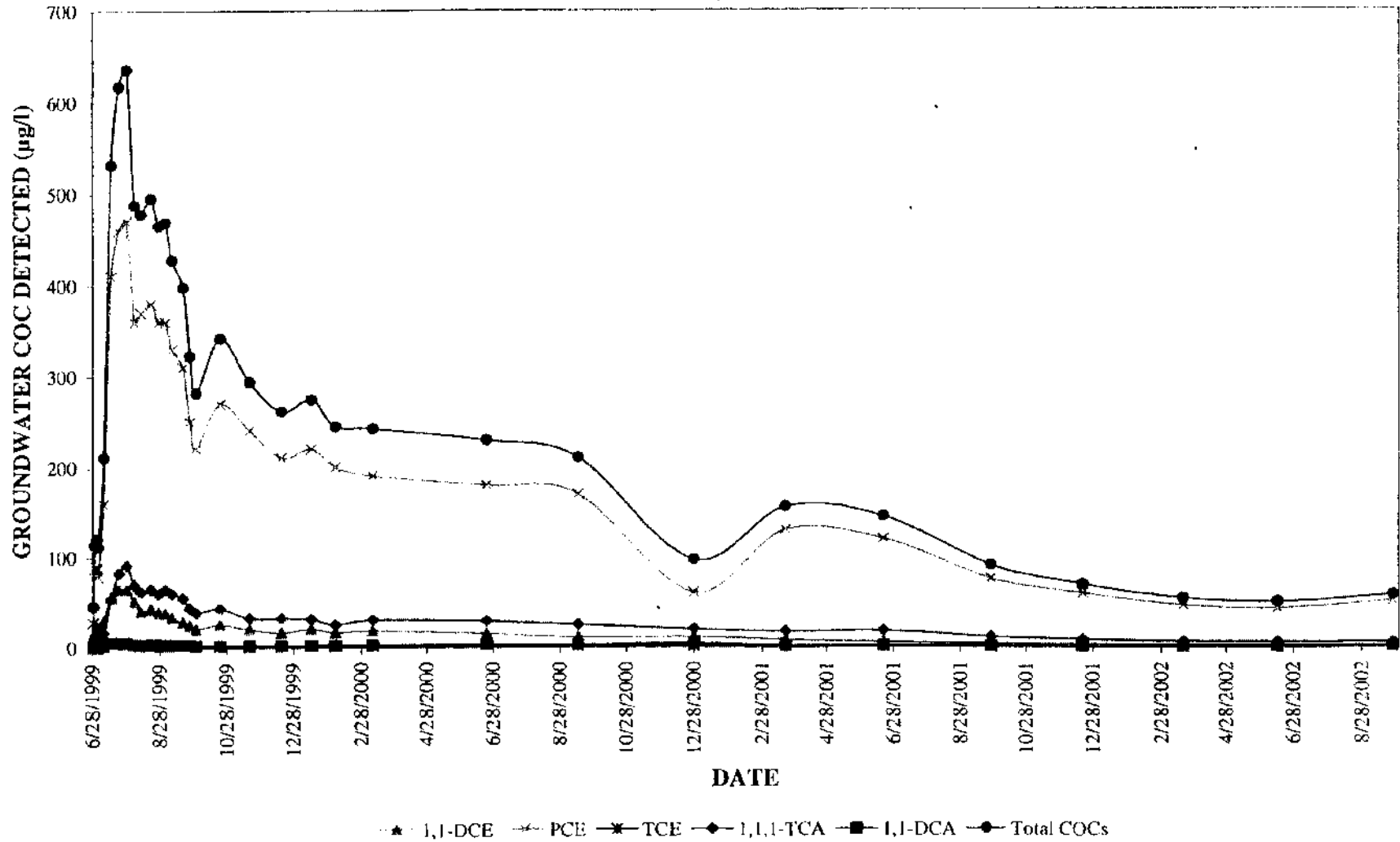
ATTACHMENT 4 GWEX - 3 INFLUENT

SHERWOOD MEDICAL COMPANY – SUPERFUND SITE NORFOLK, NEBRASKA



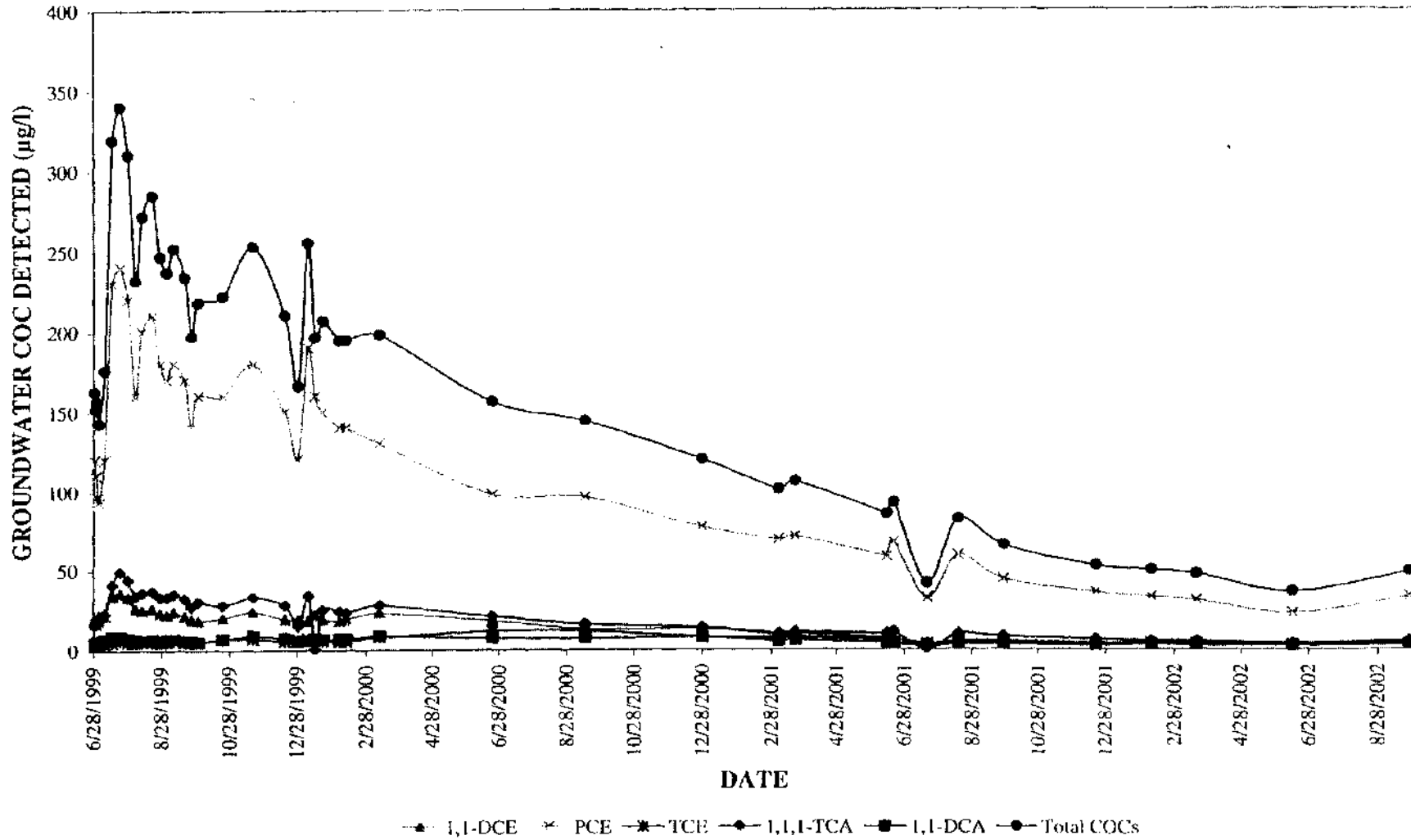
ATTACHMENT 5 GWEX - 4 INFLUENT

SHERWOOD MEDICAL COMPANY – SUPERFUND SITE NORFOLK, NEBRASKA



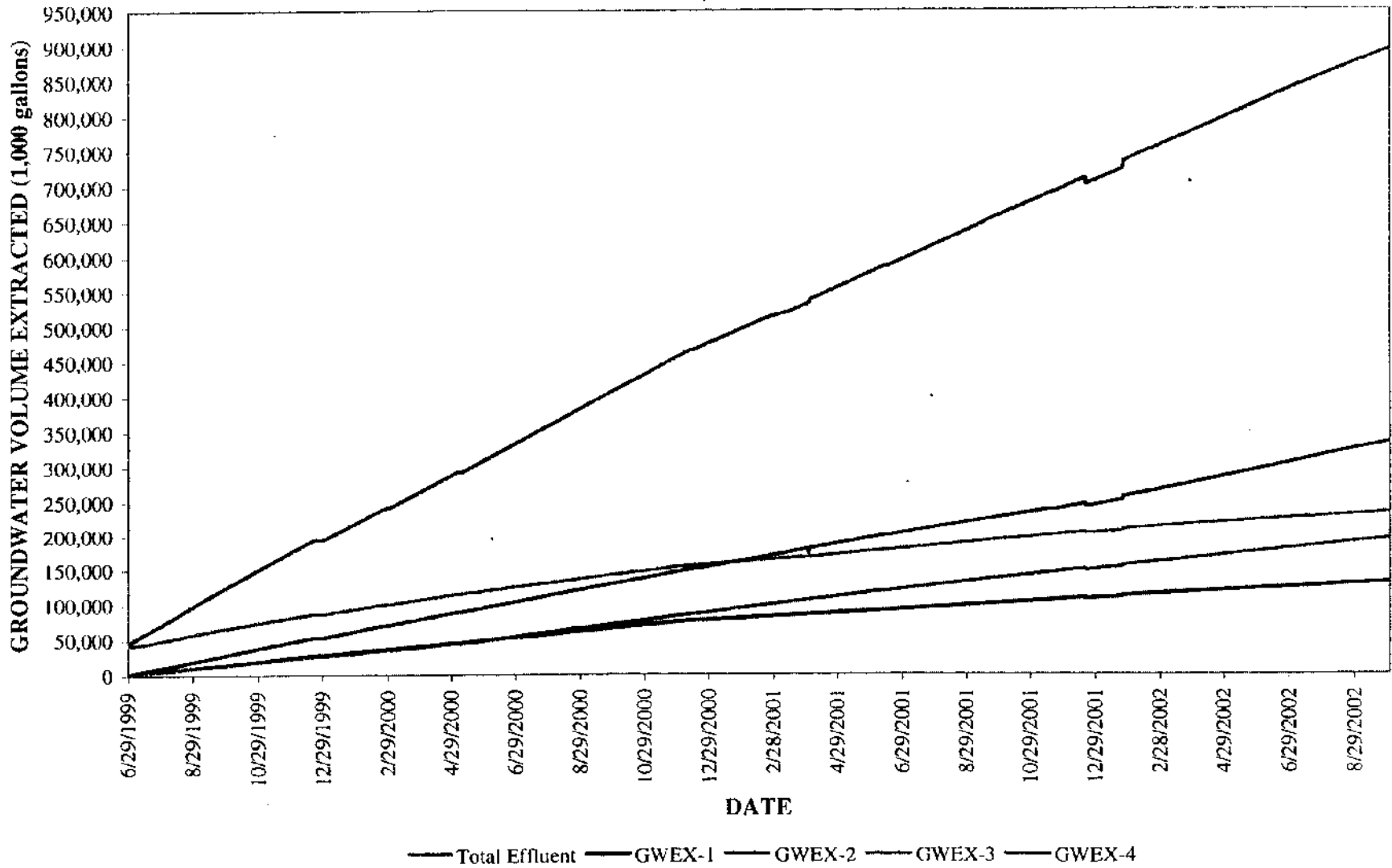
ATTACHMENT 6 TREATMENT PLANT INFLUENT

SHERWOOD MEDICAL COMPANY – SUPERFUND SITE NORFOLK, NEBRASKA



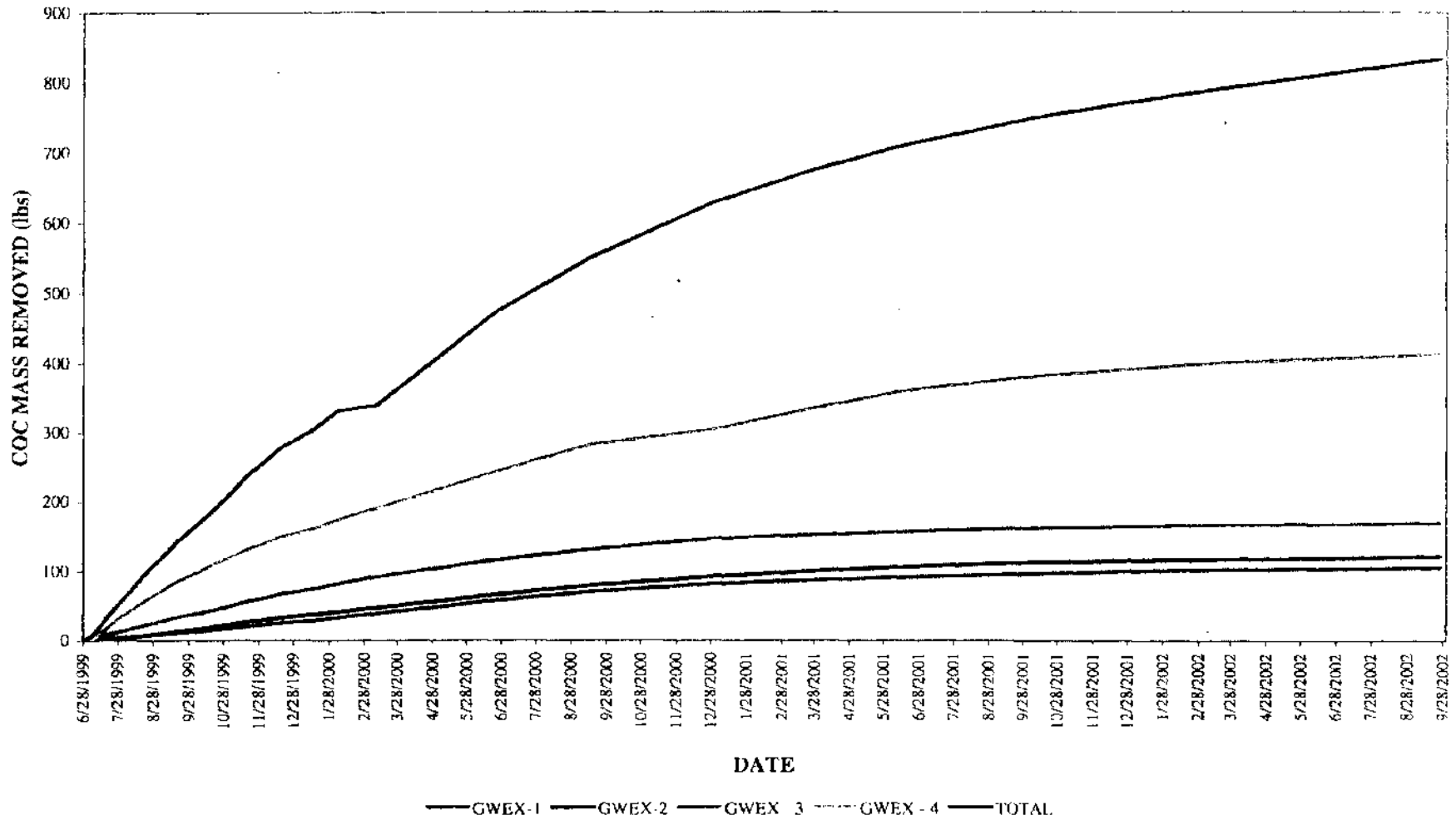
ATTACHMENT 7 GROUNDWATER EXTRACTED

SHERWOOD MEDICAL COMPANY – SUPERFUND SITE NORFOLK, NEBRASKA

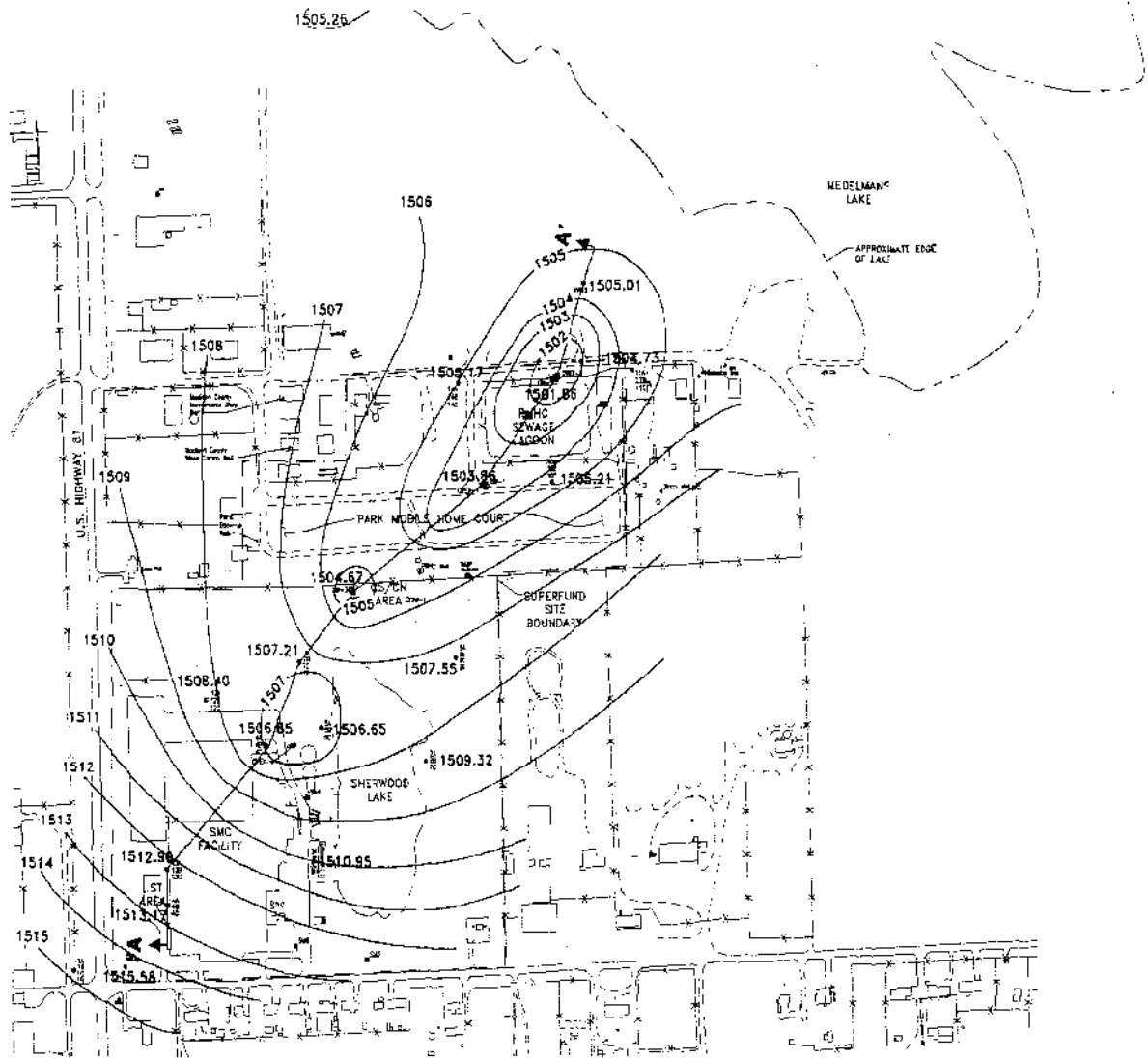


ATTACHMENT 8 TOTAL CONTAMINANTS REMOVED

SHERWOOD MEDICAL COMPANY – SUPERFUND SITE NORFOLK, NEBRASKA



ATTACHMENT 9 WELL LOCATION MAP



LEGEND

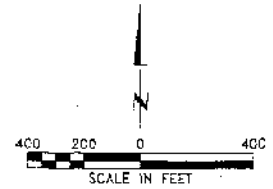
- MONITORING WELLS
- DEWATERING WELL
- EXTRACTION WELL
- STAFF GAGE
- FACILITY PRODUCTION WELL
- OBSERVATION WELL

- APPROXIMATE GROUNDWATER POTENTIOMETRIC SURFACE CONTOURS
- 1503.83 GROUNDWATER LEVEL ELEVATION IN INTERMEDIATE (B) WELL ON MARCH 18, 2002
- A A' LOCATION AND DIRECTION OF VERTICAL PROFILE

NOTES:

1. MEVELMAN'S LAKE BOUNDARY DEVELOPED FROM FIELD SURVEY COMPLETED APRIL 1999.
2. THE INFLUENCE OF SM-2 PUMPING IS NOT REFLECTED IN CONTOURS DUE TO LACK OF DATA FOR THAT AREA.
3. APPROXIMATE PUMPING RATES ON MARCH 31, 2002 WERE:

- GWEX-1 = 56 GPM
- GWEX-2 = 116 GPM
- GWEX-3 = 68 GPM
- GWEX-4 = 227 GPM



ATTACHMENT 11 MONITORING WELL 15

SHERWOOD MEDICAL COMPANY SUPERFUND SITE NORFOLK, NEBRASKA

Sample Date	Contaminant of Concern							
	Benzene µg/L	1,1,1-TCA µg/L	1,1,2-TCA µg/L	1,1-DCA µg/L	1,1-DCE µg/L	PCE µg/L	TCE µg/L	VC µg/L
4/10/1999	<1 U	12	<1 U	38	29	39	77	1
9/15/1999	<1 U	10	<1 U	68	36	22	77	15
12/7/1999	<1 U	4.6	<1 U	97	36	33	110	25
3/9/2000	<1 U	1.4 J	<1 U	120	46	18 J	74	33
6/22/2000	<1 U	<1 U	<1 U	26	9.2	<1 U	8.4	6
9/12/2000	<1 U	<1 U	<1 U	18	6.4	<1 U	1.6	8.5
3/21/2001	<1 U	<1 U	<1 U	6.1	2.5	<1 U	2.4	3.5
3/18/2002	<1 U	<1 U	<1 U	4.7	<1 U	<1 U	<1 U	7
9/25/2002	<1 U	<1 U	<1 U	3.3	1.6	<1 U	<1 U	3.5

Abbreviations:

COC = Contaminants of Concern

J = Estimated value

UJ = Reporting limit is estimated. Analyte was not detected above the reporting limit.

µg/l = Micrograms per liter

1,1,1-TCA = 1,1,1-Trichloroethane

1,1,2-TCA = 1,1,2-Trichloroethane

1,1-DCA = 1,1-Dichloroethane

1,1-DCE = 1,1-Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

VC = Vinyl Chloride

ATTACHMENT 12 MONITORING WELL 6A

SHERWOOD MEDICAL COMPANY SUPERFUND SITE NORFOLK, NEBRASKA

Sample Date	Contaminant of Concern							
	Benzene µg/L	1,1,1-TCA µg/L	1,1,2-TCA µg/L	1,1-DCA µg/L	1,1-DCE µg/L	PCE µg/L	TCE µg/L	VC µg/L
4/6/1999	<1 U	54	1	1	45	320	3	<1 U
9/15/1999	<1 U	770	<1 U	14	400	4400	130	<1 U
12/8/1999	<1 U	400	5.5	27	170 J	2900	41	<1 U
3/8/2000	<1 U	290	2.2	12	54	1000	19	<1 U
9/13/2000	<1 U	27	<1 U	1.1	11	210	2.1	<1 U

Abbreviations:

COC = Contaminants of Concern

J = Estimated value

UJ = Reporting limit is estimated. Analyte was not detected above the reporting limit.

µg/L = Micrograms per liter

1,1,1-TCA = 1,1,1-Trichloroethane

1,1,2-TCA = 1,1,2-Trichloromethane

1,1-DCA = 1,1-Dichloroethane

1,1-DCE = 1,1-Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

VC = Vinyl Chloride

ATTACHMENT 13 MONITORING WELL 6B

SHERWOOD MEDICAL COMPANY SUPERFUND SITE NORFOLK, NEBRASKA

Sample Date	Contaminant of Concern							
	Benzene µg/L	1,1,1-TCA µg/L	1,1,2-TCA µg/L	1,1-DCA µg/L	1,1-DCE µg/L	PCE µg/L	TCE µg/L	VC µg/L
4/8/1999	<1 U	470	<1 U	7	140	4200	21	<1 U
9/14/1999	<1 U	<1 U	<1 U	<1 U	<1 U	240	4	<1 U
12/7/1999	<1 U	<1 U	<1 U	<1 U	<1 U	290	<1 U	<1 U
3/7/2000	<1 U	<1 U	<1 U	<1 U	<1 U	79	<1 U	<1 U
6/20/2000	<1 UJ	<1 U	<1 U	<1 U	<1 U	33	<1 U	<1 U
9/12/2000	<1 UJ	<1 U	<1 U	<1 U	<1 U	44	<1 U	<1 U
3/20/2001	<1 U	<1 U	<1 U	<1 U	<1 U	18	<1 U	<1 U
3/18/2002	<1 U	<1 U	<1 U	<1 U	<1 U	21	<1 U	<1 U
9/24/2002	<1 U	<1 U	<1 U	<1 U	<1 U	15	<1 U	<1 U

Abbreviation:

COC = Contaminants of Concern

J = Estimated value

UJ = Reporting limit is estimated. Analyte was not detected above the reporting limit.

µg/L = Micrograms per liter

1,1,1-TCA = 1,1,1-Trichloroethane

1,1,2-TCA = 1,1,2-Trichloroethane

1,1-DCA = 1,1-Dichloroethane

1,1-DCE = 1,1-Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

VC = Vinyl Chloride

ATTACHMENT 14 MONITORING WELL 7B

SHERWOOD MEDICAL COMPANY SUPERFUND SITE NORFOLK, NEBRASKA

Sample Date	Contaminant of Concern							
	Benzene µg/L	1,1,1-TCA µg/L	1,1,2-TCA µg/L	1,1-DCA µg/L	1,1-DCE µg/L	PCE µg/L	TCE µg/L	VC µg/L
4/8/1999	<1 U	640	<1 U	29	340	5400	33	<1 U
9/14/1999	<1 U	250	<1 U	19	100	1400	21	<1 U
12/6/1999	<1 U	22	<1 U	<1 U	6 J	340	2	<1 U
3/6/2000	<1 U	2.5	<1 U	<1 U	1.4	47	<1 U	<1 U
6/19/2000	<1 UJ	<1 U	<1 U	<1 U	<1 U	27	<1 U	<1 U
9/12/2000	<1 U	1.3	<1 U	<1 U	<1 U	38	<1 U	<1 U
3/20/2001	<1U	<1U	<1U	<1U	<1U	17	<1U	<1U
3/18/2002	<1 U	<1 U	<1 U	<1 U	<1 U	24	<1 U	<1 U
9/24/2002	<1 U	<1 U	<1 U	<1 U	<1 U	17	<1 U	<1 U

Abbreviations:

COC = Contaminants of Concern

J = Estimated value

UJ = Reporting limit is estimated. Analyte was not detected above the reporting limit.

µg/L = Micrograms per liter

1,1,1-TCA = 1,1,1-Trichloroethane

1,1,2-TCA = 1,1,2-Trichloroethane

1,1-DCA = 1,1-Dichloroethane

1,1-DCE = 1,1-Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

VC = Vinyl Chloride

ATTACHMENT 15 MONITORING WELL 13A

SHERWOOD MEDICAL COMPANY SUPERFUND SITE NORFOLK, NEBRASKA

Sample Date	Contaminant of Concern							
	Benzene µg/L	1,1,1-TCA µg/L	1,1,2-TCA µg/L	1,1-DCA µg/L	1,1-DCE µg/L	PCE µg/L	TCE µg/L	VC µg/L
4/8/1999	<1 U	16	<1 U	<1 U	<1 U	1200	8	<1 U
9/14/1999	<1 U	15	<1 U	<1 U	<1 U	1300	6	<1 U
12/7/1999	<1 U	6.1	<1 U	<1 U	<1 U	2100	4.3	<1 U
3/9/2000	<1 U	16	<1 U	<1 U	<1 U	1000	5.3	<1 U
9/12/2000	<1 U	8.8	<1 U	<1 U	<1 U	370	1	<1 U
3/18/2002	<1 U	9.2	<1 U	<1 U	<1 U	340	6.2	<1 U

Abbreviations:

COC = Contaminants of Concern

J = Estimated value

UJ = Reporting limit is estimated. Analyte was not detected above the reporting limit.

µg/L = Micrograms per liter

1,1,1-TCA = 1,1,1-Trichloroethane

1,1,2-TCA = 1,1,2-Trichloroethane

1,1-DCA = 1,1-Dichloroethane

1,1-DCE = 1,1-Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

VC = Vinyl Chloride

ATTACHMENT 16 MONITORING WELL 4A

SHERWOOD MEDICAL COMPANY SUPERFUND SITE NORFOLK, NEBRASKA

Sample Date	Contaminant of Concern							
	Benzene µg/L	1,1,1-TCA µg/L	1,1,2-TCA µg/L	1,1-DCA µg/L	1,1-DCE µg/L	PCE µg/L	TCE µg/L	VC µg/L
4/6/1999	1 U	1 U	1 U	1 U	1 U	5	1 U	1 U
9/16/1999	1 U	2	1 U	7	1 U	12	1 U	1 U
12/8/1999	1 U	U	1 U	1 U	1 U	1 U	1 U	1 U
3/9/2000	1 U	1 UJ	1 U	1 U	1 U	1.7 J	1 U	1 U
6/22/2000	1 U	1 U	1 U	1 U	1 U	4.3	1 U	1 U
9/13/2000	1 U	1 U	1 U	1 U	1 U	31	<1 U	<1 U
3/20/2001	1 U	1 U	1 U	1 U	1 U	12	<1 U	<1 U
3/18/2002	1 U	1 U	1 U	1 U	1 U	45	1 U	1 U
9/26/2002	1 U	1 U	1 U	1 U	1 U	60	1 U	1 U

Abbreviations:

COC = Contaminants of Concern

J = Estimated value

UJ = Reporting limit is estimated. Analyte was not detected above the reporting limit.

µg/L = Micrograms per liter

1,1,1-TCA = 1,1,1-Trichloroethane

1,1,2-TCA = 1,1,2-Trichloroethane

1,1-DCA = 1,1-Dichloroethane

1,1-DCE = 1,1-Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

VC = Vinyl Chloride

ATTACHMENT 17 MONITORING WELL 7R

SHERWOOD MEDICAL COMPANY SUPERFUND SITE NORFOLK, NEBRASKA

Sample Date	Contaminant of Concern							
	Benzene µg/L	1,1,1-TCA µg/L	1,1,2-TCA µg/L	1,1-DCA µg/L	1,1-DCE µg/L	PCE µg/L	TCE µg/L	VC µg/L
4/18/1999	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
9/13/1999	<1 U	<1U	<1U	1	2	<1U	5	<1U
12/6/1999	<1 U	<1 U	<1 U	1	2.3	<1 U	3.6	<1 U
3/6/2000	<1 U	<1 U	<1 U	1.4	2.6	<1 U	4.9	<1 U
6/19/2000	<1 UJ	<1 U	<1 U	1.6	4.3	<1 U	6.3	<1 U
9/12/2000	<1 U	<1 U	<1 U	1.6	4.1	<1 U	4.7	<1 U
3/20/2001	<1 U	<1 U	<1 U	1.6	5.4	<1 U	4.7	<1 U
3/18/2002	<1 U	<1 U	<1 U	1.4	4.8	<1 U	3	<1 U
9/24/2002	<1 U	<1 U	<1U	1.5	4.9	<1 U	1.7	<1 U

Abbreviations:

COC = Contaminants of Concern

J = Estimated value

UJ = Reporting limit is estimated. Analyte was not detected above the reporting limit.

µg/L = Micrograms per liter

1,1,1-TCA = 1,1,1-Trichloroethane

1,1,2-TCA = 1,1,2-Trichloroethane

1,1-DCA = 1,1-Dichloroethane

1,1-DCE = 1,1-Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

VC = Vinyl Chloride

APPENDIX A

INSPECTION REPORT

**SITE INSPECTION
FOR THE
SHERWOOD MEDICAL COMPANY SITE**

Introduction

An inspection of the Sherwood Medical Company site (Site) was conducted on July 16, 2003, by Steve Auchterlonie, the EPA RPM for the Site. The purpose of the inspection was to assess the protectiveness of the remedy, including the operation of the Groundwater Extraction and Treatment System (GETS). The RPM followed the Five Year Review Guidance, in conducting the inspection.

Issues

No significant issues were identified which negatively affect the protectiveness of the remedy:

- 1) Sherwood has provided a potable water supply to neighboring properties, using both a water supply system and bottled water depending on the quantity of water required by the user(s);
- 2) Sherwood completed the institutional control requiring a deed restriction prohibiting land disturbance in the two soil source areas and the use of groundwater supply wells in the contaminated portion of the aquifer; and,
- 3) The GETS has operated continuously and effectively since startup.

During the inspection, photographs of key components of the GETS were taken. These photographs are attached to this inspection report (Figures 1 through 8).

Sherwood identified an ongoing maintenance problem with iron build-up on well screens and in the air stripper packing material. To this point, Sherwood has managed the problem through implementing maintenance procedures which includes periodic cleaning of the air stripper and extraction wells, and continuously adding a biocide to the extracted water prior to air stripping.

Local Interviews

Interviews were conducted during the site visit with several key employees of Sherwood: 1) Larry Belz, Plant Manager; 2) Jim David, Maintenance Manager; and, 3) Rick Tomjack, GETS Technical Manager. These Sherwood personnel discussed the maintenance problems related to the iron buildup, and the potential consequences if the five year cleanup goal is not met for the groundwater.

FIGURE 1. GWEX-1 WELL



FIGURE 2. GWEX-2 WELL



FIGURE 3. GWEX-3 WELL



FIGURE 4. GWEX-4 WELL



FIGURE 5. GWEX TREATMENT PLANT



FIGURE 6. INFLUENT HEADER SYSTEM

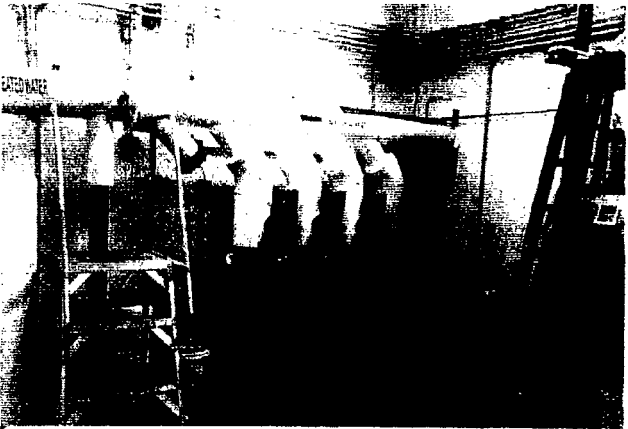


FIGURE 7. ADDITIVE SYSTEM FOR IRON TREATMENT



FIGURE 8. DISCHARGE OF TREATED WATER TO ELKHORN RIVER

