Five-Year Review Report

Second Five-Year Review Report
for
Conservation Chemical Company Site
Located in
Kansas City, Missouri

September 2007

Prepared by:
U.S. Environmental Protection Agency
Region 7
Kansas City, Kansas

Approved by: **Date:**

9/20/07

Cecilia Tapia, Director
Superfund Division

Table of Contents

Tables

Figures

Attachments

List of Abbreviations and Specialized Terms Used in this Five-Year Review Report

Aquifer:	An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be used for drinking or other purposes. The water contained in the aquifer is called groundwater.
ARARs	**Applicable or Relevant and Appropriate Requirements (ARARs):** Cleanup standards, standards of control and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that either specifically address the circumstances at the site or address problems sufficiently similar to those circumstances that their use is well suited to the particular site.
CERCLA	**Comprehensive Environmental, Response, Compensation, and Liability Act:** The law enacted by Congress in 1980 to evaluate and cleanup abandoned, hazardous waste sites.
CFR	**Code of Federal Regulations**
Consent Decree	The Consent Decree entered in 1988 in United States v. Conservation Chemical Company, et al., in the Western District of Missouri, Civil No. 82-0983-CV-W-5.
Contaminant Plume	A column of contamination with measurable horizontal and vertical dimensions that is suspended in and moves with groundwater.
Defendants	The parties to the Consent Decree who agreed to perform the remedial action at the Conservation Chemical Company site.
Downgradient:	Downstream from the flow of groundwater. The term refers to groundwater flow in the same way it does to a river's flow.
ESD	**Explanation of Significant Differences:** A decision document which modifies a remedy selected for a site through a Record of Decision. An ESD is utilized when the modification does not fundamentally change the remedy.
gpm	**Gallons per minute**
Groundwater	Underground water that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

ICs	**Institutional Controls:** The placement of laws, regulations, restrictions, etc., on a site/property which assists or assures protection of human health by eliminating exposure pathways.
MCLs	**Maximum Contaminant Levels:** The maximum permissible level of a contaminant in water that is delivered to any user of a public water system.
Migrate	To move from one area to another; to change location.
Monitoring	Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action.
NPL	**National Priorities List**
NPDES	**National Pollutant Discharge Elimination System**
O&M	**Operation and Maintenance:** Activities conducted at a site after the construction phase to ensure the cleanup continues to be effective.
ppb	**Parts per billion:** A unit of measurement used to describe concentrations of contamination. For example, one gallon of solvent in one billion gallons of water is equal to 1 ppb.
ppm	**Parts per million**
Performance Standards	Measurable values in the environment that allow the evaluation of whether a remedial action has met a given objective.
Plume	A body of contaminated groundwater flowing from a specific source.
ROD	**Record of Decision:** The decision document in which EPA selects the remedy for a Superfund site.
RAO	**Remedial Action Objective:** The specific purpose of a remedial action, usually put in terms of measurable standards in environmental media.
RCRA	**Resource Conservation and Recovery Act**
RPM	**Remedial Project Manager**
Site	The former Conservation Chemical Company facility located at 8900 Front Street, Kansas City, Missouri.
SVOCs	**Semi-Volatile Organic Compounds**

ug/l	**Micrograms per liter**
VOCs	**Volatile Organic Compounds:** Carbon compounds such as solvents, which readily volatilize at room temperature and atmospheric pressure. Most are not readily dissolved in water, but their solubility is above health-based standards for potable use. Some VOCs can cause cancer.

EXECUTIVE SUMMARY

The remedy for the Conservation Chemical Company site (Site) in Kansas City, Missouri, included (1) implementation of a surface cleanup by dismantling buildings, equipment, and drums; (2) installation of a permeable soil cap and security fence; (3) installation of groundwater extraction wells and monitoring wells; and (4) construction and operation of a groundwater treatment system. The Site achieved construction completion with the signing of the *Interim Close-Out Report* on September 23, 1991. The Defendants have operated the groundwater extraction and treatment systems since 1991 with oversight conducted by the Environmental Protection Agency and the Missouri Department of Natural Resources. An Explanation of Significant Differences was issued in 2003 to eliminate a metals treatment process and to set effluent criteria for metals based on current ecological guidance.

Based upon available data, the assessment of this five-year review found the remedy is currently protective of human health and the environment because all threats have been addressed through installation of a soil cap with security fencing and hydraulic control of the source area contamination. In the long term, the remedy is expected to be protective upon attainment of groundwater cleanup standards. The time frame to reach those standards has not been estimated since the remedy is based upon source containment.

Protectiveness of the remedial action will be monitored and verified by obtaining operation and maintenance data required by the Consent Decree. Current data indicate the source area is hydraulically controlled, contamination concentrations in the source area are decreasing, and downgradient contaminant concentrations are attenuating.

The trigger for this five-year review was the completion of the previous five-year review on February 29, 2000. The next five-year review for the Site is required by September 2012, five years from the date of this review.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: CONSERVATION CHEMICAL COMPANY		
EPA ID *(from WasteLAN)*: MOD000829705		
Region: 7	**State:** MO	**City/County:** KANSAS CITY / JACKSON
SITE STATUS		
NPL status: ■ Final □ Deleted □ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ■ Operating □ Complete		
Multiple OUs?* □YES ■ NO	**Construction completion date:** September 23, 1991	
Has site been put into reuse? ☐ YES ■ NO		
REVIEW STATUS		
Lead agency: ■ EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: Steve Auchterlonie		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA Region 7	
Review period: October 2004 to September 2007		
Date(s) of site inspection: Multiple inspections over the last seven years, with the most recent on May 22, 2007		
Type of review:	■ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only □ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion	
Review number: □ 1 (first) ■ 2 (second) □ 3 (third) □ Other (specify)		
Triggering action: ☐ Actual RA On-site Construction___ ☐ Construction Completion ☐ Other (specify)	□ Actual RA Start at OU# NA ■ Previous Five-Year Review Report	
Triggering action date *(from WasteLAN)*: February 29, 2000		
Due date *(five years after triggering action date)*: February 29, 2005		

* OU stands for operable unit

Five-Year Review Summary Form, cont'd.

Issues:

After removal of the sulfide system as a secondary metals treatment process, the primary metals removal treatment process has continued to produce effluent concentrations comparable to those attained with the sulfide system in operation.

A field investigation and screening level ecological risk assessment were conducted to address the contaminated groundwater located immediately adjacent to the Missouri and Big Blue Rivers. The contamination is attenuating at a significant rate but not as fast as contamination in groundwater in the source area. Additional investigation is recommended in connection with the ecological risk assessment.

Failure to maintain the inward gradient specification for the south half of the Site occurred on two separate occasions. Reevaluation of the hydrology and development of an updated computer model for the Site concluded hydraulic control was maintained.

A failure in the screen in the south extraction well resulted in modification of the well from being a well that fully penetrated the saturated depth of the aquifer (fully penetrating well) to being one that only partially penetrated the saturated depth of the aquifer (partially penetrating well). Utilizing the newly developed computer model, the Defendants concluded the partially penetrating well would continue to maintain hydraulic control of the Site. Four years of chemical monitoring have verified this conclusion.

Additional work is required to investigate if Institutional Controls are necessary for the Site to limit potential future land and resource use.

Recommendations and Follow-up Actions:

Ecological Investigation – conduct transition zone sampling in the Missouri and Big Blue Rivers and characterize the ecological resources.

Institutional Controls – investigate whether institutional controls are required to prevent potential future land use at the Site.

Metals Treatment Optimization – investigate whether metals removal is required in the treatment plant based upon current concentrations of influent metals.

New Hydraulic Control Management – investigate whether another approach than using the current piezometer pairs would more reliably verify hydraulic control while (1) eliminating chronic problems with existing piezometer approach, (2) allowing optimization of the extraction of contaminated groundwater, and (3) allowing optimization of the treatment plant operation through reduced influent flowrate.

Protectiveness Statement(s):

Based upon available data, the assessment of this five-year review found the remedy is currently protective of human health and the environment because all threats have been addressed through installation of a soil cap with security fencing and hydraulic control of the source area contamination. In the long term, the remedy is expected to be protective upon attainment of groundwater cleanup standards. The time frame to reach those standards has not been estimated since the remedy is based upon source containment.

Long-term protectiveness of the remedial action will be monitored and verified by obtaining operation and maintenance data required by the Consent Decree. Current data indicate the source area is hydraulically controlled, contamination concentrations in the source area are decreasing, and downgradient contaminant concentrations are attenuating.

Other Comments:

This report is over two years behind schedule. The reason for this delay is due to a long-term illness in the family of EPA's remedial project manager who is responsible for management of the CCC Site and production of this report. Due to the complexity and long history of several issues addressed in this report, the EPA remedial project manager requested the opportunity to conduct and complete the five-year review rather than assign it to another remedial project manager. The priority was management continuity at a key time in the project.

CONSERVATION CHEMICAL COMPANY SITE
KANSAS CITY, MISSOURI
SECOND FIVE-YEAR REVIEW REPORT

I. INTRODUCTION

The purpose of a five-year review is to determine whether the remedy at a site remains protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, the Environmental Protection Agency (EPA) uses five-year review reports to identify issues found during the review, if any, and to make recommendations to address them.

EPA is preparing this Five-Year Review Report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) section 121 and the National Contingency Plan (NCP). CERCLA section 121(c) 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.

EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) 300.430(f)(4)(ii) which states:

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

EPA Region 7 conducted the five-year review of the remedies implemented at the Conservation Chemical Company (CCC) site (Site). This review was conducted by the Remedial Project Manager (RPM) for the entire Site from October 15, 2004, to June15, 2007. This report documents the results of the review.

This is the second five-year review for the Site. The triggering action for this statutory review is the completion of the first five-year review on February 29, 2000. The five-year review is required due to the fact hazardous substances, pollutants, or contaminants remain at the Site above concentrations that allow for unlimited use and unrestricted exposure.

II. SITE CHRONOLOGY

Table 1 - Chronology of Site Events

Event	Date
1. CCC initiated site construction and waste disposal activities.	1960
2. Fire destroyed many operating records.	1970
3. Missouri Department of Natural Resources requested CCC cease disposal of solid wastes and implement remedial actions.	1975
4. Missouri Clean Water Commission ordered the Site closed and covered.	1977
5. The Site was referred to EPA. EPA filed its first civil complaint against CCC pursuant to the Resource Conservation and Recovery Act (RCRA).	1979
6. CCC ceased the waste disposal operation. Also, EPA completed the initial site investigation.	1980
7. EPA filed a second complaint against the Defendants pursuant to both RCRA and CERCLA.	1982
8. The Defendants conducted a remedial investigation and feasibility study.	1982 - 1984
9. EPA proposed the Site for the National Priorities List (NPL). Also, the Defendants and EPA reached an agreement for a remedy for the Site.	1985
10. During design, new information identified the initial remedy was technically impracticable to construct. Thus, EPA conducted a second feasibility study which resulted in a second remedy documented in a Record of Decision.	1987
11. EPA and Defendants negotiated a Consent Decree for the Defendants to implement the second remedy. The Consent Decree was entered by the court.	1988
12. The design for the second remedy was implemented in three phases: surface cleanup including a soil cap, groundwater monitoring and extraction wells, and groundwater treatment plant.	1989
13. The construction of the surface cleanup phase was completed.	1989
14. The construction of the groundwater wells and treatment plant phases were completed.	1990
15. The operational and functional period for the remedy was completed. Subsequently, EPA completed the *Interim Close-Out Report for the Long-Term Remedial Action* for the Site. As a result, the Long-Term Response Phase of the remedy was initiated.	1991
16. EPA completed the *Five- and Ten-Year Review Report* for the Site.	February 2000
17. EPA completed an *Explanation of Significant Differences* document allowing deletion of the sulfide treatment system from the groundwater treatment process.	January 2003
18. The Defendants conducted a reevaluation of the Site's hydrogeology resulting in an updated site computer model.	October 2004
19. EPA conducted a study of groundwater contamination located outside the Site boundaries but within the CCC groundwater plume.	2004 – 2005

III. BACKGROUND

3.1 Physical Characteristics

The Site is located approximately 1.75 miles east of Interstate 435 along the Levee Road in Jackson County, Missouri, and it is within the city limits of Kansas City, Missouri. The Site is approximately six acres in size and is situated on the flood plain of the Missouri River near the confluence of the Missouri and Big Blue Rivers on the river side of the levee (Figure 1).

3.2 Land and Resource Use

LAND USES

The area in which the Site is located is industrially zoned (Figure 2). Bayer Agriculture Division (Bayer) operates an agricultural chemical manufacturing plant southwest of the Site. Also, Bayer owns property south and southeast of the Site which is undeveloped, but a portion of which has been used for agricultural purposes in the past. Kansas City Power and Light (KCPL) operates the Hawthorne Power Plant to the west of the Site and owns undeveloped land to the north of the Site. Development immediately adjacent to the Site is limited by the flood plains and levees associated with both the Big Blue and Missouri Rivers.

The former Sugar Creek Refinery is located approximately 1.3 miles downstream, and the well fields for the cities of Independence and Liberty extract water approximately three to four miles downstream in the Missouri River's alluvial aquifer (Figure 3). Notably, two waste water treatment plants are located near the Site and within the alluvial aquifers of the Big Blue and Missouri Rivers: (1) the New Rock Creek Plant operated by the city of Independence is located 0.7 miles southeast from the Site, and (2) the Birmingham Plant/Land application farm operated by Kansas City is located 1.3 miles northeast from the Site (Figure 4).

GROUNDWATER AND SURFACE WATER USES

Groundwater is used primarily for industrial purposes in the immediate vicinity of the Site. Specifically, Bayer and KCPL operate industrial wells for plant needs. However, local municipalities utilize well fields located downgradient from the Site and in the alluvium of the Missouri River. The public water supplies closest to the Site are operated by the cities of Independence and Liberty and are approximately three to four miles downstream.

Surface water uses in the Missouri River include commercial navigation (barges, etc.) and fishing from banks by individuals. Surface water uses in the Big Blue River are limited near the Site due to the industrial zoning. Numerous facilities discharge

FIGURE 1. SITE LOCATION

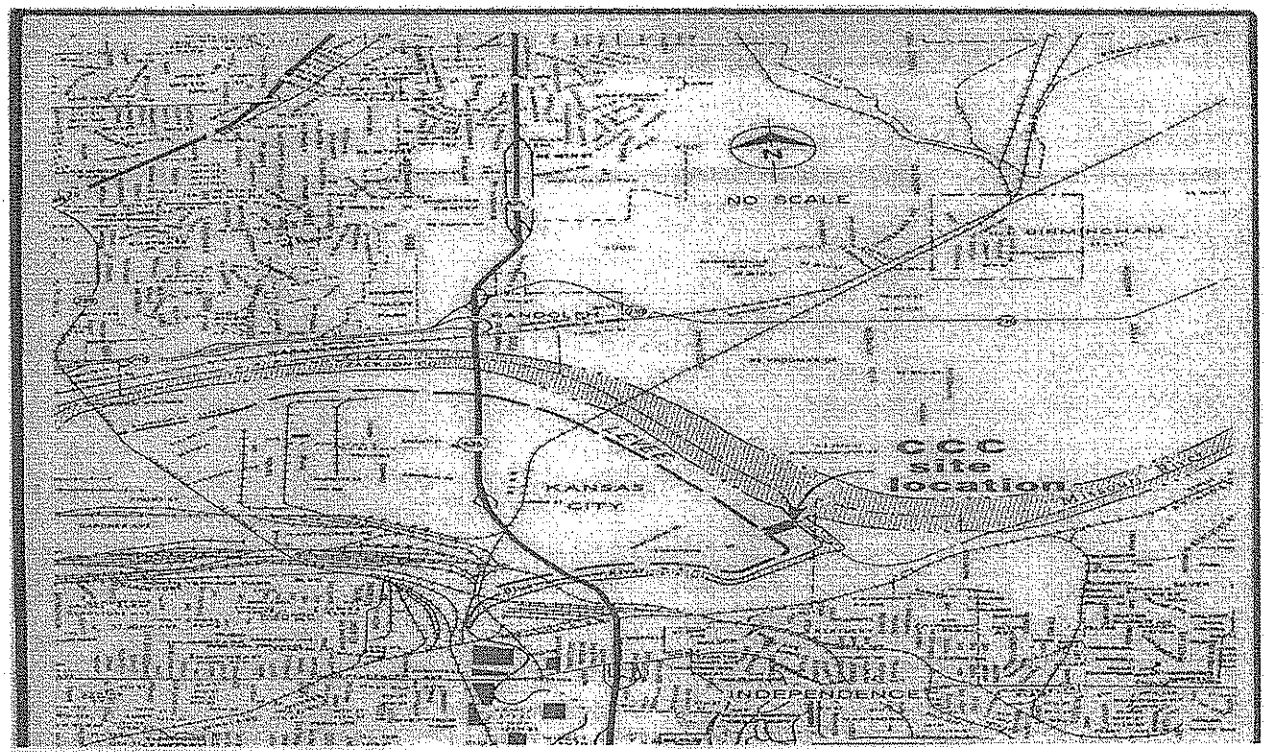


FIGURE 2. LAND USE ADJACENT TO SITE

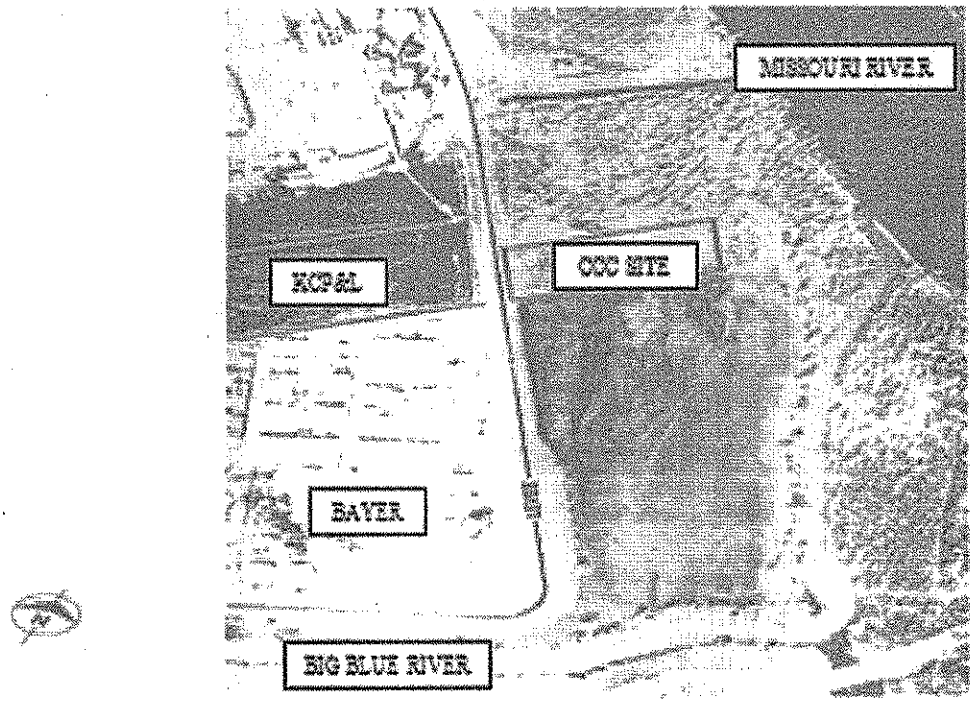


FIGURE 3. LAND-USE FEATURES ADJACENT TO MISSOURI RIVER

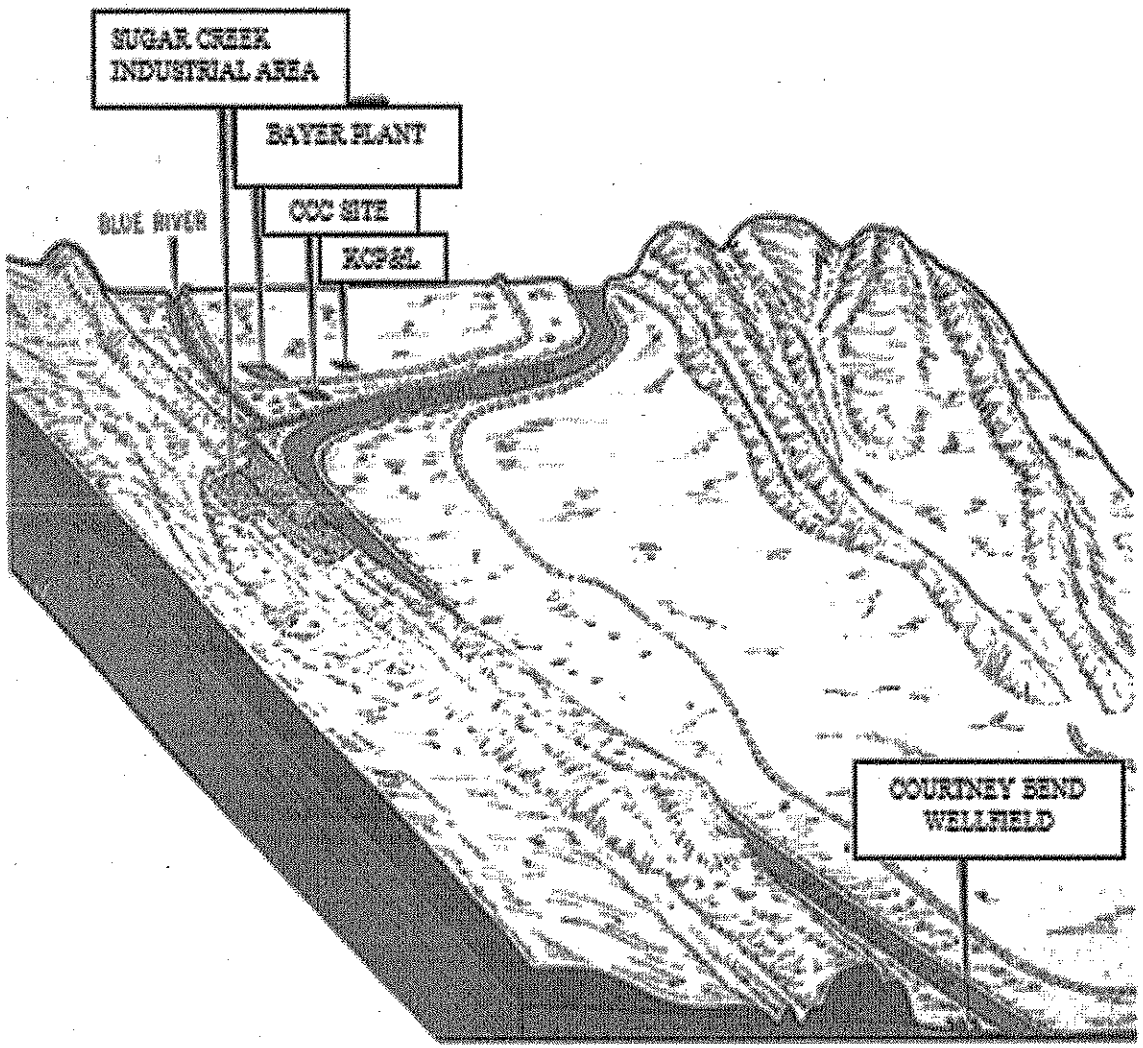
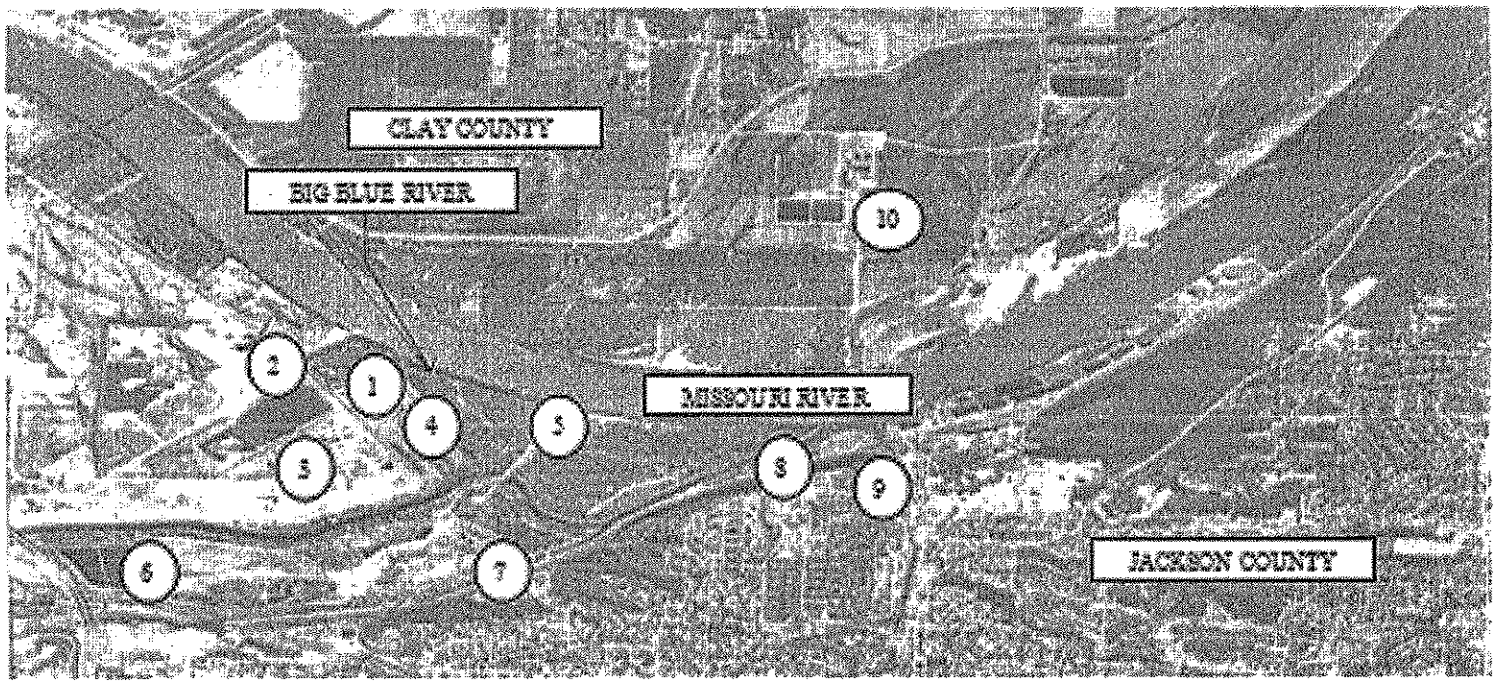


FIGURE 4. LAND-USE FEATURES IN AREA OF SITE



1. CONSERVATION CHEMICAL COMPANY SITE
2. KCPL HAWTHORNE POWER PLANT
3. BAYER CROP SCIENCE PLANT
4. UNDEVELOPED LAND OWNER BY BAYER
5. UNDEVELOPED LAND OWNED BY AK STEEL
6. MILL WATER COOLING PONDS FOR AK STEEL
7. NEW ROCK CREEK WASTE WATER TREATMENT PLANT
8. FORMER ROCK CREEK WASTE WATER TREATMENT PLANT
9. FOMER SUGAR CREEK REFINERY
10. BIRMINGHAM WASTE WATER PLANT/LAND APPLICATION FARM

Industrial effluent streams into the Big Blue and Missouri Rivers pursuant to permits issued by the Missouri Department of Natural Resources (MDNR).

Fishing from the bank of the rivers is also restricted in the immediate vicinity of the Site as a result of limited access due to strict control of traffic on the levee and due to security measures implemented by Bayer and KCPL facilities.

3.3 History of Contamination

The CCC business included recycling and on-site disposal of industrial wastes. The CCC initiated its activities at the Site in 1960 beginning with construction of chemical treatment basins, the process area, and a roadway ramp. Waste disposal operations began at the Site soon after construction was initiated and continued until approximately 1980. CCC officials claim a fire in 1970 destroyed many operating records. However, available operating records indicated the primary materials accepted at the Site included organics, solvents, acids, caustics, metal hydroxides, and cyanide compounds. Reports also indicated pesticides, herbicides, waste oils, arsenic, and elemental phosphorus were handled at the Site. There were also reports and some evidence pressurized cylinders and other metal containers were placed in the basins. Subsequent investigations confirmed the presence of a broad variety of wastes. The facility handled liquids, sludges, and solids. It is estimated approximately 93,000 cubic yards of materials were buried on the Site.

3.4 Initial Response

In 1975, MDNR investigated the Site and found it to be operating as a solid waste disposal area. On December 15, 1975, MDNR requested CCC cease the disposal of solid wastes at the Site and remedial actions be taken to clean up the Site. In 1977, the Missouri Clean Water Commission ordered the Site closed and covered. The plan developed by CCC to close the Site included an attempt to stabilize waste materials in the lagoons by mixing them with fly ash obtained from coal-burning power plants and waste pickle liquor, an acidic waste resulting from steel production and metal finishing operations. While CCC did implement this plan, the Site was never fully closed in accordance with the plan; and tests subsequently conducted on the *stabilized* materials determined waste materials had not been effectively stabilized by this process.

In September 1979, the United States filed its first civil complaint against CCC regarding this Site. The complaint which predated CERCLA was filed pursuant to the imminent hazard provision of the Resource Conservation and Recovery Act (RCRA). A second complaint was filed under both RCRA and CERCLA in November 1982 against not only CCC but also its president and chief operating officer, a related company that sent wastes to the Site, and the four companies believed to be the major generators of wastes sent to the Site. For convenience, these parties will be referred to as the Defendants.

The Site was proposed for listing on the National Priorities List (NPL) in April 1985 and was added to the list in October 1989.

In May 1985, an agreement was reached with the Defendants on a remedy that would contain the contamination on the Site using an impermeable barrier wall. A Preliminary Agreement was signed on August 2, 1985, which called for the Defendants to implement this remedy. The remedy was subsequently approved by the court after issuing a public notice and holding a public hearing.

During the remedial design, the Defendants obtained information which they claimed made the barrier wall remedy technically infeasible to complete. EPA did not agree with this conclusion and sought an order from the court compelling the Defendants to complete the agreed-upon remedy. However, the court did not choose to do so and a revised remedy was ultimately selected. Following public notice and an opportunity for the public to comment on a revised Feasibility Study and Proposed Plan, a Record of Decision (ROD) was signed on September 30, 1987, by the Regional Administrator selecting the revised remedy. The Defendants and EPA signed a Consent Decree that was entered by the court in 1988 requiring the Defendants to implement the remedy selected in the ROD.

3.5 Basis for Taking Action

CONTAMINANTS

As listed previously in this report, many types of wastes were disposed at the Site including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. Reviewing the many years of historic sampling results, the list of contaminants of concern at the Site is very long; however, the following list of hazardous substances has been identified as indicator chemicals at the Site:

- VOCs – 1,2-dichloroethene, methylene chloride, trichloroethene, and vinyl chloride
- SVOCs – phenol, 2,4-dimethyl phenol, 2-methyl phenol, and 4-methyl phenol
- Metals – cyanide, iron, nickel, and zinc

Indicator chemicals are simply a reduced list of chemicals to analyze and track during operation of the remedy. If and when the cleanup standards are achieved, the full list of Site contaminants will be utilized to make this determination.

CONTAMINATED MEDIA

Surface soils and subsurface soils on-site, groundwater on-site and adjacent to the Site, and surface water in the Big Blue and Missouri Rivers are the media of concern for contamination due to the Site.

EXPOSURES

Exposures to the Site contaminants via contaminated media were associated with significant human health threats and ecological impacts based upon reasonable maximum exposure scenarios:

- Soils – Unacceptable risks to human health due to potential direct exposure to the contaminants in the shallow soils in the former disposal areas were identified.

- Groundwater – Unacceptable risks to human health due to potential potable uses of the contaminated groundwater on the north side of the Missouri River, and potential ecological impacts resulting from uncontrolled discharge of contaminated groundwater into the Missouri River were identified.

- Surface Water – Potential ecological effects were associated with surface water in the Missouri River.

IV. REMEDIAL ACTIONS

4.1 Remedy Selection

Based upon the evaluation of the remedial alternatives and in consideration of the applicable or relevant and appropriate requirements (ARARs) described in the ROD, an active groundwater containment system was selected as the remedial action for the Site. This alternative was consistent with the general requirements of section 121(b) of CERCLA that a remedial action shall be selected which is "protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable."

The objectives of the ROD required the remedial action include:

- Surface cleanup involving (1) demolition and on-site disposal of existing buildings, tanks, and debris; (2) surface preparation to minimize flood damage; and (3) installation of a two-layer cap over the existing fill consisting of geotechnically stable loess and top soil to prevent direct contact to wastes.

- Installation of a groundwater withdrawal well system to hydraulically control the source of groundwater contamination by maintaining a groundwater inward

gradient to be measured by piezometer pairs along the perimeter of the Site. The inward gradient was specified at 0.06 foot (refer to Figure 5 for visual explanation of hydraulic control).

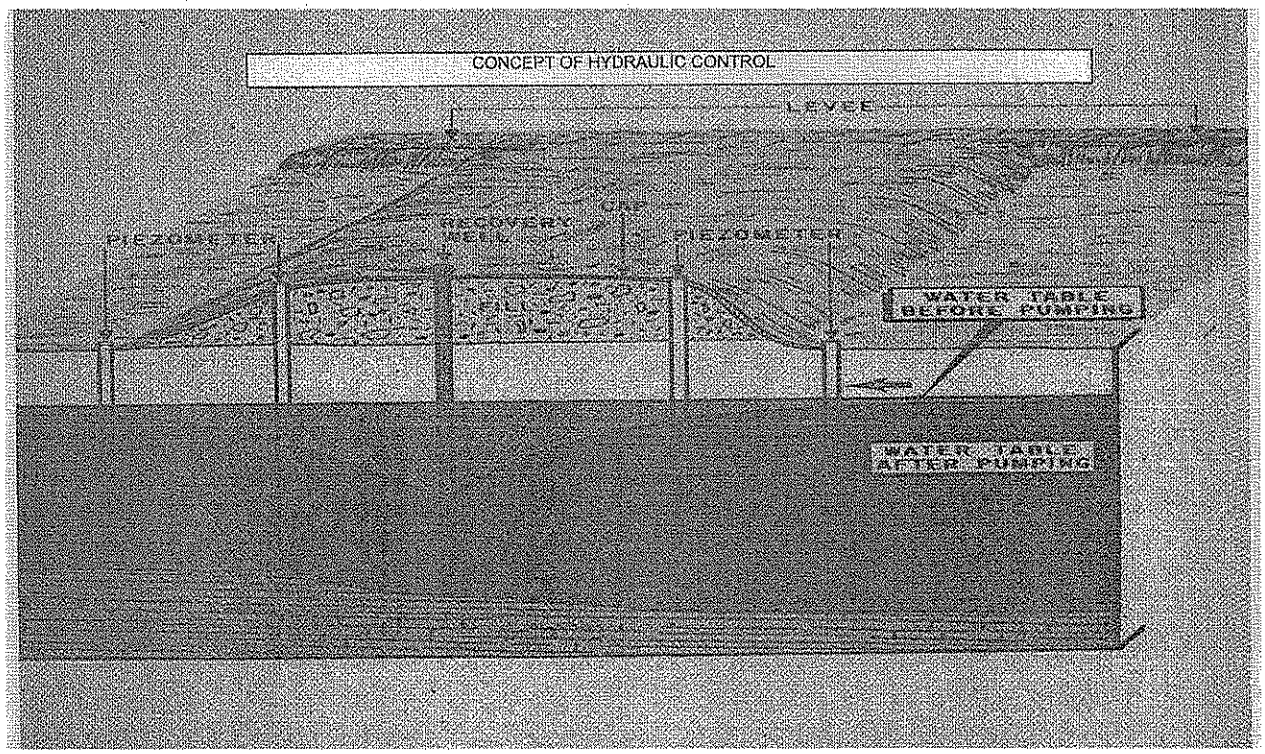
- Installation of a groundwater treatment system, including sulfide precipitation to maximize metals removal, that would at a minimum meet the National Pollutant Discharge Elimination System (NPDES) discharge criteria set by the state.

- Chemical monitoring of groundwater both within and outside the boundaries of the CCC property.

- Satisfying specified ARARs.

- No institutional controls (ICs) were required.

FIGURE 5. HYDRAULIC CONTROL



4.2 Remedy Implementation

The Defendants conducted the design and construction efforts in three phases:

Phase 1

- Surface cleanup and preparation consisting of removal of the on-site buildings and septic system, removal of existing tanks and solid debris, and regrading the surface of the Site to prevent flood erosion (refer to Figures 6 and 7 for historic photos showing condition of the Site during the waste disposal period).

- Placement of a two-layer protective surface cap consisting of a lower layer of at least 18 inches of geotechnically stable loess and an upper layer of at least six inches of top soil capable of supporting persistent vegetation and raising the surface elevation to above the 100-year flood elevation.

- Placement of rip-rap to prevent flood erosion and installation of a six-foot metal security fence along the perimeter of the Site.

Phase 2

- Installation of four new monitoring well pairs and redevelopment of two existing pairs of monitoring wells.

- Installation of four paired piezometers to monitor the groundwater elevations beneath the Site.

- Installation of two on-site extraction wells capable of withdrawing a combined total of 300 gallons per minute (gpm).

Phase 3

- Construction of an on-site, 300-gpm-capacity groundwater treatment plant which includes metals precipitation (utilizing both lime and sulfide precipitation), filtration, biological treatment, and carbon absorption.

EPA's approval of the remedial designs for Phases 1, 2, and 3 occurred on January 27, 1989; March 24, 1989; and May 26, 1989, respectively, and simultaneously marked the start of the remedial action construction phases. Phase 1 construction was completed August 2, 1989. On December 1, 1989, EPA conducted the final inspection for Phase 1 and determined the remedial action construction was in accordance with the scope of work specified in the Consent Decree. Construction of Phases 2 and 3 was completed

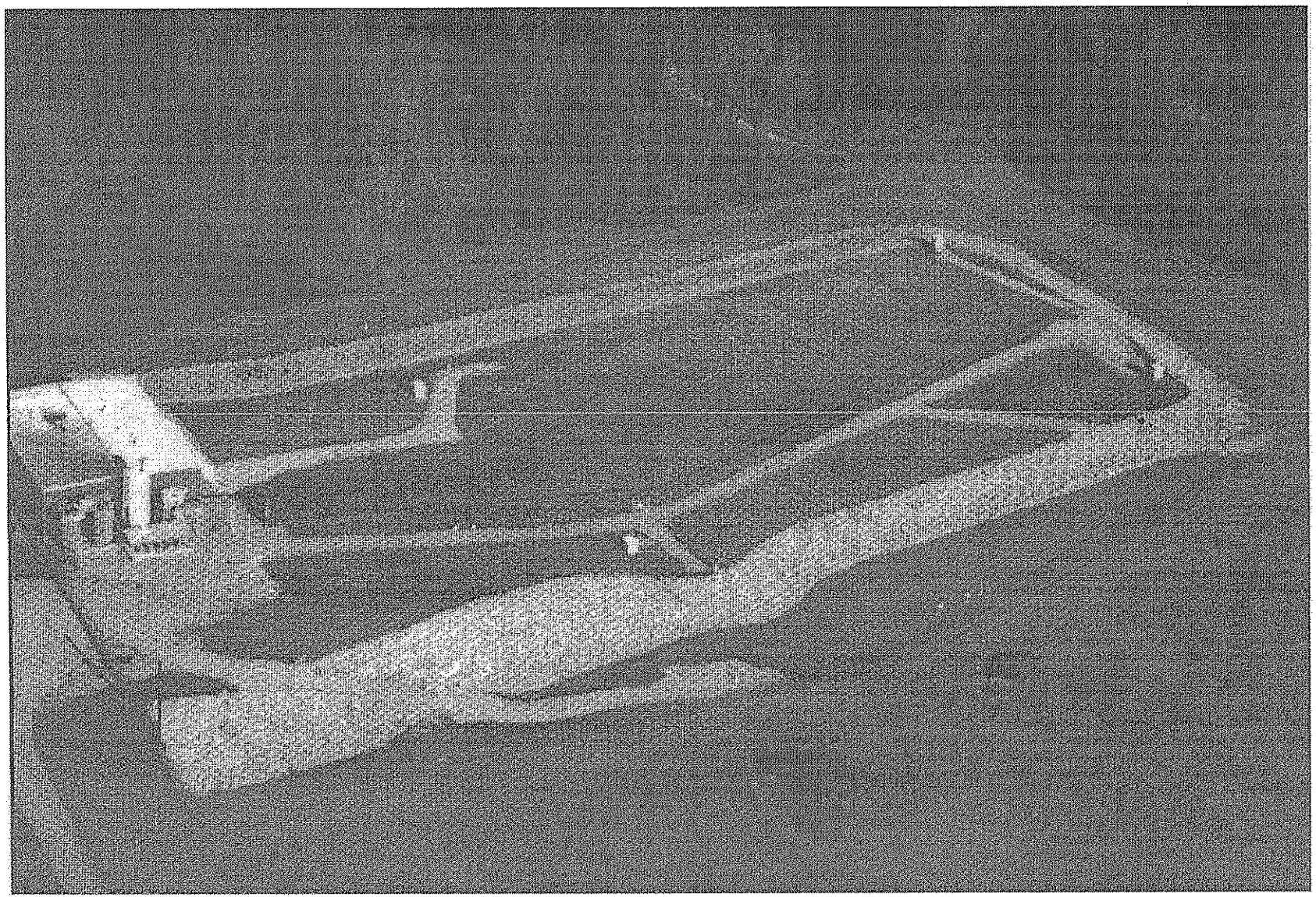
in April 1990. On June 27, 1990, EPA conducted the final inspection for Phases 2 and 3 and determined the remedial action construction was in accordance with the scope of work specified in the Consent Decree (refer to Figure 8 for photo of Site following remedy construction). MDNR participated throughout the design, construction, and inspection phases.

Following one year of operation, EPA issued an *Interim Close-Out Report for the Long-Term Remedial Action* on September 23, 1991. In this report, EPA stated the remedial action was functioning as designed and in compliance with the ROD and Consent Decree. As a result, the report formally initiated the long-term operation and maintenance (O&M) phase of the remedial actions.

FIGURE 6. PHOTO OF SITE DURING WASTE DISPOSAL PERIOD

FIGURE 7. AERIAL PHOTO OF SITE DURING WASTE DISPOSAL PERIOD

FIGURE 8. AERIAL PHOTO OF SITE FOLLOWING REMEDY CONSTRUCTION



4.3 System Operation, Operation and Maintenance

System Operations/Operation & Maintenance Requirements

Pursuant to the Consent Decree, the Defendants are required to operate and maintain the remedial action. As a result, an O&M Plan was developed by the Defendants and approved by EPA. The O&M Plan is a comprehensive document to oversee the remedial action; the scope of the O&M Plan includes the groundwater treatment facility, extraction system, the monitoring network, and the protective cap.

An annual operating summary has been prepared by the Defendants at the end of each calendar year. It is an effective means of advising and informing EPA and the state of the status of the remedial action. It includes data to show the effectiveness of treatment, maintenance issues, and other items that may have a bearing on the remedial action. The Defendants have presented the operating summary to representatives of EPA and the state in annual meetings.

In addition, the Consent Decree requires the Defendants submit NPDES Reports, Off-Site Groundwater Monitoring Reports, Metals Removal Reports, and Groundwater Level Monitoring Reports on specified schedules.

- NPDES Reports – The Defendants are required to satisfy sampling and reporting requirements specified in an NPDES permit authorized by the state. The Defendants have implemented the sampling and reporting requirements on schedule. In 2006, the permit was reauthorized and revised to allow a less frequent sampling based upon 15 years of data. The permit modified the frequency from weekly to quarterly.

- Off-site Groundwater Monitoring Reports – The Defendants are required to monitor and report the off-site groundwater quality and elevations on a quarterly frequency for the first five years and annually for years six through twenty. The Defendants have conducted this effort on schedule.

- Metals Removal Reports – The Defendants are required to monitor and report the groundwater metals removal process on a monthly basis. The Defendants have conducted this effort on schedule. Coordinating with the changes in the revised NPDES permit, EPA has allowed a change in sampling frequency from monthly to quarterly for certain metals and a change in reporting frequency from monthly to quarterly based upon 15 years of data.

- Groundwater Level Monitoring Reports – The Defendants are required to continuously monitor the groundwater elevations and corresponding inward gradients and to report results on a monthly basis. The Defendants have conducted this effort on schedule.

Operation & Maintenance Problems

Typical maintenance issues have required attention at the Site and are not noteworthy for the purpose of this report. Examples of typical maintenance include pump and blower repairs, software upgrades, and tank repairs and replacement.

Two significant O&M problems at the Site have occurred:

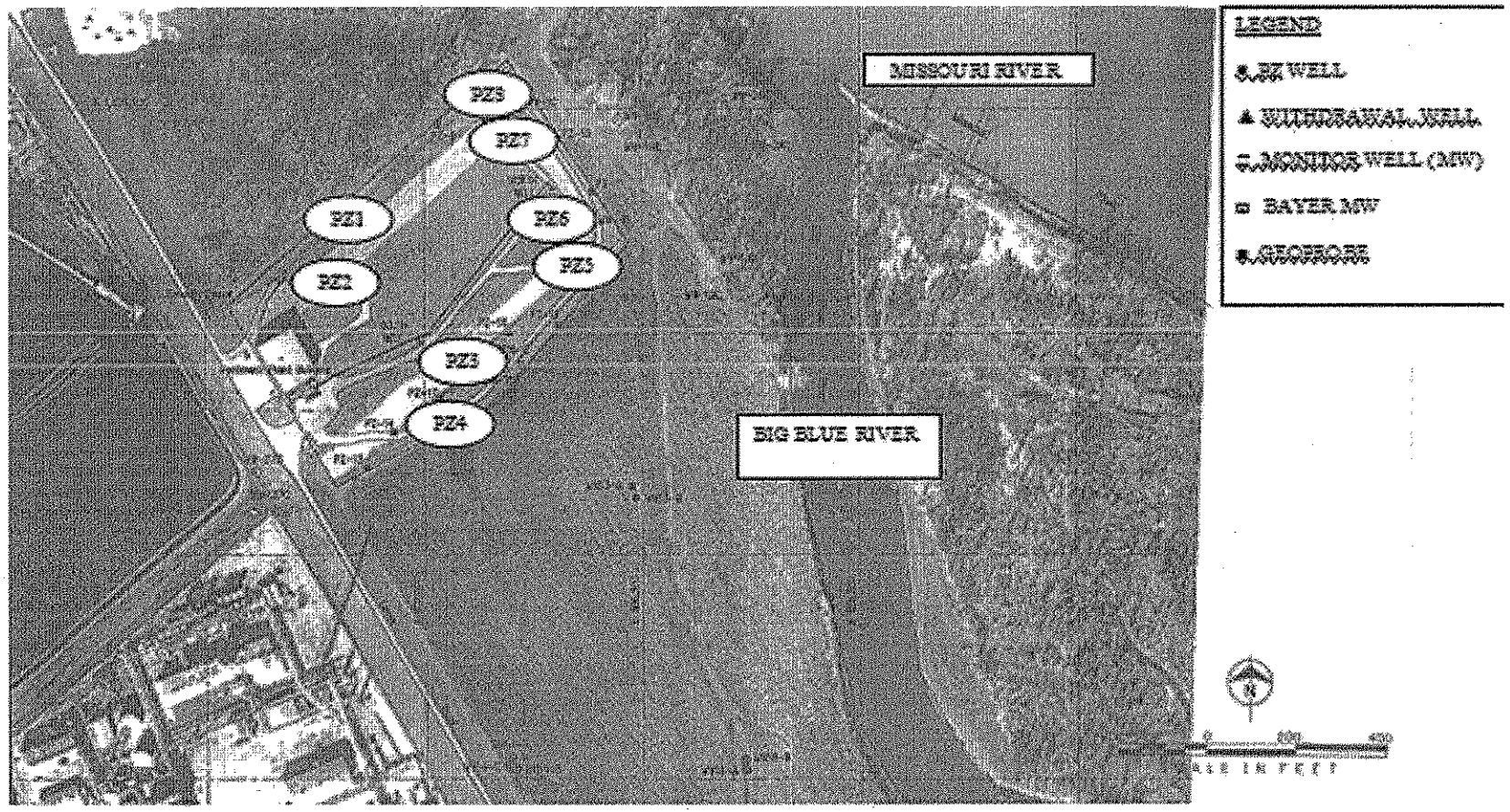
- One problem involved an inability to maintain the minimum inward hydraulic gradient in the southwest piezometer pair (identified as PZ-3 and PZ-4 on Figure 9). This problem started early after startup in 1991 and has recurred several times over the years. Despite periods of time below the minimum requirement, the overall average has achieved an inward gradient and the reductions in chemical concentrations reflect plume control. However, as a result of the chronic nature of this issue, EPA requested and the Defendants agreed to reevaluate the hydrogeology for the area to verify whether changes have occurred which prevent achieving the minimum gradient specification. The reevaluation utilized a detailed computer modeling analysis. The results of this analysis are presented in Sections V.B and VI. 6.4 of this report.

- The second problem occurred in 2003 when the screen in the south extraction well failed, and the bottom 12 feet of the casing filled with solids. In-well video identified a crack in the stainless steel screen. The Defendants chose to address this problem by installing a concrete plug in the well to a depth 10 feet above the crack. The result was a reduction in well depth from 104 feet to 83 feet below grade and a reduction in screen length from 72 feet to 51 feet. These modifications changed the south extraction well from a fully penetrating well to a partially penetrating well. The question became whether a partially penetrating well would maintain hydraulic control of the Site. The Defendants included an analysis of this change in the study of the computer model noted previously. Likewise, the results of this analysis are presented in Section 6.4 of this report.

Operation & Maintenance Costs

O&M costs have changed significantly from startup in 1991 to recent years primarily due to a large reduction in disposal costs for sludge produced by the metals removal processes. Prior to 1995, O&M costs averaged $1,000,000 per year except the two years of 1993 and 1994. Annual O&M costs averaged $1,500,000 during those two years because the sludge produced by the metals extraction system required incineration due to cyanide concentrations exceeding EPA land disposal restriction criteria. In 1995, EPA revised the land disposal restriction. Since 1995, the annual total O&M costs have averaged approximately $800,000: (1) labor at 50 percent, (2) sludge disposal /carbon replacement combined at 20 percent, (3) lab/utilities/chemicals combined at 15 percent, and (4) replacements/upgrades/miscellaneous combined at 15 percent.

FIGURE 9. WELL LOCATIONS



V. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This section presents a discussion of the activities conducted at the Site since the first five-year review was completed in February 2000. Specifically, activities performed in response to issues and recommendations identified in the first five-year review will be summarized into two categories: (1) sulfide metals treatment, and (2) high concentrations in the north area of the plume.

Sulfide Metals Treatment

The ROD and Consent Decree specified the use of a sulfide precipitation system (sulfide system) as part of the treatment processes utilized to remove contaminants from the groundwater. The sulfide system was specified for the purpose of achieving low concentrations for metals contaminants in the plant effluent. The sulfide system satisfied the remedy criteria referred to as *Best Available Technology*. In addition, metals concentrations for the treatment plant were specified in the ROD and Consent Decree. Basically, the sulfide system was designed as a secondary removal process for the metals—essentially a *polishing* step. The primary metals removal process was specified to be lime or hydroxide precipitation.

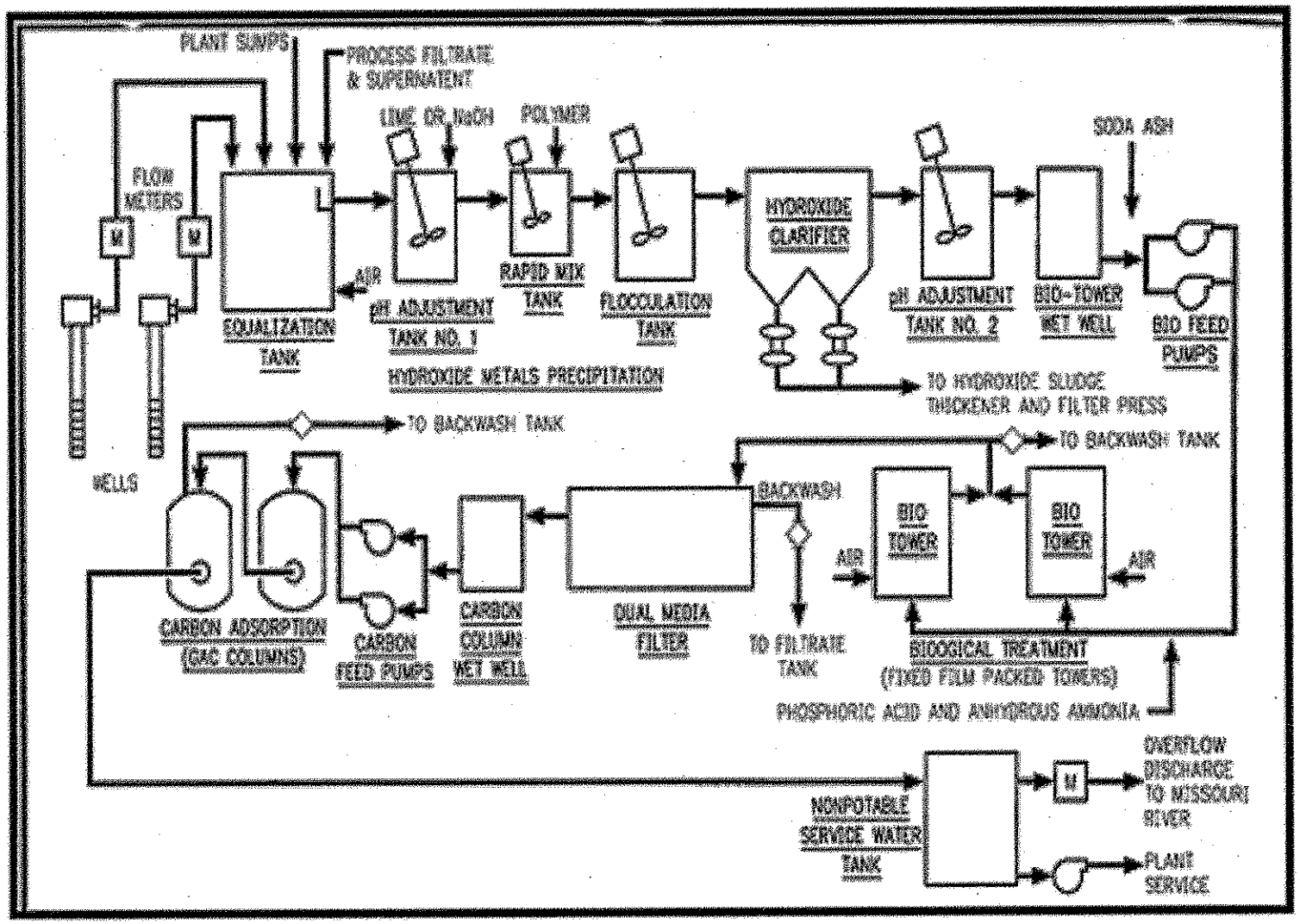
During the first nine years of operation, the treatment processes achieved the effluent metals concentrations. In 1999, the sulfide system failed catastrophically thereby requiring a complete replacement or renovation. Rather than immediately replacing the system, the Defendants proposed and EPA approved to conduct a long-term pilot program to fully investigate metals effluent concentrations without the sulfide system in operation. The basis for the long-term pilot program was the fact the sulfide system may not be required to achieve effluent criteria because the influent metals concentrations had dropped significantly during the nine years of operation.

Two years of operation without the sulfide system documented the treatment plant achieved effluent metals concentrations comparable to those achieved with the sulfide system in operation. In addition, toxicity tests conducted on the treated effluent documented no change in the toxicity of the plant effluent with the sulfide system not operational.

In parallel, EPA identified current guidance (Ecotox Thresholds, EPA 540/F-95/038, 1996) which provided a method for the development of metals concentrations based upon ecological toxicity. Changing the metals criteria to reflect the current standards and technical guidance was viewed by EPA as an appropriate step for a long-term remedial action such as groundwater remediation at the Site.

As a result, EPA developed an Explanation of Significant Differences (ESD) document in January 2003. The ESD specified two modifications to the ROD: (1) EPA eliminated the requirement a process based on sulfide technology be utilized to remove metals

FIGURE 10. TREATMENT PROCESS WITHOUT SULFIDE SYSTEM



(refer to Figure 10 for treatment processes without the sulfide system), and (2) EPA established a revised set of metals criteria for the plant effluent based on ecotox criteria.

New Metals Criteria for Site:

Metal	Limit (Parts per million [ppm])
Arsenic	0.080
Cadmium	0.005
Chromium	0.200
Iron	1.000
Lead	0.015
Nickel	0.508
Zinc	0.338

Contamination Immediately Adjacent to Rivers

As described in the first five-year review, high concentrations of VOCs and phenolic compounds were found immediately adjacent to the rivers in 1996. This contamination is outside the area required to be controlled by the ROD and the Consent Decree. EPA was concerned this contamination may pose an unacceptable risk requiring additional remedial actions.

Investigations were conducted during the past seven years to answer this concern. This section presents the findings of those investigations.

A. EPA Groundwater Sampling Study

For the Site, the contaminant concentrations—most notably VOCs and phenolic compounds—in both the source area and outside the source area have decreased significantly (greater than 90 percent) in all monitoring well locations. Figures 29 through 36 present the contaminant concentrations for indicator VOCs and phenolic compounds for all monitoring wells since 1989 (refer to Figure 9 for the well locations). For the last couple years in the monitoring wells, maximum concentrations of total indicator VOCs have decreased below 500 micrograms per liter (ug/l) and maximum concentrations of total indicator phenolic compounds concentrations have decreased below 100 parts per billion (ppb).

In 1996, the Defendants investigated the possibility of utilizing enhanced natural attenuation at the Site to replace the existing active pump-and-treat approach. As part of that study, two new monitoring wells (identified as 28C and 29C on Figure 9) were installed adjacent to the Missouri and Big Blue Rivers. Sampling of these wells in 1996 found concentrations of VOCs and phenolic compounds at much higher concentrations than found in the other monitoring wells. Specifically, total indicator

VOC concentrations ranged from approximately 1,000 ppb to approximately 28,000 ppb, and total indicator phenolic compound concentrations ranged from approximately 1,700 ppb to approximately 83,000 ppb. Well 28C was contaminated at the higher concentrations.

EPA asked the Defendants to conduct a groundwater study to define the extent of contamination in the area adjacent to the rivers and to develop a risk assessment associated with the contamination concentrations. The Defendants declined to conduct the study indicating the work was beyond the scope of the existing Consent Decree. EPA funded the study in 2004. The field work was completed in 2004, and a report was finalized in 2005. The findings and conclusions of this work are summarized below:

- A direct-push groundwater sampling method was utilized to obtain samples from seven new locations with several depths sampled at each location. Figure 11 identifies the sampling locations as GP-1 through GP-7. An on-site laboratory was utilized to determine the number and location of sampling points necessary to define the extent of contamination. In addition, duplicate samples were sent to a standard off-site laboratory for verification analyses.

- The VOCs analyses from the on-site laboratory were typically higher in detected concentrations than found by the off-site laboratory. However, use of the on-site results is considered acceptable for determining the qualitative nature and extent of the contamination.

- Figures 12, 13, and 14 present graphic analyses of the results for three indicator contaminants: (1) vinyl chloride; (2) cis-1,2-dichloroethene; and (3) 2,4-dimethylphenol. These interpretations indicate two plumes (the Site and an area next to the rivers) separated by an area of much lower contamination concentrations. These interpretations correlate with expectations for a contaminant plume when the source area is controlled. Based on the results for the VOCs and phenolic compounds, the ongoing remedial action appears effective in controlling the contamination being released from the Site as required by the ROD and Consent Decree and in reducing the contaminant concentrations outside the Site that is within the capture zone of the on-site extraction wells. However, the contaminant concentrations in the area immediately adjacent to the rivers appear to be outside the capture zone of the on-site extraction wells. Although contaminant concentrations appear to be decreasing over time, they are doing so at a significantly slower rate than contamination concentrations located closer to the Site.

- Figure 15 presents a graphic analysis of the results for total VOCs and total phenolic compounds found at various depths in the sampling locations relative to the depths of the rivers. Sampling depths were taken from three zones: (1) approximately the rivers' bottoms, (2) 25 feet below the rivers' bottoms, and (3)

50 feet below the rivers' bottoms which is near the top of bedrock. Contamination exists in all three sampling zones, but the highest concentrations of contamination for both VOCs and phenolic compounds are in the deepest sampling zone as shown in Table 2.

- The contaminated groundwater from this area migrates into the rivers' systems. Sampling was not conducted in the rivers and sediments because the dilution factors for these rivers are expected to be very large especially for VOCs and phenolic compounds.

FIGURE 11. NEW WELL LOCATIONS INSTALLED DURING STUDY

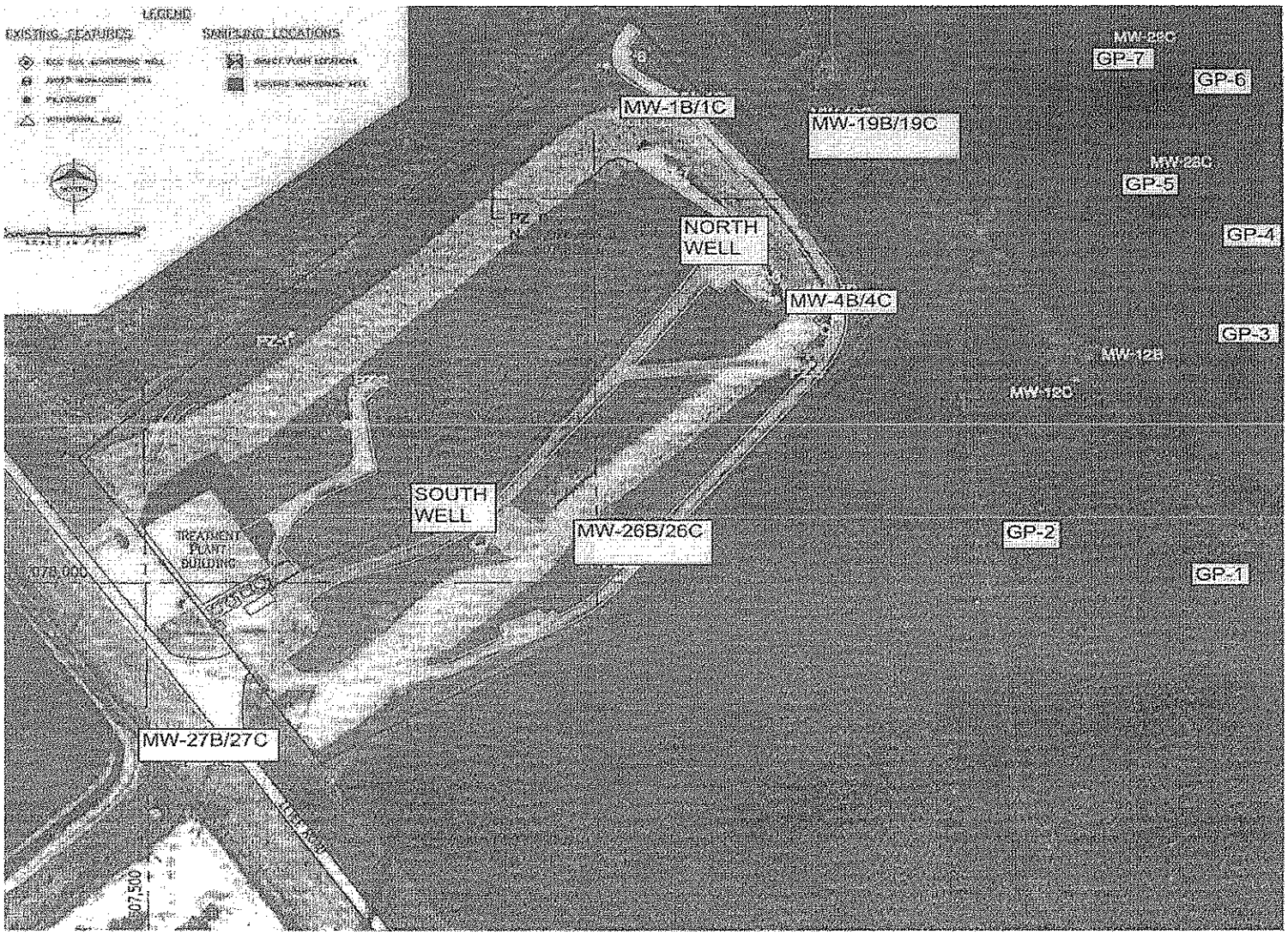


FIGURE 12. ESTIMATED CONTOURS FOR VINYL CHLORIDE AT DEPTH GREATER THAN 75 FEET

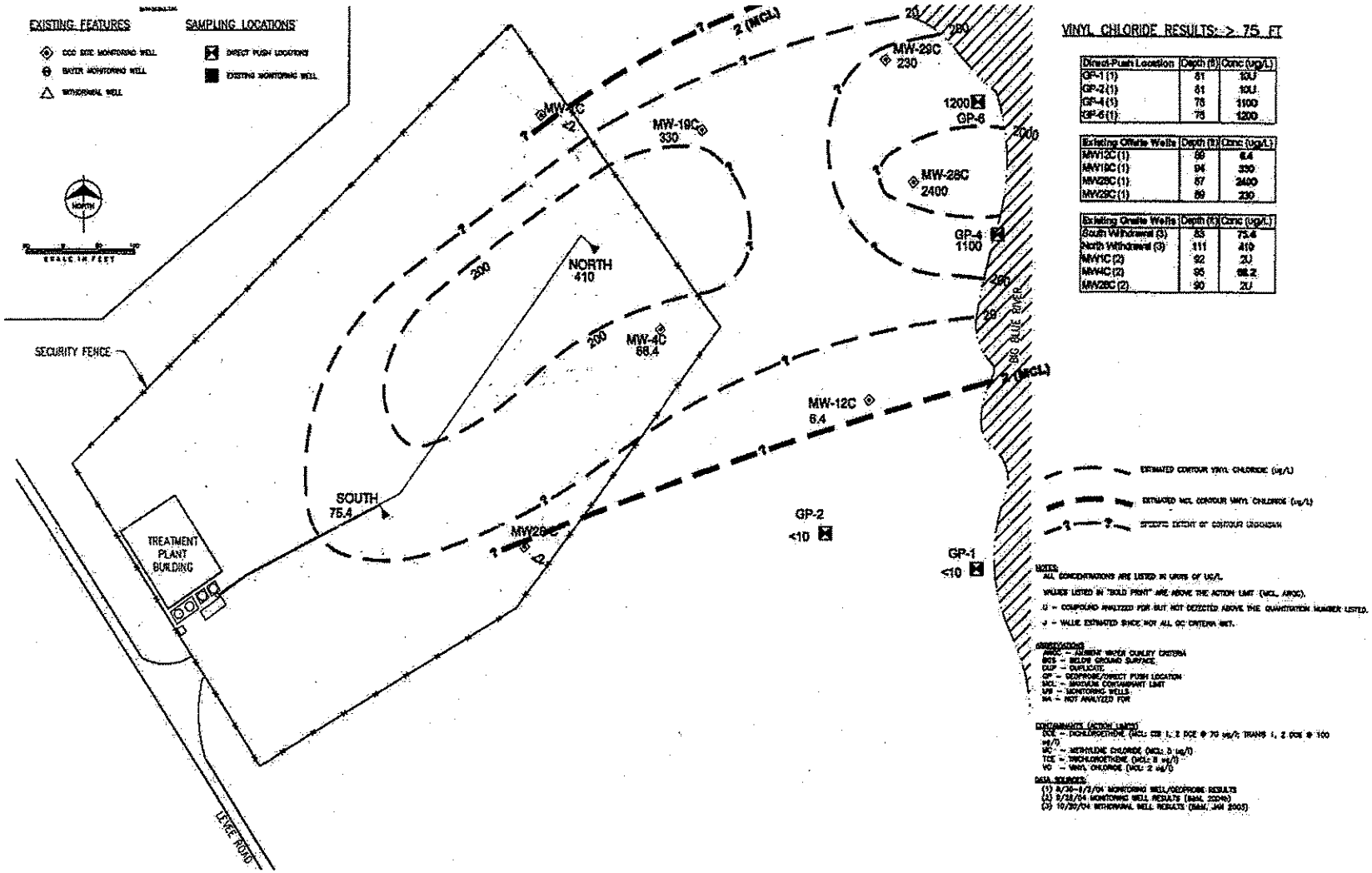


FIGURE 13. ESTIMATED CONTOURS FOR CIS-1,2-DICHLOROETHENE AT DEPTH GREATER THAN 75 FEET

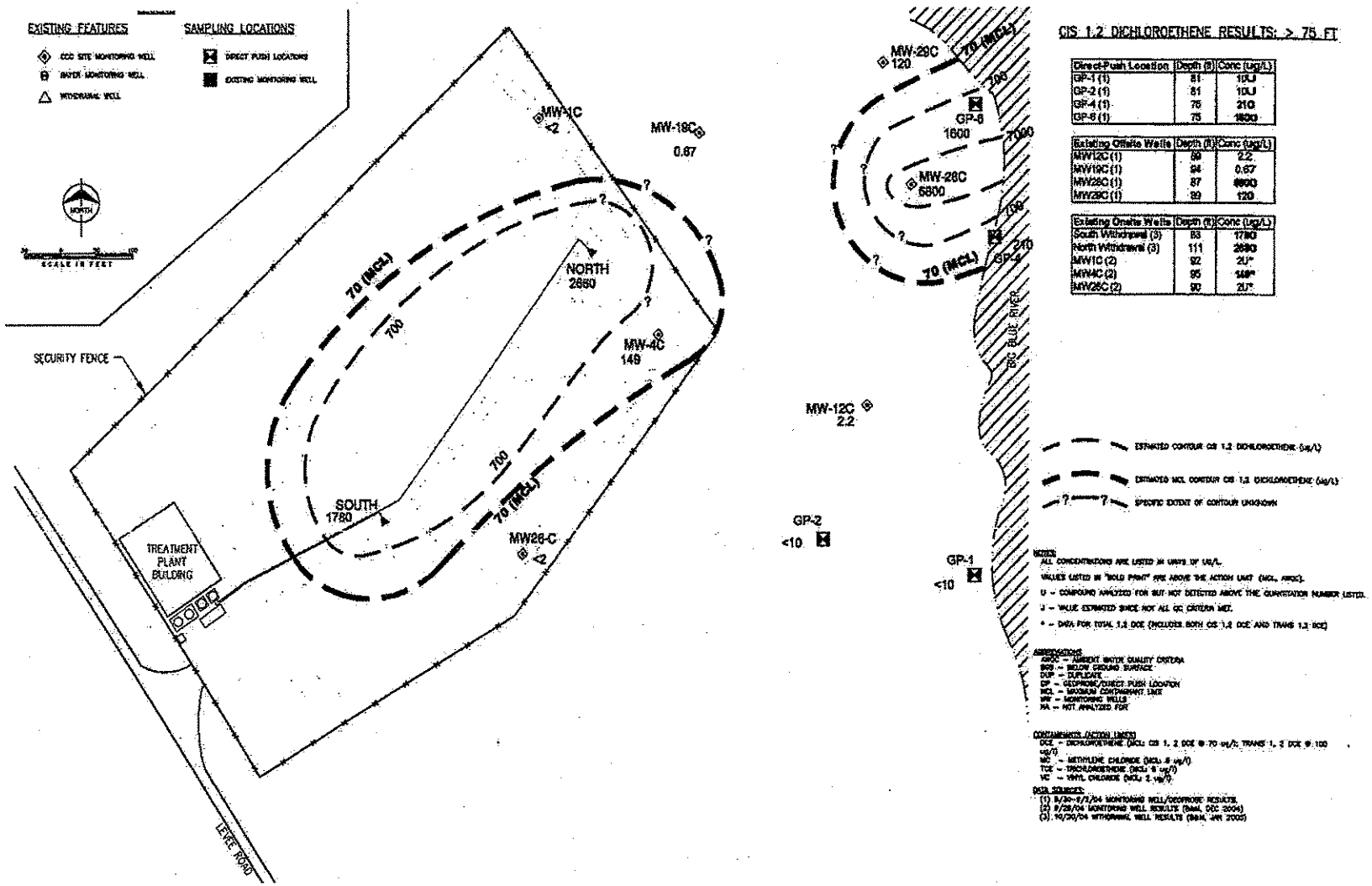


FIGURE 14. ESTIMATED CONTOURS FOR 2,4-DIMETHYL PHENOL AT DEPTH GREATER THAN 75 FEET

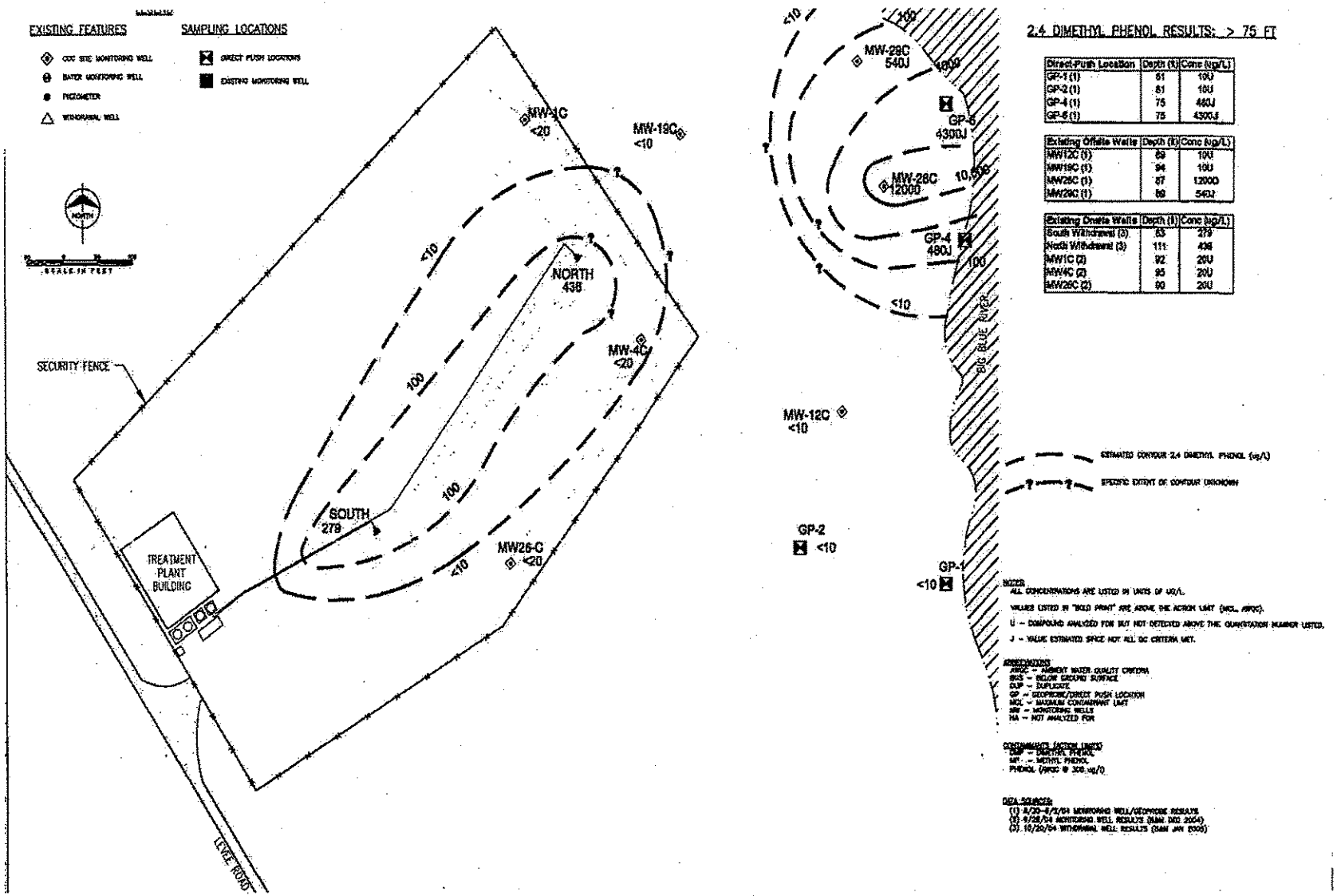


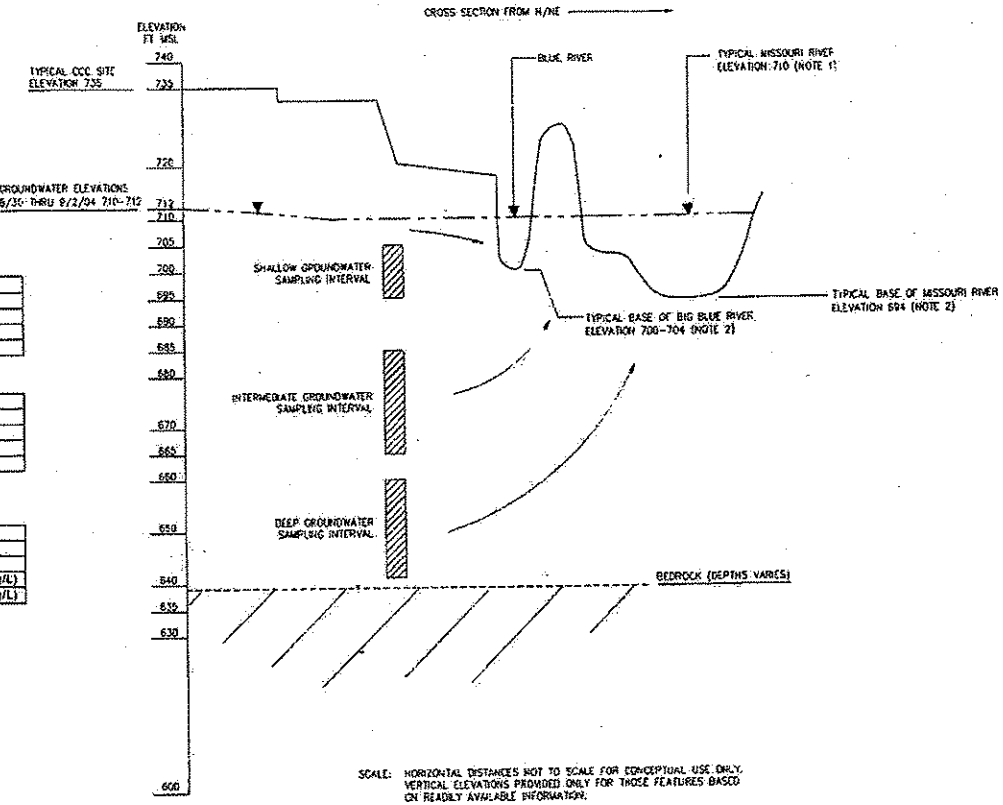
FIGURE 15. CONCEPTUAL DIAGRAM OF POTENTIAL IMPACTS OF CONTAMINATED GROUNDWATER ON BIG BLUE AND MISSOURI RIVERS

GROUNDWATER SAMPLING RESULTS OBTAINED: 8/30-9/2/94

Shallow Groundwater Sampling Interval: Elevation Range 695 to 705 ft MSL (Note 3)						
Locations: GP-1 Through GP-7 and well 13A						
Conc Range		ND	ND-10ug/L	10-100ug/L	100-1000ug/L	>1000 ug/L
VOCs	# in Range/	2/8	1/8	4/8		1/8 (GP4@1,158 ug/L)
SVOCs	#Locations	5/7	1/7			1/7 (GP4@2,200 ug/L)

Intermediate Groundwater Sampling Interval: Elevation Range 665 to 680 ft MSL (Note 3)						
Locations: GP-1 Through GP-7 and wells MW12B, MW13B, MW19B						
Conc Range		ND	ND-10ug/L	10-100ug/L	100-1000ug/L	>1000 ug/L
VOCs	# in Range/			7/10	3/10(GP4@868 ug/L)	
SVOCs	#Locations	8/10			2/10(GP4@587 ug/L)	

Deep Groundwater Sampling Interval: Elevation Range 640 to 660 ft MSL (Note 3)						
Locations: GP-1, GP-2, GP-4, GP-6 and wells MW12C, MW19C, MW28C, MW29C)						
Conc Range		ND	ND-10ug/L	10-100ug/L	100-1000ug/L	>1000 ug/L
VOCs	# in Range/			3/8	2/8	3/8(MW28C@54,911 ug/L)
SVOCs	#Locations	4/8			2/8	2/8(MW28C@23,000 ug/L)



LEGEND:

GROUNDWATER SAMPLING INTERVAL

WATER TABLE

GROUNDWATER FLOW DIRECTION

ABBREVIATIONS:

VOCs VOLATILE ORGANIC COMPOUNDS (SEE APPENDIX B FOR SPECIFIC DATA RESULTS)

SVOCs SEMIVOLATILE ORGANIC COMPOUNDS (SEE APPENDIX B FOR SPECIFIC DATA RESULTS)

ND NOT DETECTED ABOVE REPORTING LIMIT

GP GEOPROBE/DIRECT PUSH LOCATION

MW MONITORING WELL LOCATION

NOTES:

1. TYPICAL MISSOURI RIVER ELEVATION TAKEN FROM FIGURE 4-1 (EBASCO, 2004a).
2. BASE ELEVATIONS FOR MISSOURI AND BIG BLUE RIVERS BASED ON FLOOD PROFILE MAPS PREPARED BY FEMA AND PRESENTED FOR REFERENCE IN APPENDIX H.
3. GROUNDWATER SAMPLING LOCATION/INTERVAL ELEVATIONS WERE DETERMINED FROM SITE INVESTIGATION, GROUND LEVEL SAMPLING MEASUREMENTS, AND GROUNDWATER TABLE MEASUREMENTS FOR FURTHER DETAILS SEE TABLE 3-1 IN APPENDIX F.

FIGURE 4-2
CONCEPTUAL DIAGRAM OF POTENTIAL IMPACTS OF CONTAMINATED GROUNDWATER ON BIG BLUE AND MISSOURI RIVERS
RD/RA OVERSIGHT

Table 2. 2004 SAMPLING RESULTS VARIATION WITH DEPTH

SAMPLING ZONE	MAX TOTAL VOCS	MAX TOTAL PHENOLIC COMPUNDS
RIVER BOTTOM – 695-705 FEET MSL	1,158 ug/l	2,200 ug/l
INTERMEDIATE – 665-680 FEET MSL	988	597
TOP OF BEDROCK – 640-660 FEET MSL	34,911	23,000

- As shown in Table 3, contamination concentrations for both VOCs and phenolic compounds in wells 28C and 29C decreased by 60 percent or more between 1996 and 2004. These reductions were not as high as the reductions in wells 4C and 19C over this time period. These data indicate attenuation processes are active adjacent to the rivers.

Table 3. COMPARISON OF REDUCTION IN CONTAMINATION CONCENTRATIONS

MONITORING WELLS	TOTAL INDICATOR VOCS (mg/l or ppm)			TOTAL INDICATOR PHENOLIC COMPOUNDS (mg/l or ppm)		
	1996	2004	REDUCTION (%)	1996	2004	REDUCTION (%)
4C	29.20	0.23	99	10.85	<0.02	99+
19C	9.20	0.05	99	13.70	<0.02	99+
28C	23.90	9.66	60	60.50[1]	23.0[2]	>62
29C	1.78	0.35	80	1.70[1]	0.58[2]	>66

(1) In 1996, phenol was the only contaminant analyzed.
(2) In 2004, all four indicator phenolic compounds were analyzed.

B. Defendant's Hydraulic Control Analysis Using Groundwater Computer Model of Site

Beginning in 2003, the Defendants developed and utilized a computer model to analyze if hydrogeologic conditions at the Site had changed over the 15 years since the Consent Decree was entered to prevent their achieving the inward gradient specification. The results of that analysis were presented to EPA and MDNR in October 2004 in a report entitled, *Report on Groundwater Modeling of the Conservation Chemical Company Site, Kansas City, Missouri.* A summary of the findings presented in the report follows. Figures presented in this summary are taken from the report developed by the Defendants' consultant.

- The alluvium of the Missouri River at the Site comprises a complex system of sediments overlying bedrock. Five types of sediment have been characterized to a relatively high level of detail based on information for the Site and the immediately surrounding area.

- A computer groundwater model using the United States Geological Survey (USGS) MODFLOW computer program was developed for the Site by adding a significant amount of detailed local hydrogeological information to an existing published model that had been formulated and calibrated by the USGS for the Kansas City region. Input parameters for the site model were derived from the USGS model with the exception of hydraulic conductivities and their spatial distribution which were estimated by detailed site-specific information. The site model was calibrated to observe water level measurements that had been obtained in the field for a period of one year. After calibration and a sensitivity analysis, the comparison between field data and modeled water levels resulted in errors of 0.03 percent. In the field of groundwater modeling, this error is considered to be very low. Therefore, the site computer model was concluded to be a reasonable tool for evaluating groundwater flow conditions at various extraction well flowrates and different river stages.

- Particle-tracking analysis was utilized to evaluate hydraulic control of contaminants originating within and passing through the Site boundaries. Figure 16 presents the particle-tracking results for the pumping conditions which were common over the past five plus years – 160 gpm from the south extraction well, 40 gpm from the north extraction well, annual river stage variations, and typical pumping rates for the Bayer extraction wells. This was a common pumping rate combination in an attempt to achieve the inward gradient specification in the southeast piezometer wells. The modeled particle tracks indicate hydraulic control of all contaminants on the Site by the extraction well system. In addition, particle tracks indicate hydraulic control of contaminants located outside the Site boundaries until very close to the edges of the rivers.

- Several discrete scenarios for historical groundwater flowrates from the extraction wells which prevailed from 1990 to 2003 were modeled and indicated hydraulic capture of the groundwater beneath the Site was maintained, and hydraulic drainage divides at the edge of the cone of depression on the Site were located well outside the Site boundaries in all layers of the aquifer.

- Based on modeling results, the containment has been maintained at a relatively conservative level approximately 10 times greater than the minimum total groundwater extraction rate needed. This conclusion is demonstrated in Figure 17 which presents the particle tracks with the pumping rates at only 10 gpm for the north well and 5 gpm for the south well. Computer model results indicated hydraulic control of the Site was maintained until this 15 gpm total extraction rate. Historically, the total extraction rate has been operated above 150 gpm.

- Additional computer model scenarios (Figures 18 and 19) indicate a net decrease in current well flowrates by a factor of 20 percent would have no appreciable impact on the area of capture of the well system. Likewise, changing the balance between flowrates of the north and south wells can be done with no appreciable impact on maintaining capture.

FIGURE 16. HISTORIC PUMPING SCENARIO

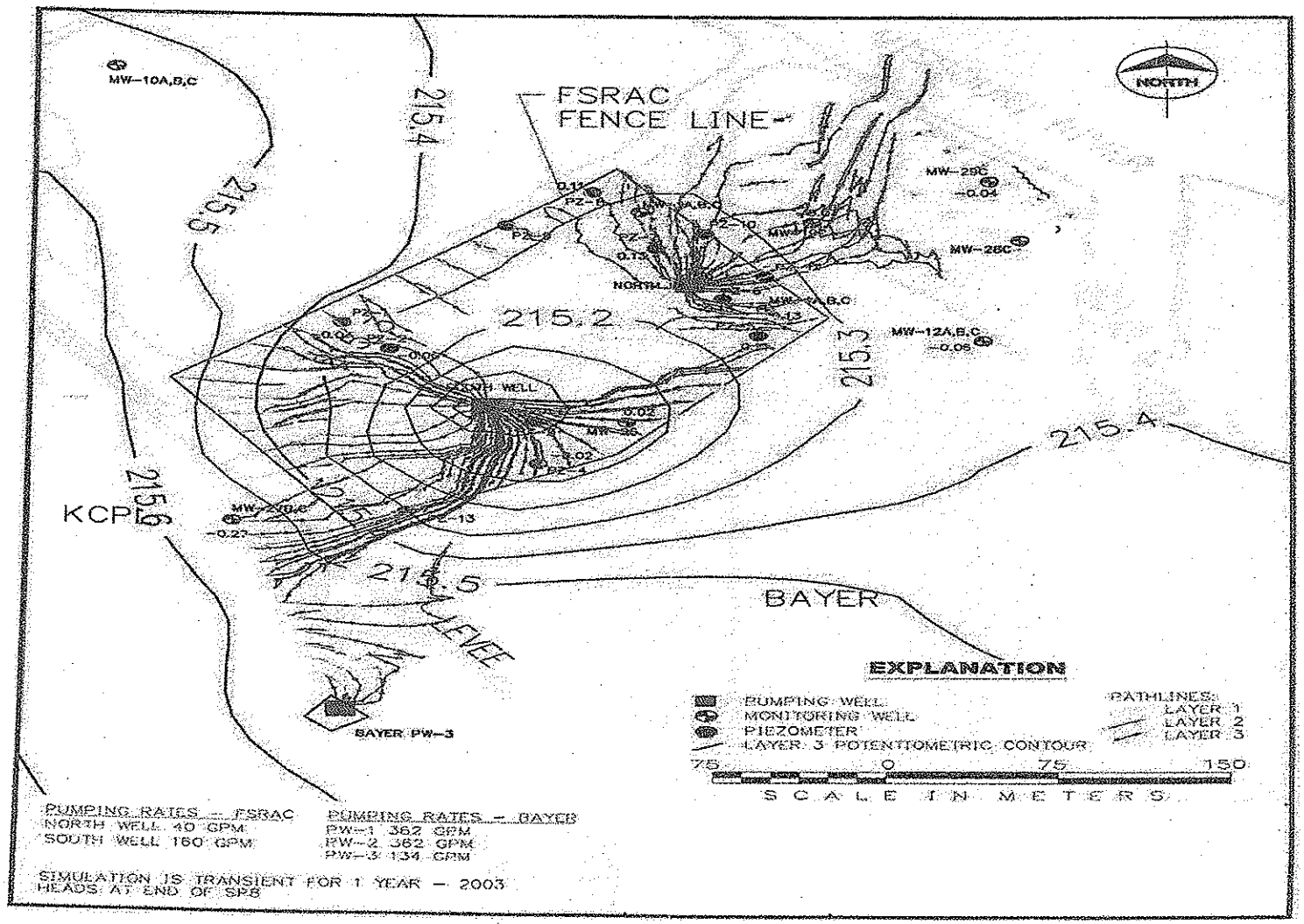


FIGURE 17. PUMPING SCENARIO WHEN HYDRAULIC CONTROL IS LOST

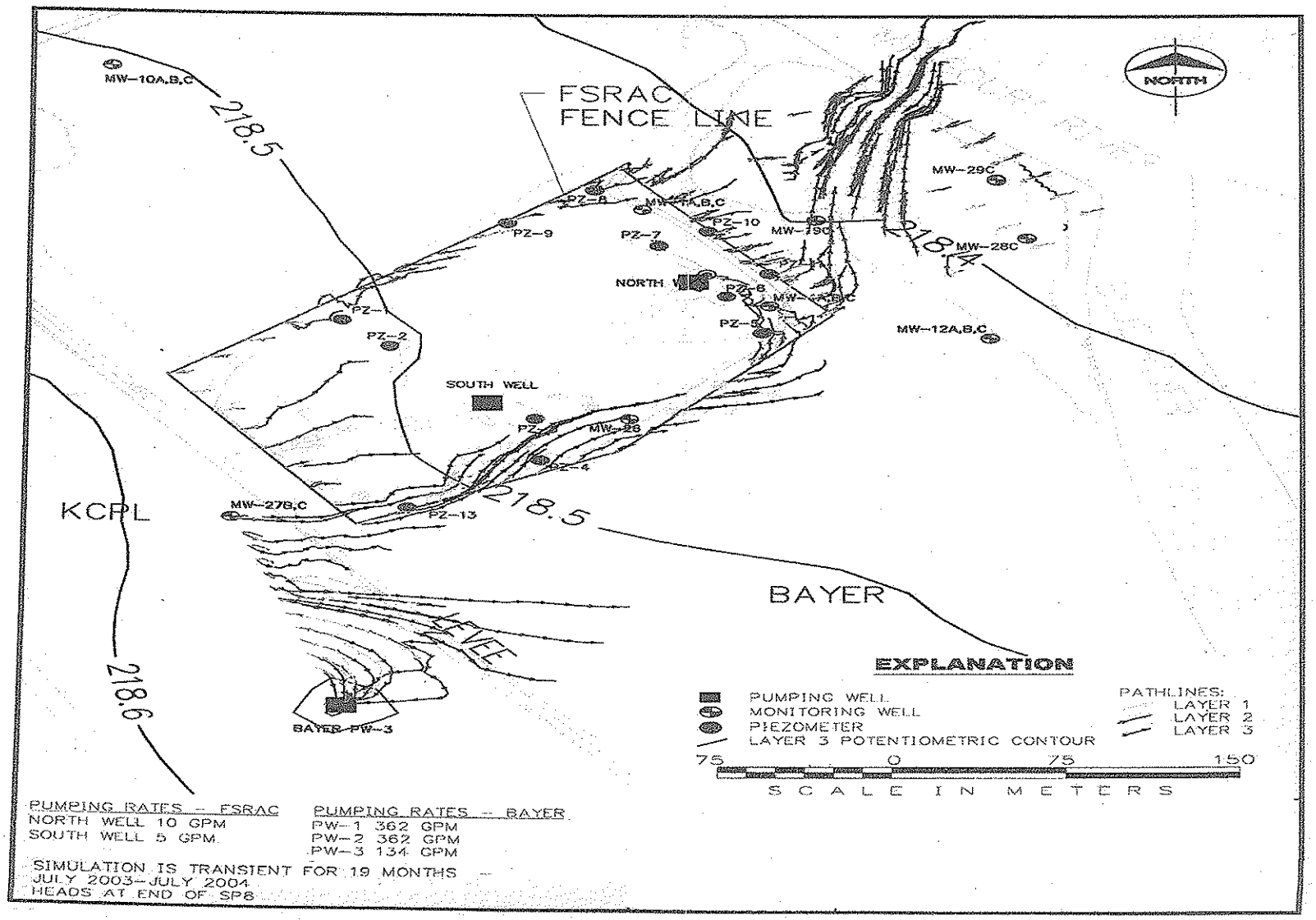


FIGURE 18. SCENARIO OF 20 PERCENT REDUCTION IN TOTAL PUMPING FLOWRATES

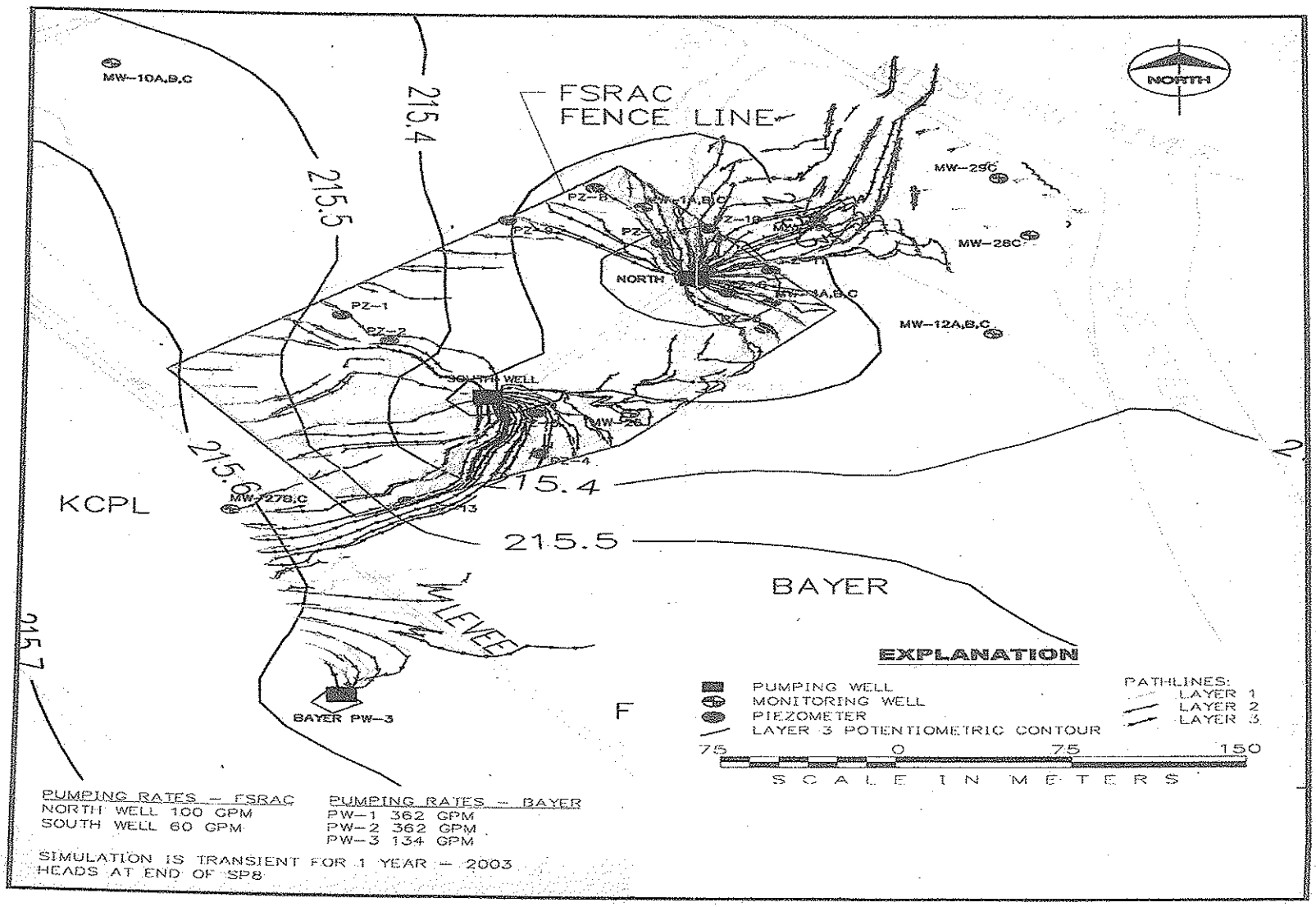
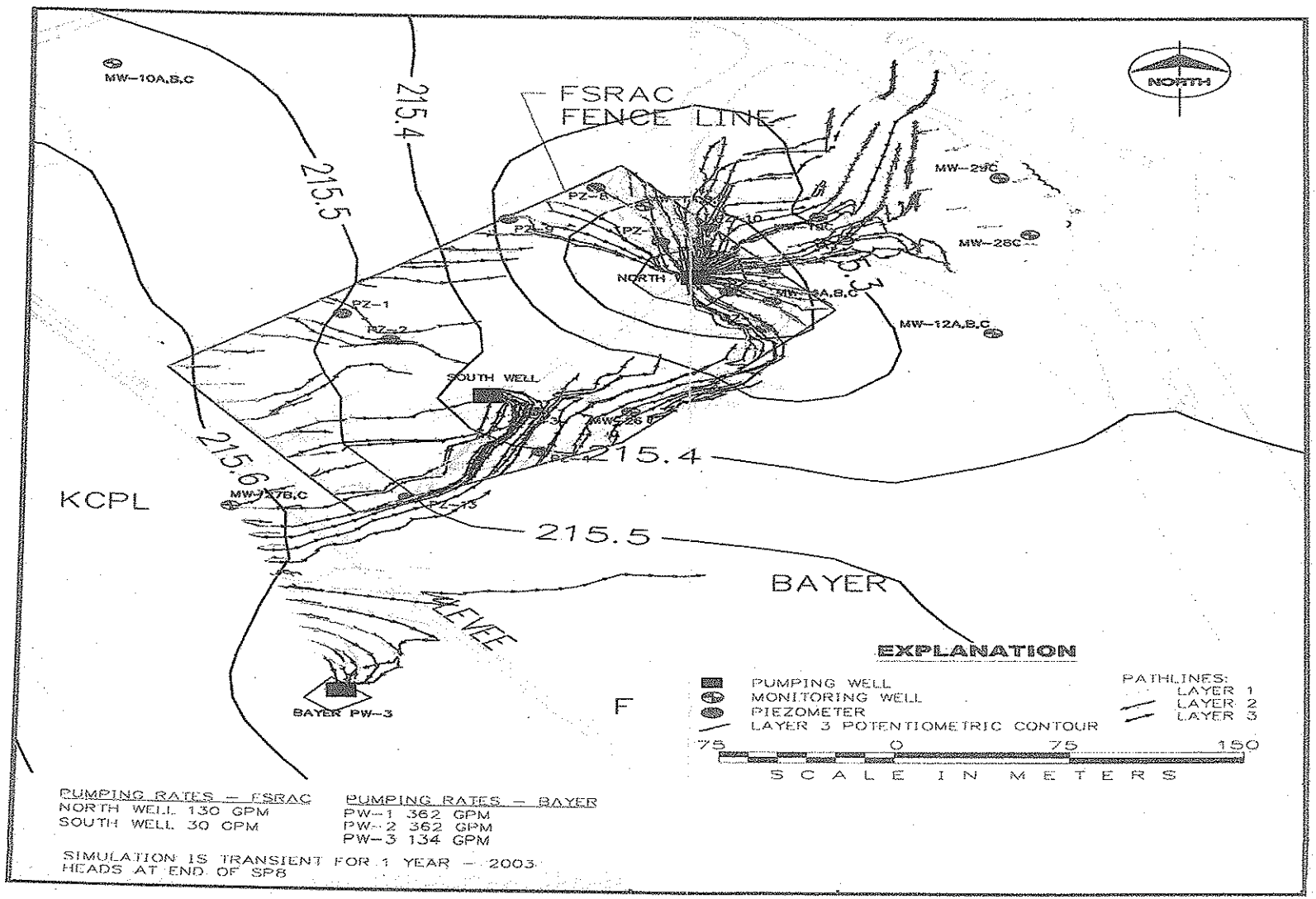


FIGURE 19. SCENARIO OF BOTH REDUCED TOTAL FLOWRATES AND CHANGE IN NORTH/SOUTH FLOWRATES RELATIONSHIP



- As stated earlier in this report, a crack in the well screen developed in the south extraction well during 2003. The crack formed in the lower 20 feet of the screen, and the Defendants addressed the issue by plugging the lower 25 feet of the well with grout. Thus, the pump could not be placed as low in the well resulting in what is called a partially penetrating well (refer to Figure 20); and the well could not produce the same maximum flowrate. However, the well immediately improved the ability to achieve the inward gradient specification. The question became whether contamination was migrating underneath the well and off-site. A supplemental computer model was developed for the immediate vicinity of the south well. This model indicates the south well continues to draw groundwater from all depths within the aquifer. It also indicates the drainage divide between the cone of depression in all aquifer layers is well outside the Site. Figure 21 presents the scenario where a low flowrate is modeled in the south extraction well. The figure shows under this condition the contamination can migrate below the south well, but the north well will capture it before leaving the Site.

- Detailed evaluation of the models indicates there is no obvious geologic or hydrogeological cause for the failure to achieve the hydraulic inward gradient in the southeast piezometer wells. The model indicates the major impacts on the groundwater flow pattern are changes in the balance of flow between the two extraction wells and changes in river stage. As the groundwater flow paths change, the differential measured by any two piezometers may no longer reflect true differentials because the groundwater flow may no longer align with the orientation of the two piezometer wells. Also, the loss in differential may be due in part to partial blockage of aquifer pore spaces in the immediate vicinity of the south well. This blockage is localized and does not affect the overall ability of the south well to provide the needed capture.

- The Defendants made three recommendations in the report: (1) allow a reduction of 20 percent in the total extracted flowrate to increase the flexibility of treatment plant operations, and this reduced total flow is still 10 times greater than the total flow required to achieve hydraulic control of the contaminants on the Site; (2) allow the proportioning of flowrates between the north and south extraction wells to allow for an increase in the northern part of the project area – the northern part is more highly contaminated; and (3) replace the existing inward gradient measurement system to verify hydraulic control with one based upon other monitoring schemes such as routine water level measurement in combination with groundwater chemical monitoring.

FIGURE 20. CHANGE IN SOUTH WELL FROM FULLY TO PARTIALLY PENETRATING

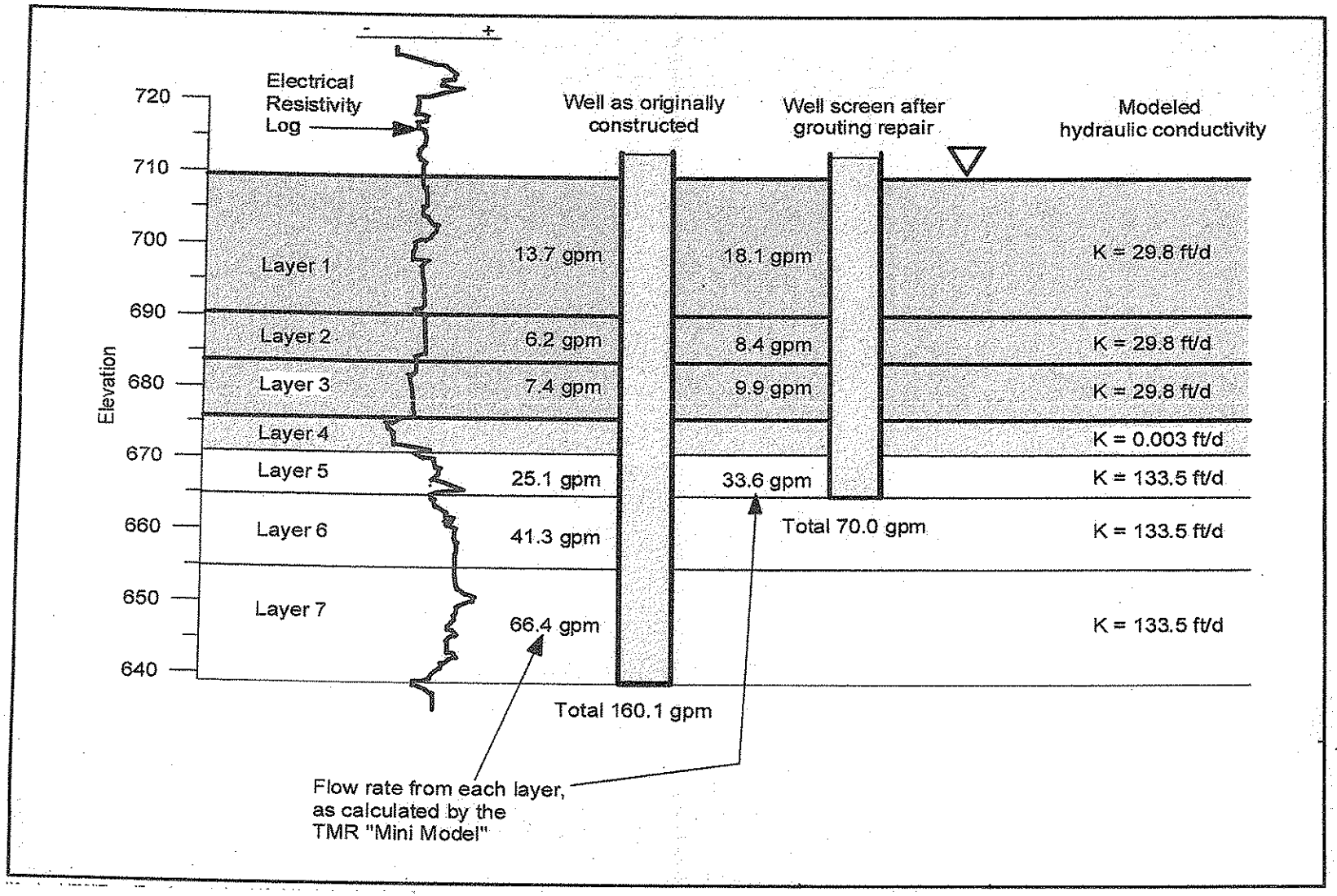
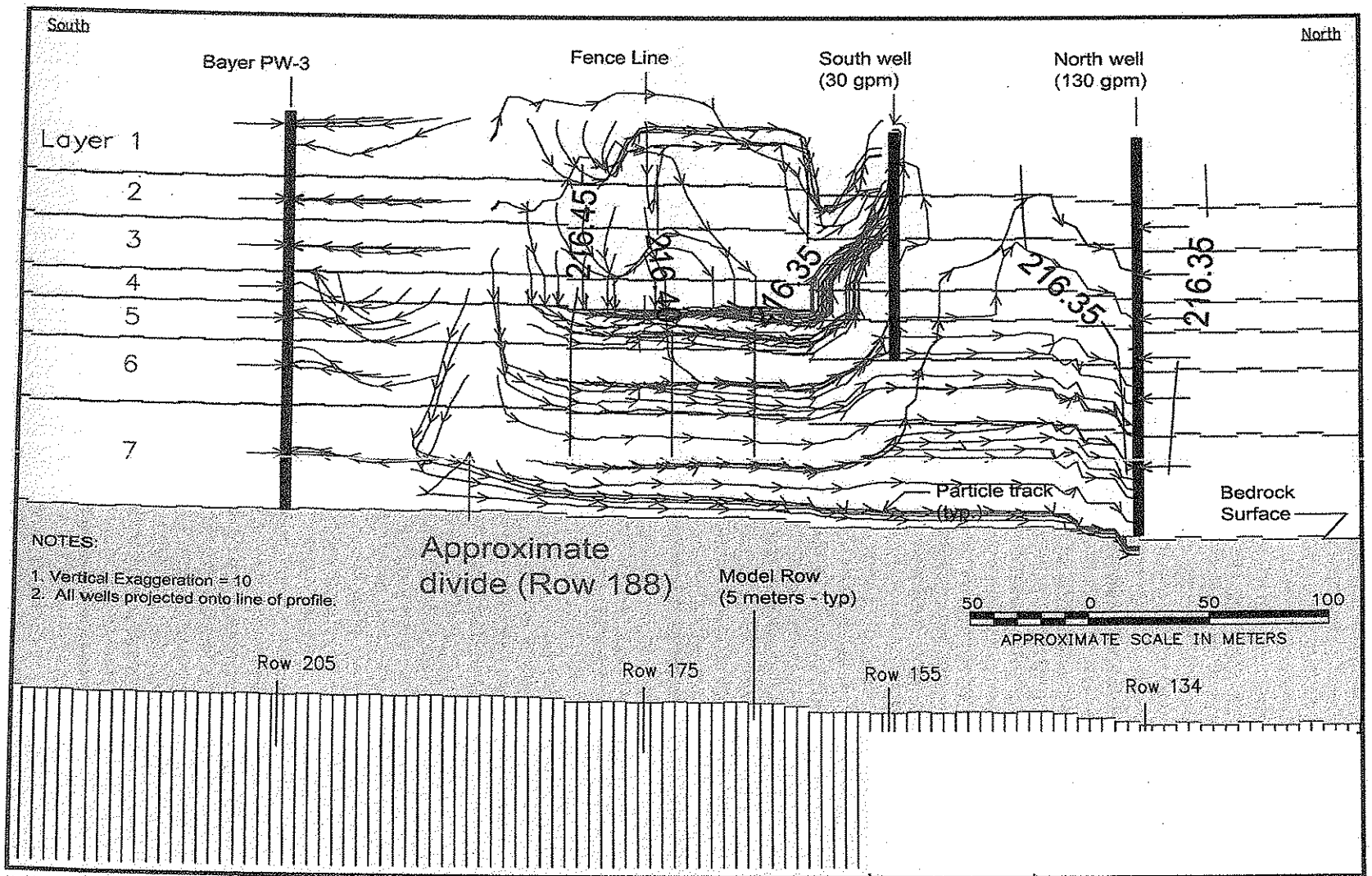


FIGURE 21. COMPUTER SCENARIO DEMONSTRATING PARTIAL PENETRATING SOUTH WELL

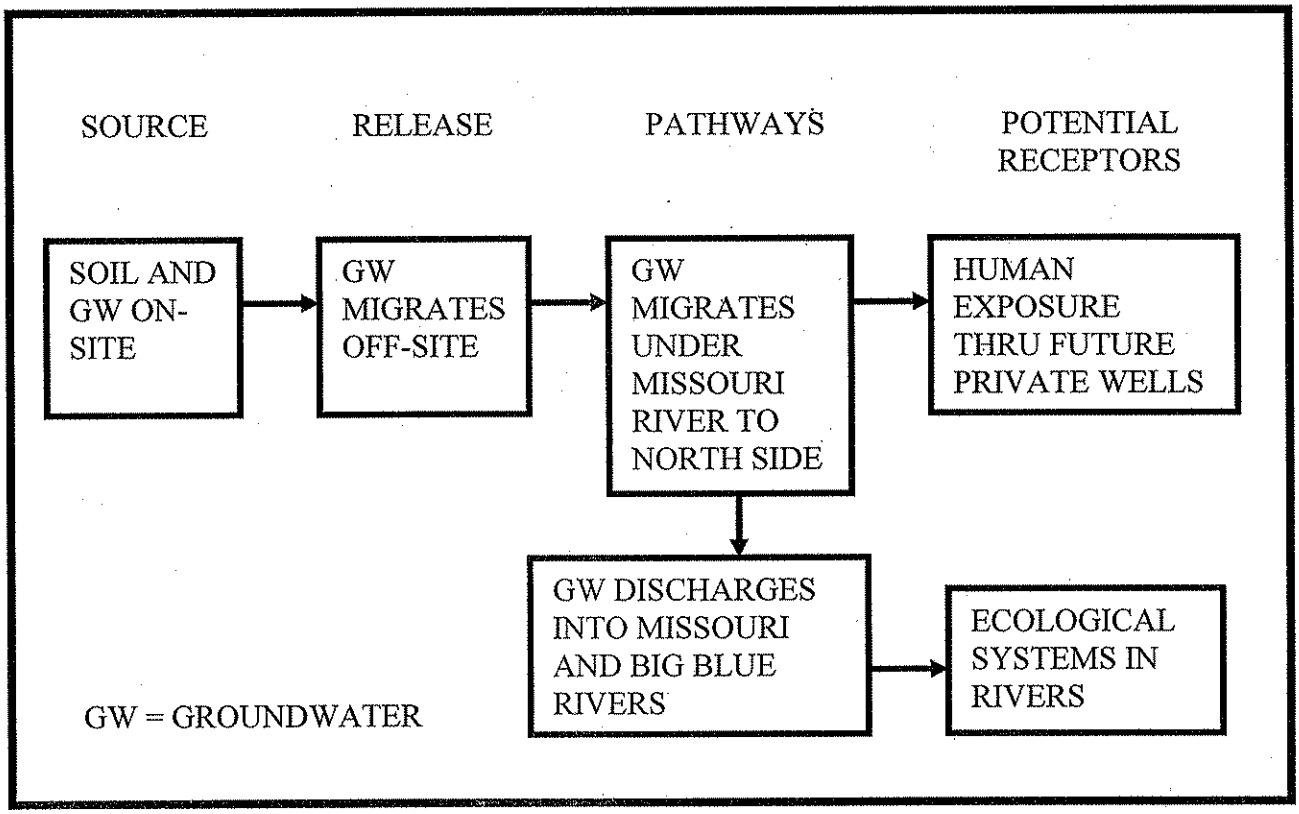


C. Risk Assessments of Contamination Adjacent to Rivers

The high concentrations of contamination found adjacent to the rivers in 1998 brought into question the protectiveness of the remedy. Determining if the remedy is still protective required (1) defining the extent of contamination near the rivers, (2) characterizing the fate and transport of the contamination, and (3) conducting risk assessments for human health and the ecological river systems. EPA's groundwater study addressed the first requirement. An ancillary product of the Defendants' groundwater computer model study addressed the second requirement. This section will summarize the risk assessment work conducted.

The conceptual model for exposure to contamination at the Site has not changed since the ROD. Figure 22 summarizes the conceptual model. Human health and ecological risk assessments were conducted for the Site in relation to the contamination adjacent to the rivers.

FIGURE 22. CONCEPTUAL SITE MODEL



Human Health Risk Assessment

- The human health risk assessment work was completed in two ways: (1) nearby property use and drinking water well use were evaluated as part of EPA's groundwater study, and (2) reference to a recent risk assessment conducted at the Bayer facility.

- As part of EPA's groundwater study, an evaluation was conducted of the uses of property in the area around the Site. Basically, the land use has not changed since the ROD was signed; there is no information to indicate unacceptable human exposures are occurring to Site contaminants. Figure 4 depicts the area property uses.

- As part of EPA's groundwater study, a private well survey was conducted in the area of the Site including north of the Missouri River. Again, well locations and uses have not changed since the ROD. No information exists to indicate unacceptable human exposures are occurring to Site contaminants.

- EPA's RCRA program conducted a quantitative risk assessment for the Bayer facility which is located adjacent to the Site. There are many similarities between the potential risks at the Site and the Bayer facility. The risk assessment was conducted as part of a corrective action process for the Bayer facility. One significant difference between the two sources is the contaminant concentrations at the Bayer property are generally much higher than the same contaminant concentrations at the CCC property.

TABLE 4. COMPARISON OF CONTAMINANT CONCENTRATIONS BETWEEN THE SITE AND THE BAYER FACILITY

	BAYER	CONSERVATION CHEMICAL		
CONTAMINANTS	**MONITOR WELLS**	**EXTRACTION WELLS**	**MONITOR WELLS**	**HUMAN HEALTH CRITERIA**
1,2-DICHLOROETHENE	28,000	1,600	295	----
TRICHLOROETHENE	3,200	207	15	5
VINYL CHLORIDE	6,000	521	190	2
2 METHYL PHENOL	97	250	<20	1,800
4 METHYL PHENOL	180	195	<20	180
2,4 DIMETHYL PHENOL	37	344	<20	730
ARSENIC	425	100	-----	0.045

- The Bayer risk assessment for human health concluded contaminated groundwater posed an unacceptable risk if a private drinking water well was installed in the area between the Bayer property and the rivers. Specifically, the risk assessment quantified the potential cancer and noncancer hazard quotient for the residential scenario to be 3 in 100 and 30, respectively. These values exceed the Superfund criteria of 1 in 10,000 and 1 for the cancer risk and noncancer hazard quotient, respectively. Even though the Site source concentrations are a factor of 10 lower than Bayer's concentrations, calculating the Site values for the same exposure scenario would exceed both cancer risk and noncancer hazard quotient criteria. Although possible, the likelihood for installation of a residential well in that area is remote since Bayer currently owns the property, and the location is on the river side of the levee and in the flood plain.

Ecological Risk Assessment

- Three screening level assessments were conducted of the impact to the ecological systems in the rivers: (1) EPA's assessment for the Bayer facility, (2) U.S. Army Corps of Engineers (USACE) at the request of EPA, and (3) EPA.

- EPA's risk assessment for the Bayer facility used a computer model to estimate the contaminant concentrations at the rivers' edges based upon the source concentrations found on the Bayer property. These estimated concentrations were compared to ecological screening criteria for various contaminants including contaminants identical to CCC. The conclusion was further analysis was not required because no unacceptable exposures were identified. An important point is to remember the Bayer contaminant concentrations are much higher than the CCC contaminant concentrations.

- At EPA's request, USACE conducted a screening level assessment. USACE utilized the maximum values of the 2004 EPA groundwater study at the rivers' edges and reduced those concentrations by a factor of 100 or 1,000 to account for dilution effects as the contamination migrated into the rivers. Noteworthy, this approach did not account for the highest contamination concentrations existing at depths well below the bottom of the rivers. The dilution effects should be much higher if these deep contaminants migrated vertically up into a river bottom. Thus, this approach is best characterized as conservative. Then the calculated values were compared to various ecological screening criteria. The results identified a potential for an unacceptable impact to the ecological river systems due to the contaminants 2,4-dimethylphenol; 4-methylphenol; 2-methylphenol; and toluene. These are contaminants of concern for the Site.

- The third assessment was conducted by an EPA ecological risk assessor. The EPA assessment was conducted independent from the USACE's assessment. This assessment utilized the same approach by using the 2004 maximum data

and comparing those concentrations to ecological screening criteria. The two major differences are (1) no reduction in the 2004 data was made to account for attenuation effects such as river dilution and fate and transport, and (2) the depth to contamination was considered by comparing shallow contaminant concentrations separately from deep contaminant concentrations. Again, the results of this assessment are conservative due to the absence of dilution effects. Noteworthy, the results indicated a potential impact to ecological systems in the rivers due to the deep contaminant concentrations but not due to the shallow contaminant concentrations. The assessment concluded (1) further investigation is required by sampling the river bottom transition zone which is where deep contamination would potentially enter the ecological system, and (2) characterization is required of the ecological resources.

- Refer to Table 5 for a quantitative summary of the three assessments. This summary utilizes the ecological screening criteria used by EPA's risk assessor to compare to the contaminant values for each of the three approaches. In addition, the bottom two rows show the number of exceedances when a contaminant level for that approach exceeded the screening criteria. Finally, the bottom row presents the number of exceedances when a 100 dilution effect is applied to the contaminant concentrations utilized in the EPA approach. The contaminants 2-methylphenol and 2,4-dimethylphenol exceeded the screening criteria with the 100 dilution effect applied to the deep contaminant concentrations.

VI. FIVE-YEAR REVIEW PROCESS

6.1 Administrative Components

MDNR and responsible parties were notified of the initiation and status of the five-year review on numerous occasions beginning in 2004. The review was led by Steve Auchterlonie of EPA (RPM for the Site). A technical and legal review team was assembled with expertise in computer modeling, hydrology, risk assessment, and Superfund law and procedures. Candice McGhee of the state assisted in the review as the representative for the support agency.

A schedule was developed for the five-year review extending through September 30, 2007, which included the following components: (1) document review, (2) data review, (3) site inspection and interviews, and (4) five-year review report development and review.

TABLE 5. SUMMARY OF THREE ECOLOGICAL SCREENING LEVEL ASSESSMENTS

(ug/L = ppb) CONTAMINANT	ECOLOGICAL SCREENING CRITERIA[1]	BAYER ESTIMATED RIVER EDGE CONCENTRATIONS	USACE RIVER DILUTION CONCENTRATIONS	EPA SHALLOW CONCENTRATIONS (NO DILUTION EFFECT)	EPA DEEP CONCENTRATIONS (NO DILUTION EFFECT)
1,2 DCE	970	199	22	373	6,800
TCE	47	1	<1	19	260
VINYL CHLORIDE	930	445	18	152	2,400
2M PHENOL	13	---	5	460	5,400
4M PHENOL	543	---	16	510	4,600
2,4DM PHENOL	100	---	43	1,000	12,000
PHENOL	180	---	2	230	1,000
TOLUENE	9.8	---	3	12	690
#EXCEEDANCES OF CRITERIA		0	0	5	8
#EXCEEDANCES AFTER 100X DILUTION		NA	NA	0	2

(1) SCREENING CRITERIA PRESENTED ARE VALUES USED BYEPA'S RISK ASSESSOR
1,2 DCE is 1,2-DICHLOROETHENE, TCE IS TRICHLOROETHENE, 2M IS 2-METHYL, 4M IS 4-METHYL, 2,4DM IS 2,4-DIMETHYL

6.2 Community Involvement

The following community involvement activities were conducted since the first five-year review:

- Public notice of the completion of the ESD document was published in the *Kansas City Star* newspaper on February 17, 2003.

- Public notice of the initiation of the five-year review was published in the *Kansas City Star* newspaper on May 24, 2006 (see copy as Attachment 1).

Public interest and involvement at the Site have been minimal since the start of O&M. EPA received no inquiries from the public in response to the notice of the ESD or the notice of initiation of the five-year review process.

6.3 Document Review

This five-year review included a review of relevant documents including O&M records, monthly/quarterly/annual reports, and numerous reports associated with the work conducted since the first five-year review (listed in Table 6).

Cleanup levels and ARARs were reviewed. The intent of the review was to evaluate whether the selected remedy remains protective of human health and the environment. EPA did not identify any new ARARs which require changing the remedy.

TABLE 6. LIST OF DOCUMENTS REVIEWED

Annual Groundwater Monitoring Reports, 1999 to 2006
Annual Operations Review Reports, 1999 to 2006
Quarterly NPDES Reports, 1999 to 2006
Monthly Groundwater Level Monitoring Reports, 1999 to 2006
Monthly Report on Metals Removal, Groundwater Treatment Plant, 1999 to 2006
Report on Groundwater Modeling of the Conservation Chemical Company Site, Kansas City, Missouri; Burns and McDonnell Engineers; October 2004
Data Evaluation Report, Groundwater Field Sampling Investigation, Conservation Chemical Company Site; Black and Veatch Engineering; June 2005
Report of Intrinsic and Air Enhanced Remedial Processes Testing for Conservation Chemical Company Site; IT Corp.; February 10,1999
The Five- and Ten-Year Review Report, Conservation Chemical Company Site; EPA; February 29, 2000
Remedial Design/Construction Consent Decree, Civil No. 82-0983-CV-W-5; 1988
Human Health and Screening Level Ecological Risk Assessment, Bayer CropScience Facility, Kansas City, Missouri; Tetra Tech EM, Inc.; March 7, 2006
Screening Ecological Risk Assessment, Conservation Chemical Company, Kansas City, Missouri; U.S. Army Corps of Engineers; July 11, 2007
Groundwater/Surface Water Ecological Screen, Conservation Chemical; EPA; June 19, 2007
Explanation of Significant Differences, Conservation Chemical Company Site; EPA; January 28, 2003
Revised NPDES Permit
Numerous Correspondence from Burns and McDonnell Engineering, representative of Defendants

6.4 Data Review

Fundamentally, the two most important types of data to track at the Site to evaluate the performance of the remedy are (1) concentrations of contaminants in the monitoring wells and the extraction wells, and (2) the inward gradient rolling annual average values for the four piezometer pairs of wells. The trends in concentrations of contaminants provide an indication of the effectiveness of the remedy, and the inward gradients document if hydraulic control has been maintained.

Concentrations of Contaminants

Graphical presentations of the trends of concentrations of contaminants in monitoring and extraction wells are depicted in Figures 23 through 48, located in Attachment 2. Figures 23 through 28 present the trends in the two extraction wells for total indicator VOCs, total indicator phenolic compounds, and indicator metals. Figures 29 through 32 present the trends in the shallow and deep monitoring wells for total indicator VOCs. Figures 33 through 36 present the trends in the shallow and deep monitoring wells for total indicator phenolic compounds. Figures 37 through 48 present the trends in the shallow and deep monitoring wells for indicator metals.

Observations and conclusions from analysis of the contaminant trends are summarized below:

Extraction Wells

- VOCs: (1) total concentrations in the south extraction well increased in 2003 when the well was converted to a partial penetrating well due to the screen failure. Basically, the partial penetrating well draws water from a wider radius which resulted in the south well drawing more highly contaminated water from the north portion of the Site. Since 2003, the total concentrations in the south well have decreased more than 60 percent; (2) total concentrations in the north extraction well decreased by approximately 50 percent during the last seven years; and (3) indicator concentrations remain well above drinking water standards with total concentrations at approximately 1,200 ppb for the south well and 2,500 ppb for the north well.

- Phenolic Compounds: (1) total concentrations in the south well increased in 2003 due to the change to a partial penetrating well. Since 2003, the total concentrations in the south well have decreased by approximately 50 percent; (2) total concentrations in the north well decreased by approximately 75 percent during the last seven years; and (3) total concentrations remain elevated with concentrations in the 400 ppb to 500 ppb range.

- Metals: (1) influent concentrations of the indicator metals iron, zinc, and nickel are at background concentrations for the river alluvium; and (2) cyanide concentrations increased from 50 ppb to 200 ppb during a three-year period from 2002 to 2004. This increase is not considered a result of the partial penetration change in the south well because the increase in cyanide concentrations began in 2002 which is one year prior to the change in the well. However, the cyanide concentration decreased in 2005 and 2006 with a return to the 50 ppb level in 2006.

Monitoring Wells

- VOCs: (1) since startup, total indicator concentrations have decreased by over 99 percent in all monitoring wells including the on-site monitoring wells; (2) with the exception of well 1B, all wells are either at nondetect concentrations or have decreased in total concentrations by greater than 60 percent during the last seven years and the total VOC concentrations in well 1B remained at low concentrations but experienced two years when the concentration jumped to 100 ppb; (3) except well 4C where the concentration is 300 ppb, total indicator concentrations in all wells have decreased to below 100 ppb; and (4) contaminant concentrations in all monitoring wells have either reached or are approaching MCL-based drinking water standards.

- Phenolic Compounds: (1) since startup, total indicator concentrations have decreased by over 99 percent in all monitoring wells including on-site monitoring wells; and (2) all monitoring wells have been nondetect for phenolic compounds for the last three years.

- Metals: Indicator metals concentrations have reached background concentrations in all wells. For example, background iron concentrations documented during the remedial investigation conducted in the 1980s ranged from 5 ppm to 30 ppm. For several years iron concentrations have been below 25 ppm in all monitoring wells, and iron concentrations have been below 15 ppm in most wells.

Inward Gradient Measurements

Hydraulic control has been measured using four pairs of piezometer wells generally located at each corner of the Site. As shown on Table 9, the piezometer wells 1 and 2 compose the southwest piezometer pair, piezometer wells 3 and 4 compose the southeast piezometer pair, piezometer wells 5 and 6 compose the northeast piezometer pair, and piezometer wells 7 and 8 compose the northwest piezometer pair. Basically, the southwest and southeast piezometer pairs monitor the water table drawdown of the south extraction well; and the northwest and northeast piezometer pairs monitor the water table drawdown of the north extraction well.

The inward gradient is equal the difference in water table measurements between the two piezometer wells in each pair. Thus, there are four inward gradient measurements (one for each piezometer pair). As specified in the Consent Decree, the remedy must maintain a minimum inward gradient of 0.06 feet (0.72 inches) for all four piezometer pairs calculated as a rolling annual average. To summarize, continuous measurements are made and averaged over a one-year period of time.

In Attachment 3, Tables 9 and 10 present the rolling annual average inward gradients for all four piezometer pairs for the past six years. Observations and conclusions are summarized below:

- The southeast piezometer pair failed to meet the minimum inward gradient specification from March 2001 to May 2003. During this two-year period, the Defendants conducted multiple efforts to meet the inward hydraulic gradient criteria including pumping higher volumes of water from the south extraction well and implementing maintenance procedures to improve the efficiency of the south extraction well. Questions were raised by the Defendants that the hydrology for the area might have changed making it impossible to achieve the inward gradient criteria including (1) increased pumping at the Bayer facility, (2) construction of a subsurface vault at the KCPL facility, and (3) significant changes in the Missouri River stage managed by the USACE. As a result, the Defendants conducted the reevaluation of the computer model described previously in this report.

- The minimum inward gradient was achieved in June 2003 after the change in the south extraction well to a partially penetrating well. As explained previously in this report, the deep section of the well screen failed in the spring of 2003 which resulted in the Defendants modifying the well so it changed from a fully penetrating well to a partially penetrating well. One immediate effect was achieving the inward gradient.

- The southwest piezometer pair failed to meet the minimum inward gradient from July 2006 to February 2007. During this eight-month period, the Defendants conducted maintenance procedures to improve the efficiency of the south extraction well and the minimum inward gradient was again achieved.

- Chemical monitoring documented contaminants were not escaping the Site as a result of the periods of time when the minimum inward gradient was not achieved.

- As described previously in this report, based on the computer model, the Defendants estimate hydraulic control of the Site contaminants is achieved at extraction well pumping rates well below the rates required to meet the minimum inward gradient performance standard in the Consent Decree.

- Using their computer model, the Defendants estimate the partially penetrating south extraction well can work effectively in hydraulically controlling the Site contaminants when managed in coordination with the pumping rates for the north extraction well.

- Based on the chemical monitoring in conjunction with the Defendants' computer model, EPA finds hydraulic control was maintained at the Site even though there were two periods of time when the minimum inward gradient performance standard was not achieved.

- The Defendants believe hydraulic control can be maintained at gradients less than 0.06 foot and hydraulic control can be accurately measured using a different approach than the current piezometer pairs on each corner of the Site. The Defendants recommended changing the verification of hydraulic control for the Site from the current piezometer system to one that uses a combination of water table elevation measurements, extraction well pumping rates, and river stage elevation. The Defendants suggest this system would allow more flexible plant operation purposes and be more reflective of the nature of the river alluvium system.

6.5 Site Inspection

The EPA RPM has conducted several Site inspections each year during O&M. These inspections were typically unannounced. Following these inspections, pictures and reports were not produced by the RPM.

The MDNR project manager has participated in Site inspections on several occasions. On May 22, 2007, the most recent Site inspection included two representatives from the USACE who were involved in developing a screening level ecological risk assessment.

The typical inspection included walking the entire Site to observe the condition of the cap and fence, inspecting the piezometer wells and associated pressure transducers, observing the maintenance condition of the treatment equipment, and discussing the plant operation with the two full-time plant operators. These operators have worked at the Site for over ten years.

O&M of the Site and treatment plant have consistently been managed with a high level of professionalism.

6.6 Site Interviews

The Consent Decree required the Defendants to submit to EPA annual reports of observations and corrective actions for the O&M of the remedy. Although not required, the Defendants have conducted annual meetings with EPA and MDNR to summarize

the annual reports and to discuss items associated with the remedy. In addition, the Defendants have arranged several meetings with EPA and MDNR focused on the development of the computer model and the metals treatment systems.

VII. TECHNICAL ASSESSMENT

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

REMEDIAL ACTION PERFORMANCE

The review of documents, ARARs, risk assumptions, and the results of the site inspections indicate the remedy is functioning as intended by the ROD as modified by the ESD. The intent of the design was to hydraulically control the contaminants at the source area. Using chemical data, control of the contaminants at the source area has been documented through continued reductions (60 percent and greater) in the contaminant concentrations in the monitoring well network surrounding the source area. Using hydraulic data, the minimum inward gradient specification was not met in the south half of the Site for two periods of time during the last seven years. However, the reevaluation of the Site hydrology indicated hydraulic control was maintained throughout these periods of time.

The containment remedy for the Site has proven effective in controlling the source contaminants and in reducing the groundwater contaminant concentrations located outside the source area. For example, the contaminant concentrations have approached cleanup standards in monitoring wells 12b, 12c, 19b, and 19c located immediately outside the Site boundaries.

Cleanup levels for the Site will be the achievement of drinking water standards in the source area and downgradient of the source area. These standards have been already achieved for several indicator chemicals in several monitoring wells and approached in all monitoring wells. However, despite significant reductions in the source area, the contaminant concentrations in the influent stream to the treatment plant are still much higher (a factor of 250 to 500) than the cleanup standards. As a result, the expectation is the remedy will require many more years of operation.

SYSTEM OPERATIONS/OPERATION & MAINTENANCE

Operating procedures as implemented maintained the effectiveness of the response action. Notably, metals effluent concentrations have been consistently achieved without use of the sulfide system. Chronic difficulties have been experienced in maintaining the efficiency of the south extraction well; however, this is not uncommon with long-term pumping from groundwater wells. Maintenance procedures on the south extraction well have produced acceptable results.

OPPORTUNITIES FOR OPTIMIZATION

Two optimization opportunities have been identified for the Site:

- Determine the approach proposed by the Defendants to verify hydraulic control based on a combination of water table elevation measurements, extraction well pumping rates, and river stage elevation would more reliably measure control than the current approach using piezometer pairs. Potential benefits of using the proposed approach include (1) providing verification hydraulic control is being maintained with reduced pumping rates, thereby reducing total flow to the treatment plant resulting in lower O&M costs; (2) providing the possibility of increased flexibility in relative pumping rates between the north and south wells including greater flows from the north half of the Site which is contaminated at higher concentrations; and (3) elimination of chronic problems associated with river stage effects on the measurement of inward gradients in the south piezometer pairs.

- Determine if metals removal treatment is still required due to (1) the fact metals concentrations at the Site have approached or achieved background concentrations, and (2) the toxicity of the effluent concentrations of metals from the treatment plant discharging into the Missouri River. The potential is for an elimination of 140,000 pounds of treatment sludge generated and the associated O&M costs. Technically, discharging the untreated metals concentrations directly to the river must not fail toxicity tests, and removal of the metals treatment process must not affect the historically high plant's operational uptime by upsetting downstream (in the treatment plant) processes.

EARLY INDICATORS OF POTENTIAL ISSUES

Four years have passed since the conversion of the south well from fully to partially penetrating. During these four years, chemical data for the extraction wells and monitoring wells indicate contaminant migration is controlled and contaminant concentrations have continued to decrease. The conclusion is the south extraction well remains effective as part of a groundwater containment system.

Contaminant concentrations found adjacent to the Missouri and Big Blue Rivers are significantly higher than contaminant concentrations found in the monitoring well network located around the source area and in the extraction wells. When first sampled in 1996, the high contaminant concentrations adjacent to the rivers were unexpected and lead to the additional investigation conducted in 2004. The 2004 study found reductions in contaminated concentrations of 60 percent or more compared to the 1996 data indicating attenuation is occurring next to the rivers. The highest contaminant concentrations are located at least 40 feet below the bottoms of the rivers. A human health risk assessment for the exact plume area identified the only unacceptable risk as potential potable use of the contaminated groundwater. Three separate screening level

ecological risk assessments were conducted for the area and resulted in mixed conclusions, varying from no risk identified to recommending additional monitoring of the transition zones in the bottoms of the rivers. No unacceptable exposure was documented for the ecological systems. Due to the dilution effect of the rivers and the depth to contamination, the potential for an impact to the ecological systems is considered to be low. However, no sampling was conducted to verify this expectation.

IMPLEMENTATION OF INSTITUTIONAL CONTROLS AND OTHER MEASURES

ICs were not required in the ROD. However, since the ROD was signed, EPA has been looking more carefully at the use of ICs to ensure the protectiveness and long-term effectiveness of Superfund remedial actions. As part of this five-year review, EPA evaluated whether ICs are needed at the Site. This evaluation identified two potential exposure pathways that could require an IC: (1) exposure to contaminated subsurface soils located in the source area, and (2) exposure to contaminated groundwater on and emanating from the Site.

Currently, the security fence prevents unauthorized access to the Site. The soil cap serves as a physical barrier to prevent exposure to subsurface soils located in the source area. The Consent Decree requires the Defendants to maintain both the security fence and the cap until cleanup levels have been achieved. After cleanup levels have been achieved, the existing cap will be replaced with an impermeable cap that must be maintained in the future. Current property ownership and land use of the plume area prevent potable use of the contaminated groundwater. However, although unlikely, there is the potential for these exposures in the future if the remedy is completed and the Defendants are no longer required to maintain the Site.

The state of Missouri includes the Site on its *Missouri Registry of Confirmed, Abandoned, or Uncontrolled Hazardous Waste Disposal Sites* (Registry) as a Class 2 site. The current listing on the Registry essentially functions as an informational IC in that it provides notice of the contamination present on the Site. Being listed on the Registry also triggers certain requirements such as a deed notification, annual inspection, notice to buyer, change of use review and approval, notice to state if sold, classification of threat, contaminants, health concerns, public and private drinking water wells, and others. If implemented, some of these requirements would serve as ICs for the Site. However, listing on the Registry may not provide as much protection as EPA would find necessary. First, the level of protection offered by listing depends in large part on whether the required actions have been taken, e.g., has a legally effective deed notice been filed? Further investigation is necessary to verify whether the required actions have been taken. Second, these requirements are not directly enforceable by EPA, and EPA is potentially removed from the decision-making process including a decision to remove the Site from the Registry.

Both USACE and the city of Kansas City, Missouri, may have authority to restrict actions on the flood control levee or property located between the levee and the rivers that provide additional options for ICs. Additional research is necessary to determine more specifically what these authorities are and how they might be useful as ICs.

EPA will continue to research the issue of ICs for the Site with the goal to be completed before the next five-year review.

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

CHANGES IN STANDARDS AND TO BE CONSIDERED(s)

The cleanup standards for the Site were identified in the ROD.

- Groundwater – cleanup standards were defined in Table 9 of the ROD. These standards were based primarily upon the drinking water maximum contaminant levels (MCLs), and where MCLs did not exist, ambient water quality criteria. Although some of the values presented in Table 9 have changed since the ROD, using MCLs for the cleanup standards is protective of human health.

- Surface Water Discharge – the ROD specified two sets of criteria for the treatment plant effluent discharge to the Missouri River: (1) effluent limits set by the state of Missouri in an NPDES permit, and (2) specific values for metals based upon the use of a sulfide precipitation system to remove metals. As described in more detail in Section V above, the Consent Decree required the Defendants to develop and follow operating procedures for effective operation of the metals treatment processes. The Consent Decree also provided the Defendants could request EPA to set effluent limits for metals in lieu of following operating rules. The Defendants could use other treatment processes including taking the sulfide precipitation unit out of operation as long as they met the specified effluent limits. Based on a request by the Defendants, EPA modified the remedy in 2003 to include specified effluent limits for metals. The sulfide system was removed from the treatment plant, and new values for the metals were specified based upon guidance for ecological toxicity. The Defendants are in compliance with both the EPA effluent limits and the NPDES permit which was reauthorized in 2006.

- Air Discharge – the ROD specified the treatment plant must meet requirements of Missouri's air program. However, a permit was not required since the release of contaminants to the air was below the de minimis level.

- Soils – the ROD required a security fence and permeable soil cap to eliminate the exposure pathway to contaminated soils. In addition, the ROD required installation of a final cap which meets RCRA closure requirements for that time when the remedial action is complete. These standards remain protective.

CHANGES IN EXPOSURE PATHWAYS

Basically, the remedial investigation and ROD identified three existing or potential exposure pathways to contaminants at the Site:

- Potential human exposure to contaminated groundwater in the source area and in the downgradient plume area

- Ecological exposure to contaminated groundwater migrating into the rivers

- Potential human exposure to contaminated soils in the source area

As addressed previously in this report, the exposure pathways have not changed since the ROD. The only land use change since the ROD is the open field directly south of the Site is no longer used for agricultural purposes; it is currently not being used at all.

CHANGES IN TOXICITY AND OTHER CONTAMINANT CHARACTERISTICS

Since the risk assessment was developed in the mid-1980s, many changes have occurred in the values of chemical toxicity. However, these changes do not affect the protectiveness of this remedy because (1) a comprehensive remedy was implemented, and (2) the cleanup standards are based upon promulgated standards (i.e., drinking water MCLs) which are periodically revised using updated toxicity information.

CHANGES IN RISK ASSESSMENT METHODS

Since the risk assessment was developed in the mid-1980s, many changes have occurred in the methods and procedures to conduct risk assessments. Most notably, the risk assessment for the Site was qualitative in nature. Today's risk assessments are quantitative. However, these changes do not affect the protectiveness of this remedy because the implemented remedy is comprehensive in adequately addressing all exposure pathways.

As presented previously in this report, the ecological risk was reevaluated due to the contamination located immediately adjacent to the rivers. Current ecological risk assessment methods and procedures were utilized.

EXPECTED PROGRESS TOWARD MEETING REMEDIAL ACTION OBJECTIVES

The ROD specified the RAOs for the Site were (1) to install a protective cap on the Site to prevent direct contact with the contaminants, (2) to install a groundwater withdrawal well system to capture all groundwater emanating in or passing through the Site, (3) to restore the groundwater beneath the Site to drinking water quality for possible use as a drinking water supply, and (4) to treat contaminated groundwater so discharges to the Missouri River comply with ARAR-based standards. The ROD specified an anticipated schedule for completion of the remedial design, construction of the surface cap, and installation of the groundwater extraction and treatment system with associated verification using a groundwater monitoring system. No time frame was specified to achieve the restoration goal for on-site groundwater.

The ROD provided for the protective cap to be approached in two phases. Until the groundwater pump and treat system is in operation, a permeable cap will be in place covering the Site. The permeable cap will protect against direct contact with the waste materials while allowing infiltration through the Site. The infiltration will increase leaching of contaminants from soils, thereby allowing capture of the released contaminants in the pump and treat system. Upon completion of the groundwater cleanup when the pump and treat system is no longer required, the permeable cap will be replaced by an impermeable cap. The permeable cap is in place and being maintained by the Defendants.

The groundwater withdrawal system is in place and being operated and maintained by the Defendants. As discussed previously in this document, the groundwater extraction system has failed to meet the inward hydraulic gradient performance standard for two periods of time during the last seven years. The Defendants have submitted information based in part on a groundwater model to show the extraction system captured contaminants leaving the Site even when the inward hydraulic gradient performance standard was not being met. EPA agrees that based on the currently available information, this information tends to show hydraulic control has been maintained so contaminants have not escaped from the Site.

As presented previously in this report, significant progress has been made toward meeting the requirement to restore the groundwater beneath the Site to drinking water quality. Specifically, total VOC and phenolic compound concentrations in the extraction wells have decreased 90 and 97 percent, respectively, since startup in 1990. More recently, reductions of 67 and 94 percent have been achieved during the last seven years for total VOC and phenolic compound concentrations, respectively. However, total VOC concentrations in the extraction wells are still at least 1,000 ppb which is at least a factor of 200 greater than cleanup standards for specific VOC contaminants. Progress toward the groundwater restoration goal is even more impressive when reviewing results for the monitoring well network. Reductions of greater than 99

percent have been achieved in all monitoring wells for both total VOCs and phenolic compounds. Current maximum total VOC concentrations are 200 to 300 ppb while total phenolic compound concentrations are below detection limits.

Operation of the treatment plant has achieved compliance with EPA site-specific and state NPDES effluent criteria on a consistent basis.

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

The results of the previously mentioned screening level ecological risk assessments recommended additional sampling in the transition zones at the bottoms of the rivers. This sampling method will be implemented prior to the next five-year review.

The likelihood is low contamination is migrating from deep below the rivers at concentrations of significance. This sampling work is considered investigative and consistent with the newest ecological risk methods. However, the remedy is considered protective to the river ecological systems until direct evidence shows otherwise.

Technical Assessment Summary

According to the data reviewed, the site inspections, and the interviews, the remedy is functioning as intended by the ROD as modified by the ESD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Additional work is required to determine if ICs are needed to address the potential for future use of the Site. Cleanup standards for air, groundwater, surface water, and soil remain protective. Changes in toxicity factors and risk assessment methods do not affect the protectiveness of this comprehensive remedy. Transition zone sampling will be conducted in the rivers to investigate if contamination is migrating into the river bottoms at significant concentrations. However, the remedy is considered protective to human health and the environment until direct evidence shows otherwise.

IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 8 - Recommendations and Follow-Up Actions

Issue	Recommendation/ Follow-up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Institutional Controls	Investigate whether ICs are required to prevent potential future land use at the Site	EPA	EPA	Before next five-year review	N	Y
Metals Treatment Optimization	Investigate whether metals removal is required in treatment plant based upon current concentrations of influent metals	Defendants	EPA	Before next five-year review	N	N
New Hydraulic Control Verification Approach	Investigate whether new approach would more effectively measure hydraulic containment of contamination on the Site than existing piezometer approach	Defendants	EPA	Before next five-year review	N	N
Ecological Sampling	Conduct transition zone sampling in the rivers and characterize ecological resources	EPA and/or Defendants	EPA	Before next five-year review	N	N

VIII. ISSUES

Table 7. Issues Identified During the Five-Year Review

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Removal of the Sulfide System (documented in ESD)	N	N
Failure to achieve Inward Gradient Specification in South Piezometer Pairs (reevaluation of the Site hydrology and development of groundwater computer model)	N	N
Change in South Extraction Well from fully to partially penetrating (development of groundwater computer model and four years of chemical monitoring)	N	N
Are ICs required for potential, future land use of the Site	N	Y
Contaminated groundwater located immediately adjacent to the rivers (investigation and screening level, ecological risk assessments conducted)	N	N

X. PROTECTIVENESS STATEMENT

Based upon available data, the assessment of this five-year review found the remedy is currently protective of human health and the environment because all threats have been addressed through installation of a soil cap with security fencing and hydraulic control of the source area contamination. In the long term, the remedy is expected to be protective upon attainment of groundwater cleanup standards. The time frame to reach those standards has not been estimated since the remedy is based upon source containment.

Protectiveness of the remedial action will be monitored and verified by obtaining O&M data required by the Consent Decree. Current data indicate the source area is hydraulically controlled, contamination concentrations in the source area are decreasing, and downgradient contaminant concentrations are attenuating.

XI. NEXT REVIEW

The next five-year review for the Site is required by September 2012, five years from the date of this review.

ATTACHMENT I

PUBLIC NOTICE

Region 7

Iowa
Kansas
Missouri
Nebraska

Fact Sheet

May 2006

Second Five-Year Review Begins

Conservation Chemical Company Superfund Site, Kansas City, MO

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) conducts regular five-year reviews on Superfund sites where cleanups have been completed. These reviews are required by the Superfund law [42 U.S.C. § 9621(c)]. EPA Region 7 and the Missouri Department of Natural Resources (MDNR) have initiated their second five-year review of the Conservation Chemical Company (CCC) Superfund site in Kansas City, Missouri.

SITE BACKGROUND

The CCC initiated its activities at the site in 1960, beginning with construction of chemical treatment basins, the process area, and a roadway ramp. Waste disposal operations began at the site soon after site construction was initiated and continued until approximately 1980. Available records indicated that the materials accepted at the CCC site included organics, metals, and pesticides. Subsequent site investigations confirmed the presence of the broad variety of wastes. The facility handled liquids, sludges, and solids. It is estimated that approximately 93,000 cubic yards of materials were buried on the site.

In 1975, MDNR investigated the site and found it to be operating as a solid waste disposal area. On December 15, 1975, MDNR requested that CCC cease the disposal of solid wastes at the site and that remedial actions be taken to clean up the site.

The site was proposed for listing on the National Priorities List in April 1985 and was added to the list in October 1989.

A Record of Decision was signed on September 30, 1987, which selected an active groundwater containment system as the remedy for the CCC site.

The purpose of a five-year review is to evaluate whether the selected remedy is still protective of human health and the environment. The first five-year review for the CCC site was completed on February 29, 2000.

ADDITIONAL INFORMATION

The Administrative Record associated with the CCC site is available at the following location during normal business hours:

EPA Region 7 Records Center
901 North 5th Street
Kansas City, KS

If you have questions or need additional information on the Conservation Chemical Company Superfund site or the five-year review process, please contact:

Fritz Hirter
Community Involvement Coordinator
EPA Region 7
901 North 5th Street
Kansas City, KS 66101
Phone: 913-551-7003
Toll free: 1-800-223-0425
E-mail: hirter.fritz@epa.gov

OR

Steve Auchterlonie
Remedial Project Manager
Superfund Division
EPA Region 7
901 North 5th Street
Kansas City, KS 66101
Toll free: 1-800-223-0425
E-mail: auchterlonie.steve@epa.gov

U.S. Environmental Protection Agency (EPA) Region 7
And
Missouri Department of Natural Resources (MDNR)
Begin
Second Five-Year Review for the
Conservation Chemical Company Superfund Site

EPA and MDNR have initiated the second five-year review at the Conservation Chemical Company (CCC) Superfund site. The review is required by the Superfund law to make sure the completed cleanup continues to protect human health and the environment.

The Administrative Record is available at the following location during normal business hours:

EPA Region 7 Records Center
901 N. 5th Street
Kansas City, KS

If you have questions or need additional information on this Superfund site or the five-year review process, please contact:

Fritz Hirter
Community Involvement Coordinator
U.S. EPA Region 7
901 N. 5th Street
Kansas City, KS 66101
913-551-7003
Toll Free: 1-800-223-0425
E-mail: hirter.fritz@epa.gov

OR

Steve Auchterlonie
Remedial Project Manager
Superfund Division
U.S. EPA Region 7
901 N. 5th Street
Kansas City, KS 66101
Toll Free: 1-800-223-0425
E-mail: auchterlonie.steve@epa.gov

ATTACHMENT 2

CHEMICAL TRENDS

FIGURE 23. TOTAL VOLATILE ORGANIC CONCENTRATIONS IN EXTRACTION WELLS

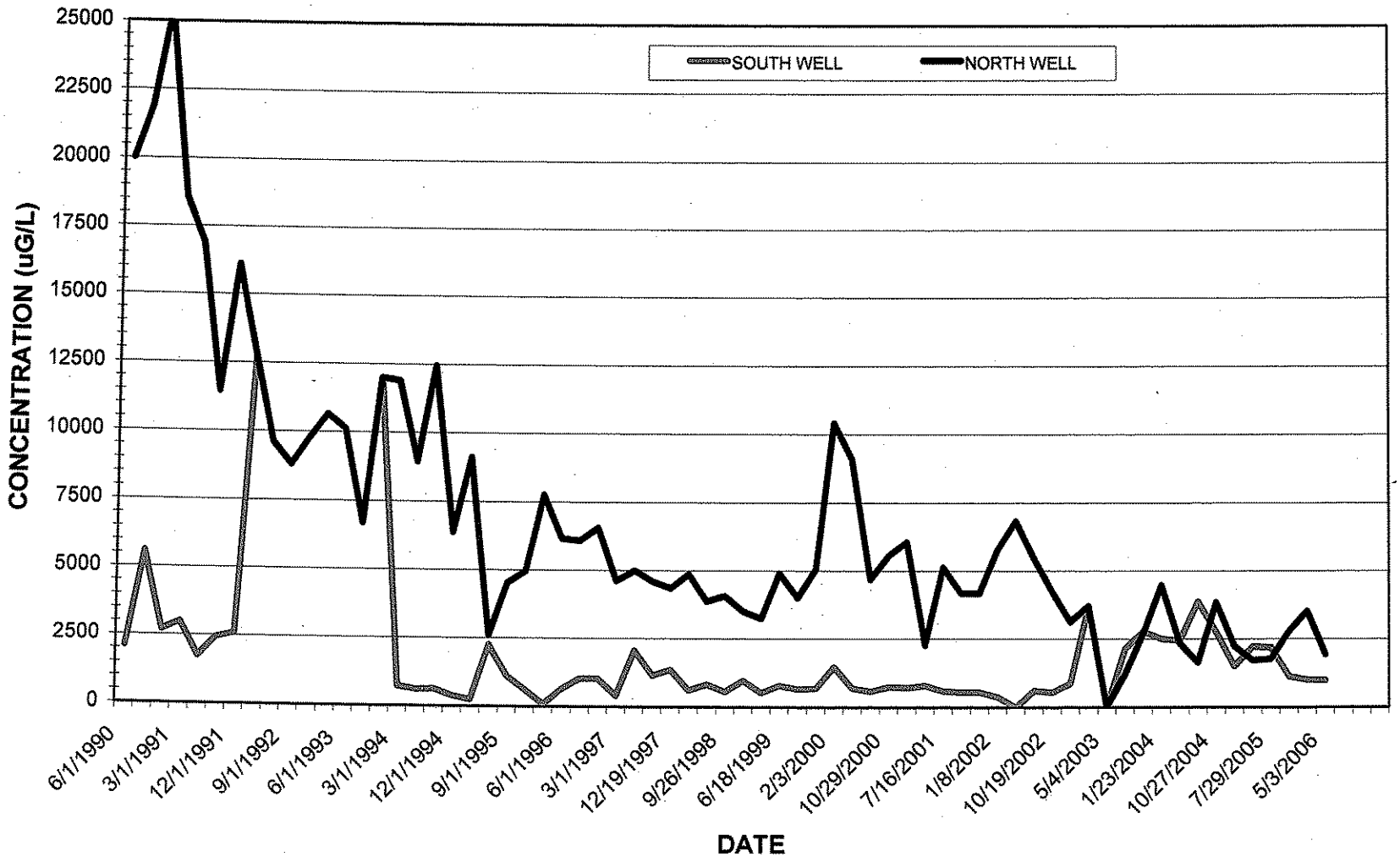


FIGURE 24. TOTAL VOLATILE ORGANIC CONCENTRATIONS IN EXTRACTION WELLS - 1999 TO 2006

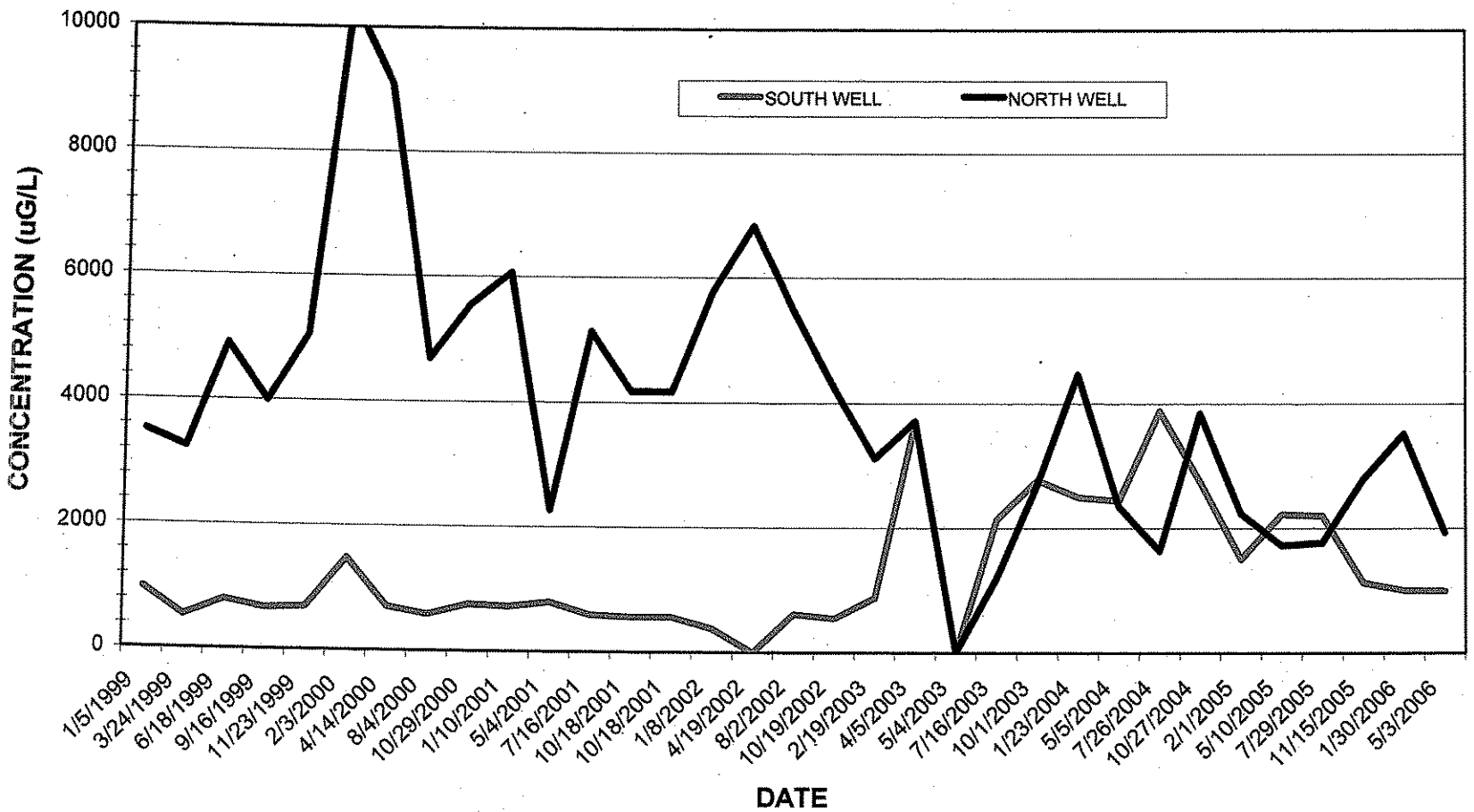


FIGURE 25. TOTAL PHENOLS IN EXTRACTION WELLS

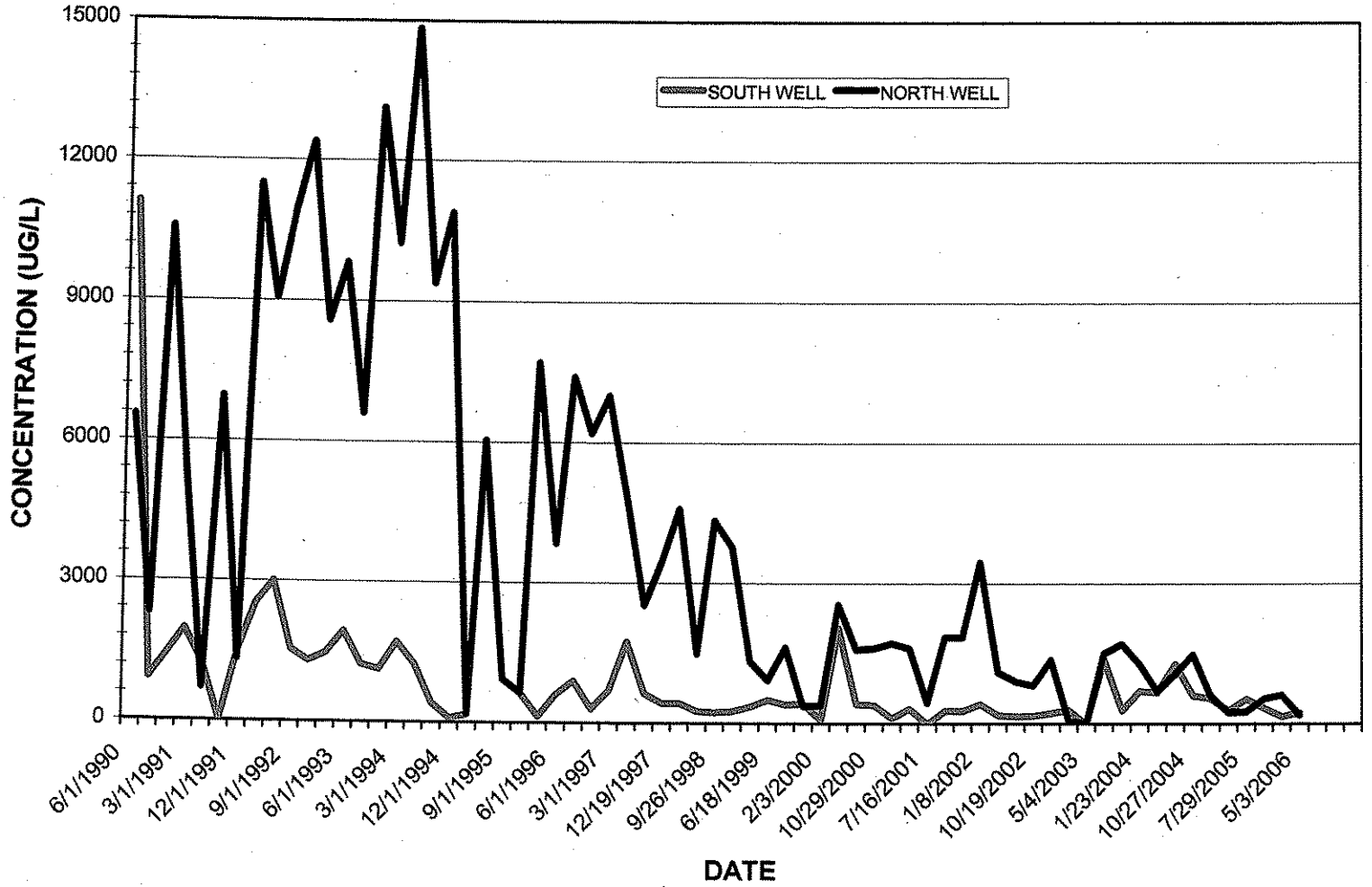


FIGURE 26. TOTAL PHENOLS IN EXTRACTION WELLS - 1999 TO 2006

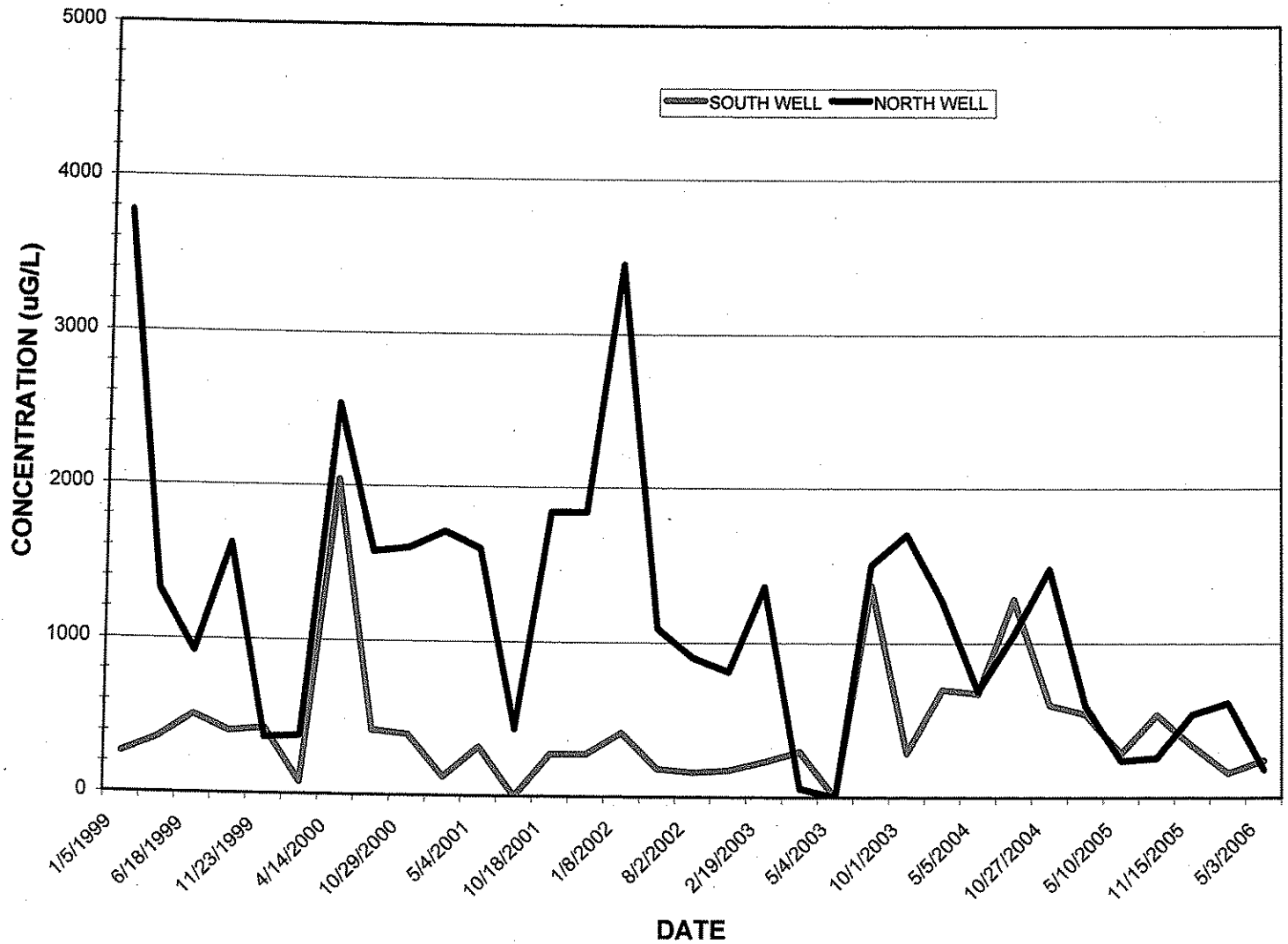


FIGURE 27. METALS IN PLANT INFLUENT

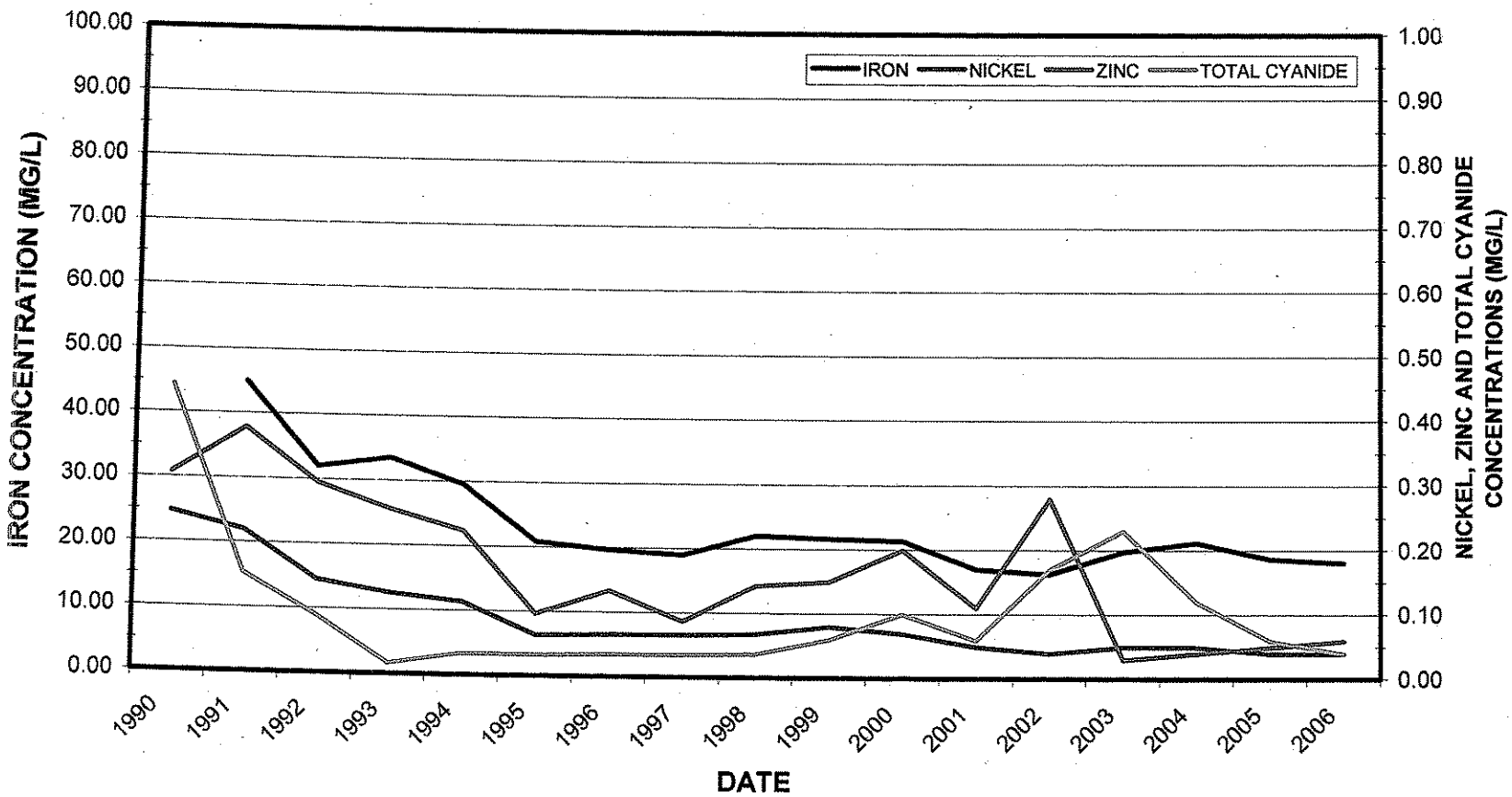


FIGURE 28. METALS IN PLANT EFFLUENT - 1999 TO 2006

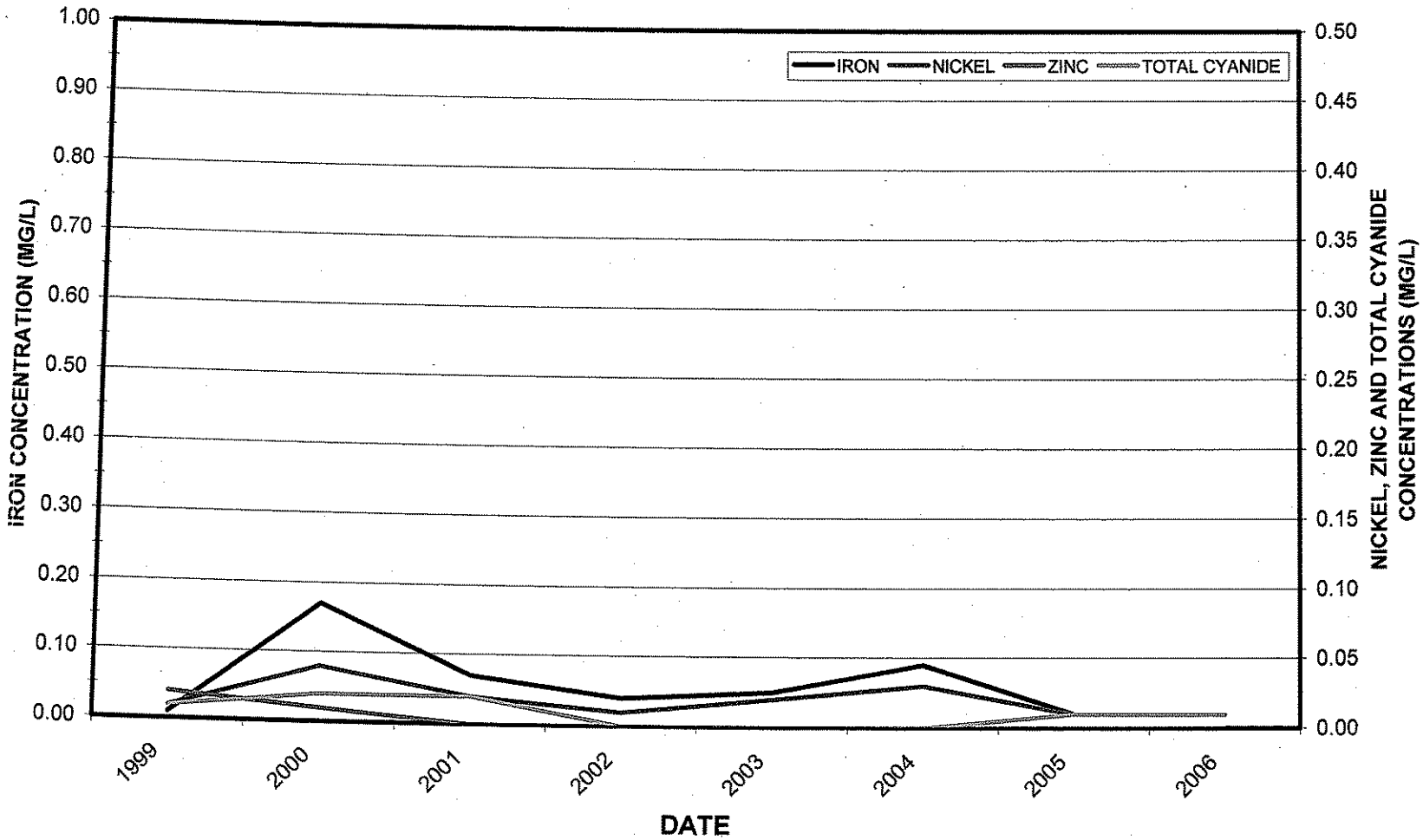


FIGURE 29. TOTAL VOLATILE ORGANICS TRENDS COMPARISON IN SHALLOW MONITORING WELLS

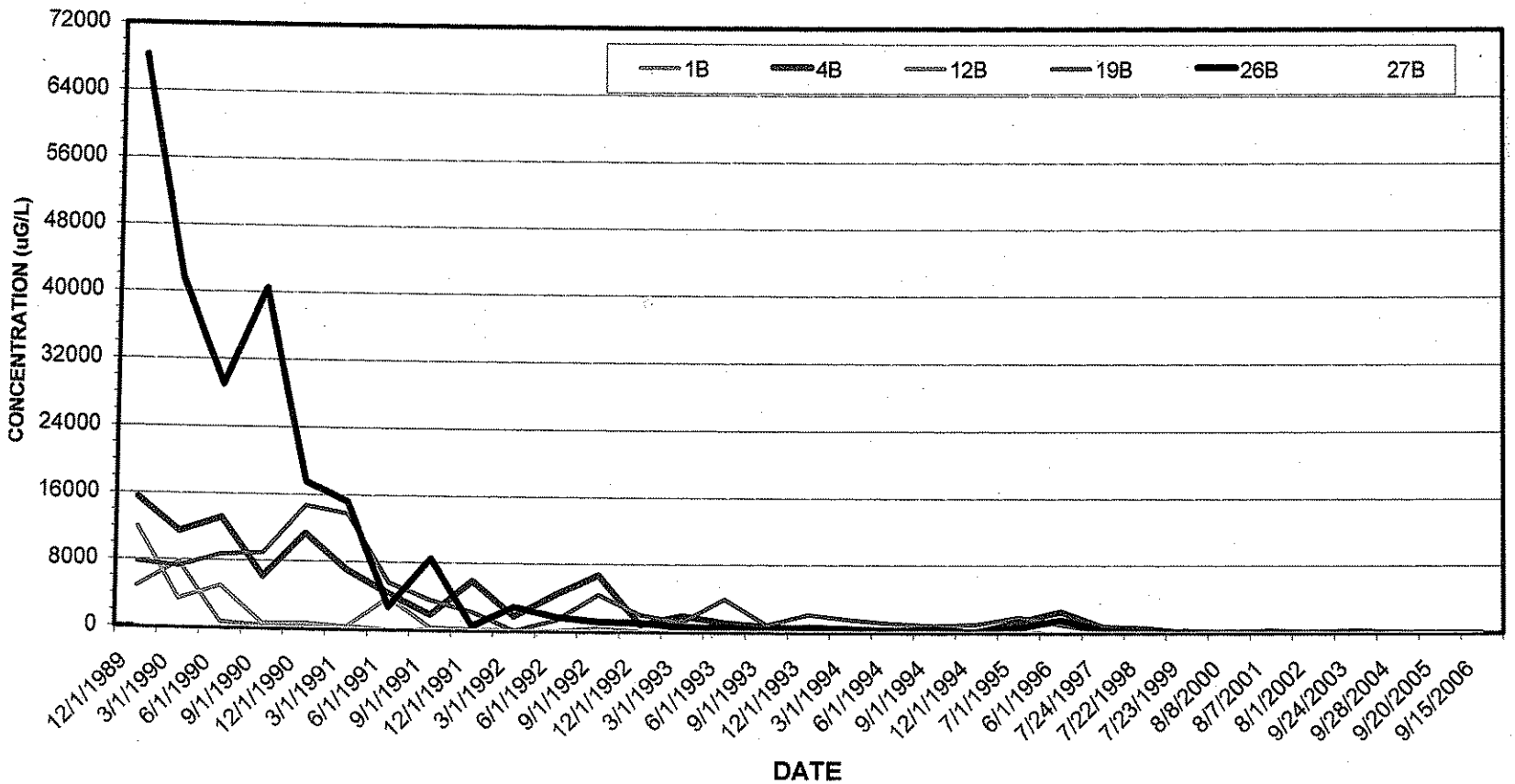


FIGURE 30. TOTAL VOLATILE ORGANICS TRENDS IN SHALLOW WELLS - 1999 TO 2006

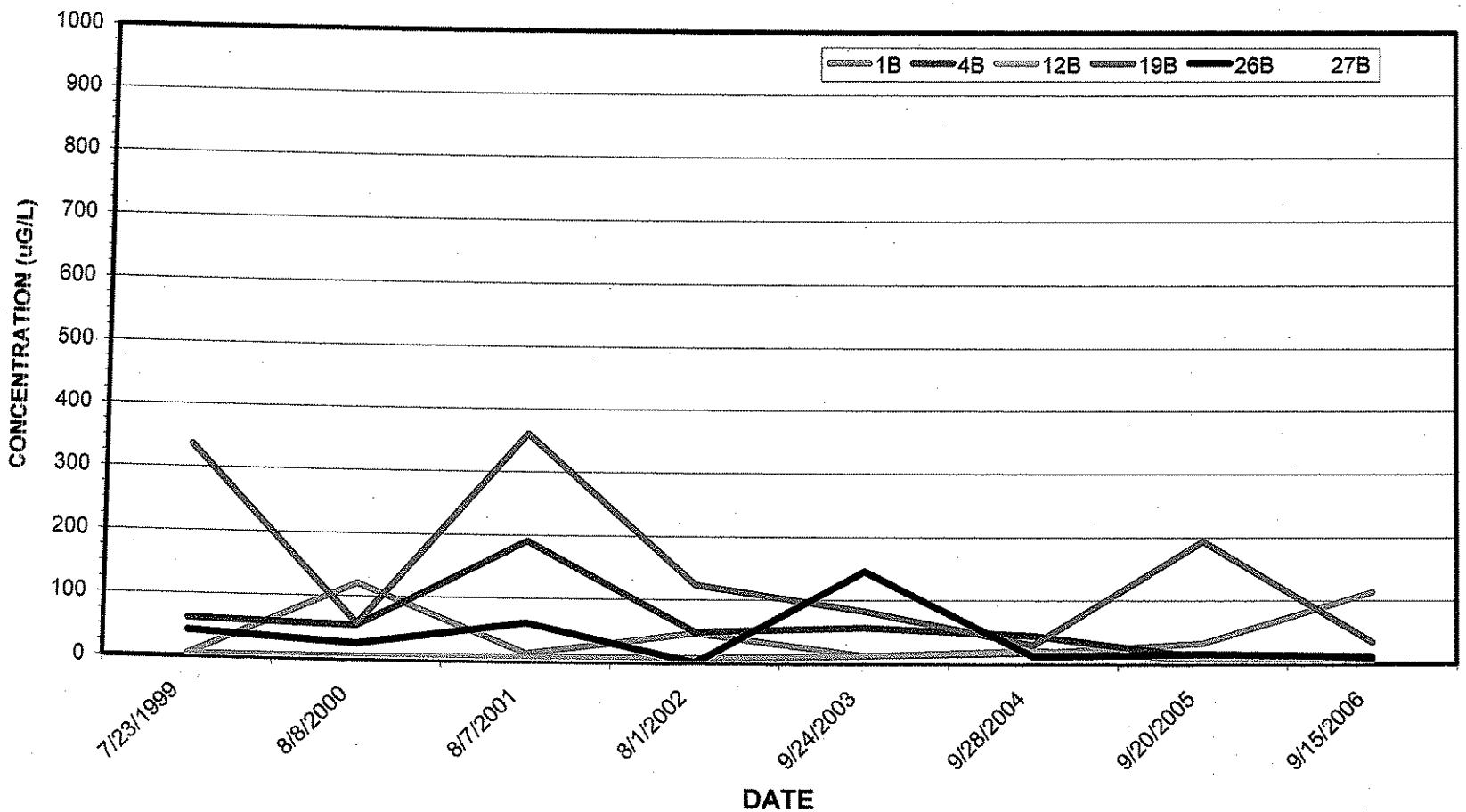


FIGURE 31. TOTAL VOLATILE ORGANICS TRENDS IN DEEP MONITORING WELLS

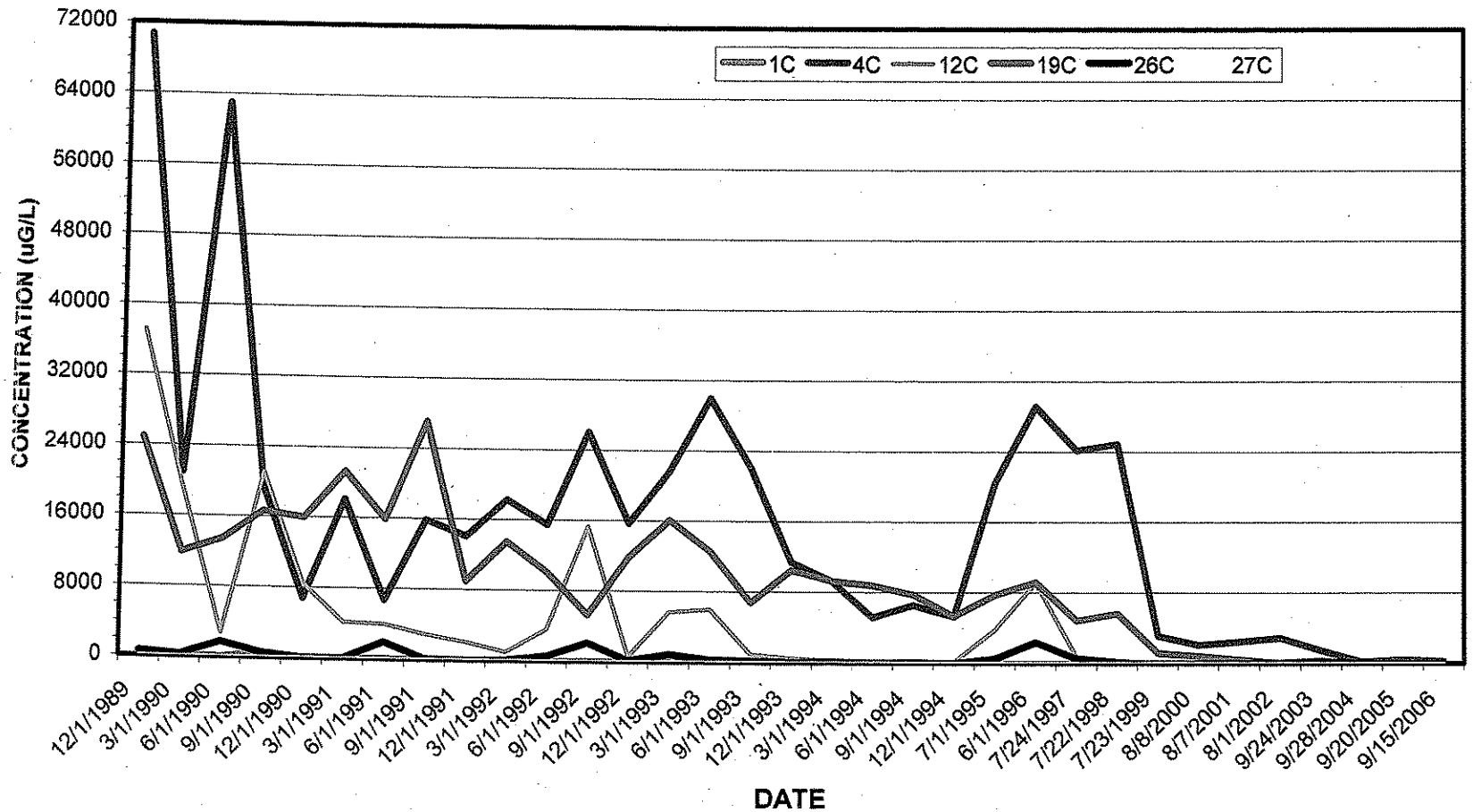


FIGURE 32. TOTAL VOLATILE ORGANICS TRENDS IN DEEP MONITORING WELLS - 1999 TO 2006

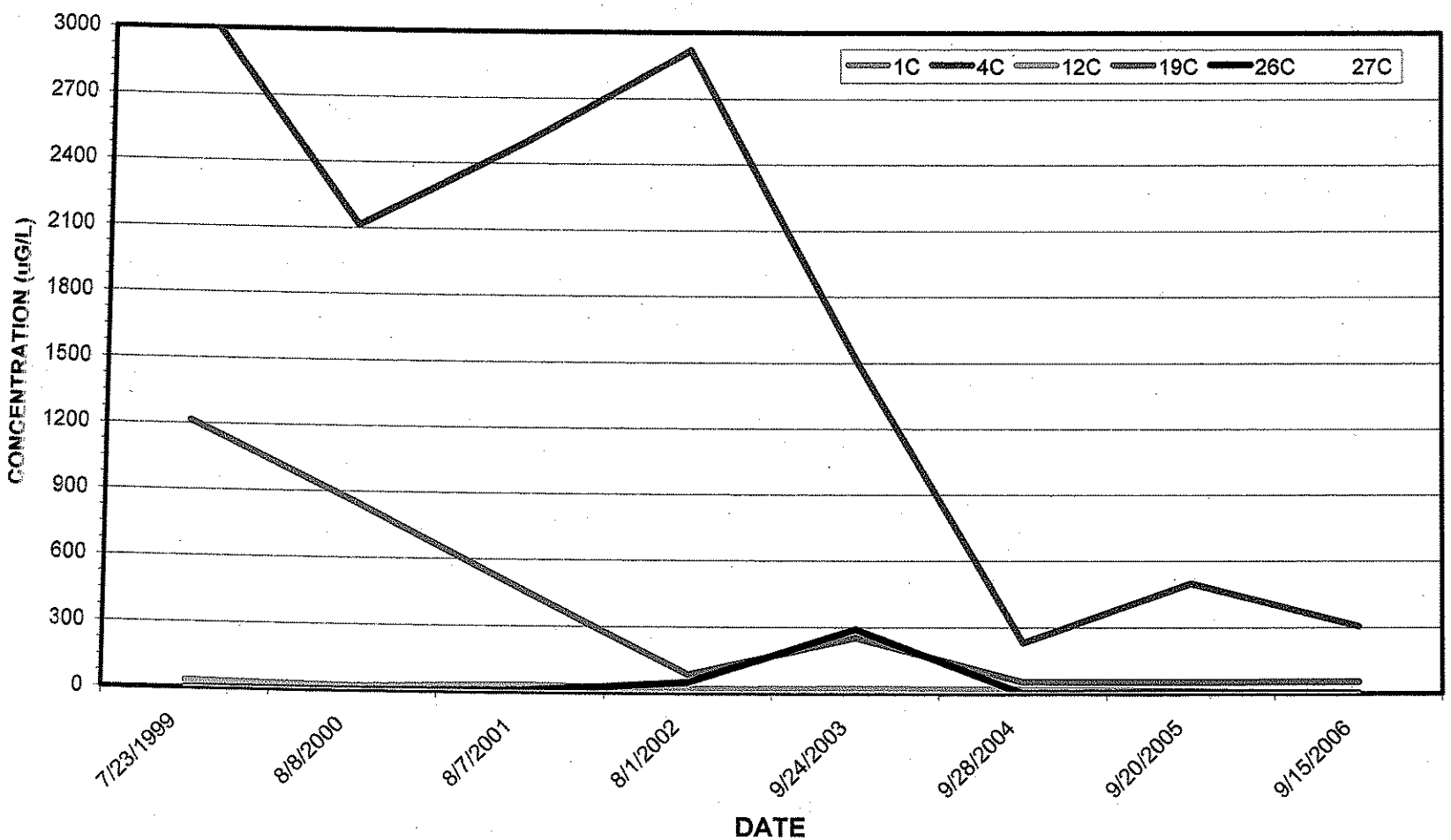


FIGURE 33. TOTAL PHENOLS TRENDS IN SHALLOW WELLS

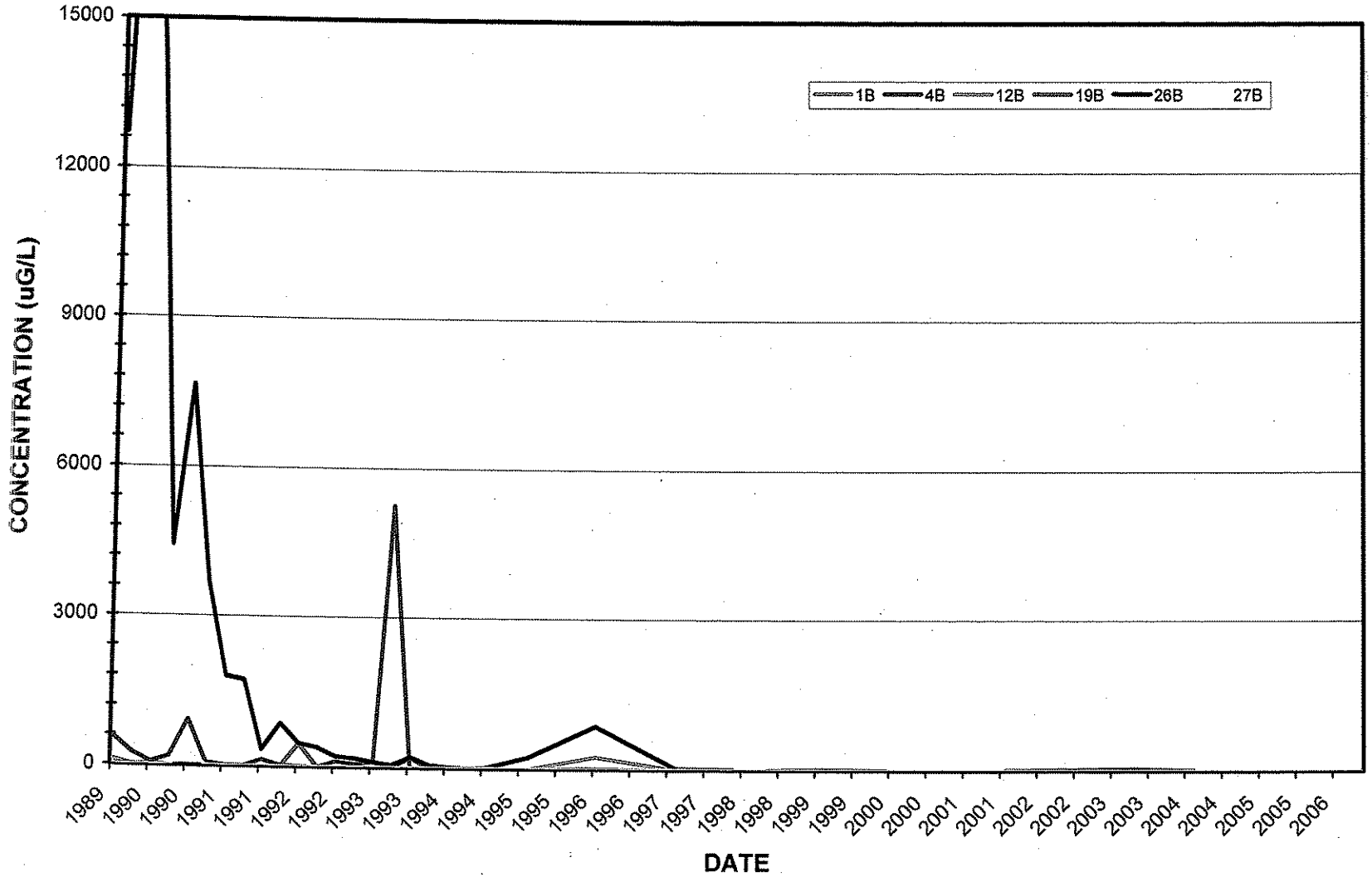


FIGURE 34. TOTAL PHENOLS TRENDS IN SHALLOW WELLS - 1999 TO 2006

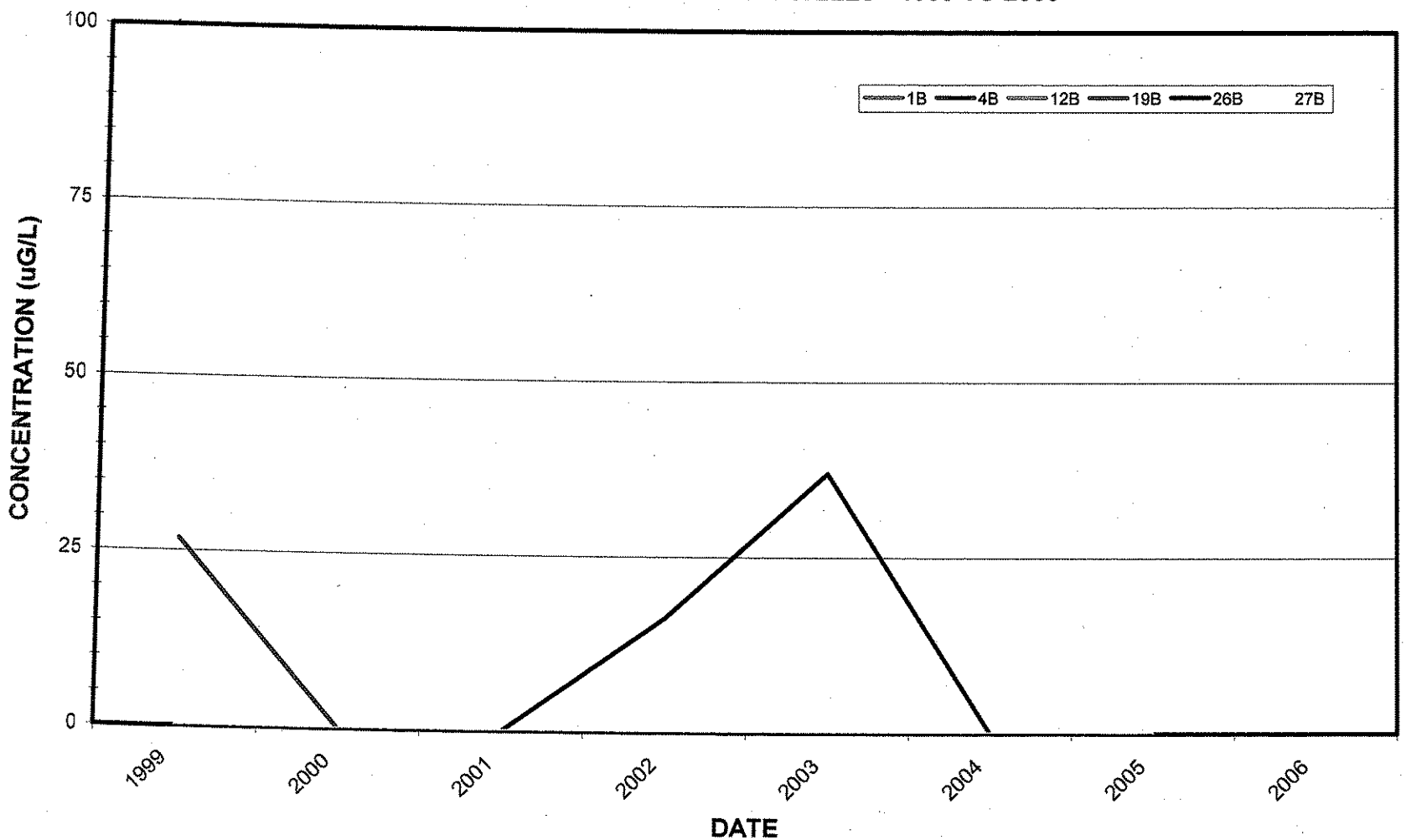


FIGURE 35. TOTAL PHENOLS TRENDS IN DEEP WELLS

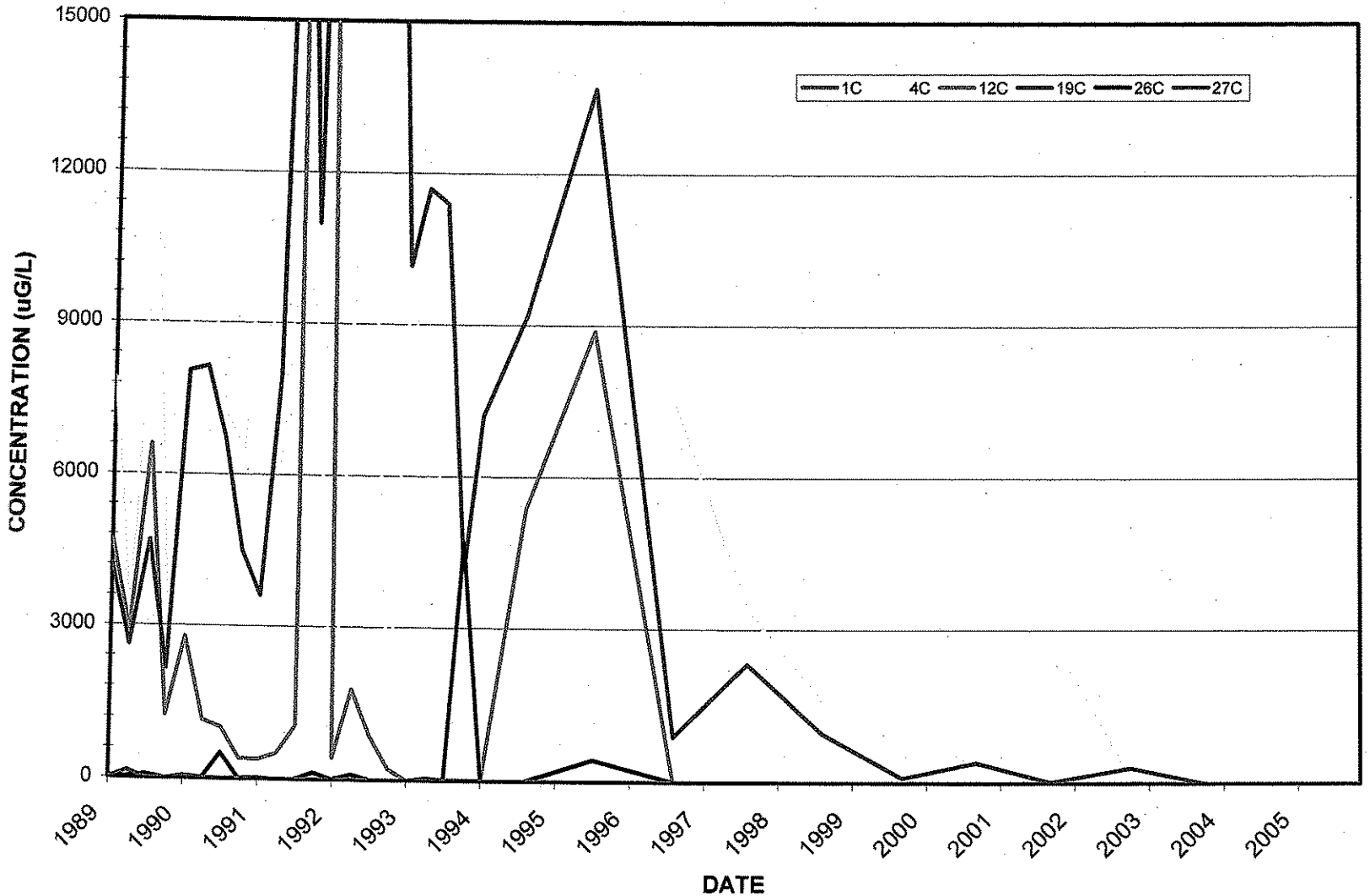


FIGURE 36. TOTAL PHENOLS TRENDS IN DEEP WELLS - 1999 TO 2006

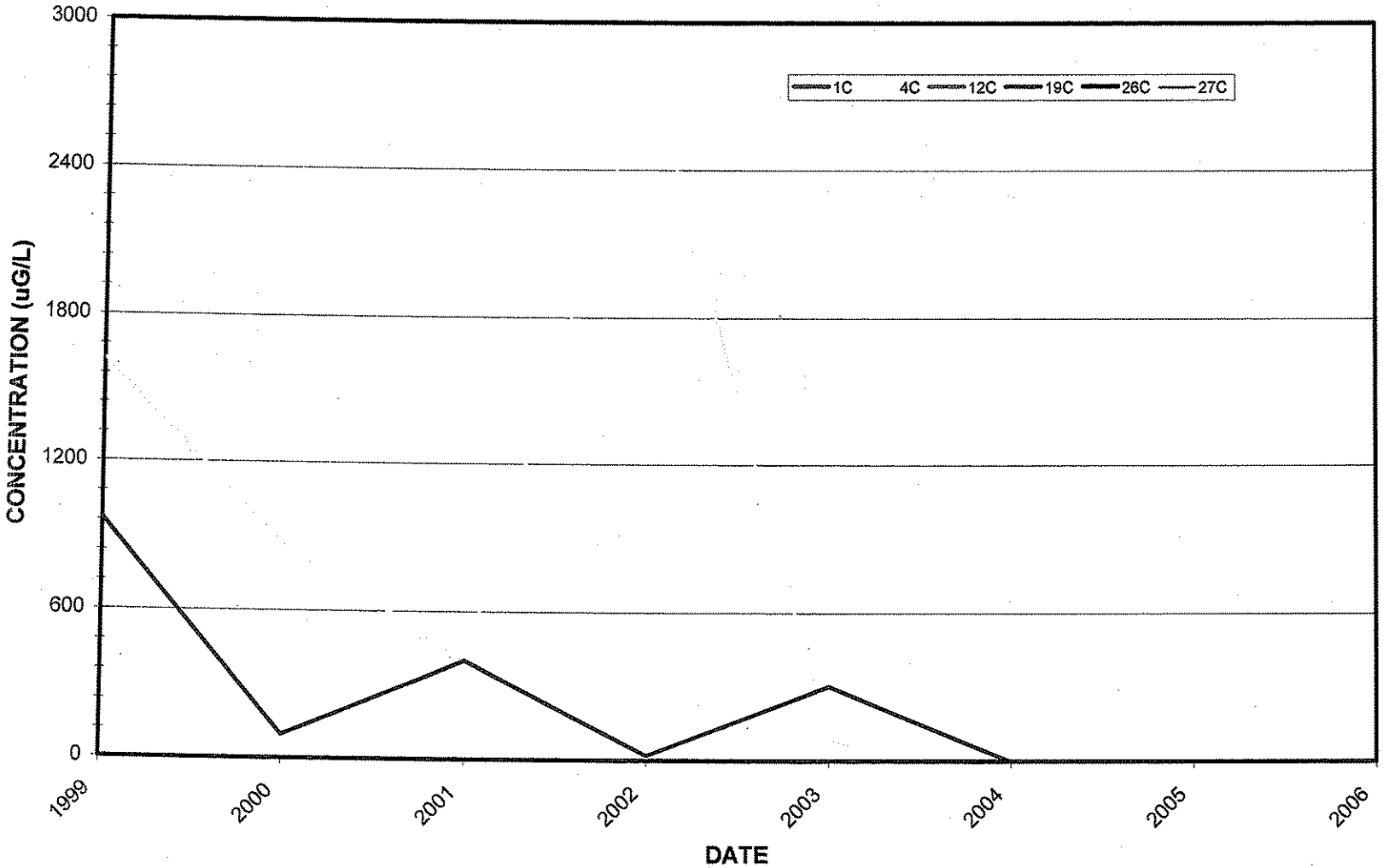


FIGURE 37. METALS IN MW-1B

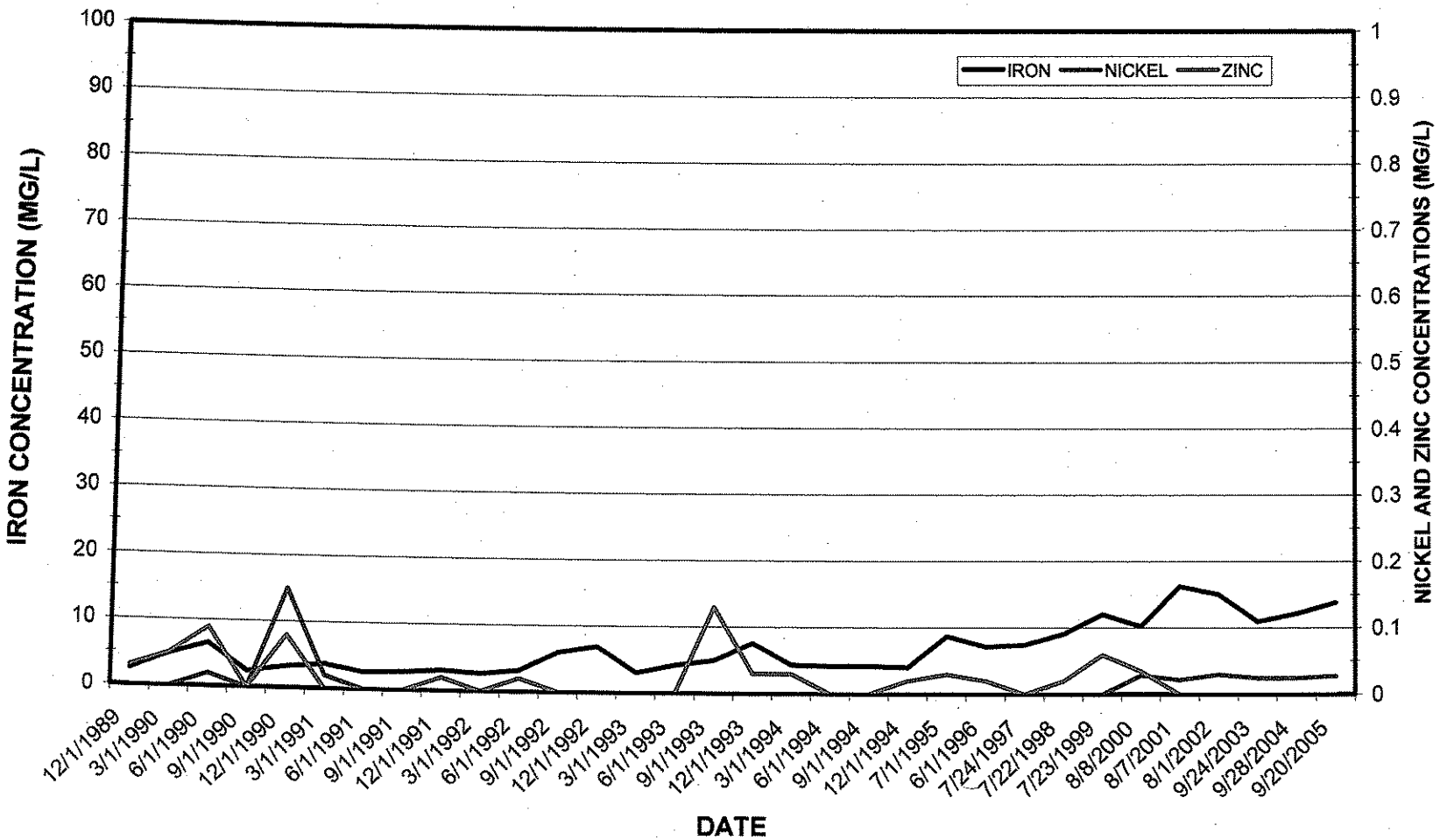


FIGURE 38. METALS IN MW-1C

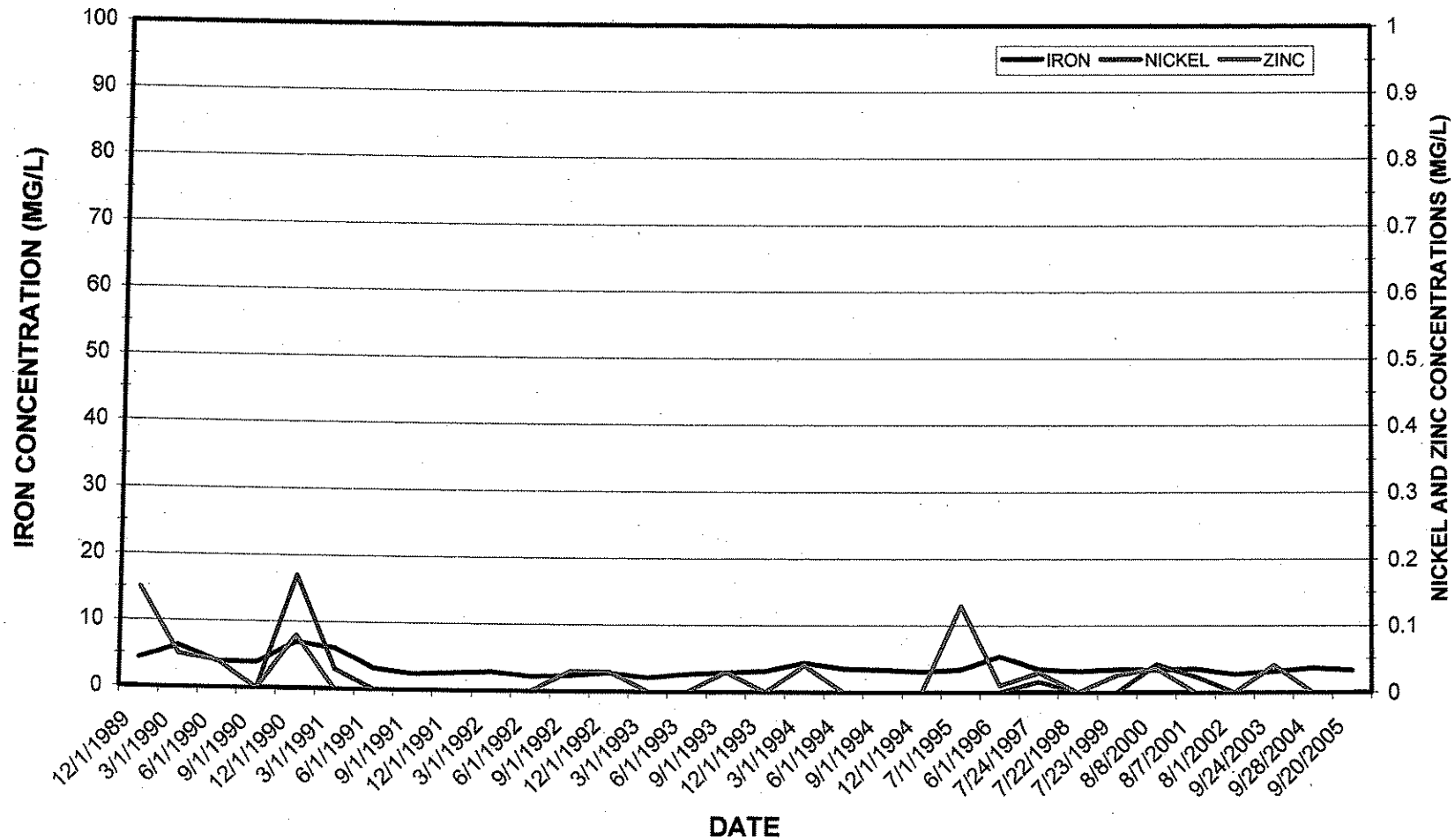


FIGURE 39. METALS IN MW-4B

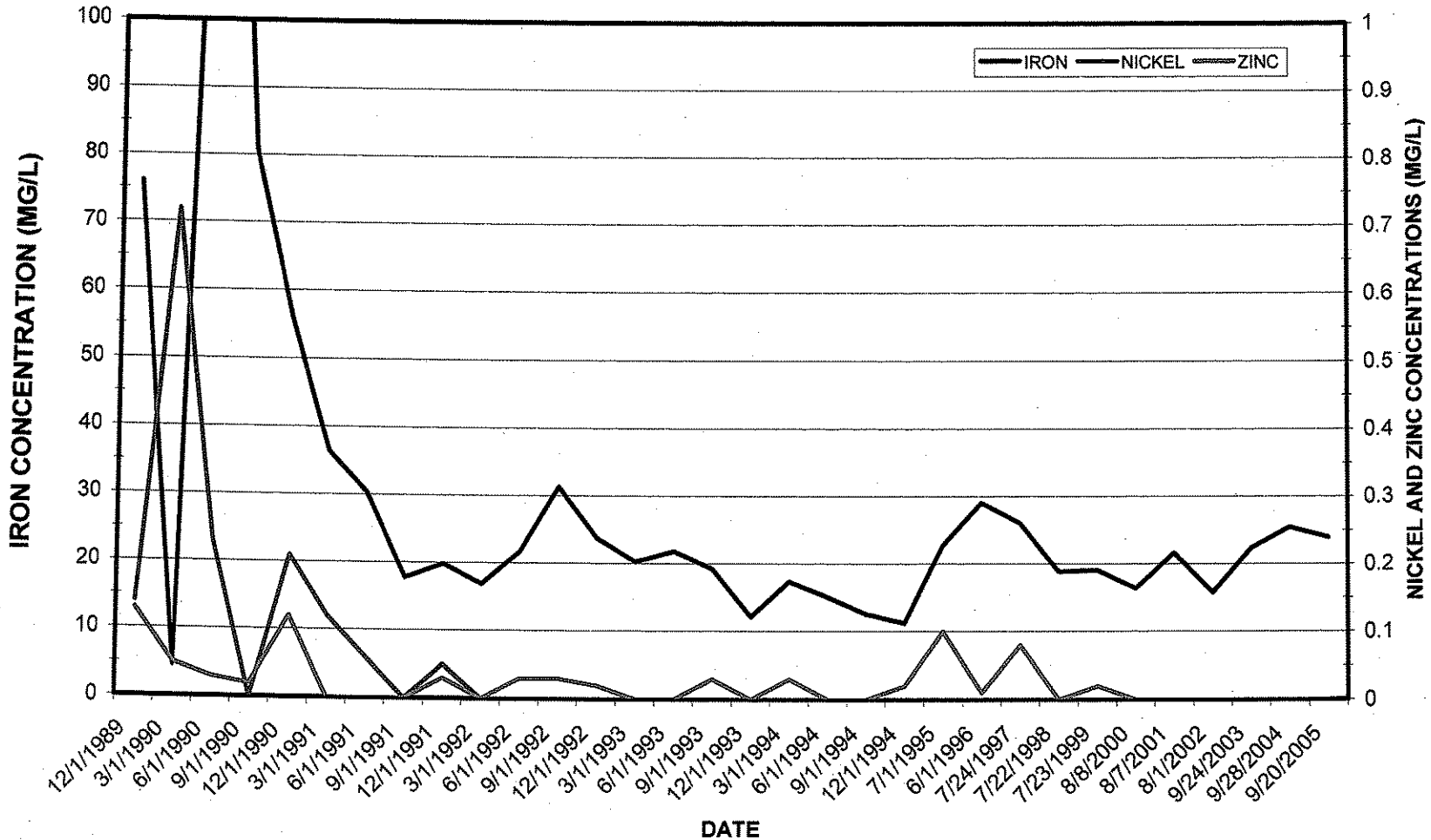


FIGURE 40. METALS IN MW-4C

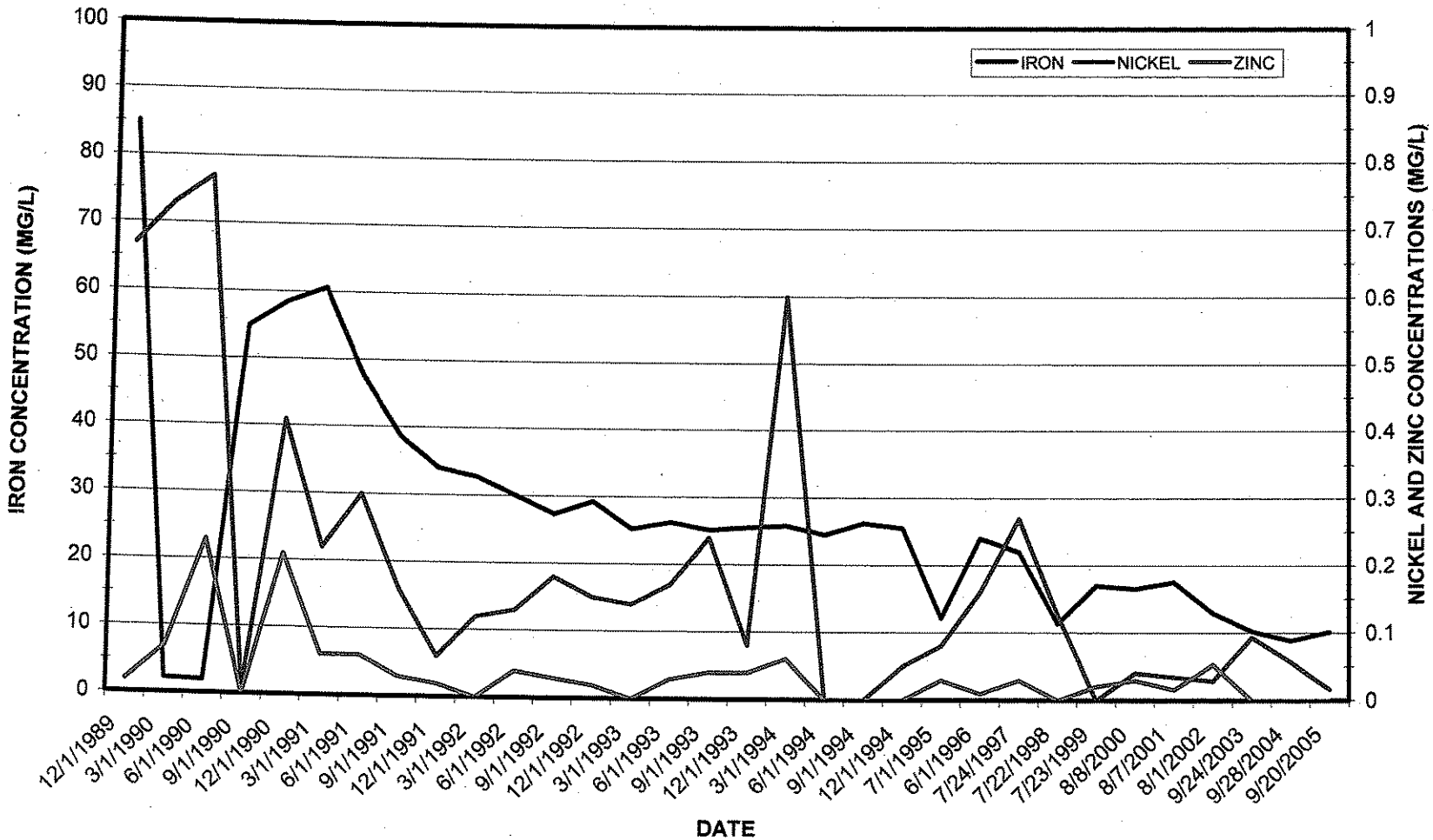


FIGURE 41. METALS IN MW-12B

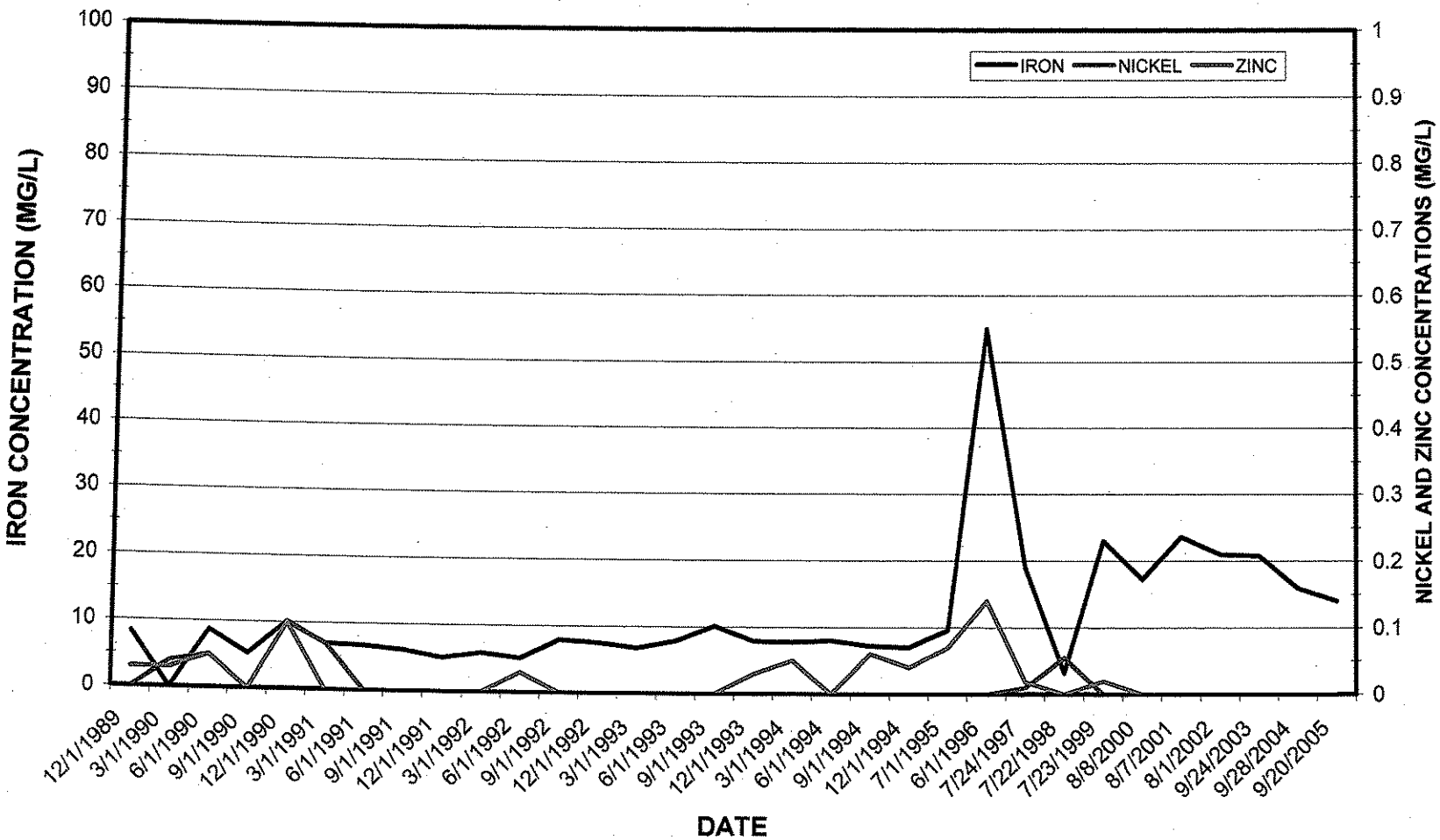


FIGURE 42. METALS IN MW-12C

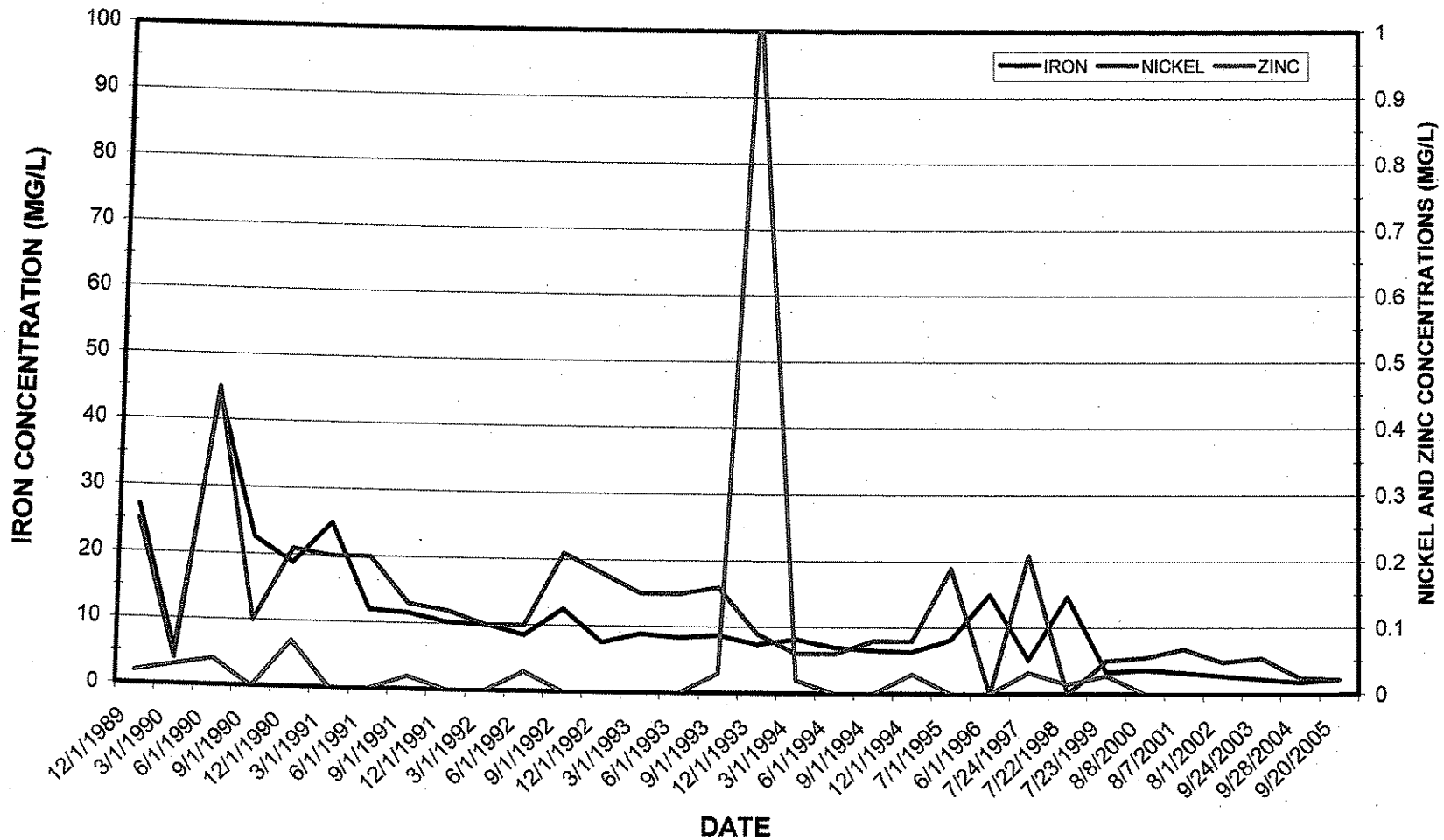


FIGURE 43. METALS IN MW-19B

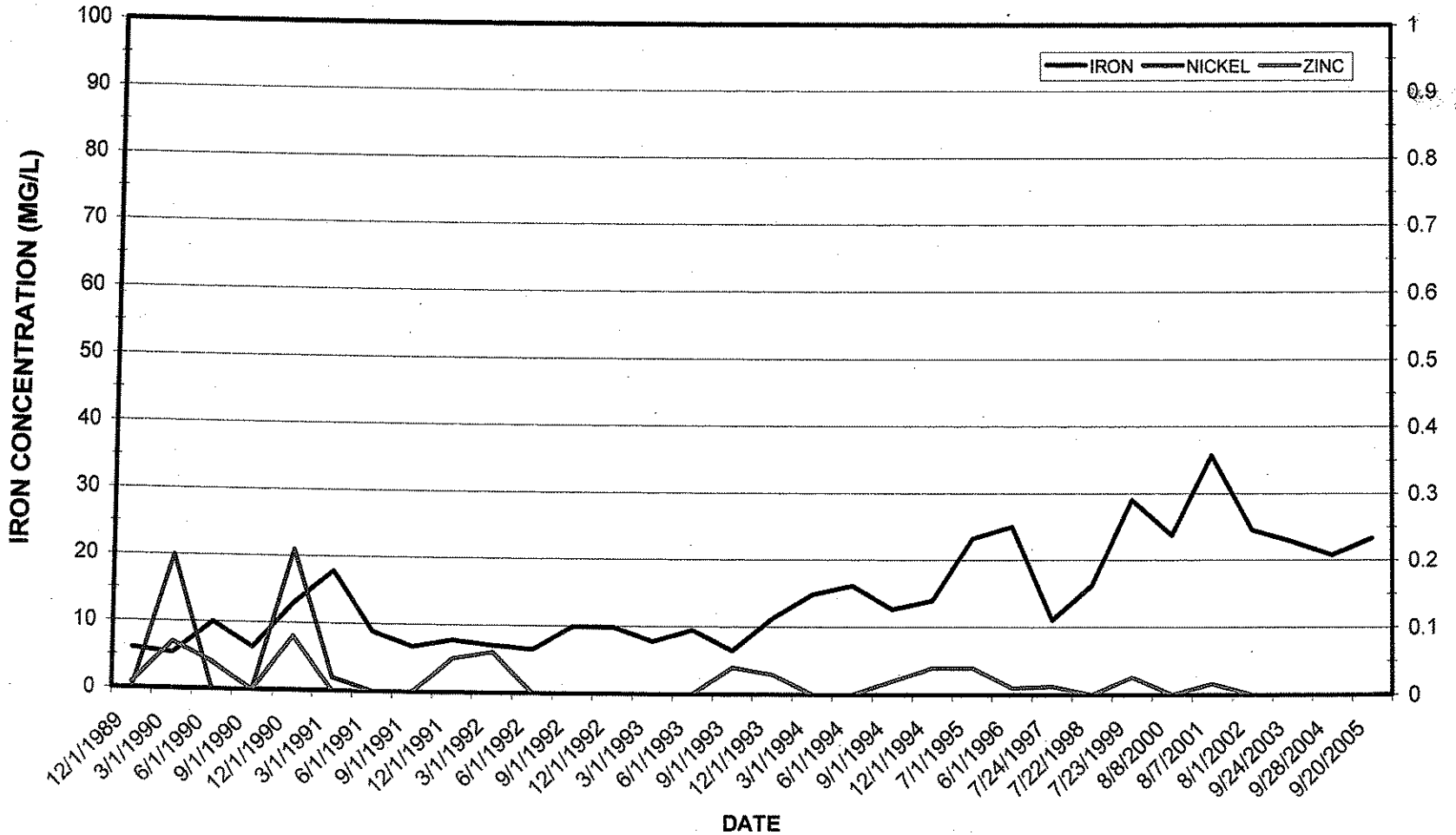


FIGURE 44. PHENOLS IN MW-19C

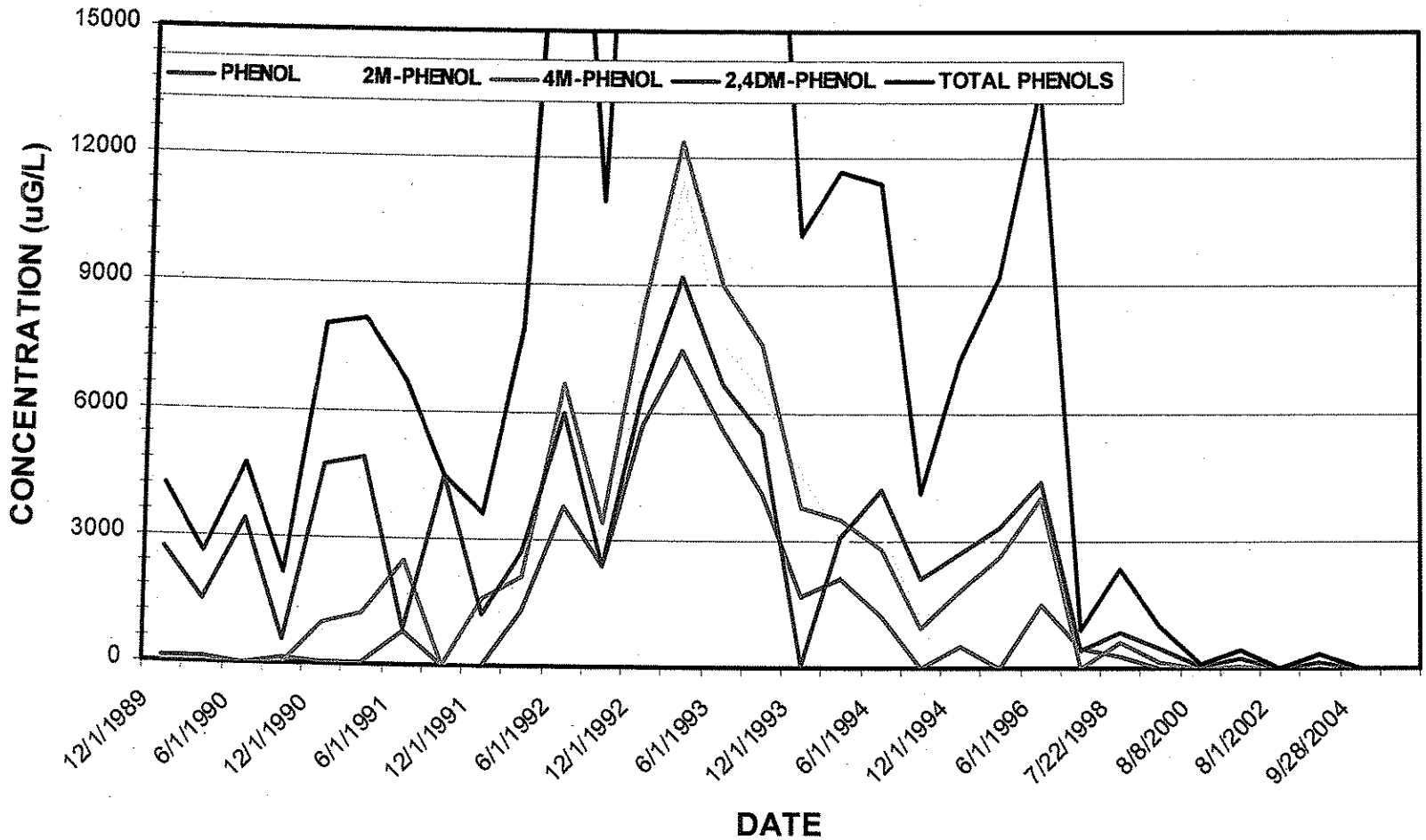


FIGURE 45. METALS IN MW-26B

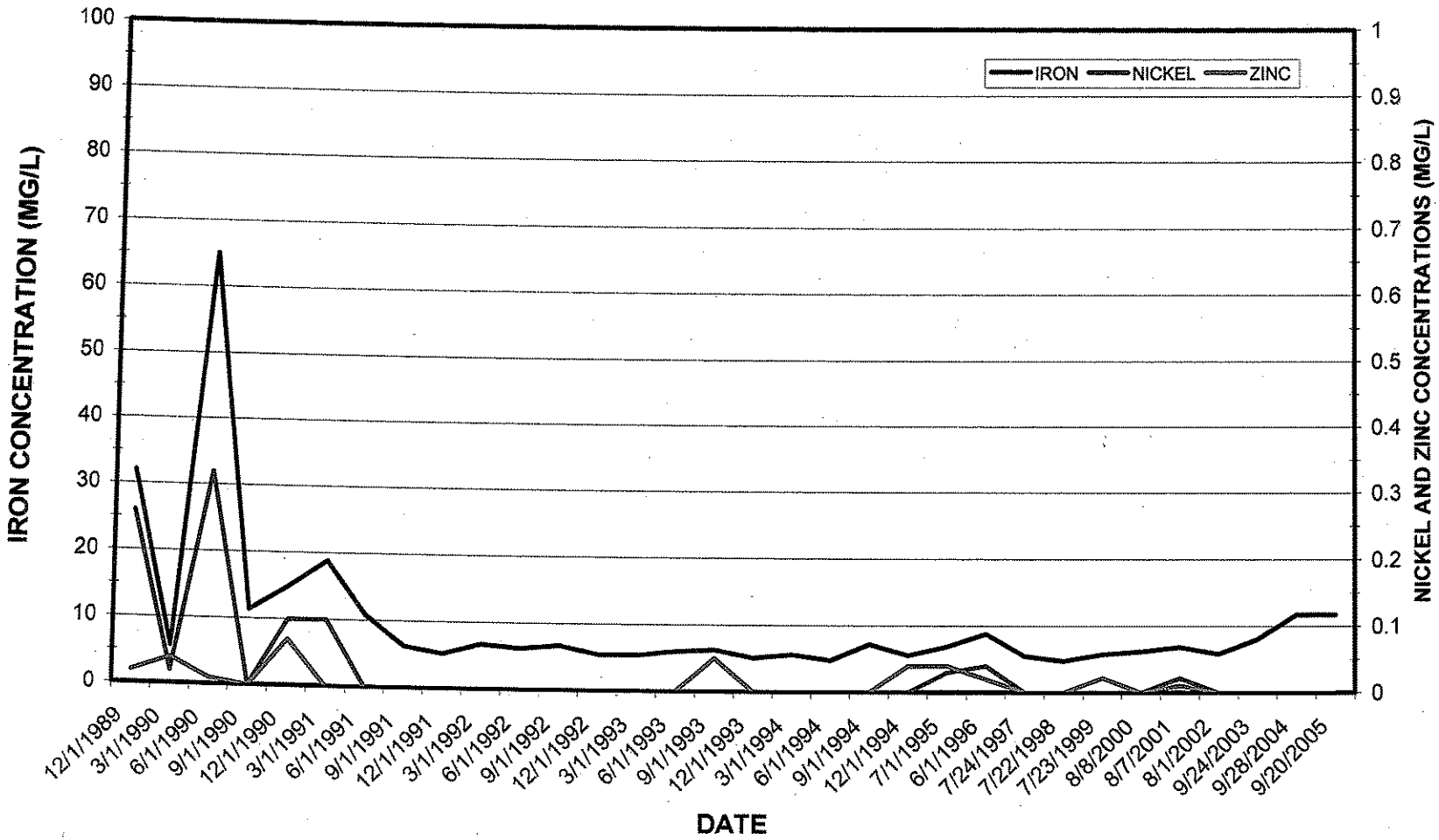


FIGURE 46. METALS IN MW-26C

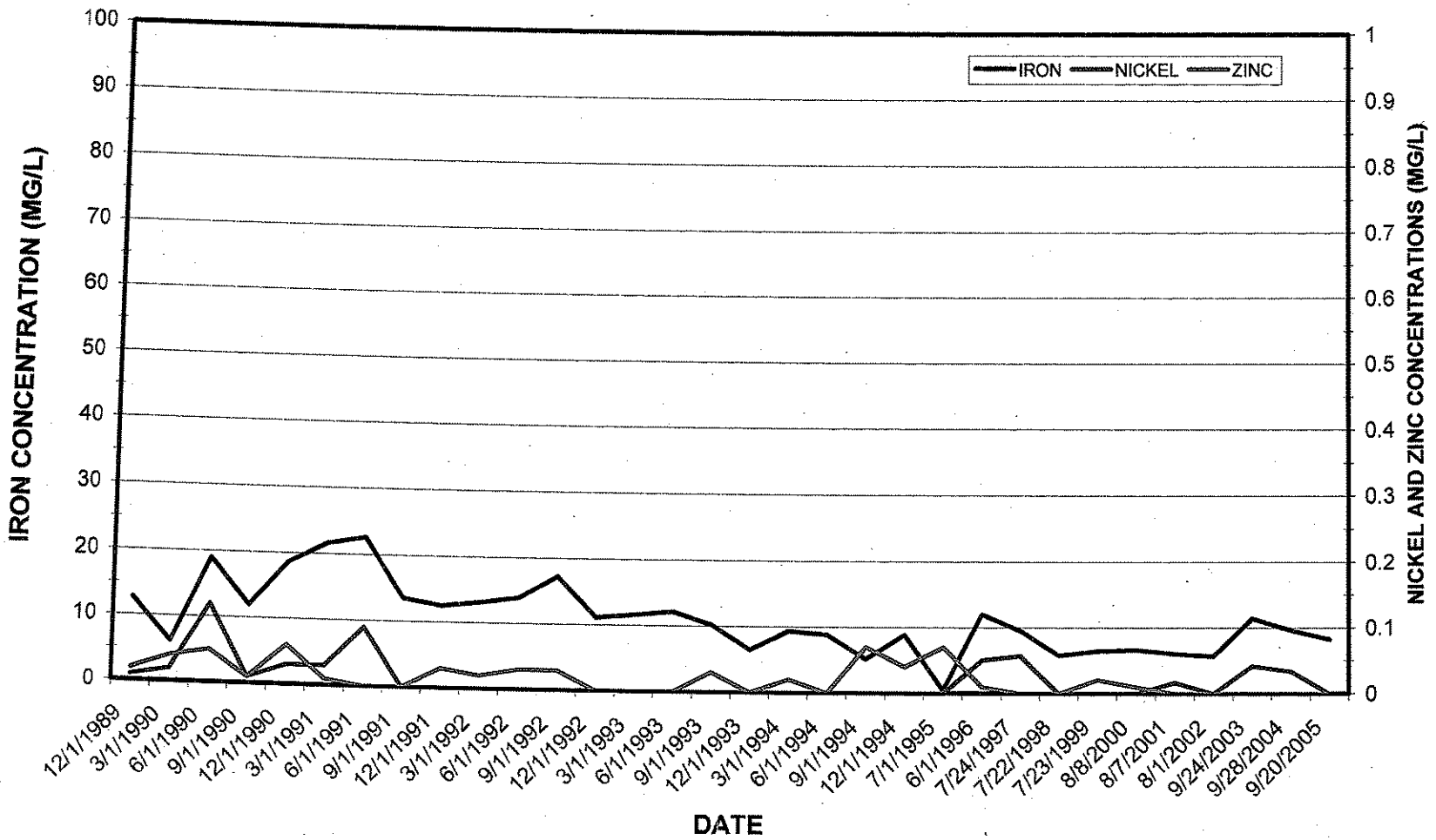


FIGURE 47. METALS IN MW-27B

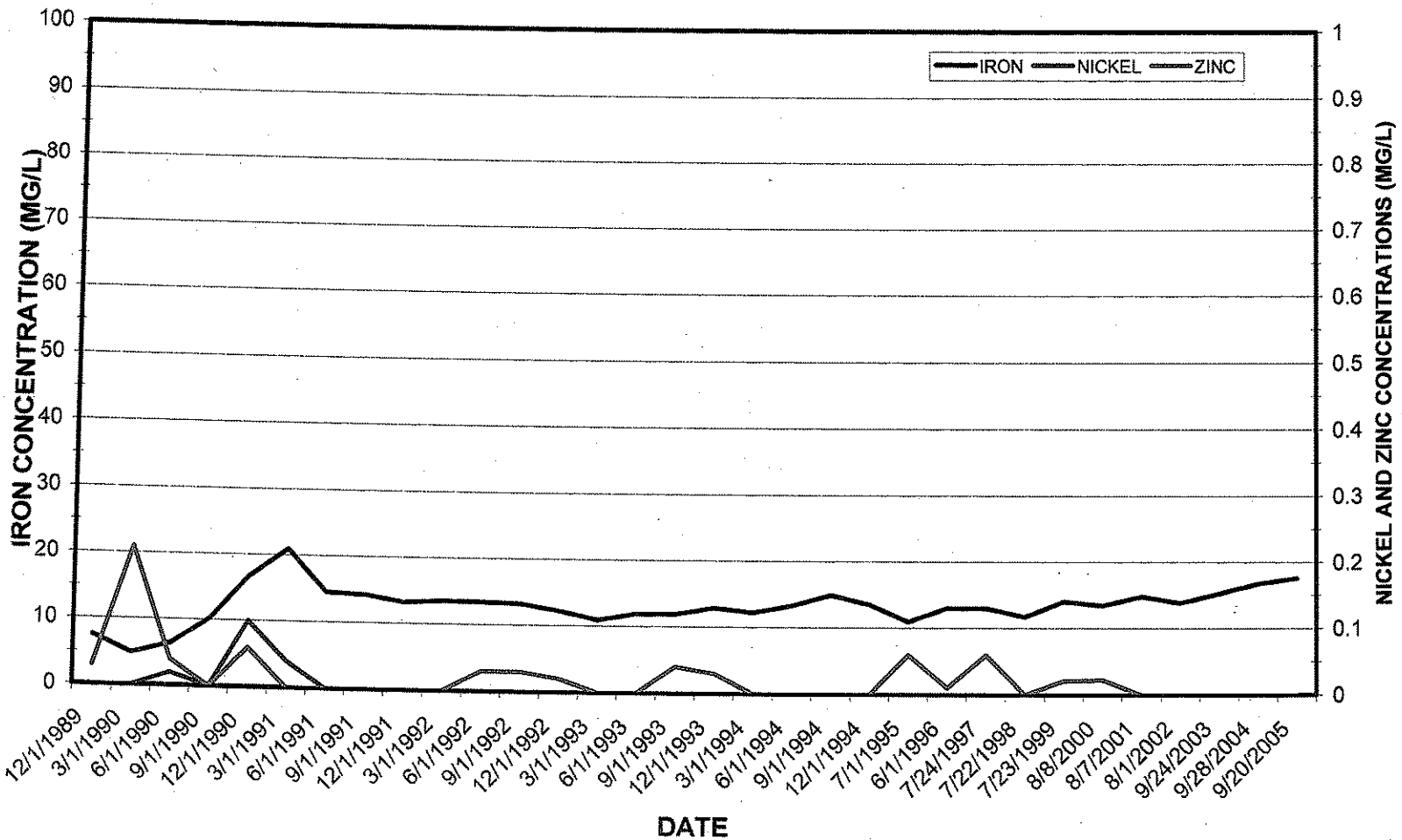
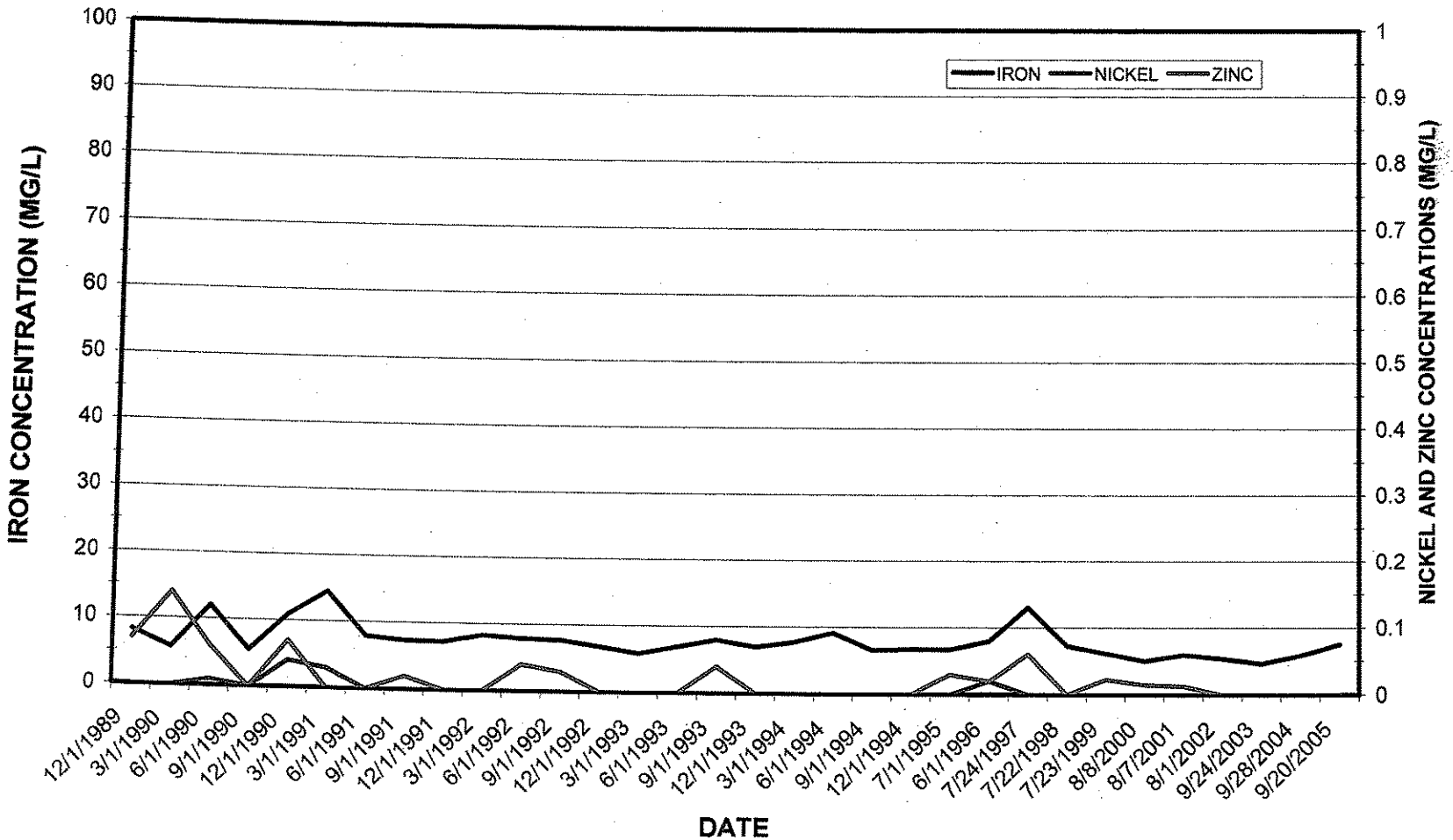


FIGURE 48. METALS IN MW-27C



ATTACHMENT 3

INWARD GRADIENT DATA

Table 9. Inward Gradients for Conservation Chemical Company Site

FRONT STREET REMEDIAL ACTION CORPORTATION - CCC SITE

PIEZOMETER PAIR DIFFERENTIALS

DATE	SW PZ PAIR #1	NW PZ PAIR #2	NE PZ PAIR #3	SE PZ PAIR #4	NORTH PUMPING (GPM)	SOUTH PUMPING (GPM)	TOTAL PUMPING (GPM)	CUMUL. PERIOD (DAYS)
Mar 2001	1.069	1.767	0.687	0.630	54.511	129.880	184.391	3916
Apr 2001	1.058	1.862	0.724	0.625	59.880	129.126	189.007	3946
May 2001	0.994	1.994	0.764	0.634	62.656	129.703	192.359	3977
Jun 2001	0.901	2.043	0.806	0.680	64.055	128.814	192.869	4007
Jul 2001	0.812	2.027	0.872	0.696	64.354	126.349	190.703	4038
Aug 2001	0.746	2.034	0.953	0.692	66.317	124.196	190.512	4069
Sep 2001	0.773	2.034	0.910	0.696	63.956	128.649	192.605	4099
Oct 2001	0.764	1.935	0.876	0.702	58.712	132.890	191.602	4128
Nov 2001	0.815	1.887	0.839	0.691	56.021	139.579	195.601	4158
Dec 2001	0.860	1.941	0.767	0.610	54.397	141.755	196.150	4189
Jan 2002	0.892	1.949	0.758	0.584	52.156	144.638	196.794	4218
Feb 2002	0.896	1.902	0.763	0.605	48.951	148.235	197.187	4245
Mar 2002	0.906	1.748	0.785	0.690	42.490	155.630	198.120	4278
Apr 2002	0.916	1.757	0.772	0.672	38.633	157.049	195.682	4308
May 2002	0.973	1.705	0.789	0.663	37.519	154.527	192.046	4339
Jun 2002	1.060	1.655	0.838	0.669	36.693	155.865	192.558	4375
Jul 2002	1.162	1.658	0.840	0.674	36.536	156.245	192.782	4406
Aug 2002	1.252	1.734	0.795	0.642	36.988	156.313	193.301	4437
Sep 2002	1.238	1.775	0.831	0.613	38.758	154.401	193.160	4467
Oct 2002	1.256	1.906	0.793	0.551	41.235	152.319	193.554	4492
Nov 2002	1.224	1.974	0.795	0.533	43.435	150.377	193.812	4522
Dec 2002	1.204	1.952	0.795	0.547	42.910	150.710	193.620	4553
Jan 2003	1.199	1.917	0.806	0.594	42.651	151.124	193.774	4584
Feb 2003	1.196	1.921	0.787	0.635	42.382	151.861	194.243	4612
Mar 2003	1.205	1.927	0.768	0.661	41.786	152.443	194.229	4643
Apr 2003	1.232	2.009	0.776	0.677	44.214	148.577	192.791	4673
May 2003	1.155	2.194	0.804	0.672	50.414	140.854	191.268	4704
Jun 2003	1.069	2.373	0.859	0.765	57.025	134.656	191.681	4734
Jul 2003	0.972	2.592	0.952	0.838	65.642	126.185	191.826	4765
Aug 2003	0.918	2.691	1.110	0.974	72.584	119.144	191.724	4796
Sep 2003	0.846	2.804	1.248	1.119	78.967	112.766	191.733	4826
Oct 2003	0.777	2.906	1.406	1.272	85.225	107.095	192.451	4857
Nov 2003	0.755	3.010	1.531	1.401	91.535	100.920	192.456	4887
Dec 2003	0.739	3.099	1.736	1.502	100.048	92.020	192.069	4918
Jan 2004	0.739	3.184	1.867	1.546	106.539	83.122	189.613	4949
Feb 2004	0.746	3.259	2.027	1.579	113.213	75.448	188.660	4978

Footnote: All values shown are 12-month running averages through the end of the listed month, measured in inches.

Table 10. Inward Gradients for Conservation Chemical Company Site

FRONT STREET REMEDIAL ACTION CORPORTATION - CCC SITE

PIEZOMETER PAIR DIFFERENTIALS

DATE	SW PZ PAIR #1	NW PZ PAIR #2	NE PZ PAIR #3	SE PZ PAIR #4	NORTH PUMPING (GPM)	SOUTH PUMPING (GPM)	TOTAL PUMPING (GPM)	CUMUL. PERIOD (DAYS)
Jun 2004	0.863	3.286	2.394	1.818	124.519	69.359	193.877	5100
Jul 2004	0.883	3.270	2.396	1.801	124.471	68.695	193.166	5131
Aug 2004	0.921	3.278	2.403	1.807	124.508	68.622	193.130	5162
Sep 2004	0.977	3.274	2.418	1.791	124.518	68.396	192.914	5192
Oct 2004	1.019	3.207	2.468	1.767	124.466	68.274	192.740	5223
Nov 2004	0.984	3.120	2.559	1.741	124.452	68.203	192.655	5253
Dec 2004	0.943	3.196	2.530	1.674	124.879	68.003	192.882	5284
Jan 2005	0.888	3.289	2.555	1.616	126.541	67.605	194.145	5315
Feb 2005	0.854	3.396	2.528	1.540	127.406	67.064	194.470	5343
Mar 2005	0.862	3.336	2.626	1.519	126.313	65.815	192.128	5374
Apr 2005	0.861	3.385	2.649	1.431	126.749	62.990	189.739	5404
May 2005	0.850	3.368	2.633	1.386	124.662	62.902	187.564	5435
Jun 2005	0.824	3.292	2.608	1.363	119.733	62.884	182.617	5465
Jul 2005	0.839	3.165	2.609	1.373	114.769	63.567	178.336	5496
Aug 2005	0.832	3.099	2.530	1.283	109.701	63.624	173.325	5527
Sep 2005	0.837	3.019	2.463	1.218	104.765	63.820	168.585	5557
Oct 2005	0.842	2.968	2.398	1.181	99.674	63.845	163.519	5588
Nov 2005	0.858	2.885	2.364	1.181	94.809	63.883	158.692	5618
Dec 2005	0.877	2.788	2.264	1.129	90.145	63.768	153.912	5649
Jan 2006	0.900	2.746	2.153	1.090	85.848	64.187	150.035	5680
Feb 2006	0.900	2.616	2.112	1.088	81.309	64.711	146.020	5708
Mar 2006	0.843	2.558	2.005	1.020	77.403	64.920	142.323	5739
Apr 2006	0.803	2.501	1.880	0.958	72.323	67.432	139.755	5769
May 2006	0.752	2.424	1.827	0.925	68.399	67.075	135.474	5800
Jun 2006	0.727	2.388	1.849	0.889	68.062	65.591	133.653	5830
Jul 2006	0.691	2.424	1.819	0.826	68.013	64.972	132.985	5862
Aug 2006	0.645	2.440	1.788	0.877	67.516	68.451	135.968	5893
Sep 2006	0.600	2.425	1.738	0.981	65.887	72.520	138.390	5923
Oct 2006	0.568	2.379	1.699	1.086	63.793	76.442	140.235	5954
Nov 2006	0.589	2.337	1.629	1.136	62.166	80.121	142.288	5984
Dec 2006	0.607	2.303	1.619	1.207	60.472	83.809	144.281	6015
Jan 2007	0.639	2.271	1.644	1.265	58.796	86.981	145.776	6046
Feb 2007	0.678	2.281	1.581	1.310	57.297	89.699	146.996	6074
Mar 2007	0.724	2.350	1.461	1.350	55.615	93.646	149.261	6105
Apr 2007	0.759	2.321	1.438	1.475	54.148	96.734	150.882	6135
May 2007	0.814	2.361	1.400	1.616	53.403	100.472	153.875	6166

Footnote: All values shown are 12-month running averages through the end of the listed month, measured in inches.