FIVE-YEAR REVIEW

SECOND FIVE-YEAR REVIEW REPORT

for

MIDCO I
GARY, INDIANA

MAY 2004

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Region 5
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5-17-04

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LIST OF ACRONYMS AND ABBREVIATIONS

AWQC	Ambient Water Quality Criteria
cm/sec	centimeters per second (a unit for hydraulic conductivity)
Consent Decree	Consent Decree for Civil Action No. H 79-556, United States of America vs Midwest Solvent Recovery, Inc., et al. (Defendants); American Can Company, Inc., et al. (Third Party Defendants); vs Accutronics, et al. (Third Party Defendants), which was filed in the United States District Court in Hammond, Indiana on July 23, 1992.
CN	Cyanide
CR	cumulative, incremental lifetime cancer risk
ENVIRON	ENVIRON International Corporation, a consultant for the MRC from June 2000 to the present
EPA	United States Environmental Protection Agency
ERM	Environmental Resources Management - North Central, Inc. or ERM-Enviroclean - North Central, Inc., affiliated consulting firms working for the MRC from around 1987 - September 2002
ESD	Explanation of Significant Differences (EPA document to describe and explain changes to the ROD that do not require an amendment)
ESD#1	Explanation of Significant Differences dated 1/9/96 (EPA document to change MAC and GWCAL for 1,1-dichloroethane)
ESD#2	Explanation of Significant Differences dated 11/2/99 to change the MAC and GWCALs for certain polyaromatic hydrocarbons
ESI	The MRC's contractor for data validation
GWCALs	groundwater cleanup action levels (these are concentrations of contaminants required to be achieved at the end of the groundwater cleanup)
HBLs	Health Based Levels used to evaluate requests to delist hazardous wastes under the Resource Conservation and Recovery Act (for groundwater HBLs were set equal to the MCL or to the more stringent of CR = 10^{-6} or HI = 1.0 for residential water usage if an MCL was not available)
HEAST	EPA's 1997 Health Effects Assessment Summary Tables
HI	cumulative incremental non-carcinogenic hazard index

IDEM	Indiana Department of Environmental Management
InDOT	Indiana Department of Transportation
IRIS	EPA's Integrated Risk Information System.
MACs	maximum allowable concentrations (the treated groundwater must be less than these concentrations before being deep well injected)
MCLs	Primary Maximum Contaminant Levels from 40 CFR 121
mg/kg	milligrams per kilogram, a unit for contaminant concentration in soil, equal to parts per million
mg/m^3	milligrams per cubic meter (a unit for concentration of fugitive dust)
MRC	Midco Remedial Corporation (a corporation formed by the Settling Defendants to the Midco I and Midco II Consent Decree for the purpose of implementing the requirements of the Consent Decree)
NCEA	EPA's National Center for Environmental Assessment
psi	pounds per square inch (a unit for compressive strength)
PAHs	Polyaromatic hydrocarbons
PCBs	Polyphlorinated biphenyls
PRG	EPA, Region 9's preliminary remediation goals
PSGW	Project specific groundwater parameter list. This was a compilation 243 contaminants that are included in the Contract Laboratory Program Target Compound List and Target Analyte List, and additional contaminants listed in Appendix IX of 40 CFR § 261 QAPP Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
Review	the second Five-Year Review
RfD	Reference Dose for non-carcinogenic health effects
RfD_i	Inhalation non-carcinogen reference dose
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision (EPA's official decision document). Unless otherwise noted, this refers to the 1989 ROD as updated by the 1992 ROD Amendment and the two ESDs.

RPM	EPA Remedial Project Manager
sediment/soil CALs	sediment/soil cleanup action levels (required to be achieved in soil below sediments that are excavated)
SF	Cancer potency factor
SF_i	Inhalation cancer potency factor
SOP	Standard Operating Procedures, which are procedures used by a laboratory for conducting a chemical analysis
SOW	Statement of Work, Appendix I to the Midco I and Midco II Consent Decree
S/S	solidification/stabilization
STALs	soil treatment action levels (source area soils that exceed these action levels must be treated by S/S and or by SVE)
SVE	soil vapor extraction
SVOCs	semivolatile organic compounds
µg/l	micrograms per liter, a unit used to express the concentration of contaminants in groundwater and is equal to parts per billion in water
UIC	EPA, Region 5's Underground Injection Control Branch
VOCs	volatile organic compounds
Weston	Weston Solutions, Inc., EPA's oversight contractor

EXECUTIVE SUMMARY

The selected remedy includes access and deed restrictions, excavation of contaminated soil from sediment areas and consolidation of the excavated soil onto the source area, groundwater pump-and-treat and disposal via deep well injection, soil treatment by soil vapor extraction (SVE) and solidification/stabilization (S/S), and a site cover over the source area. The remedial actions are being implemented under a Consent Decree by a group of Settling Defendants, who have formed the Midco Remedial Corporation (MRC) to implement the remedy. EPA is overseeing implementation of the remedy.

The access and deed restriction, and groundwater cleanup portions of the remedy are functioning as intended in the ROD, including complying with air emission limitations and deep well injection requirements for disposal of the treated groundwater. EPA staff believe that the pump-and-treat system is capturing all of the groundwater contamination from the Midco I operation, and there have been reductions in the concentrations of some groundwater contaminants. Operation and monitoring concerns have included:

- an inadequate data validation process;
- inadequate reporting of problems related to complying with groundwater treatment requirements (maximum allowable concentrations or MACs) prior to deep well injection;

- pulling off-site contamination into the groundwater cleanup area; and
- downgradient chromium, nickel, and cyanide groundwater contamination that is not well defined.

EPA has submitted letters to the MRC to resolve problems with the data validation, and reporting. The annual monitoring data will be closely observed for signs of migration of off-site contaminants into the cleanup area, and for downgradient migration of the chromium, nickel and cyanide groundwater contamination. Additional downgradient monitoring wells and/or off-site monitoring wells will be installed if necessary.

Implementation of the soil treatment phase has been delayed. Apparently as a result of this, concentrations of some contaminants in the most highly contaminated source area groundwater have not been significantly reduced. In December 2003, the MRC initiated the SVE soil treatment by construction of a groundwater barrier wall around the most highly contaminated source area groundwater and initiating dewatering the upper 12 feet of the aquifer within the barrier wall. Following this dewatering, the MRC will conduct SVE to remove at least 97% of the VOCs from the soil. The MRC's actions will be more effective at removing VOCs from under and near the water table than the ROD remedy, which did not include a barrier wall or dewatering prior to SVE. Following completion of the SVE, the ROD requires soil treatment by S/S and then construction of a RCRA compliant cover over the source area. During the last couple months the MRC has fallen beyond the expected schedule for dewatering. In response to this, EPA issued a letter to MRC requesting that they develop a plan to accelerate the dewatering.

The top 3 to 12 inches of contaminated sediments and soil from sediment areas have been excavated and consolidated onto the source area, but contamination remains in the soils left in place. The site fence has been extended to enclose the sediment areas to human restrict access. It would be most efficient to

address the risks from the remaining contaminated soils in the sediment areas, during design and construction of the site cover. Although wildlife can be exposed to the contaminants remaining in these sediment areas, EPA has decided that it is acceptable to reduce costs by delaying action on the contaminated sediment areas until the site cover is designed and constructed because the area affected is small, the value of the habitat is minor, the contaminant concentrations may not exceed background.

EPA determined that the toxicity factors and exposure assumptions for evaluating air emissions, and the treatment requirements prior to deep well injection are protective. However, the groundwater cleanup action levels may need to be updated before the pump-and-treat system is shut-down.

In summary, the access/deed restrictions and groundwater remedial actions at Midco I currently protect human health and the environment because contaminated groundwater from Midco I is being contained, because air emission and deep well injection requirements are satisfied, and because direct contact with the contaminated soils and groundwater is being prevented. However in order to assure that the remedy remains protective the following actions need to be implemented:

- improved notification and reporting of operating and maintenance problems affecting compliance with the MACs;
- more comprehensive data validation;
- closely observing annual monitoring data for signs of migration of off-site contaminants into the cleanup area, and for downgradient migration of the chromium, nickel and cyanide groundwater contamination;
- additional downgradient monitoring wells and/or off-site monitoring wells should be installed and monitored if necessary;
- during design of the site cover the human health and ecological risks from the remaining soil contamination in the sediment areas needs to be considered and further evaluated if necessary.

The sediment excavation, soil treatment and site cover phases of the remedy are expected to be protective of human health and the environmental upon completion, and the interim exposure pathways that could result in unacceptable risks are being controlled.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Midco I		
EPA ID *(from WasteLAN)*: IND9908615421		
Region: 5	**State:** IN	**City/County:** Gary / Lake

SITE STATUS	
NPL status: X Final ☐ Deleted ☐ Other (specify)	
Remediation status (choose all that apply): X Under Construction X Operating ☐ Complete	
Multiple OUs?* X YES ☐ NO	**Construction completion date:** NA ___ / ___ / _____
Has site been put into reuse? ☐ YES X NO	

REVIEW STATUS	
Lead agency: X EPA ☐ State ☐ Tribe ☐ Other Federal Agency	
Author name: Richard Boice	
Author title: Environmental Engineer	**Author affiliation:** U.S. EPA
Review period:** 9 / 4 / 03 to 5 / ___ / 2004	
Date(s) of site inspection: 4 / 30 / 04, 12/11/03, 11/19 – 12/16/03, 10/20/03, 10/9/03, 8/14/03, 6/24/03	
Type of review: X Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion	
Review number: ☐ 1 (first) X 2 (second) ☐ 3 (third) ☐ Other (specify)	
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____ ☐ Construction Completion X Previous Five-Year Review Report ☐ Other (specify)	
Triggering action date *(from WasteLAN)*: 10 / 29 / 1998	
Due date *(five years after triggering action date)*: 10 / 29 / 2003	

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:
1. Data quality problems identified in 10% validated data are not evaluated in the rest of the data.
2. Changes in operation and monitoring of the of the pump-and-treat system affecting compliance with the treatment requirements prior to deep well injection (maximum allowable concentrations or MACs) are sometimes not being reported to EPA.
3. Pump-and-treat system may be pulling in off-site contamination.
4. Soils below sediment excavation areas exceed soil CALs are temporarily enclosed in a fence.
5. The extent of downgradient groundwater chromium, nickel and cyanide contamination is not fully defined.
6. Soil treatment is behind schedule.
7. Some toxicity factors and exposure assumptions for air emissions are out of date
8. Some of the treatment standards prior to deep well injection (MACs) are out of date
9. Some groundwater cleanup action levels (GWCALs) are out of date
10. Some soil cleanup action levels (Soil CALs) are out of date

Recommendations and Follow-up Actions:
The MRC must review all data for problems identified in the 10% manually validated data. EPA sent out a letter on this dated April 8, 2004. The MRC must report operational changes affecting MAC compliance to EPA and include operating parameters in its monthly progress reports. EPA sent out a letter on this dated May 6, 2004.

To address concern about pulling off-site contamination into the pump-and-treat system contaminant trends in boundary monitoring wells will be closely watched, and off-site groundwater contamination will be better characterized if necessary. To address the concern about the extent of the chromium; nickel and cyanide contamination, concentrations in peziometer P-l will be closely watched, and an additional nest of monitoring wells installed near P-l.

To address concern about soil exceeding soil CALs in the sediment areas and the protectiveness, of the soil CALs, ecological and human health risks will be considered and further evaluated if necessary during design of the site cover.

To address concern about the delay in soil treatment that may be caused by slow dewatering, EPA sent out a letter dated May 6, 2004 requesting a plan to accelerate dewatering. The overall delay in implementation of the soil treatment will be addressed by proceeding with the soil treatment in accordance with the schedule in Figure 12 of the *Soil Treatment Design/Build Report Alternative Remedy Revision 1*.

EPA determined that the toxicity factors and exposure assumptions for air emission and the treatment standards prior to deep well injection (MACs) are protective. However, the protectiveness of the GWCALS needs to be evaluated prior to shut-down of the pump-and-treat system.

Protectiveness Statement(s):
The access /deed restrictions and groundwater remedial actions at Midco I currently protect human health and the environment because contaminated groundwater from Midco I is being contained, because air emission and deep well injection requirements are satisfied, and because direct contact with the contaminated soils and groundwater is being prevented. However in order to assure that the remedy remains protective the following actions need to be implemented:
- improved notification and reporting of operating and maintenance problems affecting compliance with the MACs;
- more comprehensive data validation;
- closely observe trends in metals and cyanide concentrations in P-l and outer monitoring wells;
- install a nest of monitoring wells at P-1 and better characterize off-site contamination if necessary;
- when evaluating a request for shutdown update the groundwater cleanup action levels if necessary; and
- during design of the final site cover, consider the human health and ecological risks from the remaining soil contamination, and further characterize these risks if necessary.

The sediment excavation, soil treatment and site cover phases of the remedy are expected to be protective of human health and the environmental upon completion, and the interim exposure pathways that could result in unacceptable risks are being controlled.

I. Introduction

This report presents the methods, findings, conclusions, and recommendations of the second Five-Year Review (Review) for the Midco I site located in Gary, Indiana. The purpose of this Review is to evaluate implementation and performance of the remedial actions in order to determine whether or not the remedy is or will be protective of human health and the environment. The remedial action for the Site is expected to result in hazardous substances remaining above concentrations that would limit use and restrict exposure at the end of the remedial action. Therefore, a Five-Year Review is required by statute. [1]

This report was prepared by Richard Boice, who has been the Remedial Project Manager (RPM) for the. United States Environmental Protection Agency (EPA) for Midco I since 1985. The Review relied upon documentation or evaluations conducted by the following parties:

- Weston Solutions, Inc. (Weston), EPA's oversight contractor since 1985;
- Environmental Resource Management, (ERM) a consultant for the Midco Remedial Corporation (MRC) [2] from 1985 through September 2002;
- Environ International Corp. (Environ), a consultant for the MRC from June 2000 through the present;
- David Brauner, Ecologist, EPA;
- Edward Karecki, Ecologist, U.S. Fish and Wildlife Service;
- EPA, Region 9, Technical Support Team.

The following parties also reviewed and provided input into the Review before it was completed:

- the EPA Region 5, Underground Injection Control Branch (UIC);
- the Indiana Department of Environmental Management (IDEM);
- the MRC.

Work specifically on this Review was initiated by the RPM on September 4, 2003, but, 1 oversight of the remedial actions and evaluation of the remedy have been an ongoing process for the last five years. This oversight and evaluation has included periodic on-site inspections; oversight of monitoring; and review of reports on operation, monitoring, pilot and treatability testing, conceptual remedial alternatives, design documents, and modifications to reduce costs and increase efficiency. This Review was officially completed on the signature date. The scheduled date for completion of the Review' was October 29, 2003 (five years from October 29, 1998, the signature date of the 1998 Five-Year Review Report).

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1 Section 121(c) of the Comprehensive Environmental Response Compensation and Liability Act, 42, U.S.C. § 9621 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and Section 300.430(f)(4)(ii) of the National Contingency Plan, requires periodic review (at least once every five years) for sites where hazardous substances, pollutants or contaminants will remain above levels that would allow unlimited use and unrestricted exposure after completion of the remedial action.

2 This is a corporation started by Settling Defendants to the Midco I and Midco II Consent Decree. The purpose of the Midco Remedial Corporation is to implement the requirements of the Midco I and Midco II Consent Decree.

This report will be placed in the Midco I Administrative Record file located at EPA's office at 77 W. Jackson Boulevard, Chicago, Illinois, and in the local document repository, which is located in the City of Gary Public Library.

II. Site Chronology

The attached Table 1 provides a chronology of past events, and Table 2 provides the future schedule.

III. Background

Physical Characteristics

The Midco I source area occupies approximately four acres located at 7400 West 15th Avenue, Gary, Indiana (see Figure 1). The original ridge and swale topography has been extensively modified by man. Within the Midco I source area the swales have been filled in to create a flat surface. Midco I is bordered on the west by an Indiana Department of Transportation (InDOT) storage facility, on the north by remnants of the original ridge and swale topography, on the east by cut-and-fill land that is now being used by a concrete recycling operation, and on the south by small business buildings (see Figure 2). It has been alleged that improper waste disposal occurred just east of Midco I on the concrete recycling operation property.

Midco I is approximately 3.8 miles south of Lake Michigan, and lies midway between the Grand Calumet River and the Little Calumet River. The 9th Avenue Dump Superfund site is approximately 500 feet north of Midco I. Some of the original dune and swale wetlands are located between Midco I and 9th Avenue Dump and east of 9th Avenue Dump. The habitat near Midco I supports a variety of fish and wildlife populations. Some Indiana-designated endangered species and threatened plants have been observed near Midco I.. The southern end of Lake Michigan is a convergence area for migratory birds following the north-south boundaries of the Lake. The only aquifer of concern at Midco I is the Calumet aquifer, whose water table is only a few feet below the surface. The Calumet aquifer is approximately 30 feet thick at Midco I and is underlain by a 110 foot thick sequence of silty clay, and silt loam. If no actions were taken, the Midco I contaminated groundwater would probably eventually vent to the Grand Calumet River.

Land and Resource Use

Midco I is in an area of mixed use for commerce and light industry, but is within 1/4 mile of a residential neighborhood in Hammond, Indiana and within 3000 feet of a residential neighborhood in Gary, Indiana. Plats for the Midco I area show a network of roads that suggest that it was originally planned for residential development. In the 1950s, the area started to be graded. The southern end of the Midco I source area was graded in the 1960s, and by 1973 was being used for storage of drums and scrap metal. By the 1970s the land surrounding Midco I vicinity was mostly graded and being used for industrial and commercial purposes. On a conceptual master plan, the City of Gary has designated Midco I as part of a Route 912 Industrial Park, and has also been considered part of a Gary-Chicago Airport Development Zone.

During the early development of northwest Indiana, the Calumet aquifer was an important source of residential water. However at this time, the Calumet aquifer is little used, and the predominant source of

residential and industrial water in the Midco I area is Lake Michigan. The Calumet aquifer is very susceptible to contamination because it is a surficial aquifer and the area is heavily developed for both industrial and residential uses. The Calumet aquifer is contaminated in many localized areas, but the majority of the aquifer still has acceptable quality for drinking. A well inventory conducted during the Remedial Investigation (RI) in around 1988, identified 68 private wells screened in the Calumet aquifer within approximately one mile of Midco 1,16 of which are potentially downgradient of Midco I.

History of Contamination

Midwest Solvent Recovery began industrial waste recycling, storage and disposal at Midco I sometime prior to June 1973. Operations included storage and disposal of thousands of drums and a number of tanks of chemical wastes. Drums and tanks of liquid wastes were stored outside without any protection from the weather. In November 1973, an inspector from the Indiana State Board of Health estimated that 6000-7000 drums were stockpiled on the site. Leakage of drums and bulk tanks, and disposal into a pit or pits on site has been documented. In December 1976, a large fire destroyed an estimated 14,000 drums containing chemical wastes and resulted in more spillage. Following the fire, the Midco I operator relocated to Midco II, which is another Superfund site located at 5900 Industrial Highway, Gary, Indiana. However, hazardous waste operations at Midco I were reinitiated in October 1977 and conducted through approximately February 1979 by Industrial Techtonics, Inc., who abandoned the property leaving an estimated 14,000 drums of industrial waste stacked up to four high, as well as thousands of fire-damaged drums. In June 1991, severe flooding reportedly caused waste from east of Cline Avenue to drain into Hammond. Contact with this flood water reportedly caused skin burns. Many believe that this was caused by drainage from Midco I or 9th Avenue Dump.

Initial Response

On February 24, 1978, the Lake County Circuit Court ordered Midwest Solvent Disposal Company to remove and properly dispose of drums of cyanide and other hazardous wastes from Midco I and Midco II. This order was never obeyed. During 1979, the Indiana State Board of Health, EPA and the Gary Fire Department investigated the site, and the United States filed a complaint in Federal District Court pursuant to Section 7003 of the Resource Conservation and Recovery Act (RCRA), Civil Action 79-556. A preliminary injunction was granted on January 31,1980. The Court also required Industrial Techtonics, Inc. to remove certain surface waste from the site, and for Midwest Solvent Disposal Company to submit a plan for investigation and cleanup of their waste. However, these Court actions were ineffective.

In June 1981, EPA installed a fence around Midco I. From January through July 1982, EPA conducted removal and off-site disposal of surficial wastes at Midco I. This action included: removal of 7,000 cubic yards of crushed drums; 84,000 gallons of solvents; 5,600 gallons of acids; 13,500 gallons of bases; 56,500 gallons of inert wastes; 940 drums of flammable solids; 170 labpacks; and 7,200 cubic yards of soil (the top 6 inches to 1 foot). It also included placing 6-12 inches of clay soil over most of Midco I.

Midco I was placed on the National Priorities List in December 1982. Shortly after EPA initiated work towards conducting its own Remedial Investigation/Feasibility Study (RI/FS), EPA reached a settlement with a group of potential generators to conduct an RI/FS and reimburse EPA costs. The group of generators conducted the RI/FS from 1985 through 1989. After the completion of the public comment period on the Proposed Plan, EPA issued a Record of Decision (ROD) in June 1989.

Basis for Taking Action

The RI included evaluation of the hydrogeology, and extensive sampling of groundwater, source area subsurface soils, and surface sediments in surrounding wetlands. All sampling and analyses were conducted in accordance with an EPA approved Quality Assurance Project Plan (QAPP). Samples were analyzed for the full list of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticide/PCBs, and inorganics (metals and cyanide) included in the routine analytical services of EPA's Contract Laboratory Program (this list will be referred to as the Target Compound List (TCL) for organic contaminants and Target Analyte List (TAL) for inorganic contaminants). In addition, 14 samples from test trenches in the most contaminated source areas were also analyzed for 2,3,7,8-tetrachlorodibenzodioxin. Groundwater samples were also analyzed for chlorides and other general water quality parameters.

The RI demonstrated that the source area soils, and the groundwater near the site were highly contaminated. For residential usage of groundwater, the lifetime, incremental, cumulative carcinogenic risk (CR) was estimated to be 4.1×10^{-2} and the cumulative non-carcinogenic hazard index (HI) was estimated to be 86. For residential soil exposures, CR was estimated to be 6.8×10^{-5}, and HI was estimated to be 3.6. There were also significant risks to off-site property owners, and to biota in the vicinity of the site. It is possible that continued off-site migration of contamination in groundwater would eventually impact downgradient residential wells.

The RI groundwater results exceeded the currently effective Safe Drinking Water Act Primary Maximum Contaminant Levels (MCLs) for the following contaminants:

benzene	antimony	bis(2-ethylhexyl) phthalate
1,2-dichloroethane	arsenic	lindane
1,1-dichloroethylene	barium	pentachlorophenol
ethylbenzene	cadmium	
methylene chloride	chromium	
tetrachloroethylene	cyanide	
toluene	lead	
trans-1,2-dichloroethylene	selenium	
1,1,1-trichloroethane	thallium	
trichloroethylene	trihalomethanes	
vinyl chloride	xylene	

Other contaminants of concern identified from the RI included:

acetone	copper	butylbenzylphalate
2-butanone	iron	chlordane
bis(2-chloroethyl) ether	nickel	cresol
chlorobenzene	zinc	di-n-butylphalate
chloroethane	mercury	dieldrin
chloroform	manganese	diethylphalate
1,1-dichloroethane	vanadium	isophorone
4-methyl-2-pentanone		phenol
2-hexanone		PAHs
		PCBs
		di-n-octylphthalate
		endrin
		aldrin

No 2,3,7,8-tetrachlorodibenzodioxin was detected. An unanticipated result was that the aquifer in the vicinity of Midco I is also highly saline primarily due to sodium chloride, chloride is as high as 15,000 mg/l below the site. It was found that most of the salinity was caused by migration from the InDOT salt storage facility, which is adjacent to the west side of Midco I.

IV. Remedial Actions

Remedy Selection

Remedial Objectives

The remedial objectives used to select the remedial action in the 1989 ROD as revised by the 1992 ROD Amendment included:

- Eliminate direct contract threat from contaminated source area soil and sediments;
- Treat the principal threat in soil to substantially reduce the threat of groundwater contamination and the direct contact threat;
- Prevent off-site migration of contamination in groundwater;
- Assure that contaminants do not adversely affect biota;
- Cleanup groundwater.

ROD Requirements

The 1989 ROD as amended by the 1992 ROD Amendment provides for the following remedy components:

- Excavation and solidification/stabilization (S/S) of contaminated sediments and underlying soils in defined wetland areas surrounding Midco I;
- Construction and operation of a groundwater pump-and-treat system to contain and cleanup contaminated groundwater, and to treat the extracted groundwater as required prior to discharge;
- Construction and operation of a deep underground injection well for disposal of the contaminated groundwater following treatment;
- Treatment of highly contaminated soil by a combination of solidification/stabilization (S/S) and soil vapor extraction (SVE);
- Construction of a final cover, access restrictions, deed restrictions and monitoring.

The attached Table 3 provides a summary of the ROD cleanup and performance requirements applying to each of these remedy components:

Based on updated toxicological information, the maximum allowable concentration prior to deep well injection (MAC) was relaxed and the GWCAL made more stringent for 1,1-dichloroethane in an Explanation of Significant Differences dated January 9,1996 (ESD#1). Also using updated toxicological information, the MACs for a number of the polyaromatic hydrocarbons (PAHs) were relaxed, the inhalation carcinogenic potency factor for hexavalent chromium corrected, and oral and inhalation carcinogenic potency factors for vinyl chloride added, in an Explanation of Significant Differences dated November 2, 1999 (ESD#2).

Remedy Implementation

Settlement

EPA, the State of Indiana and Settling Defendants entered into an agreement on the final remedial actions for both Midco I and Midco II in a Consent Decree, which became effective on June 23, 1992. The Settling Defendants formed the MRC to carry out the remedial actions. The MRC contracted with ERM and later with Environ to be the MRC's primary contractor for design, construction, operation, maintenance and monitoring of the remedial actions.

Quality Assurance

In accordance with Consent Decree requirements, all sampling data for the remedial design and remedial action work have been produced in accordance with procedures in an EPA-approved Quality Assurance Project Plan (QAPP). EPA approved the *Remedial Design/Remedial Action Quality Assurance Project Plan* dated May 14, 1993. This QAPP defined sampling and analytical procedures, and provided for validation of 100% of the data by an independent contractor.

The SOW requires that the groundwater monitoring samples be analyzed for all contaminants on the TCL/TAL and additional contaminants listed in Appendix IX of 40 CFR § 261 that were detected during the first round of sampling. To address this requirement during preparation of the QAPP, a list of 243 project specific groundwater parameters (PSGWs) were developed, which included the TAL/TCL and additional hazardous constituents included in Appendix IX. The PSGWs were divided into the following organic and inorganic fractions for the analyses: VOCs, direct injection VOCs, methanol, SVOCs, low concentration PAHs, chlorinated pesticides/PCBs, organophosphate pesticides, herbicides, dioxin and furans, metals, cyanide, sulfide, fluoride, and hexavalent chromium. The parameters in each fraction and the project-required detection limits are listed in the attached Table 4 (Table 3-2 of the QAPP). Following the initial sampling the PSGWs were reduced to 180 contaminants to be included in the annual groundwater monitoring and MAC compliance testing. This groundwater monitoring list is identified in the attached Table 5.

From time to time, the QAPP has been added to, corrected, and updated as follows:

- March 29,1996, EPA approved an Addendum to the QAPP to add SOPs for additional laboratories and to make corrections;
- April 25, 1996, EPA approved a revised SOP for CompuChem's direct injection procedures for methanol analysis.
- August 15, 1997, ERM submitted updated SOPs for herbicide analyses by IEA, Inc.
- April 18, 2000, EPA approved a low-flow sampling method for sampling the piezometers, and use of OLM 4.2 instead of the low concentration method for volatile organic compound analyses for wells containing more than 1000 µg/l of VOCs because it was found that ketone results were not useable using the low concentration method.
- August 21, 2002, EPA approved reducing manual data validation to 10% of samples and a change in validation contractors.
- May 7, 2004, EPA approved a revised sulfide SOP.

EPA and Weston site managers routinely review the validation reports. In addition, a Weston chemist has audited a number of the data validation reports by checking the validation report against information in the raw data packages. The attached Table 6 summarizes the results of these audits. Except for the

audit of the Midco II sediment sample results conducted in November 1994, the audits verified that the data was reliable and that the validation had been properly conducted.

EPA, IDEM, and Weston have routinely monitored data quality and data interpretation through review of monitoring reports. This has included annual groundwater monitoring reports, air monitoring data, capture zone evaluations, soil treatability study results, soil . treatment proposals, and other documents submitted by the MRC. EPA and Weston's review of the *2002 Annual Ground Water Monitoring Report* identified the following problems with validating only 10% of the samples:

- all samples were to be validated using field QC data, but this was done only for the manually validated samples.
- the data that were not manually validated were not checked for the data problems and data qualifiers resulting from the manual validation.

EPA and Environ have agreed that in the future any data quality problem identified in the data that is manually validated will also be manually checked in the remainder of the data.

In 1999, EPA tasked Weston to perform hydraulic modeling to evaluate the Midco I water level data. Subsequently EPA and the MRC agreed to use Weston's modeling to evaluate water level data to estimate the extent of groundwater capture, and evaluate alternatives for expansion and redistribution of groundwater pumping.

To evaluate the quality of field sampling and measurements, EPA has had Weston provide field oversight of each of the annual groundwater monitoring events, of critical water-level monitoring events, of some of the air monitoring events, and occasionally of the treatment system influent and effluent sampling (see Table 16). Because of persistent problems with the water-level surveys, ERM with input from EPA and Weston developed standard operating procedures for water level measurements during 1998 and 1999. The UIC oversees testing of the deep injection well.

EPA has overseen the quality of construction by reviewing and approving design documents, and by field oversight of the construction. Weston provides support to EPA in review of design documents, and IDEM also participates in this review. The design documents have included construction quality assurance plans, which define procedures to be implemented to assure that the construction meets the specifications.

The RPM, IDEM site project manager, IDEM technical specialists, and Weston also review construction completion reports. The EPA Region 5 UIC reviews documents related to the deep underground injection well. EPA has tasked Weston to provide field oversight of all construction and remedial actions (see Table 16) other than the deep well work, while the Region 5 UIC has overseen construction work for the deep injection well.

EPA has overseen operation and maintenance of the pump-and-treat and deep well injection system, through on-site inspections, review of the Operation and Maintenance Plan, health and safety plans, monthly progress reports and other documents related to operation and maintenance. The operation and maintenance must be in accordance with the EPA-approved Operation and Maintenance Plan. The RPM, the Region 5 UIC program, and the Weston site manager have routinely reviewed the MRC's monthly progress reports, and have periodically inspected the facility for operation and maintenance (see Table 16).

Health and Safety

Contractors for the MRC have prepared health and safety plans, which have been reviewed by EPA. ERM prepared the following Health and Safety Plans to cover remedial design and remedial action activities:

- *Remedial Design/Remedial Action Health and Safety Plan*, May 14,1993;
- *Construction Health and Safety Plan*, August 1994;
- *Operating and Maintenance Health and Safety Plan*, November 1996.

During an inspection on February 14, 2001, a Weston inspector identified concerns about health and safety procedures. In response to this, Environ conducted an audit of the operation and maintenance health and safety activities, and implemented certain improvements (see March 13, 2001 Environ letter).

In November 2003, Contract Dewatering, Inc. submitted a separate heath and safety plan applying to construction of the groundwater barrier wall.

Access and Deed Restrictions

The soil and groundwater treatment and containment actions have not yet been completed. However, in the interim the site remains protective of public health through access and deed restrictions. Access to the site was already restricted prior to the MRC taking over the remedy. The MRC has expanded the site fence as needed to enclose an expanded area of potential soil contamination, the groundwater treatment facility, and contaminated sediments that were not excavated. The present extent of the Midco I fence is shown in Figure 3.

In addition to the fence, access is restricted by Environ personnel, who are present on the site to operate the ground water treatment system almost every day. These personnel will be able to observe evidence of trespassing on the site and initiate corrective measures. In addition, EPA representatives visit the site several times each year.

The Consent Decree requires that certain Settling Defendants perform the following actions relative to deeds and the land records applying to the property that they own:

- file an EPA-approved notice to subsequent property owners in the land records of Lake County that they own part a facility where hazardous substances were disposed of;
- notify EPA and the State of Indiana prior to transfer of the property, and assure that any deed, title or other instrument of conveyance of the property must contain a notice that the property is subject of the Consent Decree;
- record a copy of the Consent Decree in the chain of title in the land records of Lake County, Indiana for property that they own;
- file in the land records a deed/use restriction in the form shown in Attachment 1 to this report (Appendix 8 of the Consent Decree).

To the extent that property is not owned by the Settling Defendants, the Consent Decree requires them to use their best efforts to cause the owners of such property to implement the deed notices, and restrictions identified above. According to first Annual Report to the Court, in 1992 the Settling Defendants monitored and assisted in placing deed restrictions in the land records for property within the Midco I and Midco II site boundaries.

Compliance with Air Emission Requirements

The Investigation and Monitoring Plan requires monitoring of air emissions, and ambient air for VOCs and particulates. In addition, monitoring air emissions with a photoionization detector is required during intrusive work for health and safety reasons. As described in the 1998 *Five-Year Review Report*, EPA determined that air emissions during sediment excavation, and during groundwater treatment system were well below the air emission criteria. For that reason, EPA approved discontinuation of air emission and ambient air monitoring for the groundwater treatment system.

During construction of the groundwater barrier wall in November and December 2003, total VOC air emissions were continuously monitored during excavation operations using a photoionization detector (PID). PID readings increased above background only momentarily. As a result, there was no need for workers to don respirators. In addition, Environ collected upwind and downwind Suma canister samples for analysis of VOCs twice during the excavation. The Suma canister sample results will be used to evaluate compliance with the air emissions criteria.

For design of the SVE system, Environ expects to use an afterburner to reduce VOC emissions. EPA will require Suma canister samples from the emissions, and upwind and downwind locations to evaluate compliance with the air emissions criteria. Because it may be impossible to meet the 10^{-7} cancer risk criteria at the property boundary, EPA has agreed to apply this criteria at the nearest residence instead of at the property boundary.

On-site Storage and Off-site Disposal

In the ROD, EPA determined that the following listed hazardous waste as defined in RCRA regulations had been disposed on-site: F001; F002; F003; F005; F007; F008; and F009. For this reason, any residuals from treatment of groundwater or soil, must be handled and disposed of as a RCRA hazardous waste unless testing is conducted to demonstrate that the waste is not hazardous under RCRA. This would include the pre-filters from the groundwater treatment. Judy Kleiman, the RCRA/Superfund Coordinator stated that the post filters qualify as debris and are regulated by 40 CFR 268.45 (see December 21,1998 memorandum). Judy Kleiman also clarified that the pre-filters could not be disposed under the site cover (see January 14, 1999 conversation record).

The MRC has stored soil from drill settings, waste water from sampling, personal protective equipment, and spent carbon in barrels, which were stored on pallets and covered with a tarp in the exclusion zone. Pre-filters and post-filters have been segregated and stored in the exclusion zone on top of a tarp, and with a covering tarp, or in a roll-off box covered with a tarp. Waste water residuals from sampling have been disposed of by adding to the influent to the UV/HP unit.

From November 27-December 19,1998, ERM arranged for barrels containing soil cuttings from the monitoring well installation emptied and spread onto the flexible membrane liner covering the sediment storage area, and the empty barrels crushed. In March 1999, ERM placed new synthetic liner placed over the sediment area. In December 1998, ERM arranged for transport and off-site disposal , of 900 pounds of spent carbon by Waste Management Industrial Services, Calumet City, Illinois. The disposal facility was Chemical Waste Management Resource Recovery, West Carrollton, Ohio, where it was disposed of by fuel blending. This facility was in compliance with EPA's off-site policy. In September 18 and 25, 2001, ERM arranged for transport and off-site disposal of waste filters from the treatment system by "microencapsulation" at Environmental Quality Company, Belleville, Michigan.

In 2001, an Environ and a Weston employee observed that the business east of Midco I was dumping some type of sludge near the eastern fence of Midco I. EPA notified IDEM of this problem. In 2002, an Environ operator observed that InDOT drivers were discharging some type of liquid on its property near, the deep injection well. This was ^ reported to the State, and this practice has been discontinued.

Environ is planning for another disposal event. The remaining prefilters will be disposed as RCRA hazardous wastes, and the post-filters disposed as a non-hazardous waste at Environmental Quality Company, Belleville, Michigan.

Excavation of Sediments Exceeding the Soil CALs

In August through October 1993, the ERM conducted partial excavation and on-site containment of sediments in the areas defined in the Consent Decree. From 3 to 12 inches of sediment/soils were removed, and the excavation extended down to the water table and into the native sand in all areas. The excavated sediment/soils were placed on the Midco I site in the minimum areas for soil treatment. The sediments were mixed with ground corn cobs to absorb free water, and a temporary flexible membrane liner was placed over the pile to prevent erosion. The condition of the flexible membrane liner is regularly inspected.

Following the excavation, ERM, with oversight by Weston, collected confirmatory samples to evaluate attainment of the soil CALs. The sampling, analysis and data validation was conducted in accordance with an EPA approved Quality Assurance Project Plan. 14 out of 27 confirmatory samples exceeded the CR = 10^{-6} soil CAL. This was due to the following detections:

- Carcinogenic PAHs in 13 samples with CR as high as 4 X 10^{-4} and total concentration as high as 22 mg/kg. However, three of the highest risk locations were G2, G3 and G4, all of which may be affected by run-off from off-site sources (see the attached Figure 3).
- Polychlorinated biphenyls (PCBs) in 2 samples (603 and B04) with CR as high as 1 X 10^{-4}, and a concentration as high as 2.6 mg/kg.
- Bis(2-ethylhexyl) phthalate in 2 samples (E02 and E03) with CR as high as 3.2 X 10^{-6}, and a concentration as high as 19 mg/kg. In addition, one of the fourteen samples (F04) exceeded the soil CAL for lead (621 mg/kg).

Because of the difficulties in excavating soil below the water table, limitation of storage area on the site, and uncertainty about the extent of additional excavation that would be necessary to meet the soil CALs, the MRC proposed that the site fence be extended around the sediment areas (see Figure 3) instead of conducting further excavation. Since the calculated risks were based on lifetime residential exposures, EPA concurs that the fence would provide sufficient protection to public health. In addition, off-site migration of contaminants through the groundwater is being prevented by the pump-and-treat system, and the area is flat enough so that off-site migration in surface water is not significant. However, initial screening of the soil data indicates that, concentrations of chrysene, phenanthrene, total polyaromatic hydrocarbons, lead, manganese, chromium, copper and nickel are high enough in some samples to cause severe effects on invertebrates (see attached December 1, 1997 memorandum from Edward Karecki of the United States Fish and Wildlife Service). Therefore, it is possible that there is an ongoing negative impact on wildlife that live or feed in the contaminated sediment areas.

As an interim measure, EPA has allowed the MRC to enclose the sediment areas with a fence rather than requiring further excavation. The fence and the flexible membrane liner over the sediments are regularly inspected. During design of the site cover, EPA will require consideration of human health and

ecological risks from the contaminated soils in the sediment areas. Options to address that may be considered to address the contaminated soils in the sediment areas include covering the contaminated sediment areas with clean soils, conducting further excavation and containing the excavated soils under the site cover, and leaving contaminated soils in place. If the MRC proposes to leave contaminated soils in place, EPA would require that the residual human health and ecological risks be more fully evaluated.

Deep Well Injection System

Protection of underground sources of drinking water from the deep well injection operation is assured by complying with the requirements of the EPA, Underground Injection Control program. The deep well injection is required to be into the lower Mount Simon aquifer, which is not a drinking water aquifer at Midco I because the total dissolved solids exceed 10,000 mg/l. As stated in the 1998 *Five-Year Review Report*, EPA has determined that the geologic location of the deep injection well does not meet the stringent requirements for deep injection of hazardous wastes (as defined by RCRA). Therefore, the well is a Class I non-hazardous injection well, which can only inject non-hazardous fluids. The measures being implemented to comply with requirements for a Class I non-hazardous injection well are summarized in the following EPA approved documents: *Midco Remedial Corporation, Midco I and Midco II Superfund Sites, Gary, Indiana, Underground Injection Control Permit Application*, Golden Environmental Services, Inc. June 1993; and as updated by the *Five Year Underground Injection Well Reapplication Midco WDW-1, Midco Remedial Corporation*, ERM, March 20,1998. A list of some of specific requirements for deep well are also listed in the 1998 Five-Year Review Report, and these requirements have not changed.

In 1993-1994 the Golden Environmental Services under contract with the MRC, designed and constructed the deep injection well. The well as constructed met the requirements of the Underground Injection Control Permit Application. The MRC has performed the required monitoring, including conducting and gaining EPA approval of the required annual pressure transient tests and five-year mechanical integrity tests. Monitoring for compliance with the MACs are discussed in the next section.

From time to time the ERM and Environ has made changes to the underground injection procedures, equipment, or monitoring to make improvement or increase efficiency. To address increases in injection pressure possibly caused by biological growth, the MRC conducted well cleaning by injection of well cleaning fluids in 9/98, 1/00, 5/00, and 9/00. It appeared that the effectiveness of the well cleaning events was only temporary. Therefore, Environ installed an acid feed system that can adjust the pH of the injectate. Using this system, the pH of the injectate is lowered to 3-4 when injection pressures start to rise. This system started operating in December 2001, and since then, periodic well cleaning events have been unnecessary. This system has also saved money, and eliminated the downtimes needed for well cleaning.

In October 1998, the ERM conducted an inspection and workover of the deep well, which included: replacement of the carbon steel injection tubing with fiberglass tubing because of concern about corrosion of the carbon steel; replacement of some carbon steel piping with PVC piping; and cleaning and refurbishing valves. Environ reported a , leak of combined treated groundwater from Midco I and Midco II at the deep well injection wellhead building on March 30, 2003 and on May 1, 2004. Both leaks were caused by a break in the aboveground piping at the wellhead, which is on InDOT property adjacent to Midco I. Environ reported an estimated release of 2,200 gallons of the combined treated Midco I and Midco II groundwater on March 30, 2003 and 1,500 gallons on May 1, 2004. In both events, the water leaked was contained in a sump around the wellhead area, and was recovered.

Following the March 30, 2003 release, Environ replaced the piping to the wellhead with piping with a higher pressure rating, added more bracing, and installed an alarm and automatic shut-down in response to water build-up in the wellhead sump. Environ reported that this alarm and automatic shutdown performed properly on May 1, 2004. Environ reported that they believe that the May 1, 2004 leak was caused by fatigue due to long-term vibrations. In response to this, Environ plans to replace the PVC pipe back to steel pipe.

Design, Construction, Operation and Maintenance of the Groundwater Pump-and-Treat System

ERM performed the initial remedial design for the groundwater extraction, treatment and deep well injection system from 1993-1994. Groundwater sampling was conducted during the spring of 1993 to determine the required extent of the capture zone and to evaluate treatment options. Based on this sampling, it was determined that it would be unnecessary to treat metals, but that treatment of certain VOCs would be necessary to meet the MACs. The MRC proposed and EPA approved a treatment system consisting of filtration and organic treatment using an ultraviolet light/hydrogen peroxide (UV/HP) system. The design process consisted of the following in. order of treatment: an equalization tank; prefiltration using cartridge filters; an acid feed system to prevent dirt, oil or precipitates from inhibiting UV light penetration; a UV/HP unit; a caustic feed system to neutralize the acid if necessary; automated post treatment monitoring for indicator VOCs using a gas chromatograph (GC); and post treatment filtration using cartridge filters prior to combining the treated groundwater with treated groundwater pumped from Midco II and pumping the combined flow to the deep well.

In 1994-95 ERM constructed the groundwater extraction, treatment and injection system. During the summer of 1996, ERM added an air stripper with carbon off-gas treatment following the UV/HP unit. Continuous operation of the Midco I pump-and-treat system was initiated in February 1997. Following start up, air emissions and ambient air were periodically sampled, and air between carbon units was continuously monitored with a flame ionization detector.

The groundwater pump-and-treat system is to be operated and maintained in accordance with the *Ground Water Remediation Systems Operation and Maintenance Plan*, ERM, August 1994, Revised November 1996. Procedures in this plan have been updated from time to time as necessary to implement improved or streamlined procedures and operate new equipment. Updates are included in the following documents:

- *Ground Water Extraction and Treatment System Corrective Action Recommendations Report*, ERM, August 1998, as revised by ERM's October 27, 1 998 memorandum. These documents outlined measures that would be taken to improve groundwater extraction rates.
- Letters re: Modification to the Extraction Well Maintenance Procedures, ERM, 9/14/98, 10/2/98 and 10/6/98.
- Letter re: Capture Zone Evaluations, Midco I, Environ, December 21 , 2001. This letter identified the increased and redistributed pumping rates.
- Letter re: Midco I Site, Environ, . January 15, 2002. This letter identified the following changes: bypassing the air stripper; reduction to use of one UV lamp; and changes to the prefiltration system.

In January 2001, ERM started permanent operation of the treatment system started permanent operation using additional extraction well (EW7), and the higher pumping rates (total equals 32 gpm) approved by EPA in order to achieve the required capture zone.

The influent and effluent data from the MAC compliance demonstration and the quarterly influent/ effluent sampling documents that the treatment system can be very effective in reducing concentrations of certain VOCs. The following VOCs appear to be easy to reduce: monoaromatic hyrocarbons, such as toluene and phenols; chlorinated alkenes, such as vinyl chloride and cis-1,2-dichloroethylene; and some other VOCs, such as chloroethane, 1,2-dichloropropane, and methyl-isobutyl ketone. It also appears that some reduction is achieved for chlorinated alkanes such as 1,1-dichloroethane, methylene chloride, 1,1,1-trichloroethane, and 1,2-dichloropropane, but these VOCs are more difficult to treat using the UV/HP system. Acetone appears to be generated by the treatment as it is consistently higher in the effluent than the influent. However, the effluent acetone concentrations are consistently less than the MAC.

To investigate whether the UV/HP system reduces organic contaminants other than VOCs, the influent and effluent data that equaled or exceeded the practical quantitation levels for non-volatile organic contaminants is tabulated in the attached Table 7. Although some of the data in Table 7 appears to indicate that the treatment system can reduce non-volatile organic compounds, inconsistencies between detections in duplicate samples and influent/effluent samples indicates that these low-level detections need to be used with caution. Therefore, no conclusions should be reached using this data. However, the Midco I UV/HP treatment system is similar to Midco II's, where the data does demonstrate a reduction in low concentration PAH compounds.

Groundwater Treatment and Monitoring to Meet the MACs

The approved Investigation and Monitoring Plan provides that, before continuous treatment and deep well injection is initiated, testing conducted over 24-hour, three-day, and four-week periods must demonstrate that the system consistently meets the MACs. During each test effluent samples must be collected periodically and analyzed for the groundwater monitoring parameters, and the results compared to the MACs. The water discharged from the one-day test had to be stored on-site until it was determined that treatment conditions resulted in compliance with the MACs. In the spring of 1995, ERM conducted a number of one-day tests under more and more severe treatment conditions. Finally, ERM concluded that the UV/HP system could not reduce 1,1-dichloroethane to its MAC (2.5 µg/l).

The MAC for 1,1-dichloroethane in the 1992 ROD Amendment was based on an HBL, which relied upon an estimate of the carcinogenic potency of 1,1-dichloroethane from a 1985 EPA report. EPA risk assessors carefully reviewed the most up to date information on the toxicity of 1,1-dichloroethane, and concluded that it was no longer justifiable to characterize 1,1-dichloroethane as a carcinogenic compound. They recommended that the MAC be revised to 880 µg/l. This change was formalized in ESD#1. Subsequent to issuance of ESD#1, ERM proceeded with additional 24-hour tests, but found that it could not meet the MAC for methylene chloride. To address this problem during the summer of 1996, ERM added a small air stripper following the UV/HP unit, and a vapor phase carbon treatment system to control air emissions from the air stripper. Subsequent 24-hour, three-day and four-week tests demonstrated that, with the addition of the air stripper, the treatment system consistently met all MACs, and the pump-and-treat system started continuous operation on January 30, 1997.

The Investigation and Monitoring Plan provides for the following monitoring for compliance with MACs once continuous operation of the pump-and-treat system was initiated:

- every three months, sampling the treatment system influent for the groundwater monitoring parameters;
- sampling the effluent annually for the groundwater monitoring parameters;

- monthly sampling of the effluent for surrogate parameters; and
- hourly sampling for an indicator parameter once continuous operation was initiated.

The surrogate and indicator parameters were to be chosen after some initial treatability testing. The chosen surrogate parameters for the monthly effluent sampling were the VOC organic fraction. The initial indicator for hourly monitoring was methylene chloride measured using an on-site gas chromatograph. The design provides for automatic shutdown of the system if methylene chloride is detected exceeding the MAC. In a letter dated April 18, 2000, EPA approved discontinuation of the GC monitoring, but it was later reinitiated because it was helpful to assure compliance with the MAC during minor process revisions. EPA and Environ later, agreed to add GC monitoring for vinyl chloride. In an October 4, 2001 letter, EPA identified the need to monitor for low concentration PAHs in the monthly effluent samples because of PAH detections exceeding the MACs in March and June 2001.

The monthly effluent sampling for VOCs and PAHs appears to be sufficient because detections of other contaminants exceeding the MAC in the influent have been infrequent (see attached Table 9). Aldrin was detected slightly exceeding its MAC in June 2003 in the field sample, but not in its duplicate. This makes the detection of aldrin questionable. Bis(2-chloroethyl) ether was detected exceeding its MAC in February 2001, but this detection may have been caused by field contamination. Dieldrin was detected slightly exceeding its MAC in June of 2000.

Over time, EPA and Environ have come to trust the GC readings. However, Environ staff have found that on hot days, a false methylene chloride detection is sometimes caused by migration of a GC peak for an unknown VOC into the retention time window for methylene chloride. This typically happens on hot sunny days when the sun beats down on the wall where the carrier gas cylinder is attached, and apparently increases the temperature from the morning calibration conditions. The occurrence of this peak migration is apparent from studying the GC output for the day. For this reason, when Environ determines that a shutdown is clearly caused by a false methylene chloride detection from GC peak migration, Environ has restarted the system without further testing.

The Environ conducted a 24-hour test in October 2000, which demonstrated that the effluent met the MACs without use of the air stripper when flow from the new extraction well (EW7) was added to the system. However, the MAC was exceeded on March 1, 2001 during weekly sampling of the effluent using this treatment configuration. Therefore, the system was shutdown, and operation reinitiated without use of EW7 and using the original design pumping rates. After EPA and Environ agreed upon a pumping distribution with a total design rate of 32 gpm, the Environ conducted testing for compliance with the MAC using the revised pumping and without the air stripper and using only one of the three UV lamps from January 28 through February 25, 2002. The results indicated that the revised system complied with the MACs. The reduced UV usage was apparently possible because influent VOC concentrations have been reduced, and in recent years exceedances of the MACs for VOCs have been sporadic (see attached Table 8).

Subsequently with EPA approval, Environ started operating the pump-and-treat system using only one UV light. However in March and April 2004 because of methylene chloride detections by the GC exceeding the MAC, UV lamp usage was increased back to 3 and pumping from source area wells was decreased. Both of these operational changes were made without notifying EPA. In response to this, EPA sent a letter requesting the following from Environ:

- provide notification to EPA of any changes to operating conditions that may impact compliance with the MACs;

- provide a plan for addressing the methylene chloride detections exceeding the MACs; and
- add identification of operating parameters and changes to operating parameters in the monthly progress reports.

The attached Table 10 provides a summary of shutdowns in response to apparent exceedances of the MAC in the Midco I effluent that has occurred since February 1996, including the results, and response actions. Except for March 31, 2001 and April and May 2004 events, the apparent MAC exceedances were found to be caused by laboratory or field contamination. EPA has determined that the MRC has responded appropriately to each indication that the MAC was exceeded, except that the problem with methylene chloride exceedances and operational changes made to address the methylene chloride were not reported to EPA.

Determining the Required Groundwater Capture Zone

The ROD requires that all portions of the Calumet aquifer affected by the Site or by Midco I operations that exceed the GWCALs must be recovered by the pump-and-treat system. The SOW requires groundwater sampling to define the full extent of hazardous substance migration. The attached Figure 4 identifies ERM's "estimated extent of hazardous substance migration," which became the target capture zone and was calculated by ERM by multiplying the number of years since Midco I started operating times an estimate of the groundwater velocity using groundwater gradients from the RI, a hydraulic conductivity of 7.7 feet/day, and assuming no retardation. Updated testing indicates that the hydraulic conductivity of the aquifer is better represented for design of the pump-and-treat system by 26.6 feet/day, which is approximately 3.5 times the estimate used by ERM. Therefore, a better estimate of the maximum distance of hazardous substance migration would be 3.5 times as far from the site as identified on Figure 4. Based on the March 1993 sampling results, EPA was concerned that Midco I contamination could extend beyond the "estimated extent of hazardous substance migration", because of results exceeding the GWCALs in G30, N30, Q10, and Q30 and noted that many of the elevated contaminants were also detected on-site (see August 26, 1993 EPA letter).

However, evaluation of data from the 2002 ground water sampling indicates that the target capture zone provides adequate groundwater capture. The most mobile contaminant group at Superfund sites is usually VOCs. The target capture zone easily bounds the VOC plume from Midco I. The RI data indicates that the high concentration VOC plume extended past well cluster B, but only trace concentrations of VOCs were detected at monitoring well clusters G and H (see Figures 5-32 and 5-33, of the RI). Since start of operation of the pump-and-treat system, VOCs have been cleaned up from monitoring well clusters G and H, and the higher concentrated VOC plume has contracted towards the source area and now ends at around clusters D and P.

We also need to consider the data on the inorganic contaminants. The following inorganic contaminants contributed to exceedances of the GWCALs in groundwater at certain downgradient boundary wells (P-1, P-4, G10, G30, K10, K30, N10, and N30): antimony; arsenic; barium; chromium; cyanide; iron; lead; nickel; selenium; thallium; and vanadium (see the attached Table 11). Of these contaminants, only chromium, iron, nickel and cyanide appear to be significantly elevated in source area monitoring wells (See attached Table 12 (Table 3-1 of the 2002 Annual Ground Water Monitoring Report) for MW-3S, MW-3D, MW-5S, MW-5D, MW-6S, MW-6D, C-10, C-30, D-10, D-30).

Antimony, arsenic, barium, selenium, thallium, and vanadium do not appear to be elevated in groundwater at source area monitoring wells, and, therefore, could be from off-site or area-wide sources.

Other potential sources of contamination in the immediate vicinity of Midco I include the InDOT maintenance facility on the western border of Midco I. It appears that the InDOT facility contributed most of the salt contamination and some. of the cyanide contamination present in groundwater in the vicinity of Midco I, although Midco Ms also a source of salt and cyanide contamination. In addition, improper disposal has been observed on the property east of Midco I near monitoring well N10.

Keeping in mind that the Midco I pump-and-treat system has been containing the Midco I source area, the following contaminant trends also suggest an off-site source of metal contamination:

- Vanadium in G30 increased from 24 to 224 µg/l from 1993-2002;
- Iron in K-10 increased from 3,680 to 13,400 µg/l from 1993-2002;
- Arsenic in MW-4S increased from < 3.5 to 15.8 µg/l from 1999-2002;
- Antimony in N-10 increased from < 1.6 to 20.7 µg/l from 2001-2002;
- Selenium in N-10 increased from < 2.5 to 16.7 µg/l from 1999-2002;
- Vanadium in N-10 increased from 3.4 to 117 µg/l from 1993-2002;
- Cyanide in Q-10 increased from < 10 to 73.6 µg/l from 1998-2002.

Therefore, this report considers only the inorganic contaminants that are elevated in source area monitoring wells (chromium, iron, nickel and cyanide), in the discussion of the required extent of groundwater capture. It is observed that chromium at G-10, and nickel and cyanide at G-30 only marginally exceed the GWCALs, and were not elevated at P-1, which is downgradient from the G cluster. The target capture zone extends about 100 feet downgradient from G-30, approximately equidistant between P-1 and the G cluster. For these reasons, it appears that the target capture zone should be adequate to contain the chromium, nickel and cyanide contamination from Midco I.[3] Iron exceeds the GWCAL at K10, K30, and P-4. However, the increasing iron trend in J K10 suggests that these downgradient boundary wells are being affected by an off-site source of iron, and that iron in background groundwater is likely to be higher than estimated from the RI data. It follows that the iron background concentration needs to be updated, and that the iron detections in the downgradient boundary monitoring wells should not trigger expansion of the monitoring system or the target capture zone at this time. .

Achievement of the Required Groundwater Capture Zone

Between 1996 and 1998, ERM submitted a number of capture zone demonstrations for Midco I and Midco II to evaluate achievement of the target capture zone. The capture zone evaluations became more sophisticated attempting to take precipitation and downtimes into account, but none were successful in demonstrating achievement of the required capture zone. In a letter dated February 24, 1998, EPA identified that Midco I was not achieving the design groundwater extraction rate of 16.5 gpm due to both an inability to consistently reach the design extraction rate and to an abundance of downtimes, and EPA required that the MRC submit a Corrective Action Report, consisting of a plan to increase the operating flow rate and to reduce downtimes. ERM submitted a corrective action report and corrective measures were implemented in 1998 and 1999 and resulted in achieving average groundwater extraction rates equal to the design rate.

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3 It should be noted that P-1 contamination that is concentrated in the upper or lower part of the aquifer may be diluted because P-1 is screened throughout the depth of the Calumet aquifer.

In spite of the improved pumping rates, the capture zone evaluation conducted in September 1999 by ERM again failed to demonstrate the target capture zone was being achieved. At that point, EPA had Weston conduct groundwater modeling to evaluate capture. In a January 2000 modeling report, Weston found that the potentiometric surface plots that had been prepared by ERM were misleading because essentially all of the draw-down was based on extraction well water levels, which do not provide information on the width of the draw-down cone and are unreliable because of well inefficiencies. In addition, the hydraulic monitoring network was inadequate because hydraulic monitoring points were too far from the extraction wells to detect significant draw-down. The available water level data demonstrated that the hydraulic conductivity of the aquifer was much greater than 7.7 feet per day used for design of the pump-and-treat system, but a precise range of hydraulic conductivity that fit the water level data could not be determined because the hydraulic monitoring points were too far from the extraction wells. Weston determined that the hydraulic conductivity must be greater than 25 feet per day. Weston also found that ERM's estimated recharge rate of 18 inches per year appeared very high. Based on this information, Weston recommended an increase in groundwater pumping rates, installation of additional extraction wells, installation of more piezometers near the extraction wells for hydraulic monitoring, and use of MODFLOW modeling software to interpret the water level data. EPA also required expansion of the monitoring system to include a number of outlying piezometers, P-1 and P-2, in order to detect potential off-site migration of contaminants.

In response to the deficiencies identified by Weston, Environ installed an additional extraction well (EW7) and 10 piezometers installed in August 2000, and conducted pump tests in September 2000. Environ tested an initial pumping distribution including EW7 and a design pumping rate of 23.6 gpm from January 15 through March 1, 2001. Environ conducted a water level survey on February 14, 2001. Weston evaluated the water level data in a modeling report dated June 2001. Weston derived a calibrated hydraulic conductivity of 26.6. feet per day. Using this hydraulic conductivity, Weston's modeling indicated that the previous pump-and-treat system with a design extraction rate of 16.5 gpm was probably containing the worst of the source area groundwater, but not the entire downgradient plume. This is consistent with the annual groundwater monitoring data, which identified only very low levels of VOCs in downgradient monitoring wells.

Based on Weston's evaluation, EPA concluded that the pumping rate of 23.6 gpm still did not achieve adequate groundwater capture. In December 2001, EPA and Environ agreed upon an alternative pumping distribution, which included EW7 and increased the total pumping rate to 32 gallons per minute (see December 3 and December 21, 2001 Environ letters). Continuous operation at this extraction rate and pumping distribution was initiated in January 2002. Based on Weston's modeling of water levels measured by the MRC on February 20, 2002, it appears that the expanded pump-and-treat system is achieving the target capture zone (see July 17, 2002 EPA letter). During the 2004 monitoring event and annually thereafter, a capture zone evaluation needs to be repeated to assess the impact of the groundwater barrier wall and any adjustments to the pumping rates.

Groundwater Cleanup

Groundwater monitoring has been conducted annually to assess the progress of the groundwater cleanup. The 2002 annual monitoring, included collection of samples from 42 monitoring wells and the seven extraction wells. The SOW provides that monitoring wells that meet the GWCALs for three consecutive years can be removed from the annual groundwater monitoring until the final sampling. In response to the MRC's, request, EPA agreed that four Midco monitoring wells met this criteria, and, therefore, do not have to be sampled during 2004.

In order to reduce costs, from time to time EPA has approved relaxation of the groundwater monitoring requirements provided for in the SOW. This has included:

- In January 1996, EPA approved discontinuation of annual groundwater monitoring for acetonitrile, methacrylonitrile, hexachloro-dibenzo-dioxin, and tin (see EPA letter dated January 19,1996);
- In February 1998, EPA approved reducing the frequency of monitoring for semi-volatile organic compounds, polynuclear aromatic hydrocarbons, organophosphorus pesticides, chlorinated pesticides, PCBs, and herbicides from annually to triannually;
- In May 2001, EPA approved delaying groundwater monitoring for semi-volatile organic compounds, polynuclear aromatic hydrocarbons, organophosphorus pesticides, chlorinated pesticides, PCBs, and herbicides until after soil remediation is performed, and every five years thereafter (however, EPA is requiring monitoring for these parameters in 2005 because they have not been monitored since 1997, see EPA letters dated May 10, 2001 and March 11, 2004);
- In January 2004, EPA waived the annual monitoring requirement for 2003 because of the extensive work being done on design of the soil treatment remedy during 2003 (see EPA letter dated January 12, 2004);
- In March 2004, EPA waived the requirement to sample monitoring wells within the groundwater barrier wall during 2004.

Attached are Tables 13 and 14, which present the maximum VOC, SVOC, pesticides, low concentration PAHs, PCBs and inorganic contaminant detections from the RI data to the present. Table 13 provides the VOCs and inorganic data through 2002 (this is Table 4-6 from the *2002 Annual Ground Water Monitoring Report*). Table 14 provides the SVOCs, chlorinated pesticides, PCB, low level PAH, organophosphate pesticides, and herbicide data through 1997, which is the last year when these contaminants were analyzed (this is Table 4-3 from the *1997 Annual Ground Water Monitoring Report*): Also attached is Table 12, which presents the VOCs and inorganic contaminants that contributed to GWCAL exceedances (this is Table 4-2 from the *2002 Annual Ground Water Monitoring Report*).

Observation of the trends in maximum detections of the most highly concentrated VOCs and cyanide indicate that there has apparently been a substantial decrease (greater than or approximately 10 X) in a number of contaminants since the RI or the 1993 pre-design investigation, including: chloroethane; methylene chloride; acetone; trans-1,2-dichloroethylene; chloroform; 1,1,1-trichloroethane; trichloroethylene; benzene; and tetrachloroethylene. It is likely that these reductions are from biodegradation, as well as operation of the pump-and-treat system.

Other highly concentrated VOCs decreased less and are still at concentrations comparable to detections during the RI and predesign sampling in the most contaminated groundwater, including: vinyl chloride; 2-butanone; 1,1-dichloroethane; cis-1,2-dichloroethylene; cis-1,2-dichloropropane; 4-methyl-2-pentanone; toluene; ethylbenzene; xylenes; and cyanide. To some extent high detections of these compounds may reflect a shift to degradation products and the less degradable VOCs. However, toluene, ethylbenzene, xylenes and cyanide are normally very degradable in groundwater, and their continuing very high detections in certain monitoring wells may be the result of ongoing contaminant leaching from the highly contaminated soil in the source area. Treatment by SVE, which is now scheduled to begin in 2005, should finally start to address this problem.

Observation of trends in the highest concentrations of metals does not indicate an obvious trend in antimony, arsenic, copper, iron, magnesium, selenium, or vanadium. The apparent decreases in barium,

cadmium, lead, nickel, thallium, and zinc are likely the result of improvements in sampling technique and not actual changes in groundwater conditions.

Observation of trends in the highest concentrations of SVOCs, pesticides, and PCBs do not indicate an obvious trend between the RI and the predesign sampling and the 1996 and 1997 samplings for 2-methylphenol, napthalene, low concentration PAHs, or pesticides. There are only minor reductions (less than 90% reduction) in bis(2-chloroethyl) ether, and 4-methylphenol. There appears to be a substantial (greater than 90%) decrease for phenol, 1,3-dimethylphenol, isophorone, diethylphthalate, and 4,6-dinitro-2-methylphenol. This decrease could be from a combination of degradation and improved sampling techniques.

According to the *2002 Annual Ground Water Monitoring Report*, the following VOCs contributed to exceeding a MAC in source area monitoring wells (MW-2S, MW-2D, MW-3S, MW-3D, MW-4S, MW-4D, MW-5S, MW-5D, MW-6S, MW-6D, C-10, C-30, D-10, D-30, EW-3, EW-5) during the 2002 monitoring (see Table 12): benzene; 2-butanone; cis-1,2-dichloroethylene, 1,1-dichlorethane; ethylbenzene; methylene chloride; 4-methyl-2-pentanone; toluene; vinyl chloride; and xylene. It is likely that the presence of some VOCs in the most highly contaminated monitoring wells has been masked by higher concentration VOCs. It is believed that as the groundwater is cleaned up and VOC concentrations decrease that the VOC detection limits will improve. The following inorganics contributed to exceeding a MAC in source area monitoring wells during 2002: antimony; arsenic; chromium, copper, cyanide; iron; nickel; thallium; and vanadium.

In downgradient boundary monitoring wells (P-4, K-10, K-30, G-10, G-30, P-1, EW-7, N-10, N-30, O-10, O-30) no VOCs contributed to exceeding a MAC in 2002. This indicates that even at a design pumping rate of 16.5 gpm, the pump-and-treat system was probably capturing groundwater from the highly contaminated source area. The following inorganics contributed to exceeding a MAC in downgradient boundary monitoring wells: antimony; arsenic; barium; chromium; cyanide; iron; lead; manganese; nickel; selenium; thallium; and vanadium.

In 1997, no direct injection VOCs, SVOCs, chlorinated pesticides, PCBs, low concentration PAHs, organophosphate pesticides or herbicides, contributed to exceeding the MACs in source area monitoring wells except for dieldrin in MW-2S. In addition, bis(2-chloroethyl) ether and n-nitroso-di-n-propylamine exceeded their PRGs, and hydrogen sulfide exceeded its PRGs and Ambient Water Quality Criteria (AWQC) in source area monitoring wells (see Section VI).

Soil Treatment

From 1990-1991, EPA worked on developing a plan for a S/S treatability study. From 1992-1995, EPA and the MRC planned, performed and evaluated the results of a soil treatability study for S/S, in accordance with the SOW. The MRG had ERM arrange for testing to develop binders. In August 1993, the binders selected by ERM were submitted to a Weston subcontractor, who conducted the testing for achievement of the S/S performance standards. The results were reviewed by specialists for EPA and the MRC. EPA specialists concluded that the binders tested were not promising. Therefore, EPA conducted further planning, testing, and evaluation of results for S/S from 1995-1997. The testing included binders developed through recommendations of EPA staff and proprietary binders provided by a vendor. ERM provided support to collect soil for the testing, provided input into the planning documents, and provided input into the evaluation of results. Based on the results of this testing, EPA developed proposed revised performance standards for S/S, and revised criteria for determining the extent of soil

treatment. These were proposed to the MRC in a draft ESD dated December 1997. In April 1998, ERM conducted soil sampling to determine the extent of soil treatment. From September 1998-April 2000, EPA and the MRC discussed how to determine the extent of soil treatment.

In a February 22, 2000 letter, EPA agreed to delay implementation of soil treatment to allow the MRC to test chemical oxidation treatment of Midco I and Midco II source area soils. During 2000 and 2001, ERM prepared plans and conducted treatability testing for soil treatment by chemical oxidation. In letter reports dated June 18, 2001 and November 1, 2001, ERM summarized the results of the testing. ERM concluded that permanganate demand is extremely high making permanganate oxidation not cost effective. Persulfate demand was also higher that usual and persulfate oxidation did not appear to be capable of oxidizing methylene chloride. For these reasons, chemical oxidation treatment of soils was not further considered.

During 2002, Environ and ERM, with EPA permission, conducted additional investigations and evaluations for an alternative soil treatment proposal and to test for other sources of contamination. The results of these investigations are summarized in the attached Table 15.

In October 2002, the MRC submitted a proposal for an alternative soil treatment remedy for Midco I, including construction of a groundwater barrier wall around the source area, dewatering within the barrier wall, conducting SVE following dewatering, and possibly conducting some soil excavation tp address the highest metal and cyanide contamination. On December 20, 2002, EPA approved proceeding with the soil vapor extraction and barrier wall design. On September 3, 2003, EPA approved the Design/Build Document for the barrier wall and soil vapor extraction. The barrier wall was constructed during November and December 2003.

If the dewatering is successful, the SVE will go beyond ROD requirements by doing a better job of removing VOCs from soils at and below the water table. During December thru mid-February dewatering progressed ahead of schedule. However, since mid-February little progress has been made in dewatering apparently because of infiltration of snow-melt and rain. In addition in late April, the dewatering rate was reduced because of methylene chloride detections exceeding the MAC. In response to this, EPA sent a letter dated May 6, 2004 requesting submission of a plan to address the methylene chloride problem and to accelerate dewatering.

If the barrier wall is left in place and maintained, it would also provide more containment of the Midco I source area than required in the ROD, which only required containment using a site cover.

A ROD revision and Court approval will be required to change the ROD requirements relative to soil treatment by S/S. EPA and the MRC intend to proceed with work on resolving the remaining soil treatment issues as the barrier wall and SVE system is constructed and operated.

Final Site Cover

The final cover to cover the Midco I source area will be designed and constructed after completion of the soil treatment.

V. Progress Since the Last Five-Year Review

Following is the protectiveness statement from the *Addendum to Five-Year Review Report Midco I, Gary, Indiana* Issued on 10/29/98 (dated 9/28/01): "The remedy is considered protective in the short-term, because there is no evidence that there is current exposure. However, in order for the remedy to remain protective in the long-term, the following measures need to be taken:

- the pump and treatment system has to be improved so that it achieves the required capture zone;
- the sediment areas either have to be further excavated or filled-in with clean soil;
- the soil treatment and site cover phases have to be implemented."

Since the last Five-Year Review, the access and deed restrictions on the site are still in place; the excavated sediments are still stored safety on-site under a flexible membrane liner; and the pump-and-treat system has continued to remove VOCs from the Calumet aquifer and has continued to satisfy air emission and underground injection well requirements. However, there have not been large reductions in some VOCs, metal or cyanide concentrations in the most highly contaminated source area monitoring wells. This may be because of continued contribution of contaminants from the source area soils. Implementation of SVE should address this problem at least for VOCs.

The 1998 *Five-Year Review Report* noted that the pump-and-treat system was not achieving the target groundwater capture zone. Since that time, EPA determined that the pump-and-treat system had been under-designed primarily because the hydraulic conductivity value used for the design was much too low, although the pump-and-treat system was containing the most highly contaminated groundwater in the source area. In 2002, the MRC expanded the pump-and-treat system, and EPA determined that the expanded system is achieving the target capture zone.

The 1998 *Five-Year Review Report* also noted that soil below the excavated sediments exceeding the soil CALs was left in place and enclosed within the site fence. The site fence is preventing human contact with these soils, and the ecological risk will be addressed during design of the final site cover. Because the soil treatment has not been completed, no progress has been made in addressing the ecological risk from these soils. The Addendum to the Five-Year Review Report contains the following further explanation of the ecological risks from the soil sediment areas. This explanation is still valid.

> "Although the ecological screening identified that contaminants remaining after excavation are likely to cause severe impact on an aquatic micro-invertebrate community, the value of the ponded areas near Midco I [as] an aquatic habitat is very low. This is why one of the options mentioned in the December 1,1997 memorandum from the biologist is filling in the ponds. In addition, carcinogenic polyaromatic hydrocarbons, polychlorinated biphenyls, bis(2-ethylhexyl) phthalate, and lead are commonly detected in urban environments, and the detections are low enough to suggest that they may be at or near background concentrations for that area. EPA took this information (small affected area, small value as a habitat, and low concentrations) into account in allowing the MRC to enclose the sediment area with a fence and divert ditch water around the contaminated sediment area as an interim measure. In addition, it will be less costly and more convenient for the MRC to further address the excavated areas in conjunction with construction of the final site cover than to conduct a special evaluation of the hazard and mobilize to take an action now."

Relative to the soil treatment, since the last Five-Year Review in 2000-2001, the MRC conducted a treatability study on using chemical oxidation, but the results were not favorable. In 2002, the MRC

conducted further testing and evaluations, and submitted a proposal for an alternative to the ROD remedy for soils. In December 2002, EPA approved proceeding with the groundwater barrier wall and SVE. In 2003 with EPA approval, the MRC proceeded with construction of a groundwater barrier wall around the Midco I source area. The MRC plans to dewater within the barrier wall, and then implement SVE treatment of the soils. The SVE should remove the bulk of the continuing threat of mobilization of the soil VOC contamination.

VI. Five-Year Review Process

Administrative Components

Environ and Weston staff were notified of the initiation of the Five-Year Review process in September 2003. In February 2004, the RPM prepared a first draft of the *Second Five-Year Review Report* and distributed it to: Region 5 Regional Counsel; Weston; Region 5 UIC Branch; Virginia Laszewski, Environmental Scientist, Region 5 Environmental Planning and Evaluation Branch; Donald Bruce Chief Region 5 Remedial Response Section #6; and to Rosita Clark-Moreno, EPA Region 5 Five-Year Review Coordinator. After obtaining this input in March 2004, a second draft of the *Second Five-Year Review Report* was distributed to Environ, IDEM, the City of Gary, and the Gary-Chicago Airport Authority for their review.

Community Notification and Involvement

Stuart Hill, EPA Region 5 Community Involvement Coordinator arranged to have a notification of the Five-Year Review published in the October 8, 2003 edition of the Post-Tribune, which is a local newspaper. EPA received no public comments or inquiries in response to this notification. When the Review is completed, a notification and summary of results will be published in the same newspaper, and the *Second Five-Year Review Report* will be made available at the Gary Public Library.

During 1998 and 1999, Sally Swanson of EPA Region 5's Water Enforcement and Compliance Assurance Branch and Thomas Geishecker of EPA Region 5's Emergency Response Branch, participated in periodic meetings regarding expansion of the Gary-Chicago Regional Airport. Support facilities for this airport may impact Midco I. Other participants have included personnel from the Gary-Chicago Airport Authority, the City of Gary, IDEM, the U.S. Fish & Wildlife Service, the U.S. Army Corps of Engineers, environmental groups, the MRC, and other private parties. The RPM and the site attorney also attended one of these meetings. From 2002 to the present, EPA staff have been in communication with the Federal Aviation Administration, the Gary-Chicago Airport Authority, and other agencies regarding an environmental impact statement for expansion of the airport. Virginia Laszewski of Region 5's Environmental Planning and Evaluation Branch, is EPA's primary reviewer for this environmental impact statement. She will be coordinating with the RPM regarding information on and the impact on Midco I.

Document and Data Review

A listing of the major documents and data used for this Review is in Attachment 2 to this report.

Interviews

EPA received a letter dated July 13, 1998 from R. J. Conner requesting information on impact of Midco I on property south of the site because he is planning to sell it. EPA responded in a letter dated July 22, 1998.

The MRC was contacted by Mr. Bob Heine, who operates a concrete recycling business on property east of Midco I. Mr. Heine had acquired spme property that is part of the Midco I site and talked of taking down the fences to extend the area he is filling. The MRC sent a letter to Mr. Heine dated November 4, 1998 explaining that the MRC must have continued access to the property to conduct the remedial action.

During several site inspections, the RPM met with the Environ site operator and discussed operation of the treatment system.

During construction pf the groundwater barrier wall, the RPM and Om Patel of Weston staff met with Al Villareal, who ownsrShd operates S. SjF. Repair in the building just south of Midco I at 1366 Blaine Street. The actual time of the meeting was from 12:30 - 1:00 PM on December 11, 2003. We asked whether Mr. Villareal had any concerns about Midco I. Mr. Villareal said that he was concerned about soil contamination on his property. He expressed the following concerns:

- He was concerned that his property should stay clean. He had tested soil samples from his property four years ago before he purchased it, and it was clean. The Weston staff explained that the Midco I property is contaminated but that waste operations were discontinued in 1978 or 1979. Therefore, if his property was clean four years ago it should still be clean.
- He was concerned about tanker trucks entering Midco I. Weston staff explained that those trucks would be for delivering peroxide and sulfuric acid for the groundwater treatment. Weston emphasized that there is no known liquid disposal onto the ground going on at Midco I.
- Sometimes trucks entering Midco I block the gate to his business for as long as 45 minutes. The RPM committed to raise this concern with Environ.
- Some slurry has been washed onto his parking lot. He identified this to us. There was a thin film of slurry covering about the 5 feet pf the asphalt lot, which is adjacent to the Midco I fence. The RPM committed to raise this concern with Environ. Environ said that the barrier wall contractor, Contract Dewatering Services, Inc., had committed to washing the slurry off of the parking lot.

On-site Inspections since Last Five-Year Review

The Midco I site has been periodically inspected since the 1998 Five-Year Review. The results of these inspections are summarized in the attached Table 16.

VII. Technical Assessment

Question A: Is the Remedy Functioning as Intended by the Decision Document?

In general the answer to this question is yes for the access and deed restriction, and groundwater treatment portions of the remedy, but no for the sediment excavation and soil treatment portions because the soil remedy has not been implemented. Access and deed restrictions are in place as was provided for in the ROD. The excavated sediments are stored safely on-site under a flexible membrane liner as provided for in the ROD.

The pump-and-treat system is operating in compliance with all air emission and underground injection well requirements. In addition, The pump-and-treat system is now achieving adequate groundwater capture, and appears to have resulted in cleanup of VOCs from the monitoring wells downgradient from the source area. There have not been a large reduction in some VOC, metal or cyanide concentrations in the highly contaminated source area monitoring wells. This may be because of continued contribution of contaminants from the source area soils.

When possible, measures have been taken to improve the performance and reduce costs for operation, maintenance and monitoring of the pump-and-treat system. This has included:

- Measures taken to reduce downtimes, and operation at above the design pumping rates to compensate for downtimes;
- Measures to feed periodically hydrochloric acid into the deep well instead of conducting periodic well cleaning;
- Reducing the frequency of groundwater monitoring for SVOCs, pesticides, and PCBs;
- Reduced data validation requirements.

As previously noted in Section IV, there is some concern about the pump-and-treat system meeting ROD requirements because of deficiencies in data validation, deficiencies in reporting of operational changes affecting compliance with the MACs, insufficient background data on some metals, potential to pull off-site groundwater contamination into the area being cleaned up, and uncertainty about the extent of downgradient chromium, nickel and cyanide groundwater contamination.

As previously explained in Section IV, the ROD required that after the sediment excavation, the soils in sediment areas should be below the soil CALs, but these soils actually substantially exceed the soil CALs. As an interim measure until the final site cover is constructed, these sediment areas have been enclosed in a fence, which effectively prevents human contact with the contaminants, but not necessarily contact by wildlife. However as explained in the *Addendum to Five-Year Review Report*, the wetlands affected are small in area, of low quality, and the contaminants presenting the potential risk are at levels that may be caused by background contamination in this urban and industrialized area. For those reasons, it should be acceptable to delay the final action on these sediments.

The soil treatment phase of the remedy has been delayed from what was anticipated at the time of the 1992 ROD Amendment. However, the MRC has agreed to proceed with the SVE soil treatment, which is provided for in the ROD, but to enhance its effectiveness beyond what is required in the ROD by construction of a groundwater barrier wall around the source area and dewatering within the barrier wall. The groundwater barrier wall should also contain the source area groundwater contamination. The MRC constructed the barrier wall in November and December 2003. The MRC plans to dewater within the barrier wall during 2004, and to conduct the SVE treatment starting in 2005. Soil treatment by S/S is required in the ROD, and this requirement is still under discussion.

Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Objectives Used at the Time of the Remedy Selection Still Valid?

The remedial objectives used at the time of remedy selection as identified in Section IV of the 1998 *Five-Year Review Report* are still valid. There have been no changes in the physical conditions at the site that would affect the protectiveness of the remedy.

The inhalation toxicity factors, inhalation exposure assumptions, the MACs, soil CALs and GWCALs that presently apply to this cleanup were defined based on values, assumptions, criteria and standards that were available at the time of the 1992 ROD Amendment, or for a few contaminants at the time pf ESD#1 and ESD#2 (except for MCLs which are updated when promulgated in accordance with the SOW). Many of these values, assumptions and standards have been updated since those times. In this review, data from the Region 9 PRG tables (as updated by more recent toxicity factors from EPA's Integrated Risk Information System (IRIS) for a few contaminants) and updated benchmarks used for screening for ecological risks, were used as screening tools to indicate whether there may be a need to update the inhalation toxicity factors, inhalation exposure assumption, MACs, GWCALs, or soil CALs in order for the remedy to be protective.

Question B for Air Emissions

The purpose of the 3 pound per hour limitation on emissions of VOCs as defined under the Clean Air Act is to reduce ozone formation on an area wide basis. This limitation has not become more stringent.

To limit potential human health risks from toxic air emissions during cleanup activities, the ROD provides that air emissions from each Midco II operation must not result in an a risk to a nearby resident or worker of more than CR = 10^{-7} or HI = 1.0. The 1992 ROD Amendment provides a generic procedure for calculation of CR and HI using defined exposure rate assumptions and toxicity factors. The toxicity factors were identified in the 1992 ROD Amendment for 36 VOCs, 24 SVOCs, 5 pesticides, and PCBs. It should be noted that the procedure for modeling emissions to obtain ambient air concentrations was not defined in the ROD.

Using a simple air model with the toxicity factors and exposure rate assumptions from the 1992 ROD Amendment, ERM calculated parameter specific action level emission rates and fugitive dust action, levels for the groundwater treatment and sediment excavation (see the1993 Remedial Design/Remedial Action Work Plan). In 1999, ESD#2 added an inhalation toxicity factor for vinyl chloride and corrected the inhalation toxicity factor for chromium (VI). During design of the SVE/air sparging system, Environ will be performing modeling to evaluate compliance with the air emission criteria during the SVE/air sparging. EPA will review this modeling.

To screen whether the ROD toxicity factors and exposure rate assumptions (from the 1992 ROD Amendment as updated by ESD#2) are still protective, we compared the ROD inhalation carcinogenic potency factors (SF_i), the inhalation reference doses (RfD_i), and exposure rate assumptions to those used for calculation of the 2002 update of the PRGs (except the RfD_i for 4-methyl-2-pentanone, phenol and 1,4-dichlorobenzene are IRIS values, which were updated since 2002).

Comparison of the ROD inhalation exposure rate assumptions to those used for the PRGs demonstrates that the ROD assumptions are still protective. In fact, the exposure rate assumptions in the ROD are significantly more stringent than the exposure rate assumptions used for characterizing inhalation risks for the PRGs. To characterize lifetime carcinogenic risks, the ROD exposure assumptions are more than twice as stringent (8240 cubic meter air inhaled per kilogram body weight (m^3/kg) compared to 3800 m^3/kg using PRG exposure assumptions). To characterize non-carcinogenic risks exposure to children (ages up to 6 years) is assumed, and the ROD exposure assumptions are approximately 40% more stringent (1980 m^3/kg compared to 1400 m^3/kg using PRG assumptions).

To evaluate toxicity factors, Table 17 compares R0D and PRG toxicity factors for contaminants whose toxicity factors are either new (that is available in the PRG tables but not in the ROD) or more stringent. Table 17 shows that many of the PRG SF_i and RfD_i are more stringent than the ROD toxicity factors, and many more SF_i and RfD_i are now available for contaminants that previously had none.

For the SVE/air sparging system, VOCs emissions are the primary concern. The more stringent or new toxicity values for SVOCs, PAHs, pesticides and PCBs would have a minor impact on the SVE/air sparging air emission criteria because even though some of these contaminants (such as PAHs and PCBs) have a relatively high SF, and have significant concentrations in on-site soils, their emission rates would be relatively low because of their low volatility compared to the VOCs. Based on their volatility and high concentration in Midco I soils and groundwater, the lower or new RfDi for the following VOCs would likely have the most significant impact on the HI from air emissions from the SVE system: acetone; ethylbenzene; 4-methyl-2-pentanone; tetrachloroethylene; toluene; trichloroethylene; and xylenes. However, review of Table 6-16 from the Investigation and Monitoring Plan indicates that carcinogenic risks from VOCs will be the controlling or most stringent criteria for air emissions from SVE.

For this reason, the larger or new SF_i for the following carcinogenic VOCs would have the only significant impact on the emission limitations because of their high concentration in Midco I soil and groundwater (see Tables 6-2 and 6-3 of the 1993 Investigation and Monitoring Plan): trichloroethylene; tetrachloroethylene; and ethylbenzene. However, none of the SF_i for these VOCs have been finalized in IRIS. According to IRIS, ethyl benzene is placed in cancer classification D (not classifiable as to human carcinogenicity); tetrachloroethylene's carcinogenic assessment is not available at this time; and trichloroethylene's carcinogenicity assessment has been withdrawn. IRIS has never identified ethylbenzene as a carcinogen and older SF_i for tetrachloroethylene and trichloroethylene were less stringent than the SF_i used for the PRGs. Because the Comprehensive Five-Year Review Guidance indicates that IRIS should be the primary reference risked to assess protectiveness of toxicity factors (see Exhibit 4-2), EPA is not recommending that the SF, be updated at this time. However, it would be a good idea to check emissions using the updated RfD_i to assure that the HI index is satisfied.

It should be noted that if all the SF_i are updated, air emissions limitations might not become more stringent, because the more stringent SF_i, and RfD_i for the contaminants in Table 17 may be balanced by a less stringent SF_i for vinyl chloride. Vinyl chloride is presently the most potent carcinogenic VOC listed in the ROD, but the updated SF_i, listed in IRIS (0.031) is less stringent by almost an order of magnitude than the ROD value (0.295). Although vinyl chloride was not detected in Midco I soils during the RI, it is present in the groundwater.

The fugitive dust emission calculations would not be significantly affected by the new or more stringent toxicity factors for VOCs and SVOCs because of the generally higher concentrations and SF, of arsenic, chromium, and nickel in soils would result in arsenic, chromium, and nickel controlling the cancer risk (see Tables 6-7 and 6-18 of the Investigation and Monitoring Plan).

Question B for the MACs

In addition to the protection to drinking water aquifers provided by the deep injection well location, monitoring and mechanical requirements, risks from the deep well injection are controlled by assuring that the groundwater is less than or equal to the MACs prior to deep well injection. In the 1992 ROD Amendment, the MACs were established for 183 hazardous constituents. The MACs were established at

6.3 times the then existing Health-Based Levels (HBLs), which were used for evaluating RCRA delisting petitions. Cumulative risks were not considered. The 6.3 factor provides a very conservative allowance for the protection provided by the location, monitoring and mechanical requirements of the deep well. If an MCL was available, the HBLs were set at the MCLs. Otherwise, the HBLs were set at the more stringent of CR = 10^{-6} or HI = 1.0 for residential water usage. The HBL for 1,1-dichloroethane was updated in ESD#1, and the HBLs for a number of carcinogenic PAHs were updated in ESD#2.

During preparation of the QAPP, PSGWs were developed. The PSGWs include the TAL/TCLs, and additional hazardous constituents listed in 40 CFR § 261, Appendix IX, plus any other contaminants having GWCALs. The PSGWs excluded 15 contaminants having MACs because there was no reliable laboratory test for them. In addition, the method detection limit of the approved analytical method for 31 of the hazardous constituents is greater than the MAC. EPA considers these 31 constituents to achieve the MACs if they are not detected even though the method detection limits exceed the MACs. These 46 hazardous constituents are not known to have been disposed on the Site, and EPA decided that it is not justifiable to go to the effort of developing special analytical methods for them when there were stringent MACs for many hazardous constituents known to be present in soil or groundwater at the Site.

The number of hazardous constituents routinely monitored for compliance with the MACs was further reduced because Appendix IX hazardous constituents that were not on the TAL/TCL and were not detected during the initial round of sampling were eliminated from further monitoring requirements. The end result is that 180 contaminants are routinely included in groundwater monitoring, including the annual groundwater monitoring, and monitoring for MAC compliance. This includes 129 hazardous constituents that have an assigned MAC, including 41 VOCs, 2 direct injection VOCs, 40 SVOCs, 8 low concentration PAHs, 13 chlorinated pesticides, PCBs, 4 organophosphate pesticides, 4 herbicides, 14 metals, cyanide, and fluoride. 51 contaminants are on the groundwater monitoring list that do not have assigned MACs, including 6 VOCs, 27 SVOCs, 8 chlorinated pesticides, 1 organophosphate pesticide, and 9 metals.

It should be noted that there are now MCLs for a number of contaminants that were not included in the PSGW. This includes:

- alochlor, atrazine, 2,4-D, Dalapon, diquat, endothall, glyphsate, picloram and simazine, which are herbicides;
- carbofuran, which is a fumigant used on rice and alphalfa;
- oxamyl, which is an insecticide used on apples, potatoes and tomatoes; and
- di(2-ethylhexyl) adipate, which is used in making plastics including PVC films, as a plasticizer or solvent for cosmetics, and can be released from municipal waste incineration, and manufacturing plants including foundries and rubber manufacture.

EPA has determined that it is not necessary to add these contaminants to the PSGW for the following reasons:

- There is no evidence that these contaminants were disposed at the Site;
- According to an EPA consumer information fact sheet, (2-ethylhexyl) adipate will not leach through soil to groundwater and is broken down by microbes in the environment;
- The new herbicides, fumigant, and insecticide are unlikely to have been disposed at Midco I. The 1993 Work Plan provides for analysis of 30 pesticides and herbicides, and it is believed that these analyses are sufficient for these classes of contaminants.

In order to evaluate whether updated toxicity factors or standards indicate that the MACs may no longer be protective, the existing HBLs were, compared to the MCL or the PRGs for contaminants that do not have MCLs.[4] The attached Table 18 provides data on the 11 contaminants whose PRGs (or MCLs for contaminants that have them), are significantly more stringent than the existing HBLs.[5] Copper was also included in Table 18 because it has a new MCL and does not have an HBL.

From review of Table 18, it is apparent that it is unnecessary to update the MACs to 6.3 X PRG (or MCL) for 11 out of 12 of these contaminants (including copper) because the influent concentrations are already consistently less than 6.3 X PRG (MCL). Furthermore reducing the MAC for the other contaminant (bis(2-chloroethyl) ether) would have no practical impact because its MAC is already well below the practical quantitation level (compare 0.189 to the 1 µg/l detection limit). For these reasons, it is not necessary to update the MACs to address updated toxicity factors and standards in order to assure that the deep well injection process will be protective.

Question B for the GWCALS

As described in the previous section it is not necessary to expand the groundwater monitoring analysis list to add contaminants that have new MCLs.

In accordance with the ROD Amendment, GWCALs are established at the lowest of the MCLs, the AWQC X 3.9, CR = 1 X 10^{-5}, and HI = 1.0, with the following exceptions:

- if an MCL is promulgated for a contaminant and that contaminant in a groundwater sample is the only one having a CR $\geq$ 1 X10^{-5}, then for that sample, the GWCAL for that contaminant defaults to the MCL or AWQC X 3.9 whichever is less, and that contaminant is not used in the CR calculation for that sample.
- if background concentrations or the lowest practical detection limit is less stringent than the lowest of these values, then the background concentration or the detection limit become the GWCAL.

In accordance with the SOW, the MCLs are automatically added or updated when they are promulgated. For that reason, updates to toxicity values used to calculate CR are only relevant for contaminants that do not have MCLs, or if two or more contaminants contribute to a CR $\geq$ 1 X10^{-5}.

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4 It was found that there are a four contaminants having HBLs whose HBLs can not be evaluated in this manner because they do not have MCLs or PRGs. These include: acetopnenone; 7,12-dimethylbenz(a) anthracene (a PAH); famphur; and 3-methylcholanthrene (a PAH). According to the *1997 Annual Ground Water Monitoring Report*, these contaminants were either not detected in Midco I groundwater samples or were detected at low concentrations. Between March of 1998 and June of 2000, famfur was not detected in the influent, and the maximum acetonphenone detection has been 2 µg/l, which is very minor compared to its MAC of 25,200 µg/l. Therefore, the risks of deep well injection of famfur and acetopnenone are very unlikely to be significant. Because the low concentration PAHs have similar toxicities, the PRGs for benzo(a) anthracene, chrysene, benzo(b) fluoranthene, benzo(a) pyrene, dibenzo(a, h) anthracene, and indeno(1,2,3-cd) pyrene) can be used to evaluate the protectiveness of the HBLs for 7,12-dimethylbenz(a) anthracene, and 3-methylchlolanthrene.

3 According to Section 2.4 of the PRG instructions, EPA Region 9 and State of California lexicologists have agreed that the PRGs values are at best order-of-magnitude estimates. Therefore, only PRGs that are a factor of 0.3 (½ order of magnitude less using a logrithmic base 10 scale) or less than the HBLs are considered significantly more stringent (that is the 0.3 X HBL > PRG)

In accordance with the SOW and ROD, the toxicity values for calculation of the CR and HI criteria were defined for 65 of the contaminants on the groundwater monitoring list including for 22 VOCs, 6 low concentration PAHs, 16 other SVOCs, 5 pesticides, 14 metals, cyanide, and PCBs. These were the contaminants of most concern at the site according to the RI. Exposure assumptions were also defined. The AWQC for calculation of the GWCALs were included in the SOW and ROD for 14 metals, 3 pesticides, pentachlorophenol, cyanide and PCBs.

ERM developed parameter specific GWCALs, which are shown in the attached Table 19 for VOCs and inorganic contaminants. The GWCALs take into account cumulative risks, but the parameter specific values can be used to determine whether toxicity factors or exposure assumptions have become more stringent. To evaluate whether the GWCALs will be protective to human health when they are achieved, the parameter specific GWCALs have been compared to adjusted PRGs. For carcinogenic compounds, the PRGs were adjusted to CR = 10^{-5} or to the HI = 1.0 if it is more stringent than the CR = 10^{-5}. For contaminants whose adjusted PRGs are significantly5 more stringent than the GWCALs, this comparison is shown in the attached Table 20 along with the maximum groundwater detections from the most recent groundwater monitoring (2002 for VOCs and inorganic contaminants, and 1997 for other parameter groups). Table 20 also compares the PRGs to the maximum groundwater detections for contaminants on the groundwater monitoring list that do not have GWCALs, but do have PRGs.

Updating GWCALs to address more stringent toxicity values should be considered unnecessary to protect human health if: 1. groundwater concentrations are already consistently less than what could be the more stringent GWCAL; 2. the existing GWCAL is already established at the lowest practical quantitation level or at background; or 3. the existing GWCAL is still within an acceptable risk range.

Comparison of columns 3 and 4 of Table 20, shows that reason 1 applies to all of the groundwater monitoring contaminants that do not have GWCALs, except for chloroethane, bis(2-chloroethyl) ether, n-nitroso-di-n-propylamine, methyl parathion, and hydrogen sulfide. Reason 1 also applies to the following contaminants that have GWCALs: acetone; methanol and nitrobenzene.

Reason 2 applies to arsenic, 1,2-dibromoethane and vinyl chloride. It should be noted that the detection limits for the VOCs is generally 1 µg/l, 10 µg/l for direct injection VOCs, 5 µg/l for SVOCs, 0.01-0.02 µg/l for pesticides, 0.5 µg/l for organophosphorus pesticides, and 0.4-2.0 µg/l for herbicides. However, detection limits are elevated in some of the highest contaminated samples, and, therefore, the presence of some contaminants may be masked by the higher concentration contaminants. However, it is expected that as the groundwater cleans up, the detection limits will improve.

Inspection of Table 20 shows that the contaminants that could present a significant human health risk at Midco I even when the GWCALs are achieved include: ethyl benzene; tetrachloroethylene, trichloroethylene, xylene, 4-methylphenol, naphthalene, and manganese. The HIs for the following contaminants could still significantly exceed 1.0 even when the GWCALs are achieved (assuming that the PRGs are correct): xylene; 4-methylphenol, naphthalene and manganese. The CRs for the following contaminants could exceed 1 X 10^{-4} even when the GWCALs are achieved (assuming the PRGs are correct): ethylbenzene; and trichloroethylene. It should be kept in mind that ethyl benzene, trichloroethylene, and xylene have MCLs, and that the MCLs may be applicable at the end of the remedial actions rather than the CR or HI. In addition, the PRGs for ethyl benzene, tetrachloroethylene, trichloroethylene, and 4-methylphenol utilized RfDs or SFs that have not been incorporated into IRIS.

The following contaminants that do not have GWCALs, exceeded the PRGs: bis(2-chloroethyl) ether; n-nitroso-di-n-propylamine; methyl parathion; and hydrogen sulfide. These contaminants may present a risk in groundwater if they are still present when the GWCALs are achieved.

: In addition to the human health risks there is potential for a risk to biota from the contaminated groundwater recharging the wetlands north of the site. This concern was addressed in the ROD by setting the GWCALs equal to 3.9 times the AWQC, if this value was more stringent than the MCLs, the CR, and HI criteria. Since the time of the 1992 ROD Amendment, EPA Geologists have started to screen for ecological protection using benchmarks. To evaluate whether updated toxicity information may indicate that the GWCALs may not be protective of aquatic life, Table 21 provides a comparison of the ecological benchmarks derived from other projects multiplied by 3.9 (3.9 X Benchmark) with the GWCALs, and with the maximum groundwater concentrations. A benchmark was not available for all contaminants having GWCALs. As you can see from Table 21, the following contaminants are present at concentrations significantly exceeding 3.9 X Benchmark, and have 3.9 X benchmarks that are significantly[5] more stringent than the GWCALs: xylenes; barium; manganese; and zinc. It should also be noted that sulfide was detected at as high as 15,000 µg/l, which greatly exceeds its AWQC of 2 µg/l.

Considering these results, EPA has determined that a more detailed evaluation of the human health and ecological risks from the groundwater should be conducted sometime before the pump-and-treat system is shutdown. In the Midco Conceptual Design Work Plan, the MRC proposed revising the GWCALs related to the AWQC, and natural attenuation of groundwater outside the contained area. EPA provided comments on the MRC's proposals. It appears that the most efficient time to conduct a more detailed evaluation of the human and ecological risks from the groundwater contamination would be during evaluations of the MRC's proposals.

Question B for Soil/Sediment CALs

Updated toxicity factors would not change the conclusion from the 1998 *Five-Year Review Report* that the soil CALs were not achieved in the Midco I sediment areas, and that ecological risks need to be further evaluated if contaminated sediments are left in place. The 1998 *Five-Year Review Report* identified that the soil/sediment CALs were exceeded for carcinogenic PAHs, PCBs, bis(2-ethylhexyl) phthalate, and lead with detections as high as 22 mg/kg for carcinogenic PAHs, 2.6 mg/kg for PCBs, 19 mg/kg for bis(2-ethylhexyl) phthalate, and 621 mg/kg for lead. These concentrations also exceed the 2002 residential soil, PRGs. Therefore, updated toxicity factors and risk calculation methods would not result in changing this result. An ecological risk assessment conducted by Ed Karecky of the U.S. Fish and Wildlife Service for the 1998 Review also identified that concentrations of chrysene, phenanthrene, lead, manganese, chromium, copper and nickel could present an ecological risk. I compared the toxicity reference values used by Ed Karecki to the benchmarks for sediments used in David Brauner's September 16, 2003 memorandum. The benchmarks were much more stringent that the toxicity reference values for chrysene, phenanthrene, and lead (benchmarks were not determined for chromium, copper or nickel). Therefore, an updated ecological screening would indicate an ecological risk may be present.

Question B for STALs

Although calculation of the STALs utilize toxicity factors and risk-based calculations, the purpose of the STALs is to define the extent of soil treatment that would constitute the principal threat. For this reason assessment of the protectiveness of the STALs is not necessary.

Question C: Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

All known relevant information has been addressed in previous portions of the Review.

Technical Assessment Summary

The access and deed restriction portion of the remedy are functioning as intended in the ROD. The groundwater pump-and-treat portion of the remedy is also functioning as intended in the ROD except for a few specific areas of concern. Sediments from sediment areas have been excavated and are being safely temporarily contained on-site. Soils remaining in the sediment areas still exceed the soil CALs, and action to fully address these risks are being delayed until the final site cover is constructed. In the meantime human access with these soils is restricted by a fence, and ecological risks are ongoing but are considered to be minor.

The soil treatment phase has been substantially delayed, but work on the SVE phase has been initiated. To enhance the effectiveness of the SVE, a groundwater barrier wall has recently been constructed around the source area. The source area will be dewatered, and then the SVE implemented. The barrier wall is not part of the ROD, but goes beyond ROD requirements and will result in more effective SVE treatment of soils, and containment of groundwater within the barrier wall.

Many human health and ecological toxicity factors have changed, and this needs to be considered in evaluating the protectiveness of the groundwater and soil/sediment cleanup.

VIII. Issues

Issue	Affects Current Protectiveness of Remedy? (Y/N)	Affects Future Protectiveness of Remedy? (Y/N)
1 . Data quality problems identified in 10% validated data are not evaluated in the rest of the data.	N	Y
2. Changes in operation and monitoring of the of the pump-and-treat system affecting compliance with the MACs are sometimes not being reported to EPA.	Y	Y
3. Pump-and-treat system may be pulling in off-site contamination.	N	Y
4. Soils below sediment excavation areas exceed soil CALs are temporarily enclosed in a fence	Y	Y
5. The extent of downgradient groundwater chromium, nickel and cyanide contamination hot fully defined	N	Y
6. Delay in implementation of soil treatment	N	N
7. Some toxicity factors and exposure assumptions for air emissions are out of date	N	N
8. Some MACs out of date	N	N
9. Some GWCALs out of date	N	Y
10. Some Soil CALs out of date	N	Y

IX. Recommendations for Follow-Up Actions

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1 . Data Validation	Follow up on problems identified in 10% of data manually validated	MRC	EPA	4/8/04[6]	N	Y
2. Reporting of changes affecting MAC compliance	Notify EPA of changes, and include operating parameters in monthly progress reports	MRC	EPA	5/6/04[6]	Y	Y
3. Off-site contamination	Closely observe trends in boundary wells / better characterize off-site contamination, if necessary	MRC	EPA	Ongoing	N	Y
4. Soil exceeds soil CALs	Implement soil treatment and final site cover	MRC	EPA	Ongoing	Y	Y
5. Extent of chromium, nickel, CN plume	Closely observe trends in P-1, and Install a well nest at P-1 , if necessary	MRC	EPA	Ongoing	N	Y
6. Delay in soil treatment	Accelerate dewatering. and implement SVE	MRC	EPA	5/6/04[6]	N	N
7. Air toxicity factors/exposure assumptions	Not necessary				N	N
8. MACs	Not necessary				N	N
9. GWCALs	Update GWCALs	EPA		Future[7]	N	Y
10. Soil CALs	Update soil CALs	EPA	EPA	Future[8]	N	Y

6 EPA sent a letter to the MRC requiring corrective action.

7 It would be most efficent to evaluate and update the GWCALs when the MRC submits a request to shutdown the pump-and-treat system.

8 It would be most efficient to evaluate the soil CALs during review of the MRC's design for the final site cover.

X. Protectiveness Statement

In summary, the access/deed restrictions and groundwater remedial actions at Midco I currently protect human health and the environment because contaminated groundwater from Midco I is being contained, because air emission and deep well injection requirements are satisfied, and because direct contact with the contaminated soils and groundwater is being prevented. However in order to assure that the remedy remains protective the following actions need to be implemented:

- improved notification and reporting of operating and maintenance problems affecting compliance with the MACs; more comprehensive data validation;
- closely observe trends in metals and cyanide concentrations in P-1 and outer monitoring wells,
- install a nest of monitoring wells at P-1 and better characterize off-site and background contamination, if necessary;
- when evaluating a request for shutdown update the groundwater cleanup action levels if necessary; and
- during design of the final site cover, consider the human health and ecological risks from the remaining soil contamination, and further characterize these risks if necessary.

The sediment excavation, soil treatment and site cover phases of the remedy are expected to be protective of human health and the environmental upon completion, and the interim exposure pathways that could result in unacceptable risks are being controlled.

XI. Next Review

The next five-year review for the Midco I sites is scheduled five years from the date of this report.

Table 1 – Chronology of Past Events Midco I

EVENTS THROUGH REMEDY SELECTION	DATES
Midwest Solvent Recovery used the Midco I site for industrial waste storage, recycling, and disposal	1973 – 1976
Large drum fire	12 / 76
Industrial Techtonics, Inc. used the Midco I site industrial waste storage, recycling and disposal	1977 – 1979
EPA installed a fence around the site	6 / 81
EPA removed all surface wastes (including thousands of drums, a number of tanks), removed the top 6 - 12 inches of contaminated soil), and placed clay soil over site.	2/82 – 7/82
EPA placed Midco I on the National Priorities List	9 / 8 / 83
Federal Court entered a consent decree for a settlement between EPA and a group of generators to conduct a RI/FS and recover past costs	1985
Settling Defendants conducted RI/FS	1985-1989
EPA issued ROD	6 / 30 / 89
EPA issued a unilateral administrative order requiring implementation of the ROD (the recipients did not obey the order)	11 / 89
EPA issued ROD Amendment	4 / 13 / 92
Federal Court entered Consent Decree for a settlement between EPA and a group of generators to implement the ROD, and recover past costs. The generators formed the MRC.	6 / 23 / 92
EVENTS FOR IMPLEMENTATION OF GROUNDWATER REMEDY	
MRC prepared and EPA reviewed RD/RA Project Plans, and Underground Injection Well Application Package	1992 – 1993
MRC constructed deep well	7 / 93 – 5 / 95
MRC constructed initial groundwater pump-and-treat system	1994-1995
MRC performed process optimization and conducted testing for compliance of groundwater discharge with MACs	7 / 95 – 4 / 96
EPA issued an ESD #1 to relax the MAC for 1,1-dichloroethane	1 / 9 / 96
MRC added air stripper to groundwater treatment system, and conducted testing for compliance with MACs	6 /96 – 11 / 96
MRC initiated continuous operation of the pump and treat system	1 / 30 / 97
MRC conducted groundwater capture zone evaluations	2 /97 – 9 /99
EPA required corrective actions to increase groundwater pumping rate to design rate	2 / 24 / 98
MRC evaluated and implemented corrective actions to increase groundwater pumping rates and reduce downtimes	3 / 98 – 1999

EPA issued first *Five-Year Review Report*	10 /29 / 98
EPA approved MRC's request to discontinue routine air monitoring for emissions from pump-and-treat system	11 / 12 / 98
EPA approved the MRC's Five-Year Underground Injection Well Re-Application Package	5 / 7 / 98
EPA issued ESD #2 to relax the MACs for certain polyaromatic hydrocarbons, to correct the inhalation carcinogenic potency factor of hexavalent chromium, and to add oral and inhalation carcinogenic potency factors for vinyl chloride	11 / 2 / 99
EPA determined that the pump-and-treat system was not achieving adequate groundwater capture because is was under-designed, and required re-evaluation of the design pumping rates	12 / 23 / 99
MRC conducted additional hydraulic monitoring and evaluation of alternatives for improving groundwater capture	1/ 00 – 12 / 01
EPA issued *Addendum to Five-Year Review Report*	9 / 28 / 01
MRC constructed an expansion to pump-and-treat system to improve groundwater capture	1 / 02
EVENTS FOR IMPLEMENTATION OF THE SOIL REMEDY	
EPA and MRC cooperatively worked on the initial soil S/S treatability study	1992 – 1995
MRC completed partial sediment excavation and on-site containment	8 / 93 –10 / 93
EPA with sampling help from the MRC conducted second soil S/S treatability study	4/95 – 1/97
EPA proposed changes to the performance standards for soil treatment by soil vapor extraction and S/S, and to procedures to determine the extent of soil treatment	12/ 9 / 97
MRC conducted sampling to determine the extent of soil treatment	8 / 98
EPA and MRC discussed how to determine the extent of soil treatment by soil vapor extraction and S/S	9 / 98– 4/ 00
EPA agreed to delay soil treatment in response to the MRC's request to conduct testing for chemical oxidation treatment of soils	2 / 22 / 00
MRC prepared plans for and conducted soil treatability study for chemical oxidation	2000 – 2001
MRC conducted additional investigations and evaluations for an alternative soil treatment proposal and to test for other sources of contamination	2002
MRC submitted proposal for an alternative soil treatment remedy, including use of soil vapor extraction, a groundwater barrier wall, and dewatering within the barrier wall during soil vapor extraction	10 / 02
EPA approved proceeding with the soil vapor extraction and barrier wall	12 / 20 / 02
MRC proceeded with design of the soil vapor extraction and barrier wall	3 / 03
EPA approved the Design/Build Document for the barrier wall and soil vapor extraction	9 / 3 / 03
MRC constructed the barrier wall	11 – 12 / 03

Table 2 – Future Schedule

MRC will dewater within the barrier wall	12/03 – 12/04
MRC will construct soil vapor extraction system	2/05 – 9/05
MRC will initiate continuous operation of soil vapor extraction system	10 / 05
MRC will submit amended Underground Injection Well Application Package	11 / 7 / 05

Table 3 – ROD Cleanup and Performance Requirements for Midco I

Component	Applicability	Requirements
Access and deed restrictions	Site access and property transactions	Six foot chain link fence with 3-strand barbed wire around site, and imposition of deed restrictions.
Sediment and soil excavation (sediment/soil cleanup action levels (CALs))	Excavation in defined sediment areas is required until CALs are met	CR = 10^{-6} ; HI = 1.0;[9] and lead = 500 mg/kg
Groundwater pump-and-treat (capture zone)	Extent of groundwater capture	All portions of the Calumet aquifer affected by Midco I that exceed the GWCALs.
Groundwater pump-and treat / ground- water cleanup action levels (GWCALs)	Pump-and-treat must continue until the GWCALs are achieved	MCLs ; CR = 10^{-5} for residential water usage; HI = 1.0; and AWQC X 3.9 For parameter specific GWCALs see Table 19
Deep well injection (location, monitoring and mechanical requirements)	The deep well must be located, constructed, tested, monitored and operated to meet these requirements	Requirements for Class I, non-hazardous injections wells identified in 40 CFR 144 Subparts A, B, D, and E, and 146 Subparts A,B and F, and in SOW
Deep well injection (Maximum Allowable Concentrations (MACs))	The extracted groundwater must not exceed the MACs prior to deep well injection	6.3 times the Health Based Levels (HBLs) used for RCRA delisting demonstrations in July 1991, except as changed by ESD#1 and ESD#2.[10] MACs are presented in Table 22.
Soil treatment (minimum areas for treatment)	Soils within these defined areas must be treated by S/S and SVE	Areas and depths identified in a map in the 1992 ROD Amendment (total volume is approximately 5200 cubic yards)
Soil Treatment (soil treatment action levels (STALS))	Outside of defined minimum areas for treatment, if STALs are exceeded soil must be treated by S/S and/or SVE	CR = 5 X 10^{-4} assuming residential soil exposure; HI = 1.0; and lead = 1000 mg/kg.

[9] The CR and HI are calculated assuming hypothetical lifetime residential exposure to soils having the sampling point concentrations.

[10] By not exceeding the MACs the groundwater meets the equivalent of RCRA delisting requirements and is considered non-hazardous pursuant to RCRA.

Continuation: Table 3 – ROD Cleanup and Performance Requirements Midco I		
SVE (performance standards)	Must be achieved in soil following completion of SVE	97% reduction in VOCs in treated soils
S/S (Minimum Performance Standards	Where S/S is required, must be achieved after completion of S/S	Metals≥90-99% reduction in mobility[11]; SVOCs ≥ 50% reduction[12]; hydraulic conductivity ≤ 10^{-7} cm/sec; unconfined compressive strength > 50psi; wet-dry durability < 10% weight loss; freeze-thaw durability <10% weight loss.
Air emissions (air emission criteria)	Air emissions must not exceed the pounds per hour limitation, the fugitive dust limitation, nor have the potential to cause the risk levels.[13]	CR = 1 X 10^{-7}; HI = 1.0; 3 pounds per hour of VOCs (Clean Air Act definition); Indiana Administrative Code 6-4 for fugitive dust
Final cover requirements	Final cover extent and quality	a multilayer cover over the entire site. Must meet requirements for RCRA Subtitle C landfill closure

[11] The reduction in mobility is measured by comparing before and after treatment results of the Synthetic Precipitation Leaching procedure (SW-846, Method 1312).

[12] The reduction refers to a comparison of the concentration in methylene chloride extract from soil before treatment to the concentration after treatment. The reduction criteria applies to the following compounds: anthracene, bis(2-ethylhexyl)phthalate, ethyl benzene, fluoranthene, naphthalene phenanthrene, phenol, toluene and xylene.

[13] The 1992 ROD provides that the CR and HI criteria applies to the nearest resident and workers on adjacent properties, but the SOW provides that it applies to a hypothetical resident located at the site boundary. These criteria applies separately to air emissions from each separate emission source, such as the groundwater treatment system, the S/S system, SVE, and excavation activities. The 3 pound per hour criteria applies cumulatively to all sources operating at the site at one time.

FIVE-YEAR REVIEW
TABLE 4

TABLE 3-2

PROJECT-SPECIFIC GROUND WATER (PSGW) FRACTIONS
WITH PROJECT-REQUIRED DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Parameters	Detection Limit (ug/l)	Parameters	Detection Limit (ug/l)
Volatile Organics			
Acetone	100	cis-1,2-Dichloroethene	5
Acetonitrile	200	trans-1,2-Dichloroethene	5
Acrolein	75	1,2-Dichloropropane	2.5
Acrylonitrile	34.7	cis-1,3-Dichloropropene	1.9
Allyl chloride (3-Chloropropene)	5	trans-1,3-Dichloropropene	1.6
Benzene	2.5	Ethyl benzene	5
Bromodichloromethane	1.86	Ethyl methacrylate	30
Bromoform (Tribromomethane)	2	2-Hexanone	50
Bromomethane	10	Iodomethane	5
2-Butanone (MEK)	20	Methacrylonitrile	10
Carbon disulfide	5	Methylene chloride (Dichloromethane)	5
Carbon tetrachloride	1	Methyl methacrylate	20
Chlorobenzene	5	4-Methyl-2-pentanone (MIBK)	5
Chloroethane	5	Propionitrile	34.4
Chloroform	1	Styrene	1
Chloromethane (Methyl Chloride)	10	1,1,1,2-Tetrachloroethane	5
Chloroprene (2-Chloro-1,3-butadiene)	10	1,1,2,2-Tetrachloroethane	0.5
Dibromochloromethane	2	Tetrachloroethene	2.5
1,2-Dibromo-3-chloropropane	4.4	Toluene	2
1,2-Dibromoethane (Ethylene dibromide)	1.6	1,1,1-Trichloroethane	5
Dibromomethane	5	1,1,2-Trichloroethane	0.5
1,2-Dichlorobenzene	10	Trichloroethene	3
1,3-Dichlorobenzene	5	Trichlorofluoromethane	5
1,4-Dichlorobenzene	5	1,2,3-Trichloropropane	5
trans-1,4-dichloro-2-butene	66.1	Vinyl acetate	5
1,1-Dichloroethane	2.38	Vinyl chloride	2
1,2-Dichloroethane	0.6	Xylenes (total)	5
1,1-Dichloroethene	1		
Direct Aqueous Injection Volatile Organics			
Dichlorodifluoromethane	30,000	Ethyl ether	30,000
1,4-Dioxane	28,200	Isobutanol	45,000
2-Ethoxy ethanol	25,000		
Methanol			45,000
Semivolatile Organics			
Acenaphthene	10	bis(2-chloroisopropyl)ether	10
Acenaphthylene	10	bis(2-ethylhexyl)phthalate	10
Acetophenone	10	4-Bromophenyl phenyl ether	10
2-Acetyleminofluorene	10	Butyl benzyl phthalate	5
4-Aminobiphenyl	10	4-Chloroaniline	5
Aniline	10	Chlorobenzilate	10
Anthracene	10	4-Chloro-3-methylphenol	5
Aramite	70	2-Chloronaphthalene	10
Benzo(k)fluoranthene	10	2-Chlorophenol	5
Benzoic acid	500	4-Chlorophenyl phenyl ether	10
Benzo(g,h,i)perylene	10	cis-Diallate	5.7
Benzyl alcohol	20	trans-Diallate	5.7
bis(2-chloroethoxy)methane	10	Dibenzofuran	10
bis(2-chloroethyl)ether	5.6	Di-n-butyl phthalate	10

TABLE 3-2

PROJECT-SPECIFIC GROUND WATER (PSGW) FRACTIONS
WITH PROJECT-REQUIRED DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Parameters	Detection Limit (ug/l)	Parameters	Detection Limit (ug/l)
Semivolatile Organic Compounds (continued)			
3,3'-Dichlorobenzidine	2.8	4-Nitroaniline	50
2,4-Dichlorophenol	5	Nitrobenzene	10
2,6-Dichlorophenol	10	2-Nitrophenol	5
Diethyl phthalate	5	4-Nitrophenol	20
p-Dimethylaminoazobenzene	10	4-Nitroquinoline-1-oxide	17.7
3,3'-Dimethylbenzidine	16.1	N-Nitrosodi-n-butylamine	5.0
a,a-Dimethylphenethylamine	27.4	N-Nitrosodiethylamine	4.8
2,4-Dimethylphenol	20	N-Nitrosodimethylamine	5.3
Dimethyl phthalate	5	N-Nitrosodiphenylamine	10
1,3-Dinitrobenzene	10	N-Nitrosodipropylamine	6.0
4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	50	N-Nitrosomethylethylamine	4.6
2,4-Dinitrophenol	50	N-Nitrosomorpholine	10
2,4-Dinitrotoluene	3.4	N-Nitrosopiperidine	4.6
2,6-Dinitrotoluene	4.0	N-Nitrosopyrrolidine	6.0
Di-n-octyl phthalate	10	5-Nitro-o-toluidine	10
Diphenylamine	10	Pentachlorobenzene	10
Ethyl methanesulfonate	6.0	Pentachloroethane	5
Fluoranthene	10	Pentachloronitrobenzene	10
Fluorene	10	Pentachlorophenol	18
Hexachlorobenzene	4	Phenacetin	23.6
Hexachlorobutadiene	2.9	Phenanthrene	10
Hexachlorocyclopentadiene	20	Phenol	10
Hexachloroethane	5	4-Phenylenediamine	83.9
Hexachloropropene	10	2-Picoline	5
Isodrin	10	Pronamide	10
Isophorone	10	Pyrene	10
Isosafrole	10	Pyridine	10
Kepone	100	Safrole	5.1
Methapyrilene	10	1,2,4,5-Tetrachlorobenzene	10
Methyl methanesulfonate	10	2,3,4,6-Tetrachlorophenol	50
2-Methylnaphthalene	10	Tetraethyl dithiophosphate (Sulfotepp)	40
2-Methylphenol	20	Thionazin	10
3-Methylphenol	20	2-Toluidine	7.2
4-Methylphenol	20	1,2,4-Trichlorobenzene	10
Naphthalene	10	2,4,5-Trichlorophenol	10
1,4-Naphthoquinone	10	2,4,6-Trichlorophenol	10
1-Naphthylamine	10	0,0,0-Triethylphosphorothioate	10
2-Naphthylamine	25	1,3,5-Trinitrobenzene	13.6
2-Nitroanaline	50		
3-Nitroaniline	50		
Polynuclear Aromatic Hydrocarbons			
Benzo(a)anthracene	0.001	Dibenzo(a,h)anthracene	0.0025
Benzo(b)fluoranthene	0.005	7,12-Dimethylbenz(a)anthracene	0.006
Benzo(a)pyrene	0.001	Indeno(1,2,3-c,d)pyrene	0.005
Chrysene	0.005	3-Methylcholanthrene	0.025

TABLE 3-2

PROJECT-SPECIFIC GROUND WATER (PSGW) FRACTIONS
WITH PROJECT-REQUIRED DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Parameters	Detection Limit (ug/l)	Parameters	Detection Limit (ug/l)
Chlorinated Pesticides/Polychlorinated Biphenyls			
Aldrin	0.01	Endrin	0.02
alpha-BHC	0.01	Endrin aldehyde	0.02
beta-BHC	0.01	Heptachlor	0.01
delta-BHC	0.01	Heptachlor epoxide (alpha, beta, gamma)	0.01
gamma-BHC (Lindane)	0.01	Methoxychlor	0.1
alpha-Chlordane	0.01	Toxaphene	1
gamma-Chlordane	0.01	Aroclor-1016	0.41
4,4'-DDD	0.02	Aroclor-1221	0.41
4,4'-DDE	0.02	Aroclor-1232	0.41
4,4'-DDT	0.02	Aroclor-1242	0.41
Dieldrin	0.005	Aroclor-1248	0.41
Endosulfan I	0.01	Aroclor-1254	0.41
Endosulfan II	0.02	Aroclor-1260	0.41
Endosulfan sulfate	0.02		
Organophosphate Pesticides			
Disulfoton	2	Parathion	10
Famphur	21.2	Phorate	2
Methyl parathion	0.5	Dimethoate	10
Herbicides			
2,4-D	30	2,4,5-TP (Silvex)	4
2,4,5-T	2	Dinoseb	1
Dioxins and Furans			
Hexachlorodibenzo-p-dioxins (total)	0.01	Tetrachlorodibenzo-p-dioxins (total)	0.01
Hexachlorodibenzofurans (total)	0.01	Tetrachlorodibenzofurans (total)	0.01
Pentachlorodibenzo-p-dioxins (total)	0.01	2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.005
Pentachlorodibenzofurans (total)	0.01		
Metals			
Aluminum	200	Magnesium	5000
Antimony	30	Manganese	50
Arsenic	10	Mercury	2
Barium	20	Nickel	50
Beryllium	2	Potassium	5000
Cadmium	4	Selenium	20
Calcium	5000	Silver	70
Chromium	10	Sodium	5000
Cobalt	10	Thallium	10
Copper	30	Tin	8000
Iron	100	Vanadium	40
Lead	10	Zinc	20
Sulfide			10000
Cyanide			40
Fluoride			1000
Chromium (VI)			10

FIVE YEAR REVIEW
TABLE 5

TABLE 1-1

LIST OF PARAMETERS ANALYZED AND DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Chemical	Detection Limit (µg/L)
Volatile Organic Compounds	
Chloromethane	1
Bromomethane	1
Vinyl chloride	1
Chloroethane	1
Methylene chloride	1
Acetone	5
Carbon disulfide	1
1,1-Dichloroethene	1
1,1-Dichloroethane	1
cis-1,2-Dichloroethene	1
trans-1,2-Dichloroethene	1
Chloroform	1
1,2-Dichloroethane	1
2-Butanone	5
Bromochloromethane	1
1,1,1-Trichloroethane	1
Carbon tetrachloride	1
Bromodichloromethane	1
1,2-Dichloropropane	1
cis-1,3-Dichloropropene	1
Trichloroethene	1
Chlorodibromomethane	1
1,1,2-Trichloroethane	1
Benzene	1
trans-1,3-Dichloropropene	1
Bromoform	1
4-Methyl-2-pentanone	5
2-Hexanone	5
Tetrachloroethene	1
1,1,2,2-Tetrachloroethane	1
1,2-Dibromoethane (Ethylene dibromide)	1
Toluene	1
Chlorobenzene	1
Ethylbenzene	1
Styrene	1
Xylenes (Total)	5
1,3-Dichlorobenzene	1
1,4-Dichlorobenzene	1
1,2-Dichlorobenzene	1
1,2-Dibromo-3-chloropropane (DBCP)	1
Direct Injection Volatile Organic Compounds	
1,4-Dioxane	10
Methanol	10
Semivolatile Organic Compounds	
Phenol	5
bis(2-Chloroethyl)ether	5
2-Chlorophenol	5
2-Methylphenol	5
2,2'-oxybis(1-Chloropropane)	5
4-Methylphenol	5
N-Nitroso-di-n-propylamine	5
Hexachloroethane	5
Nitrobenzene	5
Isophorone	5
2-Nitrophenol	5
2,4-Dimethylphenol	5
bis(2-Chloroethoxy)methane	5
2,4-Dichlorophenol	5
1,2,4-Trichlorobenzene	5
Naphthalene	5
4-Chloroaniline	5
Hexachlorobutadiene	5
4-Chloro-3-methylphenol	5
2-Methylnaphthalene	5

Chemical	Detection Limit (µg/L)
Semivolatile Organic Compounds	
Hexachlorccyclopentadiene	5
2,4,6-Trichlorophenol	5
2,4,5-Trichlorophenol	20
2-Chloronaphthalene	5
2-Nitroaniline	20
Dimethylphthalate	5
Acenaphthylene	5
2,6-Dinitrotoluene	5
3-Nitroaniline	20
Acenaphthene	5
2,4-Dinitrophenol	20
4-Nitrophenol	20
Dibenzofuran	5
2,4-Dinitrotoluene	5
Diethylphthalate	5
4-Chlorophenyl-phenylether	5
Fluorene	5
4-Nitroaniline	20
4,6-Dinitro-2-methylphenol	20
N-Nitrosodiphenylamine	5
4-Bromophenyl-phenylether	5
Hexachlorobenzene	5
Pentachlorophenol	20
Phenanthrene	5
Anthracene	5
Di-n-butylphthalate	5
Fluoranthene	5
Pyrene	5
Butylbenzylphthalate	5
3,3'-Dichlorobenzidine	5
Benzo(a)anthracene	5
Chrysene	5
bis(2-Ethylhexyl)phthalate	5
Di-n-octylphthalate	5
Benzo(b)fluoranthene	5
Benzo(k)fluoranthene	5
Benzo(a)pyrene	5
Indeno(1,2,3-cd)pyrene	5
Dibenz(a,h)anthracene	5
Benzo(g,h,i)perylene	5
Benzyl alcohol	5
Benzoic acid	25
Acetophenone	5
2-Acetylaminofluorene	10
Aramite	20
Chlorobenzilate	5
1,3-Dinitrobenzene	10
Diphenylamine	10
Isodrin	10
3-Methylphenol	20
N-Nitrosopyrrolidine	20
N-Nitrosomorpholine	5
Pronamide	5
2,3,4,6-Tetrachlorophenol	5
Polynuclear Aromatic Hydrocarbons	
Benzo(a)anthracene	0.11
Chrysene	0.040
Benzo(b)fluoranthene	0.048
Benzo(a)pyrene	0.075
Dibenzo(a,h)anthracene	0.13
Indeno(1,2,3-cd)pyrene	0.034
3-methylcholanthrene	0.090
7,12-dimethylbenz(a)anthracen	0.040

TABLE 1-1

LIST OF PARAMETERS ANALYZED AND DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Chemical	Detection Limit (µg/L)	Chemical	Detection Limit (µg/L)
Chlorinated Pesticides/PCBs		**Herbicides**	
alpha-BHC	0.010	2,4-D	2.0
beta-BHC	0.010	2,4,5-TP (Silvex)	0.40
delta-BHC	0.010	2,4,5-T	0.50
gamma-BHC (Lindane)	0.010	Dinoseb	2.0
Heptachlor	0.010	**Inorganics**	
Aldrin	0.010	Aluminum	21.0
Heptachlor epoxide	0.010	Antimony	1.0
Endosulfan I	0.010	Arsenic	2.0
Dieldrin	0.020	Barium	20.0
4,4'-DDE	0.020	Beryllium	1.0
Endrin	0.020	Cadmium	1.0
Endosulfan II	0.020	Calcium	5,000
4,4'-DDD	0.020	Chromium	1.0
Endosulfan sulfate	0.020	Cobalt	1.0
4,4'-DDT	0.020	Copper	1.0
Methoxychlor	0.10	Iron	50
Endrin ketone	0.020	Lead	1.0
Endrin aldehyde	0.020	Magnesium	5,000
alpha-Chlordane	0.010	Manganese	25
gamma-Chlordane	0.010	Mercury	0.20
Toxaphene	1.0	Nickel	7.0
Aroclor-1016	0.20	Potassium	5,000
Aroclor-1221	0.40	Selenium	2.0
Aroclor-1232	0.20	Silver	1.0
Aroclor-1242	0.20	Sodium	5,000
Aroclor-1248	0.20	Thallium	3.0
Aroclor-1254	0.20	Vanadium	1.0
Aroclor-1260	0.20	Zinc	1.0
Organophosphorous Pesticides		Cyanide	10.0
Thionazin	0.50	Chromium (VI)	10
Dimethoate	0.50	Sulfide (mg/L)	1.00
Methyl parathion	0.50		
Famphur	0.50		
Ethyl parathion	0.50		

Table 6 – Results of Weston's Data Validation Audits

DATE	SAMPLES AUDITED	RESULTS
11 / 94	Midco II sediments	The audit determined that the large number of problems with the pesticide/PCB data contraindicated conclusion of ESI (MRC's data validation contractor) that the quality of the data was good. EPA concluded that the pesticide/PCB data was unuseable. The Weston reviewer believed that ESI reviewers were trying to avoid the appearance of antagonism by simply noting deficiencies without drawing the needed conclusions regarding the data useability. See November 3, 1994 EPA letter.
10 / 95	24 -hour MAC compliance test for Midco II	The audit determined that the data validation was thorough and properly conducted.
2 / 96	24-hour MAC compliance test for Midco I, and 4-week test for Midco II	The audit determined that the validation was being properly conducted but identified improvement that could be made in both analyses and validation. See February 13, 1996 EPA letter.
9 / 96	Annual groundwater monitoring for Midco I and Midco II.	The audit determined that the data was reliable and validation was acceptable, and ESI was commended for addressing all correctable deficiencies in the laboratory data. See October 30, 1996 EPA letter.
3 / 97	4-week MAC compliance test for Midco I	The audit determined that the data was reliable and validation was acceptable, but Weston recommended that the laboratories SOPs be updated for PAHs, organophosphorus pesticides, and herbicides. See June 9, 1997 EPA letter
5 / 98	Air samples for Midco I	The audit determined that the data was reliable and validation was acceptable. See 5/29/98 Weston letter.
2 / 00	Annual groundwater monitoring for Midco I and Midco II	The audit found that the data was reliable and the data validation was accurate and complete. See 3/23/00 EPA letter.
6 / 00	Annual treatment system influent and effluent samples collected on 11/22 and 12/15/99 for Midco I and Midco II	The audit found that the data was reliable and the validation was accurate and complete. See 6/29/00 EPA letter.

Table 7 – Non-Volatile Organic Contaminant Detections in Samples from the Midco I Treatment System Influent and Effluent that Exceeded the Practical Quantitation Levels (all concentrations are in ug/l)

DATE	CONTAMINANT	INFLUENT	EFFLUENT
3/19/01	Bis(2-ethylhexyl)phthalate benzo(a)anthracene	38 1.54	< 5.0 0.063 – 0.085
1/29/02	bis(2-ethylhexyl)phthalate	5	2 – < 5.0
2/4/02	benzo(a)anthracene	1.4 – 1.7	< 0.02
2/14/ 02	chrysene	1.1	0.068 – 0.19
3/18/02	bis(2-ethylhexyl)phthalate dieldrin	5 < 0.018	3 – < 5.0 < 0.019 – 0.027
12/16/02	benzo(a)anthracene benzo(b)fluouranthene chrysene	0.028 – 0.033 0.11 – 0.16 1.9 – 2.2	< 0.022 < 0.016 < 0.022
2/24/03	bis(2-ethylhexyl)phthalate chrysene	3.2 2.6	1.6 – 45 < 0.036
6/24/03	benzo(a)anthracene benzo(a)pyrene chrysene dibenz(a,h)anthracene indeno(1,2,3-cd)pyrene 3-methylcholanthrene	< 0.014 – 0.0219 < 0.016 – 0.0181 0.530 – 0.7 < 0.027 – 0.0276 < 0.028 – 0.0427 < 0.036 – 0.0442	< 0.014 < 0.016 < 0.036 < 0.027 < 0.028 < 0.036
9/23/03	benzo(a)anthracene	< 0.014 – 1.72	< 0.014

Table 8 – VOC Detections Exceeding the MAC in Midco I Influent since January 2001 (all concentrations are in ug/l)

DATE	CONTAMINANT	DETECTION	MAC
3/1/01	methylene chloride	37	32
3/19/01	methylene chloride	33	32
9/19/02	benzene chloroform cis-1,2-dichloroethylene trichloroethylene vinyl chloride	40 43 590 32 73	31.5 37.8 441 31.5 12.6
12/16/02	vinyl chloride	12 – 14	12.6
6/24/03	vinyl chloride	13 – 18	12.6

Table 9 – Detections of Organic Compounds Other Than VOCs and PAHs in the Midco I Influent since June 1999 (all concentrations are in ug/l)

DATE	CONTAMINANT	DETECTION	MAC
6/14/00	dieldrin	0.014	0.0126
2/8/01, 2/15/01, 2/22/01	bis(2-chlorethyl)ether	0.8 – 0.9	0.189
3/19/01	bis(2-ethylhexyl)phthalate bis(2-chloroethyl)ether	38 1	18.9 0.189
6/24/03	aldrin	< 0.0091 – 0.015	0.0126

Table 10 – Shutdowns at Midco I in Response to Apparent Exceedance of the MACs since February 1997

DATE	OCCURENCE	RESPONSE
4/11/00	MAC exceeded for 1,1,2,2-tetrachloroethylene, and 1,2-dibromo-3chloropropane in field sample, but not in duplicates.	ERM shutdown system on 4/24/00. Subsequent tests, did not detect these hazardous constituents. Review by chemists indicates that laboratory contamination was the likely source of the detections. ERM reinitiated continuous operation on 5/5/00.
3/1/01	During the fourth week of compliance test adding EW7 and without using the air stripper, the MAC exceeded for methylene chloride and bis(2-chloroethylether).	Environ shutdown system shutdown on March 26. Environ restarted system the next day using previous configuration – that is without EW7 and with the air stripper.
2/24/03	MAC exceeded for bis(2-ethylhexyl)phthalate in duplicate but not in field sample.	Environ determined that the exceedance was caused by field contamination from gloves. In response, Environ required use of phthalate free gloves, and included SVOCs in the next three monthly effluent samplings.
3/04, 4/04	Several exceedances for methylene chloride detected by the GC apparently caused by increased infiltration from winter thaw and spring rains.	Environ increased UV lamp usage from 1 to 3. On 4/26 Environ reduced the pumping rate from source area wells. EPA requested that Environ submit a plan for addressing the methylene chloride problem.

Table 11 – Detections Exceeding the GWCALs in Downgradient Boundary Monitoring Wells at Midco I Based on Data from the 2002 Annual Groundwater Monitoring Report (wells P-1, P-4, cluster G, cluster K, and cluster N, all concentrations are in ug/l)[14]

CONTAMINANT	WELL #	RESULT	GWCAL
Antimony	N10	20.7	6
Arsenic	G30	10.1	6
Chromium	G10	103	100
Cyanide	G30	46.1	20.3
Hazard Index[15]	G30 K30 N10	4 2 2	1
Iron	K10 K30 P-4	13,400 6,340 6,540	3,900
Nickel	G30	986	655
Thallium	K30	3.4	3

[14] Although P-1 is outside of the G cluster and the MRC attempted to sample it from the deep part of the aquifer, we can not be confident that P-1 results actually represent the deep part of the aquifer at P-1 because the well is screened throughout the saturated part of the aquifer.

[15] Hazard index exceedance was caused by nickel, barium, vanadium at G-30; by thallium and barium at K-30; and by antimony, vanadium, and selenium at N-10,

FIVE-YEAR REVIEW TABLE 12

TABLE 4-2

SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2,3)
MIDCO I SITE, GARY, INDIANA
(Page 1 of 3)

Monitoring Location	Carcinogenic Risk (4)			Noncarcinogenic Risk (4)			Parameters at or Above the MCL or AWQC				Background
	Total	Contributing Parameters	Concentration (µg/L)	Total	Contributing Parameters	Concentration (µg/L)	Parameter	Concentration (µg/L)	MCL (µg/L)	AWQC (µg/L)	Concentration (5) (µg/L)
MW-2S	7.E-06			0.2			Iron	6,820		3,900	3,880
MW-2D (6)	0.E+00			0.02			Iron	10,500		3,900	3,880
MW-3S (6)	3.E-06			0.04			Iron	14,500		3,900	3,880
MW-3D	0.E+00			0.1							
MW-4S	9.E-04	(7)		2	Thallium	2.2 J	Arsenic	15.8	10	187	6
					Arsenic	15.8	Thallium	2.2 J	2	156	
					Antimony	2.7 J	Cyanide	55.9	200	20.3	10.4
					Nickel	94.8					
					Cyanide	55.9					
MW-4D	0.E+00			0.5			Iron	8,070		3,900	3,880
							Cyanide	25.4	200	20.3	10.4
MW-5S (6)	1.E-01	Vinyl chloride	1,000 J	52	2-Butanone	17,000	Vinyl Chloride	1,000 J	2		1.32
		Benzene	230 J		4-Methyl-2-pentanone	14,000	cis-1,2-Dichloroethene	380 J	70		
					Toluene	35,000	Benzene	230 J	5		
					Xylenes (Total)	12,000	Toluene	35,000	1,000		
					Nickel	585	Ethyl benzene	2,000 J	700		
					1,1-Dichloroethane	450 J	Xylenes (Total)	12,000	10,000		
					Ethyl benzene	2,000 J	Chromium (III) (8)	1,040	100	858	8
					Manganese	1,670	Copper	369		50.7	
					Antimony	2.8 J	Iron	18,400		3,900	3,880
					Vanadium	22.7					
MW-5D (6)	4.E-06			0.001			Iron	7,700		3,900	3,880
MW-6S (6)	5.E-04	(7)		6	2-Butanone	1,700 J	Benzene	130 J	5		
					4-Methyl-2-pentanone	1,900	Toluene	1,100	1,000		
					Nickel	811	Chromium (III) (8)	145	100	858	8
							Nickel	811		655	58
							Cyanide	52.7	200	20.3	10.4
MW-6D	0.E+00			0.6			Iron	10,000		3,900	3,880
MW-11S	1.E-06			0.002							
MW-11D	0.E+00			0.08							
A-10	0.E+00			0.0007			Iron	4,330		3,900	3,880
A-30	0.E+00			0.2							
B-10	0.E+00			0.003			Iron	8,470		3,900	3,880
B-30 (6)	0.E+00			0.2			Iron	8,180		3,900	3,880

TABLE 10

TABLE 4-2

SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2,3)
MIDCO I SITE, GARY, INDIANA
(Page 2 of 3)

Monitoring Location	Carcinogenic Risk (4)			Noncarcinogenic Risk (4)			Parameters at or Above the MCL or AWQC				Background
	Total	Contributing Parameters	Concentration (µg/L)	Total	Contributing Parameters	Concentration (µg/L)	Parameter	Concentration (µg/L)	MCL (µg/L)	AWQC (µg/L)	Concentration (5) (µg/L)
C-10 (6)	3.E-07			3	Cyanide	1,580	Chromium (III)(8)	214	100	858	8
					Nickel	128	Copper	67.6		50.7	
					Antimony	2.5 J	Iron	8,390		3,900	3,880
							Cyanide	1,580	200	20.3	10.4
C-30	0.E+00			0.3			Iron	8,440		3,900	3,880
							Cyanide	24.2	200	20.3	10.4
D-10 (6)	1.E-03	Benzene	380	0.7			Benzene	380	5		
		Methylene Chloride	4 J				Iron	18,700		3,900	3,880
							Cyanide	45.6	200	20.3	10.4
D-30	7.E-07			0.2							
G-10	0.E+00			0.02			Chromium (III)(8)	103	100	858	8
G-30 (6)	5.E-04	(7)		4	Nickel	986	Arsenic	10.1	10	187	6
					Barium	1,670	Nickel	986		655	58
					Vanadium	224	Cyanide	46.1	200	20.3	10.4
H-10	7.E-07			0.004			Iron	8,280		3,900	3,880
							Lead	18.8		13.7	
H-30	0.E+00			1	Nickel	367	Cyanide	28.2	200	20.3	10.4
					Barium	695					
					Vanadium	55.4					
K-10	0.E+00			0.2			Iron	13,400 J		3,900	3,880
K-30	0.E+00			2	Thallium	3.4 J	Iron	6,340 J		3,900	3,880
					Barium	308 J	Thallium	3.4 J	2	156	
L-10	0.E+00			2	(7)		Thallium	3.4 J	2	156	
L-30	0.E+00			0.2			Iron	5,060		3,900	3,880
M-10	0.E+00			0.1			Iron	6,300		3,900	3,880
							Cyanide	32.2	200	20.3	10.4
M-30	0.E+00			0.3							
N-10	0.E+00			2	Antimony	20.7 J	Antimony	20.7 J	6		
					Vanadium	117					
					Selenium	16.7					
N-30	1.E-06			0.7							
O-10	0.E+00			0.001							
O-30	1.E-05	(7)		0.5			Iron	6,350 J		3,900	3,880

TABLE 4-2

SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2,3)
MIDCO I SITE, GARY, INDIANA
(Page 3 of 3)

Monitoring Location	Carcinogenic Risk (4)			Noncarcinogenic Risk (4)			Parameters at or Above the MCL or AWQC				Background
	Total	Contributing Parameters	Concentration (µg/L)	Total	Contributing Parameters	Concentration (µg/L)	Parameter	Concentration (µg/L)	MCL (µg/L)	AWQC (µg/L)	Concentration (5) (µg/L)
P-10 (6)	1.E-04	(7)		3	Antimony	28.5 J	Benzene	35	5		
					Manganese	1,580	Antimony	28.5 J	6		
					Barium	303 J	Iron	23,500 J		3,900	3,880
P-30	0.E+00			0.1							
Q-10	0.E+00			0.4			Iron	6,190		3,900	3,880
							Cyanide	73.6	200	20.3	10.4
Q-30	0.E+00			0.2			Iron	6,260		3,900	3,880
							Cyanide	25.3	200	20.3	10.4
R-10	1.E-06			0.1							
R-30	0.E+00			0.2			Iron	4,190 J		3,900	3,880
P-1	0.E+00			0							
P-4	0.E+00			0.2			Iron	6,540 J		3,900	3,880

Key:

µg/l = Micrograms per liter
MCL = Maximum Contaminant Level. MCLs were obtained from 40 CFR Sec. 141
AWQC = Ambient Water Quality Criteria. Obtained from Table 2 of Attachment 2 of the Statement of Work
J = The concentration is approximate due to limitations identified during the quality assurance review
CFR = Code of Federal Regulations

(1) All parameters detected below the background concentrations were not considered, as established in Attachment 2 of the Statement of Work.
(2) The complete validated data tables and risk calculation tables are included in Appendices D and E, respectively.
(3) The quantitation limits for thallium at all locations, except for MW-3S, MW-5D, B-10, and D-10, were above their respective Clean-up Action Levels, as indicated in Table 4-3.
(4) Parameters are shown only if the cumulative risks for the location are above the acceptable carcinogenic risk of 1E-05 or above the acceptable noncarcinogenic risk of 1, and:
- Multiple parameters produce individual carcinogenic risks above 1E-05, or they produce individual carcinogenic risks higher than 1E-06 and their sum produces a cumulative carcinogenic risk above 1E-05; or
- Multiple parameters produce individual noncarcinogenic risks above 1, or (for parameters with the same effects) they produce individual noncarcinogenic risks above 0.1 and their sum produces a cumulative noncarcinogenic risk above 1.

Parameters are shown in order of risk produced for the risk columns and in the order shown in Table 5-1 for the comparison with the MCLs and AWQCs.
(5) The background concentrations were obtained from Table 1 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992.
(6) This location had parameters, excluding thallium, with quantitation limits above their respective Clean up Action Levels, as indicated in Table 4-3.
(7) The carcinogenic or noncarcinogenic risk calculated for this location is above 1E-05 or 1, but it is produced by a single analyte for which an MCL has been promulgated (the list of parameters per sampling locations and risk type is included in Appendix C). In accordance to Attachment 2 of the Statement of Work, the analyte should not be included in the risk calculation, and its clean-up action level should be the corresponding MCL or AWQC, whichever is lower.
(8) The MCL is for total chromium and the AWQC is for trivalent chromium. The value detected was analyzed for total chromium.

FIVE-YEAR REVIEW
TABLE 13

TABLE 4-6

SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS AND COMPARISON WITH PREVIOUSLY COLLECTED DATA (1)
MIDCO I SITE, GARY, INDIANA
(Page 1 of 2)

	2002 Annual Ground Water Monitoring			2001 Annual Ground Water Monitoring			2000 Annual Ground Water Monitoring			1999 Annual Ground Water Monitoring			1998 Annual Ground Water Monitoring			1997 Annual Ground Water Monitoring		
Parameter	*Frequency of Detection*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*	*Frequency of Detection*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*	*Frequency of Detection*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*	*Frequency of Detection*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*	*Frequency of Detection*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*	*Frequency of Detection*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*
Volatile Organic Compounds																		
Chloromethane				2/42	3	L-10										15/40	250 J	MW-5S
Bromomethane				1/42	0.09 J	M-30												
Vinyl chloride	4/42	1,000 J	MW-5S	5/42	250	MW-5S	2/42	120 J	MW-5S				3/40	2	MW-3D, MW-11D	11/40	650 J	MW-5S
Chloroethane	4/42	44	B-30	8/42	50	B-30	7/42	27	B-30	6/40	32	B-30	5/40	40	B-30	11/40	180	B-30
Methylene chloride	6/42	4 J	B-30	10/42	380	MW-5S												
Acetone	3/42	89 J	D-10	1/42	2,500 J	MW-5S	3/42	2,900	MW-5S	18/40	11,000 J	MW-5S	7/40	16 J	G-30	9/40	46 J	N-30
Carbon disulfide	2/42	0.2 J	MW-11S, C-30	18/42	11 J	MW-5S	4/42	0.3 J	MW-11S	1/40	2	MW-11S				5/40	0.9 J	MW-11S
1,1-Dichloroethene																		
1,1-Dichloroethane	4/42	450 J	MW-5S	7/42	260	MW-5S	7/42	110 J	MW-5S				1/40	1	R-10	9/40	320 J	MW-5S
cis-1,2-Dichloroethene	4/42	310 J	MW-5S	5/42	110	MW-5S	1/42	3 J	P-10				1/40	2,500	MW-5S	5/40	620 J	MW-5S
trans-1,2-Dichloroethene	2/42	0.7 J	MW-2S	6/42	17 J	MW-5S	3/42	0.2 J	A-30, B-30							2/40	0.5 J	MW-5D
Chloroform				3/42	0.8 J	B-30										1/40	3 J	B-10
1,2-Dichloroethane				1/42	24 J	D-10										16/40	0.6 J	C-30
2-Butanone	2/42	17,000	MW-5S	2/42	2,100	MW-5S	3/42	3,100 J	MW-6S	2/40	11,000 J	MW-5S	1/40	4 J	D-30	4/40	18,000 J	MW-5S
1,1,1-Trichloroethane							1/42	0.2 J	C-10							2/40	1,300	C-10
Carbon tetrachloride													2/40	1 J	MW-2D	1/40	170	C-10
1,2-Dichloropropane				5/42	38 J	MW-5S							2/40	0.6 J	MW-2D			
cis-1,3-Dichloropropene				1/42	0.2 J	MW-4D												
Trichloroethene	2/42	0.4 J	MW-3S	5/42	0.7 J	P-10	1/42	0.4 J	MW-3S				2/40	0.8 J	MW-2D	2/40	35 J	C-10
Dibromochloromethane							1/42	0.1 J	MW-3D									
1,1,2-Trichloroethane				1/42	36 J	D-10	1/42	0.2 J	MW-3D									
Benzene	12/42	380	D-10	11/42	630	D-10	17/42	470	D-10	8/40	180 J	MW-6S	11/40	180 J	MW-6S	13/40	920 J	MW-5S
Bromoform							1/42	0.2 J	MW-3D									
4-Methyl-2-pentanone	3/42	14,000	MW-5S	3/42	3,700	MW-5S	3/42	3,400	MW-5S	2/40	9,200	MW-6S	4/40	13,000	MW-5S	2/40	14,000	MW-5S
2-Hexanone				1/42	430	MW-5S	2/42	230 J	MW-5S									
Tetrachloroethene	1/42	1	MW-3S	1/42	0.8 J	MW-3S	1/42	9	MW-3S				2/40	1 J	MW-2D	2/40	24 J	C-10
1,1,2,2-Tetrachloroethane							1/42	0.3 J	MW-3D									
Toluene	4/42	35,000	MW-5S	6/42	12,000	MW-5S	4/42	13,000	MW-5S	4/40	34,000	MW-5S	4/40	44,000	MW-5S	3/40	30,000	MW-5S
Chlorobenzene										1/40	0.5 J	MW-3D	1/40	0.5 J	K-10			
Ethyl benzene	5/42	2,000 J	MW-5S	4/42	1,800	MW-5S	5/42	1,600	MW-5S	3/40	2,900	MW-5S	4/40	2,500 J	MW-5S	6/40	2,700	MW-5S
Styrene																		
Xylenes (Total)	4/42	12,000	MW-5S	4/42	11,000	MW-5S	7/42	9,900	MW-5S	4/40	16,000	MW-5S	5/40	13,000	MW-5S	7/40	12,000	MW-5S
1,4-Dichlorobenzene				2/42	31 J	D-10												
1,2-Dichlorobenzene	1/42	0.1 J	MW-2S															
1,2-Dibromo-3-chloropropane							1/42	0.3 J	MW-3D									
1,2,4-Trichlorobenzene				1/42	0.1 J	L-10							1/40	0.6 J	M-10			
Inorganics																		
Aluminum	13/42	2,150	C-10	22/42	1,690	MW-11S	18/42	1,200	Q-10	8/40	1,120	G-30	16/40	3,360	MW-6S	37/40	3,970 J	C-30
Antimony	6/42	28.5 J	P-10	10/42	13.0	MW-3D				1/40	11.8	MW-6S				4/40	2.5	MW-6S
Arsenic	9/42	15.8	MW-4S	32/42	13.5	G-10	10/42	17.8	MW-6S				4/40	12.6 J	MW-6S	30/40	11.9	L-10
Barium	42/42	1,670 J	G-30	42/42	1,960	G-30	42/42	2,680	C-30	38/40	2,810	G-30	40/40	3,380	G-30	40/40	3,920	H-30
Beryllium	2/42	0.26 J	MW-4D										1/40	0.1	R-10			
Cadmium	8/42	1.3 J	MW-5S	2/42	2.5	MW-5S	15/42	2.5	MW-6S	18/40	5.3	M-10				6/40	2.2	MW-6S
Calcium	42/42	328,000	L-10	42/42	365,000	N-10	42/42	454,000	C-30	40/40	297,000	L-10	40/40	241,000	L-10	40/40	402,000	L-10
Chromium	42/42	1,040	MW-5S	39/42	1,730	MW-5S	41/42	857	G-10	39/40	1,310	MW-5S	38/40	806	MW-5S	40/40	644	MW-5S
Cobalt	30/42	63.1	G-30	13/42	74.8	G-30	35/42	88.5	G-30	27/40	99.0	G-30	30/40	94.9	G-30	33/40	122	H-30
Copper	21/42	369	MW-5S	21/42	814	MW-5S	17/42	267	MW-5S	8/40	52.8	MW-6S	29/40	79.9 J	MW-5S	18/40	273	MW-5S
Iron	41/42	23,500 J	P-10	42/42	53,500	MW-5S	41/42	55,400	P-10	40/40	19,500	D-10	40/40	19,800	P-10	40/40	16,400	C-30
Lead	15/42	18.8	H-10	3/42	4.2	MW-6S	6/42	20.7	H-10	3/40	38.3	H-10	13/40	11.6	H-10	8/40	10.0	Q-10
Magnesium	42/42	129,000	N-30	42/42	123,000	N-10	42/42	105,000	N-10	40/40	108,000	N-30	40/40	99,100	N-30	40/40	123,000	L-10
Manganese	42/42	2,690	D-10	42/42	2,310	P-10	42/42	6,585	C-30	40/40	2,090	P-10	40/40	2,020	Q-10	40/40	1,650	MW-5S
Mercury				1/42	0.11	MW-5S	12/42	0.15 J	Q-10	1/40	1.30	R-30	10/40	0.29	MW-5S			
Nickel	39/42	986	G-30	37/42	2,090	MW-6S	42/42	4,660	MW-6S	40/40	2,250	MW-6S	40/40	1,780	MW-6S	40/40	2,080	H-30
Potassium	42/42	109,000 J	G-30	42/42	140,000 J	G-30	42/42	160,000 J	G-30	40/40	172,000 J	G-30	40/40	218,000 J	H-30	40/40	199,000 J	G-30
Selenium	10/42	16.7	N-10	2/42	9.9 J	N-10	15/42	10.4 J	N-10							5/40	4.0	MW-6S
Silver																		
Sodium	42/42	5,100,000	G-30	42/42	6,260,000	G-30	42/42	6,420,000	G-30	40/40	7,520,000	G-30	40/40	9,000,000	H-30	40/40	10,700,000	H-30
Thallium	3/42	3.4 J	K-30, L-10	4/42	6.2	D-10	1/42	4.2	P-10							1/40	4.3	H-30
Vanadium	35/42	224	G-30	24/42	154	G-30	40/42	138	G-30	22/40	112.0	G-30	38/40	82.7	L-30	31/40	62.7	H-30
Zinc	29/42	106	MW-5S	11/42	210	MW-5S	21/42	714	H-10	16/40	91.0 J	C-10	14/40	75.2 J	Q-10	5/40	122	Q-10
Cyanide	42/42	1,580	C-10	22/42	399 J	C-10	15/42	114	G-30	19/40	132	H-30	10/40	133	C-10	20/40	1,830	C-10
Chromium(VI)																		

Key:
J= Estimated value
B= Compound found in laboratory blank and sample

(1) Blank spaces denote that: the parameters were below their respective laboratory quantitation limits, the data were rejected, or the parameters were not analyzed (1986-87 Remedial Investigation only).

TABLE 4-6

SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS AND COMPARISON WITH PREVIOUSLY COLLECTED DATA (1)
MIDCO I SITE, GARY, INDIANA

	1996 Annual Ground Water Monitoring			1993 Predesign Investigation			1986-87 Remedial Investigation	
Parameter	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration
Volatile Organic Compounds								
Chloromethane	12/40	0.4 J	P-10					
Bromomethane								
Vinyl chloride	6/40	170 J	C-10	5/40	2,200 J	MW-5S	1,500	D-10
Chloroethane	13/40	190	B-30	8/40	130 J	D-10	1,200	D-10
Methylene chloride							320,000	MW-5
Acetone	5/40	2,500 J	MW-6S	8/40	1,400 J	MW-6S	30,000 B	MW-6
Carbon disulfide	5/40	0.6 J	MW-11S	2/40	1 J	MW-11S		
1,1-Dichloroethene							4.3 J	B-10
1,1-Dichloroethane	8/40	270	C-10	4/40	34 J	P-10	800	C-10
cis-1,2-Dichloroethene	5/40	160 J	C-10	7/40	860 J	MW-5S		
trans-1,2-Dichloroethene	3/40	22 J	C-10	1/40	71 J	D-10	7,700	MW-5
Chloroform							1,300	MW-3
1,2-Dichloroethane							21 N	J-30
2-Butanone	3/40	4,100 J	MW-6S	6/40	4,200 J	MW-6S	80,000 J	MW-6
1,1,1-Trichloroethane	1/40	300	C-10	1/40	400 J	C-10	6,300	C-10
Carbon tetrachloride								
1,2-Dichloropropane								
cis-1,3-Dichloropropene								
Trichloroethene	2/40	36 J	C-10	2/40	0.8 J	MW-5D	380	MW-2
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene	14/40	620	MW-3S	11/40	3,300 J	D-10	6,800	MW-3
Bromoform								
4-Methyl-2-pentanone	3/40	3,000 J	MW-5S	4/40	13,000	MW-5S	31,000	MW-5
2-Hexanone							110	D-20
Tetrachloroethene	1/40	32 J	C-10	1/40	15	MW-2D	370	MW-2
1,1,2,2-Tetrachloroethane				1/40	50	MW-6S		
Toluene	7/40	14,000	MW-5S	16/40	52,000 J	MW-5S	46,600	MW-5
Chlorobenzene								
Ethyl benzene	6/40	2,000	C-10	8/40	2,700 J	MW-5S	[illegible]	MW-2
Styrene				1/40	1	L-10		
Xylenes (Total)	8/40	10,000	C-10	11/40	18,000	C-10	7,000	C-10
1,4-Dichlorobenzene	2/40	0.1 J	MW-11D, H-10					
1,2-Dichlorobenzene								
1,2-Dibromo-3-chloropropane								
1,2,4-Trichlorobenzene								
Inorganics								
Aluminum	11/40	2,350	Q-10	22/40	3,370	P-10	41,300	I-10
Antimony	2/40	7.9	MW-6S	1/40	30.2	O-10	22 J	C-30
Arsenic	14/40	15.1	MW-6S	16/40	10.1	MW-6S	66 J	B-30
Barium	40/40	4,370	H-30	39/40	6,900	H-30	11,400	I-10
Beryllium	1/40	1.0	MW-6S					
Cadmium	3/40	1.3	MW-6S				22 J	C-10
Calcium	40/40	314,000	K-10	40/40	394,000	G-30	1,270,000	G-30
Chromium	40/40	369	MW-6S	35/40	486	MW-5S	2,270 J	MW-6
Cobalt	31/40	120	H-30	12/40	93.5	O-30	80	A-30
Copper	27/40	197	MW-5S	16/40	496	MW-5S	1,280	D-10
Iron	40/40	19,500	MW-5S	39/40	32,400	P-10	187,000	G-10
Lead	9/40	12.2	Q-10	3/40	21.1 J	MW-5S	295 J	G-10
Magnesium	40/40	107,000	L-10	40/40	116,000	G-30	385,000	G-30
Manganese	40/40	1,460	MW-5S	40/40	2,470	P-10	6,810	G-10
Mercury				4/40	0.36	P-10	1.5	I-10
Nickel	39/40	5,610	MW-6S	29/40	4,880	MW-6S	21,900 J	MW-6
Potassium	40/40	254,000 J	H-30	40/40	81,000	G-30	486,000	I-30
Selenium	11/40	8.2	R-10				40 J	G-30
Silver							41 J	G-30,H-20
Sodium	40/40	11,000,000	H-30	40/40	9,330,000 J	G-30	27,600,000 J	I-30
Thallium	6/40	5.6	A-30				50 J	B-30
Vanadium	36/40	55.6	H-30	16/40	59.2	L-30	150	A-30
Zinc	12/40	82.8	MW-5S	18/40	135	MW-5S	3,110 J	MW-6
Cyanide	21/40	1,370 J	MW-6S	29/40	544	C-10	3,670	MW-5
Chromium(VI)	2/40	430	A-30	3/40	20	Q-10		

Key:

J= Estimated value B= Compound found in laboratory blank and sample

(1) Blank spaces denote that: the parameters were below their respective laboratory quantitation limits, the data were rejected, or the parameters were not analyzed (1986-87 Remedial Investigation only).

FIVE-YEAR REVIEW TABLE 14

TABLE 4-3
SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS
AND COMPARISON WITH PREVIOUSLY COLLECTED DATA (1)
MIDCO I SITE
GARY, INDIANA

Parameter	1997 Annual Ground Water Monitoring			1996 Annual Ground Water Monitoring			1993 Predesign Investigation			1986-87 Remedial Investigation	
	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration
Semivolatile Organic Compounds (continued)											
Diethyl phthalate							6/40	130 J	MW-6S		
4,6-Dinitro-2-methylphenol							1/40	10,000	MW-6S		
N-Nitrosodiphenylamine							1/40	2 J	C-10	3 JB	D-10
Pentachlorophenol				1/40	4 J	MW-4S	5/40	7 J	C-10		
Phenanthrene										4 J	MW-11
Anthracene										4 J	MW-11
Di-n-butyl phthalate	8/40	0.8 J	H-10	2/40	0.7 J	MW-2D	19/40	2 J	L-10, Q-30		
Butyl benzyl phthalate							9/40	2 J	MW-5S, MW-5D, Q-30		
bis(2-Ethylhexyl)phthalate										10 J	B-10
Benzoic acid	19/40	20,000	MW-5S	1/40	6,700	MW-6S	19/40	14,000 J	MW-5S	130,000	MW-6
Acetophenone	1/40	14 J	C-10	1/40	33 J	C-10					
Polynuclear Aromatic Hydrocarbons											
Benzo(a)anthracene	1/40	0.25	MW-11S				16/40	0.93 J	MW-11S		
Chrysene	1/40	0.31	MW-11S				6/40	3.0 J	MW-11S		
Benzo(b)fluoranthene	1/40	0.081	MW-11S				7/40	1.2 J	MW-11S		
Benzo(a)pyrene	1/40	0.21	MW-11S	6/40	0.12	MW-11S	23/40	0.93 J	MW-11S		
Dibenzo(a,h)anthracene	1/40	0.054 J	MW-11S				5/40	0.17 J	MW-11S		
Indeno(1,2,3-cd)pyrene							2/40	0.38 J	MW-11S		
3-Methylcholanthrene	1/40	0.0050 J	MW-11S								
7,12-Dimethylbenzanthracene	1/40	0.075 J	MW-11S								
Chlorinated Pesticides/Polychlorinated Biphenyls											
alpha-BHC	3/40	0.0029 J	P-30				10/40	0.0017 J	P-10		
beta-BHC	3/40	0.041 J	MW-5S				7/40	0.031 J	MW-5S		
delta-BHC							7/40	0.017 J	P-10		
gamma-BHC (Lindane)							12/40	0.0029 J	H-10	0.25	D-10
Heptachlor	3/40	0.0019 J	MW-5D				1/40	0.013 J	MW-5S		
Aldrin							4/40	0.0043 J	D-10		
Heptachlor epoxide	1/40	0.0036 J	MW-2S				4/40	0.027 J	MW-2S		
Endosulfan I	1/40	0.0016 J	B-30				11/40	0.026 J	MW-6S		
Dieldrin	3/40	0.015 J	MW-2S				13/40	0.020 J	MW-5D	0.32	MW-6
4,4'-DDE							8/40	0.0023 J	MW-3D, MW-4D		
Endrin							6/40	0.017 J	MW-5D	0.50	MW-6
Endosulfan II	1/40	0.0065 J	MW-5S				6/40	0.023 J	MW-5S		
4,4'-DDD							2/40	0.0031 J	MW-6S		
Endosulfan sulfate	1/40	0.059 J	MW-5S								
4,4'-DDT							3/40	0.0043 J	Q-10		
Endrin ketone							4/40	0.021 J	MW-5D		
Endrin aldehyde							3/40	0.074 J	MW-6S		
alpha-chlordane							8/40	0.0041 J	MW-5S		
gamma-chlordane	2/40	0.0067 J	MW-5S				8/40	0.11 J	Q-30		
Aroclor-1016							1/40	0.20	C-30		

TABLE 4-3
SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS
AND COMPARISON WITH PREVIOUSLY COLLECTED DATA (1)
MIDCO I SITE
GARY, INDIANA

	1997 Annual Ground Water Monitoring			1996 Annual Ground Water Monitoring			1993 Predesign Investigation			1986-87 Remedial Investigation	
Parameter	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration
Volatile Organic Compounds											
Chloromethane	15/40	250 J	MW-5S	12/40	0.4 J	P-10					
Vinyl chloride	11/40	650 J	MW-5S	6/40	170 J	C-10	5/40	2,200 J	MW-5S	1,500	D-10
Chloroethane	11/40	180	B-30	13/40	190	B-30	8/40	130 J	D-10	1,200	D-10
Methylene chloride										320,000	MW-5
Acetone	9/40	46 J	N-30	5/40	2,500 J	MW-6S	8/40	1,400 J	MW-6S	30,000 B	MW-6
Carbon disulfide	5/40	0.9 J	MW-11S	5/40	0.6 J	MW-11S	2/40	1 J	MW-11S		
1,1-Dichloroethene										4.3 J	B-10
1,1-Dichloroethane	9/40	320 J	MW-5S	8/40	270	C-10	4/40	34 J	P-10	800	C-10
cis-1,2-Dichloroethene	5/40	620 J	MW-5S	5/40	160 J	C-10	7/40	860 J	MW-5S		
trans-1,2-Dichloroethene	2/40	0.5 J	MW-5D	3/40	22 J	C-10	1/40	71 J	D-10	7,700	MW-5
Chloroform	1/40	3 J	B-10							1,300	MW-3
1,2-Dichloroethane	16/40	0.6 J	C-30							21 N	J-30
2-Butanone	4/40	18,000 J	MW-5S	3/40	4,100 J	MW-6S	6/40	4,200 J	MW-6S	80,000 J	MW-6
1,1,1-Trichloroethane	2/40	1,300	C-10	1/40	300	C-10	1/40	400 J	C-10	6,300	C-10
Carbon tetrachloride	1/40	170	C-10								
Trichloroethene	2/40	35 J	C-10	2/40	36 J	C-10	2/40	0.8 J	MW-5D	380	MW-2
Benzene	13/40	920 J	MW-5S	14/40	620	MW-3S	11/40	3,300 J	D-10	6,800	MW-3
4-Methyl-2-pentanone	2/40	14,000	MW-5S	3/40	3,000 J	MW-5S	4/40	13,000	MW-5S	31,000	MW-5
2-Hexanone										110	D-20
Tetrachloroethene	2/40	24 J	C-10	1/40	32 J	C-10	1/40	15	MW-2D	370	MW-2
1,1,2,2-Tetrachloroethane							1/40	50	MW-6S		
Toluene	3/40	30,000	MW-5S	7/40	14,000	MW-5S	16/40	52,000 J	MW-5S	46,600	MW-5
Ethyl benzene	6/40	2,700	MW-5S	6/40	2,000	C-10	8/40	2,700 J	MW-5S	1,900	MW-2
Styrene							1/40	1	L-10		
Xylenes (Total)	7/40	12,000	MW-5S	8/40	10,000	C-10	11/40	18,000	C-10	7,000	C-10
1,4-Dichlorobenzene				2/40	0.1 J	MW-11D, H-10					
Semivolatile Organic Compounds											
Phenol	8/40	3,200	MW-5S	4/40	1,000	MW-6S	15/40	6,500	MW-5S	37,000	MW-5
bis(2-Chloroethyl)ether	3/40	9 J	P-10	2/40	14 J	P-10	5/40	43 J	MW-5S	23	D-20
2-Methylphenol	3/40	37 J	C-10	3/40	64 J	MW-5S	5/40	25	MW-2S	52	MW-3
4-Methylphenol (2)	6/40	400 J	MW-6S	3/40	450	MW-5S	10/40	1,100 J	MW-5S	880 J	MW-6
N-Nitroso-di-n-propylamine	1/40	1,200 J	MW-5S								
Isophorone							5/40	19 J	P-10	1,500 J	MW-5
2,4-Dimethylphenol	2/40	35 J	C-10	3/40	78 J	MW-5S	4/40	91 J	MW-5S	120	D-10
2,4-Dichlorophenol	1/40	9	G-30	1/40	11 J	C-10	4/40	17	MW-6S	3.8 J	D-20
Naphthalene	4/40	34 J	C-10	1/40	79	C-10	4/40	53	C-10	22 J	C-10
4-Chloro-3-methylphenol	3/40	6 J	D-10	3/40	14 J	D-10	2/40	12	D-10		
2-Methylnaphthalene							2/40	3 J	C-10		
2,4,6-Trichlorophenol							1/40	1 J	C-10		
2,4,5-Trichlorophenol							1/40	0.9 J	C-10		
Dimethyl phthalate	1/40	7 J	L-30				2/40	5 J	MW-5S		
2,6-Dinitrotoluene							1/40	4	G-30		
4-Nitrophenol							1/40	2 J	K-30		

Table 15 – Results of Additional Investigations Conducted by ERM and Environ during 2002

INVESTIGATION	RESULTS
Groundwater sampling to evaluate whether elevated nickel, chromium and vanadium in samples from certain monitoring wells could be caused by well corrosion.	Elevated nickel, chromium and vanadium detections indicate actual groundwater contamination, and not the effects of corrosion of the well casings.
Analyses of filtered and unfiltered samples for arsenic, barium, chromium, copper, manganese, nickel and vanadium to evaluate whether a significant portion of these metals in groundwater samples is actually from suspended solids.	In general, there was reasonable agreement between filtered and unfiltered results, which verifies that the total metals results can be used to represent concentrations of metals in the aquifer, and which validates that the low flow sampling procedure being used.
Analysis of total cyanide and cyanide amenable to chlorination.	A significant portion of the cyanide in groundwater is not amenable to chlorination.
Geoprobe sampling to better define the extent of VOC contamination in the shallow aquifer.	VOC contamination in groundwater is relatively low outside of the source area.

Table 16 – EPA and Weston Inspections of Midco I from October 1998 – December 2004

DATE	INSPECTOR	RESULTS
5 days 11/98 12/98	Om Patel, Weston	Weston oversaw emptying of drill cuttings onto sediment storage area and drum crushing.
12/16/98	Om Patel, Weston	Weston oversaw the quarterly influent and effluent sampling. Weston identified a couple concerns with the sample collection procedures. Also bumper post bent. Soil cuttings placed on top of sediment pile had not been covered, and existing flexible membrane liner is badly ripped in a number of locations. One UV lamp turned off. ERM was informed and corrected the problems.
4 / 26 –29 / 99	Weston	Oversaw annual groundwater monitoring
9 / 99	Om Patel, Weston	4 spent carbon drums were observed outside of the carbon building. ERM moved these into the carbon building.
4/00	Weston	Oversaw annual groundwater sampling.
10/17/00	Rich Boice, EPA	Operation and storage OK..
2/14/01	Weston	Oversight of water level survey. Identified poor reproducibility in measurements, and apparent inconsistencies with Heath and Safety Plan. In response, Environ conducted a safety audit.
4/01	Weston	Oversaw annual groundwater sampling
6/14/01	Weston	Oversight of water level survey. Identified poor reproducibility in measurements.
1/28/01	Weston	Weston inspected treatment operation at start of 4-week compliance test, and inspected storage.
2/22/02	Rich Boice, EPA	Inspected treatment system.
4/18/02	Weston	Oversaw geoprobe sampling to investigate the extent of VOC plume outside the source area.
4/29,4/30 5/1,5/2/02	Weston	Oversaw annual groundwater sampling.
2/26/03	Om Patel, Weston	Inspected treatment operation.
6/24/03	Om Patel, Weston Rich Boice, EPA	Inspected treatment operation and storage. The Environ operators provided a print out displaying the migration of VOC peaks apparently due to change in temperature during the day.
8/14/03	Om Patel, Weston	Inspected treatment operation. Identified an exceedance of MAC for methylene chloride on 8/1 based on GC output.

Continuation: Table 16 – Results of EPA and Weston Inspections from October 1998 – December 2004		
9/19/03	Om Patel, Weston	Pre-meeting for construction of groundwater barrier wall. Inspected treatment system. In response to Weston concerns bags of filters were moved under tarp.
10/9/03	Rich Boice, EPA Om Patel, Weston	Inspect treatment system.
10/20/03	Rich Boice, EPA Om Patel, Weston	50% design meeting for groundwater barrier wall. Decided that light poles should not have to be moved. Inspect treatment system.
11/19 – 12/16/03	Weston	Oversaw construction and testing for the groundwater barrier wall. Weston identified some health and safety lapses, which were discussed with Environ and corrected.
12/11/03	Rich Boice, EPA Om Patel, Weston	Oversaw groundwater barrier wall construction, and interviewed owner of adjacent business.
4/30/04	Om Patel, Weston	Weston identified that Environ had reduced pumping from source area wells in order to prevent exceeding the MAC for methylene chloride without notifying EPA.. EPA sent a letter to Environ requesting that they submit a plan to address the methylene chloride problem.

Table 17 – Comparison of Inhalation Carcinogenic Potency Factors (SF_i) and Reference Doses (RfD_i) from ROD with SF_i and RfD_i from the 2002 PRG Tables for Contaminants with New or More Stringent SF_i or RfD_i (SF_i is expressed in 1/MG/KG-D, and RfD_i in MG/KG-D; – means not available or not applicable; sources of PRG values are listed respectively as: i = IRIS[16]; h = HEAST[17]; n = NCEA[18]; r = route extrapolation; C = California EPA[19])

CONTAMINANT	ROD VALUES		2002 PRG TABLE VALUES		
	SF_i	RfD_i	SF_i	RfD_i	SOURCE
VOCs					
Acetone	–	–	–	0.1	r
1,2-Dichloropropane	–	–	0.068	0.0011	r,i
Ethylbenzene	–	–	0.00385	0.29	n,i
Trichloroethylene	0.013	–	0.4	0.01	n,n
4-Methyl-2-pentanone	–	–	–	0.86[20]	i
Tetrachloroethylene	0.0033	–	0.01	0.17	C,n
Toluene	–	1.0	–	0.11	i
Xylenes	–	0.4	–	0.029	i
SVOCs					
Phenol	–	–	–	0.3[20]	r
1,4-dichlorobenzene	–	0.7	0.022	0.23[20]	n,i
Cresol	–	–	–	0.05 / 0.005	r,h
2,4-dichlorophenol	–	–	–	0.003	r
Nitrobenzene	–	0.0006	–	0.00057	h
Isophorone	–	–	0.00095	0.2	r,r
Benzoic acid	–	–	–	4.0	r
Napththalene	–	–	–	0.00086	i

[16] IRIS is the acronym for EPA's Integrated Risk Information System.

[17] HEAST is the acronym for EPA's 1997 Human Effects Assessment Summary Tables.

[18] NCEA is the acronym for EPA's National Center for Environmental Assessment.

[19] California EPA Air Toxics Hot Spots Program as identified in OSWER No. 9285.7-75, June 12, 2003.

[20] This value was recalculated using the IRIS value, which has been updated since the October 2002 PRG tables.

Table 17 Continued – Comparison of SF_i and RfD_i from ROD with SF_i and RfD_i from the 2002 PRG Tables for Contaminants with New or More Stringent SF_i or RfD_i					
4-Chloroaniline	–	–	–	0.004	r
Diethylphthalate	–	–	–	0.8	r
N-nitrosodiphenyl-amine	–	–	0.0049	–	r
Pentachlorophenol	–	–	0.12	0.03	r,r
Dibutylphthalate	–	–	–	0.1	r
Butylbenzyl-phthalate	–	–	–	0.2	r
Benzo(a)anthracene	–	–	0.73	–	r
Bis(2-ethylhexyl) phthalate	–	–	0.014	0.02	r,r
Chrysene	–	–	0.0073	–	r
Benzo(b)fluoranthene	–	–	0.73	–	r
Benzo(a)pyrene	–	–	7.3	–	r
Indeno(1,2,3-cd) pyrene	–	–	0.73	–	r
Dibenz(a,h) anthracene	–	–	7.3	–	r
Endrin	–	–	–	0.0003	r
PCBs	–	–	2.0	0.00007 / 0.00002	i,r

Table 18 – Comparison of HBLS to PRGs (or MCLs if an MCL is Available), MACs to 6.3 times the PRG (or MCL), and to the Range of Detections from 3/98 – 6/02 in Midco I Influent for Contaminants whose PRGs are Significantly More Stringent than the HBLs (all concentrations are in ug/l)

CONTAMINANT	HBL	PRG (or MCL)	MAC	6.3 X PRG or MCL	Range of Detections
Acenapthene	2,000	370	12,300	2,331	< 4 – < 5
Acetone	4,000	610	25,200	3,843	< 20 – 310
Arsenic	50	10 (MCL)	315	63	< 2.2 – 2.4
Bis(2-chlorethyl) ether	0.05	0.0098	0.189	0.06174	< 1 – 2
Butylbenzyl phthalate	7,000	730	44,100	4,599	< 4 – 1
Chlorobenzilate	700	25	4,410	158	< 4 – < 5
2-Chlorophenol	200	30	1,260	189	< 4 – < 5
Copper			1,300 (MCL)	8190	0.93 – 23.4
Cresols	2,000	1,800/ 180	12,600	11,340 /1,134	10 – 54
Naphthalene	100	6.2	630	39	< 2 – 2
Nitrobenzene	20	3.4	126	21.4	< 4 – < 5
Pyrene	1,000	180	6,300	1,134	< 4 – < 5

TABLE 3-1

PARAMETER-SPECIFIC CLEANUP ACTION LEVELS [1]
MIDCO I AND II SITES
GARY, INDIANA

Parameter	*Background*		*Project-Specific QL*	*MCL*	*AWQC x F*		*Risk-Based Carc.*	*Risk-Based Noncarc.*	*Parameter-specific CAL* [2]	
	Midco I	*Midco II*			*Midco I*	*Midco II*			*Midco I*	*Midco II*
Organics:										
Acetone		6.9	5					3,240	3,240	3,240
Benzene		0.04	1	5			2.69		2.69	2.69
2-Butanone			5					588	588	588
Carbon tetrachloride			1	5			0.6	23	1	1
Chlorobenzene			1	100				48.8	48.8	48.8

Midco I and II Statement of Work, dated June 1992
Background = Site-specific background ground water concentrations; from Table 1 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992
QL = Quantitation Limit
Carc. = Carcinogenic risk-based concentration equivalent to 1E-05 carcinogenic risk for the individual parameter.
Noncarc. = Noncarcinogenic risk-based concentration equivalent to 1 noncarcinogenic hazard index for the individual parameter.
CAL = Clean-up Action Level

[1] All concentrations are given in micrograms per liter.

[2] Lowest value between the MCL, AWQC, and the risk-based concentrations calculated as if the parameter was the only parameter detected in the sample, but not less than the project-specific detection limit or the site-specific background concentrations. The risk-based concentrations were calculated by following the procedures in Attachment 2 of the Midco I and Midco II Statement of Work, dated June 1992. These values are only used to assess the effect of the sample detection limits and rejected data on the evaluation of compliance with the CALs for each sampling location. The actual evaluation of compliance with the CALs for each sampling location is summarized in Table 4-2.

FIVE-YEAR REVIEW TABLE 17

Table 20 – GWCALs, Adjusted PRGs,[21] and Maximum Midco I Groundwater Detections (and Well Number) from the Most Recent Sampling for Contaminants Whose PRGs are Significantly More Stringent than the GWCALs, and for Contaminants That Do Not Have GWCALs But Have PRGs.[22] (sources of PRG values are listed in order of oral then inhalation as: i = IRIS; h = HEAST; n = NCEA; r = route extrapolation; C = California EPA. ND = not detected. nc = PRG based on noncarcinogenic effects. c = PRG based on carcinogenic effects. All units are in ug/l)

CONTAMINANT	GWCAL	PRG or Adjusted PRG (SF/RfD source) (nc/c)	MAXIMUM CONCENTRATION (Well #)
VOCs			
Acetone	3,240	610 (i,r) (nc)	89 (D10)
Bromodichloromethane	–	1.8 (i,r) (c)	ND
Bromoform	–	85 (i,i) (c)	ND
Bromomethane	–	8.7 (i,i) (nc)	ND
Carbon disulfide	–	1,000 (i,i) (nc)	0.2 (MW-11S, C30)
Chloroethane	–	46 (n,r) (c)	44 (B30)
Chloromethane	–	15 (h,h) (c)	ND
Chlorodibromomethane	–	1.3 (i,r) (c)	ND
1,2-Dibromoethane	1	0.0076 (i,i) (c)	ND
1,3-Dichlorobenzene	–	5.5 (n,r) (nc)	ND
cis-1,3-Dichloropropene	–	4.0 (i,i) (c)	ND
trans-1,3-Dichloropropene	–	4.0 (i,i) (c)	ND
Ethyl benzene	700	29 (r,n) (c)	2,000 (MW-5S)
Tetrachloroethyene	5	1.0 (C,C)[23] (c)	1 (MW-3S)
Trichloroethylene	5	0.28 (n,n) (c)	0.4 (MW-3S)

[21] For carcinogenic contaminants, the PRGs are adjusted from the 10^{-6} to the 10^{-5} risk level or to the PRG based in the RfD because in the ROD the EPA determined that groundwater cleanup to the 10^{-5} risk level will be protective.

[22] For VOCs, metals, sulfide, flouride, and cyanide the most recent sampling was in 2002, and for SVOCs, direct injection VOCs, chlorinated pesticides, PCBs, organophosphate pesticides, and low Concentration PAHs, and Herbicides the most recent sampling was in 1996 and 1997.

[23] PRG was adjusted by use of the California EPA Air Toxics Hot Spots Program SF_o and SF_i (see OSWER No. 9285.7-75, June 12, 2003).

Table 20 Continued – GWCALs, Adjusted PRGs, and Maximum Midco I Groundwater Detections (and Well Number) from the Most Recent Sampling for Contaminants Whose PRGs are Significantly More Stringent than the GWCALs, and for Contaminants That Do Not Have GWCALs But Have PRGs			
Vinyl chloride	1.32	0.2 (i,i) (c)	1,000 (MW-5S)
Xylenes	3,860	210 (i,i) (nc)	12,000 (MW-5S)
Direct Injection VOCs			
Methanol	126,000	18,000 (i,r) (nc)	ND
SVOCs			
Acenapthene	–	370 (i) (nc)	ND
Anthracene	–	1,800 (i) (nc)	ND
Aramite	–	27 (i) (c)	ND
Benzo(k)flouranthene	–	9.2 (n) (c)	ND
Benzyl alcohol	–	11,000 (h) (nc)	ND
Bis(2-chloroethyl)ether	–	0.098 (i) (c)	14 (P10)
Chlorobenzilate	–	2.5 (h) (c)	ND
2-Chloronaphthalene	–	490 (i) (nc)	ND
2-Chlorophenol	–	30 (i) (nc)	ND
Dibenzofuran	–	24 (n) (nc)	ND
1,3-Dinitrobenzene	–	3.6 (i) (nc)	ND
3,3'-Dichlorobenzidine	–	1.5 (i) (c)	ND
Dimethylphthalate	–	360,000 (h) (nc)	7 (L30)
2,4-Dimethylphenol	–	730 (i) (nc)	35 (C30)
2,4-Dinitrophenol	–	73 (i) (nc)	ND
2,4-Dinitrotoluene	–	73 (i) (nc)	ND
2,6-Dinitrotoluene	–	36 (h) (nc)	ND
Diphenylamine	–	910 (i) (nc)	ND
Flouranthene	–	1,500 (i) (nc)	ND
Flourene	–	240 (i) (nc)	ND
Hexachlorobutadiene	–	8.6 (i) (c)	ND
Hexachlorocyclopentadiene	–	220 (i) (nc)	ND

Table 20 Continued – GWCALs, Adjusted PRGs, and Maximum Midco I Groundwater Detections (and Well Number) from the Most Recent Sampling for Contaminants Whose PRGs are Significantly More Stringent than the GWCALs, and for Contaminants That Do Not Have GWCALs But Have PRGs			
Hexachloroethane	–	36 (i) (nc)	ND
4-Methylphenol	1,618	180 (h) (nc)	400 (MW-6S)
Naphthalene	12,940	6.2 (i) (nc)	34 (C10)
2-Nitroaniline	–	1.0 (r) (nc)	ND
Nitrobenzene	16.2	3.4 (i) (nc)	ND
N-nitroso-di-n-propylamine	–	0.096 (i) (c)	1,200 (MW-5S)
N-nitrosopyrrolidine	–	0.32 (i) (c)	ND
Pronamide	–	2,700 (i) (nc)	ND
Pyrene	–	180 (i) (nc)	ND
2,3,4,6-Tetrachlorophenol	–	1,100 (i) (nc)	ND
2,4,5-Trichlorophenol	–	3,600 (i) (nc)	ND
2,4,6-Tichlorophenol	–	3.6 (i) (nc)	ND
Pesticide/PCBs			
alpha-BHC	–	0.11 (i) (c)	0.0029 (P30)
beta-BHC	–	0.37 (i) (c)	0.041 (W-5S)
4,4'-DDD	–	2.8 (i) (c)	ND
4,4'-DDE	–	2.0 (i) (c)	ND
Endosulfan	–	220 (i) (nc)	0.0065 (MW-5S)
Toxaphene	–	0.61 (i) (c)	ND
Organophosphate Pesticides			
Dimethoate	–	7.3 (i) (nc)	ND
Methylparathion	–	9.1 (i) (nc)	200 (C30)
Herbicides			
2,4-D	–	360 (i) (nc)	49 (MW-5D)
2,4,5-T	–	360 (i) (nc)	0.032 (MW-6S)
Inorganics			
Aluminum	–	36,000 (n) (nc)	2,150 (C10)
Arsenic	6	0.45 (i) (c)	15.8 (MW -4S)

Table 20 Continued – GWCALs, Adjusted PRGs, and Maximum Midco I Groundwater Detections (and Well Number) from the Most Recent Sampling for Contaminants Whose PRGs are Significantly More Stringent than the GWCALs, and for Contaminants That Do Not Have GWCALs But Have PRGs			
Cobalt	–	730 (n) (nc)	63.1 (G30)
Manganese	6,470	880 (i) (nc)	2,690 (D10)
Hydrogen sulfide	–	110 (i) (nc)	15,000 (MW-6S)

Table 21 – Comparison of GWCALs to 3.6 X Ecological Benchmarks, and Maximum Concentrations from 2002 Groundwater Sampling (all concentrations are in ug/l)

CONTAMINANT	GWCAL	BENCHMARK[24] X 3.9	MAXIMUM CONC. (WELL #)
Toluene	1,000	683	35,000 (MW-5S)
Xylenes	3,860	7	12,000 (MW-5S)
1,2-Dichlorobenzene	398	62	0.1 (MW-2S)
Bis(2-ethylhexyl)phthalate	23.1	13.2	ND
4-4'-DDT	0.952	0.0039	ND
Chlordane	0.2489	0.017	0.0067 ((MW-5S)
Heptochlor	0.4	0.015	0.0019 (MW-5D)
Barium	1,620	15	1670 (G30)
Beryllium	4	2	0.26 (MW-4S)
Cadmium	4.68	2.6	1.3 (MW-5S)
Copper	57	26	369 (MW-5S)
Lead	13.7	5.1	18.8 (H10)
Manganese	6,470	312	2,690 (D10)
Nickel	647	342	986 (G30)
Vanadium	227	75	224 (G30)
Zinc	1,330	230	106 (MW-5S)

[24] From memoranda by David Brauner of EPA dated June 4, 2001 and September 16, 2003.

FIVE-YEAR REVIEW
TABLE 22

TABLE 2-3

MAXIMUM ALLOWABLE CONCENTRATIONS[1]
MIDCO I AND II SITES
GARY, INDIANA

Parameter	Maximum Allowable Concentration (ug/l)	Parameter	Maximum Allowable Concentration (ug/l)
Volatile Organic Compounds			
Acetone	25,200	1,4-Dioxane	18.9
Acetonitrile	1,260	Ethyl benzene	4,410
Acrolein	3,150	Ethyl methacrylate	18,900
Acrylonitrile	0.378	Isobutanol	63,000
Benzene	31.5	Methacrylonitrile	25.2
Bromodichloromethane	1.89	Methanol	126,000
Bromomethane	315	Methyl chloride	18.9
Carbon disulfide	25,200	Methyl ethyl ketone	12,600
Carbon tetrachloride	31.5	Methyl isobutyl ketone	12,600
Chlorobenzene	630	Methyl methacrylate	18,900
2-Chloro-1,3-butadiene (Chloroprene)	4,410	Styrene	630
Chloroform	37.8	1,1,1,2-Tetrachloroethane	6.3
3-Chloropropene (allyl chloride)	12.6	1,1,2,2-Tetrachloroethane	1.26
Dibromochloromethane	2.52	Tetrachloroethene	31.5
1,2-Dibromo-3-chloropropane	1.26	Toluene	6,300
Dibromomethane	2,520	Tribromomethane (Bromoform)	25.2
Dichlorodifluoromethane	44,100	1,1,1-Trichloroethane	1,260
1,1-Dichloroethane	2.52	1,1,2-Trichloroethane	31.5
1,2-Dichloroethane	31.5	Trichloroethene	31.5
1,1-Dichloroethene	44.1	Trichlorofluoromethane	63,000
cis-1,2-Dichloroethene	441	1,2,3-Trichloropropane	1,260
trans-1,2-Dichloroethene	630	1,3,5-Trinitrobenzene	12.6
Dichloromethane	31.5	Vinyl chloride	12.6
1,2-Dichloropropane	31.5	Xylene (total)	63,000
1,3-Dichloropropene	1.26		
Semivolatile Organic Compounds			
Acenaphthene	12,600	Dibenz(a,h)anthracene	0.00441
Acetophenone	25,200	Di-n-butyl phthalate	25,200
Acrylamide	--	1,2-Dichlorobenzene	3,780
Aniline	37.8	1,4-Dichlorobenzene	472.5
Aramite	6.3	3,3'-Dichlorobenzidine	0.504
Benz(a)anthracene	0.063	2,4-Dichlorophenol	630
Benzidine	0.00126	Diethyl phthalate	189,000
Benzo(a)pyrene	1.26	Diethylstilbesterol	0.000441
Benzo(b)fluoranthene	0.126	Dimethoate	44.1
Benzyl alcohol	63,000	3,3'-Dimethoxybenzidine	18.9
Benzyl chloride	1.26	3,3'-Dimethylbenzidine	0.252
bis(2-Chloroethyl)ether	0.189	7,12-Dimethylbenz(a)anthracene	0.0063
bis(2-Chloroisopropyl)ether	6,300	2,4-Dimethylphenol	4,410
bis(2-Ethylhexyl)phthalate	18.9	Dimethyl phthalate	252,000
Butyl benzyl phthalate	44,100	1,3-Dinitrobenzene	25.2
p-Chloroaniline	630	2,4-Dinitrophenol	441
Chlorobenzilate	4,410	Dinitrotoluene	0.315
2-Chlorophenol	1,260	Di-n-octyl phthalate	4,410
Chrysene	1.26	Diphenylamine	5,670
Cresols	12,600	1,2-Diphenylhydrazine	0.252

TABLE 2-3

MAXIMUM ALLOWABLE CONCENTRATIONS[1]
MIDCO I AND II SITES
GARY, INDIANA
(Page 2 of 3)

Parameter	Maximum Allowable Concentration (ug/l)	Parameter	Maximum Allowable Concentration (ug/l)
Semivolatile Organic Compounds (continued)			
Disulfoton	6.3	N-Nitrosomethylethylamine	0.0126
Epichlorohydrin (1-Chloro-2,3-epoxypropane)	–	N-Nitrosopiperidine	0.0504
2-Ethoxy ethanol	63,000	Nitrosopyrrolidine	0.126
Ethyl ether	126,000	Octamethyl pyrophosphoramide	441
Ethylene dibromide	0.315	Parathion	1,260
Ethyl methanesulfonate	0.0063	Pentachlorobenzene	189
Famphur	6.3	Pentachloronitrobenzene	630
Fluoranthene	6,300	Pentachlorophenol	6.3
Fluorene	6,300	Phenol	126,000
Formic Acid	441,000	Phorate	44.1
Hexachlorobenzene	6.3	Pronamide	18,900
Hexachlorobutadiene	2.52	Pyrene	6,300
Hexachlorocyclopentadiene	315	Pyridine	252
Hexachloroethane	18.9	Safrole	0.63
Hexachlorophene	63	Strychnine and salts	63
Indeno(1,2,3-cd)pyrene	1.26	1,2,4,5-Tetrachlorobenzene	63
Isophorone	56.7	2,3,4,6-Tetrachlorophenol	6,300
3-Methylcholanthrene	0.0252	Tetraethyl dithiopyrophosphate	126
Methyl parathion	56.7	Toluene-2,4-diamine	0.567
Naphthalene	630	Toluene-2,6-diamine	44,100
2-Naphthylamine	0.252	o-Toluidine	0.63
Nitrobenzene	126	p-Toluidine	1.26
2-Nitropropane	0.0252	1,2,4-Trichlorobenzene	56.7
N-Nitroso-di-n-butylamine	0.0378	2,4,5-Trichlorophenol	25,200
N-Nitrosodiethylamine	0.00126	2,4,6-Trichlorophenol	18.9
N-Nitrosodimethylamine	0.00441	1,1,2-Trichloro-1,2,2-trifluoroethane	6,300,000
N-Nitrosodiphenylamine	44.1	Tris(2,3-dibromopropyl)phospate	0.189
N-Nitrosodi-n-propylamine	0.0315		
Pesticides/Polychlorinated Biphenyls			
Aldrin	0.0126	Heptachlor	2.52
Chlordane	12.6	Heptachlor epoxide (alpha, beta, gamma)	1.26
4,4'-DDD	0.63	alpha-HCH (alpha-BHC)	0.0378
4,4'-DDE	0.63	beta-HCH (beta-BHC)	0.126
4,4'-DDT	0.63	Kepone	0.0126
Diallate	3.78	Lindane (gamma-HCH)(gamma-BHC)	1.26
Dieldrin	0.0126	Methoxychlor	2.52
Endosulfan	12.6	Polychlorinated biphenyls	3.15
Endrin	1.26	Toxaphene	18.9
Herbicides			
2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	44.1	2,4,5-TP (Silvex)	315
2,4-Dichlorophenoxyacetic acid (2,4-D)	441	2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	2,520

TABLE 2-3

MAXIMUM ALLOWABLE CONCENTRATIONS[1]
MIDCO I AND II SITES
GARY, INDIANA

Parameter	Maximum Allowable Concentration (ug/l)	Parameter	Maximum Allowable Concentration (ug/l)
Inorganics			
Antimony	63	Lead	94.5
Arsenic	315	Mercury	12.6
Barium	6,300	Nickel	630
Beryllium	6.3	Selenium	315
Cadmium	31.5	Silver	315
Chromium	630	Thallium	12.6
Cyanide	1,260	Vanadium	1,260
Fluoride	25,200	Zinc	44,100

NOTE:

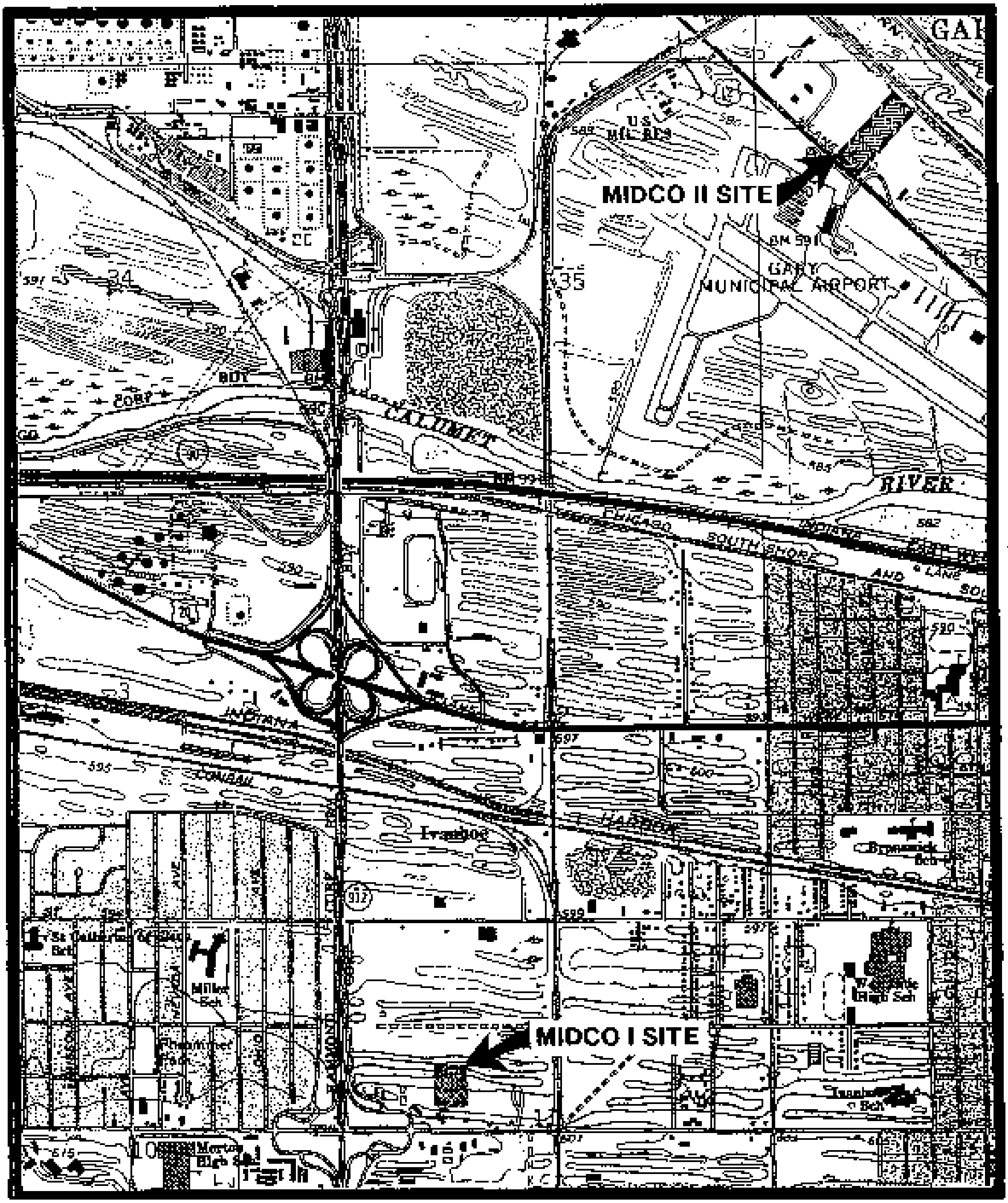
[1] The numbers shown were calculated as 6.3 times the health-based levels listed in Attachment 3 of the Statement of Work (SOW), which is included as Appendix A of the remedial design/remedial action (RD/RA) Work Plan (WP). A petition to modify this table is included in Section 7.0 of the WP.

KEY:

-- The parameter's health-based level is shown in Attachment 3 of the SOW as "treatment technique." The SOW is included as Appendix A of the RD/RA WP.

WHITING AND HIGHLAND QUADRANGLES
INDIANA-LAKE COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC)
1968
PHOTOREVISED 1980 AND 1986

N
W E
S



SCALE 1:24000
1 .5 0 1 MILE

CONTOUR INTERVAL 5 FEET

FIGURE 1-4

FIVE-YEAR REVIEW FIGURE 1

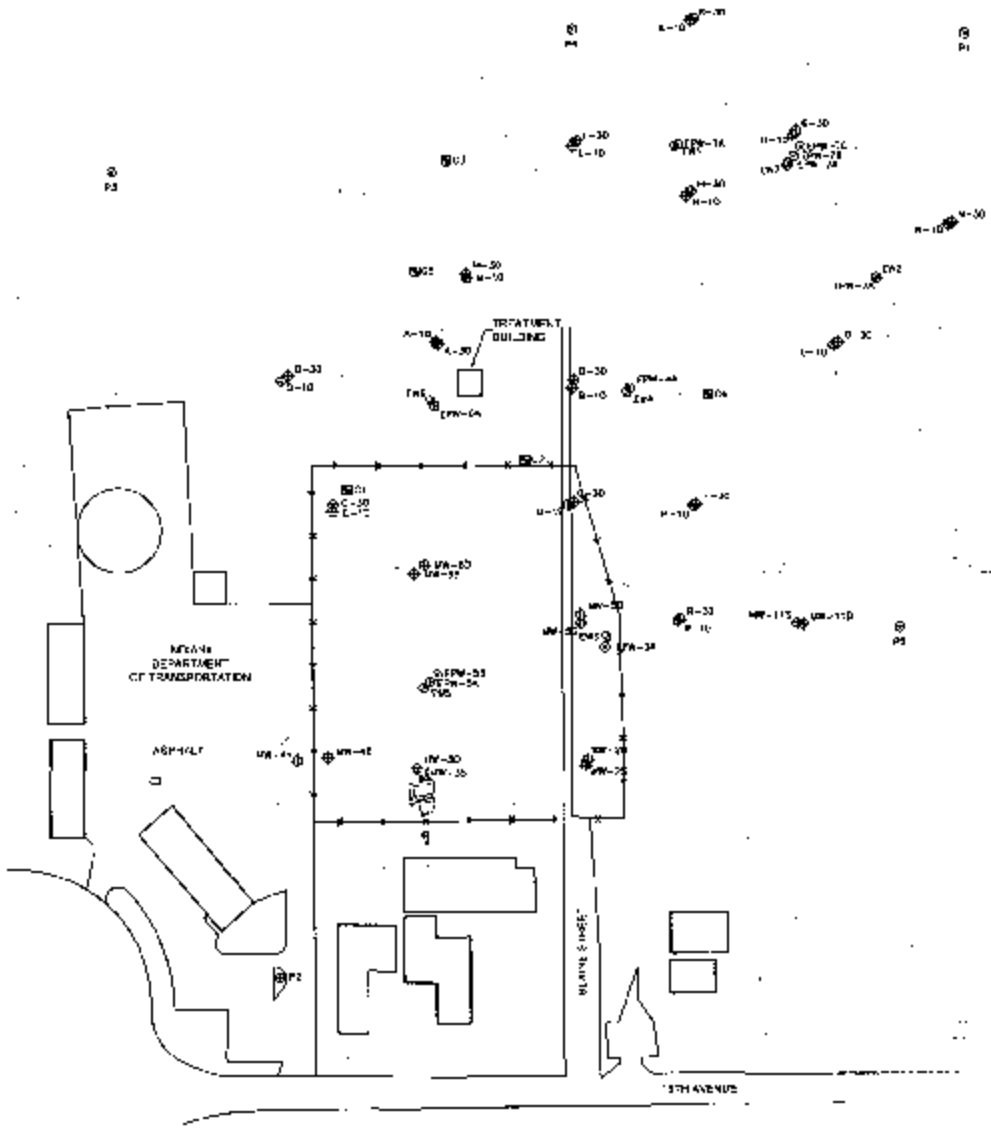
SITE LOCATION MAP
MIDCO I AND II SITES
GARY, INDIANA

QUADRANGLE LOCATION

ERM

MIDCO REMEDIAL CORPORATION
8/17/92
CMM
92127-8

FIGURE 2



LEGEND

- Fence
- Extraction Well Location
- Monitoring Well Location
- Piezometer Location
- Staff Gauge Location

APPROX. SCALE (ft.)
0 150

ENVIRON

Well and Piezometer Locations
Midco I Site
Gary, Indiana

DATE	PROJECT NUMBER	REVISION
10/16/00	21,886I	1
DRAWN BY: APR	CHECKED BY: SLH	

FIVE-YEAR REVIEW
FIGURE 3

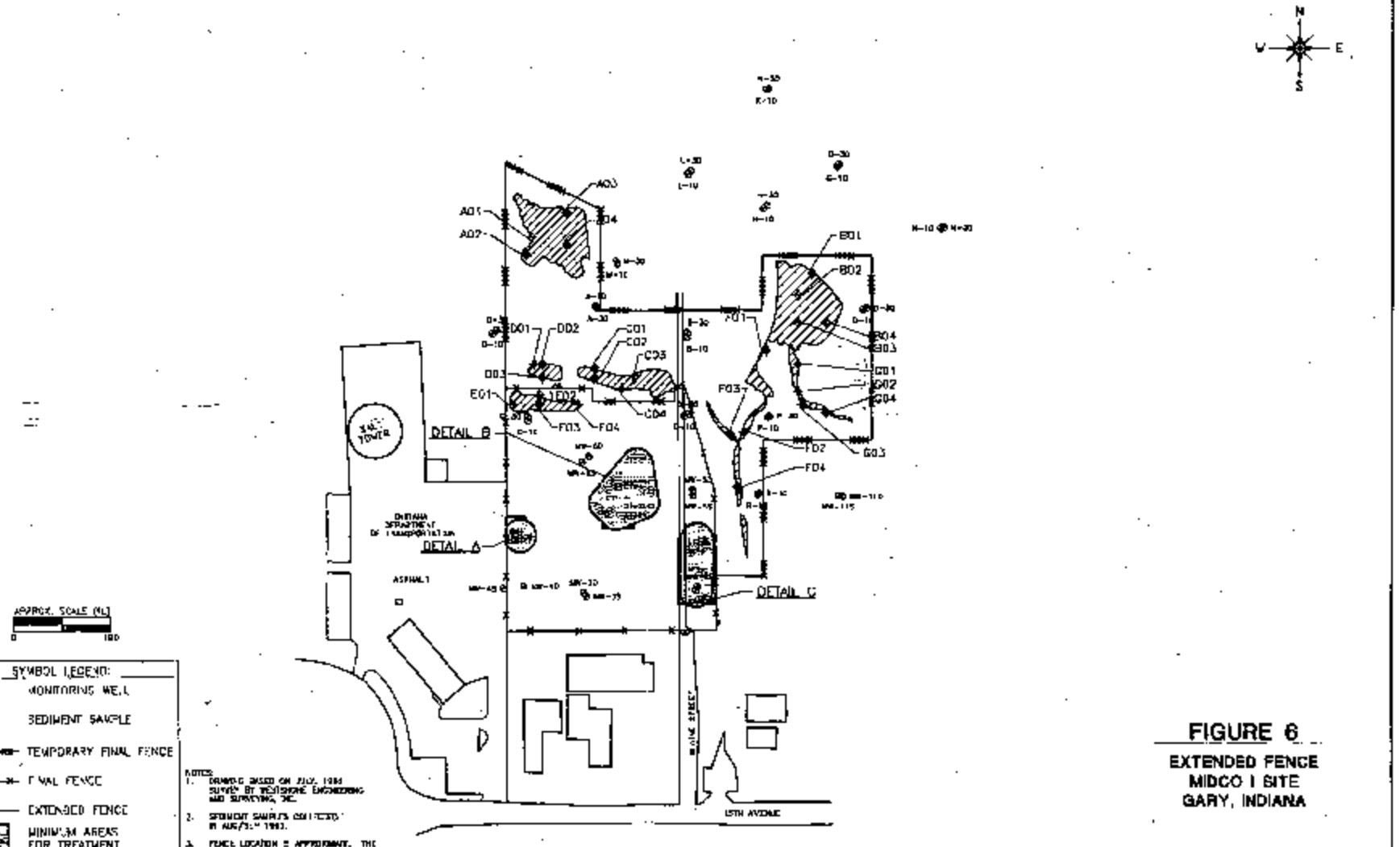


FIGURE 6

EXTENDED FENCE
MIDCO I SITE
GARY, INDIANA

ERM

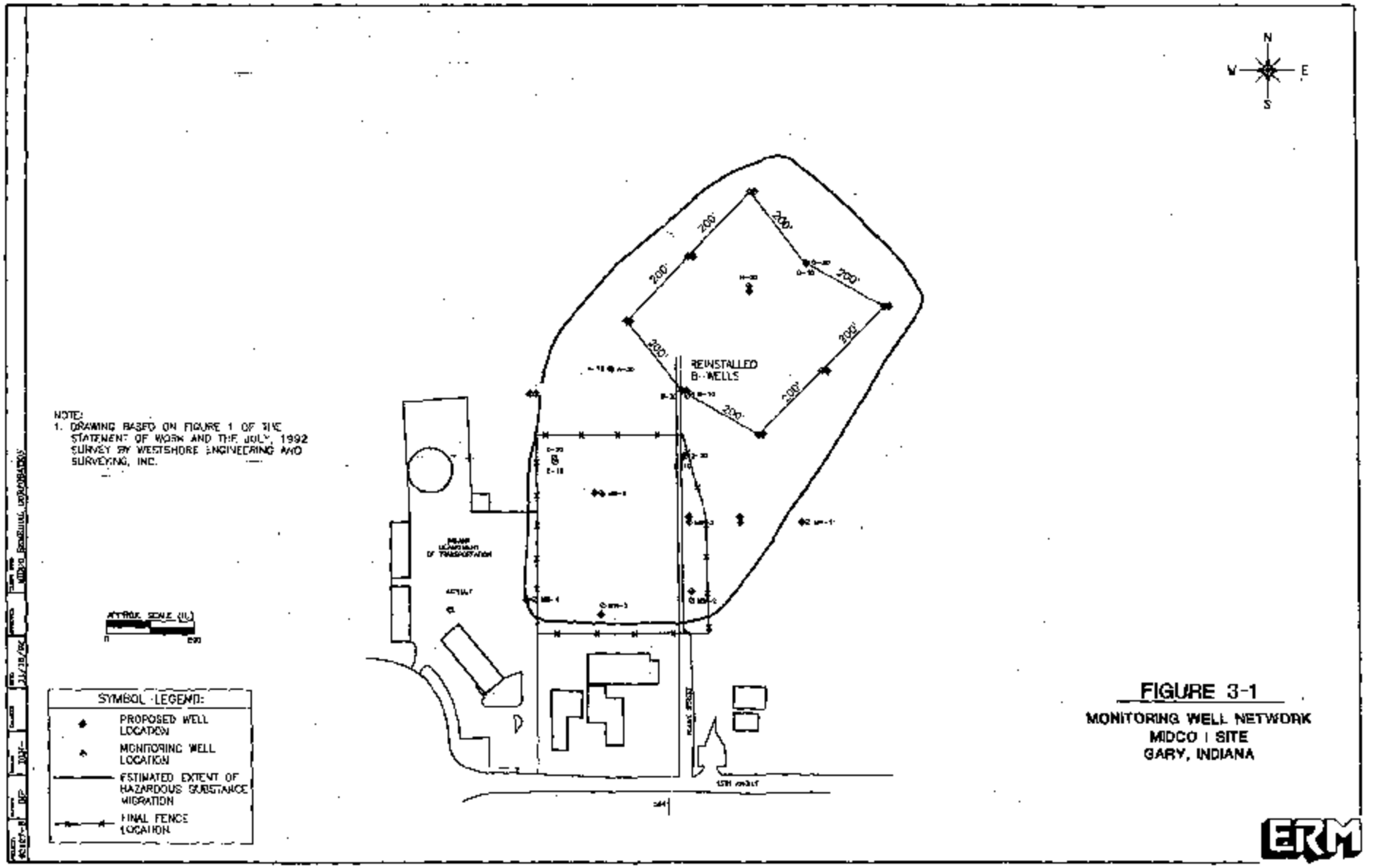


FIGURE 3-1
MONITORING WELL NETWORK
MIDCO I SITE
GARY, INDIANA

ERM

Attachment 1
FIVE-YEAR REVIEW
ATTACHMENT 1

APPENDIX 8

DEED RESTRICTION

_____, owner in fee simple of the real estate described below, hereby imposes restrictions on the described real estate ("_____ Property"), which is part of the Midco _ Facility, Township _____, Lake County, State of Indiana.

[Description of land]

Containing ___ acres, more or less.

The following restrictions are imposed on the _____ Property, its present and any future owners, their authorized agents, assigns, employees or persons acting under their direction or control, for the purpose of protecting public health and the environment and preventing interference with remedial action work and maintenance work approved by the United States Environmental Protection Agency ("USEPA") and/or the United States District Court for the Northern District of Indiana at the Midco _ Facility located at or about _____, Gary, Indiana ("Midco _ Facility").

1. Until the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, there shall be no consumptive or other use of the groundwater underlying the _____ Property that could cause exposure of humans or animals to the groundwater underlying the _____ Property or the Midco _ Facility;

2. Until the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, there shall be no residential, commercial, or agricultural use of the _____ Property, including but not limited to the construction, installation or use of any structures or buildings for residential, commercial, or agricultural purposes;

3. Until the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, there shall be no use of the _____ Property that would allow the continued presence of humans at the _____ Property, other than presence necessary for implementation of remedial action work or maintenance work approved by USEPA and/or the United Stats District Court for the Northern District Court of Indiana. Prohibit uses which would allow the continued presence of humans at the _____ Property will include but not necessarily be limited to recreational and educational uses.

4. Until the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, there shall be no installation, removal, construction or use of any buildings, wells, pipes, roads, ditches or any other structures at the ___ Property except as approved by USEPA.

5. There shall be no tampering with, or removal of, any containment or monitoring systems or remedial action work on the _____ Property.

6. There shall be no interference with the performance of work and remedial action, or with the maintenance of remedial measures approved by USEPA and/or the United States District Court for the Northern District of Indiana.

7. After the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, all uses of the _____ Property shall be consistent with the final remedial action implemented at the Midco _ Facility.

All of the above restrictions shall run with the land and continue in perpetuity.

IN WITNESS WHEREOF, _____ has caused these Deed Restrictions to be executed this _____ day of _____, 199_.

_____

By:_____

ATTEST:

DRAFT 3/23/04

ATTACHMENT 2

LIST OF DOCUMENTS AND REFERENCES REVIEWED OR USED FOR THE 2004 FIVE-YEAR REVIEW

Remedial Investigation of Midwest Solvent Recovery, Inc. (Midco I), Gary Indiana; Midco Trustees, December 1987.

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Letter re: Notification of Disposal of Spent Activated Carbon and Composite Oil/Water/Sludge Waste; ERM; December 8, 1998.

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Memorandum re: Midco I and Midco II; EPA; December 21, 1998.

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