

ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES

**Small Business Liability Relief and Brownfields Revitalization Act
United States Environmental Protection Agency CERCLA Section 128(a)
State Response Program Cooperative Agreement #RP-00E14606**

**Indiana Brownfields Program
Former Shell Bulk Oil Terminal Facility
2121 and 2219 West Michigan Street
Indianapolis, Marion County, Indiana
Brownfield Site ID: 4980013
June 2013**

This Analysis of Brownfield Cleanup Alternatives (ABCA) was prepared in cooperation among the Indiana Brownfields Program (Program), the Westside Community Development Corporation of Indianapolis (WCDC) and Heartland Environmental Associates, Inc. (Heartland) as a requirement for 128(a) funding for the cleanup of the former Shell Bulk Oil Terminal facility located at 2121 and 2219 West Michigan Street in Indianapolis, Marion County, Indiana (Site). The Program and the United States Environmental Protection Agency (USEPA) deemed the Site eligible for the expenditure of approximately \$73,000. Further Site Investigation (FSI) activities that were conducted in June 2013 determined that groundwater impacts were present and provided limited delineation of groundwater impacts at the Site. The area of groundwater impacts were determined to be in the eastern portion of the site, located beneath the easternmost of the two parcels of which the site is segregated. Environmental remediation activities utilizing this federal funding are anticipated to be completed by the end of August 2013. Site reuse is planned for commercial purposes.

This ABCA outlines the following three remedial alternatives considered for the Site:

1. Alternative 1: Source Removal via Soil Excavation and Offsite Disposal
2. Alternative 2: Monitored Natural Attenuation
3. Alternative 3: Sequestration/Solidification of Impacts

Groundwater impacts have been detected within the area of concern at the Site exceeding the Indiana Department of Environmental Management (IDEM) Remediation Closure Guide (RCG) Residential Screening Levels (RSLs) for volatile organic compounds (VOCs) and polyaromatic hydrocarbons (PAHs). These impacts require remediation prior to redevelopment; therefore this ABCA has been developed. The ABCA generally follows the outline developed by the USEPA and serves to summarize Site information, identify applicable regulations and document remedial alternative evaluation.

Site Background Information

Site Name and Location: Former Shell Bulk Oil Terminal Facility
2121 and 2219 West Michigan Street
Indianapolis, Marion County, Indiana 46222

Site Owner: Westside Community Development Corporation
2232 West Michigan Street
Indianapolis, Marion County, Indiana 46222

Site Background:

The former Shell Bulk Oil Terminal facility was historically operated as a bulk oil storage, warehouse and dispensing facility. The site is located on approximately 4.70-acres situated on two parcels (Parcel #'s 9021170 & 9054011). The facility historically dispensed, sold and stored petroleum products. Petroleum storage activities occurred from at least 1937 through 1996, when the property was demolished. Site demolition activities included the razing of all site buildings and superstructures, the removal of all foundations and footers, and the backfilling of the site to grade. The site has remained vacant since this time, and is currently covered by landscaped areas and overgrowth vegetation. The site was obtained by the City of Indianapolis in 1996, and transferred to the WCDC in 1999. Figures depicting the site are included with this ABCA.

Previous Environmental Assessments and Investigations:

Beginning in 1995, the site was subject to numerous subsurface investigations and remediation. From 1995 through 2001, site activities included the advancement of at least 87 shallow and deep soil borings and the installation of at least 13 groundwater monitoring wells. Soil and groundwater impacts were historically detected for numerous volatile organic compound (VOC) and semi-volatile organic compound (SVOC) constituents, (PAH subset) exceeding IDEM Risk Integrated System of Closure (RISC) Default Closure Levels. Underground storage tank (UST) removal and soil remedial excavations were also completed during this time frame to remove source areas of impacts to both soil and groundwater.

In 1999, a limited human-health risk evaluation for groundwater was completed. This risk evaluation determined that, although residual impacts were present at the site exceeding IDEM residential default criteria, no significant pathway existed for groundwater migration and existing groundwater impacts did not pose a threat to human health or the environment. Furthermore, utilizing statistical risk analysis, residual soil impacts exceeding the IDEM RISC direct contact closure levels were determined acceptable.

Based on these determinations, the site was issued a Certificate of Completion from the IDEM Voluntary Remediation Program in March 2004. The site was subsequently issued a Covenant Not to Sue (CNTS) in August 2005. Based on the terms of the CNTS, the site was restricted from future residential use.

In May 2011, the WCDC was provided a Site Status Letter from the Program to clarify IDEM's position on the necessity of an environmental response at the site and to establish whether existing environmental conditions at the site might hinder future redevelopment and/or transferal of the site. Based on the review by the Program, it was determined that, with the implementation of an environmental restrictive covenant limiting exposure to impacted groundwater and addressing potential vapor intrusion (VI) issues at the site, non-default commercial closure of the site under RISC would be suitable and no additional response action by IDEM was required.

In late 2012, the City of Indianapolis and the WCDC began evaluating the site for purposes of redevelopment. As part of this redevelopment evaluation, it was determined that additional investigation was needed throughout the site to determine the long term effectiveness of the prior remedial efforts and to assess existing subsurface conditions at the site. As part of this investigation Heartland advanced a total of five soil borings and installed five temporary groundwater piezometers at the site. These five temporary groundwater piezometers and the existing groundwater monitoring wells were sampled.

Impacts exceeding IDEM RCG RSLs for VOCs and PAHs were encountered in the central-eastern and south-southeastern portions of the site. VOC impacts included benzene, ethylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, trichloroethene and xylenes. PAH impacts included naphthalene and 2-methylnaphthalene. The impacts were present in the easternmost parcel (Parcel #9054011). Furthermore, the investigation indicated the presence of light non-aqueous phase liquids (LNAPLs) in one existing groundwater monitoring well (MW-1) and in two temporary piezometers (B-102 and B-103).

The FSI determined that petroleum impacts were still present in the central-eastern and south-southeastern portions of the site. Additional investigation was recommended to assess and delineate petroleum impacts in the area of concern and to determine the proper course of action to mitigate LNAPLs. Additional FSI activities completed in early June 2013 included the completion of a laser-induced fluorescence (LIF) survey and the installation of four new groundwater monitoring wells to vertically and horizontally delineate previously encountered impacts. The results of this FSI indicated the presence of petroleum impacts to groundwater from a depth 22 feet to 27 feet below ground surface (bgs). Furthermore the presence of LNAPLs was confirmed in the location of MW-1. The LIF survey indicated petroleum impacts consisted of a mixture of gasoline, diesel fuel and kerosene, likely impacting the site due to historic bulk storage of petroleum products.

Site Specific Remedial Goals:

The site is currently vacant and undeveloped. The site is being evaluated for redevelopment for commercial purposes to revitalize the site and the surrounding area. It was determined, based on FSI investigation activities, that impacts present at the site, although encountered at depth, present a potential concern regarding groundwater usage and potential vapor intrusion in any new construction within the area of concern. Therefore, remediation of groundwater impacts was recommended to mitigate potential future vapor intrusion issues and any potential additional exposure pathways.

Regulations and Cleanup Standards

Project Oversight:

The Program has worked and will continue to work with the WCDC and the City of Indianapolis in the development and implementation of groundwater remediation at the Site. Heartland was engaged by the Program to complete the FSI in June 2013 and to develop a remediation work plan (RWP) for site activities. All site activities were completed by Heartland in accordance to the pre-approved Quality Assurance Project Plan (QAPP) submitted to the USEPA in May 2013. Heartland submitted its RWP to the Program for review and preliminary approval prior to the development of this ABCA. Implementation of the final, approved remedial alternative will be completed by Heartland under supervision of the Program and the USEPA.

Cleanup Standards and other Applicable Laws and Regulations:

Impacts of VOCs and PAHs have been encountered at the Site exceeding the applicable IDEM RCG RSLs. These standards will be utilized in determining the effectiveness of groundwater cleanup. Applicable IDEM RCG RSLs are documented in Table A-6, Appendix A of the IDEM *Remediation Closure Guide* dated March 22, 2012.

All site activities will comply with the USEPA Brownfields Program requirements for site activities and will be completed with the pre-approved QAPP. Furthermore, all site activities and implemented remedial alternatives will comply with USEPA *Principles for Greener Cleanups*, promoting environmentally friendly site operations.

Evaluation of Remedial Alternatives

Remedial Alternatives Evaluated:

The following three remedial alternatives considered for the Site:

1. Alternative 1: Source Removal via Soil Excavation and Offsite Disposal
2. Alternative 2: Monitored Natural Attenuation
3. Alternative 3: Sequestration/Solidification of Impacts

Candidate remedial alternatives were evaluated based on effectiveness of the proposed alternative in mitigating impacts, the feasibility in implementation of the proposed alternative and the costs, both initial and long term, in remedial implementation.

Remedial Alternative Evaluation:

Based on the identified impacted media, extent and magnitude of impacts, and the corrective action goals, candidate remediation technologies were evaluated to address petroleum impacts to groundwater. Heartland has evaluated the following as potential remedial alternatives:

Source Removal via Soil Excavation and Off-site Disposal – The removal of impacted soils is often very effective in reducing or eliminating the leaching of impacts to groundwater at petroleum sites. Excavation and removal of impacted soils is often the most time efficient remedial methodology and can focus on the area of concern.

Due to the presence of impacts at a depth of 22 feet to 27 feet bgs, and evidence of potential residual petroleum impacts at a depth of 10 feet bgs, soil remedial excavation at the site would require an extensive amount of removal and disposal. Furthermore, soil excavation would be limited horizontally and vertically along the eastern border of the area of concern due to the presence of an electric substation. Although an effective alternative, soil removal and disposal would not be cost effective due to the large amount of soil that would be necessary to be removed (>7,000 tons) and the horizontal and vertical limits placed on a potential excavation along the eastern border. Estimated costs for this remedial alternative ranges from \$378,000 - \$600,000, depending on the final tonnage of impacted soils removed.

Monitored Natural Attenuation (MNA) – Since the area of concern is limited, the groundwater could be left to naturally attenuate. Monitored Natural Attenuation would be the simplest method of corrective action. However, due to high concentrations of VOCs in the area of concern, this goal would take several years to achieve, and would likely place restrictions on potential redevelopment at the site. Furthermore, long term monitoring would require long term site access and groundwater monitoring, extending and potentially delaying full redevelopment of the site and as a result would not be a cost-effective solution. Estimated costs for this remedial alternative are approximately \$160,000, accounting for up to seven years of continuous quarterly groundwater monitoring, as recommended for MNA.

Sequestration/Solidification of Impacts – Sequestration/solidification of impacts using injectable, adsorbent materials can be utilized to capture and hold VOC and petroleum impacts in groundwater and within the groundwater smear zone within the area of concern. Sequestration/solidification presents not only a time efficient application process for remedial implementation, but provides a long term solution to mitigating groundwater impacts. Groundwater impacts will adsorb over time and will continually mitigate. The final adsorbed product will remain in place as an inert, stable silica-glass material that will remain in place for any foreseen length of time. By introducing this material, not only will groundwater impacts be mitigated, but residual smear zone impacts in soils will also be mitigated, remediating a potential continual source of impacts to groundwater. Sequestration will also serve to mitigate potential vapor intrusion issues by solidifying VOC impacts, therefore eliminating vapor migration pathways.

This remedial alternative will require a minimum of four quarters of groundwater monitoring to confirm the effectiveness of the remediation, and potential annual monitoring after the completion of quarterly monitoring to confirm long term effectiveness. Estimated costs for this remedial alternative are approximately \$73,000.

Recommended Remedial Alternative:

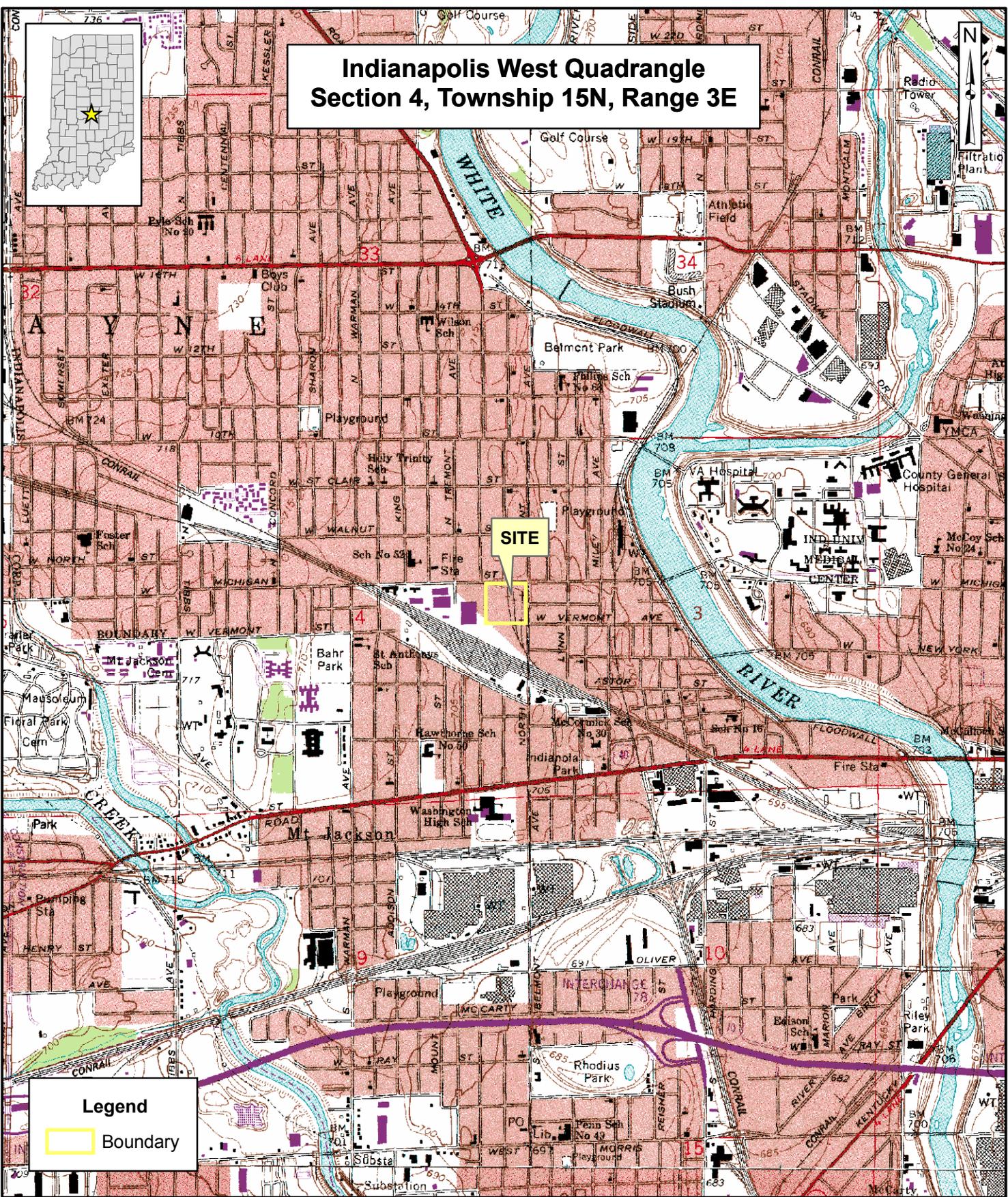
The most time effective and cost efficient remedial alternative is Alternative 3: Sequestration/Solidification of Impacts. This remedial alternative can be implemented within a short time frame and will be effective in remediating groundwater impacts and mitigating potential future exposure pathways.

Decision Document

A decision document will be issued at the close of the public comment period with additional details on the selected remedial alternative. This decision document will serve as a notice to proceed with 128(a) funded remedial activities and will be available in the local information repositories for public view, along with this Site ABCA and other Site-related documents for public review.

FIGURES

Indianapolis West Quadrangle Section 4, Township 15N, Range 3E



Base Map: USGS 7.5 Minute DRG Quadrangle



Heartland Environmental Associates, Inc.
3410 Mishawaka Avenue, South Bend, Indiana 46615

**FIGURE 1
SITE LOCATION MAP**

**FORMER SHELL BULK OIL FACILITY
2121 & 2219 WEST MICHIGAN STREET
INDIANAPOLIS, INDIANA**

Date:
6/16/13

Scale:
1"=100'

Drawn By:
NV



Legend

 Parcel Boundary

Base Map: 2011 IndianaMap Orthophotography



Heartland Environmental Associates, Inc.
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FIGURE 2
SITE LOCATION MAP W/PARCEL BOUNDARIES

FORMER SHELL BULK OIL FACILITY
2121 & 2219 WEST MICHIGAN STREET
INDIANAPOLIS, INDIANA

Date:
6/16/13
Scale:
1"=100'
Drawn By:
NV



Sheffield Ave

Michigan St



Belmont Ave



Legend

 Former Structures

Base Map: 2011 IndianaMap Orthophotography

FIGURE 3
SITE LOCATION MAP W/HISTORIC SITE STRUCTURES

FORMER SHELL BULK OIL FACILITY
2121 & 2219 WEST MICHIGAN STREET
INDIANAPOLIS, INDIANA

Date:
6/16/13

Scale:
1"=100'

Drawn By:
NV



Heartland Environmental Associates, Inc.
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Michigan St

Sheffield Ave

Belmont Ave

L02

L03

L01

L07

L06

L05

L04

Legend

- LIF Boring
- Area of Concern

Base Map: 2011 IndianaMap Orthophotography



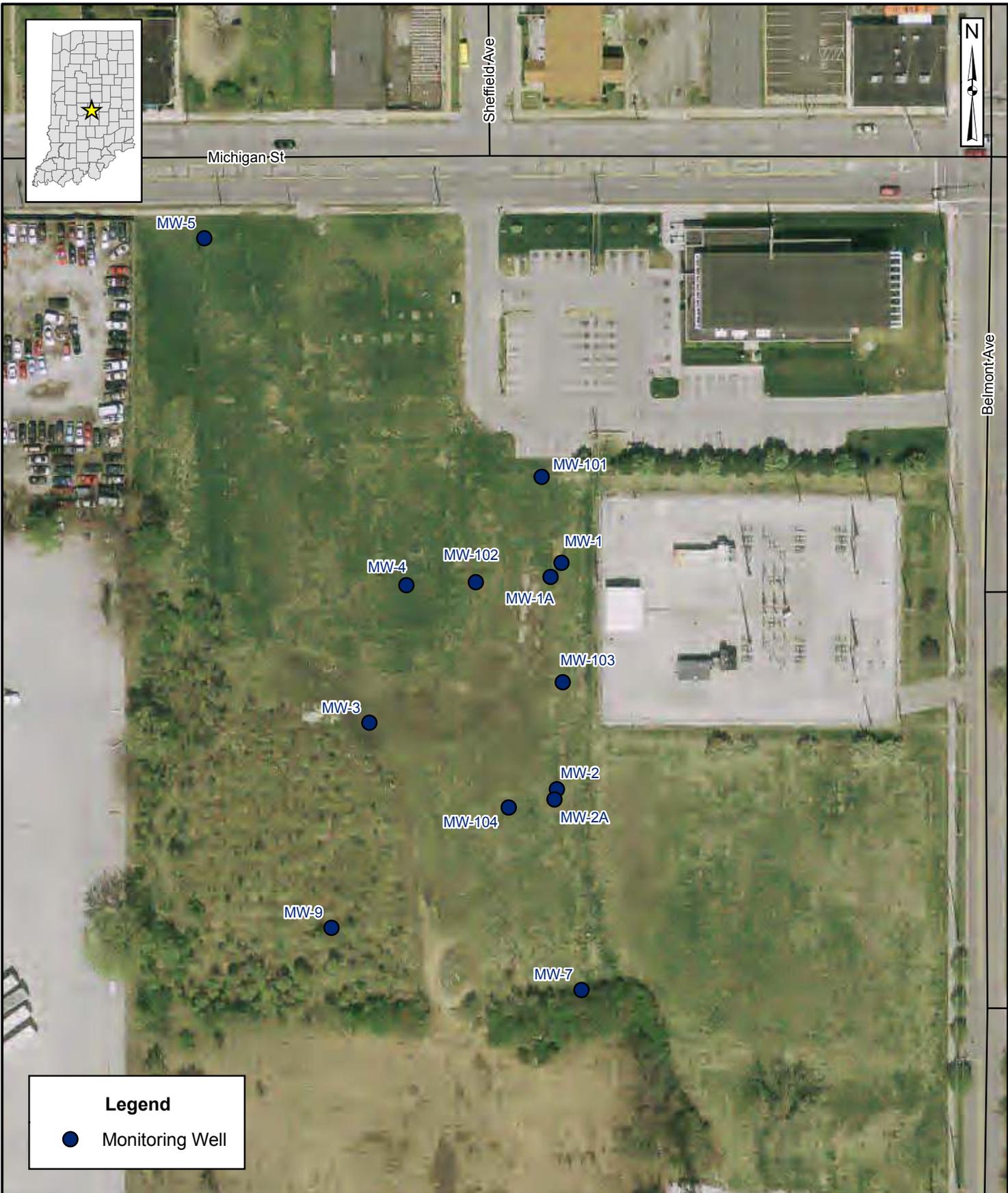
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FIGURE 4
SITE LOCATION MAP W/LIF AREA OF CONCERN
AND LIF BORING LOCATIONS
FORMER SHELL BULK OIL FACILITY
2121 & 2219 WEST MICHIGAN STREET
INDIANAPOLIS, INDIANA

Date:
6/16/13

Scale:
1"=100'

Drawn By:
NV



Legend

- Monitoring Well

Base Map: 2011 IndianaMap Orthophotography



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FIGURE 5
SITE LOCATION MAP WITH
NEW MONITORING WELL LOCATIONS
FORMER SHELL BULK OIL FACILITY
2121 & 2219 WEST MICHIGAN STREET
INDIANAPOLIS, INDIANA

Date:
6/16/13
Scale:
1"=100'
Drawn By:
NV



Sample ID	MW - 102
Sampled Date	6/6/13
Benzene	133
n-Butylbenzene	46.9
sec-Butylbenzene	54.2
tert-Butylbenzene	8.8
Ethylbenzene	7,870
Isopropylbenzene (Cumene)	169
n-Propylbenzene	293
1,2,4-Trimethylbenzene	2,010
1,3,5-Trimethylbenzene	591
Xylene (Total)	25,000
Fluorene	1.1
1-Methylnaphthalene	27.4
2-Methylnaphthalene	42.6
Naphthalene	246

Sample ID	MW - 1
Sampled Date	6/6/13
Benzene	85.6
n-Butylbenzene	44.5
sec-Butylbenzene	37.5
1,2-Dichlorobenzene	21.9
Ethylbenzene	362
Isopropylbenzene	82.2
n-Propylbenzene	144
1,2,4-Trimethylbenzene	579
1,3,5-Trimethylbenzene	20.5
Xylene (Total)	592
Fluorene	1.1
1-Methylnaphthalene	17.4
2-Methylnaphthalene	25.1
Naphthalene	211
Phenanthrene	1.1

Sample ID	MW - 101
Sampled Date	6/6/13
Tetrachloroethene	8.2

Sample ID	MW - 4
Sampled Date	6/6/13
Ethylbenzene	10.8
Isopropylbenzene	9.8
n-Propylbenzene	14.3
1,2,4-Trimethylbenzene	17.0
Xylene (Total)	77.6
1-Methylnaphthalene	4.6
2-Methylnaphthalene	3.6
Naphthalene	14.0

Sample ID	MW - 103
Sampled Date	6/7/13
Benzene	133
n-Butylbenzene	40.2
sec-Butylbenzene	53.3
tert-Butylbenzene	11.3
Ethylbenzene	5,900
Isopropylbenzene (Cumene)	272
n-Propylbenzene	514
Toluene	183
1,2,4-Trimethylbenzene	3,750
1,3,5-Trimethylbenzene	1,100
Xylene (Total)	25,400
1-Methylnaphthalene	12.6
2-Methylnaphthalene	20.9
Naphthalene	503

Sample ID	MW - 104
Sampled Date	6/7/13
n-Butylbenzene	20.7
sec-Butylbenzene	29.4
Ethylbenzene	41.3
Isopropylbenzene (Cumene)	31.4
n-Propylbenzene	30.5
1,2,4-Trimethylbenzene	46.6
Xylene (Total)	114
Acenaphthene	1.9
Anthracene	0.22
Fluorene	2.5
1-Methylnaphthalene	17.8
2-Methylnaphthalene	8.9
Naphthalene	5.6
Phenanthrene	2.9

Sample ID	MW - 7
Sampled Date	6/5/13
n-Butylbenzene	44.4
sec-Butylbenzene	21.2
1,2-Dichlorobenzene	566
1,1-Dichloroethane	41.8
Ethylbenzene	180
Isopropylbenzene	38.5
n-Propylbenzene	68.3
1,2,4-Trimethylbenzene	742
1,3,5-Trimethylbenzene	116
Xylene (Total)	433
1-Methylnaphthalene	3.3
2-Methylnaphthalene	4.8
Naphthalene	186

Sample ID	MW - 2
Sampled Date	6/5/13
Benzene	102
Chloroethane	82.2
1,1-Dichloroethane	57.6
cis-1,2-Dichloroethene	22.4
Ethylbenzene	499
Isopropylbenzene	9.6
1,2,4-Trimethylbenzene	48.8
1,3,5-Trimethylbenzene	14.6
Vinyl Chloride	4.7
Xylene (Total)	1,100
Naphthalene	2.7

Legend

● Monitoring Well

Notes:
 Values presented in parts per billion (ppb) or ug/l
 Bold text denotes value exceeds IDEM RCG RSLs
 Only results above detection limit shown.

Base Map: 2011 IndianaMap Orthophotography



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FIGURE 6
GROUNDWATER ANALYTICAL MAP
 FORMER SHELL BULK OIL FACILITY
 2121 & 2219 WEST MICHIGAN STREET
 INDIANAPOLIS, INDIANA

Date:
6/16/13
 Scale:
1"=100'
 Drawn By:
NV