DRAFT, DISCARD AFTER REVIEW
Thursday, June 19, 2020

June 19, 2020

Project No. 3986-304-04-01

COMPREHENSIVE SITE INVESTIGATION / REMEDIATION OBJECTIVES / REMEDIAL ACTION PLAN

VILLAGE OF BELLWOOD

LPC #0310155091

4901 St. Charles Road

Bellwood, Illinois

PREPARED BY

Weaver Consultants Group

EXECUTIVE SUMMARY

On behalf of the Village of Bellwood, the Remediation Applicant (RA), **Weaver Consultants Group North Central, LLC** (Weaver Consultants) is submitting this Comprehensive Site Investigation / Remediation Objectives / Remedial Action Plan (CSI/RO/RAP) pursuant to the requirements of 35 Illinois Administrative Code (IAC) 740.425, 740.445, and 740.450 for the property located at 4901 St. Charles Road in Bellwood, Illinois (the Property). It is the intention of the RA to secure a Comprehensive No Further Remediation (NFR) Letter from the Illinois Environmental Protection Agency (IEPA) Site Remediation Program (SRP) demonstrating the Property is compliant with remediation objectives under the residential land use scenario. The DRM-2 Form for document review has been provided with this report.

The Property is located at 4901 and 4905 St. Charles Road in Bellwood, Illinois (refer to **Figure 1 – Site Location Map**). For purposes of this Comprehensive NFR request, the "Remediation Site", also referenced herein as the "Property", consists of the entire Property as depicted on **Figure 2 – Site Base Map**. The Property generally lies north of St. Charles Road, east of 50th Avenue, south of Erie Street, and west of 49th Avenue. Residential properties are located to the north, west, and east of the Property and the building to the south of the Property across St. Charles Road is used as a church followed by residential properties (refer to **Figure 3 – Surrounding Land Use Map**). The Property consists of approximately 0.33 acres of land with approximately 125 feet of frontage along St. Charles Road and approximately 125 feet of frontage along 49th Avenue.

The Property is currently unimproved and unoccupied. The surface of the northern portion of the Property is grass-covered and the southern portion consists of asphalt. Concrete sidewalks are located along the eastern and western borders of the Property. **Figure 2 – Site Base Map** shows the location of the above referenced Property features.

Phase I ESA and Phase II ESA activities were historically conducted at the Property for the Cook County West Suburban Coalition and were funded by their United States Environmental Protection Agency (USEPA) Hazardous Substances and Petroleum Brownfields Community-Wide Assessment Grant (USEPA Agreement # BF00E01367-0). On behalf of Weaver Consultants, Integrated Environmental Solutions, Inc. (IES) conducted a Phase I Environmental Site Assessment (ESA) for the Property in accordance with American Society for Testing and Materials (ASTM) Standard Practice E1527-13. According to the Phase I ESA report dated October 2016, the following vapor encroachment condition (VEC) was identified as a recognized environmental condition (REC) in connection with the Property:

- REC-1: The known subsurface conditions at the Property are identified as a REC/VEC based on the presence of petroleum compounds in soil and groundwater, and since previous environmental investigations and the NFR Letter did not address vapor.

In addition, according to the Phase I ESA, the following controlled REC (CREC) was identified in connection with the Property:

- CREC-1: The Village received an NFR Letter from the IEPA SRP for the Property on November 16, 2011, which was recorded on November 22, 2011. The Property has been approved for industrial/commercial land use with institutional controls including a groundwater ordinance, a Highway Authority Agreement Memorandum of Agreement, and a construction worker caution to mitigate the risks of inhalation of residual soil contaminants. In addition, an engineered barrier must remain over the impacted soils and must be properly maintained. This NFR Letter with preventative controls addressing possible worker exposure in the event that any future excavation and construction activities may occur within the impacted soil located under the engineered barrier has been identified as a CREC.

Based on a review of historical records conducted in support of the aforementioned Phase I ESA, the Property consisted of undeveloped land from at least 1939 to 1954. Between 1954 and 1962, the Property was developed as a gasoline and automobile service station that included one commercial structure, eight underground storage tanks (USTs), associated underground piping, pump islands for vehicle fueling, and vehicle maintenance. The Property was identified on the Office of the Illinois State Fire Marshal (OSFM) UST database as formerly containing four 3,000-gallon gasoline USTs; one 10,000-gallon gasoline UST; one 1,000-gallon heating oil UST; one 300-gallon used oil UST; and one 2,000-gallon gasoline UST. According to city directories, the Property was occupied by Herb's Enco Service Station, Bellwood Enco Service Station, Sloan Oil Company, Bellwood Union 76, Madanis, Inc., and/or Sergio's Automotive Shop from at least 1969 to 1992. The Property remained in the same general configuration through at least 1993. Between 1993 and 1998, the structure on the Property appeared to have been razed and on August 12, 1999, the eight USTs were removed. The Property has remained as vacant land through the present day.

Leaking UST (LUST) incident 971779 was issued by Illinois Emergency Management Agency (IEMA) on September 22, 1997 based on the discovery of petroleum-related impacts during a 1997 subsurface investigation. A Corrective Action Completion Report (CACR) was prepared for the LUST incident in May 2004 by K-Plus Environmental, Inc. (K-Plus), but was rejected by the

IEPA on September 8, 2004 for multiple reasons including the absence of an appropriate engineered barrier, the absence of sufficient quality assurance/quality control documentation for the soil and groundwater sample laboratory analyses, and for insufficient analyses of soil samples collected from the former used oil UST excavation.

The Property was enrolled in the IEPA Site Remediation Program (SRP) in June 2006 to address impacts associated with the LUST incident. Site investigation activities were completed by Shaw Environmental Inc. (Shaw) in February and May 2006. Shaw identified the presence of benzene, ethylbenzene, benzo(a)pyrene, naphthalene, and total iron, lead, and manganese impacts within soil, and benzene, methyl tert-butyl ether (MTBE), and total arsenic, iron, and manganese impacts within groundwater. Remediation activities were completed in June 2011 and on November 16, 2011, the IEPA issued a Focused NFR Letter for the Property with an industrial/commercial land use restriction, a construction worker caution, a Highway Authority Agreement, an engineered barrier in the southwestern portion, and a groundwater use restriction. The contaminants of concern (COCs) identified in the Focused NFR Letter include the Target Compound List (TCL) parameters, with the exception of arsenic, iron, lead, and manganese.

Based on the date the NFR Letter was issued, the Indoor Inhalation Exposure Route was not addressed. As a result, Weaver Consultants conducted a Phase II ESA on February 13, 2017 for the Cook County West Suburban Coalition. The Phase II ESA was funded by their USEPA Hazardous Substances and Petroleum Brownfields Community-Wide Assessment Grant (USEPA Agreement #BF00E01367-0). Work was conducted in accordance with the Sampling and Analysis Plan (SAP) dated January 5, 2017 which was approved by the USEPA on January 23, 2017.

The Scope of Work for the Phase II ESA included the installation of five soil-gas implants for soil-gas sample collection and analysis (refer to **Figure 4 – Approximate Soil Boring/Monitoring Well/Probe Location Map**). Soil-gas samples collected in support of the February 2017 Phase II ESA were submitted for laboratory analyses for various volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and mercury. Analytical results were compared to TACO Tier 1 Soil-Gas Remediation Objectives (S-GROs) listed in 35 Illinois Admn Code (IAC) 742, Appendix B, Tables G-H. According to the analytical results, the soil-gas sample results were below laboratory reporting limits and/or Tier 1 S-GROs with the exception of benzene within BV-SG-GP-04 and BV-SG-GP-05, and ethylbenzene detected in sample BV-SG-GP-05 exceeding the Tier 1 S-GROs for the Indoor Inhalation Exposure Route.

As indicated above, the November 16, 2011 NFR Letter was issued under an industrial/commercial land use scenario that relied on engineered barriers to address subsurface environmental conditions and did not address the Indoor Inhalation Exposure Route. At this time, the Village of Bellwood plans to redevelop the Property for residential land use. As a result, the Village of Bellwood is seeking to obtain another NFR Letter under a residential land use scenario without reliance on engineered barriers and to address the Indoor Inhalation Exposure Route. In support of this effort, the Village of Bellwood has sought assistance from Cook County. Cook County was awarded a Brownfields Revolving Loan Fund (RLF) to provide financial assistance to various municipalities to conduct environmental cleanup activities. The Cook County RLF will be used in support of these SRP activities to secure the new NFR Letter.

Based on the above, the Village of Bellwood enrolled the Property into the SRP on April 20, 2020. In support of these SRP activities, a SAP dated May 15, 2020 was submitted to the IEPA for review. Following SAP submittal, Weaver Consultants conducted a Comprehensive Site Investigation on May 20-21, 2020 in accordance with SRP Comprehensive Site Investigation requirements (35 IAC 740.415, 740.420, and 740.425). Soil, groundwater, and soil-gas are considered the media of concern for this Property. Soil and groundwater samples were submitted for laboratory analysis of various TCL parameters as presented in 35 IAC 740 Appendix A, Table A-D, which are the COCs for this Property.

Laboratory analytical results were compared to Tier 1 SROs for Residential Properties and Tier 1 GROs for Class II Groundwater. Benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tert-butyl ether (MTBE) were detected in excess of the applicable Tier 1 SROs. In addition, arsenic and toxicity characteristic leaching procedure (TCLP) iron were detected in excess of the applicable Tier 1 SROs.

The COCs exceeding applicable Tier 1 GROs for Class II Groundwater include benzene, ethylbenzene, and total inorganics. Groundwater samples submitted for laboratory analysis of dissolved inorganics were below laboratory reporting limits and/or Tier 1 GROs for Class II Groundwater, with the exception of dissolved iron. In addition, the COCs exceeding Tier 1 S-GROs for Residential Properties include benzene and ethylbenzene.

Based on the results, the vertical and horizontal extent of soil, groundwater, and soil-gas impacts has been characterized in accordance with SRP requirements. The majority of the organic soil impacts were located at the central-western, central-south, and south portions of the Property to an approximate depth of seven to twelve (12) feet below ground surface, and are likely related

to the historical UST impacts. The majority of arsenic impacts were detected at intermittent locations across the Property and are likely attributed to typical urban fill material.

The remediation objectives proposed for the Property include Tier 1 SROs, GROs, and S-GROs. To achieve compliance with these remediation objectives, remedial action is proposed that includes a risk-based strategy with reliance on institutional controls in conjunction with "hot spot" removal to address subsurface impacts. "Hot spot" removal will include the excavation and offsite disposal of soil exhibiting benzene, toluene, total xylenes, and arsenic concentrations exceeding Tier 1 SROs for the Soil Ingestion and Inhalation Exposure Routes and Tier 1 S-GROs for the Indoor Inhalation Exposure Route. Soils in the vicinity of soil-gas samples BV-SG-GP-04 and BV-SG-GP-05 exceeding the Tier 1 S-GRO for the Indoor Inhalation Exposure Route are proposed for removal as part of the "hot spot" removal. In addition, BTEX and naphthalene impacts in excess of the Tier 1 SROs for the Construction Worker Scenario will also be removed along with these "hot spot" removal activities.

The RAP also proposes reliance on a groundwater use restriction to address both components of the Groundwater Ingestion Exposure Route. Upon completion, a Remedial Action Completion Report will be prepared, and the RA will request issuance of the draft Comprehensive NFR Letter for the Property.

The CSI Report, **Section 2.0**, identifies the REC, CREC, and COCs; summarizes the site investigation activities; and demonstrates appropriate characterization of the nature and extent of impacts. The RO Report, **Section 3.0**, describes the evaluation completed to establish the appropriate remediation objectives for the COCs. The RAP is provided in **Section 4.0** of this Report. **Section 5.0** provides conclusions and **Section 6.0** includes the signatures and certifications of the RA and Professional Engineer. **Section 7.0** includes sources consulted or reviewed in connection with this report.

COMPREHENSIVE SITE INVESTIGATION / REMEDIATION OBJECTIVES / REMEDIAL ACTION PLAN

Village of Bellwood
4901 St. Charles Road
Bellwood, Illinois

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1 INTRODUCTION

The following presents the information required by 35 Illinois Admin. Code (IAC) 740.425, 740.445, and 740.450 for submission of a Comprehensive Site Investigation / Remediation Objectives / Remedial Action Plan (CSI/RO/RAP). It is the intention of the Village of Bellwood, the Remediation Applicant, to secure a Comprehensive No Further Remediation (NFR) Letter from the Illinois Environmental Protection Agency (IEPA) Site Remediation Program (SRP) demonstrating the Property is compliant with remediation objectives under the residential land use scenario. The required IEPA SRP DRM-2 form has been included with this report.

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Laboratory analytical results were compared to Tier 1 SROs for Residential Properties and Tier 1 GROs for Class II Groundwater. Benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tert-butyl ether (MTBE) were detected in excess of the applicable Tier 1 SROs. In addition, arsenic and toxicity characteristic leaching procedure (TCLP) iron were detected in excess of the applicable Tier 1 SROs.

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Based on the results, the vertical and horizontal extent of soil, groundwater, and soil-gas impacts has been characterized in accordance with SRP requirements. The majority of the organic soil impacts were located at the central-western, central-south, and south portions of the Property to an approximate depth of seven to twelve (12) feet below ground surface, and are likely related

to the historical UST impacts. The majority of arsenic impacts were detected at intermittent locations across the Property and are likely attributed to typical urban fill material.

The remediation objectives proposed for the Property include Tier 1 SROs and S-GROs. To achieve compliance with these remediation objectives, remedial action is proposed that includes a risk-based strategy with reliance on institutional controls in conjunction with "hot spot" removal to address subsurface impacts. "Hot spot" removal will include the excavation and offsite disposal of soil exhibiting benzene, toluene, total xylenes, and arsenic concentrations exceeding Tier 1 SROs for the Soil Ingestion and Inhalation Exposure Routes and Tier 1 S-GROs for the Indoor Inhalation Exposure Route. Soils in the vicinity of soil-gas samples BV-SG-GP-04 and BV-SG-GP-05 exceeding the Tier 1 S-GRO for the Indoor Inhalation Exposure Route are proposed for removal as part of the "hot spot" removal. In addition, BTEX and naphthalene impacts in excess of the Tier 1 SROs for the Construction Worker Scenario will also be removed along with these "hot spot" removal activities.

The RAP also proposes reliance on a groundwater use restriction to address both components of the Groundwater Ingestion Exposure Route. Upon completion, a Remedial Action Completion Report will be prepared, and the RA will request issuance of the draft Comprehensive NFR Letter for the Property.

1.1 Report Purpose

It is the intention of the RA to secure a Comprehensive NFR Letter for the Property. This Report is being submitted to address the following SRP requirements:

1. Submission of a CSI Report for a Comprehensive Site Investigation in accordance with 35 IAC Section 740.425;
2. Submission of a RO Report in accordance with 35 IAC Section 740.445; and
3. Submission of a RAP in accordance with 35 IAC Section 740.450.

The CSI Report, **Section 2.0**, summarizes the site investigation activities and includes a characterization of the horizontal and vertical extent of observed impacts. The RO Report, **Section 3.0**, describes the evaluation completed to establish the appropriate remediation objectives for the COCs. The RAP, **Section 4.0**, describes proposed remediation technology and implementation approaches anticipated to achieve compliance with the proposed remediation objectives. **Section 5.0** provides our conclusions and **Section 6.0** includes the signatures and certifications of the RA and Professional Engineer. **Section 7.0** includes sources consulted or reviewed in support of the development of this report.

1.2 User Reliance

This report has been prepared on behalf of the RA, the Village of Bellwood, for submission to the IEPA SRP. No additional parties may use the information contained in this report without obtaining the written permission of Weaver Consultants and Village of Bellwood. Weaver Consultants' duties and obligations extend only to Village of Bellwood. Weaver Consultants' duties and obligations to such parties are not transferable to any person, corporation, or organization without the express written consent of Weaver Consultants and Village of Bellwood.

1.3 Project Background

The following presents a general summary of the available information concerning historical site assessments/investigations from the reports identified below. This summary is intended to provide a general understanding of the timing, scope and findings of the historical documents and site investigation activities as well as providing information from relevant government agencies. Copies of the historical environmental reports have been provided on compact disc in **Appendix A**.

The following historical environmental documents were reviewed as part of the recent Phase I ESA and in support of SRP activities:

1. Phase I ESA, 4901 St. Charles Rd. Bellwood, Illinois. Shaw, February 2006.
2. CSI Report, 4901 St. Charles Road, Bellwood, Illinois. Shaw, May 2006.
3. Election to Proceed Under SRP and SRP Enrollment Application. Shaw, May 24, 2006.
4. CSI review letter. IEPA, February 7, 2007.
5. Addendum to Comprehensive Site Investigation Report. Shaw, March 21, 2007.
6. Review and Evaluation Licensed Professional Engineer (RELPE) review letter to Earth Tech, Inc. IEPA, November 7, 2007.
7. RELPE agreement letter to the IEPA. Village of Bellwood, November 29, 2007.
8. RELPE review authorization letter to Earth Tech. IEPA, December 20, 2007.
9. CSI review letter. IEPA, January 24, 2008.
10. Additional Site Investigation Work Plan, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, August 2009.

11. Revised Additional Site Investigation Work Plan, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, September 2009.
12. CSI Report, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, January 2010.
13. Addendum to the CSI Report, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, October 4, 2010.
14. RO/RAP, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, October 2010.
15. Highway Authority Agreement Memorandum of Agreement for 4901 St. Charles Road.
16. Summary of Soil Mitigation at Former Gas Station Property, 4901 St. Charles Rd. Bellwood, Illinois. Apex Companies, LLC (Apex), June 22, 2011.
17. Expanded Ownership Report, 4901 St. Charles Road, Bellwood, Illinois. MACTEC Engineering and Consulting, Inc. (MACTEC), July 5, 2011.
18. Remedial Action Completion Report, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, July 2011.
19. Memorandum of Agreement. By and between the Village of Bellwood and IEPA, August 2011.
20. Focused NFR Letter, IEPA to the Village of Bellwood, November 16, 2011.
21. Site Remediation Program (SRP) Checklist.
22. Phase I ESA, 4901 and 4905 St. Charles Road, Bellwood, Illinois. IES under contract with Weaver Consultants, October 2016.
23. Phase II ESA SAP, 4901 and 4905 St. Charles Road, Bellwood, Illinois. Weaver Consultants, January 5, 2017.
24. Phase II ESA, 4901 and 4905 St. Charles Road, Bellwood, Illinois. Weaver Consultants, May 3, 2017.
25. Site Investigation SAP, 4901 and 4905 St. Charles Road, Bellwood, Illinois. Weaver Consultants, May 15, 2020.

The above referenced reports are summarized below.

- Phase I ESA 4901 St. Charles Rd. Bellwood, Illinois, Shaw, February 2006

According to the Phase I ESA Report dated February 2006, the following RECs were identified in connection with the Property:

- *The Site was utilized as a gasoline station in the 1970s and 1980s. Operations at the Site included the installation of eight Underground Storage Tanks (USTs). Releases of gasoline and used oil were reported to the Illinois Emergency Management Agency (IEMA) in 1997 from the on-site USTs. Although the Site has been enrolled in the Illinois Environmental Protection Agency (IEPA) Leaking Underground Storage Tank (LUST) Program, the IEPA has not issued a No Further Remediation Determination (NFR) for the Site. It is the opinion of Shaw that the active LUST incident at the Site indicates a past release of hazardous materials at the Site and thus constitutes an on-site Recognized Environmental Condition.*
- *The southeastern adjoining property, Krafftkare Automotive, Inc., 4820 St. Charles Road, Bellwood, Illinois is a vehicle repair facility. The Krafftkare Automotive, Inc. facility is identified as a Resource Conservation and Recovery Act, Small Quantity Generator. Vehicle repair facilities typically handle bulk quantities of hazardous materials such as oils, lubricants, and antifreeze. During the Site reconnaissance, Shaw observed two potential Underground Storage Tank (UST) vent pipes along the southern wall of the Krafftkare Automotive, Inc. facility. Shwa additionally observed a triple basin oil and gas interceptor and potential UST fill port in the asphalt parking lot south of the Kraftkare Automotive, Inc. facility. The Krafftkare Automotive, Inc. facility is not identified in the IEPA UST List database. It is the opinion of Shaw, that the use of the southeastern adjoining property as a vehicle repair facility and the potential storage of bulk quantities of hazardous materials in USTs indicate a material threat of a release of hazardous materials into the subsurface and thus constitutes a Recognized Environmental Condition with respect to the Site.*
- *Tri-Town Service, Inc., 5020 St. Charles Road Bellwood, Illinois, located approximately 390 feet to the west-southwest of the Site, is identified under LUST Incident #921334. The LUST incident, reported to the IEMA on May 18, 1992, was in relation to a release of gasoline. The 20-Day Report and 45-Day Report were received on December 5, 2000 and December 22, 2000, respectively; however, an NFR Determination has not been issued by the IEPA for the 1992 LUST incident. It is the opinion of Shaw that due to its close proximity to the Site, and lack of regulatory compliance in the form of an NFR Determination, the LUST incident at the Tri-Town facility has a potential for impacting*

the site, and thus constitutes a Recognized Environmental Condition with respect to the Site.

- CSI Report, 4901 St. Charles Road, Bellwood, Illinois, Shaw, May 2006

The site investigation activities completed by Shaw in 2006 included the advancement of nine soil borings, the installation of five monitoring wells, and the collection of soil and groundwater samples (refer to **Figure 4 – Boring/Monitoring Well/Probe Location Map**). Soil sampling analytical results indicated the presence of benzo(a)pyrene, benzene, ethylbenzene, naphthalene, and total iron, lead, and manganese above the IEPA TACO Tier 1 SROs (refer to **Table 1 – Historical Soil Analytical Summary** and **Table 2 – Historical pH-Specific SROs Analytical Summary**). Groundwater sampling analytical results indicated the presence of benzene, MTBE, and total arsenic, iron, and manganese above the Tier 1 GROs for the Groundwater Exposure Ingestion Route for Class II Groundwater (refer to **Table 3 – Historical Groundwater Analytical Summary**). It was Shaw's opinion that the identified residual soil and groundwater impacts posed a risk to human health and the environment and they recommended the development of a RO Report/RAP for submittal to the IEPA SRP.

- Election to Proceed Under SRP and SRP Enrollment Application, Shaw, May 24, 2006

IEPA form requesting to proceed with closing LUST Incident #97-1779 under the SRP.

- IEPA review letter dated February 7, 2007

IEPA review letter regarding the Shaw CSI Report. The IEPA requested copies of the 1997 "45-Day" report by Noble & Associates; 1999 Phase II investigation report by Noble & Associates; and the 2001 Phase II investigation report by K-Plus as well as a figure showing the locations of the former USTs.

- Addendum to CSI Report, Shaw, March 21, 2007

The addendum included the following documents:

  - Phase II Subsurface Investigation, K-Plus, July 9, 2001.
  - Corrective Action Completion Report, K-Plus, 2004.

Shaw clarified that the Noble & Associates documents were cited as a reference based on discussions in the K-Plus reports. Shaw further indicated that they were not provided with copies of the Noble & Associates documents.

A review of the K-Plus Phase II Subsurface Investigation report indicated that in June 2001, K-Plus advanced thirteen (13) soil borings at the Property to delineate the horizontal and vertical extent

of petroleum contamination that was previously identified (refer to **Figure 4**). Based on analytical results, elevated benzene concentrations were detected above the most stringent soil remediation objectives for industrial/commercial properties in seven of seventeen (17) soil samples submitted for laboratory testing of BTEX. Elevated ethylbenzene concentrations were detected in two of seventeen (17) soil samples above the most stringent soil remediation objectives for industrial/commercial properties (refer to **Table 1**). According to the report, elevated polynuclear aromatic hydrocarbon (PNA) constituents were not identified in the vicinity of the former used oil and heating oil USTs above the most stringent soil remediation objectives for industrial/commercial properties.

The Phase II Subsurface Investigation report indicated that several areas of elevated BTEX constituents were present at the Property, and the area of impacted soils appeared to extend from just below the ground surface to an approximate depth of 8 feet below ground surface (bgs) along the central portion of the Property. According to the report, impacted soils appeared to extend to an approximate depth of 11 feet bgs along the southeastern portion of the Property and to an approximate depth of 15 feet bgs along the southwestern portion of the Property. K-Plus indicated that the area of elevated BTEX constituents appeared to extend off-site to the south below St. Charles Road and that limited BTEX contamination had migrated off-site to the west.

A review of the K-Plus 2004 CACR indicated that in April 2004, K-Plus advanced one soil boring on the Property and eleven (11) borings on adjacent properties west and south of the Property to determine the extent of off-site contamination as well as supplement the 2001 Phase II subsurface investigation (refer to **Figure 4**). Three borings were converted to monitoring wells. According to the report, soil sample laboratory analyses indicated that contamination had extended west of the southwest corner of the Property and that no contaminants were detected in the three groundwater samples. As part of the CACR, K-Plus also conducted an exclusion pathway analysis. Based on the analysis and evaluation of the risk to human health, K-Plus requested that the LUST incident be closed and the IEPA issue an NFR Letter with the following restrictions: an engineered barrier, industrial/commercial land use restriction, groundwater ordinance, highway authority agreement, and construction worker cautionary statement. In order to address the contamination identified on the adjacent property to the west, K-Plus recommended utilizing the asphalt paved parking lot as an engineered barrier as well as an Environmental Land Use Control (ELUC) in order to maintain the institutional control.

- November 7, 2007 letter from IEPA to Earth Tech, Inc. requesting a cost estimate for RELPE review and comment on the Shaw Phase I ESA and CSI Report
- November 29, 2007 letter to the IEPA from the Village of Bellwood agreeing to the provision of RELPE services by Earth Tech for the Property
- December 20, 2007 letter from the IEPA to Earth Tech authorizing RELPE services for the Property
- January 24, 2008 letter from the IEPA to Shaw with comments on the CSI Report
- Additional Site Investigation Work Plan, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois, Shaw, August 2009

The work plan was submitted to the IEPA to address additional activities at the Property as part of the IEPA SRP.

- Revised Additional Site Investigation Work Plan, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois Shaw, September 2009

Revised work plan prepared by Shaw to address IEPA comments to the August 2009 Additional Site Investigation Work Plan.

- Addendum to the CSI Report, Shaw, October 4, 2010

Site investigation report addendum documenting the additional activities conducted in September 2010 to define the extent of petroleum-related soil impacts along the western Property boundary extending offsite. The report indicated that benzene and naphthalene were present at two locations at concentrations that exceeded IEPA TACO Tier 1 SROs (refer to **Tables 1-2**).

- CSI Report, Remedial Action Completion Report, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, October 2010
- RO/RAP, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, October 2010
- Highway Authority Agreement Memorandum of Agreement for 4901 St. Charles Road
- Summary of Soil Mitigation at Former Gas Station Property 4901 St. Charles Rd. Bellwood, Illinois, Apex Companies, LLC, June 22, 2011

Report documenting remediation activities including the abandonment of five groundwater monitoring wells; the excavation and disposal of petroleum-impacted soil beneath the Property and the parking lot of an adjacent western property; restoration of the parking lot; and the

installation of an asphalt engineered barrier on the south/southwestern portion of the Property. This report was prepared by the remedial contractor and appended to the Shaw Remedial Action Completion Report (RACR) dated July 2011.

- Expanded Ownership Report, 4901 St. Charles Road, Bellwood, Illinois, MACTEC Engineering and Consulting, Inc., dated July 5, 2011

The report presented an EDR Environmental Chain of Title Report and EDR Environmental LienSearch™ Report. The report indicated that no environmental liens or other activity use limitations (AULs) were found for 4901 St. Charles Road.

- Remedial Action Completion Report, Former Filling Station Property, 4901 St. Charles Road, Bellwood, Illinois. Shaw, July 2011

The RACR documented the remedial action proposed within the RO/RAP, including the abandonment of the five monitoring wells, the excavation and off-site disposal of impacted soil, and collection of confirmation soil samples. According to the RACR, excavation dimensions extended approximately 65 feet by 21 feet to an average depth of 8 feet bgs. The excavation extended to a depth of 11 feet bgs in the vicinity of one floor sample. A total of 795 cubic yards (1,075 tons) was excavated and disposed off-site and 7,242 gallons of water was removed from the excavation. The excavation was backfilled with imported CA-1 stone and covered with a geotextile. The approximately 1,300 square-foot area was patched with asphalt. The proposed on-site engineered barrier was constructed of asphalt pavement over an approximately 6,200 square-foot area.

- Memorandum of Agreement by and between the Village of Bellwood and the Illinois Environmental Protection Agency, August 2011
- No Further Remediation Letter from the IEPA to the Village of Bellwood, dated November 16, 2011
- Phase I ESA, 4901 and 4905 St. Charles Road, Bellwood, Illinois, IES, on behalf of Weaver Consultants, October 2016

According to the Phase I ESA Report dated October 2016, the following REC was identified in connection with the Property:

  - REC-1: The known subsurface conditions at the Property are identified as a REC/VEC based on the presence of petroleum compounds in soil and groundwater, and since previous environmental investigations and the NFR Letter did not address vapor.

In addition, according to the Phase I ESA, the following CREC was identified in connection with the Property:

- CREC-1: The Village received an NFR letter from the IEPA SRP for the Property on November 16, 2011, which was recorded on November 22, 2011. The Property has been approved for industrial/commercial land use with institutional controls including a groundwater ordinance, a Highway Authority Agreement Memorandum of Agreement, and a construction worker caution to mitigate the risks of inhalation of residual soil contaminants. In addition, an engineered barrier must remain over the impacted soils and must be properly maintained. This NFR Letter with preventative controls addressing possible worker exposure in the event that any future excavation and construction activities may occur within the impacted soil located under the engineered barrier has been identified as a CREC.

- Phase II ESA SAP, 4901 and 4905 St. Charles Road, Bellwood, Illinois. Weaver Consultants, January 5, 2017

The SAP for the Phase II ESA activities proposed the collection of five soil-gas samples to assess for the potential presence of subsurface soil-gas impacts associated with the identified REC and CREC. The Phase II ESA SAP was approved by USEPA on January 23, 2017.

- Phase II ESA, 4901 and 4905 St. Charles Road, Bellwood, Illinois. Weaver Consultants, May 3, 2017

The Scope of Work for the Phase II ESA included the installation of five soil-gas implants for soil-gas sample collection and analysis (refer to **Figure 4**). Soil-gas samples collected in support of the February 2017 Phase II ESA were submitted for laboratory analyses for various VOCs, SVOCs, and mercury. Analytical results were compared to Tier 1 S-GROs. According to the analytical results, the soil-gas sample results were below laboratory reporting limits or Tier 1 S-GROs with the exception of benzene within BV-SG-GP-04 and BV-SG-GP-05 and ethylbenzene detected in sample BV-SG-GP-05 exceeding the Tier 1 S-GROs for the Indoor Inhalation Exposure Route (refer to **Table 4 – Phase II ESA Soil-Gas Analytical Summary**).

- Site Investigation SAP, 4901 and 4905 St. Charles Road, Bellwood, Illinois. Weaver Consultants, May 15, 2020

The site investigation SAP proposed the advancement of twelve (12) soil probes, collection of twenty-eight (28) soil samples, installation of three temporary one-inch diameter monitoring wells, and collection of three groundwater samples. Samples were proposed for analysis of

various TCL parameters in support of characterizing the vertical and horizontal extent of impacts and addressing SRP site characterization requirements.

The report contained herein documents implementation of the site investigation pursuant to IEPA SRP CSI requirements (**Section 2.0**). The RO section of the report (**Section 3.0**) describes the evaluation completed to establish the appropriate remediation objectives for the COCs. The RAP (**Section 4.0**) describes the remedial action and approaches anticipated to achieve compliance with the proposed remediation objectives. The following section provides a summary of the CSI activities.

2 COMPREHENSIVE SITE INVESTIGATION

2.1 Site Characterization

2.1.1 *Sources Consulted or Reviewed*

Sources consulted or reviewed in preparation of this report are included in **Section 7.0**. This section includes select information on historical site assessment and investigation activities as summarized in the above **Section 1.3**.

2.1.2 *Site Historical Uses*

The Weaver Consultants Phase I ESA dated March 10, 2017 included the following historical sources:

- Historical aerial photographs dated 1938, 1951, 1954, 1962, 1974, 1981, 1988, 1993, 1998, 2005, 2007, 2009, and 2012;
- Historical topographic maps dated 1893, 1901, 1919, 1951, 1953, 1975, and 1987; and
- Local Street Directories dated 1969, 1971, 1976, 1981, 1986, 1992, 1995, 1999, 2003 2008, and 2013.

A detailed discussion of the historical uses of the Property is provided in Section 4.4 of the Phase I ESA (refer to **Appendix A** for previous Phase I ESA [historical reports appended], Phase II ESA SAP, and Phase II ESA). The following presents a summary of the historical use of the Property based upon information presented within this Phase I ESA:

- The Property consisted of undeveloped land from at least 1939 to 1954.
- Between 1954 and 1962, the Property was developed as a gasoline and automobile service station that included one commercial structure, eight USTs, associated underground piping, pump islands for vehicle fueling, and vehicle maintenance. The USTs reportedly contained gasoline, heating oil, and used oil. According to city directories, the Property was occupied by Herb's Enco Service Station, Bellwood Enco Service Station, Sloan Oil Company, Bellwood Union 76, Madanis, Inc., and/or Sergio's Automotive Shop from at least 1969 to 1992.
- The Property remained in the same general configuration through at least 1993.
- Between 1993 and 1998, the structure on the Property appeared to have been razed and in 1999, the eight USTs were removed. The Property has remained as vacant land through the present day.

2.1.3 *Site Description*

2.1.3.1 General Site Features

The Property consists of approximately 0.33 acres of land with approximately 125 feet of frontage along St. Charles Road and approximately 125 feet of frontage along 49th Avenue. The Property generally lies north of St. Charles Road, east of 50th Avenue, south of Erie Street, and west of 49th Avenue (refer to **Figure 1 – Site Location Map**). The Property consists of two parcels of land located within the northeast portion of Section 8, Township 39 North, Range 12 East of the Third Principal Meridian in Cook County, Illinois.

The Property is currently unimproved and unoccupied. The surface of the northern portion of the Property is grass-covered and the southern portion consists of asphalt. Concrete sidewalks are located along the eastern and western borders of the Property (refer to **Figure 2 – Site Base Map**).

2.1.3.2 Surrounding Land Uses

The Property is located within a residential/commercial area of Bellwood, Illinois. Residential properties are located to the north, west, and east of the Property and the building to the south of the Property across St. Charles Road is used as a church followed by residential properties. Based upon historical and current development practices at and near the Property, the current uses are not anticipated to undergo significant change in the future (see **Figure 3 – Surrounding Land Use Map**).

The following table includes a summary of the uses of adjoining properties:

CURRENT ADJOINING PROPERTIES			
Property Name/Occupant	**Address**	**Operation/Use**	**Direction from the Property**
Single Family Residences	4128 49th Avenue Bellwood, Illinois	Residential	North across Public Alley
Multi-Family Residences	131 50th Avenue Bellwood, Illinois	Residential	North across Public Alley
Multi-Family Residences	133 – 137 50th Avenue Bellwood, Illinois	Residential	East

CURRENT ADJOINING PROPERTIES			
Property Name/Occupant	**Address**	**Operation/Use**	**Direction from the Property**
Children's Learning Center	4821 St. Charles Road Bellwood, Illinois	Daycare	West across 49th Avenue
St. Thomas Syro-Malabar Castholic Cathedral	5000 St. Charles Road Bellwood, Illinois	Commercial	South

2.1.3.3 Physiography

A review of the 1997 Elmhurst, Illinois, 7.5-minute quadrangle, topographic map published by the United States Geological Survey (USGS; see **Figure 1**) suggests that the Property is at an elevation of approximately 630 feet above mean sea level (msl). The topography of the Property and surrounding area is generally flat with a slight slope to the east/southeast.

2.1.3.4 Regional Geology/Hydrogeology

Based on Weaver Consultants' review of certain ISGS documents (Berg et al. 1988 and Berg et al. 1984), the Property is underlain by clay and silt soil of the Carmi Member of the Equality Formation, overlying clayey and silty tills[1] of the Wedron Formation, since reclassified as the Wedron Group (Hansel and Johnson 1996). The Wedron Formation is described as uniform, relatively impermeable, clayey till that is estimated to be greater than twenty (20) feet thick. Published information suggests bedrock is encountered at depths greater than fifty (50) feet of the surface in the vicinity of the Property.

The regional near-surface hydrostratigraphic units can be generalized into two aquifers: a shallow aquifer zone in more permeable soil (not always present) that may be present in the glacial drift, and deep aquifer in the underlying bedrock aquifers. The ISGS documents also indicate that the potential for groundwater contamination is low and is classified as "E" due to the presence of greater than fifty (50) feet of clayey till soil.

[1] "Till" means those unconsolidated materials deposited directly from a glacier without reworking by water (e.g., rivers or streams).

2.1.3.5 Site Geology/Hydrogeology

The following interpretation of the subsurface conditions is based upon the thirteen (13) soil probes advanced and three one-inch temporary monitoring wells installed as part of the CSI activities (refer to **Appendix B – Soil Probe/Monitoring Well Logs**). The following includes a summary of soils that were encountered during soil probing and monitoring well installation activities at the Property.

The following units were generally observed within the subsurface of the Property:

- Organic topsoil consisting of black to brown clay was observed within various soil probes from the ground surface to approximately 0.5 feet bgs.
- Fill materials consisting of gravel, sandy clay, clay, and silt were encountered from approximately 0.5 feet to approximately 1 to 6 feet bgs. However, due to the historic presence eight USTs on the Property, it is likely that the fill materials in the former UST cavities in the central portion of the Property extend beyond 6 feet bgs.
- Brown and gray silty clays, clayey silts, and clayey sands containing little gravel were encountered at depths ranging from approximately 1 to 6 feet bgs to approximately 20 feet bgs, the maximum depth explored for these CSI activities.

In addition, saturated conditions were observed within the following soil probes:

- BW1-SB-GP-06 from a depth of approximately 4 to 6 feet bgs;
- BW1-SB-GP-11 from a depth of approximately 4 to 5 feet bgs; and
- BW1-SB-GP-12 from depths of approximately 4 to 5 feet bgs and 12 to 13 bgs.

Based upon the information collected during the soil probing activities, a consistent saturated unit was not observed across the Property.

2.1.3.6 Groundwater Classification

Pursuant to 35 Ill. Adm. Code 620.220, the shallow subsurface groundwater in the unconsolidated soils is considered to be Class II Groundwater. This determination was made because the conditions observed at the Property do not meet the following provisions of Section 620.210 for Class I Potable Resource Groundwater:

a) Groundwater located 10 feet or more below the land surface and within:

1) The minimum setback zone of a well which serves as a potable water supply and to the bottom of such well;

2) Unconsolidated sand, gravel or sand and gravel which is 5 feet or more in thickness and that contains 12 percent or less of fines (i.e. fines which pass through a No. 200 sieve tested according to ASTM Standard Practice D2488-84, incorporated by reference at Section 620.125);

3) Sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness; or

4) Any geologic material which is capable of a:

A) Sustained groundwater yield, from up to a 12 inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less; or

B) Hydraulic conductivity of 1 x 10(-4) cm/sec or greater using one of the following test methods or its equivalent:

i. Permeameter;

ii. Slug test; or

iii. Pump test.

As presented below, the shallow groundwater conditions are believed to be Class II Groundwater based on the following:

a) Groundwater/intermittent saturated zones were encountered within the monitoring wells at depths less than 10 feet bgs.

1. As described in **Section 2.1.5**, the Property is not located within a minimum or maximum setback zone of a water supply well. In addition, the Property and the surrounding areas are serviced by the Village of Bellwood municipal water system, which draws in water from Lake Michigan. The Village of Bellwood maintains an ordinance that prohibits the installation and use of potable groundwater wells.

2. Based on the soil probe logs (see **Appendix B**) and the information provided above in **Section 2.1.3.5**, a consistent water bearing unit consisting of sand and gravel that is more than five feet in thickness was not encountered across the Property. Intermittent saturated zones were observed generally from approximately 4 to 13

feet bgs. Based on the location of the soil probes, and since the saturated zones were not encountered in each of the soil probes, it is believed that these zones are not interconnected. Therefore, these saturated zones are representative of perched groundwater and seams, not a continuous water bearing unit consisting of sand and gravel that is more than five feet in thickness.

3. No sandstone or fractured carbonate layers were observed within the soil probes advanced to a depth of 20 feet bgs (see **Appendix B** for soil probe logs).

4. A) Based on the silt and silty clay characteristic of native subsurface soils and Weaver Consultants' experience with this type of soil, it is unlikely that the soil at the Property could have a sustained groundwater yield from a twelve-inch borehole of 150 gallons per day or more from a thickness of fifteen (15) feet or less.

   B) Hydraulic conductivity evaluations were conducted in the form of slug tests by Shaw in March 2006 (see **Appendix A** for a summary of the hydraulic conductivity evaluations). Slug tests were conducted on former two-inch monitoring wells (rising head and falling head for MW-1 and rising head for MW-5). Results of the hydraulic conductivity evaluations yielded values of $5.908x10^{-4}$ centimeters per second (cm/sec), $3.631.x10^{-4}$ cm/sec, and $2.619x10^{-4}$ cm/sec for an average hydraulic conductivity of $4.053x10^{-4}$ (refer to **Appendix C – Shaw Aqtesolv Data Outputs**). The average hydraulic conductivity is greater than 1×10^{-4} cm/sec.

As a result of the above, subsurface soil conditions do not meet the above criteria for Class I Potable Resource Groundwater and the groundwater classification for the Property is considered to be Class II Groundwater.

2.1.4 *Site Base Map*

Attached as **Figure 2** is the Site Base Map denoting the following information as required by 35 IAC 740.435(b)(2)(C):

1. The sources or potential sources of COCs, spill areas, and other suspected areas for COCs.
2. On-site and off-site injection and withdrawal wells.
3. All buildings, tanks, piles, utilities, paved areas, easements, rights-of-way and other features, including all known past and current product and waste underground tanks or piping.

2.1.5 *Water Well Search*

Weaver Consultants has contacted each of the below referenced sources to assess the location of wells within a 2,500-foot radius of the Property. Weaver Consultants also reviewed water well information from the ISGS online database using their "ILWATER" Interactive Map and the IEPA online database using their "Source Water Assessment Program" (SWAP) Web Mapping Tool. Based on the information reviewed using the SWAP and ILWATER databases, four engineering test wells were identified within 2,500 feet of the Property (refer to **Figure 5 – Approximate Water Well Location and Identification Map**). The following includes a summary of the information available from applicable governmental agencies:

- ISGS: The "ILWATER" database identified several water wells within 2,500 feet of the Property:
    - API # 120310037900, ISWS Number 410645, well name "City of Bellwood 4," drilled on January 1, 1964, is a Community Water Supply (CWS) water well to the depth of 1,965 feet. The well is located approximately 285 feet west of the northwestern Site corner with a 200-foot setback zone affiliated with a Village of Bellwood Water Department wastewater treatment facility.
    - API # 120313612200, well name "MSD Chicago-Berkely Etc Sewer B-1A," drilled on July 19, 1990, is an engineering well to the depth of 283 feet, and API # 120313611300, well name "MSD Chicago-Berkely Etc Sewer B-1," drilled on October 2, 1989, is an engineering well to a depth of forty-four (44) feet bgs. These wells are located approximately 1,900 feet southwest of the Property.
    - API # 120313611400, well name "MSD Chicago-Berkely Etc Sewer B-2," drilled on January 8, 1990, is an engineering well drilled to a depth of 37 feet. The well is located approximately 2,300 feet southwest of the Property.

  A copy of the information acquired from ILWATER database is included in **Appendix D – Water Well Information**. In addition, Weaver Consultants submitted a Freedom of Information Act (FOIA) request to the ISGS on June 1, 2020 requesting any additional information concerning water wells. Weaver Consultants has not received a FOIA response as of the date of this report. A copy of the FOIA request is included in **Appendix D**.

- IEPA: The IEPA SWAP database appeared to be generally consistent with the findings of the ISGS ILWATER database. In addition, the Property is not located within a minimum or

maximum setback zone or wellhead protection area of a well. A copy of the information acquired from the SWAP database is included in **Appendix D**. In addition, Weaver Consultants submitted a FOIA request to the IEPA Division of Public Water Supplies on June 8, 2020 to obtain information for water wells within a 2,500-foot radius of the Property. As of the date of this report, Weaver Consultants has not received a FOIA response from the IEPA. A copy of the FOIA request is included in **Appendix D**.

Illinois State Water Survey (ISWS): Weaver Consultants submitted a FOIA request to the ISWS on June 1, 2020 to obtain information for water wells within a 2,500-foot radius of the Property. Weaver Consultants has not received a FOIA response as of the date of this report. A copy of the FOIA request is included in **Appendix D**.

- Illinois Department of Public Health (IDPH): Weaver Consultants submitted a FOIA request to the IDPH on June 1, 2020 to obtain information for water wells within a 2,500-foot radius of the Property. According to a response dated June 6, 2020, the IDPH maintains records on non-community public water supply wells, which IDPH defines as a non-residential well that serves at least twenty-five (25) or more individuals and that the ISWS maintains records for community, semi-private, and private water wells. IDPH does not have any records on file pertaining to non-community public water supply wells for the Property. Copies of the FOIA request and response are included in **Appendix D**.
- Cook County Departments of Public Health (CCDPH): Weaver Consultants submitted FOIA requests to the CCDPH on June 2, 2020 to obtain information for water wells within a 2,500-foot radius of the Property. According to a June 9, 2020 response, CCDPH does not have any records on file. Copies of the FOIA request and response are included in **Appendix D**.
- Village of Bellwood: Weaver Consultants submitted a FOIA request to the Village of Bellwood on June 9, 2020 for information related to water wells within a 2,500-foot radius of the Property. Weaver Consultants has not received a FOIA response as of the date of this report. A copy of the FOIA request is included in **Appendix D**.

Based on the information presented above, two engineering test wells and one water well were identified within 2,500 feet of the Property (refer to **Figure 5)**. According to the IEPA SWAP database, the identified water well is Bellwood CWS Well #4, located approximately 285 feet northwest of the Property with a 200-foot setback zone affiliated with a Village of Bellwood Water Department wastewater treatment facility. According to the SWAP database, the Property is located outside the 200-foot setback zone (refer to **Figure 5**). In addition, the Village

of Bellwood maintains a groundwater ordinance prohibiting the installation and use of potable water supply wells within its municipal limits (Ordinance 10-46); therefore the existence of potable wells near the Property is not anticipated in the future.

2.1.6 *Legal Description*

A legal description for the two parcels that comprise the remediation site boundary has been provided in **Appendix E**. The Parcel Identification Numbers (PINs) are as follows:

- 15-08-210-009-0000
- 15-08-103-029-0000

2.2 Field Activities

The following sections describe the site investigation activities conducted by Weaver Consultants in May 2020, which included soil and groundwater sample collection and analysis. On May 20, 2020, Weaver Consultants advanced thirteen (13) soil probes and installed three temporary monitoring wells in support of characterizing subsurface environmental conditions. The soil and groundwater sampling locations were based upon the REC and CREC identified in the Phase I ESA, as well as the analytical results from the previous investigation activities. Analytical results from the previous activities have been incorporated into this CSI and are presented alongside the results from the May 2020 sampling activities (**Tables 1-4** for historical analytical results and **Tables 5-7** for site investigation). It should be noted that the K-Plus data that was previously rejected by IEPA has been included in the report, but has not been relied upon as part of the CSI activities.

2.2.1 *Areas of Exploration*

As shown on **Figure 4**, soil probe and monitoring well locations were advanced within the following general areas in accordance with the May 15, 2020 SAP:

Soil Probe/Monitoring Well	Areas of Exploration
BW1-SB-GP-01/BW1-GW-TW-01; BW1-SB-GP-04; BW1-SB-GP-06; BW1-SB-GP-13	Northern Portion of Property: Assess subsurface environmental conditions associated with the historical use of the Property and LUST Incident, characterize the extent of previous impacts
BW1-SB-GP-03/BW-GW-TW-03; BW1-SB-GP-07; BW1-SB-GP-10; BW1-SB-GP-12	Southeastern Portion of Property: Assess subsurface environmental conditions associated with the historical use

Soil Probe/Monitoring Well	Areas of Exploration
	of the Property and LUST Incident, characterize the extent of previous impacts
BW1-SB-GP-02/BW-GW-TW-02; BW1-SB-GP-05; BW1-SB-GP-19	Central and Western Portion of Property: Assess subsurface environmental conditions associated with the historical use of the Property and LUST Incident, characterize the extent of previous impacts
BW1-SB-GP-08; BW1-SB-GP-09; BW1-SB-GP-11	Southwestern Portion of Property: Assess subsurface environmental conditions associated with the historical use of the Property and LUST Incident, characterize the extent of previous impacts

2.2.2 *Soil Probe Activities*

Soil probes were advanced by Environmental Soil Probing Corporation (ESP) of St. Charles, Illinois utilizing Geoprobe® drilling rigs (e.g. direct-push technology). Soil probes were advanced by ESP using a Geoprobe® 6600 track-mounted drill rig. Prior to drilling activities, ESP contacted DIGGER to locate public utilities at the Property. Weaver Consultants coordinated with GPRS of Toledo, Ohio to locate private utilities at the Property.

A Weaver Consultants representative was present during soil probing activities to observe and document field conditions and collect the soil samples. Soil samples were obtained by the direct push of five-foot long, two-inch diameter probe rods into the undisturbed subsurface. Soil samples were continuously collected via individual five-foot long, two-inch diameter acrylic liners. The drilling subcontractor, ESP, decontaminated the sampler between soil probe locations. In addition, Weaver Consultants decontaminated the re-usable soil sampling equipment between samples and collection of soil probes. The decontamination process consisted of an initial wash with a Liquinox/water solution, followed by a clean water rinse.

Upon retrieval, each split sample was placed into a zip-locked bag for field screening by a RAE Systems™ Mini-Rae 3000 PID with an 11.4 eV lamp. According to manufacturer specifications, this device is capable of detecting up to 15,000 parts per million (ppm) of VOCs. The PID provides a qualitative field measurement of VOCs contained in the sample. The field screening process involved placing a portion of the soil sample in a zip-lock plastic bag. The headspace was then sampled, and soil-gas VOC concentrations were measured and recorded. In addition to PID

screening, visual and olfactory observations were used to assess the presence of impacted soil and selection of the appropriate sample interval for laboratory analysis as described further below. Each soil sample was described and logged by a Weaver Consultants representative. The color, soil type, moisture content, and other applicable characteristics for each soil sample were recorded, and the data was then used to construct a log of the subsurface conditions encountered at each probe location (refer to **Appendix B**).

2.2.2.1 Soil Sample Collection

In May 20, 2020, a total of thirteen (13) soil probes were advanced by Weaver Consultants to depths of approximately fifteen (15) to twenty (20) feet bgs as part of the CSI activities (refer to **Figure 4**). Three one-inch temporary monitoring wells were also installed at soil probe locations, as described further in **Section 2.2.3**. A summary of the Weaver Consultants May 20, 2020 site investigation soil analytical results is included as **Table 5** and **Table 6** and discussed in **Section 2.5**.

Sample selection was based on the following methodology to characterize subsurface environmental conditions:

1. One discrete soil sample was collected for laboratory analysis from the two-foot interval exhibiting the greatest indication of environmental impact, based on field screening results (i.e., visual/olfactory observations, PID results) as described in **Section 2.2.2**. If there were no indications of environmental impacts in the field, then a soil sample was submitted from the approximate depth that would be expected to exhibit impacts (i.e. near the surface, below the bottom of a UST, directly above the water table, etc.).
2. To characterize the horizontal extent of impacts, soil samples were collected from soil probes surrounding previously identified impacts at the Property. One discrete soil sample was collected for laboratory analysis at a consistent depth interval of previously identified impacts.
3. To characterize the vertical extent of COC migration, at soil probe locations exhibiting impacts in the field, a second sample was collected from a deeper interval appearing free of impacts. These samples were placed on hold pending results of the shallower sample intervals.

Based on the above criteria, select soil samples from probes were placed into pre-cleaned, laboratory supplied sample containers preserved as necessary for subsequent laboratory analysis. Soil samples were obtained as quickly as practicable upon opening the Geoprobe®

sample liner. The samples with chemical preservative were the soil samples collected for VOC analysis, which were collected using SW-846 Method 5035. The sample containers were tightly capped, labeled, and placed in a cooler and surrounded with ice in order to maintain their temperature near 4° C. Each sample was logged onto a chain of custody form, which is used to track the samples from the point of collection to receipt by the laboratory. The chain of custody is included with the laboratory analysis reports in **Appendix F – Laboratory Analytical Reports**. After completion of sampling at each probe location, the probe hole was backfilled to the ground surface with bentonite chips and patched with similar surficial material.

Based on the above and information contained within **Section 1.3**, a total of fifty-eight (58) soil probes were advanced at the Property as part of the historical site investigation, Phase II ESA, and site investigation activities. Based on the approximate 0.33-acre size of the Property, approximately one soil probe per 0.0057-acre was advanced at the Property.

2.2.3 *Groundwater Sampling Activities*

Monitoring wells were installed at the Property by ESP utilizing a Geoprobe® drilling rig (e.g., direct-push technology). On May 20, 2020, the ESP representative utilized a Geoprobe® 6600 track-mounted drill rig to install three once-inch temporary wells (refer to **Figure 4**). The monitoring wells were intended to assess for potential impacts associated with the aforementioned REC and CREC and characterize the extent of previous impacts as discussed in **Section 2.2.1**. A summary of the groundwater analytical results from the site investigation activities are included as **Table 7** and are described further in **Section 2.6**. Prior to drilling activities, ESP contacted DIGGER to locate public utilities. Weaver Consultants also coordinated with GPRS to locate private utilities at the Property.

The temporary monitoring wells were constructed of a one-inch ID Schedule 40 PVC risers and 0.010-inch slotted ten-foot PVC well screens. The temporary wells were screened from approximately five to twenty (20) feet bgs. The screen and PVC riser were lowered into completed probe holes following the completion of the soil probing activities and backfilled with Global #5 clean quartz sand.

The temporary wells were allowed to remain open for a period of approximately twenty-four (24) hours prior to assessing the groundwater levels utilizing a Solinist™ water level indicator. Weaver Consultants allowed the wells to recharge and groundwater samples were collected from each of the monitoring wells for laboratory analysis of the applicable COCs. The temporary monitoring wells were removed from the probe hole following sample collection activities. Following removal, the borehole was patched with like surface material.

2.2.3.1 Groundwater Sample Collection

Groundwater samples were collected from the monitoring wells on May 20, 2020. Groundwater samples were collected from the monitoring wells using a Geotech Series II peristaltic pump, disposable Tygon® tubing, and a disposable length of ¼" diameter polyethylene tubing. The pump was adjusted for low flow methodology to minimize sediment disturbance (e.g., less than 100 milliliters/minute). Prior to sampling, depth to water measurements were recorded and the wells were purged of a minimum of three well volumes, or until the purge water exhibits stable conditions based upon field measurements of pH, specific conductivity, and temperature (refer to **Appendix G – Groundwater Sampling Field Forms**). The monitoring wells were purged approximately three well volumes or until the water clarity was reduced of visible suspended solids (refer to **Appendix G**).

To assess particulate effect on groundwater quality, unfiltered and filtered groundwater samples were collected for laboratory analysis of total and dissolved inorganic parameters, respectively. Therefore, the metal analyses represent total and dissolved metals concentrations. Groundwater samples collected for total and dissolved metals were collected concurrently at each monitoring well location. In-line high capacity disposable filter cartridges with a maximum pore size of 0.45-microns were utilized for field filtration. The Quickfilter model# FF8200 in-line disposable filter, or equivalent, was used to field filter dissolved metals samples. The Geotech Series II peristaltic pump was used to transfer groundwater samples through the filter membrane and into the nitric acid preserved sample containers.

Collection of groundwater samples in this manner was designed to represent a complete characterization of shallow groundwater conditions. Groundwater samples were collected in containers provided by the laboratory and preserved as necessary for their respective analyses. Samples were sealed in their respective containers, labeled, placed on ice, documented using chain of custody forms, and delivered to the analytical laboratory.

2.3 Project Quality Assurance

Sample collection and laboratory analysis procedures were conducted in accordance with appropriate SRP requirements to enhance project data quality. The quality of the data collected will be assessed as described in the May 29, 2015 Quality Assurance Project Plan (QAPP), which was updated on June 12, 2019 and approved by the USEPA on September 16, 2019; qualified if necessary; and then considered in accordance with the objectives of the investigation. Assessment of data quality will consider adherence to established SOPs, verification of results obtained, and overall completeness.

Quality assurance/quality control (QA/QC) sampling was conducted as part of the site investigation activities in accordance with a USEPA approved QAPP, and included three duplicate soils samples, one duplicate groundwater sample, matrix spike/matrix spike duplicates (MS/MSDs), one equipment blank, and two trip blanks. Samples were submitted to STAT Analytical of Chicago, Illinois (STAT), a National Environmental Laboratory Accreditation Program (NELAP) approved laboratory as required by the IEPA SRP (see **Appendix F**). Sampling and laboratory analysis were performed in general accordance with approved techniques and methods as outlined in *USEPA SW-846, Test Methods For Evaluating Solid Waste, Third Edition*, and other published sources.

2.4 Sample Analysis

2.4.1 *Soil Sample Analysis*

Soil samples were collected and submitted for laboratory analysis as shown on the attached tables.

2.4.2 *Groundwater Sample Analysis*

Groundwater samples were collected and submitted for laboratory analysis as shown on the attached tables.

2.5 Soil Analytical Results

Soil sample analytical results have been tabulated and presented in **Tables 5** and **6**. Soil sample results were compared to the following:

- Tier 1 SROs for Residential Properties and the Construction Worker Scenario listed in 35 IAC 742, Appendix B, Tables A-B;
- Backgrounds within MSAs listed in 35 IAC 742, Appendix A, Tables G-H; and
- pH-Specific SROs listed in 35 IAC 742, Appendix B, Tables C-D.

Concentrations of COCs observed above applicable SROs are denoted on the tables. Laboratory analytical reports are included in **Appendix F**. The following presents a summary of the soil analytical results for each parameter analyzed for May 20, 2020 site investigation activities.

2.5.1 *Target Compound List*

Two soil samples were submitted for TCL laboratory analysis. Concentrations of TCL parameters were below laboratory reporting limits or Tier 1 SROs, with the exception of the following:

- Soil sample BW1-SB-GP-02/1-3' exhibited a cobalt concentration (16 mg/kg) in excess of the Backgrounds within MSAs concentration (8.9 mg/kg) and exhibited a iron concentration (27,000 mg/kg) in excess of the Backgrounds within MSAs concentration (15,900 mg/kg); and

- Soil sample BW1-SB-GP-05/5-7' exhibited a benzene concentration (3.8 mg/kg) in excess of the Tier 1 SRO for the Soil Inhalation Exposure Route (0.8 mg/kg), the Soil Inhalation Exposure Route for Construction Workers SRO (2.2 mg/kg), and the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg); exhibited an arsenic concentration (14 mg/kg) in excess of the Soil Ingestion Exposure Route for Residential Properties SRO (13 mg/kg) and in excess of Backgrounds within MSAs SRO (13 mg/kg); exhibited a cobalt concentration (15 mg/kg) in excess of the Background within MSAs concentration (8.9 mg/kg); and exhibited an iron concentration (25,000 mg/kg) in excess of the Background within MSAs concentration (15,900 mg/kg).

2.5.2 *VOC*

Six soil samples were submitted for VOC laboratory analysis. Concentrations of VOCs were below laboratory reporting limits and/or Tier 1 SROs and Backgrounds within MSAs.

2.5.3 *BTEX + MTBE*

Twenty-eight (28) soil samples were submitted for BTEX + MTBE analysis. Concentrations of BTEX + MTBE were below laboratory reporting limits and/or Tier 1 SROs with the exception of the following:

- Soil sample BW1-SB-GP-03/2-4'
    - Field duplicate BW1-SB-GP-FD-01 (field duplicate for BW1-SB-GP-03/2-4') exhibited a benzene concentration (2.8 mg/kg) in excess of the Soil Inhalation Exposure Route (0.8 mg/kg), in excess of the Soil Inhalation Exposure Route for the Construction Worker SRO (2.2 mg/kg), and in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg);
- Soil sample BW1-SB-GP-03/8-10' exhibited a benzene concentration (7.8 mg/kg) in excess of the Soil Inhalation Exposure Route (0.8 mg/kg), in excess of the Soil Inhalation Exposure Route for the Construction Worker SRO (2.2 mg/kg), and in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg);

- Soil sample BW1-SB-GP-03/13-15' exhibited a benzene concentration (0.65 mg/kg) in excess of the Soil Inhalation Exposure Route (0.8 mg/kg) and the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg) and a MTBE concentration (0.84 mg/kg) in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.32 mg/kg);
- Soil sample BW1-SB-GP-FD-03 exhibited a benzene concentration (0.21 mg/kg) in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg);
- Soil sample BW1-SB-GP-05/2-4' exhibited a benzene concentration (3.8 mg/kg) in excess of the Soil Inhalation Exposure Route (0.8 mg/kg), in excess of the Soil Inhalation Exposure Route for the Construction Worker SRO (2.2 mg/kg), and in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg); exhibited a ethylbenzene concentration (70 mg/kg) in excess of the Soil Inhalation Exposure Route for the Construction Worker SRO (58 mg/kg) and for the Soil Component of Groundwater Ingestion Exposure route for Class II Groundwater SRO (19 mg/kg); and exhibited a total xylenes concentration (6.6 mg/kg) in excess of the Soil Inhalation Exposure Route for the Construction Worker SRO (5.6 mg/kg);
- Soil sample BW1-SB-GP-05/ 5-7'
    - Field duplicate BW1-SB-GP-FD-02 (field duplicate for BW1-SB-GP-05/5-7') exhibited a benzene concentration (4.3 mg/kg) in excess of the Soil Inhalation Exposure Route (0.8 mg/kg), the Soil Inhalation Exposure Route for the Construction Worker SRO (2.2 mg/kg), and the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg);
- Soil sample BW1-SB-GP-06/5-7' exhibited a benzene concentration (0.39 mg/kg) in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg);
- Soil sample BW1-SB-GP-08/2-4' exhibited a benzene concentration (130 mg/ kg) in excess of the Soil Inhalation and Ingestion Exposure Routes (0.8 mg/kg and 12 mg/kg, respectively), the Soil Inhalation Exposure Route for the Construction Worker SRO (2.2 mg/kg), and the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg); a ethylbenzene concentration (210 mg/kg) in excess of

the Soil Inhalation Exposure Route for Construction Workers SRO (58 mg/kg) and the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (19 mg/kg); a toluene concentration (870 mg/kg) in excess of the Soil Inhalation Exposure Route (650 mg/kg), the Soil Inhalation Exposure Route for Construction Workers SRO (42 mg/kg), and the Soil Component of the Groundwater Exposure Route for Class II Groundwater SRO (29 mg/kg); and a total xylenes concentration (1,200 mg/kg) in excess of the Soil Inhalation Exposure Route (320 mg/kg), the Soil Inhalation Exposure Route for Construction Workers (5.6 mg/kg), and the Soil Component of Groundwater Ingestion Exposure Route for Class II Groundwater SRO (150 mg/kg);

- Soil sample BW1-SB-GP-08/5-7' exhibited a benzene concentration (11 mg/kg) in excess of the Soil Inhalation Exposure Route (0.8 mg/kg), the Soil Inhalation Exposure Route for the Construction Worker SRO (2.2 mg/kg), and the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg);
- Soil sample BW1-SB-GP-08/8-10' exhibited a MTBE concentration (0.97 mg/kg) in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.32 mg/kg);
- Soil sample BW1-SB-GP-09/1-3' exhibited a benzene concentration (0.76 mg/kg) in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg); and
- Soil Sample BW1-SB-GP-09/8-10' exhibited a benzene concentration (0.58 mg/kg) in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater SRO (0.17 mg/kg).

2.5.4 *Semi-Volatile Organic Compounds*

Nine soil samples were submitted for SVOC laboratory analysis. Concentrations of SVOCs were below laboratory reporting limits and/or Tier 1 SROs and Backgrounds within MSAs.

2.5.5 *Polynuclear Aromatic Hydrocarbons*

Twenty-five (25) soil samples were submitted for PNA laboratory analysis. Concentrations of PNAs were below laboratory reporting limits and/or Tier 1 SROs for Industrial/Commercial Properties and Backgrounds within MSAs, with exception of the following:

- Soil sample BW1-SB-GP-05/2-4' exhibited a naphthalene concentration (3.7 mg/kg) in excess of the Soil Inhalation Exposure Route for the Construction Worker (1.8 mg/kg); and

- Soil sample BW1-SB-GP-08/2-4' exhibited a naphthalene concentration (35 mg/kg) in excess of the Soil Inhalation Exposure Route for the Construction Worker (1.8 mg/kg) and in excess of the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater (18 mg/kg).

2.5.6 *RCRA Metals*

Twenty-five (25) soil samples were submitted for RCRA metals analysis. Concentrations of RCRA metals were below laboratory reporting limits and/or Tier 1 SROs for Industrial/Commercial Properties and Backgrounds within MSAs with the exception of the following:

- Soil sample BW1-SB-GP-05/2-4' exhibited an arsenic concentration (16 mg/kg) in excess of the Soil Ingestion Exposure Route and the Background with MSAs concentration (13 mg/kg);
- Soil sample BW1-SB-GP-06/1-3' exhibited a lead concentration (140 mg/kg) in excess of the Background within MSAs concentration (36 mg/kg);
- Soil sample BW1-SB-GP-10/1-3' exhibited an arsenic concentration (17 mg/kg) in excess of the Soil Ingestion Exposure Route and in excess of the Background within MSAs concentration (13 mg/kg); and
- Soil sample BW1-SB-GP-11/2-4' exhibited an arsenic concentration (17 mg/kg) in excess of the Soil Ingestion Exposure Route and in excess of the Background within MSAs concentration (13 mg/kg).

2.5.7 *TAL Metals*

Seven soil samples were submitted for TAL metals laboratory analysis. Concentrations of TAL metals were below laboratory reporting limits and/or Tier 1 SROs, and Backgrounds within MSAs with the exception of the following:

- Soil sample BW1-SB-GP-03/2-4' exhibited a cobalt concentration (16 mg/kg) in excess of the Backgrounds within MSAs concentration (8.9 mg/kg) and an iron concentration (25,000 mg/kg) in excess of the Backgrounds within MSAs concentration (15,900);
- Soil sample BW1-SB-GP-04/1-3' exhibited an iron concentration (16,000 mg/kg) in excess of the Backgrounds within MSAs concentration (15,900);
- Soil sample BW1-SB-GP-07/1-3' exhibited an aluminum concentration (10,000 mg/kg) in excess of the Backgrounds within MSAs concentration (9,500 mg/kg) and an iron

concentration (27,000 mg/kg) in excess of the Backgrounds within MSAs concentration (15,900 mg/kg);

- Soil sample BW1-SB-GP-09/5-7' exhibited an aluminum concentration (9,600 mg/kg) in excess of the Backgrounds within MSAs concentration (9,500 mg/kg) and an iron concentration (24,000 mg/kg) in excess of the Backgrounds within MSAs concentration (15,900 mg/kg);
- Soil sample BW1-SB-GP-11/8-10' exhibited an iron concentration (24,000 mg/kg) in excess of the Backgrounds within MSAs concentration (15,900 mg/kg); and
- Soil sample BW1-SB-GP-12/5-7' exhibited an iron concentration (23,000 mg/kg) in excess of the Backgrounds within MSAs concentration (15,900 mg/kg).

2.5.8 *Arsenic*

One soil sample was submitted for total arsenic laboratory analysis. Concentrations of SPLP chromium were below Tier 1 SROs and Backgrounds within MSAs concentration, except for the following:

- Soil sample BW1-SB-GP-05/10-12' exhibited an arsenic concentration (16 mg/kg) in excess of the Soil Ingestion Exposure Route for Residential Properties SRO and the Backgrounds within MSAs concentration (13 mg/kg).

2.5.9 *SPLP Chromium*

One soil sample was submitted for SPLP chromium laboratory analysis. Concentrations of SPLP chromium were below Tier 1 SROs and Backgrounds within MSAs concentrations.

2.5.10 *TCLP RCRA Metals*

One soil sample was submitted for TCLP RCRA metal laboratory analysis. Concentrations of TCLP RCRA metals were below laboratory reporting limits and/or Tier 1 SROs.

2.5.11 *TCLP Iron*

One soil sample was submitted for TCLP iron laboratory analysis. The concentration of TCLP iron was below laboratory reporting limits.

2.5.12 *Organic Carbon Content*

Two soil samples were submitted for Fractional Organic Carbon (f_{oc}) laboratory analysis using American Society for Testing and Materials (ASTM) 2974-00. Soil samples BW1-SB-GP-05/2-4' exhibited 1.57% f_{oc} and soil sample BW1-SB-GP-12/1-3' exhibited 2.73% f_{oc}.

2.5.13 *Organic Matter*

Two soil samples were submitted for organic matter laboratory analysis. Soil sample BW1-SB-GP-05/ 2-4' exhibited an organic matter content of 2.7% and soil sample BW1-SB-GP-12/1-3' exhibited an organic matter content of 4.71%.

2.5.14 *pH*

Thirty-three (33) soil samples were submitted for pH analysis. Analytical results from the soil samples exhibited pH values ranging from 7.67 to 8.6 standard units (s.u.).

2.6 Groundwater Analytical Results

Groundwater sample analytical results collected during the May 20, 2020 site investigation activities have been tabulated and presented in **Table 3**. Groundwater sample analytical results were compared to the Tier 1 GROs for the Groundwater Ingestion Exposure Route for Class I and Class II Groundwater and the Tier 1 GROs for the Indoor Inhalation Exposure Route for Industrial/Commercial Properties. Laboratory analytical reports from the site investigation activities are included in **Appendix F**. The following presents a summary of the groundwater analytical results for each parameter analyzed as part of the May 2020 site investigation activities.

2.6.1 *Target Compound List*

One groundwater sample was submitted for TCL laboratory analysis. Concentrations of TCL parameters were below laboratory reporting limits and/or Tier 1 GROs for Class II Groundwater, with the exception of the following:

- Groundwater sample BW1-GW-TW-02 exhibited a total iron concentration (25 mg/L) in excess of the Tier 1 GROs for the Groundwater Ingestions Exposure Route for Class II Groundwater (5 mg/L).

2.6.2 *Volatile Organic Compounds*

Three groundwater samples were submitted for VOC laboratory analysis. Concentrations of VOCs were below laboratory reporting limits.

2.6.1 *Benzene, Toluene, Ethyl benzene, & Xylenes*

Three groundwater samples were submitted for BTEX laboratory analysis. Concentrations of BTEX were below laboratory reporting limits and/or Tier 1 GROs with exception of the following:

- Groundwater sample BW1-GW-TW-03 exhibited a benzene concentration (0.12 mg/kg) in excess of the Groundwater Ingestion Exposure Route for Class II Groundwater (0.025 mg/kg) and the Indoor Inhalation Exposure Route for Residential Properties GRO (0.11 mg/kg).

2.6.2 *Semi-Volatile Organic Compounds*

One groundwater sample was submitted for SVOC laboratory analysis. Concentrations of SVOCs were below applicable Tier 1 GROs.

2.6.3 *Polynuclear Aromatic Compounds*

Four groundwater samples were submitted for PNA laboratory analysis. Concentrations of PNAs were below laboratory reporting limits and/or applicable Tier 1 GROs.

2.6.4 *Total RCRA Metals*

Three groundwater samples were submitted for total RCRA metals laboratory analysis. Concentrations of total RCRA metals were below laboratory reporting limits and/or Tier 1 GROs for Class II Groundwater.

2.6.5 *Dissolved RCRA Metals*

Three groundwater samples were submitted for dissolved RCRA metals laboratory analysis. Concentrations of dissolved RCRA metals were below laboratory reporting limits and/or Tier 1 GROs.

2.6.6 *Total Target Analyte List*

One groundwater sample was submitted for total TAL laboratory analysis. Concentrations of total TAL parameters were below laboratory reporting limits and/or applicable Tier 1 GROs, with the exception of the following:

- Groundwater sample BW1-GW-TW-03 exhibited an iron concentration (15 mg/kg) in excess of the Groundwater Ingestion Exposure Route for Class II Groundwater GRO (5.0 mg/kg).

2.6.7 *Dissolved Target Analyte List*

One groundwater samples were submitted for dissolved TAL laboratory analysis. Concentrations of dissolved TAL parameters were below laboratory reporting limits and/or applicable Tier 1 GROs, with the exception of the following:

- Groundwater sample BW1-TW-GW-03 exhibited a dissolved iron concentration (12 mg/kg) in excess of the Groundwater Ingestion Exposure Route for Class II Groundwater GRO (5.0 mg/kg).

2.7 Endangerment Assessment

2.7.1 *Recognized Environmental Conditions*

The ASTM E 1527-13 defines a recognized environmental condition as follows:

> *"the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions."*

Based on the October 2016 Phase I ESA, the following REC has been identified in connection with the Property:

- REC-1: The known subsurface conditions at the Property are identified as a REC/VEC based on the presence of petroleum compounds in soil and groundwater, and since previous environmental investigations and the NFR Letter did not address vapor.

In addition, according to the Phase I ESA, the following CREC was identified in connection with the Property:

- CREC-1: The Village received an NFR Letter from the IEPA SRP for the Property on November 16, 2011, which was recorded on November 22, 2011. The Property has been approved for industrial/commercial land use with institutional controls including a groundwater ordinance, a Highway Authority Agreement Memorandum of Agreement, and a construction worker caution to mitigate the risks of inhalation of residual soil contaminants. In addition, an engineered barrier must remain over the impacted soils and must be properly maintained. This NFR Letter with preventative controls addressing possible worker exposure in the event that any future excavation and construction activities may occur within the impacted soil located under the engineered barrier has been identified as a CREC.

As described in **Section 2.2.1**, soil and groundwater samples were collected as part of the site investigation activities to assess potential impacts associated with the REC and CREC and to characterize the horizontal and vertical extent of impacts detected during the previous site investigation activities. The subsurface soil and groundwater exhibited COCs exceeding

applicable Tier 1 SROs and Tier 1 GROs. BTEX+MTBE and naphthalene concentrations exceeding applicable Tier 1 SROs have been identified in the southwestern and central portions and arsenic concentrations exceeding applicable Tier 1 SROs have been identified in various portions of the Property (see **Figures 9** through **Figure 11D**).

The BTEX+MTBE and naphthalene impacts appear to be associated with the historical use of the Property as a filling station and associated LUST Incident. The arsenic soil impacts within the fill materials and the fill material-native soil interface appear to be associated with typical urban fill material and arsenic within native soils appears to be naturally occurring. Based on our past experience with the type of fill material encountered, the location of the Property in an urbanized area of Cook County, and according to the IEPA documents *Polycyclic Aromatic Hydrocarbons (PAHs) in Surface Soil in Illinois* and *A Summary of Selected Background Conditions for Inorganics in Soil*, the inorganic impacts appear to be associated with typical urban fill material and not the result of a release from historical use of the Property.

The COCs exceeding applicable Tier 1 GROs for Class II Groundwater include benzene, ethylbenzene, naphthalene, total arsenic, and total and dissolved iron (see **Figure 9A and Figure 9B**). Groundwater samples submitted for laboratory analysis of dissolved inorganics were below laboratory reporting limits or Tier 1 GROs for Class II Groundwater, with the exception of dissolved iron detected in one sample. As discussed above, based on the published IEPA documents and our past experience with this type of fill material encountered, the total inorganic groundwater impacts are believed to be associated with particulates of the typical urban fill material and not the result of a release from historical use of the Property.

The IEPA has identified various potential exposure routes to be evaluated at sites for which TACO remediation objectives are established. These exposure routes include Outdoor Soil Inhalation, Soil Ingestion, Indoor Inhalation, and the Soil and Groundwater Components of Groundwater Ingestion for Class I or Class II Groundwater. The applicability of these exposure routes was undertaken by evaluating physical site conditions encountered during the site investigation.

2.7.2 *Nature, Concentration and Extent of Contaminants of Concern*

The following presents a summary of the COCs observed at the Property associated with the recognized environmental conditions. COCs are defined under 35 IAC 740.120 as:

> "*any contaminant that is expected to be present at the site based upon past and current land uses and associated releases that are known to the Remediation Applicant based upon reasonable inquiry.*"

The COCs have been assessed from the results of analytical testing of soil and groundwater samples collected. The COCs for the Property consist of the IEPA SRP TCL. Soil, groundwater, and soil-gas are the media of concern.

The nature and extent of COC impacts is based on the data gathered during the historical site investigation activities and Weaver Consultants' Phase II ESA and site investigation activities. As a result, COCs exhibiting concentrations exceeding Tier 1 Remediation Objectives are presented below.

2.7.3 *Outdoor Soil Inhalation Exposure Route*

2.7.3.1 Benzene

Historical and site investigation soil samples located in the western and southern portions of the Property exhibited benzene impacts in excess of the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route. As shown on **Figure 6**, the approximate horizontal and vertical extent of impacts associated with these soil samples has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route and the surrounding soil samples exhibiting benzene concentrations below the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route:

Location on Property & Samples Above Tier 1 SRO	**Samples Characterizing the Horizontal Extent of Impacts**			
	North	**South**	**East**	**West**
South-southwestern Portion: A4/2-4'; A5/2-4'; GP-5/5-6'; GP-6/5-6'; GP-12/1-3'; GP-12/6-8'; GP-14/4-6'; GP-15/4-6'; BW1-SB-GP-03/2-4'; BW1-SB-GP-03/8-10'; BW1-SB-GP-08/2-4'; BW1-SB-GP-08/5-7'	A6/2-4'; B4/5-7.5; GP-7/2-3'; GP-7/2-3'; GP-7/5.5-6.5'; GP-7/14-16'; BW1-SB-GP09/1-3'; BW1-SB-GP09/5-7'; BW1-SB-GP09/8-10'	B5/2.5-5'; B6/7.5'-10'; Property Boundary	GP-4/1.5-2.5'; GP-4/6-8'; GP-4/18-20'; BW1-SB-GP-10/1-3'; BW1-SB-GP10/5-7'; BW1-SB-GP-12/1-3'; BW1-SB-GP12/5-7'	Property Boundary
Central-western Portion: BW1-SB-GP-05/2-4'; BW1-SB-GP-05/5-7'	GP-1/1-1.5'; GP-1/4.5-5.5'; GP-1/16-18'; B1/2.5-5'; B2/2.5-5'	GP-7/2-3'; GP-7/2-3'; GP-7/5.5-6.5'; GP-7/14-16'; BW1-SB-GP09/1-3'; BW1-SB-	A3/8-10'; B4/5-7.5'; GP-2/2-3'; GP-2/6-8'; GP-2/18-20'; BW1-SB-GP-02/1-3'; BW1-SB-	A6/2-4'; GP-11/1-3'; GP-11/6-8'

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
		GP09/5-7'; BW1-SB-GP09/8-10'	GP09/1-3'; BW1-SB-GP09/5-7'; BW1-SB-GP-02/5-7'	

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
South-southwestern Portion: A4/2-4'; A5/2-4'; GP-5/5-6'; GP-6/5-6'; GP-12/1-3'; GP-12/6-8'; GP-14/4-6'; GP-15/4-6'; BW1-SB-GP-03/3-4'; BW1-SB-GP-03/8-10'; BW1-SB-GP-08-2-4'; BW1-SB-GP-08/5-7'	A6/10-12'; GP-5/16-18'; GP-6/14-16'; BW1-SB-GP-03/13-15''; BW1-SB-GP-08/8-10'
Central-western Portion: BW1-SB-GP-05/2-4'; BW1-SB-GP-05/5-7'	A6/10-12'; GP-7/14-16'; BW1-SB-GP-02/5-7'; BW1-SB-GP-02/10-12'

In addition, the five soil-gas samples collected during the Phase II ESA were below Tier 1 S-GROs for the Outdoor Inhalation Exposure Route.

Based on the above, soil samples exhibiting benzene impacts in excess of the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route are isolated to the central-western and south-southwestern portions of the Property, and depths of approximately 2 to 10 feet bgs.

In addition, the soil samples identified above exceeding Tier 1 SROs for the Outdoor Soil Inhalation Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below.

2.7.3.2 Toluene

Historical and site investigation soil samples located in the western portion of the Property exhibited toluene impacts in excess of the Tier 1 SRO for the Outdoor Soil Inhalation Exposure

Route. As shown on **Figure 9**, the approximate horizontal and vertical extent of impacts associated with this soil sample has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route and the surrounding soil samples exhibiting toluene concentrations below the Tier 1 SRO for the Soil Inhalation Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Central-western Portion: BW1-SB-GP-08/2-4'	A6/2-4'; GP-7/2-3'	GP-12/1-3'	BW1-SB-GP-09/1-2'	Property Boundary

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Central-western Portion: BW1-SB-GP-08/2-4'	BW1-SB-GP-08/5-7'; BW1-SB-GP-08/8-10'

In addition, the five soil-gas samples collected during the Phase II ESA were below Tier 1 S-GROs for the Outdoor Inhalation Exposure Route.

Based on the above, soil samples exhibiting toluene impacts in excess of the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route are isolated to the central-western portion of the Property, and depths of approximately 2 to 4 feet bgs.

In addition, soil sample BW1-SB-GP-08/2-4' exceeding Tier 1 SROs for the Outdoor Soil Inhalation Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below.

2.7.3.3 Total Xylenes

Historical and site investigation soil samples located in the western portion of the Property exhibited xylene impacts in excess of the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route. As shown on **Figure 9**, the approximate horizontal and vertical extent of impacts associated with this soil sample has been characterized. The following table summarizes the

historical and site investigation soil samples exceeding the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route and the surrounding soil samples exhibiting xylene concentrations below the Tier 1 SRO for the Soil Inhalation Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Central-western Portion: BW1-SB-GP-08/2-4'	A6/2-4'; GP-7/2-3'	GP-12/1-3'	BW1-SB-GP-09/1-2'	Property Boundary

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Central-western Portion: BW1-SB-GP-08/2-4'	BW1-SB-GP-08/5-7'; BW1-SB-GP-08/8-10'

In addition, the five soil-gas samples collected during the Phase II ESA were below Tier 1 S-GROs for the Outdoor Inhalation Exposure Route.

Based on the above, soil samples exhibiting xylene impacts in excess of the Tier 1 SRO for the Outdoor Soil Inhalation Exposure Route are isolated to the central-western and southwestern portions of the Property, and depths of approximately 2 to 4 feet bgs.

In addition, soil sample BW1-SB-GP-08/2-4' exceeding Tier 1 SROs for the Outdoor Soil Inhalation Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below.

2.7.4 *Soil Ingestion Exposure Route*

2.7.4.1 Benzene

Historical and site investigation soil samples located in the central-western and southwestern portions of the Property exhibited benzene impacts in excess of the Tier 1 SRO for the Soil Ingestion Exposure Route. As shown on **Figure 7A**, the approximate horizontal and vertical extent of impacts associated with these soil samples has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil

Ingestion Exposure Route and the surrounding soil samples exhibiting benzene concentrations below the Tier 1 SRO for the Soil Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Central-western Portion: GP-12/6-8'; BW1-SB-GP-08/2-4'	A6/2-4'; GP-7/2-3'; GP-7/5.5-6.5'	A5/2-4'; GP-13/1-3'; GP-13/8-10'; BW1-SB-GP-11/5-7'	BW1-SB-GP-09/1-2'; BW1-SB-GP-09/5-7'	Property Boundary

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Central-western Portion: GP-12/6-8'; BW1-SB-GP-08/2-4'	A6/10-12'; BW1-SB-GP-08/5-7'; BW1-SB-GP-08/8-10'

Based on the above, soil samples exhibiting benzene impacts in excess of the Tier 1 SRO for the Soil Ingestion Exposure Route are isolated to the central-western portion of the Property, and depths of approximately 2 to 8 feet bgs.

In addition, the above soil samples exceeding Tier 1 SROs for the Soil Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below.

2.7.4.2 Arsenic

Historical and site investigation soil samples located in various portions of the Property exhibited arsenic impacts in excess of the Tier 1 SRO for the Soil Ingestion Exposure Route. As shown on **Figure 7B**, the approximate horizontal and vertical extent of impacts associated with these soil samples has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil Ingestion Exposure Route and the surrounding soil samples exhibiting arsenic concentrations below the Tier 1 SRO for the Soil Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Northwestern Portion: GP-10/1-3'; GP-10/8-10'	Property Boundary	GP-1/1-1.5'; GP-1/4.5-5.5'; BW1-SB-GP-04/1-3'; BW1-SB-GP-04/5-7'	GP-9/; BW1-SB-GP-01/1-3'; BW1-SB-GP-01/5-7'	Property Boundary
Northwestern Portion: GP-17/1-3'	Property Boundary	GP-1/1-1.5'; BW1-SB-GP-04/1-3'	Property Boundary	BW1-SB-GP-04/1-3'
Northeastern Portion: GP-18/1-3'	Property Boundary	BW1-SB-GP-06/1-3'; BW1-SB-GP-06/5-7'	GP-3/1-3'; BW1-SB-GP-13/1-3'	GP-9/1-2'; BW1-SB-GP-01/1-3'; BW1-SB-GP-01/5-7'
Central-western Portion: GP-7/2-3'; GP-7/5.5-6.5'; GP-11/1-3'; BW1-SB-GP-05/2-4'; BW1-SB-GP-05/5-7'; BW1-SB-GP-05/10-12'	GP-1/1-1.5'; GP-1/4.5-5.5'; BW1-SB-GP-04/1-3'; BW1-SB-GP-04/5-7'; BW1-SB-GP-04/5-7'	BW-SB-GP-08/2-4'; BW-SB-GP-08/5-7'; BW-SB-GP-08/8-10'; BW-SB-GP-09/2-4'; BW-SB-GP-09/5-7'; BW-SB-GP-09/8-10'	BW1-SB-GP-02/1-3'; BW-1-B-GP-02/5-7'; BW1-SB-GP-03/8-10'	Property Boundary
Southwest Portion: GP-12/1-3'; GP-12/6-8'; GP-13/1-3'; BW1-SB-GP-11/2-4'	BW1-SB-GP-08/2-4'; BW1-SB-GP-08/5-7'; BW1-SB-GP-08/8-10'	Property Boundary	GP-5/1-2'; GP-5/5-6'	Property Boundary
Southern Portion: GP-14/1-3'; GP-14/4-6'; GP-15/1-3'	BW1-SB-GP-03/2-4'; BW1-SB-GP-03/5-7'	Property Boundary	BW1-SB-GP-12/1-3', BW1-SB-GP-12/5-7'	GP-5/1-2'; GP-5/5-6'

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Southeastern Portion: GP-4/1.5-2.5'; GP-16/1-3'; BW1-SB-GP-10/1-3'	GP-8/2-3'; BW1-SB-GP-07/1-3'	Property Boundary	Property Boundary	BW1-SB-GP-12/1-3'

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Northwestern Portion: GP-10/1-3'; GP-10/8-10'; GP-17/1-3'	GP-17/8-10'
Northeastern Portion: GP-18/1-3'	GP-9/9-10'; GP-18/8-10'
Central-western Portion: GP-7/2-3'; GP-7/505-6.5'; GP-11/1-3'; BW1-SB-GP-05/2-4'; BW1-SB-GP-05/5-7'; BW1-SB-GP-05/10-12'	GP-1/16-18'
Southwest Portion: GP-12/1-3'; GP-12/6-8'; GP-13/1-3'; BW1-SB-GP-11/2-4'	GP-13/8-10'; BW1-SB-GP-08/8-10'; BW1-SB-GP-11/5-7'
Southern Portion: GP-14/1-3'; GP-14/4-6'; GP-15/1-3'	GP-5/16-18'; GP-15/4-6'; BW1-SB-GP-03/8-10'
Southeastern Portion: GP-16/1-3'; BW1-SB-GP-10/1-3'	GP-16/8-10'; BW1-SB-GP-10/5-7'

Based on the above, soil samples exhibiting arsenic impacts in excess of the Tier 1 SRO for the Soil Ingestion Exposure Route are isolated to the fill material and fill/native interface in various portions of the Property, and depths of approximately 1 to 12 feet bgs.

In addition, the above soil samples exceeding the Tier 1 SRO for the Soil Ingestion Exposure Route for arsenic are proposed for removal as part of the "hot spot" removal remediation action.

2.7.5 *Soil Component of the Groundwater Ingestion Exposure Route (Class II Groundwater)*

2.7.5.1 Benzene

Historical and site investigation soil samples located in various portions of the Property exhibited benzene impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route. As shown on **Figure 8A**, the approximate horizontal and vertical extent of impacts associated with these soil samples has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route and the surrounding soil samples exhibiting benzene concentrations below the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	**Samples Characterizing the Horizontal Extent of Impacts**			
	North	**South**	**East**	**West**
Southern/Western Portion: A4/2-4'; A5/2-4'; B4/5-7.5'; B5/2.5-5'; B6/7.5-10'; GP-5/1-2'; GP-5/5-6'; GP-6/5-6'; GP-7/5.5-6.5'; GP-12/1-3'; GP-12/6-8'; GP-14/4-6'; GP-15/4-6'; BW1-SB-GP-03/2-4'; BW1-SB-GP-03/8-10'; BW1-SB-GP-03/13-15'; BW1-SB-GP-05/2-4'; BW1-SB-GP-05/5-7'; BW1-SB-GP-08/2-4'; BW1-SB-GP-08/5-7'; BW1-SB-GP-09/1-3'; BW1-	B1/2.5-5'; GP-1/1-1.5'; GP-1/4.5-5.5'; BW1-SB-GP-04/1-3'	Property Boundary	A3/8-10'; BW1-SB-GP-02/1-3'; BW-1/SB-GP-02/5-7'; BW1-SB-GP-07/; BW1-SB-GP-12/1-3'; BW1-SB-GP-12/5-7'	A6/10-12'; GP-11/1-3'; GP-11/6-8'; BW1-SB-GP-08/8-10'

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
SB-GP-09/5-7'; BW1-SB-GP-09/8-10'				
Northern Portion: B2/2-5'; BW1-SB-GP-06/5-7'	GP-3/1-2'; GP-3/6-8'; GP-9/1-2'; GP-17/1-3'; BW1-SB-GP-01/1-3'; BW1-SB-GP-01/5-7'; BW1-SB-GP-13/1-3'; BW1-SB-GP-13/5-7'	GP-2/2-3'; GP-2/6-8'; GP-8/2-3'; GP-8/9-10'; BW1-SB-GP-07/1-3'; BW1-SB-GP-07/5-7'	GP-3/1-2'; GP-3/6-8'; Property boundary; GP-8/2-3'; GP-8/9-10'	GP-1/1-1.5'; GP-1/4.5-5.5'; GP-17/1-3'; BW1-SB-GP-04/1-3'; BW1-SB-GP-04/5-7'

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Southern/Western Portion: A4/2-4'; A5/2-4'; B4/5-7.5'; B5/2.5-5'; B6/7.5-10'; GP-5/1-2'; GP-5/5-6'; GP-6/5-6'; GP-7/5.5-6.5'; GP-12/1-3'; GP-12/6-8'; GP-14/4-6'; GP-15/4-6'; BW1-SB-GP-03/2-4'; BW1-SB-GP-03/8-10'; BW1-SB-GP-03/13-15'; BW1-SB-GP-05/2-4'; BW1-SB-GP-05/5-7'; BW1-SB-GP-08/2-4'; BW1-SB-GP-08/5-7'; BW1-SB-GP-09/1-3'; BW1-SB-GP-09/5-7'; BW1-SB-GP-09/8-10'	A6/10-12'; GP-1/16-18'; GP-2/18-20'; GP-5/16-18'; GP-6/14-16'; GP-7/14-16'; GP-13/8-10'; GP-17/8-10'; BW1-SB-GP-02/10-12', BW1-SB-GP-11/8-10'
Northern Portion: B2/2-5'; BW1-SB-GP-06/5-7'	GP-1/16-18'; GP-9/9-10'; GP-18/8-10'

Based on the above, soil samples exhibiting benzene impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are present across the southwest

and central portions of the Property and isolated to two portions of the northern portion of the Property, and depths of approximately 1 to 15 feet bgs.

With the exception of the soil samples B2/2-5', B4/5.5-7.5', B6/7.5-10', BW1-SB-GP-03/13-15', BW1-SB-GP-06/5-7', BW1-SB-GP-09/1-3', BW1-SB-GP-09/5-7', and BW1-SB-GP-09/8-10'; the above samples exceeding Tier 1 SROs for the Soil Component of the Groundwater Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below.

Fate and transport modeling was conducted using TACO Equations R14 and R26 for those COC concentrations in excess of Tier 1 SROs for Class II Groundwater not proposed for "hot spot" removal. Equation R14 was utilized to calculate the leaching factor and theoretical benzene concentration in groundwater. Equation R26 was utilized to calculate an approximate modeled extent of future theoretical impacts exceeding the Tier 1 GRO.

As presented in **Section 3.3.4** below, the future theoretical benzene impacts for B2/2.5-5', B4/5-7.5', B6/7.5-10', BW1-SB-GP-03/13-15', BW1-SB-GP-06/5-7', BW1-SB-GP-09/1-3', BW1-SB-GP-09/5-7', and BW1-SB-GP-09/8-10' model approximately six to eight feet downgradient, and meet the Tier 1 GRO prior to reaching the Property boundary (see **Figure 8A** for modeled extent of theoretical impacts). Therefore, results of the fate and transport modeling indicate that the above benzene impacts do not extend offsite within groundwater.

2.7.5.2 Ethylbenzene

Historical and site investigation soil samples located in the southern and western portions of the Property exhibited ethylbenzene impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Component of the Groundwater Ingestion Exposure Route. As shown on **Figure 8C**, the approximate horizontal and vertical extent of impacts associated with these soil samples has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route and the surrounding soil samples exhibiting ethylbenzene concentrations below the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	**Samples Characterizing the Horizontal Extent of Impacts**			
	North	**South**	**East**	**West**

Southern Portion: GP-6/5-6'; GP-14/4-6'; GP-15/4-6'	GP-5/; BW1-SB-GP-05/5-7'	Property Boundary	BW1-SB-GP-12/1-3'; BW1-SB-GP-12/5-7'	A5/; B5/; K13/; BW1-SB-GP-11/2-4'; BW1-SB-GP-11/5-7'
Northwestern Portion: BW1-SB-GP-05/2-4'	GP-1/1-1.5'; BW1-SB-GP-04/1-3'	GP-7/2-3'; BW1-SB-GP-09/1-3'	B2/2.5-5'; GP-2/2-3'; BW1-SB-GP-02/1-3'	A6/2-4'; GP-11/1-3'
Western Portion: BW1-SB-GP-08/2-4'	Property Boundary	GP-12/1-3'	GP-7/2-3'; BW1-SB-GP-09/1-3'	Property Boundary

Location on Property and Samples Above Tier 1 SRO	**Samples Characterizing the Vertical Extent of Impacts**
Southern Portion: GP-6/5-6'; GP-14/4-6'; GP-15/4-6'	GP-6/14-16'
Northwestern Portion: BW1-SB-GP-05/2-4'	GP-7/14-16'
Western Portion: BW1-SB-GP-08/2-4'	A6/10-12'; GP-12/6-8'

Based on the above, soil samples exhibiting ethylbenzene impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are isolated to western and southern portions of the Property, and depths of approximately 2 to 6 feet bgs.

In addition, the above soil samples exceeding Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below. As a result, fate and transport modeling was not conducted for these COC concentrations in excess of Tier 1 SRO for Class II Groundwater.

2.7.5.3 Toluene

Historical and site investigation soil samples located in the southern and western portions of the Property exhibited toluene impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Component of the Groundwater Ingestion Exposure Route. As shown on **Figure 8C**, the approximate horizontal and vertical extent of impacts associated with these soil samples has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route and the surrounding soil samples exhibiting toluene concentrations below the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	**Samples Characterizing the Horizontal Extent of Impacts**			
	North	**South**	**East**	**West**
Southwestern Portion: A5/2-4’	BW1-SB-GP-11/2-4’; BW1-SB-GP-11/5-7’	Property Boundary	GP-13/1-3’; GP-13/8-10’	GP-5/1-2’; GP-5/5-6’; GP-14/1-3’; GP-14/4-6’
Southern-Central Portion: A4/2-4’	GP-6/2-3’	Property Boundary	GP-15/1-3’; BW1-SB-GP-12/1-3’	GP-6/2-3’, GP-14/1-3’
Central-western Portion: BW1-SB-GP-08/2-4’	GP-7/2-3’	GP-12/1-3’	GP-7/2-3’; BW1-SB-GP-09/1-3’	Property Boundary

Location on Property and Samples Above Tier 1 SRO	**Samples Characterizing the Vertical Extent of Impacts**
Southwestern Portion: A5/2-4’	BW1-SB-GP-11/8-10’

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Southern-Central Portion: A4/2-4'	GP-6/5-6'; B6/7.5-10'
Central-western Portion: BW1-SB-GP-08/2-4'	A6/10-12'; GP-12/6-8'

Based on the above, soil samples exhibiting toluene impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are isolated to western and southern portions of the Property, and depths of approximately 2 to 6 feet bgs.

In addition, the above soil samples exceeding Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below. As a result, fate and transport modeling was not conducted for these COC concentrations in excess of Tier 1 SROs for Class II Groundwater.

2.7.5.4 Total Xylenes

One site investigation soil sample located in the central-western portion of the Property exhibited xylene impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Component of the Groundwater Ingestion Exposure Route. As shown on **Figure 8C**, the approximate horizontal and vertical extent of impacts associated with this soil sample has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route and the surrounding soil samples exhibiting xylene concentrations below the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Central-western Portion:	GP-7/2-3'	GP-12/1-3'	GP-7/2-3'; BW1-SB-GP-09/1-3'	Property Boundary

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
BW1-SB-GP-08/2-4'				

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Central-western Portion: BW1-SB-GP-08/2-4'	A6/10-12'; GP-12/6-8'

Based on the above, soil samples exhibiting xylene impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are isolated to western portion of the Property, and depths of approximately 2 to 4 feet bgs.

In addition, the above soil sample exceeding Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below. As a result, fate and transport modeling was not conducted for these COC concentrations in excess of Tier 1 SROs for Class II Groundwater.

2.7.5.5 MTBE

One site investigation soil sample located in the wester-central portion of the Property exhibited MTBE impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Component of the Groundwater Ingestion Exposure Route. As shown on **Figure 8B**, the approximate horizontal and vertical extent of impacts associated with this soil samples have been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route and the surrounding soil samples exhibiting xylene concentrations below the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Central-western Portion: BW1-SB-GP-08/2-4'	GP-7/2-3'	GP-12/1-3'	GP-7/2-3'; BW1-SB-GP-09/1-3'	Property Boundary

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Central-western Portion: BW1-SB-GP-08/2-4'	A6/10-12'; GP-12/6-8'

Based on the above, the soil sample exhibiting MTBE impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are isolated to western portion of the Property, and depths of approximately 2 to 4 feet bgs.

In addition, the above soil sample exceeding Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below. As a result, fate and transport modeling was not conducted for these COC concentrations in excess of Tier 1 SROs for Class II Groundwater.

2.7.5.6 Naphthalene

One site investigation soil sample located in the central-western portion of the Property exhibited MTBE impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Component of the Groundwater Ingestion Exposure Route. As shown on **Figure 8C**, the approximate horizontal and vertical extent of impacts associated with this soil samples have been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route and the surrounding soil samples exhibiting xylene concentrations below the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Central-western Portion: BW1-SB-GP-08/2-4'	GP-7/2-3'	GP-12/1-3'	GP-7/2-3'; BW1-SB-GP-09/1-3'	Property Boundary

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Central-western Portion: BW1-SB-GP-08/2-4'	A6/10-12'; GP-12/6-8'

Based on the above, the soil sample exhibiting MTBE impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are isolated to western portion of the Property, and depths of approximately 2 to 4 feet bgs.

In addition, the above soil sample exceeding Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below. As a result, fate and transport modeling was not conducted for these COC concentrations in excess of Tier 1 SROs for Class II Groundwater.

2.7.5.7 Inorganics

Various soil samples located across the Property exhibited various inorganic concentrations in excess of the Tier 1 SROs for the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater. Additionally, soil samples exhibited concentrations of various inorganics for which Tier 1 SROs have not been developed. These impacts exceeded the Backgrounds within MSAs. Based on these results, select samples were analyzed for TCLP and/or SPLP metals analysis. Generally, samples with the highest total inorganic concentrations were chosen for TCLP/SPLP analysis. The following table summarizes the samples that exhibited inorganic exceedances, the subsequent TCLP and/or SPLP results, and the corresponding Tier 1 SROs.

Contaminant of Concern	Sample IDs	Total Inorganic Concentration (mg/kg)	TCLP/SPLP Concentration (mg/L)	Tier 1 SRO (mg/L)
Aluminum	BW1-SB-GP-7/1-3’	10,000	<0.10	5
Arsenic	GP-4/1.5-2.5’	25.2	0.011	0.2
	GP-7/5.5-6.5’	33	0.006	
	BW1-SB-GP-02/1-3’	8.7	<0.10	
Barium	BW1-SB-GP-02/1-3’	37	0.53	2.0
Beryllium	GP-4/1.5-2.5’	1.1	<0.10	0.5
Cadmium	BW1-SB-GP-02/1-3’	0.96	<0.005	0.05
Cobalt	GP-4/1.5-2.5	25.8	<0.10	1
	BW1-SB-GP-02/1-3’	16	<0.004	
Chromium	GP-3/18-20’	20.3	0.001	0.1
	GP-4/1.5-2.5’	22.8	0.023	
	GP-9/1-2’	28.7	0.026	
	BW1-SB-GP-02/1-3’	14	<0.001	
	BW1-SB-GP-12/1-3’	28	0.0044	
Copper	GP-2/6-8’	30.8	<0.001	0.65
	GP-4/1.5-2.5’	70.1	0.053	
Iron	GP-2/6-8’	22,800	3.6	5
	GP-4/1.5-2.5’	52,500	**26.5**	

Contaminant of Concern	Sample IDs	Total Inorganic Concentration (mg/kg)	TCLP/SPLP Concentration (mg/L)	Tier 1 SRO (mg/L)
	BW1-SB-GP-02/1-3'	27,000	<0.25	
Lead	GP-1/4.5-5.5'	65	0.002	0.1
	GP-3/1-2'	67.4	0.008	
	BW1-SB-GP-02/1-3'	140	0.05	
Manganese	GP-4/1.5-2.5'	1,570	0.2	10
Mercury	GP-1/1-1.5'	0.07	<0.005	0.01
	BW1-SB-GP-02/1-3'	0.032	<0.0002	
Nickel	GP-2/6-8'	25.8	<0.10	2
	GP-4/1.5-2.5'	32.2	<0.10	
Selenium	BW1-SB-GP-02/1-3'	<1.0	<0.01	0.05
Silver	BW1-SB-GP-02/1-3'	<1.0	<0.01	0.05
Vanadium	GP-4/1.5-2.5'	32.4	<0.10	0.1

Note: **BOLD** indicates a SPLP/TCLP concentration in excess of the applicable Tier 1 SRO.

As shown in the above table, various TCLP and SPLP inorganics results were below applicable Tier 1 SROs, with the exception of TCLP iron detected in sample GP-4/1.5-2.5'.

As shown on **Figure 8D**, the approximate horizontal and vertical extent of impacts associated with this soil sample has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route and the surrounding soil samples exhibiting iron

concentrations below the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Southeastern Portion: GP-4/1.5-2.5'	BW-1-SB-GP-02/1-3'; GP-2/6-8'	Property Boundary	Property Boundary	BW-1-SB-GP-02/1-3'; GP-2/6-8'

Location on Property and Samples Above Tier 1 SRO	Samples Characterizing the Vertical Extent of Impacts
Southeastern Portion: GP-4/1.5-2.5'	GP-2/6-8'

Based on the above, TCLP iron impacts in excess of the Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route are isolated to southeastern portion of the Property, and depths of approximately 1.5 to 2.5 feet bgs.

In addition, the above soil sample exceeding Tier 1 SRO for the Soil Component of the Groundwater Ingestion Exposure Route is proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below. As a result, fate and transport modeling was not conducted for this COC concentration in excess of Tier 1 SRO for Class II Groundwater.

2.7.6 *Groundwater Ingestion Exposure Route (Class II Groundwater)*

2.7.6.1 Benzene

Historical and site investigation groundwater samples located in the central-western portion of the Property exhibited benzene impacts in excess of the Tier 1 GRO for the Groundwater Ingestion Exposure Route. As shown on **Figure 9A**, the approximate horizontal and vertical extent of impacts associated with this groundwater samples have been characterized. The following table summarizes the historical and site investigation groundwater samples exceeding the Tier 1 GRO for the Groundwater Ingestion Exposure Route and the surrounding groundwater samples

exhibiting benzene concentrations below the Tier 1 GRO for the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Southern Portion: B5; MW-5; BW1-SB-TW-03	MW-2; BW1-SB-TW-02	Property Boundary	MW-4	Property Boundary
Northern Portion: B1; MW-1	Property Boundary	MW-2; BW1-SB-TW-02	MW-3; BW1-SB-TW-01	Property Boundary

Based on the above, the groundwater samples exhibiting benzene impacts in excess of the Tier 1 GRO for the Groundwater Ingestion Exposure Route are isolated to southwestern and northern portions of the Property.

In addition, wet soil in the vicinity of groundwater sample locations BW1-SB-TW-03 exceeding the Tier 1 GRO for the Groundwater Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below. As a result, fate and transport modeling was not conducted for this COC concentrations in excess of Tier 1 SROs for Class II Groundwater.

In addition, fate and transport modeling was performed using TACO Equation R26 for the benzene concentrations at monitoring wells B1, B5, MW-1, and MW-5 in excess of the Tier 1 GRO for the Groundwater Ingestion Exposure Route for Class II Groundwater. Equation R26 was utilized to calculate an approximate modeled extent of future theoretical impacts exceeding the Tier 1 GRO at these monitoring well locations. It should be noted that monitoring wells B1, MW-1, and MW-5 were sampled twice; therefore, WCG utilized the most recent sampling data for fate and transport modeling.

As presented in **Section 3.3.4** below, the future theoretical benzene impacts for B1, B5, MW-1, and MW-5 model approximately six to twelve (12) feet downgradient, and meet the Tier 1 GRO prior to reaching the Property boundary (see **Figure 9A** for modeled extent of theoretical impacts). Therefore, results of the fate and transport modeling indicate that the above benzene impacts do not extend offsite within groundwater.

2.7.6.2 Inorganics

Groundwater samples BW1-GW-TW-02 and BW1-GW-TW-03 and historical groundwater samples MW-1, MW-2, MW-4, and MW-5 exhibited total iron concentrations exceeding Tier 1 GROs for the Groundwater Component of the Groundwater Ingestion Exposure Route for Class II Groundwater. However, groundwater samples were collected for field filtration and direct containerizing concurrently from each of the May 2020 site investigation temporary monitoring wells for laboratory analysis of total and dissolved metals, as discussed in **Section 2.6.4** through **Section 2.6.7**. The dissolved iron concentrations for these samples were below the Tier 1 GRO for the Groundwater Ingestion Exposure Route for Class II Groundwater, with the exception of dissolved iron detected in groundwater sample BW1-GW-TW-03 (refer to **Table 7**). As a result, it is believed the total metal impacts detected in excess of Tier 1 GROs are attributed to the suspended solids within the groundwater and not the result of a release at the Property, with the exception of iron as discussed below

2.7.6.3 Dissolved Iron

One site investigation groundwater sample located in the southern-central portion of the Property exhibited dissolved iron impacts in excess of the Tier 1 GRO for the Groundwater Ingestion Exposure Route. As shown on **Figure 9B**, the approximate horizontal and vertical extent of impacts associated with these groundwater samples have been characterized. The following table summarizes the historical and site investigation groundwater samples exceeding the Tier 1 GRO for the Groundwater Ingestion Exposure Route and the surrounding groundwater samples exhibiting dissolved iron concentrations below the Tier 1 GRO for the Groundwater Ingestion Exposure Route:

Location on Property & Samples Above Tier 1 SRO	**Samples Characterizing the Horizontal Extent of Impacts**			
	North	**South**	**East**	**West**
Central Portion: BW1-SB-TW-03	MW-2; BW1-SB-TW-02	Property Boundary	MW-4	Property Boundary

Based on the above, the groundwater sample exhibiting dissolved iron impacts in excess of the Tier 1 GRO for the Groundwater Ingestion Exposure Route are isolated to southwestern portion of the Property.

In addition, groundwater sample location BW1-SB-TW-03 exceeding the Tier 1 GRO for the Groundwater Ingestion Exposure Route are proposed for removal as part of the "hot spot" removal remediation action, as discussed in **Section 4.0** below. As a result, fate and transport modeling was not conducted for these COC concentrations in excess of Tier 1 SROs for Class II Groundwater.

In addition, to further address the dissolved iron concentrations in excess of the Tier 1 GRO for the Groundwater Ingestion Exposure Route for Class II Groundwater, Weaver Consultants conducted a Nutritional-Based Comparison evaluation by comparing the dissolved iron concentrations with the corresponding dietary intake values (refer to **Table 8 – Summary of Nutritional-Based Comparison - Iron**). This evaluation demonstrated that ingestion of shallow groundwater containing the highest total iron concentration reported at monitoring wells MW-1, MW-2, MW-4, MW-5, BW1-SB-TW-02, and BW1-SB-TW-03 will pose no adverse health effects to the human population, as discussed further in **Section 3.3.5.1**.

2.7.7 *Indoor Inhalation Exposure Route*

2.7.7.1 Benzene

Historical and site investigation groundwater samples and soil-gas samples located in the western and southern portions of the Property exhibited benzene impacts in excess of the Tier 1 GRO and S-GRO for the Indoor Inhalation Exposure Route. As shown on **Figure 10**, the approximate horizontal and vertical extent of impacts associated with these samples has been characterized. The following table summarizes the historical and site investigation soil samples exceeding the Tier 1 GRO and S-GRO for the Indoor Inhalation Exposure Route and the surrounding samples exhibiting benzene concentrations below the Tier 1 GRO and S-GRO for the Indoor Inhalation Exposure Route:

Location on Property & Samples Above Tier 1 SRO	**Samples Characterizing the Horizontal Extent of Impacts**			
	North	**South**	**East**	**West**
Southern-Central and Central Portions: B-5; MW-5; BW1-GW-TW-03; BV-SG-GP-04; BV-SG-GP-05	MW-2; BW1-SB-TW-02	Property Boundary	MW-4	Property Boundary

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Northern Portion: B1; MW-1	Property Boundary	MW-2; BW1-SB-TW-02	BW1-SB-TW-01	BV-SG-GP-01

Soil-gas sample BV-SG-GP-01 collected in the vicinity of the groundwater benzene concentrations, B1 and MW-1, was below the Tier 1 S-GROs. This soil-gas sample result is being relied upon to address the Indoor Inhalation Exposure Route.

Based on the above, soil-gas samples exhibiting benzene impacts in excess of the Tier 1 S-GRO for the Indoor Inhalation Exposure Route are isolated to the southern-central and central portions of the Property. Soils in the vicinity of soil-gas samples BV-SG-GP-04 and BV-SG-GP-05 exceeding the Tier 1 S-GRO for the Indoor Inhalation Exposure Route are proposed for removal as part of the "hot spot" removal remedial action as discussed in **Section 4.0** below. In addition, soil at MW-5 at BW1-GW-TW-03 will be removed as part of the "hot spot" removal.

2.7.7.2 Ethylbenzene

Historical and site investigation groundwater samples and soil-gas samples located in the western and southern portions of the Property exhibited ethylbenzene impacts in excess of the Tier 1 GRO and S-GRO for the Indoor Inhalation Exposure Route. As shown on **Figure 10**, the approximate horizontal and vertical extent of impacts associated with these samples has been characterized. The following table summarizes the historical and site investigation samples exceeding the Tier 1 GRO and S-GRO for the Indoor Inhalation Exposure Route and the surrounding soil samples exhibiting ethylbenzene concentrations below the Tier 1 GRO and S-GRO for the Indoor Inhalation Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Southern-Central Portion: BV-SG-GP-05	MW-2; BW1-SB-TW-02	Property Boundary	BW1-GW-TW-03	MW-5

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Northern Portion: MW-1	Property Boundary	MW-2; BW1-SB-TW-02	BW1-SB-TW-01	BV-SG-GP-01

* - Soil-gas sample BV-SG-GP-01 collected within 15 feet of MW-1. Results below Tier 1 S-GROs.

Soil-gas sample BV-SG-GP-01 collected in the vicinity of the groundwater ethylbenzene concentrations, MW-1, was below the Tier 1 S-GROs. This soil-gas sample result is being relied upon to address the Indoor Inhalation Exposure Route.

Based on the above, soil-gas sample exhibiting ethylbenzene impacts in excess of the Tier 1 S-GRO for the Indoor Inhalation Exposure Route is isolated to the southern-central portion of the Property. Soils in the vicinity of soil-gas samples BV-SG-GP-05 exceeding the Tier 1 S-GRO for the Indoor Inhalation Exposure Route are proposed for removal as part of the "hot spot" removal remedial action.

2.7.7.3 Naphthalene

One historical groundwater sample located in the northern portion of the Property exhibited naphthalene impacts in excess of the Tier 1 GRO for the Indoor Inhalation Exposure Route. As shown on **Figure 10**, the approximate horizontal and vertical extent of impacts associated with this sample has been characterized. The following table summarizes the historical site investigation sample exceeding the Tier 1 GO for the Indoor Inhalation Exposure Route and the surrounding samples exhibiting naphthalene concentrations below the Tier 1 GRO and S-GRO for the Indoor Inhalation Exposure Route:

Location on Property & Samples Above Tier 1 SRO	Samples Characterizing the Horizontal Extent of Impacts			
	North	South	East	West
Northern Portion: MW-1	Property Boundary	MW-2; BW1-SB-TW-02	BW1-SB-TW-01	BV-SG-GP-01

Soil-gas sample BV-SG-GP-01 collected in the vicinity of the groundwater naphthalene concentrations, MW-1, was below the Tier 1 S-GROs. Also, none of the soil gas samples collected on February 7, 2019 exhibited naphthalene above reporting limits. This soil-gas sample result is being relied upon to address the Indoor Inhalation Exposure Route.

2.8 Significant Physical Features of Remediation Site

The Property is located in a commercial/residential area at 4901 and 4905 St. Charles Road in Bellwood, Illinois. The Property consists of approximately 0.33 acres of land with approximately 125 feet of frontage along St. Charles Road and approximately 125 feet of frontage along 49th Avenue. The Property generally lies north of St. Charles Road, east of 50th Avenue, south of Erie Street, and west of 49th Avenue (refer to **Figure 1**). The Property consists of two parcels of land located within the northeast portion of Section 8, Township 39 North, Range 12 East of the Third Principal Meridian in Cook County, Illinois.

The Property is currently unimproved and unoccupied. The surface of the northern portion of the Property is grass-covered and the southern portion consists of asphalt. Concrete sidewalks are located along the eastern and western borders of the Property. **Figure 2 – Site Base Map** shows the location of the above referenced Property features.

2.8.1 *Comparisons to Remediation Objectives*

Analytical data from the site investigation activities has been compared to baseline remediation objectives for each applicable exposure route contained in 35 IAC 742, Appendix B, Table B, and other relevant sources. **Tables 1 – 4** present the soil analytical results and **Tables 7 – 8** present the groundwater analytical results derived from the completed Phase II ESA and site investigations with comparisons to the following:

1. Tier 1 Soil Remediation Objectives for Residential Properties (35 IAC 742, Appendix B, Table A);
2. Tier 1 Soil Remediation Objectives for the Construction Worker Scenario (35 IAC 742, Appendix B, Table B);
3. Tier 1 Soil Remediation Objectives for the Soil Component of the Groundwater Ingestion Exposure Route (35 IAC Section 742, Appendix B, Table B);
4. Soil Background Concentrations for MSAs (35 IAC 742, Appendix A, Tables G and H);

5. pH-Specific Soil Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Exposure Route (Class II Groundwater) (35 IAC 742, Appendix B, Table D);
6. Tier 1 Groundwater Remediation Objectives for the Groundwater Component of the Groundwater Ingestion Exposure Route (35 IAC 742, Appendix B, Table E); and
7. Tier 1 Soil Gas and Groundwater Remediation Objectives for the Indoor Inhalation Exposure Route – Diffusion and Advection (35 IAC 742, Appendix B, Table H).

In summary, based upon these comparisons, soil and groundwater conditions have been identified with COC impacts exceeding applicable Tier 1 SROs for the Soil Ingestion Exposure Route, Soil Inhalation Exposure Route, and the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater; Tier 1 GROs for the Groundwater Ingestion Exposure Route for Class II Groundwater; and Tier 1 S-GROs for Residential Properties.

As presented above, the Property has undergone appropriate investigation for purposes of characterizing the nature and extent of the COCs in accordance with the CSI requirements set forth within 35 IAC 742.425.

3 REMEDIATION OBJECTIVES REPORT

3.1 Introduction

The following presents the proposed Remediation Objectives for the Property developed in accordance with the procedures outlined at 35 IAC 740.440 and 740.445. Analytical data has been compared to Tier 1 SROs for Residential Properties and the Construction Worker Scenario contained in tables listed in 35 IAC 742, Appendix B, Tables A-B and Tier 1 GROs for Class II Groundwater and Residential Properties contained in tables listed in 35 IAC 742, Appendix B, Table E and Table H.

3.2 TACO Exposure Route Evaluation

The IEPA has identified five potential exposure routes to be evaluated under TACO (35 IAC 742). These routes are as follows:

a) Outdoor Soil Inhalation Exposure Route;

b) Indoor Inhalation Exposure Route;

c) Soil Ingestion Exposure Route;

d) Soil Component of the Groundwater Ingestion Exposure Route for Class I or II Groundwater; and

e) Groundwater Ingestion Exposure Route for Class I or Class II Groundwater.

TACO allows the evaluation of each of the exposure routes for potential exclusion from consideration. If institutional controls are used to exclude exposure routes, then the institutional controls will be maintained and recorded onto the Property deed. Within this document, support is being provided demonstrating that each of the applicable TACO exposure routes can be excluded from consideration at the Property.

3.3 Remediation Objectives

SROs, GROs, and S-GROs were developed by IEPA and were designed to protect human health and take into account site conditions and land use. Remediation objectives generated by TACO are risk-based and site-specific. TACO provides flexibility to site owners and operators in developing site-specific remediation objectives.

The following options are available under TACO:

- Exclusion of exposure routes;

- Use of area background concentrations as remediation objectives; and
- Three tiers for developing remediation objectives.

The following includes a comparison of analytical data to Tier 1 SROs, S-GROs, and GROs, and a risk-based evaluation for those COCs that exhibited concentrations in excess of Tier 1 remediation objectives.

3.3.1 *Tier 1 Evaluation*

Tables 1-7 present analytical results of the historical site investigation, Weaver Consultants' Phase II ESA, and site investigation activities, with comparisons to:

1. Tier 1 Soil Remediation Objectives for Residential Properties (35 IAC Section 742, Appendix B, Table A);
2. Tier 1 Soil Remediation Objectives for the Construction Worker Scenario (35 IAC Section 742, Appendix B, Table B);
3. Tier 1 Soil Remediation Objectives for the Soil Component of the Groundwater Ingestion Exposure Route (35 IAC Section 742, Appendix B, Table B);
4. Soil Background Concentrations for MSAs (35 IAC Section 742, Appendix A, Tables G and H); and
5. pH-Specific Soil Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Exposure Route (Class II Groundwater) (35 IAC 742, Appendix B, Table D).
6. Tier 1 Groundwater Remediation Objectives for the Groundwater Ingestion Exposure Route (35 IAC Section 742, Appendix B, Table E); and
7. Tier 1 Soil-Gas and Groundwater Remediation Objectives for the Indoor Inhalation Exposure Route – Diffusion & Advection (35 IAC 742, Appendix B, Table H).

3.3.1.1 Soil

Under Tier 1, available soil analytical data have been compared to baseline remediation objectives, contained in tables listed in 35 IAC 742, Appendix B. As presented above, **Tables 1 - 2** and **Tables 5-6** present analytical data for the COCs with comparisons to the Tier 1 SROs for Residential Properties and the Construction Worker Scenario (35 IAC 742, Appendix B, Tables A-B). Based on these comparisons, COC concentrations are below Tier 1 SROs for Residential Properties and the Construction Worker Scenario except the following:

- Benzene;
- Ethylbenzene;
- Toluene;
- Total xylenes;
- MTBE;
- Naphthalene;
- Arsenic; and
- Iron.

Based on these comparisons to Tier 1 SROs, COCs exceeding the Outdoor Soil Inhalation Exposure Route, Soil Ingestion Exposure Route, and the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater are proposed for exclusion (**Section 3**).

3.3.1.2 Groundwater

Under Tier 1, available groundwater analytical data have been compared to baseline remediation objectives, contained in tables listed in 35 IAC 742, Appendix B. As presented above, **Table 3** and **Table 7** present analytical data for the COCs with comparisons to the Tier 1 GROs for Class II Groundwater (35 IAC 742, Appendix B, Table E) and Tier 1 GROs for the Indoor Inhalation Exposure Route for Residential Properties (35 IAC 742, Appendix B, Table H). Based on these comparisons, COC concentrations are below Tier 1 GROs for Class II Groundwater except for benzene and dissolved iron.

The groundwater samples were analyzed for various parameters applicable to the Indoor Inhalation Exposure Route, as listed in 35 IAC 742, Appendix A, Table J. Groundwater sample for the Indoor Inhalation parameters were below the applicable Tier 1 GROs for the Indoor Inhalation Exposure Route, expect the following:

- Benzene;
- Ethylbenzene; and
- Naphthalene.

Based on these comparisons to Tier 1 GROs, COCs exceeding the Groundwater Ingestion Exposure Route for Class II Groundwater is proposed for exclusion (**Section 3**).

As indicated above, soil-gas samples BV-SG-GP-01 collected in the vicinity of the groundwater benzene concentrations, B1 and MW-1, was below the Tier 1 S-GROs. The soil-gas sample are results are being relied upon to address the Indoor Inhalation Exposure Route.

3.3.1.3 Soil-Gas

Under Tier 1, available soil-gas analytical data have been compared to baseline remediation objectives, contained in tables listed in 35 IAC 742, Appendix B. As presented above, **Table 4**

present analytical data for the COCs with comparisons to the Tier 1 S-GROs for Residential Properties and the Construction Worker Scenario (35 IAC 742, Appendix B, Tables A-B). Based on these comparisons, COC concentrations are below Tier 1 GROs for Residential Properties except the following:

- Benzene;
- Ethylbenzene; and
- Naphthalene.

Based on these comparisons to Tier 1 S-GROs, COCs exceeding the Indoor Inhalation Exposure Route are proposed to be removed (**Section 3**).

3.3.2 *Remediation Strategy*

In summary, the following is being proposed in accordance with TACO requirements to address COCs exceeding Tier 1 SROs, Tier 1 GROs, and Tier 1 S-GROs:

- The Outdoor and Indoor Inhalation Exposure Routes are proposed for "hot spot" removal of impacted soils (**Section 4**);
- The Soil Ingestion Exposure Route is proposed for "hot spot" removal of impacted soils (**Section 4**).
- The Groundwater Ingestion Exposure Route (both soil and groundwater components) is proposed for exclusion by demonstrating compliance with 35 IAC 742.320 (**Section 3**); and
- COC impacts exceeding Tier 1 SROs for the Soil Inhalation and/or Ingestion Exposure Route for the Construction Worker Scenario are proposed for "hot spot" removal of impacted soils (**Section 4**).

3.3.3 *Exclusion of Exposure Routes*

To exclude the above applicable exposure routes, the general requirements listed in 35 IAC 742.300 and 742.305 must be satisfied. The following presents these general requirements, followed by an explanation of how the applicable criteria have been satisfied.

35 IAC Section 742.300(b): "No exposure route may be excluded from consideration until characterization of the extent and concentrations of contaminants of concern at the site have been performed. The actual steps and methods taken to characterize a site shall be determined by the specific program requirements under which the site remediation is being addressed."

As detailed in the Comprehensive Site Investigation Report in **Section 2.0**, the Property has undergone appropriate investigation for purposes of characterizing the nature and extent of the COC impacts in excess of Tier 1 SROs, GROs, and S-GROs. The comprehensive site investigation activities resulted in analysis of the TCL parameters as presented in 35 IAC 740, Appendix A, Tables A-D, which are the COCs for this Property. Soil, groundwater, and soil-gas impacts exceeding Tier 1 Remediation Objectives for Residential Properties, the Construction Worker Scenario, and Class II Groundwater were detected in the subsurface at the Property. Therefore, Section 742.300(b) has been satisfied.

35 IAC Section 742.305(a): "The sum of the concentrations of all organic contaminants of concern shall not exceed the attenuation capacity of the soil as determined under Section 742.215."

Section 742.215(b) states that the soil attenuation capacity will not be exceeded if:

1. *The sum of the organic contaminant residual concentrations analyzed for the purposes of the remediation program for which the analysis is performed, at each discrete sampling point, is less than the natural organic carbon fraction (f_{oc}) of the soil.*
   A. *A default value of 6,000 mg/kg for soils within the top meter and 2,000 mg/kg for soils below one meter of the surface; or*
   B. *A site-specific value as measured by the analytical method referenced in Appendix C, Table F, multiplied by 0.58 to estimate the fraction of organic carbon, as stated in Nelson and Sommers (1982), as incorporated by reference in Section 742.210;*
2. *The total petroleum hydrocarbon concentration is less than the natural organic carbon fraction of the soil as demonstrated using a method approved by the Agency. The method selected shall be appropriate for the contaminants of concern to be addressed; or*
3. *Another method, approved by the Agency, shows that the soil attenuation capacity is not exceeded.*

According to **Table 1**, **Table 4**, and **Table 5**, the sum of organic constituents within each soil sample, except for BW1-SB-GP-08 / 2-4, which will be excavated during the "hot spot" removal efforts, are below the default soil attenuation capacity for subsurface soils. In addition, Shaw collected three samples for TPH laboratory analysis and concentrations of TPH were below the default soil attenuation capacity in the three samples (see **Table 1**). Therefore, Section 742.305(a) will be satisfied upon the conclusion of the "hot spot" remediation outlined in **Section 4.**

35 IAC Section 742.305(b): "The concentrations of any organic contaminants of concern remaining in the soil shall not exceed the soil saturation limit as determined under Section 742.220."

Section 742.220 – Determination of Soil Saturation Limit states:

a) *For any organic contaminant that has a melting point below 30°C, the remediation objective for the outdoor inhalation exposure route developed under Tier 2 shall not exceed the soil saturation limit, as determined under subsection (c).*
b) *For any organic contaminant that has a melting point below 30°C, the remediation objective under Tier 2 for the soil component of the groundwater ingestion exposure route shall not exceed the soil saturation limit, as determined under subsection (c).*
c) *The soil saturation limit shall be:*
    1. *The value listed in Appendix A, Table A (of the TACO regulations) for that specific contaminant;*
    2. *A value derived from Equation S29 in Appendix C, Table A (of the TACO regulations); or*
    3. *A value derived from another method approved by the Agency.*

As shown on **Table 1** and **Table 3**, soil samples exhibited concentrations of COCs below their respective default soil saturation limits (C_{sat}), with the exception of soil sample BW1-SB-GP-08/2-4' that exhibited a concentration of toluene (870 mg/kg) and total xylenes (1,200 mg/kg) in excess of the soil saturation limit for the Outdoor Inhalation Exposure Route (580 mg/kg and 280 mg/kg, respectively) and Soil Component of Groundwater Ingestion Exposure Route (290 and 110 mg/kg, respectively). In addition, soil sample BW1-SB-GP-08/2-4' exhibited a concentration of ethylbenzene (210 mg/kg) in excess of the soil saturation limits for the Soil Component of Groundwater Ingestion Exposure Route (150 mg/kg).

As mentioned above, soils in the vicinity of soil sample BW1-SB-GP-08/2-4' are proposed for removal during "hot spot" removal activities, further discussed in **Section 4.4.1.** Confirmation sample results collected during the proposed "hot spot" removal will be analyzed for ethylbenzene, toluene, and total xylenes. Laboratory results will be compared to the default C_{sat} value, and if needed, a site-specific C_{sat} value will be calculated based on the f_{oc}. Therefore, Section 742.305(b) will be satisfied upon the conclusion of the work outlined in **Section 4.4.**

35 IAC Section 742.305(c): "Any soil which contains contaminants of concern shall not exhibit any of the characteristics of reactivity for hazardous waste as determined under 35 Ill. Adm Code 721.123."

Results of reactive cyanide and reactive sulfide analysis from soil sample BW1-SB-GP-08/2-4', as shown on **Table 5**, were not detected above laboratory reporting limits indicating that the soils do not have reactive characteristics. Therefore, Section 742.305(c) has been satisfied.

35 IAC Section 742.305(d): Any soil which contains contaminants of concern shall not exhibit a pH less than or equal to 2.0 or greater than or equal to 12.5, as determined by SW-846 Method 9040B: pH Electrometric for soils with 20% or greater aqueous (moisture) content or by SW-846 Method 9045C: Soil pH for soils with less than 20% aqueous (moisture) content as incorporated by reference in Section 742.210."

As shown on **Table 1** and **Table 5**, forty-nine (49) soil samples collected from various soil probes were analyzed for pH, as presented above in **Section 2.5.14**. Based on these results, soil samples exhibited pH ranges from 7.70 s.u. to 9.14 s.u. and did not exhibit a pH of less than or equal to 2.0 s.u., or greater than or equal to 12.5 s.u. Therefore, Section 742.305(d) has been satisfied.

35 IAC Section 742.305(e): "Any soil which contains contaminants of concern in the following list of inorganic chemicals or their salts shall not exhibit any of the characteristics of toxicity for hazardous waste as determined by 35 Ill. Adm. Code 721.124: arsenic, barium, cadmium, chromium, lead, mercury, selenium, or silver."

Soil samples collected during the historical and May 2020 site investigation activities did not exhibit characteristics of toxicity for hazardous waste. As shown on **Table 5**, TCLP concentrations for RCRA metals are below hazardous waste standards for soil sample SBW1-SB-GP-06/1-3'. Therefore, Section 742.305(e) has been satisfied.

35 IAC Section 742.305(f): "If contaminants of concern include polychlorinated biphenyls (PCBs), the concentration of any PCBs in the soil shall not exceed 50 parts per million as determined by SW-846 Methods."

As shown on **Table 1** and **Table 5**, the results of the soil samples submitted for PCB laboratory analysis from soil samples GP-1-1.5', GP-2/2-3', GP-3/1-2', GP-4/1.5-2.5', GP-5/1-2', GP-10/1-3', GP-16/1-3', GP-18/8-10', BW1-SB-GP-02/1-3', and BW1-SB-GP-05/5-7' were below laboratory detection limits. Therefore, Section 742.305(f) has been met.

35 IAC Section 742.305(g): "The concentration of any contaminant of concern in soil-gas shall not exceed 10% of its Lower Explosive Limit (LEL) as measured by a hand held combustible gas indicator that has been calibrated to manufacturer specifications."

As discussed in **Section 2.2.3**, PID measurements were taken during soil probing activities performed by Weaver Consultants. The PID was calibrated in the field on a daily basis before use

in accordance with the manufacturer's specifications. For most VOCs, the toxic exposure limit (in parts per million) as measured by a PID would be exceeded long before you reach a concentration sufficient to reach the LEL (in parts per hundred). As shown in **Appendix B** – **Soil Probe/Monitoring Well Logs**, PID measurements obtained during soil probing activities did not reach the instrument measurement ceiling (15,000 ppm). Therefore, Section 742.305(g) has been met.

The information presented above demonstrates that the above generic requirements for exclusion of an exposure route have been met, or will be met upon the completion of additional remedial activities proposed for the Property. In addition to the above generic requirements, specific requirements must also be achieved for each individual exposure route that is proposed for exclusion. The following sections describe how each of these specific requirements has been met.

3.3.4 *Groundwater Ingestion Exposure Route (Both Components)*

To address COCs exceeding the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater, it is proposed that the Soil Component of the Groundwater Ingestion Exposure Route be excluded from further consideration. In support of satisfying the 35 IAC 742.320 exclusion requirements, COCs exceeding the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater were evaluated using the appropriate RBCA Equations. In addition, a groundwater use ordinance has been adopted by the Village of Bellwood that prohibits the installation of potable groundwater supply wells and the use of such wells.

The following provides a listing of the specific requirements for the exclusion of the Soil Component of the Groundwater Ingestion Exposure Route, along with an explanation of how each requirement has been satisfied.

The groundwater ingestion exposure route may be excluded from consideration if:

a) The requirements of Sections 742.300 and 742.305 are met;

The requirements of Sections 742.300 and 742.305 have been met, as discussed in **Section 3.3.3**. Therefore, Section 742.320(a) has been satisfied.

b) The corrective action measures have been completed to remove any free product to the maximum extent practicable;

Free product was not encountered during the site investigation activities conducted at the Property. Therefore, Section 742.320(b) has been satisfied.

c) The source of the release is not located within the minimum or designated maximum setback zone or within a regulated recharge area of a potable water supply well;

One CWS water well was reportedly located within 2,500 feet of the Property, as discussed in **Section 2.1.5**. The well is located approximately 285 feet northwest of the Property with a 200-foot setback zone affiliated with a Village of Bellwood Water Department wastewater treatment facility. As a result, the Property is not located within the minimum or designated maximum setback zone or within a regulated recharge area of a potable supply well. Therefore, Section 742.320(c) has been satisfied.

d) As demonstrated in accordance with Section 742.1015, for any area within the measured and modeled extent of groundwater contamination above what would otherwise be the applicable Tier 1 groundwater remediation objectives, an ordinance adopted by a unit of local government is in place that effectively prohibits the installation of potable water supply wells (and the use of such wells);

The Village of Bellwood Ordinance prohibits the installation and use of any new potable water wells and is included in **Appendix H - Groundwater Ordinance**. The local government (the Village of Bellwood) entered into a MOU with the IEPA allowing the ordinance to be used as an institutional control. The MOU is entered into for the purpose of satisfying the requirements of 35 IAC 742.1015 for the use of potable supply well ordinances as environmental institutional controls in support of excluding both components of groundwater ingestion exposure route. Therefore, Section 742.320(d) has been satisfied.

e) As demonstrated using Equation R26 in Appendix C, Table C, in accordance with Section 742.810, the concentration of any contaminant of concern in groundwater within the minimum or designated maximum setback zone of an existing potable water supply will meet the applicable Tier 1 groundwater remediation objective

As identified in **Section 2.1.5**, the Property is not located within a minimum or designated maximum setback zone of an existing potable water supply well. As shown below, RBCA equation R26 demonstrates that COC concentrations in the groundwater will meet Tier 1 GROs within the nearest setback zone. Therefore, Section 742.320(e) has been satisfied.

f) As demonstrated using Equation R26, in Appendix C, Table C, in accordance with Section 742.810, the concentration of any contaminant of concern in groundwater discharging

into a surface water will meet the applicable surface water quality standard under 35 Ill. Adm. Code 302.

The nearest surface water feature is Addison Creek, which is located approximately 1.15 miles east of the Property. RBCA equation R26 has been used to demonstrate that COC concentrations meet applicable surface water standards prior to reaching the nearest surface water boundary. Therefore, Section 742.320(f) has been satisfied.

3.3.4.1 RBCA Evaluation

Weaver Consultants conducted a RBCA evaluation utilizing equations R14 and R26 that is listed in 35 IAC 742, Appendix C, Table C to assess the theoretical leaching and migration of COCs observed in the soil above Tier 1 SROs for the Soil Component of the Groundwater Ingestion Exposure Route for Class II Groundwater. Equation R14 was utilized to determine the theoretical leaching of COCs from the soil to the groundwater, while R26 was utilized to model the possible extent of migration within the groundwater. For select parameters where site-specific data was not available, allowable conservative default values were utilized.

As presented in the table below, RBCA Equation R14 was utilized to calculate a leaching factor that was multiplied by the concentrations of COCs that was observed in the soil (refer to **Tables 1-2** and **Tables 5-6**) to obtain a theoretical groundwater concentration. This theoretical groundwater concentration was later utilized for the Equation R26 modeling (refer to **Table 9A** for R14 Calculation). In summary, the following leaching factors and theoretical groundwater concentrations were calculated:

Sample Location	Constituent	Concentration in Soil (mg/kg)	Leaching Factor (Equation R14 on Table 9A)	Theoretical Groundwater Concentration (mg/L)
B2/2.5-5'	Benzene	0.599	0.2177	0.1304
B4/5-7.5'	Benzene	0.77	0.2177	0.1676
B6/7.5-10’	Benzene	0.511	0.3367	0.1720
BW1-SB-GP-03/13-15'	Benzene	0.65	0.4347	0.2825
BW1-SB-GP-06/5-7'	Benzene	0.39	0.3367	0.1313

Sample Location	Constituent	Concentration in Soil (mg/kg)	Leaching Factor (Equation R14 on Table 9A)	Theoretical Groundwater Concentration (mg/L)
BW1-SB-GP-09/1-3'	Benzene	0.76	0.2092	0.1590
BW1-SB-GP-09/5-7'	Benzene	0.61	0.3367	0.2054
BW1-SB-GP-09/8-10'	Benzene	0.58	0.3367	0.1953

These theoretical groundwater concentrations have been evaluated below using Equation R26 (refer to **Table 9** for R26 Calculation). Based on the Property subsurface physical soil conditions, the following site-specific parameters, along with conservative default values, were used for the RBCA calculations presented in **Table 9B**:

- The geology at the Property generally consists of fill material followed by silty clay, clayey silt. Although there was not a significant water bearing unit observed across the Property, slug testing was performed by Shaw to measure the hydraulic conductivity of the soil. Shaw performed a hydraulic conductivity (K) evaluation utilizing an In-Situ® Level TROLL™ pressure transducer. The Level TROLL™ data was input into Aqtesolv to calculate a K value based on the Unconfined Bower-Rice solution method equation. Results of three hydraulic conductivity evaluations on MW-1 and MW-5 yielded values of $5.908x10^{-4}$ centimeters per second (cm/sec), $3.631.x10^{-4}$ cm/sec, and $2.619x10^{-4}$ cm/sec. Weaver Consultants utilized the arithmetic mean of the results ($4.053x10^{-4}$ cm/sec). The previous Aqtesolv data output sheets are included as **Appendix C**.
- The two-inch monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5) were surveyed as part of the previous Shaw comprehensive site investigation activities. Depth to water measurements were obtained to obtain groundwater elevations in the wells. Based on the groundwater elevations, Shaw calculated a hydraulic gradient (i) of 0.0297 feet/feet, with groundwater flowing towards the southeast.
- Weaver Consultants utilized the conservative default value presented within TACO for the thickness of the water bearing unit, which is approximately two meters (S_d).
- According to the historical Shaw site investigation activities, groundwater flows to the southeast. As a result, constituent concentrations were modeled southeast to the

nearest Property boundary as the point of compliance (refer to **Figures 8A-9B** for points of compliance for sample locations).

- The maximum source width (S_w) perpendicular to the groundwater flow direction in the horizontal plane was estimated based upon the soil analytical results. Constituent concentration source widths were interpolated using approximately one-half the distance between an impacted sample location and a sample location appearing free of impacts and/or below Tier 1 SROs for Class II Groundwater. As shown on **Figures 8A-9B**, source width areas were interpolated for select COCs based on the above methodology.
- Fractional organic carbon analysis was performed on soil samples collected from the Property appearing free of organic COC impacts. The soil samples referenced below were utilized for the RBCA calculation depending on the depth and location of impacts.

Sample ID	Organic Carbon Content (%)	f_{oc} (%)
BW1-SB-GP-05 / 2-4'	2.70	1.57
BW1-SB-GP-12 / 1-3	4.71	2.73
GP-2/2-3’	1.59	0.92
GP-2/18-20’	1.28	0.74
GP-4/6-8’	1.62	0.94
GP-7/14-16’	1.18	0.68
GP-9/9-10’	1.48	0.86

Results of the Equations R14 and R26 RBCA evaluation is provided on **Table 9A** and **Table 9B** and summarized below:

Sample Location	Constituent [1]	Theoretical Groundwater Concentration (mg/L)	Tier 1 GRO for Class II Groundwater (mg/L)	Approximate Distance to Property Boundary (cm)	Theoretical Concentration at Property Boundary (mg/L)
B2/2.5-5'	Benzene	0.1304	0.025	2042	3.00×10^{-7}
B4/5-7.5'	Benzene	0.1676	0.025	2042	3.85×10^{-7}
B6/7.5-10’	Benzene	0.1720	0.025	488	2.35×10^{-3}
BW1-SB-GP-03/13-15'	Benzene	0.2825	0.025	1280	2.91×10^{-5}
BW1-SB-GP-06/5-7'	Benzene	0.1313	0.025	945	9.35×10^{-5}
BW1-SB-GP-09/1-3’	Benzene	0.1590	0.025	2896	1.07×10^{-8}
BW1-SB-GP-09/5-7’	Benzene	0.2054	0.025	2896	1.38×10^{-8}
BW1-SB-GP-09/8-10’	Benzene	0.1953	0.025	2896	1.31×10^{-8}
B1	Benzene	0.6630	0.025	3962	1.59×10^{-9}
B5	Benzene	1.5	0.025	488	2.08×10^{-2}
MW-1	Benzene	0.2950	0.025	2896	2.88×10^{-8}
MW-5	Benzene	2.98	0.025	732	8.82×10^{-3}

[1] COCs observed exceeding the Tier 1 SRO or Tier 1 GROs for the Groundwater Ingestion Exposure Route for Class II Groundwater (both components).

Based on these calculations, it is calculated that the theoretical groundwater concentrations for the above COCs are below Tier 1 GROs for Class II Groundwater at the downgradient points of compliance. Furthermore, groundwater analytical results from monitoring well MW-4, located in the southeastern portion near the Property boundary, exhibited concentrations of benzene below the Tier 1 GRO for the Groundwater Ingestion Exposure Route for Class II Groundwater. Therefore, the groundwater analytical results indicate that the above benzene impacts do not extend offsite within groundwater.

3.3.5 *Construction Worker Scenario*

Benzene, ethylbenzene, toluene, xylene, and naphthalene concentrations detected in excess of the Soil Inhalation and Ingestion Exposure Routes for the Construction Worker Scenario are proposed to be remediated during the "hot spot" removal activities discussed in **Section 4.4** below.

3.4 Recommended Deed Restrictions/Institutional Controls

In accordance with 35 IAC 742.1000, institutional controls will be applied to the Property in the form of deed restrictions, which include the following:

- The presence of a building with a full concrete slab-on-grade or a full concrete basement floor and walls with no sumps in accordance with 35 IAC 742.1000(a)(9); and
- Reliance on a site-specific groundwater use restriction and/or the Village of Bellwood ordinance prohibiting the installation and use of new potable groundwater wells on the Property.

4 REMEDIAL ACTION PLAN

The following discusses the proposed remediation technology and implementation approaches anticipated to achieve compliance with the proposed remediation objectives. This RAP has been prepared in accordance with the IEPA SRP 35 IAC 740.450 requirements. Specifically, the following are presented to address the SRP RAP requirements:

1. Technical approach of proposed remediation activities;
2. Scope of remedial action; and
3. Schedule of proposed remediation activities.

Benzene, toluene, xylene, and arsenic impacts exceeding the Tier 1 SROs for the Outdoor Soil Inhalation and/or Soil Ingestion Exposure Routes, and BTEX and naphthalene impacts in excess of the Tier 1 SROs for the Construction Worker Scenario will also be removed along with these "hot spot" removal activities. In addition, soils in the vicinity of soil-gas samples BV-SG-GP-04 and BV-SG-GP-05 exceeding the Tier 1 S-GRO for the Indoor Inhalation Exposure Route are proposed for removal as part of the "hot spot" removal remedial action. Also, the toluene and ethylbenzene impacts in excess of their respective C_{sat} values are proposed for removal (see **Figure 11** for "hot spot" removal location).

The following is being submitted to fulfill the requirements of 35 IAC Section 740.450 detailing submittal of a RAP. The RO Report presented an evaluation of appropriate remediation objectives applicable to the project. The primary purpose of this section of the report is to demonstrate how the RA will fulfill the requirements necessary to attain the remediation objectives proposed for the Property.

4.1 Proposed Remediation Activities

The proposed remedial action includes a risk-based strategy with reliance on institutional controls in conjunction with "hot spot" removal to address subsurface impacts. "Hot spot" removal will include the excavation and offsite disposal of soil exhibiting benzene, toluene, xylenes, and arsenic impacts exceeding Tier 1 SROs for the Outdoor Soil Inhalation and/or Soil Ingestion Exposure Route, and Tier 1 S-GROs for the Indoor Inhalation Exposure Route.

The RAP proposes reliance on a groundwater use restriction to address both components of the Groundwater Ingestion Exposure Route. Upon completion, a RACR will be prepared and the RA

will request issuance of the draft Comprehensive NFR Letter for the Property. The following includes a summary of the proposed remediation activities scope of work.

4.2 Scope of Remedial Action

The proposed remediation activities were developed based on results of the site investigation activities conducted. Proposed remedial efforts include implementation of the "hot spot" removal activities. Based on the data, the excavation will extend to variable depths to remove impacted soil detected in excess of the Tier 1 SROs for the Outdoor Soil Inhalation, both Outdoor and Indoor, and the Soil Ingestion Exposure Routes, as follows:

4.2.1 *BTEX and Naphthalene "Hot Spot" Removal*

The follow "hot spot" removal activities will be conducted to address BTEX and naphthalene impacts:

- Excavation will extend to a depth of approximately seven feet bgs at the southern portion of the Property;
- Excavation will extend to a depth of approximately eleven (11) feet bgs at the central-southern portion of the Property;
- Excavation will extend to a depth of approximately eight feet bgs at the central-western and central portions of the Property; and
- Excavation will extend to a depth of approximately eight feet bgs in the central portion of the Property in the vicinity of BV-SG-GP-04.

4.2.2 *Arsenic "Hot Spot" Removal*

- Excavation will extend to a depth of approximately three to four feet bgs at the location of soil probes GP-4, GP-11, GP-16, GP-17, GP-18, and BW1-SB-GP-10; and
- Excavation will extend to a depth of approximately ten (10) feet bgs in GP-10 and twelve (12) feet bgs in BW1-SB-GP-05.

Based on the above, approximately 3,200 cubic yards of impacted soil is estimated for removal across the Property (see **Figure 11** for the approximate extent of "hot spot" removal. The extent of soil removal may be modified based on confirmation soil sample results.

4.3 Schedule of Activities

According to the Remediation Applicant, "hot spot" removal will be conducted within one month of IEPA RAP approval. Upon completion of the above activities, Weaver Consultants will prepare

a RACR. The RACR will demonstrate that remediation activities are in compliance with applicable remediation objectives. The RAC report may be submitted for IEPA review approximately three to four weeks after completion of the remedial and engineered barrier construction activities.

4.4 Remediation Technology

Remediation technologies will include use of heavy machinery, such as backhoe excavators and hauling trucks in support of "hot spot" soil removal activities. In general, the remedial efforts will be conducted to address the impacts of various COCs exceeding the Tier 1 SROs on the Property.

Confirmation samples will be collected from the bottom and sidewalls of the excavation, as further described in **Section 4.5**. If confirmation sample laboratory analytical results exhibit concentrations in excess of the applicable Tier 1 SROs, the excavation may be extended until favorable confirmation soil sample results are attained. Following "hot spot" removal, the excavation will be backfilled with imported clean stone. The backfill will be moderately compacted with the backhoe.

4.5 Confirmation Sampling Plan

Confirmation samples will be collected from the bottom and sidewalls of the excavations. Based on the anticipated size of each excavation, one to two samples will be collected from each excavation sidewall, or one per twenty (20) linear feet of sidewall. Sidewall samples will be collected at the depth interval where previous impacts were detected. At various locations where distinct COCs impacted soil was previously detected at variable depth intervals, sidewalls samples may be collected at each of the corresponding depth intervals. In addition, confirmation samples will be collected from the approximate center of the floor of the excavations one per 400 square feet of excavation floor.

The soil samples will be collected directly from a backhoe bucket with decontaminated stainless steel sampling equipment. Sidewall samples will be collected from a depth that corresponds to the previously identified impacts in each area. Soil samples will be submitted for laboratory analysis based on the COC soil impacts being removed at that specific location of excavation. In addition, soil-gas samples will be collected at a frequently of one every 40 linear feet in the approximately one to two feet exterior to the excavation areas where indoor inhalation impacts were detected.

Soil samples will be placed in a cooler and packed with ice to maintain a constant temperature near 4 degrees Celsius and submitted to a NELAP certified laboratory for analyses. Sampling and

laboratory analysis will be performed in general accordance with approved techniques and methods as outlined in USEPA *SW-846, Test Methods for Evaluating Solid Waste, Third Edition*.

4.6 Current and Post-remediation Site Use

As stated in **Section 2.1.3**, the Property is located in a commercial/residential area at 4901 and 4905 St. Charles Road in Bellwood, Illinois. The Property generally lies north of St. Charles Road, east of 50th Avenue, south of Erie Street, and west of 49th Avenue. The future planned used of the Property will be for Residential purposes. Residential properties are located to the north, west, and east of the Property and the building to the south of the Property across St. Charles Road is used as a church followed by residential properties. Based upon historical and current development practices at and near the Property, the current uses are not anticipated to undergo significant change in the future

4.6.1 *Institutional Controls*

In accordance with 35 IAC 742.1000, institutional controls will be applied to the Property in the form of deed restrictions. One of the deed restrictions will require the presence of a full concrete slab-on-grade or a full concrete basement floor and walls with no sumps, unless sumps are appropriately sealed in accordance with IEPA requirements, for any existing and proposed buildings. This deed restriction will provide measures to be taken to ensure safety for construction workers during intrusive activities in areas where concentrations of COCs in soil exceed the applicable construction worker remediation objectives.

In accordance with Section 742.1015, an ordinance has been adopted by the Village of Bellwood that prohibits the installation of potable groundwater supply wells and the use of such wells. The Village of Bellwood ordinance will also be used as an institutional control in support of excluding the Soil Component and Groundwater Component of the Groundwater Ingestion Exposure Route. In addition, Weaver Consultants will provide notification to the Village of Bellwood that the ordinance prohibiting the installation and use of new potable groundwater wells on the Property has been relied upon.

5 CONCLUSION

On behalf of the RA, the Village of Bellwood, Weaver Consultants has prepared this Comprehensive SI/RO/RAP Report in accordance with applicable SRP requirements listed in 35 IAC 740.425, 740.445, and 740.450. It is the intention of the RA to secure a Comprehensive NFR Letter from the IEPA SRP demonstrating the Property is compliant with remediation objectives under the Residential land use scenario.

As detailed in the Comprehensive Site Investigation section (**Section 2.0**) of this document, appropriate assessment and subsurface investigations of environmental conditions at the Property have been undertaken. The scope of these investigations included soil and groundwater sample collection and analysis for the various COCs at the Property, which include the TCL constituents. The site investigations were performed to assess the horizontal and vertical distribution of detected constituents. The number of samples collected and analyzed in vicinity of the impacted areas is believed to be sufficient to characterize the vertical and horizontal extent of COCs above Tier 1 SROs, GROs, Tier 1 S-GROs, and/or Backgrounds within MSAs.

In summary, concentrations of select COCs have been detected at the Property above applicable Tier 1 SROs for Residential Properties, Tier 1 GROs for Class II Groundwater, and Tier 1 S-GROs for Residential Properties and/or Backgrounds within MSAs. As detailed in **Section 3.0**, the following is proposed to address COC impacts at the Property:

- The Outdoor and Indoor Inhalation Exposure Routes are proposed for "hot spot" removal of impacted soils (**Section 4**).
- The Soil Ingestion Exposure Route is proposed for "hot spot" removal of impacted soils (**Section 4**).
- The Groundwater Ingestion Exposure Route (both soil and groundwater components) is proposed for exclusion by demonstrating compliance with 35 IAC 742.320 (**Section 3** and **Section 3**).
- COC impacts exceeding Tier 1 SROs for the Soil Inhalation and/or Ingestion Exposure Route for the Construction Worker Scenario are proposed "hot spot" removal of impacted soils (**Section 4**).

As presented above, remedial action is proposed in order to exclude the applicable exposure routes and remove soil impacts. Proposed remediation activities include "hot spot" soil removal and offsite disposal in multiple locations throughout the Property.

In support of exposure route exclusion, institutional controls will be applied to the Property in the form of deed restrictions, which include the following:

- Existing buildings or future buildings constructed must contain a full concrete slab-on-grade floor or full concrete basement floor and walls with no sumps, unless sumps are appropriately sealed in accordance with IEPA requirements; and
- Reliance on a site-specific groundwater use restriction and/or the Village of Bellwood ordinance or prohibiting the installation and use of new potable groundwater wells on the Property.

6 SIGNATORIES AND CERTIFICATIONS

Pursuant to 35 IAC Section 740.410, the following presents the information required concerning the Remediation Applicant, to whom inquiries may be addressed; the Remediation Applicant signature; and the affirmation and signature of the Licensed Professional Engineer responsible for preparation of this Report.

Remediation Applicant

Mayor Andre F. Harvey
Village of Bellwood
3200 Washington Boulevard
Bellwood, Illinois 60104

	Mayor
By (print):	Title:
By (signature):	Date:

Licensed Professional Engineer Affirmation

I attest that all site investigations or remedial activities that are the subject of this plan(s) or report(s) were performed under my direction, and this document and all attachments were prepared under my direction or reviewed by me, and to the best of my knowledge and belief, the work described in the plan and report has been designed or completed in accordance with the Illinois Environmental Protection Act (415 ILCS 5), 35 Ill. Adm. Code 740, and generally accepted engineering practices or principles of professional geology, and the information presented is accurate and complete.

John Talbot, P.E., JD, LEED AP	
By (print):	Registration Number:
By (signature):	Expiration Date:
Date:	

7 REFERENCES

- 35 Illinois Administrative Code Part 740, Site Remediation Program.
- 35 Illinois Administrative Code Part 742, Tiered Approach to Corrective Action Objectives.