UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 W. JACKSON BOULEVARD
CHICAGO, IL 60604

CORRECTIVE ACTION INTERIM MEASURES EVALUATION REPORT

MEMORANDUM TO FILE

INSTALLATION NAME:	Radio Materials Corporation
U.S. EPA ID No.:	IND 005 477 021
LOCATION ADDRESS:	1095 East Summit Street Attica, Indiana 47918
DATE OF INSPECTION:	August 21, 2015
EPA INSPECTOR:	Michael Valentino

PREPARED BY: Michael Valentino — 12-9-15

Michael Valentino
Environmental Engineer
Date

REVIEWED BY: [signature] — 12/10/15

Michael Cunningham, Chief
Compliance Section 1
Date

Purpose:

This report discusses the findings of a Corrective Action Compliance Evaluation (CAC) to assess compliance with the corrective action provisions of the Resource Conservation and Recovery Act (RCRA) Section 3008(h) Administrative Order on Consent dated March 1, 1999, Docket No. R8H-5-99-005, ("Consent Order") at the Radio Materials Corporation ("RMC") facility located on Summit Street in Attica, Indiana ("the Site").

The purpose of the CAC was to evaluate RMC's compliance with the requirements under Section VIII, Work to be Performed, of the Consent Order to address groundwater and soil contamination resulting from historical Site activities.

The CAC included a visual inspection of the Site and review of documents and other information obtained from Steven Wanner of GHD[1] and from the Site Administrative Record[2].

Advance notice of the inspection was provided via e-mail by Michael Valentino of EPA to Joseph Riley, Jr., President, RMC, and Mr. Wanner on August 4, 2015.

Participants:

Steven Wanner, Principal, (email: Steven.Wanner@ghd.com; phone: (317) 291-7007) and Timothy Pranger, Field Technician, represented GHD. Michael Valentino of the RCRA Branch, Land and Chemicals Division, represented EPA Region 5.

Background:

In 1947 Joseph Riley, Sr. purchased the Site. In 1948 Mr. Riley, Sr. began the manufacture of television tubes and ceramic capacitors in the main RMC plant. In 1957 P.R. Mallory Company, Inc. purchased the facility, and owned the company and facility until 1978 at which time the Riley family repurchased the facility and continued to manufacture ceramic capacitors. There have been no manufacturing operations at the Site since 2000.

On March 1, 1999, EPA Region 5 issued an Administrative Order on Consent under Section 3008(h) of RCRA. The Consent Order requires RMC to complete specific corrective actions at the Site, including stabilization of contaminated groundwater migration from the Site, control of exposure pathways that could potentially impact human health, and the implementation of final corrective measures.

[1] In July 2014 Conestoga-Rovers & Associates (CRA) merged with GHD, a global engineering, consulting and construction company. CRA was contracted by Kraft Foods Group, Inc. to undertake environmental investigation and remediation under the RCRA Corrective Action Program pursuant to the provisions of the 1999 Consent Order. At the time of the merger, CRA's Steven Wanner was the project manager for CRA for the Site. He continues in that role with GHD.

[2] *See* Region 5 website at: http://www.epa.gov/region5/cleanup/rcra/rmc/index.html.

RMC went out of business in 2001 and could not continue to fund investigative work and remediation under the Consent Order. In 2002, Kraft Foods Group, Inc. ("Kraft") entered into an agreement with RMC to provide financial assistance to complete certain investigatory and remedial activities at the Site. Kraft's involvement with RMC is due to a series of corporate mergers, acquisitions and sales.

Kraft completed a RCRA Facility Investigation (RFI) and has implemented several interim corrective measures (ICMs) to address soil and groundwater impacts from several solid waste management units (SWMUs) and areas of concern (AOCs) and residential vapor intrusion in homes within a subdivision located between approximately 300 feet and 2000 feet from, and hydraulically down-gradient to, the Site. To date, ICMs have included soil excavation and off-site disposal or treatment, limited (*i.e.*, hot spot-focused) in-situ chemical oxidation and air sparging/soil vapor extraction.

As part of the RFI and implementation of ICMs under the Consent Order, 66 overburden and 26 bedrock monitoring wells and 18 piezometers have been installed and have been monitored in order to assess groundwater quality and hydrogeological conditions beneath and down-gradient from the Site.[3] Groundwater monitoring indicates that the primary contaminants in groundwater consist of chlorinated volatile organic compounds (cVOCs) including cis-1,2-dichloroethene (cDCE), trichloroethene (TCE), tetrachloroethene (PCE), and vinyl chloride.

The RFI identified two dissolved phase groundwater plumes present on-site and extending off-site in a west-northwesterly direction.[4] The southern groundwater plume has as its source of origin waste releases and disposal practices from the main RMC plant south of Summit Street. The northern groundwater plume originates from outdoor drum storage and disposal areas in the far northeast quadrant of the Site. Each of these plumes is traveling toward the Wabash River under influence from recharge to the River, with relatively flat hydraulic gradients in the overburden aquifer and bedrock aquifer. (Attachment 1.)

While some ICM activity has been decommissioned (see below), other ICMs are still operational. The effectiveness of previously shut-down and ongoing operations will be addressed in the Corrective Measures Study, which Kraft will produce under the terms of the Consent Order.

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[3] The numbers of monitoring wells and piezometers were obtained from the following sources: RFI Addendum 2 Supplemental Vapor Intrusion Investigation and Mitigation Work Plan Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure 3.1, Piezometer and Monitoring Well Locations, (September 26, 2013), and January 27, 2014 letter from Steven Wanner, Conestoga-Rovers & Associates, RE: Proposed Groundwater Monitoring Plan First 2014 Semiannual Groundwater Monitoring Event Radio Materials Corporation Site, Figure 1, Monitoring Well and Piezometer Locations, (January 17, 2014) and Table 1 – Proposed February 2014 Monitoring Program.

[4] Based on groundwater elevations from numerous monitoring wells and piezometers placed in both the overburden (surficial) aquifer and the bedrock aquifer installed as part of the RCRA Facility Investigation (RFI) and as part of the implementation of Interim Corrective Measures (ICMs), Conestoga-Rovers & Associates developed groundwater potentiometric surface maps. These maps indicate west-northwest groundwater flow direction in both aquifers. *See* Attachment 1 (from Groundwater Interim Corrective Measures Design Plans and Specifications Radio Materials Corporation (Conestoga-Rovers & Associates, October 2010), Figures 2.2 and 2.3)

Site Description:

The RMC facility is located in a residential-agricultural area in the City of Attica, Fountain County, Indiana. The Site occupies approximately 19.5 acres and is bordered on the northwest, north, and northeast by undeveloped land, to the south and southeast by residences, and to the south by Ravine Park.

The main plant is located on a relatively level ground at an elevation of 670 feet above sea mean level (AMSL) in an area that slopes gently toward the Wabash River. The Site is situated in the Wabash River Basin but lies outside the 100-year flood boundary of the Wabash River. The nearest surface water body is Riley Lake, a manmade pond used as a source of water for firefighting activities and recreation, which is located about 300 feet northwest of the main RMC plant.

Other surface water bodies in the area include an unnamed intermittent stream located 1000 feet south of the Site in Ravine Park and an unnamed intermittent stream located 3600 feet northeast of the Site. A freshwater wetland area of the Wabash River floodplain is located about one-half mile northwest of the Site. The Wabash River is approximately two-thirds of a mile northwest of the Site.

Regional geology in the area of the Site consists of unconsolidated glacial deposits overlying bedrock. The depth to bedrock at the Site varies from less than 20 feet below ground surface (bgs) at SWMUs 1 and 2 in the northeast quadrant of the Site to up to 60 feet bgs at SWMU 5, just southwest of the main plant. The thickness of the unconsolidated overburden deposits is related to the regional topography and bedrock topography. The highest elevations at the Site are observed near the intersection of Summit Street and Avenue 6 where elevations approach 670 feet AMSL. The elevations decrease towards the northwest as the Wabash River is approached, where the lowest elevations are in the range of 500 to 510 feet AMSL.[5]

The typical lithological profile for unconsolidated deposits in the vicinity of SWMUs 1 and 2 consists of a native silt layer ranging in thickness from less than one foot to several feet, underlain by a fine- to medium-grained sand, which overlies bedrock. The typical lithological profiles for SWMU 5 and SWMU 11/AOC 2 (beneath the main plant) consists of alternating sand and clay units that overlie shale bedrock. In general, the upper 20 to 30 feet consists primarily of silt inter-mixed with some sand layers and occasional clay. Below a depth of 30 feet bgs is a relatively thick, poorly-graded sand unit that extends to bedrock, which is generally encountered at approximately 55 feet bgs.[6]

The overburden deposits thicken west and northwest of the Site, where such deposits approach 150 feet in thickness. The overburden to the west and northwest of the Site consist of alternating

[5] *See* Phase IIB RCRA Facility Investigation Volume I Radio Materials Corporation (Conestoga-Rovers & Associates, October 2005, rev. May 2010), Section 5.2, pp. 83-84.
[6] Ibid.

deposits of silt, clay, and sand that tend to consist of coarser granular deposits near the bottom of the deposit.[7]

Groundwater elevation gradients are relatively flat beneath the Site and gradually increase northwest of the Site, west of the AS/SVE trench system north of Summit Street.[8] (Attachment 1.)

The RMC facility consists of a main plant of four interconnected buildings on the south side of Summit Street and six buildings and a former drum storage area on the north side of Summit Street. When operational, the main plant consisted of production areas, administrative offices, laboratories and storage areas for raw materials and finished products. The buildings on the north side of Summit were used for storage, warehousing, and maintenance.

RMC began operating at its Attica facility in 1948. Processes included the manufacture of television tubes and ceramic components such as capacitors and resonators for the electronics industry. Barium titanate based ceramic powders were mixed with small amounts of other compounds and milled. The milled mixture was dried by spray drying, oven drying or with a filter press to form a dielectric material. Some of this material was calcined, ground and packaged to customer specifications for the manufacture of their own electrical components. The remaining dielectric material was stored at the RMC plant for the production of disc capacitors.

Manufacturing operations released cVOCs such as TCE and PCE to soils at the Site. Some of these contaminants reached groundwater and moved off the RMC property to the north and northwest.

Manufacturing at the Site ceased in 2000. Some office space is still used in the main plant building. The main plant also is used for the storage of raw materials, products and solid and hazardous wastes, as are Buildings 5, 6, 7 and 8.

Historical waste generation at the Site included the following:[9]

[7] Ibid.

[8] Using wells OB-01 and OB-04, the hydraulic gradient between these wells is approximately 0.0021 ft/ft. The water table elevations at OB-01 and OB-04 from March 2015 were 607.66 ft and 606.78 ft, respectively. The distance (calculated from the contour map and scale) is roughly 410 feet, leaving $\Delta h/\Delta L = 0.88$ ft/410 ft = 0.0021. Using wells on the west end of the RMC main plant, OB-12 and OB-09, I calculate a hydraulic gradient of 0.0045 ft/ft ($\Delta h/\Delta L = 0.88$ ft/490 ft). West of the AS/SVE trench north of Summit Street, the hydraulic gradient in the overburden increases to roughly 0.06 ft/ft based on elevation contours and distances between the contours. *See* July 6, 2015 CA725 EI Determination, Steven Wanner, GHD, to Bhooma Sundar, EPA, Attachment A, Figure A.2. In the bedrock aquifer, elevation gradients are similar offsite as those in the overburden (Figure A.3) but beneath the main plant hydraulic gradients are quite flat (0.00017 ft/ft and 0.00004 ft/ft to the south and southeast, respectively) and do not show westward flow until west of the main plant and Riley Lake. (Attachment 1.)

[9] *See* Table 2, page A-4, attachments to Resource Conservation and Recovery Act (RCRA) Section 3008(h) Administrative Order on Consent dated March 1, 1999, Docket No. R8H-5-99-005.

HAZARDOUS WASTE STREAM	EPA WASTE CODE CHARACTERISTIC (C) OR LISTED (L)
Trichloroethylene	F001 (L)
Tetrachloroethylene	F001 (L)
Acetone/alcohol	F003 (L)
Phenolic resin	D001 (C)
Solder dross (lead)	D008 (C)
Non-halogenated solvent	F005 (L)
Ethyl acetate	F003 (L)
Methyl ethyl ketone	F005 (L)
Waste ink (silver)	D011 (C)
Ceramic scrap (barium)	D005 (C)

Typical waste generation amounts and disposal or treatment methods during the time RMC was operational are found in the following table:[10]

WASTE STREAM DESCRIPTION	GENERATION AMOUNT	DISPOSAL/TREATMENT METHOD
Ceramic waste	6 drums/year	Recycled
Fired ceramic discs	86 lbs./month	Municipal landfill
Aluminum oxide refractory scrap	100 lbs./month	Recycled/stored/landfilled
Waste epoxy and phenolic resin	75 lbs./month	Stored on-site
Aqueous flux in alcohol	23 gal/month	Manifested off-site
Ink-jet inks and solvents	<1 gal/month	Manifested off-site
Cleaning and rinse water	1700 gal/month	City sewer
Tetrachloroethylene, trichloroethylene, acetone/alcohol, and ethyl acetate	23 gal/month (average)	Manifested off-site
Oil/water waste	8-10 drums/year	Oil recovery tank truck
Waste silver Waste copper wire Solder dross Product rejects	10 trace ounces/month 161 lbs./month 20 lbs./month 108 lbs./month	Smelted and refined for recovery of metal content or stored on-site when metal markets are low
Empty raw material bags that contained barium carbonate and titanium dioxide	100 bags/month	Municipal landfill

Waste streams, including hazardous waste, were removed off-site in 2007, 2008 and 2013.[11] Total waste shipped off-site, 2007-2013, from on-site chemical inventory:

- Hazardous waste only = 37,862 lbs.
- Hazardous and non-hazardous = 53,051 lbs.[12]

[10] Ibid, Table 1, page A-3.
[11] *See* Focused Compliance Inspection August 21, 2015 Waste Inventory Status Report, pages 9-22.
[12] Total excludes investigation-derived waste during the RCRA facility investigation and implementation of corrective action interim measures (*e.g.*, soil cuttings, well tailings). *See* Focused Compliance Inspection August 21, 2015 Waste Inventory Status Report, pg. 22.

Site Aerial Photos:

The following aerial photos give perspective to neighboring residences impacted by COCs traveling offsite, the proximity of the Wabash River to the Site, the locations of the City of Attica municipal wells, and locations of SWMUs and AOCs.

The first aerial photo is a regional view and shows the proximity from the Site of the Wabash River and a residential community.

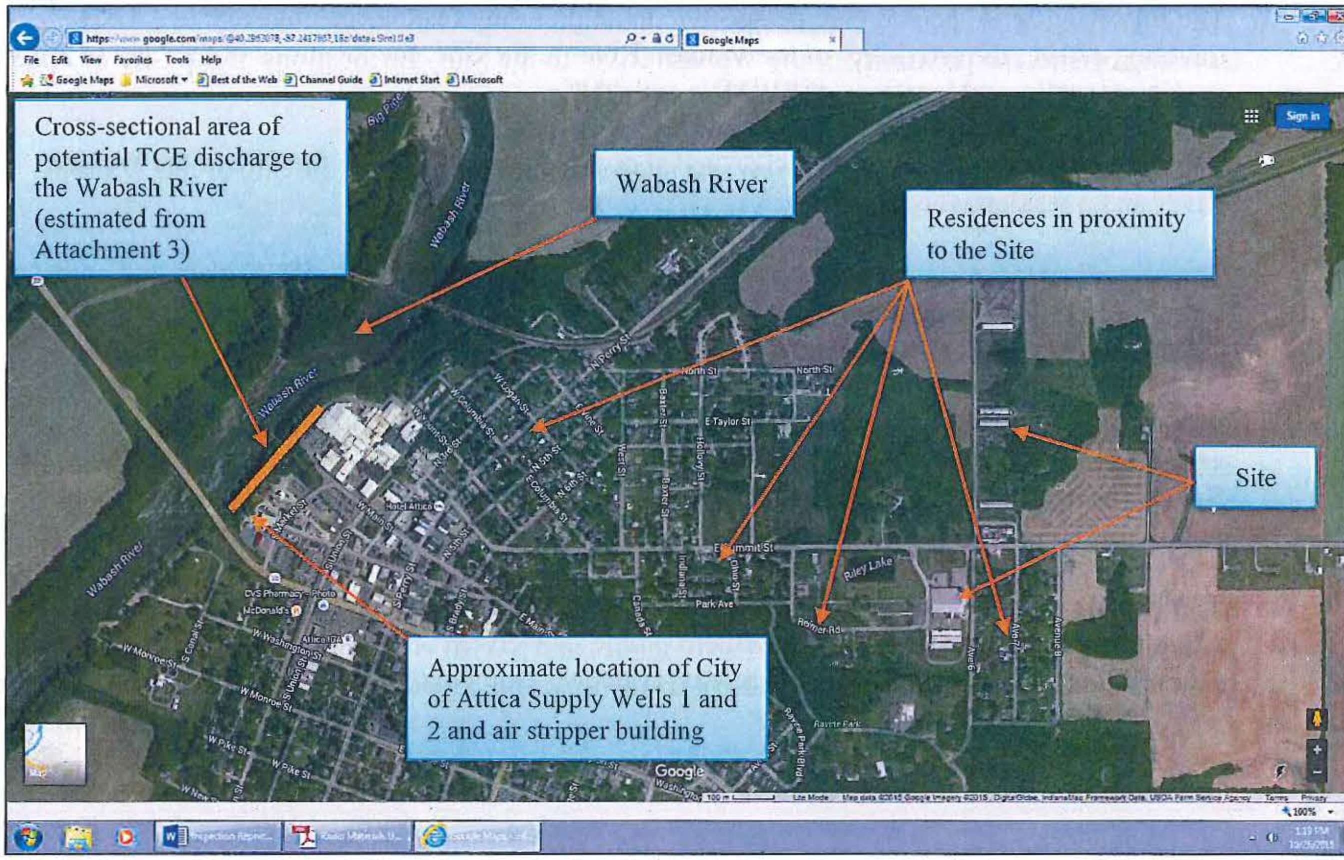
The second and third aerial photos show important features of the main RMC plant and northern section of the Site, respectively. Locations of the chief sources of the contaminants of concern (SWMUs 1, 2, 5 and 11 and AOC 2) are also shown.

The fourth aerial photo shows the approximate placement of the air sparging/soil vapor extraction trench which is located northwest of the Site and east of a public park to the north of Summit Street.[13] The placement of the trench is designed to remove chlorinated organics up-gradient of the population northwest of the Site.

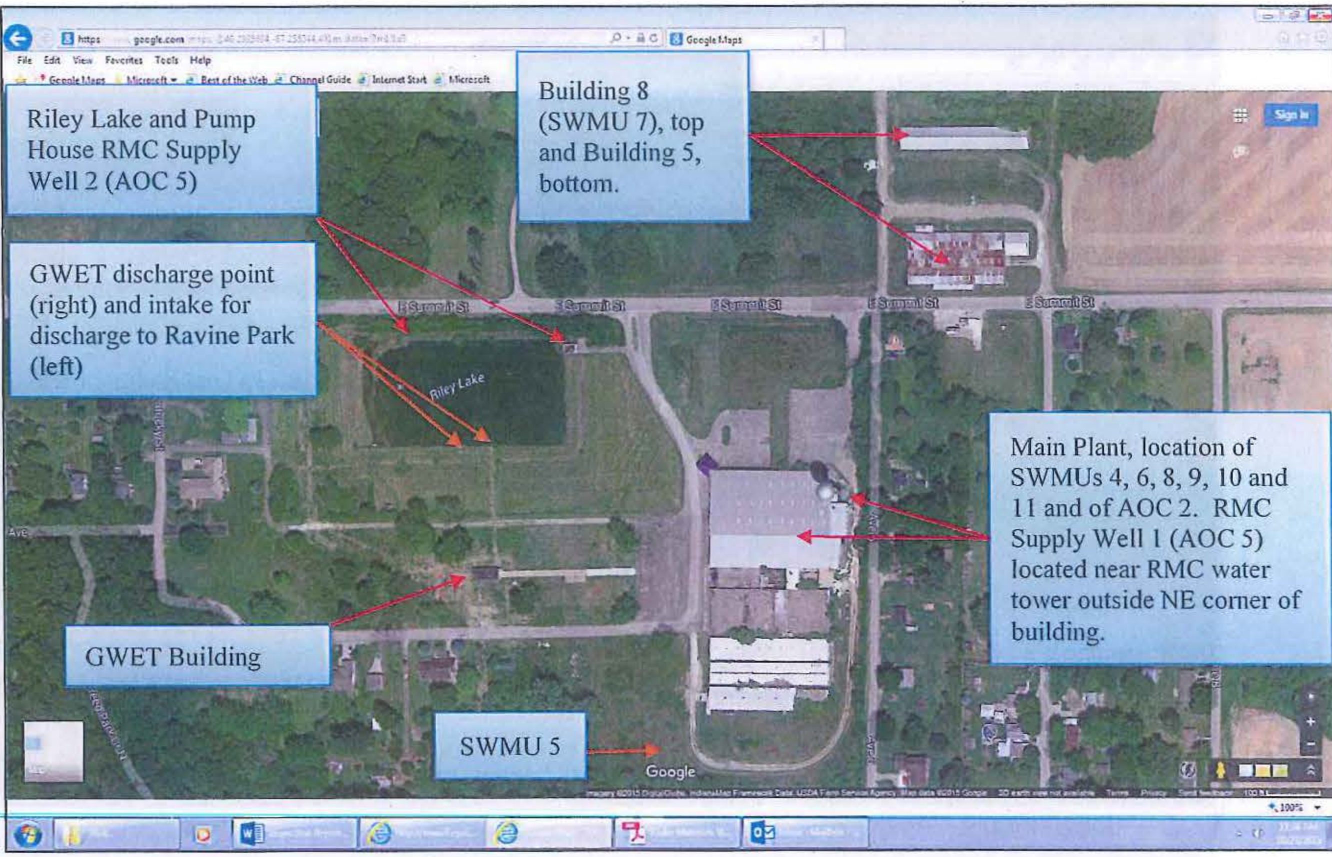
The fifth aerial photo shows a west-northwest direction of contaminant plume travel – resulting from releases at SWMUs 1 and 2 (northern plume) and SWMUs 5 and 11 and AOC 2 (southern plume) – in the direction of down-gradient residences, and beyond them, the Wabash River.

[13] Approximate location obtained from RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure 5.1.

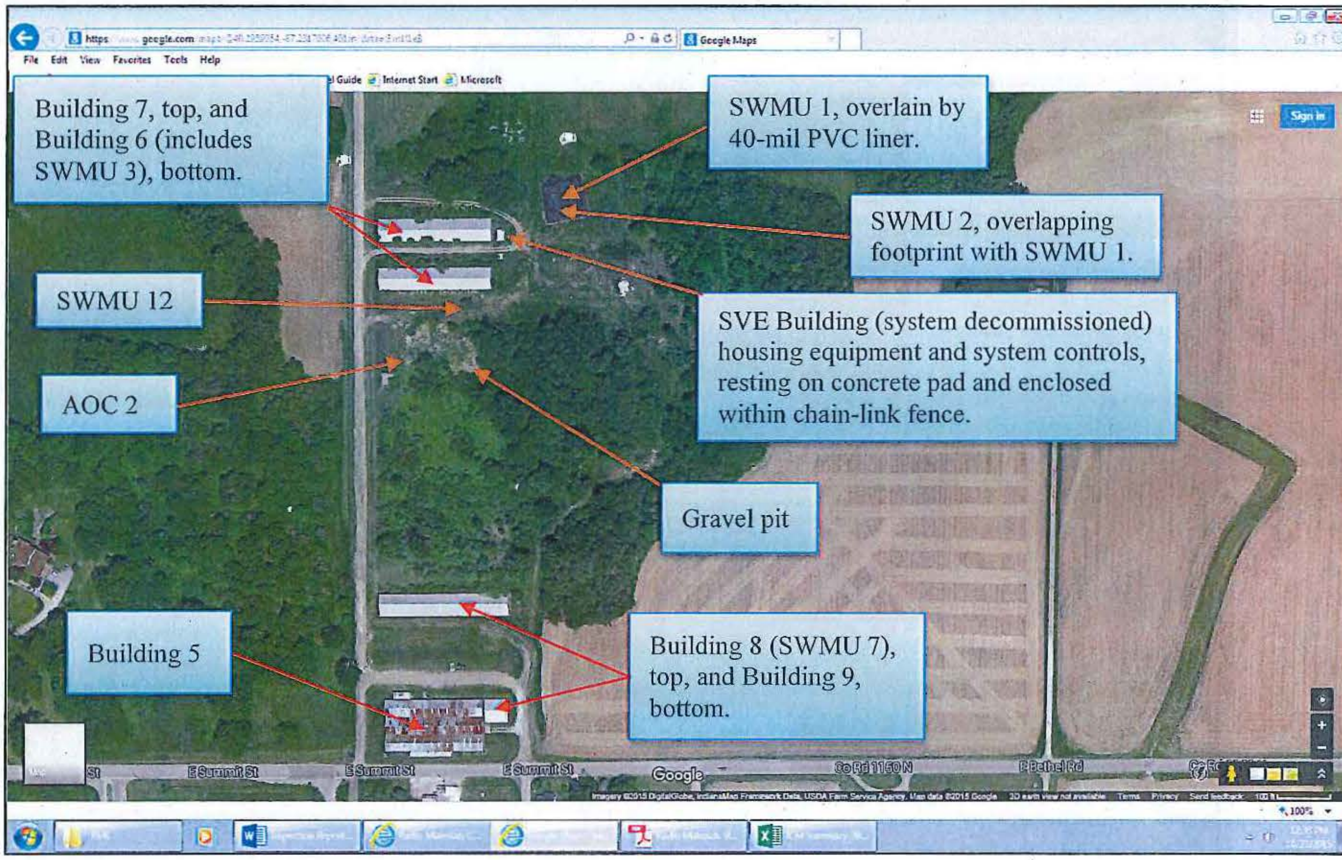
Aerial Photo 1 – Regional



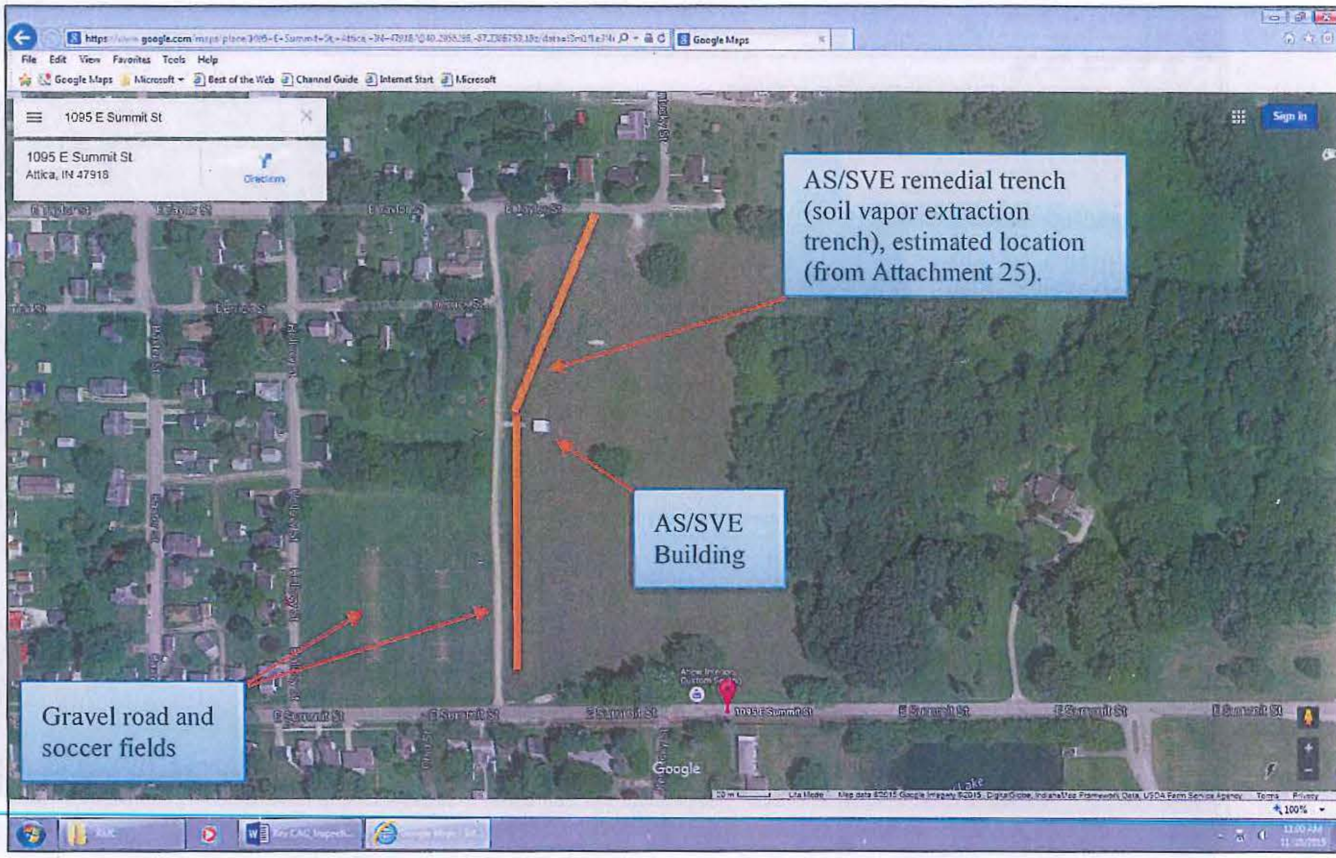
Aerial Photo 2 – RMC Main Plant



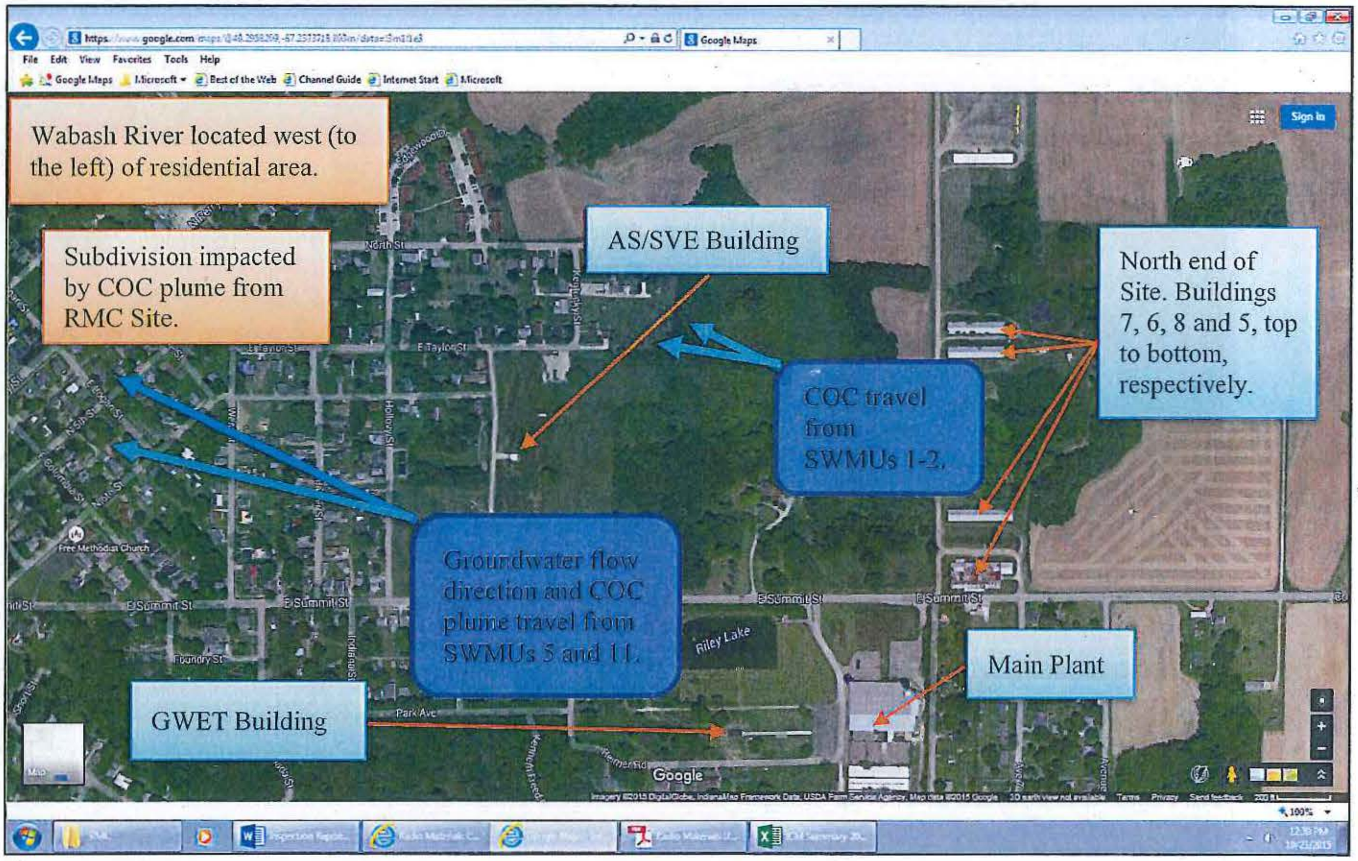
Aerial Photo 3 – North Section of Site



Aerial Photo 4 – AS/SVE System Extraction System Trench Location



Aerial Photo 5 – Impacted Community Down-gradient of Main Plant



Corrective Action Activity:

Under the Consent Order the Respondent (RMC) was required to perform work consistent with the Statement of Work attached to the Consent Order. Pursuant to Section VIII, Work to be Performed, under the Consent Order RMC was to undertake interim measures, conduct an RFI, submit a CMS and implement final corrective measures. As discussed above, work under the Consent Order has been and continues to be financed and carried out by Kraft in place of RMC.

Since 2002, Kraft, through its consultant Conestoga-Rovers & Associates and, later, GHD, has conducted environmental investigations and has implemented several interim corrective measures at the RMC Site. Project management for Kraft continues to be provided by GHD and project oversight is provided by EPA Region 5's Corrective Action Program under the supervision of Corrective Action Project Manager Dr. Bhooma Sundar.

The Consent Order identifies a number of solid waste management units (SWMUs) and areas of concern (AOCs) which were discovered as part of a Preliminary Assessment and Visual Site Inspection (PA/VSI) conducted in August 1992. These include:

UNIT	DESCRIPTION
SWMU 1	Former outdoor drum storage area located in the northeast quadrant of the Site. The drum storage area measured approximately 150 ft. by 150 ft. Wastes managed at this location included halogenated and non-halogenated waste solvents, solder wastes containing lead, plating solutions, ferric chloride, barium titanate sludge, silver sludge, and phenolic resin. The unit was in operation beginning in 1981 until around 1988-1990 when the unit was closed. The drum storage area lacked secondary containment. Soils from this unit were excavated and consolidated into an area measuring approximately 75 ft. by 75 ft. The area was underlain by a 40-mil PVC liner covering the base of the cell and the surrounding berm. Horizontal SVE extraction piping, vent piping and an extraction header were installed in the cell. The cell was then covered with a 40-mil PVC liner to minimize infiltration. The SVE system was operational from August 2008 to April 2014.
SWMU 2	Past disposal area 'A'. This former site measured approximately 100 ft. by 40 ft. and was situated adjacent to and south of SWMU 1. This site managed waste ceramic, phenolic resin, acetone/alcohol, tetrachloroethylene and trichloroethylene. This operated between approximately 1963 and 1979-80 when it was closed. Soils were excavated and this area now shares a common footprint with the SVE treatment area serving SWMU 1. The SVE system was operational from August 2008 to April 2014.
SWMU 3	Temporary drum storage area. This unit measured approximately 12 ft. by 36 ft. and was located east of Building 6 in the northeast quadrant of the Site. Wastes stored at this unit included drums of ceramic waste, phenolic and epoxy resin, waste solvents, and oil/water wastes.
SWMU 4	Centrifuge area. This unit was located in Building 2 during a brief operational life in 1977. The unit was formally closed in 1988. Wastes managed in this unit included a mixture of tetrachloroethylene, silver and ethyl acetate. No release controls were known to exist at this unit, however the unit was located on a concrete floor in a room with no floor drains.
SWMU 5	Past disposal area 'B'. This unit was an unlined pit of unknown depth. It was located approximately 200 feet southwest of the main RMC plant. It operated from approximately 1950-1963. This unit is believed to have contained chlorinated solvents, acetone, alcohol, waxes, paints, phenolic resins, and ceramics. No release controls are known to have existed at this unit. Approximately 7000 cubic yards of contaminated soil were removed and disposed of by RMC in 1995-1996.
SWMU 6	Eight 55-gallon drum storage area. This unit was located in the east side of Building 2 in the main RMC plant near the raw material storage area. This unit occupied an area of approximately 10 ft. by 5 ft. Wastes stored at this area include drums of ceramic waste stored on wooded pallets. No release controls are known to have existed at this unit, although at the time of the PA/VSI no evidence of leaks or spills were observed.
SWMU 7	Etching room. Located in Building 8, this unit measured approximately 10 ft. by 25 ft. Wastes managed in this unit

	included ferric chloride sludge. This unit was operational between 1967 and 1989 when operations were ceased. No release controls were known to have existed at this unit.
SWMU 8	Phenolic dip area. This unit was located in a former processing area in Building 1, just west of the fluid bed epoxy coating room. In this unit disc capacitors were coated by dipping them in a phenolic resin. Operations began at this unit in 1949. Contamination consisted of phenolic resin drippings onto the floor as a result of the manufacturing process. No release controls were known to have existed at this unit although the unit was underlain by a concrete floor.
SWMU 9	Epoxy coating room. This unit was located in the south central portion of Building 1, just east of the phenolic dip area (SWMU 8). The unit measured approximately 12 ft. by 15 ft. Epoxy resin waste was managed in this unit. The area appeared to be contaminated by a yellow powder during the PA/SVI. No release controls were known to have existed at this unit.
AOC 1	Flux/molten solder bath area. This unit was located in the southeast portion of Building 1 as part of the disc capacitor assembly area. Trays of discs were coated with flux and conveyed to a bath of molten solder. During the PA/VSI spillage of flux/molten solder was observed on the concrete floor of this area.
AOC 2	Underground product storage tanks. This area was located outside at the main RMC plant, between Buildings 1 and 2 on the east side of the buildings. The area consisted of three underground storage tanks, each with a capacity of 6000 gallons. Installed in 1965, the tanks were used to store heating oil, acetone/alcohol, and tetrachloroethylene. Subsequently, the second and third tanks were cleaned in 1991 and converted to heating oil storage. The PA/VSI was unclear as to whether these tanks contained any leak detection system. In addition, one heating oil tank (1000 gallons) south of Building 1 was excavated and removed in 1992. As part of the tank removal, soils contaminated with heating oil were also removed. In addition, in 1992 a heating oil tank was removed north of Building 5. The surrounding soils were not found to be contaminated, therefore no soil excavation was required.

Subsequent to the PA/VSI, several other units have been identified. These include the following three SWMUs and three AOCs: (i) SWMU 10 (original phenolic dip area located in the north-central area of the main RMC plant); (ii) SWMU 11 (tetrachloroethylene vapor degreaser, located in the main RMC plant just east of SWMUs 9 and 10); (iii) SWMU 12 (dynamite burial area south of Building 6 in the northeast quadrant of the Site where approximately 130 pounds of dynamite were buried); (iv) AOC 3A (discharge location to creek located southeast of SWMU 5 and near the Site's south property boundary); (v) AOC 3B (discharge to draining ditch located immediately east of Buildings 5 and 9, north of Summit Street near the Site's eastern property boundary); and (vi) AOC 5 (potable water supply wells and former RMC supply well no. 1; these wells have subsequently been closed and connections made to Attica's municipal water supply). Locations of SWMUs and AOCs are shown on the attached Site map. (Attachment 2.)

Site investigative work undertaken by CRA, and later CHD, for its client Kraft has identified chemicals of concern (COCs) associated with each of the following SWMUs and AOCs. For on-site and off-site impacts, the primary COCs include the following chlorinated volatile organic compounds (cVOCs): cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethene (tDCE), 1,1-dichloroethene (1,1-DCE), trichloroethene (TCE), tetrachloroethene (PCE) and vinyl chloride.

The table below[14] identifies the SWMU, AOC or other area (*i.e.*, groundwater source of City water and groundwater plume extending from the Site down-gradient to a nearby residential community), the respective COCs, impacted media and selected treatment technology as part of the ICMs implemented to date.

SWMU, AOC OR OTHER AND DESCRIPTION	CONTAMINANTS OF CONCERN	IMPACTED MEDIA[15]	INTERIM CORRECTIVE MEASURES TREATMENT TECHNOLOGY[16]
SWMU 1 – Former Drum Storage Area	Cis-1,2-DCE, TCE, PCE	Soil and vadose zone pore space	Excavation and SVE
SWMU 2 – Past Disposal Area 'A'	Cis-1,2-DCE, TCE, PCE	Soil and vadose zone pore space	Excavation and SVE
SWMU 5 – Past Disposal Area 'B'	VOCs	Soil and vadose zone pore space	ISCO and SVE
SWMU 11 – PCE Vapor Degreaser	PCE	Soil and vadose zone pore space	ISCO and SVE
AOC 2 – PCE Underground Storage Tank	PCE	Soil and vadose zone pore space	ISCO and SVE
SWMU 12 – Dynamite Burial Site	Dynamite	Dynamite buried in soil	Excavation and Off-Site Incineration
AOC 3B – North Outfall	Lead	Soil	Excavation and Off-Site Disposal
AOC 5 – On-Site Water Supply Wells	cVOCs	Groundwater	Closed wells; users connected to municipal well supply
Groundwater – Southern VOC Plume	cVOCs	Groundwater	Air stripping/air sparging
Groundwater – City of Attica Supply Wells 1 and 2	TCE	Groundwater	Air stripping

[14] Information obtained from Steven Wanner, GHD, by e-mail dated August 26, 2015, at 12:36 pm, which included an interim corrective measures summary spreadsheet (Attachment 22).

[15] Impacts from SWMUs 1 and 2 are also seen in travel of the north groundwater plume, in both the overburden (surficial aquifer) and bedrock aquifer as cVOCs travel in a west-northwest direction from these source areas. Soil vapor intrusion into down-gradient residences also results from the volatilization and upward migration of these VOCs in the vadose zone. The same holds true for impacts seen in the south groundwater plume resulting from source areas SWMUs 5 and 11 and AOC 2.

[16] ISCO = in-situ chemical oxidation where potassium permanganate ($KMnO_4$) was used to enhance the oxidation and bioremediation of cVOCs in soils at two or three hot spots (elevated cVOCs or possibly existence of free product) in SWMUs 5 and 11. The use of $KMnO_4$ was limited. SVE = soil vapor extraction where cVOC vapors in the vadose zone are pulled through a series of pipes and headers and discharged to atmosphere via above ground stacks.

Kraft completed excavation and off-site treatment (incineration) of 130 pounds of dynamite from SWMU 12 in 2008. Kraft also completed the excavation and off-site disposal of approximately 350 tons of lead-impacted soils from AOC 3B in 2007.

As previously noted (pg. 3, ¶4, above) there are two groundwater plumes emanating from the Site and traveling in a west-northwest direction in both the overburden and bedrock aquifers. These distinct plumes originate from SWMUs 1 and 2 in the north end of the Site (Northern Study Area) and from SWMUs 5 and 11 and AOC 2 in the south end of the Site (Southern Study Area).

Important information regarding contaminants of concern and their fate and transport within the Southern Study Area and Northern Study Area can be found in the RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), at Sections 3.2 and 3.3, respectively:

> "In the Southern Study Area, groundwater cVOC impacts, primarily consisting of dissolved PCE, TCE, and cDCE, appear to be originating primarily from SWMU 5, where the highest cVOC groundwater concentrations were observed in the overburden monitoring wells. The overburden groundwater cVOC plume in the Southern Study Area extends towards the west-northwest. TCE concentrations in the monitoring wells located farthest downgradient (OB-49 through OB-53) range from 0.11 µg/L at OB-49 to 25 µg/L at OB-50. In this farthest downgradient reach, non-Site related sources of cVOCs may be present.
>
> The bedrock groundwater downgradient of SWMU 5 does not exhibit the same magnitude of cVOC concentrations as was observed in the overburden groundwater. cDCE is the cVOC exhibiting the highest concentrations downgradient of SWMU 5 in bedrock groundwater comprising 70 percent or more of the total cVOC concentration. Additionally, vinyl chloride is detected more frequently and at higher concentrations in the bedrock groundwater than is detected in the overburden monitoring wells downgradient of SWMU 5. Farther downgradient at monitoring well BW-07, vinyl chloride.comprises a larger percentage of the total cVOC concentration. These data indicate that the parent compounds (TCE and, to a lesser extent, PCE) are undergoing dechlorination with depth and distance downgradient of SWMU 5."[17]
>
> And:
>
> "In the Northern Study Area, an overburden groundwater cVOC plume extends towards the northwest from the SWMU 1 and 2 areas. The northern overburden cVOC plume is comprised primarily of dissolved PCE and TCE. Elevated concentrations of cVOCs were detected in proximity to the buried waste deposits

[17] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Section 3.2, pg. 9.

> formerly present in the SWMU 1 and 2 areas, and seem to be the primary contributor to dissolved cVOCs in the overburden groundwater in this area. The overburden is much thinner in this area (less than 20 feet thick) as compared to the Southern Study Area and the contact between overburden and bedrock is obscured by the presence of a loosely cemented weathered sandstone present to the southeast of monitoring well OB-30. Monitoring well OB-30 and some of the other shallow monitoring wells installed closer to SWMUs 1 and 2 are screened in the loosely cemented sandstone deposits as opposed to the unconsolidated overburden deposits.
>
> The overburden cVOC plume extends towards the northwest, parallel to groundwater flow beneath an agricultural field and the former Riley Airport landing strip located to the northwest. PCE and TCE are present in the farthest downgradient overburden monitoring wells (OB-30 and OB-31). Groundwater is absent from the overburden and loosely cemented sandstone farther downgradient of OB-30.
>
> PCE and TCE concentrations in bedrock are highest at the bedrock monitoring wells located closest to SWMUs 1 and 2 (BW-05 and BW-09). The concentrations of VOCs dissipate rapidly with distance from SWMUs 1 and 2. The compound cDCE forms approximately 70 percent of the total cVOC concentrations in the bedrock groundwater samples in this area. These data indicate that the parent compounds (TCE and PCE) are undergoing reductive dechlorination with depth and distance downgradient of SWMUs 1 and 2."[18]

Based on TCE concentrations in groundwater from on-Site and off-Site overburden monitoring wells, Conestoga-Rovers & Associates plotted TCE concentration contours and determined the approximate cross-sectional area of potential discharge to the Wabash River. (Attachment 3.) This area is located immediately northwest of the two City of Attica source wells and extends about 1000 feet along the eastern shore of the River.

In April 2014, EPA approved the shut-down of the SVE system serving SWMUs 1 and 2.[19] EPA's letter stated, "Post shutdown activities including dismantling and disposal should be assessed as part of the Corrective Measures Study (CMS). The CMS should evaluate if SVE system shutdown has any demonstrable effect on the groundwater VOC contaminant plume."[20] EPA's approval followed receipt of Kraft's February 2014 proposal to shut down the SVE system serving these SWMUs.[21] In a letter report dated February 25, 2014, Conestoga-Rovers & Associates presented data which confirmed diminishing returns with the SVE system's ability to remove target cVOCs (PCE, TCE and cDCE) from soils. (Attachments 4 and 5.)

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[18] Ibid, Section 3.3, pg. 10.

[19] *See* April 8, 2014 letter, Re: Approval of SVE System Shutdown Proposed Decommissioning of SWMU 1 and 2 SVE system, Bhooma Sundar, EPA, to Steven Wanner, Conestoga-Rovers & Associates.

[20] Ibid, pg. 1, ¶2.

[21] *See* February 25, 2014 letter-report, Re: Proposed Decommissioning of SMWU 1 and 2 SVE System, Steven Wanner, Conestoga-Rovers & Associates, to Bhooma Sundar, EPA.

In its February 25, 2014 letter, Conestoga-Rovers & Associates states, "As of November 2013, the total mass of primary VOCs removed is approximately 1,082 pounds (0.5409 tons), including approximately 815 pounds of PCE, 142 pounds of TCE, and 125 pounds of cDCE. This has resulted in over a 90 percent reduction in concentration observed between the 2003 RFI soil sample set and the 2011 progress soil sample set."[22] The letter also states, "The highest rate of VOC removal occurred during the first two years of the SVE System operation (i.e., specifically, the period from startup in August 2008 through July 2010) when the total mass of primary VOC removal amounted to approximately 0.5 tons. During the period from July 2010 to January 2012, the SVE System removed another 0.0376 tons (approximately 75 pounds) of primary VOCs. From January 2012 to the present, the SVE System has removed only another approximately 0.004 tons (approximately 8 pounds) of primary VOCs. Currently, the SVE System removes well under a pound of primary VOCs per month of operation."[23]

Kraft continues remediation of sub-surface soil and groundwater contaminated with target cVOCs via air sparging and soil vapor extraction (AS/SVE) in the overburden aquifer north and south of Summit Street.

In addition to groundwater remediation, Kraft has undertaken interim measures to address the infiltration of cVOC vapors into homes near the Site. One report prepared by Conestoga-Rovers & Associates for Kraft, the RFI Addendum 2 Supplemental Vapor Intrusion Investigation and Work Plan (September 2013), states:

> "To date, several hundred indoor air samples have been collected from nearly 130 residences located in and around the study area located to the northwest of the RMC plant. Additionally, and as appropriate, subslab vapor and crawlspace air samples have been obtained from these residences. Based on the analytical data obtained during the residential VI sampling efforts, mitigation was performed at 60 residences consistent with the Vapor Intrusion Mitigation Interim Corrective Measures Work Plan.
>
> Mitigation systems installed at the residences were of two types, active mitigation systems (i.e., subslab depressurization [SSD] or submembrane depressurization [SMD]), or passive mitigation systems (i.e., seal existing cracks, joints, utility penetrations or other features that might serve as potential diffusion routes in floors and foundation walls). Active vapor mitigation systems were installed in 46 residences where indoor air concentrations above action levels and corresponding subslab vapor sources were observed. Fourteen residences with subslab vapor or crawlspace air detections above approved screening levels and indoor air

[22] Ibid, pg. 4, Section 4.0, ¶1.
[23] Ibid, pg. 4, Section 3.2, ¶2.

concentrations below screening levels were fitted with the passive mitigation systems."[24]

Vapor intrusion (VI) studies were completed in the residential area down-gradient of SWMU 5 to assess the vapor intrusion pathway. All investigative work was completed consistent with the procedures described in the Vapor Intrusion Study (VIS) Work Plan, which was submitted to EPA in May 2005 and subsequently approved by EPA. The most recent VI-related submittal to EPA was "RFI Addendum 4 Supplemental Vapor Intrusion Investigation and Mitigation Report" (Addendum 4; CRA, March 18, 2015).

From 2010 to 2015, vapor intrusion studies included the installation and sampling of soil vapor probes, and the sampling of residential indoor air, crawlspace air, and subslab vapors. Several hundred indoor air, subslab, and soil vapor samples were collected from the Site during the RFI. The COCs resulting from the VI study included the following cVOCs: PCE, TCE, 1,1-DCE, cDCE, tDCE and vinyl chloride. Of these, only PCE and TCE were found to exceed the subslab and indoor air action levels.

The residences at which indoor air sample results exceeded the Site-specific action levels had been mitigated at the time of the CAC. Also, according to GHD, as of the time of the CAC none of the residence's indoor air quality was believed to be above action levels within the study area.

Extensive sampling of down-gradient residences for the target cVOCs were used to determine which homes were candidates for passive or active mitigation. The target cVOCs identified in the vapor intrusion study were based on potential off-site contributions from groundwater contamination in the northern Site study area (*i.e.*, resulting from releases at SWMUs 1 and 2) and in the southern Site study area (*i.e.*, resulting from releases at SWMUs 5 and 11 and AOC 2). (Attachments 6-8.)

The volatilization of volatile organic compounds from the water column to the unsaturated zone (vadose) is a mechanism based on various physical properties of the chemical, such as its solubility in water, vapor pressure and Henry's Law Constant.

As VOCs rise through the water column and into the vadose zone they will continue to rise within the interstitial pore spaces, with some organics being bound to organic carbon in the soil column, and will either be prevented from further migration due to an impermeable structure (*e.g.*, concrete slab) or will find their way to eventually be released to atmosphere through the surface. Subslab vapors in the residences were those cVOC vapors measured beneath the slabs of the homes in the VI study.

The table below[25] shows that for four of the six target analytes the indoor air action levels were met even at the maximum indoor concentrations detected in the vapor intrusion study area.

[24] RFI Addendum 2 Supplemental Vapor Intrusion Investigation and Work Plan (September 2013), pg. 2, ¶¶ 1-2. *See* also, RFI Addendum 4 Supplemental Vapor Intrusion Investigation and Mitigation Report (Conestoga-Rovers & Associates, March 2015), §1.1, pg. 2.

[25] Ibid, pg. 5.

However, maximum concentrations for TCE and PCE were found to be at 52 times and nearly six times their respective indoor air action levels.

CHEMICAL	INDOOR AIR ACTION LEVEL (μg/m^3)	MINIMUM INDOOR AIR CONCENTRATION (μg/m^3)	MAXIMUM INDOOR AIR CONCENTRATION (μg/m^3)
1,1-DCE	200	ND	0.12
cDCE	60	ND	6.8
tDCE	60	ND	0.19
TCE	2.1	ND	110
PCE	42	ND	240
Vinyl chloride	2.8	ND	0.68

The table below[26] shows that for four of the six target analytes the screening levels were met even at the maximum subslab concentrations detected. However, maximum concentrations for TCE and PCE were found to be at 57 times and 19 times their respective vapor screening levels.

CHEMICAL	SUBSLAB VAPOR SCREENING LEVEL (μg/m^3)	MINIMUM SUBSLAB CONCENTRATION (μg/m^3)	MAXIMUM SUBSLAB CONCENTRATION (μg/m^3)
1,1-DCE	2000	ND	ND
cDCE	600	ND	99
tDCE	600	ND	ND
TCE	21	ND	1200
PCE	420	ND	8000
Vinyl chloride	28	ND	0.2

The City of Attica operates a well field with two municipal supply wells (Well Nos. 1 and 2) located in the northwestern portion of town adjacent to the eastern shore of the Wabash River. The wells are capable of producing at a rate of approximately 1,000 gallons per minute (gpm). The wells pump groundwater directly into the City's distribution network and into two 500,000-gallon reservoirs. A third well (Well No. 3) has not been operational since the 1990s.

Historically, low-level concentrations of TCE have been detected in Wells Nos. 1 and 2, generally at concentrations below the Indiana Department of Environmental Management's (IDEM) Residential Default Closure Level (RDCL) and the federal Maximum Contaminant Level (MCL) of 5 micrograms per liter (μg/L). However, occasional detections of TCE at concentrations slightly above the RDCL and MCL have occurred at Well No. 1, but not in consecutive sampling rounds.

A review of recent groundwater quality data for the City of Attica revealed no exceedances of the TCE MCL going back to 2013.[27]

[26] Ibid, pg. 6.

[27] https://myweb.in.gov/IDEM/DWW/JSP/SearchDispatch?number=&name=Attica&county=FOUNTAIN&WaterSystemType=C&SourceWaterType=GW&PointOfContactType=None&SampleType=NonTCRAll&begin_date=10%2F28%2F2013&end_date=10%2F28%2F2015&action1=Search+For+Samples and

Kraft responded to the detections of TCE in the municipal water supply by building a treatment building near Wells 1 and 2 on the west end of the City of Attica. Here, air stripping is employed to remove TCE from the water supply. Further protection to residents of Attica is provided by a City ordinance prohibiting the installation of private water wells within the City limits.[28] (Attachment 9.)

Groundwater Impacts and Contaminants of Concern:

Contamination with chlorinated volatile organics in sub-surface soils (vadose zone) and within the water column necessitates remediation technologies which strips these cVOCs from organic matter in soils, from within interstitial spaces within the soil column and from the water column into the air space above it. For certain COCs air sparging and soil vapor extraction are technically practicable and cost-effective means to remove cVOCs from the vadose zone and water column.

This is because the effectiveness of SVE is dependent on physical properties of the targeted chemical, including vapor pressure and Henry's Law Constant (HLC). The table below[29] shows some pertinent physical properties for the cVOCs targeted as part of interim measures for addressing soil, groundwater and indoor air (residential) contamination resulting from Site activities. Generally, the greater the vapor pressure and higher the HLC the more amenable a given chemical is to move from the aqueous phase to the air space in the soil above the water table and from that soil air space to be removed via sparging and vapor extraction to an ex-situ treatment train or atmospheric discharge.

CONSTITUENT	VAPOR PRESSURE (mm Hg) at 25°C	HENRY'S LAW CONSTANT (HLC) (atm-m^3/mol) at 25°C	SOLUBILITY IN WATER (mg/L) at 25°C
cDCE	205	3.74E-03	3.5E+03
tDCE	315	9.16E-03	6.3E+03
1,1-DCE	221	5.43E-03	5.1E+03
TCE	75	9.37E-03	1.1E+03
PCE	19	1.74E-02	2.0E+02
Vinyl chloride	2600	2.78E-02	1.1E+03

Through a series of perforated PVC pipes and headers, cVOC vapors are extracted from the impacted soil column at SWMU 11 and AOC 2 are carried to an air-moisture separator (knock-out vessel) housed in the RMC main plant.[30] Vapors removed from the soil column are then discharged to atmosphere via a short stack adjacent to Building 4.[31]

https://attica-in.gov/wp-content/uploads/2014/07/ccr-annual-drinking-water-quality-report-2013.pdf

[28] City of Attica Restrictive Groundwater Ordinance, effective March 11, 2013.

[29] Data borrowed largely from: http://announce.exponent.com/practice/environmental/ef/morrison_murphy.pdf.

[30] *See* Photos 2-7, Radio Materials Corporation Site Post CA 550 Inspection Photo Log – Inspection Date August 21, 2015.

[31] *See* Photo 9, Radio Materials Corporation Site Post CA 550 Inspection Photo Log – Inspection Date August 21, 2015.

North of Summit Street, cVOCs from the soil interstitial space and from the water column are extracted through a similar network of SVE piping. Vapor extraction is enhanced by air sparging – the forced distribution of ambient air via positive displacement blowers (two in series) housed in a small trailer east of a residential subdivision and west of the northern section of the RMC property.[32] Incoming cVOC-laden air is dewatered in knock-out vessels and discharged to atmosphere through two 20-ft stacks.[33]

Groundwater quality trends indicate: (i) cVOC concentration contours show plume travel in a west-northwest direction from both the RMC main plant and from SWMUs 1 and 2; (ii) impacts to the overburden aquifer are essentially order of magnitude equivalent to those in the bedrock aquifer for cDCE and TCE and lessened for PCE and vinyl chloride, indicating hydraulic connection between the aquifers, effectiveness of ICMs in lessening the impacts from releases at the source SWMUs (via in-situ chemical oxidation and SVE), and some volatilization of cVOCs from the water column and into the vadose zone; (iii) predicted fate and transport mechanisms resulting in movement of aqueous-phase cVOCs in the direction of groundwater flow (toward the Wabash River) and vertical downward travel of the dense and relatively insoluble cVOC portion; and (iv) some de-chlorination effects in the soil when looking at TCE versus PCE concentration contours in the overburden, and when looking at cDCE contours being the highest immediately west-northwest of SWMU 5. (Attachments 10-16.)

A trend analysis shows: (i) no upward trends for PCE in any overburden or bedrock wells, a downward trend in 10 overburden wells and six bedrock wells, and no trend in six overburden wells and five bedrock wells; (ii) an upward trend for TCE in one bedrock well, a downward trend in 11 overburden wells and eight bedrock wells, and no trend in five overburden wells and two bedrock wells; (iii) an upward trend for cDCE at one overburden well, a downward trend at seven overburden wells and seven bedrock wells, and no trend at eight overburden wells and four bedrock wells; and (iv) an upward trend for vinyl chloride in two overburden wells and two bedrock wells. (Attachment 17.)

Also, "RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA 750) Migration of Contaminated Groundwater under Control" (April 2014)[34] states:

> "Groundwater analytical data obtained during the investigations conducted at the Site were compared to the IDEM's Residential Default Closure Levels (RDCLs) for groundwater. The RDCLs are equivalent to the maximum contaminant levels (MCLs) promulgated under the Federal Safe Drinking Water Act (SDWA). Phase IIB RFI groundwater analytical results indicate that the primary analytes detected above the RDCLs were several VOCs including PCE, TCE, cis-1,2-dichloroethene (cDCE), and vinyl chloride. The highest concentrations of total

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[32] *See* Photos 26-28, Radio Materials Corporation Site Post CA 550 Inspection Photo Log – Inspection Date August 21, 2015.

[33] *See* Photos 29 and 31, Radio Materials Corporation Site Post CA 550 Inspection Photo Log – Inspection Date August 21, 2015.

[34] *See* http://www3.epa.gov/region5/cleanup/rcra/rmc/pdfs/rmc-ca-750-201404.pdf.

VOCs were detected in overburden groundwater near and immediately down gradient of SWMU 1 and 2 (Northern Study Area), and SWMU 5 and SWMU 11/AOC 2 (Southern Study Area). VOC concentrations in bedrock groundwater were generally below 2000 µg/L (ppb). Groundwater total VOC concentrations fall below 100 µg/L within several hundred feet down gradient of SWMU 1 and 2 and SWMU 5 areas. Overburden groundwater containing VOCs at concentrations above the RDCLs extends to the northwest of the Site."[35]

And:

"The overburden groundwater VOC plume in the Southern Study Area extends towards the west-northwest. TCE concentrations in the monitoring wells located farthest down gradient (OB-49 through OB-53) range from non-detect at OB-49 to 28 micrograms per liter (µg/L) at OB-50. In this farthest down gradient reach, non-Site related sources of VOCs may be present. The bedrock groundwater down gradient of SWMU 5 does not exhibit the same magnitude of VOC concentrations as was observed in the overburden groundwater. Moreover, rather than TCE, cDCE is the VOC exhibiting the highest concentrations down gradient of SWMU 5, comprising 70 percent or more of the total VOC concentration. Additionally, vinyl chloride is detected more frequently and at higher concentrations in the bedrock groundwater than is detected in the overburden monitoring wells down gradient of SWMU 5. Farther down gradient at monitoring well BW-07, vinyl chloride comprises a larger percentage of the total VOC concentration. These data indicate that the parent compounds (TCE and, to a lesser extent, PCE) are undergoing degradation with depth and distance down gradient of SWMU 5."[36]

The following groundwater quality tables are borrowed from the same document:[37]

CHEMICAL IN GROUNDWATER	MAXIMUM BEDROCK CONCENTRATION ONSITE (PPB)	MAXIMUM BEDROCK CONCENTRATION OFFSITE (PPB)	MAXIMUM OVERBURDEN CONCENTRATION ONSITE (PPB)	MAXIMUM OVERBURDEN CONCENTRATION OFFSITE (PPB)	IDEM RDCL (PPB)
Southern Study Area					
PCE	ND	ND	24	ND	5
TCE	4.7	ND	870	25	5
dDCE	75	25	2100	7.6	70
Vinyl chloride	12	10	11	ND	2

[35] RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA 750) Migration of Contaminated Groundwater under Control" (April 2014), pg.4.
[36] Ibid, pg. 5.
[37] Ibid, pp. 4-5.

Northern Study Area					
PCE	210	0.2	68	26	5
TCE	310	1.3	9.6	9.4	5
dDCE	1300	0.6	25	ND	70
Vinyl chloride	80	ND	ND	ND	2

Interim Corrective Measures Flow Diagrams:

Simplified process flow diagrams for the interim corrective measures to treat soil (cVOC impacts in the soil column above the water tables in the Northern and Southern Study Areas) and groundwater (both in the overburden and bedrock aquifers as well as the City's municipal water supply) follow.

The systems consist of either soil vapor extraction (with or without air sparging) to treat the void spaces within the vadose zone (*i.e.*, cVOC-laden air above the water table) and direct release of cVOCs to atmosphere or the use of air stripping to remove the same chlorinated organics from groundwater from either the overburden and/or bedrock aquifers (to treat impacts resulting from Site releases in the Northern and Southern Study Areas) or from the City of Attica supply wells (in which case impacts may be attributable to industrial sources in addition to RMC).

Soil gases laden with cVOC vapors and water vapor pass through an air-moisture separator where water vapor is removed and allowed to condense and collect in a knock-out vessel. The condensate is then discharged on a periodic basis to the City's sewer system under a local discharge authorization or, in the case of the AS/SVE system serving the Northern Study Area, the condensate is reintroduced to an infiltration gallery up-gradient to the sparge curtain where it is allowed to percolate to the water table and is subsequently treated (by removal in the AS/SVE building of cVOCs from the soil vapors).

No treatment of the air streams from the SVE, AS/SVE or air strippers is required because each of the systems' total estimated contaminant load – based on potential to emit (PTE) calculations by Conestoga-Rovers & Associates for Kraft – was found to be less than IDEM's ten tons per year (10 TPY) permit threshold.[38] As such, direct discharge of those cVOCs removed from the treated soil gases or groundwater streams is allowable.

This discharge is done through relatively short (roughly 20 feet high) stacks located immediately next to the SWMUs 1 and 2 SVE treatment trailer (now decommissioned), Building 4 (the SWMU 11 and AOC 2 SVE system), the AS/SVE Building north of Summit Street, the GWET

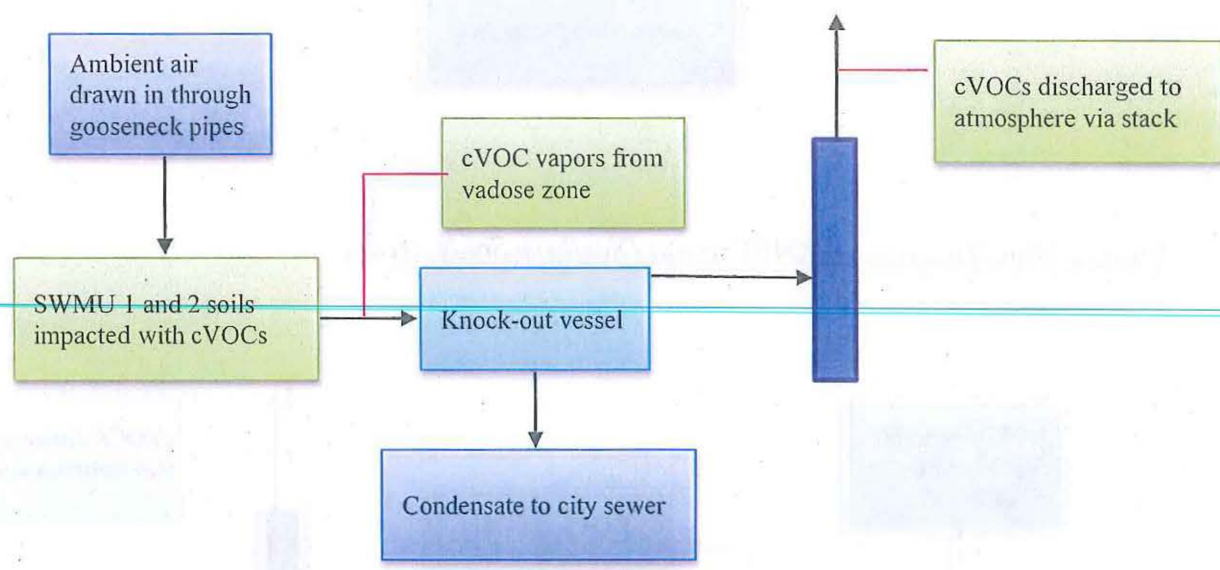
[38] "In summary, the total PTE from all of the existing and proposed remedial systems is 4.6 tons per year (tpy) of VOCs, 3.8 tpy of the highest single hazardous air pollutant (HAP) (i.e., TCE), and 5.2 tpy of combined HAPs. These values are well below the Indiana permitting thresholds of 10 tpy of VOCs, 10 tpy of the highest single HAP, and 25 tpy of combined HAPs. Therefore, the air stripper and AS/SVE system do not require Indiana air permitting in accordance with 326 IAC 2." *See* Groundwater Interim Corrective Measures Design Plans and Specifications Radio Materials Corporation (Conestoga-Rovers & Associates, October 2010), Section 4.1, pg. 19.

Building west of the RMC main plant and the air stripper serving the City of Attica's supply wells on the west side of Attica near the Wabash River.

For the GWET system treated groundwater from the air stripper is discharged via an 8-inch line to Riley Lake at a rate of approximately 140-150 gpm. Equalization of water level is maintained by discharging through a collection point at the south end of Riley Lake to a tributary in nearby Ravine Park which in turn meanders to the Wabash River. Effluent from the GWET Building is sampled monthly to meet required NPDES permit discharge limits.

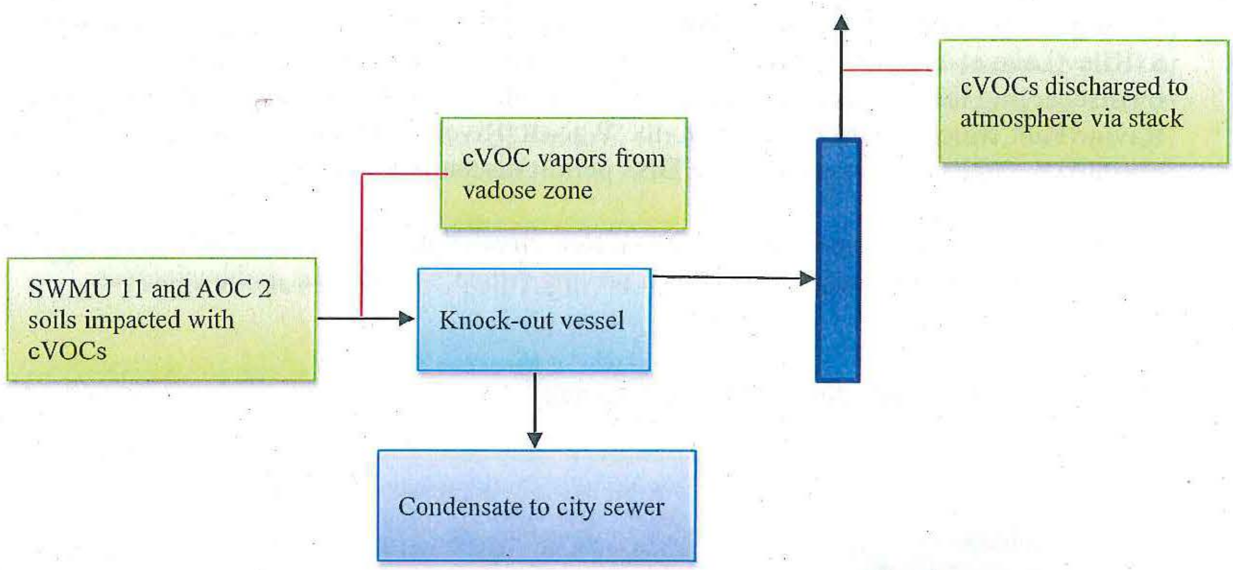
For the City of Attica's municipal supply system, treated groundwater from the air stripper building is sent to the distribution system serving Attica's residences and businesses.

Process Flow Diagram – SWMU 1-2 SVE System[39]

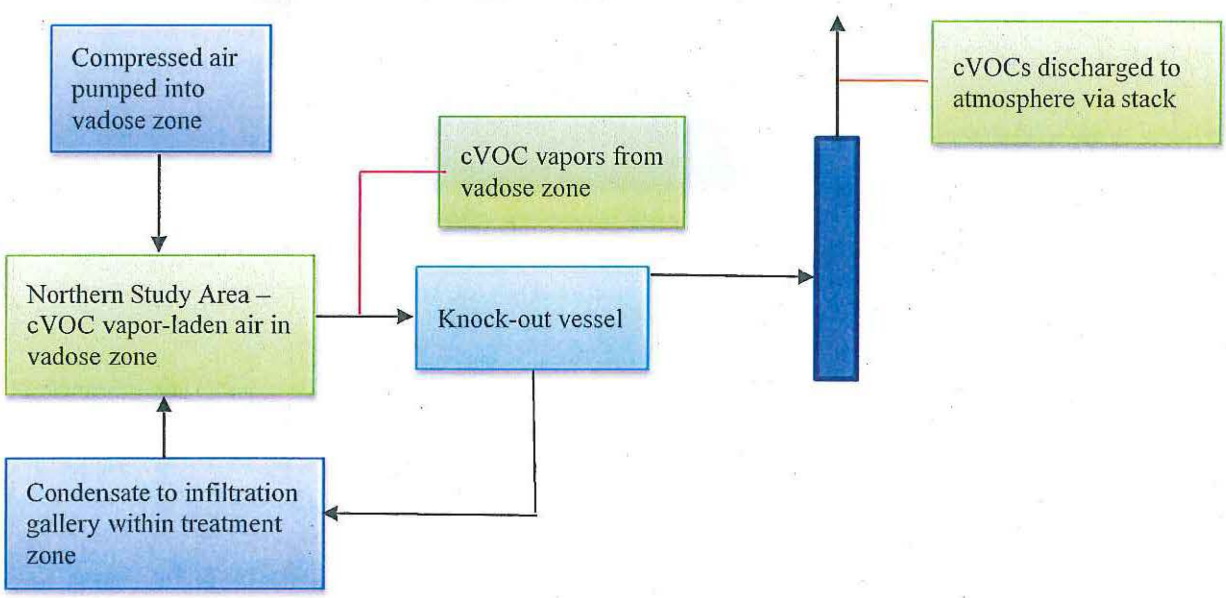


[39] Decommissioned as of April 2014.

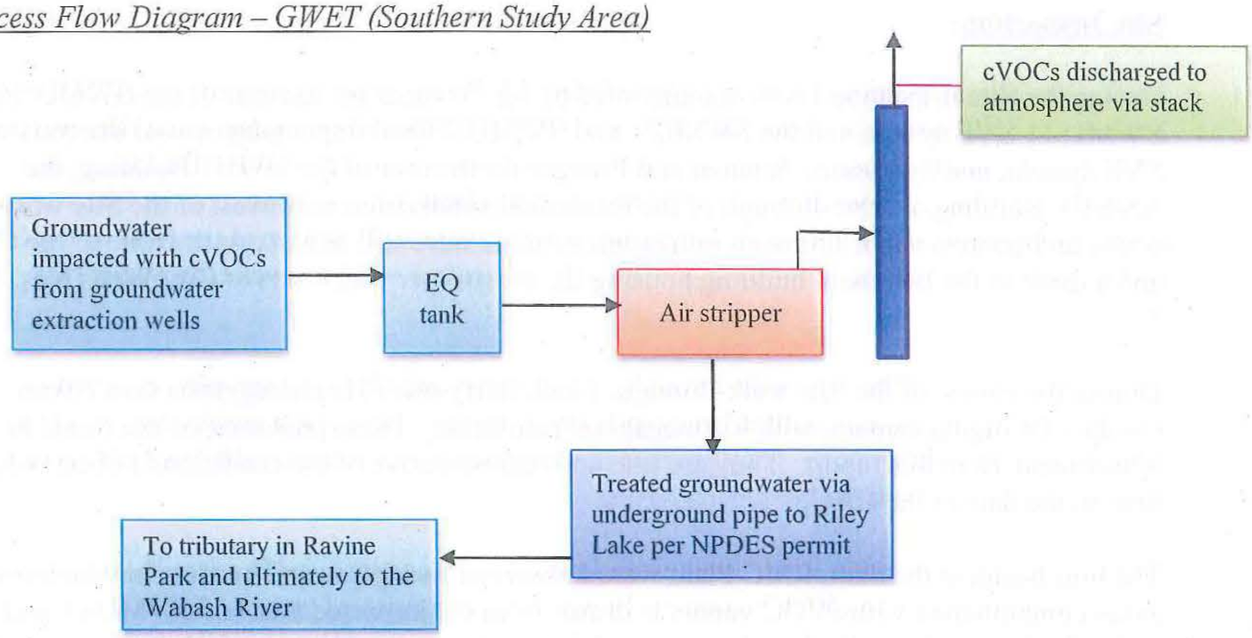
Process Flow Diagram – SWMU 11 and AOC 2 SVE System



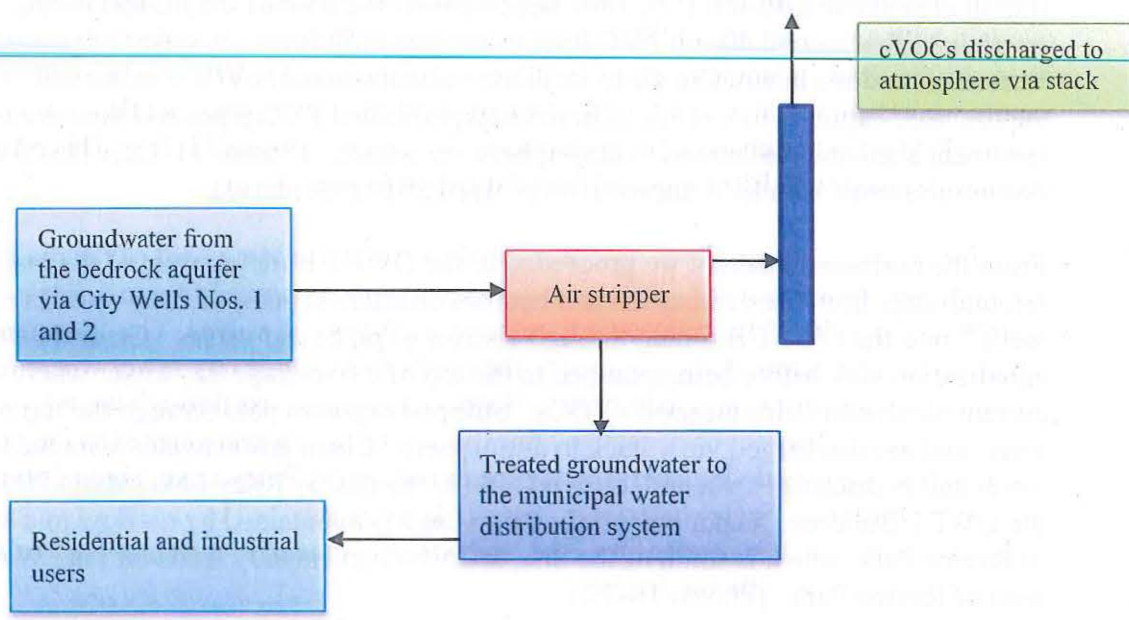
Process Flow Diagram – AS/SVE System (Northern Study Area)



Process Flow Diagram – GWET (Southern Study Area)



Process Flow Diagram – Municipal Water Supply Treatment



Site Inspection:

During the Site inspection I was accompanied by Mr. Wanner for the tour of the SWMU 5 and SWMU 11 SVE system and the SWMU 1 and SWMU 2 lined impoundment and decomissioned SVE system, and by Messrs. Wanner and Pranger for the tour of the GWET Building, the AS/SVE Building, a drive-through of the residential subdivision northwest of the Site where active and passive vapor intrusion mitigation systems were still in place at the time of the CAC, and a drive to the treatment building housing the air stripper which serves City Wells Nos. 1 and 2.

During the course of the Site walk-through, I took thirty-one (31) photographs on a Nikon Coolpix P4 digital camera, with 8.1 megapixel resolution. These photographs are found in Attachment 18 to this report. They are true and representative of the conditions I observed at the Site on the date of the CAC.

The tour began at the main RMC Plant were I observed riser pipes and headers in which soil gases contaminated with cVOC vapors is drawn from the impacted areas of SWMUs 5 and 11 and AOC 2, pass through a knock-out vessel for moisture removal and exit through a discharge stack adjacent to the south face of Building 4. (Photos 1-9 of Attachment 18.)

In the northeastern quadrant of the Site we toured the lined and covered area where SWMUs 1 and 2 share a common footprint. Soils from these SWMUs were excavated and placed back into the fill area above a 40-mil PVC liner which covers the base of the fill and berms. The fill is overlain with a second 40-mil PVC liner to prevent infiltration. A series of gooseneck pipes were used to draw in ambient air to facilitate volatilization of cVOCs in the soil. Contaminant vapors were captured in a series of horizontal perforated PVC pipes and then drawn into the SVE treatment shed and discharged to atmosphere via a stack. (Photos 11-15.) This SVE system was decommissioned with EPA approval as of April 2014 (see above).

From the northeast quadrant we proceeded to the GWET Building west of the main plant. Groundwater from the overburden and bedrock aquifers is pumped from a series of 16 extraction wells[40] into the GWET Building through a series of pipes and valves. Groundwater enters an equalization tank before being pumped to the top of a five-stage tray tower where a counter-current air stream strips targeted cVOCs. Stripped organics pass through the top of the tray tower and are discharged via a stack to atmosphere. Clean groundwater exits the bottom of the tower and is discharged via underground pipe to the nearby Riley Lake, about 200 feet north of the GWET Building. Water balance in Riley Lake is maintained by outflow to a small tributary in Ravine Park, which is south of the Site, and which eventually feeds into the Wabash River west of Ravine Park. (Photos 16-25.)

[40] Fifteen extraction wells, designated EW-01 to EW-15, are installed in the overburden aquifer. One extraction well, designated BEW-01, is installed in the bedrock aquifer.

Under an NPDES permit issued by IDEM (Permit No. IN0063657[41]), Kraft monitors monthly for discharges to Outfall 001[42] for the following parameters (effluent limit concentration provided): PCE (0.005 mg/L), TCE (0.005 mg/L), cDCE (0.07 mg/L) and vinyl chloride (0.002 mg/L). (Attachment 18.) Samples are taken from a sample port in the northeast corner of the GWET Building. (Photos 21-22.) (Attachment 19.)

I asked Mr. Wanner for a printout of real-time data for the GWET system. He assured me he would get that for me, and I received it the following day.[43] On the day of the CAC (at the time of the screen capture), of the 16 groundwater extraction wells 13 were operational and drawing groundwater at a cumulative rate of 150 gpm. (Attachment 20.)

After leaving the GWET Building, Messrs. Wanner and Pranger and I drove in Mr. Pranger's vehicle and went to the location of the treatment building which houses the air stripper that serves the City's two municipal supply wells. The groundwater treatment building is located on the western edge of Attica at the intersection of S. Market Street and W. Mill Street.[44]

We then drove through the neighboring community where Messrs. Wanner and Pranger pointed out residences which were equipped with active subslab mitigation systems. I observed these systems affixed to the sides of multiple residences but did not leave the vehicle to take photos of the residences.

We concluded the Site tour with a visit to the AS/SVE Building located north of the Site, between Summit Street and Derrick Street, east of an unnamed gravel road and about 200 feet northeast of a public park and soccer fields.[45]

The AS/SVE Building's equipment serves to mitigate cVOCs resulting in releases from SWMUs 1, 2, 5 and 11 in the overburden aquifer. Here I observed two air compressors which force ambient air into the soil column in order to enhance volatilization of cVOCs, two knock-out vessels for the removal of water from the incoming vapor-laden soil gasses, and two positive displacement blowers to move the stripped organics through two short stacks located on the east exterior of the building. (Photos 26-31.)

At the conclusion of the Site tour Mr. Wanner and I returned to the office area at the RMC main plant. There I met with Joseph Riley, Jr. and asked him for manifests of off-site shipments of hazardous and non-hazardous waste streams.[46] After I received the documents from Mr. Riley, Mr. Wanner and I left the building for our vehicles. I left the Site immediately afterward.

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[41] Permit No. IN0063657 has an effective date of July 31, 2015, and an expiration date of July 30, 2020.
[42] Outfall 001 is the GWET Building discharge to Riley Lake following the stripping of cVOCs in the tray tower.
[43] By e-mail from Steven Wanner, GHD, dated August 22, 2015, at 8:12 am, I received a screenshot of the GWET system operations screen from August 21, 2015 at 1:09 pm EDT. *See* Attachment 16.
[44] *See* Aerial Photo 1, above.
[45] *See* Aerial Photo 4, above.
[46] Manifests were used to produce Summary of Waste Shipments, pages 9-22, Focused Compliance Inspection August 21, 2015.

Monthly Progress Reports:

Pursuant to Section XIV, paragraph A of the Consent Order, the Respondent (RMC) is required to submit monthly progress reports to the EPA Project Coordinator (in this case, Dr. Sundar). These reports are to summarize work completed for the prior month pursuant to the Statement of Work attached to the Consent Order. Since all work under the terms of the Consent Order is carried out by Kraft, reports required under the Consent Order have been and continue to be submitted on behalf of Kraft by its consultant, Conestoga-Rovers & Associates and, later, GHD.

As part of the task of completing this CAC report I reviewed monthly progress reports for calendar years 2014 and 2015. Each report was addressed to Dr. Sundar and was signed by Mr. Wanner. The 22 reports I reviewed were dated: January 15, 2014; February 15, 2014; March 17, 2014; April 15, 2014; May 15, 2014; June 15, 2014; July 15, 2014; August 15, 2014; September 15, 2014; October 15, 2014; November 18, 2014; December 15, 2014; January 15, 2015; February 16, 2015; March 17, 2015; April 15, 2015; May 15, 2015; June 15, 2015; July 15, 2015; August 17, 2015; September 15, 2015; and October 15, 2015.

These progress reports summarize significant activities relating to vapor intrusion mitigation, soil vapor extraction and groundwater ICMs for the period December 1, 2013 through September 30, 2015.

The monthly progress reports include monthly soil vapor extraction system information sheets. The monthly SVE information sheets include monthly run times for the HB 950 blower system (housed in Building 4) as well as cumulative run times for the former SWMUs 1 and 2 SVE system and the HB 1300 blower system, which was removed from service in February 2012 and replaced by HB 950.

The SVE information sheets also show monthly removal estimates for TCE, PCE and cDCE as well as cumulative totals for each of these chemicals. The cumulative totals include the SVE system serving SWMUs 5 and 11 as well as the now shut-down SVE system which had served SWMUs 1 and 2. For the period in review, the lowest removal rates occurred in July 2014, as the estimated amounts of TCE, PCE and cDCE removed were 6.9 lbs., 0.8 lbs., and 1.3 lbs., respectively. The maximum removal rates, based on corrected removal estimates submitted with the October 15, 2015 progress report, were 416 lbs., 48.6 lbs. and 70.1 lbs. for TCE, PCE and cDCE, respectively which occurred in July 2015.[47] As of September 2015, the cumulative amount of TCE removed from the two SVE systems was 5.2 tons. The cumulative totals for PCE and cDCE as of September 2015 were 2.9 tons and 1.1 tons, respectively.

The monthly progress reports each state that the federal Discharge Monitoring Reports (DMRs) and State Monthly Monitoring Reports (MMRs) were submitted to IDEM as required by NPDES Permit No. IN006357 for the prior month's reporting period. These include samples drawn from Outfall 001 (GWET Building effluent) which are analyzed each month for PCE, TCE, cDCE and vinyl chloride.

[47] *See* October 15, 2015 progress report, Attachment C – Revised SVE OM&M System Reports.

The September 15, 2014 progress report includes IDEM's NPDES Industrial Facility Inspection Report dated August 13, 2014.[48] (Attachment 21.) IDEM reported no violations were observed.[49]

The progress reports include annual Vapor Mitigation System inspection forms by Conestoga-Rovers & Associates (for 2014-2015) and GHD (for 2015). Inspection forms are only provided for about 25% of the homes fitted with vapor intrusion controls.

The May 15, 2015 progress report included as attachments letters dated April 15, 2015, from Mr. Wanner to residences within the vapor intrusion zone.[50] These letters include analytical results summaries for PCE, TCE, 1,1-DCE, cDCE, tDCE and vinyl chloride from subslab and indoor air samples (not every residence had subslab samples taken) obtained in December 2014 or January 2015. None of the residences exceeded EPA's screening levels for either indoor air quality or subslab vapor concentrations.

The two most recent progress reports as of the date of this report are attached. (Attachment 22.)

Status of Interim Corrective Measures:

As discussed above, a number of interim corrective measures to address impacts to soil and groundwater from releases of chlorinated organics from historical practices at the Site have been implemented by Kraft. These ICMs address impacts from SWMUs 1, 2, 5, 11 and 12 and from AOCs 2, 3B and 5, as well as offering protection to the City of Attica's public drinking water supply wells. Kraft has also connected all residences surrounding the Site to the City's municipal supply wells and has installed vapor intrusion controls at 60 nearby residences to protect indoor air quality at these residences.

The ICMs have consisted of in-situ chemical oxidation, soil excavation and offsite disposal or incineration, air sparging and soil vapor extraction, and air stripping to remove cVOCs from groundwater and the air space above groundwater. ICMs have been completed to date at AOCs 3B and 5 and at SWMU 12. The SVE system serving SWMUs 1 and 2 was shut down in April 2014 and its final status will be evaluated in the forthcoming Corrective Measures Study.

At EPA's request, Mr. Wanner generated a spreadsheet summarizing interim corrective measures implemented at the Site.[51] The spreadsheet shows the SWMU or AOC targeted for treatment by ICMs, media of concern, contaminants of concern, treatment technology, and system status (*i.e.*, ongoing, corrective measures completed, or system shut-down and remediation goals to be evaluated in the Corrective Measures Study). (Attachment 23.)

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[48] *See* Attachment A to the September 15, 2014 monthly progress report.

[49] *See* August 19, 2014 letter from Donald R. Daily, Office of Water Quality, IDEM, to Steve Davis. (Attachment 20.)

[50] *See* May 15, 2015 monthly progress report, Attachment C – Resident Data Transmittal Letters.

[51] By e-mail from Steven Wanner, GHD, dated August 26, 2015, at 12:36 pm, I received an ICM summary spreadsheet. *See* Attachment 21.

The effects of the groundwater extraction and AS/SVE system ICMs can be seen in the regression of the PCE and TCE plumes in the overburden from October 2010 to April and July 2013. (Attachment 24.) In these figures, comparisons between the 5 µg/L concentration contours for both chemicals show regression of the plumes in their respective west-northwest expansion from the source areas (SWMUs 1 and 2 in the north; SWMUs 5 and 11 and AOC 2 in the south). Groundwater quality at the majority of down-gradient wells shows improvement as concentrations for PCE and TCE are seen to be decreasing in all but a few exceptions for the time period evaluated.

The regression in the areal extent of the TCE plume is slightly more pronounced than that of the PCE plume, but the data indicate some measure of success with the ICMs to date.

Also, Attachment 25 shows the locations of the AS/SVE remedial trench as well as the locations of groundwater extraction wells EW-01 to EW-16 and BEW-01 and the simulated hydraulic containment resulting from these two ICMs (AS/SVE in the north; SVE of incoming groundwater in the GWET Building in the south).

A comparison of both PCE and TCE concentrations in overburden groundwater between February 2014 and November 2014 with October 2010 reveals a lowering, generally speaking, of cVOC concentrations at the overburden wells.[52] For example, with respect to PCE concentrations in the overburden, a comparison of 2014 data shows lower concentrations at wells OB-34, OB-36, OB-37 and OB-44 over time. Similarly, TCE concentrations in overburden wells OB-06, OB-32, OB-34 and OB-36 were lower in 2014 than in 2010. Only well OB-44 saw a slight increase in TCE concentration from 2010 to 2014. (Attachment 26.)

Similarly, a comparison of selected cVOC concentrations from various overburden wells from the time period September 2008 to July 2009 versus selected cVOC concentrations from February and November 2014, when compared to IDEM tap water standards, shows improved overburden groundwater quality. (Attachment 27.)

The implementation of ICMs has also resulted in the achievement of site-specific soil vapor criteria between May 2014 and January 2015 with the lone exception of soil vapor probe VP-35, where the TCE soil vapor criterion was exceeded during sampling on May 19, 2014, but subsequent sampling on July 11, 2014, July 30, 2014 and January 9, 2015 all showed the TCE soil vapor criterion was met at this probe. (Attachment 28.)

CA 725 and CA 750 Environmental Indicators Determinations:

On July 6, 2015 GHD submitted an Environmental Indicators (EI) 725 Determination to EPA.[53] EIs are measures being used by the RCRA Corrective Action program to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment

[52] Comparison of PCE and TCE concentrations in the overburden aquifer from Attachment 26 (February and November 2014 data) to Attachments 10 and 11 (October 2010 data).

[53] Letter from Steven Wanner, GHD, to Dr. Bhooma Sundar, EPA Project Coordinator, dated July 6, 2015.

in relation to current human exposures (CA 725) to contamination and the migration of contaminated groundwater (CA 750).

GHD evaluated whether Site contaminants of concern are both present at concentrations greater than risk-based protection levels and that exposure pathways for human receptors are completed. GHD made the above determination for seven media where potential exposure routes exist: groundwater, indoor air, surface soil, subsurface soil, surface water, sediment and ambient air.

According to EPA's EI 725 summary worksheet[54] a positive Current Human Exposures Under Control EI determination ("YES" under column 4 in the following table) indicates that there are no unacceptable human exposures to contaminants in concentrations in excess of appropriate risk-based levels that can be reasonably expected under current land- and groundwater-use conditions (for all contamination subject to RCRA corrective action at or from the identified facility, including both on-site and off-site impacts).

The following table was produced from GHD's July 6, 2015 submittal:

ENVIRONMENTAL INDICATORS SUMMARY TABLE			
MEDIA	**CONTAMINANTS ABOVE PROTECTIVE RISK-BASED LEVELS (Y/N)**	**COMPLETED EXPOSURE PATHWAYS WITH HUMAN RECEPTORS (Y/N)[55]**	**CURRENT HUMAN EXPOSURES UNDER CONTROL (Y/N)**
Groundwater	YES	NO	YES
Air (indoors)	YES	NO	YES
Surface soil (< 2 ft)	NO	N/A	YES
Surface water	NO	N/A	YES
Sediment	NO	N/A	YES
Subsurface soil (> 2 ft)	YES	NO	YES
Air (outdoors)	NO	N/A	YES

Although GHD provides rationale for the above EI determination – specifically, in Attachments A and B of its submittal and with supporting documentation – the EI 725 determination is ultimately made by EPA. The July 6, 2015 submittal will assist the EPA project manager in making this determination.

In March 2014, Dr. Sundar prepared an EI CA 750 determination to assess if migration of contaminated groundwater was under control. In her CA 750 determination, Dr. Sundar states:

> "The groundwater VOC plume is being addressed by ICMs including on-Site overburden and bedrock groundwater extraction wells installed (and operating) down gradient from the main plant area south of Summit Street, and a

[54] Documentation of Environmental Indicator Determination (Interim Final 2/5/99).

[55] If within a given media there are no contaminants above protective risk-based levels, the question of whether there are completed exposure pathways with human receptors is not applicable (N/A).

groundwater AS/SVE remedial trench installed to the north of Summit Street. The ICMs have resulted in significant reductions in on-Site VOC concentrations in soil and groundwater and reductions in contaminant migration. Further the Attica city water treatment system has eliminated low-level concentrations of TCE in the city water supply.

The ICM monitoring plan has been implemented in addition to the semi-annual groundwater monitoring events that continue. A new groundwater monitoring plan will be mandated in future that combines portions of these two plans into one monitoring program. This new groundwater monitoring plan will include monitoring well locations that are chosen to evaluate the effectiveness of the ICMs and wells to verify that plume attenuation occurs within the existing area of contaminated ground water.

Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Radio Materials Corporation facility. Specifically, this determination indicates that the migration of contaminated groundwater is under control."[56]

The CA 750 goes on to further state that "monitoring will be conducted to confirm that contaminated groundwater remains within the 'existing area of contaminated groundwater.'"[57]

Based on the above EI determinations – with the caveat that a final EI 725 determination will be determined by EPA's project coordinator – ICMs implemented on-Site and off-Site have resulted in control of the migration of contaminated groundwater and the absence of completed human exposure pathways for Site COCs in all environmental media evaluated.

Findings:

The Site inspection, interviews with Mr. Wanner and pre- and post-CAC records reviews have confirmed that: (i) the SVE system which served SWMUs 1 and 2 has been decommissioned with EPA approval following reduction of cVOCs in subsurface soils and miniscule reductions of cVOCs at relatively high operational costs (*i.e.*, nearly asymptotic cumulative cVOC removal rates over time during the final months leading up to shut-down of the system); (ii) Kraft, through GHD, continues to operate the GWET Building controls and AS/SVE Building controls in an ongoing effort to mitigate cVOC impacts to the overburden down-gradient of the Site and to the bedrock aquifer beneath and down-gradient to the Site; (iii) active and passive residential soil vapor mitigation systems which Kraft had installed are still operational and continue to protect indoor air quality for several dozen residences west-northwest of the Site, and; (iv) Kraft,

[56] *See* Documentation of Environmental Indicator Determination – Environmental Indicator (EI) RCRIS code (CA750), Migration of Contaminated Groundwater Under Control, Radio Materials Corporation, completed and signed by Bhooma Sundar, Toxicologist, on March 31, 2014, pp. 11-12.
[57] Ibid, pg. 12.

through GHD, continues to operate an air stripper to ensure TCE (and other cVOCs) levels in the public drinking water supply (Wells Nos. 1 and 2) do not exceed federal MCLs or State RDCLs.

Based on the above, as of the date of this report RMC and Kraft are in compliance with the requirements of the Consent Order.

Further Action Required:

No further action is anticipated at this point.

List of Attachments:

1. Groundwater Potentiometric Surface and Direction Maps (4)[58]
2. Site map showing SWMUs and AOCs[59]
3. Figure – Area of Potential Discharge to Wabash River[60]
4. Graph - SWMU 1 and 2 Air Effluent VOC Concentration vs. Time[61]
5. Graph - Cumulative Primary VOC Removal versus Time[62]
6. Figure - PCE Soil Gas Concentration Summary[63]
7. Figure - TCE Soil Gas Concentration Summary[64]
8. Figure - Summary of Vapor Mitigation Activities[65]
9. City of Attica Restrictive Groundwater Ordinance
10. Figure - Overburden Observed PCE Concentrations (October 2010)[66]
11. Figure - Overburden Observed TCE Concentrations (October 2010)[67]
12. Figure - Overburden Observed cDCE Concentrations (October 2010)[68]

[58] *See* Groundwater Interim Corrective Measures Design Plans and Specifications Radio Materials Corporation (Conestoga-Rovers & Associates, October 2010), Figures 2.2 and 2.3; July 6, 2015 CA725 EI Determination, Steven Wanner, GHD, to Bhooma Sundar, EPA, Attachment A, Figures A.2 and A.3.

[59] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure 1.2.

[60] Ibid, Figure 4.1.

[61] Proposed Decommissioning of SMWU 1 and 2 SVE System, (Conestoga-Rovers & Associates, February 25, 2014), Attachment A.

[62] Proposed Decommissioning of SMWU 1 and 2 SVE System, (Conestoga-Rovers & Associates, February 25, 2014), Attachment B.

[63] RFI Addendum 2 Supplemental Vapor Intrusion Investigation and Mitigation Work Plan Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure 3.6.

[64] RFI Addendum 2 Supplemental Vapor Intrusion Investigation and Mitigation Work Plan Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure 3.7.

[65] RFI Addendum 2 Supplemental Vapor Intrusion Investigation and Mitigation Work Plan Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure 3.8.

[66] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure A.1.

[67] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure A.2.

[68] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure A.3.

13. Figure - Overburden Observed Vinyl Chloride Concentrations (October 2010)[69]
14. Figure - Observed PCE Concentrations in Bedrock (October 2010)[70]
15. Figure - Observed TCE Concentrations in Bedrock (October 2010)[71]
16. Figure - Observed cDCE Concentrations in Bedrock (October 2010)[72]
17. Chart - Mann-Kendrall Trend Test Summary[73]
18. Radio Materials Corporation Site Post CA 550 Inspection Photo Log – Inspection Date August 21, 2015
19. IDEM NPDES Permit No. IN0063657
20. GWET System operations screen capture from August 21, 2015
21. IDEM August 13, 2014 NPDES Industrial Facility Inspection Report
22. Monthly Progress Reports dated September 15, 2015 and October 15, 2015
23. Spreadsheet – Summary of Interim Corrective Measures Status – August 2015
24. Figures – 2010 and 2013 TCE Plume Extent (Overburden) and 2010 and 2013 PCE Plume Extent (Overburden)[74]
25. Figure – Simulated Hydraulic Containment for GW ICMs[75]
26. Figures – PCE and TCE Concentrations in Overburden Groundwater – February 2014 and November 2014 (4)[76]
27. Figures – Summary of VOC Detections Above RDCLs (2008-2009) and Summary of 2014 Semiannual Groundwater Analytical Results for Selected cVOCs[77]
28. Figure – 2014 and 2015 Soil Vapor Results[78]

[69] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure A.4.
[70] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure A.5.
[71] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure A.6.
[72] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, February 2013), Figure A.7.
[73] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, February 2013), Table 3.3.
[74] RFI Addendum 4 Supplemental Vapor Intrusion Investigation and Mitigation Report (Conestoga-Rovers & Associates, March 2015), Figures 15 and 16.
[75] RFI Addendum 3 Groundwater Investigation Update Radio Materials Corporation (Conestoga-Rovers & Associates, September 2013), Figure 5.1.
[76] RFI Addendum 4 Supplemental Vapor Intrusion Investigation and Mitigation Report (Conestoga-Rovers & Associates, March 2015), Figures 8-11.
[77]Groundwater Interim Corrective Measures Design Plans and Specifications Radio Materials Corporation (Conestoga-Rovers & Associates, October 2010), Figures 2.4 and RFI Addendum 4 Supplemental Vapor Intrusion Investigation and Mitigation Report (Conestoga-Rovers & Associates, March 2015), Figure 7.
[78] Ibid, Figure 12.

ATTACHMENT 1

RADIO MATERIALS CORPORATION

GROUNDWATER POTENTIOMETRIC SURFACE AND DIRECTION MAPS

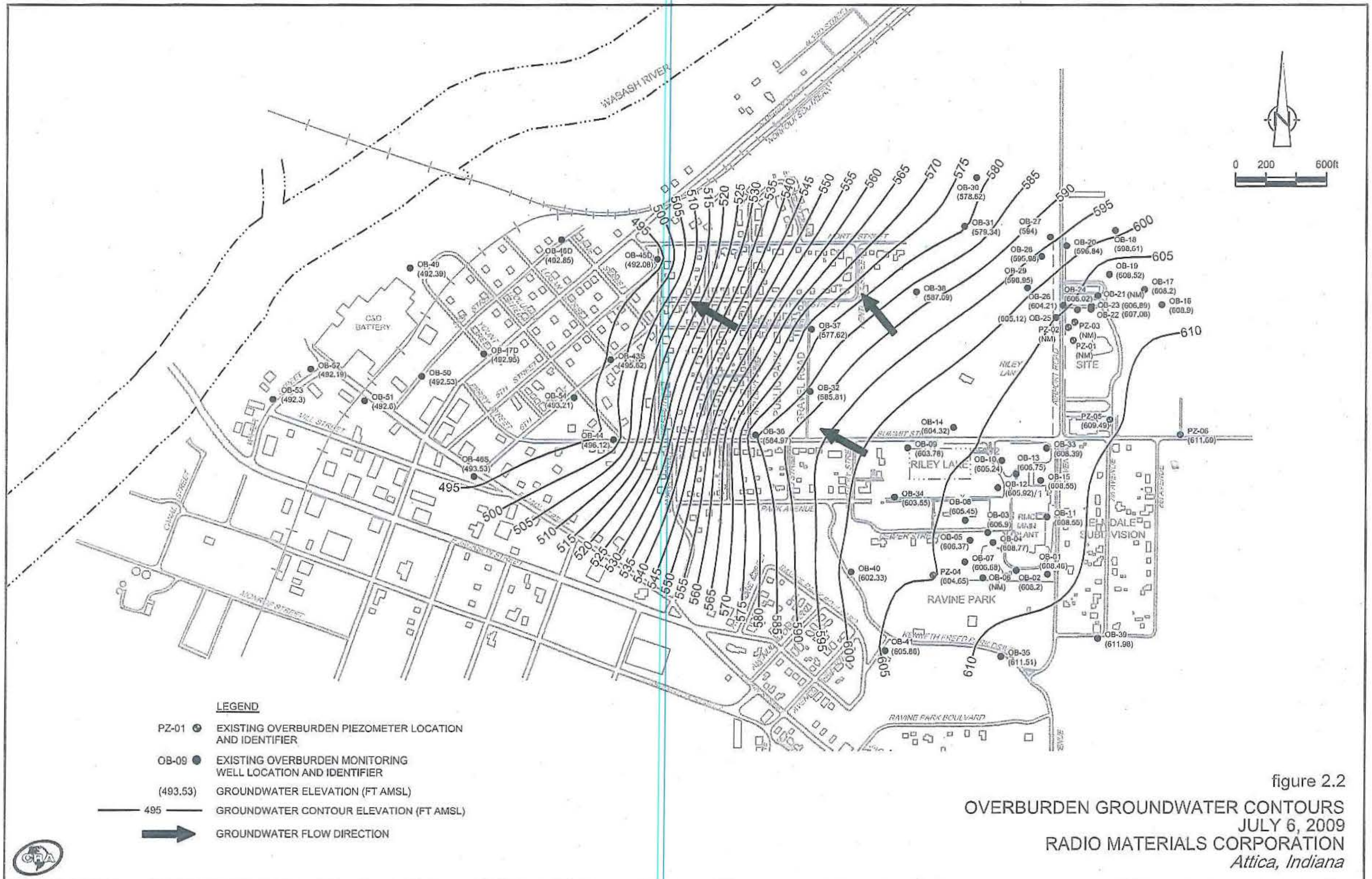


figure 2.2

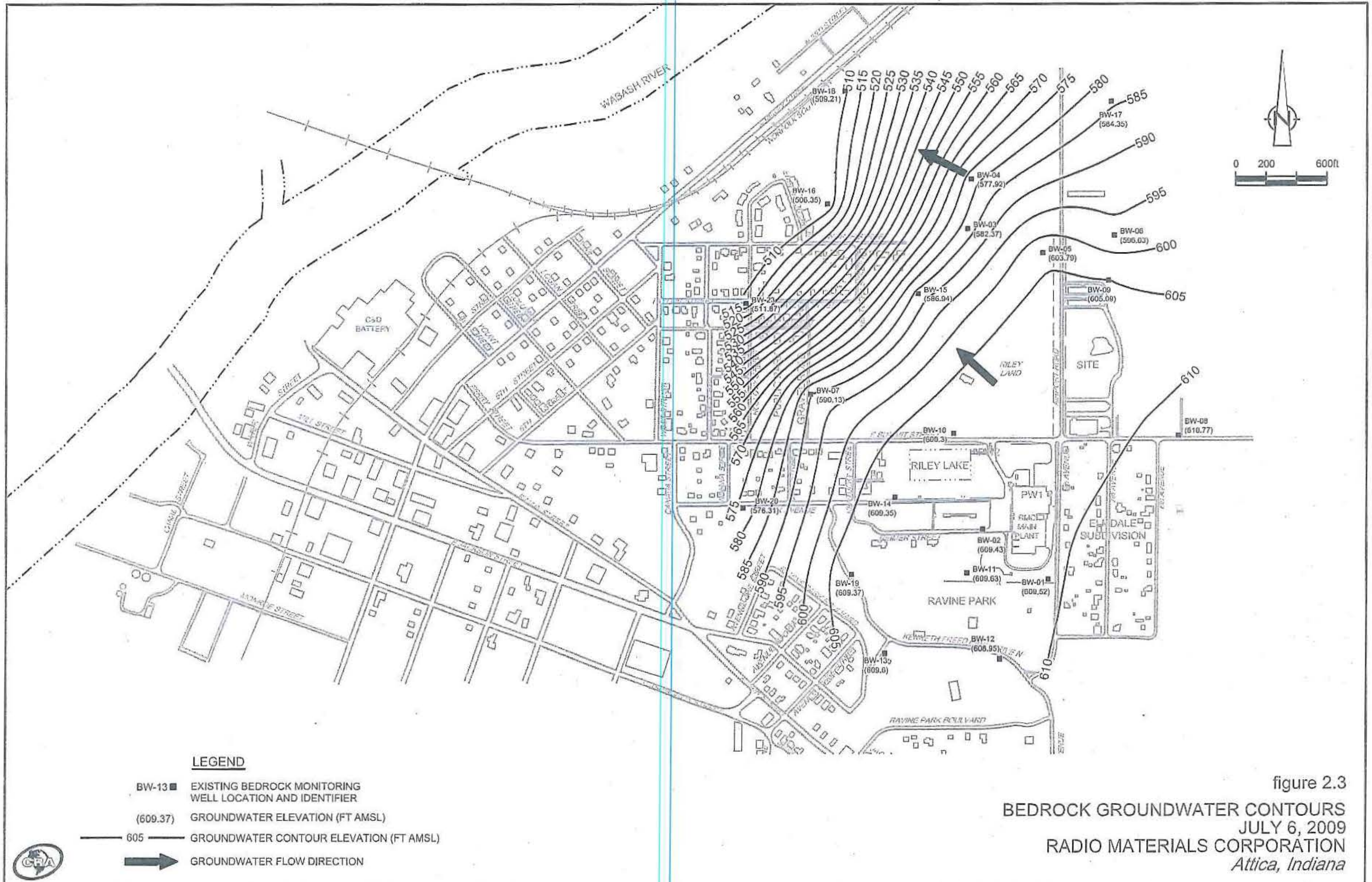
OVERBURDEN GROUNDWATER CONTOURS

JULY 6, 2009

RADIO MATERIALS CORPORATION

Attica, Indiana

19190-02(041)GN-CO007 FEB 24/2010



LEGEND

BW-13 ■ EXISTING BEDROCK MONITORING WELL LOCATION AND IDENTIFIER

(609.37) GROUNDWATER ELEVATION (FT AMSL)

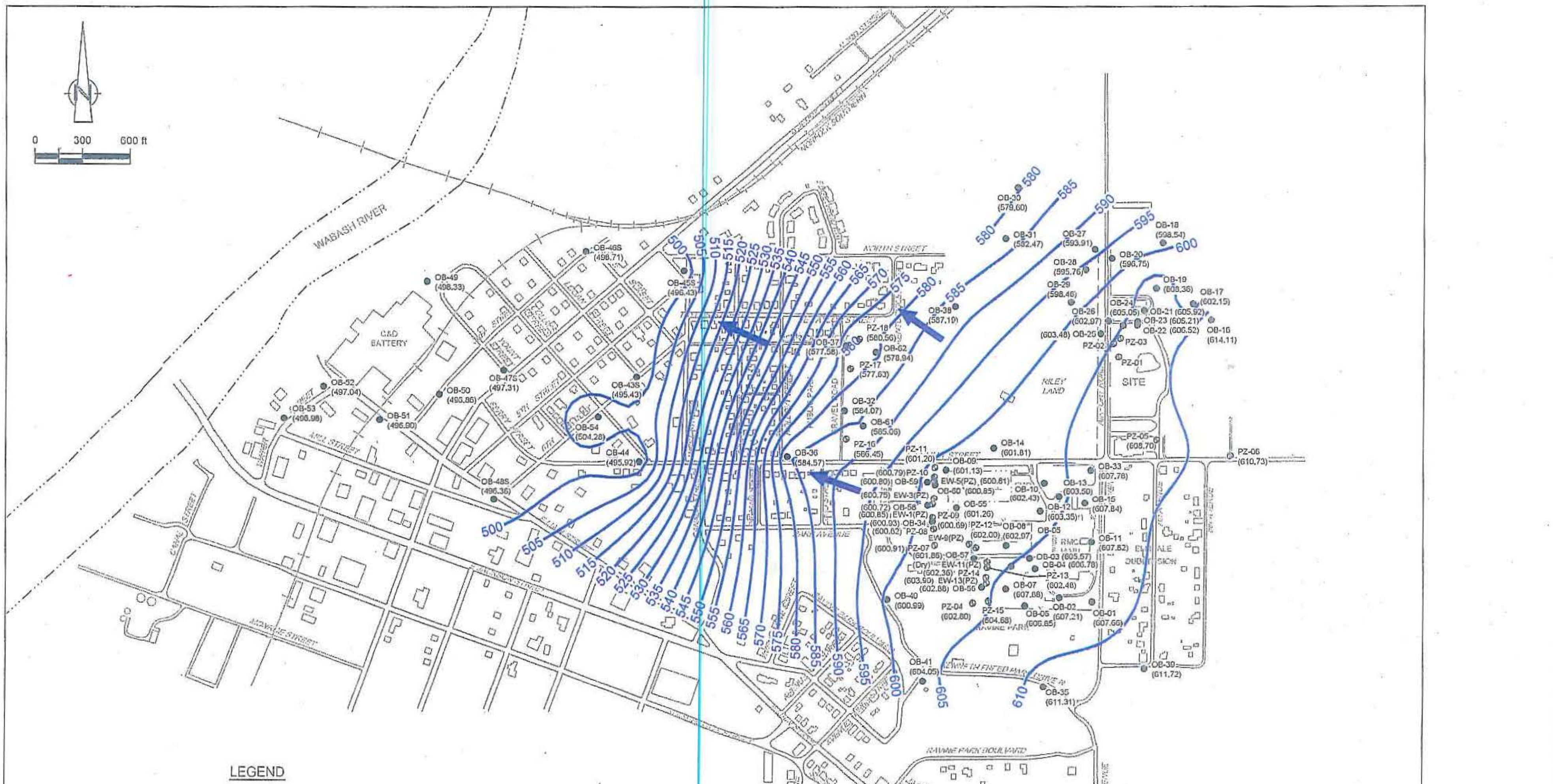
—— 605 —— GROUNDWATER CONTOUR ELEVATION (FT AMSL)

➡ GROUNDWATER FLOW DIRECTION

figure 2.3

BEDROCK GROUNDWATER CONTOURS
JULY 6, 2009
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(041)GN-CO008 FEB 24/2010



LEGEND

OB-09 ● EXISTING OVERBURDEN MONITORING WELL LOCATION AND IDENTIFIER

PZ-01 ◎ EXISTING OVERBURDEN PIEZOMETER LOCATION AND IDENTIFIER

(601.43) GROUNDWATER ELEVATION (FT AMSL)

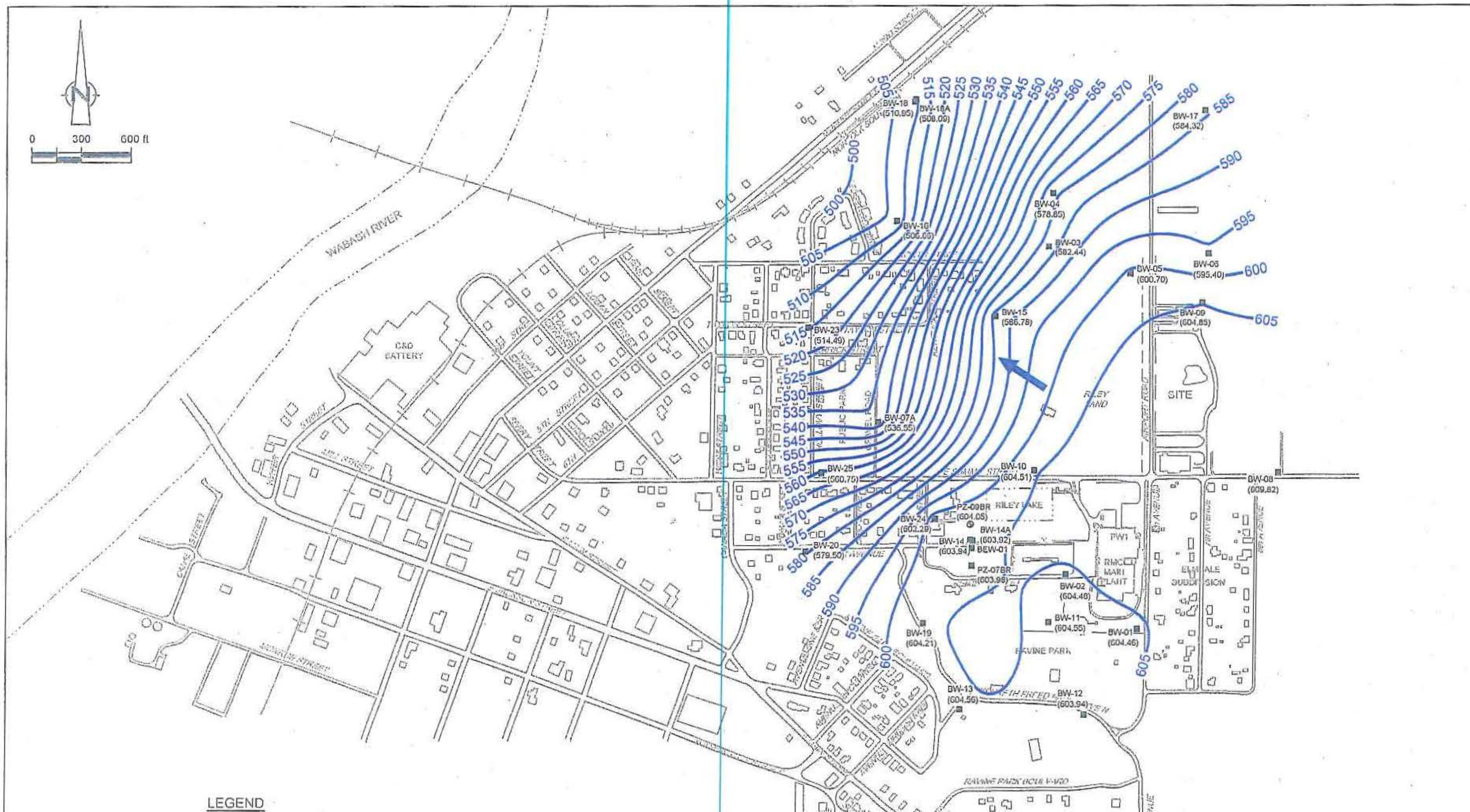
—600— GROUNDWATER CONTOUR ELEVATION (FT AMSL)

➡ GROUNDWATER FLOW DIRECTION

figure A.2

MARCH 2015 OVERBURDEN WELL
REGIONAL GROUNDWATER CONTOUR MAP
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-50(SUND161)GN-WA002 JUN 11, 2015



LEGEND

BW-7 EXISTING BEDROCK MONITORING WELL LOCATION AND IDENTIFIER

PZ-09BR EXISTING BEDROCK PIEZOMETER LOCATION

(607.76) GROUNDWATER ELEVATION (FT AMSL)

605 GROUNDWATER CONTOUR ELEVATION (FT AMSL)

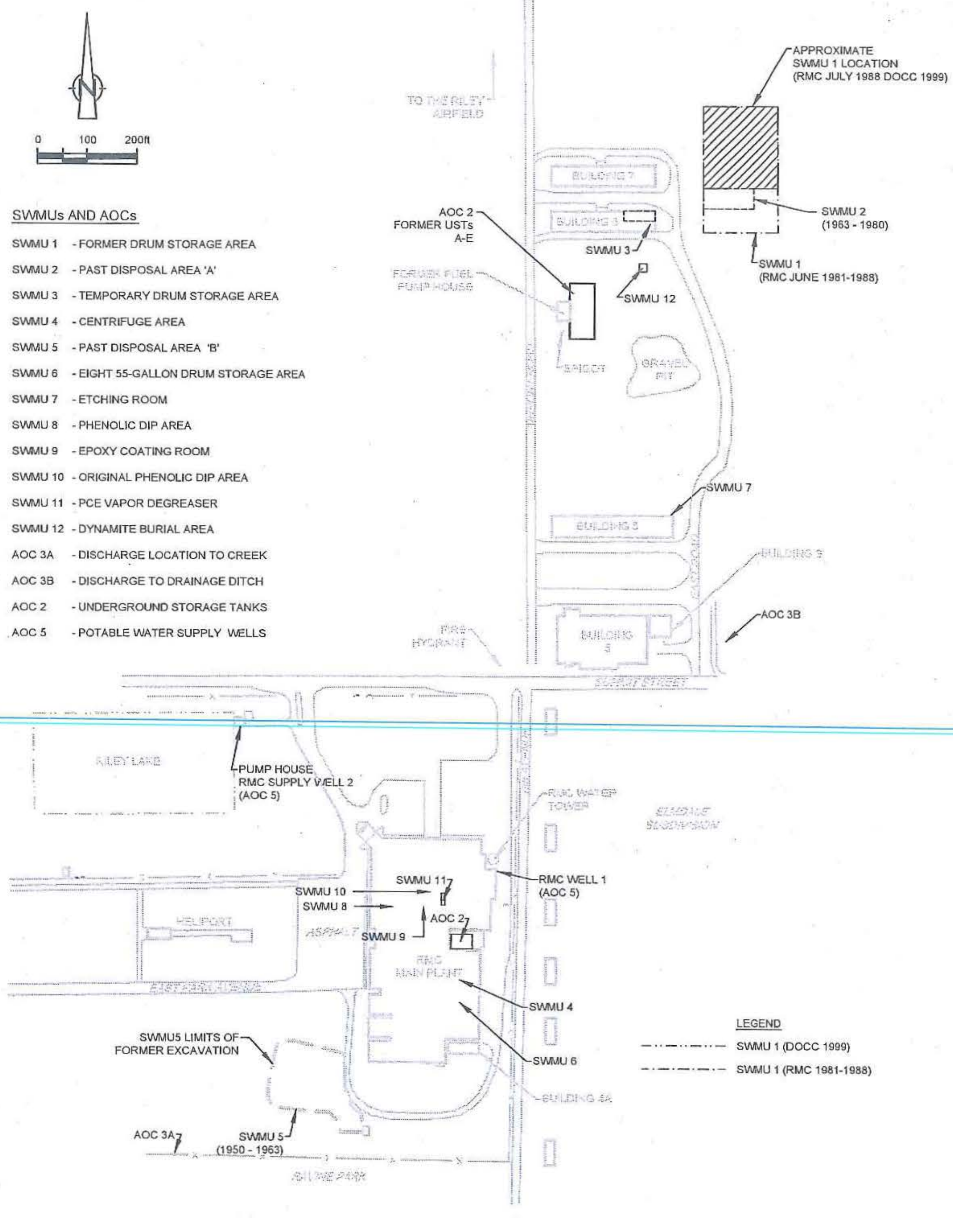
GROUNDWATER FLOW DIRECTION

figure A.3

MARCH 2015 BEDROCK WELL
REGIONAL GROUNDWATER CONTOUR MAP
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-50(SUND161)GN-WA003 JUN 11, 2015

ATTACHMENT 2
RADIO MATERIALS CORPORATION
SITE MAP SHOWING SWMUS AND AOCS



NOTE:

SWMU 1 APPEARS TO HAVE VARIED IN SIZE FROM THE EXTENTS SHOWN IN RMC DRAWINGS (1981 TO 1988) TO THE DOCC REPORT (1999)

figure 1.2

SITE PLAN WITH SWMUs AND AOCs
RADIO MATERIALS CORPORATION
Attica, Indiana

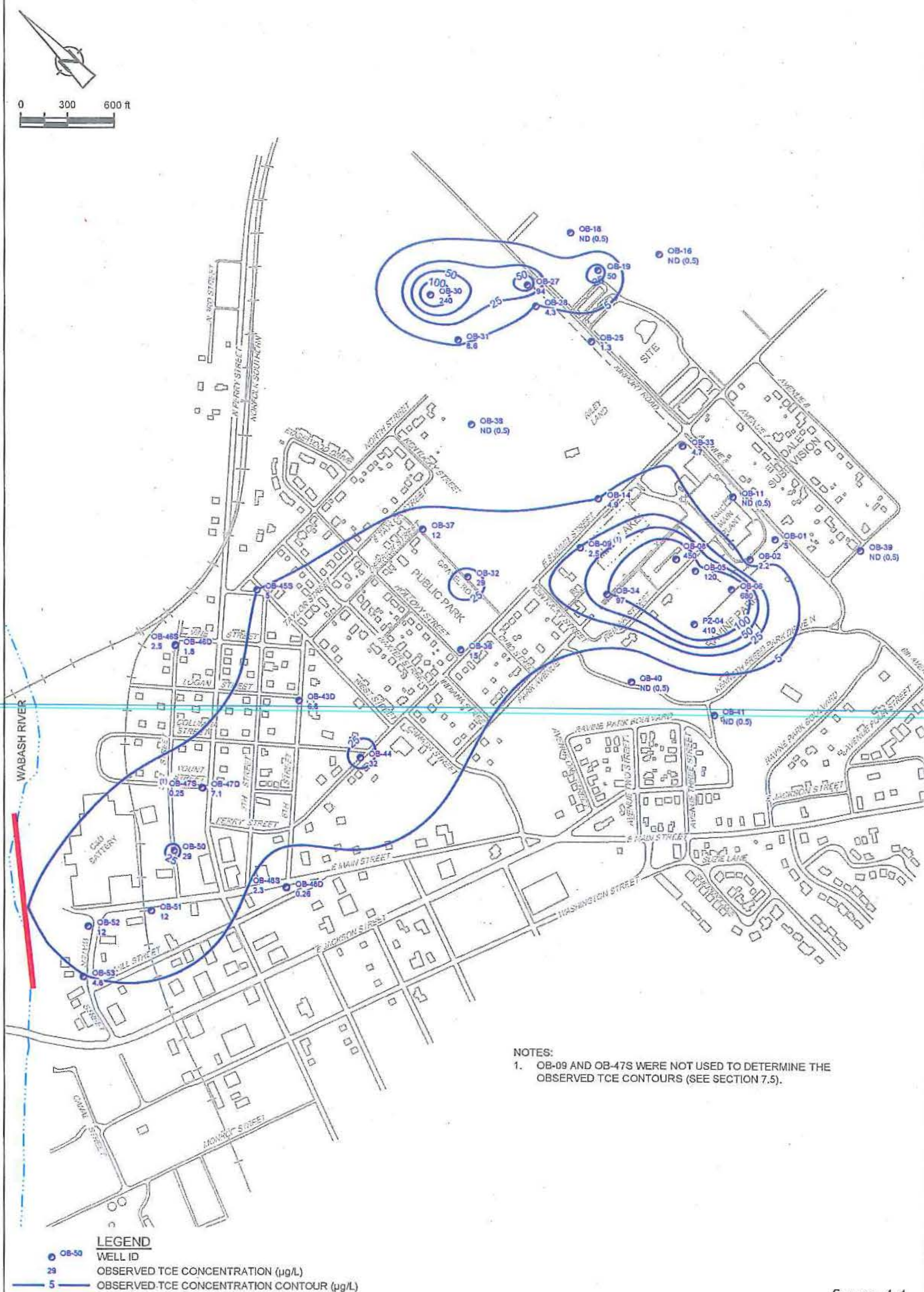
SOURCE: PHASE I RFI (2000)

19190-02(056)GN-WA005 SEP 24/2013

ATTACHMENT 3

RADIO MATERIALS CORPORATION

FIGURE SHOWING AREA OF POTENTIAL DISCHARGE TO WABASH RIVER



NOTES:
1. OB-09 AND OB-47S WERE NOT USED TO DETERMINE THE OBSERVED TCE CONTOURS (SEE SECTION 7.5).

LEGEND

- OB-50 WELL ID
- 29 OBSERVED TCE CONCENTRATION (µg/L)
- 5 OBSERVED TCE CONCENTRATION CONTOUR (µg/L)
- CROSS-SECTIONAL AREA OF POTENTIAL TCE DISCHARGE

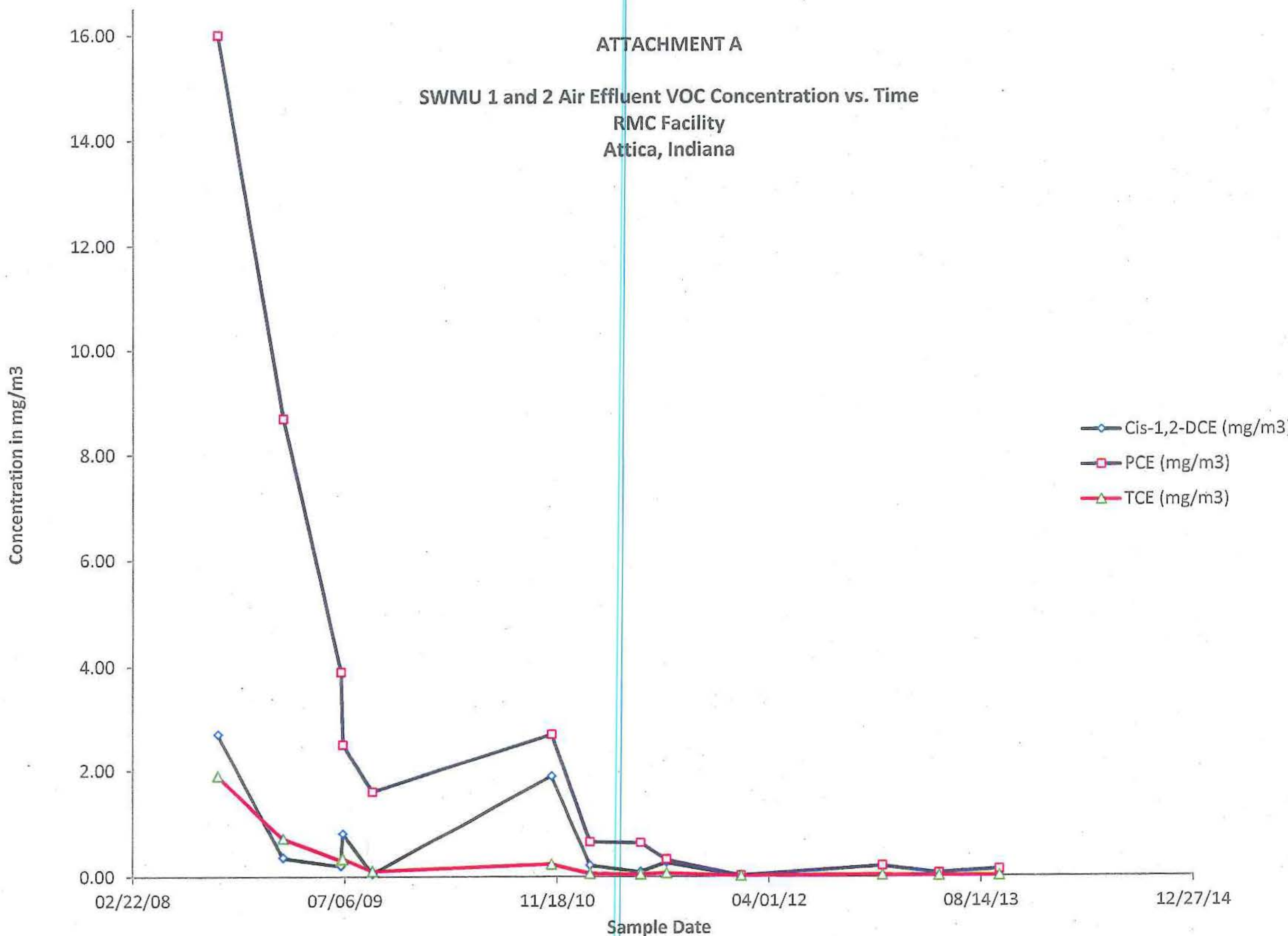
figure 4.1
AREA OF POTENTIAL DISCHARGE TO WABASH RIVER
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA008 SEP 24/2013

ATTACHMENT 4

RADIO MATERIALS CORPORATION

GRAPH SHOWING SWMU 1 AND 2 AIR EFFLUENT CONCENTRATION VERSUS TIME

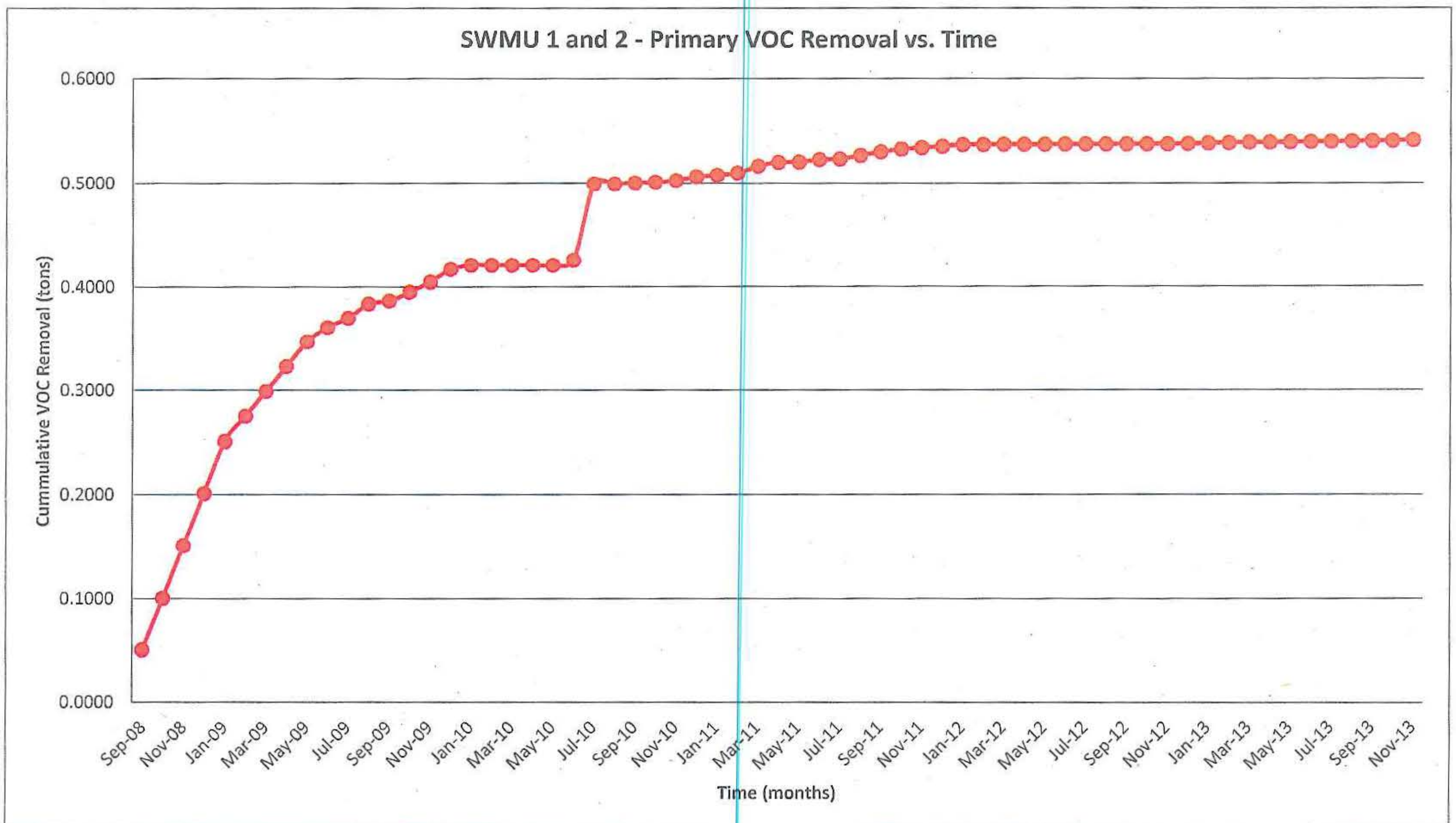


019190-10(SUNDXXX)

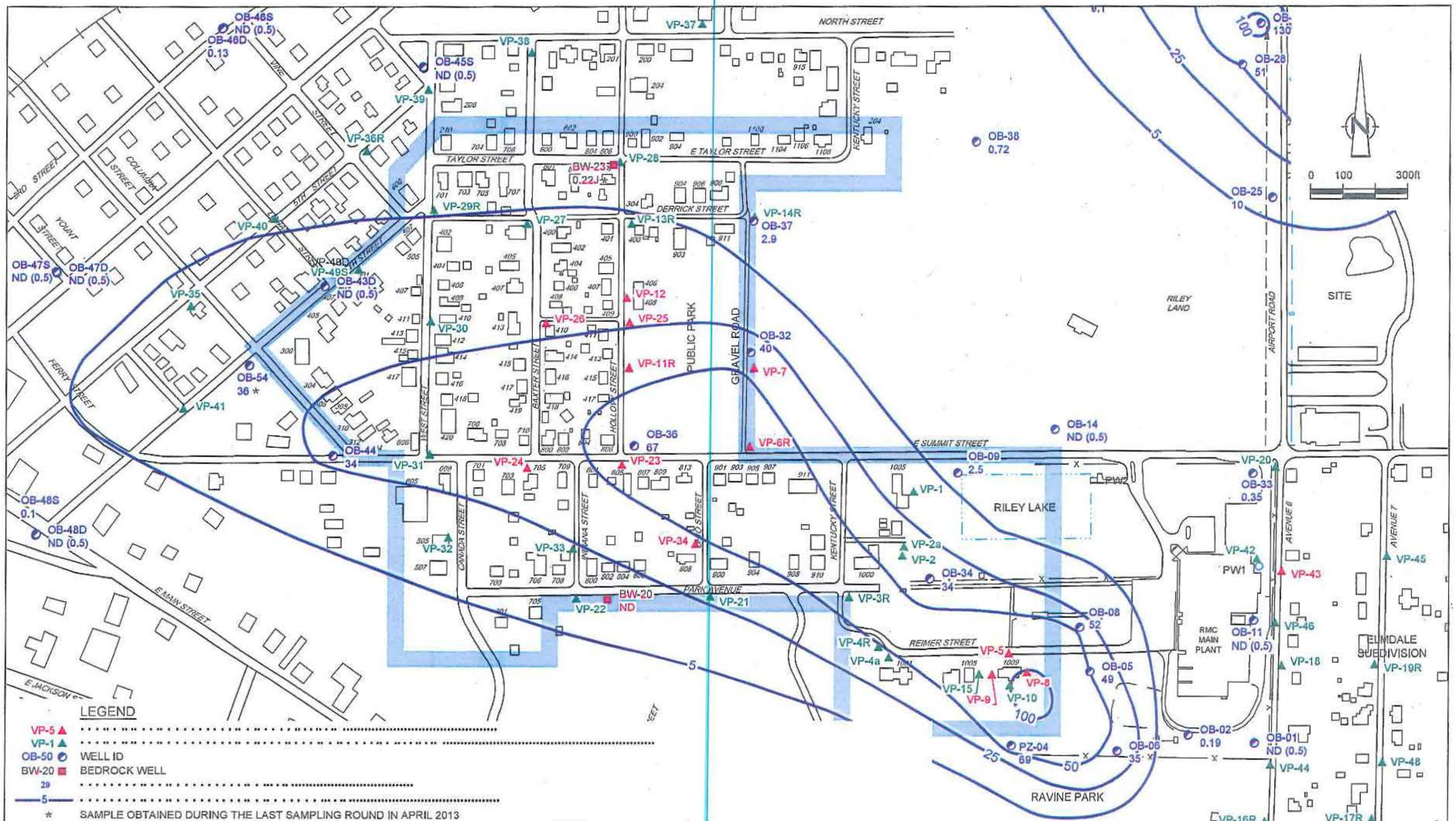
ATTACHMENT 5

RADIO MATERIALS CORPORATION

GRAPH SHOWING CUMULATIVE PRIMARY VOC REMOVAL VERSUS TIME


SWMU 1 and 2 - Primary VOC Removal vs. Time
Cummulative VOC Removal (tons)
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Mar-13
May-13
Jul-13
Sep-13
Nov-13
Time (months)

ATTACHMENT 6
RADIO MATERIALS CORPORATION
FIGURE SHOWING PCE SOIL GAS CONCENTRATION SUMMARY



LEGEND

VP-5 ▲
VP-1 ▲
OB-50 WELL ID
BW-20 BEDROCK WELL
29
5
* SAMPLE OBTAINED DURING THE LAST SAMPLING ROUND IN APRIL 2013

NOTE:
1. STUDY AREA OUTLINED IN BLUE FROM VAPOR INTRUSION MITIGATION INTERIM CORRECTIVE MEASURES WORK PLAN (CRA, OCTOBER 5, 2009)

figure 3.6

PCE SOIL GAS CONCENTRATION SUMMARY
RADIO MATERIALS CORPORATION
Attica, Indiana

CRA

19190-00(055)GN-WA011 SEP 26/2013

ATTACHMENT 7

RADIO MATERIALS CORPORATION

FIGURE SHOWING TCE SOIL GAS CONCENTRATION SUMMARY

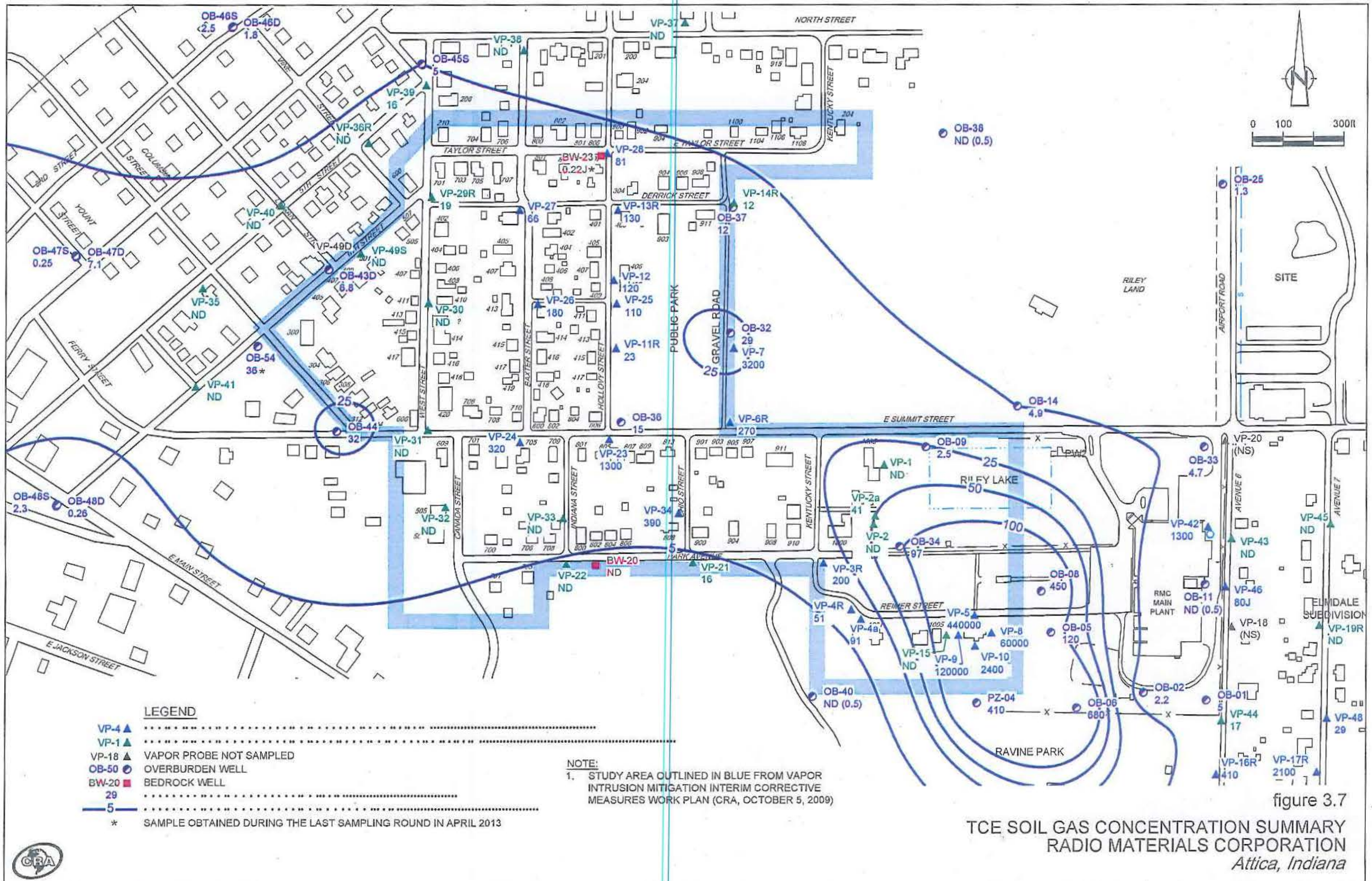


figure 3.7

TCE SOIL GAS CONCENTRATION SUMMARY
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-00(055)GN-WA001 SEP 26/2013

ATTACHMENT 8

RADIO MATERIALS CORPORATION

FIGURE SHOWING SUMMARY OF VAPOR MITIGATION ACTIVITIES

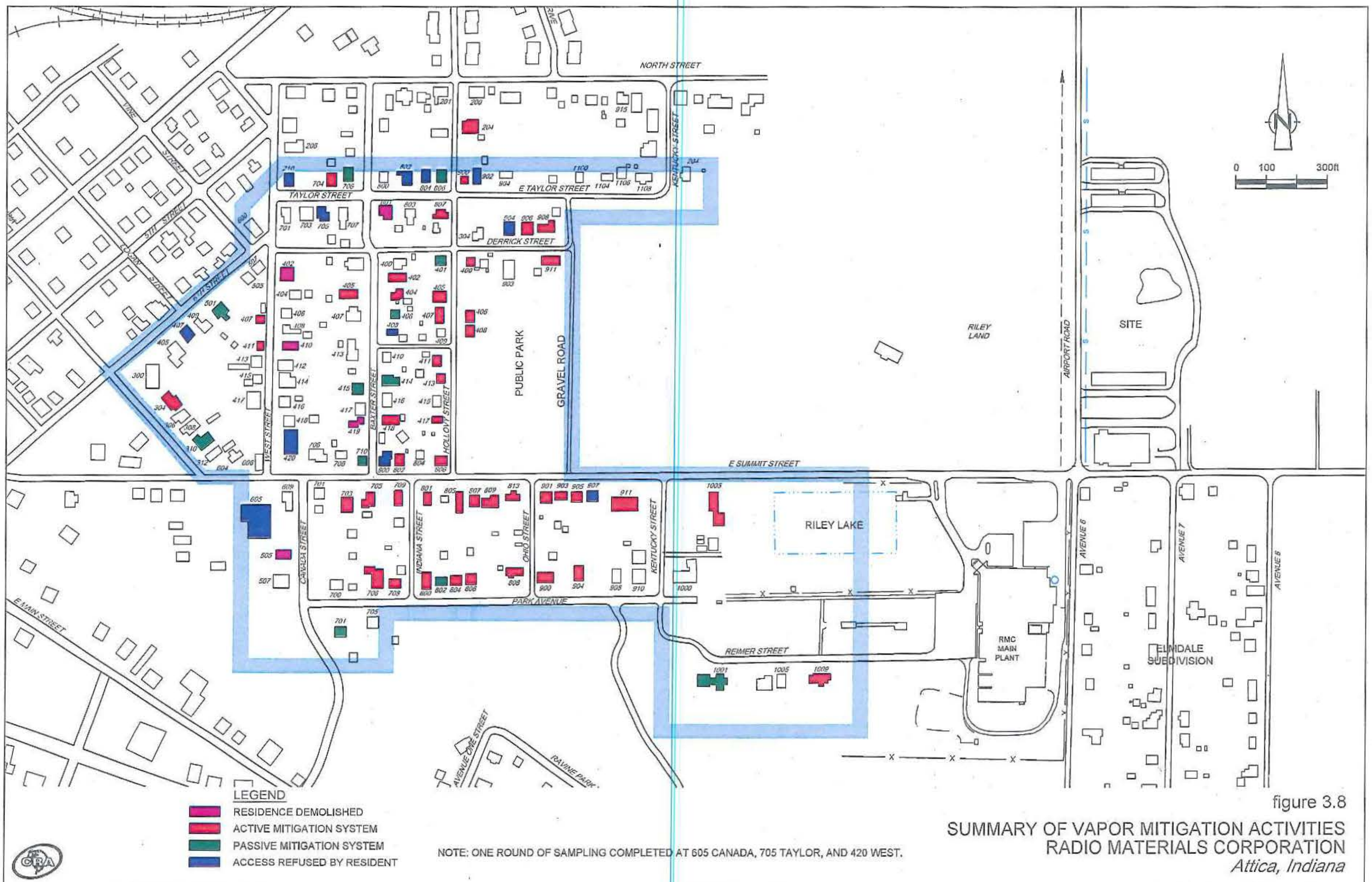


figure 3.8

SUMMARY OF VAPOR MITIGATION ACTIVITIES
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-00(055)GN-WA009 SEP 26/2013

ATTACHMENT 9
RADIO MATERIALS CORPORATION
CITY OF ATTICA RESTRICTIVE GROUNDWATER ORDINANCE

ORDINANCE NO. 2 2013

AN ORDINANCE AMENDING CHAPTER 9, ARTICLE 6, SECTION 9
BY THE INCLUSION OF SECTION 9-89
PROHIBITING THE INSTALLATION AND USE OF NEW WATER WELLS
WITHIN THE CITY OF ATTICA, INDIANA

WHEREAS, ground water existing beneath the ground of the City of Attica may contain certain volatile organic compounds, in some instances above U.S. EPA's maximum contaminant levels (MCLs) for those specific compounds; and

WHEREAS, the Common Council for the City of Attica finds that the public health, safety and welfare of the Attica residents is best protected by restricting installation or use of new water wells within the City of Attica; and

WHEREAS, a public water utility system is operated and maintained for the City of Attica that provides a safe and reliable water supply to customers throughout the entire City.

NOW, THEREFORE, be it ordained by the Common Council for the City of Attica as follows:

Section One: The term "water well" means any system used to extract ground water for human consumption or other use. The term does not include ground water wells used as part of an environmental investigation, monitoring or remediation project.

Section Two: Beginning on the effective date of this Ordinance, the installation or use of any new water well at any property within the City of Attica is prohibited.

Section Three: No person, including any corporation, partnership or association, shall use, drill, or otherwise install any new water well within the City of Attica in violation of this Ordinance.

Section Four: Nothing in this Ordinance shall be construed as requiring Attica or any public water utility to install or provide any water improvements or service to any person or premises that are not otherwise currently in existence at the time of passage of this Ordinance.

Section Five: Violations of this Ordinance shall subject the Violator to the provisions of Section 1-17 of the Attica City Code. In addition, the City may seek to enjoin the violation of the provisions of this Ordinance in a Court of competent jurisdiction. Each day that such person continues to operate or maintain any such water well shall be a separate violation.

Section Six: Pursuant to Indiana Code § 36-1-6-11, Attica must give written notice to the Indiana Department of Environmental Management (IDEM) of the adoption of this Ordinance within thirty (30) days of its passage. The City is hereby ordered to provide such notice to IDEM at the following address:

IDEM, Office of Land Quality
Remediation Services Branch
Attn: Branch Chief
100 N. Senate Avenue
MC66-22
Indianapolis, Indiana 46204-2251

Section Seven: In addition, and also pursuant to Indiana Code § 36-1-6-11, the City must give written notice to IDEM no later than sixty days before Attica would either amend or repeal this Ordinance. Accordingly, this Ordinance provides that such notice be timely provided in the event the City ever seeks to amend or repeal this Ordinance. If this Ordinance is subsequently amended or repealed, Attica must further provide written notice to IDEM of such repeal or amendment. Attica is hereby ordered to provide such written notices as may be required by Section 7.

Section Eight: This Ordinance shall become effective upon its final passage by the Attica City Council.

This Ordinance was adopted by the Common Council for the City of Attica, Indiana, this 11 day of March, 2013, by a vote of 5 for and 0 against.

Valarie S. Maus
Sponsoring Council Member

ATTEST:

Susan Stoll
Susan Stoll, Clerk-Treasurer

Robert Shepherd
Robert Shepherd, Mayor

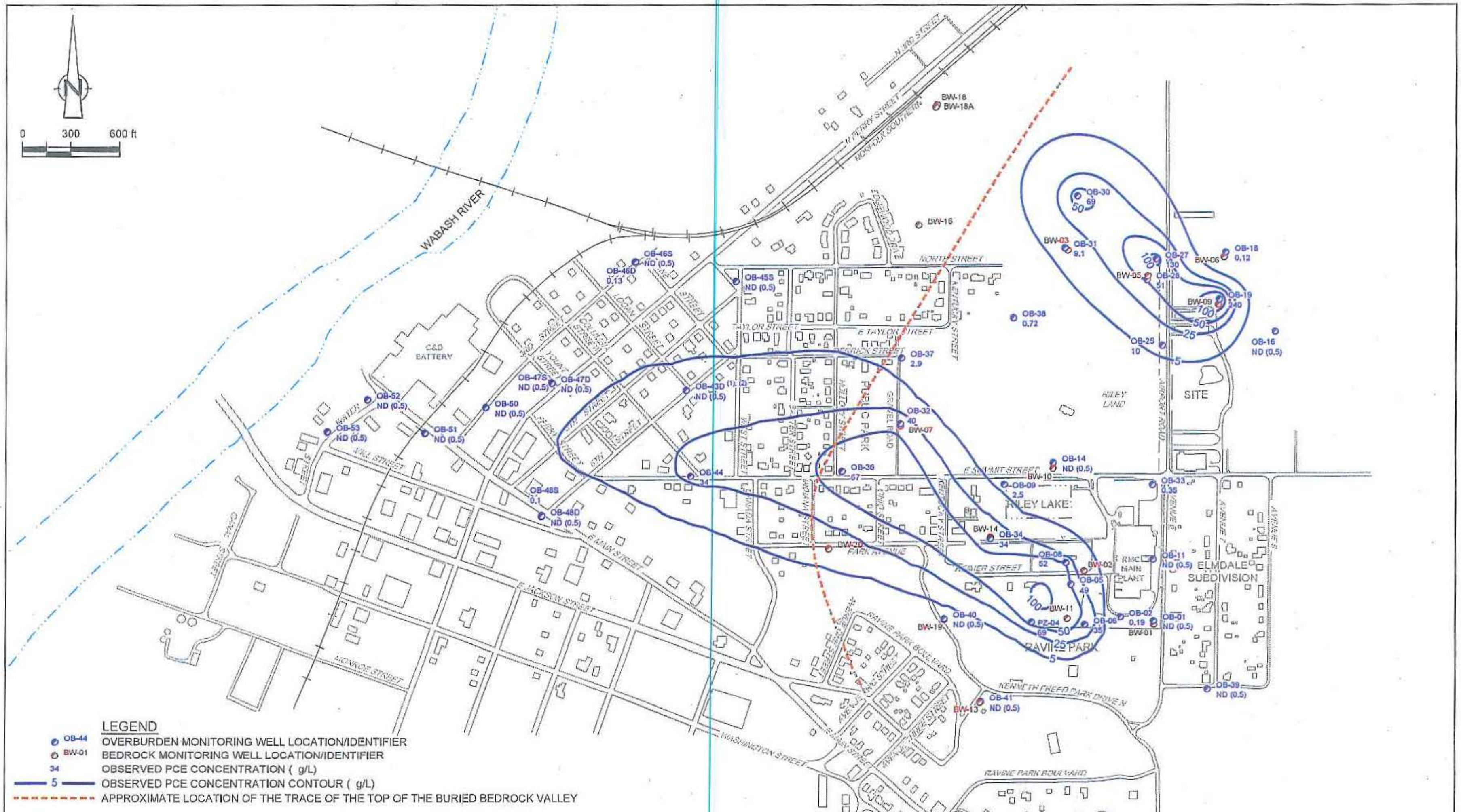
ATTEST: Susan Stoll

Susan Stoll, Clerk-Treasurer

ATTACHMENT 10

RADIO MATERIALS CORPORATION

FIGURE SHOWING OVERBURDEN OBSERVED PCE CONCENTRATIONS (OCTOBER 2010)



LEGEND

- OB-44 — OVERBURDEN MONITORING WELL LOCATION/IDENTIFIER
- BW-01 — BEDROCK MONITORING WELL LOCATION/IDENTIFIER
- 34 — OBSERVED PCE CONCENTRATION (g/L)
- 5 — OBSERVED PCE CONCENTRATION CONTOUR (g/L)
- - - - APPROXIMATE LOCATION OF THE TRACE OF THE TOP OF THE BURIED BEDROCK VALLEY

NOTES:
1. OB-43D WAS NOT USED TO DETERMINE THE OBSERVED PCE CONTOURS (SEE SECTION 7.5).
2. GROUNDWATER QUALITY FROM OB-43S WAS NOT MEASURED IN OCTOBER 2010. THE PCE CONCENTRATION OF 5.1 µg/L DETECTED AT OB-43S IN OCTOBER 2009 WAS USED TO DETERMINE THE OBSERVED PCE EXTENT.

figure A.1

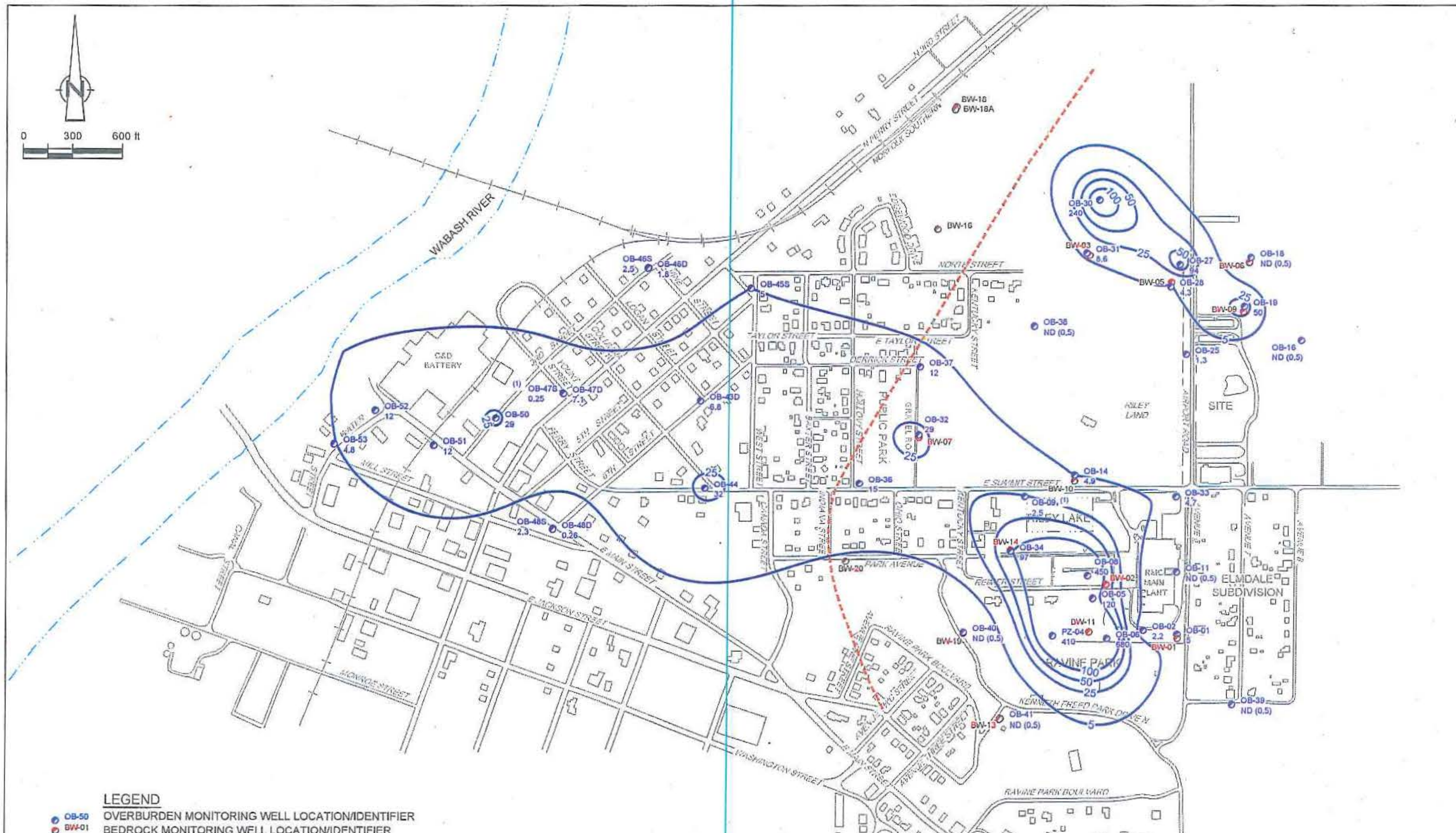
OVERBURDEN OBSERVED PCE CONCENTRATIONS (OCTOBER 2010)
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA011 SEP 24/2013

Attachment 11

Radio Materials Corporation

Figure Showing Overburden Observed TCE Concentrations (October 2010)



LEGEND

- OB-50 OVERBURDEN MONITORING WELL LOCATION/IDENTIFIER
- BW-01 BEDROCK MONITORING WELL LOCATION/IDENTIFIER
- 29 OBSERVED TCE CONCENTRATION (g/L)
- — 5 — OBSERVED TCE CONCENTRATION CONTOUR (g/L)
- - - - - APPROXIMATE LOCATION OF THE TRACE OF THE TOP OF THE BURIED BEDROCK VALLEY

NOTES:

1. OB-09 AND OB-47S WERE NOT USED TO DETERMINE THE OBSERVED TCE CONTOURS (SEE SECTION 7.5).

figure A.2

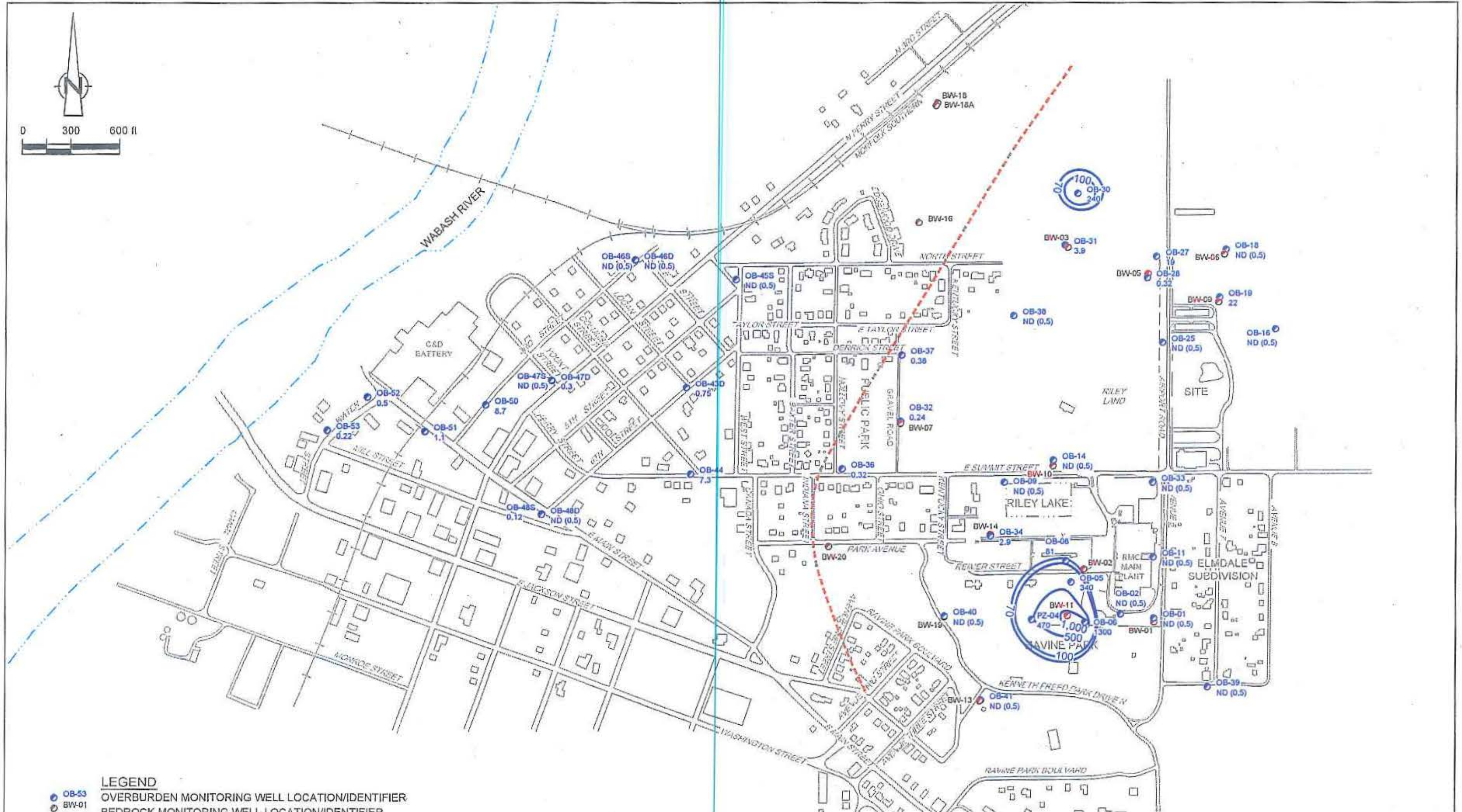
OVERBURDEN OBSERVED TCE CONCENTRATIONS (OCTOBER 2010)
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA012 SEP 24/2013

ATTACHMENT 12

RADIO MATERIALS CORPORATION

FIGURE SHOWING OVERBURDEN OBSERVED cDCE CONCENTRATIONS (OCTOBER 2010)



LEGEND

- OB-53 OVERBURDEN MONITORING WELL LOCATION/IDENTIFIER
- BW-01 BEDROCK MONITORING WELL LOCATION/IDENTIFIER
- 0.22 OBSERVED DCE CONCENTRATION (g/L)
- 70 OBSERVED DCE CONCENTRATION CONTOUR (g/L)
- APPROXIMATE LOCATION OF THE TRACE OF THE TOP OF THE BURIED BEDROCK VALLEY

figure A.3

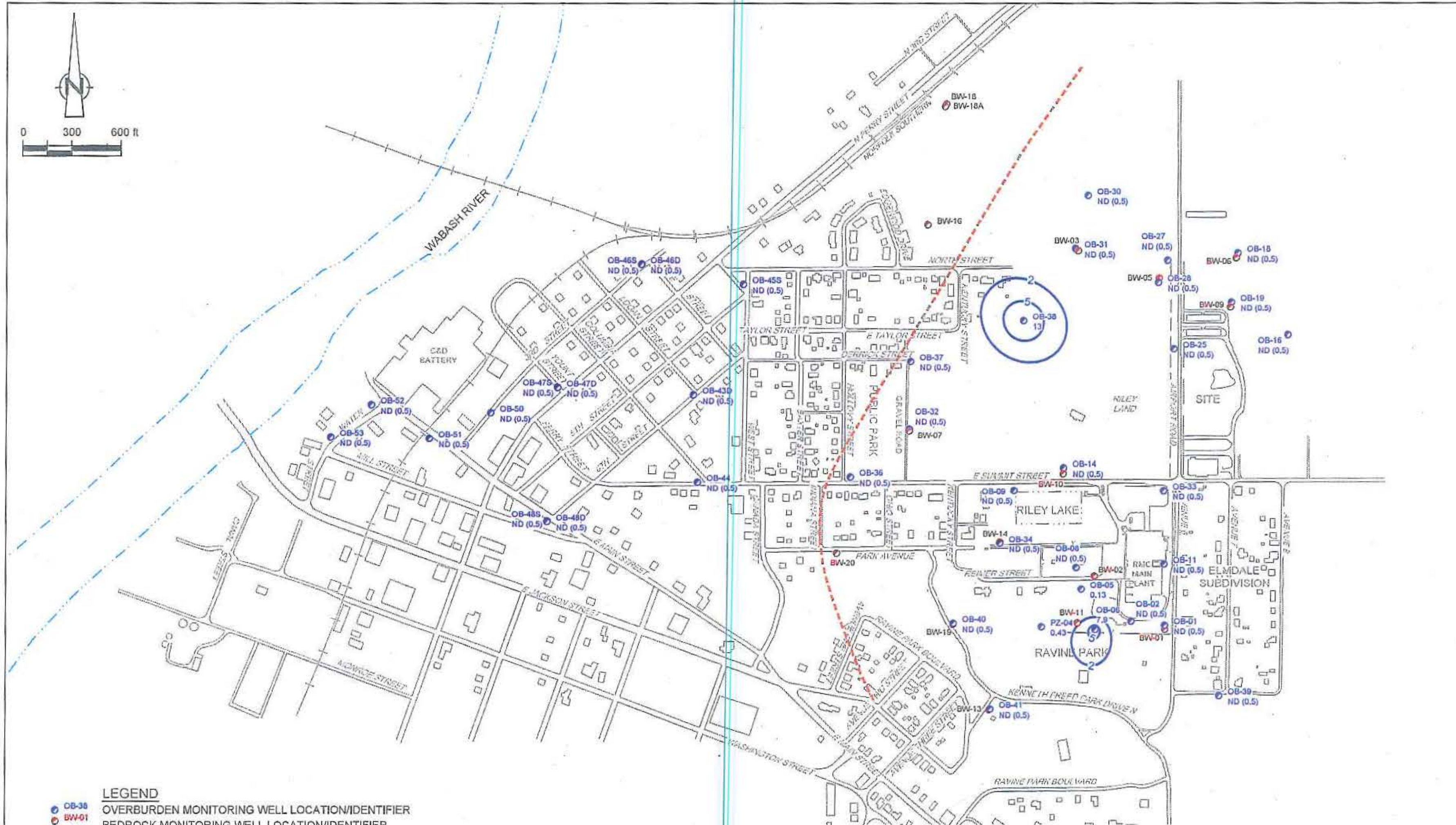
OVERBURDEN OBSERVED cDCE CONCENTRATIONS (OCTOBER 2010)
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA013 SEP 24/2013

ATTACHMENT 13

RADIO MATERIALS CORPORATION

FIGURE SHOWING OVERBURDEN OBSERVED VINYL CHLORIDE CONCENTRATIONS (OCTOBER 2010)



LEGEND

- OB-38 OVERBURDEN MONITORING WELL LOCATION/IDENTIFIER
- BW-01 BEDROCK MONITORING WELL LOCATION/IDENTIFIER
- 13 OBSERVED VC CONCENTRATION (g/L)
- 2 OBSERVED VC CONCENTRATION CONTOUR (g/L)
- APPROXIMATE LOCATION OF THE TRACE OF THE TOP OF THE BURIED BEDROCK VALLEY

figure A.4

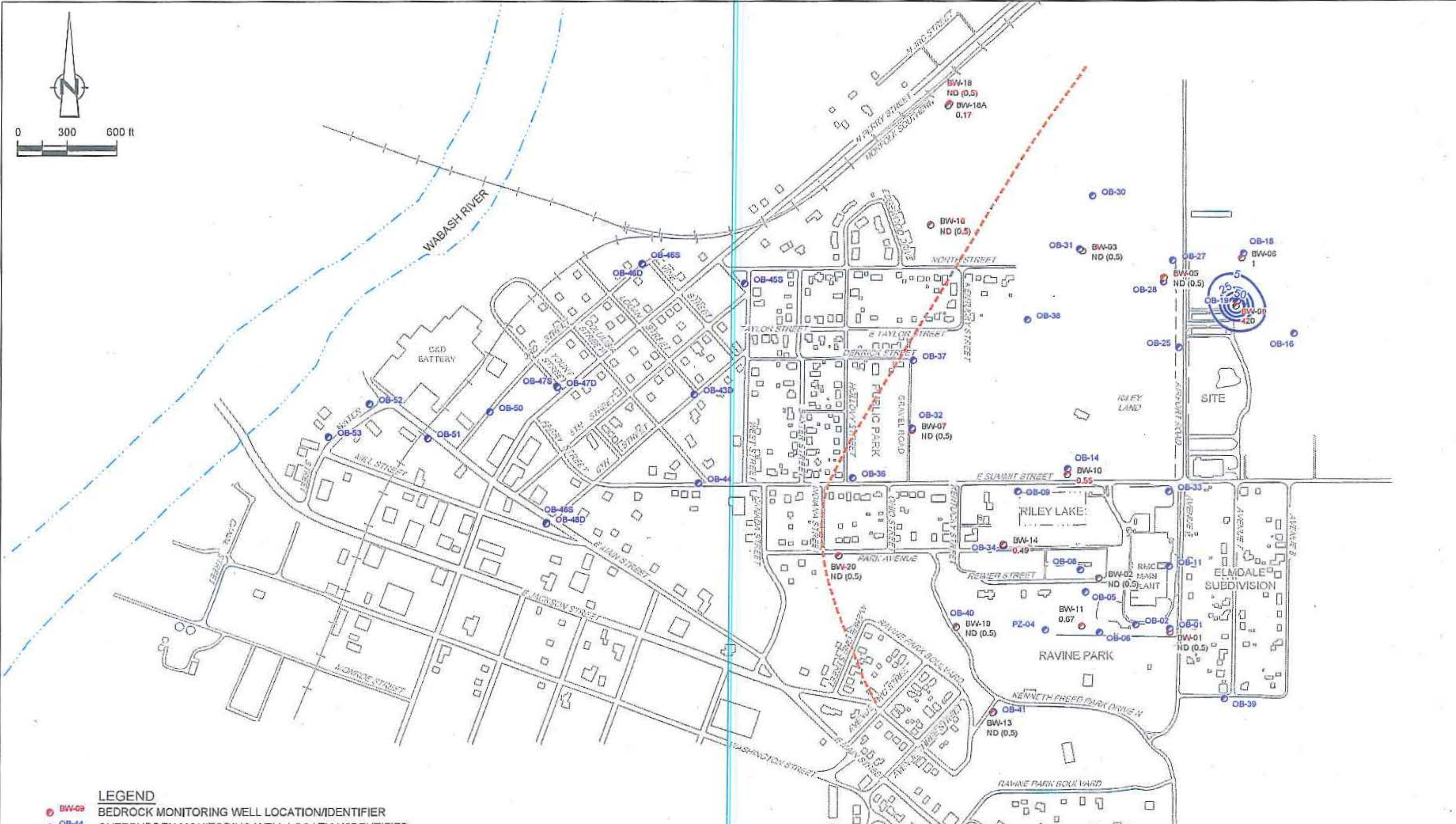
OVERBURDEN OBSERVED VC CONCENTRATIONS (OCTOBER 2010)
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA014 SEP 24/2013

ATTACHMENT 14

RADIO MATERIALS CORPORATION

FIGURE SHOWING OBSERVED PCE CONCENTRATIONS IN BEDROCK (OCTOBER 2010)



LEGEND

- BW-09 BEDROCK MONITORING WELL LOCATION/IDENTIFIER
- OB-44 OVERBURDEN MONITORING WELL LOCATION/IDENTIFIER
- 420 OBSERVED PCE CONCENTRATION (g/L)
- 5 OBSERVED PCE CONCENTRATION CONTOUR (g/L)
- APPROXIMATE LOCATION OF THE TRACE OF THE TOP OF THE BURIED BEDROCK VALLEY

figure A.5

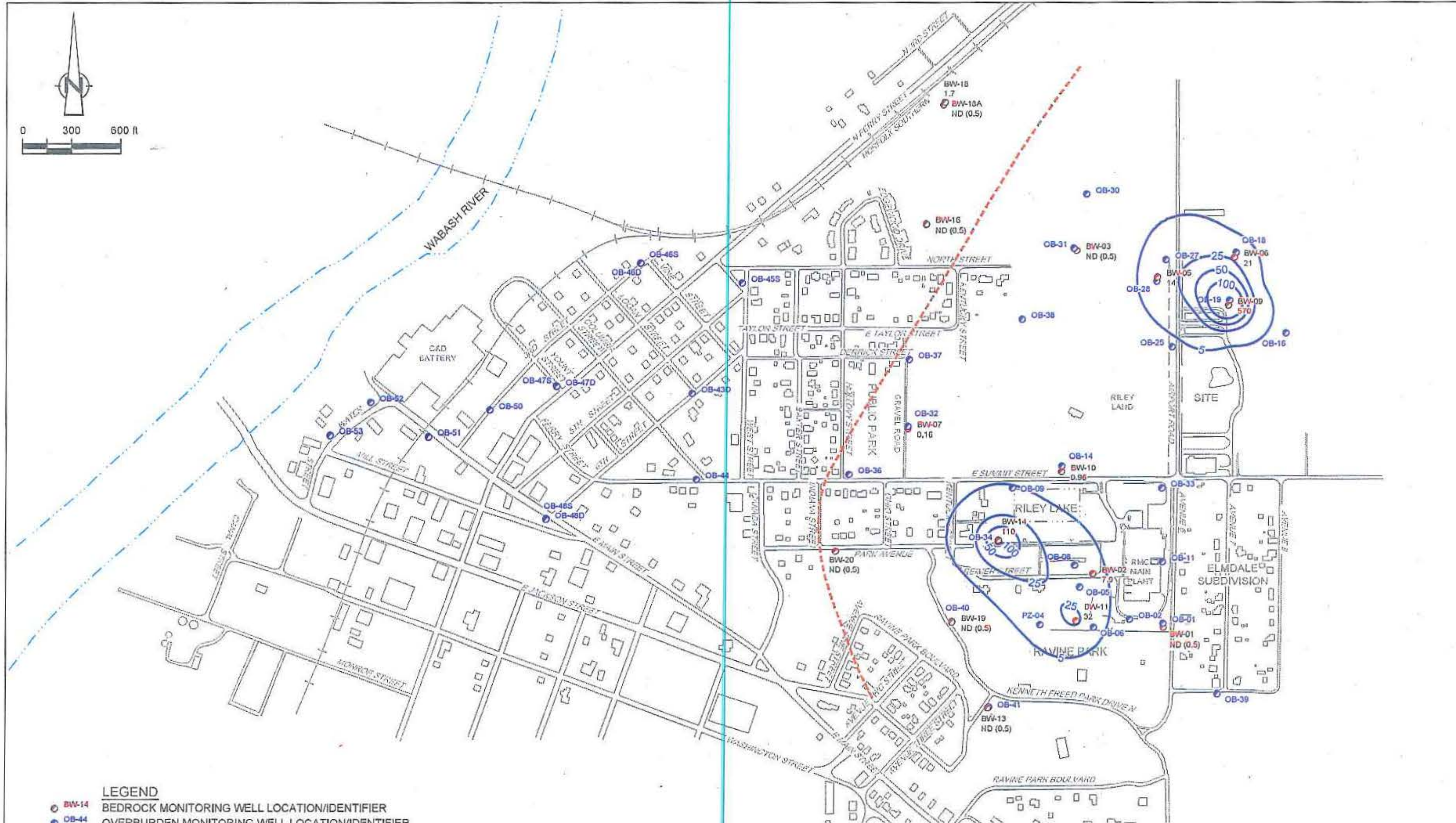
OBSERVED PCE CONCENTRATIONS IN BEDROCK (OCTOBER 2010)
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA015 SEP 24/2013

ATTACHMENT 15

RADIO MATERIALS CORPORATION

FIGURE SHOWING OBSERVED TCE CONCENTRATIONS IN BEDROCK (OCTOBER 2010)



LEGEND

BW-14 BEDROCK MONITORING WELL LOCATION/IDENTIFIER
OB-44 OVERBURDEN MONITORING WELL LOCATION/IDENTIFIER
110 OBSERVED TCE CONCENTRATION (g/L)
5 OBSERVED TCE CONCENTRATION CONTOUR (g/L)
APPROXIMATE LOCATION OF THE TRACE OF THE TOP OF THE BURIED BEDROCK VALLEY

figure A.6

OBSERVED TCE CONCENTRATIONS IN BEDROCK (OCTOBER 2010)
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA016 SEP 24/2013