

US EPA ARCHIVE DOCUMENT

Current Human Exposures Under Control
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DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: Radio Materials Corporation
Facility Address: 1095 East Summit Street, Attica, IN 47918
Facility EPA ID #: IND005477021

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?
- If yes - check here and continue with #2 below.
- If no - re-evaluate existing data
- If data are not available skip to #6 and enter AIN@ (more information needed) status code.

Background

The Radio Material Corporation (RMC) Facility encompasses approximately 38 acres in Fountain County in west central Indiana within the Middle Wabash River Basin. The Wabash River is located approximately 3,500 feet northwest of the Site. The Site is located at the edge of Wabash River basin on a local topographic high at approximately 670 feet above mean sea level (amsl). From this local high, there is a slope to the south toward an intermittent stream (approximately 650 feet amsl) in Ravine Park and a regional slope to the northwest, toward the Wabash River (approximately 500 feet amsl). In general, the glacial overburden deposits are up to 60 feet thick in the southern portion of the site but thin to approximately 10 feet in the northern portion of the Site.

Historical Site operations, which began in 1948, included the manufacture of television tubes and disc capacitors within the main plant located south of Summit Street. There are no active manufacturing operations at the Site. Production was discontinued in approximately 2000. The Site buildings, including the main building, are used for general storage of equipment and supplies.

The PA/VSI identified nine SWMUs (including SWMU 2 and SWMU 5) and one Area of Concern (AOC), AOC 5. Based on the U.S. EPA PA/VSI information and the past releases and management areas at the Site, the U.S. EPA Region 5 issued a RCRA 3008 (h) Consent Order to RMC that became effective on March 1, 1999. The DOCC report identified three additional SWMUs and four additional AOCs beyond those identified in the revised Part A application, PA/VSI and Consent Order.

SWMU 5, which is currently grass covered, was used for the placement of Site generated manufacturing byproducts in the 1950s and 1960s. The manufacturing byproducts reportedly placed in SWMU 5 contained chlorinated solvents, acetone, isopropyl alcohol, phenolic resins, ceramic byproduct, waxes and paints. SWMU 5 is located outdoors, 200 feet southwest of the main plant building. Approximately 7,000 cubic yards of impacted soil were excavated from the SWMU 5 area and transported off Site between November 1995 and February 1996. The excavation was 100 feet by 120 feet, and the maximum depth of the excavation was 20 feet. Reportedly 6 inches of granular soil was placed to protect the clay layer at the base of the excavation because the clay layer was thought to be a barrier to vertical migration of contaminants. A Phase I RCRA Facility

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Investigation (RFI) was completed at the Site and the results of this investigation presented in the Phase I RFI Report (BSI, June 2000). The Phase IIB RCRA Facility investigation report was submitted in October 2005. Since then following interim measures have taken place in the facility.

- Excavation and off-site disposal of approximately 350 tons of lead-impacted soil in AOC 3B
- Injection of chemical oxidants into the soil near/in/around SWMUs5 and 11 to treat free product.
- Installation and start up of soil vapor extraction systems to cleanup areas of VOC-impacted soil located in/near/around SWMUs5 and 11.
- Excavation, consolidation and placement of 700 tons of VOC impacted soil from SWMU 1 and 2 in a containment cell for on-site treatment.
- Installation and start up of a soil vapor extraction system in the area of SWMUs1 and 2 for the treatment of VOC impacted soil in the containment cell.

Figure 1 shows the locations of site and the Wabash river.

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of ACurrent Human Exposures Under Control@ EI

A positive ACurrent Human Exposures Under Control@ EI determination (AYE@ status code) indicates that there are no Aunacceptable@ human exposures to Acontamination@ (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all Acontamination@ subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRAs). The Current Human Exposures Under Control@ EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program=s overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

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2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be “contaminated”¹ above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

Media of Concern	Yes	No	?	Rationale / Key Contaminants
Groundwater	X			PCE, TCE, Cis 1,2 DCE and vinyl chloride
Air (indoors) ²	X			TCE and PCE exceeded the residential indoor air screening criteria
Surface Soil (e.g., <2 ft)		X		Lead contaminated soil removed and disposed off site as an interim measure.
Surface Water		X		Constituents did not exceed the IDEM Residential default closure levels
Sediment		X		Constituents did not exceed the IDEM Residential default closure levels
Subsurface Soil (e.g., >2 ft)	X			PCE, TCE, Cis 1,2 DCE and vinyl chloride
Air (outdoors)		X		Constituents did not exceed the screening criteria

- If no (for all media) - skip to #6, and enter a YE status code after providing or citing appropriate “levels”, and referencing sufficient supporting documentation demonstrating that these “levels” are not exceeded.
- X If yes (for any media) - continue after identifying key contaminants in each “contaminated” medium, citing appropriate “levels” (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.
- If unknown (for any media) - skip to #6 and enter “IN” status code.

Rationale and Reference(s):

1. *Descriptions of Current conditions Report, RCRA 3008(h) Consent Order, May 1999*
2. *USEPA RCRA 3008(h) Consent order for Radio Materials Corporation, March 1999.*
3. *Phase I RFI report, June 2000.*

¹ AContamination@ and Acontaminated@ describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based Alevels@ (for the media, that identify risks within the acceptable risk range).

² Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

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4. *Phase IIB RFI Work Plan, Radio Materials Corporation Facility, June 2003*
5. *Interim Data transmittal and supplemental Phase IIB RFI scope of Work, June 2004*
6. *Phase IIB RFI Report, October 2005*
7. *Interim Corrective Measures Work plan, February, 2007*
8. *Indoor Air Sampling Work plan, March 2008*
9. *Vapor intrusion Mitigation system installation work plan, March 2008*
10. *City Water Treatment system design work plan, September 2008*
11. *Aquifer Testing Report, December 2008*

Groundwater

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). The RDCLs were selected over the IDEM's Industrial Default Closure Levels (IDCLs) due to the existing use of on-Site groundwater for plant and residential potable water use. Groundwater at the Site has been investigated through the installation of numerous overburden monitoring wells, bedrock monitoring wells, and piezometers. Groundwater flow in the overburden and shallow bedrock has been determined to be towards the northwest which is consistent with the regional topography, which slopes toward the Wabash River located northwest of the Site.

The following table provides the maximum concentration of volatile constituents observed onsite and offsite in the bedrock and overburden aquifer.

Groundwater Constituent	Maximum Conc. (ppb) in Bedrock aquifer		Maximum Conc. (ppb) in Overburden aquifer		IDEM RDCL (ppb)
	Onsite	Offsite	Onsite	Offsite	
Monitoring well	BW-07	BW-09	PZ 04	OB-36	
Cis 1,2 DCE	32	1600	2100	3.8	70
Trans 1,2 DCE	1.0	5	16	ND	100
TCE	0.09	570	2500	22	5
PCE	ND	620	320	97	5
Vinyl chloride	12	94	1.6	ND	2
Methylene chloride	ND	ND	ND	ND	5
1,1 Dichloroethene	0.15	4.2	3.8	ND	7
Chloroform	ND	ND	1.2	0.74	80

ND = Not detected or below screening criteria.

Surface soil

AOC 3B is the only area where surface soil is contaminated at concentrations above IDEM screening criteria. An exposure pathway is potentially complete for occasional on-Site workers, construction workers, and trespassers at AOC 3B where surface soil contains lead as high as 6550 ppm. As an interim measure, 350 tons of lead contaminated soil was removed and disposed offsite in the first quarter of 2008.

Subsurface soil

Volatile constituents such as TCE, PCE and cDCE were found to exceed the IDCL in SWMUs 1 and 2, SWMU 5, SWMU 11. Lead was found at a maximum concentration of 9150 mg/kg in AOC 3B.

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Sediment and Surface Water

Onsite: Sediment and surface water samples were collected from Riley Lake during the Phase IIB RFI. VOC and metals were not detected in surface water or sediment samples collected from Riley Lake at concentrations above the IDEM RDCLs.

An artesian well was discovered northwest of the Riley residence in an undeveloped portion of Riley Land. A sample of the water emerging from the well was collected and analyzed for VOCs. Vinyl chloride (15 µg/L) and cDCE (98 µg/L) were detected above ingestion-based RDCLs. The artesian well was closed by an Indiana licensed well driller in accordance with IDNR regulations (312 IAC 13-10-2) in July 2005. Consequently, contaminated groundwater no longer discharges from this location. The surface soil/sediment samples collected at the point of discharge from the artesian did not detect any VOCs.

Outdoor Air

Releases from SWMUs and AOCs have impacted subsurface soil and groundwater. Due to the limited exposure frequency, volatilization from subsurface stratum in to the ambient air is considered less significant for potential receptors such as trespassers and construction workers.

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3. Are there **complete pathways** between “contamination” and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

“Contaminated” Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food ³
Groundwater	Yes	No	No	Yes	No	No	No
Air (indoors)	Yes	No	No	No	No	No	No
Soil (surface, e.g., <2 ft)							
Surface Water							
Sediment							
Soil (subsurface e.g., >2 ft)	No	No	No	Yes	No	No	No
Air (outdoors)							

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors= spaces for Media which are not Acontaminated@ as identified in #2 above.
2. Enter Ayes@ or Ano@ for potential Acompleteness@ under each AContaminated@ Media – Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential AContaminated@ Media - Human Receptor combinations (Pathways) do not have check spaces (A__@). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

- If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter @YE@ status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).
- X If yes (pathways are complete for any AContaminated@ Media - Human Receptor combination) - continue after providing supporting explanation.
- If unknown (for any AContaminated@ Media - Human Receptor combination) - skip to #6 and enter AIN@ status code.

Rationale and Reference(s):

Groundwater

Onsite Drinking Water: During the RFI, grab water samples were obtained from the two on-Site production wells (AOC 5). The TCE concentrations in PW-1 water samples ranged from 1.8 to 2.3 µg/L and the cDCE concentrations ranged from 3.7 to 4.9 µg/L. The TCE concentrations in the residential water samples ranged from 1.8 to 2.2 µg/L and the cDCE concentrations ranged from 3.8 to 4.3 µg/L, which is comparable to the concentrations of these analytes

³ Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

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observed in the post-iron filter sample collected from PW-1. None of the metals were detected at concentrations above the federal MCLs or IDEM RDCLs. Since the third quarter of 2008, the production wells onsite are decommissioned and those residences that received the water from the RMC facility have been connected to city of Attica Municipal water supply. Construction worker exposure to contaminated onsite groundwater is potentially a complete pathway.

Offsite Drinking Water: The degreasing operations at the RMC facility in the past may have resulted in the transport of TCE in to the Wabash River Valley and considered partially responsible for the TCE contamination found in Attica Municipal wells. Occasional detections of TCE at concentrations slightly above the MCL have occurred in Attica Municipal well1 but not in consecutive sampling rounds

Soil Gas/Indoor Air

Offsite Residential Exposure: A vapor intrusion study (VIS) was expanded in areas west/northwest of the RMC since the EI was completed in October 2005. The expanded investigation was necessary due to the availability of standard operating procedures for sub slab sampling from the EPA head quarters and also due to the availability of stringent screening levels published by Indiana Department of Environmental Management (IDEM) in April, 2006. Sampling results indicated that groundwater and soil gas in areas down gradient of the facility have detectable concentrations of PCE and TCE. Some of the soil gas, sub slab and indoor air concentrations exceeded IDEM's soil gas prompt action levels presented in the IDEM Draft Vapor Intrusion Guidance. The soil gas concentration in the neighborhood ranged from 0.014 $\mu\text{g}/\text{m}^3$ to 10,000 $\mu\text{g}/\text{m}^3$ for PCE and 0.011 $\mu\text{g}/\text{m}^3$ to 1.3 for TCE in the December 2007 Sampling event. Based on the soil gas analysis, 13 residences have been provided with sub slab depressurization system to curtail vapor intrusion in to indoor air. The sampling data from October 2008 in homes retrofitted with the mitigation system indicated a residual contamination of TCE and PCE in the indoor air. The indoor air concentration in those homes mitigated with subslab depressurization system ranged from 1.5 to 20 $\mu\text{g}/\text{m}^3$ for TCE and 1.1 to 67 $\mu\text{g}/\text{m}^3$ PCE. The indoor air concentration in those homes with no vapor intrusion controls ranged from 0.1 to 27 $\mu\text{g}/\text{m}^3$ for TCE and 0.6 to 240 $\mu\text{g}/\text{m}^3$ for PCE. Therefore, exposure to contaminated indoor air is a complete pathway for the residents in the northwest of RMC facility.

Onsite industrial worker Exposure: The VOCs detected in the groundwater from overburden monitoring wells close to the main facility did not exceed the industrial indoor vapor intrusion criteria. The maximum concentration of TCE and PCE from these wells were 88ug/l (or ppb) and 75 ppb respectively. The highest concentration of PCE (1900 mg/kg (or ppm)) and TCE (940 ppm) found in SWMU11 inside the main facility exceeds the industrial indoor air screening criteria 60 ppm and 37 ppm respectively. Although the operations have ceased at the facility, for a care taker, the inhalation exposure pathway due to indoor air contamination is complete. An SVE system is currently in place to remove the soil gas vapors from SWMU11 and SWMU 5 where the TCE and PCE source is present.

Subsurface soil

Construction Worker Exposure: PCE concentration as high as 1000 ppm, and TCE concentration as high as 940 ppm is present onsite that is not covered by concrete or other protective cap. The exposure to contaminated subsurface soil is potentially a complete pathway for construction workers.

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4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **Asignificant**⁴ (i.e., potentially **Aunacceptable** because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable **Alevels** (used to identify the **Acontamination**); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable **Alevels**) could result in greater than acceptable risks)?

If no (exposures can not be reasonably expected to be significant (i.e., potentially **Aunacceptable**) for any complete exposure pathway) - skip to #6 and enter **AYE** status code after explaining and/or complete pathways) to referencing documentation justifying why the exposures (from each of the **Acontamination** (identified in #3) are not expected to be **Asignificant**.)

If yes (exposures could be reasonably expected to be **Asignificant** (i.e., potentially **Aunacceptable**) for any complete exposure pathway) - continue after providing a description (of each potentially **Aunacceptable** exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to **Acontamination** (identified in #3) are not expected to be **Asignificant**.)

If unknown (for any complete pathway) - skip to #6 and enter **AIN** status code

Rationale and Reference(s):

Groundwater

Offsite Drinking Water Exposure: The contaminated groundwater from the site discharges in to the Wabash river. The regional groundwater flow on the eastern side of the Wabash River is towards the northwest where the municipal wells are located. The city of Attica is supplied by two production wells (No 1 &2) and are screened to depths of 110 feet to 125 feet below ground surface. The city generally operates the well on an alternating basis, where only one of the pumps operates at any given time. There have been occasional exceedance of MCL in the past few months. In May 2008, the TCE level in Municipal well 1 was 5.3 µg/L slightly exceeding MCL. Therefore, the exposure to drinking water contamination by residence is considered significant.

Onsite Construction Worker Exposure: The RMC plant is closed with no active manufacturing operations at the site and the property is largely unused. Construction activities are not planned currently. Risk to construction or excavation workers that are potentially associated with the inhalation pathway is negligible because health and safety programs are in place that require PPE for any environmental investigation or remediation work.

Indoor air

The indoor air concentration of TCE and PCE in about 30 homes tested exceed IDEM's 5 year prompt action level as well as 30 year chronic action levels. Therefore, the exposure is considered significant.

Subsurface soil

The subsurface average lead concentration in AOC 3B was calculated to be 1354 ppm. Site specific PRG for lead for the potential construction or excavation workers is 4601 ppm based on an exposure frequency of 50 days a year. Thus the exposure to subsurface lead is considered insignificant for construction or excavation workers. The Soil

⁴ If there is any question on whether the identified exposures are **Asignificant** (i.e., potentially **Aunacceptable**) consult a human health Risk Assessment specialist with appropriate education, training and experience.

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contaminated above the IDCLs is present on Site in the areas of SWMUs 1 and 2, SWMU 5 and SWMU 11 where elevated concentrations of Site-related analytes were detected in soil samples collected at depths greater than 10 feet below ground surface. However, the RMC plant is closed with no active manufacturing operations at the Site and the property is largely unused. Construction activities are not planned currently. Risk to construction or excavation workers that are potentially associated with the inhalation pathway is negligible because health and safety programs are in place that require PPE for any environmental investigation or remediation work.

5. Can the Asignificant@ exposures (identified in #4) be shown to be within acceptable limits?

If yes (all Asignificant@ exposures have been shown to be within acceptable limits) - continue and enter AYE@ after summarizing and referencing documentation justifying why all Asignificant@ exposures to Acontamination@ are within acceptable limits (e.g., a site-specific Human Health Assessment).

If no (there are current exposures that can be reasonably expected to be Aunacceptable@)- continue and enter ANO@ status code after providing a description of each potentially Aunacceptable@ exposure.

If unknown (for any potentially Aunacceptable@ exposure) - continue and enter AIN@ status code

Rationale and Reference(s):

Ground Water

Drinking Water Exposure: Occasional detections of TCE at concentrations slightly above the MCL have occurred in Attica Municipal well11 but not in consecutive sampling rounds. The sampling results from November 2008 from the city reported a TCE concentration of 4.2 and 2.33 µg/L from well 1 and 2 respectively. Therefore, the exposure to residents of contaminated drinking water is considered to be within acceptable limits. For additional measure of safety, RMC has submitted the city water treatment system design work plan to treat water obtained from the two municipal wells located adjacent to the Wabash River for low levels of TCE. Further, RMC has submitted aquifer testing report to evaluate the extraction and treatment of ground water onsite.

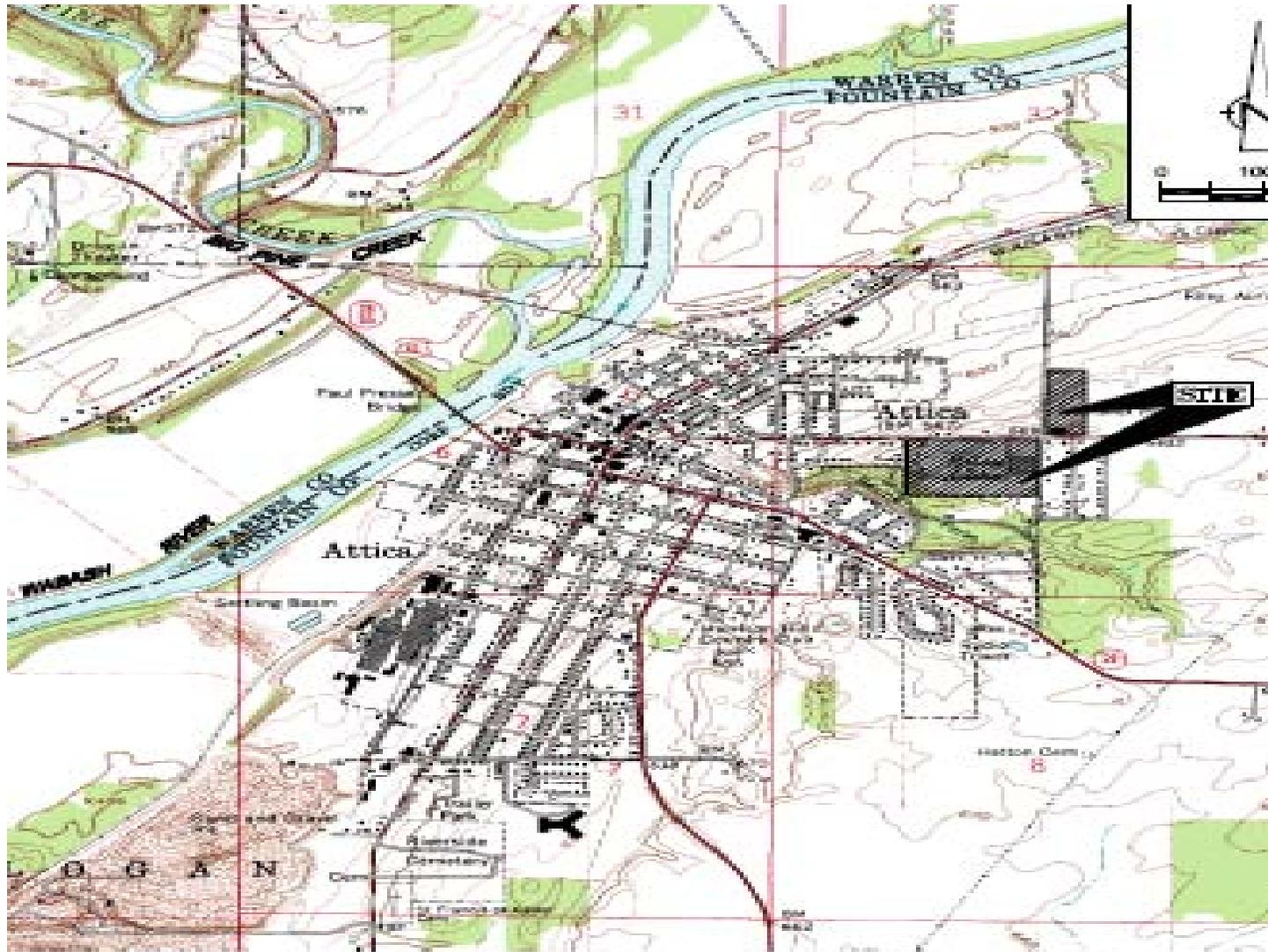
Indoor air

Inhalation Exposure: The indoor air concentration of chlorinated solvents in about 100 homes exceed IDEM's 5 year prompt action level as well as 30 year chronic action levels. In few homes, the exceedance is found in the main living area. Therefore, the exposure is found to be significant and above acceptable limits set by IDEM.

Based on the results of the investigations to date, about 100 home owners have been notified of the indoor air vapor intrusion problems in the area and have been offered an indoor air purification system. The UV light treatment based indoor air purification system is considered a short term action plan rather quickly. The air treatment system is designed to be installed in the duct work of forced hot air furnaces. To ensure optimum results, the furnace fan needs to be set for continuous operation. In the event a house does not have a forced-air furnace, other indoor air treatment units are available. The particular type of unit appropriate for each house will be determined based on discussions with the homeowner and inspection of the house. By this measure, the indoor air concentration of PCE and TCE is expected to be brought down to the acceptable levels of 1.2 µg/ m³ and 3.2 µg/ m³ respectively within the next three months. In the long term, vapor intrusion mitigation alternatives such as sub slab depressurization system or SVE wells at the two corners of the home or a neighborhood SVE will be considered based on the technical feasibility and cost benefit analysis. Figure 2 shows the offsite residential boundary for the proposed mitigation plans.

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FIGURE 1 SHOWING THE SITE LOCATION



SOURCE: ATTICA AND WILLIAMSPORT, INDIANA
U.S.G.S. TOPOGRAPHIC MAPS

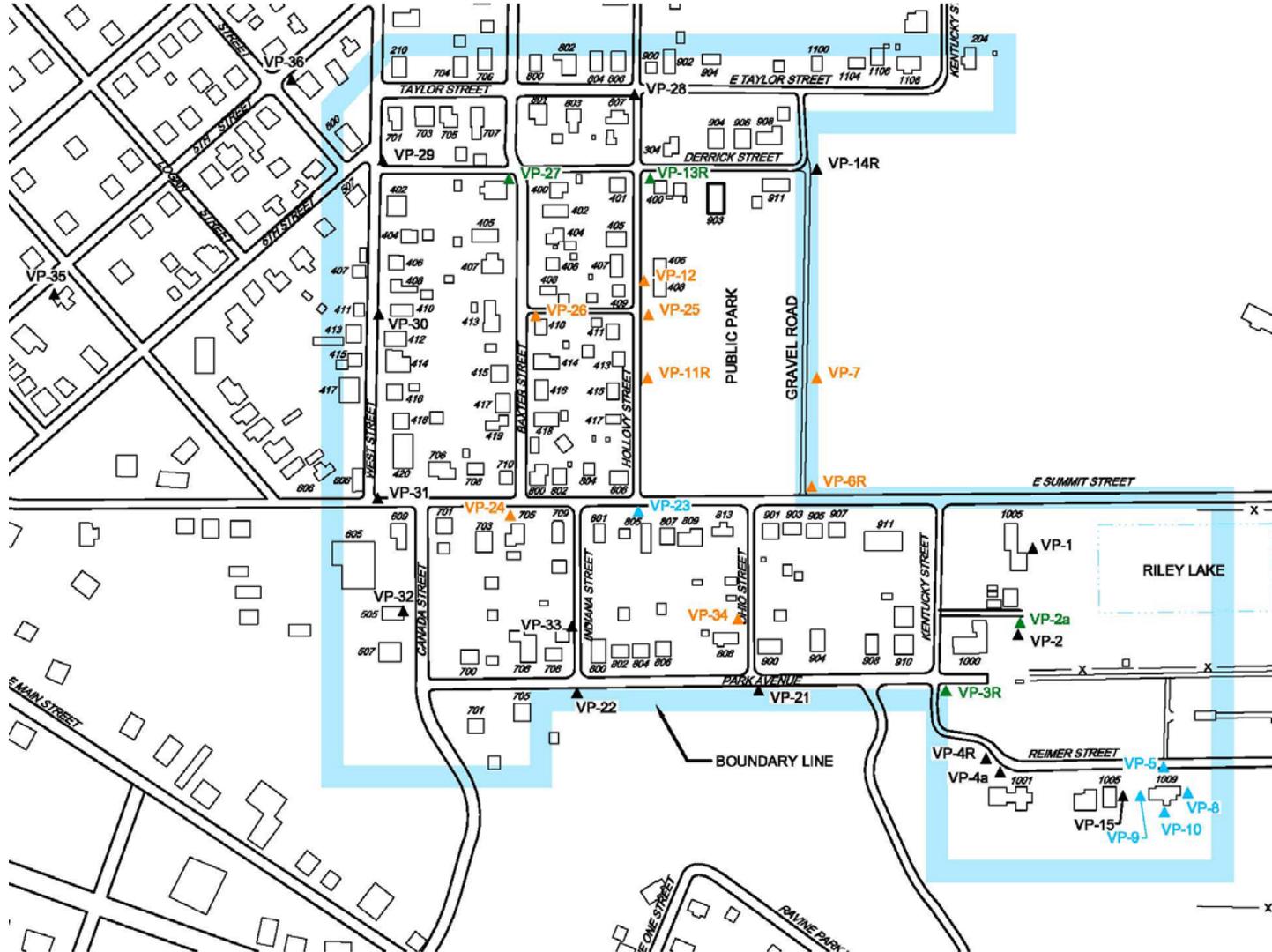


figure
SITE LOCATION
RADIO MATERIALS CORPORATION
Attica, IN

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Figure 2 showing the boundary for the short term and long term mitigation options for vapor intrusion in the offsite residential area of RMC facility.



- LEGEND**
- VP-1 ▲ EXISTING VAPOR MONITORING PROBE LOCATION/IDENTIFIER (NO ACTION LEVEL EXCEEDED)
 - VP-23 ▲ VAPOR PROBE EXCEEDING IDEM 1-YEAR PROMPT ACTION LEVEL FOR EITHER PCE (5.2 mg/m³) OR TCE (2.0 mg/m³)
 - VP-6R ▲ VAPOR PROBE EXCEEDING IDEM 5-YEAR PROMPT ACTION LEVEL FOR EITHER PCE (1.0 mg/m³) OR TCE (0.41 mg/m³)
 - VP-27 ▲ VAPOR PROBE EXCEEDING IDEM 30-YEAR POTENTIAL CHRONIC LEVEL FOR EITHER PCE (0.32 mg/m³) OR TCE (0.12 mg/m³)

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