

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: Rohm & Haas Company - Bristol Plant
Facility Address: Route 413 & Old Route 13, Bristol, PA
Facility EPA ID #: PAD 002 292 068

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?

 X If yes - check here and continue with #2 below.
 If no - re-evaluate existing data, or
 if data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

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 "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (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 "contamination" 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, GPRRA). 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)?

Trailer Staging Area (TSA)

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	X			see below
Air (indoors) ²		X		no buildings present
Surface Soil (e.g., <2 ft)	X			see below
Surface Water	X			see below
Sediment	X			see below
Subsurf. Soil (e.g., >2 ft)	X			included in surface soil
Air (outdoors)		X		based on modeled concentrations- see below

Manufacturing Study Area (MSA)

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	X			see below
Air (indoors) ²		X		based on vapor intrusion evaluation-see below
Surface Soil (e.g., <2 ft)	X			see below
Surface Water		X		included in ASA evaluation
Sediment		X		included in ASA evaluation
Subsurf. Soil (e.g., >2 ft)	X			see below
Air (outdoors)		X		based on modeled concentrations and air sampling-see below

Ammonium Sulfate Area (ASA)

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	X			see below
Air (indoors) ²		X		based on vadose zone monitoring-see below
Surface Soil (e.g., <2 ft)		X		see below
Surface Water	X			see below
Sediment		X		see below
Subsurf. Soil (e.g., >2 ft)		X		see below
Air (outdoors)		X		based on modeled concentrations and air sampling-see below

Former Wastewater Treatment Area (WWTA)

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	X			see below
Air (indoors) ²		X		below screening levels-see below
Surface Soil (e.g., <2 ft)	X			see below
Surface Water		X		see below
Sediment		X		see below
Subsurf. Soil (e.g., >2 ft)	X			see below
Air (outdoors)		X		below screening levels-see below

Bristol Landfill

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	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater		X		containment remedy complete/ no releases
Air (indoors) ²		X		“
Surface Soil (e.g., <2 ft)		X		“
Surface Water		X		“
Sediment		X		“
Subsurf. Soil (e.g., >2 ft)		X		“
Air (outdoors)		X		“

Parcel North of River Road

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	X			TCE - see below
Air (indoors) ²		X		no buildings present
Surface Soil (e.g., <2 ft)	X			see below
Surface Water		X		see below
Sediment		X		see below
Subsurf. Soil (e.g., >2 ft)		X		see below
Air (outdoors)		X		see below

_____ If no (for all media) - skip to #6, and enter “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:

Background - The Rohm & Haas Company Bristol Plant (R&H Bristol) is an 880-acre chemical manufacturing facility which produces plastics, resins, and emulsion polymers. The plant is located in Bristol Township, PA, and has been in operation since 1917. The plant is located in a mixed industrial, commercial, and residential area north of Philadelphia. The property is adjacent to the Delaware River. The plant uses municipal water supplied by AQUA Pennsylvania (formerly Philadelphia Suburban Water Company) from the Bristol Borough filtration plant for drinking and some process purposes. The plant is separated into five study areas under the Resource Conservation and Recovery Act (RCRA) Corrective Action Order: the Trailer Staging Area (TSA), the Manufacturing Study Area (MSA), the Ammonium Sulfate Area (ASA), the former Wastewater Treatment (WWTP) area, and the Bristol Landfill. Rohm & Haas also owns undeveloped property on the north side of River Road. That property, referred to as the Parcel North of River Road, is also evaluated in this document. Figure 1 shows the five study areas of current and historic operations and waste management practices, and the Parcel North of River Road.

Trailer Staging Area (TSA) - The TSA is located on the northeastern side of the old Bristol plant, as shown on Figure 2. The TSA is a 7-acre area currently used for storage of hazardous and non-hazardous waste prior to shipment to an off-site disposal facility. The area is filled with 12 feet of fill material, and the surface is covered with gravel and/or asphalt. The area was originally tidal marsh until it was backfilled with miscellaneous construction debris, waste material, and dredge spoils during the 1940's and 1950's. There are no building structures

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in the TSA area. Samples were collected from groundwater, soil, sediments, surface water, and seeps. Samples were analyzed for a comprehensive list of organic and inorganic chemicals and analytes. The results of the investigations, including a bioremediation study, are presented in the reports listed below (references).

Groundwater contamination: Groundwater is contaminated with a variety of organic and inorganic chemicals. Highest concentrations of contaminants are located in the shallow aquifer near the center of the TSA, around wells W-40 and W-43, with significantly lower concentrations in the surrounding wells. Chemical with concentrations (12/2001 data) detected above EPA Drinking Water Standards (MCLs), or EPA Region III Risk-Based Concentration (RBC) for tap water (for chemicals without MCLs) are:

<u>contaminant</u>	<u>groundwater concentration</u>	<u>screening level</u>
1,2-Dichloroethane	non-detect (ND) to 180,100 ppb	5 ppb (MCL)
BCEE	ND to 14,000 ppb	0.01 ppb (RBC)
TCE	ND to 13 ppb	5 ppb (MCL)
PCE	ND to 29 ppb	5 ppb (MCL)
Benzene	ND to 800 ppb	5 ppb (MCL)
Toluene	ND to 2,400 ppb	1,000 ppb (MCL)
Chloroform	ND to 840 ppb	0.15 ppb (RBC)
Methylene Chloride	ND to 840	4.1 ppb (RBC)
1,2-Dichloropropane	ND to 83	5 ppb (MCL)
1,4-Dichlorobenzene	ND to 110	75 ppb (MCL)
1,2-Dichlorobenzene	ND to 21,000 ppb	600 ppb (MCL)
Naphthlene	ND to 15 ppb	6.5 ppb (RBC)
PAH compounds (7)	ND to 2.3 ppb	<1 ppb (RBC)
Arsenic	ND to 1,270	10ppb (MCL)
Cadmium	4.2 to 166 ppb	5 ppb (MCL)
Chromium	ND to 145 ppb	100 ppb (MCL)
Iron (dissolved)	ND to 305,000 ppb	11,000 ppb (RBC)
Lead	ND to 59	15 ppb (MCL)
Manganese	18 to 6,440 ppb	730 ppb (RBC)

Indoor Air: There are no buildings at the TSA, therefore, accumulation of vapors in indoor area is not of concern.

Soil contamination: Surface and subsurface soil are considered together. Chemicals with concentrations detected above EPA Region III Risk-Based Concentration (RBC) for Industrial exposure are:

<u>contaminant</u>	<u>soil concentration</u>	<u>screening level</u>
1,2-Dichloroethane	<1 ppm to 6,810 ppm	31 ppm
bis(2-chloroethyl)ether (BCEE)	<1 ppb to 26.2 ppm	2.6 ppm
Arsenic	<1 to 645 ppm	1.9 ppm
Lead	<1 to 2,050 ppm	500 ppm
Mercury	<1 to 26.5 ppm	
PAH compounds	Up to 210 ppm(total conc.)	≈10 ppm (total)
4,4'-DDT	<1 to 63.3 ppm	8.4 ppm
4,4'-DDD	<1 to 15.6 ppm	12 ppm
4,4'-DDE	<1 to 17.7 ppm	8.4 ppm

Surface Water and Sediment contamination: Otter Creek, which borders the TSA to the north and east, receives both surface and groundwater discharge from the TSA. Surface water concentrations were screened against EPA Drinking Water Standards (MCLs), or EPA Region III Risk-Based Concentration (RBC) for tap water (for chemicals without MCLs). Sediment concentrations were screened against EPA RBCs for residential soil.

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Contaminant concentrations detected in Surface water:

- VOCs: low ppb levels - highest concentration: 16 ppb of acetone (below RBC)
- SVOCs : low ppb levels - highest concentration: 64 ppb of bis(2-ethylhexyl)phthalate (above RBC of 4.8 ppb)
- Metals: generally below 1 ppm and MCL levels

Contaminant concentrations detected in Sediment:

- VOCs: low ppb levels
- SVOCs: highest concentration: 500 ppb of BCEE (below RBC of 580 ppb)
- PAH compounds: several compounds at <2 ppm - Several compounds were at concentrations above the residential RBC but below the industrial RBC. Only Benzo(a)pyrene, at 1.2 ppm, exceeded both screening levels.
- Metals: concentrations generally <1 ppm, up to 565 ppm of zinc and 452 ppm of manganese (below RBCs)

Outdoor Air: Modeled air concentrations (Ecology and Environment 1992) were below EPA Region III RBCs for ambient air.

Manufacturing Study Area (MSA) - The MSA is located in the east-central portion of the Bristol Plant, as shown in Figure 3. The MSA is currently active. Various speciality chemical products are manufactured there. It has also been used historically for raw material and product storage. Numerous buildings are located in this area. Several buildings have been razed. Samples were collected from groundwater and soil, and were analyzed for a comprehensive list of organic and inorganic chemicals and analytes. The results of the investigations are presented in the reports listed below (references). Vapor intrusion into occupied buildings was evaluated using the EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002). Indoor air concentrations were modeled using the Johnson and Ettinger (1991) model.

Groundwater contamination: The groundwater is contaminated with a variety of organic and inorganic chemicals, frequently localized in extent of contamination. The following table shows the highest groundwater concentrations detected since 1990, however, average concentrations over the area are generally much lower. Chemical concentrations were screened against EPA Drinking Water Standards (MCLs), or EPA Region III Risk-Based Concentration (RBC) for tap water (for chemicals without MCLs).

<u>contaminant</u>	<u>groundwater concentration</u>	<u>screening level</u>
TCE	170 ppb	5 ppb (MCL)
Benzene	1,200 ppb	5 ppb (MCL)
Toluene	2,200 ppb	1,000 ppb (MCL)
Naphthlene	1,000 ppb	6.5 ppb (RBC)
Ethylbenzene	2,800 ppb	700 ppb (MCL)
Xylene	20,000 ppb	10,000 ppb (MCL)
Chlorobenzene	1,400 ppb	100 ppb (MCL)
4-Methylphenol	14,000 ppb	180 ppb (RBC)
2,4-Dimethylphenol	33,000 ppb	730 (RBC)
TCE	170 ppb	5 ppb (MCL)
Manganese	19,100 ppb	750 ppb (RBC)
Arsenic	15.2 ppb	10 ppb (MCL)

Air (Indoor) - Modeled concentrations, using the Johnson & Ettinger model, predict indoor air concentrations significantly lower than screening levels. See rationale to Question 3, page 11.

Soil contamination: The soil is contaminated with a variety of organic and inorganic chemicals, frequently localized in extent of contamination. The following table shows detected high soil concentrations since 1990, however, average concentrations over the area are generally much lower. Soil concentrations are screened against EPA

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Region III Risk-Based Concentration (RBC) for Industrial exposure.

<u>contaminant</u>	<u>soil concentration</u>	<u>screening level</u>
PAH compounds	>100 ppm(total conc.)	≈10 ppm (total)
Arsenic	142 ppm	1.9 ppm
TCE	294ppm	7.2 ppm
Dioxins and Furans	0.464 ppm	
benzo(a)anthracine	14 ppm	3.9 ppm
benzo(b)fluoranthene	19 ppm	3.9 ppm
benzo(a)pyrene	7.8 ppm	0.39 ppm

Air (Outdoor) - Based on air sampling and modeled air concentrations (Ecology and Environment 1992), outdoor air concentrations from contaminated media are not a concern. See rationale to Question 3, page 12.

Ammonium Sulfate Area (ASA) - The ASA is located on the south side of River Road, as shown in Figure 4. The groundwater is contaminated with a dense plume that has collected above the bedrock, and a diffuse plume that has spread through the upper aquifers. The primary contaminants are ammonia, sulfate and acetone. Samples were collected from groundwater, soil, sediments, surface water, and two residential wells. Samples were analyzed for a comprehensive list of organic and inorganic chemicals. Soil vapor was sampled for ammonia and acetone to determine the potential for vapor migration to the surface. The results of the investigations are presented in the reports listed below (references).

Groundwater from two residential wells, located south of the Manufacturing Area and near the Delaware River, was sampled. No contaminants were detected above drinking water/tap water screening levels. Both properties are connected to municipal water. Groundwater is not used for drinking or household use. One resident uses groundwater to fill a swimming pool.

Vapor sampling for acetone and ammonia (chemicals with the greatest potential for migration due to concentration and volatility) was conducted in the vadose zone above the dense ammonium sulfate contaminant plume. Acetone and ammonia were not detected in the vapor samples

Groundwater contamination: Contaminant concentrations exceed screening levels in both the dense plume and the dilute plume. Chemical concentrations were screened against EPA Drinking Water Standards (MCLs), or EPA Region III Risk-Based Concentration (RBC) for tap water (for chemicals without MCLs). The following table shows the highest groundwater concentrations detected in each plume.

<u>contaminant</u>	<u>Dilute plume</u>	<u>Dense plume</u>	<u>screening level</u>
	<u>groundwater concentration</u>	<u>groundwater concentration</u>	
Ammonia	1,490 ppm	16,800 ppm	210 ppb (RBC)
Sulfate	1,850 ppm	39,100 ppm	no MCL or RBC
Manganese	97,400 ppb	9,650 ppb	730 ppb (RBC)
Acetone		340 ppm	5.5 ppm (RBC)
Arsenic		1,660 ppb	10 ppb (MCL)

Air (Indoor) - Detectable levels of contaminants were not found in vadose zone samples, therefore, the vapor intrusion pathway is not of concern.

Soil contamination: Surface and subsurface soil are considered together. Low levels of organic and inorganic compounds, below human health screening levels, were detected.

Surface Water - Low levels of VOCs and metals were detected. No SVOCs were detected. The highest concentration of ammonia detected, 320 ppb, was slightly above the tap water RBC. The highest concentration of

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sulfate detected was 49,000 ppb. Sulfate does not have an MCL or tap water RBC.

Sediment - Low levels of VOCs and SVOCs were detected. PAH concentrations were generally below 1 ppm. Metal concentrations were below the industrial soil screening levels.

Air (Outdoor) - Modeled air concentrations (Ecology and Environment 1992) were below EPA Region III RBCs for ambient air.

Former Wastewater Treatment Area (WWTA) - The WWTP area is about 100 acres and contains active and inactive WWTP structures and a series of four treated water basins (about 60 acres), as shown in Figure 5. The WWTP was constructed in the late 1940s and early 1950s. Most of this area overlaps the ASA. Samples were collected from groundwater, soil, surface water and sediment, and were analyzed for a comprehensive list of organic and inorganic chemicals and analytes. The results of the investigations are presented in the reports listed below (references).

Groundwater contamination: Several organic chemicals and metals exceed the screening levels. The following table shows the highest groundwater concentrations detected in 2001, however, average concentrations over the area are generally much lower. Chemicals above the EPA Drinking Water Standards (MCLs) or EPA Region III Risk-Based Concentration (RBC) for tap water (for chemicals without MCLs) are:

<u>contaminant</u>	<u>groundwater concentration</u>	<u>screening level</u>
Arsenic	52.1ppb	10ppb (MCL)
Cadmium	7.1 ppb	5 ppb (MCL)
Manganese	4,440 ppb	730 (RBC)
Iron (dissolved)	133,000 ppb	11,000 ppb (RBC)
bis(2-ethylhexyl)phthalate	100 ppb	6 ppb (MCL)
1,2-dichloroethane	10 ppb	5 ppb (MCL)

Soil - Arsenic exceeded the industrial soil RBC in two samples, with a high concentration of 8.5 ppm. These levels may represent naturally occurring levels of arsenic. Benzo(a)pyrene was detected in one sample at 3.9 ppm, above the industrial RBC of 0.39 ppm.

Surface Water and Sediments - Low levels of contaminants were detected. One sediment sample contained a total PAH concentration of 7,890 ppb. Low levels of DDD, DDE, and DDT were also detected.

Bristol Landfill - The landfill is bounded by River Roar and the Delaware River, at the western end of the property, as shown in Figure 6. Rohm & Haas operated the landfill from 1952 to 1975. The landfill is fenced around the perimeter. Remediation of the Landfill is complete. The Landfill is encapsulated with a hydraulic barrier & cap containment system. The hydraulic barrier (soil/bentonite wall) is tied-into bedrock saprolite to prevent releases of groundwater from the structure. The synthetic/clay cap prevents the infiltration of surface water. The containment system prevents exposure or releases of contamination. The containment structure was completed in September 1997. Ongoing monitoring confirms that releases are not occurring from the site. No further evaluation is needed for this area.

Parcel North of River Road - This 110 acre area is located between River Road and State Road, north of the Rohm & Haas Bristol plant, as shown in Figure 1. The property is owned by Rohm & Haas but has never been used for manufacturing or waste disposal. It is undeveloped land comprised of wooded and wetland areas.

Most of the area is included in the Croydon TCE Superfund site. Superfund is operating a groundwater recovery and treatment system to remediate TCE contamination in the groundwater beneath the property. Extraction wells and a treatment system are located on the property. Past investigations concluded that the TCE groundwater plume

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originated north of the Rohm & Haas property.

In past investigations by Rohm and Haas and the EPA, samples were collected from groundwater, soil, sediments, and surface water. Samples were analyzed for a comprehensive list of organic and inorganic chemicals. The results of the investigations are presented in the reports listed below (references). Since the only potential exposures at the area are for intermittent work activities and trespass activities, the contaminant concentrations were screened against industrial RBCs.

Groundwater contamination - The EPA Superfund program is operating an extraction and treatment system to remove TCE and its degradation products from the groundwater. Remediation is nearly complete.

Air (Indoor) - There are no buildings at the on the property, therefore, accumulation of vapors in indoor area is not of concern.

Soil contamination: Contaminant concentrations above human health screening levels were detected in only two localized areas in surface soil samples. A fill area at the rear of a truck garage had high PAH concentrations in one of the six samples collected. The area of the former Bucks County Mosquito Control Commission site had high DDT concentrations in 3 of 15 samples collected (over two separate sampling events). The concentrations of the contaminants are:

<u>contaminant</u>	<u>soil concentration</u>	<u>screening level</u>
PAH compounds	ND to >100 ppm (total conc.)	≈ 10 ppm (total)
4,4'-DDT	ND to 700	8.4 ppm

Surface Water and Sediment - Historically, elevated levels of TCE were detected. The Superfund remediation project has removed the source of the contamination.

Outdoor Air: Chemicals of concern are not present in concentrations that would present an outdoor air contamination concern.

References:

Several investigations were completed for each area:

Trailer Staging Area RFI, (BCM 1992).

Human Health and Ecological Risk Assessment for the TSA and MFA of the Rohm and Haas Bristol Plant (Ecology and Environment 1992).

Trailer Staging Area RFI Residential Well Sampling (BCM 1992).

Groundwater Sampling and Analysis Report, Trailer Staging Area FRI, December 2001 (ST Environmental Professionals 2002).

Manufacturing Area RFI (BCM 1989).

Manufacturing Area RFI Interim Report (BCM 1992)

Environmental Site Evaluation Report, Bristol Manufacturing Area Study Area East (ST Environmental Professionals 2001)

Environmental Site Investigation Report, Parcel South of River Road (ST Environmental Professionals 2003)

Groundwater Sampling Report for Bristol Research Technical Center & Atofine Production Area (ST Environmental Professionals 2004)

Vapor Intrusion Evaluation for Rohm & Haas Bristol Facility Human Health Indicator Determination, Attachment A (CH2MHill 2005)

Ammonium Sulfate Area RCRA Facility Investigation Interim Report (BCM, 1993)

Ammonium Sulfate Area RCRA Facility Investigation, Phase II RFI Report (Smith Environmental Technologies Corporation 1996).

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Phase III RFI Report for Ammonium Sulfate Area (ST Environmental Professionals 2001).
RCRA Facility Investigation Report - Former Wastewater Treatment Plant, Bristol Complex (URS 2002).
Bristol Landfill Post-Closure Monitoring Program (ST Environmental Professionals 2003).
Final Phase I Remedial Investigation Report, Croydon TCE Site, Bucks County, PA (NUS Corp. 1998)
Environmental Site Investigation Report, Parcel North of River Road (ST Environmental Professionals 2001)
Environmental Site Investigation Report, Parcel North of River Road (ST Environmental Professionals 2003)

Footnotes:

¹ “Contamination” and “contaminated” 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 “levels” (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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Former Wastewater Treatment Area (WWTA)

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

Parcel North of River Road

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

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not “contaminated” as identified in #2 above.
2. enter “yes” or “no” for potential “completeness” under each “Contaminated” Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media - Human Receptor combinations (Pathways) do not have check spaces (“_____”). 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 “Contaminated” Media - Human Receptor combination) - continue after providing supporting explanation.
- _____ If unknown (for any “Contaminated” Media - Human Receptor combination) - skip to #6 and enter “IN” status code.

Rationale:

Groundwater

Municipal water is used at the Bristol Plant. Based on a survey of residences surrounding the Bristol Plant, all area residences also use municipal water as a potable water supply. Since contaminated groundwater is not withdrawn for use either on-site or off-site, the only potential for a complete exposure pathway is for construction workers during subsurface construction activities.

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Air (Indoor)

TSA - Currently, there are no permanent building structures at the TSA. Therefore, the potential for subsurface migration to indoor air is an incomplete pathway.

MSA - Vapor intrusion into occupied buildings was evaluated by Rohm & Haas using the EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002). Indoor air concentrations were modeled using the Johnson and Ettinger (1991) model. The evaluation further calculated the total risk to building occupants from all chemical constituents at levels predicted by the Johnson and Ettinger model. The calculated excess cancer risks were 1×10^{-8} for occupants of the Research Technical Center (RTC) buildings, and 3×10^{-8} for occupants of the Manufacturing Study Area (MSA) buildings. These risk levels are significantly below the EPA risk reduction goals of 10^{-4} to 10^{-6} . The calculated hazard index is 0.00003 for the RTC worker scenario, and 0.0004 for the MSA worker scenario. They are significantly below the EPA risk reduction goal of 1.0. The assessment is presented in *Vapor Intrusion Evaluation for Rohm & Haas Bristol Facility Human Health Indicator Determination, Attachment A* (CH2MHill 2005). Therefore, this is an incomplete pathway for contaminant exposure.

EPA has requested additional information to allow a detailed review of the vapor intrusion evaluation. After the review, EPA will update this form to include the results of the review.

ASA - Vapor sampling for acetone and ammonia (chemicals with the greatest potential for migration due to concentration and volatility) was conducted in the vadose zone above the dense ammonium sulfate contaminant plume. Acetone and ammonia were not detected in the vapor samples. The results indicate that vapor intrusion into buildings is not an exposure pathway of concern for residents or workers in the area of the AS plume.

WWTP Area - Volatile chemical concentrations are below the screening levels identified in EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002)

North of River Road - Currently, there are no permanent building structures at this property. Therefore, the potential for subsurface migration to indoor air is an incomplete pathway.

Soil (Surface and Subsurface) - At the operating plant and disposal areas, access to the property is controlled by fencing. Areas of contaminated soil are covered with paving or buildings. The only reasonably expected exposure opportunity is during surface and subsurface excavation activities. Therefore, the only reasonably expected complete pathway is for construction workers involved in excavation activities.

The Parcel North of River Road is undeveloped with the exception of utility lines and the EPA groundwater remediation system. The only reasonably expected complete pathway is for workers involved in maintenance activities and trespassers.

Surface Water and Sediment - Access to surface water and sediment within the plant area is restricted by fencing. Access to Otter Creek is confined by steep banks both adjacent to the TSA and on the opposite side of Otter Creek. Surface water and sediment contaminant levels in areas with unrestricted access are generally below human health screening levels. Complete pathways for exposure, therefore, are not reasonably expected.

Air (outdoor) - Many of the contaminated areas are paved, thus controlling vapor movement into the air. Rohm & Haas has conducted Industrial Hygiene monitoring at many areas of the plant. Data submitted from monitoring of a tank farm area shows air concentrations 2 to 3 orders of magnitude below the OSHA PELs.

Vapor monitoring at the ASA and vapor migration modeling for the MSA show that migration of contamination to the air is not a significant concern.

Reference(s):

Vapor Intrusion Evaluation for Rohm & Haas Bristol Facility Human Health Indicator Determination, Attachment A (CH2MHill 2005)

Rohm & Haas letter to EPA, Re: Bristol Facility Human Health Environmental Indicators; April 22, 2005

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

Current Human Exposures Under Control
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4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **“significant”**⁴ (i.e., potentially “unacceptable” 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 “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks)?

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

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

 If unknown (for any complete pathway) - skip to #6 and enter “IN” status code

Rationale:

Rohm & Haas Plant Area - The only reasonably expected complete pathway for contaminant exposure is for construction workers during surface or subsurface excavation activities. All such activities are controlled under the “Digging Procedures” of the Bristol plant. Excavations in known or suspected areas of contamination require the use of proper protective equipment, necessary air monitoring, and properly trained individuals. Work is performed after the development of a formal, detailed health and safety plan, and under the supervision of a properly trained health and safety technician. Details of the procedures are contained in the 4/22/05 Rohm & Haas letter (with attachment) referenced below. These procedures are adequate to prevent an unacceptable exposure through the potential exposure pathway for construction workers.

Parcel North of River Road - The only reasonably expected complete pathway is for exposure to contaminated surface soil by workers involved in maintenance activities and trespassers.

The areas of contamination are not in the vicinity of the utilities or the groundwater remediation system that may need maintenance. Also, the contamination is in two isolated areas of the 110 acre property. Access to the property adjacent to the truck repair garage is restricted by a fence on the River Road side, and by wetlands, Hog Run Creek and dense vegetation from other directions. Access to the former mosquito control facility is restricted by a fence on the River Road side. Considering the short duration of expected activities and the limited extent of the contaminated area, possible exposures are not expected to be significant.

Rohm & Haas recently transferred ownership of the eastern section of the parcel to the Township of Bristol. That section does not include the contaminated areas described above. Rohm & Haas is considering the transfer of the remaining area for public use as a nature area. Remediation or further restrictions to access at the contaminated areas would be warranted if the area is open to public use.

Reference(s):

Rohm & Haas letter to EPA, Re: Bristol Facility Human Health Environmental Indicators; April 22, 2005

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

5. Can the “significant” exposures (identified in #4) be shown to be within acceptable limits?

_____ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be “unacceptable”)- continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.

_____ If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code

Rationale and Reference(s):

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

 X YE - Yes, “Current Human Exposures Under Control” has been verified. Based on a review of the information contained in this EI Determination, “Current Human Exposures” are expected to be “Under Control” at the Rohm & Haas Company, Bristol Plant facility, EPA ID #PAD 00202920068 located at Route 414 & Old Route 13, Bristol, PA, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

_____ NO - “Current Human Exposures” are NOT “Under Control.”

_____ IN - More information is needed to make a determination.

Completed by (signature) _____ /s/ _____ Date 9/30/05
(print) Maureen Essenthier
(title) RCRA Project Manager

Supervisor (signature) _____ /s/ _____ Date 9/30/05
(print) Paul Gotthold
(title) PA Operations Branch Chief
(EPA Region or State) EPA, Region III

Locations where References may be found:

EPA Region III
1650 Arch Street
Philadelphia, PA 19103

Contact telephone and e-mail numbers:

(name) Maureen Essenthier
(phone #) 215-814-3416
(e-mail) essenthier.maureen@epa.gov

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.