

## DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

### RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA725) Current Human Exposures Under Control

**Facility Name:** Ferro Corporation. Delaware River Plant  
**Facility Address:** NJ State Highway Route 130 South, Bridgeport, New Jersey 08014  
**Facility EPA ID#:** NJR 000 035 865

#### **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 EIs 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 objectives of the RCRA Corrective Action program, the EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The "Current Human Exposures Under Control" EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and does 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 Determination status codes should remain in the 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).

#### **Facility Information**

The Ferro Corporation Facility (Ferro) is located on 293 acres in Bridgeport, New Jersey. The facility is bounded to the north by the Solutia facility (formerly known as the Monsanto Delaware River Plant), Shell Oil Company to the east, the Logan Cogeneration Plant to the west, and U.S. Highway Route 130 to the south. The Delaware River is located to the north across the Solutia site which is immediately adjacent to the east bank of the river. All land surrounding the site is zoned for industrial uses, but much of it to the east and south is currently being leased for agricultural purposes. Several residences are

located within one-half mile of the site, but the overall area remains sparsely populated; an estimated 5,400 people live within four miles of the site.

The Ferro facility was part of Solutia's 461 acre property before Ferro purchased the business from Solutia in August 2000. Ferro now includes Solutia's production area and all the tank and container storage areas. As part of the transaction, Ferro executed a long term lease of the Ferro facility from Solutia. The purchase agreement also contains provisions to transfer title to Ferro upon Solutia's completion of certain activities. The title has not yet been transferred. Solutia has retained ownership and operating control of the remaining portion of the 461 acres which includes several former waste disposal areas that are currently undergoing RCRA corrective action. Birch Creek bisects the Solutia property from south to north and drains to the Delaware River. Ferro's operational area is situated west of the Birch Creek.

Manufacturing operations began at the Solutia plant in 1961 under the ownership of Monsanto. Solutia manufactured plasticizers, flame retardants and organic industrial chemicals, and dyes. Ferro continues to manufacture the same products with the exception of dyes.

Investigation and corrective action efforts have been in progress at the entire Solutia site since 1983. Solutia's final Hazardous and Solid Waste Amendments (HSWA) permit (1994) includes requirements for corrective action at 14 solid waste management units (SWMUs) and areas of concern (AOCs). In addition, Solutia's New Jersey Pollutant Discharge Elimination System-Discharge to Groundwater (NJPDES-DGW) post-closure permit issued in September 1988 requires ongoing monitoring of both shallow and deep groundwater. While several SWMUs and AOCs currently exist on the portion of the property which Ferro purchased in 2000, Solutia will continue to maintain its HSWA responsibility and be accountable for all the contaminated areas at the entire 461 acre site, including the portion currently leased and maintained by Ferro.

While Ferro continues production at the site, on January 23, 2006, NJDEP determined that all of the RCRA units at Ferro had clean closed and that the facility had been removed from the list of hazardous waste facilities.

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, or

If data are not available skip to #6 and enter IN (more information needed) status code.

**Summary of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs):**

As stated in the facility description, Ferro acquired 293 acres of the 461 acre Solutia site in 2000, which included all the tanks and container storage areas. This change in operation was reflected in the transfer of the Facility-Wide permit to Ferro by permit modification in 2000. Consequently, several of the fourteen SWMUs and AOCs that were identified in Solutia's 1994 HSWA permit (Ref. 1) are now under the control of Ferro and each is discussed in detail below. A map showing the location of all of the SWMUs and AOCs is provided at Figure 9 in Solutia's Description of Current Condition Report (Ref. 2).

**SWMU 7, Raw Waste Equalization Lagoon (RWEL):** This unit is located on the western edge of the property. The lagoon has a single polyolefin liner and is approximately 250 feet by 230 feet by 10 feet deep. The RWEL was originally used as an off-specification wastewater lagoon for the waste water treatment plant (WWTP). In 1978, it was converted to an on-line equalization lagoon for wastewater from the WWTP primary clarification step. The lagoon stopped operating in 1990, and the contents were disposed off site. The process formerly performed in the RWEL is now conducted in an aboveground equalization tank. The HSWA permit required completion of a RCRA Facility Investigation (RFI) for soil, soil gas, and groundwater at this SWMU. Solutia found no significant contamination in any of these media during the 1997 field investigation and groundwater monitoring in this area showed no contaminants above New Jersey Ground Water Quality Criteria (NJ GWQC) (Ref. 3). This SWMU was approved for no further action in October 1998 (Ref. 4).

**SWMU 8, Process Sewer System (PSS):** The PSS collects and conveys all wastewater generated at the plant to the on-site WWTP. Sources discharging to the sewer system include surface water runoff collected from the production areas of the plant, cooling and process water from production operations, and surface water runoff from the hazardous waste storage pad and storage tank containment areas. Early groundwater monitoring revealed several volatile organic compounds (VOCs) in shallow groundwater near a damaged process sewer manhole. The manhole was repaired in February 1985, and major upgrading of portions of the sewer system was completed in 1992 and 1993. To assess the effectiveness of this work in mitigating the potential source area, the HSWA permit required completion of an RFI for soil, soil gas, and groundwater at this SWMU. Solutia found no significant contamination in soil gas or groundwater during the 1997 field investigation. VOCs were detected in subsurface soil above respective New Jersey Impact to Groundwater Soil Cleanup Criteria (NJ IGWSCC) in the vicinity of the former damaged manhole; however, historic groundwater data suggest that this contamination is not adversely impacting groundwater quality. Direct exposure to contaminants is not a concern (Ref. 3). This SWMU was approved for no further action in October 1998 (Ref. 4). A deed notice should be implemented in this location due to VOCs detection in subsurface soil above NJDEP regulated standards.

**AOC 11, Rail Loading Area:** This AOC encompasses the area where raw materials (anhydrous ammonia

and phosphoric acid) and finished products are loaded and unloaded from railroad tank cars. During the 1988 NJDEP visual site inspection (VSI), stained gravel and elevated soil gas readings indicated the possibility of contamination related to spills in this area. The HSWA permit required completion of an RFI for soil at this AOC. Two constituents, di-n-octylphthalate (183 mg/kg) and bis(2-ethylhexyl)phthalate (up to 4,700 mg/kg), were found in two different surface soil (0 to 6 inches bgs) samples. Bis(2-ethylhexyl)phthalate was detected above the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NJ NRDCSCC) (210 mg/kg), while di-n-octylphthalate and bis(2-ethylhexyl)phthalate were both detected above the NJ IGWSCC (100 mg/kg for both constituents). The ground surface at this area is covered by up to two feet of railroad ballast, and direct exposure to contaminated soil is unlikely (Ref. 3). This AOC was approved for no further action in October 1998 (Ref. 4). A deed notice should be implemented in this location due to detection in subsurface soil above NJDEP non-residential standards.

**SWMU 12, Three Aboveground Storage Tanks (ASTs):** The AST area is located at the east end of the plant process area. Three RCRA-regulated ASTs in this area were used to store hazardous wastes generated at the site as follow; Vertical Benzyl Chloride Tank (14,000 gallons), Horizontal Benzyl Chloride Tank (15,000 gallons) and Benzyl Diethylamine (BDEA) Residue Tank (6,900 gallons). The tanks are situated on diked concrete pads that drain to the plant sewer system and the WWTP. The area is paved and diked, but records indicate that deficiencies in the secondary containment system may have allowed runoff to escape before the pads were upgraded. The RCRA permit for the ASTs in this location was renewed in January 1994. However, as outlined in NJDEP's January 23, 2006 letter to Ferro, NJDEP accepted closure certificates for the 14,000 gallon tank on February 14, 1995, and on January 31, 2000, for the 15,000 gallon tank as they were closed in accordance with the closure plan approved in the permit (Ref. 6).

The HSWA permit also addressed this SWMU by requiring completion of an RFI for soil in exposed areas surrounding the pads. Trichloroethene (TCE) (1.41 mg/kg) was found in one surface soil sample above the NJ IGWSCC (1.0 mg/kg) but below the NJ NRDCSCC (54 mg/kg). Because TCE has not been reported in surrounding groundwater, this contamination does not appear to be negatively impacting other media. Furthermore, surface soil at SWMU 12 is covered with gravel and not exposed at the ground surface (Ref. 3). This SWMU was approved for no further action in October 1998 (Ref. 4). In addition, the BDEA tank (6,900 gallons) was also closed in October 2005. NJDEP reviewed the closure report and the closure certification submitted by Ferro and conducted an inspection of the BDEA tank on November 30, 2005. Based on these submittals and inspection, NJDEP notified Ferro in a letter dated January 23, 2006, that the BDEA tank had been clean closed (Ref. 6).

**AOC 12A, Two Removed Aboveground Process Tanks:** Steamer Overheads Tank (15,000 gallons) and Phosphate Esters Steamers Overheads Tank (6,000 gallons). These ASTs were included in the original RCRA permit issued by NJDEP in June 1988. The tanks were removed from the permit when it was renewed in January 1994 because they were classified as a process tanks rather than as storage tanks. The ASTs are situated within a concrete secondary containment basin in the area of SWMU 12. The bottom of the basin is set approximately 3.5 feet bgs. The HSWA permit required completion of an RFI for soil in exposed areas surrounding the basin. No impacted soil was identified during the 1997 field investigation, and this AOC was approved for no further action in October 1998 (Ref. 3 & 4).

**SWMU 13, Drum Storage Area:** This unit is a RCRA-regulated paved drum storage pad covering 1,160 square feet with a capacity of 23,100 gallons (420 55-gallon drums). Hazardous wastes stored in this unit include spent benzyl chloride, phthalic anhydride, and waste oil. The pad is located on a portion of the central plant area that was paved in 1970. When cracks were found in the paved surface in 1981, the pad was resurfaced with an additional layer of asphalt, a spill containment curb was constructed, and a spill drainage collection system was installed. It is unclear whether secondary containment was provided for the unit before these upgrading steps were implemented. Although no soil gas readings were detected in

the exposed sandy soil around the pad during NJDEP's 1988 VSI, the HSWA permit required completion of an RFI for soil around the pad's perimeter. Hexachlorobenzene (5.56 mg/kg) was detected in one surface soil sample at a concentration exceeding the NJ NRDCSCC (2.0 mg/kg) but below the NJ IGWSCC (100 mg/kg). According to approved documentation, there is little or no potential for direct exposure to soil at SWMU 13 (Ref. 3 & 7). Groundwater monitoring conducted in May and November 2008 showed no contaminants above NJ GWQC in this area. This SWMU was recommended for no further action in October 1998 (Ref. 4).

In 2005, Ferro ceased operation at the drum storage area and submitted a closure certification dated October 12, 2005 to NJDEP. NJDEP accepted the closure certification and subsequently issued a letter on January 23, 2006, notifying Ferro that the clean closure of the drum storage area was now complete (Ref. 6). As a result and because the drum storage area and the BDEA tank were the only remaining authorized storage areas in the hazardous waste facility, NJDEP determined that all of the hazardous waste facilities activities at Ferro have been closed and Ferro is no longer authorized to store hazardous waste (Ref. 6).

### **References:**

1. HSWA Permit issued to the Monsanto Company Delaware River Plant, Bridgeport, New Jersey. Prepared by USEPA. Dated December 5, 1994.
2. Solutia's Description of Current Conditions Report. Prepared by Smith Technology Corporation. Dated January 1997.
3. Solutia Delaware River Plant, Environmental Indicator (CA725) determination, Current Human Exposures Under Control, Dated May 29, 2003.
4. Letter from Barry Tornick, USEPA, to Donald Hoegel, Solutia, re: Solutia, EPA ID No. NJD001700707. Dated July 17, 1998.
5. Email from Mark Mazanec, Ferro Corporation, to Sam Abdellatif, EPA, re: Ferro CA725. Dated June 5, 2009.
6. Letter from Robert Confer, NJDEP to Ralph Nyland, Ferro Corporation, re: Acceptance of Closure Certifications for Drum Storage Area and the BDEA Tank. Dated January 23, 2006.
7. SWMU/AOC Sampling and Analysis Report, Solutia Delaware River Plant, Bridgeport, New Jersey. Prepared by BCM Engineers. Dated January 1998.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be “**contaminated**”<sup>1</sup> 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	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			Benzene, Vinyl Chloride
Air (indoors) <sup>2</sup>		X		
Surface Soil (e.g., <2 ft)	X			Hexachlorobenzene, Bis(2-ethylhexyl)phthalate
Surface Water		X		
Sediment		X		
Subsurface Soil (e.g., >2 ft)	X			Hexachlorobenzene
Air (Outdoor)		X		

\_\_\_\_\_ 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.

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<sup>1</sup> “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).

<sup>2</sup> 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.

## **Rationale:**

### **Groundwater**

There are two distinct water-bearing units below the entire site of Ferro & Solutia. Water table groundwater at the site is encountered at depths of 1.5 to 14 feet bgs in the Cape May sands and dredge fill material. The water table aquifer is effectively separated from a deeper confined aquifer by the Raritan-Magothy Formation, which appears to be continuous across the site. The deeper aquifer is comprised of two zones separated by a layer of low permeability. The upper zone is approximately 50 feet thick at the plant site and contains fresh water. The lower zone contains brackish water.

Groundwater in the water table aquifer moves in three general directions at the site: easterly toward Birch Creek, westerly toward the site's western property boundary, and north to the Delaware River. The dividing line between easterly and westerly water table flow appears to be located just west of Birch Creek.

There are a total of more than 60 groundwater wells that are currently included in Solutia's groundwater monitoring program and are being monitored on a semi-annual basis as part of Solutia's NJPDES-DGW permit. Several of these wells are currently located on the Ferro property. Semiannual sampling is performed in May and November. All wells included in the program are targeted for sampling in May, while a smaller set is sampled in November.

Based upon the most recent sample monitoring events conducted in May and November 2008, benzene was detected in well MW-31-D ( $1.4 \mu\text{g/L}$ ) during the May event, above the NJ GWQC ( $1 \mu\text{g/L}$ ) but didn't exceed the EPA maximum contaminant level (MCL) ( $5 \mu\text{g/L}$ ). Also, vinyl chloride was detected at Well MW-31S ( $20 \mu\text{g/L}$ ) during the May 2007 sampling event above both the NJ GWQC ( $1 \mu\text{g/L}$ ) and the EPA MCL ( $5 \mu\text{g/L}$ ); however, this detection seems anomalous as vinyl chloride historically was never detected in this well above criteria since the 1993 sampling event.

Moreover, under natural conditions, groundwater flow in the Raritan-Magothy Formation was likely toward the Delaware River. However, Ferro operates three production wells (formerly utilized by Solutia) "West Production Well [MW-30D], East Production Well [MW-31D], and Production Well No. 3 [MW-37D]" that pump from the upper portion of this deeper aquifer at a permitted rate of 1,800 gallons per minute (Ref. 1). These wells provide water for plant production process and non-community potable water use. The location of these production wells is depicted on Figure 9 in the Description of Current Conditions Report (Ref. 1). As a result of sustained on-site pumping, groundwater in this unit now moves radially inward from all directions around the withdrawal wells. The cone of depression associated with pumping at Ferro appears to extend as much as two miles beyond the site property, drawing groundwater toward the site from adjacent and nearby properties (Ref. 1). Data indicate that the pumping of this unit has no observable effect on the water table aquifer. Because overall flow in this unit is from the property boundary inward, the possibility of groundwater moving off site in the confined aquifer is remote as long as pumping continues (Ref. 1).

### **Indoor Air**

Soil and groundwater contamination is generally not located in the portion of the facility that has been leased by Ferro from Solutia, which is the only portion where there are on-site industrial buildings (Ref. 2). For instance, all wells with high groundwater exceedences in November 2008 (MW-53-1, MW-1T, MW-2T, MW-4T) are located in the northwest quadrant of the Solutia site, away from the active portion of the facility now maintained by Ferro (Ref. 3). Also, since the only structure near MW-31S, where VOCs were anomalously detected above NJ GWQC during May 2007, is a building that houses water

pumps and is not generally occupied (Ref. 7), there is no concern for potential migration of contaminants in shallow groundwater into enclosed structures at the facility.

### **Surface and Subsurface Soil**

Residual contamination is present in soil at a number of the SWMUs/AOCs at the Ferro site above relevant NJ standards, as outlined below (Ref. 1, 4, and 5):

***SWMU 8, Process Sewer System*** - Acetone, ethylbenzene, and total xylenes were detected in subsurface soil above the NJ IGWSCC, but below the NJ RDCSCC and the NJ NRDCSCC. Given that the contaminants are not present above a direct contact screening criteria, SWMU 8 is not considered a contaminated SWMU for purposes of this EI Determination as contaminant concentrations are below applicable human health direct contact criteria.

***AOC 11, Rail Loading Area*** - Bis(2-ethylhexyl)phthalate (up to 4,700 mg/kg) was detected in two surface soil sample above the NJ NRDCSCC (210 mg/kg). Di-n-octylphthalate was also detected in surface above the NJ IGWSCC, but below the NJ RDCSCC and the NJ NRDCSCC.

***SWMU 12, Three ASTs*** – TCE was detected in one surface soil sample above the NJ IGWSCC, but below the NJ RDCSCC and NJ NRDCSCC. However, given that TCE is not present above a direct contact screening criteria, SWMU 12 is not considered a “contaminated” SWMU for purposes of this EI Determination.

***SWMU 13, Container Storage Area*** - Hexachlorobenzene (5.56 mg/kg) was detected in one surface soil sample above the NJ NRDCSCC (2.0 mg/kg).

### **Surface Water/Sediment**

The Delaware River is located north of the Ferro property just across the Solutia site. The river forms Solutia’s boundary to the north and northwest and drains a large area in New York, New Jersey, and Pennsylvania prior to passing the Solutia site. The Delaware River is tidally influenced in the vicinity of the Solutia site and river water is fresh/brackish along the property boundary. The river channel is approximately 6,000 feet wide and a dredged channel bottom is maintained to a depth of 40 feet. River flow rate in the area of the Solutia site has been estimated at approximately 13,000 cubic feet (Ref. 4). The Birch Creek also bisects Ferro and Solutia properties from south to north and drains to the Delaware River. The creek is also tidally influenced. None of the site area east of Birch Creek is developed.

Groundwater in the shallow Cape May aquifer (1.5 feet to 14 feet bgs) is connected to the surface water regime of the Delaware River. Groundwater in the lower Raritan-Magothy aquifer is not connected to the local surface water bodies (Ref. 1).

Based upon the latest groundwater (November & May 2008) data, there is the only one exceedence of NJ GWQC in one well on the Ferro site. In May 2008, Benzene was detected in well MW-31D at concentration of (1.4  $\mu\text{g/L}$ ). Given that the concentration in MW-31D is below the relevant New Jersey Surface Water Quality Criteria (NJ SWQC) for saline coastal and saline estuary waterways (benzene = 71  $\mu\text{g/L}$ ) and given that groundwater moves radially inward from all directions around the production wells, in addition to the significant dilution and volatilization that is expected from the large flow of the Delaware River if groundwater was to discharge to surface water, site-related impacts of surface water and/or sediment are not expected.

In addition, surface water and sediment pore water samples were collected from the Delaware River in August 2005 as part of Solutia’s EI CA750 Migration of Contaminated Groundwater Under Control



determination. Results indicated no significant groundwater to surface water discharge in the vicinity of the Solutia's site (Ref. 6).

### **Outdoor Air**

Based upon a review of available information, most of the impacted soil areas at are either covered with soil and/or synthetic caps, asphalt, ballast, and/or gravel, thus emissions of volatiles and/or particulates are not expected (Ref. 4). Also, given the concentrations and limited detected of volatiles in groundwater, migration of volatile contaminants from groundwater into outdoor air at significant levels is not currently a concern at the Solutia site.

### **References:**

1. Description of Current Conditions Report for Solutia, prepared by Smith Technology Corporation, Dated January 1997.
2. Solutia Delaware River Plant, Environmental Indicator (CA725) determination, Current Human Exposure under Control, Dated May 5, 2003.
3. Results of Second-Half 2008 Semi-Annual Groundwater Monitoring Program. Solutia, Delaware River Plant, Dated March 27, 2009
4. SWMU/AOC Sampling and Analysis Report, Solutia Delaware River Plant, Bridgeport, New Jersey. Prepared by BCM Engineers. Dated January, 1998.
5. Solutia's Sampling and Analysis Report for Phase II RFI and Corrective Measures Evaluation. Prepared by URS Corporation. Dated December 2001.
6. Solutia Delaware River Plant, Environmental Indicator (CA750) determination, Migration of Contaminated Groundwater Under Control, Dated May 23, 2009.
7. Email from Mark Mazanec, Ferro Corporation, to Sam Abdellatif, EPA, re: Ferro Ca725. Dated June 5, 2009.

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	Trespasser	Recreation	Food <sup>3</sup>
Groundwater	No	No	No	Yes	-	-	No
Air (indoor)							
Surface Soil (e.g. < 2 ft)	No	No	No	Yes	No	No	No
Surface Water							
<del>Sediment</del>							
Subsurface Soil (e.g., > 2 ft)	No	No	No	No	No	No	No
Air (outdoors)							

Instruction 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. These spaces instead have dashes (“-”). 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:**

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

## Groundwater

As mentioned previously, shallow groundwater at the site is encountered at depths of 1.5 to 14 feet bgs in the Cape May sands and dredge fill material. Thus, there is a potential for on-site construction workers to come in direct contact with impacted groundwater in the water table while conducting intrusive activities at the site.

Groundwater in the water table aquifer moves in three general directions at the entire Solutia site: easterly toward Birch Creek, westerly toward the site's western property boundary, and north to the Delaware River. The dividing line between easterly and westerly water table flow appears to be located just west of Birch Creek. As mentioned in Question No. 2, the water table aquifer is effectively separated from a deeper confined aquifer by the Raritan-Magothy Formation, which appears to be continuous across the site. The deeper aquifer is comprised of two zones separated by a layer of low permeability. The upper zone is approximately 50 feet thick at the plant site and contains fresh water. The lower zone contains brackish water.

Areas of impact are located in the shallow Cape May Formation. The Cape May Formation is not utilized for potable use at the Ferro site or in the surrounding areas. Thus, exposure to contaminants in shallow groundwater through potable use both on- and off-site are not potentially complete exposure pathways.

Ferro currently maintains three production wells (formerly utilized by Solutia) that pump from the upper portion of the deeper aquifer at a permitted rate of 1,800 gallons per minute (Ref. 1). The wells are identified as West Production Well (MW-30D), East Production Well (MW-31D), and Production Well No. 3 (MW-37D). As a result of sustained on-site pumping, groundwater in this unit now moves radially inward from all directions around the withdrawal wells. The cone of depression associated with pumping at Ferro appears to extend as much as two miles beyond the site property, drawing groundwater toward the site from adjacent and nearby properties. Because overall flow in this unit is from the property boundary inward, the possibility of groundwater moving off site in the confined aquifer is remote as long as pumping continues.

Vinyl chloride was detected a few times in well MW-27D since 2001, which extends into the deeper confined Raritan-Magothy Formation, above the NJ GWQC ( $1 \mu\text{g/L}$ ). Given that the vinyl chloride was detected in this deeper unit, and given that the well is located approximately 700 feet away from the West Production Well and within the cone of depression, there is a concern that elevated concentrations of vinyl chloride may be reaching this production well. The three production wells are utilized by Ferro and provide water for plant production processes and non-community potable water use (Ref. 1). However, these wells are included in Solutia's site groundwater monitoring program (sampled in May each year), and recent data indicate no exceedences in these wells, except well MW-31-D that showed Benzene at ( $1.4 \mu\text{g/L}$ ) slightly above NJ GQWC of ( $1.0 \mu\text{g/L}$ ). It should also be noted that samples historically collected from each of the three production wells (e.g., May and August of 1994) showed no constituents above either the MCL or the NJ GWQC. In addition, Ferro's potable water is tested regularly and conforms with the non-community drinking water standards (Ref. 2). Also, well MW-27D was sampled in November 2008, and vinyl chloride was not detected during this round of groundwater sampling (Ref. 3). Thus, based upon current available information, on-site worker exposure to deeper groundwater is not considered a potentially complete exposure pathway.

In addition to the three production wells at the Ferro site, there are two potable water supply wells located immediately west of the site that are operated by U.S. Generating Company (Ref. 1). Both wells are also completed in the upper portion of the Raritan-Magothy Formation. However, these wells are within the cone of depression of the three production wells on the Ferro site and, thus, these wells are not a concern relative to releases from the Ferro site. Also, there are two deep wells owned by New Jersey American

Water Company (NJAWC) located approximately 4200 feet south-southeast of the site (Ref. 4 & 5). However, contamination is limited to the shallow aquifer and all wells with high groundwater exceedences are located in the northwest quadrant of the Solutia site approximately 7500 feet or more away from the NJAWC wells.

### **Surface and Subsurface Soil**

The Ferro facility site employs a number of security measures designed to deter, detect, delay, and respond to possible unauthorized entry into the site where hazardous waste are processed or stored (Ref. 6).

The manufacturing portion of the site is fenced and/or protected by buffer zone cameras and security lighting. No trespassing signs are posted along the fence line and gate areas. The site has one gate access point for all employees, contractors, drivers, and visitors. A railroad access gate is remotely controlled by contract guard who can monitor the gate via camera from the guard house at the main gate entrance. Employees enter the site through a turnstile by swiping their access control ID badge. The guard house is manned by a contract guard around the clock, seven days a week. Any attempt of unauthorized entry or suspicious behavior, will trigger personal to contact a response from the Logan Township Police. In addition, the Ferro site complies with New Jersey Best Security Practices by performing an annual security audit reviewed by the Logan Township Police (Ref. 6). Thus, it is unlikely that a trespasser would gain access to the facility. Therefore, trespassing on the Ferro site is not considered a concern for exposure to surface soil.

Only limited areas of impacted exposed surface soil were identified at the Ferro site, such as one sampling location at each of SWMUs 12 and 13, and at two sampling locations at AOC 11. However, surface soils at these SWMUs are covered with gravel, or in the case of AOC 11, with up to two feet of railroad ballast, and are therefore not exposed at ground surface. Thus direct exposure to on-site workers in these locations is unlikely. However, the potential for on-site construction workers to come in contact with contaminated soil when performing intrusive activities at the site is considered a potentially complete exposure pathway.

### **References:**

1. Description of Current Conditions Report. Prepared by Smith Technology Corporation. Dated January 1997.
2. Letter from Glenn Randall, URS Corporation, to Gregory Zalaskus, NJDEP, re: Solutia's Classification Exception Area Designation Request. Dated March 19, 2002.
3. Results of Second-Half 2008 Semi-Annual Groundwater Monitoring Program. Solutia, Delaware River Plant Dated March 27, 2009.
4. Letter from Barry Tornick, USEPA, to Glenn Randall, URS Corporation, re: Solutia 2003 Groundwater Evaluation Report. Dated June 21, 2007.
5. Email from Ray Pinkstone, NJDEP, to Sam Abdellatif, EPA, re: Solutia & Ferro. Dated August 4, 2009.
6. Email from Mark Mazanec, Ferro Corporation, to Sam Abdellatif, EPA, re: Ferro Ca725. Dated June 5, 2009.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably

expected to be **significant**<sup>4</sup> (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?

- If no (exposures cannot 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:**

#### **Groundwater**

As discussed in response to Question # 3, the potential for on-site construction workers (e.g., remedial workers) to come in direct contact with contaminated groundwater is being considered a potentially complete exposure pathway. Remedial workers are expected to perform work under health and safety plans following strict Occupational Health and Safety Administration (OSHA) guidelines. Personal protective equipment (PPE) would be used during any intrusive activities on the site, thus minimizing the potential for direct exposure to impacted groundwater. Therefore, any potential exposures that may occur for on-site construction workers (e.g., remedial workers) are not expected to be significant.

#### **Surface and Subsurface Soil**

With regards to soil contamination at the Ferro site, exposure is expected to be insignificant for several reasons. First, the extent of contamination is extremely minimal (e.g., only two sample locations in AOC 11, and only one sample location in SWMU 13). Contamination in AOC 11 is located under ballast material along a railroad track area, thus it is unlikely that intrusive activities would be performed in this area as the integrity of the railroad tracks may be threatened. Contamination in SWMU 13 has been covered by gravel as a control mechanism to prevent exposure (Ref. 1); thus, it is not expected that

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<sup>4</sup> 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.

intrusive activities would be performed in this area to disturb the cover materials. In addition, Ferro will utilize their health and safety procedures if activities needed to occur in any impacted areas. Therefore, exposure for on-site construction workers to contaminated soil is not expected to pose significant exposures.

**References:**

1. Solutia Delaware River Plant, Environmental Indicator (CA725) determination, Current Human Exposure under Control, Dated May 5, 2003.

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:**

This question is not applicable. See response to question #4.

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):

- 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 Ferro Corporation, Delaware River Plant, EPA ID# NJR 000 035 865 , located at NJ State Highway Route 130 in Bridgeport, New Jersey 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:** \_\_\_\_\_ Date: \_\_\_\_\_  
Sameh Abdellatif, Remedial Project Manager  
RCRA Programs Branch  
USEPA Region 2

**Reviewed by:** \_\_\_\_\_ Date: \_\_\_\_\_  
Barry Tornick, Chief  
New Jersey Section  
RCRA Programs Branch  
USEPA Region 2

**Approved by:** Original signed by: \_\_\_\_\_ Date: August 12, 2009  
Adolph Everett, Chief  
RCRA Programs Branch  
USEPA Region 2

**Locations where references may be found:**

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the USEPA Region 2, RCRA Records Center, located at 290 Broadway, 15<sup>th</sup> Floor, New York, New York, and the New Jersey Department of Environmental Protection Office located at 401 East State Street, Records Center, 6<sup>th</sup> Floor, Trenton, New Jersey.

**Contact telephone and e-mail numbers:** Sameh Abdellatif, USEPA RPM  
(212) 637-4103  
[abdellatif.sameh@epa.gov](mailto:abdellatif.sameh@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.**

## **Attachments**

The following attachments have been provided to support this EI determination.

- ▶ Attachment 1 – Figure 1, showing the approximate boundaries for Ferro and Solutia.
- ▶ Attachment 2 – Figure 9, Site Plan showing the locations of all of the SWMUs & AOCs.
- ▶ Attachment 3 – Figure showing the approximate location of the New Jersey American Water Company wells.
- ▶ Attachment 4 – May 2008 Groundwater Semi-Annual Sampling map.
- ▶ Attachment 5 – November 2008 Groundwater Semi-Annual Sampling map.

Note: The attachments 2, 3, 4 and 5 available upon request.

— = STATE LINES  
 — = RIVER'S EDGE

■ = UPLANDS TO BE CONVEYED TO FERRO  
 ■ = UPLANDS TO BE RETAINED BY SOLUTIA  
 ■ = RIPARIAN PROPERTY

Solutia Inc. DRP  
 Bridgeport, New Jersey

Source: USGS Quadrangle / Marcus Hook, PA-NJ-DE 1987 (Photorevised 1986)

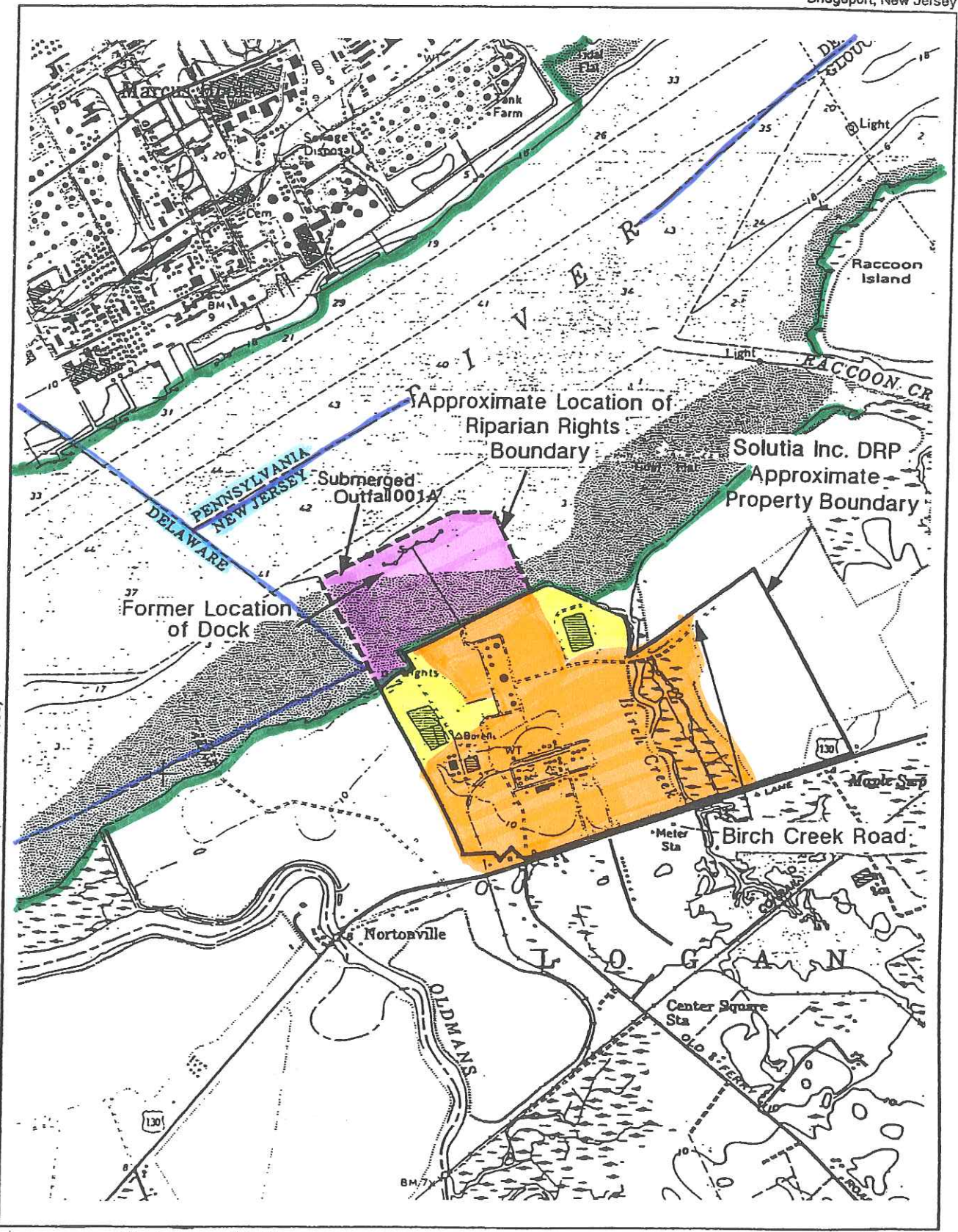


Figure 1  
 Facility Location Map