

HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Sherwin-Williams/Hilliards Creek

EPA ID No.: NJSFN0204181

Contact Persons

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Pathways, Components, or Threats Not Scored

The ground water migration, soil exposure, and air migration pathways were not evaluated because they are not expected to add significantly to the Hazard Ranking System (HRS) site score.

Ground Water Migration Pathway:

Although ground water contamination has been documented on site, the number of drinking water wells located within a 4-mile radius of the site is low (Reference [Ref.] 31, p. 2-13, 2-14).

Soil Exposure Pathway:

Lead-contaminated soil has been documented on one residential property. In October 2003, an interim removal action was completed on the property: the top 6 inches of soil were excavated from the property and disposed of (Ref. 50, pp. ES-1, 2-3). Lead-contaminated soil may remain on the property (Ref. 51, Table 4 and Appendix A) since only the top 6 inches of soil were removed from the property and the results for samples collected from below this depth indicated concentrations of lead greater than 400 milligrams per kilogram (Refs. 50, pp. 1-2, 2-3; 51, Appendix A). Soil samples were collected from within the 100-year flood plain of Hilliards Creek to evaluate whether periodic flooding transported contaminated sediments from Hilliards Creek to the banks (flood plain) of Hilliards Creek (Ref. 51, pp. 5, 8). As documented in the other sources section of this HRS documentation record, lead was detected in the flood plain soil samples at concentrations exceeding three times the background concentration along Hilliards Creek from Gibbsboro Road to sample location T-14, a distance of approximately 2,800 feet (Ref. 51, Figure 4; the other source section of this HRS documentation record). Six areas of concern were identified including the Hilliards Creek Wildlife Preserve (Ref. 51, p. 9). Many homes are located near the 100-year flood plain of Hilliards Creek. There is the potential for the lead-contaminated sediment in Hilliards Creek to be carried by floods onto residential properties located within or near the 100-year flood plain of Hilliards Creek (Ref. 97). However, current reference documentation does not indicate that contaminated soil is located on additional residential properties.

HRS DOCUMENTATION RECORD COVER SHEET (Continued)

Air Migration Pathway:

No air samples have been collected. Therefore, an observed release to the air migration pathway from on-site sources can not be documented. As documented in Section 2.4.1 for Source 1, volatile organic compounds (VOC) have been detected in free-phase product samples collected from ground water located near Buildings 55 and 67. VOCs also were detected in soil samples collected from Sources 1, 2, and 4, as documented in Section 2.4.1 for each source. There is the potential for the VOCs in the source areas to release to air and into occupied buildings.

HRS DOCUMENTATION RECORD

Name of Site: Sherwin-Williams/Hilliards Creek
EPA Region: 2
Date Prepared: February 8, 2006
Street Address of Site*: Foster Avenue and Gibbsboro Road
City, County, State: Gibbsboro, Camden County, New Jersey 08026
General Location in the State: Central
Topographic Map: Clementon, New Jersey
Latitude: 39.835525541° North
Longitude: 74.964976916° West

The coordinates of Sherwin-Williams/Hilliards Creek were calculated from the northwest corner of Building 67 shown on Reference 97.* The coordinates were measured using map interpolation from Clementon, New Jersey Quadrangle, using ArcGIS 9© software. Universal Transverse Mercator (UTM) coordinates converted to latitude and longitude NAD83 using CorpsCon software, US Army Corps of Engineers Topographic Engineering Center (Ref. 9).

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general site location. The information represents one or more locations U.S. Environmental Protection Agency (EPA) considers part of the site based on the screening information EPA used to evaluate the site for listing on the National Priorities List. EPA assigns national priorities from the known “releases or threatened releases” of hazardous substances; thus, the focus is on the release, and not on precisely delineated boundaries. A site is defined as an area where a hazardous substance has been “deposited, stored, placed, or otherwise have come to be located.” Generally, HRS scoring and the subsequent listing of a release represent the initial determination that a certain area may need to be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act. Accordingly, EPA contemplates that the preliminary description of site boundaries at the time of scoring will be refined as more information is developed on the location of contamination.

Scores	
Ground Water Migration Pathway	Not Scored
Surface Water Migration Pathway	100
Soil Exposure Pathway	Not Scored
Air Migration Pathway	Not Scored
HRS SITE SCORE	50.00

WORKSHEET FOR COMPUTING HRS SITE SCORE

	<u>S</u>	<u>S²</u>
1. Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	<u>0.00</u>	<u>0.00</u>
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	<u>100</u>	<u>10,000</u>
2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	<u>84</u>	<u>7,056</u>
2c. Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	<u>10,000</u>	<u>10,000</u>
3. Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	<u>0.00</u>	<u>0.00</u>
4. Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	<u>0.00</u>	<u>0.00</u>
5. Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		<u>10,000</u>
6. HRS Site Score Divide the value on line 5 by 4 and take the square root	<u>50.00</u>	

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE SHEET

Factor categories and factors		Maximum Value	Value Assigned	
Watershed Evaluated: Hilliards Creek				
Drinking Water Threat				
Likelihood of Release:				
	1. Observed Release	550	550	
	2. Potential to Release by Overland Flow:			
	2a. Containment	10		
	2b. Runoff	10		
	2c. Distance to Surface Water	5		
	2d. Potential to Release by Overland Flow [(lines 2a(2b + 2c)]	35		
	3. Potential to Release by Flood:			
	3a. Containment (Flood)	10		
	3b. Flood Frequency	50		
	3c. Potential to Release by Flood (lines 3a x 3b)	500		
	4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500		
	5. Likelihood of Release (higher of lines 1 and 4)	550		550
Waste Characteristics:				
	6. Toxicity/Persistence	(a)	10000	
	7. Hazardous Waste Quantity	(a)	100	
	8. Waste Characteristics	100		32
Targets:				
	9. Nearest Intake	50		
	10. Population:			
	10a. Level I Concentrations	(b)		
	10b. Level II Concentrations	(b)		
	10c. Potential Contamination	(b)		
	10d. Population (lines 10a + 10b + 10c)	(b)		
	11. Resources	5		
	12. Targets (lines 9 + 10d + 11)	(b)		
Drinking Water Threat Score:				
	13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100		0
Human Food Chain Threat				
Likelihood of Release:				
	14. Likelihood of Release (same value as line 5)	550		550

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE SHEET				
Factor categories and factors		Maximum Value	Value Assigned	
Waste Characteristics:				
	15. Toxicity/Persistence/Bioaccumulation	(a)	500,000,000	
	16. Hazardous Waste Quantity	(a)	100	
	17. Waste Characteristics	1000		320
Targets:				
	18. Food Chain Individual	50	20	
	19. Population			
	19a. Level I Concentration	(b)		
	19b. Level II Concentration	(b)		
	19c. Potential Human Food Chain Contamination	(b)		
	19d. Population (lines 19a + 19b + 19c)	(b)		
	20. Targets (lines 18 + 19d)	(b)		20
Human Food Chain Threat Score:				
	21. Human Food Chain Threat Score [(lines 14x17x20)/82,500, subject to max of 100]	100		42.67
Environmental Threat				
Likelihood of Release:				
	22. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:				
	23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	500,000,000	
	24. Hazardous Waste Quantity	(a)	100	
	25. Waste Characteristics	1000		320
Targets:				
	26. Sensitive Environments			
	26a. Level I Concentrations	(b)	750	
	26b. Level II Concentrations	(b)	25	
	26c. Potential Contamination	(b)		
	26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	775	
	27. Targets (value from line 26d)	(b)		775
Environmental Threat Score:				
	28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60		60
Surface Water Overland/Flood Migration Component Score for a Watershed				
	29. Watershed Score ^c (lines 13+21+28, subject to a max of 100)	100		100
Surface Water Overland/Flood Migration Component Score				
	30. Component Score (S_{sw}) ^c (highest score from line 29 for all watersheds evaluated)	100		100
	^a Maximum value applies to waste characteristics category			
	^b Maximum value not applicable			
	^c Do not round to nearest integer			

TABLE 4-25 --GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORE SHEET

Factor categories and factors	Maximum Value		Value Assigned
Aquifer Evaluated: Surficial			
Drinking Water Threat			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	550	
2. Potential to Release:			
2a. Containment	10		
2b. Net Precipitation	10		
2c. Depth to Aquifer	5		
2d. Travel Time	35		
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500		
3. Likelihood of Release (higher of lines 1 and 2e)	550		550
Waste Characteristics:			
4. Toxicity/Mobility	(a)	10000	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		32
Targets:			
7. Nearest Well	(b)	0	
8. Population:			
8a. Level I Concentrations	(b)		
8b. Level II Concentrations	(b)		
8c. Potential Contamination	(b)		
8d. Population (lines 8a + 8b + 8c)	(b)		
9. Resources	5		
10. Targets (lines 7 + 8d + 9)	(b)	0	
Drinking Water Threat Score:			
11. Drinking Water Threat Score ([lines 3 x 6 x 10]/82,500, subject to max of 100)	100		0
Human Food Chain Threat			
Likelihood of Release:			
12. Likelihood of Release (same value as line 3)	550		550
Waste Characteristics:			
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)	20000000	
14. Hazardous Waste Quantity	(a)	100	
15. Waste Characteristics	1000		180

TABLE 4-25 --GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORE SHEET			
Factor categories and factors		Maximum Value	Value Assigned
Targets:			
16.	Food Chain Individual	20	
17.	Population		
	17a. Level I Concentration	(b)	
	17b. Level II Concentration	(b)	
	17c. Potential Human Food Chain Contamination	(b)	
	17d. Population (lines 17a + 17b + 17c)	(b)	
18.	Targets (lines 16 + 17d)	(b)	
Human Food Chain Threat Score:			
19.	Human Food Chain Threat Score [(lines 12x15x18)/82,500,subject to max of 100]	100	24
Environmental Threat			
Likelihood of Release:			
20.	Likelihood of Release (same value as line 3)	550	550
Waste Characteristics:			
21.	Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	50000000
22.	Hazardous Waste Quantity	(a)	100
23.	Waste Characteristics	1000	180
Targets:			
24.	Sensitive Environments		
	24a. Level I Concentrations	(b)	750
	24b. Level II Concentrations	(b)	25
	24c. Potential Contamination	(b)	
	24d. Sensitive Environments (lines 24a + 24b + 24c)	(b)	775
25.	Targets (value from line 24d)	(b)	775
Environmental Threat Score:			
26.	Environmental Threat Score [(lines 20x23x25)/82,500 subject to a max of 60]	60	60
Ground Water to Surface Water Migration Component Score for a Watershed			
27.	Watershed Score ^c (lines 11 + 19 + 28, subject to a max of 100)	100	84
28.	Component Score (S _{gs}) ^c (highest score from line 27 for all watersheds evaluated, subject to a max of 100)	100	84
^a Maximum value applies to waste characteristics category			
^b Maximum value not applicable			
^c Do not round to nearest integer			

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SITE SUMMARY

The Sherwin-Williams/Hilliards Creek site is located in Gibbsboro, Camden County, New Jersey. The Sherwin-Williams/Hilliards Creek site includes, but is not limited to, contaminated soil on and ground water underlying the former Lucas Paint Works Plant (Lucas plant) and contaminated soil and sediment associated with Hilliards Creek. The former Lucas plant encompassed 60 acres of land and was bounded to the north by Silver Lake and Route 561; to the east by United States (US) Avenue; to the south by vacant land, a cemetery, and Bridgewood Lake; and to the west by Clementon-Gibbsboro Road (Refs. 6, p. 2-1 and Figure 2-4; 9; 68, p. 2-1). Hilliards Creek, also known as Millard Creek, flows southwesterly through the former Lucas plant, under Foster Avenue, then turns west under W. Clementon Road, receives the outflow of Bridgewood Lake, and continues west to Kirkwood Lake. Approximately 1,000 feet upstream from Kirkwood Lake, Hilliards Creek receives surface water flow from Nichols Creek. Hilliards Creek merges with the Cooper River just before it enters Kirkwood Lake (Refs. 6, p. 2-11 and Figure 2-2; 9; see Reference 97, Sampling Location and Lucas Plant Area Map).

Hilliards Creek received surface water runoff and discharges from the Lucas plant (see Figure 2-4 in Reference 6). The Lucas plant began operation in 1851 and it manufactured varnishes, lacquers, and lead-based-paints, including dry colors, paste paints, and linseed oil liquid paints. Wastes generated from the plant were disposed of in Hilliards Creek, on-site wastewater lagoons, the Route 561 Dump Site, and the US Avenue Burn Site (Refs. 31, p. 2-5; 61, pp. 3, 4, 5). The Route 561 Dump Site and US Avenue Burn Site have been evaluated as separate sites and are therefore not included in this Hazard Ranking System (HRS) documentation record (Ref. 61, p. 5).

Ground water at the Lucas plant occurs in two distinct zones: the shallow zone (30 to 40 feet thick) and a deeper zone (total thickness unknown). The two zones are separated by a silt unit that acts as a confining layer (Ref. 31, p. 4-2). The saturated thickness of the shallow zone is approximately 30 to 40 feet. Depth to ground water is between 1 to 15 feet below ground surface (bgs). The horizontal direction of ground flow is generally to the south-southwest. Locally, Hilliards Creek, White Sand Branch, and Bridgewood Lake act as discharge zones for shallow ground water (Ref. 31, p. 4-2).

Sherwin-Williams terminated production at the Lucas plant in late 1976. The entire operation and facility were permanently closed on September 1, 1978 (Ref. 31, pp. 2-2, 2-6). Robert K. Scarborough purchased a portion of the facility from Sherwin-Williams sometime between June 26, 1981, and September 7, 1983. In 1983, Scarborough demolished most of the Sherwin-Williams facility and undertook various construction projects (Refs. 31, p. 2-2; 32, p. 5). The Paints Works Corporate Associates I (the Paint Works), a New Jersey-based corporation, purchased a portion of the plant from Sherwin-Williams sometime between June 26, 1981, and September 7, 1983. The Paint Works re-graded the plant (Ref. 32, p. 5). The Lucas plant is currently used as an office and light industrial park and is called the Paint Works Corporate Center (the Paint Works) (Ref. 6, p. 2-1).

Current Conditions

In 1981, a majority of the land encompassing the former Lucas plant or Sherwin-Williams plant was sold to Robert K. Scarborough and developed as a light industrial park known as "The Paint Works Corporate Center" (Refs. 6, p. 2-1; 31, p. 1-1). Development of the property included demolition or renovation of existing structures and construction of new office, manufacturing, and warehouse space (Ref. 31, p. 2-1). The current layout is presented in Reference 31, Figure 2-2. The center is made up of nine buildings. As of November 2001 when the RI/FS Work Plan was revised, 20 tenant companies occupy office,

SITE SUMMARY (Continued)

warehouse, and manufacturing space at the park (Ref. 6, p. 2-2). Two of the tenants used hazardous materials including Academy Paints and Scotko Sign & Display Company. Both Academy Paints and Scotko Sign & Display, Inc. were listed by EPA as large-quantity generators. Scotko was listed as generating D001, F003, and F005 wastes. Both have terminated their lease and left the park (Ref. 6, p. 2-6). Currently, about 1,200 persons are employed by tenants of the Paint Works Corporate Center (Ref. 31, p. 2-16).

The north boundary of the corporate center is bounded by Silver Lake, which discharges into Hilliards Creek. Hilliards Creek transverses the corporate center in a northeast-southwest direction. The corporate center is bisected by Foster Avenue. The portion of the corporate center north of Foster Avenue is occupied by numerous buildings including former Buildings 14, 33, 55, 57, 58, and 82, a new building paralleling Foster Avenue, and a shed. The grounds surrounding the buildings are paved parking lots. The northernmost part of the corporate center along US Avenue, north of all the buildings, is a gravel parking lot. The area immediately south of Foster Avenue is occupied by buildings and is surrounded by paved parking lots (Ref. 31, p. 2-1 and Figure 3-2).

The corporate center is surrounded by residential properties (Ref. 31, p. 2-15). A public school, library, and municipal offices are located approximately 0.2 mile west of the corporate center, along Kirkwood Road. Bridgewood Lake and Silver Lake are located on the corporate center. A pedestrian walk surrounds Silver Lake, and a shooting range is located on the southern shore of Bridgewood Lake. Silver Lake discharges into Hilliard Creek through an underground culvert system that crosses under the parking lot between the lake and Foster Avenue. The creek returns to open flow 200 feet south of Foster Avenue (Ref. 31, p. 2-17).

Generally, the topographic gradient is from northeast to southeast. The corporate center is flat and graded toward storm water collection points. Near Hilliards Creek and Bridgewood Lake, the topographic gradient slopes gently toward these water bodies (Ref. 31, p. 2-8). Surface water runoff from the northernmost portion of the corporate center discharges directly into Silver Lake. The north-central portion of the corporate center is occupied by buildings and paved areas. Runoff generated in the area between Silver Lake and Foster Avenue enters a network of catch basins and storm sewers, which discharge into Hilliards Creek, immediately south of Foster Avenue (Ref. 31, p. 2-9).

Operational History: John Lucas and Company

The Lucas business was first established in March 1849 to import white lead, paints, and colors (Ref. 13, p. 3). The company was called “Gibbsboro White Lead, Zinc, and Color Works” (Ref. 17, p. D-10). From 1851 to 1930, John Lucas and Company owned and operated a paint and varnish manufacturing facility at the Lucas plant (Refs. 31, p. 2-2; 32, p. 2; 60, p. 6). The Lucas plant was constructed at the former location of a sawmill and, subsequently, a grain mill (Refs. 13, p. 4; 31, p. 2-2; 60, p. 15). John Lucas and Company developed and manufactured oil-based paints, varnishes, and lacquer (Ref. 31, p. 2-2).

The plant was expanded at various stages to accommodate new operations such as grinding white lead and colors in oils (Ref. 60, pp. 19, 26, 30). A historical map that shows locations of old buildings and structures is presented in Reference 6, Figure 2-4 and Refs. 3, 4, and 5. The expansions included more than 53 buildings and occupied only a portion of the current 60-acre property (Refs. 14; 15; 31, p. 2-3). In

SITE SUMMARY (Continued)

the early 1880s, the plant operations included dry color production, color grinding in oil, varnish production, and production of ready-mixed oil paint (Ref. 60, p. 30). During World War II, John Lucas and Company supplied protective finishes for many types of equipment, such as trucks, tanks, gun carriages, and barracks. The company also supplied marine finishes to the Maritime Fleet (Ref. 13, p. 10). Information on the constituents of marine finishes was not identified in the reference documentation.

The primary products manufactured by the John Lucas and company were white lead paint, varnish, and lacquer. Other products included dry colors produced from chemical reactions, blending, filtering, and drying; oil-based paints produced from grinding pigments in oil and adding thinners, oils, and hardeners; and ready-mixed linseed oil paints produced from blending linseed oil with pigments and thinners (Refs. 31, p. 2-3; 60, pp. 6, 8, 12, 22, 26). A memorandum prepared by John Lucas lists the following as components for Chinese blue paint manufactured by Lucas Paints: prussiate potash, copper sulphate, sulphate of iron, clear nitric acid, and sulphuric acid (Ref. 11).

The manufacturing history of John Lucas and Company began in 1849, and dry colors were among the first products manufactured (Refs. 12; 13, p. 1). Dry color was the largest operation at the Lucas plant through the end of the 19th century (Ref. 60, p. 33). Chrome yellow and Prussian blue were the two major pigments produced at the Lucas plant (Ref. 60, p. 37). John Lucas made the first chrome greens and chrome yellows produced in America. Mr. Lucas also introduced the use of brightening agents. Paints produced included white lead, white zinc, iron blues, Paris green, chrome orange, zinc yellow, lithol, para and toluidine reds, scarlet and maroon lakes, and alizarine colors (Refs. 12; 13, p. 1; 60, pp. 11, 17, 19, 22, 23). Prussian blue, paste paints, pure linseed oil liquid paints, French greens, Swiss green, Chinese blue, and laundry blue also were manufactured (Refs. 13, pp. 3, 6, 7; 17, p. D-11; 60, pp. 17, 19, 22, 24). Reference 16 provides a comprehensive list of paints and products manufactured by Lucas. The basic pigments used by Lucas were lead and zinc oxides, white lead, non-lead chrome green, and chrome yellow. White lead was ground at the plant (Refs. 8, p. 3; 60, pp. 1, 19 20, 21, 42). Lucas produced 24 different varieties of varnish (Ref. 60, pp. 22, 73).

Many of the buildings on the Lucas plant were used to store paint and drums. Materials stored included varnish, colors, oil, lacquer, paint, dry colors, coal, and sludge (Refs. 4; 5; 14; 15, pp. 1 through 6; 60, p. 29) (see Figure 2-4 in Reference 6). Raw materials Lucas used included calcined acetate of lead, lead oxide, zinc oxide, lead chromate, ferrous sulfate, sulfuric acid, linseed oil, and various paint solvents (Refs. 31, p. 2-3; 60, pp. 10, 26). The operations south and southwest of Silver Lake involved manufacturing, refining, storage, handling, and transporting hazardous substances above ground and below ground. These areas contained drums of oils and varnishes and tank farms and railroad tankers of lacquers, solvents, caustic solutions, and petroleum-based products. All the products were used in the paint manufacturing industry (Ref. 10, p. 9).

During the 1880s, storage tanks for oils and oil-based paints were installed in the area of Tank Farm A. In 1887, a rail spur was installed at the facility to improve transportation and handling of raw materials and finished goods (Ref. 31, pp. 2-3, 2-4).

Several disasters occurred at the Lucas plant, including a flood in 1940 and two fires between 1905 and 1949 (Refs. 13, p. 11; 31, p. 2-5; 32, p. 3). In 1905, a fire occurred in Building 32, the Varnish Filter House, where varnish was thinned and filtered. The second fire occurred on September 18, 1915, inside Building 39, which was used as a dry color paint mill at the time (Refs. 31, pp. 2-5, 2-6; 60, pp. 33, 66).

SITE SUMMARY (Continued)

Operational History: Sherwin-Williams Company

In approximately 1930, Sherwin-Williams acquired control of Lucas plant; however, Mr. Lucas continued to operate the plant until 1967 (Refs. 8, p. 1; 17, p. D-12; 31, p. 2-2; 32, p. 2). Sherwin-Williams operated the Lucas plant from 1967 until production ended at the plant in late 1976 or early 1977 (Refs. 8, p. 1; 31, p. 2-2; 32, p. 2). Sherwin-Williams closed the plant permanently on September 1, 1978 (Ref. 31, p. 2-2).

When it was owned and operated by Sherwin-Williams, the plant included an area for unloading raw materials from railroad cars; tank farms for raw materials including storage tanks constructed prior to 1908; storage areas for drummed raw materials; an industrial and domestic wastewater treatment and disposal system consisting of unlined percolation/settling lagoons; a solid waste disposal area for paint sludges; an extensive system of pipes to transport raw materials; and a drum cleaning area. Raw materials were mixed and processed in a number of specialized buildings in the plant (Refs. 4; 5; 32, p. 2) (see Figure 2-4 in Reference 6). Raw materials stored on the plant included V.M.&P. naphtha (8,000 gallons), xylene (26,000 gallons), mineral spirits (100,000 gallons), toluene and solvent blends (65,000 gallons), and aromatic naphtha (1,500 gallons) (Refs. 4; 5; 31, Table 2-2; 32, pp. 2, 3).

From 1967, the plant manufactured interior and exterior house paint, latex, and oil-based interior and exterior house paint until 1975, lacquer finishes until 1975, and polymerized oils and formulated dyes until 1972 (Ref. 8, p. 1).

Sherwin-Williams expanded the operations at the plant. Office and manufacturing facilities occupied one-third of the property, with the center of the plant located around Foster Avenue. During the 1930s, Sherwin-Williams terminated dry color production, but the plant continued to produce oil-based paints, varnishes, lacquers, and emulsion paints until December 1975. In 1956, Sherwin-Williams began production of alkyd or synthetic varnish, but this operation terminated in December 1975. The plant produced emulsion paints only between December 1975 and early 1977 (Ref. 31, p. 2-4).

Raw products used from approximately the late 1950s included titanium dioxide, a major component for products. The following products were used in resin production: polymers, pigments, linseed oil, soya oil, ray linseed oil, mineral spirits, refined linseed oil, glycerine, V.M.&P. naphtha, and xylene (used in resin production). The following materials were used in lacquer production: isobutyl alcohol; c.p. acetone; methyl amyl acetate; isopropyl acetate; xylene; lacquer solvent; toluene; toluene-based solvent blend; methyl ethyl ketone; ethyl acetate; methyl butyl ketone; and aromatic naphtha. Pulp pigments, liquid mixers, and solvents were used in production of Sher-dye (Ref. 8, p. 2).

Raw materials were stored in aboveground storage tanks (ASTs) and underground storage tanks (USTs) in two areas on the plant: Tank Farm Areas A and B. Raw materials (paint pigments) were also stored in 55-gallon drums. Raw materials and finished goods were typically stored in former Buildings 55, 56, 57, 58, 62, and 67 (Ref. 31, p. 2-4 and Figure 2-2; 4; 5; 60, p. 68) (see Reference 6, Figure 2-4 and Reference 31, Figure 3-2). Between 1950 and 1977, wastewater generated from the manufacturing process was treated and disposed of in four unlined lagoons on the southern portion of the property (Ref. 31, p. 2-5) (see Reference 6, Figure 2-4 and Reference 31, Figure 3-2).

Two fires occurred at the plant; the first fire broke out on February 21, 1930, and destroyed Building 36, a warehouse used to store raw materials. After the fire in the former Building 36, a concrete foundation pad

SITE SUMMARY (Continued)

was used for exterior storage of drummed materials. Subsequently, on July 30, 1949, a fire destroyed 1,000 drums of nitrocellulose and lacquer stored on the concrete pad at Building 36 (Refs. 31, pp. 2-5, 2-6; 60, pp. 33, 66).

Operational History: Robert K. Scarborough

In June 1981, a majority of the Lucas plant was sold to developer Robert K. Scarborough. Scarborough developed the former plant into a light industrial complex named The Paint Works Corporate Center. The center is made up of nine buildings (Ref. 31, p. 2-16). At present, 20 tenant companies occupy office, warehouse, and manufacturing space on the former plant property. In December 1977, a portion of the former plant property was sold to Brandywine Reality Trust (Refs. 18, p. 1-1; 31, p. 2-2).

History of Investigations:

In January 1990, the New Jersey Department of Environmental Protection (NJDEP) issued a Spill Act Directive to Scarborough (the owner of the Lucas plant property) and Sherwin-Williams Corporation (the former owner of the Lucas plant property) requiring that a remedial investigation and feasibility study (RI/FS) be conducted at the former Lucas plant and immediately adjacent lands. Sherwin-Williams subsequently entered into an Administrative Consent Order (ACO) with NJDEP to conduct the RI/FS (Ref. 31, p. 1-1).

The subsequent RI was conducted at the Lucas plant from August 1991 through January 2000 (Refs. 31, pp. 1-1, 1-2; 59, Appendix II, p. II17). Seeps located on the facility were identified as an area of Immediate Environmental Concern (IEC). Sherwin-Williams entered into an ACO with NJDEP to address this IEC. A soil vapor extraction (SVE) system and a free-phase product removal system were installed in the area of the seeps, and a free-product removal system was installed in the area of former Tank Farm A (Ref. 31, p. 1-5).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Name of source: Free-Phase Product

Number of source: 1

Source Type: Other

This source includes free-phase product present in ground water underlying the former Lucas plant in the areas of Building 50, Building 67, and Tank Farm A (Ref. 31, pp. ES-6, 3-30, 4-18, 4-19, 4-20). The three locations where free-phase product have been identified are referred to as seeps in reference documentation and are shown on Figure 2-2 in Reference 31 as seep areas. The free-phase product is composed of benzene, ethylbenzene, xylene, naphthalene, and 2-methylnaphthalene (Ref. 31, p. 4-25 and Table 4-20). Analysis of the product indicates that it is paint thinner (Ref. 31, p. 4-26) because there was no evidence of any organolead or organomanganese in the samples of the product (Ref. 31, p. 4-27). A free-phase product recovery (FPR) and soil vapor extraction (SVE) system have been installed in the area of Buildings 50 and 67 to recover the free-phase product (Refs. 31, pp. 3-24, 3-25; 48, Figure 2-1). (A separate gasoline ground water plume is located west of Building 67 and is not evaluated in this HRS documentation record [Ref. 31, Figure 3-2 and Appendix K, Figures 4-11 and 4-12].)

The potential sources of the free-phase product plume are Tank Farm A (Ref. 31, pp. 2-3, 2-4, and Table 2-2); operations in Lucas plant Buildings 50, 55, and 67 (formerly Building 36) including the transfer and temporary storage of process chemicals (Refs. 6, Figure 2-4; 31, Figure 3-2; 59, Appendix II, p. II-57; 60, p. 68) and storage of product in Building 36 or platform 36 (Ref. 6, Figure 2-4); a 6-inch terra-cotta pipe leading from Building 50 (Paint Works Maintenance Shop) (Ref. 18, pp. 3-4, 3-5); two 6,000-gallon vertical steel AST formerly containing mineral spirits 66-2 and 802-15 alkyd resin adjacent to Building 50 (Ref. 18, pp. 3-5, 4-1); hazardous material and hazardous waste storage adjacent to Building 50 (Ref. 31, p. 6-3); the Lucas plant solvent railroad and truck tank unloading station on the north side of Building 67 (Refs. 7, pp. 4 through 11, 17; 6, Figure 2-4); storage areas for empty and dirty drums east of Building 67 (Ref. 5); contamination in the Building 67 parking lot (Ref. 31, p. 3-3); leakage of storage lagoons or drums that were once stored behind Building 67 (between Building 67 and 50); spillage from tank cars (Ref. 10, pp. 18, 19); and two USTs, one for oil and another for solvent, located in the parking lot located east of Building 67 (Ref. 65, p. 1). Storage lagoons are identified as a source in Reference 10, pages 18 and 19; however, no storage lagoons in the area of Buildings 50 and 67 are observed in aerial photographs or discussed in the reports for any other investigations at the plant.

The free-phase product plume present in the ground water underlying Buildings 50 and 67 and former Tank Farm A, has been characterized by the collection of product samples and soil samples as documented in the sections below. Numerous investigations have been conducted in the area of the free-phase product plume associated with Buildings 50 and 67. A summary of those investigations is provided in the section below.

Free-Phase Product - Buildings 50 and 67

The reference documentation for the free-phase product identified product on west side of Building 50 and on the north and east sides of Building 67. The narrative discussion in the reference documentation describes the two free-phase product locations together. It is therefore, difficult to separate the discussion of the free-phase product in area of Building 50 from the free-phase product in area of Building 67 (Ref. 31, Figure 2-2 [shown as seep areas], pp. 3-2 through 3-7, 3-8 through 3-12, 3-22, 3-23 through 3-25, 4-18 through 4-24, 5-5, 5-6). The two locations of free-phase product have a similar migration pathway. Free-phase product released to Hilliards Creek at the location where the creek emerges from underground, south of Foster Avenue, resulted from the migration of free-phase product into the storm sewer system from free-phase product located on the west side of Building 50 and east side of Building 67 (Ref. 31, p 3-6) (shown as seep areas on Figure 2-2 of Reference 31).

The free-phase product plume in ground water near Buildings 50 and 67 was initially identified in 1983 when an oily substance was observed in the parking lot between former Buildings 50 (currently police station) and 67 (also known as the Academy Paints Building). The oily substance flowed overland to a storm water catch basin in the parking lot then into a storm sewer that discharged into Hilliards Creek (Refs. 32, p. 5; 65, pp. 1, 2, 3). The product was observed on many occasions during construction of the corporate center that now occupies the former Lucas plant (Ref. 65, p. 1).

In February 1985 and 1987, product was observed in the parking lot between Buildings 50 and 67 and flowing from the eastern bank of Hilliards Creek (Refs. 6, Figure 2-4; 10, pp. 1, 2; 31, p. 3-3 and Figures 2-2 and 3-2; 32, pp. 5, 6).

Note: Numerous reports describing investigations conducted in this area refer to Building 67 as the former Academy Paints Building (former occupants of the building) and Building 50 as the Gibbsboro Police Station Building (current occupants of the building). Building 67 is the former location of Lucas plant Building 36 (Refs. 6, Figure 2-4; 31, Figure 3-2). On February 21, 1930, a fire destroyed Building 36, which was a warehouse used to store raw materials. After the fire, the concrete foundation pad for the former Building 36 was used for exterior storage of drummed materials (Refs. 31, pp. 2-5, 2-6; 60, pp. 33, 66; 7, p. 5). Lucas used Building 50 as a garage (Ref. 60, p. 99). Hazardous material and hazardous waste were stored adjacent to Building 50 (Ref. 31, p. 6-3).

In 1987, after free-phase product was observed flowing into Hilliards Creek, the New Jersey Department of Water Resources (DWR) issued a directive to Sherwin-Williams requesting that actions be taken to mitigate the release to Hilliards Creek (Ref. 10, p. 1). Sherwin-Williams refused to comply with the DWR directive. However, the owner of the property at the time, Scarborough, procured an environmental contractor to mitigate the release. An enclosure was constructed to prevent product from flowing through the parking lot into a storm water inlet and finally into Hilliards Creek. The product in the enclosure was pumped out and disposed of off the property. As of July 1987, 4,200 gallons of product were collected and disposed of off the property (Refs. 10, p. 2; 32, pp. 6, 7).

Observations during the 1987 investigations included product flowing from the bank of Hilliards Creek, product flowing from cracks in the pavement in the parking lot between Buildings 50 and 67 and other areas in the parking lot, and severe contamination in soil (Ref. 10, pp. 9, 18). Oil-absorbent booms and

filter fences were installed in the area surrounding the seep and at the rip-rap channel and storm water conveyance to collect free-phase product. The rip-rap channel collected surface water runoff from the parking lot and directed the water to Hilliards Creek. A berm was constructed around the seep in the parking lot, and a temporary bypass was constructed in Hilliards Creek, conveying Hilliards Creek around the product that emanated from the creek. A bulkhead was constructed around the perimeter of the product that emanated into the creek (Ref. 10, pp. 2, 3).

Free-phase product entered the storm sewer system when the water table was high, indicating the product is associated with a ground water plume underlying the Lucas plant and extending to Hilliards Creek (Refs. 6, p. 3-47; 18, p. 2-3). On February 19, 1988, and again on February 25, 1988, NJDEP observed product discharging into Hilliards Creek (Refs. 36; 37).

In 1989, NJDEP submitted a sample of the product to an analytical laboratory for comparison to known petroleum and solvent products. The comparison indicated that constituents in the product sample were most similar to a mixture of solvents and to 627 solvent (a solvent), Varsol 18 (an oil), and mineral spirits (a solvent) (Refs. 63, pp. 1, 2; 56).

In 1994, free-phase product began to enter a storm sewer north of Building 67. The free-phase product was removed (Ref. 31, p. 3-22). Based on the potential for repeated seepage of product into a leaky storm water system, NJDEP identified this area as an area of IEC. NJDEP issued a directive to Sherwin-Williams to address this IEC. A FPR and SVE system were installed after a focused feasibility study (FFS) and a remedial action work plan (RAW) had been completed for the area of free-phase product. Passive skimmers were installed in the thickest free-phase product to recover mobile product. The leaky portion of the storm sewer was excavated and replaced with a sealed system to prevent infiltration of free-phase product. Free-phase product removal equipment was also installed in the area of former Tank Farm A (Ref. 31, pp. 1-5, 3-22, 3-23).

In 1995, Sherwin-Williams entered into an ACO with NJDEP to conduct an RI/FS in the area of Source 1 and to remove free-phase product (Refs. 18, p. 1-1; 61).

Sherwin-Williams conducted the following remedial actions in the area of Source 1:

- Removal and disposal of the former wooden containment structure installed by the owner of the property when the contamination was discovered.
- Removal and disposal of contaminated soils and ground water from the area east of Hilliards Creek and west of the police station (Building 50) (Ref. 18, p. 1-1).
- Excavation of exploratory trenches in the area immediately west of the police station building (Building 50).
- Replacement of storm sewer immediately north of the Building 67.
- Installation of a FPR and SVE system on the east side of Building 67 (Refs. 6, pp. 3-47 through 3-52; 18, p. 1-2; 31, pp. 3-22, 3-23, 3-24; 48, Figure 2-1).

The aboveground treatment system consisted of a free-phase product collection and holding tank and the SVE/Thermal Oxidizer skid (Ref. 31, p. 3-25).

In 1996, while investigating the free-phase product plume at Buildings 50 and 67, a 6-inch terra-cotta pipe leading from Building 50 to Hilliards Creek was uncovered. The pipe end was encountered 3 feet bgs, and the pipe extended 10 feet to the west from Building 50 toward Hilliards Creek. The end of the pipe was exposed. The pipe terminated abruptly, and no french drain or sump was found at its terminus. Free-phase product was present in the interior of the pipe. The pipe was traced to a floor drain in Building 50. The pipe was above the water table; therefore, the product found in the pipe was not introduced by contaminated ground water. The seep on the west side of Building 50 was attributed to the pipe (Ref. 18, pp. 3-4, 3-5, 4-1). Since John Lucas and Company used Building 50 as a garage, the free-phase product may have resulted from the discharge of petroleum-type wastes (Refs. 6, Figure 2-4; 60, p. 99).

Also while investigating the free-phase product plume at Buildings 50 and 67, additional product was identified in the former location of two ASTs used by Academy Paint, a tenant of Building 67, to store mineral spirits 66-2 and 802-15 alkyd resin (Ref. 18, pp. 3-4, 3-5, 4-1, Figure 3-1). The AST were located on the south side of Building 50 (Ref. 18, Figure 3-1).

During the removal action in 1996, Sherwin-Williams recovered 13,910 gallons of the mixture of nonhazardous liquid, water, and oil from Buildings 50 and 67 free-phase product plume and disposed of the material off the property (Refs. 18, pp. ES-1, 3-5; 31, p. 3-24). After remedial action was completed, residual contamination remained in the area of the Lucas plant property and Hilliards Creek (Refs. 18, pp. ES-1, 4-1; 31, Figure 3-2).

In November 1997, the installation of the FPR and SVE system was completed east and north of Building 67 and south of Building 50 (Ref. 48, pp. 1-1, 2-2, 3-1, Figure 2-1). As of June 20, 2002, a total of 44,785 gallons of product have been recovered and removed off site for disposal since startup of the system in November 1997. Approximately 8,275 gallons of this total volume collected was primarily product from the product recovery tank. The remaining 36,510 gallons of product were collected during the ground water seep response and recovery efforts associated with the FPR and SVE system (Ref. 48, p. 2-1).

On April 9, 2002, free-phase product from the free-phase product recovery system was observed in the storm water drain north of Building 67 and in Hilliards Creek. Product was pumped out of the storm water drain, and additional measures were taken to prevent further releases to the drain and Hilliards Creek (Refs. 48, p. 2-3; 72, pp. 2, 4; 73, pp. 2, 4).

Location of the source, with reference to a map of the site: Source 1 is located on the west side of Building 50, on the east and southeast sides of Building 67, the storm sewer system north of Building 67, and in the area of Tank Farm A. Figure 2-2 of Reference 31 shows the three seep areas: one on the west side of Building 50, one on the east side of Building 67, and one in the area of Tank Farm A and the location of the sewer. The seep areas are the locations where free-phase product was observed at the ground surface or in on-site monitoring wells.

Containment:

Release to ground water: Migration of hazardous substances from the source area has been documented; therefore, a containment factor value of 10 is assigned to this source. Additionally, as documented in the section above, the source does not have a liner or containment system (Ref. 1, Table 3-2).

Release via overland migration and/or flood: Migration of hazardous substances from the source area has been documented; therefore, a containment factor value of 10 is assigned to this source. Additionally, as documented in the section above, a maintained engineered cover, or functioning and maintained run-on control system and runoff management system, is not associated with Source 1 (Ref. 1, Table 4-2).

Gas release to air: The air migration pathway was not scored.

Particulate release to air: The air migration pathway was not scored.

2.4 WASTE CHARACTERISTICS

2.4.1 Hazardous Substances:

Samples of free-phase product and soil are used to characterize the hazardous substances associated with Source 1. The soil samples were collected from locations where free-phase product was observed. The sections below provide a description and documentation of the free-phase product and soil samples collected to characterize Source 1.

Free-Phase Product

On February 7, 1985, NJDEP personnel collected an aqueous sample of product while it was discharging into Hilliards Creek (Ref. 32, pp. 5, 6). The following hazardous substances were detected in product sample: 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, naphthalene, xylenes, ethylbenzene, cumene, and tetrachloroethene (Ref. 32, pp. 6, 7).

In February 1987, product was observed in the parking lot between Buildings 50 and 67 and flowing from the eastern bank of Hilliards Creek. An aqueous sample was collected from the product flowing into Hilliards Creek, and a sediment sample was collected below the bituminous layer of the parking lot where the product was observed (Refs. 6, Figure 2-4; 10, pp. 1, 2; 31, p. 3-3 and Figures 2-2 and 3-2).

The free-phase product ground water plume was investigated during five phases of the RI for the Lucas plant (Ref. 31, p. 3-3). The RI identifies five areas of environmental concern (AEC). The seep areas or areas where free-phase product was observed at the surface in the areas of Buildings 50 and 67, were identified as AEC III. AEC III was combined with AEC I, Tank Farm A, because of similarities in the nature of contaminants (Ref. 31, p. 3-1). Figure 3-1 of Reference 31 shows the AECs, and Figure 2-2 of Reference 31 shows the location of three seeps one on the west side of Building 50, one on the east side of Building 67, and one in the southern section of the former location of Tank Farm A.

The RI report for the five phases of the investigation refers to AEC I/III when presenting analytical data collected for the free-phase product ground water plume. Figure 3-2 of Reference 31 was used to identify sampling locations specifically associated with the free-phase product.

During Phase II activities, from June 1993 through October 1993, three well points (WP-1, WP-2, and WP-3) were installed to delineate the free-phase product ground water plume detected in MW-13 (Ref. 31, pp. 3-3, 3-15). Samples of free-phase product were collected from the MW-11 (located on the southern end of Tank Farm A) and MW-13 (located east of Building 67) (Ref. 31, p. 3-17, Figure 3-2). Analytical results for the product sample collected from MW-11 on August 6, 1993 indicated the presence of 2-methylnaphthalene (360 milligrams per liter [mg/L]), 4-chloroaniline (320 mg/L), naphthalene (930 mg/L), chlorobenzene (100 mg/L), ethylbenzene (at an estimated concentration of 520 mg/L), and xylene (at 4,600 mg/L) (Ref. 31, Table 4-20). The product sample collected from MW-13 on August 6, 1993 contained 2-methylnaphthalene (1,800 mg/L), naphthalene (6,200 mg/L), benzene (at 110 mg/L), ethylbenzene (1,200 mg/L), and xylene (2,100 mg/L) (Ref. 31, Table 4-20).

During Phase III activities, from July 1995 through August 1995, 45 hand-augered borings were located throughout the seep area to attempt to delineate the extent of free-phase product through photoionization detector (PID) field screening and visual observation. No samples were collected from these locations (Ref. 31, pp. 3-3, 3-18). Additional monitoring wells were installed, and two rounds of ground water samples were collected (Ref. 31, p. 3-19). On July 14, 1995, samples of the free-phase product were collected from the MW-11 (located on the southern end of Tank Farm A), MW-13 (located east of Building 67), and MW-21 (southeast of Building 67) (Ref. 31, p. 3-17, Figure 3-2). Analytical results for the product sample collected from MW-11 indicated the presence of naphthalene (at an estimated concentration of 600 mg/L), ethylbenzene (66 mg/L), and xylene (2,500 mg/L). The product sample collected from MW-13 contained naphthalene (at 3,200 mg/L), benzene (at 570 mg/L), ethylbenzene (at 1,400 mg/L), and xylene (at 7,500 mg/L). Analytical results for the product sample collected from MW-26 indicated 2-methylnaphthalene (at an estimated concentration of 460 mg/L), naphthalene (1,600 mg/L), and xylene (420 mg/L) (Ref. 31, Table 4-20).

Also during the Phase III activities, free-phase product was measured for the mobile thickness of the product, the volume of recoverable product, and the recharge rates of the product (Ref. 31, p. 3-20). A bail-down test was conducted to identify the thickness of the product (Ref. 31, Appendix K, Tables E1 through E4).

The bail-down test completed in WP-3 in the area of the Building 50 indicated that the thickness of the product in July 1995 as 0.33 foot and in August 1995 as 0.48 foot (Ref. 31, Figures 4-11 and 4-12). The bail-down test completed in the area of the Building 67 indicated that the thickness of the product in July 1995 at MW-21 as 2.21 feet, at MW-13R as 0.98 foot, and at WP-1 as 1.33 feet (Ref. 31, Figure 4-11). In August 1995 the thickness of product was recorded at MW-21 as 0.66 foot, at MW-13R as 1.28 feet, and at WP-1 as 1.33 feet (Ref. 31, Figure 4-12). The bail-down test completed in MW-11 in the area of the Tank Farm A identified the thickness of product as 1.47 feet in July 1995 and 0.45 foot in August 1995 (Ref. 31, Appendix K, Table E2, and Figures 4-11 and 4-12). The lateral extent of three separate product plumes in ground water are shown on Figures 4-11 and 4-12, Appendix K, Reference 31. The plumes are considered separate because of the absence of product in the monitoring wells located between the plumes (Ref. 31, p. 4-20).

The hazardous substance and concentrations detected in product samples collected from MW-11, in the area of Tank Farm A, and from MW-13, in the area of Building 67 are similar (Ref. 31, Table 4-20, Figure 3-2). The fingerprint analysis of a sample of free-phase product from the storm sewer indicated that the product most closely resembled degraded mineral spirits (Ref. 75, p. 15). Therefore, the product in ground water in the areas of Tank Farm A and Building 67 may be from the release of mineral spirits from Tank Farm A and Building 67. Both areas were used for the storage of mineral spirits (Refs. 4; 5; 6; 31, 2-4, Table 2-2, Figure 2-2; 60, pp. 68 and 99).

According to the RI report, the source of free-phase product on the west side of Building 50 may be from the discharge of waste oils to soils over time, migration of free-phase product from the former Academy Paints hazardous materials storage area, or the Lucas maintenance shop formerly located in Building 50 (Ref. 31, pp. 4-23 and 4-24).

The RI report provides a discussion of the composition of the free-phase product. Much of the analytical data supporting the discussion are not in the RI report. Analytical data are presented for product samples collected from MW-11, MW-13, MW-21, and MW-26 in Table 4-20 of the RI report. The report stated that xylene was the VOC detected at the highest concentration, and of the base/neutral acids, naphthalene was detected at the highest concentration. The majority of the product constituents are tentatively identified compounds (TIC). VOC TICs consist primarily of unknown substituted benzenes. Semivolatile organic compound (SVOC) TICs include cycloalkanes, alkanes, benzenes, and unknown polycyclic aromatic hydrocarbons (PAH) (Ref. 31, p. 4-25). Two free-phase product samples collected from MW-11 and SVE Vent No. 6 located west of Building 67 were analyzed by American Society for Testing and Materials (ASTM) D5134 (Component Analysis) (Refs. 31, p. 4-26, Figure 3-2; 48, Figure 2-1). The ASTM D5134 analysis provided identification of an exhaustive list (the list was not provided in the RI report) of hydrocarbon compounds, that are not typically analyzed for and quantified by routine SW846 methods. The result of the free-phase product analyses were compared to the results of analyses of fresh samples of gasoline and paint-thinner. The comparison was done by principal component analysis (PCA). The PCA suggested that the samples were more related to paint-thinner rather than gasoline (Ref. 31, p. 4-26).

One ground water sample (MW-36 located 150 feet south of Building 67) was collected and analyzed by Modified EPA Method 8015 (capillary gas chromatography). No free-phase hydrocarbons could be recovered from the ground water sample (Ref. 31, p. 4-26, Figure 3-2).

The RI report states that 14 free-phase product samples were analyzed for petroleum hydrocarbon products. Analytical data for the analysis of the product samples are not presented in the RI report. No evidence of the presence of any organolead or organomanganese compounds were found in any of the free-phase product samples. Two free-phase product samples collected from SVE-3 and MW-36, located east and south of Building 67, respectively, contained no petroleum product (Refs. 31, p. 4-27, Figure 3-2; 48, Figure 2-1). (Note: The location and definition of SVE-3 is not in the RI report. SVE probably indicates soil vapor extraction and the number represents the vent number as shown on Figure 2-1 of Reference 48). The report indicates that analytical results for product samples revealed the presence of a biodegraded, low boiling point petroleum hydrocarbon (Ref. 31, p. 4-27). From the report is not clear where these product samples were collected. However, the report does indicate that the product in the area of Source 1 may be a mixture of solvents and waste petroleum product.

On April 9, 2002, free-phase product from the FPR and SVE system was observed in the storm water system (catch basin A and inlet C) and rip-rap north of Building 67 and in Hilliards Creek. The product was pumped out of the storm water drain, and additional measures were taken to prevent further releases to the drain and Hilliards Creek (Refs. 48, p. 2-3; 72, pp. 2, 4; 73, pp. 2, 4). As shown on Figure 2-4 of Reference 48, inlet A is the catch basin in the parking lot north of Building 67 that drains to the storm sewer that runs from east to west to rip-rap and finally to Hilliards Creek. Inlet C is located on the western end to the storm sewer system just east of the discharge point of the storm water system to the rip-rap (Ref. 48, Figure 2-4). Figure 2-1 of Reference 48 shows the location of the vertical vents and the layout of the FPR and SVE system.

On April 10, 2002, samples of the free-phase product were collected and analyzed for VOCs, petroleum products, and fingerprinted (Ref. 75, pp. 2, 4, 5). The concentrations of hazardous substances detected in

the product sample are in the units of micrograms per kilogram ($\mu\text{g}/\text{kg}$) indicating that the sample was analyzed as a solid. Analytical results for the samples indicated the presence of benzene (up to 240,000 $\mu\text{g}/\text{kg}$), ethylbenzene (up to 4,600,000 $\mu\text{g}/\text{kg}$), xylene (up to 26,000,000 $\mu\text{g}/\text{kg}$), naphthalene (up to 1,800,000 $\mu\text{g}/\text{kg}$), 2-methylnaphthalene (up to an estimated concentration of 400,000 $\mu\text{g}/\text{kg}$), and numerous TICs (Ref. 75, pp. 6, 7, 8). The fingerprint analysis indicated that the product samples most closely resembled degraded mineral spirits (Ref. 75, p. 15).

Analytical results for the wastewater sample from the product tank indicated an estimated concentration of benzene and ethylbenzene and the presence of m/p xylenes, naphthalene, and 2-methylnaphthalene (Refs. 76, pp. 8, 9; 77, p. 35). Metals detected in the product tank include aluminum, arsenic, chromium, copper, iron, lead, magnesium, manganese, selenium, and zinc (Ref. 77, p. 75). The toxicity characteristic leaching procedure (TCLP) analysis revealed benzene (230 micrograms per liter [$\mu\text{g}/\text{L}$]) (Ref. 77, p. 31). The inlet C sample analysis revealed an estimated concentration of benzene and the presence of ethylbenzene, m/p- xylenes, naphthalene, and 2-methylnaphthalene (Refs. 76, pp. 10, 11; 77, p. 39). The only TCLP metal detected in the inlet C sample was lead (455 $\mu\text{g}/\text{L}$) (Ref. 77, p. 82). The inlet C water sample analysis revealed an estimated concentration of benzene, the presence of ethylbenzene and m/p-xylenes, and estimated concentrations of naphthalene, 2-methylnaphthalene, and fluoranthene (Ref. 76, pp. 12, 13, 19, 20). Metals were also detected in the inlet C water sample, including aluminum, arsenic, barium, chromium, copper, iron, lead, magnesium, manganese, and zinc (Ref. 77, p. 76).

As of June 30, 2002, the FPR system recovered approximately 44,785 gallons of product and /or water since startup of the recovery system in November 1979. Approximately 8,275 gallons of this total volume collected is primarily product from the product recovery tank. The remaining 36,510 gallons or product/water mix were collected during the ground water seep response and recovery efforts associated with inlets A and C (Ref. 48, p. 2-1).

In May 2003, EPA's environmental consultant collected samples of the free-phase product mixed with water from basin A, inlet C, and the rip-rap. The samples were analyzed for target compound list (TCL) VOCs, SVOC, pesticides and polychlorinated biphenyls (PCB), target analyte list (TAL) metals and cyanide, gasoline range organics (GRO), diesel range organics (DRO), percent sulfur, percent ash, Kjeldahl nitrogen, pH, and flashpoint. The analytical results confirmed the presence of benzene, ethylbenzene, xylene, naphthalene, and 2-methylnaphthalene (Ref. 78, pp. 16, 11). Other constituents of the product sample included the following metals: aluminum (up to 9,150 $\mu\text{g}/\text{L}$), arsenic (up to 51.2 $\mu\text{g}/\text{L}$), barium (up to 408 $\mu\text{g}/\text{L}$), chromium (up to 33.3 $\mu\text{g}/\text{L}$), copper (up to 79.0 $\mu\text{g}/\text{L}$), iron (up to 95,200 $\mu\text{g}/\text{L}$), lead (up to 139 $\mu\text{g}/\text{L}$), magnesium (up to 23,000 $\mu\text{g}/\text{L}$), manganese (up to 1,380 $\mu\text{g}/\text{L}$), and zinc (up to 413 $\mu\text{g}/\text{L}$) (Ref. 78, pp. 15, 16).

Hazardous substances associated with the analytical results from product samples collected from Source 1 and discussed above are summarized in Table 1 (Ref. 31, pp. 4-18 through 4-24). As documented in Table 1, free-phase product samples were collected from seeps (product) emanating from the ground surface, monitoring wells, and the FPR and SVE system. The analytical data presented in Table 1 from Reference 31 are from the analysis of free-phase product samples collected from on-site monitoring wells. Reference 32 provides analytical data for the analysis of a discharge to a creek. The seep (free-phase product) was continuously discharging into the creek (Ref. 32, pp. 5, 6). The analytical data presented in References. 76 and 77 are for a product sample collected from the product tank associated with the FPR

system, inlet C, and rip-rap area where the storm sewer discharges (Refs. 77, p. 2; 48, Figure 2-4). The analytical data presented in Reference 78 are from basin A (the storm sewer basin in the parking lot adjacent to Building 67), inlet C, and the rip-rap area (Refs. 78, p. 1; 79). The analytical data presented in Reference 79 are from a sample collected from the product tank associated with the FPR system and a bi-phase sample collected from inlet C (an inlet in the storm sewer) (Refs. 48, Figure 2-4; 76, p. 1).

TABLE 1
HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 1

Hazardous Substance	Evidence	Reference
Metals		
Aluminum	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 5, 16
Arsenic	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 15, 16
Barium	Product sample	77, pp. 1, 2, 76; 78, pp. 1, 15, 16
Chromium	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 15, 16
Copper	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 15, 16
Iron	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 15, 16
Lead	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 15, 16
Magnesium	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 15, 16
Manganese	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 15, 16
Zinc	Product sample	77, pp. 1, 2, 75, 76; 78, pp. 1, 15, 16
Volatile Organic Compounds		
Benzene	Product sample	31, pp. 4-25, 6-9, Table 4-20, Figure 3-2; 32, pp. 5, 6; 75, pp. 2, 6, 12; 76, pp. 1 through 4, 12; 77, pp. 10, 19, 31; 78, p. 1; 79, pp. 2, 4
Cumene	Product (seep) sample	32, pp. 6, 7
Ethylbenzene	Product (seep) sample	31, pp. 4-25, 6-9, Table 5-20, Figure 3-2; 32, pp. 6, 7; 75, pp. 2, 6, 9, 12; 76, pp. 1 through 4, 9, 13; 77, pp. 11, 20; 78, p. 1; 79, p. 5
Tetrachloroethene	Product (seep) sample	32, pp. 6, 7
1,2,4-Trimethyl benzene	Product (seep) sample	32, pp. 6, 7

TABLE 1 (Continued)

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 1

Hazardous Substance	Evidence	Reference
Volatile Organic Compounds (Continued)		
1,3,5-Trimethyl benzene	Product (seep) sample	32, pp. 6, 7
Xylene	Product (seep) sample	10, pp. 25, 27; 31, pp. 4-25, 6-9, Table 5-20; Figure 3-2 in Reference 31; 32, pp. 6, 7; 75, pp. 2, 6, 9; 76, pp. 1 through 4, 9, 13; 77, pp. 11, 20; 79, pp. 2, 5
Semivolatile Organic Compounds		
Benzo(a)pyrene	Product sample	78, pp. 1 through 4, 13; 79, p. 28
Chrysene	Product sample	78, pp 1 through 4, 13; 79, p. 28
Fluoranthene	Product sample	76, pp. 1 through 4, 9, 20; 77, p. 45; 78, pp. 1 through 4, 10; 79, p. 23
2-Methylnaphthalene	Product (seep) sample	31, pp. 4-25, 6-9, Table 5-20, Figure 3-2; 75, pp. 2, 6, 9, 19, 35, 44; 78, pp. 6, 11; 79, pp. 12, 17
Naphthalene	Product (seep) sample	31, pp. 4-25, 6-9, Table 5-20, Figure 3-2; 32, pp. 6, 7; 75, pp. 2, 6, 9; 76, pp. 1 through 4, 16, 19, 35, 44; 78, pp. 6, 9, 11; 79, pp. 12, 17, 22

Soil Samples - Source 1

1987 Investigation

In 1987, contaminated soil was identified in the area of Buildings 50 and 67 during a subsurface soil investigation (Ref. 10, p. 5). The source of the contaminated soil is the free-phase product. Soil samples were analyzed for priority pollutants and total petroleum hydrocarbons (Ref. 10, p. 6), revealing the presence of petroleum hydrocarbons, VOCs (xylene), SVOCs [pentachlorophenol, di-n-butyl phthalate, bis(2-ethylhexyl)phthalate], cyanide, chromium, copper, and lead (Ref. 10, pp. 10 and 25 through 39).

Remedial Investigation

Hazardous substances associated with Source 1 were identified during numerous soil sampling investigations conducted in the area of the free-phase product ground water plume. The most recent

investigation was a five-phase RI for the Lucas plant (Ref. 31, p. 3-3). The soil samples collected during the RI are used to characterize Source 1 because the soil contamination is a result of the ground water plume. The RI identifies Source 1 as AEC I/III (Ref. 31, p. 3-3 to 3-6). The RI report refers to AEC I/III when soil samples were collected from Source 1. Figure 3-2, in Reference 31, was used to identify soil sampling locations specifically associated with Source 1, free-phase product.

Soil samples were collected from Source 1 during three phases of the RI as described in the sections below.

Phase I RI

Soil samples were collected in the area of Source 1 (AEC I/III) (Ref. 31, p. 3-7) from August 1991 through January 1992, during a Phase I RI for the Lucas plant (Ref. 31, p. 3-3). The Phase I RI focused in the seep area (ground water plume in the area of Buildings 50 and 67) and Tank Farm A. Four test borings (TB-6, TB-7, B-13, and TB-14) were drilled in the area of the free-phase product identified near Building 67 (Ref. 31, Figure 3-2). Two soil samples were collected from each boring at 0 to 2 feet below the bgs and at the water table. The samples were analyzed for Priority Pollutant Volatile Organic Analysis plus 15-non target compounds (PP VOA+15), Priority Pollutant Base Neutral Analysis (PP BNA), lead, chromium, and barium. Two of the test borings were converted into monitoring wells. The monitoring wells, MW-13 and MW-14, were sampled and analyzed for PP VOA+15, PP BNA, lead, chromium, barium, and phenols (Ref. 31, p. 3-11). Free-phase product was identified in both MW-13 and MW-14 (Ref. 31, p. 4-18, Table 4-20). MW-14 is located adjacent to the storm sewer systems where free-phase product has been recovered. The storm system is known to leak product to the surrounding area (Ref. 31, pp. 1-5, 3-22, 3-23, Figure 3-2).

Six soil borings (TB-1 through TB-4, TB-11 [converted to MW-11], and 12 [converted to MW-12]) were installed in and around the free-phase product ground water plume in the area of former Tank Farm A. The soil borings were drilled to a depth of 10 to 20 feet bgs (Ref. 31, pp. 3-7, 3-8, Figure 3-2). Splitspoon samples were collected continuously until the water table was encountered. Two soil samples from each boring were collected and analyzed for PP VOA+15, PP BNA, lead, chromium, and barium. Samples were collected at 0 to 2 feet bgs and at the water table interface (Ref. 31, p. 3-8).

Phase II RI

Screening techniques were employed in the area of Source 1 to evaluate the presence or absence of sources, to identify hot spots, and to provide additional data concerning the subsurface from June 1993 and October 1993, during a Phase II RI for the Lucas plant. Soil borings were drilled in the free-phase areas near Buildings 50 and 67 and Tank Farm A and soil samples were collected at various depths (Ref. 31, pp. 3-3, 3-14, 3-15).

Phase III RI

During Phase III of the RI, from July 1995 through August 1995, soil samples were collected from Source 1 and 45 hand-augered borings were located throughout the seep area (seep near Buildings 50 and 67) to delineate the extent of free-phase product (Ref. 31, pp. 3-3, 3-18).

Analytical results for soil samples collected during the RI from Source 1 indicated the presence of the following hazardous substances: acetone; 2-butanone; 1,2-dichloroethene; ethylbenzene; 1,1,2,2-tetrachloroethane; tetrachloroethene; toluene; 1,1,2-trichloroethane; trichloroethene; xylene (total); benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; 2,4-dimethylphenol; fluoranthene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; aluminum; arsenic; barium; cadmium; chromium; copper; iron; lead; magnesium; mercury; nickel; selenium; silver; vanadium; and zinc (Ref. 31, Table 4-5, Figure 3-2).

As documented in the RI report, the area of contaminated soil associated with Buildings 50 and 67 is estimated as 7,000 square feet (Ref. 31, pp. 5-4, 5-5, Figure 3-2). The RI also indicates that the estimated volume of contaminated soil in the area of Tank Farm A is 9,000 cubic yards (Ref. 31, p. 5-3).

Provided below is a summary of the analyses for soil samples collected in Source 1 revealing the presence of contaminated soil in the vicinity of the product seep areas. The sampling locations are shown on Figure 3-2 in Reference 31. Soil samples collected from MW-12 are used to document background concentrations for shallow soil samples and are used as source samples for deeper soil samples. The soil in the shallow portion of MW-12 does not contain hazardous substances found in the free-phase product, Source 1. The free-phase product ground water plume has not contaminated the shallow soil at the location of MW-12. No other soil sampling location was identified that could be used to establish background concentrations for shallow soil. All the soil samples are collected from the Westphalia and Nixonton Urban land complex soil types (Ref. 31, Figure 2-10).

Source 1 Soil Sample: 013-B001 (The well log for MW-13 indicates that a flame ionization detector [FID] detected 1,000 [units not listed] units of VOCs [Ref. 31, Appendix C, p. 12]).

Location ID	MW-13	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	013-B001	012-B001
Date Collected	10/28/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-5 (p. 1), p. 3-11, and Figure 3-2	31, Table 4-5 (p. 1), p. 3-11, and Figure 3-2
Location	E Bldg 67	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	3.9	ND
Xylene (total)	9	ND
Semivolatile Organic Compounds (mg/kg)		
2,4-Dimethylphenol	4.1	ND
2-Methylnaphthalene	3.1	ND
Naphthalene	10	ND
Metals (mg/kg)		
Barium	37.5	10.6
Lead	27.5	6

Source 1 Soil Sample: 013-B002

Location ID	MW-13	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	013-B002	012-B001
Date Collected	10/28/1991	10/14/1991
Depth (ft bgs)	2.0-4.0	0.0-2.0
Reference	31, Table 4-5 (p. 2, 16), p. 3-11, and Figure 3-2	31, Table 4-5 (p. 2, 15), p. 3-11, and Figure 3-2
Location	E Bldg 67	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
2-Butanone	22	ND
Ethylbenzene	61	ND
Xylene (total)	200	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	10	ND
Naphthalene	42	ND

Metals (mg/kg)		
Barium	68.1	10.6
Lead	22.4	4.1

Source 1 Soil Sample: 014-B001

Location ID	MW-14	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	014-B001	012-B001
Date Collected	10/28/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-5 (p. 1), p. 3-11, and Figure 3-2	31, Table 4-5 (p. 15), p. 3-11, and Figure 3-2
Location	N Bldg 67	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
2-Butanone	0.24	ND
Toluene	0.009	ND
Trichloroethene	0.01	ND
Metals (mg/kg)		
Barium	67.3	10.6
Lead	24.6	4.1

Source 1 Soil Sample: PS-01 (Background soil samples are not available; no other surface soil samples were collected. [Ref. 31, Appendix C, p. 577]).

Location ID	PS-01	
Sample Type	Source - Soil	
Field Sample ID	PS-01	
Date Collected	2/21/1996	
Depth (ft bgs)	Surface	
Reference	31, Table 4-5 (pp. 9, 16) and Figure 3-2	
Location	W Bldg 50	
Volatile Organic Compounds (mg/kg)		
Xylene	64	
Semivolatile Organic Compounds (mg/kg)		
Benzo(a)anthracene	1.4	J
Benzo(a)pyrene	1.5	J
Benzo(b)fluoranthene	1.2	J
Benzo(k)fluoranthene	1.3	J
Chrysene	1.6	J
Fluoranthene	2.6	J

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Source No.: 1

Location ID	PS-01	
Sample Type	Source - Soil	
Field Sample ID	PS-01	
Date Collected	2/21/1996	
Depth (ft bgs)	Surface	
Reference	31, Table 4-5 (pp. 9, 16) and Figure 3-2	
Location	W Bldg 50	
2-Methylnaphthalene	6.8	J
Naphthalene	18	
Phenanthrene	2	J
Pyrene	2.3	J
Metals (mg/kg)		
Arsenic	29.3	
Barium	493	
Cadmium	0.44	
Chromium	200	
Lead	1180	
Mercury	0.29	
Nickel	3.9	
Selenium	0.38	
Vanadium	10.8	
Zinc	130	

Source 1 Soil Sample: 007-B001 (The soil boring log for TB-07 indicates that an organic vapor analyzer [OVA] detected 300 to 1,000 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 237]).

Location ID	TB-07	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	007-B001	012-B001
Date Collected	10/29/1991	10/14/1991
Depth (ft bgs)	0.0-3.0	0.0-2.0
Reference	31, Table 4-5 (p. 3), p. 3-11, and Figure 3-2	31, Table 4-5 (p. 2), p. 3-11, and Figure 3-2
Location	SE Bldg 67	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
Xylene (total)	0.028	ND

Source 1 Soil Sample: 007-B001 (The soil boring log for TB-08 indicates that an OVA detected 1,000 [units not provided] units of VOCs and the soil had a solvent odor [Ref. 31, Appendix C, p. 238]).

Location ID	TB-08	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	007-B001	012-B001
Date Collected	10/22/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-5 (pp. 4, 11, 17), p. 3-11, and Figure 3-2	31, Table 4-5 (pp. 2, 9, 15), p. 3-7, and Figure 3-2
Location	E Bldg 67	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	0.015	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	1.7	ND
Naphthalene	4.6	ND
Metals (mg/kg)		
Barium	2,940	10.1
Chromium	90.7	7.7
Lead	2,070	4.1

Source 1 Soil Sample: 030-B001 (The soil boring log for TB-30 indicates that an OVA detected up to 1,000 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 264]).

Location ID	TB-30	TB-37
Sample Type	Source - Soil	Background - Soil
Field Sample ID	030-B001	007-B001
Date Collected	7/7/1993	7/7/1993
Depth (ft bgs)	4.2-5.0	4.7-5.5
Reference	31, Table 4-5 (pp. 4, 11), p. 3-14, and Figure 3-2	31, Table 4-5 (pp. 5, 12), p. 3-14, and Figure 3-2
Location	E Bldg 67	SE Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	3.5	ND
Xylene	27	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	48	ND
Naphthalene	180	0.049 J

Source 1 Soil Sample: 030-B001

Location ID	TB-30	SGW-236
Sample Type	Source - Soil	Background - Soil
Field Sample ID	030-B001	236-B002
Date Collected	7/7/1993	7/6/1993
Depth (ft bgs)	4.2-5.0	3.5-4.0
Reference	31, Table 4-5 (pp. 4, 11), p. 3-14, and Figure 3-2 A	31, Table 4-5 (p. 1), p. 3-14, and Figure 3-2
Location	SE Bldg 67	SE Tank A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	3.5	ND
Xylene (total)	27	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	48	NA
Naphthalene	180	NA

Source 1 Soil Sample: 011-B001 (The soil boring log for MW-11 indicates that a FID detected up to 1,000 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 6]).

Location ID	MW-11	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	011-B001	012-B001
Date Collected	10/14/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-5 (p. 9), pp. 3-7, and Figure 3-2	31, Table 4-5 (p. 9), p. 3-7, and Figure 3-2
Location	SW Tank Farm A	NW Tank Farm A
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	0.37	ND
Naphthalene	1.6	ND

Source 1 Soil Sample: 012-B002 (The soil boring log for MW-12 indicates that the FID detected up to 800 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 9]).

Location ID	MW-12	TB-6
Sample Type	Source - Soil	Background - Soil
Field Sample ID	012-B002	006-B002
Date Collected	10/14/1991	10/22/1991
Depth (ft bgs)	6.0-8.0	6.0-7.0
Reference	31, Table 4-5 (pp. 2, 9), pp. 3-7, and Figure 3-2	31, Table 4-5 (pp. 3, 10), and Figure 3-2
Location	NW Tank Farm A	S Corner Bldg 55
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	19	ND
Xylene (total)	69	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	8.4	ND
Naphthalene	39	ND

Source 1 Soil Sample: 001-B001 (The soil boring log for TB-01 indicates that an OVA detected up to 1,000 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 230]).

Location ID	TB-01	MW-12
Sample Type	Soil	Soil
Field Sample ID	001-B001	012-B001
Date Collected	10/14/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-5 (p. 10), pp. 3-7, and Figure 3-2	31, Table 4-5 (p. 9), p. 3-7, and Figure 3-2
Location	NE Tank Farm A	NW Tank Farm A
Semivolatile Organic Compounds (mg/kg)		
Benzo(k)fluoranthene	0.42	ND
Chrysene	0.52	ND
Fluoranthene	1	ND
Naphthalene	0.55	J ND
Phenanthrene	0.7	ND
Pyrene	0.81	ND

Source 1 Soil Sample: 001-B001

Location ID	TB-01	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	001-B002	012-B001
Date Collected	10/14/1991	10/14/1991
Depth (ft bgs)	10.0-12.0	6.0-8.0
Reference	31, Table 4-5 (pp. 1), pp. 3-7 and Figure 3-2	31, Table 4-5 (pp. 2, 9), p. 3-7, and Figure 3-2
Location	NE Tank Farm A	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	1,300	19
Toluene	24	ND
Xylene (total)	6,900	69

Source 1 Soil Sample: 002-B001 (The soil boring log for TB-02 indicates that an OVA detected up to 200 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 232]).

Location ID	TB-02	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	002-B001	012-B001
Date Collected	10/14/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-5 (1, 10), pp. 3-7, and Figure 3-2	31, Table 4-5 (pp. 2, 9), p. 3-7, and Figure 3-2
Location	Tank Farm A	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	5.5	ND
Trichloroethene	0.55	ND
Xylene (total)	37	ND
Semivolatile Organic Compounds (mg/kg)		
2,4-Dimethylphenol	0.66	ND
2-Methylnaphthalene	0.072	J ND
Benzo(a)anthracene	0.055	J ND
Benzo(a)pyrene	0.038	J ND
Benzo(b)fluoranthene	0.056	J ND
Benzo(k)fluoranthene	0.038	J ND
Chrysene	0.063	J ND
Semivolatile Organic Compounds (mg/kg)		
Fluoranthene	0.12	J ND

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Source No.: 1

Location ID	TB-02		MW-12
Sample Type	Source - Soil		Background - Soil
Field Sample ID	002-B001		012-B001
Date Collected	10/14/1991		10/14/1991
Depth (ft bgs)	0.0-2.0		0.0-2.0
Reference	31, Table 4-5 (1, 10), pp. 3-7, and Figure 3-2		31, Table 4-5 (pp. 2, 9), p. 3-7, and Figure 3-2
Location	Tank Farm A		NW Tank Farm A
Naphthalene	0.053	J	ND
Phenanthrene	0.14	J	ND
Pyrene	0.1	J	ND

Source 1 Soil Sample: 002-B002

Location ID	TB-02	TB-06
Sample Type	Source - Soil	Background - Soil
Field Sample ID	002-B002	006-B002
Date Collected	10/14/1991	10/22/1991
Depth (ft bgs)	8.0-10.0	6.0-7.00
Reference	31, Table 4-5 (pp. 3, 10), pp. 3-7, and Figure 3-2	31, Table 4-5 (pp. 3, 10), pp. 3-7, 3-11 and Figure 3-2
Location	Tank Farm A	S Corner Bldg 55
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	31	ND
Xylene	150	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	7.5	ND
Naphthalene	25	ND

Source 1 Soil Sample: 003-B001 (The soil boring log for TB-03 indicates that an OVA detected up to 300 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 233]).

Location ID	TB-03	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	003-B001	012-B001
Date Collected	10/14/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-5 (pp. 3, 10), pp. 3-7, and Figure 3-2	31, Table 4-5 (pp. 2, 9), p. 3-7, and Figure 3-2
Location	Tank Farm A	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	0.28	ND
Xylene	1.6	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	0.39	ND

Source 1 Soil Sample: 003-B002

Location ID	TB-03	TB-06
Sample Type	Source - Soil	Background - Soil
Field Sample ID	003-B002	006-B002
Date Collected	10/14/1991	10/22/1991
Depth (ft bgs)	8.0-10.0	6.0-7.0
Reference	31, Table 4-5 (pp. 3, 10), pp. 3-7, and Figure 3-2	31, Table 4-5 (pp. 3, 10), pp. 3-7, 3-11 and Figure 3-2
Location	Tank Farm A	S Corner Bldg 55
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	18	ND
Xylene	84	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	15	ND
Naphthalene	72	ND

Source 1 Soil Sample: 004-B001 (The soil boring log for TB-04 indicates that an OVA detected up to 900 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 234]).

Location ID	TB-04	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	004-B001	012-B001
Date Collected	10/14/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-5 (p. 3), pp. 3-7, and Figure 3-2	31, Table 4-5 (p. 2), p. 3-7, and Figure 3-2
Location	Tank Farm A	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	0.14	ND

Source 1 Soil Sample: 004-B002

Location ID	TB-04	TB-06
Sample Type	Source - Soil	Background - Soil
Field Sample ID	004-B002	006-B002
Date Collected	10/14/1991	10/22/1991
Depth (ft bgs)	8.0-10.0	6.0-7.00
Reference	31, Table 4-5 (pp. 3, 10), pp. 3-7, and Figure 3-2	31, Table 4-5 (pp. 3, 10), and Figure 3-2
Location	Tank Farm A	S Corner Bldg 55
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	4.8	ND
Xylene	33	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	18	ND
Naphthalene	92	ND

Source 1 Soil Sample: 001-B002 (The soil boring log for TB-11 (MW-11) indicates that an OVA detected up to 1,000 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 6]).

Location ID	TB-11	TB-6
Sample Type	Source - Soil	Background - Soil
Field Sample ID	011-B002	006-B002
Date Collected	10/14/1991	10/22/1991
Depth (ft bgs)	8.0-10.0	6.0-7.0
Reference	31, Table 4-5 (pp. 4, 11), pp. 3-7, 3-8, and Figure 3-2	31, Table 4-5 (pp. 3, 10), and Figure 3-2
Location	MW-11, Tank Farm A	S Corner Bldg 55
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	55	ND
Xylene (total)	560	ND
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	2.5	ND
Naphthalene	11	ND

Source 1 Soil Sample: 028-B001 (The soil boring log for TB-28 indicates that an OVA detected up to 1,000 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 262]).

Location ID	TB-28	MW-20
Sample Type	Source - Soil	Background - Soil
Field Sample ID	028-B001	020-B101
Date Collected	7/6/1993	7/14/1993
Depth (ft bgs)	1.5-2.0	0.0-2.0
Reference	31, Table 4-5 (p. 4), p. 3-14, and Figure 3-2	31, Table 4-5 (p. 1), p. 3-15, and Figure 3-2
Location	N Tank Farm A	NW Bldg 55
Volatile Organic Compounds (mg/kg)		
1,1,2-Trichloroethane	0.014	ND

Source 1 Soil Sample: 029-B002 (The soil boring log for TB-29 indicates that an OVA detected up to 500 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 263]).

Location ID	TB-29	SGW-236
Sample Type	Source - Soil	Background - Soil
Field Sample ID	029-B002	236-B002
Date Collected	7/7/1993	7/6/1993
Depth (ft bgs)	5.2-5.7	3.5-4.0
Reference	31, Table 4-5 (p. 4), p. 3-14, and Figure 3-2	31, Table 4-5 (p.1), p. 3-14, and Figure 3-2
Location	NW Tank Farm A	SE Tank Farm A
Volatile Organic Compounds (mg/kg)		
Acetone	0.066	ND

Source 1 Soil Sample: TB-54-10 (The soil boring log for TB-54 indicates that an FID detected up to 480 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 314]).

Location ID	TB-54	TB-58	
Sample Type	Source - Soil	Background - Soil	
Field Sample ID	TB-54-10	TB-58-09	
Date Collected	9/30/1996	9/30/1996	
Depth (ft bgs)	10.0-10.5	9.0-9.5	
Reference	31, Table 4-5 (p. 7), p. 3-25, and Figure 3-2	31, Table 4-5 (p. 8), and Figure 3-2	
Location	E Tank Farm A	NW Tank Farm A	
Volatile Organic Compounds (mg/kg)			
Ethylbenzene	98	11	J
Xylene (total)	420	56	

Source 1 Soil Sample: TB-55-10.5 (The soil boring log for TB-55 indicates that an organic vapor monitor (OVM) detected up to 1,246 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 316]).

Location ID	TB-55		TB-58	
Sample Type	Source - Soil		Background - Soil	
Field Sample ID	TB-55-10.5		TB-58-09	
Date Collected	9/30/1996		9/30/1996	
Depth (ft bgs)	10.5-11.0		9.0-9.5	
Reference	31, Table 4-5 (pp. 7, 13), p. 3-25, and Figure 3-2		31, Table 4-5 (pp. 8, 13), p. 3-25 and Figure 3-2	
Location	Tank Farm A		NW Tank Farm A	
Volatile Organic Compounds (mg/kg)				
Ethylbenzene	1,500		11	J
Xylene (total)	11,000	D	56	
Semivolatile Organic Compounds				
Naphthalene	17		ND	

Source 1 Soil Sample: TB-56-13 (The soil boring log for TB-56 indicates that a FID detected up to 920 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 320]).

Location ID	TB-56		TB-58	
Sample Type	Source - Soil		Background - Soil	
Field Sample ID	TB-56-13		TB-58-09	
Date Collected	9/30/1996		9/30/1996	
Depth (ft bgs)	13.0-13.5		9.0-9.5	
Reference	31, Table 4-5 (pp. 7, 13), p. 3-25, and Figure 3-2		31, Table 4-5 (pp. 7, 13), p. 3-25 and Figure 3-2	
Location	E Tank Farm A		NW Tank Farm A	
Volatile Organic Compounds (mg/kg)				
Ethylbenzene	170		11	J
Xylene (total)	1,200		58	
Semivolatile Organic Compounds (mg/kg)				
Naphthalene	6.6		ND	

Source 1 Soil Sample: TB-57-12.5 (The soil boring log for TB-57 indicates that a FID detected up to 4,200 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 323]).

Location ID	TB-57	TB-58	
Sample Type	Source - Soil	Background - Soil	
Field Sample ID	TB-57-12.5	TB-58-09	
Date Collected	9/30/1996	9/30/1996	
Depth (ft bgs)	12.0-12.5	9.0-9.5	
Reference	31, Table 4-5 (p. 7), p. 3-25, and Figure 3-2	31, Table 4-5 (p. 8), and p. 3-25 Figure 3-2	
Location	E Tank Farm A	NW Tank Farm A	
Volatile Organic Compounds (mg/kg)			
Ethylbenzene	750	11	J
Xylene (total)	4,700	58	

Notes:

B	Boring	N	North
bgs	Below ground surface	NA	Not analyzed
Bldg	Building	ND	Not detected
D	Diluted	NE	Northeast
E	East	NW	Northwest
ft	Foot	PS	Point sample
ID	Identification	S	South
J	Estimated concentration	SE	Southeast
mg/kg	Milligrams per kilogram	SW	Surface water
MW	Monitoring well	TB	Test boring
		W	West

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous constituent quantity for Source No. 1.

Sum (pounds): Unknown
Hazardous Constituent Quantity Value (C): Not available (NA)

2.4.2.1.2 Hazardous Waste Stream Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous waste stream quantity for Source No. 1.

Sum (pounds): Unknown
Hazardous Waste Stream Quantity Value: NA

2.4.2.1.3 Volume

During the Phase III activities, free-phase product was measured for the mobile thickness of the product, the volume of recoverable product, and the recharge rates of the product (Ref. 31, p. 3-20). A bail-down test was conducted to identify the thickness of the product (Ref. 31, Appendix K, Tables E1 through E4). The bail-down test completed in WP-3 in the area of the Building 50 indicated that the thickness of the product in July 1995 as 0.33 foot and in August 1995 as 0.48 foot (Ref. 31, Figures 4-11 and 4-12). The bail-down test completed in the area of the Building 67 indicated that the thickness of the product in July 1995 at MW-21 as 2.21 feet, at MW-13R as 0.98 foot, and at WP-1 as 1.33 feet (Ref. 31, Figure 4-11). In August 1995 the thickness of product was recorded at MW-21 as 0.66 foot, at MW-13R as 1.28 feet, and at WP-1 as 1.33 feet (Ref. 31, Figure 4-12). The bail-down test completed in MW-11 in the area of the Tank Farm A identified the thickness of product as 1.47 feet in July 1995 and 0.45 foot in August 1995 (Ref. 31, Appendix K, Table E2, and Figures 4-11 and 4-12). The lateral extent of three separate product plumes in ground water are shown on Figures 4-11 and 4-12, Appendix K, Reference 31. The plumes are considered separate because of the absence of product in the monitoring wells located between the plumes (Ref. 31, p. 4-20). The total volume of the free-phase product cannot be estimated.

Dimension of source (yd³ or gallons): Unknown, but greater than zero
Volume Assigned Value: Unknown, > 0

2.4.2.1.4 Area

The information available is not sufficient to adequately support the evaluation of the area or the area of observed contamination for Source No. 1.

Area of Source (ft²): Not Scored
Area Assigned Value: Not Scored

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source HWQ value for Source No. 1 is assigned a source HWQ value of greater than zero because the waste quantity associated with Source 1 has not been adequately documented; however, the presence of free-phase product in ground water has been documented.

Source Hazardous Waste Quantity Value: Unknown, but greater than zero

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Name of source: Areas of Contaminated Soil

Number of source: 2

Source Type: Contaminated Soil

This source includes three areas of contaminated soil. The areas of contaminated soil are combined as one source because they are of the same type, from the same operations, near each other, potentially from the same releases, contain the same type of contaminants, and were investigated as one source during an RI, as documented in the sections below.

Contaminated Soil: Pump House

The pump house transferred wastewater from the Lucas plant operations to the lagoon area (Ref. 31, p. 5-6). Lead contamination has been identified in the soil surrounding the former pump house (Ref. 31, pp. ES-2, 6-4).

In 1994, NJDEP advanced augers into the bank of Hilliards Creek adjacent to the pump house. Approximately 1 foot of paint sludge was observed when the augers were retrieved. The sludge tapered to a faint greenish color about 15 feet downstream of the pump house (Ref. 66, pp. 1, 2).

In 1999, a waste sample was collected adjacent to the pump house and was found to contain barium (14,400 parts per million [ppm]), lead (1,090 ppm), magnesium (7,340 ppm), and mercury (17.8 ppm) (Ref. 26, pp. 5, 8). An RI confirmed that lead-contaminated soil was associated with the pump house (Ref. 31, pp. ES-2, 3-27, 5-7, and 5-8).

Contaminated Soil: Northwest of Building 55

The RI for the Lucas plant identified contaminated soil northwest of Building 55, in the area of soil boring B-76 (Ref. 31, p. 5-5, Table 4-11, Figure 3-2). The contaminated soil may have resulted from operations in former Buildings 15 and 49, formerly located west of the Tank Farm A. Building 15 was used to store varnish in 440-, 960-, and 2,200-gallon ASTs. Building 49 was used to store varnish in 2,500- and 6,000-gallon tanks (Refs. 5; 60, p. 33). Soil may have become contaminated during transfer and temporary storage of materials near the tanks, which may have resulted in leaks and spills (Ref. 59, Appendix II, p. II55).

Other sources of the soil contamination are shown on an insurance map, dated April 16, 1964, including a solvent pump house formerly located northwest of Building 55 and leaks from raw materials stored in Building 55 (Refs. 5; 60, pp. 99, 100).

Contaminated Soil: Southeast Corned of Building 55

A soil boring (TB-06) was completed at the southeast corner of Building 55. Analytical results for soil samples collected from the boring indicated the presence of contaminated soil as documented in Section 2.4.1. The contamination at TB-06 is considered separate from the contaminated soil detected south of TB-06 in the area of free-phase product ground water plume because the plume does not exceed to sampling location TB-06 (Ref. 31, pp. 4-11 and 4-12).

Location of the source, with reference to a map of the site: The areas of contaminated soil are located on the northwest side of Building 55 in the area of test boring 76 (TB-76), on the southeast corner of Building 55, and in the area of the pump house located west of Building 67 (Ref. 31, Figures 2-2 and 3-2). The locations where soil sample analyses revealed the presence of contaminated soil and defined the area of Source 2 are shown on Figure 3-2 of Reference 31.

Containment:

Release to ground water: As documented in the section above, Source 2 is an area of contaminated soil. No liners, covers, or other containment features are associated with the source; therefore, a containment factor value of 10 is assigned to this source. Additionally, as documented in Section 4.2.1.5, there is evidence that hazardous substances have migrated from the source to ground water (Ref. 1, Table 3-2).

Release via overland migration and/or flood: As documented in the section above, Source 2 is an area of contaminated soil. No runoff control systems are associated with the source; therefore, a containment factor value of 10 is assigned to this source. Additionally, as documented in Section 4.1.2.1.1, there is evidence that hazardous materials have migrated from the source (Ref. 1, Table 4-2).

Gas release to air: The air migration pathway was not scored.

Particulate release to air: The air migration pathway was not scored.

2.4 WASTE CHARACTERISTICS

2.4.1 Hazardous Substances:

The hazardous substances associated with Source 2 were identified during numerous soil sampling investigations. The most recent investigation was a five-phase RI for the Lucas plant (Ref. 31, p. 3-3). The data from the RI are used to characterize Source 2. Figure 3-2, in Reference 31, was used to identify soil sampling locations specifically associated with Source 2. The soil samples were analyzed for Priority Pollutant Volatile Organic Analysis plus 15-non target compounds (PP VOA+15), Priority Pollutant Base Neutral Analysis (PP BNA), lead, chromium, and barium (Ref. 31, p. 3-11). During Phase IV of the RI for the Lucas plant, three soil borings were drilled around the pump house. Sludge and paint were observed in one of the borings, TB-73. A sample of the sludge and paint was collected from the boring (Ref. 31, p. 5-7). Additional investigations were conducted in the area of pump house to further delineate the extent of soil contamination (Ref. 31, pp. 3-26, 3-27). Three soil borings were hand augered in the area of the pump house (Ref. 31, pp. 3-3, 2-27). The borings were installed to delineate the extent of sludge and paint chips observed in a boring, TB-73, previously drilled in the area of the pump house (Ref. 31, p. 3-27).

The tables below provide a summary of hazardous substances detected in soil samples collected from Source 2 during numerous phases of the RI. The result for a background soil sample is listed to provide a reference concentration for the hazardous substances. Background soil sample selection is based on whether the background and source soil sample were collected within the same depth range, period of time, and whether the samples were analyzed for the same hazardous substances. All soil samples collected from 1990 to 1997 were analyzed by Weston Analytics Division, a New Jersey-certified laboratory. All samples collected from 1998 to 2000 were analyzed by Severn-Trent Laboratories (STL), a New Jersey-certified laboratory (Ref. 31, p. 3-37). Reference 111 provides a Quality Assurance Project Plan used by Sherwin-Williams' environmental consultant. The plan provides analytical methods, quantitation limits, and detection limits for some of the investigations conducted by Sherwin-Williams' (Ref. 111). It is likely that these same methods were used for analyzing the samples summarized in this section. Analytical data sheets from the laboratories are not available; however, the RI report that Sherwin-Williams prepared indicates that the analytical data are valid. The analytical results in the tables below are considered usable and of known quality (Ref. 31, p. 3-38). Table 3-1 of Reference 31 provides a summary of the analytical suite for the soil samples.

The locations of the soil samples are provided on Figure 3-2, in Reference 31, and are circled.

Contaminated soil southeast corner of Building 55:

Analytical results for a soil boring sample collected from the southeast corner of Building 55 indicated the presence of a number hazardous substances three times above the background concentrations. The soil sample does not contain the same hazardous substances as detected in the product samples and is therefore, considered a separate area of contamination, as documented below.

Source 2 Soil Sample:006-B001 (The soil boring log for TB-06 indicates that an OVA detected up to 700 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 236]).

Location ID	TB-06	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	006-B001	012-B001
Date Collected	10/22/1991	10/14/1991
Depth (ft bgs)	1.0-2.0	0.0-2.0
Reference	31, Table 4-5 (pp. 3, 17), and Figure 3-2	31, Table 4-5 (pp. 2, 15), p. 3-11, and Figure 3-2
Location	SE Corner of Bldg 55	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
1,1,2,2-Tetrachloroethane	0.05	ND
Tetrachloroethene	0.019	ND
Total-1,2-dichloroethene	0.019	ND
Trichloroethene	0.071	ND
Metals (mg/kg)		
Lead	78.3	4.1

Contaminated Soil Associated with the Pump House

Provided below is a summary of analytical results for soil samples collected in the area of the pump house. The results indicate the presence of contaminated soil.

Source 2 Soil Sample: TB-73 (Red and white paint like flakes were observed in the soil boring [Ref. 31, Appendix C, p. 370]).

Location ID	TB-73	TB-95
Sample Type	Source - Soil	Background - Soil
Date Collected	1/15/1999	1/15/1999
Depth (ft bgs)	0.5-1.5	0.8-1.3
Reference	31, pp. 5-7, 5-8, Table 4-5 (p. 18), and Figure 3-2	31, pp. 5-7, 5-8, Table 4-5 (p. 19), and Figure 3-2
Location	W Pump House	Background SW Pump House
Metals (mg/kg)		
Antimony	5.4	1.6
Barium	14,500	841
Chromium	55.7	15.5
Cobalt	78.5	7.2
Copper	1,080	73
Lead	1,040	231
Magnesium	2,900	257

Location ID	TB-73	TB-95
Sample Type	Source - Soil	Background - Soil
Date Collected	1/15/1999	1/15/1999
Depth (ft bgs)	0.5-1.5	0.8-1.3
Reference	31, pp. 5-7, 5-8, Table 4-5 (p. 18), and Figure 3-2	31, pp. 5-7, 5-8, Table 4-5 (p. 19), and Figure 3-2
Location	W Pump House	Background SW Pump House
Metals (mg/kg)		
Mercury	25.2	1.8
Nickel	46.2	5.8
Zinc	3,240	564

Contaminated Soil Located Northwest of Building 55

Provided below is a summary of analytical results for soil samples collected in the area northwest of Building 55. The results indicate the presence of contaminated soil.

Source 2 Soil Sample: TB-176 [odors and staining observed in the sample (Ref. 31, p. 5-5)].

Location ID	B-76		B-75
Sample Type	Source - Soil		Background - Soil
Field Sample ID	B-176		B-75
Date Collected	4/16/1997		4/16/1997
Depth (ft bgs)	10.0-12.0		11.5-17.0
Reference	31, Table 4-5 (pp. 9, 15), and Figure 3-2		31, Table 4-5 (p. 15), and Figure 3-2
Location	NW Bldg 55		W Bldg 58
Semivolatile Organic Compounds (mg/kg)			
2-Methylnaphthalene	1.9	J	NA
Naphthalene	9.4	J	NA
Metals (mg/kg)			
Arsenic	4.2		ND
Barium	224		29.1
Beryllium	0.11		ND
Copper	197		1.1
Lead	401		8.5
Mercury	0.12		ND
Nickel	3.2		ND

Source 2 Soil Sample: B-76 [odors and staining observed in the sample (Ref. 31, p. 5-5)].

Location ID	B-76		B-78
Sample Type	Source - Soil		Background - Soil
Field Sample ID	B-76		B-78
Date Collected	4/16/1997		4/16/1997
Depth (ft bgs)	3.0-3.5		3.5-4.0
Reference	31, Table 4-5 (pp. 2, 9, 15), and Figure 3-2		31, Table 4-5 (pp. 2, 15), and Figure 3-2
Location	NW Bldg 55		150 ft S Bldg 67
Volatile Organic Compounds (mg/kg)			
Ethylbenzene	20		ND
Xylene (total)	8.8		ND
Semivolatile Organic Compounds (mg/kg)			
Naphthalene	8.3	J	NA
Metals (mg/kg)			
Barium	82.5		10.6
Cadmium	0.42		NA
Chromium	13.2		3.6
Copper	12.1		2.2
Lead	171		6
Mercury	0.08		ND
Nickel	2.2		ND
Zinc	62.1		6.7

Source 2 Soil Sample: 020-B001 (The soil boring log for MW-20 indicates that an OVA detected up to 110 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 48]).

Location ID	MW-20		SGW-236
Sample Type	Source - Soil		Background - Soil
Field Sample ID	020-B001		236-B001
Date Collected	7/14/1993		7/06/1993
Depth (ft bgs)	1.5-2.0		1.5-2.0
Reference	31, Table 4-5 (p. 1), and Figure 3-2		31, Table 4-5 (p. 1), Figure 3-2, and p. 3-11
Location	NW Bldg 55		SE Tank Farm A
Volatile Organic Compounds (mg/kg)			
Ethylbenzene	24		0.76 J
Xylene	4.4		ND

Source 2 Soil Sample: TB-59-01 (The soil boring log for TB-59 indicates that the FID detected up to 110 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 328]).

Location ID	TB-59	SGW-236
Sample Type	Source - Soil	Background - Soil
Field Sample ID	TB-59-01	236-B001
Date Collected	10/1/1996	7/06/1993
Depth (ft bgs)	1.5-2.0	1.5-2.0
Reference	31, Table 4-5 (p. 8), and Figure 3-2	31, Table 4-5 (p. 2), p. 3-11, and Figure 3-2
Location	NW Bldg 55	SE Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	7	0.76 J
Xylene	24	ND

Source 2 Soil Sample: TB-60-04 (No background soil samples were collected within the depth range of 4.0 to 4.5 feet bgs in 1996; therefore, the result for a background sample collected from 1993 is provided in the table below. The background concentrations are not critical for this sample because the hazardous substances detected in the source soil sample are not naturally occurring. A strong petroleum odor was detected in the soil boring. The soil boring log for TB-60 indicates that the FID detected up to 4,200 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 330]).

Location ID	TB-60	TB-37
Sample Type	Source - Soil	Background - Soil
Field Sample ID	TB-60-04	007-B001
Date Collected	10/1/1996	7/06/1993
Depth (ft bgs)	4.0-4.5	4.7-5.5
Reference	31, Table 4-5 (p. 8), and Figure 3-2	31, Table 4-5 (p. 5), and Figure 3-2
Location	NW Bldg 55	SE Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	28	ND
Xylene	56	ND

Source Soil Sample: TB-61-04 (No background soil samples were collected within the depth range of 4.0 to 4.5 feet bgs in 1996; therefore, the result for a background sample collected from 1993 is provided in the table below. The background concentrations are not critical for this sample because the hazardous substances detected in the source soil sample are not naturally occurring. A petroleum odor was detected in the soil boring. The soil boring log for TB-61 indicates that the FID detected up to 3,000 [units not provided] units of VOCs [Ref. 31, Appendix C, p. 332]).

Location ID	TB-61	TB-37
Sample Type	Source - Soil	Background - Soil
Field Sample ID	TB-61-04	007-B001
Date Collected	10/1/1996	7/6/1993
Depth (ft bgs)	4.0-4.5	4.7-5.5
Reference	31, Table 4-5 (p. 8), and Figure 3-2	31, Table 4-5 (p. 5), and Figure 3-2
Location	NW Bldg 55	SE Tank Farm A
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	27	ND
Xylene	170	ND

Notes:

B	Boring	N	North
bgs	Below ground surface	NA	Not analyzed
Bldg	Building	ND	Not detected
ft	Foot	NW	Northwest
HA	Hand auger	S	South
ID	Identification	SE	Southeast
J	Estimated concentration	SW	Surface water
mg/kg	Milligram per kilogram	TB	Test boring
MW	Monitoring well	W	West

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous constituent quantity for Source No. 2.

Sum (pounds): Unknown
Hazardous Constituent Quantity Value (C): Not available (NA)

2.4.2.1.2 Hazardous Waste Stream Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous waste stream quantity for Source No. 2.

Sum (pounds): Unknown
Hazardous Waste Stream Quantity Value: NA

2.4.2.1.3 Volume

The information available is not sufficient to adequately support the determination of the volume hazardous waste quantity value for Source No. 2.

Dimension of source (yd³ or gallons): 0
Volume Assigned Value: 0

2.4.2.1.4 Area

Since the volume of contaminated soil associated with Source 2 is not adequately estimated, the area of Source 2 is evaluated (Ref. 1, Section 2.4.2.1.3). The area of contaminated soil associated with Source 2 is difficult to document because numerous areas within the area are covered with buildings, parking lots, and roads. Numerous removal actions have been conducted in the area of Source 2; however, based on Section 2.4.1 for Source 2, contamination still remains in Source 2 (Refs. 18, pp. ES-1, 1-1, 1-2, 3-5, 4-1; 31, pp. 3-22, 3-23, 3-24, 5-3, 5-4, 5-5, and Figure 3-2). Therefore, the area of soil contamination for Source 2 is assigned the value of greater than zero.

Area of Source (ft²): Unknown, > 0
Area Assigned Value: Unknown, > 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source HWQ value for Source No. 2 is assigned a source HWQ value of greater than zero because the waste quantity associated with Source 2 has not been adequately documented; however, the presence of contaminated soil has been documented.

Source Hazardous Waste Quantity Value: Unknown, but greater than zero

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Source Number: 3

Source Description: Lagoons

Source Type: Backfilled surface impoundment

Source 3 includes five backfilled surface impoundments and an associated pipeline and drainage channel. Between 1950 and 1977, wastewater generated from the paint manufacturing process was discharged into five impoundments for treatment and disposal. The lagoons were located south of the facility. Wastewater was discharged by gravity from the manufacturing plant to a lift station and subsequently pumped to a 27,000-gallon concrete holding basin. Alum was added to the wastewater, and then the wastewater was fed by gravity from the basin to Lagoon 1 for coagulation and settling. The wastewater was then transferred to Lagoons 2, 3, and 4 for biological treatment. A holding basin was also used in the wastewater treatment system (Refs. 6, pp. 2-3, 2-4, and Figure 2-4; 31, p. 2-5). Tank washout from the latex system and Sher-dye was disposed of in the lagoons (the sanitary waste system on Lucas plant) (Ref. 70, pp. 9, 11).

Aerial photographs from 1940 show two open storage areas along a railroad spur. This area appears to be the location of the lagoons (Ref. 7, pp. 4, 5). Aerial photographs from 1951 show three impoundments in the area of the lagoons. An open storage area is located north of the lagoons (Ref. 7, pp. 6, 7, 10, 11). The 1961 aerial photographs indicate that one of the three lagoons (impoundments) was divided into four separate lagoons, for a total of six lagoons. Several piles of light-toned mounded material were observed near one of the lagoons (impoundment one) (Ref. 7, p. 8). Aerial photographs from 1973 show the presence of a pipeline extending from the north bank of one of the lagoons (impoundment one) to a drainage channel (Hilliards Creek) that runs through the center of the Lucas plant. An outfall from the western bank of the lagoon area toward a drainage channel (Hilliards Creek) is visible (Ref. 7, pp. 10, 11). Aerial photographs from 1975 show the presence of leachate scars on the downslope of one of the lagoons. The lagoons are no longer visible in 1984 aerial photographs (Ref. 7, p. 13).

In 1975, one of the settling lagoons overflowed into Hilliards Creek (Ref. 59, Appendix X, p. X6).

On July 31, 1975, and September 16, 1975, NJDEP inspectors noted foul solvent odors emanating from monitoring wells in the area of the lagoons, and one of the lagoons was observed to be leaking its contents into Hilliards Creek (Ref. 32, p. 3).

On May 5, 1976, NJDEP inspectors observed that a feed pipe used for transport of raw materials in the facility had ruptured causing an oil discharge to the primary settling lagoon and Hilliards Creek (Ref. 32, p. 3).

In 1976, NJDEP directed Sherwin-Williams to conduct a subsurface investigation in the former lagoon area (AEC IV) (Ref. 31, pp. 3-1, 3-33). Approximate depths (from an average existing ground surface) were as follows:

- Lagoon 1 = 5 feet
- Lagoon 2 = 15 feet
- Lagoon 3 = 8 feet
- Lagoon 4 = 12 feet
- Holding Basin = 10 feet

Depths are documented in Reference 31 (pp. 3-33, 3-34). According to the RI report, a sludge pit was located in the area of the lagoons. The depth of the sludge pit was 20 feet (Ref. 31, pp. 3-33, 3-34). Sludge was encountered at the base of the lagoons at depths of 2 to 5 feet in the lagoons and the base of the holding basin at a depth of 3 feet. Twenty-eight soil borings were drilled in the lagoon area (Ref. 31, p. 3-34). A review of Figure 2-4 in Reference 6 indicates that the four impoundments, a holding basin (the fifth surface impoundment), and a sludge disposal area were associated with the four surface impoundments. The sludge pit, as referred to in the RI, may be the sludge disposal area shown on Figure 2-4 in Reference 6.

On August 17, 1978, NJDEP issued an administrative order to Sherwin-Williams to remove sludge in the area of the lagoons and to monitor ground water. The order was based on findings that Sherwin-Williams operated unlined wastewater treatment lagoons and stored sludge without NJDEP approval or authorization. NJDEP concluded that the lagoons allowed inadequately treated wastewater to percolate into the ground water (Ref. 57, pp. 1, 2, 3).

In 1979, a subsurface investigation was conducted in the area of the lagoons, or Site 2 as referenced in reference documentation (Ref. 41, Plates 2, 6, and 7, p. 10). The report documenting the investigation indicated that the lagoon area included the following: a holding pond (150 by 180 feet), ponds 1 and 2 (60 by 80 feet each), pond 3 (40 by 40 feet), and pond 4 (100 by 150 feet). (A sludge disposal pond, 40 by 150 feet, was also located adjacent to the lagoons. However, its waste (dried sludge) was included in another NPL site, the US Avenue Burn site and not included in the waste quantity for this site [Ref. 41, pp. 10, 14, Plate 6].) According to the report, industrial waste including paint sludge and raw sewage was emptied into the holding pond, where primary sedimentation took place. A pump suctioned material from the holding pond to pond 1. From pond 1, the fluid was transferred by gravity to pond 2, then to pond 3, and finally to pond 4. Dried sludge was excavated from ponds 1, 2, 3, and 4 then disposed of in the sludge holding pond. The report does not identify the location where pond 4 discharges (Refs. 41, p 11; 8, p. 3). Analytical results for soil borings indicated the presence of dried paint in the holding pond, ponds 1, 2, 3, and 4, and in the sludge disposal pond. (The waste quantity associated with the sludge disposal pond is evaluated as part of a separate site, US Avenue Burn Site.) Drainage from the lagoon area was noted to be toward the west, the location of Hilliards Creek (Refs. 41, p. 14; 9).

In 1979, a total of 8,096 cubic yards of sludge was removed from the lagoon area. After the sludge was visibly removed, the lagoons were filled in with clean fill. The removal was considered complete when all the visually identifiable sludge and contaminated soils were removed (Refs. 31, pp. 3-33 and 3-34; 42, p. 4). Since the removal action was based on visually removing the waste associated with Source 3, it cannot be documented that all the contamination associated with Source 3 has been removed. No

confirmatory samples were collected. Available data, provided in Section 4.0 of this documentation record, indicate that Source 3 released hazardous substances to ground water and surface water. The contamination associated with the releases to ground water and surface water has not been addressed. Since no confirmatory samples were collected to document that all contamination associated with Source 3 was removed and releases to ground water and surface water from Source 3 have not been addressed, the removal action completed in the Source 3 is not considered a qualifying removal action (Refs. 82; 83).

In 1993, a site inspection (SI) report completed by NJDEP indicated that memorandums by Sherwin-Williams described a breach of the lagoon system (Ref. 59, p. 3).

Location of the source, with reference to a map of the site: Figure 2-4, in Reference 6, shows the location of the four backfilled surface impoundments (also referred to as lagoons and ponds in reference documentation) and the holding basin, fifth backfilled surface impoundment. Source 3 is located on the southeastern portion of the former Lucas plant, on the south side of Foster Avenue and on the east side of Hilliards Creek (see Figure 2-4 in Reference 6).

Containment:

Release to ground water: The lagoons were unlined (Ref. 57, pp. 1, 2, 3); therefore, a containment factor value of 10 is assigned to this source. Additionally, as documented in the section above, there is evidence that hazardous substances migrated from the source (Ref. 1, Table 3-2).

Release via overland migration and/or flood: Migration of hazardous substances from the source area has been documented; therefore, a containment factor value of 10 is assigned to this source (Ref. 59, Appendix X, p. X6). Additionally, as documented in the section above, no surface water runoff control system was associated with Source 3 (Ref. 1, Table 4-2).

Gas release to air: The air migration pathway was not scored.

Particulate release to air: The air migration pathway was not scored.

2.4 WASTE CHARACTERISTICS

2.4.1 Hazardous Substances:

In 1977, wastewater sludge samples were analyzed for disposal purposes. The leachate analysis revealed the presence of lead, 0.16 mg/L (Ref. 19, pp. 1, 3). The paint sludge was classified as special waste (Refs. 23; 24). In 1977, analysis of spent iron residue from the wastewater treatment plant revealed 0.007 mg/L of arsenic and 0.25 mg/L of lead in the leachate (Ref. 22, pp. 1, 2). In 1978, analysis of a paint sludge sample revealed 0.08 percent by weight of lead (Ref. 20, pp. 1, 2). In April 1978, analysis of a wastewater sludge sample revealed the presence of arsenic at 0.7 mg/kg (Ref. 25, pp. 1, 2). In March 1978, analysis of leachate from paint sludge revealed 0.015 mg/L of lead (Ref. 21, p. 1).

Soil samples were collected from the approximate center of each lagoon (referred to as ponds in reference documentation) (Ref. 31, p. 3-36) in November 1996, during Phase IV of the RI for the Lucas plant (Ref. 31, p. 3-3). Analysis of a soil sample collected from the lagoons revealed the presence of 11 mg/kg of pentachlorophenol, 4.5 mg/kg of arsenic, and 0.08 mg/kg of mercury (Ref. 31, Table 4-7 [p. 2], Figure 3-2). The Table 2 summarizes the hazardous substances detected in soil boring samples collected from the lagoons during Phase IV of the RI for the Lucas plant. The soil samples were collected during the RI to confirm whether the 1979 remediation was effective. One sample was collected from the approximate center of each lagoon and the disposal area. Samples SS-P1, SS-P2, SS-P3, and SS-P4 were collected from the former lagoons. Sample SS-HP was collected from the former holding pond. The samples were collected immediately below the base of the former features or the fill material to evaluate whether natural soils were contaminated by the operations of the lagoons and ponds (Ref. 31, p. 3-36). No appropriate background soil sample was identified for comparison to results for soil samples collected from the lagoons.

All soil samples collected during the RI from 1990 to 1997 were analyzed by Weston Analytics Division, a New Jersey-certified laboratory. All samples collected from 1998 to 2000 were analyzed by STL, a New Jersey-certified laboratory (Ref. 31, p. 3-37). The analytical results in the tables below are considered usable and of known quality (Ref. 31, p. 3-38). Table 3-1 of Reference 31 provides a summary of the analytical suite for the soil samples. The detection limits were not provided in the RI report.

TABLE 2

SUMMARY OF WASTE SAMPLES ASSOCIATED WITH LAGOONS

Sample type	Hazardous Substance	Concentration	Date	Reference
Wastewater Sludge	lead	0.16 mg/L	1977	Ref. 19, p. 1, 3
Leachate	arsenic	0.007 mg/L	1977	Ref. 22, pp. 1, 2
	lead	0.25 mg/L	1977	Ref. 22, p. 1, 2
Paint Sludge	lead	008 % by weight	1978	Ref. 20, pp. 1, 2

Sample type	Hazardous Substance	Concentration	Date	Reference
Wastewater Sludge	arsenic	0.7 mg/kg	1978	Ref. 25, pp. 1, 2
Leachate/Paint Sludge	lead	0.015 mg/L	1978	Ref. 21, p. 1

**SUMMARY OF HAZARDOUS SUBSTANCES DETECTED
IN SOIL SAMPLES COLLECTED FROM SOURCE 3**

Site ID	Holding Pond	Lagoon 1	Lagoon 2	Lagoon 3	Lagoon 4
Location ID	SS-HP	SS-P1	SS-P2	SS-P3	SS-P4
Field Sample ID	SS-HP	SS-P1	SS-P2	SS-P3	SS-P4
Date Collected	4/17/1997	4/17/1997	4/17/1997	4/17/1997	4/17/1997
Depth (ft bgs)	10.0-12.0	10.0-12.0	10.0-12.0	10.0-12.0	10.0-12.0
Reference	31, p. 3-36, Table 4-7 [pp. 1, 2, 3]	31, p. 3-36, Table 4-7 [pp. 1, 2, 3]	31, p. 3-36, Table 4-7 [pp. 1, 2, 3]	31, p. 3-36, Table 4-7 [pp. 1, 2, 3]	31, p. 3-36, Table 4-7 [pp. 1, 2, 3]
Volatile Organic Compounds (mg/kg)					
2-Butanone	0.029	0.018 J	0.023	0.014	0.029
Carbon Disulfide	ND	0.012 J	0.018	0.004 J	0.063
Ethylbenzene	0.039	0.19	0.014	0.005 J	ND
Xylenes (total)	0.26	0.93	0.071	0.012	0.004 J
Semivolatile Organic Compounds (mg/kg)					
Benzoic Acid	ND	0.051 J	0.12 J	ND	3.4
Pentachlorophenol	11	0.31 J	13	0.11 J	0.055 J
Metals (mg/kg)					
Arsenic	3.4	ND	ND	ND	ND
Barium	5.5	13.1	2.8	6.2	4.5
Cadmium	ND	ND	ND	ND	ND
Chromium	6.6	7.2	8.6	6.9	8.1
Copper	1.3	2.7	1.9	17.1	1.2
Lead	4.1	7	4.9	10	5
Mercury	0.03	0.06	0.04	0.02	0.04
Nickel	ND	2.0	2.4	2.1	5.7
Zinc	4.2	8.4	30.4	34.9	39.7

Notes:

- HP Holding pond
- ID Identification
- mg/kg Milligram per kilogram
- ND Not detected
- P Pond
- SS Soil sample

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous constituent quantity for Source No. 3.

Sum (pounds): Unknown
Hazardous Constituent Quantity Value (C): Not available (NA)

2.4.2.1.2 Hazardous Waste Stream Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous waste stream quantity for Source No. 3.

Sum (pounds): Unknown
Hazardous Waste Stream Quantity Value: NA

2.4.2.1.3 Volume

In 1979, a total of 8,096 cubic yards of sludge was removed from the lagoon area. After the sludge was visibly removed, the lagoons were filled with clean fill. The removal was considered complete when all the visually identifiable sludge and contaminated soils were removed (Refs. 31, p. 3-34; 42, p. 4). Analytical results for soil samples collected during a latter investigation, after the removal, indicate that residual contamination remains in the soil underlying the lagoons. The hazardous waste quantity associated with the lagoon area cannot be quantified.

Dimension of source (yd³ or gallons): 0
Volume Assigned Value: 0

2.4.2.1.4 Area

In 1979, a subsurface investigation was conducted in the area of the lagoons, or Site 2 as referenced in reference documentation (Ref. 41, Plates 2, 6, and 7, p. 10). The report documenting the investigation indicated that the lagoon area included the following: a holding pond (150 by 180 feet), ponds 1 and 2 (60 by 80 feet each), pond 3 (40 by 40 feet), and pond 4 (100 by 150 feet). (The sludge disposal pond, 40 by 150 feet, was also identified, but the waste quantity associated with that source was evaluated as part of a separate site, the US Avenue Burn site [Ref. 41, pp. 10, 14, Plate 6].) The area associated with the lagoon area is estimated to be 26,200 sq ft to 32,200 sq ft. Since the Source 3 area cannot be adequately confirmed, the area of Source 3 is assigned the value of greater than 0.

Area of Source (ft²): Unknown, > 0
Area Assigned Value: Unknown, >0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source HWQ value for Source No. 3 is assigned a value of greater than zero because the waste quantity associated with Source 3 has not been adequately documented; however, the presence of contaminated soil has been documented.

Source Hazardous Waste Quantity Value: Unknown, but greater than zero

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Source Number: 4

Source Description: Contaminated Soil Associated with Tank Farm B

Source Type: Contaminated Soil

Source 4 is an area of contaminated soil identified through sampling in the area of Tank Farm B (Refs. 31, Table 4-3, Figure 3-2; 59, Appendix II, pp. II31, II32). The presence of contaminated soil in the area of Tank Farm B, as documented in Section 2.4.1, indicates that product leaked and spilled from the tank farm. Tank Farm B is located in the southern section of the plant on the south side of Foster Avenue and on the west bank of Hilliards Creek (See Reference 6, Figure 2-4). Raw materials were stored in ASTs and USTs in the area of Tank Farm B. Seventeen tanks were associated with Tank Farm B (Refs. 31, Table 2-2; 6, Figure 2-4). Materials stored in the tanks included isobutyl alcohol, C.P. acetone, methyl amyl acetate, isopropyl acetate, xylene, lacquer solvent, toluene, toluene-based solvent blend, methyl ethyl ketone, ethyl acetate, isopropanol, solvent, methyl isobutyl ketone, solvent blend, and aromatic naphtha (Refs. 5; 31, Table 2-2).

All ASTs and USTs were dismantled and removed from the property in June 1981, after the Lucas plant was sold to Scarborough (Ref. 31, p. 2-4).

The soil sample analytical data generated from an RI in the area of Tank Farm B revealed the presence of numerous hazardous substances in the area of Tank Farm B, including: acetone; 2-butanone; 2-hexanone; chloroform; ethylbenzene; toluene; 1,1,1-trichloroethane; trichloroethene; xylenes; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; di-n-butyl phthalate; fluoranthene; phenanthrene; pyrene; aluminum; antimony; arsenic; barium; chromium; cobalt; lead; magnesium; mercury; zinc; and cyanide (Refs. 31, Table 4-3, Figure 3-2; 59, Appendix II, pp. II31, II32).

Location of the source, with reference to a map of the site: As shown on Figure 2-4, in Reference 6, Tank Farm B was located on the west side of Hilliards Creek and on the south side of Foster Avenue, just west of Building 50 (Refs. 6, Figure 2-4; 31, Figure 3-2).

Containment:

Release to ground water: As documented in the section above, Source 4 is an area of contaminated soil. No containment structures are associated with the source; therefore, a containment factor value of 10 is assigned to this source (Ref. 1, Table 3-2).

Release via overland migration and/or flood: As documented in the section above, Source 4 is an area of contaminated soil. No containment structures are associated with the source; therefore, a containment factor value of 10 is assigned to this source (Ref. 1, Table 4-2).

Gas release to air: The air migration pathway was not scored.

Particulate release to air: The air migration pathway was not scored.

2.4 WASTE CHARACTERISTICS

2.4.1 Hazardous Substances:

Liquid hazardous substances were stored in the tanks in the area of Tank Farm B. The contents of the tanks are summarized in Table 2-2 of Reference 31. The presence of contaminated soil in the area of Tank Farm B, as documented below, indicates that product leaked and spilled from the tank farm.

Four soil borings (TB-5, MW-16, MW-17, and MW-18) were installed in the vicinity of former Tank Farm B (Ref. 31, pp. 3-1, 3-31) from August 1991 through January 1992, during Phase I of the RI (Ref. 31, p. 3-3). The soil samples were analyzed for PP VOA+15, PP BNA, lead, barium, and chromium (Ref. 31, p. 3-31).

Additional soil borings (TB-91 through TB-93) were installed to delineate the extent of subsurface xylene contamination in the area from July 1998 through January 2000, during Phase V of the RI (Ref. 31, pp. 3-3, 3-33). Two samples were collected from each boring and sent for analysis of VOCs (Ref. 31, p. 3-33).

A summary of soil samples collected from Source 4 during two phases of the RI is provided in the tables below. The result for a background soil sample is listed when available to provide a reference concentration for the hazardous substances. Background soil samples were selected based on whether the background and source soil sample were collected within the same depth range and same period of time and whether the samples were analyzed for the same hazardous substances. All soil samples collected from 1990 to 1997 were analyzed by Weston Analytics Division, a New Jersey-certified laboratory. All samples collected from 1998 to 2000 were analyzed by STL, a New Jersey-certified laboratory (Ref. 31, p. 3-37). The analytical results in the tables below are considered usable and of known quality (Ref. 31, p. 3-38). Table 3-1 of Reference 31 provides a summary of the analytical suite for the soil samples. No background soil samples could be identified for the source soil samples collected in 1993 and 1996.

Soil boring samples collected from MW-14 are used as background sampling locations for shallow soil intervals. The deeper soil intervals in MW-14 is contaminated with hazardous substances associated with the free-phase product ground water plume in the area of Buildings 55 and 67 as documented in Section 2.4.1 for Source 1.

Source 4 Soil Sample: 016-B001

Location ID	MW-16	MW-12
Sample Type	Source - Soil	Background - soil
Field Sample ID	016-B001	012-B001
Date Collected	10/18/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-3 (p. 1), and Figure 3-2	31, Table 4-5 (p. 2), p. 3-11, and Figure 3-2
Location	Tank Farm B	S Bldg 55
Volatile Organic Compounds (mg/kg)		
Chloroform	0.02	ND
Toluene	0.013	ND
Trichloroethane	0.006	ND
Trichloroethene	0.069	ND

Source 4 Soil Sample: 017-B001

Location ID	MW-17	MW-14
Sample Type	Source - Soil	Background - Soil
Field Sample ID	017-B001	014-B002
Date Collected	10/18/1991	10/28/1991
Depth (ft bgs)	2.0-4.0	2.0-4.0
Reference	31, Table 4-3 (pp. 1, 5), and Figure 3-2	31, Table 4-5 (pp. 2, 16), and Figure 3-2
Location	S Tank Farm B	N Bldg 67
Volatile Organic Compounds (mg/kg)		
Chloroform	0.046	ND
Toluene	0.013	ND
Trichloroethane	0.017	ND
Trichloroethene	0.17	0.003 J
Xylenes	0.017	ND
Metals (mg/kg)		
Barium	165	9.1
Chromium	21.2	2.2
Lead	634	2.1

Source 4 Soil Sample: 017-B002

Location ID	MW-17	TB-37
Sample Type	Source - Soil	Background - Soil
Field Sample ID	017-B002	007-B002
Date Collected	10/18/1991	10/29/1991
Depth (ft bgs)	4.0-6.0	3.0-6.0
Reference	31, Table 4-3 (p. 1), and Figure 3-2	31, Table 4-5 (p. 5), and Figure 3-2
Location	S Tank Farm B	S Tank Farm A
Volatile Organic Compounds (mg/kg)		
Chloroform	0.022	ND
Toluene	0.016	ND
Trichloroethane	0.011	ND
Trichloroethene	0.06	ND
Xylenes	0.01	ND

Source 4 Soil Sample: 018-B001

Location ID	MW-18	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	018-B001	012-B001
Date Collected	10/18/1991	10/14/1991
Depth (ft bgs)	0.0-2.0	0.0-2.0
Reference	31, Table 4-3 (p. 1), and Figure 3-2	31, Table 4-5 (p. 2), p. 3-11, and Figure 3-2
Location	S Tank Farm B	S Bldg 55
Volatile Organic Compounds (mg/kg)		
Chloroform	0.035	ND
Toluene	0.011	ND
Trichloroethane	0.013	ND
Trichloroethene	0.13	ND

Source 4 Soil Sample: 018-B002

Location ID	MW-18	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	018-B002	012-B002
Date Collected	10/18/1991	10/14/1991
Depth (ft bgs)	6.0-8.0	6.0-8.0
Reference	31, Table 4-3 (pp. 3, 5), and Figure 3-2	31, Table 4-5 (pp. 9, 15), and Figure 3-2
Location	Tank Farm B	S Bldg 55
Semivolatile Organic Compounds (mg/kg)		
Benzo(b)fluoranthene	0.37	ND
Fluoranthene	0.38	ND
Pyrene	0.41	ND
Metals (mg/kg)		
Barium	379	2
Chromium	39.2	4.7
Lead	660	1.8

Source 4 Soil Sample: 005-B001

Location ID	TB-05	TB-37
Sample Type	Source - Soil	Background - Soil
Field Sample ID	005-B001	007-B002
Date Collected	10/18/1991	10/29/1991
Depth (ft bgs)	4.0-6.0	3.0-6.0
Reference	31, Table 4-3 (p. 1), and Figure 3-2	31, Table 4-5 (p. 5), and Figure 3-2
Location	Tank Farm B	S Tank Farm A
Volatile Organic Compounds (mg/kg)		
Chloroform	0.024	ND
Ethylbenzene	0.01	ND
Toluene	0.024	ND
Trichloroethane	0.009	ND
Trichloroethene	0.082	ND
Xylenes	0.092	ND

Source 4 Soil Sample: 005-B002

Location ID	TB-05	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	005-B002	012-B002
Date Collected	10/18/1991	10/14/1991
Depth (ft bgs)	6.0-8.0	6.0-8.0
Reference	31, Table 4-3 (p. 1), and Figure 3-2	31, Table 4-5 (p. 2), and Figure 3-2
Location	Tank Farm B	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
Chloroform	0.01	ND
Toluene	0.025	ND
Trichloroethane	0.003 J	ND
Trichloroethene	0.035	ND

Source 4 Soil Sample: 005-B102

Location ID	TB-05	MW-12
Sample Type	Source - Soil	Background - Soil
Field Sample ID	005-B102	012-B002
Date Collected	10/18/1991	10/14/1991
Depth (ft bgs)	6.0-8.0	6.0-8.0
Reference	31, Table 4-3 (p. 1), and Figure 3-2	31, Table 4-5 (p. 1), and Figure 3-2
Location	Tank Farm B	NW Tank Farm A
Volatile Organic Compounds (mg/kg)		
2-Butanone	0.027	ND
Chloroform	0.018	ND
Ethylbenzene	0.037	ND
Toluene	0.027	ND
Trichloroethane	ND	ND
Trichloroethene	0.06	ND
Xylenes	0.46	ND

Source 4 Soil Sample: 032-B001

Location ID	TB-32	SGW-278
Sample Type	Source - Soil	Background - Soil
Field Sample ID	032-B001	278-B001
Date Collected	7/8/1993	7/8/1993
Depth (ft bgs)	4.5-5.0	4.5-5.2
Reference	31, Table 4-3 (pp. 2, 5, 7), and Figure 3-2	31, Table 4-3 (pp. 1, 5, 7) and Figure 3-2
Location	Tank Farm B	NW Tank Farm B
Volatile Organic Compounds (mg/kg)		
Acetone	0.07	ND
Metals (mg/kg)		
Arsenic	9.7	1.2
Chromium	68.9	10.1
Cobalt	1.6	ND
Lead	859	ND
Magnesium	284	77
Mercury	0.59	ND
Zinc	611	2.6
Cyanide	2.8	NA

Notes:

Bldg	Building	NA	Not analyzed
ft bgs	Feet below ground surface	ND	Not detected
ID	Identification	NW	Northwest
mg/kg	Milligram per kilogram	S	South
MW	Monitoring well	TB	Test boring
N	North		

No soil samples were collected in 1996 and 1999 that could be used as background for the 1996 and 1999 soil source samples listed in the tables below. No background concentration is provided. Therefore, only concentrations of hazardous substances that are not naturally occurring and associated with operations at the Lucas plant are listed in the tables below and used to characterize Source 4.

Source 4 Soil Sample: TB-67-01

Location ID	TB-67
Sample Type	Source - Soil
Field Sample ID	TB-67-01
Date Collected	10/1/1996
Depth (ft bgs)	1.5-2.0
Reference	31, Table 4-3 (pp. 2, 6), and Figure 3-2
Location	Tank Farm B
Volatile Organic Compounds (mg/kg)	
Ethylbenzene	19
Toluene	63
Xylenes	370
Metals (mg/kg)	
Lead	1,070

Source 4 Soil Sample: TB-69-01

Location ID	TB-69
Sample Type	Source - Soil
Field Sample ID	TB-69-01
Date Collected	10/1/1996
Depth (ft bgs)	1.5-2.0
Reference	31, Table 4-3 (p. 4), and Figure 3-2
Location	Tank Farm B
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)anthracene	0.46
Benzo(a)pyrene	0.45
Benzo(b)fluoranthene	0.44
Benzo(k)fluoranthene	0.39
Chrysene	0.49
Di-n-butyl Phthalate	0.82
Fluoranthene	0.85
Phenanthrene	0.64
Pyrene	0.86

Source 4 Soil Sample: TB-69-5.5

Location ID	TB-69
Sample Type	Source - Soil
Field Sample ID	TB-69-5.5
Date Collected	10/1/1996
Depth (ft bgs)	4.0-4.5
Reference	31, Table 4-3 (p. 6), and Figure 3-2
Location	Tank Farm B
Metals (mg/kg)	
Lead	398

Source 4 Soil Sample: TB-91A

Location ID	TB91
Sample Type	Source - Soil
Field Sample ID	TB-91A
Date Collected	2/5/1999
Depth (ft bgs)	3.5-4.0
Reference	31, Table 4-3 (p. 2), and Figure 3-2
Location	Tank Farm B
Volatile Organic Compounds (mg/kg)	
2-Butanone	0.46
Acetone	0.34
Ethylbenzene	0.13
Toluene	0.71
Xylenes	0.80

Source 4 Soil Sample: TB-91B

Location ID	TB91
Sample Type	Source - Soil
Field Sample ID	TB-91B
Date Collected	2/5/1999
Depth (ft bgs)	4.8-5.0
Reference	31, Table 4-3 (p. 2), and Figure 3-2
Location	Tank Farm B
Volatile Organic Compounds (mg/kg)	
2-Butanone	0.14
2-Hexanone	0.069
Acetone	0.14
Ethylbenzene	1.2
Toluene	1.9
Xylenes	5.8

Source 4 Soil Sample: TB-92A

Location ID	TB-92
Sample Type	Source - Soil
Field Sample ID	TB-92A
Date Collected	2/5/1999
Depth (ft bgs)	3.5-4.0
Reference	31, Table 4-3 (p. 2), and Figure 3-2
Location	Tank Farm B
Volatile Organic Compounds (mg/kg)	
2-Butanone	0.19
Acetone	0.14
Xylenes	0.59

Source 4 Soil Sample: TB-92B

Location ID	TB-92
Sample Type	Source - Soil
Field Sample ID	TB-92B
Date Collected	2/5/1999
Depth (ft bgs)	5.0-5.5
Reference	31, Table 4-3, (p. 2) and Figure 3-2
Location	Tank Farm B
Volatile Organic Compounds (mg/kg)	
2-Butanone	0.14
Acetone	0.12
Toluene	0.12
Xylenes	0.18

Source 4 Soil Sample: TB-93A

Location ID	TB-93
Sample Type	Source - Soil
Field Sample ID	TB-93A
Date Collected	2/5/1999
Depth (ft bgs)	1.5-2.0
Reference	31, Table 4-3 (p. 2), and Figure 3-2
Location	Tank Farm B
Volatile Organic Compounds (mg/kg)	
2-Butanone	0.13
Acetone	0.11

Source 4 Soil Sample: TB-93B

Location ID	TB-93
Sample Type	Source - Soil
Field Sample ID	TB-93B
Date Collected	2/5/1999
Depth (ft bgs)	4.5-5.0
Reference	31, Table 4-3 (p. 2), and Figure 3-2
Location	Tank Farm B
Volatile Organic Compounds (mg/kg)	
2-Butanone	0.19
Acetone	0.21

Notes:
ft bgs Feet below ground surface
ID Identification
mg/kg Milligram per kilogram
TB Test boring

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous constituent quantity for Source No. 4.

Sum (pounds): Unknown
Hazardous Constituent Quantity Value (C): Not available (NA)

2.4.2.1.2 Hazardous Waste Stream Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous waste stream quantity for Source No. 4.

Sum (pounds): Unknown
Hazardous Waste Stream Quantity Value: NA

2.4.2.1.3 Volume

The information available is not sufficient to adequately support the determination of the volume hazardous waste quantity value for Source No. 4.

Dimension of source (yd³ or gallons): 0
Volume Assigned Value: 0

2.4.2.1.4 Area

The information available is not sufficient to adequately support the determination of the area hazardous waste quantity value for Source No. 4. However, the area hazardous waste quantity is considered to be greater than zero, but unknown because contaminated soil remains in Source 4 as documented in Section 2.4.1.

Area of Source (ft²): Unknown, > 0
Area Assigned Value: Unknown, > 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source HWQ value for Source No. 4 is assigned a value of greater than zero because the waste quantity associated with Source 4 has not been adequately documented; however, the presence of contaminated soil has been documented.

Source Hazardous Waste Quantity Value: Unknown, but greater than zero

SUMMARY OF SOURCE EVALUATED

SHERWIN-WILLIAMS/HILLIARDS CREEK

Source No.	Source Hazardous Waste Quantity Value	Ground Water	Surface Water	Air Gas	Air Particulate
1	>0	10	10	Not scored	Not scored
2	>0	10	10	Not scored	Not scored
3	>0	10	10	Not scored	Not scored
4	>0	10	10	Not scored	Not scored

Total Source Hazardous Waste Quantity Value: >0

Site Hazardous Waste Quantity Factor Value: 100 (Level II Wetland)

(Ref. 1 [Table 2-6], Section 2.4.2.2)

Other Sources:

Numerous structures are shown on a 1964 insurance map that are potential areas of contaminated soil, including (1) the soil underlying the empty and dirty drum storage area on the southern portion of the Lucas plant, east of Hilliards Creek; (2) the soil underlying a solvent railroad and truck tanker unloading station in the southern section of the Lucas plant, on the east side of Hilliards Creek, and west of the empty and dirty drum storage area, and north of current Building 67; (3) soil underlying Building 67 (formerly Building 36) used to store unknown materials, located on the southern portion of the facility, east of Hilliards Creek; (4) soil underlying the former location of a sewage treatment plant; (5) soil underlying piping associated with the Building 67 that runs from east to west across the facility and extends from Building 67 and crosses under Foster Avenue to the north and eastern portions of the former Lucas plant; (5) soil underlying former Building 56, where drums of finished stock were stored; (6) soil underlying Building 57 used to store pigments, located on the northwest portion of the former Lucas plant, on the east side of Gibbsboro-Clementon Road; (7) soil underlying the 22,000-gallon fuel oil tank, former coal storage bin, latex storage tanks, and drum storage area formerly located on the north side of Foster Avenue in the areas of former Buildings 37 and 52; (8) soil underlying Building 52, used for mixing lacquers, and Building 53, used for storing laquer and filling cans with solvent; (9) soil underlying the former railroad that ran from Foster Avenue, north to numerous locations on the former Lucas plant; (10) soil underlying former Building 39 where paint products were stored and mixed; (11) soil underlying Buildings 7-1, 7-2, 29, and 58, which were used to store cans of paint and finished stock (Refs. 4; 5; 60, pp. 66, 67, 68, 96). Sampling investigations of many of these potential source areas have not been conducted.

Aerial photographs from 1961 show two open storage areas in the northeastern corner of the Lucas plant (Ref. 7, p. 8). This area is referred to as the vacant lot in RI documents.

The 1984 aerial photographs show drums stacked around buildings in the northern portion of the Lucas plant and open storage areas in the north and central portions of the plant (Ref. 7, p. 13).

Lacquer storage tanks were located at an unidentified location on the Lucas plant, and the soil underlying the tanks may be contaminated (Ref. 13, p. 7).

Septic systems located on the plant are also potential sources of soil contamination (Ref. 31, pp. 3-17, 4-28, 4-29, 4-30, Table 4-21, Figure 3-2).

Surface runoff from the northern section of the former Lucas plant flowed to Silver Lake. The bottom sediments of Silver Lake were periodically excavated to maintain the volume of water in the lake for water power and purity. The sediments were removed from the plant area and spread on nearby fields (Ref. 60, pp. 56, 57). Since potential areas of soil contamination were located on the northern section of the plant, as evidenced by historical maps, the sediments in Silver Lake may have been contaminated and may have contaminated nearby fields (Refs. 4; 5).

Gasoline Station

A gasoline station is located on the northeastern section of the former Lucas plant. Free-phase product was observed in the area of the former gasoline station. Analytical results for a product sample indicated benzene, ethylbenzene, xylene, naphthalene, and 2-methyl naphthalene (Ref. 31, pp. ES-6, 3-30).

Twelve soil samples (TB-39 through TB-48, TB-52, and TB-53) were collected from the area of the former gasoline station from July 1995 through August 1995, during Phase III of the RI for the Lucas plant (Ref. 31, pp. 3-3, 3-18). The soil samples were collected within the vadose zone and were biased toward intervals that exhibited elevated field screening results (Ref. 31, p. 3-18). Analytical for soil samples collected during the RI did not identify a significant area of soil contamination in the area of the gasoline station; however, ground water contamination in the area was identified (Ref. 31, Table 4-11, Figure 3-2).

Test pits were excavated on the gasoline station property to identify the USTs and the waste oil pit reportedly located on the property on July 11 and 12, 1995, during Phase III of the RI for the Lucas plant. Two steel USTs were located and uncovered. The tanks were observed to be corroded, and holes were visible in the tanks. The waste oil pit was not uncovered during the excavation (Ref. 31, p. 3-21).

The plume identified in the area of gas station was determined to be limited to a small area on the northwest side of the former gas station building and to be separate from the plumes identified in the areas of Buildings 50 and 67 and former Tank Farm A (Ref. 31, Figures 4-11 and 4-12).

Lead-Contaminated Soil Surrounding Hilliards Creek

Soil samples were collected from 16 transects set across Hilliards Creek between Clementon-Gibbsboro Road and Hilliard Road (T1 through T15 and T17) (Ref. 51, pp. 5, 8) between December 1999 and

January 2000. As shown on Reference 97, Hilliards Creek is located downgradient of the former Lucas plant and received surface water runoff from the plant during and before its operation (see Reference 6, Figure 2-4 and Reference 31, Figure 3-2) (Ref. 31, pp. 2-9, 2-17). The soil samples were collected to evaluate whether periodic flooding transported contaminated sediments from Hilliards Creek to the flood plain of Hilliards Creek. A soil sample was collected from the north and south banks of Hilliards Creek at each transect location. The transects were spaced 200 feet apart. Soil samples were collected at 30-foot intervals along each transect. The soil samples collected from the banks of Hilliards Creek were collected from within the 100-year flood plain. Additional soil samples were collected as needed to complete the horizontal and vertical delineation of lead contamination, and four soil boring samples were collected from the southern berm of the manmade pond located off Gibbsboro-Clementon Road (Ref. 51, pp. 5, 8).

All samples were analyzed for lead (Ref. 51, p. 5). Approximately 25 percent of all samples were analyzed for TAL metals plus cyanide, 5 percent for TCLP metals (including copper and zinc), 5 percent for TCLP VOCs and BNA analyses (Ref. 51, p. 6). All samples were collected in accordance with the November 1999 work plan for the Hilliard's Creek Site, Gibbsboro, New Jersey, and the December 1999 work plan addendum (Refs. 51, p. 4; 68; 69). The results from the analysis of the soil samples were validated according to Region II Contract Laboratory Program (CLP) data validation protocols (Ref. 51, p. 20). The analytical laboratory used CLP statement of work (SOW) ILM04.0 for the analysis of lead and TAL metals (Ref. 68, Table 2).

No background soil sample was collected. However, a transect (T17) was placed across Nicholson Branch, a tributary of Hilliards Creek. The transect was used to collect surface and subsurface soil from the two banks of Nicholson Branch (Ref. 51, pp. 5, 8, and Figure 4). The samples collected from transect 17 are used to establish background levels for lead in soil located within the Hilliards Creek flood plain. Analytical results for soil samples indicating concentrations of lead above three times the background concentration are provided in the Tables 3 and 4. The background soil samples were analyzed for lead only. Therefore, lead is the only metal evaluated. As documented in Tables 3 and 4, analytical results for soil samples collected from the banks or flood plains of Hilliards Creek indicated the presence of lead-contaminated soil.

TABLE 3

**SURFACE SOIL SAMPLES COLLECTED FROM THE FLOOD PLAIN
OF HILLIARDS CREEK (0 to 0.5 ft bgs)**

Location ID	T17E	T17W	T01N	T01N15	T01S	T02N	T02N15	T02N30	T02S
Field Sample ID	SS-T17E-0.0-0.5	SS-T17W-0.0-0.5	SS-T01N-0.0-0.5	SS-T01N15-0.0-0.5	SS-T01S-0.0-0.5	SS-T02N-0.0-0.5	SS-T02N15-0.0-0.5	SS-T02N30-0.0-0.5	SS-T02S-0.0-0.5
Date Collected	12/13/1999	12/13/1999	12/3/1999	12/28/1999	12/3/1999	12/3/1999	12/28/1999	12/28/1999	12/3/1999
Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Sample Type	Background	Background	Source	Source	Source	Source	Source	Source	Source
Reference	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 4, Figure 4	51, Table 4-c, p. 4, Figure 4	51, Table 4-c, p. 4, Figure 4	51, Table 4-c, p. 5, Figure 4	51, Table 4-c, p. 5, Figure 4	51, Table 4-c, p. 5, Figure 4	51, Table 4-c, p. 5, Figure 4
Metals (mg/kg)									
Lead	124	49.8	524	420	1,030	1,490	1,070	733	1,370

Notes:

bgs Below ground surface
 E East
 ft Foot
 ID Identification
 mg/kg Milligram per kilogram
 N North
 T Transect
 S South
 SS Surface soil
 W West

TABLE 3 (Continued)

**SURFACE SOIL SAMPLES COLLECTED FROM THE FLOOD PLAIN
OF HILLIARDS CREEK (0 to 0.5 ft bgs)**

Location ID	T17E	T17W	T02S15	T02S30	T06N	T06S	T07N	T07S	T08N
Field Sample ID	SS-T17E-0.0-005	SS-T17W-0.0-005	SS-T02S15-0.0-0.5	SS-T02S30-0.0-0.5	SS-T06N-0.0-0.5	SS-T06S-0.0-0.5	SS-T07N-0.0-0.5	SS-T07S-0.0-0.5	SS-T08N-0.0-0.5
Date Collected	12/13/1999	12/13/1999	12/3/1999	12/3/1999	12/8/1999	12/8/1999	12/8/1999	12/8/1999	12/8/1999
Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Sample Type	Background	Background	Source	Source	Source	Source	Source	Source	Source
Reference	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 5, Figure 4	51, Table 4-c, p. 6, Figure 4	51, Table 4-c, p. 8, Figure 4	51, Table 4-c, p. 8, Figure 4	51, Table 4-c, p. 8, Figure 4	51, Table 4-c, p. 8, Figure 4	51, Table 4-c, p. 8, Figure 4
Metals (mg/kg)									
Lead	124	49.8	718	460	4,660	3,460	2,330	2,020	2,810

Notes:

- bgs Below ground surface
- E East
- ft Foot
- ID Identification
- mg/kg Milligram per kilogram
- N North
- T Transect
- S South
- SS Surface soil
- W West

TABLE 3 (Continued)

**SURFACE SOIL SAMPLES COLLECTED FROM THE FLOOD PLAIN
OF HILLIARDS CREEK (0.0 to 0.5 ft bgs)**

Location ID	T17E	T17W	T08S	T09S	T11S	T13S	T14S
Field Sample ID	SS-T17E-0.0-005	SS-T17W-0.0-005	SS-T08S-0.0-0.5	SS-T09S-0.0-0.5	SS-T11S-0.0-0.5	SS-T13S-0.0-0.5	SS-T14S-0.0-0.5
Date Collected	12/13/1999	12/13/1999	12/8/1999	12/10/1999	12/10/1999	12/10/1999	12/10/1999
Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Sample Type	Background	Background	Source	Source	Source	Source	Source
Reference	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 8, Figure 4	51, Table 4-c, p. 10, Figure 4	51, Table 4-c, p. 11, Figure 4	51, Table 4-c, p. 12, Figure 4	51, Table 4-c, p. 13, Figure 4
Metals (mg/kg)							
Lead	124	49.8	7,530	1,660	409	508	513

Notes:

bgs Below ground surface
E East
ft Foot
ID Identification
mg/kg Milligram per kilogram
N North
T Transect
S South
SS Surface soil
W West

TABLE 4

**SUBSURFACE SOIL SAMPLES COLLECTED FROM THE FLOOD PLAIN
OF HILLIARDS CREEK (1.5 to 2.0 ft bgs)**

Location ID	T17E	T01N	T01S	T01S15	T02N	T02N15	T02N30	T02S	T02S15	T02S30
Field Sample ID	SS-T17E-1.5-2.0	SS-T01N-1.5-2.0	SS-T01S-1.5-2.0	SS-T01S15--1.5-2.0	SS-T02N-1.5-2.0	SS-T02N15-1.5-2.0	SS-T02N30-1.5-2.0	SS-T02S-1.5-2.0	SS-T02S15-1.5-2.0	SS-T02S30-1.5-2.0
Date Collected	12/13/1999	12/3/1999	12/3/1999	12/28/1999	12/3/1999	12/28/1999	12/28/1999	12/3/1999	12/3/1999	12/3/1999
Depth (ft bgs)	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0
Sample Type	Background	Source	Source	Source	Source	Source	Source	Source	Source	Source
Reference	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 4, Figure 4	51, Table 4-c, p. 4, Figure 4	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 5, Figure 4	51, Table 4-c, p. 5, Figure 4	51, Table 4-c, p. 5, Figure 4	51, Table 4-c, p. 5, Figure 4	51, Table 4-c, p. 6, Figure 4	51, Table 4-c, p. 6, Figure 4
Metals (mg/kg)										
Lead	6	5,720	898	184	5,290	4,430	121	1,080	24,300	916

Notes:

- bgs Below ground surface
- E East
- ft Foot
- ID Identification
- mg/kg Milligram per kilogram
- N North
- T Transect
- S South
- SS Surface soil
- W West

TABLE 4 (Continued)

**SUBSURFACE SOIL SAMPLES COLLECTED FROM THE FLOOD PLAIN
OF HILLIARDS CREEK (1.5 to 2.0 ft bgs)**

Location ID	T17E	T04S	T06N	T06S	T07N	T07S	T08N	T08S	T11N	T12N
Field Sample ID	SS-T17E-1.5-2.0	SS-T04S-1.5-2.0	SS-T06N-1.5-2.0	SS-T06S-1.5-2.0	SS-T07N-1.5-2.0	SS-T07S-1.5-2.0	SS-T08N-1.5-2.0	SS-T08S-1.5-2.0	SS-T11N-1.5-2.0	SS-T12N-0.0-0.5
Date Collected	12/13/1999	12/3/1999	12/8/1999	12/8/1999	12/8/1999	12/8/1999	12/8/1999	12/8/1999	12/10/1999	12/10/1999
Source Type	Background	Source	Source	Source	Source	Source	Source	Source	Source	Source
Depth (ft bgs)	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0
Reference	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 7, Figure 4	51, Table 4-c, p. 8, Figure 4	51, Table 4-c, p. 8, Figure 4	51, Table 4-c, p. 8, Figure 4	51, Table 4-c, p. 9, Figure 4	51, Table 4-c, p. 9, Figure 4	51, Table 4-c, p. 9, Figure 4	51, Table 4-c, p. 11, Figure 4	51, Table 4-c, p. 12, Figure 4
Metals (mg/kg)										
Lead	6	220	108	56	3,140	3,820	589	16,300	593	2,950

Notes:

- bgs Below ground surface
- E East
- ft Foot
- ID Identification
- mg/kg Milligram per kilogram
- N North
- T Transect
- S South
- SS Surface soil
- W West

TABLE 4 (Continued)

**SUBSURFACE SOIL SAMPLES COLLECTED FROM THE FLOOD PLAIN
OF HILLIARDS CREEK (1.5 to 2.0 ft bgs)**

Location ID	T17E	T12N	T13N	T13N15	T13S	T14N	T14N15	T14N30	T14S
Field Sample ID	SS-T17E-1.5-2.0	SS-T12N-0.0-0.5	SS-T13N-1.5-2.0	SS-T13N15-1.5-2.0	SS-T13S-1.5-2.0	SS-T14N-1.5-2.0	SS-T14N15-1.5-2.0	SS-T14N30-1.5-2.0	SS-T14S-1.5-2.0
Date Collected	12/13/1999	12/10/1999	12/9/1999	12/28/1999	12/10/1999	12/9/1999	12/28/1999	12/28/1999	12/10/1999
Depth (ft bgs)	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0
Source Type	Background	Source	Source	Source	Source	Source	Source	Source	Source
Reference	51, Table 4-c, p. 14, Figure 4	51, Table 4-c, p. 12, Figure 4	51, Table 4-c, p. 12, Figure 4	51, Table 4-c, p. 12, Figure 4	51, Table 4-c, p. 13, Figure 4	51, Table 4-c, p. 13, Figure 4	51, Table 4-c, p. 13, Figure 4	51, Table 4-c, p. 13, Figure 4	51, Table 4-c, p. 13, Figure 4
Metals (mg/kg)									
Lead	6	2,950	4,330	604	61	562	144	1,330	61

Notes:

- bgs Below ground surface
- E East
- ft Foot
- ID Identification
- mg/kg Milligram per kilogram
- N North
- T Transect
- S South
- SS Surface soil
- W West

Lead-Contaminated Soil at 165 Kirkwood Road

Analytical results for soil samples collected as part of the ACO indicated the presence of lead in surface and subsurface (1 to 6.5 feet bgs) soil on a residential property at 165 Kirkwood Road (Refs. 50, p. 1-2; 51, Appendix A). In April 2000, composite samples were collected from 165 Kirkwood Road and analyzed for TCLP metals, VOCs, and SVOCs (Refs. 30, p. 1; 51, Table 1, pp. 24, 25, Appendix A). The leachate from the samples contained arsenic (up to 1,190 µg/L), barium (up to 1,740 µg/L), cadmium (up to 42.3 µg/L), chromium (up to 59.1 µg/L), and lead (up to 53,000 µg/L) (Ref. 30, pp. 16, 18, 20, 22, 24, 26, 28, 30, 99, 101, 103, 105, 107, 119, 121, 123, 125, 127, 135, 137 through 149, 181, 182, 183, 185, 186, 188, 190, 191, 192, 194, 195, 196). No VOCs or SVOCs were detected in the samples. Analytical results for soil samples indicated high concentrations of lead in surface and subsurface soil (1.0 to 6.5 feet bgs) (Ref. 51, Table 4 and Appendix A).

Also in April 2000, soil samples were collected from 165 Kirkwood Road to complete the delineation of lead-contaminated soil (Ref. 51, p. 6). The property was divided into grids representing no more than 20 cubic yards each. Four borings were completed in each of these grids and samples were collected at intervals of 0 to 6 inches, 12 to 18 inches, and 24 to 30 inches. The four samples from each interval were composited on an equal-weight basis and analyzed for total lead. In total, 413 soil samples were collected during the April 2000 sampling event. The results of the April 2000 investigation indicated that lead was present at 165 Kirkwood Road at levels ranging from non-detect to 38,800 mg/kg (Ref. 51, p. 7 and Table 4). The address 165 Kirkwood Road is located on the flood plain of Hilliards Creek (Ref. 51, Table 4-b). Hilliards Creek bisects the backyard the property (Ref. 50, p. 1-2). Lead-contaminated soil at this location may be caused by releases from the Lucas plant to Hilliards Creek and the subsequent flooding of 165 Kirkwood Road by Hilliards Creek.

In September and November 2001, surface and subsurface soil samples were collected at 165 Kirkwood Road to complete delineation of lead contamination identified during earlier sampling events. Soil borings were drilled up to 10 feet bgs. Subsurface soil samples were collected at 1-foot intervals ranging from 0 to 10 feet bgs. The uppermost 6 inches of each interval were collected for analysis (Ref. 51, pp. 13, 14, 19, 23). In October 2003, an interim removal action was completed at 165 Kirkwood Road: the top 6 inches of soil were excavated from the property and disposed of (Ref. 50, pp. ES-1, 2-3). Lead-contaminated soil may remain on the property (Ref. 51, Table 4 and Appendix A) since only the top 6 inches of soil were removed from the property and results for soil samples below this depth indicated concentrations of lead greater than 400 mg/kg.