HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site: Lake Calumet Cluster

Contact Persons

Site Investigation: Lance Range, IEPA, Office of Site Evaluation, (217) 524-1660

Documentation Record: Lance Range, IEPA, Office of Site Evaluation, (217) 524-1660

Pathways, Components, or Threats Not Scored

The soil exposure route, ground water pathway, ground water to surface water pathway, surface water drinking water threat, surface water human food chain threat, and air pathway were not scored.

There is insufficient documentation to evaluate the threat posed by these pathways at this time.

HRS DOCUMENTATION RECORD

Name of Site: Lake Calumet Cluster

EPA Identification No.: ILD000716852

EPA Region: 5 Date Prepared: August 2005

Street Address of Site: 122nd Street and Stony Island Avenue *

County/State/Zip Code: Cook County, Illinois, 60633

General Location in the State: Northeastern Illinois

Topographic Map: Lake Calumet Quadrangle (Illinois-Indiana)

Latitude: N41^{o}40'46" Longitude: W87^{o}34'08" (Ref. 14 p. 4, Figure 2 and Ref. 16)

Site Reference Point: Approximate center of the source area

Congressional District: 02

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Preliminary Scores

Air Pathway	*Not Scored (NS)*
Ground Water Pathway	*NS*
Soil Exposure Pathway	*NS*
Surface Water Pathway	*60.00*
HRS SITE SCORE	***30.00***

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S		S^2
1.	Ground Water Migration Pathway Score (S_{gw})	NS		
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	60		3600
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS		
2c.	Surface Water Migration Pathway Score (S_{sw} Enter the larger of lines 2a and 2b as the pathway score.	60		3600
3.	Soil Exposure Pathway Score (S_s (from Table 5-1, line 22)	NS		
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS		
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	3600		3600
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root		30.00	

TABLE 4-1
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

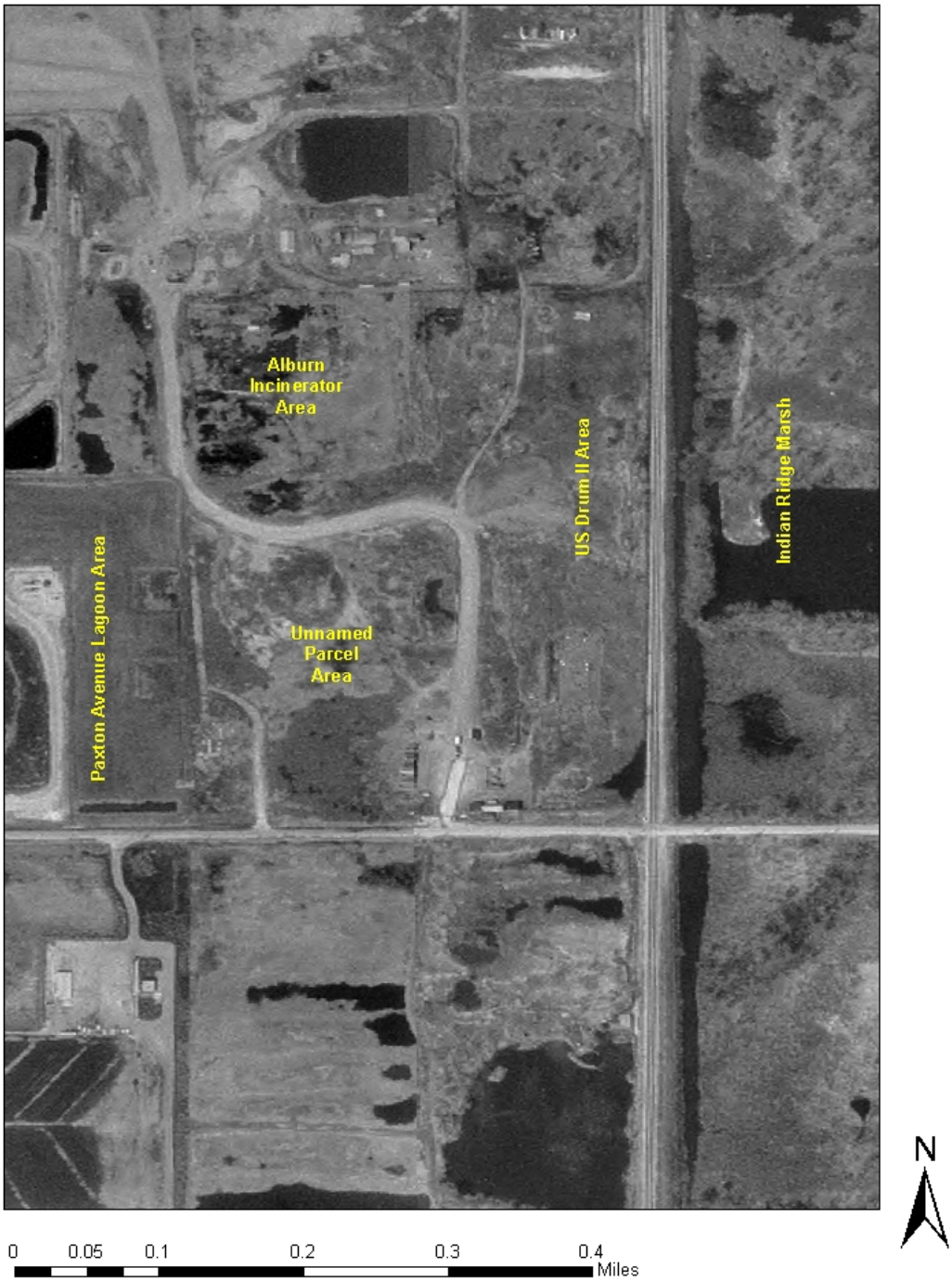
Factor Categories and Factors	Maximum Value	Value Assigned
DRINKING WATER THREAT		
Likelihood of Release		
1. Observed Release	550	550
2. Potential to Release by Overland Flow		
2a. Containment	10	
2b. Runoff	25	
2c. Distance to Surface Water	25	
2d. Potential to Release by Overland Flow (lines 2a x (2b + 2c))	500	
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	NS
7. Hazardous Waste Quantity	a	NS
8. Waste Characteristics	100	NS
Targets		
9. Nearest Intake	50	NS
10. Population		
10a. Level I Concentrations	b	NS
10b. Level II Concentrations	b	NS
10c. Potential Contamination	b	NS
10d. Population (lines 10a + 10b + 10c)	b	NS
11. Resources	5	NS

12. Targets (lines 9 + 10d + 11)	b	NS
Factor Categories and Factors	Maximum Value	
DRINKING WATER THREAT (Concluded)		
Drinking Water Threat Score		
13. Drinking Water Threat Score ((lines 5 x 8 x 12)/82,500, subject to a maximum of 100)	100	NS
HUMAN FOOD CHAIN THREAT		
Likelihood of Release		
14. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	a	NS
16. Hazardous Waste Quantity	a	NS
17. Waste Characteristics	1,000	NS
Targets		
18. Food Chain Individual	50	NS
19. Population		
19a. Level I Concentrations	b	NS
19b. Level II Concentrations	b	NS
19c. Potential Human Food Chain Contamination	b	NS
19d. Population (lines 19a + 19b + 19c)	b	NS
20. Targets (lines 18 + 19d)	b	NS
Human Food Chain Threat Score		
21. Human Food Chain Threat Score ((lines 14 x 17 x 20)/82,500, subject to a maximum of 100)	100	NS
Factor Categories and Factors	Maximum Value	Value Assigned
ENVIRONMENTAL THREAT		
Likelihood of Release		
22. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics		
		500,000,000

23.	Ecosystem Toxicity/Persistence/ Bioaccumulation	a	
24.	Hazardous Waste Quantity	a	100
25.	Waste Characteristics	1,000	320
	Targets		
26.	Sensitive Environments		
	26a. Level I Concentrations	b	0
	26b. Level II Concentrations	b	225
	26c. Potential Contamination	b	0
	26d. Sensitive Environments (lines 26a + 26b + 26c)	b	
27.	Targets (value from 26d)	b	
	Environmental Threat Score		
28.	Environmental Threat Score ((lines 22 x 25 x 27)/82,500, subject to a maximum 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 maximum of 100)	100	60
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE			
30.	Component Score (S_{of})[c], (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100	60

[a]Maximum= value applies to waste characteristics category.
[b]Maximum value not applicable.
[c]Do not round to nearest integer.

Area Map


Alburn
Incinerator
Area
Paxton Avenue Lagoon Area
Unnamed
Parcel
Area
US Drum II Area
Indian Ridge Marsh
N
0
0.05
0.1
0.2
0.3
0.4
Miles

REFERENCES

Reference Number	Description of the Reference
1	United States Environmental Protection Agency. Hazard Ranking System; Final Rule. 40 CFR Part 300, Part A, Federal Register, Volume 55, No. 241. December 14, 1990. 135 p.
2	United States Environmental Protection Agency. Superfund Chemical Data Matrix. January 2004. 43 p.
3	Ecology and Environment, Incorporated. Phase II Lake Calumet Cluster Site analytical data. 1999. 662 p.
4	Kay, Robert T., Duwelius, Richard F., Brown, Timothy A., Micke, Frederick A., Witt-Smith, Carol A., United States Geological Survey. Geohydrology, Water Levels and Directions of Flow, and Occurrence of Light-Nonaqueous-Phase Liquids on Ground Water in Northwestern Indiana and the Lake Calumet Area of Northeastern Illinois. Water-Resources Investigations Report 95-4253. De Kalb, Illinois and Indianapolis, Indiana. 1996. 84 p.
5	Roy F. Weston, Incorporated. Final Phase I Ecological Reclamation Study Lake Calumet Cluster Site, Chicago, Illinois. February 1998. 323 p.
6	Roadcap, G.S., Wentzel, M.B., Lin, S.D., Herricks, E.E., Raman, R.K., Hullinger, D.L., Locke, R.L., Illinois State Water Survey. An Assessment of the Hydrology and Water Quality of Indian Ridge Marsh and the Potential Effects of Wetland Rehabilitation on the Diversity of Wetland Plant Communities. January 1999. 140 p.
7	Ecology and Environment, Incorporated. Site Assessment Status Report: Results of Phase I Sampling Activities for Lake Calumet Cluster Site, Chicago, Illinois. March 10, 1999. 90 p.
8	Illinois Environmental Protection Agency. CERCLA Expanded Site Inspection Analytical Results, Interlake Area (ILD000810432). 1999. 536 p.
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11 National Park Service. Proposed Calumet National Heritage Area. Brochure. March 1999. 8 p.

12 Illinois Environmental Protection Agency. CERCLA Expanded Site Inspection, Interlake Area (ILD000810432). 1999. 42 p.

13 Ecology and Environment, Incorporated. Lake Calumet Cluster Site Phase I Analytical Data. 1998. 47 p.

14 United States Environmental Protection Agency. Aerial Photographic Analysis Lake Calumet Cluster Sites. TS-PIC-9905552S. February 1999. 44 p.

15 Illinois Environmental Protection Agency. Arcview Map of the Lake Calumet Cluster Site. 2000. one page.

16 United States Geological Society. Topographic Map for Lake Calumet. 1 page.

17 Illinois Environmental Protection Agency. CERCLA Expanded Site Inspection Analytical Results Volume 1, Alburn Incinerator (ILD000716852). 2002. 990 p.

18 Illinois Environmental Protection Agency. CERCLA Expanded Site Inspection Analytical Results Volume 2, Alburn Incinerator (ILD000716852). 2002. 1191 p.

19 Illinois Environmental Protection Agency. CERCLA Expanded Site Inspection Analytical Results Volume 3, Alburn Incinerator (ILD000716852). 2002. 881 p.

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22 Illinois Environmental Protection Agency. CERCLA Expanded Site Inspection, U.S. Drum II (ILD981961667). 2001. 166 p.

23 John Mathes & Associates, Inc. Summary Report Field Investigation, Paxton Avenue Lagoons, Chicago, Illinois. December 9, 1985. 63 p.

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25 Illinois Environmental Protection Agency. CERCLA Expanded Site Inspection Analytical Results Volume 2, U.S. Drum II (ILD981961667). 2001. 866 p.

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28 Illinois Environmental Protection Agency. CERCLA Brownfield Investigation Analytical Results, Unnamed Parcel (ILN 000 000 039). 2000. 1328 p.

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31 United States Environmental Protection Agency. Using Qualified Data to Document an Observed Release, Office of Solid Waste and Emergency Response, July 1994. 14 p.

32 United States Environmental Protection Agency. Hazard Ranking System Guidance Manual, Office of Solid Waste and Emergency Response, November 1992. 492 p.

33 Analytical Data for Nature and Extent of Contamination at the Lake Calumet Cluster site. October 21, 1998. 630 p.

34 Illinois Department of Natural Resources, to Colonel Mark A. Roncoli, Department of the Army. Correspondence. February 13, 2001. 4 p.

35 Photo taken of Fish caught at Indian Ridge Marsh, Lance Range, Illinois Environmental Protection Agency, 2003. 1 page.

36 Title 17: Conservation, Chapter 1: Department of Natural Resources, Subchapter b: Fish and Wildlife, Part 810: Sport Fishing Regulations for the Waters of Illinois. March 1, 2004. 74 p. http://dnr.state.il.us/Legal/810.htm 5/19/2004.

37 Cravens, S.J., and Zahn, A.L., 1990, Ground-water quality investigation and monitoring program design for the Lake Calumet area of southeast Chicago: Illinois Hazardous Waste Research and Information Center SWS Contract Report 496, 114 p.

38 Illinois Environmental Protection Agency. Analytical Sample Results from the Addendum to the Expanded Site Inspection of the Lake Calumet Cluster Site. January 26, 2005. 1020 p.

39 Illinois Environmental Protection Agency. Addendum to the Expanded Site Inspection of the Lake Calumet Cluster Site. January 26, 2005. 74 p.

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41 U.S. Geological Survey Water-Resources Investigations Report 94-4002: *Nationwide summary of U.S. Geological Survey regional regression equations for estimating magnitude and frequency of floods for ungaged sites,* Figure 2, The 2-year 24-hour precipitation in Illinois. 1993, 1 page.

42 Range, Lance. Illinois Environmental Protection Agency. Memo to Bureau of Land File and Wetland Area Map, March 10, 2005, 2 p.

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of the source: 1

Name: Lake Calumet Cluster

HRS Source Type: Other

Description and Location of the source:

The Lake Calumet Cluster (Cluster) is located within the Calumet Region of Southeast Chicago. It is comprised of a group of contiguous areas previously utilized as a former incinerator, drum storage facility, an undocumented waste disposal area, and a hazardous waste lagoon which were constructed on top of a 87 acre landfill (Ref. 7, p. 1, Ref. 16, Ref. 30, Attachment H, Map of the Lake Calumet Cluster Sites). These properties are located in the middle of an ecological rich area (Ref. 11 (Important Natural Areas Map)) and have been previously investigated individually under the Superfund program (Ref. 21, 22, 27). Time critical removal actions have previously been undertaken on some of these properties by both the United States Environmental Protection Agency (U.S. EPA) and Illinois Environmental Protection Agency (Illinois EPA). However, significant surface and subsurface contamination remains within these areas, and continues to pose a threat to public health and the environment (Ref. 21, 22, 23).

The contaminants discovered in the areas are similar in nature, have commingled, and cannot be correlated to one specific operation that occurred at the Cluster. Since contaminants were allowed to leak and or have been buried in various areas of the Cluster, it is difficult to ascertain if the contaminants in the landfill were present before any operations began at the Cluster. U.S. EPA and Illinois EPA have previously undertaken time critical removal actions on some of these areas. However, significant surface and subsurface contamination remains within these areas, and continues to pose a threat to public health and the environment ((Ref. 21, Table 2), (Ref. 22, Table 2), (Ref. 27, Table 2), (Ref. 39, Tables 2, 4, 6)). Some clay capping has been completed at the source, but documentation of the areas and boundaries that are capped with clay cannot be determined at this time.

A variety of operations occurred at the Lake Calumet Cluster (Ref. 30 (p. 2-1 through 2-2)). The contaminants discovered at the property are similar in nature, have commingled, and cannot be correlated to one specific operation that occurred at the Cluster ((Ref. 21, Table 2), (Ref. 22, Table 2), (Ref. 27, Table 2), (Ref. 39, Tables 2, 4, 6)); therefore, they are considered to be part of a single, overall source. Photo documentation during the ESIs established the municipal, industrial and chemical waste that was deposited in the landfill (Ref. 21, Table 2, Ref. 22, Table 2, Ref. 27, Tables 1 and 2, and Appendix B).

The Cluster forms a rectangular peninsula of land of approximately 87 acres in an area in which Lake Calumet is located to the west and the Calumet River to the south and west

(Ref. 16, (Ref. 30, Attachment H, Map of the Lake Calumet Cluster Sites)). Nearby land-uses consist of a combination of commercial, residential, industrial and open spaces (Ref. 6, p. 1). Scattered tracts of natural areas also exist near the Cluster (Ref. 6, p. 7). These areas serve as the home to a variety of birds, mammals, and native vegetation (Ref. 10, p. 1).

It should be noted that water levels in most of the Calumet aquifer near the surface water bodies rise and fall within moments of changes in river or lake stage (Ref. 4, p. 29, Lee Watson, U.S. Geological Survey, oral communication, 1992). Due to these changes, ground water may seep up through contamination to be releasing contaminants to surface water bodies. "Ground-water inflow into Indian Ridge Marsh was directly observed on January 19, 1999, when the water in the pools was frozen. The discharge of warmer ground water in small areas along the bank either free of ice or covered by a much thinner layer of ice than on the rest of the pool. The main area of ground-water inflow was along the middle third of the western boundary of the north pool. Large individual springs were not observed, probably because the underlying sand and/or the ballast under the railroad tracks diffuses any macropore flow. A small spring also was observed in the northeast corner of the north pool" (Ref. 6, p. 11).

Numerous contaminants have been discovered in the waste and soil sampled at the surface and below the water table within the Lake Calumet Cluster. The landfill at the Lake Calumet Cluster contains numerous hazardous substances including inorganics, volatile organic chemicals (VOCs), semi-volatile organic chemicals (SVOCs), polychlorinated biphenyls (PCBs) and pesticides ((Ref. 21, Tables 2-5), (Ref. 22, Table 2), (Ref. 27, Table 2), (Ref. 39, Tables 2, 4, 6)). Ground water contamination includes numerous inorganics, VOCs and SVOCs (Ref. 29, p. 3, Attachment A). A total of 283 soil samples were collected from the 2000 ESI ((Ref. 21, Table 1), (Ref. 22, Table 1), Ref. 27, Table 1)). These samples were collected from six inches to 30 feet below ground surface, with the majority of the soil samples collected in the three to ten foot range ((Ref. 21, Table 2), (Ref. 22, Table 2), (Ref. 27, Table 2)). There were 24 soil samples collected from the upper two feet of fill material at the Cluster during the Addendum portion to the ESI (Ref. 39, Table 1).

Other possible sources within the Cluster:

Alburn Inc. CERCLIS ID: ILD000716845

The Alburn Inc. property (Alburn) is an approximately 9 acre inactive landfill and hazardous waste incineration and hazardous waste storage/transfer operation located in a highly industrialized area in Chicago, Illinois. To the north of Alburn is the Paxton II landfill, to the west is Land and Lakes Landfill, to the south is the Unnamed Parcel and to the east is U.S. Drum II (Ref. 15). The property is essentially an open field, much of which is covered with ponded water and heavy vegetative growth. Pits and trenches were used to bury waste on the property from 1967 through 1977 (Ref. 30, p. 2-1).

U.S. Drum II Site CERCLIS ID: ILD980679401

The U.S. Drum II property (U.S. Drum) is a 5.6-acre inactive liquid waste transfer station. The property is located in a heavily industrialized area on the southeast side of Chicago. Prior to utilization of the area as a liquid waste transfer station (Ref. 30, p. 2-2), U.S. Drum was part of a larger wetland area (Ref. 24, p. 10). To the south of the property is a wetland area, Indian Ridge Marsh is located to the east, Alburn Incinerator to the west, and ACME Steel to the north (Ref. 15). A removal in 1984 revealed approximately 1,500 buried punctured drums (Ref. 30, p. 2-2). The drums, several hundred cubic yards of soil and 62,000 gallons of standing water were removed from the property (Ref. 30, p. 2).

Unnamed Parcel CERCLIS ID: ILN 000 000 039

The Unnamed Parcel is located directly south of Alburn Incinerator with Paxton Avenue Lagoons to the west and U.S. Drum II to the east (Ref. 15). The property is an unfenced, undeveloped area directly north of the Paxton Landfill entrance gate at 122nd Street and covers about 38 acres (Ref. 27, p. 4).

There is very little historic information about the Unnamed Parcel. Aerial photography suggests that this area was a landfill that operated from the 1950s through the mid-1970s (Ref. 14, p. 12-26). The area of the former landfill is essentially a marshy field (Ref. 27, p. 4). The environmental investigation conducted in the summer of 2000 on the Unnamed Parcel revealed over 200 chemical and inorganic contaminants and Tentatively Identified Compounds (TICs). Some of the notable contaminants are toluene, polychlorinated biphenyls, ethylbenzene, polynuclear aromatics and 1,1,1-trichloroetane (Ref. 27, Table 2).

Paxton Avenue Lagoons CERCLIS ID: ILD 981 960 404

The 13-acre Paxton Avenue Lagoons (Paxton Lagoons) was an illegal dumpsite since the 1950s. The property is bordered by Alburn Incinerator to the north, Land and Lakes to the west, 122nd Street to the south, and Unnamed Parcel to the east (Ref. 15). Two notches are cut into the perimeter fence due to unauthorized access during the removal action at Paxton Avenue Lagoons. During the 2000 ESI of Unnamed Parcel (Ref. 27), three samples were collected from each of the two notches located in the perimeter fence (Ref. 27, Figure 3, Pit 21 and Pit 34), separating Unnamed Parcel and Paxton Avenue Lagoons. These samples showed the presence of volatiles, semi-volatiles, PCBs, and inorganics (Ref. 27, Table 2, samples X146-X148 and X162 – X164). Three intact drums with raw materials were discovered in the northern notch (Ref. 27, Appendix B, p. 14-15).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

- Background Concentrations:

Illinois EPA collected surface soil samples during the 2000 ESIs and the 2004 Addendum to the ESI to document background soil conditions. Background samples were collected from the outer perimeter of the Cluster ((Ref. 27, Figure 4), (Ref. 22, Figure 3 and Table 1), (Ref. 21, Figure 3 and Table 1), (Ref. 12, Figure 5) and (Ref. 39, Figures 2 and 3)). Sample locations were selected due to the lower probability that these areas were affected by past activities in the area. These background samples demonstrated similar properties with other samples collected from the Cluster. These samples were collected from the upper two feet of soil and were of the same general soil description. Local background levels for hazardous substances are difficult to determine because intense industrial and waste disposal activities have been occurring in the area of the Cluster for over a century (Ref. 5, p. 105). Four samples were selected for background concentrations. These samples included X101 (Ref.22, p. 30), X107 (Ref.22, p. 30), X105 (Ref.21, p. 31), and X103 (Ref 39, p. 6). These samples ranged in depth from 4 inches to 3.5 ft below ground surface. Sampling locations can be found on the maps ((Ref. 22, p. 25), (Ref. 21, Figure 3), (Ref. 27, Figure 4), (Ref. 12, p. 29) and (Ref. 39, Figure 2 and 3)).

The background samples were collected from 3 different sampling events of the same area. All samples were collected using the same protocols and were analyzed for the same parameters (target analyte list for semi-volatiles in accordance with the EPA CLP Statement of Work). Samples X101 and X107 were analyzed according to CLP SOW OLM04.2 5/99 (Contract No. 68-W-99-069) (Ref. 24, p. 3, 266, 278) on September 13, 2000. Samples X101 and X107 were analyzed by Clayton Environmental Consultants, Inc., located at 22345 Roethel Drive, Novi, Michigan. Sample X105 was analyzed according to CLP SWO OLM04.2 5/99 (Contract No. 68-W-99-079) on June 27, 2000 (Ref. 18, p. 3, 498). X105 was analyzed by Southwest Labs of Oklahoma, Inc. located at 1700 West Albany, Suite C, Broken Arrow, Oklahoma, 74012. X103 was analyzed according to CLP SOW OLM04.3 (Contract No. 68-W-03-018) (Ref. 38, p. 169, 306). Sample X103 was analyzed by Ceimic Corporation, located at 10 Dean Knauss Drive, Narragansett, Rhode Island. U.S.EPA's Superfund Field Services Section validated the analytical results from the background soil samples.

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Quantitation Limit	Reference
X101	Soil	8/21/00	Pyrene	33 J ug/kg (273.9)	380 ug/kg	24, p. 53, 68, 266
X101	Soil	8/21/00	Benzo(a)anthracene	380 U ug/kg	380 ug/kg	24, p.53, 68, 266
X101	Soil	8/21/00	Benzo(b)fluoranthene	380 U ug/kg	380 ug/kg	24, p. 53, 68, 266
X101	Soil	8/21/00	Benzo(a)pyrene	380 U ug/kg	380 ug/kg	24, p. 53, 68, 266
X101	Soil	8/21/00	Benzo(g,h,i)perylene	37 J ug/kg (370)	380 ug/kg	24, p. 53, 68, 266
X101	Soil	8/21/00	Chrysene	33 J ug/kg (141.9)	380 ug/kg	24, p. 53, 68, 266
X101	Soil	8/21/00	Fluoranthene	380 U ug/kg	380 ug/kg	24, p. 53, 68, 266
X101	Soil	8/21/00	Phenanthrene	100 J ug/kg (1000)	380 ug/kg	24, p. 53, 68, 266
X107	Soil	8/21/00	Pyrene	120 J ug/kg (996)	450 ug/kg	24, p.54, 69, 278
X107	Soil	8/21/00	Benzo(a)anthracene	71 J ug/kg (305.3)	450 ug/kg	24, p.54, 69, 70 278
X107	Soil	8/21/00	Benzo(b)fluoranthene	66 J ug/kg (660)	450 ug/kg	24, p.54, 69, 70, 278
X107	Soil	8/21/00	Benzo(a)pyrene	63 J ug/kg (630)	450 ug/kg	24, p. 54, 69, 70, 278
X107	Soil	8/21/00	Benzo(g,h,i)perylene	73 J ug/kg (730)	450 ug/kg	24, p. 54, 69, 70, 278
X107	Soil	8/21/00	Chrysene	91 J ug/kg (391.3)	450 ug/kg	24, p. 54, 69, 70, 278
X107	Soil	8/21/00	Fluoranthene	150 J ug/kg (1500)	450 ug/kg	24, p. 54, 69, 70, 278
X107	Soil	8/21/00	Phenanthrene	160 J ug/kg (1600)	450 ug/kg	24, p. 54, 69, 70, 278
X105	Soil	6/19/00	Pyrene	170 J ug/kg (1411)	540 ug/kg	18, p.173, 198, 499
X105	Soil	6/19/00	Benzo(a)anthracene	95 J ug/kg (408.5)	540 ug/kg	18, p. 173, 198, 499
X105	Soil	6/19/00	Benzo(b)fluoranthene	160 J ug/kg (1600)	540 ug/kg	18, p.173, 198, 499
X105	Soil	6/19/00	Benzo(a)pyrene	160 J ug/kg (1600)	540 ug/kg	18, p.173, 198, 499
X105	Soil	6/19/00	Benzo(g,h,i)perylene	190 J ug/kg (1900)	540 ug/kg	18, p.173, 198, 499
X105	Soil	6/19/00	Chrysene	110 J ug/kg (473)	540 ug/kg	18, p. 173, 198, 499
X105	Soil	6/19/00	Fluoranthene	160 J ug/kg (1600)	540 ug/kg	18, p.173, 198, 499
X105	Soil	6/19/00	Phenanthrene	110 J ug/kg (1100)	540 ug/kg	18, p. 173, 198, 499
X103	Soil	11/30/04	Pyrene	41 J ug/kg (340.3)	410 ug/kg	38, p.193, 306
X103	Soil	11/30/04	Benzo(a)anthracene	410 U ug/kg	410 ug/kg	38, p. 193, 306
X103	Soil	11/30/04	Benzo(b)fluoranthene	44 J ug/kg (440)	410 ug/kg	38, p. 193, 306
X103	Soil	11/30/04	Benzo(a)pyrene	410 U ug/kg	410 ug/kg	38, p. 193, 306
X103	Soil	11/30/04	Benzo(g,h,i)perylene	410 U ug/kg	410 ug/kg	38, p. 193, 306
X103	Soil	11/30/04	Chrysene	43 J ug/kg (184.9)	410 ug/kg	38, p. 193, 306

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Quantitation Limit	Reference
X103	Soil	11/30/04	Fluoranthene	77 J ug/kg (770)	410 ug/kg	38, p. 193, 306
X103	Soil	11/30/04	Phenanthrene	54 J ug/kg (540)	410 ug/kg	38, p.193, 306

Notes:
Values in parentheses are adjusted values derived from U.S.EPA Using Qualified Data to Document An Observed Release (Ref. 31). Sample concentrations that are labeled with a "J" qualifier are below the CRQL, but above the MDL.

Key
ug/kg micrograms per kilogram
J The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample. "J" values do not have a bias.
U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

- Source Samples:

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Quantitation Limit	Reference
X138	Soil	6/19/00	Pyrene	6800 ug/kg	4900 ug/kg	17, p. 91, 428
X138	Soil	6/19/00	Fluoranthene	5300 ug/kg	4900 ug/kg	17, p. 91, 428
X138	Soil	6/19/00	Phenanthrene	9100 ug/kg	4900 ug/kg	17, p. 91, 428
X165	Soil	6/21/00	Pyrene	170000 ug/kg D	62000 ug/kg	17, p. 567, 895
X165	Soil	6/21/00	Benzo(a)anthracene	64000 ug/kg D	62000 ug/kg	17, p.567, 895
X165	Soil	6/21/00	Chrysene	67000 ug/kg D	62000 ug/kg	17, p. 567, 895
X165	Soil	6/21/00	Fluoranthene	230000 ug/kg D	62000 ug/kg	17, p. 567, 895
X165	Soil	6/21/00	Phenanthrene	360000 ug/kg D	62000 ug/kg	17, p. 567, 895
X182 re	Soil	7/20/00	Fluoranthene	20000 ug/kg	19000 ug/kg	28, p. 1212, 1288
X180dl	Soil	8/24/00	Pyrene	90000 ug/kg D	30000 ug/kg	24, p. 430, 589
X180dl	Soil	8/24/00	Benzo(a)anthracene	34000 ug/kg D	30000 ug/kg	24, p. 430, 589
X180dl	Soil	8/24/00	Benzo(a)pyrene	33000 ug/kg D	30000 ug/kg	24, p. 430, 589
X180	Soil	8/24/00	Benzo(g,h,i)perylene	20000 ug/kg	5100 ug/kg	24, p. 428, 586
X180dl	Soil	8/24/00	Fluoranthene	95000 ug/kg D	30000 ug/kg	24, p. 430, 589
X180dl	Soil	8/24/00	Phenanthrene	150000 ug/kg D	30000 ug/kg	24, p. 430, 589
X196dl	Soil	8/24/00	Fluoranthene	150000 ug/kg D	27000 ug/kg	24, p. 426, 648
X196dl	Soil	8/24/00	Pyrene	150000 ug/kg D	27000 ug/kg	24, p. 426, 648
X196dl	Soil	8/24/00	Benzo(a)anthracene	67000 ug/kg D	27000 ug/kg	24, p. 426, 648
X196dl	Soil	8/24/00	Chrysene	59000 ug/kg D	27000 ug/kg	24, p. 426, 648
X196dl	Soil	8/24/00	Benzo(b)fluoranthene	44000 ug/kg D	27000 ug/kg	24, p. 426, 648
X196dl	Soil	8/24/00	Benzo(a)pyrene	33000 ug/kg D	27000 ug/kg	24, p. 426, 648
X107	Soil	11/30/04	Fluoranthene	5700 ug/kg	900 ug/kg	38, p. 195, 318
X107	Soil	11/30/04	Pyrene	5200 ug/kg	900 ug/kg	38, p. 195, 318
X107	Soil	11/30/04	Benzo(a)anthracene	2700 ug/kg	900 ug/kg	38, p. 195, 318
X113dl	Soil	11/30/04	Phenanthrene	29000 ug/kg D	11000 ug/kg	38, p. 197, 343
X113dl	Soil	11/30/04	Fluoranthene	59000 ug/kg D	11000 ug/kg	38, p. 197, 343
X113dl	Soil	11/30/04	Pyrene	53000 ug/kg D	11000 ug/kg	38, p. 197, 343
X113dl	Soil	11/30/04	Benzo(a)anthracene	28000 ug/kg D	11000 ug/kg	38, p. 197, 343
X113dl	Soil	11/30/04	Benzo(b)fluoranthene	33000 ug/kg D	11000 ug/kg	38, p. 197, 343
X113dl	Soil	11/30/04	Benzo(a)pyrene	25000 ug/kg D	11000 ug/kg	38, p. 197, 343
X113dl	Soil	11/30/04	Benzo(g,h,i)perylene	12000 ug/kg D	11000 ug/kg	38, p. 343

Key
ug/kg micrograms per kilogram
J The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample. "J" values do not have a bias.
U The analyte was analyzed for, but was not detected above the reported sample quantitation limit
D or dl The analyte was diluted. For the analyte that exceeded the calibration range in the original sample analysis; the results of the diluted analysis should be considered the sample's analyte concentration. (Ref. 24, p. 386).

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Containment Description	Containment Factor Value	Ref.
Gas release to air: NS		
Particulate release to air: NS		
Release to ground water: There are no known liners for this landfill. (Ref. 1, p. 51596)	10	5, p. 15
Release via overland migration and/or flood: Runoff from the Lake Calumet Cluster is coming into contact with the contaminated landfill and releasing into Indian Ridge Marsh (Ref. 1, p. 51605; Ref. 6, p. 8; Ref. 39, p. 70-71). The source area has been flooded at a time that a hazardous substance was present in the source, and material containing a hazardous substance was in direct contact with the surface water (Ref. 1, p. 51609).	10	39, p. 60-74

Notes: NS Not Scored

2.4.2. HAZARDOUS WASTE QUANTITY

2.4.2.1.1. Hazardous Constituent Quantity

Description

Hazardous Substance	Constituent Quantity (pounds)	References

Sum (pounds):
Sufficient information is not available to evaluate the hazardous constituent quantity.

Hazardous Constituent Quantity Value (S): NS

2.4.2.1.2. Hazardous Wastestream Quantity

Hazardous Wastestream	Wastestream Quantity (pounds)	References

Sum (pounds):
Sum of Wastestream Quantity/5,000 (Table 2-5):
Sufficient information is not available to evaluate the hazardous wastestream quantity.

Hazardous Wastestream Quantity Value (W): NS

2.4.2.1.3. Volume

Description

Source Type	Description (# of drums or dimensions)	Units (yd^3)	References
Other	Unknown but > 0	yd^3	Ref. 15, Ref. 21 (Table 2), Ref. 22 (Table 2), Ref. 27 (Table 2)

Sum (yd^3): Unknown but > 0
Equation for Assigning Value (Ref. HRS Section 2.4.2.1.4, Table 2-5): Tier C Volume, V/2.5

Volume Assigned Value: Unknown but > 0

2.4.2.1.4. Area

Description

Source Type	Units (ft^2)	References

Sum (pounds):

Sum (ft^2):

Area Assigned Value: 0

2.4.2.1.5. Source Hazardous Waste Quantity Value

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Y/N)	Containment Factor Value by Pathway				
			Ground water (GW) Table (3-2)	Surface Water (SW)		Air	
				Overland/flood (Table 4-2)	GW to SW (Table 3-2)	Gas (Table 6-3)	Particulate (Table 6-9)
1	>0		NS	10	NS	NS	NS

Description of Other Potential Sources:

There are other areas in the region that may be contributing to the contamination of Indian Ridge Marsh and the surface water pathway. At this time, these additional areas are being addressed by another program within the Illinois EPA. Due to the involvement and remediation of these areas, it was decided to not include these parcels of area in the documentation record.

4.0 SURFACE WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 Definition of Hazardous Substance Migration Pathway for Overland/Flood Component

The overland flow/runoff draining from the Lake Calumet Cluster was witnessed during the November/December 2005 sampling event. During this event, there was a rainstorm, which produced a moderate amount of rain. Runoff from the Cluster has a tendency to form pools in shallow undulations in the topography of the Cluster. The overland flow migration is generally from west to east, following channels and roadways. When the overland flow reaches the eastern portion of the area, then the water is channeled into a ditch paralleling the Norfolk and Southern Railroad tracks. The flow of the water once in the ditch was documented as flowing north to a culvert pipe, which leads into Indian Ridge Marsh. It should be noted that even though the flow was photographed as flowing north, it is possible that some of the water drainage flows to the south to the standing pool of water in the southwestern corner of the Lake Calumet Cluster. Documentation of the overland flow route for the surface water migration pathway is located in Reference 39, Appendix 3.

The probable point of entry (PPE) for contamination of the surface water pathway occurs at the north end of Indian Ridge Marsh. Two culverts are located beneath the railroad tracks approximately one block south of 116th Street. These culverts carry water from the Lake Calumet Cluster. Flow from this culvert exceeds 5 cubic feet per second (cfs) during large storm events (Ref. 6, p. 8 and Ref. 39, p. 70-71, Appendix 3). Water flow in the Indian Ridge Marsh is north to south. Indian Ridge Marsh is divided by 122nd Avenue but connected by a culvert. This culvert is often blocked by sediment or debris, which can cause the water level in the northern section of Indian Ridge Marsh to rise by several feet (Ref. 6, p. 8). The water then flows through a channel to the Calumet River. The 15-mile target distance limit begins at the inflow of contaminated soils and surface water at the northern end of Indian Ridge Marsh flowing for one mile to the confluence of the Calumet River (Ref. 16). Contamination then flows through the Calumet River for 14 miles with a termination of the target limit distance near Crestwood, Illinois (Ref. 16). The Calumet River is a documented fishery (Ref. 36, p. 16).

The total wetland area in Indian Ridge Marsh is approximately 92 acres. The surface areas of the north and south pools are 49 and 26 acres respectively (only the north portion was sampled during the 2004 Addendum). Other areas of surface water area in the marsh, but are isolated from the north and south pools by undeveloped causeways (Ref. 6, p. 2). Contaminated ground water is being released directly into the Indian Ridge Marsh (Ref. 6, p. 11). Contamination is entering Indian Ridge Marsh by the Overland flow route (Ref. 39, Appendix 3).

Likelihood of Release

4.1.2.1.1 Observed Release

Observed releases to Indian Ridge Marsh have been documented by chemical analysis of sediment samples collected during the 2004 Addendum to the ESI (Ref. 39).

Chemical Analysis

Illinois EPA conducted an Addendum to the ESI in November/December 2004 (Ref. 39). During the Addendum, sediment samples were collected from Indian Ridge Marsh (Ref. 39, p. 9-10). Sediment sampling locations from the 2005 Addendum are shown in Figure 3, Reference 39. Analytical data from the 2004 Addendum sampling event supports an observed release by chemical analysis to Indian Ridge Marsh, which is presented below.

- Background Sample:

Illinois EPA collected a sediment sample during the 2004 Addendum to the ESI to document background sediment conditions (Ref. 39, p. 9). Sample X203 was collected from the southern portion of Indian Ridge Marsh in an area suspected of low impact from contaminants and is not located in the main channel of the marsh, which would take the sample location out of the expected flow path of the contaminants flowing through Indian Ridge Marsh (Ref. 39, p. 31, Figure 3). The sample used to document background sediment conditions, X203, was collected from a depth of 6-12 inches below the surface of the sediment. Water depth at this location was approximately 1.5 ft (Ref. 39, p. 9). The background sediment sample was of similar makeup and consistency as the other sediment samples collected from Indian Ridge Marsh (Ref. 39, p. 9-10). The background sample was collected during the same sampling event as the release samples, at approximately the same depth (0-12 inches), using the same sampling protocols and were analyzed for the sample parameters (target analyte list semi-volatiles in accordance with the EPA CLP Statement of Work) (Contact No. 68W03018) (Ref. 38, p. 445, 449-451). The background sediment sample was analyzed for target analyte list for semi-volatiles by Ceimic Corporation, located at 10 Dean Knauss Drive, Narragansett, Rhode Island, in accordance with EPA CLP Statement of Work using Methods CLP SOW OLM04.3 (Ref. 38, p. 404). U.S.EPA's Superfund Field Services Section validated the analytical results for the background sediment sample; analytical results for this data package are provided in Reference 38, p. 444 to 760.

Sample ID	Sample Medium	Sample Location	Depth	Date	Reference
X203	Sediment	Indian Ridge Marsh	6-12 inches	12/01/04	39, p. 9

- Background Concentration

The table below provides a summary of the concentrations of hazardous substances detected in the background samples collected from Indian Ridge Marsh during the 2004 Addendum to the ESI. The analytical data package and data validation report from the sampling event are provided in Reference 38.

Sample ID	Hazardous Substance	Sample Concentration (ug/kg)	CRDL (ug/kg)	Reference
X203	Fluoranthene	710 U ug/kg	710 ug/kg	38, p. 545
X203	Chrysene	710 U ug/kg	710 ug/kg	38, p. 545
X203	Benzo(b)fluoranthene	710 U ug/kg	710 ug/kg	38, p. 545
X203	Benzo(a)pyrene	710 U ug/kg	710 ug/kg	38, p. 545
X203	Phenanthrene	710 U ug/kg	710 ug/kg	38, p. 545
X203	Indeno(1,2,3-cd)pyrene	710 U ug/kg	710 ug/kg	38, p. 545
X203	Benzo(g,h,i)perylene	710 U ug/kg	710 ug/kg	38, p. 545
X203	Benzo(a)anthracene	710 U ug/kg	710 ug/kg	38, p. 545
X203	Pyrene	710 U ug/kg	710 ug/kg	38, p. 545

CRDL Contract-required detection limit
ug/kg micrograms per kilogram
U The analyte was analyzed for, but was not detected above the reported contract required detection limit (CRDL).
IRM Indian Ridge Marsh

- Contaminated Samples

Sample ID	Sample Medium	Sample Location	Distance from PPE	Depth	Date	Reference
X201	Sediment	IRM	971 ft	2-12 inches	12/02/04	39, p. 9
X204	Sediment	IRM	2438 ft	0-12 inches	12/01/04	39, p. 9
X207	Sediment	IRM	2374 ft	0-12 inches	12/01/04	39, p. 9
X210	Sediment	IRM	1141 ft	6-12 inches	12/01/04	39, p. 9
X211	Sediment	IRM	936 ft	6-12 inches	12/01/04	39, p. 10
X212	Sediment	IRM	695 ft	12-24 inches	12/01/04	39, p. 10
X213	Sediment	IRM	563 ft	6-12 inches	12/01/04	39, p. 10
X214	Sediment	IRM	0 ft	6-12	12/01/04	39, p. 10

Sample ID	Sample Medium	Sample Location	Distance from PPE	Depth	Date	Reference
				inches		
X215	Sediment	IRM	209 ft	2-10 inches	12/01/04	39, p. 10
X217	Sediment	IRM	0 ft	2-12 inches	12/02/04	39, p. 10

The distance from the PPE (probable point of entry) was calculated using ESRI®ArcMap™ 9.0, Copyright© 1999-2004, ESRI Inc. The distance was determined based on the locations of the sediment samples as logged into the Trimble Global Positioning System Unit upon the time of collection, and then transferred to the ESRI®ArcMap™ 9.0 program. These locations were then placed on the digitized and rectified aerial photograph of the area. Then using this program, the ruler option of the program allows users to find distances between sample locations. Sample locations are depicted in Reference 39, Figure 3, p. 31.

Sample ID	Sample Location	Depth	Date	Reference
X201	Northeast portion of IRM	2-12 in	12/02/04	Ref. 39, p. 9
X214	From sediment east of culvert (PPE)	6-12 in	12/01/04	Ref. 39, p. 10
X215	200 ft east of culvert	2-10 in	12/01/04	Ref. 39, p. 10

Sample ID	Sample Medium	Hazardous Substance	Hazardous Substance Concentration	CRDL Concentration	Benchmark for SW Environmental Ref. 2, App. BII	Reference
X201	Sediment	Fluoranthene	2200 ug/kg	1800 ug/kg	NA	38, p. 1019
X201	Sediment	Chrysene	2300 ug/kg	1800 ug/kg	NA	38, p. 1019
X201	Sediment	Benzo(b)fluoranthene	2900 ug/kg	1800 ug/kg	NA	38, p. 1019
X201	Sediment	Benzo(a)pyrene	2900 ug/kg	1800 ug/kg	NA	38, p. 1019
X214	Sediment	Phenanthrene	2600 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Fluoranthene	3800 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Pyrene	3300 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Benzo(a)anthracene	2300 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Chrysene	2400 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Benzo(b)fluoranthene	3500 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Benzo(g,h,i)perylene	2600 ug/kg	980 ug/kg	NA	38, p. 578
X215	Sediment	Fluoranthene	2400 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Pyrene	2300 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Benzo(a)anthracene	2200 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Chrysene	2600 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Benzo(b)fluoranthene	3000 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Benzo(a)pyrene	3400 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Benzo(g,h,i)perylene	2600 ug/kg	2100 ug/kg	NA	38, p. 581

Key
ug/kg micrograms per kilogram

Attribution

The information gathered documents the presence of contaminants associated with the Lake Calumet Cluster and the sediments in Indian Ridge Marsh.

Former activities at the Lake Calumet Cluster included: drum storage, disposal, transfer, incineration of wastes, illegal dumping of contaminants, burying of wastes and unpermitted landfill operations (Ref. 7, p. 1). From the amount and array of contaminants found during past inspections, removals and sampling, it has been documented that many different types of contaminants were accepted at the various areas constituting the Lake Calumet Cluster. Many of these wastes were allowed to contaminate the area, either by accidental spills, dumping or puncturing of drums and containers, or by deterioration of the containers allowing the contaminants to leak onto the ground and eventually into the ground water, sediments and surface water. The landfill at the Cluster contains numerous hazardous substances including inorganics, volatile organic chemicals (VOCs), semi-volatile organic chemicals (SVOCs), polychlorinated biphenyls (PCBs) and pesticides ((Ref. 21, Tables 2-5), (Ref. 22, Table 2), (Ref. 27, Table 2)). Ground water contamination includes numerous inorganics, VOCs and SVOCs (Ref. 29, p. 3, Attachment A).

Before the area surrounding the Cluster was filled, most areas were part of a marsh complex (Ref. 14, p. 10). Development, industry, and landfill operations have resulted in lower, wetter areas being filled in with a variety of industrial and commercial wastes, including steel slag (Ref. 30, p. 2-6). The years of filling in have produced an area that is largely upland surrounded by biologically important marsh complexes (Ref. 14, p. 10). Presently, the Lake Calumet Cluster consists of swampy areas of standing water that serve as wetlands. Wetland vegetation is present in many areas of the Cluster. Several species of state endangered and threatened birds and plants are known to occur in the vicinity of the Cluster (Ref. 5, p. 69 to 71).

Contaminants allowed to leak onto the ground have contributed to the contamination of the soil and ground water in the area. Even though ground water is not utilized in the area, it has been documented that the ground water releases to the surface water (Ref. 6, p. 11). Observations show that ground water is flowing into the surface water in the Indian Ridge Marsh (Ref. 6, p. 11)

Sediment samples collected in 1998 and 2004 show contamination in parts of Indian Ridge Marsh (Ref. 30, Table E-8 and Ref. 39, Table 3 and 5). Surface water runoff from a portion of the Cluster flows into ditches along the perimeter of the source areas. These ditches drain into a culvert that discharges into Indian Ridge Marsh (Ref. 6, p. 8 and Ref. 39, Appendix 3). Indian Ridge Marsh is a documented fishery. From interviews and photos of anglers near and at the Cluster, it has been determined that Indian Ridge Marsh is a documented fishery. Photos of fishermen were taken during the Addendum to the ESI in 2004 (Ref. 39, p. 48, Appendix 2). The Calumet River is a documented fishery (Ref. 36, p. 16).

The source of the surface water contamination is, at least in part, the contaminated ground water plume that is in direct communication with the surface water. Complex interactions occur between the surface water and ground water throughout the Cluster, except where sheet piles have been installed for bank stability (Ref. 4, p.29). Surface water depth levels were measured below ground water levels, indicating that ground water has the potential to discharge to surface water bodies (Ref. 4, p.45-46).

Hazardous Substances Released:
Fluoranthene
Chrysene
Benzo(b)fluoranthen
e
Benzo(a)pyrene
Phenanthrene
Benzo(g,h,i)perylene
Benzo(a)anthracene
Pyrene

Surface Water Observed Release Factor Value: 550

4.1.4 Environmental Threat

4.1.4.2 Environmental Threat Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

The ecosystem toxicity and persistence values, the environmental bioaccumulation values, and the ecosystem toxicity/persistence/bioaccumulation factor values for all hazardous substances associated with a source that has a surface water containment value greater than zero are presented in the table below. Values are based on freshwater. The combined ecosystem toxicity/persistence/bioaccumulation factor values were obtained from HRS Table 4-21 (Ref. 1, Section 4.1.4.2.1.4).

Hazardous Substance	Source No.	Ecosystem Toxicity Factor Value	Persistence Factor Value*	Bioaccumulation Value**	Ecosystem Tox/Persistence/Bio Factor Value (Table 4-21)	Ref.
Fluoranthene (Benzo(j,k)fluorene)	1	10,000	1	5,000	50,000,000	2, Appendix BI
Chrysene	1	1,000	1	5,000	5,000,000	2, Appendix BI
Benzo(b)fluoranthene	1	NA	NA	NA	NA	NA
Benzo(a)pyrene	1	10,000	1	50,000	500,000,000	2, Appendix BI
Phenanthrene	1	10,000	0.4000	50,000	200,000,000	2, Appendix BI
Benzo(g,h,i)perylene	1	0	1	50,000	0	2, Appendix BI
Benzo(a)anthracene	1	10,000	1	50,000	500,000,000	2, Appendix BI
Pyrene	1	10,000	1	50,000	500,000,000	2, Appendix BI

Notes:
*Persistence value for Lake
**Bioaccumulation factor value for Freshwater

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 500,000,000 or 5×10^8

4.1.4.2.2 Hazardous Waste Quantity

Source No.	Source Type	Source Hazardous Waste Quantity
1	Other	>0

Sum of Values:

As documented in Section 4.1.4.3, targets along the surface water migration pathway are subject to Level II concentrations; therefore, a HWQ value from Table 2-6 or 100, whichever is greater, is assigned as the hazardous waste quantity factor value for that pathway (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Section 2.4.2.2)

4.1.4.2.3 Waste Characteristics Factor Category Value

The environmental waste characteristics factor value is obtained by multiplying the ecosystem toxicity/persistence factor value and the HWQ factor value for the watershed and multiplying this product by the ecosystem bioaccumulation potential factor value for that hazardous substance (Ref. 1, Section 4.1.4.2.3). The product is assigned a waste characteristic factor category value from HRS Table 2-7 (Ref. 1, Section 2.4.3.1). The values presented below are for pyrene.

Ecosystem Toxicity/Persistence Factor Value: 5×10^8
Hazardous Waste Quantity Factor Value: 100

Ecosystem Toxicity/Persistence Factor Value (5×10^8) x
Hazardous Waste Quantity Factor Value (100): 5×10^{10}

Waste Characteristics Factor Category Value: 320
(Ref 1, Table 2-7)

4.1.4.3 Environmental Threat Targets

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.2 Level II Concentrations

Actual contamination is shown in the preceding sections by establishing an observed release by chemical analysis to surface water of the same substances. Contaminants that meet the criteria for an observed release to surface water were detected in sediment samples. Therefore, Level II concentrations are assigned (Ref. 1, p. 51592, Sec. 2.5).

Before the area surrounding the Cluster was filled, most areas were part of a marsh complex (Ref. 14, p. iii). Development, industry, and landfill operations have resulted in lower, wetter areas being filled in (Ref. 14, p. iii). The years of waste filling have produced an area that is largely upland surrounded by biologically important marsh complexes ((Ref. 6, p. 7), (Ref. 10)). Presently, the Lake Calumet Cluster consists of swampy areas of standing water ((Ref. 21, p. 4), (Ref. 5, p. 5), (Ref. 27, p. 4)). Indian Ridge Marsh is divided by 122nd Avenue into what is known as the North and South pools. These pools are connected and flow into the Calumet River. There are smaller isolated pools located to the east of the main body of marsh. The smaller, isolated east pools are hydraulically connected by ground-water flow through the causeways (Ref. 6, p. 8). The total wetland area in Indian Ridge Marsh is approximately 92 acres. The surface areas of the north pool, south pool, and the six combined east pools are 49, 26, and 17 acres, respectively (Ref. 6, p. 2). Wetland vegetation is present in many areas of the Cluster (Ref. 5, p. 70 to 71, Appendix F). Several species of state endangered and threatened birds and plants are known to occur in the vicinity of the Cluster (Ref. 10 and Ref. 34 p. 2). The listed species use Indian Ridge Marsh as a rookery (Ref. 34, p. 2).

Surrounding Indian Ridge Marsh, there are a large number of other isolated wetlands and lakes. More than 284 acres of the wetlands to the west have been mapped (Ref. 6, Table 1), including Big Marsh, Dead Stick Pond, and unnamed wetlands often referred to as the Gun Club Wetlands. Another 131 acres of unmapped wetlands are within a mile of the marsh, including ponds on the Lake Calumet Cluster, the wetlands north of Big Marsh, and Hegewisch Marsh to the south. However, there are probably an additional 40-50 acres of small wetlands in the area that are too small to be delineated for the larger scale map (Ref. 6, (Table 1). Thus there are nearly 500 acres of wetlands in and around Indian Ridge Marsh (Ref. 6, p. 7).

Sample ID	Sample Medium	Hazardous Substance	Hazardous Substance Concentration	CRDL Concentration	Benchmark for SW Environmental Ref. 2, App. BII	Reference
X201	Sediment	Fluoranthene	2200 ug/kg	1800 ug/kg	NA	38, p. 1019
X201	Sediment	Chrysene	2300 ug/kg	1800 ug/kg	NA	38, p. 1019
X201	Sediment	Benzo(b)fluoranthene	2900 ug/kg	1800 ug/kg	NA	38, p. 1019
X201	Sediment	Benzo(a)pyrene	2900 ug/kg	1800 ug/kg	NA	38, p. 1019
X214	Sediment	Phenanthrene	2600 ug/kg	980 ug/kg	NA	38, p. 578

Sample ID	Sample Medium	Hazardous Substance	Hazardous Substance Concentration	CRDL Concentration	Benchmark for SW Environmental Ref. 2, App. BII	Reference
X214	Sediment	Fluoranthene	3800 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Pyrene	3300 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Benzo(a)anthracene	2300 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Chrysene	2400 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Benzo(b)fluoranthene	3500 ug/kg	980 ug/kg	NA	38, p. 578
X214	Sediment	Benzo(g,h,i)perylene	2600 ug/kg	980 ug/kg	NA	38, p. 578
X215	Sediment	Fluoranthene	2400 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Pyrene	2300 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Benzo(a)anthracene	2200 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Chrysene	2600 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Benzo(b)fluoranthene	3000 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Benzo(a)pyrene	3400 ug/kg	2100 ug/kg	NA	38, p. 581
X215	Sediment	Benzo(g,h,i)perylene	2600 ug/kg	2100 ug/kg	NA	38, p. 581

Key
ug/kg micrograms per kilogram

Sensitive Environment	Distance from PPE to Nearest Sensitive Environment	Reference	Sensitive Environment Value (Table 4-23)
Habitat known to be used by State designated endangered or threatened species (Yellow-headed Blackbird)	0 ft	Ref. 10, Ref. 34, p. 2	50
Habitat known to be used by State designated endangered or threatened species (Black-crowned Night Heron)	0 ft	Ref. 10, Ref. 34, p. 2 Ref. 5, p. 1-4, 3-25	50
Habitat known to be used by State designated endangered or threatened species (Common Moorhen)	0 ft	Ref. 10, Ref. 34, p. 2	50
Particular areas, relatively small in size, important to maintenance of unique biotic communities	0 ft	Ref. 11	25

The distance from the PPE (probable point of entry) was calculated using ESRI®ArcMap™ 9.0, Copyright© 1999-2004, ESRI Inc. The distance was determined based on the locations of the sediment samples as logged into the Trimble Global Positioning System Unit upon the time of collection, and then transferred to the ESRI®ArcMap™ 9.0 program. These locations were then placed on the digitized and rectified aerial photograph of the area. Then using this program, the ruler option of the program allows users to find distances between sample locations. Sample locations are depicted in Reference 39, Figure 3, p. 31.

Sum of Level II Sensitive Environments Value: 175

Wetlands

The total length of wetlands documented at the Cluster that are subject to Level II concentrations of hazardous substances is determined by measuring the distance from the PPE to X204 (Ref. 39, p. 31, Figure 3). Wetlands are located along both sides of the marsh; therefore, the wetland frontage subject to Level II concentrations is 1.327 miles. The perimeter of the wetlands was calculated using ESRI®ArcMap™ 9.0, Copyright© 1999-2004, ESRI Inc. Only the largest wetland was measured in Ref. 21, Figure 4, p. 28. Reference 42 describes the data and technologies used to determine the perimeter of the wetlands. The assigned HRS wetland rating for Level II concentrations is 50 (Ref. 1, Table 4-24).

Wetland	Wetland Frontage (ft)	Wetland Frontage (miles)	Reference
PEMF	7004.117	1.327	Ref. 21, p. 28, Figure 4, and Ref. 42

Notes:
The perimeter of the wetlands was calculated using ESRI®ArcMap™ 9.0, Copyright© 1999-2004, ESRI Inc. Only the largest wetland was measured (PEMF) in Ref. 21, Figure 4, p. 28. Reference 42 describes the data and technologies used to determine the perimeter of the wetlands.

Sum of Level II Wetland Frontages: 1.327 miles
Wetlands Value (Ref. 1, Table 4-24): 50

Sum of Level II Sensitive Environments Value + Wetlands Value: 175 + 50

Level II Concentrations Factor Value: 225