



Public Health Assessment for

LAKE CALUMET CLUSTER SITE
CHICAGO, COOK COUNTY, ILLINOIS
EPA FACILITY ID: ILD000716852
FEBRUARY 11, 2009

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Public Health Assessment

Lake Calumet Cluster Site

EPA Facility ID# ILD000716852

Chicago, Cook County, Illinois

Prepared by:

Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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Summary

The Lake Calumet Cluster Site is a combination of three former hazardous waste storage and disposal facilities and one former waste incinerator. The site is located in a heavily industrialized portion of southeast Chicago. Past activities at the site included illegal dumping, landfill operations, hazardous waste disposal, and waste incineration. These activities resulted in elevated levels of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and metals in soil, groundwater and surface water. As a result of these elevated levels of contaminants, the U. S. Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (Illinois EPA) conducted removal actions on portions of this property in the 1980s.

Samples from the site taken in 2004 had elevated levels of metals and PAHs in soil, sediment, and surface water. No groundwater or air samples were available for review. In 2005, the site was proposed for placement on the National Priorities List (NPL).

Past workers at the Calumet Cluster Site were likely to have been exposed to site-related contaminants through inhalation and ingestion of contaminated soils and dust. It is not known if past workers had significant contact with surface water or groundwater at any of the sites, nor is there any data related to air sampling activities.

Portions of contaminated soil and sediments on the site have been removed in the past and currently, USEPA and Illinois EPA are constructing a soil cover for the site. The final remedy for the site has not yet been selected. There are no private residential drinking water wells within one mile of the site, and a city of Chicago ordinance prohibits the construction of new drinking water wells [1]. The former Alburn Incinerator property has a water well on it; however, the facility is partially demolished and it is unlikely anyone would use the well for drinking water purposes.

IDPH is not aware of any community health concerns at this time based on discussions with Illinois EPA Community Relations staff who are familiar with the community. No health outcome data was evaluated for this site because IDPH does not expect adverse health effects from exposures related to the Cluster Site.

The Illinois Department of Public Health (IDPH) concludes that the site poses no apparent public health hazard. Currently, no one is being exposed to chemicals at levels that would be expected to cause adverse health effects. Groundwater beneath the site is contaminated and should continue to be monitored. Although the groundwater is not used for drinking or bathing, it does have the potential for further migration into area surface water.

The soil cover currently under construction should prevent any further human contact with chemicals in the surface soil. IDPH recommends that a deed restriction be enacted to regulate future building or excavation at the Cluster Site. IDPH also recommends that Illinois EPA continue to monitor groundwater and surface water in the area to assess further contaminant migration to off-site water bodies.

Purpose

The U.S. Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (Illinois EPA) requested that the Illinois Department of Public Health (IDPH) conduct a public health assessment of the Lake Calumet Cluster Site. In 2005, the site was proposed for placement on the National Priorities List (NPL). The purpose of this public health assessment is to evaluate, based on the information currently available, any known or potential adverse human health effects if people are exposed to contaminants related to the site.

Background and Statement of Issues

Site Description

The Lake Calumet Cluster Site (Cluster) is located in the Southeast portion of Chicago. The site is a combination of four individual sites formerly known as Alburn Incinerator, U.S. Drum II, Paxton Avenue Lagoons, and an “Unnamed Parcel [1].” The four sites have been combined into a single site due to their proximity to one another and because the similarities of the contaminants associated with the individual sites make it impossible to define the boundaries of the original sources [1].

The Cluster Site is approximately 87 acres in size and is bounded by industrial and ecologically sensitive areas (Figure 1). A Norfolk Southern railroad track and the Indian Ridge Marsh, one of three major wetland areas in the vicinity of the site, bound the east side of the site. The northern edge of the Cluster Site is bordered by two former landfills, Paxton I and Paxton II. Directly to the north of the Paxton landfills is Interlake Properties, another former waste dump site and Big Marsh. The western edge of the Cluster Site borders the Land and Lakes Landfill. Activities at all of these properties included hazardous waste disposal and storage, municipal waste disposal, and illegal dumping.

Site History

Alburn Incinerator

Alburn Incinerator is a nine-acre parcel located in the northwest portion of the Cluster Site. Alburn began operations in 1967 as a landfill and eventually expanded operations to include a hazardous waste incinerator and storage facility in 1977. Wastes accepted by the facility included paints, chlorinated solvents, adhesives, petroleum, styrene, and coal tar. In addition to the incinerator, the facility maintained a 175,000 gallon waste lagoon and numerous above and below ground storage tanks for liquid wastes. In 1982, Illinois EPA revoked the facility’s Resource Conservation and Recovery Act (RCRA) permit for numerous violations including leaking drums and improper storage of wastes. In July 1983, two drums at the facility exploded, prompting USEPA to initiate an immediate removal action. USEPA removed 36 bulk storage tanks, 6,000 drums, 239 five-gallon buckets, and 174,000 gallons of waste liquid and sludge from the lagoon. In addition, the topsoil was removed to a depth of six inches and at least part of the site was covered with a two-foot clay cap. During this removal action, the incinerator and the control room were dismantled and removed from the property [2]. Since the removal action was

completed, there have been a number of sampling activities conducted at the Alburn Incinerator site. The most recent sampling activities were conducted in 2004. Data obtained from the samples indicate the presence of heavy metals, chlorinated compounds, and PAHs in the soil and in surface water on the site.

U.S. Drum II

U.S. Drum II is a 5.6-acre portion of the Cluster Site located along the southern half of the eastern boundary of the site. The property has been used as a dumping ground for municipal and industrial waste since the beginning of the 1900s. In the 1970s, the site was illegally used as both a hazardous waste transfer and solvent recovery facility. The illegal operations ceased in 1975 as a result of a fire that occurred at the facility. In 1979, the site became a temporary storage and transfer facility for waste drums. Operations of the storage and transfer facility were shut down in 1979 and an estimated 34,100 gallons of liquid and semi-solid wastes were removed from the site. In 1984, USEPA conducted an Emergency Removal Action on the property. The USEPA action resulted in the removal of 435 cubic yards of soil, 62,000 gallons of standing water, and over 3,000 drums. Some of the drums removed from the site had been cut or punctured to allow the contents to drain onto the ground [3]. Areas of the ground where removal activities occurred were capped with clay and topsoil. Since the removal action was completed, there have been a number of sampling activities conducted at the US Drum II site. The most recent sampling activities were conducted in 2004. Data obtained from the samples indicate the presence of heavy metals, chlorinated compounds, and PAHs in the soil and in surface water on the site.

Unnamed Parcel

Unnamed Parcel is a 38-acre area of the Cluster Site that is located in the southern portion of the site. The unnamed parcel is bordered by Paxton Lagoons on the west and by U.S. Drum II on the east. Alburn Incinerator lies directly to the north of the parcel and 122nd Ave. comprises the southern border. The Unnamed Parcel is situated on a primarily marshy and vegetated portion of the Cluster Site. There is little information regarding the history of this parcel. However, it is suspected that the area has been used as an unauthorized dumping ground for nearby industry. The area also may have been a landfill from the 1950s through the 1970s. Wastes deposited at the site include fill material, slag from local steel mills, unknown industrial and commercial wastes, and trash and debris from various unknown sources [4]. Previous sampling activities have indicated the presence of a number of contaminants including PCBs and 1,1,1-trichloroethane.

Paxton Avenue Lagoons

Paxton Avenue Lagoons is a 13-acre parcel located in the southwestern portion of the Cluster Site. Paxton Lagoons is bordered on the west by the Land and Lakes landfill, and by 122nd Ave. to the south. The northern border of the parcel is adjacent to Alburn Incinerator and the eastern border is adjacent to the Unnamed Parcel. Paxton Lagoons has been used as an illegal dump site since the 1950s [1]. No other historical information is available for Paxton Lagoons. The most recent sampling activities at this parcel from 2004 have identified the presence of PCBs and both VOCs and semi-volatile organic compounds (SVOCs).

Demographics

As of the 2000 Census, the total population with the zip code for the Cluster Site is 13,262. Of this number, 905 are children under the age of 5, and 2,055 are adults over the age of 65. The ethnic make-up of the community is 66.1% white, 18.6% African American, 22.8% Hispanic/Latino and less than 2% Native American and Asian [5].

Land Use

The Cluster Site is located in a heavily industrialized area in southeast Chicago. Within 1 mile of the site, there is a mix of residential, industrial, and business areas. Lake Calumet lies within a quarter mile to the west of the Cluster Site. The closest residence is less than 500 feet from the northeastern border of the site. The closest school is slightly more than 1 mile from the site. There are no hospitals within 5 miles of the site.

Natural Resources

Within and surrounding the Cluster Site are several wetland areas with ecological significance. Indian Ridge Marsh, which borders the site on the east, is home to at least one state listed endangered species. Big Marsh is located just north of the Cluster Site and Lake Calumet is less than one-quarter mile to the west. To the south and east is the Calumet River. There are no public water intakes within 15 miles of the Cluster Site. Both the wetlands and the lake can be used for fishing and hunting.

Several acres of wetlands exist within the boundaries of the site. The wetlands adjacent to the landfills are known habitats of approximately 15 different Federal and State Endangered or Threatened Species. Fishing also has been observed in Indian Ridge Marsh, Big Marsh, Dead Stick Pond, and Heron Pond (Figure 1). [6]

Site Visit

On May 7, 2007 staff from IDPH visited the Cluster Site. The southern boundary was fenced and had only one gate visible to IDPH staff. Staff observed numerous dump trucks that passed through the gate on 122nd Street. Just west of the gate on 122nd Street there was significant ponding of water across the road. IDPH staff was not able to determine the source of the water. Access to the site was blocked on the west by the presence of the Land and Lakes landfill, which was fenced. The eastern boundary is partially fenced but could be accessed by walking along the railroad track. "No Trespassing" signs were posted on the entrance at the northeast corner of the site. To the north, the site could be accessed through Interlake Properties and the Paxton I and II landfills. While IDPH staff did not gain direct access to the Cluster Site property, they did observe evidence of hunting and fishing activities while exploring the northern border of the Cluster Site. Spent shotgun shells and food containers were found throughout the area. Pieces of old carpet or cardboard evidently used for seating were found along the banks of Big Marsh.

IDPH revisited the site in July 2008, and conditions were essentially the same as during the May 2007 visit.

Discussion

Chemicals of Interest

IDPH compared the maximum level of each chemical detected during environmental sampling with appropriate screening comparison values. This was to select chemicals for further evaluation for both carcinogenic and non-carcinogenic health effects. Chemicals that exceeded comparison values or those for which no comparison values exist were selected for further evaluation (Table 1). A description of each of the comparison values is found in Attachment 1.

For soil and sediment samples, IDPH only evaluated the samples that contained material from the top four inches. Samples taken exclusively from depths beyond four inches are unlikely to be contacted by humans during non-construction activities. IDPH assumes that anyone engaged in construction activities at the site will wear the appropriate personal protective equipment.

IDPH used the comparison values to screen for contaminants that warranted further evaluation. These comparison values do not represent thresholds of toxicity. Although some of these chemicals may exist at levels greater than comparison values, the contaminants can affect only someone exposed to sufficient doses. The amount of the contaminant, the duration and route of exposure, and the health status of exposed individuals are important factors in determining the potential for adverse health effects.

On-Site Contamination

Groundwater

No current sampling data was available for review; however, it is known from past sampling activities that contamination exists below the water table. This contamination has reached the surficial aquifer and interacts with surface water in the area as well [1].

Groundwater in the area is not used for drinking water purposes and the city of Chicago has an ordinance that prevents the construction of new residential wells.

Surface Water

Only one sample of surface water on the site was collected during the 2005 sampling event. Results of this sample did not indicate the presence of any chemical greater than health-based screening values.

Sediments

On-site sediments were sampled in 2005 and contained PAHs, arsenic, antimony, cadmium, and vanadium at levels greater than comparison values. Table 2 is a summary of the chemicals that were found to exceed comparison values in sediments on the site.

Soil

The chemicals of interest in on-site soil are manganese, arsenic, cadmium, thallium, vanadium, and copper. Table 3 shows the chemicals that were found to exceed comparison values in soil on the site.

Off-Site Contamination

Surface Water

Surface water in Indian Ridge Marsh was sampled in 2005. Results indicated the presence of numerous inorganic chemicals at levels that exceeded comparison values. Table 1 shows a summary of the chemicals that were found to exceed comparison values in off-site surface water.

Sediments

PAHs were present at levels greater than comparison values in off-site sediments. All of the sediment samples were taken from Indian Ridge Marsh. Table 2 shows the chemicals that were found to exceed comparison values in off-site sediments.

Soil

Only one sample of off-site soil was collected during the 2005 sampling event. Results of this sample did not indicate the presence of any chemical greater than health based screening values (Table 3).

Exposure Evaluation

A hazardous chemical can affect people only if they contact it through an exposure pathway at a sufficient concentration to cause a toxic effect. This requires:

- A source of exposure,
- An environmental transport medium,
- A route of exposure,
- A receptor population, and
- A point of exposure.

A pathway is complete if all its components are present and exposure of people occurred in the past, is occurring, or will occur in the future. If (1) parts of a pathway are absent, (2) data are insufficient to decide whether it is complete, or (3) exposure may occur at some time (past, present, future), then it is a potential pathway. If a part of a pathway is not present and will never exist, the pathway is incomplete and can be eliminated from further consideration.

Exposure to surface water, sediment and soil are potential exposure pathways. The ongoing project to create a soil cover for the Cluster Site and the previous removal actions will end the potential for future exposure to contaminants in the soil, sediments and surface water on the site. Contaminants from the site may be carried by the surface water to the sediments in Indian Ridge Marsh; however, the soil cover work should reduce or eliminate this as well. Currently no one is using the groundwater at the site. Sediments in Indian Ridge Marsh contain elevated levels of

PAHs. Although there is no data from fish samples available at this time, IDPH deems that the low frequency of fishing activity at the site would make it unlikely that this indeterminate route of exposure would pose a health hazard.

Surface Soil and Sediment

IDPH estimated exposure doses to chemicals in on-site surface soil based on two exposure scenarios: one for children ages 12-17, and one for adult trespassers. For children, we used a body weight of 50 kg and assumed that children would contact and ingest 100 milligrams of soil daily while trespassing on the site three days per week, 24 weeks per year for five years. Our adult trespasser exposure scenario was for an adult (70-kg) contacting and ingesting 100 milligrams of soil daily while trespassing on the site three days per week, 24 weeks per year for 5 years. Dermal exposure to soil was calculated using the same assumptions (Tables 5 and 6).

Dermal exposures to sediments were calculated based on a three days per week, 24 weeks per year contact period. Dermal exposure to sediments would only be expected during fishing activities in Indian Ridge Marsh, so only the surface area of the hands and forearms were considered in the dose estimation (Table 7).

IDPH compared the estimated doses to minimal risk levels (MRLs) developed by the Agency for Toxic Substances and Disease Registry (ATSDR) for chemicals commonly found at hazardous waste sites. An MRL is an estimate of the daily exposure to a contaminant below which noncancerous, adverse health effects are unlikely to occur. When an MRL was not available, IDPH used the USEPA reference dose (RfD). Dermal RfDs were obtained from the U.S. Department of Energy (DOE).

Based on the exposure scenarios described above, none of the chemicals of interest would be expected to cause adverse health effects. Additionally, IDPH did not determine that any chemical was present above a level that would cause an appreciable increased risk of cancer.

Surface Water

IDPH estimated exposure doses to chemicals in surface water for children ages 12-17. We used a body weight of 50 kg and assumed that children would incidentally ingest 50 mL of water while swimming 2 days per week, for twelve weeks per year (Table 8).

No chemicals were found at levels that would be expected to cause adverse health effects in humans.

Child Health Considerations

IDPH recognizes that children are especially sensitive to some contaminants. Given the same contaminant concentrations, children likely receive greater exposure than adults. This is because children play in soil, wash hands less frequently than adults, and commonly exhibit hand-mouth behavior. Children also have a smaller body size, meaning that they receive a greater dose from the same amount of absorbed contaminant.

Because the site is in a heavily industrialized area some distance from residential areas, IDPH considers the exposure of a small child to the contaminated areas of the Lake Calumet Cluster Site to be unlikely. The construction of a cap for the site will eliminate any further potential for contact with contaminated surface soil. IDPH considered children in the exposure scenarios for exposure to surface soil, sediment and surface water, and would not expect any such exposures to result in adverse health effects.

Community Health Concerns

IDPH is not aware of any community health concerns at this time based on discussions with Illinois EPA Community Relations staff who are familiar with the community.

A copy of the draft Public Health Assessment for the site was available for public review and comment from September 22, 2008, to October 24, 2008. No public comments were received.

Health Outcome Data

No health outcome data were evaluated for this site because IDPH does not expect adverse health effects from exposures related to the Cluster Site.

Conclusions

Based on available information and site conditions, IDPH concludes that human exposures to chemicals in soil at the Lake Calumet Cluster Site are not expected to cause adverse health effects. IDPH further concludes that the site currently poses no apparent public health hazard. Groundwater at the site remains in contact with site-related contaminants and interacts with surface water in the area and is not used for drinking water purposes. Limited off-site sampling of sediment and surface water has been done, and data suggest the present levels of contaminants do not exceed values that would be expected to cause adverse health effects. IDPH will review any new information as it becomes available.

Recommendations

IDPH recommends that:

- Illinois EPA ensures that the site fence is maintained and that restricted access will continue for any areas of remaining contamination or physical hazards.
- USEPA or Illinois EPA continues to monitor groundwater and surface water at the Cluster Site and adjacent wetlands
- Illinois EPA considers enacting a deed restriction to regulate any future building or excavation at the site.

Public Health Action Plan

IDPH staff have reviewed the laboratory results from the February 2005 Illinois EPA expanded site investigation. IDPH staff provided a health-based evaluation of these data for the residents and participating agencies.

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Tables

Table 1. Chemicals of Interest in Off-Site Surface Water at Lake Calumet Cluster Site.

Chemical	Comparison Values				Concentration
	Noncancer		Cancer		Off-Site
	Value (ppb)	Source	Value (ppb)	Source	Range (ppb)
Antimony	6	MCL			ND – 104
Arsenic	10	MCL	0.02	CREG	ND – 48.4
Barium	2000	MCL			ND – 2,190
Beryllium	4	MCL			ND – 49.6
Cadmium	5	MCL			ND – 52.2
Chromium	100	MCL			ND – 204
Cobalt	100	Int. EMEG			ND – 510
Copper	100	Int. EMEG			ND – 262
Lead	15	Action Level			ND – 22.9
Manganese	500	MCL			ND – 686
Nickel	200	RMEG			ND – 508
Selenium	50	MCL			ND – 51.9
Thallium	2	MCL			ND – 39.1
Vanadium	0.001	Int. EMEG			ND - 507

ppb = parts per billion

MCL = maximum contaminant level

CEMEG = chronic environmental media evaluation guide

RMEG = reference dose media evaluation guide

CREG = cancer risk evaluation

Int. EMEG = intermediate environmental evaluation guide

ND = not detected

Table 2. Chemicals of Interest in On and Off-site Sediments at Lake Calumet Cluster Site.

Chemical	Comparison Values				Concentration	
	Noncancer		Cancer		On-site	Off-site
	Value (ppm)	Source	Value (ppm)	Source	Range	Range
Antimony	20	RMEG			ND – 56.8	
Arsenic	20	Chronic EMEG	0.5	CREG	ND – 30.2	
Benzo(a)pyrene			0.1	CREG		ND – 8.25
Cadmium	10	Intermediate EMEG			ND – 28.9	
Vanadium	200	Intermediate EMEG			ND – 303	

ppm = parts per million

RMEG = reference dose media evaluation guide

CREG = cancer risk evaluation

Int. EMEG = intermediate environmental media evaluation guide

ND = not detected

Table 3. Chemicals of Interest in On-site Soil at Lake Calumet Cluster Site.

Chemical	Comparison Values				Concentration
	Noncancer		Cancer		On-Site
	Value (ppm)	Source	Value (ppm)	Source	Range
Arsenic	20	Chronic EMEG	0.5	CREG	ND – 21
Cadmium	10	Chronic EMEG			ND – 15
Copper	500	Intermediate EMEG			ND - 1,260
Thallium	6.3	IEPA			ND – 7.9
Vanadium	200	Intermediate EMEG			ND – 448

ppm = parts per million

RMEG = reference dose media evaluation guide

CREG = cancer risk evaluation

Int. EMEG = intermediate environmental evaluation guide

ND = not detected

Table 4. Elements of potential exposure pathways at the Lake Calumet Cluster Site, Chicago, Illinois.

Pathway	Source	Medium	Exposure point	Exposure route	Receptor population	Time of exposure	Exposure activities	Estimated # exposed	Chemicals
Surface Water	Cluster Site	Surface Water	Indian Ridge Marsh	Ingestion	Nearby children	Past Present Future	Wading	20	Metals
Soil	Cluster Site	Surface soil	On-site soil	Dermal Ingestion	Children Adults	Past Present Future	Trespassing on the site	20	Metals
Soil	Cluster Site	Sediment	On and Off-site sediment	Dermal	Children Adults	Past Present Future	Trespassing on the site	20	Metals PAHs

Table 5. Hazard Indices and Cancer Risk from Ingestion of On-Site Surface Soil

Chemical	Concentration (mg/kg)	Adult Trespasser Dose (mg/kg-day)	Child (age 12-17) Trespasser Dose (mg/kg-day)	Comparison Value (mg/kg-day)	Source	Hazard Index Adult/Child	Potency Factor	Cancer Risk* Adult/Child
Arsenic	21	5.94E-06	8.32E-06	0.0003	MRL	0.02/0.03	1.5	6.4E-07/ 8.9E-07
Cadmium	15	4.25E-06	5.94E-06	0.0002	MRL	0.02/0.03	--	--
Copper	1,260	3.56E-04	4.99E-04	0.01	MRL	0.04/0.05	--	--
Vanadium	448	1.27E-04	1.77E-04	0.003	MRL	0.04/0.06	--	--
Thallium	7.9	2.23E-06	3.13E-06	9.00E-05	RfD	0.02/0.03	--	--

* Dose adjusted for number of years exposed – 5 years for a child and adult

mg - milligram

kg - kilogram

MRL – Minimum Risk Level

RfD – Reference Dose

Dose Calculation
$$\frac{\text{Concentration} \times \text{Intake} \times \text{Exposure Factors}}{\text{Body Weight}}$$

Table 6. Hazard Indices and Cancer Risk from Dermal Exposure to On-site Soil.

Chemical	Concentration (mg/kg)	Adult Trespasser Dose (mg/kg-day)	Child (age 12-17) Trespasser Dose (mg/kg-day)	Comparison Value (mg/kg-day)	Source	Hazard Index Adult/Child	Potency Factor	Cancer Risk* Adult/Child
Arsenic	21	1.68E-05	2.15E-05	0.0003	MRL	0.06/0.07	1.5	1.8E-06/ 2.3E-06
Cadmium	15	3.99E-07	5.11E-07	0.0002	MRL	0.002/ 0.003		
Copper	1,260	3.35E-05	4.29E-05	0.01	MRL	0.003/ 0.004		
Vanadium	448	1.19E-05	1.53E-05	0.003	MRL	0.004/ 0.005		
Thallium	7.9	2.10E-07	2.69E-07	9.00E-05	RfD	0.002/ 0.003		

* Dose adjusted for number of years exposed – 5 years for a child and adult

mg - milligram

kg - kilogram

MRL – Minimum Risk Level

RfD – Reference Dose

Dose Calculation $\frac{\text{Concentration} \times \text{Intake} \times \text{Exposure Factors}}{\text{Body Weight}}$

Table 7. Hazard Indices and Cancer Risk from Dermal Exposure to On-site and Off-site Sediment.

Chemical	Concentration (mg/kg)	Adult Trespasser Dose (mg/kg-day)	Child (age 12-17) Trespasser Dose (mg/kg-day)	Comparison Value (mg/kg-day)	Source	Hazard Index Adult/ Child	Potency Factor	Cancer Risk* Adult/Child
Antimony	56.8	1.50E-06	1.93E-06	0.0004	RfD	0.004/ 0.005		
Arsenic	30.2	2.40E-05	3.09E-05	0.0003	MRL	0.08/0.1	1.5	2.5E-06/ 3.30E-06
Benzo(a)pyrene	8.25	**	3.65E-05	--	--	--	7.3	**/1.9E-05
Cadmium	28.9	7.68E-07	9.80E-07	0.0002	MRL	0.004/ 0.005		
Vanadium	303	1.20E-05	1.03E-05	0.003	MRL	0.004/ 0.003		

* Dose adjusted for number of years exposed – 5 years for a child and adult

** Off-site only

mg - milligram

kg - kilogram

MRL – Minimum Risk Level

RfD – Reference Dose

Dose Calculation
$$\frac{\text{Concentration} \times \text{Intake} \times \text{Exposure Factors}}{\text{Body Weight}}$$

Table 8. Hazard Indices and Cancer Risk from Incidental Ingestion of Off-site Surface Water.

Chemical	Concentration (mg/l)	Child (age 12-17) Trespasser Dose (mg/kg-day)	Comparison Value (mg/kg-day)	Source	Hazard Index	Potency Factor	Cancer Risk*
Antimony	0.104	6.86E-06	0.0004	RfD	0.02		
Arsenic	0.0484	3.19E-06	0.0003	MRL	0.01	1.5	3.42E-07
Barium	2.19	1.45E-04	0.6	MRL	0.0002		
Beryllium	0.0496	3.27E-06	0.002	MRL	0.002		
Cadmium	0.0522	3.45E-06	0.0002	MRL	0.02		
Chromium	0.204	1.35E-05	0.003	RfD	0.004		
Cobalt	0.51	3.37E-05	0.01	MRL	0.003		
Copper	0.262	1.73E-05	0.01	MRL	0.002		
Manganese	0.686	4.12E-05	0.05	RfD	0.0008		
Nickel	0.508	3.35E-05	0.02	RfD	0.002		
Selenium	0.0519	3.11E-06	0.005	MRL	0.0006		
Thallium	0.0391	2.58E-06	9.00E-05	RfD	0.03		
Vanadium	0.507	3.35E-05	0.003	MRL	0.01		

* Dose adjusted for number of years exposed – 5 years for a child

mg - milligram

l - liter

MRL – Minimum Risk Level

RfD – Reference Dose

Dose Calculation $\frac{\text{Concentration} \times \text{Intake} \times \text{Exposure Factors}}{\text{Body Weight}}$

Figures

Figure 1. Lake Calumet Cluster Site



ATSDR Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health. This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

General Terms

Absorption

The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

Acute

Occurring over a short time [compare with chronic].

Acute exposure

Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

Adverse health effect

A change in body function or cell structure that might lead to disease or health problems

Ambient

Surrounding (for example, ambient air).

Background level

An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Biota

Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Body burden

The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

Cancer

Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

Cancer risk

A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

Carcinogen

A substance that causes cancer.

Central nervous system

The part of the nervous system that consists of the brain and the spinal cord.

CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

Chronic

Occurring over a long time [compare with acute].

Chronic exposure

Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]

Cluster investigation

A review of an unusual number, real or perceived, of health events (for example, reports of cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.

Comparison value (CV)

Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous

substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

Concentration

The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant

A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Dermal

Referring to the skin. For example, dermal absorption means passing through the skin.

Dermal contact

Contact with (touching) the skin [see route of exposure].

Detection limit

The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Disease registry

A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

Dose (for chemicals that are not radioactive)

The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose (for radioactive chemicals)

The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship

The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

Environmental media

Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

Environmental media and transport mechanism

Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.

Epidemiology

The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

Exposure

Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

Exposure assessment

The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure investigation

The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

Exposure pathway

The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Feasibility study

A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

Geographic information system (GIS)

A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

Groundwater

Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

Half-life ($t_{1/2}$)

The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.

Hazard

A source of potential harm from past, current, or future exposures.

Hazardous waste

Potentially harmful substances that have been released or discarded into the environment.

Health consultation

A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

Health education

Programs designed with a community to help it know about health risks and how to reduce these risks.

Health investigation

The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to evaluate the possible association between the occurrence and exposure to hazardous substances.

Health statistics review

The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.

Indeterminate public health hazard

The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

Incidence

The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

Ingestion

The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

Inhalation

The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

Intermediate duration exposure

Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].

Lowest-observed-adverse-effect level (LOAEL)

The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Medical monitoring

A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

Metabolism

The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite

Any product of metabolism.

mg/kg

Milligram per kilogram.

mg/cm²

Milligram per square centimeter (of a surface).

mg/m³

Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration

Moving from one location to another.

Minimal risk level (MRL)

An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

National Priorities List (NPL)

EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

No apparent public health hazard

A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

No-observed-adverse-effect level (NOAEL)

The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

No public health hazard

A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

NPL [see National Priorities List]

Pica

A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

Plume

A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Point of exposure

The place where someone can come into contact with a substance present in the environment [see exposure pathway].

Population

A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

Potentially responsible party (PRP)

A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

ppb

Parts per billion.

ppm

Parts per million.

Prevalence

The number of existing disease cases in a defined population during a specific time period [contrast with incidence].

Prevention

Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public availability session

An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public comment period

An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public health action

A list of steps to protect public health.

Public health advisory

A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

Public health assessment (PHA)

An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].

Public health hazard

A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

Public health hazard categories

Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

Public meeting

A public forum with community members for communication about a site.

Radioisotope

An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.

Radionuclide

Any radioactive isotope (form) of any element.

RCRA [see Resource Conservation and Recovery Act (1976, 1984)]

Receptor population

People who could come into contact with hazardous substances [see exposure pathway].

Reference dose (RfD)

An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

Remedial investigation

The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)

This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

RfD [see reference dose]

Risk

The probability that something will cause injury or harm.

Risk reduction

Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

Risk communication

The exchange of information to increase understanding of health risks.

Route of exposure

The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

Safety factor [see uncertainty factor]

Sample

A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sample size

The number of units chosen from a population or an environment.

Solvent

A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

Source of contamination

The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

Substance

A chemical.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)]

Surface water

Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

Survey

A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted

by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].

Toxicological profile

An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

Toxicology

The study of the harmful effects of substances on humans or animals.

Tumor

An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor

Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].

Urgent public health hazard

A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

Volatile organic compounds (VOCs)

Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:

Environmental Protection Agency (<http://www.epa.gov/OCEPAterms/>)

National Center for Environmental Health (CDC)
(<http://www.cdc.gov/nceh/dls/report/glossary.htm>)

National Library of Medicine (NIH)
(<http://www.nlm.nih.gov/medlineplus/mplusdictionary.html>)

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