

Health Consultation

ACME STEEL COKE PLANT

11236 SOUTH TORRENCE AVENUE

CHICAGO, COOK COUNTY, ILLINOIS

EPA FACILITY ID: ILN000509241

AUGUST 24, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation 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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Prepared By:

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

Purpose

The Illinois Environmental Protection Agency (Illinois EPA) has requested that the Illinois Department of Public Health (IDPH) evaluate site information and available environmental data for the ACME Steel Coke Plant site. In response to this request, IDPH evaluated the information available to determine if contaminants in soil and groundwater currently pose a public health hazard.

Background and Statement of Issues

Site Location and Description

The ACME Steel Coke Plant site is on about 104 acres of land at 11236 South Torrence Avenue in Chicago, Illinois. Industrial, agricultural, and residential properties surround the site. The facility is bordered by Torrence Avenue on the east, a few residences to the south, a rail line and a wetland site known as “Interlake Property” to the west, and a vacant property to the north (Figure 1). More residences are about 1,000 feet north of the site. Lake Calumet is about 0.8 miles west of the site. The Calumet River is about 0.3 miles east of the site and Lake Michigan is about 3 miles east-northeast of the site.

This area was first industrialized in the late 1800s, and a coke plant has operated on the site since at least 1905. The plant operated under various names and owners until Acme Steel Company merged with the previous owners in 1964. The coke plant began to shut down operations in late 2001 (Illinois EPA 2005).

Also known as the “Chicago Coke Plant,” operations at this site produced coke from coal. This process involved the destructive distillation of coal in coke ovens without the presence of oxygen. The coke was then shipped to another facility to be used to extract iron from ore. Gaseous waste produced in the coking process included hydrogen, methane, carbon monoxide, carbon dioxide, ethane, hydrogen sulfide, ammonia and nitrogen, which were condensed, cooled, and compressed. Cleaned “coal gas” was recycled back into the coal ovens or sold as fuel (USEPA 1995). Liquid wastes included water, tar, and crude light oil. Solid waste included coal dust, heavy hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs) (USEPA 1995).

The site is primarily flat. Coal fines and cinders disposed of on the site have created some elevations and depressions that cause surface water to flow in various directions on the site. Waste materials also were used to create berms and ditches on the site. Surface water exists on the site in three main areas: 1) a settling basin on the southeast corner of the site, 2) a pond area on the northwest corner of the property, and 3) a former waterway that flowed thorough the west-central portion of the site. A french drain system collects surface water run-off and directs it to a sump that is pumped to the sanitary sewer (Illinois EPA 2005).

Illinois EPA began investigating the site in April 2005 and conducted limited environmental sampling in May 2005. Sampling included sediment, shallow groundwater, soil, and surface and subsurface waste material that would be representative of the different sections of the site. The

majority of samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, metals, and cyanide (Illinois EPA 2005).

About 20 buildings and several above ground storage tanks remain on the site. In addition, several drums, cylinder tanks, lead-acid batteries, and a sulfuric acid tank are on the site, as well as some open pits. These abandoned structures are in various conditions of decay and pose a physical hazard to trespassers.

A website entitled “Chicago Snapshot” includes a person’s diary describing photos taken while exploring the site after the plant ceased operations. The website includes the opportunity for persons viewing the site to post comments on the website. The posted comments include former workers and those drawn to explore the “industrial beauty” of the site (Chicago Snapshot 2006).

According to the “Chicagoist” web site, a group of local preservationists, environmentalists, and historians desire to save the Acme facility and have it registered as an endangered historic place. The group’s plan is to turn the buildings into a museum that would preserve the history of the steel industry in southeast Chicago (Chicagoist 2004).

Site Visit

IDPH staff visited the site on February 27, 2006. The perimeter of the ACME Steel Coke Plant property is fenced; however, several gaps in the fence provide access to anyone desiring to explore the site on foot. Vehicular access was restricted by locked gates and concrete barriers. Coal fines, cinders, and sparse vegetation cover the site. Tire tracks leading onto the site at the main gate along Torrence Avenue suggest that authorized access of the property still takes place. The nearest homes are south of the site along Torrence Avenue and the access road along the southern site boundary. Residents of these low-income homes use public water. A residential neighborhood is about 1,000 feet north of the site. The Calumet River is about 0.3 miles east of the site and Lake Calumet is about 0.8 miles west of the site. Groundwater flow at the site is to the east.

Discussion

Chemicals of Interest

IDPH compared the results of each environmental sample with the appropriate comparison values used to select chemicals for further evaluation for carcinogenic and noncarcinogenic health effects. Chemicals found at levels greater than comparison values or those for which no comparison values exist were selected for further evaluation (Attachment 1).

The chemicals of interest in soil, waste material, and sediment are arsenic, lead, manganese, benzidine, and polycyclic aromatic hydrocarbons (PAHs) (Tables 1 & 2). Of these, benzidine

and PAHs are of greatest interest because the levels of these chemicals are so high in relation to their comparison values.

The chemicals of interest in groundwater are benzene, cyanide, manganese, and mercury (Table 3). Of these, benzene was detected at levels more than 70 times the drinking water standard.

In addition to these chemicals of interest, several other chemicals were analyzed, but with detection limits greater than the comparison values used. Therefore, more chemicals of interest may exist; however, we will base our evaluation of the site on the known chemicals of interest. IDPH will recommend that Illinois EPA use lower detection limits as the site is evaluated further.

Exposure Evaluation

A chemical can cause an adverse effect only if people contact it at a sufficient level for a sufficient time. That requires a source of exposure, an environmental transport medium, a point of exposure, a route of exposure, and a receptor population. An exposure pathway is complete if all of the components are present, and people were exposed in the past, are currently exposed, or will be exposed in the future. If parts of a pathway are absent or if data are insufficient to decide whether the pathway is complete or whether exposure could occur at some time (past, present, future), then a potential exposure pathway exists. If part of an exposure pathway is not present and will never exist, the pathway is incomplete and can be eliminated from further consideration.

Given current conditions, persons trespassing onto the site can be exposed to contaminants in soil, waste material and sediments. Residents may have been exposed to dust blown from the site and to emissions from the coke plant during the years it was in operation.

Although contaminants exist in shallow groundwater beneath the site, no one drinks this water. Residents who live near the site use public water drawn from Lake Michigan and would not be exposed to the chemicals in the area groundwater. Groundwater flow from the site would not affect nearby homes.

Trespassers

Trespassers may be exposed to contaminants in on-site soil, wastes, and sediment by dermal contact. If dust is stirred up, particles could be inhaled or ingested.

For trespassers, IDPH assumed that middle school aged children (40 kg) to adults (70 kg) would come onto the site 50 days per year for 7 years of their lifetime. IDPH assumed that trespassers would incidentally ingest 150 milligrams of soil daily from hiking and digging activities, and would be exposed to the maximum level of contaminants in soil.

On the basis of the above exposure scenario, child and adult trespassers could be exposed to benzidine and PAHs at levels that could pose a moderate increased risk of cancer. In this scenario, no adverse health effects would be expected from exposure to arsenic, lead, and manganese.

Former Workers

Former workers, especially those who worked with waste materials, may have been exposed to contaminants in on-site soil, wastes, and sediment. Some former workers likely have greater exposures because they handled these materials and were close to the operations. Many years of operation occurred prior to workplace and environmental regulations.

For workers, IDPH assumed that adults (70 kg) would be exposed to the maximum level of chemicals detected and would incidentally ingest 100 milligrams of soil a day for 250 days per year for 20 years.

On the basis of that exposure scenario, workers may have been exposed to benzidine and PAHs at levels that could pose a moderate increased risk of cancer. In this scenario, no adverse health effects would be expected from exposure to arsenic, lead, and manganese.

Residents

To date, dust or soil samples have not been collected from residential properties adjacent to the site. Residents adjacent to the site may be exposed to elevated levels of chemicals in their household dust and, in the past, nearby residents may have experienced exposures through air emissions from the facility. Particles emitted into the air from the coking process eventually settle onto soil and household surfaces. Although no air data have been reviewed for this site, in the past, before engineered air controls were installed in these operations, fumes and particles likely existed.

Toxicological Evaluation

The likelihood that a person would experience adverse health effects depends upon the frequency and length of exposure, the age, body weight, and health status of the individual; the levels of the metals encountered; and the toxicity of individual metals. Exposure varies from person to person. Even persons working side-by-side can have different personal habits (e.g., smoking, nail biting) that could result in large differences in exposure.

Much information regarding adverse health effects from exposure to hazards is based on exposure to a single substance. Whether interactions among mixtures of metals and PAHs increase or diminish adverse effects is uncertain. The following sections will discuss chemicals to which persons may be exposed at sufficient levels to cause adverse health effects.

Benzidine

Child and adult trespassers and former workers may be exposed to low levels of benzidine in soil, waste, and sediments. Long-term exposure to low levels of benzidine may lead to an increased risk of cancer of the urinary bladder. The Department of Health and Human Services, the World Health Organization, and the U.S. Environmental Protection Agency (USEPA) have determined that benzidine is a human carcinogen (ATSDR 2001).

Cancers caused by chemical exposure often do not appear until 10 or more years after exposure. Also, cancers caused by chemicals cannot be distinguished from cancers that occur spontaneously. Other than possible short-term skin irritation, no other adverse health effects would be expected from exposure to benzidine at the site.

Polycyclic Aromatic Hydrocarbons (PAHs)

Benzo(a)pyrene (BaP) is one of the most potent PAHs and probably one of the most studied. Little is known about many of the other PAHs. USEPA has developed toxicity equivalency factors (TEFs) for many of the PAHs on the basis of their toxicity relative to BaP. These TEFs can be used to estimate the potential for adverse human health effects from exposure to mixtures of PAHs. IDPH converted the PAH results to BaP equivalents for evaluation of potential cancer risk.

Child and adult trespassers and former workers may be exposed to low levels of PAHs in soil, waste, and sediments. Long-term exposure to low levels of PAHs may lead to an increased risk of stomach and skin cancer. The Department of Health and Human Services has determined that that some PAHs may reasonably be expected to be carcinogens (ATSDR 1995).

Animal studies also have shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short-term and long-term exposure. These effects have not been seen in people.

Community Health Concerns

The local residential community has expressed concern about emissions from the site during its years of operation, but this concern has waned since the closure of the facility. An area group of local preservationists, environmentalists, and historians is concerned that the property may be lost as a piece of Chicago history. They desire to save the Acme facility and have it registered as an endangered historic place.

Child Health Considerations

IDPH recognizes that children are especially sensitive to some contaminants. Children trespassing onto the site may be exposed levels of benzidine and PAHs that could increase their lifetime risk of cancer and result in adverse skin effects. Trespassing children may also be at risk to physical hazards at the site.

Conclusions

IDPH concludes that exposure to contaminated surface materials and sediments at the Acme Steel Coke Plant site poses a public health hazard to trespassers. Former workers also may have been exposed to contaminants on the site. In addition, remaining buildings at the site pose a

physical hazard to trespassers. IDPH has observed evidence of trespassing onto the site, so this exposure pathway is complete. Nearby residential properties have not been sampled to date.

Recommendations

IDPH recommends that

- Illinois EPA restrict access to the site by overseeing the installation and repair of a perimeter fence.
- Illinois EPA conduct further environmental sampling, including off-site sampling of adjacent residential properties, to determine if the site warrants further action, including listing on the National Priorities List.

Public Health Actions

IDPH staff have reviewed the results from the 2005 Illinois EPA investigation and determined that adverse health effects could occur if people trespass regularly on the site. The recommendation to repair the fence should eliminate this exposure pathway.

IDPH also has recommended that Illinois EPA conduct additional off-site sampling to determine if contamination has migrated off the site.

When additional environmental sampling is performed, IDPH staff will provide a health-based evaluation of these data for the residents and participating agencies.

Preparers of Report

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References

Agency for Toxic Substances and Disease Registry. Toxicological profile for benzidine. Atlanta: U.S. Department of Health & Human Services; September 2001.

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http://www.chicagosnapshot.com/cs/archives/2004/08/acme_steel_coke_20.php
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Accessed February 2006.

Illinois Environmental Protection Agency. CERCLA Combined Assessment Report for Acme Steel Coke Plant. September 15, 2005.

Table 1. Chemicals of Interest in Soil and Waste Material at Acme Steel Site in milligrams per kilogram (mg/kg).

Chemical	Greatest Level Detected	Number of Samples Exceeding Comparison Value	Comparison Value
Arsenic	140	2/20	20 EMEG
Lead	1,130	1/20	400 IDPH
Manganese	5,700	1/20	3,000 RMEG
Benzidine	690	3/15	0.003 CREG
Polycyclic Aromatic Hydrocarbons as Benzo(a)pyrene	1,652	15/15	0.1 CREG

USEPA has developed toxicity equivalency factors (TEFs) for many of the PAHs on the basis of their toxicity relative to BaP. These TEFs can be used to estimate the potential for adverse human health effects from exposure to mixtures of PAHs.

EMEG – Environmental Media Evaluation Guide

IDPH – Illinois Department of Public Health Lead Poisoning Prevention Code

RMEG – Reference Dose Media Evaluation Guide

CREG – Cancer Risk Evaluation Guide

Table 2. Chemicals of Interest in Sediment at Acme Steel Site in milligrams per kilogram (mg/kg).

Chemical	Greatest Level Detected	Number of Samples Exceeding Comparison Value	Comparison Value
Benzidine	46	6/6	0.003 CREG
Polycyclic Aromatic Hydrocarbons as Benzo(a)pyrene	681	6/6	0.1 CREG

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CREG – Cancer Risk Evaluation Guide

Table 3. Chemicals of Interest in Groundwater at Acme Steel Site in micrograms per liter (µg/L).

Chemical	Greatest Level Detected	Number of Samples Exceeding Comparison Value	Comparison Value
Manganese	1,520	6/6	500 RMEG
Mercury	2.6	2/6	2 MCL
Cyanide	591	3/6	200 MCL
Benzene	370	4/6	5 MCL

RMEG – Reference Dose Media Evaluation Guide

MCL – Maximum Contaminant Level

Table 4. Summary of Estimated Increased Cancer Risks for Trespassers and Workers

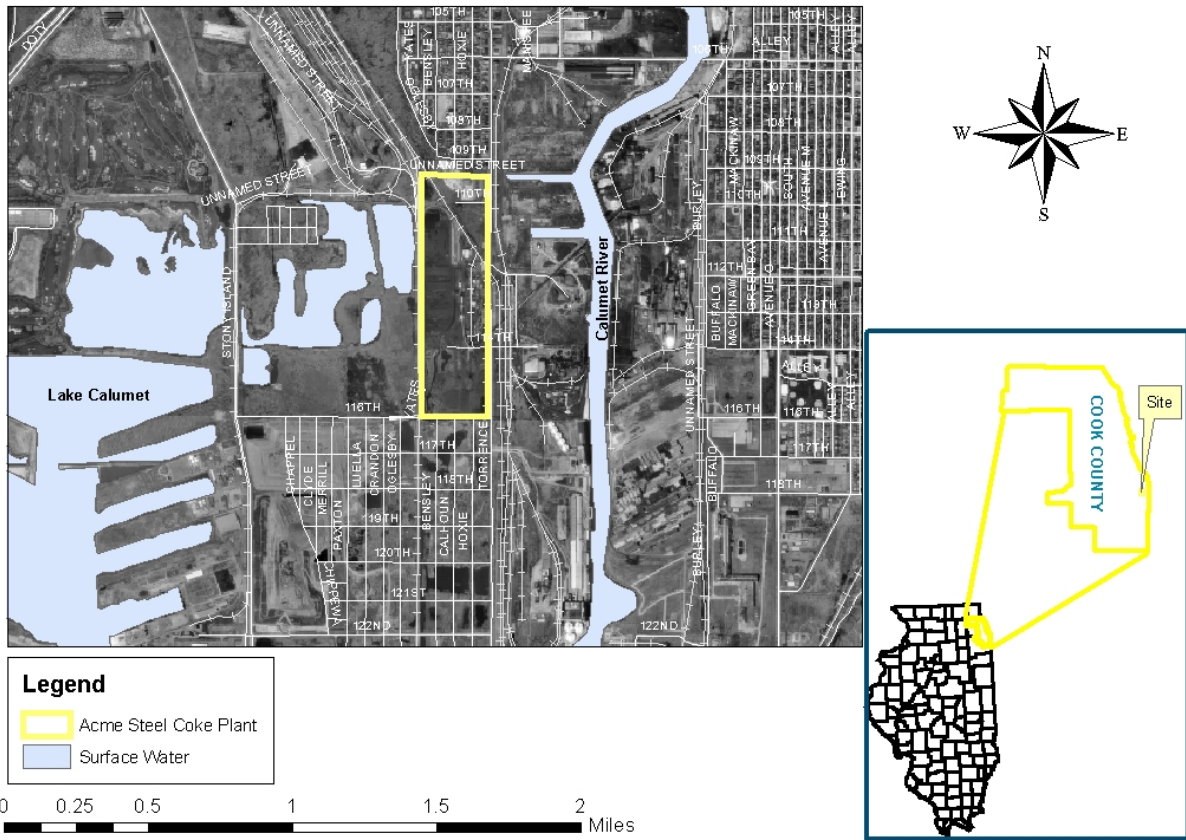
Chemical	Estimated Dose (milligrams per kilogram-day)	Cancer Potency Factor	Estimated Increased Cancer Risk
<i>Trespasser Scenario</i>			
Arsenic	5 E-5	1.5	7 E-5
Benzidine	2 E-4	230	5 E-2
PAHs as Benzo(a)pyrene	6 E-4	7.3	4 E-3
<i>Worker Scenario</i>			
Arsenic	6 E-5	1.5	9 E-5
Benzidine	3 E-4	230	7 E-2
PAHs as Benzo(a)pyrene	7 E-4	7.3	5 E-3

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For workers, IDPH assumed that adults (70 kg) would be exposed to the maximum level of chemicals detected and would incidentally ingest 100 milligrams of soil a day for 250 days per year for 20 years.

Figure 1. Acme Steel Coke Plant Site Location Map



Comparison Values Used In Screening Contaminants for Further Evaluation

Environmental media evaluation guides (EMEGs) are developed for chemicals on the basis of their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive populations and are not action levels, but rather comparison values. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Reference dose media evaluation guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

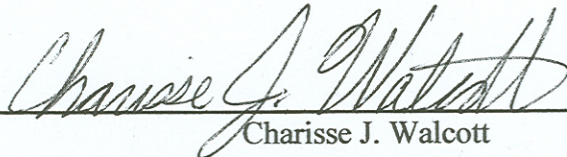
Cancer risk evaluation guides (CREGs) are estimated contaminant concentrations that are based on a probability of 1 excess cancer in 1 million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.

Maximum contaminant levels (MCLs) have been established by USEPA for public water supplies to reduce the chances of adverse health effects from contaminated drinking water. These standards are well below levels for which health effects have been observed and take into account the financial feasibility of achieving specific contaminant levels. These are enforceable limits that public water supplies must meet.

Lifetime health advisories for drinking water (LTHAs) have been established by USEPA for drinking water and are the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects over a lifetime of exposure. These are conservative values that incorporate a margin of safety.

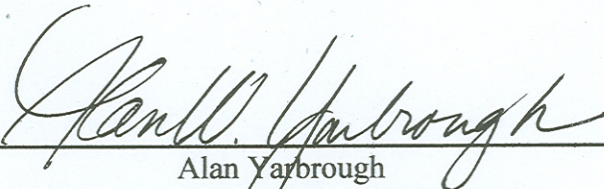
Certification

This Acme Steel Coke Plant public health consultation was prepared by the Illinois Department of Public Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.



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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



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