Public Health Assessment for

BIG JOHN SALVAGE – HOULT ROAD SITE
FAIRMONT, MARION COUNTY, WEST VIRGINIA
EPA FACILITY ID: WVD054827944
MARCH 14, 2005

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.

Agency for Toxic Substances & Disease Registry.. Julie L. Gerberding, M.D., M.P.H., Administrator
Thomas Sinks, Ph.D., M.S., Acting Director

Division of Health Assessment and Consultation…. .... William Cibulas, Jr., Ph.D., Director
Sharon Williams-Fleetwood, Ph.D., Deputy Director

Community Involvement Branch .... Germano E. Pereira, M.P.A., Chief

Exposure Investigations and Consultation Branch..Donald Joe, M.S., Deputy Branch Chief

Federal Facilities Assessment Branch .... Sandra G. Isaacs, B.S., Chief

Superfund and Program Assessment Branch ....Richard E. Gillig, M.C.P., Chief

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PUBLIC HEALTH ASSESSMENT

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FAIRMONT, MARION COUNTY, WEST VIRGINIA

EPA FACILITY ID: WVD054827944

Prepared by:

West Virginia Department of Health and Human Resources
Bureau for Public Health
Office of Environmental Health Services
Public Health Sanitation Division

Under a Cooperative Agreement with
The U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Atlanta, Georgia

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Executive Summary

The Big John Salvage - Hoult Road (Big John Salvage) site is an abandoned salvage facility in Fairmont, Marion County, West Virginia. The site is located in a mixed industrial/residential area. The site is approximately 20 acres in size and lies along the western edge of Hoult Road (Co. Rd. 72-2).

This site was used for many years by the Reilly Tar and Chemical Corporation (RTCC) as a coal tar refinery. RTCC processed approximately 12,000 gallons of crude tar waste from the nearby Domestic Coke Corporation and Dupont Coke plant daily from 1932 until 1973. In January 1973, RTCC sold its property to Big John Salvage. Big John Salvage operated a metal, glass, and oil salvaging operation until its closure around 1985.

This site was added to the National Priorities List (NPL) on July 27, 2000, because of on-site chemical contamination and off-site contamination of an adjacent stream and the Monongahela River. As mandated by Congress, the Agency for Toxic Substances and Disease Registry (ATSDR) and the West Virginia Department of Health and Human Resources (WVDHHR) have prepared this public health assessment (PHA) for the Big John Salvage site. WVDHHR and ATSDR staff evaluated data pertaining to the site. This PHA evaluates whether exposure to site-related contaminants is occurring and whether health effects could result from exposures.

Sampling of on-site soils, sediments, waste, surface water, and air identified polynuclear aromatic hydrocarbons (PAHs) and metals as contaminants of concern at the site. Sampling data indicate that site-related contaminants have migrated off-site to the nearby Monongahela River. Other nearby sources of PAHs and metals are Sharon Steel, Westinghouse, and the Fairmont Cullet Pile.

Surface water runoff appears to be a major means of off-site contaminant migration. Runoff from the site discharges primarily into an unnamed tributary (referred to as Sharon Steel Run) which empties into the Monongahela River, a major water resource for the state. Exposure to contaminants in the Monongahela River near the site by recreational users is not likely to result in adverse human health effects.

The Big John Salvage - Hoult Road site has posed a **public health hazard** in the past and present. Exposures to hazardous chemicals on or near this site could have resulted in adverse health effects. A past and present public health hazard exists for children, trespassers, and adults on and off this site from exposures to soil, sediment, water, and waste.

- People routinely exposed to polynuclear aromatic hydrocarbons (PAHs) on- and off-site may have a significant increased risk to develop squamous cell cancers of the skin, lungs, and stomach. Exposure to PAHs in residential soil may increase the risk of cancer in children who are regularly exposed to the soil.
- Regular exposure to arsenic contamination from the site may have caused an increase in lung, skin, bladder, liver, kidney, or prostate cancers. People who have been exposed to

arsenic in the soil, sediment, water on-site, or the sediment off-site should be aware of the increased risk of skin cancers. If skin cancers occur, these people should be aware of a potential increased risk for other types of cancers. In addition, possible noncarcinogenic health effects likely from these exposures are dark corns on the skin, numbness of the hands, and feet, fatigue, headache, and dizziness.

- Lead exposures may have caused neurological effects, such as decreased learning ability or developmental effects if fetuses were exposed to lead while in the womb. These effects could have occurred in children, trespassers, and adults both on and off the site.
- Exposures to copper in the soil at this site could have caused short-term nausea, vomiting, and abdominal pain in children and adults in the past.

WVDHHR based the following conclusions on limited fish tissue data taken over 15 years ago. WVDHHR believes that these conclusions are prudent to protect the public health until additional fish tissue data is collected. They are not, however, a formal fish advisory. Based on this limited and outdated data, women of child-bearing age and young children should limit the amount of fish, other than channel catfish, eaten from this area to less than one meal per week. There is a current fish advisory for channel catfish from the Monongahela River. It advises that channel catfish should be eaten 6 times a year or less due to the presence of polychlorinated biphenyls (PCBs). WVDHHR recommends that the EPA collect fish tissue samples from this area and test, at a minimum, for polynuclear aromatic hydrocarbons, lead, mercury, aldrin, dieldrin, chlordane, heptachlor epoxide, and Aroclors.

The amount of mercury vapors may have been sufficient to cause health problems in the past to people who inhaled vapors on-site. An estimate of exposure doses cannot be calculated from available data.

The future conditions at the Big John Salvage - Hoult Road site cannot be predicted because of ongoing EPA removal actions. This site is classified as an **indeterminate public health hazard** for the future. Current exposures to hazardous chemicals have been reduced because of the EPA removal actions. Access to the site has been restricted by new fencing and the posting of a guard during the removal actions. Trespassing and land-based recreational activities near the site may continue to expose people to hazardous chemicals.

Background

Site History

The Big John Salvage - Hoult Road (Big John Salvage) (a/k/a Big John's Salvage - Hoult Road site) site is an abandoned salvage facility located in Fairmont, Marion County, West Virginia. Big John Salvage (the site) was originally owned and operated by the Reilly Tar and Chemical Corporation (RTCC) from 1932 until 1973. The RTCC processed approximately 12,000 gallons of crude tar waste daily from the nearby Domestic Coke Corporation (now the Sharon Steel National Priorities List [NPL] site) and the Dupont coke plant in Belle, West Virginia [1, 2]. Crude tar was pumped from tank cars to storage tanks and later separated by distillation and condensation processes. The creosote product was removed, stored, and sold as a wood preserving compound. The distillate oils were removed and treated at an extraction unit to remove phenol. The oil would then be cooled to remove naphthalene, which was stored on-site. Remaining crude acids were shipped to other RTCC facilities for final processing. Tar was another by-product of the process [2].

Wastes generated from the coal tar distillation processes were retained in a pond near the southern property line. This pond also received wastes from three on-site sewers and several drainage ditches. All cooling waters, acid waters, and tar wastes were supposed to pass through the pond. Discharge from the retention pond flowed through a pipe in the center of the pond into Sharon Steel Run, which discharged into the Monongahela River [2]. No other physical barriers blocked pollutants from transport to the stream. In 1940, the West Virginia Department of Health (now West Virginia Department of Health and Human Resources [WVDHHR]) investigated the RTCC as a potential source of phenol and tar contamination at the Morgantown water plant, 15 miles downstream from this site [1]. In 1960, the RTCC spilled approximately 20,000 gallons of coal tar on-site. Some of the coal tar subsequently flowed into the Monongahela River [3]. Coal tar seeps located on the southern portion of the site were observed as late as 2001 at the point where Sharon Steel Run enters the Monongahela River [4]. Cleanup efforts from 1983 through 1999 removed more than 10,000 tons of coal tar waste solids and thousands of tons of contaminated soil [5, 6]. In 1999, approximately 2,500 square feet of coal tar-contaminated soil was found in the eastern portion of the site near Sharon Steel Run [2]. The US Environmental Protection Agency (EPA) has been conducting a removal action on-site since late 2000.

In January 1973, the RTCC sold the property to Big John Salvage. In 1976, Big John Salvage purchased additional land from the Mar-Mar Corporation, part of the Westinghouse Electric and Manufacturing Corporation facility (Westinghouse). The Big John Salvage facility was a metal, glass, and oil salvage company operating at this site from 1973 until 1984. In 1981, Big John Salvage received 1,600 tons/year (tons/yr) of scrap fluorescent lights, 75 tons/year of lead dust, 25 tons/year of used oil and spent solvents, about 12 tons/year of used xylene coating solution, and mercury contaminated clothing from the nearby Westinghouse facility [7]. Some of the drums found on-site were labeled as containing acetone, xylenes, alcohol, or turpentine [8].

Big John Salvage crushed fluorescent lights and washed the crushed glass as it moved along a conveyor belt [9]. The wash water drained off-site into Sharon Steel Run. Workers stood upwind of the conveyor belt during most of the process. The bulbs contained a variety of heavy metals. The piles of broken glass (cullet) were found to contain aluminum, arsenic, chromium, lead, mercury, strontium, and vanadium [10-12]. Fluorescent light bulbs currently manufactured by Westinghouse contain 0.02% elemental mercury by weight [13]. Assuming that the bulbs crushed by Big John Salvage contained this amount of mercury, crushing 1,600 tons of bulbs (the amount received in 1981) would release 640 pounds of mercury to the environment. A large amount of cullet remained on-site after the site was closed. In 1999, cullet was observed spread over more than 2 acres. In addition, on-site cullet piles were estimated to total 360 cubic yards [2, 14]. Cullet apparently washed from the site and was observed in the sediment of Sharon Steel Run. Nearly 4,000 tons of cullet were removed during the 2000-2001 EPA removal action [15].

Big John Salvage dumped waste oil from drums into a large underground tank. Workers were splattered with the oil during this process [9]. The drums were removed to another site owned by this firm for crushing and recycling. In May of 1998, the EPA began the removal of 12,000 gallons of contaminated oil containing mercury (maximum concentration 400 parts per million or ppm), methylene chloride (1,100 ppm), 1,1,1-trichloroethane (110 ppm), carbon tetrachloride (15 ppm), napthalene (270 ppm), and numerous polynuclear aromatic hydrocarbons (PAHs) from the site [16].

The site has not been used for any salvaging or crude tar operations since Big John Salvage ceased operations. The site is currently owned by Steel Fabricators, Inc. which removed some timber from the site in 1998. This increased the erosion of materials from the site [17].

EPA assumed that all on-site soil was contaminated, on the basis of 1999 results [2]. This site was included in the National Priorities List (NPL) on July 27, 2000, because of widespread chemical contamination on-site, in an adjacent stream, and in the Monongahela River. The on-site contamination was determined to be contributing to environmental contamination associated with the Monongahela River [18].

Site Description

The Big John Salvage site is located within Marion County, which is part of the Valley and Ridge Physiographic Province in West Virginia (Figure 1). The location coordinates are 39° 29' 54" N and 80° 07' 17" W. The site is approximately 20 acres in size and lies along the western edge of Hoult Road (Co. Rd. 72-2) approximately 1,320 feet east of the Monongahela River near mile marker 127 [14]. The northern portion of the site is relatively flat. This was the area used by the refinery and the recycling operations. The southern portion of the site is very steep [17]. Features noted in this site description are indicated in Figure 2.

Sharon Steel Run (or Unnamed Tributary #1) is a perennial stream that flows westward along the southern border of the site for approximately 0.25 miles before discharging into the Monongahela River. Sharon Steel Run receives surface water runoff from the majority of the site, including the coal tar seeps and the cullet areas as well as drainage from Sharon Steel. Unnamed Tributary #2 flows along the northern border of the site and is an intermittent stream. Unnamed Tributary #2 is not considered to be a major contributor to the contaminant surface water migration pathway [18]. One on-site pond was created to collect the discharges from RTCC. Three ponds were created by Big John Salvage to collect the drainage from the cullet washing operations. A fourth pond was created by the EPA as part of the 1998 removal action [17].

The site is bordered on the north and south by woods. Another Superfund site, Sharon Steel Corporation (also referred to as Domestic Coke Corporation, Fairmont Coke Works, or the Exxon site), is located southeast of the site. The Westinghouse property (now owned by Viacom, Inc.), the former Creative Labels plant, and the Fairmont Cullet pile (another fluorescent light bulb disposal area) lie northwest of the site. A former strip mine is located south of the area where the refinery was located. A mixed industrial/residential area lies to the east of the site.

One or two residences were located on the site when it was owned by Big John Salvage. Currently, the nearest residence is approximately 200 yards from the site boundary to the northwest. Another residence is located to the east, approximately 200 yards from the site. Approximately 18 residences are within 0.25 mile of this site. An additional 41 residences and five small businesses are between 0.25 and 0.5 mile of the site. Approximately 130 people live within a 0.5-mile radius of the site. There are no known schools, day-care facilities, or hospitals within a 1-mile radius of this site.

According to the 2000 Census data, approximately 2,400 people live within a 1-mile radius of the site. Of these people, 92% were white and 8% were black or African Americans. Of the residents located within the 1-mile radius, 120 (5%) are 4-years-old or younger, 336 (14%) are between 5 and 18-years-old, 1,464 (61%) are between 19 and 64-years-old, and 480 (20%) are 65 years of age or older.

The Fairmont Water Works has provided public water to all the residents within the 1-mile radius since the 1920s. The water intake for the Fairmont Water Works is more than 3 miles upstream (on the Tygart River) from any area of contamination from this site. There are no drinking water intakes on the Monongahela River within 15 miles downstream of the site. Because of the distance to this intake, no site-related contaminants are expected to be currently distributed to consumers in public water. However, an investigation in 1940 indicated that noticeable amounts of contaminants that may have come from this site reached the water intake 15 miles downstream. Public water test data does not exist for this time period that would allow an assessment of any exposures. Groundwater around this site is considered unusable due to poor yield and/or quality. There are no known water wells existing in a 1-mile radius of the site [18].

Site Visits

Agency for Toxic Substances and Disease Registry (ATSDR) staff visited the site on September 14, 2000, accompanied by EPA staff. The site was heavily vegetated in most areas. Standing water on-site and water in Sharon Steel Run had an oily, metallic sheen. A black, tar-like substance was observed bubbling up along the banks of Sharon Steel Run. Surface soil was stained black and black chunks of material, believed to be coal tar were observed on-site. A smell of coal tar was noted on-site and along Sharon Steel Run. Staff observed glass cullet piles in the western portion of the site. A shallow pond was within 10 feet of a cullet pile. The pond contained some glass debris and amphibious life. All-terrain vehicle (ATV) tracks were observed along an embankment close to Sharon Steel Run.

Representatives of the WVDHHR observed the site from the perimeter fence on July 31, 2003. The site was fenced on three sides. The steep southwestern part of the property is not fenced. A chain-link fence blocked access to the site along the haul road from the Marion County rail to trail area where Sharon Steel Run empties into the Monongahela River. No vegetation was observed on-site in the area visible from Hoult Road. WVDHHR representatives observed large piles of soil. These are piles of contaminated materials staged for removal. No black soil, tar smell, or water with oily or metallic sheen was observed during this site visit. Evidence of ATV activity was noted along the hillsides on both sides of Sharon Steel Run from the rail to trail area.

ATSDR held a public availability session on September 14, 2000, to gather community health concerns. The meeting was attended by representatives of ATSDR, EPA, WVDHHR, West Virginia Department of Environmental Protection (WVDEP), and various local media and officials. Residents were given an opportunity to discuss their health concerns one-on-one with attending representatives. Most residents were concerned about past exposures to former employees and nearby residents when the facility was operational and what health effects are possible from these past exposures. These questions are addressed in the Community Health Concerns section.

Discussion

Data Review and Selection of Chemicals of Concern

The on-site sources of contamination include coal tar and/or creosote seeps, glass cullet piles, and contaminated soil, sediment, and surface water. Samples collected from the coal tar seep contained the highest concentrations of PAHs detected on-site. Broken fluorescent light glass, lead dust, and waste oil are the likely sources of metal contamination at the site.

Data from the March 1999 EPA site inspection provided evidence that hazardous substances are migrating from the site into the Monongahela River [12]. The waters of the Monongahela River are contaminated with elevated levels of PAHs. Sharon Steel Run appeared to receive the major contaminants from the Big John Salvage site, not from the Sharon Steel NPL site [18]. Contamination of the Monongahela River from Sharon Steel Run is longstanding. Phenols were found in the water in the 1940s at the point where drainage from the site entered Sharon Steel Run [19].

The selection of chemicals of concern and the further analysis of these chemicals involved the use of media and health-based guidelines, called comparison values (CVs). These values are derived by various government agencies to identify contaminants that require further evaluation during the public health assessment process. CVs are very conservative (i.e., protective of public health). For chemicals that have multiple CVs, the most conservative (i.e., the lowest value) one was selected, using the ATSDR hierarchy process. CVs are used to eliminate chemicals from further consideration that are below the level where harmful health effects are likely to occur. Chemicals of concern are those that need further evaluation to determine if they *could have* caused adverse health effects. Chemicals of concern are *not necessarily* chemicals that *have* caused adverse health effects.

Tables B-1 through B-3 list chemicals of concern for data collected from 1981 through 1999. [9,10,12,20-24]. These chemicals will be reviewed further in this report.

- The *surface water on-site* contained metals (arsenic, cadmium, lead, mercury) and PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene).
- *Surface water off-site* contained metals (arsenic, cadmium, lead, manganese, mercury, vanadium), PAHs (acenapthene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, pyrene), napthalene, and 4,4'-DDT.
- *Soil on-site* contained metals (arsenic, lead, mercury), PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, carbazole, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, pyrene), and ethylbenzene.
- *Soils off-site* contained metals (arsenic, lead, mercury) and PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene).
- *Sediment on-site* contained metals (antimony, arsenic, lead, mercury) and PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene).
- *Sediment off-site* contained metals (antimony, arsenic, cadmium, lead, mercury), PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, dibenzofuran, indeno(1,2,3-cd)pyrene), naphthalene, and 2-methylnapthalene.
- *Coal tar on-site* contained metals (arsenic, lead, mercury), PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, carbazole, chrysene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, pyrene), napthalene, and 2-methylnapthalene.

In October 2000 and December 2000, EPA conducted additional sampling at the site to further characterize contaminant levels on- and off-site, to characterize the effects of removal actions, and to evaluate potential remedial worker exposure at the site [25]. Tables C-1 through C-4 list contaminants of concern selected in this process. These chemicals will be reviewed further in this report.

- The *surface water on-site* contained metals (aluminum, antimony, arsenic, barium, cadmium, cobalt, copper, lead, manganese, mercury, nickel, thallium, vanadium), and

PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, indeno(1,2,3-cd)pyrene).

- *Surface water off-site* contained metals (aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, thallium, vanadium), PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, carbazole, chrysene, indeno(1,2,3-cd)pyrene, pyrene), benzene, Aroclor-1242, hexachlorobutadiene, and N-nitroso-di-n-propylamine.
- *Soil on-site* contained metals (antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, thallium) and PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, indeno(1,2,3-cd)pyrene).
- *Sediment on-site* contained metals (arsenic, cadmium, lead, mercury) and PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, indeno(1,2,3-cd)pyrene).
- *Sediment off-site* contained metals (arsenic, cadmium, lead, mercury) and PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, indeno(1,2,3-cd)pyrene).
- *Coal tar on-site* contained metals (arsenic, mercury, thallium), PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, carbazole, chrysene, dibenzofuran, indeno(1,2,3-cd)pyrene), benzene, and napthalene.
- *Cullet (pond area)* contained metals (arsenic, mercury, and thallium)
- *Air samples on-site* contained benzene, *m*-,*p*-xylene, 1,2,4-trimethylbenzene, copper, lead, and nickel.

Air samples taken by the EPA in December 2000 could not be evaluated for aluminum, barium, calcium, chromium, iron, magnesium, manganese, potassium, sodium, or zinc because of contamination of the blanks. The reported amounts for cadmium, copper, lead, and nickel may be lower than they were in the sample because of modifications from the standard EPA method of collecting and analyzing for these chemicals.

In 1998 EPA measured and found mercury vapor in air at a maximum of 0.025 milligrams per square meter (mg/m^3), with a range of 0.003 to 0.025 mg/m^3 [16]. A 1981 notation in an inspector's notebook located in the WVDEP files indicated that volatile mercury was found in the air at levels of 0.04 - 2.5 mg/m^3. Because no quality control or quality assurance data was available, exposure doses were not calculated for inhalation of mercury.

Data from fish tissue collected in the Monongahela River near the site, between mile markers 116 and 127, were reviewed. These data were from the West Virginia Department of Natural Resources (data provided by the WVDEP) (Table D-6) [26].

Many chemicals found off-site cannot be attributed only to Big John Salvage because other nearby sites (Sharon Steel, Westinghouse and the Fairmont Cullet Pile) are associated with the same chemicals found on the Big John Salvage site. Many of the chemicals found in the fish tissue samples were not found on this site.

Quality control and quality assurance data were available only for the Roy F. Weston 1999 report and the EPA 2000 reports. The conclusions drawn from data used in this report rely on the assumption that adequate chain of custody, laboratory procedures, and data reporting for all data sets were followed, except where otherwise noted.

Human Exposure Pathway Analysis

ATSDR identifies human exposure pathways by considering five things:

(1) a source of contamination,
(2) movement of the contaminant(s) into and through the environment,
(3) a place where humans could be exposed to the contaminant(s),
(4) a way for humans to be exposed to the contaminant(s)(such as drinking the water or breathing the air), and
(5) the existence of one or more persons who may have been in contact with the contaminant(s).

Exposure pathways are considered "complete" when all five of these elements existed at some point in the past, exist in the present, or are likely to occur in the future. Exposure pathways are considered "potential" when one or more of the elements is missing or uncertain but could have existed in the past, could be occurring now, or could exist in the future. Pathways are considered to be "eliminated" when one or more of these five items do not exist or where conditions make exposures highly unlikely. The completed and potential exposure pathways for this site are summarized in Tables A-1 and A-2, respectively.

Completed Exposure Pathways

Children and Trespassers On-Site

Children (2-6-years-old) and trespassers (children 7-16-years-old) would have had free access to this site during a 50-year time period. Exposures to hazardous chemicals could have occurred in the past. Currently, access is more restricted, but still possible. Shortly after the September 2000 site visit, the fence along Hoult Road was completed. The site is currently fenced on three sides. The site is accessible by foot and ATV up the steep southern slopes. ATV tracks were observed on-site when ATSDR and EPA staff visited the site in September 2000 and July 2003. Area residents informed EPA staff that hunting takes place on the site.

Children of former RTCC and Big John Salvage employees reported that they spent hundreds of hours playing and eating lunch on-site while their fathers worked. Before 1984, the owner of Big John Salvage lived on-site with his family, which included at least one child. In 1990, an 8-year-old boy received a chemical burn while playing at this site [27].

Children and trespassers could be exposed to contaminants in surface soils, sediments, waste materials (e.g., tar seeps, glass cullet piles), and surface waters if they engage in activities which bring them into contact with these contaminated media. They may have gotten contaminated soils, sediment, waste material, or water onto their hands and accidentally ingested small amounts of contaminants as a result of eating, smoking, or other hand-to-mouth behavior. This is called incidental ingestion. Children or trespassers could have walked barefoot or played in contaminated soil or sediments or waded into contaminated surface waters present in on-site tributaries, puddles, or ponds. Exposures to chemicals can occur by adsorption of the chemical through the skin (dermal). Items on the skin can also be a source of incidental ingestion if an individual handled the contaminated material and then failed to wash the material off their hands or body within a timely fashion.

This health assessment assumed that children under 6-years-old accessed the site 4 hours a day, 180 days per year for 5 years. Persons over 7-years-old were assumed to access this site for 3 hours per day, 180 days per year for 10 years.

There is a past, completed exposure pathway for children and trespassers who were exposed to on-site soil, sediment, solids, or water. Exposures were through dermal exposures (skin contact) or through incidental ingestion. Fencing makes trespassing less likely and is assumed to have eliminated access to children. There is a current and future exposure pathway for trespassers through dermal and incidental ingestion exposures.

Off-Site Land-Based Recreational Activities

People could have been exposed to chemicals from this site while in areas near to the site. People could have been exposed to chemicals in a similar manner to the description for on-site exposures except that there would be no contact with on-site soil, coal tar seeps, and cullet piles. Data show that PAHs and metals have been and are leaving this site and contaminating water and sediments in Sharon Steel Run (Unnamed Tributary #2) and the Monongahela River.

This health assessment assumed that a 2-6-year-old child would play near the site for 4 hours a day, 180 days per year for 5 years, a 7-16-year-old child would be near the site for 3 hours a day, 180 days per year for 10 years, and an adult would be near the site for 8 hours a day, 260 days per year for 25 years.

There is a past, present, and future completed exposure pathway for exposure to off-site sediment, or water through dermal absorption or incidental ingestion of contaminants from this site.

Nearby Residents

People living near this site could have been exposed to contaminants deposited by off-site migration. In the past, the facilities operating on the site may have emitted pollutants from their stacks or from the on-site fires [18, 28]. Stack emissions may have settled into the yards and garden areas of nearby homes. There are no data to show which compounds, if any, were emitted from stacks during active operation of the facilities. In 1997, ATSDR evaluated the nearby Sharon Steel NPL site and found low levels of PAHs and other contaminants in the yards of nearby residents. These contaminants could also have come from the Big John Salvage – Hoult Road site.

This data was included in this report, because this is the same residential area that is near the Big John Salvage site [24]. These soils are assumed to still remain in the residential areas.

This assessment calculated the exposure rates of a 2-6-year-old child with exposures for 260 days per year over a 5 year period and a 7-16-year-old child with exposures for 180 days over a 10-year period.

Local residents could be exposed through incidental soil ingestion or dermal contact with contaminated soil while working or playing outside. Exposures could affect young children to a greater degree because they engage in more frequent hand-to-mouth activity. There is a completed exposure pathway for local residents for the past, present, and future through dermal and incidental ingestion pathways.

Recreational Users of the Monongahela River and Nearby Tributaries

Surface water runoff from the site flows toward the Monongahela River. The Monongahela River is commonly used for boating, swimming, water skiing, and other recreational activities. Recreational river users may have dermal exposures to chemicals in the water, may accidentally ingest contaminated water, or may come into contact with contaminated sediments. The PAH contamination on the Monongahela River has been noted in the past as a surface film or sheen on the water. This material would be expected to stick to boat hulls, swimmers, and waders. Dermal exposure to this oily film may involve a higher exposure than that found in the river water underlying the sheen [29]. Past, present, and future exposures are possible for people who use the Monongahela River or surface water draining from this site. Exposures would be through dermal or incidental ingestion of contaminants in the sediments or waters off-site. Completed pathways exist for these activities for the past, present, and future.

Consumers of Locally Caught Fish

The Monongahela River is fished near this site, between mile markers 115.4 and 130. Food chain exposures are possible if people consume fish that have been contaminated through contact with contaminated water or sediments. Persons who eat locally caught fish that have bioaccumulated chemicals will be exposed to these chemicals [18]. The most recent data from the area near this site are for fish tissue from 1985. Some of the chemicals of concern noted in fish tissue in this area were not associated with this site. There is a data gap for this health assessment, as PAHs have not been analyzed in fish tissue from this portion of the river. PAHs can accumulate in fish tissue [29]. There is a current fish advisory for channel catfish from the Monongahela River. It advises that channel catfish should be eaten 6 times a year or less due to the presence of polychlorinated biphenyls (PCBs).

Contamination is still on-site and has been demonstrated to be affecting the Monongahela River. It is assumed that the ongoing presence of contaminated sediments will pose a continuing source of contamination of fish tissue for the future. Therefore, there is a completed pathway for people who ingest locally caught fish for the past, present, and future.

Inhalation Pathway

Persons who were on-site could have inhaled contaminated ambient air when disturbing contaminated soils or waste materials while working, walking, or playing on the site. The inhalation exposure pathway is classified as a completed pathway for the past and present.

Potential Exposure Pathways

Inhalation Pathway

Data are incomplete regarding the hazards from the inhalation of mercury at this site. Inhalation of mercury vapors was possible due to the nature of the fluorescent light bulb crushing operations and the amount of mercury that was apparently released into the environment. Some of the possible health effects from breathing elemental mercury are irritation of the nose and mouth, tremor, anxiety, forgetfulness, loss of appetite, fatigue, and miscarriages. The available data are inadequate to indicate if these effects could have occurred. Additionally, no data for the amount of PAHs in the air has been collected. From the amounts of PAHs found on- and off -site, it appears likely that there were enough PAHs in the air at one time that inhalation hazards could have occurred in the past. The effects of PAH inhalation can include reduced lung function, bloody vomit, cough, and throat and chest irritation. Because of the data gap for mercury and PAHs, the inhalation exposure pathway for these chemicals for children, trespassers, nearby residents, and off-site land-based activities are all classified as potential pathways for the past and present. Trespassers on-site in the future without adequate respiratory protection could be exposed to vapors and metal-containing dust in the air.

Former Facility Workers, Reilly Tar and Chemical Corporation

Former plant employees who worked with coal tar materials as part of their occupational duties (e.g., processing, loading, or disposing of tar wastes) were likely exposed to contaminants via inhalation, direct skin (dermal) contact, or incidental ingestion. Workers may have inhaled tar fumes or breathed in tar-related constituents attached to small particles of dust as they worked around the facility. Besides breathing in the vapors, they may have contacted the coal tar constituents directly, absorbed some contaminants through the skin, or transferred some of the contaminants into their mouths through eating, drinking, smoking, or casual hand-to-mouth contact. Workers may also have been exposed to contamination in the soil, sediment, or surface water via inhalation, direct skin (dermal) contact, or incidental ingestion. In some instances, workers may have accidentally transported the contaminants home on their clothing or skin and exposed their family members. The lack of data during the operation of this facility means that the potential health effects of contamination to these workers at this site cannot be evaluated.

There is a past, potential exposure pathway for the former employees at the RTCC facility. There is no present or future exposure pathway for this population because the facility is closed.

Former Facility Workers, Big John Salvage

Former employees of Big John Salvage were exposed in the past to compounds via inhalation, skin contact, or incidental ingestion as they carried out their occupational duties at the facility. Workers may also have been exposed to contamination remaining in the environment from the RTCC operations. While at the facility, workers may have inhaled contaminants in tar fumes, dust containing metals, or chemicals, and various vapors including mercury from the fluorescent light bulbs that were being washed and crushed. Although the 1983 NIOSH study concluded that there was no health hazard associated with the air quality near the tar pits or with the glass crushing operation (as long as particulate cartridge respirators were used), the study did not test for mercury. Workers may have contacted heavy metals or coal tar constituents directly through contact with the waste materials or contaminated soil, sediment, or water. They may have absorbed some contaminants through the skin, and transferred some of the contaminants into their mouths through eating, drinking, smoking, or casual hand-to-mouth contact [9]. In some instances, workers may have accidentally transported the contaminants home on their clothing or skin and exposed their family members. The minimal data available from when the facility was operating are insufficient to evaluate the potential health effects from these exposures. Therefore there is a past, potential, exposure pathway for the former workers at Big John Salvage. There is no present or future exposure pathway for this population because the facility is closed.

Lumberjacks and Utility Workers

Workers on-site for timbering operations or utility maintenance, such as brush-hogging the gas line right of way or digging holes for utility poles, may have been exposed to contaminants in the soil, sediment, waste materials, or surface water from this site. Lumberjacks and utility workers who worked on-site without adequate protective measures may have been exposed to inhalation, dermal, and incidental ingestion hazards from the contaminated soils, sediment, water, and materials on-site. These activities could cause inhalation, incidental ingestion, and dermal exposure to the contaminants on-site. Because there is no quantitative data on the exposures to workers on-site during these activities, the exposure doses could not be calculated. Because of this data gap, the potential for adverse health effects from exposures cannot be determined. Therefore, the lumberjack and utility worker exposure pathway is classified as a potential pathway for the past, present, and future.

Users of Groundwater

The use of private wells in the area should be considered a potential future exposure pathway if groundwater is used for drinking. There are no known drinking water wells near this site at this time. There is a potential pathway for exposures from the use of groundwater, if the groundwater is contaminated from this site.

Consumers of Locally Caught Game

Eating locally caught game is a potential pathway for the past, present, and future. No data on contaminants in locally caught game is available to evaluate this pathway. Plants grown in PAH contaminated soil can accumulate these chemicals. Animals can accumulate PAHs when they eat PAH contaminated plants [29]. However, game animals move on and off contaminated sites. This reduces the amount of contamination in the meat. People may only kill and eat game animals during certain seasons, reducing their exposure to chemicals from game. Evaluating chemicals found in meat from game animals is difficult because the home range of the animal is generally unknown and may involve eating contaminated and uncontaminated plants. For these reasons, sampling game animals is not recommended.

Eliminated Exposure Pathways

Users of the Rail to Trail Area

A rail to trail area is located along the bank of the Monongahela River. People access this area infrequently. People who use this area would be unlikely to be exposed to contaminants from this site at levels that would affect the public health. Therefore, this pathway is eliminated.

Children On-Site, Present and Future

Due to the current restrictions to on-site access, the potential for children to be on-site is considered unlikely for the present and future. The exposure pathway for on-site soil, sediment, and solids is eliminated for children in the present and future.

Exposure Analysis

Chemicals of concern are listed in Tables B-1 through B-3, and C-1 through C-4. These chemicals of concern are used for the exposure dose calculations which are noted in Tables D1 through D-6 and E-1 through E-5. An exposure dose is the amount of a chemical that is ingested or absorbed per unit of body weight. The method for calculating estimated exposure doses and the assumptions used are found in Appendix F.

The calculated exposure dose takes into account exposure scenarios. These are based on conservative assumptions about past, present, and future activities on or near this site. These assumptions are conservative because they assume regular exposures for a period of many years. Few, if any, people, will actually have the amount of exposure that is assumed in these calculations. The final review of the data will discuss the conservative assumptions in conjunction with possible adverse health effects and changes in exposures over time. For instance, the assumed current inaccessibility of the site to children makes future exposures unlikely. Estimated absorbed dose calculations for skin exposures have many assumptions and use data on dermal absorption rates that may not reflect the actual exposure parameters at this site. The estimated skin exposure doses are more uncertain than the incidental ingestion exposure doses.

Estimated exposure doses were compared with an appropriate health guideline comparison value (CV). The health-based comparison values, ATSDR Minimal Risk Levels (MRLs) and EPA Reference Doses (RfDs) are comparison values that express exposure concentrations that are protective of public health. Other health-based comparison values used values from the EPA Health Effects Assessment Summary Table (HEAST) and provisional values and reference doses from the EPA National Center for Environmental Assessment (NCEA). Many factors are included in the development of these numbers to add “safety factors” to these numbers where the toxicological data is uncertain. Health guideline CVs represent the amount of a chemical per unit of body weight below which adverse health effects are not likely to occur. Some of the factors considered when selecting the appropriate health guideline CVs are the length of time of the exposure and the carcinogenic or noncarcinogenic effects of the chemical.

This analysis did not take into account other sources of exposure to these chemicals. These could include, for example, exposure to lead from lead paint.

Possible Health Consequences of Chemical Exposures - Toxicological Assessment

Noncarcinogenic effects

Estimated exposure doses were compared with health-based comparison values (Tables D 1-6, and E 1-5). Chemicals of concern whose estimated exposure doses were below these health-based comparison values were eliminated from further review because these exposures are not expected to result in adverse health effects.

The remaining estimated exposure doses were compared to doses and effects reported in published research, such as in the ATSDR Toxicological Profiles, to evaluate possible health effects from exposures to these chemicals. An exposure dose where no effects are observed is called the no-observed-adverse-effect level (NOAEL). The lowest exposure dose where an adverse health effect is observed is called the lowest-observed-adverse-effect level (LOAEL). Because exposures from multiple sources (such as sediment, water, and waste) were possible, potential cumulative adverse health effects have been considered.

The following chemicals were eliminated from further consideration for any oral or dermal exposure pathways; antimony, thallium [48] , ethylbenzene [38], 2-methylnapthalene [44], heptachlor, heptachlor epoxide [39], benzo(k)fluoranthene, carbazole, and indeno(1,2,3-cd)pyrene [45]. The estimated exposure doses for these chemicals were significantly less than the LOAEL (more than 1,000 times less) for that chemical.

Carcinogenic effects

Two chemicals, arsenic and PAHs, were found at levels where possible carcinogenic effects were likely. These two chemicals may interact. Arsenic and benzo(a)pyrene, a PAH, have been shown to cause lung cancer in hamsters. It is not known if this chemical interaction occurs in humans. No estimate was made for this potential chemical interaction.

The theoretical excess cancer risk was calculated for all chemicals that have a cancer risk evaluation guide (CREG) (Tables D1–D6 and E 1–E5). A CREG is a level of a chemical that would be expected to cause no more than one excess cancer in a million people exposed over their lifetime (70 years). Theoretical excess cancer risks were calculated using estimated noncarcinogenic exposure doses and averaging the exposures over a 70-year period. For example, a 10-year exposure period would be averaged over a 70-year lifetime. This number was multiplied by the EPA's cancer slope factor (CSF) to obtain the theoretical excess cancer risk for the exposure.

The actual risk of cancer is probably lower than the calculated number. The method assumes that there is no safe level for exposure to a carcinogen. Lastly, the method computes the 95% upper bound for the risk, rather than the average risk, which results in there being a very good chance that the risk is actually lower, perhaps by several orders of magnitude. One order of magnitude is 10 times greater or lower than the original number, two orders of magnitude are 100 times greater or lower, and three orders are 1,000 times greater or lower. Because of the uncertainties and conservative assumptions made in calculating the CSFs, the calculated excess cancer risks are only estimates of risk. The true risk is unknown and could be as low as zero.

Finally, a decision was made whether the exposure doses or cancer risks might be a health hazard, judged from a reasonable evaluation of the probable or actual exposure scenarios. Taking these uncertainties into account, theoretical cancer risks below 1 in 10,000 are considered to be a very low risk and are not discussed in the text. Theoretical cancer risks between 1 and 9.9 in 10,000 are classified as a low risk, between 10 and 99 are classified as a moderate risk, and 100 and more in 10,000 are classified as a significant risk.

Chemicals Reviewed

Arsenic

Arsenic is an element that is often found in West Virginia soils. Levels of arsenic exceeding background levels at this site were likely from coal byproducts refining and fluorescent glass recycling operations on this site.

Both squamous cell and basal cell skin cancers are more commonly seen in people who have ingested arsenic. There is evidence that people who have had arsenic-induced skin cancers after ingestion of arsenic are more likely to get liver, bladder, kidney, lung, and prostate cancers [31]. These calculations for theoretical excess cancer risk estimate the risk for skin cancers only. In this public health assessment, a significant amount of the theoretical excess cancer risk is from dermal exposure. No studies were found that associate cancer in humans with dermal exposure to arsenic [31]. Therefore, the stated theoretical excess cancer risks may be much higher than the actual risk.

Copper

Copper is a common naturally occurring element in the environment. Levels found in the soil at this site were substantially over the expected background levels of copper in the soil. The source of copper at this site is unknown.

Lead

Lead detected at this site could have come from the lead dust received from Westinghouse, lead found in gasoline (tetraethyl lead) that could have been spilled at this site, or from other unknown sources. If tetraethyl lead was on-site at one time, it is likely that it has been degraded to inorganic lead. This analysis assumes that the lead on- and off-site was in the inorganic form.

The toxic effects of lead are the same, regardless of whether lead enters the body through ingestion, inhalation, or absorption through the skin. However, studies have shown that lead in soil is not absorbed as well as lead in water. The contribution of lead absorbed through the skin to the amount of lead in the body is not well understood [41]. The inhalation exposures to lead on-site were not taken into account due to a lack of data. Other exposures to lead not associated with this site, such as lead in paint, could alter the potential adverse health effects likely to occur.

Exposures to lead are most dangerous to young and unborn children. Adults can be exposed to more lead without experiencing adverse health effects. People exposed to lead in the soil, sediments, surface water, and cullet on-site and/or to surface water and sediment of Sharon Steel Run off-site could have been exposed to enough lead to cause difficulties in learning. Young children and fetuses could have been exposed to enough lead in fish caught near this site to have caused developmental and learning difficulties if they ate a significant amount of fish from this area. This is estimated to occur if a person were to eat fish at one or more meals every day.

The effects of lead are often related to the elevation of lead in the blood. The CDC level of concern for blood lead levels in children is 10 micrograms per deciliter (µg/dL). Some researchers believe, however, that elevation of blood lead levels less than 10 µg/dL in children will cause measurable adverse health effects. Some of these effects are subtle changes in brain function (Payton et al. 1998), changes in the cardiovascular system that can be detected in children’s electrocardiograms (Silver and Rodriguez-Torres 1968), growth retardation (Shukla et al. 1989), and changes in the blood (Chisolm et al. 1985). Exposure to lead in the womb up to the time of early childhood has been shown to slow mental development and result in lower intelligence later in childhood. There is evidence that some of these effects may persist beyond childhood [41].

Mercury

Mercury was found on this site. The primary source of mercury on-site was assumed to be from the fluorescent light bulbs crushed on-site from 1973-1984. Different forms of mercury are absorbed by the body in different ways. Mercury in the environment can change into other chemical forms. The form of mercury on-site was assumed to be elemental. The form of mercury in fish in the Monongahela River near this site was assumed to be methylmercury.

Polynuclear Aromatic Hydrocarbons (PAHs)

PAHs are a group of chemicals that are formed when organic materials burn incompletely. They are very common in coal tar, soot, and tobacco and wood smoke. Food that has been grilled or smoked will contain PAHs. People can be exposed to this group of chemicals from eating food containing PAHs, breathing air that contains PAHs, or from absorption of PAHs through the skin.

Although people come into contact with mixtures of PAHs, little is known about the effects of these mixtures. Several experiments have shown that most PAH mixtures cause fewer cancers than when exposures are to individual PAHs. Other factors may increase a person’s susceptibility to the carcinogenic effects of PAHs such as exposure to the sun, smoking, liver, and skin disease, and immunodeficiency. The theoretical excess cancer risks are only estimates based on the assumptions and limitations noted.

The exposure of workers to coal tars and the creosote oils, oil mists, and pitches formed from the distillation of coal tars has been shown to increase the risk of lung and skin cancers in workers. Stomach tumors have been observed following ingestion. Lung tumors have been observed following inhalation. Squamous cell skin and lung cancers are seen after exposure to the skin. [45].

In addition to the cancers caused by absorbing PAHs into the body, many of the PAHs are thought to cause cancer by direct effects on the skin. Dermal exposure to these chemicals could have caused carcinogenic effects to the skin without being absorbed. These chemicals, found on-site, are: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene [45]. However, this effect cannot be calculated because there is no CSF for direct dermal effects.

Children, Trespassers, and Adults on-site

There is a past and current risk for cancer from exposure of children (2-6-years), trespassers (children 7-16-years-old), and adults to arsenic and PAHs in on-site soil, sediment, water, and coal tar. Actual risks of cancer may be less than calculated. There is a past and present public health hazard from copper and lead to children, trespassers, and adults on this site. Arsenic may have posed a public health hazard for noncarcinogenic effects to children who were exposed to soil, water, and sediment on-site. Inhalation of mercury vapors could have posed a public health hazard on-site in the past and may be a hazard for the present. Current restrictions to the site will further reduce exposures to these chemicals in the future.

Arsenic – noncarcinogenic effects

Possible adverse health effects from arsenic exposure on-site would be likely for persons exposed to water, soil, sediment, and coal tar on a regular basis. If all exposures to the highest amounts of arsenic at this site (water, soil, sediment, and coal tar) are added together, the estimated exposure doses to arsenic were 0.006 mg/kg/day for a child, 0.005 mg/kg/day for a trespasser, and 0.012 mg/kg/day for an adult. This assumes that the person is exposed from dermal and incidental ingestion routes. A LOAEL of 0.005 mg/kg/day of arsenic was selected as an appropriate LOAEL based on a study of arsenic exposure in drinking water by Lianfang and Jianzhong in 1994 [31]. Williams et al. (1998) determined that a 2-year-old child would only absorb a fifth of the total concentration of arsenic in the soil [31]. Taking the limited absorption from the soil into account, the adjusted estimated exposure dose to people exposed to all on-site media would be still be within the range where adverse health effects could occur. Possible harmful (adverse) health effects could be the development of dark warts or corns on the skin, numbness of the hands and feet, fatigue, headache, and dizziness.

Arsenic – carcinogenic effects

The highest risk from exposure to on-site arsenic is from an adult's skin exposure to soil on-site. This risk was calculated at 52 in 10,000. If a person were to contact all site media - soil, water, sediment, and coal tar - at the maximum measured concentration as a child, trespasser, and as an adult in a prolonged and persistent manner (as per the assumptions used for calculating exposure doses), the calculated risk would be 70 in 10,000. This is a moderate level of risk. As a result of the current soil and sediment removal activities and restrictions to access to this site, it is unlikely that a person could be exposed to these media at these rates throughout a lifetime.

Copper

Copper can cause nausea, vomiting, and abdominal pain at levels of 0.01 - 0.07 mg/kg/day after short-term (acute) oral exposures. Estimated exposures of children, trespassers, and adults to the soil were sufficient to produce these effects [47]. Judging from available data, no long term health effects would be expected.

Lead

Adverse health effects have been possible for children, trespassers, and adults exposed to lead on–site. The estimated noncarcinogenic exposure doses to lead from on-site media, water, soil, sediment, and coal tar were calculated. Note that combined exposures were rounded.

	Incidental Ingestion	Dermal	Both exposures
Child	0.038 mg/kg/day	0.018 mg/kg/day	0.055 mg/kg/day
Trespasser	0.015 mg/kg/day	0.018 mg/kg/day	0.032 mg/kg/day
Adult	0.014 mg/kg/day	0.051 mg/kg/day	0.065 mg/kg/day

An LOAEL of 0.05 mg/kg/day, derived from a study by Rice in 1985, was selected as being appropriate LOAEL for this assessment. Rice found that rhesus monkeys had less ability to learn after almost daily exposure to lead acetate at 0.05 mg/kg/day over a period exceeding 1 year [41]. If the dose for incidental ingestion and dermal exposures for all media are considered, it appears that this adverse health effect is possible for people exposed to lead on-site in water, soil, sediment, and coal tar.

Mercury

The maximum estimated exposure from soil, incidental ingestion, and skin exposure to mercury on-site was 0.013 mg/kg/day for children, 0.001 mg/kg/day for trespassers, and 0.014 mg/kg/day for adults. These exposures to elemental mercury were 33 times less than the LOAEL of 0.46 mg/kg/day, the level determined by Deiter et al. in 1992 after feeding mercuric chloride to rats [43]. That study found changes to kidney weight and other renal effects in rats exposed to mercury. Elemental mercury is absorbed at a much lower rate than mercuric chloride. On the basis of this research and the data for incidental ingestion and dermal effects *only*, the mercury found in soil, sediment, water, and coal tar is not expected to cause adverse health effects.

Metallic mercury is absorbed very rapidly when inhaled, which is a very significant potential exposure pathway at this site. There are indications that mercury vapors may have been sufficient to have caused health problems to people who inhaled these vapors on-site in the past or to cause health problems in the present. Due to a lack of credible data, the inhalation exposure cannot be assessed.

Polynuclear Aromatic Hydrocarbons (PAHs) – Noncarcinogenic Effects

Noncarcinogenic effects from exposure to PAHs on-site are not likely for past or present exposures. The largest estimated exposure dose - for noncarcinogenic effects - was to an adult who was exposed to PAHs in soil, sediment, and water on-site through both incidental ingestion and dermal routes. The total exposure was calculated to be 4.466 mg/kg/day. This is 28 times less than the LOAEL (125 mg/kg/day) for effects to mouse livers observed by EPA in a 1989 study [45]. The effects to mouse livers were observable, but not considered serious. Humans absorb a smaller amount of PAHs than do animals. Therefore, exposures were not great enough to be likely to cause adverse noncarcinogenic health effects. Complete data are not available for the amount of PAHs in the air. No estimate can be made for an inhalation hazard from PAHs. If exposure from this source were known, this conclusion might be changed.

Polynuclear Aromatic Hydrocarbons (PAHs) – Carcinogenic Effects

There has been and continues to be a significant risk for cancers induced by PAHs in on-site media through incidental ingestion and skin contact to PAHs. A comparison of 1981-1999 data to 2000-2001 data showed a decrease in this risk. The potential for prolonged exposure to PAHs on the skin was reduced after workers were no longer at the site regularly and has been reduced in recent years with the recent removal of visible coal tar seeps.

The greatest theoretical excess cancer risk was found through exposure to benzo(a)pyrene from coal tar on the skin. This risk was more than 3,700 in 10,000 people. The theoretical excess cancer risk to on-site exposures to all the PAHs on this site was calculated to be a greater than one in three risk. This risk was calculated for a person that was routinely exposed to soil, water, sediment, and coal tar on this site from the age of 2-years through adult. The exposures would be through the skin and incidental ingestion.

Benzo(a)pyrene is known to cause skin cancer in mice. People are not normally exposed to this chemical alone. Benzo(a)pyrene usually exists in a mixture with other PAHs. Exposure of workers to coal tars and the products that come from distillation of coal tars (all containing PAHs) have been shown to increase the risk of lung, stomach, and skin cancers [45].

Land-based Recreational Activities Off-Site

There has been a past and present (noncarcinogenic) public health hazard to children, trespassers, and adults from off-site exposures to lead. Arsenic was not found off-site at levels that were likely to cause adverse noncarcinogenic effects.

Arsenic – noncarcinogenic effects

The highest estimated exposure dose calculated for exposure to water and sediment off-site through both incidental ingestion and dermal exposures was for an adult. This amount is 0.0015 mg/kg/day of arsenic. This amount is three times less than the LOAEL of 0.005 mg/kg/day of arsenic, within the range of uncertainty that allows for effects in sensitive individuals. Therefore, the off-site arsenic exposures were not likely to cause adverse health effects.

Arsenic – carcinogenic effects

Exposure to arsenic in sediment through incidental ingestion and dermal exposures was calculated to increase the risk of cancer in an adult by 7 in 10,000. As noted above, the actual risk for developing cancer from dermal exposures are unknown. The excess cancer risk from this exposure is likely much lower than the calculations.

Lead

Exposures to lead in water and sediment in Sharon Steel Run could have caused possible adverse health effects, such as a decrease in the ability to learn. Exposures to lead in the water and sediment of Sharon Steel Run were estimated. Note that combined exposures were rounded.

	Incidental Ingestion	**Dermal**	**Both exposures**
Child	0.011 mg/kg/day	0.006 mg/kg/day	0.016 mg/kg/day
Trespasser	0.004 mg/kg/day	0.005 mg/kg/day	0.010 mg/kg/day
Adult	0.004 mg/kg/day	0.017 mg/kg/day	0.020 mg/kg/day

The calculated estimated exposure doses were between 2.5 and 8.3 times less than the LOAEL of 0.05 mg/kg/day, for monkeys exposed to lead acetate on a nearly daily basis [41]. Rice found that rhesus monkeys had less ability to learn after almost daily exposure to lead acetate at 0.05 mg/kg/day for more than a year [41]. Applying an uncertainty factor of 10 to the LOAEL for a monkey when applying these values to a human being results in exposures within the range of possible effects on the ability to learn. Most people would be exposed to lead in this area and on-site. The assumption was made that exposure to lead in Sharon Steel Run would not be the only source of lead exposure to children, trespassers, and adults.

Mercury

The amount of mercury found off-site in sediments was not enough to be likely to have caused harmful health effects. The highest amount of exposure, to an adult exposed through both incidental ingestion and through the skin (0.0002 mg/kg/day) was more than 2,000 times less than the LOAEL of 0.46 mg/kg/day for rats exposed to mercuric chloride.

Polynuclear Aromatic Hydrocarbons (PAHs) – Noncarcinogenic Effects

No adverse noncarcinogenic effects are likely from exposure of children, trespassers, or adults to the water and sediment of Sharon Steel Run for the past and present. The highest estimated exposure dose for an adult exposed to off-site water and sediment was 1.249 mg/kg/day. This was not likely to cause adverse noncarcinogenic health effects. This amount was 100 times less that the LOAEL of 125 mg/kg/day. Humans absorb smaller amounts of PAHs than animals. Therefore, adverse health effects from the exposures would not be expected.

Polynuclear Aromatic Hydrocarbons (PAHs) – Carcinogenic Effects

Exposures to off-site water and sediment in Sharon Steel Run have been shown to significantly increase the excess theoretical cancer risk. The risk of cancer from exposures to PAHs in water and sediment through the incidental ingestion and dermal routes for children, trespassers, and adults is more than one in four.

Water-Based Recreational Activities Off-Site

No chemicals were found at levels that were expected to cause adverse health effects to people engaging in water-based recreational activities near this site.

Nearby Residents

A moderate excess cancer risk was calculated for exposures to PAHs in residential soils. No chemicals found in residential soil were at levels that would be expected to cause harmful (adverse) noncarcinogenic effects.

Lead

The exposure to lead in residential soil near this site would not likely cause adverse health effects to children and adults exposed to it, unless there were other sources of lead exposure. The maximum exposure was calculated to be at 70 times less than the LOAEL of 0.05 mg/kg/day selected for this assessment.

Polynuclear aromatic hydrocarbons (PAHs) – carcinogenic effects

The excess cancer risk assumes that children were exposed to sticky or muddy soil that adheres tightly to the skin between 120 to 130 days per year during the ages of 2-16. Using these assumptions, an excess cancer risk of 220 in 10,000 was calculated. This is a significant excess cancer risk. Less exposure to these soils would lower the estimate of cancer risk.

Consumers of Locally Caught Fish

WVDHHR based the following conclusions on limited fish tissue data taken over 15-years ago. WVDHHR believes that these conclusions are prudent to protect the public health until additional fish tissue data is collected. They are not, however, a formal fish advisory. Based on this limited and outdated data, women of child-bearing age and young children should limit the amount of fish eaten from this area to less than one meal per week. Even though there is a data gap, current testing indicates that lead and mercury have continued to enter the Monongahela River up until the present. Chemicals other than lead and mercury were detected in fish tissue sampled near this site but were not found in samples taken on the site. Aldrin, dieldrin, chlordane, heptachlor epoxide, and Aroclors or PCBs were found in high enough concentrations (i.e., the estimated exposure doses were greater than the health based guideline) to be evaluated for potential human health effects (Table D-6).

Lead

Fish sampling data show that there was a potential for exposure to lead when eating fish caught in the Monongahela River near the site. People who ate a lot of catfish and walleye from this area (about 1/3 of a pound of fish each day) could have received lead at a rate of 0.005

mg/kg/day for an adult and 0.006 mg/kg/day for a child under 6-years-old. There is a potential for adverse health effects from lead in the fish to children and pregnant women who get most of the protein in their diet from eating fish from this area. Possible effects could be developmental effects if the person was exposed as a fetus or young child. Neurological effects might be observed, such as changes in the ability to learn. People who do not eat this much fish from this area would be less likely to have adverse health effects unless they were exposed to lead from other sources.

Mercury

Children and adults who ate a lot of channel catfish or walleye (about one-third of a pound of fish a day) from this portion of the river, could have ingested enough methylmercury to cause some adverse health effects. Mercury found in fish was assumed to be in the form of methylmercury. Methylmercury is absorbed into the body through the intestinal tract. Some studies of humans exposed to these levels of methylmercury have shown changes in development, such as delays in the age when walking begins, or a lowering of IQ [43]. Recreational fishermen would not have been exposed to enough methylmercury from this site to develop these adverse health effects.

Pesticides

Several pesticides, aldrin, dieldrin, chlordane, and heptachlor epoxide were found in fish tissue in high enough concentrations that the calculated excess cancer risk is in the low to moderate range for people who eat a lot of fish (about 1/3 pound a day, daily for more than 50 years.) These chemicals are called probable human carcinogens because while studies have shown that these chemicals cause cancer in animals, these chemicals have not been shown to cause cancer in humans. People who eat a more moderate amount of fish caught in the Monongahela River near this site would have a very low to low calculated excess cancer risk. (Table D-6)

Aldrin and dieldrin are related chemicals. Aldrin breaks down into dieldrin. They were used for termite control from 1972 until 1987. Aldrin and dieldrin have been shown to increase the number of liver tumors seen in rats and mice.

Chlordane was used as a pesticide from 1948 until 1988. It was used for termite control from 1983 until 1988. Chlordane has been shown to increase the amount of liver cancer seen in mice that were fed low levels of the chemical for a long time.

Heptachlor epoxide is another pesticide that has been shown to cause liver tumors in animals while there is not enough evidence to say that it causes cancer in humans.

Aroclors (Polychlorinated Biphenyls or PCBs)

Some human studies have shown that if a person is exposed to Aroclors (PCBs) while in the womb or through their mother’s milk, that the exposure can affect the development of the baby.

Fish caught near this site in the Monongahela River contained Aroclors at levels that could affect the health of infants and young children. Therefore, women of childbearing age and young children should restrict the amount of fish that they eat from the Monongahela River near this site. There is a current fish advisory for channel catfish from the Monongahela River. It advises that channel catfish should be eaten 6 times a year or less due to the presence of polychlorinated biphenyls (PCBs).

Aroclor 1260 might cause up to 46 in 10,000 excess cancers for adults eating 1/3 pound of walleye a day every day for 54 years.

<u>Inhalation exposures to On-Site Removal Workers</u>

Test results indicate that the estimated inhalation exposure doses for benzene, *m*-,*p*-xylene, 1,2,4-trimethylbenzene, and cadmium were at levels below the EPA reference dose for inhalation. Therefore, these chemicals would not be expected to be at levels that would result in adverse health effects. Copper, lead, and nickel in the air were at levels where adverse health effects from breathing these chemicals would not be expected. The concentration of these chemicals in air was more than 1,000 times less than the relevant LOAELs for these chemicals. There is a possible inhalation hazard from mercury. Potential adverse health effects could not be estimated because of a gap in data for this exposure.

Public Comment Period

The public comment period version of this report was issued on February 20, 2004. Copies of the report were sent to the petitioner, local officials, and other interested parties. The document was available for review at the Fairmont Public Library. The public comment period ended April 5, 2004. Governmental agencies submitted comments, but none were received from the public. Various technical changes were made to the report as a result of these comments. One of the significant changes was the reassessment of the inhalation hazards from metals on-site after an update to the data package was received.

Child Health Considerations

Children are at greater risk than are adults from certain kinds of exposure to hazardous substances emitted from waste sites. They are more likely to be exposed for several reasons. Children are smaller than adults are, resulting in higher doses of chemical exposure per body weight. Children are often more sensitive to the effects of chemical exposures than adults and can sustain permanent damage if toxic exposures occur during critical growing stages. Children are outside playing more often than adults, which increases the likelihood that they will come into contact with chemicals in the environment. Finally, children depend on adults for risk identification and avoidance. For these reasons, this public health assessment considered possible exposure scenarios to children related to this site.

Exposure of children to lead in soil, sediment, and water on- and off-site was evaluated. Young children are the most vulnerable to the effects of lead. Children were known to live and play on this site in the past. The estimated exposures to children were great enough to conclude that lead exposures could have caused neurological effects in children exposed on and off the site.

Polychlorinated biphenyls (PCBs), found in fish caught near this site, can cause neurological problems in fetuses and young children. Although this chemical was not associated with the site, women of childbearing age and young children are advised to limit the amount of fish, other than channel catfish, eaten from the Monongahela River near this site to no more than one meal per week. People are advised to follow the West Virginia fish advisory for channel catfish in the Monongahela River. The advice is to eat no more than 6 meals per year of channel catfish from the Monongahela River due to PCB contamination.

Community Health Concerns

As part of the public health assessment process, ATSDR gathers health concerns raised by the community. In the following subsection, ATSDR addresses the community concerns raised at the public availability session held on September 14, 2000, and from two letters subsequently received from residents. A response immediately follows the concern/question.

Are children and adults who hunt or ride all-terrain vehicles on the site at risk from exposure to site contaminants?

Response:

People who hunt or ride ATVs on the site could be at risk from exposures to chemicals at this site. The primary risk is from exposure to lead. Lead has a variety of effects that depend both on the amount of lead entering the body and the age of the person contacting the lead. Fetuses and young children are the most sensitive to the effects of lead. Ingestion of lead at the levels found at this site has been shown to cause changes in the blood, liver, and reproductive systems in animals. Lead is known to cause developmental effects if fetuses are exposed to lead while in the womb. These health effects would be most probable when the site and surrounding areas are accessed frequently.

Were the cancers of several former employees of Big John Salvage caused by past operations at the site? Is there a cancer cluster amongst former employees or residents?

Response:

The concise answer to these questions is that we don't know and, unfortunately, it is probably impossible to find an answer due to the lack of the information needed to make such a determination. The polynuclear aromatic hydrocarbons associated with this site are carcinogens that have been shown to cause lung, skin, and stomach tumors of the squamous cell type. Regarding cancer in former workers, identifying the cause of a specific case of cancer is very *rarely possible. Past exposures to workers were not measured. Due to this lack of information these concerns cannot be evaluated with any certainty.*

Could past site operations cause current health effects (e.g., heart defects, strokes, stomach ailments, Crohn's disease, etc.) in former workers and residents who live near the site?

Response:

The analysis of potential health effects from chemicals associated with this site did not specifically identify these illnesses. However, exposure to lead can cause birth defects, which could be associated with congenital heart defects. Lead has been associated with an increase in blood pressure. High blood pressure increases the risk of stroke. We would need more information on the diseases found in people associated with this site and information about levels of exposures to answer this question more specifically. It is not possible for us to associate a specific person's illness with exposures to chemicals from this site with the information that we have available. Individuals with concerns about their own health are encouraged to discuss them with their personal physicians, or to meet with an occupational and environmental health specialist.

Could past air emissions from stacks lead to ongoing exposures?

Response:

Yes, this could have occurred if enough of the contaminants emitted from the stacks made it to locations where people now frequent and if these contaminants were able to persist in the environment. To address this question, data from residential soil was reviewed. Exposure calculations indicated that exposures to residential soil might cause some additional cancers in children who were exposed to the soil over many days per year for 14 years. (Table D-2 and D-4).

Could eating fish from the Monongahela River harm my health?

Response:

Food chain exposures are possible if people consume fish or other aquatic animals that have been contaminated via contact with contaminated water or sediments. The data currently available indicate that people who have consumed 1/3 of a pound of walleye or channel catfish from the Monongahela River near this site daily for 50 years could have adverse health effects. However, because lead, mercury, and PCBs, all can have developmental and neurological effects if fetuses and young children are exposed to them, it is recommended that women of childbearing age and young children less than one meal per week of fish, except for channel catfish, caught from this area, until more current fish tissue data is collected and evaluated. There is a current fish advisory for channel catfish from the Monongahela River. The advisory *recommends that channel catfish from the Monongahela River should be eaten 6 times a year or less due to the presence of PCBs.*

Is the site safe for a playground or residential homes to be built on the site after remedial actions are completed?

Response:

The EPA has not determined a future use scenario for this site. Environmental data would need to be evaluated after remedial actions are completed to determine the answer to this question.

Evaluation of Health Outcome Data

The Superfund law requires that health outcome (i.e., mortality and morbidity) data (HOD) be considered in a public health assessment [52]. The main requirements for evaluating HOD are presence of a completed human exposure pathway, contaminant levels to result in measurable health effects, sufficient persons in the completed pathway for health effects to be measured, and a health outcome database in which disease rates for population of concern can be identified [53].

Although completed human exposure pathways exist at this site, there are no health outcome data available for most of the potential adverse health effects identified. The actual numbers of people exposed to the contaminants on- and off-site cannot be determined with a certainty that allows meaningful analysis of the existing health outcome data. This site does not meet the requirements for including an evaluation of HOD in this public health assessment.

Conclusions

1. The Big John Salvage - Hoult Road site has posed a **public health hazard** in the past and present. Exposures to hazardous chemicals on or near this site could have resulted in adverse health effects. A past and present public health hazard exists for children, trespassers, and adults on and off this site from exposures to soil, sediment, water, and waste.

- People routinely exposed to polynuclear aromatic hydrocarbons (PAHs) on- and off-site may have a significant increased risk to develop squamous cell cancers of the skin, lungs, and stomach. Exposure to PAHs in residential soil may increase the risk of cancer in children who are regularly exposed to the soil.
- Regular exposure to arsenic contamination at the site may have caused an increase in lung, skin, bladder, liver, kidney, or prostate cancers. People who have been exposed to arsenic in the soil, sediment, water on-site, or the sediment off-site should be aware of the increased risk of skin cancers. If skin cancers occur, these people should be aware of a potential increased risk for other types of cancers. In addition, possible noncarcinogenic health effects likely from these arsenic exposures are dark corns on the skin, numbness of the hands and feet, fatigue, headache, and dizziness.

- Lead exposures may have caused neurological effects, such as decreases in the ability to learn or developmental effects if fetuses were exposed to lead while in the womb. These effects could have occurred in children, trespassers, and adults both on and off the site.
- Exposures to copper in the soil at this site could have caused short-term nausea, vomiting, and abdominal pain in children and adults in the past.

2. WVDHHR based the following conclusions on limited fish tissue data taken over 15 years ago. WVDHHR believes that these conclusions are prudent to protect the public health until additional fish tissue data is collected. They are not, however, a formal fish advisory. Based on this limited and outdated data, women of child-bearing age and young children should limit the amount of fish, other than channel catfish, eaten from this area to less than one meal a week. There is a current fish advisory for channel catfish from the Monongahela River. It advises that channel catfish should be eaten 6 times a year or less due to the presence of polychlorinated biphenyls (PCBs). WVDHHR recommends that the EPA collect fish tissue samples from this area and test, at a minimum, for polynuclear aromatic hydrocarbons, lead, mercury, aldrin, dieldrin, chlordane, heptachlor epoxide, and Aroclors.

3. The amount of mercury vapors may have been sufficient to have caused health problems in the past to people who inhaled vapors on-site. An estimate of exposure doses cannot be calculated because of the nature of the data.

4. The future conditions at the Big John Salvage - Hoult Road cannot be predicted because of ongoing EPA removal actions. This site is classified as an **indeterminate public health hazard** for the future. Current exposures to hazardous chemicals have been reduced because of the EPA removal actions. Access to the site has been restricted by new fencing and the posting of a guard during the removal actions. Trespassing and land-based recreational activities near the site may continue to exposures people to hazardous chemicals.

Recommendations

1. Persons exposed to arsenic and PAHs on- or off-site should consult their physicians to determine if they should be monitored for skin or other cancers that may be caused from these exposures.

2. EPA should sample and analyze fish from the Monongahela River near the site to determine the amount of contaminants currently found in fish tissue. The analyses should include polynuclear aromatic hydrocarbons, lead, mercury, aldrin, dieldrin, chlordane, heptachlor epoxide, and Aroclors. EPA should share the information with WVDHHR for further review.

3. EPA should sample the air on and near the site for mercury vapors to determine if levels of mercury vapors in the air are in amounts that may cause harmful health effects to people on or near the site. EPA should share the information with WVDHHR for further review.

4. EPA should continue to restrict all entrance points to the site. Fencing and posting of the site should be maintained and upgraded as necessary to restrict access to the site.

5. EPA should continue the removal and remedial programs at this site and should provide sampling data to WVDHHR for further review.

Public Health Action Plan

1. WVDHHR will communicate the conclusions of this report to the West Virginia Fish Consumption Advisory Committee. The WVDHHR will ask the Committee to determine if a modification of the current fish advisory is needed in this portion of the Monongahela River.

2. WVDHHR will evaluate new sample data from this site provided by the EPA and other sources as necessary.

3. WVDHHR will provide public availability sessions and health education to persons associated with or interested in this site.

Preparer of Report

Barbara J. Smith, M.S.
Epidemiologist II
Public Health Sanitation Division
Office of Environmental Health Services
Bureau for Public Health, WV DHHR

Reviewers of Report

Joseph A. Wyatt, RS
Acting Director

Alrena Lightbourn, REM, MS
Environmental Toxicologist

Fred R. Barley, RS
Sanitarian Chief/Health Educator

Public Health Sanitation Division
Office of Environmental Health Services
Bureau for Public Health, WV DHHR

ATSDR Technical Project Officer

LCDR Alan G. Parham, REHS, MPH
Technical Project Officer
Agency for Toxic Substances and Disease Registry
1600 Clifton Road, N.E. MS-E32
Atlanta, Georgia 30333

ATSDR Regional Representatives

Lora Siegmann-Werner
ATSDR Region III Regional Representative
1650 Arch Street Mail Stop 3HS00
Philadelphia, PA 19103

Thomas Stukas
ATSDR Region III Regional Representative
1650 Arch Street Mail Stop 3HS00
Philadelphia, PA 19103

CERTIFICATION

The West Virginia Department of Health and Human Resources (WVDHHR) prepared this Big John Salvage Public Health Assessment under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures in existence at the time the Public Health Assessment was initiated.

Alan G. Parham

Alan G. Parham, REHS, MPH
Technical Project Officer
Division of Health Assessment and Consultation (DHAC), ATSDR

The Division of Health Assessment and Consultation of ATSDR has reviewed this Public Health Assessment, and concurred with its findings.

Roberta Erl

Roberta Erlwein
Team Leader SPAB, DHAC, ATSDR

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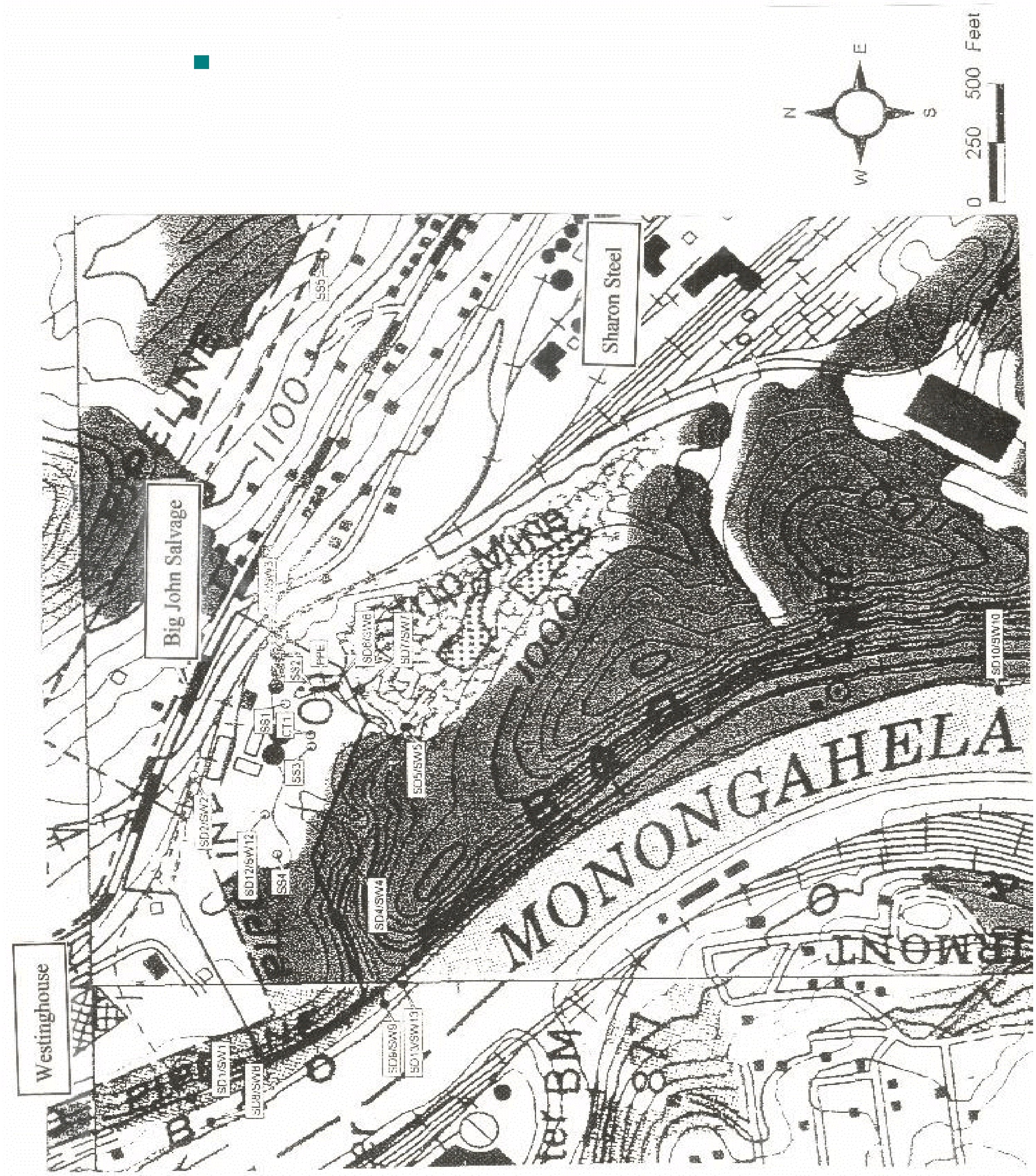
FIGURES

Figure 1. Site Location



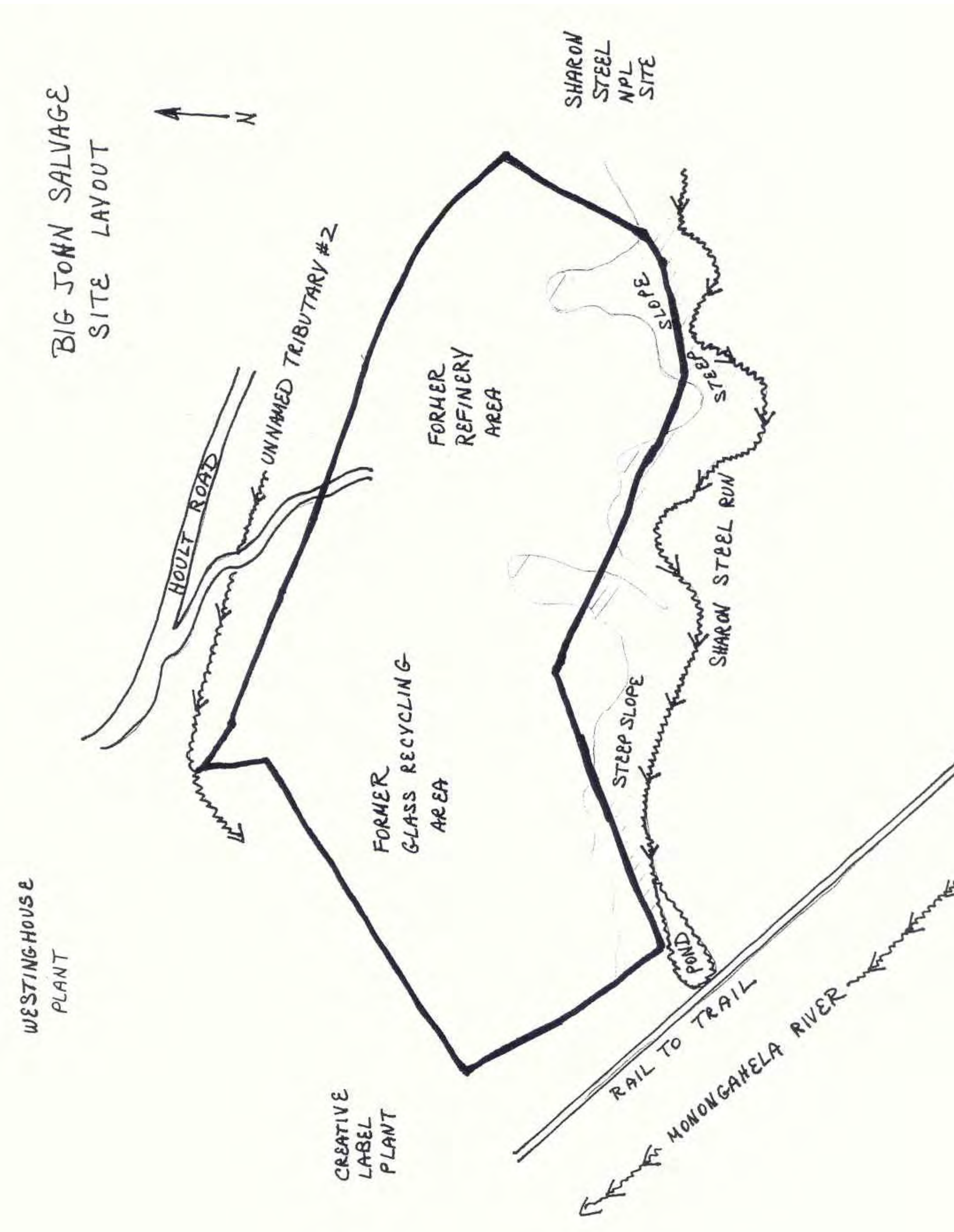


Figure 2. Site Features

APPENDIX A

Tables A-1 and A-2 Exposure Pathway Tables

Table A-1: Completed Exposure Pathways Big John Salvage - Hoult Road Site					
Pathway	Exposure Elements				
	Medium	Point of Exposure	Route of Exposure	Time	Exposed Population
Soil - on-site - contaminant mixing,leaching, and air deposition	Soil	on-site contaminated soil	Dermal	Past	child/trespasser
				Present	trespasser
				Future	trespasser
			Incidental Ingestion	Past	child/trespasser
				Present	trespasser
				Future	trespasser
			Inhalation	Past	workers
				Present	workers
Soil - off-site - airborne deposition and runoff	Soil	off-site contaminated soil	Dermal	Past	nearby residents/off-site land-based recreation
				Present	nearby residents/off-site land-based recreation
				Future	nearby residents/off-site land-based recreation
			Incidental Ingestion	Past	nearby residents/off-site land-based recreation
				Present	nearby residents/off-site land-based recreation
				Future	nearby residents/off-site land-based recreation
Sediment - on-site - contaminant mixing, leaching, air deposition	Sediment	on-site sediment	Dermal	Past	child/trespasser
				Present	trespasser
				Future	trespasser
			Incidental Ingestion	Past	child/trespasser
				Present	trespasser
				Future	trespasser
Sediment - off-site - surface runoff and air deposition	Sediment	off-site sediment	Dermal	Past	off-site land based and water-based activities
				Present	off-site land based and water-based activities
				Future	off-site land based and water-based activities
			Incidental Ingestion	Past	off-site land based and water-based activities
				Present	off-site land based and water-based activities
				Future	off-site land based and water-based activities
Surface water - on-site - contaminant leaching and air deposition	Surface water	on-site ponds, puddles and drains	Dermal	Past	child/trespasser
				Present	trespasser
				Future	trespasser
			Incidental Ingestion	Past	child/trespasser
				Present	trespasser
				Future	trespasser

Table A-1: Completed Exposure Pathways Big John Salvage - Hoult Road Site					
Pathway	Exposure Elements				
	Medium	Point of Exposure	Route of Exposure	Time	Exposed Population
Surface water - off-site - contaminant leaching, and air deposition	Surface water	Monongahela River and tributaries near the site	Dermal	Past	off-site land based and water-based activities
				Present	off-site land based and water-based activities
				Future	off-site land based and water-based activities
			Incidental Ingestion	Past	off-site land based and water-based activities
				Present	off-site land based and water-based activities
				Future	off-site land based and water-based activities
Waste Material - on-site	Tar Creosote Cullet	on site tar and creosote seeps glass cullet piles	Dermal	Past	child/trespasser
				Present	trespasser
				Future	trespasser
			Incidental Ingestion	Past	child/trespasser
				Present	trespasser
				Future	trespasser
Biota - contaminant bioaccumulation of contaminants from surface water and sediments into fish tissue	Fish	consumption of locally caught fish	Ingestion	Past	consumers of fish
				Present	consumers of fish
				Future	consumers of fish

Table A-2: Potential Exposure Pathways Big John Salvage - Hoult Road Site					
Pathway	Exposure Elements				
	Medium	Point of Exposure	Route of Exposure	Time	Exposed Population
Soil - on-site - contaminant mixing,leaching, air deposition and volatilization	Soil	on-site soil	Dermal	Past	RTCC/BJS/lumberjacks/utility workers
				Present	trespassers
				Future	trespassers
			Incidental Ingestion	Past	RTCC/BJS/lumberjacks/utility workers
			Inhalation	Past	child/trespasser/RTCC/BJS/lumberjacks/utility workers
				Future	trespassers
Soil - off-site - runoff, airborne deposition, and volatalization	Soil	off-site soil	Inhalation	Past	nearby residents
				Present	nearby residents
				Future	nearby residents
Sediment - on-site - contaminant mixing, leaching, air deposition, and volatilization	Sediment	on-site sediment	Dermal	Past	RTCC/BJS/lumberjacks/utility workers
				Present	trespassers
				Future	trespassers
			Incidental Ingestion	Past	child/trespasser/RTCC/BJS/lumberjacks/utility workers
				Present	trespassers
				Future	trespassers
			Inhalation	Past	RTCC/BJS/lumberjacks/utility workers
				Present	trespassers
				Future	trespassers/utility workers
Sediment - off-site - surface runoff, air deposition, and volatilazation	Sediment	off-site sediment	Inhalation	Past	off-site land-based and water-based activities
				Present	off-site land-based and water-based activities
				Future	off-site land-based and water-based activities
Surface water - on-site - contaminant leaching, air deposition, and volatilization	Surface water	on-site ponds, puddles, and drains	Dermal	Past	RTCC/BJS/lumberjacks/utility workers
				Present	trespassers
				Future	trespassers
			Incidental Ingestion	Past	RTCC/BJS/lumberjacks/utility workers
			Inhalation	Past	child/trespasser/RTCC/BJS/lumberjacks/utility workers
Waste material - on-site air deposition and volatilaztion	Tar Creosote Cullet	on-site piles and seeps	Dermal	Past	RTCC/BJS/lumberjacks/utility workers
			Incidental Ingestion	Past	RTCC/BJS/lumberjacks/utility workers
			Inhalation	Past	child/Trespasser/RTCC/BJS/lumberjacks/utility workers
Groundwater - contaminant leaching into groundwater	Groundwater	well water	Ingestion	Future	well water users
Biota - contaminant intake by contaminated soil, sediment, water, plants and animals	Game	consumption of locally caught game	Ingestion	Past	consumers of game
				Present	consumers of game
				Future	consumers of game

RTCC = Reilly Tar and Chemical Corporation

BJS = Big John Salvage

APPENDIX B

Tables B-1 through B-3. Contaminants of Concern - Data from 1981-1999

Table: B-1: Contaminants of Concern in Surface Water - data from 1981 - 1999						
Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV µg/L (ppb)	Environmental Guideline Comparison Values (CV) ppb (µg/L)	Type of CV	Number detections greater than the CV
WATER DRAINING FROM CULLET PILE (on-site)						
lead	2	2	4,000-22,500	15	EPA Action Level	2
mercury	2	2	1,200-12,000		none	2
POND (on-site)						
arsenic	1	1	295	0.02	CREG	1
cadmium	1	1	33.4	2	ATSDR chron EMEG child	1
lead	1	1	224	15	EPA Action Level	1
mercury	1	1	213		none	1
benzo(a)anthracene	1	1	3	0.092	Reg III RBC	1
benzo(b)fluoranthene	1	1	5	0.092	Reg III RBC	1
benzo(a)pyrene	1	1	3	0.005	CREG	1
indeno(1,2,3-cd)pyrene	1	1	2	0.092	Reg III RBC	1
SHARON STEEL RUN (off-site)						
arsenic	2	1	1.7	0.02	CREG	1
lead	2	1	16	15	EPA Action Level	1
manganese	2	1	2,640	500	ATSDR RMEG child	1
mercury	2	1	0.77		none	1
vanadium	2	1	38.8	30	ATSDR int EMEG child	1
acenaphthene	2	1	3,800	600	ATSDR RMEG child	1
benzo(a)anthracene	2	1	1,100	0.092	Reg III RBC	1
benzo(b)fluoranthene	2	1	1,300	0.092	Reg III RBC	1
benzo(a)pyrene	2	1	600	0.005	CREG	1
chrysene	2	1	930	9.2	Reg III RBC	1
fluoranthene	2	2	4,900	400	ATSDR RMEG child	1
fluorene	2	2	3,800	400	ATSDR RMEG child	1
indeno(1,2,3-cd)pyrene	2	1	240	0.092	Reg III RBC	1
napthalene	2	2	16,000	200	ATSDR int EMEG child	1
pyrene	2	1	3,300	300	ATSDR RMEG child	1
4,4' DDT (DDT)	2	2	2.1	0.1	CREG	1
UNNAMED TRIBUTARY #2 (off-site)						
arsenic	4	4	1.9-85.6	0.02	CREG	4
cadmium	4	1	5.1	2	ATSDR chron EMEG child	1
lead	4	4	7.2-57.8	15	EPA Action Level	4
manganese	4	4	2,970	500	ATSDR RMEG child	1
mercury	4	3	0.12-3.6		none	3
benzo(b)fluoranthene	4	1	1	0.092	Reg III RBC	1

Table: B-1: Contaminants of Concern in Surface Water - data from 1981 - 1999						
Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV µg/L (ppb)	Environmental Guideline Comparison Values (CV) ppb (µg/L)	Type of CV	Number detections greater than the CV
MONONGAHELA RIVER NEAR SHARON STEEL RUN (off-site)						
lead	3	1	21	15	EPA Action Level	1
manganese	3	2	129-1,700	500	ATSDR RMEG child	2

µg/L = micrograms per liter or parts per billion (ppb)

CREG = EPA Cancer Risk Evaluation Guide

EPA Action Level = the level where public water systems must take remedial action

ATSDR RMEG child = Reference Media Evaluation Guide for a child

ATSDR int EMEG child = ATSDR Intermediate Environmental Media Evaluation Guide for a child exposed for 15-365 days

ATSDR chron EMEG child = ATSDR Chronic Environmental Media Evaluation Guide for a child exposed for more than 365 days

Reg III RBC = EPA Region III Risk-Based Concentration (Table version 04/2003)

Table B-2: Contaminants of Concern in Soil and Sediment - data from 1981 - 1999 Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV mg/kg (ppm)	Environmental Guideline Comparison Values (CV) mg/kg (ppm)	Type of CV	Number detections greater than CV
SURFACE SOIL (on-site)						
arsenic	5	5	4.1-39.4	0.5	CREG	5
lead	5	2	190-890		none	2
mercury	5	5	0.28-1.3		none	5
benzo(a)anthracene	8	8	1.1-3,900	0.87	RBC	8
benzo(b)fluoranthene	9	9	1.8-3,400	0.87	RBC	9
benzo(k)fluoranthene	8	8	3.8-1,900	8.7	RBC	7
benzo(a)pyrene	9	9	0.94-1,100	0.1	CREG	9
carbazole	4	2	141	32	RBC	1
chrysene	8	8	128-3,200	87	RBC	5
dibenzo(a,h)anthracene	4	1	11	0.062	PRG	1
dibenzofuran	4	1	642	160	RBC	1
ethylbenzene	5	1	15,000	5,000	ATSDR RMEG child	1
fluoranthene	9	9	4,600-10,300	3,100	RBC	2
fluorene	1	1	3,500	3,100	RBC	1
indeno(1,2,3-cd)pyrene	6	6	3.5-62	0.87	RBC	5
pyrene	8	8	4,200	2,000	ATSDR RMEG child	1
POND SEDIMENT (on-site)						
antimony	1	1	63.5	20	ATSDR RMEG child	1
arsenic	1	1	18.4	0.5	CREG	1
lead	1	1	460		none	1
mercury	1	1	256		none	1
benzo(a)anthracene	1	1	41	0.87	RBC	1
benzo(b)fluoranthene	1	1	51	0.87	RBC	1
benzo(k)fluroanthene	1	1	6.7	8.7	RBC	1
benzo(a)pyrene	1	1	25	0.1	CREG	1
dibenzo(a,h)anthracene	1	1	10	0.062	PRG	1
indeno(1,2,3-cd)pyrene	1	1	18	0.87	RBC	1

Table B-2: Contaminants of Concern in Soil and Sediment - data from 1981 - 1999						
Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV mg/kg	Environmental Guideline Comparison Values (CV) mg/kg	Type of CV	Number detections greater than CV
RESIDENTIAL SURFACE SOIL (off-site)						
arsenic	1	1	7.5	0.5	CREG	1
lead	3	3	28.6-74.7		none	3
mercury	1	1	0.17		none	1
benzo(a)anthracene	2	2	6.8	0.87	RBC	1
benzo (b)fluoranthene	2	2	12	0.87	RBC	1
benzo(a)pyrene	1	1	8.9	0.1	CREG	1
SEDIMENT - SHARON STEEL RUN (off-site)						
antimony	2	1	27.1	20	ATSDR RMEG child	1
arsenic	2	2	8.6 - 106	0.5	CREG	2
cadmium	2	2	63.7	10	ATSDR EMEG chron	1
lead	3	3	600 - 3,790		none	2
mercury	4	4	0.44 - 240		none	3
2-methylnapthalene	2	2	1,886	310	RBC	1
benzo(a)anthracene	4	4	6.3 - 660	0.87	RBC	4
benzo(b)fluoranthene	4	4	4 - 590	0.87	RBC	4
benzo(k)fluoranthene	3	3	73 - 340	8.7	RBC	2
benzo(a)pyrene	4	3	12 - 520	0.1	CREG	3
carbazole	2	2	431	32	RBC	1
chrysene	5	5	400 - 402	87	RBC	2
dibenzo(a,h)anthracene	4	3	1 - 820	0.062	PRG	3
dibenzofuran	3	3	3 - 1,087	160	RBC	2
indeno(1,2,3-cd)pyrene	2	2	9 - 70	0.87	RBC	2
napthalene	4	3	3,906	1000	ATSDR int EMEG child	1
SEDIMIENT UNNAMED TRIBUTARY #2 (off-site)						
arsenic	4	4	12 - 81	0.5	CREG	4
cadmium	4	2	145	10	ATSDR chron EMEG child	1
lead	4	4	57.9 - 260		none	4
mercury	4	4	0.62 - 123		none	3
benzo(a)anthracene	2	2	12 - 73	0.87	RBC	2
benzo(b)fluoranthene	1	1	110	0.87	RBC	1
benzo(k)fluoranthene	3	2	21 - 100	8.7	RBC	2
benzo(a)pyrene	2	2	8.6 - 40	0.1	CREG	2
dibenzo(a,h)anthracene	3	3	1.5 - 14	0.062	PRG	2
indeno(1,2,3-cd)pyrene	2	2	22 - 32	0.87	RBC	2

Table B-2: Contaminants of Concern in Soil and Sediment - data from 1981 - 1999						
Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV mg/kg	Environmental Guideline Comparison Values (CV) mg/kg	Type of CV	Number detections greater than CV
SEDIMENT MONONGAHELA RIVER (off-site)						
arsenic	2	2	8.4 - 11.5	0.5	CREG	2
lead	2	2	20.4 - 70.9		none	2
mercury	2	2	0.08 - 0.75		none	2
benzo(a)anthracene	2	2	3.6 - 29	0.87	RBC	2
benzo(b)fluoranthene	2	2	5.3 - 31	0.87	RBC	2
benzo(a)pyrene	2	2	3 - 21	0.1	CREG	2
dibenzo(a,h)anthracene	2	1	4	0.062	PRG	1
indeno(1,2,3-cd)pyrene	2	1	9.1	0.87	RBC	1

mg/kg = milligrams of contamiant per kilogram of soil or sediment (equivalent to parts per million or ppm)

CREG = EPA Cancer Risk Evaluation Guide

RBC = EPA Risk Based Concentrations, the Residential levels were used

PRG = EPA Region 9 Preliminary Remedial Goal for Residential Soil

ATSDR RMEG child = Reference Media Evaluation Guide for a child

ATSDR EMEG chron = ATSDR Environmental Media Evaluation Guide for chronic exposures (over 365 days)

ATSDR int EMEG child = ATSDR Intermediate Environmental Media Evaluation Guide for a child exposed for 15-365 days

ATSDR chron EMEG child = ATSDR Chronic Environmental Media Evaluation Guide for a child exposed over 365 days

Table B-3: Contaminants of Concern in Solids - data from 1981 - 1999 Big John Salvage - Hoult Road Site					
Contaminant	Number Samples	Range of Concentrations measured over CV mg/kg (ppm)	Environmental Guideline Comparison Values (CV) ppm (mg/kg)	Type of CV	Number detections greater than the CV
COAL TAR					
arsenic	1	13.2	0.5	CREG	1
lead	1	131		none	1
mercury	1	2.1	0.002	MCLG	1
2-methylnapthalene	1	2,510	1,600	RBC	1
benzo(a)anthracene	2	2,500 - 2,814	0.87	RBC	2
benzo(b)fluoranthene	2	2,200 - 2,403	0.87	RBC	2
benzo(k)fluoranthene	2	980 - 1,876	8.7	RBC	2
benzo(a)pyrene	2	1,700 - 2,507	0.1	CREG	2
carbazole	1	2,677	32	RBC	1
chrysene	2	1,600 - 2,661	87	RBC	2
dibenzofuran	1	3,218	160	RBC	1
fluoranthene	2	5,000 - 8,611	3,100	RBC	2
fluorene	2	3,772	3,100	RBC	1
indeno(1,2,3-cd)pyrene	1	1,151	0.87	RBC	1
napthalene	2	13,971	1,000	ATSDR int EMEG child	1
pyrene	2	5,700 - 5,958	2,000	RMEG child	2

mg/kg = milligrams per kilogram (equivalent to parts per million or ppm)

CREG = EPA Cancer Risk Evaluation Guide

MCLG = EPA Maximum Contaminant Level Goal

RBC = EPA Risk Based Concentrations, the Residential levels were used

ATSDR Intermediate EMEG child = ATSDR Intermediate Environmental Media Evaluation Guides for a child exposed for 15-365 days

RMEG child = ATSDR Reference Media Evaluation Guide for a child

NOTE: number of samples = number of detections

APPENDIX C

Tables C-1 through C-4 Contaminants of Concern - Data from 2000-2001

Table C-1: Contaminants of Concern in Surface Water - data from 2000 - 2001 Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV µg/L (ppb)	Environmental Guideline Comparison Values (CV)		Number detections greater than CV
				ppb (µg/L)	Type of CV	
SURFACE WATER (on-site)						
aluminum	9	9	41,000 - 161,000	20,000	ATSDR int EMEG child	2
antimony	6	6	39.1	4	ATSDR RMEG child	1
arsenic	8	8	2.8 - 2,170	0.02	CREG	8
barium	9	9	837	700	ATSDR RMEG child	1
cadmium	6	6	2.3 - 473	2	CREG	6
cobalt	7	7	109	100	ATSDR int EMEG child	1
copper	9	9	1,410	300	ATSDR int EMEG child	1
lead	8	8	37 - 2,120	15	EPA Action Level	7
manganese	9	9	805 - 11,700	500	ATSDR RMEG child	4
mercury	8	6	8.7 - 1,150			6
nickel	9	9	252	200	ATSDR RMEG child	1
thallium	5	1	15.3	0.5	LTHA	1
vanadium	7	7	49.9 - 132	30	ATSDR int EMEG child	2
benzo(a)anthracene	9	4	3 - 21	0.092	Reg III RBC	4
benzo(b)fluoranthene	9	4	2 - 28	0.092	Reg III RBC	4
benzo(a)pyrene	9	4	2 - 23	0.005	CREG	4
chrysene	9	4	22	9.2	Reg III RBC	1
indeno(1,2,3-cd)-pyrene	9	3	2 - 13	0.092	Reg III RBC	3
SHARON STEEL RUN (off-site)						
aluminum	5	5	49,800 - 55,300	20,000	ATSDR int EMEG child	2
antimony	2	2	8.2	4	ATSDR RMEG child	1
arsenic	5	5	31.7 - 63.4	0.02	CREG	2
barium	5	5	793	700	ATSDR RMEG child	1
cadmium	2	2	9.2 - 30.6	2	ATSDR chron EMEG child	2
chromium	4	4	118	100	LTHA	1
cobalt	4	4	115 - 136	100	ATSDR int EMEG child	2
lead	5	5	189 - 511	15	EPA Action Level	2
manganese	5	5	2,610 - 34,000	500	ATSDR RMEG child	4
mercury	5	2	11.2 - 172			2
nickel	4	4	219	200	ATSDR RMEG child	1
thallium	4	1	12.9	0.5	LTHA	1
vanadium	3	3	35.2 - 82.6	30	ATSDR int EMEG child	2
benzene	5	3	4 - 830	0.6	CREG	3
benzo(a)anthracene	5	2	1 - 4	0.092	Reg III RBC	2
benzo(b)fluoranthene	5	1	3	0.092	Reg III RBC	1
benzo(a)pyrene	5	1	2	0.005	CREG	1
carbazole	5	3	7 - 17	3.4	PRG	3
indeno(1,2,3-cd)-pyrene	5	2	1	0.092	Reg III RBC	2
POND (off-site)						

Table C-1: Contaminants of Concern in Surface Water - data from 2000 - 2001 Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV μg/L (ppb)	Environmental Guideline Comparison Values (CV) ppb (μg/L)	Type of CV	Number detections greater than CV
aluminum	3	3	24,000	20,000	ATSDR int EMEG child	1
cadmium	1	1	2.1	2	ATSDR chron EMEG child	1
lead	3	3	27.3 - 32.7	15	EPA Action Level	3
manganese	3	3	1,810 - 4,300	500	ATSDR RMEG child	3
thallium	2	2	7-9	0.5	LTHA	2
vanadium	3	3	33.8 - 53.8	30	ATSDR int EMEG child	2
aroclor-1242	1	1	0.92	0.034	PRG	1
benzene	3	3	10 - 71	0.6	CREG	3
benzo(a)anthracene	4	1	1	0.092	Reg III RBC	1
carbazole	4	4	4	3.4	PRG	1
hexachlorobutadiene	4	2	2	0.4	CREG	1
n-nitroso-di-n-propylamine	4	1	2	0.005	CREG	1
UNNAMED TRIBUTARY #2 (off-site)						
arsenic	1	1	5.4	0.02	CREG	1
benzo(a)anthracene	1	1	10	0.092	Reg III RBC	1
benzo(b)fluoranthene	1	1	8	0.092	Reg III RBC	1
benzo(a)pyrene	1	1	10	0.005	CREG	1
chrysene	1	1	11	9.2	Reg III RBC	1
indeno(1,2,3-cd)-pyrene	1	1	6	0.092	Reg III RBC	1

μg/L = micrograms per liter or parts per billion (ppb)

CREG = ATSDR Cancer Risk Evaluation Guide

ATSDR chron EMEG child = ATSDR Environmental Media Evaluation Guide for a child exposed for more than 365 days

ATSDR int EMEG child = ATSDR Intermdiate Environmental Media Evaluation Guide for a child exposed for 15-365 days

ATSDR RMEG child = ATSDR Reference Media Evaluation Guide for a child

PRG = EPA Region 9 Preliminary Remedial Goal for Residential Soil

Reg III RBC = EPA Region III Risk-Based Concentration (Table version 4/2003)

LTHA = EPA Lifetime Health Advisory for drinking water

EPA Action Level = the level where public water systems must take action

Table C-2: Contaminants of Concern in Soil and Sediment - data from 2000 - 2001						
Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV mg/kg (ppm)	Environmental Guideline Comparison Values (CV) ppm (mg/kg)	Type of CV	Number detections greater than CV
SOIL (on-site)						
antimony	48	33	22.7 - 100	20	ATSDR RMEG child	5
arsenic	48	48	2 - 747	0.5	CREG	48
cadmium	46	35	12.8 - 240	10	ATSDR chron EMEG child	18
chromium	48	36	778	210	PRG (ca)	1
copper	48	36	10,800	2,000	ATSDR int EMEG child	1
lead	48	36	202 - 9,830	150	CAL mod PRG	19
manganese	48	38	4,160	3,000	ATSDR RMEG child	1
mercury	48	47	0.08 - 1,480		none	47
thallium	48	20	6.2 - 13.3	5.2	PRG	3
benzo(a)anthracene	14	12	18 - 330	0.62	PRG (ca)	11
benzo(b)fluoranthene	14	13	27 - 390	0.62	PRG (ca)	10
benzo(a)pyrene	14	13	19 - 330	0.1	CREG	12
chrysene	14	13	21 - 300	87	EPA SSL	10
indeno(1,2,3-cd)pyrene	14	13	7.1 - 180	0.62	PRG (ca)	12
SEDIMENT (on-site)						
arsenic	5	5	1.1 - 82.8	0.5	CREG	5
cadmium	4	4	31.5	10	ATSDR chron EMEG child	1
lead	5	5	302 - 1,550	150	CAL mod PRG	2
mercury	5	4	2.6 - 17.3		none	4
benzo(a)anthracene	2	2	1.5 - 98	0.62	PRG (ca)	2
benzo(b)fluoranthene	2	2	1.8 - 100	0.62	PRG (ca)	2
benzo(a)pyrene	2	2	1.4 - 85	0.1	CREG	2
chrysene	2	2	98	87	EPA SSL	1
indeno(1,2,3-cd)pyrene	2	2	0.65 - 29	0.62	PRG (ca)	2
POND SEDIMENT (off-site)						
arsenic	8	8	6.1 - 55.6	0.5	CREG	8
cadmium	8	5	29.4	10	ATSDR chron EMEG child	1
lead	8	5	277	150	CAL mod PRG	1
mercury	8	7	0.24 - 29.7		none	7
benzo(a)anthracene	8	8	2.9 - 14	0.62	PRG (ca)	6
benzo(b)fluoranthene	8	7	2.4 - 16	0.62	PRG (ca)	6
benzo(a)pyrene	8	7	1.5 - 13	0.1	CREG	6
indeno(1,2,3-cd)pyrene	8	7	1.1 - 4.7	0.62	PRG (ca)	6

Table C-2: Contaminants of Concern in Soil and Sediment - data from 2000 - 2001						
Big John Salvage - Hoult Road Site						
SHARON STEEL RUN SEDIMENT (off-site)						
arsenic	4	3	2.1 - 7.5	0.5	CREG	3
mercury	4	1	0.23		none	1
benzo(a)anthracene	4	4	9.1 - 120	0.62	PRG (ca)	3
benzo(b)fluoranthene	4	4	1 - 120	0.62	PRG (ca)	3
benzo(a)pyrene	4	4	7.3 - 90	0.1	CREG	3
chrysene	4	4	110	87	EPA SSL	1
indeno(1,2,3-cd)pyrene	4	4	3.7 - 26	0.62	PRG (ca)	3
mg/kg = milligrams per kilogram or parts per million (ppm)						
ppm = parts per million						
CREG= ATSDR Cancer Risk Evaluation Guide						
ATSDR chron EMEG child=ATSDR Chronic Environmental Media Evaluation Guide for a child exposed for more than 365 days						
ATSDR int EMEG child=ATSDR Intermediate Environmental Media Evaluation Guide for a child exposed for 15-365 days						
CAL mod PRG = EPA modified Preliminary Remediation Goal from California EPA's DTSC						
ATSDR RMEG child=ATSDR Reference Media Evaluation Guide for a child						
EPA SSL = EPA Soil Screening Levels						
PRG = EPA Region 9 Preliminary Remedial Goal for Residential Soil						
PRG (ca) = EPA Region 9 Preliminary Remedial Goal for Residential Soil (for cancer effects)						

Table C-3: Contaminants of Concern in Solids - data from 2000 - 2001 Big John Salvage - Hoult Road Site						
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over CV mg/kg (ppm)	Environmental Guideline Comparison Values (CV)		Number detections greater than the CV
				ppm (mg/kg)	Type of CV	
TAR						
arsenic	2	2	3.7 - 6.9	0.5	CREG	2
mercury	2	2	0.23 - 2.4		none	2
thallium	2	2	8.5 - 17.3	5.2	PRG	2
benzene	3	3	0.86	0.6	PRG (ca)	1
benzo(a)anthracene	5	5	75 - 250	0.62	PRG (ca)	5
benzo(b)fluoranthene	4	4	35 - 210	0.62	PRG (ca)	4
benzo(a)pyrene	4	4	48 - 150	0.1	CREG	4
carbazole	4	4	56 - 370	32	EPA SSL	4
chrysene	5	5	90 - 540	87	EPA SSL	4
dibenzofuran	5	5	620 - 680	160	RBC	2
indeno(1,2,3-cd)pyrene	3	3	39 - 74	0.62	PRG (ca)	3
napthalene	5	5	1,500 - 2,100	1,000	ATSDR int EMEG child	3
CULLET (pond area)						
arsenic	1	1	3.5	0.5	CREG	1
mercury	1	1	0.071		none	1
thallium	1	1	13.9	5.2	PRG	1
mg/kg = milligrams per kilogram or parts per million (ppm)						
ppm = parts per million						
CREG= ATSDR Cancer Risk Evaluation Guide						
ATSDR int EMEG child=ATSDR Intermidate Environmental Media Evaluation Guide for a child exposed for 15-365 days						
PRG = EPA Region 9 Preliminary Remedial Goal for Residential Soil						
PRG (ca) = EPA Region 9 Preliminary Remedial Goal for Residential Soil (for cancer effects)						
EPA SSL = EPA Soil Screening Levels						

Table C-4: Contaminants of Concern in Air - data from 2000-2001 Big John Salvage - Hoult Road Site							
Contaminant	Number Samples	Number Detections	Range of Concentrations measured over the CV		Environmental Guideline Comparison Values (CV)		Number detections greater than CV
			Reported	Converted		Type of CV	
AIR (on-site)							
benzene	2	2	3 µg/m^3	3 µg/m^3	0.1 µg/m^3	CREG	1
m,p-xylene	2	2	13 µg/m^3	13 µg/m^3	110 µg/m^3	RfC	1
1,2,4-trimethylbenzene	2	2	1ppb and 5 µg/m^3	1ppb and 5 µg/m^3			2
aluminum	15	15	31,600 - 110,000 µg/L	31,600 - 110,000 µg/L			15
barium	15	15	117,000 - 327,000 µg/L	117,000 - 327,000 µg/L			15
cadmium	15	3	13-90 µg/L	13,000 - 90,000 µg/m^3	0.0006 µg/m^3	CREG	2
calcium	15	15	42,000 - 164,000 µg/L	42,000 - 164,000 µg/L			15
chromium	15	15	58 - 103 µg/L	58 - 103 µg/L			15
copper	15	15	222 - 1,260 µg/L	222 - 1,260 µg/L			15
iron	15	15	2860 - 16,800 µg/L	2860 - 16,800 µg/L			15
lead	15	11	124 - 739 µg/L	124 - 739 µg/L			11
magnesium	15	15	2770 - 10,100 µg/L	2770 - 10,100 µg/L			15
manganese	15	15	180 - 654 µg/L	180,000 - 654,000 µg/m^3	0.04 µg/m^3	ATSDR Chron EMEG MRL	15
nickel	15	1	90 µg/L	90,000 µg/m3	0.2 µg/m^3	ATSDR Chron EMEG MRL	1
potassium	15	15	90,000 - 234,000 µg/L	90,000 - 234,000 µg/L			15
sodium	15	15	248,000 - 615,000 µg/L	248,000 - 615,000 µg/L			15
zinc	15	15	97,500 - 265,000 µg/L	97,500 - 265,000 µg/L			15

1,000 L = 1 m^3

mg/kg =milligram per kilogram (or parts per million)

CREG=EPA Cancer Risk Evaulation Guideline

RfC=EPA Reference Concentration for Chronic Inhalation Exposures

ATSDR Chron EMEG MRL=ATSDR Chronic Minimal Risk Level for exposures over 365 days

APPENDIX D

Tables D-1 through D-6 Estimated Exposure Dose Tables -Data from 1981 - 1999

Table D-1: Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Contaminants in Surface Water - data from 1981 - 1999 Big John Salvage - Hoult Road Site										
Contaminant	Max level	Estimated Exposure Doses			Health-based Guidelines		Excess Cancer Risk			
	mg/L	Incidental Ingestion mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
		Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
ON SITE										
arsenic	0.295	0.00006	0.00003	0.00002	0.0003	ATSDR Chron Oral MRL	1.5	>1	>1	>1
cadmium	0.0334	0.00001	0.00000	0.00000	0.0002	ATSDR Chron Oral MRL				
lead	22.5	0.00616	0.00247	0.00229						
mercury	12	0.00329	0.00132	0.00122	0.0003	ATSDR Chron Oral MRL				
benzo(a)anthracene	0.003	<0.00001	<0.00001	<0.00001			0.73*	>1	>1	>1
benzo(b)fluoranthene	0.005	<0.00001	<0.00001	<0.00001			0.73*	>1	>1	>1
benzo(a)pyrene	0.002	<0.00001	<0.00001	<0.00001			7.3	>1	>1	>1
indeno(1,2,3-cd)pyrene	0.002	<0.00001	<0.00001	<0.00001			0.73*	>1	>1	>1
Total PAHs		<0.00001	<0.00001	<0.00001				>1	>1	>1
OFF SITE										
arsenic	0.0856	0.00002	0.00001	0.00001	0.0003	ATSDR Chron Oral MRL	1.5	>1	>1	>1
cadmium	0.0051	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
lead	0.0578	0.00002	0.00001	0.00001						
manganese	2.97	0.00081	0.00033	0.00030	0.02	EPA Chron Oral RfD				
mercury	0.0036	<0.00001	<0.00001	<0.00001	0.0003	ATSDR Chron Oral MRL				
vanadium	0.0388	0.00001	<0.00001	<0.00001	0.003	ATSDR Int Oral MRL				
benzo(a)anthracene	1.1	0.00030	0.00012	0.00011			0.73*	>1	>1	>1
benzo(b)fluoranthene	1.3	0.00036	0.00014	0.00013			0.73*	>1	>1	>1
benzo(a)pyrene	0.6	0.00016	0.00007	0.00006			7.3	>1	>1	2
chrysene	0.93	0.00025	0.00010	0.00009			0.0073*	>1	>1	>1
fluoranthene	4.9	0.00134	0.00054	0.00050	0.04	EPA Chron Oral RfD				
indeno(1,2,3-cd)pyrene	0.24	0.00007	0.00003	0.00002			0.73*	>1	>1	>1
napthalene	16	0.00438	0.00175	0.00163	0.02	EPA Chron Oral RfD				
Total PAHs		0.00687	0.00275	0.00255				1	1	2

Table D-1: Estimated Exposure Doses and Cancer Risk for
Incidental Ingestion of Contaminants in Surface Water - data from 1981 - 1999
Big John Salvage - Hoult Road Site

mg/L=milligram per liter
mg/kg/day=milligram per kilogram per day
CSF=EPA Cancer Slope Factor ($mg/kg/day^{-1}$)
ATSDR Chron Oral MRL=ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days
ATSDR Int Oral MRL=ATSDR Intermediate Oral Minimal Risk Level for exposures between 15 and 365 days
EPA Chron Oral RfD=EPA Chronic Oral Reference Dose for exposures over 365 days
*EPA NCEA Provisional=EPA National Center for Environmental Assessemnt (NCEA) Provisional value
**EPA Health Effects Assessment Summary Table (HEAST)

Assumptions

		Child	Child	Adult
Age range	years	2-6	7-16	over 16
Ingestion rate	liter/day	0.01	0.01	0.01
Exposure frequency	days/year	180	180	260
	years	5	10	25
Body weight	kilograms	18	45	70

Table D-2: Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil, Sediment and Solids - data from 1981 - 1999												
Big John Salvage - Hoult Road Site												
Contaminant	Max level	Estimated Exposure Doses					Health-based Guideline		Excess Cancer Risk			
		Incidental Ingestion					mg/kg/day	Source	CSF	Number in 10,000 people		
	ppm	mg/kg/day										
		Child	Child	Adult	Resident child					Child	Child	
		2-6 years	7-16 years		2-6 years	7-16 years				2-6 years	7-16 years	Adult
SOIL (on-site)												
arsenic	39.4	0.00009	0.00003	0.00003			0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
lead	890	0.00244	0.00098	0.00091								
mercury	1.3	<0.00001	<0.00001	<0.00001								
benzo (a) anthracene	3,900	0.01068	0.00427	0.00397					0.73*	6	5	10
benzo (b) fluoranthene	3,400	0.00932	0.00373	0.00346					0.73*	5	4	9
benzo (k) fluoranthene	1,900	0.00521	0.00208	0.00193					0.073*	<1	<1	<1
benzo (a) pyrene	1,100	0.00301	0.00121	0.00112					7.3	16	13	29
carbazole	141	0.00039	0.00015	0.00014					0.02**	<1	<1	<1
chrysene	3,200	0.00877	0.00351	0.00326					0.0073*	<1	<1	<1
dibenzo(a,h)anthracene	11	0.00003	0.00001	0.00001					7.3*	<1	<1	<1
dibenzofuran	642	0.00176	0.00070	0.00065			0.002	EPA Chronic Oral RfD				
ethylbenzene	15,000	0.04110	0.01644	0.01526			0.1	EPA Chronic Oral RfD				
fluoranthene	10,300	0.02822	0.01129	0.01048			0.04	EPA Chronic Oral RfD				
fluorene	3,500	0.00959	0.00384	0.00356			0.04	EPA Chronic Oral RfD				
indeno(1,2,3-cd)pyrene	62	0.00017	0.00007	0.00006					0.73*	<1	<1	<1
pyrene	4,200	0.01151	0.00460	0.00427			0.03	EPA Chronic Oral RfD				
Total PAHs		0.12974	0.05190	0.04819						27	21	50
SOIL (off-site)												
arsenic	7.5				0.00005	0.00001	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
lead	74.7				0.00059	0.00008						
mercury	0.17				<0.00001	<0.00001						
benzo(a)anthracene	6.8				0.00005	0.00001			0.73*	<1	<1	<1
benzo(b)fluoranthene	12				0.00009	0.00001			0.73*	<1	<1	<1
benzo(a)pyrene	8.9				0.00007	0.00001			7.3	<1	<1	<1
Total PAHs					0.00022	0.00003				<1	<1	<1

Table D-2: Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil, Sediment and Solids - data from 1981 - 1999												
Big John Salvage - Hoult Road Site												
Contaminant	Max level	Estimated Exposure Doses					Health-based Guideline		Excess Cancer Risk			
		Incidental Ingestion					mg/kg/day	Source	CSF	Number in 10,000 people		
	ppm	mg/kg/day										
		Child	Child	Adult	Resident child					Child	Child	
		2-6 years	7-16 years		2-6 years	7-16 years				2-6 years	7-16 years	Adult
SEDIMENT (on-site)												
antimony	63.5	0.00017	0.00007	0.00006			0.0004	EPA Chron Oral RfD				
arsenic	18.4	0.00004	0.00002	0.00001			0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
lead	460	0.00126	0.00050	0.00047								
mercury	256	0.00070	0.00028	0.00026								
benzo(a)anthracene	41	0.00011	0.00004	0.00004					0.73*	<1	<1	<1
benzo(b)fluoranthene	51	0.00014	0.00006	0.00005					0.73*	<1	<1	<1
benzo(k)fluoranthene	6.7	0.00002	0.00001	0.00001					0.073*	<1	<1	<1
benzo(a)pyrene	25	0.00007	0.00003	0.00003					7.3	<1	<1	<1
dibenzo(a,h)anthracene	10	0.00003	0.00001	0.00001					7.3*	<1	<1	<1
indeno(1,2,3-cd)pyrene	18	0.00005	0.00002	0.00002					0.73*	<1	<1	<1
Total PAHs		0.00042	0.00017	0.00015						<1	<1	1
SEDIMENT (off-site)												
antimony	27.1	0.00007	0.00003	0.00003			0.0004	EPA Chron Oral RfD				
arsenic	106	0.00023	0.00009	0.00009			0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
cadmium	145	0.00040	0.00016	0.00015			0.001	EPA Chron Oral RfD				
lead	3,790	0.01038	0.00415	0.00386								
mercury	240	0.00066	0.00026	0.00024								
2-methylnapthalene	1,886	0.00517	0.00207	0.00192			0.004	EPA Chronic Oral RfD				
napthalene	3,906	0.01070	0.00428	0.00397			0.02	EPA Chronic Oral RfD				
benzo(a)anthracene	660	0.00181	0.00072	0.00067					0.73*	<1	<1	2
benzo(b)fluoranthene	590	0.00162	0.00065	0.00060					0.73*	<1	<1	2
benzo(k)fluoranthene	340	0.00093	0.00037	0.00035					0.073*	<1	<1	<1
benzo(a)pyrene	520	0.00142	0.00057	0.00053					7.3	7	6	14
carbazole	431	0.00118	0.00047	0.00044					0.02**	<1	<1	<1
chrysene	402	0.00110	0.00044	0.00041					0.0073*	<1	<1	<1
dibenzo(a,h)anthracene	820	0.00225	0.00090	0.00083					7.3*	12	9	22
dibenzofuran	1,087	0.00298	0.00119	0.00111			0.002	EPA Chronic Oral RfD				
indeno(1,2,3-cd)pyrene	70	0.00019	0.00008	0.00007					0.73*	<1	<1	<1
Total PAHs		0.01348	0.00539	0.00501						21	17	39

Table D-2: Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil, Sediment and Solids - data from 1981 - 1999

Big John Salvage - Hoult Road Site

Contaminant	Max level	Estimated Exposure Doses					Health-based Guideline		Excess Cancer Risk			
		Incidental Ingestion					mg/kg/day	Source	CSF	Number in 10,000 people		
	ppm	mg/kg/day										
		Child	Child	Adult	Resident child					Child	Child	
		2-6 years	7-16 years		2-6 years	7-16 years				2-6 years	7-16 years	Adult
COAL TAR												
arsenic	13.2	0.00003	0.00001	0.00001			0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
lead	131	0.00036	0.00014	0.00013								
mercury	2.1	0.00001	<0.00001	<0.00001								
2-methylnapthalene	2,510	0.00688	0.00275	0.00255			0.02	EPA Chronic Oral RfD				
napthalene	13,971	0.03828	0.01531	0.01422			0.02	EPA Chronic Oral RfD				
benzo(a)anthracene	2,814	0.00771	0.00308	0.00286					0.73*	4	3	8
benzo(b)fluoranthene	2,403	0.00658	0.00263	0.00245					0.73*	3	3	6
benzo(k)fluoranthene	1,876	0.00514	0.00206	0.00191					0.073*	<1	<1	<1
benzo(a)pyrene	2,507	0.00687	0.00275	0.00255					7.3	36	29	67
carbazole	2,677	0.00733	0.00293	0.00272					0.02**	<1	<1	<1
chrysene	2,661	0.00729	0.00292	0.00271					0.0073*	<1	<1	<1
dibenzofuran	3,218	0.00882	0.00353	0.00327			0.002	EPA Chronic Oral RfD				
fluoranthene	8,611	0.02359	0.00944	0.00876			0.04	EPA Chronic Oral RfD				
fluorene	3,772	0.01033	0.00413	0.00384			0.04	EPA Chronic Oral RfD				
indeno(1,2,3-cd)pyrene	1151	0.00315	0.00126	0.00117					0.73*	2	1	3
pyrene	5,958	0.01632	0.00653	0.00606			0.03	EPA Chronic Oral RfD				
Total PAHs		0.10315	0.04126	0.03831						45	36	84

ppm=parts per million equivalent to mg/kg or milligrams per kilogram

mg/kg/day=milligram per kilogram per day

ATSDR Chron Oral MRL=ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days

CSF=EPA Cancer Slope Factor ($mg/kg/day^{-1}$)

EPA Chron Oral RfD=EPA Chronic Oral Reference Dose for exposures over 365 days

*EPA NCEA Provisional=EPA National Center for Environmental Assessment (NCEA) Provisional value

**HEAST=EPA Health Effects Assessment Summary Table

RfD (Reference Dose) for dibenzofuran is from the National Center for Environmental Assessment (NCEA)

Assumptions

		Child	Child	Adult	Resident child	
Age range	years	2-6	7-16	over 16	2-6	7-16
Ingestion rate	kg/day	0.0001	0.0001	0.0001	0.0002	0.0001
Exposure frequency	days/year	180	180	260	260	180
	years	5	10	25	5	10
Body weight	kilogram	18	45	70	18	45

Table D-3: Estimated Absorbed Doses and Cancer Risk for Dermal Exposure to Surface Water - data from 1981 - 1999

Big John Salvage - Hoult Road Site

Contaminant	Toxicity	Perm coef	Max level	Estimated Absorbed Exposure Dose			Health-based Guideline		Excess Cancer Risk			
	adjustment	cm/hour	ppm	Dermal Exposure mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
				Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
ON SITE												
arsenic	1	0.001	0.295	0.00005	0.00004	0.00008	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
cadmium	0.025	0.001	0.0334	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
lead	1	0.0001	22.5	0.00041	0.00030	0.00060						
mercury	1	0.001	12	0.00217	0.00162	0.00322	0.0003	ATSDR Chron Oral MRL				
benzo(a)anthracene	1	0.47	0.003	0.00025	0.00019	0.00038			0.73*	<1	<1	1
benzo(b)fluoranthene	1	0.7	0.005	0.00063	0.00047	0.00094			0.73*	<1	<1	3
benzo(a)pyrene	1	0.7	0.002	0.00025	0.00019	0.00038			7.3	1	2	10
indeno(1,2,3-cd)pyrene	1	1	0.002	0.00036	0.00027	0.00054			0.73*	<1	<1	1
Total PAHs				0.00150	0.00112	0.00223				2	3	15
OFF SITE												
arsenic	1	0.001	0.0856	0.00002	0.00001	0.00002	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
cadmium	0.025	0.001	0.0051	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
lead	1	0.0001	0.0578	<0.00001	<0.00001	<0.00001						
manganese	0.04	0.001	2.97	0.00002	0.00002	0.00003	0.02	EPA Chron Oral RfD				
mercury	1	0.001	0.0036	<0.00001	<0.00001	<0.00001	0.0003	ATSDR Chron Oral MRL				
vanadium	0.026	0.001	0.0388	<0.00001	<0.00001	<0.00001	0.003	ATSDR Int Oral MRL				
benzo(a)anthracene	1	0.47	1.1	0.09348	0.06960	0.13889			0.73*	49	73	360
benzo(b)fluoranthene	1	0.7	1.3	0.16455	0.12251	0.24447			0.73*	86	130	640
benzo(a)pyrene	1	0.7	0.6	0.07595	0.05654	0.11283			7.3	400	590	2,900
chrysene	1	0.47	0.93	0.07904	0.05885	0.11743			0.0073*	<1	<1	3
fluoranthene	1	0.22	4.9	0.19493	0.14513	0.28960	0.04	EPA Chron Oral RfD				
indeno(1,2,3-cd)pyrene	1	1	0.24	0.04340	0.03231	0.06448			0.73*	23	34	170
napthalene	1	0.047	16	0.13598	0.10124	0.20202	0.02	EPA Chron Oral RfD				
Total PAHs				0.65134	0.48495	0.96770				550	820	4,100

Table D-3: Estimated Absorbed Doses and Cancer Risk for Dermal Exposure to Surface Water - data from 1981 - 1999

Big John Salvage - Hoult Road Site

cm/hour = centimeter per hour

ppm = parts per million

mg/kg/day = milligram per kilogram per day

CSF = EPA Cancer Slope Factor ($mg/kg/day^{-1}$)

Perm coef = Permeability coefficient

ATSDR Chron Oral MRL = ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days

ATSDR Int Oral MRL = ATSDR Intermediate Oral Minimal Risk Level for exposures between 15 and 365 days

EPA Chron Oral RfD = EPA Chronic Oral Reference Dose for exposures over 365 days

EPA RfD = Reference Dose from EPA 2002 Edt of the Drinking Water Standards and Health Advisories

*EPA National Center for Environmental Assessment (NCEA) Provisional value

Assumptions

		Child	Child	Adult
Age range	years	2-6	7-16	over 16
Exposed body surface	square centimeters	1,650	4,095	3,300
Exposure frequency	hours/day	4	3	8
	days/year	180	180	260
	years	5	10	25
Body weight	kilograms	18	45	70

Table D-4: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Soil, Sediments and Solids - data from 1981 - 1999 Big John Salvage - Hoult Road Site												
Contaminant	Max level	Toxicity	AF	Estimated Absorbed Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/kg	adjust		Dermal exposure			mg/kg/day	Source	CSF	Number in 10,000 people		
				mg/kg/day								
				Child	Child	Adult				Child	Child	Adult
				2-6 years	7-16 years					2-6 years	7-16 years	
SOIL (on-site)												
arsenic	39.4	1	0.03	0.00018	0.00018	0.00052	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	3
lead	890	1	0.01	0.00133	0.00132	0.00389						
mercury	1.3	1	0.01	0.00000	0.00000	0.00001						
benzo(a)anthracene	3900	1	0.13	0.07563	0.07508	0.22133			0.73*	39	78	580
benzo(b)fluoranthene	3400	1	0.13	0.06594	0.06546	0.19296			0.73*	34	68	500
benzo(k)fluoranthene	1900	1	0.13	0.03685	0.03658	0.10783			0.073*	2	4	28
benzo(a)pyrene	1100	1	0.13	0.02133	0.02118	0.06243			7.3	110	220	16
carbazole	141	1	0.10	0.00210	0.00209	0.00616			0.02**	<1	<1	<1
chrysene	3200	1	0.13	0.06206	0.06161	0.18161			0.0073*	<1	<1	5
dibenzo(a,h)anthracene	11	1	0.13	0.00021	0.00021	0.00062			7.3*	1	2	16
dibenzofuran	642	1	0.13	0.01245	0.01236	0.03643	0.002	EPA Chron Oral RfD				
ethylbenzene	15000	1	0.03	0.06713	0.06664	0.19645	0.1	EPA Chron Oral RfD				
fluoranthene	10300	1	0.13	0.19975	0.19830	0.58455	0.04	EPA Chron Oral RfD				
fluorene	3500	1	0.13	0.06788	0.06738	0.19863	0.04	EPA Chron Oral RfD				
indeno(1,2,3-cd)pyrene	62	1	0.13	0.00120	0.00119	0.00352			0.73*	<1	1	9
pyrene	4200	1	0.13	0.08145	0.08086	0.23836	0.03	EPA Chron Oral RfD				
Total PAHs				0.62685	0.62229	1.83443				190	380	2,800

Table D-4: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Soil, Sediments and Solids - data from 1981 - 1999 Big Johhn Salvage - Hoult Road Site												
Contaminant	Max level	Toxicity	AF	Estimated Absorbed Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/kg	adjust		Dermal exposure mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
				Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
SEDIMENT (on-site)												
antimony	63.5	0.15	0.01	0.00001	0.00001	0.00004	0.0004	EPA Chron Oral RfD				
arsenic	18.4	1	0.03	0.00008	0.00008	0.00024	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	1
lead	460	1	0.01	0.00069	0.00068	0.00201						
mercury	256	1	0.01	0.00038	0.00038	0.00112						
benzo(a)anthracene	41	1	0.13	0.00080	0.00079	0.00233			0.73*	<1	<1	6
benzo(b)fluoranthene	51	1	0.13	0.00099	0.00098	0.00289			0.73*	<1	1	7
benzo(k)fluoranthene	6.7	1	0.13	0.00013	0.00013	0.00038			0.073*	<1	<1	<1
benzo(a)pyrene	25	1	0.13	0.00048	0.00048	0.00142			7.3	3	5	37
dibenzo(a,h)anthracene	10	1	0.13	0.00019	0.00019	0.00057			7.3*	1	2	15
indeno(1,2,3-cd)pyrene	18	1	0.13	0.00035	0.00035	0.00102			0.73*	<1	<1	3
Total PAHs				0.00294	0.00292	0.00861				5	9	68
SEDIMENT (off-site)												
antimony	27.1	0.15	0.01	0.00001	0.00001	0.00002	0.0004	EPA Chron Oral RfD				
arsenic	106	1	0.03	0.00047	0.00047	0.00139	0.0003	ATSDR Chron Oral MRL	1.5	<1	1	7
cadmium	145	0.025	0.00	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
lead	3790	1	0.01	0.00565	0.00561	0.01655						
mercury	240	1	0.01	0.00036	0.00036	0.00105						
2-methylnapthalene	1886	1	0.10	0.02813	0.02793	0.08233	0.004	EPA Chron Oral RfD				
napthalene	3906	1	0.10	0.05827	0.05785	0.17052	0.02	EPA Chron Oral RfD				
benzo(a)anthracene	660	1	0.13	0.01280	0.01271	0.03746			0.73*	7	13	98
benzo(b)fluoranthene	590	1	0.13	0.01144	0.01136	0.03348			0.73*	6	12	87
benzo(k)fluoranthene	340	1	0.13	0.00659	0.00655	0.01930			0.073*	<1	<1	5
benzo(a)pyrene	520	1	0.13	0.01008	0.01001	0.02951			7.3	53	100	770
carbazole	431	1	0.10	0.00643	0.00638	0.01882			0.02**	<1	<1	1
chrysene	402	1	0.13	0.00780	0.00774	0.02281			0.0073*	<1	<1	<1
dibenzo(a,h)anthracene	820	1	0.13	0.01590	0.01579	0.04654			7.3*	83	160	1,200
dibenzofuran	1087	1	0.13	0.02108	0.02093	0.06169	0.002	EPA Chron Oral RfD				
indeno(1,2,3-cd)pyrene	70	1	0.13	0.00136	0.00135	0.00397			0.73*	<1	1	10
Total PAHs				0.09349	0.09281	0.27358				150	300	2,200

Table D-4: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Soil, Sediments and Solids - data from 1981 - 1999 Big Johhn Salvage - Hoult Road Site												
Contaminant	Max level	Toxicity	AF	Estimated Absorbed Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/kg	adjust		Dermal exposure			mg/kg/day	Source	CSF	Number in 10,000 people		
				mg/kg/day								
				Child	Child	Adult				Child	Child	Adult
				2-6 years	7-16 years					2-6 years	7-16 years	
COAL TAR (on-site)												
arsenic	13.2	1	0.03	0.00006	0.00006	0.00017	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
lead	131	1	0.01	0.00020	0.00019	0.00057						
mercury	2.1	1	0.01	<0.00001	<0.00001	0.00001						
2-methylnapthalene	2510	1	0.10	0.03744	0.03717	0.10958	0.004	EPA Chron Oral RfD				
napthalene	13971	1	0.10	0.20842	0.20690	0.60991	0.02	EPA Chron Oral RfD				
benzo(a)anthracene	2814	1	0.13	0.05457	0.05418	0.15970			0.73*	28	57	420
benzo(b)fluoranthene	2403	1	0.13	0.04660	0.04626	0.13638			0.73*	24	48	360
benzo(k)fluoranthene	1876	1	0.13	0.03638	0.03612	0.10647			0.073*	2	4	28
benzo(a)pyrene	2507	1	0.13	0.04862	0.04827	0.14228			7.3	250	500	3,700
carbazole	2677	1	0.10	0.03993	0.03964	0.11687			0.02**	<1	1	8
chrysene	2661	1	0.13	0.05161	0.05123	0.15102			0.0073*	<1	<1	4
dibenzofuran	3218	1	0.13	0.06241	0.06195	0.18263	0.002	EPA Chron Oral RfD				
fluoranthene	8611	1	0.13	0.16699	0.16578	0.48869	0.04	EPA Chron Oral RfD				
fluorene	3772	1	0.13	0.07315	0.07262	0.21407	0.04	EPA Chron Oral RfD				
indeno(1,2,3-cd)pyrene	1151	1	0.13	0.02232	0.02216	0.06532			0.73*	12	23	170
pyrene	5958	1	0.30	0.26664	0.26470	0.78030	0.03	EPA Chron Oral RfD				
Total PAHs				0.86923	0.86291	2.54372				320	640	4,700
SOIL (off-site, residential)												
arsenic	7.5	1	0.03	0.00003	0.00002		0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
lead	74.7	1	0.01	0.00008	0.00007							
mercury	0.17	1	0.01	0.00000	0.00000							
benzo(a)anthracene	6.8	1	0.10	0.00007	0.00007				0.73*	<1	<1	
benzo(b)fluoranthene	12	1	0.10	0.00013	0.00012				0.73*	<1	<1	
benzo(a)pyrene	8.9	1	0.10	0.00010	0.00009				7.3	<1	1	
Total PAHs				0.00030	0.00027					<1	2	

Table D-4: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Soil, Sediments and Solids - data from 1981 - 1999												
Big Johhn Salvage - Hoult Road Site												
Contaminant	Max level	Toxicity	AF	Estimated Absorbed Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/kg	adjust		Dermal exposure			mg/kg/day	Source	CSF	Number in 10,000 people		
				mg/kg/day								
				Child	Child	Adult				Child	Child	Adult
				2-6 years	7-16 years					2-6 years	7-16 years	

mg/kg=milligram per kilogram

mg/kg/day=milligram per kilogram per day

CSF=EPA Cancer Slope Factor (mg/kg/day^{-1})

AF=Absorption or bioavailaility factor (unitless)

ATSDR Chron Oral MRL=ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days

EPA Chron Oral RfD=EPA Chronic Oral Reference Dose for exposures over 365 days

RfD=Reference Dose from from the National Center for Environmental Assessment (NCEA)

*EPA National Center for Environmental Assessment (NCEA) Provisional value

**EPA Health Effects Assessment Summary Table (HEAST)

Assumptions				
		Child	Child	Adult
Age range	years	2-6	7-16	over 16
Soil to skin adherence	mg/cm^2	3.3	3.3	13
Exposed body surface	cm^2	1,650	4,095	3,300
Exposure frequency	days/year	180	180	260
	years	5	10	25
Body weight	kilograms	18	45	70
Residential exposures				
Soil to skin adherence	mg/cm^2	3.3	3.3	
Exposed body surface	cm^2	1,650	4,095	
Exposure frequency	days/year	130	120	
	years	5	10	
Body weight	kilograms	18	45	

Table D-5: Estimated Absorbed Exposure Doses and Cancer Risk for Swimming and Water Sports
in the Monongahela River - data from 1981-1999
Big John Salvage - Hoult Road Site

Contaminant	Toxicity adjustment	Perm coef cm/hour	Max level ppm	Estimated Absorbed Exposure Doses Swimming/water sports mg/kg/day		Health-based Guideline Comparison Value mg/kg/day and type
				Child	Adult	
lead	1	0.0001	0.021	<0.00001	<0.00001	
manganese	0.04	0.001	1.7	<0.00001	<0.00001	0.02 EPA Chron Oral RfD

cm/hour=centimeter per hour
ppm=parts per million
mg/kg/day=milligram per kilogram per day
EPA Chron Oral RfD=EPA Chronic Oral Reference Dose for exposures over 365 days
Perm coef=Permeability coefficient

Assumptions

		Child	Adult
Exposed body surface	square centimeters	6,600	23,000
Exposure frequency	hours/day	1	1
	days/year	365	365
	days/year	180	180
Body weight	kilograms	13.3	70

Table D-6: Estimated Exposure Doses from eating fish from the Monongahela River near the site									
Big John Salvage - Hoult Road Site									
Species	Contaminant	Number	Max	Range of	Health-based	Estimated Exposure Dose			
		Samples	Conc	Concentrations	Guideline	Recreational		Subsistence	
				measured over CV	Comparison Values	6 yr old	adult	6 yr old	adult
			ppm	ppm	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day
whole-channel catfish	lead	2	2.31	0.57 - 2.31		0.0007	0.0006	0.0055	0.0047
whole-golden redhorse sucker	lead	1	0.8	0.8		0.0002	0.0002	0.0019	0.0016
whole-spotted bass	lead	1	0.7	0.7		0.0002	0.0002	0.0017	0.0014
whole-walleye	lead	1	2.66	2.66		0.0008	0.0007	0.0063	0.0054
fillet-channel catfish	mercury	1	0.1	0.1	0.0001*	<0.0001	<0.0001	0.0002	0.0002
fillet-lm/sm bass	mercury	2	0.15	0.13 - 0.15	0.0001*	<0.0001	<0.0001	0.0004	0.0003
fillet-walleye	mercury	2	0.26	0.21 - 0.26	0.0001*	0.0001	0.0001	0.0006	0.0005
whole-channel catfish	mercury	1	0.8	0.8	0.0001*	0.0002	0.0002	0.0019	0.0016
whole-walleye	mercury	3	0.116	0.08 - 0.116	0.0001*	<0.0001	<0.0001	0.0003	0.0002
channel catfish	p,p DDE	1	0.8	0.8		0.0002	0.0002	0.0019	0.0016
walleye	p,p DDE	1	0.16	0.16		<0.0001	<0.0001	0.0004	0.0003
channel catfish	o,p DDE	1	0.03	0.03		<0.0001	<0.0001	0.0001	0.0001
walleye	o,p DDE	1	0.48	0.48		0.0001	0.0001	0.0011	0.0010
channel catfish	o,p DDT	1	0.03	0.03	0.0005	<0.0001	<0.0001	0.0001	0.0001
walleye	o,p DDT	1	0.16	0.16	0.0005	<0.0001	<0.0001	0.0004	0.0003
channel catfish	total DDT	1	0.13	0.13	0.0005	<0.0001	<0.0001	0.0003	0.0003
walleye	total DDT	1	0.8	0.8	0.0005	0.0002	0.0002	0.0019	0.0016
carp	total chlordane	1	0.07	0.07	0.0005	<0.0001	<0.0001	0.0002	0.0001
channel catfish	total chlordane	2	1.52	0.47 - 1.52	0.0005	0.0004	0.0004	0.0036	0.0031
golden redhorse sucker	total chlordane	1	0.348	0.348	0.0005	0.0001	0.0001	0.0008	0.0007
walleye	total chlordane	1	4.14	4.14	0.0005	0.0012	0.0010	0.0098	0.0084
channel catfish	aldrin	1	0.16	0.16	0.00003	<0.0001	<0.0001	0.0004	0.0003
walleye	aldrin	1	0.03	0.03	0.00003	<0.0001	<0.0001	0.0001	0.0001

Table D-6: Estimated Exposure Doses from eating fish from the Monongahela River near the site									
Big John Salvage - Hoult Road Site									
Species	Contaminant	Number	Max	Range of	Health-based	Estimated Exposure Dose			
		Samples	Conc	Concentrations	Guideline	Recreational		Subsistence	
				measured over CV	Comparison Values	6 yr old	adult	6 yr old	adult
			ppm	ppm	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day
walleye	dieldrin	1	0.02	0.02	0.00005	<0.0001	<0.0001	<0.0001	<0.0001
channel catfish	endrin	1	0.13	0.13	0.0003	<0.0001	<0.0001	0.0003	0.0003
carp	heptachlor	1	0.01	0.01	0.0005	<0.0001	<0.0001	<0.0001	<0.0001
channel catfish	heptachlor	2	0.06	0.01 - 0.06	0.0005	<0.0001	<0.0001	0.0001	0.0001
walleye	heptachlor	1	0.02	0.02	0.0005	<0.0001	<0.0001	<0.0001	<0.0001
channel catfish	heptachlor epoxide	2	0.02	0.02	0.000013	0.000006	0.000005	0.000047	0.000041
walleye	heptachlor epoxide	1	0.07	0.07	0.000013	0.000020	0.000018	0.000165	0.000142
carp	hexachlorobenzene	1	0.01	0.01	0.0008	<0.0001	<0.0001	<0.0001	<0.0001
channel catfish	hexachlorobenzene	2	0.01	0.01	0.0008	<0.0001	<0.0001	<0.0001	<0.0001
channel catfish	Aroclor 1260	2	0.88	0.88	0.00005	0.00026	0.00022	0.00208	0.00179
golden redhorse sucker	Aroclor 1260	1	0.722	0.722	0.00005	0.00021	0.00018	0.00171	0.00147
walleye	Aroclor 1260	1	1.48	1.48	0.00005	0.00043	0.00037	0.00350	0.00301
channel catfish	total Aroclor	3	0.88	0.88	0.00005	0.00026	0.00022	0.00208	0.00179
golden redhorse sucker	total Aroclor	1	0.722	0.722	0.00005	0.00021	0.00018	0.00171	0.00147
walleye	total Aroclor	1	1.48	1.48	0.00005	0.00043	0.00037	0.00350	0.00301

* value for methylmercury

fillet-lm/sm bass = fillet of large mouth or small mouth bass

ppm = parts per million Parts per million is equivalent to milligrams per kilogram (mg/kg)

mg/kg/day = milligrams per kilogram per day

Health-based Comparison Values are from Table 3-1 of the EPA Risk Based Consumption Limit Tables, except as noted.

Health-based Comparison Value for Aroclor is from the West Virginia Sportfish Consumption Advisory Guide, Table 3.

CSF = EPA Cancer Slope Factor (mg/kg/day^{-1})

DDE = dichlorodiphenyldichloroethylene

DDT = dichlorodiphenyltrichloroethylene

NOTE: number of samples = number of detections = the number of detections over the comparison value

Assumptions				
	Recreational		Subsistence	
	6 yr old	adult	6 yr old	adult
Intake Rate (mg)	6562.5	17,500	53,400	142,400
Body weight (kgms)	22.6	70	22.6	70
Exposure freq (day/yr)	365	365	365	365
Exposure freq (yrs)	10	54	10	54

Table D-6: Estimated Exposure Doses from eating fish from the Monongahela River near the site						
Big John Salvage - Hoult Road Site						
Species	Contaminant	CSF	Theoretical Excess Cancer Risk			
			Recreational		Subsistence	
			6 yr old	adult	6 yr old	adult
		(mg/kg/day)$^{-1}$	Number in 10,000 people			
whole-channel catfish	lead		n/a	n/a	n/a	n/a
whole-golden redhorse sucker	lead		n/a	n/a	n/a	n/a
whole-spotted bass	lead		n/a	n/a	n/a	n/a
whole-walleye	lead		n/a	n/a	n/a	n/a
fillet-channel catfish	mercury		n/a	n/a	n/a	n/a
fillet-lm/sm bass	mercury		n/a	n/a	n/a	n/a
fillet-walleye	mercury		n/a	n/a	n/a	n/a
whole-channel catfish	mercury		n/a	n/a	n/a	n/a
whole-walleye	mercury		n/a	n/a	n/a	n/a
channel catfish	p,p DDE	0.34	<1	<1	<1	4
walleye	p,p DDE	0.34	<1	<1	<1	<1
channel catfish	o,p DDE	0.34	<1	<1	<1	<1
walleye	o,p DDE	0.34	<1	<1	<1	3
channel catfish	o,p DDT	0.34	<1	<1	<1	<1
walleye	o,p DDT	0.34	<1	<1	<1	<1
channel catfish	total DDT	0.34	<1	<1	<1	<1
walleye	total DDT	0.34	<1	<1	<1	4
carp	total chlordane	0.35	<1	<1	<1	<1
channel catfish	total chlordane	0.35	<1	1	2	8
golden redhorse sucker	total chlordane	0.35	<1	<1	<1	2
walleye	total chlordane	0.35	<1	3	5	23
channel catfish	aldrin	17	1	5	9	43
walleye	aldrin	17	<1	<1	2	8

Table D-6: Estimated Exposure Doses from eating fish from the Monongahela River near the site						
Big John Salvage - Hoult Road Site						
Species	Contaminant	CSF	Theoretical Excess Cancer Risk			
			Recreational		Subsistence	
			6 yr old	adult	6 yr old	adult
		$(mg/kg/day)^{-1}$	Number in 10,000 people			
walleye	dieldrin	16	<1	<1	1	5
channel catfish	endrin		n/a	n/a	n/a	n/a
carp	heptachlor	4.5	<1	<1	<1	<1
channel catfish	heptachlor	4.5	<1	<1	<1	4
walleye	heptachlor	4.5	<1	<1	<1	1
channel catfish	heptachlor epoxide	9.1	<1	<1	<1	3
walleye	heptachlor epoxide	9.1	<1	1	2	10
carp	hexachlorobenzene	1.6	<1	<1	<1	<1
channel catfish	hexachlorobenzene	1.6	<1	<1	<1	<1
channel catfish	arochlor 1260	2	<1	3	6	28
golden redhorse sucker	arochlor 1260	2	<1	3	5	23
walleye	arochlor 1260	2	1	6	10	46
channel catfish	total arochlor	2	<1	3	6	28
golden redhorse sucker	total arochlor	2	<1	3	5	23
walleye	total arochlor	2	1	6	10	46

CSF = EPA Cancer Slope Factor (mg/kg/day -1)

APPENDIX E

Tables E-1 through E-5 Estimated Exposure Dose Tables - Data from 2000 - 2001

Table E-1: Estimated Exposure Doses & Cancer Risk for Incidental Ingestion of Contaminants in Surface Water - data from 2000 - 2001 Big John Salvage - Hoult Road Site										
Contaminant	Max level	Estimated Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/L	Incidental Ingestion mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
		Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
ON SITE										
aluminum	161	0.04411	0.01764	0.01638	2	ATSDR Int Oral MRL				
antimony	0.0391	0.00001	0.00000	0.00000	0.0004	EPA Chron Oral RfD				
arsenic	2.17	0.00048	0.00019	0.00018	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
barium	0.837	0.00023	0.00009	0.00009	0.07	EPA Chron Oral RfD				
cadmium	0.473	0.00013	0.00005	0.00005	0.0002	ATSDR Chron Oral MRL				
cobalt	0.109	0.00003	0.00001	0.00001	0.01	ATSDR Int Oral MRL				
copper	1.41	0.00039	0.00015	0.00014	0.03	ATSDR Int Oral MRL				
lead	2.12	0.00058	0.00023	0.00022						
manganese	11.7	0.00321	0.00128	0.00119	0.02	EPA Chron Oral RfD				
mercury	1.15	0.00032	0.00013	0.00012	0.0003	ATSDR Chron Oral MRL				
nickel	0.252	0.00007	0.00003	0.00003	0.02	EPA Chron Oral RfD				
thallium	0.0153	<0.00001	<0.00001	<0.00001	0.00007	EPA Chron Oral RfD				
vanadium	0.132	0.00004	0.00001	0.00001	0.003	ATSDR Int Oral MRL				
benzo(a)anthracene	0.021	0.00001	<0.00001	<0.00001			0.73*	<1	<1	<1
benzo(b)fluoranthene	0.028	0.00001	<0.00001	<0.00001			0.73*	<1	<1	<1
benzo(a)pyrene	0.023	0.00001	<0.00001	<0.00001			7.3	<1	<1	<1
chrysene	0.022	0.00001	<0.00001	<0.00001			0.0073*	<1	<1	<1
indeno(1,2,3-cd)pyrene	0.013	<0.00001	<0.00001	<0.00001			0.73*	<1	<1	<1
Total PAHs		0.00003	<0.00001	<0.00001				<1	<1	<1

Table E-1: Estimated Exposure Doses & Cancer Risk for Incidental Ingestion of Contaminants in Surface Water - data from 2000 - 2001 Big John Salvage - Hoult Road Site										
Contaminant	Max level	Estimated Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/L	Incidental Ingestion mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
		Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
OFF SITE										
aluminum	55.3	0.01515	0.00606	0.00563	2	ATSDR Int Oral MRL				
antimony	0.0082	<0.00001	<0.00001	<0.00001	0.0004	EPA Chron Oral RfD				
arsenic	0.0634	0.00001	0.00001	0.00001	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
barium	0.793	0.00022	0.00009	0.00008	0.07	EPA Chron Oral RfD				
cadmium	0.0306	0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
chromium	0.118	0.00003	0.00001	0.00001	0.003	EPA Chron Oral RfD				
cobalt	0.136	0.00004	0.00001	0.00001	0.01	ATSDR Int Oral MRL				
lead	0.511	0.00014	0.00006	0.00005						
manganese	34	0.00932	0.00373	0.00346	0.02	EPA Chron Oral RfD				
mercury	0.172	0.00005	0.00002	0.00002	0.0003	ATSDR Chron Oral MRL				
nickel	0.219	0.00006	0.00002	0.00002	0.02	EPA Chron Oral RfD				
thallium	0.0129	<0.00001	<0.00001	<0.00001	0.00007	EPA Chron Oral RfD				
vanadium	0.0826	0.00002	0.00001	0.00001	0.003	ATSDR Int Oral MRL				
aroclor-1242	0.00092	<0.00001	<0.00001	<0.00001			2	<1	<1	<1
benzene	0.83	0.00023	0.00009	0.00008	0.004	EPA Chron Oral RfD	0.055	<1	<1	<1
benzo(a)anthracene	0.01	<0.00001	<0.00001	<0.00001			0.73*	<1	<1	<1
benzo(b)fluoranthene	0.008	<0.00001	<0.00001	<0.00001			0.73*	<1	<1	<1
benzo(a)pyrene	0.01	<0.00001	<0.00001	<0.00001			7.3	<1	<1	<1
carbazole	0.017	<0.00001	<0.00001	<0.00001			0.02**	<1	<1	<1
chrysene	0.011	<0.00001	<0.00001	<0.00001			0.0073*	<1	<1	<1
hexachlorobutadiene	0.002	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Int Oral MRL	0.078	<1	<1	<1
indeno(1,2,3-cd)pyrene	0.006	<0.00001	<0.00001	<0.00001			0.73*	<1	<1	<1
n-nitroso-di-n-propylamine	0.002	<0.00001	<0.00001	<0.00001	0.095	ATSDR Acute Oral MRL	7	<1	<1	<1
Total PAHs		<0.00001	<0.00001	<0.00001				<1	<1	<1

Table E-1: Estimated Exposure Doses & Cancer Risk for Incidental Ingestion of Contaminants in Surface Water - data from 2000 - 2001 Big John Salvage - Hoult Road Site										
Contaminant	Max level	Estimated Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/L	Incidental Ingestion			mg/kg/day	Source	CSF	Number in 10,000 people		
		mg/kg/day								
		Child	Child	Adult				Child	Child	Adult
		2-6 years	7-16 years					2-6 years	7-16 years	

mg/L = milligram per liter

mg/kg/day=milligram per kilogram per day

CSF = EPA Cancer Slope Factor (mg/kg/day -1)

ATSDR Chron Oral MRL = ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days

ATSDR Int Oral MRL = ATSDR Intermediate Oral Minimal Risk Level for exposures between 15 and 365 days

EPA Chron Oral RfD = EPA Chronic Oral Reference Dose for exposures over 365 days

EPA RfD = Reference Dose from EPA 2002 Edt of the Drinking Water Standards and Health Advisories

*EPA National Center for Environmental Assessment (NCEA) Provisional value

** EPA Health Effects Assessment Summary Table (HEAST)

Assumptions				
		Child	Child	Adult
Age range	years	2-6 years	7-16 years	over 16
Ingestion rate	L/day	0.01	0.01	0.01
Exposure frequency	days/year	180	180	260
	years	5	10	25
Body weight	kg	18	45	70

Table E-2: Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil, Sediment and Waste Contaminants - data from 2000 - 2001 Big John Salvage - Hoult Road Site										
Contaminant	Max level	Estimated Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	ppm	Incidental Ingestion mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
		Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
SOIL (on-site)										
antimony	100	0.00027	0.00011	0.00010	0.0004	EPA Chron Oral RfD				
arsenic	747	0.00164	0.00065	0.00061	0.0003	ATSDR Chron Oral MRL	1.5	2	1	3
cadmium	240	0.00066	0.00026	0.00024	0.001	EPA Chron Oral RfD				
chromium	778	0.00213	0.00085	0.00079	0.003	EPA Chron Oral RfD				
copper	10,800	0.02959	0.01184	0.01099	0.03	ATSDR Int Oral MRL				
lead	9,830	0.02693	0.01077	0.01000						
manganese	4,160	0.01140	0.00456	0.00423	0.02	EPA Chron Oral RfD				
mercury	1,480	0.00405	0.00162	0.00151						
thallium	13.3	0.00004	0.00001	0.00001	0.00007	EPA Chron Oral RfD				
benzo(a)anthracene	330	0.00090	0.00036	0.00034			0.73*	<1	<1	<1
benzo(b)fluoranthene	390	0.00107	0.00043	0.00040			0.73*	<1	<1	<1
benzo(a)pyrene	330	0.00090	0.00036	0.00034			7.3	4	3	7
chrysene	300	0.00082	0.00033	0.00031			0.0073*	<1	<1	<1
indeno(1,2,3-cd)pyrene	180	0.00049	0.00020	0.00018			0.73*	<1	<1	<1
Total PAHs		0.00419	0.00168	0.00156				5	4	9

Table E-2: Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil, Sediment and Waste Contaminants - data from 2000 - 2001 Big John Salvage - Hoult Road Site										
Contaminant	Max level	Estimated Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	ppm	Incidental Ingestion mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
		Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
SEDIMENT (on-site)										
arsenic	82.8	0.00018	0.00007	0.00007	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
cadmium	31.5	0.00009	0.00003	0.00003	0.001	EPA Chron Oral RfD				
lead	1550	0.00425	0.00170	0.00158						
mercury	17.3	0.00005	0.00002	0.00002						
benzo(a)anthracene	98	0.00027	0.00011	0.00010			0.73*	<1	<1	<1
benzo(b)fluoranthene	100	0.00027	0.00011	0.00010			0.73*	<1	<1	<1
benzo(a)pyrene	85	0.00023	0.00009	0.00009			7.3	<1	<1	2
chrysene	98	0.00027	0.00011	0.00010			0.0073*	<1	<1	<1
indeno(1,2,3-cd)pyrene	29	0.00008	0.00003	0.00003			0.73*	<1	<1	<1
Total PAHs		0.00112	0.00045	0.00042				1	1	2
SEDIMENT (off-site)										
arsenic	55.6	0.00012	0.00005	0.00005	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
cadmium	29.4	0.00008	0.00003	0.00003	0.001	EPA Chron Oral RfD				
lead	277	0.00076	0.00030	0.00028						
mercury	29.7	0.00008	0.00003	0.00003						
benzo(a)anthracene	120	0.00033	0.00013	0.00012			0.73*	<1	<1	<1
benzo(b)fluoranthene	120	0.00033	0.00013	0.00012			0.73*	<1	<1	<1
benzo(a)pyrene	92	0.00025	0.00010	0.00009			7.3	1	<1	2
chrysene	110	0.00030	0.00012	0.00011			0.0073*	<1	<1	<1
indeno(1,2,3-cd)pyrene	26	0.00007	0.00003	0.00003			0.73*	<1	<1	<1
Total PAHs		0.00128	0.00051	0.00048				1	1	3

Table E-2: Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil, Sediment and Waste Contaminants - data from 2000 - 2001 Big John Salvage - Hoult Road Site										
Contaminant	Max level	Estimated Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	ppm	Incidental Ingestion mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
		Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
COAL TAR										
arsenic	6.9	0.00002	0.00001	0.00001	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
mercury	2.4	0.00001	<0.00001	<0.00001						
thallium	17.3	0.00005	0.00002	0.00002	0.00007	EPA Chron Oral RfD				
benzene	0.86	<0.00001	<0.00001	<0.00001	0.004	EPA Chron Oral RfD	0.055	<1	<1	<1
benzo(a)anthracene	250	0.00068	0.00027	0.00025			0.73*	<1	<1	<1
benzo(b)fluoranthene	210	0.00058	0.00023	0.00021			0.73*	<1	<1	<1
benzo(a)pyrene	150	0.00041	0.00016	0.00015			7.3	2	1	3
carbazole	370	0.00101	0.00041	0.00038			0.02**	<1	<1	<1
chrysene	540	0.00148	0.00059	0.00055			0.0073*	<1	<1	<1
dibenzofuran	680	0.00186	0.00075	0.00069	0.002	EPA Chron Oral RfD				
indeno(1,2,3-cd)pyrene	74	0.00020	0.00008	0.00008			0.73*	<1	<1	<1
napthalene	2,100	0.00575	0.00230	0.00214	0.02	EPA Chron Oral RfD				
Total PAHs		0.00623	0.00249	0.00231				2	2	4
CULLET										
arsenic	3.5	0.00001	<0.00001	<0.00001	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
mercury	0.071	<0.00001	<0.00001	<0.00001						
thallium	13.9	0.00004	0.00002	0.00001	0.00007	EPA Chron Oral RfD				

Table E-2: Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil, Sediment and Waste Contaminants - data from 2000 - 2001 Big John Salvage - Hoult Road Site										
Contaminant	Max level	Estimated Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	ppm	Incidental Ingestion mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
		Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult

ppm = parts per million

mg/kg/day = milligram per kilogram per day

CSF = EPA Cancer Slope Factor (mg/kg/day $^{-1}$)

ATSDR Chron Oral MRL = ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days

ATSDR Int Oral MRL = ATSDR Intermediate Oral Minimal Risk Level for exposures between 15 and 365 days

EPA Chron Oral RfD = EPA Chronic Oral Reference Dose for exposures over 365 days

RfD = EPA Reference dose (dibenzofuran) from the National Center for Environmental Assessment (NCEA)

*EPA National Center for Environmental Assessment (NCEA) Provisional value

**EPA Health Effects Assessment Summary Table (HEAST)

Assumptions				
		Child	Child	Adult
Age range	years	2-6	7-16	over 16
Ingestion rate	kg/day	0.0001	0.0001	0.0001
Exposure frequency	days/year	180	180	260
	years	5	10	25
Body weight	kilograms	18	45	70

Table E-3: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Surface Water - data from 2000 - 2001

Big John Salvage - Hoult Road Site

Contaminant	Toxicity	Perm coef	Max level	Estimated Absorbed Exposure Dose			Health-based Guideline		Excess Cancer Risk			
	adj	cm/hour	ppm	Dermal exposure			mg/kg/day	Source	CSF	Number in 10,000 people		
				mgkg/day								
				Child	Child	Adult				Child	Child	Adult
				2-6 years	7-16 years					2-6 years	7-16 years	
ON-SITE												
antimony	0.15	0.001	0.0391	<0.00001	<0.00001	<0.00001	0.0004	EPA Chron Oral RfD				
arsenic	1	0.001	2.17	0.00039	0.00029	0.00058	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	3
barium	0.07	0.001	0.837	0.00001	0.00001	0.00002	0.07	EPA Chron Oral RfD				
cadmium	0.025	0.001	0.473	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
copper	1	0.001	1.41	0.00025	0.00019	0.00038	0.03	ATSDR Int Oral MRL				
lead	1	0.0001	2.12	0.00004	0.00003	0.00006						
manganese	0.04	0.001	11.7	0.00008	0.00006	0.00013	0.02	EPA Chron Oral RfD				
mercury	1	0.001	1.15	0.00021	0.00015	0.00031	0.0003	ATSDR Chron Oral MRL				
nickel	0.04	0.0002	0.252	<0.00001	<0.00001	<0.00001	0.02	EPA Chron Oral RfD				
thallium	1	0.001	0.0153	<0.00001	<0.00001	<0.00001	0.00007	EPA Chron Oral RfD				
vanadium	0.026	0.001	0.132	<0.00001	<0.00001	<0.00001	0.003	ATSDR Int Oral MRL				
benzo(a)anthracene	1	0.47	0.021	0.00178	0.00133	0.00265			0.73*	<1	1	7
benzo(b)fluoranthene	1	0.7	0.028	0.00354	0.00264	0.00527			0.73*	2	3	14
benzo(a)pyrene	1	0.7	0.023	0.00291	0.00217	0.00433			7.3	15	23	110
chrysene	1	0.47	0.022	0.00187	0.00139	0.00278			0.0073*	<1	<1	<1
indeno(1,2,3-cd)pyrene	1	1	0.013	0.00235	0.00175	0.00349			0.73*	1	2	9
Total PAHs				0.01246	0.00928	0.01851				19	29	140

Table E-3: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Surface Water - data from 2000 - 2001												
Big John Salvage - Hoult Road Site												
Contaminant	Toxicity	Perm coef	Max level	Estimated Absorbed Exposure Dose			Health-based Guideline		Excess Cancer Risk			
	adj	cm/hour	ppm	Dermal exposure			mg/kg/day	Source	CSF	Number in 10,000 people		
				mgkg/day								
				Child	Child	Adult				Child	Child	Adult
				2-6 years	7-16 years					2-6 years	7-16 years	
OFF-SITE												
antimony	0.15	0.001	0.0082	<0.00001	<0.00001	<0.00001	0.0004	EPA Chron Oral RfD				
arsenic	1	0.001	0.0634	0.00001	0.00001	0.00002	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
barium	1	0.001	0.793	0.00014	0.00011	0.00021	0.07	EPA Chron Oral RfD				
cadmium	0.025	0.001	0.0306	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
chromium	0.013	0.002	0.118	<0.00001	<0.00001	<0.00001	0.003	EPA Chron Oral RfD				
lead	1	0.0001	0.511	0.00001	0.00001	0.00001						
manganese	0.04	0.001	34	0.00025	0.00018	0.00037	0.02	EPA Chron Oral RfD				
mercury	1	0.001	0.172	0.00003	0.00002	0.00005	0.0003	ATSDR Chron Oral MRL				
nickel	0.04	0.0002	0.219	<0.00001	<0.00001	<0.00001	0.02	EPA Chron Oral RfD				
thallium	1	0.001	0.0129	<0.00001	<0.00001	<0.00001	0.00007	EPA Chron Oral RfD				
vanadium	0.026	0.001	0.0826	<0.00001	<0.00001	<0.00001	0.003	ATSDR Int Oral MRL				
benzene	1	0.015	0.83	0.00225	0.00168	0.00334	0.004	EPA Chron Oral RfD	0.055	<1	<1	<1
benzo(a)anthracene	1	0.47	0.01	0.00085	0.00063	0.00126			0.73*	<1	<1	3
benzo(b)fluoranthene	1	0.7	0.008	0.00101	0.00075	0.00150			0.73*	<1	<1	4
benzo(a)pyrene	1	0.7	0.01	0.00127	0.00094	0.00188			7.3	7	10	49
carbazole	1	0.47	0.017	0.00144	0.00108	0.00215			0.02**	<1	<1	<1
chrysene	1	0.47	0.011	0.00093	0.00070	0.00139			0.0073*	<1	<1	<1
hexachlorobutadiene	1	0.081	0.002	0.00003	0.00002	0.00004	0.0002	ATSDR Int Oral MRL	0.078	<1	<1	<1
indeno(1,2,3-cd)pyrene	1	1	0.006	0.00108	0.00081	0.00161			0.73*	<1	<1	4
Total PAHs				0.00662	0.00493	0.00984				8	12	61

Table E-3: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Surface Water - data from 2000 - 2001 Big John Salvage - Hoult Road Site												
Contaminant	Toxicity	Perm coef	Max level	Estimated Absorbed Exposure Dose			Health-based Guideline		Excess Cancer Risk			
	adj	cm/hour	ppm	Dermal exposure			mg/kg/day	Source	CSF	Number in 10,000 people		
				mgkg/day								
				Child	Child	Adult				Child	Child	Adult
				2-6 years	7-16 years					2-6 years	7-16 years	

cm^2 = square centimeters
cm/hour = centimeter per hour
ppm = parts per million
mg/kg/day = milligram per kilogram per day
CSF = EPA Cancer Slope Factor (mg/kg/day $^{-1}$)
Perm coef = Permeability coefficient
ATSDR Chron Oral MRL = ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days
ATSDR Int Oral MRL = ATSDR Intermediate Oral Minimal Risk Level for exposures between 15 and 365 days
EPA Chron Oral RfD = EPA Chronic Oral Reference Dose for exposures over 365 days
*EPA National Center for Environmental Assessment (NCEA) Provisional value
**EPA Health Effects Assessment Summary Table (HEAST)

Assumptions				
		Child	Child	Adult
Age range	years	2-6	7-16	over 16
Exposed body surface	cm^2	1,650	4,095	3,300
Exposure frequency	hours/day	4	3	8
	days/year	180	180	260
	years	5	10	25
Body weight	kilograms	18	45	70

Table E-4: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Soil, Sediments and Solids - data from 2000 - 2001 Big John Salvage - Hoult Road Site												
Contaminant	Max level	Toxicity	AF	Estimated Absorbed Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/kg	adjustment		Dermal exposure mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
				Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
SOIL (on-site)												
antimony	100	0.15	0.01	0.00002	0.00002	0.00007	0.0004	EPA Chron Oral RfD				
arsenic	747	1	0.03	0.00334	0.00332	0.00978	0.0003	ATSDR Chron Oral MRL	1.5	4	7	52
cadmium	240	0.025	0.001	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
chromium	778	0.013	0.01	0.00002	0.00001	0.00004	0.003	EPA Chron Oral RfD				
copper	10,800	1	0.01	0.01611	0.01599	0.04715	0.03	ATSDR Int Oral MRL				
lead	9,830	1	0.01	0.01466	0.01456	0.04291						
manganese	4,160	0.04	0.01	0.00025	0.00025	0.00073	0.02	EPA Chron Oral RfD				
mercury	1,480	1	0.01	0.00221	0.00219	0.00646						
thallium	13.3	1	0.01	0.00002	0.00002	0.00006	0.00007	EPA Chron Oral RfD				
benzo(a)anthracene	330	1	0.13	0.00640	0.00635	0.01873			0.73*	3	7	49
benzo(b)fluoranthene	390	1	0.13	0.00756	0.00751	0.02213			0.73*	4	8	58
benzo(a)pyrene	330	1	0.13	0.00640	0.00635	0.01873			7.3	33	66	490
chrysene	300	1	0.13	0.00582	0.00578	0.01703			0.0073*	<1	<1	<1
indeno(1,2,3-cd)pyrene	180	1	0.13	0.00349	0.00347	0.01022			0.73*	2	4	27
Total PAHs				0.02967	0.02946	0.08683				43	84	620
SEDIMENT (on-site)												
arsenic	82.8	1	0.03	0.00037	0.00037	0.00108	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	6
cadmium	31.5	0.025	0.001	0.00000	0.00000	0.00000	0.0002	ATSDR Chron Oral MRL				
lead	1,550	1	0.01	0.00231	0.00230	0.00677						
mercury	17.3	1	0.01	0.00003	0.00003	0.00008						
benzo(a)anthracene	98	1	0.13	0.00190	0.00189	0.00556			0.73*	<1	2	15
benzo(b)fluoranthene	100	1	0.13	0.00194	0.00193	0.00568			0.73*	1	2	15
benzo(a)pyrene	85	1	0.13	0.00165	0.00164	0.00482			7.3	9	17	130
chrysene	98	1	0.13	0.00190	0.00189	0.00556			0.0073*	<1	<1	<1
indeno(1,2,3-cd)pyrene	29	1	0.13	0.00056	0.00056	0.00165			0.73*	<1	<1	4
Total PAHs				0.00795	0.00789	0.02327				11	22	160

Table E-4: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Soil, Sediments and Solids - data from 2000 - 2001
Big John Salvage - Hoult Road Site

Contaminant	Max level	Toxicity	AF	Estimated Absorbed Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/kg	adjustment		Dermal exposure mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
				Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
SEDIMENT (off-site)												
arsenic	55.6	1	0.03	0.00025	0.00025	0.00073	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	4
cadmium	29.4	0.025	0.001	<0.00001	<0.00001	<0.00001	0.0002	ATSDR Chron Oral MRL				
lead	277	1	0.01	0.00041	0.00041	0.00121						
mercury	29.7	1	0.01	0.00004	0.00004	0.00013						
benzo(a)anthracene	120	1	0.13	0.00233	0.00231	0.00681			0.73*	1	2	18
benzo(b)fluoranthene	120	1	0.13	0.00233	0.00231	0.00681			0.73*	1	2	18
benzo(a)pyrene	90	1	0.13	0.00175	0.00173	0.00511			7.3	9	18	130
chrysene	110	1	0.13	0.00213	0.00212	0.00624			0.0073*	<1	<1	<1
indeno(1,2,3-cd)pyrene	26	1	0.13	0.00050	0.00050	0.00148			0.73*	<1	<1	4
Total PAHs				0.00904	0.00897	0.02645				12	23	170
COAL TAR												
arsenic	6.9	1	0.03	0.00003	0.00003	0.00009	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
mercury	2.4	1	0.01	<0.00001	<0.00001	0.00001						
thallium	17.3	1	0.01	0.00003	0.00003	0.00008	0.00007	EPA Chron Oral RfD				
benzene	0.86	1	5E-04	<0.00001	<0.00001	<0.00001	0.004	EPA Chron Oral RfD	0.055	<1	<1	<1
benzo(a)anthracene	250	1	0.13	0.00485	0.00481	0.01419			0.73*	3	5	37
benzo(b)fluoranthene	210	1	0.13	0.00407	0.00404	0.01192			0.73*	2	4	31
benzo(a)pyrene	150	1	0.13	0.00291	0.00289	0.00851			7.3	15	30	220
carbazole	370	1	0.1	0.00552	0.00548	0.01615			0.02**	<1	<1	1
chrysene	540	1	0.13	0.01047	0.01040	0.03065			0.0073*	<1	<1	<1
dibenzofuran	680	1	0.13	0.01319	0.01309	0.03859	0.002	EPA Chron Oral RfD				
indeno(1,2,3-cd)pyrene	74	1	0.13	0.00144	0.00142	0.00420			0.73*	<1	2	11
napthalene	2,100	1	0.1	0.03133	0.03110	0.09168	0.02	ATSDR Int Oral MRL				
Total PAHs				0.04244	0.04214	0.12421				21	41	300

Table E-4: Estimated Absorbed Exposure Doses and Cancer Risk for Dermal Exposure to Soil, Sediments and Solids - data from 2000 - 2001 Big John Salvage - Hoult Road Site												
Contaminant	Max level	Toxicity	AF	Estimated Absorbed Exposure Doses			Health-based Guideline		Excess Cancer Risk			
	mg/kg	adjustment		Dermal exposure mg/kg/day			mg/kg/day	Source	CSF	Number in 10,000 people		
				Child 2-6 years	Child 7-16 years	Adult				Child 2-6 years	Child 7-16 years	Adult
CULLET												
arsenic	3.5	1	0.03	0.00002	0.00002	0.00005	0.0003	ATSDR Chron Oral MRL	1.5	<1	<1	<1
mercury	0.071	1	0.01	<0.00001	<0.00001	<0.00001						
thallium	13.9	1	0.01	0.00002	0.00002	0.00006	0.00007	EPA Chron Oral RfD				

cm^2 = square centimeters
mg/kg=milligrams per kilogram (or parts per million)
mg/kg/day=milligram per kilogram per day
AF=Absorption or bioavailaility factor (unitless)
CSF=EPA Cancer Slope Factor ($mg/kg/day^{-1}$)
ATSDR Chron Oral MRL=ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days
ATSDR Int Oral MRL=ATSDR Intermediate Oral Minimal Risk Level for exposures between 15 and 365 days
EPA Chron Oral RfD=EPA Chronic Oral Reference Dose for exposures over 365 days
RfD=EPA Reference dose (dibenzofuran) from the National Center for Environmental Assessment (NCEA)
*EPA National Center for Environmental Assessment (NCEA) Provisional value
**EPA Health Effects Assessment Summary Table (HEAST)

Assumptions				
		Child	Child	Adult
Age range	years	2-6	7-16	over 16
Soil to skin adherence	mg/cm^2	3.3	3.3	13
Exposed body surface	cm^2	1,650	4,095	3,300
Exposure frequency	days/year	180	180	260
	years	5	10	25
Body weight	kilograms	18	45	70

Table E-5: Estimated Exposure Doses and Cancer Risk for Big John Salvage Inhalation of Chemicals - data from 2000 -2001 Big Johns Salvage - Hoult Road Site						
Chemical	Maximum contaminant level		Estimated Exposure Doses	Health-based Guidelines		Theoretical Excess
			Adult	RFD[i]	CSF[i]	Cancer Risk
	$\mu g/m^3$	mg/m^3	mg/kg/day	mg/kg/day		
benzene	3	0.003	0.0005	0.0086	0.027	<1 in 10,000 people
1,2,4-trimethylbenzene	5	0.005	0.0009	0.0017*		
cadmium		<0.00001	<0.00001	0.000057**	6.3	<1 in 10,000 people
copper		0.0001	0.000018			
lead		0.0001	0.000018			
nickel		0.0001	0.000018			

mg/kg/day = milligrams per kilogram per day

$\mu g/m^3$=micrograms per cubic meter

m^3/day = cubic meters per day

mg/m^3 = milligrams per cubic meter

ATSDR Int Oral MRL = ATSDR Intermediate Oral Minimal Risk Level for exposures between 15 and 365 days

EPA Chron Oral MRL = EPA Chronic Oral Minimal Risk Level

ATSDR Chron Oral MRL = ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days

* EPA Provisional Peer Reviewed data

**EPA National Center for Environmental Assessment (NCEA) Provisional value

RFD[i] = EPA Reference Dose for Inhalation

CSF[i] = EPA Cancer Slope Factor for Inhalation ($mg/kg/day^{-1}$)

Assumptions		
Intake	m^3/day	18
Body weight	kilograms	70
Exposure frequency	days/year	260
	years	25

APPENDIX F

Calculations and Assumptions Used to Estimate Exposure Doses

We assumed that a child younger than 2 years of age would not be exposed to contaminants from on or off this site, except for residential exposures. We then calculated the exposure of a 1-year-old child to residential soil.

Calculation of Exposure Dose From Incidental Ingestion of Contaminated Soil, Sediment or Waste

The exposure dose formula for incidental ingestion of contaminated soil, sediment, or waste used in this document is:

$$ed = c * ir * ef * af / bw$$

where *ed* = exposure dose; *c* = contaminant concentration; *ir* = ingestion rate; *ef* = exposure factor; *af* = absorption factor; and *bw* = body weight.

The contaminant concentrations used (*c*) are the maximum amounts in milligrams per kilogram (mg/kg) from Tables B-2 and B-3 (for Table D-2) and Tables C-2 and C-3 (for Table E-2).

The assumptions used for the ingestion rate (*ir*) are as follows: for a 2-6 year-old child (playing), a 7-16 year-old child (trespassing), and adults (working) is 0.0001 kg/day (100 mg/day). A 2-6-year-old child at a residence was assumed to ingest 0.0002 kg/day (200 mg/day).

The exposure factor (*ef*) is the time period that exposure to a chemical is assumed to occur divided by the total time period during which the exposures occur. The exposures were assumed to occur 180 days a year over 5 years for 2-6 year-old children playing, 180 days per year over 10 years for 7-16 year-old children trespassing, and 260 days per year over 25 years for adults (workers). Exposures to residential soil were assumed to be for 260 days per year over 5 years for a 2-6-year-old child and 180 days a year over 10 years for a 7-16-year-old child.

As indicated in the Toxicological Profile for arsenic, the absorption factor (*af*) for arsenic is assumed to be 0.8 (i.e., 80% of the chemical ingested was absorbed into the blood stream), while 1 (100 %) was assumed for the other chemicals [31].

The assumptions for body weight (*bw*) used were 18 kg (about 40 lb.) for a 2-6-year-old child, 45 kg (about 99 lb.) for a 7-16-year-old child, and 70 kg (about 154 lb.) for an adult.

The results of these calculations can be found in Table D-2 (using contaminant concentrations from Tables B-2 and B-3) and in Table E-2 (using contaminant concentrations from Tables C-2 and C-3.)

Calculation of Exposure Dose From Incidental Ingestion of Contaminated Surface Water

The exposure dose formula used in this assessment for incidental ingestion of contaminated water is:

$$ed = c * ir * ef * af / bw$$

where *ed* = exposure dose; *c* = contaminant concentration; *ir* = ingestion rate; *ef* = exposure factor; *af* = absorption factor; and *bw* = body weight.

The contaminant concentrations used (*c*) are the maximum amounts, expressed as milligrams per liter (mg/L). The contaminant concentrations are derived from the maximum chemical concentrations from Tables B-1 for Table D-1 and amounts from Table C-1 for Table E-1.

The surface water ingestion rate (*ir*) is assumed to be 10 mL (or 0.01 liter) a day for children and adults.

The exposure factor (*ef*) is the time period that exposure to a chemical is assumed to occur divided by the total time period during which the exposures occur. The exposures were assumed to occur 180 days a year over 5 years for 2-6-year-old children playing, 180 days per year over 10 years for 7-16-year-old children (trespassing), and 260 days per year over 25 years for adults (workers).

As indicated in the Toxicological Profile for arsenic, the absorption factor (*af*) for arsenic is assumed to be 0.8 (i.e., 80% of the chemical ingested was absorbed into the blood stream), while 1 (100 %) was assumed for the other chemicals [31].

The assumptions for body weight (*bw*) used were 18 kg (about 40 lb.) for a 2-6-year-old child, 45 kg (about 99 lb.) for a 7-16-year-old child, and 70 kg (about 154 lb.) for an adult.

The results of these calculations can be found in Table D-1 and Table E-1.

Calculation of Absorbed Exposure Dose From Dermal Exposures to Water

Exposure to contaminants through the skin (dermal exposure) occurs during wading, or during direct contact to the contaminated media.

The absorbed exposure dose formula for dermal exposure to contaminated water used in this document is:

$$aed = c * p * ta * sa * ef * cf / bw,$$

where *aed* = absorbed exposure dose; *c* = concentration in water; *p* = permeability coefficient; *ta* = toxicity adjustment; *sa* = exposed body surface area; *ef* = exposure factor; *cf* = conversion factor (1L/1,000 cm^3); and *bw* = body weight.

The contaminant concentrations used (*c*) are the maximum amounts, expressed as milligrams per liter (mg/L) or parts per million (ppm), from Tables B-1 and C-1.

Contaminants can move through the skin (be absorbed) at different rates depending on the properties of the chemical. This is reflected in the permeability coefficient *(p)* (rate of chemical absorbed through the skin) [54]. Permeability coefficients are expressed as centimeters per hour. The permeability coefficients are predictions and may not be representative of the conditions at this site. Permeability coefficients for the following chemicals are outside of the effective predictive domain and therefore highly uncertain: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluorene, chrysene, fluoranthene, and indeno(1,2,3-cd)pyrene (all PAHs). The exposure dose calculations for these chemicals may not be accurate.

The toxicity adjustment (*ta*) is a unitless factor that adjusts the absorbed exposure dose to the administered doses used for the comparison values. This factor is used when the chemical is not readily absorbed by the intestinal tract. The use of this factor makes the comparison to the oral health-based guidelines more accurate.

We assumed 100% of a person's skin or body surface *(sa)* was in contact with the water while swimming and engaging in water sports. The surface area assumptions for swimming and water sports are 6,600 square centimeters (cm^2) for a 2-year-old child and 23,000 cm^2 for an adult. Twenty five percent (25%) of a person's body surface was assumed to be in contact with water while engaged in playing or trespassing. Therefore, the surface area assumptions for playing, trespassing, or working are 1,650 cm^2 for a 2-6 year-old child and 4,095 cm^2 for a 7-16 year-old child. An adult worker, with less than 25% of their skin exposed, was assumed to have a skin exposure of 3,300 cm^2 [55, 56].

The exposure factor (*ef*) is the amount of time that a person is exposed to a contaminant. The factor takes into account the hours per day that a person is exposed to the contaminant. The assumptions are 1 hour per day for 180 days for children or adults engaging in swimming and water sports. The assumptions for dermal exposure to surface water were 4 hours a day for a 2-6-year-old child playing, 3 hours a day for a 7-16-year-old child while trespassing, and 8 hours a day while working.

The assumptions for the body weight (*bw*) of persons engaged in swimming and water sports were 13.3 kg for a child and 70 kg for an adult. The assumptions for the body weight (*bw*) of persons exposed to surface water were 18 kg (about 40 lb.) for a 2-6-year-old child, 45 kg (about 99 lb.) for a 7-16-year-old child, and 70 kg (about 154 lb.) for an adult.

The results of these calculations are recorded in Table D-3 and D-5 (using contaminant concentrations from Table B-1 and Table E-3 (using contaminant concentrations from Table C-1).

Calculation of Absorbed Exposure Dose From Dermal Exposures in Soil, Sediment, and Solids

The absorbed exposure dose formula for dermal exposure to contaminated soil, sediment, and solids used in this document is:

$$aed = c * a * sur * af * ta * ef * cf / bw$$

where *aed* = absorbed exposure dose; *c* = contaminant concentration; *a* = total amount of soil adhered to the skin; *af* = absorption (bioavailability) factor; *ta* = toxicity adjustment factor; *sur*= skin surface area exposed to a chemical; *ef* = exposure factor; *cf* = conversion factor (10^{-6} kg/mg); and *bw* = body weight.

The absorbed exposure doses (*aed*) from dermal (skin) exposure to contaminated soil, sediment, or solids were calculated using the formula identified above. The absorption of contaminants from soil or other solids depends on the amount of skin in contact with the chemical, the duration of contact, and the ability of the chemical to be absorbed through the skin.

The contaminant concentrations used (*c*) are the maximum amounts expressed in milligrams per kilogram (mg/kg) from Tables B-2, B-3, C-2, and C-3.

The amount of soil, sediment, or solid that will stick to the skin (*a*) depends on the properties of the material, the part of the body exposed, and the activities being performed when in contact with the soil or solid. There are many factors involved in the adherence of soil or sediment to skin that cannot be factored into this equation. Therefore, this factor has a high degree of uncertainty. The most important factor in the adherence of the material to the skin is its moisture. The assumption used in these calculations was that the soil, sediment, or solid had adhered (stuck) to the skin and did not readily fall away. This is because the materials on this site - coal tar, and creosote - were assumed to adhere well to the skin. Although sediment is more likely to wash away from the skin under water, no factor for this was incorporated into this formula. The value for soil to skin adherence for children was assumed to be 3.3 milligrams per centimeter squared (mg/cm^2)(a value for children playing in mud). The value for workers was assumed to be 13 mg/cm^2 (for pipe layers in wet soil) [54, 55].

The assumption was made that 25% of the skin surface area (*sur*) of the person would be exposed to soil or sediment. This takes into account possible exposures to chemicals that have gotten under clothing. The assumption assumes that the person is wearing light clothing worn in the summer. This does not take into account the likelihood that additional clothing worn in the spring, fall, or winter would reduce the potential exposure to soil or sediment. The assumption is that a 2-6-year-old child would have 1,650 centimeters squared (cm^2) exposed and a 7-16-year-old child would have 4,095 cm^2 exposed. An adult worker, assumed to be more clothed than a child or trespasser would have 3,300 cm^2 exposed [56].

The total amount of soil adhered to the skin is reflected by (*a*) multiplied by (*sur*).

Not all of the contaminant found on the skin will be absorbed into the body. The factor used in this calculation to address this is the *af* = absorption or bioavailability factor. This factor is expressed in a percentage (or decimal) of the amount of chemical absorbed vs. the amount of chemical in the environment. The values used in these calculations are used in the EPA Region III Superfund program [57]. Note that the calculations assume that the absorption factor is used for coal tar and cullet, even though they have been developed for soil and sediment. It is not known if the absorption from these materials is the same as that from soil and sediment.

The toxicity adjustment (*ta*) is a unitless factor that adjusts the absorbed exposure dose to the administered doses used for the comparison values. This factor is used when the chemical is not readily absorbed by the intestinal tract. The use of this factor makes the comparison to the oral health-based guidelines more accurate.

The exposure factor (*ef*) is the number of days per year times the number of years exposed to the chemical, divided by the total number of days during the time period of exposure. The assumption was made that a 2-6-year-old child playing would be exposed for 180 days a year for 5 years; a 7-16-year-old trespasser would be exposed for 180 days per year for 10 years, and an adult worker would be exposed for 260 days per year for 25 years. Further, the assumptions made for exposure to residential soil were that a 2-year-old child would be exposed for 130 days per year for 5 years and a 7-year-old child would be exposed for 120 days per year for 10 years.

The assumptions for body weight (*bw*) used were 18 kg (about 40 lb.) for a 2-6-year-old child, 45 kg (about 99 lb.) for a 7-16-year-old child, and 70 kg (about 154 lb.) for an adult.

The results of these calculations are recorded in Table D-4 (using contaminant concentrations from Table B-2 and B-3) and Table E-4 (using contaminant concentrations from Table C-2 and C-3).

Calculation of Exposure Dose From Inhalation Exposures

The inhalation of chemicals is difficult to calculate because exposure depends on the amount of time spent outdoors, the person's activity level, gender, physical condition, age, the frequency of showering, bathing, or swimming (for volatile compounds found in water), air quality in the home and workplace, and other factors. Inhalation of dust is another factor that is evaluated. For most contaminants, the inhalation dose is equal to the concentration of the contaminant in air; therefore, no calculation is needed to determine the inhalation dose. However, if a contaminant is adhered to dust and inhaled or of the contaminant has specific toxic effects on the respiratory tract, the following calculation may be used:

$$ed = c * ir * ef / bw$$

where *ed* = exposure dose; *c* = contaminant concentration; *ir* = intake rate; *ef* = exposure factor; and *bw* = body weight.

The air intake rate used for an adult male is 15.2 m^3/day [53].

For most contaminants, the calculation of the exposure factor for ingestion is greater than the exposure factor from inhalation of dust. Household inhalation rates for volatile chemicals can be up to 6 times higher than the ingestion rate for volatile compounds [53].

The results of these calculations can be found in Table D-5.

Calculation of Exposure Dose From Eating Fish

People can be exposed to contaminants through eating contaminated fish. The calculation of the exposure dose from eating fish assumes that all fish eaten by a person are from the contaminated water body. No factor for a reduction in the chemical concentration due to cooking was used in these calculations. Furthermore, the calculations assume that once the chemical is ingested, that all the chemical is available in the body (i.e. the bioavailability factor is 1.)

The calculation of exposure dose from eating fish is:

$$ed = c * ir * ef * cf / bw$$

where *ed* = exposure dose; *c* = contaminant concentration; *ir* = intake rate; *ef* = exposure factor; *cf* = conversion factor (10^{-6} kg/mg); and *bw* = body weight.

The contaminant concentration (*c*) used , in parts per million or ppm, was the highest value found in fish tissue. The data were from a West Virginia Department of Natural Resources mercury study (October 1981), and data from fish samples taken between mile markers 116 and 127 in the Monongahela River (near the site) by the Department of Natural Resources (data provided by the West Virginia Department of Environmental Protection) [26].

The intake rate (*ir*) for adult recreational fisherman was assumed to be 17,500 mg/day and 142,400 mg/day for subsistence fishermen. The intake rate for a child of a fisherman was reduced by a factor of 0.375 to reflect the smaller portions that a child would eat. The intake rate for a child of a recreational fisherman was assumed to be 6,562.5 mg/day and 53,400 mg/day for a child of a subsistence fisher [58].

The calculations assumed that the exposure to fish occurred every day for 10 years for a child and for 54 years for an adult. These assumptions were used to calculate the exposure factor (*ef*).

The average weight (*bw*) was assumed to be 22.6 kg (about 50 lb.) for a child 6-years-old or older and 70 kg (about 154 lb.) for an adult.

The results of these calculations are recorded in Table D-6.

Calculation of Risk of Carcinogenic Effects

Carcinogenic risks from the incidental ingestion of soil, sediment, or surface water were calculated using the following procedure. The noncarcinogenic estimated exposure doses were averaged over a 70-year time period. The modified exposure dose was multiplied by the EPA's *cancer slope factor* (CSF) or *inhalation unit risk factor* (IUR) for that chemical. The theoretical excess cancer risks noted in the Tables in this report were calculated by adding the excess cancer risk for a child, trespasser, and adult, unless otherwise noted. This assumes that the exposures would occur throughout the total exposure period. Results of the calculation of carcinogenic risk from exposure can be found on Tables D-1-4 and E-1-4. The results were rounded to two significant figures.

Theoretical cancer risks less than 1 in 10,000 were considered to be a very low risk and are not discussed in the text. Theoretical cancer risks between 1 and 9.9 in 10,000 were classified as a low risk, from 10 through 99 were classified as a moderate risk, while 100 and up in 10,000 were classified as a significant risk.

Appendix G

Glossary

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.

Absorption factor
The amount of chemical likely to enter the body through the skin, lungs, or gastrointestinal track. (AF).

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.

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.

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]

cm/hour
centimeters per hour

cm^2
square centimeters

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.

Cancer Slope Factor
An estimate of the possible increases in cancer cases in a population, expressed in $(mg/kg/day)^{-1}$. Cancer slope factors are developed by the EPA.

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.

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.

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.

EPA
United States Environmental Protection Agency. (Also referred to as the EPA)

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 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.

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

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

HEAST
EPA Health Effects Assessment Summary Table

HOD
Health Outcome Data are existing statistics that measure health outcomes or characterize the health status of a defined group of people.

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.

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.

mg/L
Milligram per liter.

mg/kg
Milligram per kilogram.

mg/kg/day
Milligram per kilogram per day.

mg/cm^2
Milligram per square centimeter (of a surface).

mg/m^3
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 for Uncontrolled Hazardous Waste Sites (National Priorities List or 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.

NCEA
The EPA National Center for Environmental Assessment.

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 for Uncontrolled Hazardous Waste Sites]

Physiologically based pharmacokinetic model (PBPK model)
A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.

Permeability coefficient
A measure of the ability of a chemical to move through the skin. This factor is used to estimate the dermal absorption of chemicals from water.

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

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).

ppb
Parts per billion.

ppm
Parts per million.

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.

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.

Registry
A systematic collection of information on persons exposed to a specific substance or having specific diseases [see exposure registry and disease registry].

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].

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.

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].

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.

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.