Public Health Assessment

Final Release

BLACK RIVER PCBs

VILLAGE OF CARTHAGE/WEST CARTHAGE
TOWN OF CHAMPION
JEFFERSON COUNTY, NEW YORK

CERCLIS NO: NYN000206296

Prepared by
New York State Department of Health

OCTOBER 14, 2016

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR's Cooperative Agreement Partner 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's Cooperative Agreement Partner 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 45-day public comment period. Subsequent to the public comment period, ATSDR's Cooperative Agreement Partner 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's Cooperative Agreement Partner which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Summary

INTRODUCTION

A priority of the New York State Department of Health (DOH) and Agency for Toxic Substances and Disease Registry (ATSDR) is to ensure that the community has the best information possible about the potential health risks associated with contaminants in the Black River PCBs site in Carthage/West Carthage, New York. The United States Environmental Protection Agency (EPA) proposed that the Black River PCBs site be added to the National Priorities List (NPL) on March 4, 2010. EPA added the site to the NPL on September 29, 2010. ATSDR is required to evaluate each NPL site. This public health assessment is being completed as part of that requirement.

The public was invited to review the draft Public Health Assessment (PHA) during the comment period which ran from July 1, 2015 to August 17, 2015. DOH did not receive any public comments on the draft PHA.

The Black River PCBs site consists of polychlorinated biphenyl (PCB)-contaminated sediment that was derived, in part, from wastewater discharged from the Carthage/West Carthage Water Pollution Control Facility (i.e., the sewage treatment plant or STP). Historical information indicates that tanneries, paper mills and other industries have operated along the Black River in the Villages of Carthage and West Carthage since the 1890s, and may have contributed to PCB contamination in the river. Two active paper mills, one inactive paper mill, a machine shop, the Carthage/West Carthage STP and a hydroelectric power plant are currently located along the Black River in the Villages of Carthage and West Carthage.

The New York State Department of Environmental Conservation (DEC) and EPA report that some local residents use the Black River for recreation such as canoeing, kayaking and swimming, and that people reportedly fish in the Black River and eat their catch.

This PHA only evaluates EPA data through 2010 and DEC data through 2011. The DEC gathered environmental data used in this PHA during three investigations of the Black River in 1996-1997, 2002, and 2011. This PHA also uses data from investigations conducted by the EPA in 2009 and 2010. For this PHA, we are only evaluating data that are available for a specific segment of the Black River that constitutes the NPL site and

consists of areas immediately downstream of the Carthage/West Carthage STP to the Herrings boat launch, which is about 3.0 miles downstream (Appendix A, Figure 2). Site-related data gathered after 2011 will be evaluated for possible inclusion in a future health consultation.

CONCLUSION 1

DOH and ATSDR conclude that, based on available data, contact with PCBs or polychlorinated dibenzo-*p*-dioxins and furans (dioxin-like compounds, or DLCs) in sediments and PCBs in surface water during recreational activities, including canoeing, kayaking and swimming in the Black River, is not expected to harm people's health.

BASIS FOR DECISION 1

Sampling results show that the most of the PCB and DLC contamination is in deeper sediments at least 30 cm (about one foot) or more below the sediment surface. Exposure by incidental ingestion and dermal contact is limited to the top layer of sediments (15 cm, or about 6 inches below the sediment surface), and the levels of PCBs and DLCs in these sediments pose a low[1] or insignificant[2] increased risk for getting cancer and a minimal risk for noncancer health effects[3] for people who use the river for recreational activities. In addition, the sediments are underwater and in many cases unavailable for human contact. For surface water, the highest level of PCBs is below the federal and New York State drinking water standard for PCBs in public water systems, and poses an insignificant risk for cancer and a minimal risk for noncancer health effects for people who might ingest the water while swimming or during other recreational uses of the river.

CONCLUSION 2

DOH and ATSDR conclude that if the public follows the DOH fish consumption advisories, eating fish from the Black River PCBs site is not expected to harm people's health. The general health advisory for fish consumption (that currently applies to the Black River PCBs site area) is appropriate for the area where samples were taken to evaluate the site. The general advisory states that people can eat up to four one-half pound meals of fish a month from NYS fresh waters and some marine waters near the mouth of the Hudson River, providing no specific, more

[1]About three in one million
[2]Less than one in one million
[3]The estimated exposures are less than each contaminant's reference dose. The reference dose is defined by the US EPA as an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for a chronic duration (up to a lifetime) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

restrictive advisory applies to the particular waterbody. Advisories for New York State waters are available in DOH publications and on the DOH website located at: www.health.ny.gov/fish.

BASIS FOR DECISION 2

The DOH evaluated fish contaminant data collected by DEC and EPA. The results of that evaluation did not change the overall general health advisory for fish consumptions that currently applies to the Black River PCBs site.

NEXT STEPS

1. DOH recommends that the EPA continue to evaluate the flood history along this section of the river to determine possible floodplain locations and if soil sampling within any identified floodplain areas is needed.
2. DOH and ATSDR will evaluate all EPA data (collected after 2011) as it becomes available to determine whether further public health actions are needed.
3. Fish contaminant data will be reviewed by DOH and DEC as it becomes available. If the fish contamination data review shows that a change in the fish advisory is warranted, DOH will prepare a health consultation describing the change and the basis for the change and will conduct additional outreach activities to communicate the revised fish advisory to local residents and stakeholders.

FOR MORE INFORMATION

If you have questions about this PHA or other health concerns about this site, please contact Eamonn O'Neil of the DOH at (518) 402-7860. If you have questions about the investigation of the Black River, please contact the EPA New York Remediation Branch at (212) 637-4251.

Background and Statement of Issues

The purpose of this public health assessment (PHA) is to evaluate human exposure pathways and health risks for contaminants related to the Black River polychlorinated biphenyls (PCBs) site in Carthage, Jefferson County, New York. The U.S. Environmental Protection Agency (EPA) proposed that the Black River PCBs site be added to the National Priorities List (NPL) on March 4, 2010, and added the site to the NPL on September 29, 2010. The information used in this document is based on data collected by both the New York State Department of Environmental Conservation (DEC) and EPA from 1996 to 2011 to evaluate PCB and dioxin-like compound (DLC) concentrations found in Black River surface water, sediments, and fish near Carthage. Site-related data gathered after 2011 will be evaluated for possible inclusion in a future health consultation.

Site Description and History

The Black River originates in the southwestern Adirondacks and flows over 180 miles to the north and west along the valley between the Adirondacks and the Tug Hill Plateau, ultimately discharging into eastern Lake Ontario. Lower segments of the Black River downstream of Carthage have areas of waterfalls and strong current making it a viable source for waterpower. During the 1800's many areas along the lower segment of the river were dammed and harnessed for water power and other industrial uses. Historical information indicates that tanneries, paper mills and other industries have operated along the Black River in the Villages of Carthage and West Carthage since the 1890's. These industries may have used PCBs. Currently, two active paper mills, one inactive paper mill, a machine shop, the Carthage/West Carthage sewage treatment plant (STP) and a hydroelectric power plant are located along the Black River in the Villages of Carthage and West Carthage. Figure 1 in Appendix A shows the location of Carthage along the Black River.

The portion of the Black River between the STP in Carthage and the Village of Herrings boat launch is a relatively wide section of the river with calm flow during normal conditions (Appendix A, Figure 2). The majority of the western shoreline downstream of the STP is occupied by farm fields and wooded land, although some residential properties and camps were observed during a site visit. The eastern shoreline of the river between the STP and the Herrings boat launch is primarily occupied by residential properties directly adjacent to the river or separated only by a section of road that runs parallel to the river.

According to the DEC and the EPA, this segment of the Black River supports a wide range of recreational activities. Public fishing areas, waterfront parks and whitewater kayaking and canoeing are all popular along the river. The EPA indicated that while conducting their sampling in 2009, individuals were observed on a number of occasions boating in the river as well as fishing and keeping their catch. Based on available information, it appears that the Herrings boat launch downstream of Carthage is frequently used as a public fishing access point to the river. The Black River is home to many sport fish including walleye, bass, and pickerel.

Site Visit

Staff from the New York State Department of Health (DOH) and the DEC visited the Black River PCBs site on November 16, 2010, and observed the portion of the river between Carthage and the Herrings boat launch to be a wide section of the river with relatively calm flow, making it suitable for a wide range of recreational activities. A number of residential properties occupy the eastern shoreline of the river, many with docks and mowed lawns directly adjacent to the river's edge. Staff observed two public boat launches, one immediately downstream of the STP and the other being the Village of Herrings Launch, three miles downstream. Staff also found evidence (e.g., food wrappers, drink bottles and old night-crawler containers) that people frequently fish the river along the shoreline in several places.

Demographics

The DOH estimated, from the 2010 Census (US Bureau of the Census 2001), that about 3,135 people live within one mile of the Black River PCBs site, which is between Carthage and the Herrings boat launch. The age distribution of the area is similar to that of the rest of Jefferson County as well as New York State, excluding New York City (NYC). There were 1,311 females of reproductive age (ages 15-44) within one mile of the site. The area within one mile of the site has a similar racial and ethnic makeup as the rest of Jefferson County, with somewhat fewer minorities than the rest of state (excluding NYC). Based on the 2000 Census (US Bureau of the Census 2002), a higher percentage of the population is living below the poverty level and the median household income is lower than the rest of the state. These comparisons are provided in the following table. In addition, there are four public schools and two nursing homes within a mile of the site. See Table 1 below for a summary of demographics for the community living near the Black River site.

Table 1. Demographics for the Community Living Near the Black River PCBs Site Compared with County and State Data.

2010 Census Demographics	Area Within One Mile of Black River	Jefferson County	New York State Excluding New York City
Age Distribution[1]			
<6	11%	10%	7%
6-19	19%	19%	19%
20-64	59%	61%	60%
>64	12%	11%	15%
Race Distribution[1]			
White	91%	89%	82%
Black	3%	5%	9%
Native American	<1%	<1%	<1%
Asian	1%	1%	3%
Pacific Islander	<1%	<1%	<1%
Other	1%	1%	3%
Multi-Racial	3%	3%	2%
Percent Minority*	11%	14%	23%
Ethnicity Distribution[1]			
Percent Hispanic	4%	5%	10%
2010 Median Income[2]	$40,930	$43,265	$59,994
% Below Poverty Level[2]	15%	15%	11%

[1]US Bureau of the Census. 2010 Census of population and housing summary file 1(SF1). US Department of Commerce.
[2]US Bureau of the Census. 2006-2010 American Community Survey
* Minority includes Hispanics, African-Americans, Asian-Americans, Pacific Islanders and Native Americans.

Discussion

Environmental Contamination

The DEC and EPA gathered environmental data presented in this section during five separate sampling events. DEC conducted the first sampling event during 1996 and 1997 to evaluate sediments in the Eastern Lake Ontario drainage basin (DEC 2000). The purpose of the study was to evaluate sediments within the entire basin for levels of heavy metals, PCBs, chlorinated pesticides, polycyclic aromatic hydrocarbons (PAHs), and DLCs. Portions of this sampling effort included sampling between Carthage and the Herrings boat launch (Appendix A, Figure 2). The results showed that PCBs and DLCs are the main contaminants of concern for this portion of the river. The sampling showed that concentrations of DLCs are slightly elevated in the sediments downstream of the Village of Carthage to the Black River Bay in Lake Ontario. The highest PCB in sediment concentrations found during this sampling event were in the sediment bar immediately downstream of the STP.

In addition to the sediment sampling activities, the DEC collected additional samples to identify the sources of contamination found in the river sediments (DEC 2000). In August 1998, the DEC collected wastewater samples from key points within the Carthage and West Carthage sewer system, and conducted follow-up wastewater sampling in 1999.

In 2002, DEC conducted additional sediment sampling along the Black River between Carthage and the Herrings boat launch to better define the area PCB contamination (DEC 2004) (Appendix A, Figure 3).

In 2009, EPA, as part of its Hazardous Ranking System process, collected some additional sediment and wastewater samples (EPA 2010a). The goal was to determine the potential sources of PCBs in river sediments and in effluent from the STP (Appendix A, Figure 4).

In 2010, EPA conducted a second round of sampling to further build on the sampling results obtained during the 2009 sampling event. This sampling included the collection of surface water, sediment and fish samples from a portion of the Black River between the STP in Carthage to the Herrings public boat launch, about three miles downstream (Appendix A, Figures 5 and 6).

In 2011, DEC conducted fish sampling along the Black River between Carthage and the Herrings boat launch.

Sampling Methods

Sediments

DEC collected 28 sediment samples from seven stations along the Black River between the Village of Carthage and downstream to Black River Bay in Lake Ontario during the 1996-1997 sampling event. All samples were analyzed for DLCs. Five of the locations (stations 5, 5A, 5B, 5C and 5D) were between Carthage and the Herrings public boat launch. DEC collected sediment samples at various depths ranging from zero (0) to 100 centimeters (cm) (approximately 3 foot 3 inches), and at depths ranging from 15-45 cm (about 0.5 to 1.5 feet)

below the water surface. A total of 14 sediment samples from five sample locations were obtained and analyzed for total PCBs and DLCs.

DEC collected sediment samples from eight locations along the Black River in their 2002 sampling event. They collected a total of 96 samples ranging in sediment depth from 0-100 cm, which were analyzed for PCBs.

In 2009, EPA collected sediment samples from 27 locations (Appendix A, Figure 4) along the Black River to supplement the existing data. The sampling locations included areas of the river immediately upstream of the STP in Carthage (to establish background conditions), and areas stretching from Carthage to about three miles downstream to the Village of Herrings public boat launch. EPA collected sediment samples from the zero to 15 cm depth (approximately 0 to 6 inches) interval from each sample location, which were analyzed for PCBs.

EPA conducted additional sampling in 2010 to further characterize PCBs in sediment, as well as analyze the sediments for some additional parameters. EPA collected samples from 28 locations along the Black River area of interest. The sediment samples were collected from depths ranging from 0–8 feet (approximately zero to 244 cm), and were analyzed for numerous contaminants including pesticides, metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), PCBs, and DLCs.

Surface Water

In 2010, EPA collected five surface water samples along the Black River between the Village of Carthage and the Herrings boat launch. Surface water samples were analyzed for PCBs, metals and SVOCs.

Fish

In 2010, EPA collected fish for PCB and metals analysis at five locations within the Black River PCBs site area and at an upstream/background location. The farthest downstream location within the site area was in the Village of Herrings, just upstream of the Herrings dam. EPA submitted forage fish (fallfish and golden shiners) to the analytical laboratory as whole body specimens, and prepared and submitted the remaining fish species collected (hogsucker, rock bass, smallmouth bass, walleye, pumpkinseed and brown bullhead) to the analytical laboratory as fish fillet samples. Fish fillet samples were prepared with skin on and scales removed. The laboratory analyzed fish tissue samples as a single fish whenever possible, but composited some fish as needed to obtain the minimum sample mass for analysis (LATA Inc. 2013).

In 2011, DEC collected 30 fish from within the Black River PCB study area at Carthage. The fish collected included 10 pumpkinseed, 10 smallmouth bass, and 10 yellow perch. The DEC Analytical Services Unit at Hale Creek Field Station analyzed all 30 fish samples for levels of mercury, PCBs and selected organochlorine pesticides.

Wastewater

The 1998 sampling separately measured dissolved PCBs originating from four potential sources, specifically, the Village of Carthage sewer system, the Village of West Carthage sewer system, and the two active paper mills within the sewer system. The follow-up sampling conducted in 1999 measured both particulate- and dissolved-phase PCB concentrations from the village sewage system.

Results

Sediments

Results of the 14 sediment samples collected between Carthage and Herrings boat launch during the 1996 and 1997 sampling event showed total PCB concentrations ranging from 0.0028 to 36.0 milligrams per kilogram (mg/kg) of sediment (see Appendix B, Table 1). The sample that had the highest PCB concentration (36 mg/kg) was collected at a sediment sample depth between 40-80 cm (approximately 1.3 to 2.6 feet). Overall, the sediment sample depths that contained the highest concentrations of PCBs were greater than 25 cm (approximately 10 inches).

Results of the 28 sediment samples collected during the 1996 and 1997 sampling event and analyzed for DLCs revealed concentrations ranging from below the analytical detection limits (0.35 to 0.6 parts per trillion or nanograms per kilogram of sediment [ng/kg]) to 80.5 ng/kg.[4] DLCs in surficial sediments (depth not specified) ranged from 1.2 to 55.6 ng/kg with an average of 19.6 ng/kg. Samples taken at depths of 22 cm or deeper (up to 160 cm) ranged from detection levels to 80.5 ng/kg, and averaged 10.3 ng/kg. The sediment sample that had the highest concentration (80.5 ng/kg) was collected at a sample depth between 25 to 60 cm.

The 2002 DEC sediment sampling event consisted of 96 samples and showed total PCB concentrations ranging from less than analytical detection limits (ranging from 0.059 to 0.14 mg/kg) to 346 mg/kg (Appendix B, Table 2). In general, the sampling showed the highest PCB levels in sediments were detected within the 40-80 cm depth as was found in the 1996 and 1997 sampling event. The highest level of PCBs detected in sediment was 346 mg/kg. This result is the average from a sample that the laboratory analyzed twice. The individual results from the two samples were 610 mg/kg and 83 mg/kg PCBs. DEC collected this sample from station 5-4 at a depth of 53-63 cm. Sediment samples having the next highest PCB concentrations (140 mg/kg and 170 mg/kg) were observed in sediments ranging in depth from 65-80 cm.

The 2009 EPA sample data are shown in Appendix B, Table 3. Background sample results ranged from below the analytical detection limit (0.079-0.090 mg/kg) to 0.0055 mg/kg PCBs. Only six of the samples collected one-half mile downstream of the STP had PCBs at levels above background concentrations.

The 2010 EPA PCB sample data are shown in Appendix B, Table 4. PCB results ranged from less than analytical detection limits to 4.8 mg/kg. Of the 93 sediment samples, only three had PCB results above 1 mg/kg. These three samples were all from sediment depths of 1 foot (about 30 cm) or more, which is consistent with previous sampling results.

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[4] Dioxin-like compounds (DLCs) are a group of structurally and biologically related contaminants that occur as complex mixtures in the environment. To evaluate health risks from exposure to DLCs, toxic equivalency factors (TEFs) are applied to measured concentrations of each chemical in the group to determine the 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) equivalents of a sample (Van den Berg et al. 2006; EPA 2010b). 2,3,7,8-TCDD, the most toxic contaminant of this group, is used as reference compound with a TEF of 1. All other DLCs are assigned a TEF of 1 or less based on its toxic potency relative to TCDD. The TCDD equivalents of a sample is the sum of the concentrations of each DLC multiplied by its TEF. All analytical results for DLCs in this public health assessment are reported as TCDD equivalents.

The results of the sediment sampling data for PCBs and DLCs are summarized in Tables 2 and 3, respectively.

Table 2. Summary of Polychlorinated Biphenyl (PCB) Sampling of Black River Sediments[a]

Sampling Event	Detection Frequency	Total PCBs (mg/kg)	
		Range	Average
1996-1997 DEC Sampling			
Surface Sediments	1/1	---	0.58
Deep Sediments	7/7	0.0028 - 36	10.4
2002 DEC Sampling			
Surface Sediments	15/18	ND[b] - 11	1.01
Middle Sediments	13/15	ND - 2.4	0.99
Deep Sediments	41/63	ND – 346[c]	13.7
2009 US EPA Sampling			
Surface Sediments	20/24	ND - 5.9	0.42
Combined Sampling Events			
Surface Sediments	36/43	ND - 11	0.67
Middle Sediments	13/15	ND - 2.4	0.99
Deep Sediments	48/70	ND – 346[c]	13.4

[a]Surface sediments, middle sediments and deep sediments represent sampling depths of 15 cm or less, 15 to 30 cm, and more than 30 cm, respectively. 15 cm = 5.9 inches, and 30 cm = 11.8 inches.
[b]ND = not detected (one-half the analytical detection limit was used for non-detects in calculating averages).
[c]Highest level was the average of a sample analyzed in a split sample (83 and 610 mg/kg).
DEC = New York State Department of Environmental Conservation; US EPA = United States Environmental Protection Agency; mg/kg = milligrams per kilogram of sediment

Table 3. Summary of Dioxin-like Compound (DLC) Sampling of Black River Sediments

Sediment Depth (cm)	Detection Frequency	Sediment Concentration (ng/kg)	
		Range	Average
Surface[a]	6/6	1.2 – 55.6	19.6
0 – 40[b]	7/7	0.1 – 65.9	17.4
22 – 160[c]	10/15	ND[d] – 80.5	10.22

[a]The depth of surface sediment samples was not specified.
[b]40 cm = 15.7 inches
[c]160 cm = 63 inches
[d]ND = not detected (one-half the analytical detection limit was used for non-detects in calculating averages).
ng/kg = nanograms per kilogram of sediment, or parts per trillion

DOH compared the sediment sampling results for PCBs and DLCs to New York State restricted residential soil cleanup objectives (SCOs) and ATSDR comparison values for soils. SCOs are soil concentrations that are contaminant-specific remedial goals based on current, intended or reasonably anticipated future land use, and are set at a soil concentration at which cancer and

noncancer health effects are unlikely to occur[5], assuming people are exposed to contaminants through soil ingestion, indoor dust ingestion, and inhalation of soil particles. ATSDR comparison values for soil are chemical-specific soil concentrations that are used by ATSDR health assessors and others to identify environmental contaminants at hazardous waste sites that require further evaluation. They incorporate generic assumptions of daily exposure to the chemical and a standard amount of soil that someone may likely take into their body each day. Using the restricted residential SCOs and ATSDR soil comparison values to screen underwater sediment contaminants is likely to be conservative, since people are unlikely to be exposed to underwater sediments during recreational activities to the same degree, duration and frequency assumed for surface soil exposures under a residential scenario. In addition, given the depth of the water column above these sediments, it is likely that much of the sediment load originally on the skin will be removed as the hands and arms are moved upward from the sediment toward the surface, which must take place before incidental ingestion can occur. Since PCBs and DLC levels in sediment exceed New York State restricted residential SCOs and ATSDR comparison values (Table 4), DOH further characterized the health risks associated with exposure using a more site-specific evaluation (see Public Health Implications section).

Table 4. Comparison of Surface Sediment Contaminant Levels to NYS Restricted Residential SCOs and ATSDR Comparison Values

Contaminant	Highest Level in Black River Surface Sediments	NYS Restricted Residential SCO[1]	ATSDR Soil Comparison Value
PCBs	11 mg/kg	1 mg/kg [(2)]	0.35 mg/kg [(3)]
DLCs	55.6 ng/kg	NA	5.4 ng/kg [(4)]

NYS = New York State; SCO = soil cleanup objective; ATSDR = Agency for Toxic Substances and Disease Registry; PCBs = polychlorinated biphenyls; DLCs = dioxin-like compounds; mg/kg = milligrams per kilogram of sediment; ng/kg = nanograms per kilogram of sediment, or parts per trillion

[1]DEC/DOH 2006

[2]The restricted residential SCO for PCBs is based on the 1998 US EPA regulation that specifies cleanup levels for PCB remediation waste for high occupancy areas, where people may be present for 335 or more hours per year (DEC/DOH 2006; EPA 1998)

[3]ATSDR 2013a

[4]ATSDR 2014a

Surface Water

The 2010 surface water sampling included five samples collected along the Black River. EPA collected two of the samples at locations upstream of the STP. Most samples did not have detectable levels of PCBs. However, the sample collected at ERT-SWIM- 2 (downstream of the STP) contained 0.22 micrograms per liter (mcg/L) PCBs. This level of PCBs is below the federal and New York State Part 5 drinking water standards of 0.5 mcg/L (DOH 2007), but over the

[5] New York State health-based SCOs are set at a cancer risk level of one in one million for carcinogens, and at a hazard quotient of one for noncancer effects.

ATSDR Cancer Risk Evaluation Guide (CREG) of 0.018 mcg/L for PCBs (ATSDR, 2013b). The CREG is the PCB water concentration associated with an increased lifetime cancer risk of one in one million, and assumes a 70 kilogram person drinks two liters of water containing this PCB concentration every day for a lifetime. The CREG is also about three times lower than the reporting limit (0.05 mcg/L) for EPA Method 508. Since the CREG is exceeded, DOH further evaluated the risk associated with incidental exposure in surface water during recreational activities (see Public Health Implications section).

Fish

The 2010 EPA fish fillet data indicated that Aroclor 1254 was the only PCB Aroclor detected. PCBs are synthetic chemicals that were sold in mixtures under the trade name "Aroclor." The data showed PCBs in 31 of 57 fish tissue samples analyzed. The detected concentrations of PCBs ranged from 0.004 to 0.032 mg/kg (wet weight). The samples collected from the upstream location either did not have detectable levels of PCBs or had levels in the lower range of the Black River PCB site sample results.

The 2011 DEC fish data indicated the presence of PCB Aroclor 1242 and sum of PCB Aroclors 1254/1260. PCBs were detected in 27 of 30 fish tissue samples analyzed. The detected PCB concentrations ranged from 0.014 mg/kg to 0.28 mg/kg (wet weight). The fish contaminant data also indicated the presence of mercury in all samples. The detected mercury concentrations ranged from 0.10 mg/kg to 1.01 mg/kg (wet weight).

Wastewater

According to the DEC report (2002), the results of the wastewater sampling showed that the two paper mills were the dominant source of PCBs entering the STP. The 1998 results for dissolved PCBs indicated that PCB concentrations from the paper mill wastewater ranged from 0.012 mcg/L to 0.077 mcg/L versus 0.002 mcg/L to 0.021 mcg/L for village wastewaters entering the STP. The follow-up sampling conducted in 1999 indicated greater concentrations in the village wastewaters (0.012 mcg/L to 0.032 mcg/L) than the two paper mills (0.002 mcg/L to 0.005 mcg/L). The decrease in concentrations was attributed to upgrades, removal of old paper-making equipment and effluent flow reductions at one mill and improved pre-treatment and suspended solids removal at the other. PCB concentrations detected in the STP effluent during this sampling event were about 0.001 mcg/L.

Pathways Analysis

This section of the PHA identifies exposure pathways associated with past, present, and future uses of the river. An exposure pathway is how an individual could come into contact with contaminants originating from the river.

Sediments

Exposures to contaminants present in the sediments can occur through direct dermal contact while boating, fishing, or swimming. The sediments are underwater and exposure is expected to be limited to the first few inches in depth (i.e., up to about 6 inches or 15 cm). Although the exact number of people participating in recreational activities within the boundaries of the site is not known, a number of houses are next to the river and access to the river is available through established public boat launches.

Fish

EPA has observed and spoken with people who fish in the river, and eat fish caught from the river. Based on a review of available fish contamination data, DOH staff concluded that the general health advisory for fish consumption (that currently applies to the Black River PCBs site area), is appropriate for the area where the samples were taken. The general advisory states that people can eat up to four one-half pound meals of fish a month from NYS fresh waters and some marine waters near the mouth of the Hudson River, providing no specific, more restrictive advisory applies to the particular waterbody.

Advisories for New York State waters are available in DOH publications and on the DOH website (DOH 2015). The general advisory is presented below:

"General Advice. The general health advisory for sportfish is that people can eat up to four one-half pound meals a month (which should be spaced out to about a meal a week) of fish from all New York State fresh waters and some marine waters near the mouth of the Hudson River. If there is no specific advice for a particular waterbody, follow this general advice for these waters."

People who eat fish taken from Black River are likely exposed to contaminants contained in these fish. Because we do not have information about which and how much fish people catch and eat from the creek, we cannot evaluate these exposures. However, the concentrations of PCBs and mercury in fish tissue samples were consistent with the general health advisory for other water bodies in New York State that do not have a water body-specific advisory.

Surface Water

People using the river can be exposed to surface water contaminants through incidental ingestion or dermal absorption while boating, swimming or fishing. People launching and paddling small water craft such as kayaks or canoes in the river may come in direct contact (dermally) with surface water contaminants.

Flood Plain Soil

People accessing the river and frequenting areas immediately adjacent to the river may come into direct dermal contact with surface soils within the river's flood plain. Additional information about contaminants present in the flood plain soils is needed to determine whether public health actions are needed to address this exposure pathway.

Public Health Implications

Surface Sediments

People could be exposed to PCBs and DLCs in surface sediments (i.e., 0 to 15 cm in depth (0-6 inches)) during recreational use of the river. For estimating health risks in river sediments, DOH assumed that a person is exposed to sediments by ingestion and dermal contact two days per week for four months (mid-May to mid-September) each year, since it is unlikely a person would swim or wade in the river during the non-summer months. DOH evaluated the potential for noncancer health effects for a three year old child, and for cancer risks, we assume a person is exposed for 30 years from age three to 33. The cancer risk is estimated by multiplying the exposure from sediment by the contaminant's cancer potency factor (EPA 1996; CA EPA 2009), which is a numerical estimate of the carcinogenic strength (potency) of a chemical. To evaluate

the potential for noncancer health effects, the estimated exposures are compared to the contaminant's reference dose (EPA 1994, 2012), which is a lifetime exposure to the contaminant that is expected to be without appreciable risk for noncancer health effects.

Below is some general information about PCBs and DLCs, and the types of health effects that may be associated with exposure to these contaminants.

Health Effects of PCBs (ATSDR 2014b)

PCBs are a group of man-made chemicals (also known by the trade name Aroclor) that have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of PCBs was stopped in the United States in 1977 because of evidence that they build up in the environment and can cause harmful health effects.

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia, acne-like skin conditions, and liver, stomach and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

A few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services has concluded that PCBs may reasonably be anticipated to be carcinogens. The US EPA classifies PCBs as probable human carcinogens, and the International Agency for Research on Cancer classifies PCBs as carcinogenic to humans (Group 1).

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests that evaluated motor skills and short-term memory. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs.

Health Effects of DLCs (ATSDR 2011; NIH 2014)

DLCs are a class of chemical contaminants that are formed during combustion processes such as waste incineration, forest fires, and backyard trash burning, as well as during some industrial processes such as paper pulp bleaching and herbicide manufacturing. The most toxic chemical in the class is 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD).

The most noted health effect in people exposed to large amounts of 2,3,7,8-TCDD is chloracne. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects noted in people exposed to high doses of 2,3,7,8-TCDD include skin rashes, discoloration, and excessive body hair. Changes in blood and urine that may indicate

liver damage also are seen in people. Exposure to high concentrations of CDDs may induce long-term alterations in glucose metabolism and subtle changes in hormonal levels.

In certain animal species, 2,3,7,8-TCDD is especially harmful and can cause death after a single exposure. Exposure to lower levels can cause a variety of effects in animals, such as weight loss, liver damage, and disruption of the endocrine system. In many species of animals, 2,3,7,8-TCDD weakens the immune system and causes a decrease in the system's ability to fight bacteria and viruses. In other animal studies, exposure to 2,3,7,8-TCDD has caused reproductive damage and birth defects. Some animal species exposed to CDDs during pregnancy had miscarriages and the offspring of animals exposed to 2,3,7,8-TCDD during pregnancy often had severe birth defects including skeletal deformities, kidney defects, and weakened immune responses.

Risk Characterization

Long-term exposure (i.e., 30 years) to the highest level of PCBs (11 mg/kg) in surface sediments is estimated to pose a low increased risk of getting cancer (about three in one million). The 11 mg/kg level is the only one of 43 surface sediment results that corresponds to a risk greater than one in one million. The highest surface sediment level of DLCs (55.6 ng/kg), as well as the average surface sediment levels of PCBs (0.67 mg/kg) and DLCs (19.6 ng/kg), are estimated to pose an insignificant increased cancer risk (less than one in one million). The risk for noncancer health effects from exposure to PCBs and DLCs in surface sediments is minimal, because the estimated exposures are below each contaminant's reference dose. Sample calculations and exposure parameters used in our evaluation of the health risks of exposure to contaminants in surface sediments are found in Appendix C.

Surface Water

People could be exposed to surface water contaminants by incidental ingestion and dermal absorption during recreational uses of the river. One surface water sample downstream of the STP detected PCBs at 0.22 mcg/L. This level of PCBs is lower than the federal and New York State Part 5 drinking water standard of 0.5 mcg/L, but higher than the ATSDR Cancer Risk Evaluation Guide (CREG) of 0.018 mcg/L for PCBs (ATSDR 2013b). The CREG is set at the PCB water concentration associated with an increased lifetime cancer risk of one in one million, assumes a 70 kilogram person drinks two liters of water every day for a lifetime, and is lower than the analytical reporting limit (0.05 mcg/L) for EPA Method 508. Long-term (30 years) incidental ingestion exposure to PCBs in surface water at 0.22 mcg/L while swimming or during other recreational uses of the river is estimated to pose an insignificant increased risk of getting cancer (less than one in one million) and a minimal risk for noncancer health effects. Sample calculations and exposure parameters used in our evaluation of the health risks of exposure to PCBs in surface water are found in Appendix C.

Health Outcome Data Evaluation

The DOH has not previously evaluated health outcome data specifically for the Carthage/West Carthage or the area around the Black River PCBs site. The DOH maintains several health outcome databases, which could be used to generate health outcome data specifically for this area, if appropriate. These databases include the Cancer Registry, the Congenital Malformations Registry, Vital Records (birth and death certificates) and hospital discharge and emergency room data. In addition, the DOH's Environmental Public Health Tracking program could be used to

evaluate certain environmental health outcomes in the county. This program extends traditional environmental and health surveillance by jointly tracking environmental hazards, exposures, and health effects potentially related to environmental exposures. The Environmental Facilities and cancer mapping application, available on the DOH public web site (DOH, 2014b), can also be used to obtain information on cancer incidence in the Carthage/West Carthage and Black River PCBs site areas. The application shows the numbers of 22 types of cancer and the locations of 15 types of environmental facilities in the area.

Based on the exposure and toxicological evaluation presented elsewhere in this PHA, no evaluation of health outcome data is currently indicated, as no significant community-wide exposures were identified.

Community Health Concerns

We are not aware of any community concerns regarding this site that have been expressed to EPA, DEC or DOH.

Limitations

The evaluation conducted in this PHA is limited to the data available for evaluation. DOH and ATSDR used sufficient data of known quality in the preparation of this health assessment.

Conclusions

DOH and ATSDR conclude that, based on available data, contact with PCBs and DLCs in sediments and PCBs in surface water during recreational activities, including swimming, boating and fishing in the Black River, is not expected to harm people's health.

Sampling results show that most of the PCB and DLC contamination is in deeper sediments at least 30 cm (about one foot) or more below the sediment surface. Exposure by incidental ingestion and dermal contact is limited to the top layer of sediments (15 cm, or about 6 inches below the sediment surface), and the levels of PCBs and DLCs in these sediments pose a low[6] or insignificant[7] increased risk for getting cancer and a minimal risk for noncancer health effects[8] for people who use the river for recreational activities. In addition, the sediments are underwater and in many cases unavailable for human contact. For surface water, the highest level of PCBs is below the federal and New York State drinking water standard for PCBs in public water systems, and poses an insignificant risk for cancer and a minimal risk for noncancer health effects for people who might ingest the water while swimming or during other recreational uses of the river.

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[6]About three in one million

[7]Less than one in one million

[8]The estimated exposures are less than each contaminant's reference dose. The reference dose is defined by the US EPA as an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for a chronic duration (up to a lifetime) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

The DOH and ATSDR conclude that if the public follows the DOH fish consumption advisories, eating fish from the Black River PCBs site is not expected to harm people's health. The general health advisory for fish consumption (that currently applies to the Black River PCBs site area) is appropriate for the area where samples were taken to evaluate the site. The general advisory states that people can eat up to four one-half pound meals of fish a month from NYS fresh waters and some marine waters near the mouth of the Hudson River, providing no specific, more restrictive advisory applies to the particular waterbody. Advisories for New York State waters are available in DOH publications and on the DOH website (DOH 2015).

DOH evaluated fish contaminant data collected by DEC and EPA from the Black River PCBs site area. The results of that evaluation did not change the overall general health advisory for fish consumptions that currently applies to the Black River PCBs site.

Recommendations

DOH and ATSDR recommend that people follow the DOH fish consumption advisories to reduce their exposure to contaminants in the fish they eat. The general health advisory for sportfish consumption is that people can eat up to four one-half pound meals a month (which should be spaced out to about a meal a week) of fish from New York State fresh waters and some marine waters near the mouth of the Hudson River. If there is no specific advice for a fresh waterbody, the general advice should be followed.

Since PCBs are also found at higher levels in the fat of fish, DOH generally recommends reducing the amount of PCBs in a fish meal by removing the skin and trimming all the fat from the fillet. Broil, grill or bake the skinned and trimmed fillet on a rack so that the fat all drips away. Do not use the fat drippings to prepare sauces or gravies.

To further reduce exposures to PCBs in a fish meal, DOH generally recommends that people avoid or eat less American Eel, bluefish, carp, lake trout, salmon (Chinook & coho), striped bass, weakfish, white and channel catfish and white perch because these fish tend to have higher levels of PCBs. This advice is available in DOH publications and on the DOH website at: www.health.ny.gov/fish.

Public Health Action Plan

DOH will review future fish contamination data as it becomes available. If the fish contamination data review shows that a change in the fish advisory is warranted, DOH will prepare a health consultation describing the change and the basis for the change and will conduct additional outreach activities to communicate the revised fish advisory to local residents and stakeholders.

DOH will work with EPA as they identify floodplain areas along the river, if present, and to determine if additional floodplain sampling is needed.

DOH and ATSDR will evaluate all EPA data (collected after 2011) as it becomes available to determine whether further public health actions are needed.

DOH and ATSDR will work with the EPA as they evaluate the contribution of on-going sources to contamination of the river and take actions to control or eliminate contributing sources.

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Appendix A: Figures

Figure 1. Site Location Map

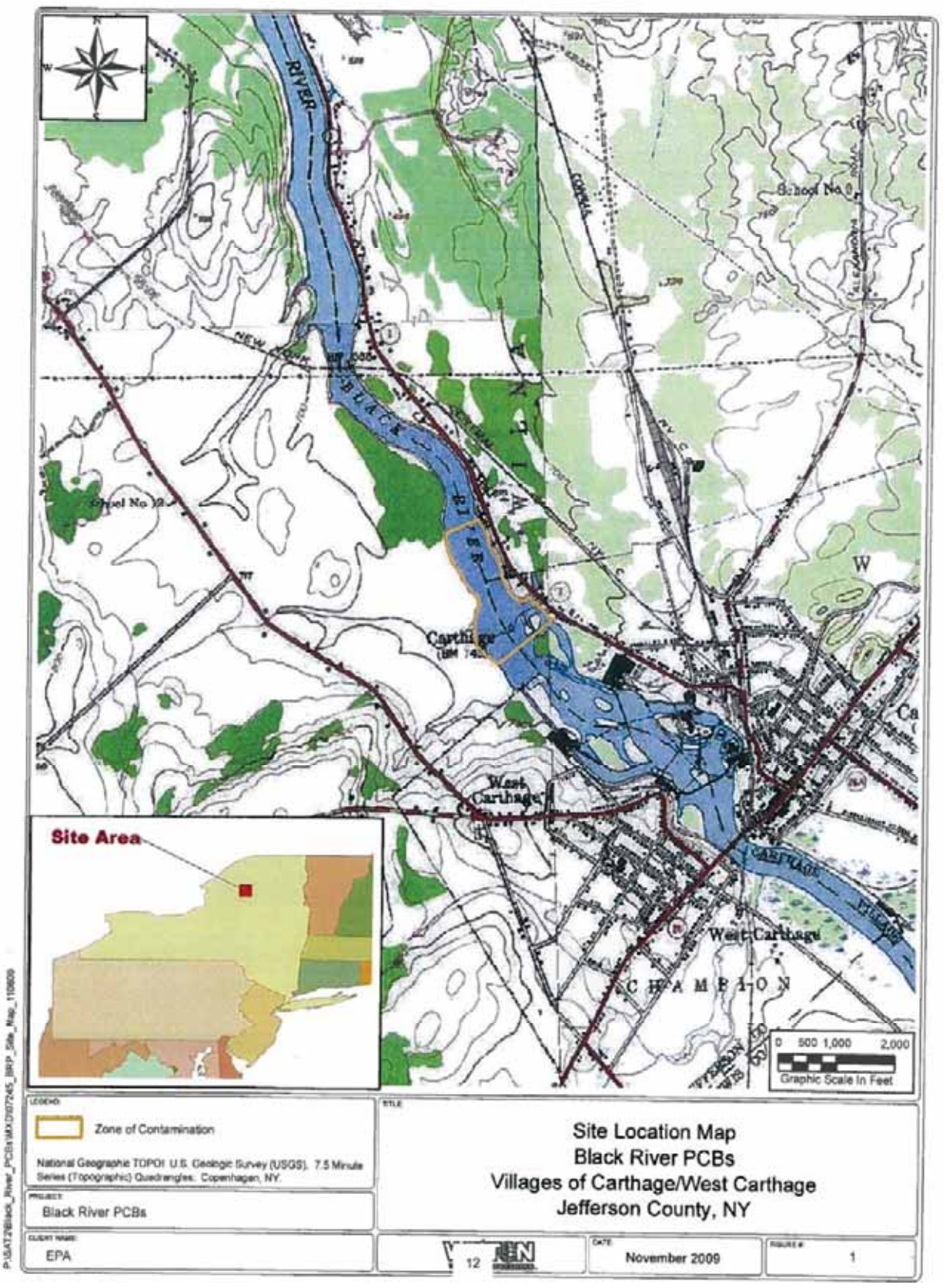

Figure 2. 1996-1997 Sampling Locations

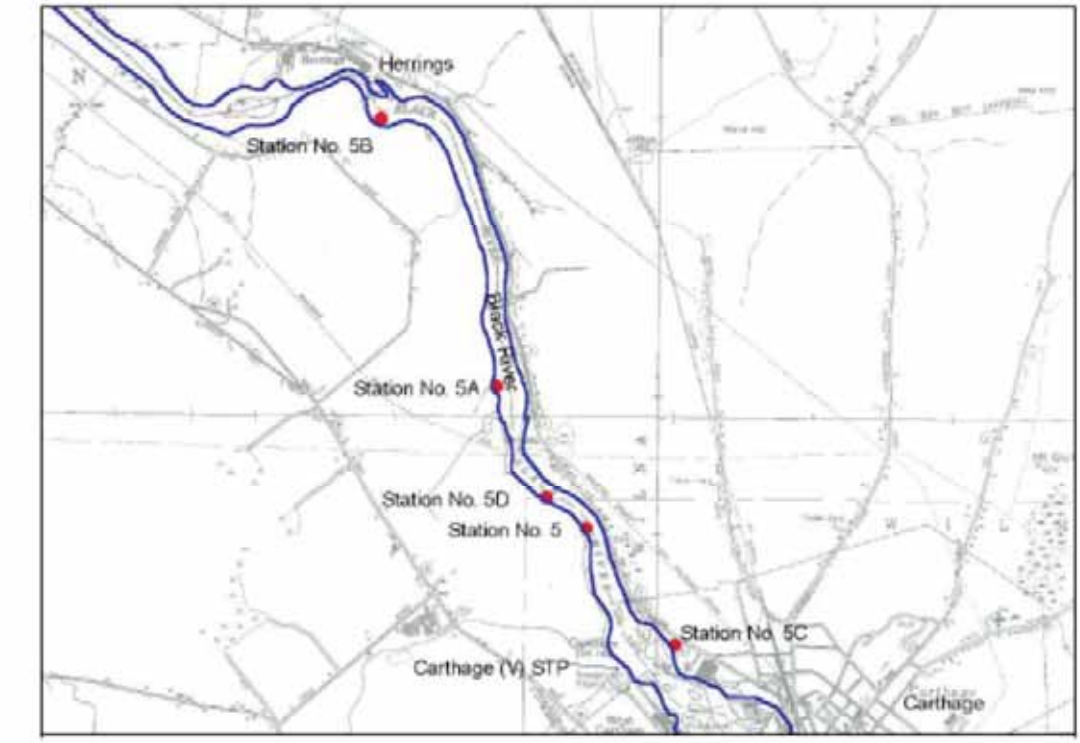

Figure 3. 2002 Sampling Locations

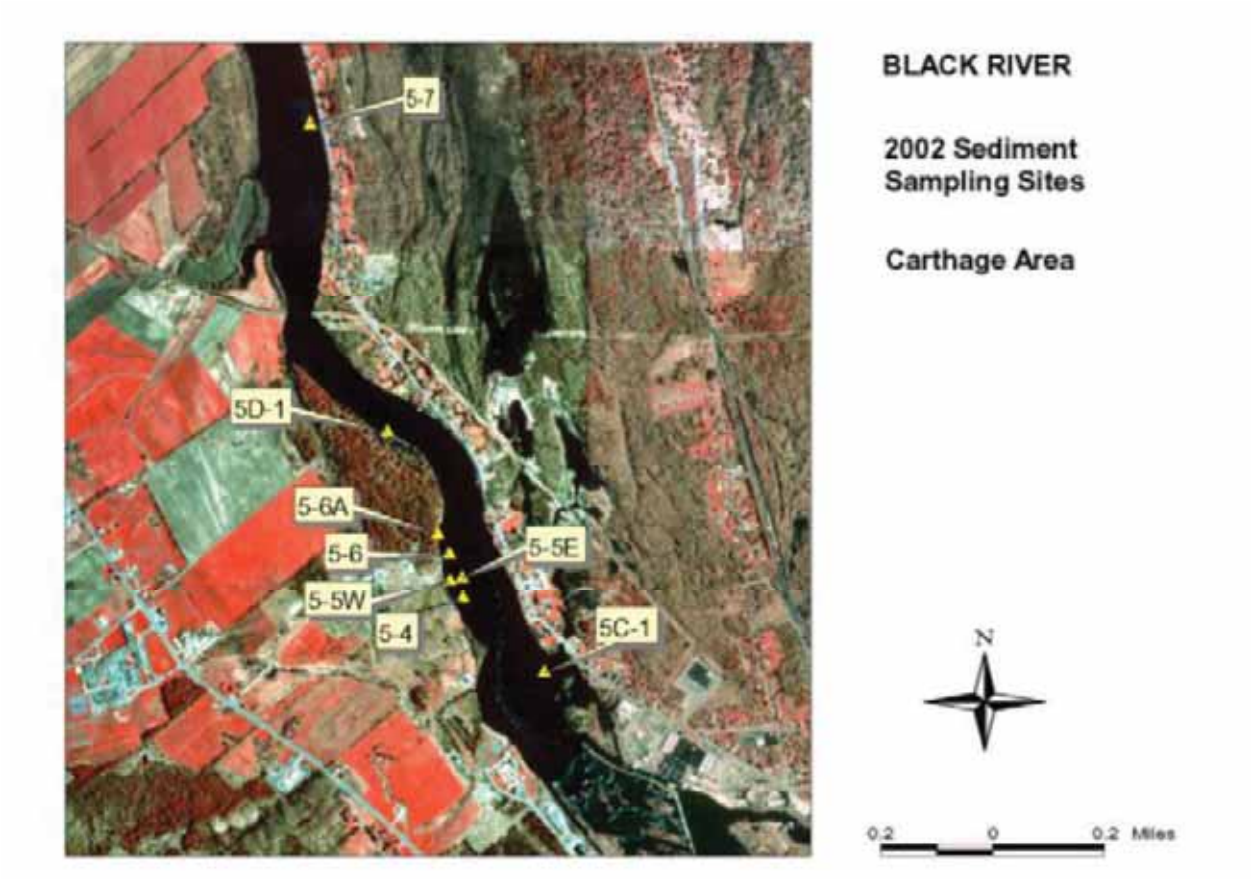

Figure 4. 2009 Sampling Locations

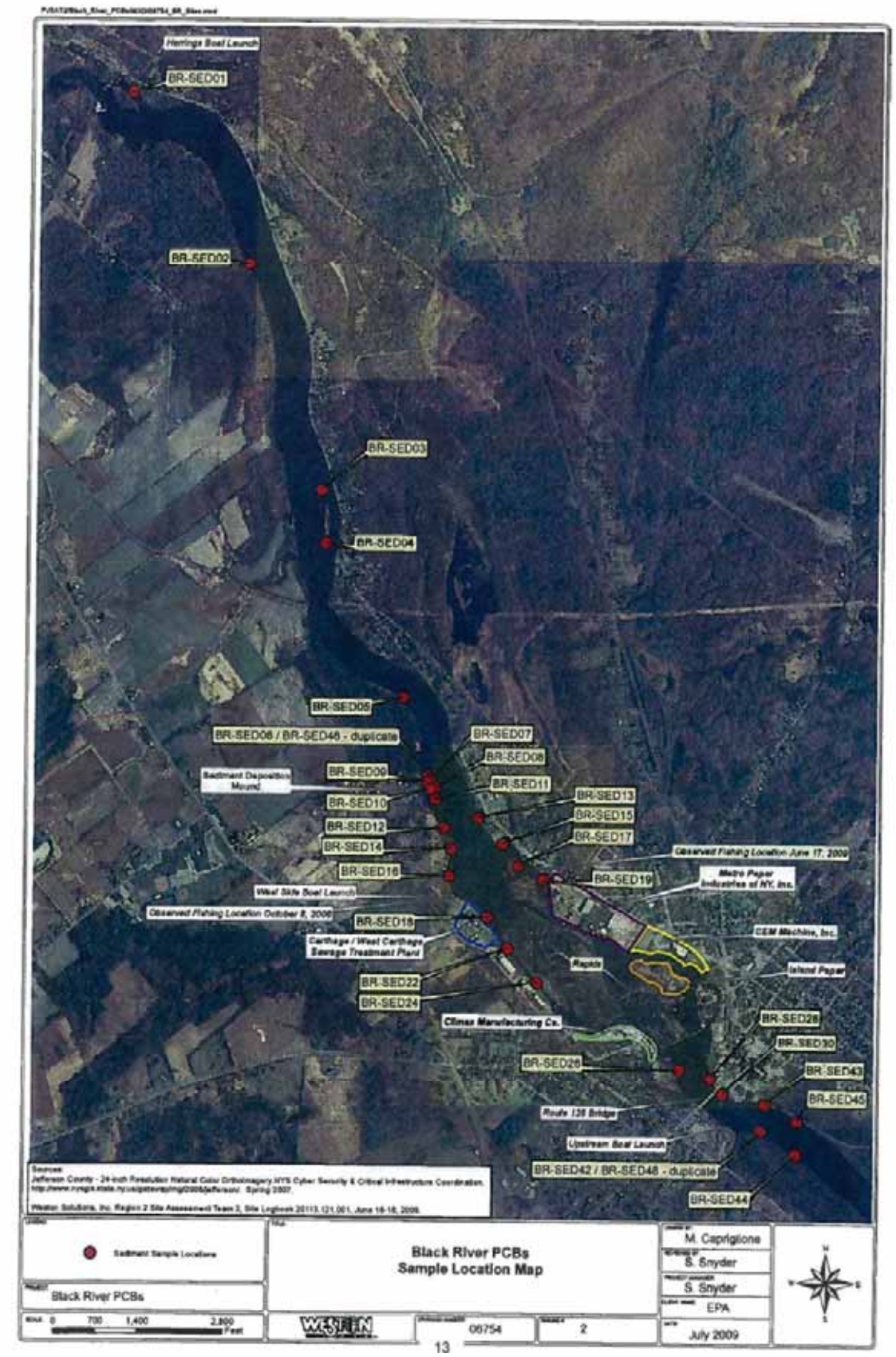

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Figure 5. 2010 Sediment Sampling Locations

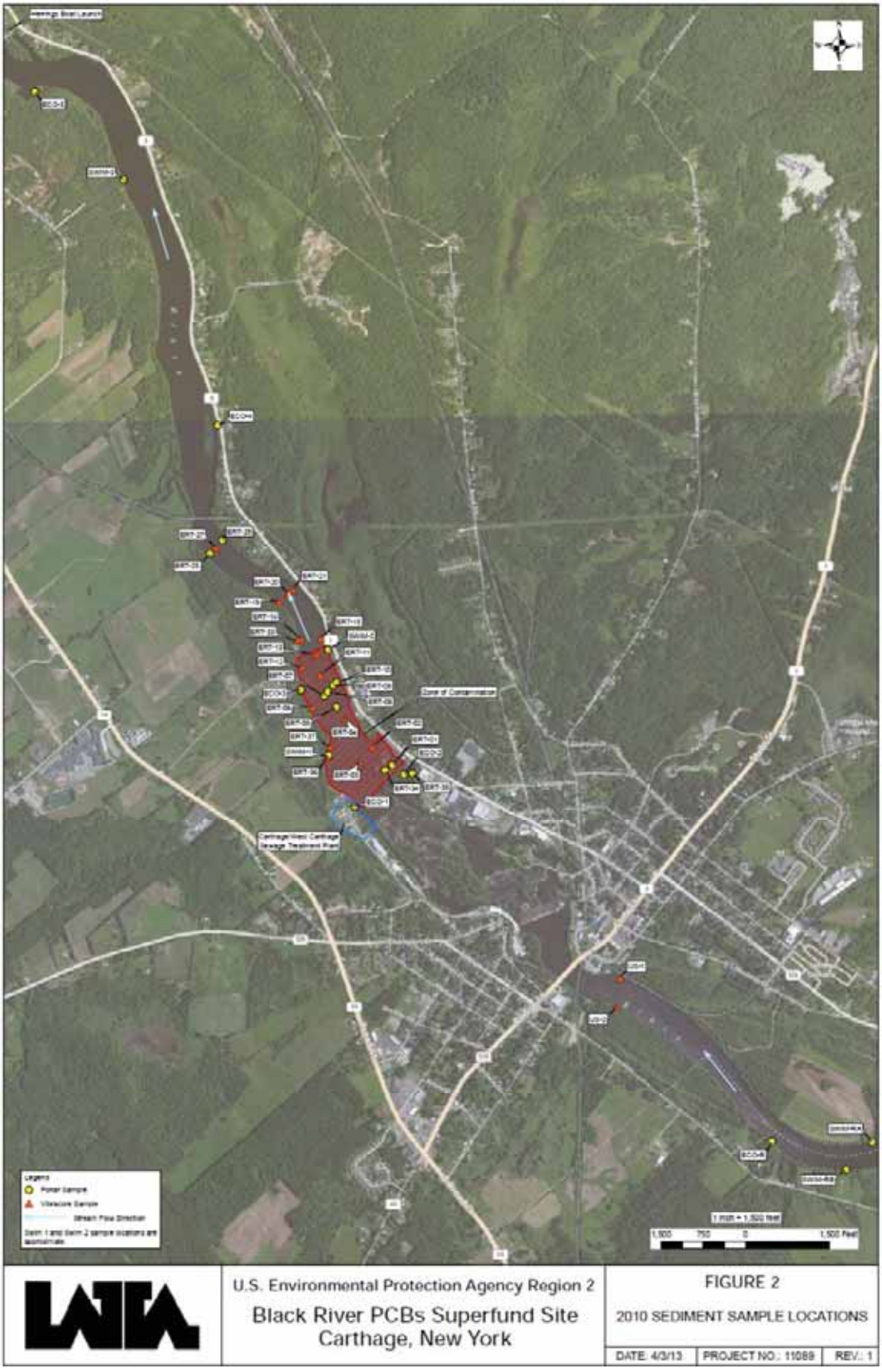

Figure 6. 2010 Fish and Surface Water Sampling Location

Appendix B: Tables

Table 1. 1996-1997 Black River Sediment Sampling Results

Sample Station	Sample Depth (centimeters)	Total PCBs (mg/kg)
5-1	Surficial	0.58
5A	Surficial	Not Analyzed
5B	Surficial	Not Analyzed
5C	Surficial	Not Analyzed
5-1	0-40	1.6
5-3	0-25	1.35
5D	0-25	1.227
5-1	40-80	36
5-3	25-60	14.8
5-3	60-90	19.8
5-3	90-111	0.029
5D	60-90	2.43
5D	90-104	0.0028
5D	73-77	0.091

Yellow highlight denotes value greater than both NY State DEC Part 375 soil cleanup objective for PCBs for residential use (1 mg/kg) and ATSDR cancer risk evaluation guide (0.35 mg/kg). Blue highlight denotes value greater than ATSDR cancer risk evaluation guide (0.35 mg/kg). mg/kg = milligrams per kilogram of sediment

Table 2. 2002 Black River Sediment Sampling Results

Sample Station	Sample Depth (centimeters)	Total PCBs (mg/kg)
4A	0-5	1.2
4A-1	0-5	0.17
5-4	0-15	11
5-5E	0-15	0.2
5-5W	0-15	0.45
5-6	0-15	0.14
5-6A	0-15	0.22
5-7	0-15	0.22
5B-1	0-15	0.17
5C-1	0-15	0.21
5D-1	0-15	0.36
6A	0-15	<0.071*
4A	5-10	0.74
4A-1	5-10	0.72
4A	10-15	0.7
4A-1	10-15	1.5
4A	15-20	1.6
4A	20-25	2.3
4A	25-30	0.25
4A-1	20-28	0.8
4A-1	15-20	1.9
5-4	15-30	0.66
5-5E	15-30	0.34
5-5W	15-30	0.64
5-6	15-30	0.95
5-6A	15-30	0.93
5-7	15-30	0.79
5B-1	15-30	0.98
5C-1	15-30	1.5
5D-1	15-30	<2.4
6A	15-30	<0.07
4A	30-35	0.95
4A	35-40	<0.082
4A	40-45	<0.059
5-4	30-45	3.8
5-5E	30-45	0.61
5-5W	30-45	0.75
5-6	30-45	2.1
5-6A	30-45	2.1

* "<" = less than method detection limit.
Yellow highlight denotes value greater than both NY State DEC Part 375 soil cleanup objective for PCBs for residential use (1 mg/kg) and ATSDR cancer risk evaluation guide (0.35 mg/kg). Blue highlight denotes value greater than ATSDR cancer risk evaluation guide (0.35 mg/kg). mg/kg = milligrams per kilogram of sediment

Table 2 (continued). 2002 Black River Sediment Sampling Results

Sample Station	Sample Depth (centimeters)	Total PCBs (mg/kg)
5-7	30-45	2.9
5B-1	30-45	2.6
5C-1	30-45	0.98
5D-1	30-45	1.2
6A	30-45	<0.068*
4A	45-50	<0.066
4A	50-55	<0.078
4A	55-60	<0.075
5-4	45-50	17
5-4	50-53	2.7
5-4	53-63	83
5-5E	45-60	6
5-5W	45-60	37
5-6	45-60	8.9
5-6A	45-50	0.35
5-6A	50-55	0.18
5-6A	55-66	<0.059
5-7	45-60	3.1
5B-1	45-60	0.13
5C-1	45-50	<0.17
5C-1	50-55	<0.13
5D-1	45-50	<0.098
5D-1	50-55	<0.12
5D-1	55-60	<0.11
6A	45-60	<0.074
5-5E	60-65	13
5-5W	60-65	12
5-6	60-65	18
5-7	60-65	1.2
5B-1	60-70	<0.15
5D-1	60-65	<0.12
6A	60-75	<0.061
5-5E	65-70	12
5-5W	65-70	5.6
5-6	65-70	140
5-7	65-70	0.36
5D-1	65-71	<0.14
5-5E	70-75	1

*"<" = less than method detection limit.
Yellow highlight denotes value greater than both NY State DEC Part 375 soil cleanup objective for PCBs for residential use (1 mg/kg) and ATSDR cancer risk evaluation guide (0.35 mg/kg). Blue highlight denotes value greater than ATSDR cancer risk evaluation guide (0.35 mg/kg). mg/kg = milligrams per kilogram of sediment

Table 2 (continued). 2002 Black River Sediment Sampling Results

Sample Station	Sample Depth (centimeters)	Total PCBs (mg/kg)
5-5W	70-75	23
5-6	70-75	0.45
5-7	70-75	0.10
5B-1	70-81	<0.12*
5-5E	75-78	0.38
5-5W	75-80	170
5-6	75-80	0.093
5-7	75-80	0.15
6A	75-90	<0.068
5-5W	80-85	23
5-6	80-85	0.08
5-7	80-85	<0.14
5-5W	85-90	1.2
5-6	85-91	0.17
5-7	85-92	<0.13
5-5W	90-100	0.58
6A	90-104	<0.06
6B	surface	<0.084
8-1	duplicate of sample 5-4	610
8-2	surface	<0.073
8-3	duplicate of sample 8-2	<0.073

*"<" = less than method detection limit.
Yellow highlight denotes value greater than both NY State DEC Part 375 soil cleanup objective for PCBs for residential use (1 mg/kg) and ATSDR cancer risk evaluation guide (0.35 mg/kg).
Blue highlight denotes value greater than ATSDR cancer risk evaluation guide (0.35 mg/kg).
mg/kg = milligrams per kilogram of sediment

Table 3. 2009 Black River Sediment Sampling Results

Sample Station	Sample Depth (centimeters)	Total PCBs (mg/kg)
Sample Results Above Background Range		
BR-SED07	0 - 15	0.77
BR-SED12	0 - 15	1.70
BR-SED13	0 - 15	0.840
BR-SED15	0 - 15	0.197
BR-SED17	0 - 15	5.90
BR-SED19	0 - 15	0.164
Background Samples		
BR-SED43	0 - 15	0.090U*
BR-SED44	0 - 15	0.0055
BR-SED45	0 - 15	0.080U
Sample Results Below Background Range		
BR-SED01	0 - 15	0.099U*
BR-SED02	0 - 15	0.01U
BR-SED03	0 - 15	0.094U
BR-SED04	0 - 15	0.002
BR-SED05	0 - 15	0.012
BR-SED06	0 - 15	0.026
BR-SED08	0 - 15	0.026
BR-SED09	0 - 15	0.050
BR-SED10	0 - 15	0.051
BR-SED11	0 - 15	0.050
BR-SED14	0 - 15	0.026
BR-SED16	0 - 15	0.042
BR-SED18	0 - 15	0.010
BR-SED22	0 - 15	0.006
BR-SED24	0 - 15	0.015
BR-SED26	0 - 15	0.05U
BR-SED28	0 - 15	0.035
BR-SED30	0 - 15	0.012

*U = Not detected at analytical detection limit shown.
Yellow highlight denotes value greater than both NY State DEC Part 375 soil cleanup objective for PCBs for residential use (1 mg/kg) and ATSDR cancer risk evaluation guide (0.35 mg/kg). Blue highlight denotes value greater than ATSDR cancer risk evaluation guide (0.35 mg/kg).
mg/kg = milligrams per kilogram of sediment

Table 4. 2010 Black River Sediment Sampling Results

Sample Station	Sample Depth (feet)	Total PCBs (mg/kg)
ERT-01	0 - 0.5	ND
ERT-02	0 - 0.5	ND
	0.5 - 1	ND
	1 - 2	ND
	2 - 3	ND
ERT-03	0 - 0.5	ND
	0.5 - 1	ND
	1 - 2	ND
	2 - 3	ND
ERT-04	0 - 0.5	0.140
	0.5 - 1	0.029
ERT-05	0 - 0.5	0.011
ERT-06	0 - 0.5	0.250
	0.5 - 1	0.490
	1 - 2	3.90
	2 - 3	0.019
	3 - 4	ND
	4 - 5	ND
	5 - 6	ND
	6 - 7	ND
ERT-07	0 - 0.5	ND
ERT-08	0 - 0.5	ND
ERT-09	0 - 0.5	ND
ERT-10	0 - 0.5	ND
ERT-11	0 - 0.5	ND
	0.5 - 1	ND
	1 - 2	ND
	2 - 3	ND
ERT-12	0 - 0.5	0.130
	0.5 - 1	0.210
	1 - 2	3.00
	2 - 3	4.80
	3 - 4	4.50
	4 - 5	0.180
	5 - 6	0.069
	6 - 7	ND
	7 - 8	ND
ERT-13	0 - 0.5	ND
	0.5 – 1	0.022
	1 – 2	0.012
	2 – 3	ND
	3 – 4	ND

Table 4 (continued). 2010 Black River Sediment Sampling Results

Sample Station	Sample Depth (feet)	Total PCBs (mg/kg)
ERT-14	0 - 0.5	0.046
	0.5 – 1	0.036
	1 – 2	0.021
	2 – 3	0.120
	3 – 4	0.061
ERT-15	0 - 0.5	0.060
	0.5 – 1	ND
	1 – 2	ND
	2 – 3	ND
	3 – 4	ND
ERT-19	0 - 0.5	0.077
	0.5 – 1	0.087
	1 – 2	0.097
	2 – 3	ND
	3 – 4	ND
	4 – 5	ND
ERT-20	0 - 0.5	0.035
	0.5 – 1	0.028
	1 – 2	0.038
ERT-21	0 - 0.5	0.069
	0.5 – 1	ND
	1 – 2	ND
ERT-25	0 - 0.5	ND
ERT-27	0 - 0.5	ND
ERT-29	0.5 – 1	0.080
	1 – 2	0.026
ERT-33	0 - 0.5	0.056
	0 - 0.5	ND
	0.5 – 1	ND
	1 – 2	0.075
	2 – 3	ND
	3 – 4	ND
	4 – 5	ND
	5 – 6	ND
ERT-34	0 - 0.5	ND
ERT-35	0 - 0.5	ND
ERT-36	0 - 0.5	ND
	0.5 – 1	ND
	1 – 2	ND
	2 – 3	ND
	3 – 4	ND

Table 4 (continued). 2010 Black River Sediment Sampling Results

Sample Station	Sample Depth (feet)	Total PCBs (mg/kg)
ERT-37	0 – 0.5	ND
	0.5 - 1	ND
ERT-US1	0 - 0.5	ND
	0.5 – 1	ND
ERT-US2	0 - 0.5	ND
	0.5 – 1	ND
	1 – 2	ND
	2 – 3	ND
	3 – 4	ND
	4 – 5	ND

Yellow highlight denotes value greater than both NY State DEC Part 375 soil cleanup objective for PCBs for residential use (1 mg/kg) and ATSDR cancer risk evaluation guide (0.35 mg/kg).
Blue highlight denotes value greater than ATSDR cancer risk evaluation guide (0.35 mg/kg).
mg/kg = milligrams per kilogram of sediment.
Sample depth reported in feet. 1 foot is about 30 centimeters.

Appendix C: Sample Calculations

Sediments

1) PCB Cancer Risk Calculation

PCB Ingestion Dose from Sediment

Yr	Range	*C* (mg/kg)	*IR* (mg/d)	*CF* (kg/mg)	*BW* (kg)	*EF1* d/wk	*EF2* wk/y	*E*	365 d/y Ing Dose (mg/kg/d)	*E*-weighted Ing Dose (mg/kg/d)	
1	3 to <4	1	120	1.E-06	18.6	0.286	0.327	0.093	6.45E-06	**6.03E-07**	
2	4 to <5	1	120	1.E-06	18.6	0.286	0.327	0.093	6.45E-06	**6.03E-07**	
3	5 to <6	1	100	1.E-06	18.6	0.286	0.327	0.093	5.38E-06	**5.02E-07**	
4	6 to <7	1	100	1.E-06	31.8	0.286	0.327	0.093	3.14E-06	**2.94E-07**	
5	7 to <8	1	100	1.E-06	31.8	0.286	0.327	0.093	3.14E-06	**2.94E-07**	
6	8 to <9	1	100	1.E-06	31.8	0.286	0.327	0.093	3.14E-06	**2.94E-07**	
7	9 to <10	1	100	1.E-06	31.8	0.286	0.327	0.093	3.14E-06	**2.94E-07**	
8	10 to <11	1	100	1.E-06	31.8	0.286	0.327	0.093	3.14E-06	**2.94E-07**	
9	11 to <12	1	100	1.E-06	56.8	0.286	0.327	0.093	1.76E-06	**1.64E-07**	
10	12 to <13	1	100	1.E-06	56.8	0.286	0.327	0.093	1.76E-06	**1.64E-07**	
11	13 to <14	1	100	1.E-06	56.8	0.286	0.327	0.093	1.76E-06	**1.64E-07**	
12	14 to <15	1	100	1.E-06	56.8	0.286	0.327	0.093	1.76E-06	**1.64E-07**	
13	15 to < 16	1	100	1.E-06	56.8	0.286	0.327	0.093	1.76E-06	**1.64E-07**	
14	16 to <17	1	100	1.E-06	71.6	0.286	0.327	0.093	1.40E-06	**1.30E-07**	
15	17 to <18	1	100	1.E-06	71.6	0.286	0.327	0.093	1.40E-06	**1.30E-07**	
16	18 to <19	1	100	1.E-06	71.6	0.286	0.327	0.093	1.40E-06	**1.30E-07**	
17	19 to <20	1	100	1.E-06	71.6	0.286	0.327	0.093	1.40E-06	**1.30E-07**	
18	20 to <21	1	100	1.E-06	71.6	0.286	0.327	0.093	1.40E-06	**1.30E-07**	
19	21 to <22	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
20	22 to <23	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
21	23 to <24	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
22	24 to <25	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
23	25 to <26	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
24	26 to <27	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
25	27 to <28	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
26	28 to <29	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
27	29 to <30	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
28	30 to <31	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
29	31 to <32	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
30	32 to <33	1	100	1.E-06	80.0	0.286	0.327	0.093	1.25E-06	**1.17E-07**	
								Average PCB Oral Dose		**2.02E-07**	**mg/kg/d**

Age Period	ED/Lifetime	Avg Dose (mg/kg/d)	Dose Weight (mg/kg/day over 70 years)
30 years	0.4286	2.02E-07	**8.65E-08**

PCB Dermal Dose from Sediment

Yr	Range	C (mg/kg)	SA (cm2)	AF (mg/cm2-d)	DABS	CF (kg/mg)	BW (kg)	EF1 d/wk	EF2 wk/y	E	365 d/y Derm Dose (mg/kg/d)	E-weighted Derm Dose (mg/kg/d)
1	3 to <4	1	2,800	0.20	0.140	1.0E-06	18.6	0.286	0.327	0.093	4.215E-06	**3.937E-07**
2	4 to <5	1	2,800	0.20	0.140	1.0E-06	18.6	0.286	0.327	0.093	4.215E-06	**3.937E-07**
3	5 to <6	1	2,800	0.20	0.140	1.0E-06	18.6	0.286	0.327	0.093	4.215E-06	**3.937E-07**
4	6 to <7	1	5,700	0.07	0.140	1.0E-06	31.8	0.286	0.327	0.093	1.757E-06	**1.641E-07**
5	7 to <8	1	5,700	0.07	0.140	1.0E-06	31.8	0.286	0.327	0.093	1.757E-06	**1.641E-07**
6	8 to <9	1	5,700	0.07	0.140	1.0E-06	31.8	0.286	0.327	0.093	1.757E-06	**1.641E-07**
7	9 to <10	1	5,700	0.07	0.140	1.0E-06	31.8	0.286	0.327	0.093	1.757E-06	**1.641E-07**
8	10 to <11	1	5,700	0.07	0.140	1.0E-06	31.8	0.286	0.327	0.093	1.757E-06	**1.641E-07**
9	11 to <12	1	5,700	0.07	0.140	1.0E-06	56.8	0.286	0.327	0.093	9.835E-07	**9.186E-08**
10	12 to <13	1	5,700	0.07	0.140	1.0E-06	56.8	0.286	0.327	0.093	9.835E-07	**9.186E-08**
11	13 to <14	1	5,700	0.07	0.140	1.0E-06	56.8	0.286	0.327	0.093	9.835E-07	**9.186E-08**
12	14 to <15	1	5,700	0.07	0.140	1.0E-06	56.8	0.286	0.327	0.093	9.835E-07	**9.186E-08**
13	15 to < 16	1	5,700	0.07	0.140	1.0E-06	56.8	0.286	0.327	0.093	9.835E-07	**9.186E-08**
14	16 to <17	1	5,700	0.07	0.140	1.0E-06	71.6	0.286	0.327	0.093	7.802E-07	**7.287E-08**
15	17 to <18	1	5,700	0.07	0.140	1.0E-06	71.6	0.286	0.327	0.093	7.802E-07	**7.287E-08**
16	18 to <19	1	5,700	0.07	0.140	1.0E-06	71.6	0.286	0.327	0.093	7.802E-07	**7.287E-08**
17	19 to <20	1	5,700	0.07	0.140	1.0E-06	71.6	0.286	0.327	0.093	7.802E-07	**7.287E-08**
18	20 to <21	1	5,700	0.07	0.140	1.0E-06	71.6	0.286	0.327	0.093	7.802E-07	**7.287E-08**
19	21 to <22	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
20	22 to <23	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
21	23 to <24	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
22	24 to <25	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
23	25 to <26	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
24	26 to <27	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
25	27 to <28	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
26	28 to <29	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
27	29 to <30	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
28	30 to <31	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
29	31 to <32	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
30	32 to <33	1	5,700	0.07	0.140	1.0E-06	80.0	0.286	0.327	0.093	6.983E-07	**6.522E-08**
										Average PCB Dermal Dose	**1.20E-07**	**mg/kg/day**

Age Period	ED/Lifetime	Avg Dose (mg/kg/day)	Dose Weight (mg/kg/day over 70 years)
30 Years	0.4286	1.20E-07	**5.15E-08**

Total Dose from 1 mg/kg (using results from above spreadsheets)

Total Dose = Oral Dose + Dermal Dose = 8.65E-8 mg/kg/day + 5.15E-8 mg/kg/day = 1.38E-7 mg/kg/day

Total Dose from 11 mg/kg PCBs

Total Dose = (1.38E-7 mg/kg/day x 11 mg/kg)/ 1 mg/kg = 1.52E-6 mg/kg/day

Cancer Risk from 11 mg/kg PCBs

Cancer Risk = Total Dose x Cancer Potency Factor = 1.52E-6 mg/kg/day x 2.0/mg/kg/day = 3E-6 or 3 in 1,000,000

2) PCB Noncancer Risk Calculation

Oral Dose = 11 mg/kg x 120 mg_s/day x 1/18.6 kg x 1E-6 kg/mg x 2 d/7 d x 17 wks/52 wks = 6.63E-6 mg/kg/day

Dermal Dose = [11 mg/kg x 2800 cm^2 x 0.2 mg_s/cm^2-d x 0.14 x 1E-6 kg/mg x 2 d/7 d x 17 wks/52 wks]/18.6 kg = 4.33E-6 mg/kg/day

Total Dose = Oral Dose + Dermal Dose = 6.63E-6 mg/kg/day + 4.33E-6 mg/kg/day = 1.10E-5 mg/kg/day

Hazard Quotient = Total Dose/Reference Dose = 1.10E-5 mg/kg/day / 2E-5 mg/kg/day = 0.55 (minimal)

Surface Water

1) PCB Cancer Risk Calculation

0.00022 mg/L x 0.053 L/day x 1/70 kg x 2 d/7 d x 17 w/52 w x 30 y/70 y = 6.67E-9 mg/kg/day

Cancer Risk = Dose x Cancer Potency Factor = 6.67E-9 mg/kg/day x 2.0/mg/kg/day = 1E-8 or 1 in 100,000,000

2) PCB Noncancer Risk Calculation

0.00022 mg/L x 0.09 L/day x 1/18.6 kg x 2 d/7 d x 17 w/52 w = 9.94E-8 mg/kg/day

Hazard Quotient = Dose/Reference Dose = 9.94E-8 mg/kg/day / 2E-5 mg/kg/day = 0.005 (minimal)

Notes: Soil ingestion rates are from EPA (2011) and DEC/DOH (2006). Body weights are those recommended by EPA (2011). Dermal absorption factors (Chapter 3 [Exhibit 3-4]) and surface area recommendations are found in EPA (2004). Cancer potency factors for DLCs (as 2,3,7,8-TCDD equivalents) are from CA EPA (2009) and EPA (1996), respectively, and reference doses are from EPA (1994, 2012). The reference dose for Aroclor 1254 (EPA 1994) was used to evaluate unspecified mixtures of PCBs. Incidental ingestion rates for surface water are those recommended by ATSDR based on Dufour et al. (2006).

Appendix D: Conclusion Categories and Hazard Statements

Conclusion Categories and Hazard Statements

ATSDR has five distinct descriptive conclusion categories that convey the overall public health conclusion about a site or release, or some specific pathway by which the public may encounter site-related contamination. These defined categories help ensure a consistent approach in drawing conclusions across sites and assist the public health agencies in determining the type of follow-up actions that might be warranted. The conclusions are based on the information available to the author(s) at the time they are written.

1. Short-term Exposure, Acute Hazard "ATSDR concludes that...could harm people's health."

This category is used for sites where short-term exposures (e.g. < 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid public health intervention.

2. Long-term Exposure, Chronic Hazard "ATSDR concludes that...could harm people's health."

This category is used for sites that pose a public health hazard due to the existence of long-term exposures (e.g. > 1 yr) to hazardous substance or conditions that could result in adverse health effects.

3. Lack of Data or Information "ATSDR cannot currently conclude whether...could harm people's health."

This category is used for sites in which data are insufficient with regard to extent of exposure and/or toxicologic properties at estimated exposure levels to support a public health decision.

4. Exposure, No Harm Expected "ATSDR concludes that ... is not expected to harm people's health."

This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.

5. No Exposure, No Harm Expected "ATSDR concludes that ...will not harm people's health."

This category is used for sites that, because of the absence of exposure, are not expected to cause any adverse health effects.

Appendix E: Glossary of Terms

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

Acute
Occurring over a short time [compare with chronic].

Adverse health effect
A change in body functions or cell structure that might lead to disease or health problems

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.

Chronic
Occurring over a long time [compare with acute].

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].

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

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

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

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

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

Dioxin-like compounds (DLCs)
A group of structurally and biologically related contaminants that occur as complex mixtures in the environment, and are formed during combustion processes such as waste incineration, forest fires, and backyard trash burning, as well as during some industrial processes such as paper pulp bleaching and herbicide manufacturing. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD) is the most toxic contaminant of this group, and the toxicity of other dioxin-like compounds is expressed relative to the toxicity of 2,3,7,8-TCDD using toxic equivalency factors.

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.

EPA
United States Environmental Protection Agency.

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 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.

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

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

Health consultation
A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations

are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

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

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

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

Integrated Risk Information System (IRIS)
EPA's IRIS system is a human health assessment program that evaluates information on health effects that may result from exposure to environmental contaminants. The IRIS database is web accessible and contains information on more than 550 chemical substances.

mcg/kg or µg/kg
Microgram per kilogram.

mcg/L or µg/L
Microgram per liter.

mg/kg
Milligram per kilogram.

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.

ng/kg
Nanogram per kilogram.

NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]

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

Polychlorinated biphenyls (PCBs)
A group of man-made chemicals (also known by the trade name Aroclor) that have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment.

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

Public health action
A list of steps to protect public 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 radionuclide's 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 listed in Appendix D.

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.

Risk
The probability that something will cause injury or harm.

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.

Semi-volatile Organic Compounds (SVOCs)
A semi-volatile organic compound is an organic compound which has a boiling point higher than water and which may vaporize when exposed to temperatures above room temperature. Semi-volatile organic compounds include substances such as phenols and polynuclear aromatic hydrocarbons (PAH).

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.

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

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

Other glossaries and dictionaries:
Environmental Protection Agency (http://www.epa.gov/OCEPAterms/)
National Library of Medicine (NIH)
(http://www.nlm.nih.gov/medlineplus/mplusdictionary.html)