Health Consultation

Potential for Exposure to PCB Contamination in Sediments
of Lincoln Creek and the Estabrook Dam Impoundment,
Milwaukee County

Prepared by the
Wisconsin Department of Health Services

JANUARY 5, 2011

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

Health Consultation: A Note of Explanation

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

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or 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 and Statement of Issues

Conclusion. DPH concludes that the consumption of designated fish species that are contaminated with polychlorinated biphenyls (PCBs) from Lincoln Creek and the Estabrook Impoundment is the most important source of exposure to PCBs from these waterways. Frequent and substantial exposure to PCBs over a long time (a year or more) can result in their accumulation in the body to the point where they could harm people's health, particularly the health of the developing fetus exposed to PCBs through their mother's body, or the very young exposed to PCBs in their mother's milk.

Basis for decision. An existing Fish Consumption Advisory warns the public against eating PCB-contaminated fish from these waterways. The exposure analysis performed in this health consultation indicates that consuming these fish can be an important source of PCB exposure.

Next steps. In order to protect community health and well-being, DPH recommends that the public follow the posted fish advisory signs and the fish consumption advisories published by the Wisconsin Department of Natural Resources.

Conclusion. DPH concludes that under "realistic" conditions, eating small amounts of sediments that are contaminated with PCBs from Lincoln Creek or the Estabrook Impoundment is not expected to result in illness over the short term.

Basis for decision. Health and environmental agencies planning the cleanup of PCBs in sediment aim to achieve a concentration that is much lower than would be needed to protect people from exposure via direct contact with sediment. Such exposure might occur from eating with dirty hands. PCB concentrations in sediment must be kept quite low in order to help prevent exposure over one's lifetime, and to keep PCBs out of waterways and fish. Daily, "worst-case" contact over a year or more with the most contaminated areas (which are not on the sediment surface) are unlikely, but does justify the need for measures to prevent exposure. Similarly, incidental exposure via hand-to-mouth contact could add to the lifetime exposure to PCBs from eating fish and from other sources. More importantly, these PCBs in sediments are available to enter the food chain and be consumed in fish.

Next steps. In order to protect community health and well-being, and prevent PCBs from entering the food supply, DPH recommends that park users wash hands after using the park, fishing, or wading in the riverbed.

Conclusion DPH acknowledges that small amounts of PCBs can be released into the air from contaminated soil or from exposed sediment, but concludes that the amount of PCBs that we might inhale from air is not expected to harm people's health.

Basis for decision. In a study by the Wisconsin Department of Natural Resources (WDNR), PCBs in air were measured at the nearby Parkway School, Glendale (Grande 2004), and found to be less than background levels found elsewhere in Milwaukee. In addition, worst case exposure

estimates were calculated using earlier air measurements made at PCB-contaminated dredge spoils elsewhere in Wisconsin. These worst-case estimates are very small compared to other sources of exposure, including accidentally eating small amounts of creek sediment from dirty hands, or from eating fish from the creek.

Next steps. To minimize minor sources of exposure to PCBs, DPH recommends that current best practices for dust control be followed during the staging and transport of PCB-contaminated dredge spoils. In addition, in the interest of safety, the public is advised to stay out of marked construction areas and away from construction equipment during the course of the sediment removal project.

Background

Site Description and History

Parklands and waterways within Glendale and the City of Milwaukee are a recreational destination for Milwaukee County residents. Lincoln Park is a 318-acre property located in parts of Glendale and the City of Milwaukee along the confluence of Lincoln Creek and the Milwaukee River. Included within the park are the Estabrook Impoundment (a shallow reservoir formed by the Estabrook Dam on the Milwaukee River at its confluence with Lincoln Creek, several islands within the impoundment, and a variety of recreational facilities such as ball sport fields, picnic areas, a swimming pool, and a golf course (Community Profile Network 1998). The area to the west of Lincoln Creek and the side of the west oxbow (Figure 1) are within the City of Milwaukee limits. The areas to the east of the Milwaukee River and south of the west oxbow are in Glendale.

PCBs have been identified as a contaminant of concern within the Milwaukee River system (Steuer *et al.* 1999), including in sediments of the Estabrook impoundment just downstream of the confluence of Lincoln Creek and the Milwaukee River (Figure 1). The PCBs in the Estabrook impoundment are believed to be from unidentified industrial sources (Appendix I), and are thought to significantly contribute to the transport and distribution of PCBs downstream in the Milwaukee River (WDNR 2005). Several surveys of PCBs in Lincoln Park sediments have been published since the early 1990s. Reported PCB concentrations in surficial sediments around Lincoln Park ranged from 0.26 to 3.3 parts per million in 1993 with a maximum concentration of 380 ppm in deeper sediments, and 2.3 to 100 parts per million in 1995 with a maximum of 870 ppm in deeper (1.3-2.1 meters depth) sediments of the lower west oxbow (Westenbroek 1993, Steuer *et al.* 1999). The area having the most concentrated PCBs in surficial sediments (1 foot deep or less) have been reported in the area of the west oxbow located west of the parkway and north of the concrete pier. The reported maximum concentrations in surface sediments were 460 ppm during a 2001-2003 survey (WDNR 2005) and 144 ppm in 2008 (STN 2009). Maximum concentrations are used in this report to provide "worst-case" estimates of exposure; the provided references should be consulted to gain a more complete view of the distribution of PCBs in park sediments.

A Fish Consumption Advisory is in effect for these waters (see discussion below). The recognition that eating fish from these waters can be a health hazard is not a new issue, and therefore will not be discussed in detail here. Exposure estimates to PCBs in fish are presented

below (1) for the purpose of comparison to other routes of exposure and (2) for the purpose of reinforcing the message of risk from consuming these fish.

Several other portions of the Milwaukee river watershed have completed, or are in the process of completing, the evaluation and cleanup of PCBs in sediments. These include the *Blatz pavilion lagoon project* in Lincoln Park (Milwaukee) completed in 2008, Cedar Creek (Cedarburg) under evaluation, and the Kinnickinnic River (Milwaukee) completed 2009 (WDNR 2008).

Demographics

Glendale, population 13,067 (U.S. Census Bureau, 2000) is located within the Milwaukee metropolitan area. The predominant racial makeup (2000 census) is 86.8% white, 8.1% black or African American, 3% Asian, and 1.8% Hispanic or Latino. Per capita income is similar to the statewide average. It is important to note that although Lincoln Park lies within the City of Glendale, users of the park represent a broader population within the City of Milwaukee, which is adjacent to the south of Glendale, as well as other nearby communities. However, there is no current information that accurately typifies park users.

Community Health Concerns

The major community health concerns addressed in this consultation are those associated with PCBs found in sediments of the Estabrook Impoundment. Possible routes of exposure to these PCBs are the consumption of fish from these waters, and from exposure to sediments, some of which are exposed and accessible during periods of low water levels. A third, though less significant, route of exposure is through inhalation of air potentially containing PCBs from these waters.

There has been an ongoing effort to educate the public about the risks of consuming PCB-containing fish from the Lincoln Park/Estabrook impoundment area. DHS has collaborated (discussed in more detail below) with WDNR, the City of Milwaukee Health Department, and the Milwaukee County Parks Department to prepare and post warning signs, and to provide information at public meetings.

The public has expressed other quality of life concerns related to Lincoln Creek, Lincoln Park, and Estabrook Dam. Most of these concerns lie outside of the immediate goals of removing contaminated sediment from the western oxbow of the Estabrook impoundment. However, DHS acknowledges the importance and legitimacy of these public concerns. DHS, in collaboration with local, state, and federal health and environmental agencies, conducted a series of public meetings that were based in the Health Impact Assessment approach, and were designed to address these concerns. The results of this work will be reported separately, but are summarized below in the Public Health Action Plan, and in Appendix II of this report.

Discussion

Exposure estimates were originally prepared in June 2009 (Thiboldeaux and Grande) to support a WDNR fact sheet on the project (Appendix 1). Below are revised versions of the June 2009 estimates.

PCB exposure from fish consumption. A consumption advisory, due to the presence of PCBs, exists for fish taken from Milwaukee River from the city of Grafton downstream to Estabrook Falls (WDNR 2010a, WDNR 2010b). The specifics of the advisory vary from "Do Not Eat" for large bottom feeders (carp), to limited consumption recommended for many smaller species (see Appendix I for excerpt from WDNR 2010b). Below is an estimate of exposure to PCBs (see ATSDR 2005) from consuming Redhorse from the Milwaukee River. The estimate assumes a consumption frequency of one meal per month, the maximum recommended in the WDNR advisory. The estimates are for adult fish consumption rates in Wisconsin (Fiore *et al.* 1989), under the consideration that our most toxicologically significant PCB exposures typically occur perinatally via the placenta and mothers milk (*e.g.* Patindin *et al.* 1997; 1998). This concept supports the need to limit cumulative PCB exposures that occur over many years.

Estimate of exposure to PCBs from consuming fish, based on WDNR fish data 2002-2007, Milwaukee River, Grafton to Estabrook Falls.

Comparison Values: PCB exposures imparting risk, using sensitive endpoints.

- "Great Lakes Protocol" *Health Protection Value* of **0.05 μg PCB/kg body wt/day** (Anderson *et al.* 1993). This value has been widely used in assessing PCB exposures in Wisconsin.
- Minimal Risk Level (*MRL*) for chronic exposure of **0.02 μg PCB/kg body wt/day** (ATSDR 2000). This comparison value was derived from epidemiological studies of human infants, and experimental studies using monkeys.

1. Equivalent whole-body exposure to 70 kg adult:

   (0.02 μg PCB/kg body wt/day)(70 kg) = 1.4 μg PCB/day

2. Fish consumption: 227 grams (about one-half pound) Redhorse meal, once per month. Equivalent to consuming 0.008 kg fish/day.

3. Average PCB found in Milwaukee River Redhorse: 1.33 mg PCB/kg fish fillet.

4. PCB dose from consuming Milwaukee River Redhorse:

   (1.33 mg PCB/kg fish)(0.008 kg fish/day) = **0.011 mg (or 11,000 ng) PCB/day**

5. Chronic dose to 70 kg adult:

(0.011 mg PCB/day)/70kg = **0.16 µg PCB/kg body wt/day**
This is 3.2-fold greater than the Great Lakes Protocol *Health Protection Value*, and 8-fold greater that the ATSDR *MRL*.

A similar calculation (not shown) using the average PCB concentration of Smallmouth Bass skin-on fillets from this area (0.20 mg/kg) yields a chronic dose of 0.023 µg PCB/kg body wt/day, which is approximately equal to the ATSDR *MRL* for chronic exposure, and about half of the Great Lakes Protocol *Health Protection Value.*

Exposure to PCBs from skin contact with exposed PCB-contaminated sediment. This exposure scenario assumes that visitors to Lincoln Park use their hands to touch exposed sediments that contain PCBs. The visitors later eat food or put fingers in their mouths without first washing hands.

1. Worst case from daily exposure to highest concentrations in shallow sediments (unlikely due to site-specific conditions):
    a. 460 mg PCB/kg soil x 100 mg incidental ingestion soil/day = **46 µg (46,000 ng) ingested PCB/day**
    b. **Adult dose =** 46 µg ingested PCB/day/70kg body weight **= 0.66 µg/kg body wt/day**
    c. **Child dose** = 460 mg PCB/kg soil x 200 mg incidental ingestion soil/day/10kg body weight = **9.2 µg/kg body wt/day**

    This worst-case daily exposure scenario is 13.2-fold greater than the Great Lakes Protocol *Health Protection Value*, and 33-fold greater than the ATSDR chronic *MRL*. Because children weigh less and potentially eat more soil, the worst-case scenario is has a caluculated exposure that is 184-fold greater than the Great Lakes Protocol *Health Protection Value*, and 460-fold greater than the ATSDR chronic *MRL*.

2. Exposure to the locally typical concentration range of 2.3 to 100 mg/kg PCB in shallow (surficial) sediment (Steurer *et al.* 1999), at a predicted typical exposure frequency. The exposure frequency used in this scenario is 3 visits per week, 5 months per year, which is equivalent to 0.164 visits per day:

    a. (2.3 to 100 mg PCB/kg soil) x 100 mg incidental ingestion soil/day = **0.23 to 10 µg (230 to 10,000 ng) ingested PCB/day**
    b. **Chronic adult dose =** 0.23 to 10 µg ingested PCB/day/70kg body weight x (0.164) = **0.0005 to 0.024 µg/kg body wt/day**

    Under the 60 visit/year exposure scenario, the chronic dose range is 0.01 to 0.48-fold that of the Great Lakes Protocol *Health Protection Value*, and 0.025 to 1.2-fold that of the ATSDR chronic *MRL*.

Exposure to PCBs in air near the Estabrook Impoundment. The concentration of PCBs in air has been measured near Lincoln Park atop Parkway School, Glendale (Grande 2004), elsewhere in Milwaukee, and in air during the removal and staging of PCB-contaminated sediments from the Fox River. The measurements were used to estimate several scenarios that expose Lincoln Park visitors and area residents to PCBs released to air from exposed, contaminated sediment:

1. **"Realistic" daily exposure for area resident**
   0.19 ng PCB/m^3 air x 21 m^3 air/24hr = **3.99 ng PCB inhaled per day.**
   This estimate is calculated from average PCB concentrations in air measured from Dec. 2002 to Dec. 2003 at Parkway School, Glendale (Grande 2004), and assumes a 24-hour exposure at varying activity levels (Derelanko & Hollinger 2002).

2. **"Realistic" average exposure for impoundment visitor**
   0.19ng PCB/m^3 air x 2hr x 3.2 m^3 air/hr = **1.2 ng PCB inhaled per visit.**
   This estimate is calculated from average PCB concentrations in air measured from Dec. 2002 to Dec. 2003 at Parkway School, Glendale (Grande 2004), and assumes a two hour visit at a moderate activity level.

3. **Theoretical maximum exposure for impoundment visitor.**
   10ng PCB/m^3 air x 1hr x 4.5 m^3 air/hr = **45 ng PCB inhaled per visit.**
   This calculated estimate assumes a one-hour visit at a high activity level, and that PCBs in air that are 50-fold higher than *average* concentrations and 11-fold higher than the *maximum* concentration measured at Parkway School (Grande 2004).

4. **Theoretical worst case in concentrated PCB environment.** 100ng PCB/m^3 air x 4hr x 4.5 m^3 air/hr = **1800 ng PCB inhaled per visit.**
   This estimate is calculated from highest PCB concentrations in air measured near staged sediment during the Fox River cleanup (D. Grande, WDNR, personal communication).

5. **Chronic dose to 70 kg adult at realistic daily exposure:**

   (3.99 ng per day PCB/day)/70kg represents a chronic exposure of = **5.7×10^{-5} μg PCB/kg body wt/day** (or 0.057 ng PCB/kg body wt/day)
   This is over 877-fold *less* than Great Lakes Protocol *Health Protection Value*, and 350-fold *less* than the ATSDR chronic *MRL* .

Summary of calculated exposure scenarios and discussion of uncertainty. The various exposure calculations indicate that, consistent with accepted knowledge of the bioaccumulative effects of PCBs, the most important exposures (on the order of 11,000 ng PCBs per day) would be from eating fish. Exposures to a frequent park visitor having regular contact with exposed sediment would be on the order of 230 to 10,000 ng per day. Inhalation exposures would be on the order of 1 to 45 ng per day. As with any estimate of environmental exposure, it is impossible to accurately predict exposure to an individual within the population due to variation in individual behavior, frequency of exposure, and variation of the concentration of contaminants in the

environment. A range of estimates, including unlikely "worst case" calculations, are included within each exposure scenario in order to provide a range of possible exposures.

Toxicology of PCBs (from ATSDR 2009). The polychlorinated biphenyls are a group of structurally related molecules that are chemically stable, highly soluble in oil, and are insoluble in water. PCBs last for decades in the environment, tend to accumulate in body fats, and accumulate in the food chain. In the environment, PCBs are found mostly adsorbed to sediments and soil rather than in water. PCBs have various effects on the body that are related to physiological development, regulation of the cell cycle, and tumorogenesis. Several population-level studies have linked prenatal and perinatal exposure to PCBs to lower birth weights and learning problems (Guo *et al.* 1999; and reviewed in ATSDR 2000). Some forms of PCBs are suspected human carcinogens. Due to the widespread dispersion and chemical stability of PCBs in the environment, some exposure (mostly through food) is unavoidable.

Impairment of the aquatic habitat. Earlier work (WDNR 2005: see figure 5b) noted that the concentration of PCBs in sediments throughout the western oxbow of Lincoln Park exceed the threshold of impairment of the aquatic habitat (WDNR 2003). That finding does not contradict the conclusions of this report. Aquatic organisms that are continuously exposed to a pollutant throughout their life cycle typically are affected by lower concentrations than people having infrequent contact.

Community Outreach. DPH conducted community outreach related to the Lincoln Creek remediation, in collaboration with a team of agencies planning the remediation project. These included the Wisconsin Department of Natural Resources (WDNR), the U.S. Environmental Protection Agency (EPA), the Milwaukee County Parks Department, the City of Milwaukee Health Department, the North Shore Health Department and University of Wisconsin-Extension. During June-August 2010, DPH guided the outreach and education effort using Health Impact Assessment (HIA) principles to facilitate community engagement activities. A summary of the project activities within the context of the HIA framework is described in Appendix II.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to food, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

Studies of health effects of PCBs in populations have examined children of mothers who were

exposed to PCBs. When these women get pregnant, the PCBs are released into their blood and may reach and enter the developing baby. This exposure may cause children to have slightly lower birth weights and to have slightly delayed learning milestones (Patindin *et al.* 1997; 1998, ATSDR 2000, ATSDR 2006). When children eat fish themselves, they are also exposed to PCBs. However, the greater goal of removing PCBs from the environment is to prevent lifetime accumulations that begin in childhood and extend into adult life. Eating contaminated fish is considered to be the most important exposure pathway for the child development-related health effects of PCBs. Direct contact with PCB-contaminated sediments in the Estabrook impoundment, while constituting a much lower level of exposure, is another route of exposure to these chemicals. Public education directed at parents, along with posted warnings, should be used to help prevent exposure.

Conclusions

- DPH concludes that consistent with the existing fish advisory, eating fish from Lincoln Creek and the Estabrook Impoundment are the most important routes of exposure to polychlorinated biphenyls (PCBs) found in these waterways. A long-term diet of these fish could harm people's health.

- DPH concludes that under typical conditions, eating small amounts of PCBs from hands that are dirty with sediments from Lincoln Creek or the Estabrook Impoundment is not expected to result in illness over the short term. The levels of PCBs allowed in sediment and soil is kept low in order to help prevent exposure over one's lifetime, and to keep PCBs out of waterways and fish. "Worst-case" exposures to PCBs in exposed sediments over a year or more are unlikely, but justify the need for measures to prevent chronic exposure to the public.

- DPH concludes that exposure to PCBs in the air around Lincoln Creek is not expected to harm people's health. The amount of PCBs that we might inhale from air near contaminated sediment in Lincoln Creek is small compared to accidentally eating small amounts of creek sediment from dirty hands, or from eating fish from the creek.

Recommendations

The most important ways to avoid exposure to PCBs from Lincoln Creek are:

- By following the existing fish consumption advisory designated for the Milwaukee River from Grafton to Estabrook Falls.
- By washing hands with soap after touching exposed sediment

Public Health Action Plan

- Support effort to remove PCBs from the impoundment. DHS supports the present and ongoing effort by WDNR and U.S. EPA to remove PCBs from the Milwaukee River and

its tributaries, with the goal of removing the fish consumption advisory from these waters.

- Advisory signs. DHS has collaborated with WDNR, the City of Milwaukee Health Department, and the Milwaukee County Parks Department to prepare and post signs detailing the fish consumption advisory (see Appendix I). The signs are posted at various locations along the waterway in Lincoln Park and along the Milwaukee River down to Estabrook Falls. DHS will assist in replacing and/or revising the signs as needed.

- Community Outreach. DPH and their local, state, and federal partners participated in past and ongoing community outreach work related to the Lincoln Park remediation. Work to date has included public availability sessions, information pamphlets, and a series of discussion groups patterned on the Health Impact Assessment (HIA) model. Ongoing work with our partners will include a written report summarizing the HIA discussions, and an information kiosk at the remediation site.

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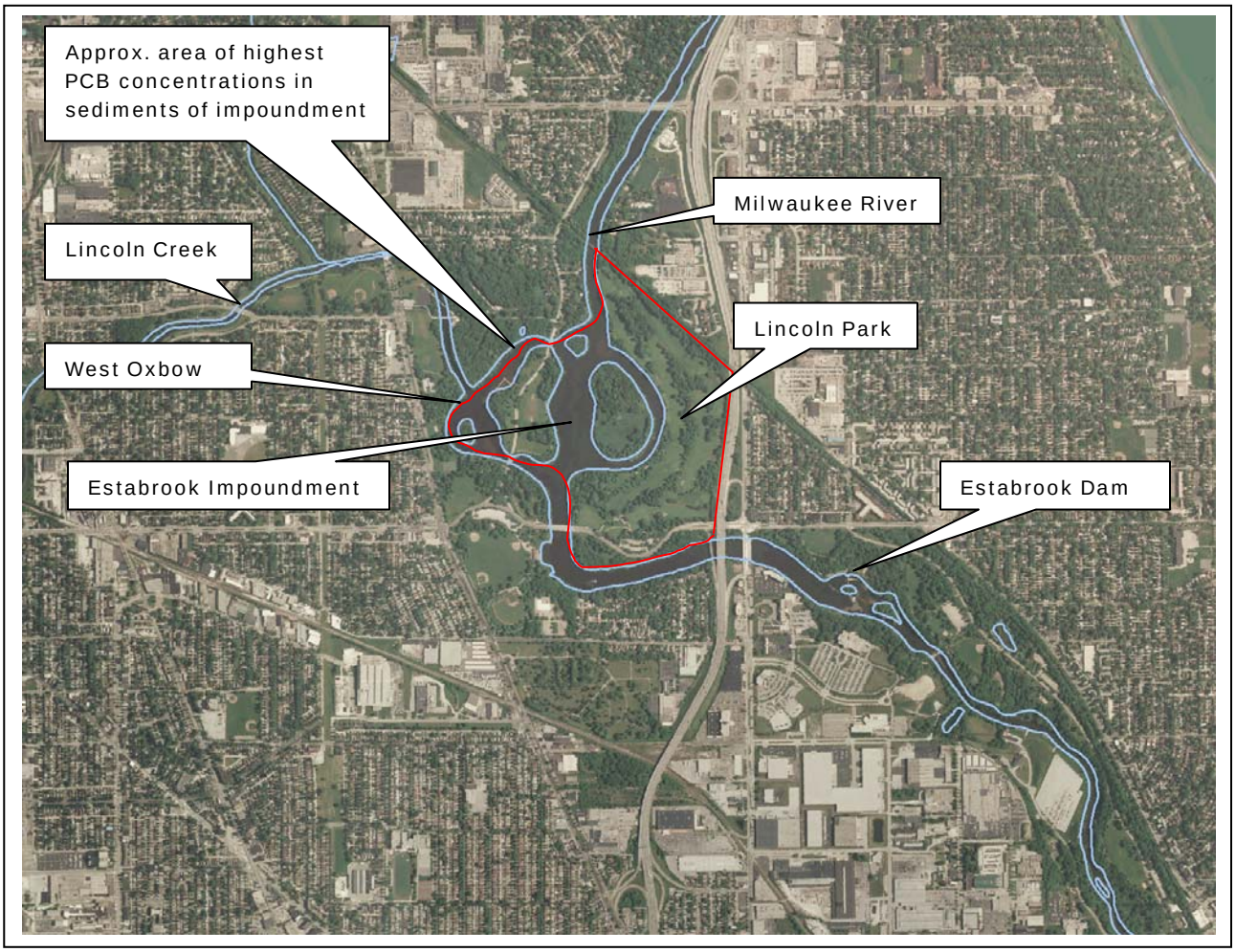
Figures

Figure 1. Map of Lincoln Park and surrounding area. City of Glendale, Milwaukee County, Wisconsin. **Prepared using WI DNR GIS Webview, *http://www.dnr.state.wi.us/maps/gis/appwebview.html***



Appendix I. *WDNR fact sheet on Lincoln Creek, prepared with the cooperation of DHS and the City of Milwaukee Health Department.*

Estabrook Impoundment/Lincoln Park Contaminated Sediment Questions and Answers

Sediments that have been deposited within the Estabrook Impoundment, specifically the western oxbow area at Lincoln Park are contaminated with PCBs. This fact sheet answers some of the most frequently asked questions about these sediments.

What are PCBs?

PCBs are polychlorinated biphenyls, a group of over 100 related molecules that are soluble in oil and insoluble in water. These compounds were manufactured in the United States until 1977, when they were banned from use. These chemicals are very persistent in the environment and tend to accumulate in the body fats of fish, humans and other animals. PCBs in the environment tend to be found in soil and sediment rather than in the water column. Documented health effects related to high exposure to PCBs include low birth weights and developmental delays in young children. The US EPA classifies some types of PCBs as probable human carcinogens.

How contaminated is the area?

The area is contaminated.with PCBs and other pollutants common in urban areas. The highest concentrations of PCBs have been found in the western oxbow of Lincoln Park.
Over 100,000 cubic yards of sediment are located in the Milwaukee River upstream from the Estabrook Park Dam. Studies have shown PCB concentrations ranging from less than 1.0 parts per million (ppm) to 870 ppm. The sediments with the highest concentrations are buried under sediments with lower concentrations. Sediments with concentrations greater than 50 ppm are regulated by the Toxic Substances Control Act.

How does this compare to other areas?

The western oxbow in Lincoln Park is more contaminated than other areas within the Milwaukee River. The PCB sediments in the Milwaukee River in Lincoln Park areas Northwest of Hampton Avenue contain the highest concentrations of PCBs in the Milwaukee River. .

What is the source of contamination?

PCBs were used as lubricants in the manufacturing of various products from 1930 to 1977. There is no identified source which caused the contamination for this sediment. The mixture of PCBs found in this area is different from those found in other areas of the Milwaukee River. There is no identified ongoing source. The PCB contamination is believed to have come from Lincoln Creek, which had a long industrial history.

Is there a problem with coming in contact with the sediments?

It is best not to have contact with the sediment. This means staying out of the river and riverbed. Signs are posted throughout the Park to recommend users to not come in contact with the

sediments. Touching the sediments will not make you sick, but ingestion of PCB contaminated sediment from dirty hands should be avoided.

People can be exposed to PCBs by swimming, wading or playing in the river or river bed. When water levels are low, it is easier to walk and play on the river bed. Parents are asked to keep children and pets from playing near the river edge and to keep out of the river bed and exposed areas when water is low. If river soils are touched, wash hands with soap and water, especially before eating and when returning home take a good soap shower or bath. Follow guidance posted on the signs.

Will someone get sick by coming in contact with PCB contaminated sediments?

Exposure to PCBs from direct contact or from airborne particles at the levels found in the impoundment is not expected to result in illness over the short term. However, PCBs can accumulate in the body over time to the point where they can cause harm. This is especially true if we eat fish from PCB-contaminated waterways. Therefore, it is important to minimize our exposure by removing PCBs from the environment.

Figure 1. Signs like this are found near contaminated areas in Lincoln and Estabrook Parks

What is being done to solve the problem?

The area in front of the Blatz Pavilion was cleaned up (remediated) in 2008. The Wisconsin Department of Natural Resources, US EPA and Milwaukee County are working together to plan a clean up of the contaminated sediments in Lincoln Park. A feasibility study is underway, and the state is in the process of applying for Great Lakes Legacy Act funding for managing the sediment.

Can I eat fish caught in the area?

It is best to follow the fish consumption advisory for the area. See PCB advisory information below. Pregnant women and small children should avoid eating fish contaminated with PCBs. Carp in the Milwaukee River in this area, including Lincoln Creek, contain high levels of PCBs and should not be eaten, at any size. Other fish can be eaten in limited amounts. See the

Wisconsin fish advisory booklet for safe fish to eat. They are listed in the section for the Milwaukee River from the City of Grafton downstream to Estabrook Falls.

Waterbody/Species	Unrestricted	Eat no more than 1 meal a week or 52 meals/year	Eat no more than 1 meal a month or 12 meals/year	Eat no more than 1 meal every 2 months or 6 meals/year	Do Not Eat
Milwaukee River from the city of Grafton downstream to Estabrook Falls					
Black Crappie		*All sizes*			
Carp					*All sizes*
Largemouth Bass			*All sizes*		
Northern Pike				*All sizes*	
Redhorse			*All sizes*		
Rock Bass		*All sizes*			
Smallmouth Bass			*All sizes*		
Trout and Salmon	*Follow the Lake Michigan PCB advisory*				

Figure 2. Fish consumption advice

Is it better to have the contaminated sediment submerged under water or above water?

When water covers the sediment there is less potential for humans to directly contact the sediment However, when the sediment is underwater, contaminants are more available to fish and other aquatic life and have a greater ability to be flushed from the impoundment area to downstream locations. The impoundment is a significant ongoing source of PCBs in the Milwaukee River system. If the sediment is exposed, erosion control measures such as vegetating the area keep the sediment in place. There are grass and other plants growing on the exposed sediment now (see below). This helps to limit dust blowing off the riverbed and reduces the possibility for erosion.

Figure 3. West Oxbow in May 2009

Figure 4. West Oxbow in August 2009

Where did the information about PCB exposure risk come from?

Department of Natural Resources (DNR) and the Wisconsin Department of Health Services (DHS) staff have been working together on this issue. DNR air quality staff and DHS health experts reviewed data and research from Lincoln Park and elsewhere in Wisconsin. They concluded that inhalation exposure of PCBs from exposed sediments in the Lincoln Park area is not significant compared to exposure from fish consumption or direct contact with exposed sediment. The calculations used to derive the risk exposure statement are available by contacting Marsha Burzynski at DNR (contact information below).

The amount of PCB that a person might inhale from air near contaminated sediment in Lincoln Park is small compared to eating fish from the river or from accidentally ingesting small amounts of sediment from dirty hands. The most important way to avoid exposure to PCBs is by following fish consumption advice for waters in this area. Park and river users should also avoid touching or walking on exposed sediment. If users do touch exposed sediment, they should wash, especially before eating.

For further information please contact

Health Effects:
City of Milwaukee Health Department (414) 286-3616,
North Shore Health Department (414) 371-2980 or
Wisconsin Department of Health and Family Services at (608) 266-1120.

Sediment Contamination and Clean-Up - Marsha Burzynski, Dept of Natural Resources (414) 263-8708 (marsha.burzynski@wi.gov)

More information about PCBs can be found at http://dhfs.wi.gov/eh/HlthHaz/fs/PCBlink.HTM
Milwaukee River PCB mass balance report http://wi.water.usgs.gov/pubs/WRIR-99-4100/
Fish consumption advisory http://www.dnr.state.wi.us/org/water/fhp/fish/pages/consumption/index.shtml
EPA PCB home page http://www.epa.gov/opptintr/pcb/

Appendix II. Health Impact Assessment Pilot Project Summary for Milwaukee Estuary – Lincoln Park Area of Concern

Prepared by Paula Tran Inzeo, MPH and Erin Mader, MPH

Beginning in 2009, the Wisconsin Bureau of Environmental and Occupational Health (BEOH) became involved in the Lincoln Park and Milwaukee River Channels Area of Concern (AOC) Sediment Remediation Project – Phase II. High levels of polychlorinated biphenyls (PCBs) were identified in waterways in this area, and the remediation project, funded by the Great Lakes Legacy Act, aims to remove these contaminants. A team of agencies are planning the remediation project activities, including the Wisconsin Department of Natural Resources (WDNR), the Environmental Protection Agency (EPA), the Milwaukee County Parks Department, the Milwaukee Public Health Department, the North Shore Health Department and UW-Extension. BEOH joined this team to guide the outreach and education using Health Impact Assessment (HIA) principles to facilitate community engagement activities. Partnership development across sectors - facilitating collaboration among the EPA, DNR, and local agencies - was critical to effectively conducting these activities. Below is a summary of the project activities within the context of the HIA framework.

Health Impact Assessment (HIA) Process for the Milwaukee AOC Project

Step 1. Screening: Determine whether or not a HIA is warranted

The Milwaukee AOC project was screened by BEOH and project partners during the Spring of 2010. Local citizens expressed a desire to be better informed about the details of the project and some have been vocal about their concerns on aspects of the remediation plan. An issue of particular contention was the status of the Estabrook Dam, which forms the impoundment at the confluence of Lincoln Creek and the Milwaukee River, and which is currently in disrepair. Milwaukee County is in the process of deciding whether to repair or to remove the dam. To provide technical assistance to project partners and the community on the remediation project, BEOH used an evidence-based approach - the HIA framework - to engage citizens, to collect their concerns, and to help democratize decisions associated with the remediation of the area, particularly decisions pertaining to public health.

To screen the project, BEOH and project partners consulted background information to create an environmental and human health profile of the community. Resources that were consulted include the EPA website, the WDNR website, the Agency for Toxic Substances and Disease Registry's (ATSDR) Baseline Report of the Milwaukee 30th Street Corridor, and information about recently completed Lincoln Park Sediment Remediation Phase I. In addition, the project partners held a Community Availability Session (open house) in November 2009. Partnering agency representatives were available to answer community questions about the project.

Through this screening process, it was determined that the project is linked to health in multiple ways. Two intervention points were identified:

1. Community recommendations for remediation plan (logistics and final outcome/design)
2. Community recommendations for public health communication improvement and other PCB exposure reduction methods (e.g. fish advisories)

The partners determined that an HIA would be useful as a guide for

1. *Systematically gathering more community input* to understand perceived health impacts of the remediation and to identify features the community would like to see incorporated in the remediation process and resulting changes to the area
2. *Collecting and reviewing resources, including scientific and grey literature,* to provide further context for the impacts of remediation projects on health determinants and health

HIA was used to provide partnering agencies a framework for engaging the Lincoln Park community, though the term 'HIA' was not explicitly used in the dialogue with community members. The ATSDR Action Model was mentioned as a guide in the first community meeting, though just briefly explained. Technical terminology about these frameworks was avoided intentionally, as the remediation project in itself entailed numerous technical steps and scientific language that needed to be translated to establish a broad, clear community understanding. The purpose of conducting the HIA was to design better communication of technical details about the clean-up project to a lay audience while also soliciting their insight and identify ways to incorporate community input into the process and final project outcome. Therefore, the decision was made to avoid the term 'HIA' and instead focus on the principles of community engagement and use the HIA steps as a guiding process to gather community feedback.

BEOH provided technical assistance in this step by

- Compiling materials for community outreach and education
- Providing leadership and convening the project team in-person and by teleconference to explain HIA and establish a common understanding of the goals of the process
- Meeting with university researchers to gain insight into the community through learning about their work on relevant public health studies of the area
- Brainstorming potential HIA key stakeholders and activities

Step 2. Scoping: Determine which health impacts to evaluate and the methods for analysis

In the Scoping Phase, the following activities were conducted to determine which impacts to evaluate and methods for analysis

1. Planning meetings were held with project partners, including a dry-run of the community input meeting (focus group style table discussions)
2. A Community Input Meeting was held on June 16, 2010 to solicit community thoughts, ideas, and concerns

BEOH provided technical assistance in this step by

- Planning format and logistics for the Community Input Meeting
- Creating materials for the meeting including educational flyers, advertisements for the meeting
- Managing RSVPs for the meeting and responding to community questions
- Preparing table facilitator scripts and ground rules
- Facilitating the meeting and guiding discussion, including facilitating one table discussion
- Recording participant thoughts, ideas, and concerns, summarizing and reporting back these concerns during the meeting to let the community know their input was captured and ask if any points were missed or misinterpreted
- Providing refreshments and handouts for meeting attendees

Step 3. Assessing Risks and Benefits: Assess impacts using existing data and qualitative and quantitative research methods to determine the magnitude and direction of potential health impacts

The Assessment Phase involved the following steps:

1. Compiling data/community input collected at the first meeting
2. Conducting qualitative analysis to identify themes
3. Identifying answers to community questions and ways to shape the remediation process through incorporation of feedback
4. Identifying resources for concerns and ideas outside the scope of the Great Lakes Legacy Act project

BEOH provided technical assistance in this step by

- Preparing, collecting, and compiling meeting evaluations from June 16,2010
- Performing qualitative analysis on the community comments collected during the Scoping Phase
- Summarizing key themes and questions in a summary table
- Facilitating each agency's response to each community-identified issue or idea
- Identifying resources for issues outside the scope of the project
- Planning for the reporting of this information back to the community on July 28, 2010

Step 4. Reporting: Synthesis of Results and Recommendations

Two goals were identified for the reporting phase:

1. To provide recommendations/ mitigations for remediation project and resulting changes to the area to maximize potential positive health impacts and minimize potential negative health impacts
2. To document process and lessons learned (See page 6 for summary of lessons learned and challenges)

Three methods of reporting were established.

1. A *Community Input Summary Table* was created which outlined all of the comments from the community at the June 16, 2010, meeting, as well as written comments received by project partners after the meeting. This table included detailed responses from the project partners to each community question, concern, or idea. For issues outside of the scope of the remediation project, resources and contacts were provided.
2. A *meeting was held on July 28, 2010* to report back to the community about a) what they heard at the June 16,2010 meeting b) respond to questions and concerns using the *Community Input Summary Table* as a guide and c) to provide additional resources and avenues for input for issues outside of the scope of the project. Project partners presented information on key areas including sediment, health, habitat, and recreation. Experts and project team members were available to answer questions during a panel discussion.
3. A *Health Impact Assessment Report* will be created, containing the information gathered throughout the process, documentation of lessons learned, and implications/next steps based on the HIA process.

BEOH provided technical assistance in this step by

- BEOH created a site-specific page linked to the State website that includes project information, resources, and public health recommendations: http://www.dhs.wisconsin.gov/eh/WISites/LincolnPark/index.htm
- Drafting the *Community Input Summary Table* and updating it with partner feedback
- Compiling and facilitating review of the presentations for the July 28, 2010 meeting
- Planning meeting logistics and materials

- Facilitating and presenting at the July 28, 2010 meeting (BEOH was responsible for addressing the health-related comments and questions from the June 16, 2010 Community Input Meeting)
- Transcribing community comments and questions at the meeting
- Preparing, collecting, and compiling meeting evaluations

Recommendations & Mitigation Strategies Based on Community Input

Below are potential recommendations for the Lincoln Park Sediment Remediation Project.
Note: These recommendations were derived through thematic review of notes from community input sessions. Prior to formalizing recommendations, the community should be consulted to review and confirm that the recommendations reflect community desires.

Overarching Recommendation

Overall, the community expressed that communication strategies need to be strengthened – project partners need to establish clear channels of communication through which community members can express their concerns and be updated on project details. Many misconceptions about the project goals, logistics, and related health risks emerged during community meetings and through public comments. Many of these concerns could have been mitigated had community members been made aware of existing communication venues to ask questions and share concerns.

Health Recommendations

1. Improve outreach plans to target those most at risk of PCB exposure in Lincoln Park.
    a. Identify who is consuming fish from the park and tailor messages.
    b. Provide better outreach to mitigate PCB exposure *before* and *during* the remediation.
    c. Improve signage, for example, through making larger fish signs and making signs more culturally relevant to park users.
2. Provide outreach information about pet exposure.
3. Provide outreach and education for parents and children and consider using the schools as a venue for outreach.
4. Consider mass mailings as a way to communicate information about the clean-up project and related health risks.
5. Provide more information about the health risks of PCB exposure (i.e. associated health outcomes).
6. Consider water quality concerns related to outside events, such as heavy rains and other sources of pollutants (e.g. agricultural run-off).

Sediment Recommendations

1. Better communicate details of project logistics to the public. Information requested includes:
    a. Project timeline
    b. Where sediments will be disposed
    c. Status of PCB contamination in sediments during and after remediation
    d. How the area will be de-watered
    e. How the sediment remediation will work in tandem with the Estabrook Dam project
    f. Identify truck routes and ensure they will not damage roadways
2. Expedite the clean-up process as much as possible.
3. Monitor PCB movement downstream.

4. Monitor and enforce safety processes during remediation.
5. Create a deeper channel for recreational purposes (e.g. paddling, fishing).
6. Limit erosion.
7. Minimize use of riprap.
8. Protect existing properties, roads, and infrastructure.
9. Remove broken cement.

Habitat Recommendations

1. Increase fish species and shallow pools for fish raising young.
2. Create deep pools or wetlands to manage flood waters.
3. Limit stagnant water, weeds, and mosquitoes and potential related health risks.
4. Protect habitats for bald eagles and herons.
5. Make the island a wildlife refuge.
6. Create a buffer between the golf course and the park.
7. Remove invasive species and plant a diverse range of native species.
8. Limit clear cutting and protect existing trees.
9. Consider the entire watershed in the design and logistics of clean-up.

Recreation Recommendations

1. Provide recreational opportunities for children after the project.
2. Create a beach for park users.
3. Create deeper water channels to facilitate paddling.
4. Provide dams or levies during remediation to allow recreation.
5. Move the pier to a better location and improve fishing opportunities.
6. Provide boat rentals and a canoe/kayak launch.
7. Consider creating new trails.
8. Enhance bird watching opportunities.
9. Improve tourism opportunities.
10. Increase use of the river.

Step 5. Monitoring: Includes evaluation, describes how he process and findings of the HIA affects the decision and ultimate health policy outcomes

Goals of monitoring and evaluation include

1. Showing the community that their voices have been heard
2. Providing ways for the community to proactively hold the group accountable
3. Specifying community-identified success indicators

Current monitoring and evaluation plans that have been developed to accomplish these goals will involve

1. Future outreach
    a. Community meetings
    b. Website updates
    c. Email communication
    d. Dissemination of other relevant project information, such as changes to timelines and updates on remediation progress

    e. A kiosk will be designed and placed in the park to display project and health-related information
2. A health communication plan will be developed based on community input from the June and July meetings

These monitoring and evaluation components were developed based on the community feedback received at both June and July meetings. The community provided ideas for populations to target with public health communications and ways to tailor messaging to make it more effective.

Lessons Learned

1. It is important to define roles and responsibilities of partners early in the HIA process.
    a. Appointing meeting facilitators and other leadership roles can streamline communication processes and planning.
    b. Defining expectations among partners can ensure that objectives are met.
2. The Screening and Scoping Phases should be allotted adequate time to clearly identify the scope of the potential HIA and available resources, as well as to clarify the intended audience and intervention points. Doing so will more effectively shape the HIA activities and timeline.
3. Timelines need to be realistic, flexible, and revisited at each step of the process.
4. When projects become technical, it is valuable to have an outreach liaison to ensure messages are understandable and relevant to the community.

Challenges

1. Balancing a strong local control voice and technical support from the State
    a. To remain true to HIA principles, it was essential to ensure the community drives the process. This can be challenging when funding streams dictate project partners, activities, and timelines.
2. It is difficult to plan outreach and communication strategies in response to community needs when operating under the confines of various agency public relations restrictions.

Please contact DHSEnvHealth@wi.gov for any of the following materials and resources.

1. Agendas
2. Minutes/ notes
3. Fliers
4. Evaluation forms
5. Presentations from June and July meetings
6. Table
7. Sign in sheet

CERTIFICATION

This Health Consultation for an Evaluation of the Health Concerns Associated with the Kenosha County Outdoor Wood Boiler Investigation was prepared by the Wisconsin Department of Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved methodology and procedures existing at the time the Health Consultation was begun. Editorial review was completed by the Cooperative Agreement partner.

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

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