3/5/01

Total Maximum Daily Load

PCB and Chlordane

Shenango River

Shenango Lake Dam to Mouth

Mercer and Lawrence Counties

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Introduction

Pennsylvania has conducted monitoring of fish tissue contaminants since 1976. Early efforts were comprised of special studies in major waterbodies as well as smaller waters with suspected sources of contaminants. Routine sampling for tissue contaminants began in 1979 with implementation of the EPA "CORE" monitoring network that mandated collection of whole fish samples. Because Pennsylvania wanted the fish tissue monitoring program to focus on protection of public health, Pennsylvania began sampling both the edible portion and whole body at one-half of the stations. In 1987, Pennsylvania began sampling the edible portion almost exclusively. In order to increase spatial coverage, the Department also began rotating sampling through its routine ambient monitoring network and provided both Department of Environmental Protection (DEP) and Fish and Boat Commission field biologists the opportunity to sample suspected problem areas.

Generations of Pennsylvania's anglers have enjoyed fishing. It's a wholesome outdoor sport for the entire family. What's more, eating fish on a regular basis can improve your overall health. Unfortunately, sometimes fish contain small amounts of chemicals. While these fish are safe to catch and handle, the chemicals can be passed on to the person eating the fish. So in Pennsylvania, we have a system that lets people know how to enjoy the health benefits of eating fish, while also reducing unwanted and potentially harmful chemicals. State agencies do this by issuing fish consumption advisories**.**

Fish have become a popular meal among people concerned with limiting their sodium, cholesterol and fat intake. Fish provide a good source of easily digested, high quality protein, as well as many vitamins and minerals. Doctors recommend fish as part of a heart-healthy diet.

Chemicals are part of our everyday lives. While we benefit from the use of chemicals, there are a few that have been shown to have an adverse effect on our health. It's been illegal to manufacture some of these chemicals, such as PCBs, for more than 20 years. However, they are extremely persistent and can still be found in small amounts in the environment. You are likely to have some of these chemicals in your body right now. These chemicals can enter the food chain and over time, build up in the food we eat. The accumulated chemicals are then passed on to us.

Fish must eat many small aquatic insects, crayfish or small fish to survive and grow. They may also be exposed to chemicals in the water and in solids. Each food item they eat may contain a trace of the chemical from the environment. The more a fish eats, the more chemicals may build up in it over time. The same is true with humans.

For most people, there's little health risk from eating fish. Fish with chemicals in them are safe to fish for, safe to catch, safe to handle and, for the most part, safe to eat. However, the risk is not the same for all of us. Some groups of people can be more susceptible to the chemicals that can build up in fish over time. To help anglers and others who eat fish caught in Pennsylvania waters understand who might be at risk and what they can do to minimize exposure, the Pennsylvania Department of Health, the Pennsylvania Department of Environmental Protection and the Pennsylvania Fish and Boat Commission, issue fish consumption advisories in certain situations. The advisories include recommendations to help those eating fish make responsible choices how many fish to eat and how to space meals of fish.

Advisories are geared toward pregnant women, children and women of childbearing age. Women beyond childbearing years and men face few health risks from chemicals in fish, but they may also

wish to follow the recommendations. Advisories sometimes suggest spacing meals of fish out to lessen the chance that you'll build up chemicals in your body to harmful levels. Even when the recommendation is to space meals out, that doesn't mean you still can't enjoy eating fresh fish. Additional information on fish consumption advisories can be found in the current *Summary of Fishing Regulations* given to every fishing license buyer and on the Internet at http://www.fish.state.pa.us.

A number of Pennsylvania water bodies were listed on the Clean Water Act Section 303(d) List of Impaired Waters for 1996 because fish consumption advisories have been issued for these water bodies. They were listed because long-term, unrestricted consumption of these fish could potentially lead to human health problems. This document addresses contamination of fish tissue in the Shenango River, Mercer and Lawrence Counties, by PCBs and chlordane.

Background

This Total Maximum Daily Load (TMDL) applies to the main stem of the Shenango River (Stream Code 35482) from Shenango Lake Dam to Mouth. This segment was included on the 1996 Section 303(d) list in State Water Plan Watershed 20-A as a low priority. It was also included on the 1998-303(d) list in State Water Plan Watershed 20-A (Segment ID 9924) as a high priority for TMDL development.

303(d) Listings for the Shenango River					
Year	**SWP**	**Miles**	**Segment ID**	**DEP Stream Code**	**EPA 305(b) Cause Code**
1996	20A	33.2	9924	35482	PCB, Chlordane
1998	20A	32.91	9924	35482	Pesticides (Chlordane)
	20A	32.91	9924	35482	Priority Organics (PCB)

Although four tributaries to Shenango River were not listed specifically on the 1998-303(d) list, they are considered part of this TMDL document since they may have been contaminated with PCBs.

Stream Name	**Stream Code**	**River Mile Index**	**Drainage Area (mi ^{2})**
UNT	36340	65.8	0.8
UNT	35974	31.22	0.2
Pine Run	35951	27.96	2.48
UNT	35844	6.24	3.5

DEP issued the initial fish consumption advisory for the Shenango River (Stream Code 35482) in July 1979. At that time, anglers were warned not to eat "fish" downstream from the Clark Street Bridge in Sharon, including those from Pine Run (River Mile 27.96) due to PCBs levels in excess of 5.0 ppm. As a result of follow-up sampling, "Do Not Eat" advice was issued for carp at Sharon on August 9, 1988. The advisory segment was changed for the 1995 advisory to better protect public health. The segment was expanded to include the Shenango River from the Shenango Lake dam (River Mile 33.1) to the mouth (River Mile 0.0) as shown in Figure 1. The advisory remained the same until application of the Great Lakes protocol in 1998. The current advice includes "Do

Not Eat" (Group 5) for muskellunge and carp, and one meal per month (Group 3) for largemouth and smallmouth bass, walleye, bluegill, crappie, and all other sunfish.

Location Map

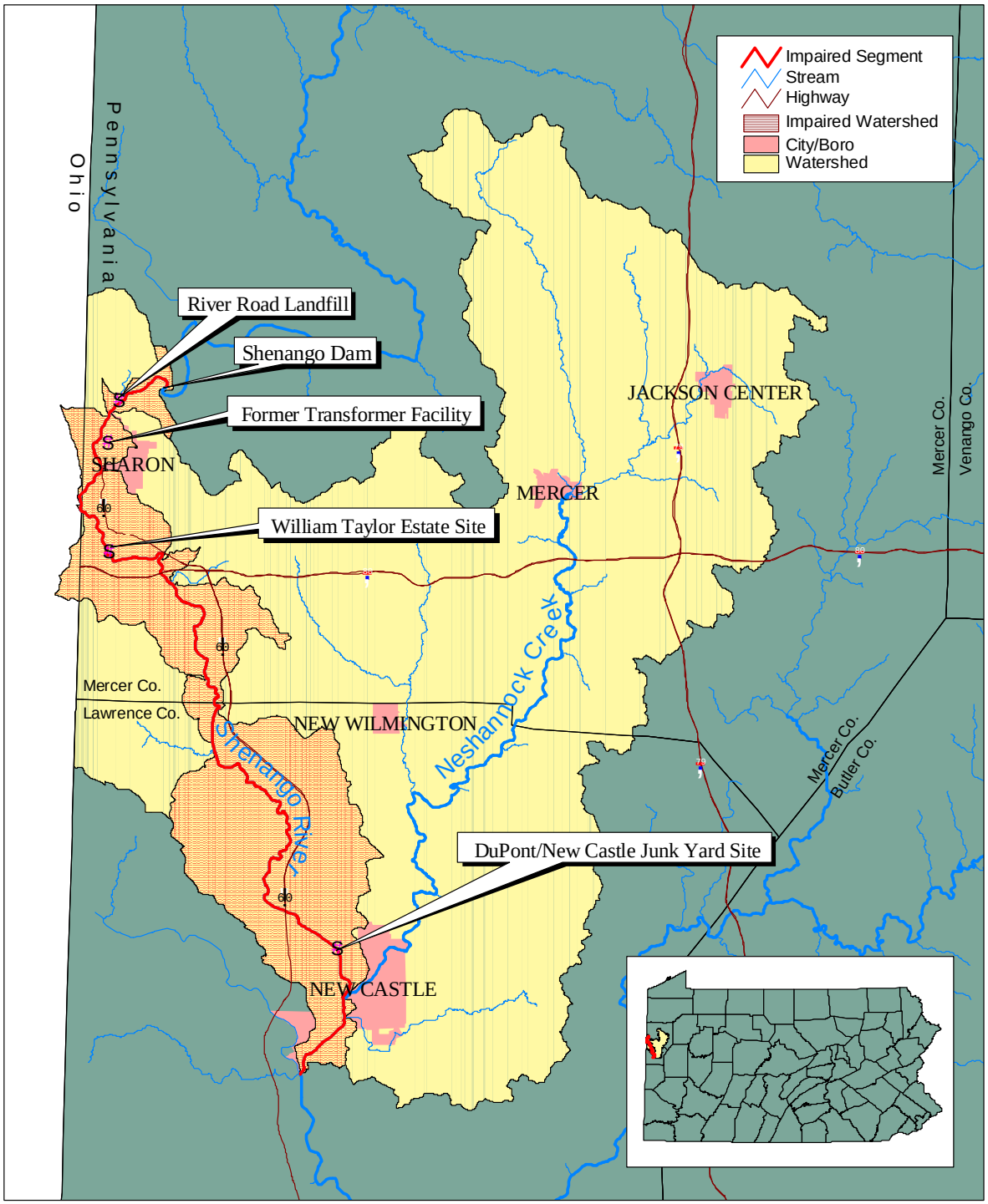

Figure 1 Shenango River (impaired area highlighted)

Driving Directions (from Philadelphia) to site:

- Former Westinghouse Facility

    1. **Take I-76 West to PA-60, exit number 1A towards New Castle/Pittsburgh**
    2. **Merge onto PA-60 North**
    3. **Take PA-60 North/US-422 West exit towards Sharon/Youngstown**
    4. **Take the PA-18 exit towards Sharon/Hermitage/West Middlesex**
    5. **Merge onto PA-18**
    6. **Turn Left onto PA-518**
    7. **Site on Sharpsville Avenue**

- River Road Landfill Site

    1. **Take I-76 West to PA-60, exit number 1A towards New Castle/Pittsburgh**
    2. **Merge onto PA-60 North**
    3. **Take PA-60 North/US-422 West exit towards Sharon/Youngstown**
    4. **PA-60 North becomes PA-3004**
    5. **PA-3004 becomes Broadway Ave.**
    6. **Broadway Ave. becomes Route 718**
    7. **Take 718 North to Route 846**
    8. **Travel for approximately 1 mile on Route 846. Site on right.**

- William Taylor Estate Site

    1. **Take I-76 West to PA-60, exit number 1A towards New Castle/Pittsburgh**
    2. **Merge onto PA-60 North**
    3. **Take PA-60 North/US-422 West exit towards Sharon/Youngstown**
    4. **PA-60 North becomes PA-3004**
    5. **PA-3004 becomes Broadway Ave.**
    6. **Broadway Ave. becomes Route 718**
    7. **Travel on Route 718 for approximately 0.5 mile to Church St.**
    8. **Turn left on Church St.**
    9. **Site located at end of Church St.**

- DuPont/New Castle Junk Yard Site

    1. **Take I-76 West to PA-60, exit number 1A towards New Castle/Pittsburgh**
    2. **Merge onto PA-60 North**
    3. **Tae the PA-108 exit, exit number 19 towards Mt. Jackson**
    4. **Turn Right onto PA-108**
    5. **Stay straight to go onto Liberty St.**
    6. **Liberty St. Becomes Atlantic Ave.**
    7. **Turn Right onto W. Washington St.**
    8. **Turn left onto US-422 BR.**
    9. **US-422 crosses Shenango River – site on right.**

- C.G. Wood Site

    1. **Take I-76 West to exit 19.**
    2. **Take I-283 North**
    3. **Merge onto I-83 North, I-83 North becomes I-81 South**
    4. **Take US-22 E/US-22 W exit, exit number 23**
    5. **Merge onto US-22 West**
    6. **Take the US-322 West exit, Merge unto US-322 W**
    7. **Stay straight to go onto PA-144.**
    8. **Turn Right onto PA-26**
    9. **Take the I-80 West/US 220 South ramp**
    10. **Merge onto I-80 West**
    11. **Take the US-19 exit, exit number 2 , towards Mercer**
    12. **Turn Right onto US-19**
    13. **Turn Left onto PA-58**
    14. **Turn Right onto US-322**
    15. **Take US-322 to Jamestown**
    16. **Take a Left on Chestnut Street**

TMDL Development

Endpoint Identification

The overall goal of a TMDL is to achieve the "fishable/swimmable" goal of the federal Clean Water Act. Because consumption advisories are in place for largemouth bass, smallmouth bass, walleye, bluegill, crappie and other sunfish, and muskellunge for PCBs, and carp for PCBs and chlordane, the “fishable” goal is not being met in this segment of the Shenango River.

The specific goal of a TMDL is to outline a plan to achieve water quality standards in the water body. For this segment of the Shenango River, the TMDL goal is for levels of PCBs and chlordane in the water column to be equal to or less than the Commonwealth's water quality criteria. Since the human health criteria for PCBs and chlordane is much smaller than the analytical detection limits for these parameters, the concentration of PCBs and chlordane in the water column will be estimated from the concentration of PCBs and chlordane in the fish tissue. The human health criterion for PCB, found in the "Water Quality Toxics Management Strategy - Statement of Policy" (Chapter 16 of the Department's rules and regulations) is 0.00004 ug/L.

The human health criterion for chlordane is 0.0005 ug/L. These compounds are probable human carcinogens, and the human health criteria were developed to protect against excess cancer risk. Specifically, the Department's water quality toxics management program controls carcinogens to an overall risk management level of one excess case of cancer in a population of 1 million (1×10^{-6}). Expressing this another way, the probability of an individual getting cancer is increased by a factor of 1 in 1 million.

Two means were employed in an effort to obtain readily available data on instream PCBs and chlordane levels for comparison to the criteria. First, the Department's Northwest Field Office searched for PCBs and chlordane data in or upstream from the Shenango River fish consumption advisory segment. Second, data from the EPA Storage and Retrieval System (STORET) was obtained. A STORET "Inventory" retrieval that includes data collected by all agencies was run for

an area with a five-mile radius around the Department's fish tissue sampling stations WQF35482-027.8 (Shenango River below Pine Run), WQF35482-015.5 (Shenango River at Pulaski), and WQN Stations #909 (Shenango River at New Castle) and #910 (Shenango River in Sharpsville). All samples results from the retrieval were less than detection except a May 15, 1979 sample from the Shenango River at Pulaski, which was 0.3 ug/l for PCB-1260. However, the data are not representative of current river conditions**.**

As a means to compare current conditions to the water quality criteria, an estimated water column concentration was calculated based on the fish tissue concentrations and bioconcentration factors. The calculation involves dividing the average fish tissue concentration by the bioconcentration factor to obtain a projected water column concentration.

The equation is:

$$\frac{TC}{BCF} = WC \times 1000, \text{ where}$$

TC = Tissue Concentration in mg/kg (equivalent to ppm)
BCF = EPA Bioconcentration Factor in L/kg
WC = Water Column Concentration (estimated) in mg/L
(Multiply by 1000 to convert from mg/L to ug/L)

The average PCBs level in carp from this segment of the Shenango River is 1.65 ppm; muskellunge 3.4 ppm; largemouth bass 0.814 ppm; smallmouth bass 0.725 ppm; walleye 0.318 ppm; bluegill 0.505 ppm; crappie 0.64 ppm; and sunfish 0.13 ppm. The average fish tissue concentration is used to calculate the water column concentration for PCBs. The average chlordane concentration in carp is 0.228 ppm.

The average fish tissue concentration is the mean of all samples as listed in the table below. The data is included as Appendix A. A Storet data retrieval of all the PCB and chlordane fish tissue data for all the fish tissue sampling stations on the Shenango River are included in Appendix B. The average concentration is used for two reasons. First, the fish tissue samples are composites. This means that the sample result represents the average tissue concentration in three to five individuals, and not an exact value. Second, use of an average value considers the natural variation in tissue burden found in wild fish populations. The PCBs bioconcentration factor (BCF) of 31,200 from the EPA criteria development document (EPA 440/5-80-068, October 1980) was used. The chlordane BCF of 14,100 from the EPA criteria development document (EA 440/5-80-027, October 1980) was also applied. These BCFs were used because no Bioaccumulation Factors (BAFs) are available for statewide use. The use of the BCFs is consistent with the provisions of the Department’s water quality toxics management strategy. Average PCB and chlordane tissue levels were determined for each species using all samples. An estimated water column concentration was then calculated for each compound for each species. These estimated water column concentrations were averaged for each compound in order to provide a single estimated water column concentration for each parameter for the segment.

Fish Tissue Data Used to calculate the TMDL for the Shenango River

Parameter	Fish Species	Number of Data Sets	Range of Years	Years
PCBs	Carp	23	1982 - 1995	1982, 1988, 1989, 1992, 1995
	Musky	1	1995	1995
	Largemouth	5	1988 - 1995	1988, 1992, 1995
	Smallmouth	7	1988 - 1995	1988, 1989, 1992, 1995
	Bluegill	2	1988 - 1995	1988, 1995
	Crappie	1	1992	1992
	Sunfish	3	1979	1979
Chlordane	Carp	23	1982 - 1995	1982, 1988, 1989, 1992, 1995

PCBs

$$WC = \frac{1.02275 \text{ mg/kg}}{31{,}200 \text{ L/kg}} \times 1000 \text{ ug/mg} = 0.0328 \text{ ug/l}$$

Chlordane

$$WC = \frac{0.228 \text{ mg/kg}}{14{,}100 \text{ L/kg}} \times 1000 \text{ ug/mg} = 0.0162 \text{ ug/l}$$

The estimated water column concentration for PCBs (0.0328 ug/l) exceeds the applicable water quality criterion of 0.00004 ug/l. The estimated concentration for chlordane (0.0162 ug/l) exceeds the water quality criterion of 0.0005 ug/l. The estimated water column concentrations most likely do not represent the actual existing instream concentrations due to the basis for the back-calculation. The back-calculations from tissue level to water column concentration were performed using data on species for which consumption advisories have been issued, i.e., fish with elevated tissue levels of these compounds. It must also be noted that the average tissue concentrations may be artificially elevated because of the use of one-half of the detection limit for data reported as less than detection. The actual concentration could lie anywhere between zero and the detection limit. The use of one-half of the detection limit is merely a means of obtaining a reasonable value to use in calculating the average. While the actual concentrations in the water column are not known, they are likely to be lower than the calculated estimates.

Source Assessment

The production and use of PCBs in the United States was banned in July of 1979. While it is now illegal to manufacture, distribute, or use PCBs in the United States, these synthetic oils were used in the past as insulating fluids in electrical transformers and other products, as cutting oils, and in carbonless paper. PCBs were introduced into the environment while use was unrestricted and occasional releases still occur. Once in a waterbody, PCBs become associated with solids particles and enters the sediments. PCBs are very resistant to breakdown and thus remains in river and lake sediments for many years.

Chlordane is a man-made organochlorine compound that was widely used as a broad-spectrum agricultural pesticide before its use was restricted to termite control around building foundations.

All uses of chlordane have been banned since April 1988. Chlordane may be introduced to surface waters through contaminated ground water or surface runoff, and is therefore a non-point source contaminant. Once in a waterbody, chlordane becomes associated with solids particles and enters the sediments. Fish are exposed to and accumulate PCBs and chlordane from the water, through contact with or ingestion of sediments, and in the food they eat.

Two methods were employed in order to locate known sources of PCBs or chlordane in this segment of the Shenango River. First, the Northwest Field Office searched for information on known existing or historical sources that might contribute PCBs or chlordane in or upstream from the fish consumption advisory reach. Second, the EPA Permit Compliance System (PCS) database was searched for any major discharge permits containing PCBs or chlordane as an effluent limitation. While no major dischargers for either compound were found on PCS, the former Westinghouse Electric Corporation site was identified as a previous point source discharge of PCBs to the Shenango River. The last NPDES permit issued permitted a discharge of air conditioner cooling water, air conditioner condensate, and storm water from this site to the Shenango River. The permit contained a limit of non-detect for PCBs. Activities authorized by this NPDES permit ceased sometime after the last NPDES permit was issued on October 14, 1990. The NPDES permit expired on October 14, 1995 and was cancelled in April 1999.

Prior to 1980, no federal legislation existed which addressed past disposals of hazardous wastes. Therefore, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to address the hazards created from past disposals. The five sites identified as possible sources of PCBs are being remediated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which is commonly referred to as Superfund. The act deals with environmental responses and provides mechanisms for reacting to emergency situations and to chronic hazardous material releases. In addition to establishing procedures to prevent and remedy problems, it establishes a system for compensating appropriate individuals and assigning appropriate liability.

CERCLA required the Environmental Protection Agency (EPA) to develop criteria for prioritizing among sites potentially needing remediation. Those sites scoring high enough on the ranking system are included on the National Priorities List (NPL). Only NPL sites are eligible for EPA remedial action. The former Westinghouse site and the River Road Landfill site have been listed on the NPL.

Once a site on the NPL has been selected for remediation, a formal process must be followed to determine and implement appropriate actions. A Remedial Investigation/Feasibility Study (RI/FS) is done first. The conditions at the site must be determined, including the extent of contamination, migration offsite, and potential for human and environmental exposure. A series of specific remediation alternatives must be developed, including specification of costs, technical feasibility, and environmental impacts. Based on the RI/FS, a Record of Decision (ROD) is written by the EPA, which documents and justifies the selection of a particular cleanup option. This process must include substantial public and state participation. Following the ROD, the detailed engineering plans are prepared (the Remedial Design), and implementation (Remedial Action) can begin.

The Superfund Amendments and Reauthorization Act (SARA) of 1986 provided additional guidance for determining “how clean is clean” for the level of removal during a site cleanup. Cleanups must be protective of human health and the environment, be cost-effective, and use permanent solutions, including treatment and resource recovery, as much as practicable. Land disposal is discouraged.

The decision-making framework for the management of sediments has two major components: the remedial investigation and the feasibility study (RI/FS). For a Superfund site with contaminated sediments, the remedial investigation identifies the character of the sediments and the extent of contamination, among other information. The feasibility study includes an evaluation of all reasonable remedial alternatives, including treatment and non-treatment options.

Pennsylvania' Hazardous Sites Cleanup Act (HSCA) was created so that Pennsylvania could effectively fulfill their statutory responsibilities under CERCLA; recover costs incurred fulfilling those statutory responsibilities; and supplement CERCLA by creating a state program for cleanup of sites not included on the National Priorities List.

Five potential sources of PCBs or chlordane were identified. A formerly permitted discharge which is now a Superfund site (former Westinghouse site), another Superfund site (River Road Landfill), and three sites listed on Pennsylvania's Hazardous Sites Cleanup Act (HSCA) list (Dupont/New Castle Junk Yard Site, the William Taylor Estate Site, and the C.G. Wood site) may contribute PCBs to surface waters. The C.G. Wood site is above the section of the Shenango River listed on the 303(d) list.

Discussion of Potential Sources of PCB/Chlordane

Former Westinghouse Facility

Westinghouse used PCBs from 1930 to 1976 for dielectric fluid in medium power transformers. PCBs were stored in an underground tank, a tank farm, and inside a building on the site. Use of PCBs was discontinued in 1976 and all liquid PCBs were removed from the site. The sources of PCBs contamination at the site include leaking tanks containing PCBs and fly ash contaminated with PCBs that was disposed in an unlined moat located at the site.

PCBs have been detected in the soil and groundwater at the site and in the sediment in the Shenango River near the site. All water sampling data from the Shenango River near the former Westinghouse site were less than detection for PCBs and chlordane. However, a July 29, 1992 sample from the Clark Street Sewer yielded a result of 2.8 ug/l Aroclor- 1248 and 4.5 ug/l Aroclor- 1260; and a July 29, 1992 sample from the Franklin Street Sewer yielded a result of 8.2 ug/l Aroclor- 1260.

River Road Landfill

The 102-acre site is located approximately two miles northeast of the City of Sharon. Approximately 37.5 acres of the site have been used for refuse disposal. From 1962 to 1980 the site accepted municipal, residential and industrial waste.

In 1980, Waste Management of Pennsylvania (WMPA) initiated response actions at the site, with construction of a subsurface leachate collection system/ground water dam. The collected leachate was temporarily stored on-site in a lagoon and periodically collected and trucked off-site for disposal until 1983. After 1983, the collected leachate was discharged into a regional Public Owned Treatment Works (POTW). In 1982 WMPA installed soil erosion and sediment control systems. The leachate lagoon was closed in 1983.

Between 1982 and 1985, in accordance with PADER approval, sludge containing PCBs was removed from segregation areas and disposed with refuse in the landfill. WMPA capped the

landfill in accordance with existing PADER regulation in 1987, and added further upgrades to the leachate collection system through 1988.

An assessment of the nature and extent of contaminants present at the River Road Landfill Site indicates that the extensive remedial actions performed at the site have, for the most part, been successful in controlling contaminant migration from the landfill to the surrounding environment. However, investigations have shown that limited migration of contaminants is occurring from the landfill.

Leachate was considered the primary potential source of contaminants at the River Road Site. However, analysis of the leachate indicted that it is limited as a potential source and no pesticides or PCBs were detected in the leachate samples.

William Taylor Estate Site

This site is an inactive, unpermitted municipal and industrial waste disposal site located in the Borough of Wheatland, 1.5 miles south of the city of Sharon, Pennsylvania. The site was active from the 1950's until at least the early 1970's. Waste disposed at the site includes foundry and slag wastes, and liquid, paint, oil and volatile wastes. PCBs were present in some of the liquid wastes disposed at the site. PCBs, volatile organic compounds and heavy metals are present in site soils, groundwater and sediments. PCBs were not detected in any of the surface water samples from the site.

DuPont/New Castle Junk Yard Site

The site is located in the City of New Castle and Union Township, Lawrence County. The site is approximately 49 acres in size and includes what are now a non-active junkyard and a china waste disposal area. From 1910 to 1961 the site was the location of a chemical manufacturing facility. After 1961 the facility was a scrap metal recycling center. In addition, from 1961 to 1979, a battery reclaiming business was also in operation. The site presently consists of two adjacent properties: an inactive junkyard owned by New Castle Junk Company, Inc. to the north and a china waste disposal area, at the former "Shenango China" facility now owned by Realties U.S.A., Inc. in the south portion. Sampling and analysis of environmental media from the junkyard have indicated the presence of PCBs.

Approximately 50% of the soils samples collected in the junkyard revealed PCB concentrations exceeding 5.0 mg/kg (average = 45.21 mg/kg; maximum = 290 mg/kg). All water samples for PCBs and chlordane were less than detection at the Dupont/New Castle Junkyard site (Final Remedial Investigation Report 1994)

C.G. Wood

The C.G. Wood site is an inactive manufacturing facility located in Jamestown Borough, Mercer County, Pennsylvania. The 29-acre site contains four waste lagoons and is adjacent to a beaver pond, located southeast of the facility. The adjacent groundwater, surface water and sediments have been contaminated with hazardous substances that were released at the Property. In May 1992, the Expanded Site Investigation (C.G. Wood ESI, 1992) reported several waste drums distributed randomly around the site, including those within the lagoons and within the pond.

The 1992 ESI reported PCB concentrations of 2,500 and 270 micrograms per kilogram (μg/kg) in the marsh and pond sediments, respectively, located adjacent to the site. A final field report prepared in 1992 suggests that one lagoon containing contaminated sediments (Lagoon 4) could pose future impacts on the down gradient unnamed tributary to the Shenango River since it is hydrologically (i.e., via surface and groundwater) connected to the marsh contained within. PCB has not been detected in surficial soil samples collected at the site.

An unnamed tributary to the Shenango River enters the site at a point along its northern border and both feeds and drains the on-site pond. The unnamed tributary continues at the pond discharge point and flows westward through the small marshy area and along the southern end of the embankment, which encompassed lagoon 4. The tributary then flows from the site into a 14-acre ponded palustrine wetland located 0.2 stream miles from the site. It converges with the Shenango River 0.2 stream miles downstream from this wetland.

Industrial activities conducted at the Property by both Jamestown Machine and Manufacturing and Blazon, Inc. involved the manufacture of children's metal outdoor gym and swing sets. Blazon operations reportedly included plating with zinc (using cyanide solutions), electrostatic spray painting and metal degreasing. Liquid plating wastes were neutralized and then discharged to a nearby pond (possibly one of the lagoons located on the Property), according to a Blazon employee. Pennsylvania Department of Health records from 1959 reference batch treatment of cyanide-bearing wastes by chlorination prior to discharge of those wastewaters from the Jamestown Machine and Manufacturing Company facility. Leisure Group, Inc. is assumed to have been involved in the same type of operation, since it was a subsidiary of Blazon, Inc.

The Department of Environmental Resources (now known as the Department of Environmental Protection) conducted a Preliminary Assessment at the site in 1986 for the U.S. Environmental Protection Agency ("EPA"). The EPA conducted a Site Inspection and Expanded Site Inspection at the site in 1987 and 1992, respectively.

A final Hazard Ranking System ("HRS") score of 50 was compiled by EPA for the site in 1995. In late 1995, the Department recommended to EPA that the site not be placed on the National Priorities List but be investigated and remediated by the Department utilizing Pennsylvania's Land Recycling and Remediation Standards Act of 1995 ("Act 2") and HSCA.

The Department conducted a Streamlined Site Characterization Study ("SSC") at the site from late 1996 to early 1997. The SSC consisted of a geophysical survey, test pit excavations, groundwater monitoring well installation, hydropunch survey, biota and wetlands survey, and sampling of soils, wastes, surface water, groundwater and fish tissue

A vat located adjacent to the building was discovered during test pit excavations. Material within the vat is considered to be a hazardous waste because it failed the Toxicity Characteristic Leaching Procedure ("TCLP") and exceeded the regulatory threshold for lead (5 mg/1). Polychlorinated biphenyls ("PCBs") were also detected at levels over 7,000 ppm.

Soil samples collected from lagoons 1, 2 and 3 contained inorganic and organic constituents exceeding the Soil Standards. These included PCBs, chromium, cadmium, arsenic, lead, cyanide, cis-1,2-dichloroethene, TCE, 1,1~dichloroethene, tetrachloroethene ("PCE"), vinyl chloride and benzene.

Lagoon 4 samples contained lead, chromium, cyanide and PCBs over the Soil Standards. Numerous VOCs were also detected in lagoon 4; however, none exceeded the Soil Standards.

Groundwater at the site was investigated through a hydropunch survey, and installation and sampling of groundwater monitoring wells. PCB analyses of residential and monitoring well samples were all non-detect for PCBs. Surface water and fish tissue samples results were all non-detect for PCBs.

The Department believed that prompt action was necessary to protect the public health, safety and the environment from the risks associated with the hazardous substances in site soils and wastes. It was not advisable to delay action for the length of time that it would have taken to formally develop and close an administrative record for the action. The Department estimated that the response would cost less than $2 million and take less than one year to complete. Accordingly, the Department chose to conduct a prompt interim response at the site pursuant to Section 505(b) of HSCA, 35 P.S. §6020.505(b).

The main objectives for the prompt interim response selected for the site were: 1) protection of public and environmental receptors from direct contact and inhalation risks associated with site-related hazardous substances, and 2) elimination of the ongoing release and threat of release of hazardous substances into the environment from site soils and wastes containing hazardous substances. This action mitigated the ongoing releases and threats of release of hazardous substances posed by prior conditions at the site.

This response was not a final response pursuant to Section 504 of HSCA and therefore was not required to meet the cleanup standards that apply to final remedial responses.

Atmospheric Deposition: Development of the TMDLs considers background pollutant contributions. The natural in-stream background concentration of chlordane is assumed to be zero because chlordane is a man-made product and there are no natural sources. PCB is also a man-made product and no natural sources of PCB load exists in the environment. Nonetheless, due to the pervasive use of PCBs prior to their ban in the late 1970s and their slow degradation rates, PCBs are now widespread in the environment. This pervasive distribution of PCBs in air, soil, and water effectively creates a background load of PCB in all water bodies. Atmospheric deposition can contribute to background concentrations of PCB in water bodies.

Atmospheric deposition of PCB plays a dominant role in PCB cycling in many freshwater systems. Monitoring conducted under the Integrated Air Deposition Network (IADN) and the Great Waters Program indicates that wet and dry deposition of PCB can vary greatly both regionally and by season. According to EPA's Lake Michigan Mass Balance (LMMB) Study, atmospheric transport and deposition of PCB provides about 82 percent of the total PCB load to Lake Michigan. Because PCB is no longer produced, the major source of PCB to the atmosphere is volatilization from sites where they have been stored, disposed, or spilled; from incineration of PCB-containing products; and, to a lesser extent, from PCB formation during production processes.

Although analysis predicts that atmospheric deposition may provide a significant source of PCB load to the water body, volatilization from the water column and sediments is likely to result in continuing PCB loss from the water body, thereby reducing, or negating, the atmospheric load. Hillery, et. al., (1998) found that the Great Lakes are currently experiencing a net loss of PCB. In each of the five Great Lakes, the net deposition of PCB is believed to be insignificant because gas

transfer out of the lakes counteracts the flow into the lakes from wet and dry deposition. Similar processes are likely to be occurring in Pennsylvania water bodies.

PCB air deposition values specific to Pennsylvania have not been identified. Therefore, no definitive data exists to document this as a source of PCBs to the impaired water.

TMDL Calculation

Development of TMDLs includes consideration of background pollutant contribution, appropriate and/or critical stream flow, and seasonal variation.

Monitoring for Background Concentrations of PCBs:

PCB concentrations in surface waters may be greater than zero in waters where no specific source, either point or nonpoint source, can be identified. Only site-specific data can be used for the TMDL calculations. However, because sufficient data does not exist for this particular waterbody segment that would allow the selection of such a background value for TMDL calculation purposes, a value of zero was used. In order to verify this assumption, or to properly select a background concentration for calculating a TMDL, site specific water quality monitoring for PCBs may be conducted at this site some time in the future.

If future background sampling were to identify PCB levels greater than zero for this segment, Pennsylvania would review and appropriately revise the TMDL. Currently, there is no approved and widely available analytical method for analyzing water column samples at the ultra low levels at which PCBs may be present. EPA method 1668-A may offer such capability, but is currently only approved for use in analyzing sewage sludge, is very expensive to run and of limited availability.

PCBs and chlordane are probable human carcinogens. Carcinogenesis is a nonthreshhold effect, an adverse impact that may occur at any exposure greater than zero. Such an effect is often related to long-term exposure to low levels of a particular chemical or compound, rather than an immediate effect due to a short duration exposure to a high level. As noted earlier, the Department's water quality toxics management program uses a cancer risk level of 1×10^{-6} to protect human health. Attainment of this risk level is predicated on exposure that includes drinking 2 liters of water and ingesting 6.5 grams of fish per day over a 70-year lifetime. The Department uses a harmonic mean flow as the appropriate design condition for dealing with exposure to carcinogens. This is a long-term flow condition that will, when applied to the Total Maximum Daily Load, represent long-term average exposure. Because seasonal increases and decreases in concentration are less important than the long-term exposure to a carcinogen, use of harmonic mean flow adequately considers seasonal variations in PCBs and chlordane concentrations.

The calculation of the Shenango River TMDLs utilize the water quality criteria and flow data from the U.S. Geological Survey surface water discharge station just below the Shenango Lake Dam at Sharpsville, PA (03103500). This method requires that the harmonic mean flow (Qhm) from the USGS gage used be divided by the gage drainage area to arrive at a Unit Qhm that is multiplied by the drainage area of the segment to produce a Segment Qhm in cubic feet per second (cfs). The cfsm (cubic feet per second per square mile) yield rate equals 0.584 (for years 1938-1992 from STORET data, calculated using EPA's Dflow program). The Segment Qhm for the Shenango River (at New Castle) is 461.36 cfs (790 square miles X 0.584 cfsm).

The Segment Qhm is used in calculating the Total Daily Maximum Load (TMDL) by multiplying it by the water quality criterion and a multiplier (0.00539) to convert from cfs x ug/L to lbs/day (pounds per day).

The PCBs TMDL is calculated as follows:

461.36 cfs x 0.00004 ug/l = 0.0184544 cfs x ug/l x 0.00539 = 0.0000995 lbs/day.

The chlordane TMDL is calculated as follows:

461.36 cfs x 0.0005 ug/l = 0.23068 cfs x ug/l x 0.00539 = 0.00124 lbs/day.

Percent Reduction

The goal of a TMDL is to achieve the water quality standards of the receiving stream, which will protect public health. In order to achieve this, the instream concentrations must be reduced from the estimated current levels to the criteria. Percent reduction is calculated using the following formula:

Percent reduction = (1 - Criterion/ Existing Instream Concentration) x 100. The percent reduction for PCBs is calculated as follows:

% Reduction = (1 - 0.00004/0.032780449) x 100
% Reduction = (1 – 0.00122024) x 100 = 99.88%

Percent reduction for chlordane is:

% Reduction = (1-0.0005/0.016170213) x 100
% Reduction = (1-.030921052) x 100 = 96.91%

Overall reductions of 99.88% for PCBs and 96.91 % for chlordane are needed to achieve the instream criteria.

Margin of Safety (MOS)

Achievement of the TMDLs will generally ensure achievement of the water quality criteria. To account for uncertainties that may be associated with the TMDL calculations, the Department proposes to hold 10% of the TMDLs in reserve. Applying this 10% margin of safety results in a PCBs MOS of 0.000009947 pounds per day and a chlordane MOS of 0.00012pounds per day.

Wasteload Allocations (WLAs) and Load Allocations (LAs)

PCBs and chlordane are man-made compounds. Therefore, natural and background concentrations are assumed to be zero.

Since the former Westinghouse Electric Company facility has ceased operations, there are no known point sources of PCBs. Therefore, the PCB load is contributed by nonpoint sources and may be introduced to surface water through contaminated ground water, surface runoff, or contaminated sediment. The Source Assessment notes that once in a water body, PCB becomes associated with soil particles and enters the sediments. Fish tissue contamination results from this sediment load. Because of this and because there is no way to accurately quantify loadings from

groundwater or erosion, the entire loading (minus the amount held in reserve as a margin of safety) for PCBs and chlordane are assigned to Load Allocations for the instream sediment. The load allocations are 0.0000895 pounds per day for PCBs and 0.00119 pounds per day for chlordane.

TMDL Summary

The TMDLs for the Shenango River from the Shenango River Lake Dam (River Mile 33.2) to the mouth (River Mile 0.0) can be summarized as follows:

TMDL Summary for Shenango River				
Pollutant	**TMDL**	**WLA**	**LA**	**MOS**
PCBs	0.000099 lbs/day	0	0.0000895 lbs/day	0.00000995 lbs/day
Chlordane	0.00124 lbs/day	0	0.00112 lbs/day	0.000124 lbs/day

Since the four tributaries (3 unnamed tributaries and Pine Run) could possibly serve as primary transport pathway for PCB contaminated sediment to the Shenango River, allowable TMDL loadings were also calculated for them. Using the same methodology as above and a harmonic mean flow yield rate calculated from the USGS 03102500 on the Little Shenango, the PCB TMDLs for these tributaries are summarized below:

TMDL Summary for UNT 36340 at C.G. Wood Site				
Pollutant	**TMDL**	**WLA**	**LA**	**MOS**
PCBs	0.000000054 lbs/day	0	0.000000048 lbs/day	0.000000005 lbs/day

TMDL Summary for UNT 35974 at River Road Landfill				
Pollutant	**TMDL**	**WLA**	**LA**	**MOS**
PCBs	0.000000013 lbs/day	0	0.000000012 lbs/day	0.000000001 lbs/day

TMDL Summary for Pine Run				
Pollutant	**TMDL**	**WLA**	**LA**	**MOS**
PCBs	0.00000017 lbs/day	0	0.00000015 lbs/day	0.000000017 lbs/day

TMDL Summary for UNT 35844 at Dupont/NC				
Pollutant	**TMDL**	**WLA**	**LA**	**MOS**
PCBs	0.00000023 lbs/day	0	0.00000021 lbs/day	0.000000023 lbs/day

TMDL Verification

The stated goal of this TMDL is to meet the PCBs and chlordane water quality criteria for the protection of public health in this reach of the Shenango River. Another way to state the goal is to reach a point where fish consumption advisories are no longer needed because tissue levels of PCBs and chlordane are no longer above the levels of concern.

The three agencies involved with the issuance of fish consumption advisories in Pennsylvania currently apply the "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory" (commonly referred to as the Great Lakes protocol) for issuance of consumption advisories due to PCBs. Following this method, meal-specific consumption advice is issued by species. The first level of consumption advice, eat no more than one meal per week, is issued when the tissue PCBs concentration is 0.06 to 0.20 mg/kg. The upper limit for unrestricted consumption is 0.05 mg/kg. In order to verify the level of protection the PCBs TMDL would provide, the estimated fish tissue concentration expected to accumulate at a water column concentration of 0.00004 ug/L was calculated. Reaching the PCBs criterion would result in an estimated tissue concentration of 0.001248 mg/kg, well below the 0.05 mg/kg level for unrestricted consumption.

Pennsylvania currently uses the U.S. Food and Drug Administration (FDA) Action Level of 0.3 mg/kg for issuance of advisories due to chlordane contamination. Achievement of the chlordane water quality criterion would result in an estimated fish tissue concentration of 0.00705 mg/kg, much lower than the Action Level. The consumption advisory could be lifted at that level.

This TMDL analysis estimates, based on back calculations from fish tissue concentration, that the concentration of PCBs in the receiving water exceeds water quality standard~~s~~. The TMDL analysis also shows that the existing loads of PCBs need to be reduced. The source analysis identifies various sources of this contamination including the former Westinghouse site and River Road Landfill, Superfund sites. For this TMDL and the specific superfund sites identified, it was assumed that controls associated with remediation of the identified sites will result in the removal of the pathway that is associated with sediment loading to the water. This elimination of the surface runoff and sediment loading pathway may reduce the associated runoff of soil-bound PCBs.

The TMDL focuses on the amount of PCBs that the water body can receive and still maintain water quality standards while the Superfund/CERLA programs focus on meeting environmental goals by eliminating the pathways of exposure of pollutants. Together, these programs can meet the allocations/goals set in this TMDL. The collaboration of the Superfund program and the TMDL program to address the impacts of legacy pollutants, such as PCBs, is the next step in an on-going and complex process of meeting water quality standards through the remediation of contaminated sediments. The integration of two often-separate programs is necessary in situations such as this where a land-based source contributes to the contamination of a waterbody. The goal of the TMDL is to reduce PCBs in the water column to water quality standards levels. This is separate from the Superfund goal which is to eliminate the pathway of contamination and not necessarily the elimination of the pollutant. Superfund balances remediation with risk determinations of human health and feasability. The TMDL program does not - it is absolute in its goal to meet standards.

A TMDL is a planning tool that may change over time as the data improves and the watersheds change. As additional data are collected the identified sources of PCBs are confirmed, a determination will be made as to whether this new data is significant and a TMDL revision is necessary. In some instances the final decision on remediation methods at the Superfund sites have not yet been made. While it is expected that this TMDL will serve as a decision tool for those remediation plans, it may be found that the removal of the sediment/runoff pathway may not be feasible or acceptable for other reasons. If this should be the case, the TMDL would be reopened and the allocations re-distributed, but still meeting the total allowable load from all sources, to take into consideration the final remediation plan. However, it is important at this time to provide a goal that is based on the need to meet water quality standards to serve as a focal point for site plan development.

Recommendations

The five sites identified as possible sources of PCBs are in different stages of cleanup. A summary and current status of the site cleanups are as follows:

C.G. Wood Site

The Department considered four alternatives for the prompt interim response at the site. Alternative 4 was chosen. This alternative consisted of excavation and off-site disposal of contaminated soils and wastes contained in Lagoons 1, 2, 3 and 4; Excavation and off-site disposal of two USTs and associated contaminated soils and wastes; excavation and off-site disposal of waste contained in the outside vat; removal and offsite disposal of contaminated dust/debris; removal and off-site disposal of asbestos-containing material within the building; building demolition.

Also, the excavation areas in the lagoons and UST area were backfilled with processed masonry products from the building demolition (as described below) and with clean soil. The existing roof and support structures were removed. Structural steel was recycled off-site. General building debris (corrugated metal roof panels and wood) was collected and disposed off-site. The concrete block walls and brick facia were knocked onto the concrete slab of the building. Masonry products were stockpiled into a central floor area where they were processed for use as fill material in the lagoon area excavations. The concrete floor of the building remains, following building demolition.

Alternative 4 was selected because it protected the public and environmental receptors from direct contact and inhalation risks associated with site-related hazardous substances; reduced the ongoing release and threat of release of hazardous substances into the environment from contaminated soils and wastes; and allowed for the safe investigation of additional sub-building contamination source areas in the most cost effective manner. Alternative 4 was implemented in a manner consistent with any future remedial actions and future investigation activities.

The public comment period for the selection of this and interim response opened on October 11, 1997 and closed on January 9, 1998. Public notice of Administrative Record opening was published in the October 11, 1997 editions of the *Pennsylvania Bulletin*, *Meadville Tribune* and *Sharon Herald*. Copies were also mailed to potentially responsible persons for the C.G. Wood site

on October 9, 1997. The Department received no written comments, and received no requests to present oral testimony at a public hearing.

The "Final Trip Reported" dated May 22, 1992 indicated no PCBs were detected in the unnamed tributary of the Shenango River, but due to the presence of PCBS in the pond sediment (that flows to tributary), future impacts on the unnamed tributary could not be ruled out.

A Phase II Prompt Interim Response Work Plan was submitted to the Department dated May 1998. This Plan was implemented in the Spring/Summer of 1998. Laboratory Analytical Reports were submitted to the Department dated September 1998. The sampling events included in this report were conducted prior to the interim remedial measures. The interim remedial measures included:

- Removal of waste piles and associated debris/soil, as well as scattered drums and other debris.
- Demolition and removal of the former manufacturing building
- Excavation and removal of two, 2,500 gallon USTs.
- Removal of sludge materials from the lagoons.

A Final Focused Feasibility Study was submitted to the Department dated March 2000. This report indicates groundwater is the only remaining issue at the site and is the subject of the FFS Report, which is based on the Streamlined Site Characterization (SSC) Report for this site (1997) and the SSC Report Phase II (1998).

The data reported in the Final Streamlined Site Characterization Report Volume II of II Streamlined Site Characterization/Focused Feasibility Study for sediment, surface water, and fish tissue were all non-detect except one sediment sample value. This value was flagged because there was a greater than 25% difference between the results obtained from the primary and confirmation columns for dual column analyses methods. The reported value is the average of the two results. A report evaluating the interim remedial measures has not been submitted at this time. There is no sampling data available subsequent to the interim remedial measures.

River Road Landfill

The Record of Decision (ROD) for the site concluded that actual or threatened releases of hazardous substances from this site have substantially been addressed by the implementation of the response actions already completed at the site. The selected response action in the ROD is inclusive of the additional action necessary to ensure that actual or threatened releases of hazardous substances from this site, which may present an imminent and substantial endangerment to public health, welfare, or the environment, do not occur.

The selected remedy for the site is a continuation of the operation and maintenance of the Existing Treatment Scheme, which already exists at the site along with the addition of Institutional Controls. The Existing Treatment Scheme and Institutional controls are:

- Continued operation and maintenance of the existing ground water/leachate collection system that removes contaminated leachate and ground water from the site.
- Continued maintenance of the PADEP approved landfill cap and surface water drainage system.
- Continued maintenance of the ground water dam.

- Continuance of the existing monitoring program developed in connection with the PADEP closure plan (or modification as required and is approved by EPA or PADEP).
- Periodic assessment of the effectiveness of the existing ground water leachate collection system, and is upgraded, as necessary, to prevent contaminant migration.
- Zoning restrictions to be implemented by the local zoning commission to prevent future zoning changes that would allow for residential development or other types of development that would be inappropriate for a former landfill.
- Deed restrictions shall be developed and submitted to EPA for approval. Once approved, these deed restrictions shall be placed in the deed to the site by filing said restrictions with Recorder of Deeds of Mercer County, PA.
- The deed restriction shall prohibit excavation or disturbance of the soil cap, which results in exposing the fill materials.
- Deed restrictions to prohibit the installation of new on-site wells for use for domestic purposes, including drinking water.
- The deed restrictions shall be designed to allow for beneficial use of the property, providing that the beneficial use would not pose a risk to human health or potential ecological receptors. The deed restrictions would, however, prohibit the building of residential construction of the site.
- The deed restrictions shall be valid and binding in the Township, County and the Commonwealth in which the site is located. The continuing need for these restrictions shall be re-evaluated during the five-year site reviews, which are conducted under CERCLA Section 121(c).
- Five-year reviews shall be conducted after the remedy is implemented to assure that the remedy continues to protect human health and the environment.

No remediation of the river sediment is planned.

Former Westinghouse Facility

Between 1984 and 1986, various remedial actions were performed by Westinghouse to address principal threats in the Moat and tank farm areas of the site. These activities resulted in the excavation and off-site disposal of over 7800 tons of soil impacted with PCBs, including soil from the removal of five underground storage tanks and from the cleanup of a spill of approximately 6750 gallons of PCB-impacted mixture of transformer oil and petroleum distillate in the Moat. Following remediation, the tank excavation area was backfilled and capped with concrete, and the Moat spill area was backfilled.

A Feasibility Study for the site soils (Operable Unit 1 – OU1) was submitted on July 27, 1998 and resubmitted on November 17, 1998. USEPA issued a Proposed Plan for the remedy of OU1 on June 7, 1999, and the ROD for OU1 is to be issued in the near future. Based on the Proposed Plan, the selected remedy for site soils may include the excavation and removal of selected soils impacted primarily by PCBs and lead, the placement of a soil cover over other selected soils impacted primarily by PCBs and lead, and the implementation of deed restrictions to prevent the uncontrolled disturbance of remaining impacted soils.

CBS submitted a Work Plan for Supplemental Feasibility Study Sampling of the groundwater, non-aqueous phase liquids (NAPLs), and sediments Operable Unit 2 (OU2) on August 14, 1998. Supplemental sediment sampling was submitted for the Data Summary Report on May 21, 1999. Based on the information obtained from this supplemental sampling event, CBS believes that sufficient data has been obtained on the nature and extent of the site-related impacts to Shenango

River sediment, such that evaluation of potential remedial alternatives for sediment can properly be conducted in preparing the Feasibility Study.

The Feasibility Report – Operable Unit 2 Sediment, Groundwater, and NAPLs was submitted on June 26, 2000. Four alternatives for the remediation of the river sediments were evaluated. The four alternatives are 1) No action, 2) Limited Action/Natural Recover, 3) Cover, and 4) Excavate and treat/dispose off site. The detailed analysis of alternative number 2 indicates, "According to the Human Health Risk Assessment (HHRA), there is no current unacceptable direct threat to human health caused by exposure to these sediments. However, impacted sediments do pose a potential threat to ecological receptors, based on the screening level Environmental Risk Assessment (ERA), allowing the potential bioaccumulation of constituents of potential concern (COPCs). Under this alternative, impacted sediments would be covered over time by natural resedimentation processes, and COPC concentrations may reduce over time due to natural attenuation processes. These processes would thus eventually reduce potential exposures of ecological receptors to impacted sediments. Continuation of the fish consumption advisories would control potential risks to human health related to fish consumption. Disturbance of impacted sediment may cause the resuspension of the sediment into the surface water, thereby potentially exposing downstream receptors."

It also indicates in the summary of alternatives section, "The National Contingency Plan (NCP), Section 300.68(i), states that the appropriate remedy shall be determined by the lead agency's selection of a cost-effective remedial alternative that effectively mitigates and minimizes the threat to and provides adequate protection of public health, welfare, and the environment. Section 121 of SARA states that: 'Remedial action in which treatment permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants as a principal element is to be preferred over remedial actions not involving such treatment. The off-site transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available.'"

A draft OU2 Feasibility Study Addendum (storm sewer sediments and bedrock groundwater) dated February 22, 2001 was submitted to the Department. A videotape inspection was conducted at four storm sewers. These storm sewers were identified as the Clark Street storm sewer, the former North Hot Well sewer line, the Franklin Street storm sewer, and the Wishart Court storm sewer. Sampling of the sediment within these storm sewers was conducted.

A Record of Decision will be issued by EPA, which will include the remedial actions that will be utilized for the river sediments, groundwater, NAPLs, and the storm sewer sediments. As indicated above the remedial actions specified would EPA determine a cost-effective remedial alternative that effectively mitigates and minimizes the threat to and provides adequate protection of public health, welfare, and the environment.

William Taylor Site

As indicated in the Department's April 13, 1998 Statement of Decision, it was determined an interim response is necessary to protect the public health, safety, and the environment from the release and threat of release of hazardous substances from wastes, soils, sediments and groundwater at the site. The interim response will consist of excavation of contaminated materials from "hot spots" throughout the site; consolidation of the hot spot materials in the two on-site disposal area to protect against flood erosion; installation of surface water management controls to direct and control run-on and run-off, reduce water infiltration and deter cover erosion; capping of the consolidated disposal areas with 1.5 feet of common fill followed by 0.5 feet of topsoil and

vegetation to prevent direct contact with contaminated materials, control erosion and eliminate fugitive dust; and contingency groundwater treatment (to be implemented in the event that post-closure monitoring or modeling demonstrates that site groundwater discharges are leading to an exceedance of the National Ambient Water Quality Criteria in the Shenango River).

In 1991, the Department, using Hazardous Sites Cleanup Act (HSCA) funds, erected a chain-link fence, with gates, between the portion of the site where wastes were visible and the nearby little league baseball fields. The fence was connected to an existing fence on an adjacent property to the north, and ran south to the Shenango River.

It was determined that there would be no remediation of the river sediment since no site-related PCBs releases to those sediments could be documented. PCBs were detected in the river sediments, but not above the background levels just upstream of the site.

A group of responsible parties has completed the HSCA remediation at the William Taylor Estate site. The cleanup began in late July 1999, and was completed in early July 2000. Remediation has resulted in the installation of erosion and sedimentation controls, impacted soil excavation, groundwater and surface runoff treatment, monitoring well modification, and revegetation. CBS, Inc., Grimes Aerospace Company, Armco, Inc., and John Maneely Company conducted the cleanup under the terms of a May 1998 HSCA cleanup order. The cleanup involved on-site consolidation and containment of wastes, contaminated soils, and sediments beneath a soil cap. Geocon, Inc., the contractor for the responsible parties, conducted the cleanup construction. Cummings-Riter Consultants, Inc. oversaw the construction on behalf of those parties.

DuPont/New Castle Junk Yard Site

The industrial activities previously conducted have contaminated the environmental media at the site; specifically, hazardous substances have been detected in the groundwater, surface water and sediments, and surface and subsurface soil/fill/waste materials at the site. In order to abate the threats to public health, safety and the environment from the contaminated soil/fill/waste materials, surface water and sediments, a remedial response was conducted at the site. No human or ecological exposures to site-related groundwater contamination are occurring at the site. The remedial response consists of (among other things): demolition of all remaining structures on the junkyard property with off-site disposal of the resultant building debris and remaining scrap; closure of the China Waste Disposal Area on the "Shenango China" property as a Class III Residual Waste Landfill, final cover for this area will consist of approximately two feet of soil material with a vegetative cover (soil cap/cover); excavation and on-site treatment of battery casings and contaminated soils and sediments using a "stabilization" treatment technology; and, re-establishment of a high quality wetland in the area north of the site.

Grace Industries, Inc. of Nazareth, PA, was awarded the remedial action contract. The Department issued Notice to Proceed in April 1999, and Grace Industries mobilized to the site in June 1999. Grace's site work was completed in early July 2000 where all PCB-contaminated soils were treated on-site and backfilled. The building debris and scrap materials have been disposed off-site. The China Waste Disposal Area has been graded and capped (soil cover). Approximately 90,000 tons of battery casings and contaminated soils and sediments were excavated, treated and backfilled on-site. There will be no sediment remediation in the river, since no site-related PCBs releases to those sediments were documented.

More than ten Federal statutes provide authority to many EPA program offices to address the problem of contaminated sediment. These statutes include: the National Environmental Policy Act;

the Clean Air Act; the Coastal Zone Management Act; the Federal Insecticide, Fungicide, and Rodenticide Act; the Marine Protection, Research, and Sanctuaries Act; the Resource Conservation and Recovery Act; the Toxic Substances Control Act; the Clean Water Act; the Great Lakes Water Quality Agreement of 1978, and the Comprehensive Emergency Response, Compensation, and Liability Act. These statutes do not include any type of sediment criteria or a cleanup standard for PCBs or chlordane. Therefore, a determination on whether to conduct remediation of contaminated sediments is not as simple as comparing the sediment concentration to a criteria or standard.

Areas of high concentrations or "hot spots" are generally actively remediated. There is no federal definition of "hot spot". For the Hudson River it was defined as 50 ppm (1). For the cleanup of the former Westinghouse site a "hot spot" has been defined as 1 ppm. They have preliminarily proposed to cleanup the sediments to a level of 1 ppm (2).

The sampling results for the sediments within the storm sewers at the former Westinghouse site were reported as follows: 0.75 and 0.36 mg/kg in the Clark Street storm sewer, 0.55 mg/kg in the former north hot well storm sewer, 0.02 and 0.11 mg/kg in the Franklin Street storm sewer, and 0.4 and 2.2 mg/kg in the Wishart Court storm sewer (3). It was estimated that the 2.2 mg/kg sampling result is representative of approximately 600 feet of the Wishart Court storm sewer.

Section 3.1 of this report indicates "For the purposes of developing estimates for this FS, a cleanup goal for Shenango River sediments of 1 ppm total PCBs was utilized. The total volume of storm sewer sediments which exceeds this cleanup goal is approximately 20 cubic yards, all located in the Wishart Court Storm Sewer, north of Silver Street." It also indicates, "Actual cleanup levels prescribed by the ROD for storm sewer sediments at this site may be based on ecological risk-based concentrations; regulations provided under TSCA, Act 2 or other ARARs; or as otherwise determined during the remedy selection process. Actual quantities and extents of affected sediments handles during remedial activities may differ, depending on current conditions and the target cleanup concentrations."

Two alternatives for clean up of the storm sewer sediments were evaluated, no action and removal and disposal of-site. Removal would be performed by either using a vacuum truck to directly remove sediment and debris or by high-pressure washing inside the sewer and vacuuming the resulting sediment/water mixture.

EPA's Contaminated Sediment Management Strategy (CSMS), indicates, "Widespread, low levels of contaminants may favor natural attenuation, while geographically limited areas containing high levels of contaminants favor active remediation." Natural attenuation may include natural processes that can reduce or degrade the concentration of contaminants in the environment including biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biologic stabilization, transformation or destruction of contaminants, and the deposition of clean sediments to diminish risks associated with the site.

The cleanups being conducted are designed to achieve the goal of overall protection of human health and the environment including the implementation of pollution prevention measures and nonpoint source controls which will allow natural attenuation. Even though the goal of these cleanups is for the overall protection of human health, it is not necessarily for the achievement of the water criteria in the water column or the lifting of the fish consumption advisory. As indicated in the Feasibility Report for Sediment, Groundwater and NAPLs for the former Westinghouse facility, the continuation of the fish consumption advisories is taken into account in order to control potential risks to human health related to fish consumption.

The remediation actions being conducted at the five sites of concern are consistent with the Contaminated Sediment Management Strategy and should mitigate the introduction of PCBs and chlordane to the receiving stream from these sites. Therefore, the concentration of PCBs and chlordane in the water column, the sediment, and fish tissue should decrease as natural attenuation of these pollutants continues in the receiving stream. Also, active remediation of the sediments will be dictated in the Record of Decision for the former Westinghouse facility.

With the ban on the production of chlordane and PCBs, the mitigation of their release into the environment as the result of the remedial actions being conducted, and the continued natural attenuation that is occurring in the receiving stream, it is believed the criteria for these pollutants in the water column will eventually be achieved and the goal of the TMDL for the receiving stream to be "fishable" will be met.

Monitoring

Pennsylvania will continue to monitor PCBs and chlordane in largemouth bass, smallmouth bass, walleye, bluegill, crappie, and other sunfish, muskellunge and carp tissue in this reach of the Shenango River. Samples will be collected once every five years. The data will be used to evaluate the possible threat to public health and to determine progress toward meeting the TMDL. The consumption advisories will remain in place until the water quality criteria are achieved and advisories are no longer needed.

Public Participation

Notice of the draft TMDL was published in the *PA Bulletin* and local newspapers with a 60-day comment period provided. A public meeting was held in the Northwest Regional Office to discuss the TMDL on October 27, 2000. The only written comments to the TMDL were comments sent to the Southwest Regional Office (SWRO) in reference t the Ohio Headwaters TMDLs. The letter indicated the comments applied to the Shenango River as well as to the rivers in SWRO for which TMDLs were written. Notice of final TMDL approval will be posted on the Department website.

Appendix A

Back-Calculation to Estimated Water Column Concentrations

Water Body	Segment	Species	Parameter	Average Tissue Concentration Mg/kg	BCF	Estimated Water Concentration Ug/l
Shenango River	Below Shenango Lake Dam	Carp	PCB	1.65	31,200	0.05288
Shenango River	Below Shenango Lake Dam	Carp	Chlordane	0.228	14,100	0.01617
Shenango River	Below Shenango Lake Dam	Muskellunge	PCB	3.4	31,200	0.10897
Shenango River	Below Shenango Lake Dam	Largemouth bass	PCB	0.814	31,200	0.02609
Shenango River	Below Shenango Lake Dam	Smallmouth bass	PCB	0.725	31,200	0.02324
Shenango River	Below Shenango Lake Dam	Walleye	PCB	0.318	31,200	0.01019
Shenango River	Below Shenango Lake Dam	Bluegill	PCB	0.505	31,200	0.01619
Shenango River	Below Shenango Lake Dam	Crappie	PCB	0.64	31,200	0.02051
Shenango River	Below Shenango Lake Dam	Sunfish	PCB	0.13	31,200	0.00417

Appendix D

COMMENT AND RESPONSE ON THE PROPOSED PCB/CHLORDANE TMDL FOR THE SHENANGO RIVER

EPA Region III

Comment: Our major comment is the need to investigate the loading from, and allocate to the existing pollutant sources. Regarding the four non-point sources of PCBs to the impaired segment (the William Taylor estate site, Dupont/New Castle Junk yard site, the former Westinghouse site and the River road landfill site), when hazardous sites with PCB contamination and the potential to contaminate surface waters are identified in the watershed, they must be allocated to. The TMDL development can be assisted with the use of data and information from Superfund. In addition, consideration should also be given to Section 121 of CERCLA, which says that any remedial activities must comply with any Applicable or Relevant and Appropriate Requirements of Environmental Laws (ARARs) including 25 PA Code 93 pertaining to Water Quality Standards for discharge to streams. It is EPA's interpretation that the cleanup of soils and stream sediments will be done such that these sources of PCBs will comply with water quality standards. The revised analysis thus allows for explicit consideration of the contaminated land based source of PCBs in the allocation. In addition, the margin of safety accounts for unknown sources of PCB contamination. The remedial action further provides reasonable assurance that the TMDL can be achieved. This type of approach is predicated on the existence of remedial actions, which will ensure that sources of PCB contamination (land-based contaminated soil runoff or in stream sediments) will be controlled in a manner such that applicable stream segments, main stem or tributaries, will attain and maintain applicable water quality standards. Alternatively, the TMDL must allocate PCB loading from non-point sources to each of the 4 land based sources of PCB contamination as well as in stream sediments. That allocation method must be scientifically defensible.

Response: The Department acknowledges EPA's assistance in looking for additional data and used that data, as appropriate, to increase discussion of sources of the PCB/chlordane pollution. Pennsylvania believes that more complete allocation of the loadings is dependent on sufficient data. Additional allocation may be part of the next step in the TMDL process, i.e., implementation. Pennsylvania is committed to fulfilling its obligation to implement the TMDLs and will address the refined allocations as a step in implementing the TMDLs. We are further committed to implementation that maximizes public participation as our citizens assume responsibility and authority in managing their watersheds. In this spirit, it is premature for DEP to make unilateral decisions on implementation so early in the process, without that citizen involvement. Conversely, the ambitious, court-directed schedule to complete TMDLs precludes a sufficiently detailed involvement of citizens in development of the TMDL. The TMDL regulation at 40 CFR § 130 does not require implementation as part of the TMDL, nor does it require reasonable assurance of implementation.

Comment: TMDL Development/Endpoint Identification: PA DEP found that insufficient STORET data were available within a five-mile radius of the fish tissue sampling stations to estimate water column concentrations for PCBs or chlordane. The TMDL should specify whether PA DEP searched for STORET data in any other portions of the listed segment to support the water column concentration estimates. Also, the TMDL should specify the analytical detection limit for those results that were reported as less than detection and whether the analytical results were only for PCBs.

Response: The STORET search was designed to be representative of the fish advisory segment, and was intended to supplement the file search conducted by the Northwest Field Office. The search included a five-mile radius around Water Quality Network Stations 909 and 910 as well as the fish tissue sampling station below Pine Run in Sharon. In addition, a 10-mile radius was searched around the tissue sampling station at Pulaski. The report has been revised to include WQN 909 and the different radius at Pulaski. The detection limits for PCB and chlordane are not important in this case because the water column data found were not representative of current conditions. The data found were from 1975 and 1979. The STORET retrieval request included both PCB and chlordane. Only one value above detection, for PCB, was found and noted in the report to document the search. As noted previously, this data is not representative of current water quality conditions.

Comment: TMDL Development/Endpoint Identification, Table**:** A table shows that the number of data sets are either the same or more than the number of years listed for the same entries. This suggests that in one or more of the years listed, two or more sets of analytical data are available for that year. The table should be modified to reflect the exact number of analytical sets for each listed year followed with an explanation of how the state arrived at the PCB and chlordane concentration in the water table. Given that the time frame is over ten years, the fish tissue PCBs and chlordane concentration data may show a trend of decreasing fish tissue concentration of either or both parameters with respect to time. An attempt should be made to evaluate time trending of PCBs and chlordane fish tissue concentrations.

Response: Average PCB and chlordane tissue levels were determined for each species using all samples. An estimated water column concentration was then calculated for each compound for each species. These estimated water column concentrations were averaged for each compound in order to provide a single estimated water column concentration for each parameter for the segment. The report has been revised to include this explanation. A listing of the fish tissue data is included in the final TMDL as Appendix A. The back-calculation was done to provide an estimated water column concentration for comparison to the water quality criteria because no current data are available. The important point for the TMDL is that the data show the criteria are most likely exceeded making a TMDL necessary.

The Department does not believe trend information based on the limited sampling results would be meaningful in this TMDL document.

Comment: Page 8, Source Assessment: The TMDL states that known point sources of PCB or chlordane are required to obtain a National Pollutant Discharge Elimination System permit and the permits set PCB and chlordane effluent limitations as non detectable. However, PA does not identify these potential sources. If there are none, then the TMDL should indicate that none have been identified. In addition, the TMDL states that several sites have been identified as potential non-point sources of PCBs and chlordane, but these sites also are not identified. Further, PA reports that no data are available to quantify the potential non-point source loads of PCBs or chlordane. Nonetheless, non-detect readings as indicated by effluent, soil, or ground water sampling may not be sufficient to omit point or non-point source discharges from a TMDL analysis and allocation. The limited ability of current sampling and testing techniques lack the precision necessary to accurately quantify levels that could ensure compliance with the Water Quality Criterion of 0.00004 micrograms per liter for PCBs. If the point sources can demonstrate that they are no longer accepting any discharge potentially containing PCBs or chlordane, removing the point sources from the TMDL analysis may be justified. Otherwise, PA should revisit the TMDL analysis and allocation to consider the impact of point sources. Also, the relevance of the statewide

ground water and soil loading standards to the TMDL and stream criteria are not clear. The soil and ground water standards should have no effect on the assessment of attainment of the water quality standard for PCB and chlordane.

Response: The comment is confusing because the draft TMDL described the previous point sources of PCB/chlordane contamination and stated that there are no current point sources. It also discussed the sites that are potential nonpoint sources. The only NPDES permit with a limitation on PCBs was the former Westinghouse permit. Industrial activities no longer occur at this site. Any surface water discharge of PCBs from this site is precipitation induced.

Comment: Source Assessment: The report states, "Appropriate level of cleanup is difficult to determine. Removal of all contaminates is virtually impossible and exceedingly expensive. However, cleaning up to any other level raises issues of dose response, which links an amount of a contaminate to the resultant effect, which is difficult to accurately predict." The word "contaminate" is used here instead of "contaminant." The entire paragraph should be clarified, and may not be appropriate for this section.

Response: The paragraph has been deleted as irrelevant.

Comment: Wasteload Allocations and Load Allocations: Because there are four sites contaminated with PCBs, it is not sufficient to simply allocate to instream sediments given that these are current or former nonpoint sources of PCBs. EPA recently assisted DEP in developing a PCB TMDL for Valley Creek that serves as a useful example of how to allocate when such sites are identified. The TMDL should be revised and PA DEP should contact applicable state/Federal agency personnel involved in the three sites. If possible, an approach similar to Valley Creek should be used. This approach is predicated on the existence of remedial actions that will ensure that sources of PCB contamination (land-based contaminated soil runoff or instream sediments) will be controlled so that applicable water quality standards will be attained and maintained. If not, PA DEP must allocate to each of the three land-based sources as well as instream sediments. That allocation method must be scientifically defensible.

Response: DEP thanks EPA for providing the resources to gather additional file and literature data that allowed for increasing the information in the Source Assessment. Allocation to the potential sources was not made because there is limited information to use in such determinations.

Comment: Sediment Remediation: The last paragraph states that there are no known "hot spots" in the advisory segment where sediment samples exceed 50 mg/kg. This suggests that sediment samples have been collected, but there is no mention of such sampling throughout the document. The definition of "hot spot" has been clarified in the TMDL.

Friends of the Riverfront (These comments were received by the Southwest Regional Office in response to the PCB TMDLs written in that regional office and referenced the Shenango River, which is in the region of the Northwest Regional Office.)

Comment: The proposed TMDL fails to identify the specific locations of contaminated stream sediments. In developing the TMDL, the Commonwealth should have conducted a study of the in-stream sediments to determine the distribution and concentrations pf PCBs and chlordane in the river. As this was not done before development of the TMDLs, we recommend such a study be incorporated as part of the implementation plan for the TMDLs. Without gathering this type of data, and conducting monitoring of sediments over time, DEP cannot know whether its

implementation plan, which is almost entirely dependent on natural attenuation, is reasonable or achieving the desired results.

Response: The specific locations of contaminated stream sediments that have been sampled are contained in the various reports that were submitted to the Department's Environmental Cleanup program as part of the remediation process of the five sites identified as potential sources of PCBs and chlordane. Additional sediment data will be collected at the former Westinghouse site after activities have been conducted to remediate the sediment. This data will be evaluated to determine whether additional remediation measures will be required.

Available sediment data has been included in Appendix C.

Comment: Implementation. The draft TMDLs depend almost entirely on natural attenuation for implementation and subsequent achievement of Water Quality Standards. However, the TMDLs provide no information on how long the Commonwealth estimates it will take for additional sedimentation and stream flushing to cover or remove contaminated sediments from the affected rivers. Without some idea how long PCB and chlordane will continue to persist at harmful levels, we believe the Commonwealth has no basis for asserting that natural attenuation will be sufficient to meet WQSs in the foreseeable future.

At the very least, the Commonwealth should take this opportunity to study the contamination in the stream and monitor the sediment and water column closely over the next several years to determine whether natural attenuation is working, or if the contamination problem is simply shifting farther downstream. Without some data or studies showing that natural attenuation is working at an acceptable pace, we believe that DEP must consider other alternatives. Alternatives may include more aggressive identification and control of point and non-point source and limited remediation of identified "hot spots".

Response: As indicated in the TMDL, only one water sample of the receiving stream was greater than detection and this sample was collected in 1979. The only water samples collected as part of the remediation of the five sites that were above detection were from within the storm sewers at the former Westinghouse site. These samples were collected on July 29, 1992. As indicated in the TMDL, the selected remedy for site soils at the former Westinghouse site may include the excavation and removal of selected soils and the placement of a soil cover over other selected soils impacted by PCBs. Only the former Westinghouse site and the William Taylor Estate Site contained sediment with concentrations of PCBs greater than 1 ppm. At the William Taylor Estate Site 2 of the 6 sampling sites had sediment concentrations greater than 1 ppm (2.3 ppm and 1.7 ppm). At the former Westinghouse site 28 individual sample results were greater than 1 ppm. Active remediation has been proposed at the former Westinghouse site to remediate the sediments to a level of 1 ppm. As indicated above, sediment data will be required after the remedial activities are conducted.

Evaluation of the fish tissue data being collected may allow the Department to determine the time it will take for the receiving stream to meet the water quality criteria for PCBs and chlordane.

Comment: Additional Monitoring. The Three RiversKeeper program asks DEP to include more frequent monitoring of fish tissue in its implementation plan. The current plan calls for monitoring only every 5 years. We believe more frequent monitoring of fish tissue, in conjunction with monitoring of the stream sediment and water column for PCB and chlordane concentration, is necessary to determine whether the TMDL implementation plans are effective in reducing contamination in the stream and in fish. Without adequate monitoring, DEP will never be in a

position to know if a change n course is necessary. Therefore, we recommend that monitoring be conducted every two years. This information can then be used for the Commonwealth's 305(b) report and determining whether further fish advisories are warranted as well as provide the data necessary to determine if the implementation plan is progressing towards achieving WQSs.

Response: The Department conducts fish tissue monitoring to the extent of its available resources. In the future, if resources become available, the fish tissue monitoring program may be expanded.

Appendix E

References

(1) A position Paper of the American Council on Sciences and Health: Public Health Concerns About Environmental Polychlorinated Biphenyls (PCBs).

(2) Feasibility Study Report – Operable Unit 2 Sediment, Groundwater and NAPLs.

(3) Draft OU2 Feasibility Study Addendum
Storm Sewer Sediments and Bedrock Groundwater

Cummings Riter Consultants, Inc. 1998. Final Feasibility Study Report – Soils, Westinghouse Electric (Sharon Plant).

Foster Wheeler Environmental Corporation, 1994. DuPont/New Castle Junk Yard Site – Final Remediation Investigation Report.

Halliburton NUS Corporation, 1993. Final Expanded Site Inspection: C.G. Wood.

Hillery, et al. *Atmospheric Deposition of Toxic Pollutants to the Great Lakes as Measure by the Integrated Atmospheric Deposition Network.* Environmental Science and Technology, 1998.

McConnell, L.L., 1998. "Air Concentrations of Organochloride Insecticides and Polychlorinated Biphenyls Over Green Bay." *Environmental Pollution.* Volume 101, Number 3. pp. 391-399.

Montgomery Watson Americas, Inc. 1995. Remedial Investigation Report: River Road Landfill.

Pennsylvania Department of Environmental Protection, 1998. Implementation and Guidance – Design Stream Flows. (Document No. 391-2000-023). PADEP.

Pennsylvania Department of Environmental Protection, 1991. PATG Section I Erosion Prediction. PADEP.

Soil Conservation Service, 1963. Soil Survey for Chester and Delaware Counties, Pennsylvania. United States Department of Agriculture, Washington, D.C.

U.S. Environmental Protection Agency, 1980. Ambient Water Quality Criteria for Polychlorinated Biphenyls. EPA 440-5-80-068. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1980. Ambient Water Quality Criteria for Chlordane. EPA 440-5-80-027. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1996, Clean Water Act Section 303(d) List of Impaired Waters. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1998 Clean Water Act Section 303(d) List of Impaired Waters. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1993. The Technical Basis for Deriving Sediment Quality Criteria for Nonionic Organic Contaminants for the Protection of Benthic Organisms by Using Equilibrium Partitioning (EPA-822-R-93-011). U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 2000. Lake Michigan Mass Balance Study.

U.S. Environmental Protection Agency, Region 3, 2000. Five-Year Review Report: Osborne Landfill Superfund Site.

U.S. Geological Survey, 1994. USGS Water-Resources Investigation Report (94-4060). USGS, Washington, D.C.