

Total Maximum Daily Load

PCB and Chlordane

West Branch Brandywine Creek

Business Route 30 in Coatesville to Confluence of Buck Run

Chester County

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Introduction

Pennsylvania has conducted monitoring of fish tissue contaminants since 1976. Early efforts were comprised of special studies in major water bodies 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, we 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, we also began rotating sampling through our 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.

Fishing is a wholesome, relaxing pastime, and fish are nutritious and good to eat. Some fish, however, may accumulate contaminants to levels that may be harmful to those who eat them over a long period of time. In an attempt to protect public health, the Commonwealth periodically (at least annually) issues fish consumption advisories based on monitoring data from a number of sources. The Department of Health, the Fish and Boat Commission, and DEP issue advisories jointly. The list of advisories is published in the "Pennsylvania Summary of Fishing Regulations and Laws" which is provided to each fishing license buyer, and is also available from the Department in hard copy and through the Internet. In addition, the annual list and any individual advisories needed between lists are issued using press releases.

A number of Pennsylvania waterbodies with fish consumption advisories were listed on the Clean Water Act Section 303(d) List of Impaired Waters for 1996 and 1998. 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 West Branch Brandywine Creek, Chester County, by PCB and chlordane.

Background

This Total Maximum Daily Load (TMDL) applies to the main stem of West Branch Brandywine Creek (Stream Code 00085) from Business Route 30 in Coatesville to the confluence of Buck Run. This segment was included on the 1996 Section 303(d) list in State Water Plan Watershed 3-H as a low priority. It was also included on the 1998 303(d) list in State Water Plan Watershed 3-H (Segment ID 9912) as a high priority for TMDL development.

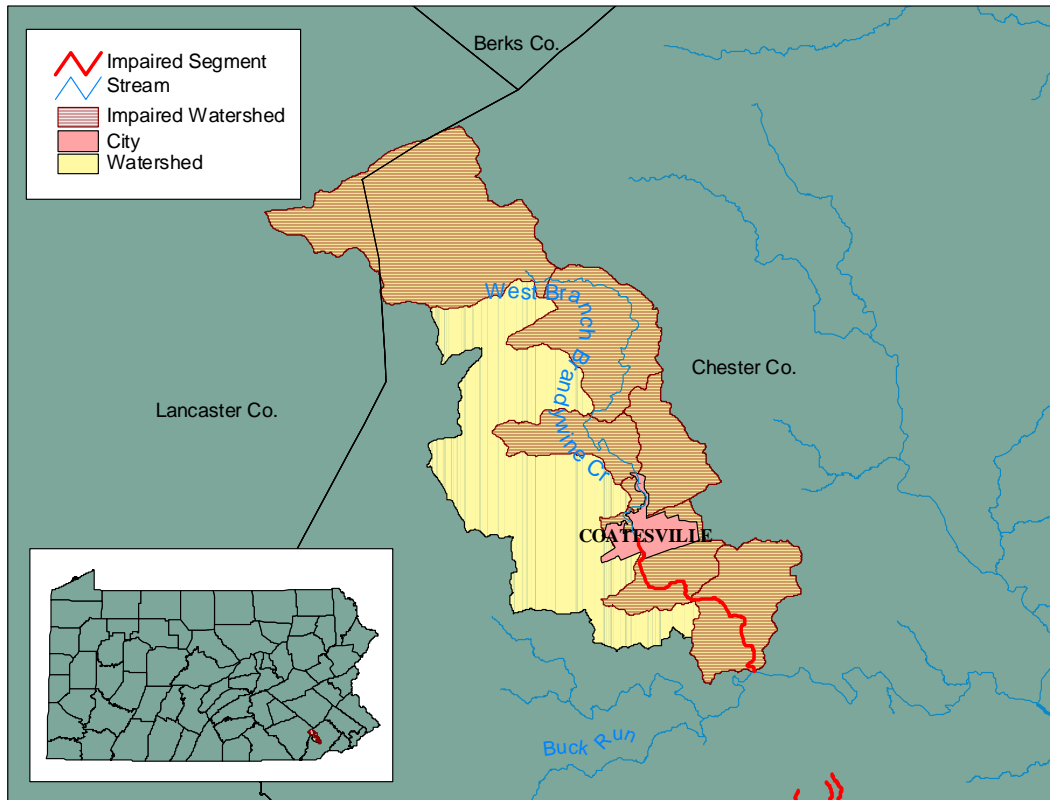
Anglers were first advised to limit consumption of American eels downstream from Coatesville on December 12, 1979 due to a PCB concentration of 2.37 ppm, even though that value did not exceed the 5.0 ppm FDA action level in effect at the time. A "Do Not Eat" advisory was issued June 26, 1986 as part of a statewide release due to PCB at 2.6 ppm (above the revised 2.0 ppm Action Level) and chlordane of 1.0 ppm. This advice remained unchanged until application of the Great Lakes protocol for the 1998 advisory. As a result, eels are to be eaten no more than one meal every 2 months (6 meals per year, Group 4) due to PCB. The most recent chlordane data show concentrations below the Action Level (0.217 ppm in 1994 and an estimated 0.110 ppm in 1995).

Driving Directions

From areas north of the segment, from the PA Turnpike, Exit 23 Downingtown, follow Route 100 South $\frac{3}{4}$ mile, right on Route 113 South approximately 4 miles, right on Business Route 30 West approximately 7.2 miles to Route 82 (1st Avenue) intersection in Coatesville. The subject stream

segment of West Branch Brandywine Creek begins immediately west of this intersection. The segment continues to the confluence with Buck Run approximately 5.7 miles downstream. The end of the segment can be reached by following 1st Avenue south 1.3 miles, left on Lower Gap Rd (becomes Brandywine Ave) 1.2 miles, left on Union St across bridge, right on Creek Rd approximately 2 miles, right on Strasburg Rd across bridge, left on Brandywine Creek Rd (Mortonville Rd) approximately 1 mile to the confluence. From areas south of the segment, it can be reached from Route 1 via 41 or 841 to 82, to the intersection with Route 30 Business in Coatesville.

Location Map



West Branch Brandywine Creek (impaired area highlighted)

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 these goals are not being met in this segment of West Branch Brandywine Creek.

The specific goal of a TMDL is to outline a plan to achieve water quality standards in the water body. For this segment of West Branch Brandywine Creek, the TMDL goal is for levels of PCB and chlordane in the water column to be equal to or less than the Commonwealth's water quality criteria. The criteria, found in the "Water Quality Toxics Management Strategy - Statement of Policy" (Chapter 16 of the Department's rules and regulations) are 0.00004 µg/L (micrograms per liter, equivalent to parts per billion) for PCB and 0.0005 µg/L for chlordane. Both of these compounds are probable human carcinogens, and these are human health criteria 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 PCB and chlordane levels for comparison to the criteria. First, the Department's Southeast Field Office searched for PCB or chlordane data in or upstream from the West Branch Brandywine Creek fish consumption advisory segment. That search failed to produce any instream data. Second, data from the EPA Storage and Retrieval System (STORET) was obtained. An "Inventory" retrieval that would include data collected by all agencies using STORET was run for an area with a five-mile radius around the Department's fish tissue sampling station. That location is Station WQF 00085-012.7, West Branch Brandywine at Modena. No water column data was found.

As a means to compare current conditions to the water quality criteria, estimated water column concentrations were 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:

$$\frac{TC}{BCF} = WC \times 1000$$

- TC = Tissue Concentration in mg/kg (equivalent to mg/L)
- BCF = EPA Bioconcentration Factor in L/kg
- WC = Water Column Concentration (estimated) in mg/L
- Multiply by 1000 to obtain $\mu\text{g/L}$

The average fish tissue concentration is the mean of all samples as listed in the table below. The data are included as Appendix A. The average concentration is used for two main 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 PCB 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 (EPA 440/5-80-027, October 1980) was also applied. The 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.

Table 1

Fish Tissue Data Used to calculate the TMDL for the West Branch Brandywine Creek

Parameter	Fish Species	Number of Data Sets	Range of Years	Years
PCB	Eel	3	1984 -1995	1984, 1994, 1995
Chlordane	Eel	3	1984 - 1995	1984, 1994,1995

The average PCB level in American eel from this West Branch Brandywine Creek segment is 1.65 mg/kg. The average chlordane concentration in American eel is 0.442 mg/kg. Eels have a lipid content of approximately 15%, which is 5 times the 3% lipid content of "average" fish for which the BCFs are normalized. Therefore, to estimate the water column concentration from the fish

tissue concentration, the average eel concentration is divided by 5, and the quotient is divided by the BCF. For PCBs, the estimated water concentration is 0.0106 µg/L and for chlordane, 0.00627 ug/l. These estimated concentrations exceed the applicable water quality criteria. These values 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 a species for which consumption advisories have been issued, i.e., fish with elevated tissue levels of these compounds. 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 PCB in the United States was banned in July of 1979. While it is now illegal to manufacture, distribute, or use PCB 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. PCB was introduced into the environment while use was unrestricted, and occasional releases still occur. In addition, some permitted discharges and Superfund sites contribute PCB to surface water. Once in a waterbody, PCB becomes associated with solids particles and enters the sediments. PCB is 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, i.e. it is a nonpoint source contaminant. Once in a waterbody, chlordane becomes associated with solids particles and enters the sediments. Fish are exposed to and accumulate PCB and chlordane from the water, through contact with or ingestion of sediments, and in the food they eat.

The EPA Permit Compliance System (PCS) database was searched for any major discharge permits containing PCB or chlordane as an effluent limitation but no known point sources were identified from this search.

To identify potential non-point sources of PCB related to uncontrolled waste sites, a search for sites within the West Branch Brandywine Creek drainage area was conducted through the use of EPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), a search of records within EPA's remedial and removal programs, and telephone interviews with representatives of DEP's hazardous sites cleanup program. Other searches included USGS reports and data, and literature searches of scientific journals.

The ECP program and EPA indicate that PCB is present at two hazardous waste sites located near Coatesville (Luria Brothers Scrap Yard and Modena Yard). There is no additional information on Luria Brothers Scrap Yard.

Pennsylvania's Environmental Clean-Up Program (ECP) and EPA indicate that PCB is present at one hazardous waste site located near Coatesville that could contribute PCB contamination through soil erosion. The site, Modena Yard, is located in Chester County, north of Creek Road in Modena, Pennsylvania. The facility is identified by EPA number PAD982363871. The site comprises 21.6 acres and is bordered on the north by Creek Road, on the south by the West Branch of Brandywine Creek, on the west by private residences and the east by wooded areas. The site has been used as a scrap yard and a rail car dismantling facility. All industrial activities at the site have been

terminated. The site is vacant and unpaved except for 5 buildings located in the northwest and central portions of the site. The total area occupied by the buildings is 0.24 acres. Based on data collected in 1996, the site is located within the 100-year floodplain of West Branch Brandywine Creek.

Previous studies were conducted on the site beginning in 1987, including a Preliminary Assessment by the Pennsylvania Department of Environmental Resources (PADER), which is currently known as DEP. The EPA performed a site inspection in 1988. This investigation found elevated levels of PCB in the soil. Following this investigation, a multimedia sampling event was conducted on November 17, 1988. Elevated levels of PCB in soil were again found at the site. On September 29, 1999, U.S. EPA signed into effect an Administrative Order by Consent for Removal Response Action (AOC) for the Modena Yard Site. This order requires the development and implementation of a Response Action Plan (RAP) that was submitted in October 1999 and approved by U.S. EPA in December 1999.

In March 2000, RMT, Inc. developed a Site Characterization Report and a Response Action Workplan for Cleanup Action to thoroughly characterize the extent and nature of contamination at the site and specify necessary remedial activities. Soil sampling and analyses showed elevated concentrations of PCB in soils at varying depths throughout the site. Concentrations of PCB measured in surface soil samples (0 to 1-foot) ranged from non-detect to 407 mg/kg with an average concentration of 20 mg/kg. The report recommended remediation of those areas of the site with contamination above the cleanup criterion of 25 mg/kg for PCB. The remediation alternative recommended is the installation of a cap over contaminated areas and a silt control fence around the southern and eastern borders of the site. This will eliminate any possibility of erosion of the contaminated soil. It is speculative to try to determine possible current loadings from the site.

PCB contamination was found in sediment at 6 ug/kg within the West Branch Brandywine Creek (USGS 1994). PCB binds preferentially to the organic materials found in the sediment; however, a portion will partition into the water column. Nevertheless, there are insufficient data to determine the amount of partitioning that occurs.

No chlordane sources in this study area were found.

Atmospheric Deposition: Development of the TMDLs for the West Branch Brandywine Creek 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 indicate 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.

PCB and chlordane are probable human carcinogens. Carcinogenesis is a nonthreshold 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 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 PCB and chlordane concentrations.

The calculation of the West Branch Brandywine Creek TMDLs uses the water quality criteria and flow data from the U.S. Geological Survey surface water gauging station, located on the left bank

of West Branch Brandywine Creek, at a bridge on SR 15068 at Modena, PA (USGS Station # 01480617). The harmonic mean flow (Q_{hm}) was calculated by dividing the flow at the gauge (52.79 cfs) by the drainage area at the gauge (55 square miles) and applying the yield (0.959818 cubic feet per second per square mile or cfs/m) to the drainage area of the TMDL segment (111.6), as described in the Department's "Implementation Guidance - Design Stream Flows" (Document No. 391-2000-023). The Segment Q_{hm} for the West Branch Brandywine Creek is 107.12 cfs.

The Segment Q_{hm} 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 µg/L to lbs/day (pounds per day). The PCB TMDL is calculated as follows:

$$107.12 \text{ cfs} \times 0.00004 \text{ } \mu\text{g/l} = 0.004285 \text{ cfs} \times \mu\text{g/l} \times 0.00539 = 0.0000231 \text{ lbs/day.}$$

The chlordane TMDL is calculated as follows:

$$107.12 \text{ cfs} \times 0.0005 \text{ } \mu\text{g/l} = 0.05356 \text{ cfs} \times \mu\text{g/l} \times 0.00539 = 0.000289 \text{ lbs/day.}$$

The Total Maximum Daily Load of PCB for this segment of West Branch Brandywine Creek is 0.0000231 pounds per day. The chlordane TMDL is 0.000289 pounds per day.

Percent Reduction

The goal of this TMDL is to achieve the water quality criteria in order to protect public health. In order to achieve this, the instream concentration must be reduced from the estimated current levels to the criteria. Percent reduction is calculated using the following formula:

$$\% \text{ Reduction} = (1 - \text{TMDL Goal/ Existing Concentration}) \times 100$$

The percent reduction for PCB is calculated as follows:

$$\begin{aligned} \% \text{ Reduction} &= (1 - 0.00004/0.0106) \times 100 \\ \% \text{ Reduction} &= (1 - 0.00377) \times 100 = 99.6\% \end{aligned}$$

Percent reduction for chlordane is:

$$\begin{aligned} \% \text{ Reduction} &= (1 - 0.0005/0.00627) \times 100 \\ \% \text{ Reduction} &= (1 - 0.797) \times 100 = 20.3\% \end{aligned}$$

Overall reductions of 99.6% for PCB and 20.3% for chlordane are needed to achieve the TMDL goal.

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 results in a margin of safety for PCB of 0.00000231 pounds per day and for chlordane 0.0000289 pounds per day.

Wasteload Allocations (WLAs) and Load Allocations (LAs)

Insufficient data on the two hazardous waste sites near Coatesville (Luria Brothers Scrap Yard and the Modena Yard) were available to calculate WLAs. The PCB load is assumed to be contributed by nonpoint sources and may be introduced to surface water through contaminated ground water or surface runoff. The entire PCB load in the West Branch Brandywine Creek is assigned to the Load Allocation (LA), that portion of the load contributed by nonpoint sources. 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 PCB TMDL minus the margin of safety of 0.0000208 pounds per day is assigned to a Load Allocation for the instream sediment.

Because there are no known sources of chlordane in this West Branch Brandywine Creek segment, it is also treated as a nonpoint source contaminant that may be introduced to surface water through contaminated ground water or surface runoff. The TMDL for chlordane is assigned to the Load Allocation (LA), that portion of the load contributed by nonpoint sources. Chlordane also becomes associated with soil particles and enters the sediments once in a water body, and fish tissue contamination results from this sediment load. Because of this, the chlordane TMDL minus the margin of safety of 0.000260 pounds per day in this reach of West Branch Brandywine Creek is assigned to a Load Allocation for the instream sediment.

TMDL Summary

The TMDLs for West Branch Brandywine Creek can be summarized as follows:

TMDL Summary

Pollutant	TMDL	WLA	LA	MOS
PCB	0.0000231 lbs/day	0	0.0000208 lbs/day	0.00000231 lbs/day
Chlordane	0.0002887 lbs/day	0	0.000260 lbs/day	0.0000289 lbs/day

TMDL Verification

The stated goal of this TMDL is to meet the PCB and chlordane water quality criteria for the protection of public health in this reach of West Branch Brandywine Creek. Another way to state the goal is to reach a point where fish consumption advisories are no longer needed because tissue levels of PCB 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 PCB. 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 PCB 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 protectiveness of the PCB TMDL, the estimated fish tissue concentration that would be expected to accumulate at a water column concentration of 0.00004 µg/L was calculated. Reaching the PCB criterion would result in an estimated tissue concentration of 0.001 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 0.007 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 standards. 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 Modena, a Superfund site. For this TMDL and the specific superfund site 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 feasibility. 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

Use of both PCB and chlordane has been banned in the United States, so there should be no new point sources present in West Branch Brandywine Creek to which controls can be applied. PCB and chlordane are believed to reside primarily in the sediment.

Generally, the levels of PCB and chlordane are expected to decline over time due to the bans on use, the ongoing remedial efforts at Modena Yard, and through natural attenuation. Examples of processes in natural attenuation are covering of contaminated sediments with newer, less contaminated materials, and flushing of sediments during periods of high stream flow. Natural attenuation may be the best implementation method because it involves less habitat

disturbance/destruction than active removal of contaminated sediments. Mechanical or vacuum dredging removes the habitat needed by certain benthic macroinvertebrates. In addition, some of these organisms will be killed during the dredging process. Suspension of sediments during dredging may also cause abrasive damage to the gills and/or sensory organs of benthic macroinvertebrates or the gills of fish. Suspended sediments can also affect the prey gathering ability of sight-feeding fish. In addition, active removal may cause resuspension of contaminated materials thus making PCB and chlordane available for additional uptake. This alternative is, of course, also the least costly option.

Monitoring

Pennsylvania will continue to routinely monitor PCB and chlordane in American eel in this reach of West Branch Brandywine Creek. 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

Request for Comment and Notice of Public Meeting for the draft TMDL was published in the *PA Bulletin* on September 30, 2000 and in the West Chester Daily Local News on October 2, 2000 with a 60 day comment period provided. A public meeting was held at the Pennsylvania Department of Environmental Protection, Southeast Regional Office, on November 15, 2000 to discuss the TMDLs. Written comments were submitted by the Environmental Protection Agency, Region III and Mid-Atlantic Environmental Law Center. Notice of final TMDL approval will be posted on the Department website.

Appendix B

COMMENT AND RESPONSE ON THE PROPOSED PCB/CHLORDANE TMDL FOR THE WEST BRANCH BRANDYWINE CREEK

EPA Region III

Comment: The tissue sampled for the consumption advisory was eel (15% lipid concentration) but the bioconcentration factor used was for fish containing 3% lipids. Please correct.

Response: The final TMDL has been changed to acknowledge the high lipid content of the species that was analyzed. This resulted in estimated water concentrations 5 times lower than listed in the draft document.

Comment: Source Assessment: The TMDL briefly mentions two potential sources but give no additional information. That information should be provided.

The draft states that PCBs and chlordane are believed to be primarily in sediment. This should be supported with characterization reports, which should also demonstrate that the two potential sources are not current sources or that actions have been taken to eliminate them. If this cannot be demonstrated, a portion of the load should be allocated to the sources.

It is not sufficient to merely allocate to nonpoint sources when two identified sources exist. When hazardous sites with PCB contamination and potential to contaminate surface waters are identified they must be allocated to. Consideration should also be given to Section 121 of CERCLA which says remedial activities must comply with Applicable or Relevant and Appropriate Requirements of Environmental Laws (ARARs) which include 24 PA Code Chapter 93 standards for discharge to streams. EPA believes that the cleanup of soils 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 approach is predicated on the existence of remedial actions that ensure water quality standards will be attained. Alternatively, the TMDL must allocate PCB loading to the two land based sources as well as in stream sediments in a scientifically defensible manner.

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.

Mid-Atlantic Environmental Law Center

Comment 1. This TMDL was developed with insufficient data regarding potential existing point sources of contamination...The CWA requires that wasteload allocations be made to any existing point sources...Even if the two sites (Modena Yard and Luria Brothers Scrap Yard) are considered by DEP to be non-point sources of PCBs, these sources must have a load allocation if they are continuing sources of PCB contamination...

Response: The EPA provided resources to gather additional file and literature data which allowed for increasing the information in the Source Assessment. To identify potential non-point sources of PCB related to uncontrolled waste sites, a search for sites within the West Branch Brandywine Creek drainage area was conducted through use of EPA's CERCLIS, a search of records within EPA's remedial and removal programs, telephone interviews with representatives of DEP's hazardous sites cleanup program. Other searches included USGS reports and data and literature searches of scientific journals. More information concerning PCB and Modena Yard was added to Source Assessment but no additional information was available for chlordane or Luria Brothers Scrap Yard.

Comment 2. The proposed TMDL fails to identify the specific locations of contaminated stream sediments and to establish load allocations for each of these sites. In developing the TMDL, the Commonwealth should have conducted a study of the in-stream sediments to determine the distribution and concentrations of PCBs and chlordane in the river...Commentors recommend such a study be part of the implementation plan...

Response: Additional information was added to the Source Assessment concerning PCB and the Modena Yard. PCB contamination was found in sediment at 6 ug/kg within the West Branch Brandywine Creek (USGS 1994). PCB binds preferentially to the organic materials found in the sediment. A portion will partition into the water column but there are insufficient data to determine the amount of partitioning that occurs.

Comment 3. ...the draft TMDL depends wholly on natural attenuation for implementation and achievement of water quality standards... provides no information on how long it will take...Commonwealth should monitor the sediment and water column closely over the next several years to determine whether natural attenuation is working..

Response: Department resources determine the extent of monitoring that can be performed with regard to TMDLs as well as other programs.

Comment 4. The Commentors urge DEP to consider limited remediation of the contaminated in-stream sediments...DEP must consider other alternatives...

Response: Additional information was added to the Source Assessment concerning PCB and the Modena Yard. In September 1999, U.S. EPA signed into affect an Administrative Order by Consent for Removal Response Action for the Modena Yard site. The order required the development and implementation of a Response Action Plan, which was submitted and approved by EPA. In March 2000, RMT, Inc. developed a site Characterization Report and a Response Action Workplan for Cleanup Action. The report recommended remediation of those areas of the site with contamination above the cleanup criterion of 25 mg/kg for PCB. The remediation alternative recommended is the installation of a cap over contaminated areas and a silt control fence around the southern and eastern borders of the site. This would eliminate the possibility of erosion of the contaminated soil. It is speculative to try to determine possible current loadings from the site.

Comment 5. TMDL proposes fish tissue monitoring only every 5 years, too long an interval to determine if natural attenuation is working as expected.

Response: The Department conducts fish tissue monitoring to the extent of its available resources.

Comment 6. TMDL should include wet weather monitoring during implementation.

Response: Department resources determine the extent of monitoring that can be performed.

Appendix C

References

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