

**COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF CLEAN WATER**

**TRIENNIAL REVIEW OF WATER QUALITY STANDARDS**

**RATIONALE FOR THE DEVELOPMENT OF  
AMBIENT WATER QUALITY CRITERIA**

**FOR HUMAN HEALTH PROTECTION**

**Introduction**

Ambient water quality criteria are numeric values limiting the amount of chemicals present in our nation's waters. A water quality criterion is the concentration of a pollutant in water that is not expected to pose a significant risk to, or adversely impact, in this case, human health protection. Water quality criteria are based solely on the best available scientific data and scientific judgments on pollutant concentrations and environmental or human health effects. These water quality criteria are developed under Section 304(a) of the federal Clean Water Act of 1972. Section 304(a)(1) of the Clean Water Act requires that the Administrator, U.S. Environmental Protection Agency (EPA), develop criteria for water quality that accurately reflects the latest scientific knowledge.

On June 29, 2015, the Environmental Protection Agency (EPA) announced the final updates recommended for the ambient water quality criteria for the protection of human health. Ninety-four priority pollutants have been updated to reflect the latest scientific information and implementation of existing EPA policies found in the *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000)*. The EPA issued the draft updated human health criteria on May 13, 2014, and accepted written views from the public until August 13, 2014. These updated recommendations reflect the latest scientific information and EPA policies, including updated body weight, drinking water consumption rate, fish consumption rate, bioaccumulation factors, health toxicity values, and relative source contributions. The final 2015 update supersedes EPA's previous recommendations to the section 304(a) human health criteria recommendations.

The EPA's recommended ambient water quality criteria for the protection of human health provide technical information for states to establish water quality standards (i.e., criteria) and to protect human health under the Clean Water Act (CWA). Under the CWA and its implementing regulations, states are required to adopt water quality criteria to protect designated uses (e.g., public water supply, aquatic life, recreational use, or industrial use) that are based on sound scientific rationale. Sections 5(b)(1) and 402 of The Clean Streams Law (35 P. S. § § 691.5(b)(1) and 691.402) authorizes the Environmental Quality Board (Board) to develop and adopt rules and regulations to implement The Clean Streams Law, and section 1920-A of The Administrative Code of 1929 (71 P.S. § 510-20), which grants the Board the power and duty to formulate, adopt and promulgate rules and regulations for the proper performance of the work

of the Department. Economic effects, achievability, and feasibility are not to be incorporated into the development of the aquatic life or human health criteria but can be considered in the criteria implementation process when setting effluent limitations, compliance schedules, and issuing other approvals and orders based on these criteria.

The Department's staff use the ambient water quality criteria found in 25 Pa Code Chapter 93, Tables 3, 5, or 6 (relating to specific water quality criteria; ... to water quality criteria for toxic substances; or ... to Great Lakes aquatic life and human health criteria, respectively) as a tool in determining the appropriate effluent limitations and loading requirements designed to protect water quality and uses. These criteria are implemented, in part, through Pennsylvania's regulations supporting the National Pollution Discharge Elimination System (NPDES), and through other approvals issued by the Department. The NPDES regulations are found in Chapter 95 (relating to wastewater treatment requirements) and in other implementation provisions found in Chapter 96 (relating to water quality standards implementation).

### Updated Exposure Inputs

The 2015 human health criteria updates incorporate the latest exposure factors for body weight, drinking water intake, and fish consumption. There is also an update to the methodology used to determine the bioaccumulation in fish, in addition to other toxicity factors (reference dose and cancer slope factors). Below are the updated inputs used to calculate the human health ambient water quality criteria. (*EPA Human Health Ambient Water Quality Criteria: 2015 Update*)

**Body Weight** – the default body weight has been increased to **80 kilograms** (176 lbs.). This is the mean body weight for adults ages 21 and older. The new weight is based on data from the National Health and Nutrition Examination Survey (NHANES), from 1999 – 2006. The previous default body weight was 70 kilograms (154 lbs.) and was based on the NHANES data from 1988-1994.

**Drinking Water** – the default drinking water intake assumption is increased to **2.4 liters per day**. This is based on NHANES data collected from 2003 to 2006 for the 90<sup>th</sup> percentile of water consumption in adults ages 21 and older. The water intake rate is based on consumer-only estimates of direct and indirect water ingestion. The previously recommended default drinking water intake rate was 2 liters per day. The data used was from adults surveyed in the US Department of Agriculture, 1994-1996 Continuing Survey of Food Intake by Individuals (CSFII) and the National Cancer Institute study of the 1977 and 1978 Nationwide Food Consumption Survey.

**Fish Consumption** – the recommended default fish consumption rate has been increased to **22 grams per day**. This rate represents the consumption of freshwater and shellfish from inland and near shore waters for adults 21 years of age and older, based on NHANES data from 2003 to 2010. The previous fish consumption rate was 17.5 grams per day based on the consumption rate of freshwater and estuarine fish for the adult population from 1994-1996 CSFII data.

**Bioaccumulation Factors** – the criteria have been updated using bioaccumulation factors as recommended in the EPA human health criteria methodology (USEPA 2000).

Bioaccumulation factors will account for the uptake and retention of a chemical by an aquatic organism from all surrounding media. (e.g. water, food, sediment) Criteria were previously calculated with bioconcentration factors that only accounted for direct water contact. In order to account for the variation in bioaccumulation due to the aquatic tropic position of an organism, EPA is recommending that the bioaccumulation factors be determined and applied to three tropic levels of fish. EPA used field measured BAF's and laboratory measured bioconcentration factors, along with octanol-water partition coefficients available from peer-reviewed databases to develop the national BAFs. EPA verified the calculated BAFs using a peer-reviewed model called Estimation Program Interface Suite (EPI Suite).

**Health Risk Factors** – EPA has updated the health risk factors using the most current toxicity information. The toxicity values for both noncarcinogenic and carcinogenic effects were used. EPA's Integrated Risk Information System (IRIS) is the primary source for reference dose and cancer slope values. For some pollutants EPA has used other sources provided by EPA's Office of Water, Office of Pesticide Programs and international and state agencies.

**Relative Source Contribution** – EPA has updated the Relative Source Contribution (RSC) to reflect chemical-specific exposure. The RSC will range from 20 -80 percent as recommended in EPA's human health methodology (USEPA 2000). This value is only applied to threshold non-carcinogens. The RSC protects against particular pollutant exposures from other foods, marine fish consumption, dermal exposure and respiratory exposures. The use of the RSC is to ensure that an individual's total exposure from all sources of a pollutant does not exceed the criteria.

## Criteria Development

Human health AWQC for toxic pollutants are necessary to protect any designated uses related to ingestion of water and ingestion of aquatic organisms. These uses can include, but are not limited to, recreation in and on the water, consumption of fish or shellfish (including consumption associated with fishing or shellfish harvesting), and protection of drinking water supplies. The derivation of human health AWQC requires information about both the toxicological endpoints of concern for water pollutants and the pathways of human exposure to those pollutants. EPA considers the following two primary pathways of human exposure to pollutants present in a particular water body when deriving human health 304(a) AWQC: (1) direct ingestion of drinking water obtained from the water body and (2) consumption of fish or shellfish obtained from the water body. (EPA Human Health Criteria Update, June 2015)

Below is the equation used for deriving human health AWQC for non-carcinogenic and carcinogenic effects, based on the consumption of both water and aquatic organism. EPA recommends including the drinking water exposure pathway for ambient surface waters where drinking water is a designated use for the following reasons: (1) drinking water is a designated use for surface waters under the CWA, and therefore criteria are needed to ensure that this designated use can be protected and maintained; (2) although they are rare, some public water

supplies provide drinking water from surface water sources without treatment; (3) even among the majority of water supplies that do treat surface waters, existing treatments might not be effective for reducing levels of particular contaminants; and (4) in consideration of the Agency's goals of pollution prevention, ambient waters should not be contaminated to a level where the burden of achieving health objectives is shifted away from those responsible for pollutant discharges and placed on downstream users that must bear the costs of upgraded or supplemental water treatment (USEPA 2000a). (EPA Human Health Criteria Update, June 2015)

The equations for deriving the criteria values are as follows (USEPA 2000a):  
For consumption of water and organisms:

$$\text{AWQC } (\mu\text{g/L}) = \frac{\text{Toxicity value (mg/kg-d)} \times \text{BW (kg)} \times 1,000 (\mu\text{g/mg}) / \text{DI (L/d)} + \sum(\text{FCR}_i)_{i=2}^4 \text{ (kg/d)} \times \text{BAF}_i \text{ (L/kg)}}{1}$$

Where:

**AWQC** = ambient water quality criteria

**Toxicity value** = RfD x RSC (mg/kg-d) for non-carcinogenic effects or 10<sup>-6</sup>/CSF (kg-d/mg) for carcinogenic effects

**RSC** = relative source contribution (applicable to only non-carcinogenic and nonlinear low-dose extrapolation for carcinogenic effects)

**BW** = body weight, default (80 Kg)

**DI** = drinking water intake, default (2.4 L/day)

**Σ<sub>i=2</sub>** = summation of values for aquatic trophic levels (TLs), where the letter *i* stands for the TLs to be considered, starting with TL2 and proceeding to TL4

**FCR<sub>i</sub>** = fish consumption rate for aquatic TLs 2, 3, and 4 – default (22.0 g/day)

**BAF<sub>i</sub>** = bioaccumulation factor for aquatic TLs 2, 3, and 4

(EPA rounds AWQC to the number of significant figures in the least precise parameter as described in the 2000 Methodology (USEPA 2000a, section 2.7.3.) The Department has rounded the AWQC in Table 5 to 2 significant figures.)

## Comparison Tables

### EPA 2015 Final Recommended Criteria and DEP Current Criteria –

Of the 94 pollutants recalculated by EPA, 55 will have a **more stringent** criterion than previously listed in Chapter 93, Table 5. These criteria have been recalculated to include chemical-specific bioaccumulation factors, which account for how long the pollutant will be available in the environment and in increased average body weight and fish consumption amount. These pollutant-specific inputs may be the driving factors for the change in the newly developed criteria. These AWQC are intended to be protective of the general adult population from non-carcinogenic or carcinogenic effects due to chronic (up to a lifetime) exposure.

**Table 1 – More Stringent Criteria**

|    | <b>Pollutant</b>                     | <b>CAS No.</b> | <b>DEP Current<br/>Water +<br/>Organism<br/>(µg/L)</b> | <b>DEP<br/>Proposed<br/>Water +<br/>Organism<br/>(µg /L)</b> | <b>EPA 2015<br/>Water +<br/>Organism<br/>(µg/L)</b> |
|----|--------------------------------------|----------------|--|--|---|
| 1  | 1,2,4-Trichlorobenzene               | 120-82-1       | 35   | .07  | 0.071   |
| 2  | 1,3-Dichlorobenzene                  | 541-73-1       | 420  | 7.0  | 7   |
| 3  | 1,3-Dichloropropene                  | 542-75-6       | 0.34   | 0.27   | 0.27  |
| 4  | 1,4-Dichlorobenzene                  | 106-46-7       | 420  | 300  | 300   |
| 5  | 2,4-Dichlorophenol                   | 120-83-2       | 77   | 10   | 10  |
| 6  | 2,4-Dimethylphenol                   | 105-67-9       | 380  | 100  | 100   |
| 7  | 2,4-Dinitrophenol                    | 51-28-5        | 69   | 10   | 10  |
| 8  | 2-Chloronaphthalene                  | 91-58-7        | 1,000  | 800  | 800   |
| 9  | 2-Chlorophenol                       | 95-57-8        | 81   | 30   | 30  |
| 10 | 2-Methyl-4,6-Dinitrophenol           | 534-52-1       | 13   | 2.0  | 2   |
| 11 | Acenaphthene                         | 83-32-9        | 670  | 70   | 70  |
| 12 | Acrolein                             | 107-02-8       | 6  | 3.0  | 3   |
| 13 | Aldrin                               | 309-00-2       | 0.000049   | 0.0000008  | 0.00000077  |
| 14 | alpha-Hexachlorocyclohexane<br>(HCH) | 319-84-6       | 0.0026   | 0.0004   | 0.00036   |
| 15 | alpha-Endosulfan                     | 959-98-8       | 62   | 20   | 20  |
| 16 | Anthracene                           | 120-12-7       | 8,300  | 300  | 300   |
| 17 | Benzene                              | 71-43-2        | 1.2  | 0.58   | 0.58  |
| 18 | Benzo(a)anthracene                   | 56-55-3        | 0.0038   | 0.001  | 0.0012  |
| 19 | Benzo(a)pyrene                       | 50-32-8        | 0.0038   | 0.0001   | 0.00012   |
| 20 | Benzo(b)fluoranthene                 | 205-99-2       | 0.0038   | 0.001  | 0.0012  |
| 21 | beta-Hexachlorocyclohexane<br>(HCH)  | 319-85-7       | 0.0091   | 0.008  | 0.0080  |
| 22 | beta-Endosulfan                      | 33213-65-9     | 62   | 20   | 20  |
| 23 | Bis(2-Chloro-1-Methylethyl)<br>Ether | 108-60-1       | 1,400  | 200  | 200   |
| 24 | Bis(2-Ethylhexyl) Phthalate          | 117-81-7       | 1.2  | 0.32   | 0.32  |
| 25 | Butylbenzyl Phthalate                | 85-68-7        | 1,500  | 0.1  | 0.10  |
| 26 | Chlordane                            | 57-74-9        | 0.0008   | 0.0003   | 0.00031   |
| 27 | Chlorobenzene                        | 108-90-7       | 130  | 100  | 100   |
| 28 | Cyanide                              | 57-12-5        | 140  | 4.0  | 4   |
| 29 | Dibenzo(a,h)anthracene               | 53-70-3        | 0.0038   | 0.0001   | 0.00012   |
| 30 | Dieldrin                             | 60-57-1        | 0.000052   | 0.000001   | 0.0000012   |
| 31 | Diethyl Phthalate                    | 84-66-2        | 17,000   | 600  | 600   |
| 32 | Dimethyl Phthalate                   | 131-11-3       | 270,000  | 2000   | 2,000   |
| 33 | Di-n-Butyl Phthalate                 | 84-74-2        | 2,000  | 20   | 20  |
| 34 | Endosulfan Sulfate                   | 1031-07-8      | 62   | 20   | 20  |
| 35 | Endrin                               | 72-20-8        | 0.059  | 0.03   | 0.03  |
| 36 | Ethylbenzene                         | 100-41-4       | 530  | 68   | 68  |
| 37 | Fluoranthene                         | 206-44-0       | 130  | 20   | 20  |
| 38 | Fluorene                             | 86-73-7        | 1,100  | 50   | 50  |
| 39 | Heptachlor                           | 76-44-8        | 0.000079   | 0.000006   | 0.0000059   |

|    |   |          |         |         |          |
|----|---|----------|---------|---------|----------|
| 40 | Hexachlorobenzene                           | 118-74-1 | 0.00028 | 0.00008 | 0.000079 |
| 41 | Hexachlorobutadiene                         | 87-68-3  | 0.44    | 0.01    | 0.01     |
| 42 | Hexachlorocyclopentadiene                   | 77-47-4  | 40      | 4.0     | 4        |
| 43 | Hexachloroethane                            | 67-72-1  | 1.4     | 0.1     | 0.1      |
| 44 | Indeno(1,2,3-cd)pyrene                      | 193-39-5 | 0.0038  | 0.001   | 0.0012   |
| 45 | Isophorone                                  | 78-59-1  | 35      | 34      | 34       |
| 46 | Nitrobenzene                                | 98-95-3  | 17      | 10      | 10       |
| 47 | Pentachlorophenol                           | 87-86-5  | 0.27    | 0.03    | 0.03     |
| 48 | Phenol                                      | 108-95-2 | 10,000  | 4000    | 4,000    |
| 49 | p,p'-Dichlorodiphenyldichloroethane (DDD)   | 72-54-8  | 0.00031 | 0.0001  | 0.00012  |
| 50 | p,p'-Dichlorodiphenyldichloroethylene (DDE) | 72-55-9  | 0.00022 | 0.00002 | 0.000018 |
| 51 | p,p'-Dichlorodiphenyltrichloroethane (DDT)  | 50-29-3  | 0.00022 | 0.00003 | 0.000030 |
| 52 | Pyrene                                      | 129-00-0 | 830     | 20      | 20       |
| 53 | Toluene                                     | 108-88-3 | 1,300   | 57      | 57       |
| 54 | trans-1,2-Dichloroethylene (DCE)            | 156-60-5 | 140     | 100     | 100      |
| 55 | Trichloroethylene (TCE)                     | 79-01-6  | 2.5     | 0.6     | 0.6      |

Per EPA **recommendation**, the following toxic pollutants **will be added** to the water quality criteria for toxic substances in Chapter 93, Table 5.

**1,1,1-Trichloroethane (TCE)** – The Department currently has acute (3000 ug/L) and chronic (800 ug/L) aquatic life criteria for 1,1,1-TCE. Chapter 93, Table 5 does not have a human health criterion for TCE. The EPA recommended human health criterion is 10000 ug/L. Ingestion of drinking water is a potentially significant source of exposure to 1,1,1-trichloroethane. Inputs used to derive the 2015 updated human health AWQC are protective of exposure to 1,1,1-trichloroethane from consuming drinking water and eating fish and shellfish (organisms) from inland and near shore waters.

**1,2-Dichloropropane**– Under the 1986 EPA *Guidelines for Carcinogen Risk Assessment* (USEPA 1986), 1,2-dichloropropane is classified as Group B2, “probable human carcinogen” (USEPA 1987). The major source of 1,2-dichloropropane in drinking water is discharge from industrial chemical factories. It may be released into the atmosphere or in wastewater during its production or use as an intermediate in chemical manufacture. There were also significant releases during its former use as a soil fumigant. It may also leach from municipal landfills. There are currently acute (11000 ug/L) and chronic (2200 ug/L) aquatic life criteria in Chapter 93, Table 5. The EPA recommended cancer risk level (CRL) is 0.9 ug/L.

**1,2,4,5-Tetrachlorobenzene** - was historically used as an insecticide, an intermediate in the production of herbicides and defoliants, and a component of dielectric fluids (USDHHS 2003). Currently, 1,2,4,5-tetrachlorobenzene is not registered for use as a pesticide (USEPA 2015c). The general population could be exposed to 1,2,4,5-tetrachlorobenzene via inhalation of ambient

air and drinking water (USDHHS 2003). EPA is recommending a human health criterion of 0.03 ug/L.

**2,4,5-Trichlorophenol** - was once registered as an antimicrobial by EPA, but is not currently a registered pesticide (USEPA 2015c). Chlorophenols can be formed when water containing humic substances is treated with chlorine and has a pH ranging from 7 to 8 (Krijgsheld and van der Gen 1986). The general population could be exposed to chlorophenols through ingestion of water and food contaminated with the compounds as well as inhalation of contaminated air (ATSDR 1999). 2,4,5-Trichlorophenol has been detected in ocean fish (ATSDR 1999). The EPA recommended human health criterion is 300 ug/L.

**3-Methyl-4-chlorophenol** - is used as a disinfectant and a preservative in the United States (USDHHS 2012). It also is registered in the United States as an antimicrobial pesticide and is currently in the reregistration process by EPA (USEPA 2015c). Exposure of the general U.S. population to the chemical might occur through inhalation and dermal contact (USDHHS 2012). EPA is recommending as human health criterion of 500 ug/L.

**Bis(chloromethyl)ether** – EPA has revised the human health criteria for bis(chloromethyl) ether to reflect the latest scientific information. Under the 1986 EPA *Guidelines for Carcinogen Risk Assessment* (USEPA 1986), bis(chloromethyl) ether is classified as Group A, “human carcinogen” (USEPA 1988). The EPA recommended cancer risk level (CRL) is 0.00015 ug/L.

**Chlorophenoxy Herbicide (2,4-D)** is a herbicide used to control broad-leaved weeds in cereals, grain crops, roadsides, and farm buildings (USDHHS 2012). 2,4-D is currently registered as a pesticide by EPA (USEPA 2015c). Human exposure to 2,4-D might occur through inhalation and ingestion of food and water (USDHHS 2012). The primary exposure routes for the general public are through food residues and water ingestion (USDHHS 2012).

Thus, based on its low potential for bioaccumulation, exposure to this chemical from ingestion of fish and shellfish is not considered likely. Because of the lack of data in fish and shell fish, EPA has not established BAF's according to trophic levels. 2,4-D is calculated with a total BAF of 13 L/kg. EPA's recommended criterion is rounded from 1371 ug/L to 1300 ug/L. The Department disagrees with this rounding and the criterion will be rounded up to 1400 ug/L.

**Chlorophenoxy Herbicide (2,4,5-TP)** is a herbicide that is no longer used in the United States. This herbicide was formerly used to control woody plants, broadleaf herbaceous weeds, and aquatic weeds (USDHHS 2010). Cancellation of all registered uses in the United States was put into effect on January 2, 1985 (USEPA 1998; USDHHS 2010). Prior to the cancellation of 2,4,5-TP, research surveys detected the chemical in large fruit samples and dairy products (USDHHS 2010). Recent monitoring information on 2,4,5-TP in imported foods could not be identified. Based on the available exposure information for 2,4,5-TP, and given that the chemical is no longer produced or used in the United States, EPA does not anticipate that there will be significant sources and routes of exposure of 2,4,5-TP other than fish and shellfish from inland and nearshore waters and water ingestion. EPA is recommending a human health criterion of 100 ug/L.

**Dinitrophenols** –DNPs can be found today in contaminated air, as well as in waste water originating from some manufacturing sites. After reviewing data presented in EPA’s ambient water quality criteria updates, the Dinitrophenols criterion will be adopted by PA DEP. The inputs used to calculate the criterion for dinitrophenols are identical to the inputs used to calculate 2,4-Dinitrophenol. Dinitrophenols will protect against other forms of dinitrophenols (2,5-dinitrophenol and 2,6-dinitrophenol). The EPA recommended criterion for dinitrophenols is 10 ug/L.

**Hexachlorocyclohexane (HCH)-technical** - has several isomers, one of which goes by the common name “lindane”. Lindane is found in prescription topical treatments and has been used as an insecticide on fruit, vegetables and forest crops. Technical grade HCH is classified as Group B2, “probable human carcinogen” (USEPA 1986b). EPA is recommending a CRL of 0.007 ug/L.

**Methoxychlor** - Methoxychlor is an insecticide that is no longer produced or used in the United States. Prior to its cancellation as an approved pesticide, the chemical was detected in fish from the Great Lakes at levels ranging from 10 to 120 µg/kg wet weight (ATSDR 2002). It also was detected in several species of migratory fish in Great Lakes tributaries at concentrations up to 1.4 µg/kg (ATSDR 2002). In EPA’s National Lake Fish Tissue Study (USEPA 2009c), the chemical was detected in 1–5 percent (i.e., 9 of 468) of the predator fillets (at a maximum concentration of 370 ppb) and 5.8 percent (i.e., 23 of 395) of the bottom dweller whole body fish samples (at a maximum concentration of 107 ppb) (USEPA 2009c). Thus, based on available exposure information and its high potential to bioaccumulate, ingestion of fish and shellfish is a potentially significant source of exposure to methoxychlor. The EPA recommended human health criterion is 0.02 ug/L.

**Pentachlorobenzene** is generated as a by-product in a variety of industrial processes, such as solid waste incineration and combustion of coal (USDHHS 2013). Air is likely the primary source by which the general population is exposed to pentachlorobenzene; however, water and food ingestion might also be significant (USDHHS 2013). Based on the physical properties and available exposure information for pentachlorobenzene, air, fish, and shellfish are potentially significant sources. EPA is recommending a human health criterion of 0.1 ug/L.

**Table 2 – New Pollutants to be added to Chapter 93, Table 5**

|   | <b>Pollutant</b>                | <b>CAS No.</b> | <b>DEP<br/>Current<br/>Water +<br/>Organism<br/>(µg/L)</b> | <b>DEP<br/>Proposed<br/>Water +<br/>Organism<br/>(µg /L)</b> | <b>EPA 2015<br/>Water +<br/>Organism<br/>(µg/L)</b> |
|---|---------------------------------|----------------|--|--|---|
| 1 | 1,1,1-Trichloroethane           | 71-55-6        | None   | 10000  | 10,000  |
| 2 | 1,2-Dichloropropane             | 78-87-5        | None   | 0.9  | 0.90  |
| 3 | 1,2,4,5-Tetrachlorobenzene      | 95-94-3        | None   | 0.03   | 0.03  |
| 4 | 2,4,5-Trichlorophenol           | 95-95-4        | None   | 300  | 300   |
| 5 | 3-Methyl-4-Chlorophenol         | 59-50-7        | None   | 500  | 500   |
| 6 | Bis(Chloromethyl)Ether          | 542-88-1       | None   | 0.0002   | 0.00015   |
| 7 | Chlorophenoxy Herbicide (2,4-D) | 94-75-7        | None   | 1400   | 1300  |

|    |   |            |      |       |        |
|----|---|------------|------|-------|--------|
| 8  | Chlorophenoxy Herbicide (2,4,5-TP) [Silvex] | 93-72-1    | None | 100   | 100    |
| 9  | Dinitrophenols                              | 25550-58-7 | None | 10    | 10     |
| 10 | Hexachlorocyclohexane (HCH)-Technical       | 608-73-1   | None | 0.007 | 0.0066 |
| 11 | Methoxychlor                                | 72-43-5    | None | 0.02  | 0.02   |
| 12 | Pentachlorobenzene                          | 608-93-5   | None | 0.1   | 0.1    |

EPA has recalculated the toxicity of the following 18 pollutants which will result in a reduced criterion. These criteria have been recalculated to include chemical-specific bioaccumulation factors, which accounts for how long the pollutant will be available in the environment and in increased average body weight and fish consumption amount. These pollutant-specific inputs may be the driving factors for the change in the newly developed criteria.

**Table 3 – Recalculated less stringent criteria**

|    | <b>Pollutant</b>                           | <b>CAS No.</b> | <b>DEP<br/>Current<br/>Water +<br/>Organism<br/>(µg/L)</b> | <b>DEP<br/>Proposed<br/>Water +<br/>Organism<br/>(µg/L)</b> | <b>EPA 2015<br/>Water +<br/>Organism<br/>(µg/L)</b> |
|----|--|----------------|--|---|---|
| 1  | 1,2-Dichlorobenzene                        | 95-50-1        | 420  | 1000  | 1,000   |
| 2  | 1,2-Dichloroethane                         | 107-06-2       | 0.38   | 9.9   | 9.9   |
| 3  | 3,3'-Dichlorobenzidine                     | 91-94-1        | 0.021  | .05   | 0.049   |
| 4  | Acrylonitrile                              | 107-13-1       | 0.051  | 0.06  | 0.061   |
| 5  | Benzidine                                  | 92-87-5        | 0.000086   | 0.0001  | 0.00014   |
| 6  | Benzo(k)fluoranthene                       | 207-08-9       | 0.0038   | 0.01  | 0.012   |
| 7  | Bromoform                                  | 75-25-2        | 4.3  | 7.0   | 7.0   |
| 8  | Carbon Tetrachloride                       | 56-23-5        | 0.223  | 0.4   | 0.4   |
| 9  | Chlorodibromomethane                       | 124-48-1       | 0.4  | 0.8   | 0.80  |
| 10 | Chloroform                                 | 67-66-3        | 5.7  | 60  | 60  |
| 11 | Chrysene                                   | 218-01-9       | 0.0038   | 0.12  | 0.12  |
| 12 | Dichlorobromomethane                       | 75-27-4        | 0.55   | 0.95  | 0.95  |
| 13 | Endrin Aldehyde                            | 7421-93-4      | 0.29   | 1.0   | 1   |
| 14 | gamma-Hexachlorocyclohexane (HCH)          | 58-89-9        | 0.98   | 4.2   | 4.2   |
| 15 | Methyl Bromide                             | 74-83-9        | 47   | 100   | 100   |
| 16 | Methylene Chloride                         | 75-09-2        | 4.6  | 20  | 20  |
| 17 | Tetrachloroethylene<br>(Perchloroethylene) | 127-18-4       | 0.69   | 10  | 10  |
| 18 | Toxaphene                                  | 8001-35-2      | 0.00028  | 0.0007  | 0.00070   |

There are 10 pollutants that have an **insignificant** change in the toxicity and will not require any change to the current criteria.

**1,1-Dichloroethylene** – Under the 1986 EPA *Guidelines for Carcinogen Risk Assessment* (USEPA 1986), 1,1-dichloroethylene is classified as Group C, “possible human carcinogen” (USEPA 2002d). EPA has not identified a cancer slope factor for this compound. Therefore, a

factor of 10 has been applied to the current human health criterion (1,1-DCE) for the protection of carcinogenic effects. Our current criterion is 33 ug/L. The recalculated criterion is 30 ug/L. This is an insignificant change, and therefore the human health criterion of 33 ug/L will remain in Chapter 93, Table 5.

**Table 4 – Criteria with no significant change**

|   | <b>Pollutant</b>          | <b>CAS No.</b> | <b>DEP Current Water + Organism (µg/L)</b> | <b>DEP Proposed Water + Organism (µg /L)</b> | <b>EPA 2015 Water + Organism (µg/L)</b> |
|---|---------------------------|----------------|--|--|---|
| 1 | 1,1-Dichloroethylene      | 75-35-4        | 33   | 30   | 300                                     |
| 2 | 1,1,2,2-Tetrachloroethane | 79-34-5        | 0.17                                       | 0.2  | 0.2                                     |
| 3 | 1,1,2-Trichloroethane     | 79-00-5        | 0.59                                       | 0.55   | 0.55                                    |
| 4 | 1,2-Diphenylhydrazine     | 122-66-7       | 0.036                                      | 0.03   | 0.03                                    |
| 5 | 2,4,6-Trichlorophenol     | 88-06-2        | 1.4  | 1.5  | 1.5                                     |
| 6 | 2,4-Dinitrotoluene        | 121-14-2       | 0.05                                       | 0.05   | 0.05                                    |
| 7 | Bis(2-Chloroethyl) Ether  | 111-44-4       | 0.03                                       | 0.03   | 0.03                                    |
| 8 | Heptachlor Epoxide        | 1024-57-3      | 0.000039                                   | 0.0004                                       | 0.00003                                 |
| 9 | Vinyl Chloride            | 75-01-4        | 0.025                                      | 0.02   | 0.02                                    |

### **Recommendation**

The EPA's recommended ambient water quality criteria for the protection of human health provide technical information for states to establish water quality standards (i.e., criteria) and to protect human health under the Clean Water Act (CWA). Under the CWA and its implementing regulations, states are required to adopt water quality criteria to protect designated uses (e.g., public water supply, aquatic life, recreational use, or industrial use) that are based on sound scientific rationale.

After a thorough review of the 94 individual recommended criteria updates, the Department recommends adopting updated criteria for 73 compounds and adding 12 new human health compounds to Chapter 93, Table 5. There are 9 EPA recommended criteria that will remain the same as currently in the Chapter 93, Table 5 regulation.

In addition, DEP recommends updating the applicable criteria in Table 5 with EPA's latest exposure factors for body weight, drinking water intake, and fish consumption; also using the methodology used to determine the bioaccumulation in fish, and other toxicity factors (reference dose and cancer slope factors).

**Literature Cited**

US EPA, *Final Updated Ambient Water Quality Criteria for the Protection of Human Health*, EPA-HQ-OW-2014-0135; FRL-9929-85-OW, (June 29, 2015)  
<http://water.epa.gov/scitech/swguidance/standards/criteria/current/hhfinal.cfm>

US EPA, *EPA Guidelines for Carcinogen Risk Assessment* (USEPA 1986)

US EPA, *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (2000).

Centers for Disease Control and Prevention (CDC), *National Health and Nutrition Examination Survey (NHANES), 1999 – 2006; 2003 to 2010*.

PA Code, Title 25, Chapter 93, *Water Quality Standards*, Table 5, *Water Quality Criteria for Toxic Substances*.

U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Toxic Substances Portal  
<https://www.atsdr.cdc.gov/substances/index.asp>