September 30, 2019

WEST VIRGINIA MANUFACTURERS ASSOCIATION
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VIA US MAIL AND EMAIL

Ms. Laura K. Cooper
Water Quality Standards, DWWM
WV Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

Re: Proposed Human Health Criteria Prepared in Response to 47 CSR § 2-8.6

Dear Ms. Cooper:

During the 2019 session, the West Virginia Legislature added subsection 8.6 to 47 CSR 2, which provides the following:

> On or before April 1, 2020, the Secretary shall propose updates to the numeric human health criteria found in Appendix E, subsection 8.23 Organics and subsection 8.25 Phenolic Materials to be presented to the 2021 Legislative Session. The Secretary shall allow for submission of proposed human health criteria until October 1, 2019, and for public comment and agency review for an appropriate time thereafter.

The West Virginia Manufacturers Association (WVMA) has reviewed the 2015 national recommended human health criteria prepared by the US Environmental Protection Agency (the 2015 US EPA HH Criteria), along with the recalculated criteria prepared by the West Virginia Department of Environmental Protection (DEP) in July 2018. Based on this review, the WVMA has prepared proposed human health criteria for consideration by the Secretary pursuant to 47 CSR § 2-8.6 (the WVMA Draft HH Criteria). The calculations for the WVMA Draft HH Criteria are provided in Attachment A and an Excel spreadsheet to facilitate review by DEP and the public.

Scope of Review

The US EPA HH Criteria are calculated based on the following factors for each chemical:

- Cancer slope factor (CSF) for carcinogens
- Reference dose (RfD) for non-carcinogens
- Relative source contribution (RSC) for non-carcinogens
- Bioaccumulation factors (BAFs) for each trophic level
- Fish consumption rate for each trophic level

- Body weight
- Water consumption rate

The WVMA reviewed each factor except for body weight and water consumption rate. While EPA encourages States to consider local information for these factors, they are beyond the scope of the current WVMA review.

The West Virginia Water Quality Standards in 47 CSR 2 contain values for sixty-one (61) organic parameters. Three parameters have values that have not changed in EPA's 2015 recommended HH Criteria (PCBs, dioxin, and benzene). Therefore, we reviewed the criteria calculations for fifty-eight (58) organic parameters.

In 2000, US EPA published its *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (the 2000 Methodology).[1] We have assumed that the 2000 Methodology is a valid technical approach for the calculation of human health criteria. Any criticisms of this approach are beyond the current scope of review.

Prior to issuing the 2015 US EPA HH Criteria, the last version of the US EPA human health criteria was published in 2002. The WVMA reviewed the *2002 Human Health Criteria Calculation Matrix* (the 2002 Matrix) to assess the factors that changed between the 2002 and 2015 national recommended human health criteria.[2] A copy of the 2002 Matrix is provided in Attachment B.

Cancer Slope Factor and Reference Dose

DEP also utilizes CSF and RfD in the calculation of *de minimis* criteria as part of the West Virginia Voluntary Remediation Program (VRP). The WVMA's review of the CSF and RfD focused on consistency between the factors used in the human health water quality criteria and the VRP. The WVMA is aware of criticisms regarding the multiple layers of conservatism utilized in US EPA's calculation of CSF and RfD. The overall calculation technique for these factors is beyond the limited scope of the WVMA review and is neither confirmed not challenged in the calculations presented herein.

The WVMA consulted with DEP regarding the differences between the CSF and RfD utilized by the two programs. The methodology for determination of these factors for the VRP is prescribed by statute, whereas the values are determined according to the 2000 Methodology for human health criteria. Therefore, the differences between the CSF and RfD developed for these two programs are associated with the methodologies employed.

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[1] *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (2000). EPA-822-B-00-004. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Washington, DC.

[2] *Human Health Criteria Calculation Matrix* (2002). EPA-822-R-02-012. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Washington, DC.

Based on this review, the WVMA has used the CSF and RfD utilized in the 2015 US EPA HH Criteria.

Relative Source Contribution

The RSC is utilized in calculation of human health criteria for non-carcinogens. The RSC is applied to the criteria calculations to account for other potential human exposures to the chemical, such as through consuming food other than fish, dermal exposure, or inhalation.

EPA derived the RSC for each chemical by using the Exposure Decision Tree approach described in the 2000 Methodology. Where insufficient data are available on other sources of exposure to a chemical, the Exposure Decision Tree approach results in a recommended RSC of 20 percent (0.2). According to the 2000 Methodology, the 20 percent value for the RSC may be replaced where sufficient data are available to develop a scientifically defensible alternative value.

The WVMA believes that there is sufficient information available to determine relatively accurate RSC values for several chemicals. Two examples are provided below:

The Agency for Toxic Substances & Disease Registry (ATSDR; www.atsdr.cdc.gov) provides detailed information on the sources, fate, and human health/environmental effects for several chemicals. Two chemicals for which EPA issued updated human health criteria, having a RSC of 0.2, are chlordane and DDT. Both chemicals are synthetic and were used as pesticides for several decades before being banned by the United States. Regarding chlordane, ATSDR states that:

> The most common source of chlordane exposure is from ingesting chlordane-contaminated food…..Chlordane may also be found in fish and shellfish caught in chlordane-contaminated waters….Chlordane is almost never detected in drinking water. (Chlordane Public Health Statement).

Regarding DDT, the Public Health Statement issued by ATSDR states:

> People in the United States are exposed to DDT, DDE, and DDD mainly by eating foods containing small amounts of these compounds…DDT from contaminated water and sediment may be taken up by fish…The largest fraction of DDT in a person's diet comes from meat, poultry, dairy products, and fish, including the consumption of sport fish.

The WVMA believes that the DEP should consult readily-available information to determine realistic, scientifically-based RSC values. The default RSC value of 0.2 for many chemicals is based on a policy determination, not actual information on environmental sources and exposure likelihood.

Twenty-three of the parameters with WV human health criteria are based on non-carcinogenic effects and therefore utilize the RSC in the criteria calculations. All but five of these rely on US EPA's default RSC of 20 percent. The WVMA notes that EPA has approved state-proposed RSC values that are higher than 0.2. EPA Region 10 recently provided to the Washington Department of Ecology a letter that reverses several decisions concerning Washington's adoption of HH criteria (EPA Region 10 letter to Maia Bellon, Director of Washington Department of Ecology dated May 18, 2019). Regarding RSC values, EPA Region 10 allows Washington to use a value of 1.0 (i.e., all exposure of a given chemical originates from drinking water or consumption of fish):

> The EPA now concludes that Ecology's use of an RSC of 1, coupled with other more conservative inputs in the HHC equations, appropriately balanced risks and resulted in HHC that are based on sound science and are protective of Washington's designated uses, consistent with the rationale provided in Ecology's submittal.

Accordingly, as of now the WVMA proposes to adopt the RSC presented in the 2015 US EPA HH Criteria. We believe, however, that it is incumbent for DEP to conduct research that determines realistic, scientifically defensible RSC values for all of the draft HH criteria. When additional work is completed to develop actual RSC values under the EPA Exposure Decision Tree, the RSC utilized in the calculation of the WV human health criteria should be revised accordingly.

Bioaccumulation Factors

Based on our initial review of the 2015 US EPA HH Criteria, we determined that the BAF was the primary component influencing the changes in the criteria as compared to the 2002 national recommended criteria. Accordingly, the scope of the WVMA review focused on the BAF utilized in the 2015 US EPA HH Criteria.

We encountered substantial difficulty in assembling the information utilized by EPA in preparing its 2015 BAF. We were hampered by a lack of transparency and difficulty in obtaining the necessary data for review. The studies relied upon by EPA were poorly described, sometimes difficult to locate, and frequently expensive to obtain. We had expected that the studies would be readily available from the EPA, but that was not the case. Our contacts with EPA were slow to produce useful information on the BAF studies, which affected our ability to complete the intended work.

We were further surprised by the lack of recent data for EPA's calculations. During the 2018 Legislative Session, the WVMA was repeatedly accused of obstructing the adoption of the most recent science. To the contrary, we learned that of the over 160 studies relied upon by EPA, only 12 had been published since 2000. Doing our own research on only a couple of the human health parameters, we located 75 studies that had been published after 2000, and there are probably hundreds of more recent, relevant scientific studies if the literature for all the criteria were surveyed. There may be reasons EPA did not evaluate or include the newer data, but this

justification is absent from the EPA documents available to the public regarding the 2015 US EPA HH Criteria.

The 2002 methodology presents four alternatives for determination of the BAF used in the calculation of the national recommended HH criteria. The following is the order of preference for determination of BAFs:

1) BAF - Bioaccumulation Factors calculated from actual exposure in surface waters
2) BSAF – Bio-sediment Accumulation Factors calculated from sediment exposures
3) BCF – Bioconcentration Factors calculated from laboratory exposure studies
4) Log K_{ow} – Calculated values based on the octanol-water partition coefficient for the chemical

The octanol-water partition coefficient (K_{ow}) is widely used to assess the partitioning behavior of chemicals in the environment. It serves as a surrogate for the partitioning of chemicals from aqueous media to organic matrices, such as the lipid tissue in aquatic organisms and humans. K_{ow} is a constant, meaning it has a specific value for each chemical, but it can be influenced by factors such as pH and temperature.

EPA's BAF were calculated from Log K_{ow} for the large majority of the fifty-eight human health criteria under review herein:

Calculated from K_{ow}	33
BCF Method	10
BAF Method	9
Copied from Benzo(a)pyrene	6
TOTAL	58

The Log K_{ow} is the least preferred method for determination of BAFs. EPA's database contains no BSAFs, although many studies report BSAFs for organics. Therefore, the 2015 US EPA HH Criteria do not consider one of the preferred alternatives for determination of BAFs.

When EPA believes the BAF, BSAF, and BCF data are insufficient, EPA uses a model to convert the Log K_{ow} value to BAFs for each of the fish trophic levels. In the 2015 US EPA HH Criteria, EPA used the BCFBAF model to estimate national BAFs from Log K_{ow}. The following factors have default values (assumptions) that are used in BCFBAF model to calculate the national BAFs:

- Weight of organisms
- Mean water temperature
- Overall food web biomagnification factor
- Maximum trophic level dilution factor
- Lipid content of lowest trophic level organisms (TL1)
- Lipid fractions for TL2, TL3, and TL4 fish
- Fraction of freely dissolved chemical in the water

The BAFBCF model was calibrated largely from data collected from the Great Lakes with no demonstration that the assumptions are appropriate for other surface waters in the United States. For example, lakes and reservoirs in West Virginia do not have hydraulic residence times that are similar to the Great Lakes. The use of Great Lakes values was controversial in the adoption of the 2015 US EPA HH Criteria. Moreover, the BCFBAF model departs from the requirements of the 2002 Methodology.

The WVMA is faced with an incredible lack of information to develop appropriate BAFs under the 2000 Methodology. The BAFs utilized in the 2015 US EPA HH Criteria are based largely on modeled results from Log K_{ow} employing a technique that does not align with the requirements of the 2000 Methodology. The database for recalculation of BAFs is woefully insufficient.

Accordingly, the WVMA proposes to adopt the BAFs presented in the 2002 Matrix. These BAFs were selected by US EPA soon after preparation of the 2000 Methodology. For the group of parameters commonly known as polynuclear aromatic hydrocarbons, we propose that DEP maintain the current human health criteria, as they were adjusted by EPA in 2002 based on values in the IRIS database and are lower than the calculations based on the 2002 BAFs.

Fish Consumption Rates

In July 2018, DEP developed West Virginia-specific fish consumption rates for each trophic level of fish. This work was based upon a fish consumption study conducted by Responsive Management on behalf of DEP in 2008. In addition, DEP consulted with the West Virginia Division of Natural Resources regarding the allocation of the West Virginia fish consumption rate among the trophic fish levels. In preparing the WVMA Draft HH Criteria, we have accepted the work by DEP on developing a fish consumption rate for the State, along with its allocation among the three trophic levels.

Criteria for Phthalates

Although it was included in the scope of work for the criteria review, the WVMA does not propose criteria for bis(2-ethylhexyl) phthalate (BEHP). This chemical is a common laboratory contaminant with known false positive detections. We have calculated and included proposed criteria for other phthalates. However, DEP may determine that continued regulation of total phthalates is preferred to adoption of criteria for individual phthalates.

Recommendations for Additional Work

We believe that the WVMA Draft HH Criteria satisfy the Legislative mandates of 47 CSR § 2-8.6. However, substantial additional work should be completed that is beyond the constraints imposed by the October 1, 2019 deadline and the financial resources of the WVMA. The following additional tasks should be considered by DEP to improve the accuracy of the West Virginia human health criteria:

1. **Revise the Log K_{ow} numbers and BAFs based on West Virginia-specific water conditions.** Log K_{ow} is a measure of how a chemical partitions between lipid (fat) and water, and gives some indication of potential bioaccumulation. Most of the BAFs are based on Log K_{ow} rather than laboratory or empirical data. The Log K_{ow} are converted to calculated BAFs using a computer model. The assumptions in the model should be adjusted based on information for West Virginia streams, such as pH and temperature.

2. **Make more realistic approximations of RSC.** Relative Source Contributions are approximations of where exposures to non-carcinogens occur. By assuming a RSC of 20%, EPA assumes most of our exposure to a chemical comes from sources other than drinking water and eating fish. This unlikely assumption substantially reduces the criterion that is calculated for each chemical. DEP should use readily-available information to delineate relatively accurate RSC values.

3. **Evaluate EPA studies, and give greater weight to those that provide data on fish that are caught in West Virginia.** Many of the EPA studies contain data on bioaccumulation or bioconcentration by marine species, minnows, or plants, which either aren't eaten by West Virginians, or cannot be affected by our water quality standards. In deciding on West Virginia criteria, we should be looking at the fish that West Virginians eat that could be affected by pollutant concentrations in West Virginia. We cannot control exposures in other States.

4. **Use probabilistic rather than deterministic statistical methods.** When developing criteria, assumptions are used to address uncertainty regarding how a chemical will affect humans. For example, when rat studies are used to determine carcinogenicity or toxicity, conservative assumptions are made to account for the unknown difference between rat and human physiology. These assumptions result in more stringent calculations than would otherwise be justified by the data. However, when conservative assumptions are made for several factors in the calculation of criteria, the conservativism multiplies beyond reason. Probabilistic analysis adjusts for that, and results in a more reasonable, but still conservative, criterion.

The WVMA may propose further work in one or more of the foregoing areas. While we hope that the DEP will consider initiating its own investigations of these additional tasks, we understand time and resource constraints. At a minimum, we encourage DEP to consider proposing, as part of any future water quality standards rulemaking, a provision for developing site-specific criteria that allows use of one or more of these tools.

Summary

We have used the following data and methodologies in developing the WVMA Draft HH Criteria:

- EPA's 2015 RfD and RSC for non-carcinogens

- EPA's 2015 CSF for carcinogens
- EPA's 2015 new drinking water consumption and body weight numbers
- West Virginia's fish consumption rate and trophic level apportionment
- EPA's 2002 Bioaccumulation Factors.

We appreciate the opportunity to provide proposed human health criteria for consideration by DEP. Please let us know of any additional information that might facilitate your review of this proposal.

Best regards,

Rebecca McPhail, President

RRM/ss
enclosures

Attachment A

	Current WV Human Health Criteria		2018 DEP Proposed Criteria		2019 WVMA Proposed Criteria	
	C	A	C	A	C	A
1,1,1- trichloroethane[b] (mg/l)		12	370	13	577	13
1,1,2,2-tetrachloroethane (ug/l)	11	0.17	6	0.2	8	0.2
1,1-dichloroethylene[b] (ug/l)	3.2	0.03	34000	330	14,000	326
1,2-dichlorobenzene (mg/l)	17	2.7	7	2	9	2
1,2-dichloroethane[b] (ug/l)	99	0.035	1400	10	2040	10
1,3-dichlorobenzene (mg/l)	2.6	0.4	0.027	0.009	0.06	0.01
1,4-dichlorobenzene (mg/l)	2.6	0.4	1.8	0.4	2.0	0.4
2,4-dinitrotoluene[b] (ug/l)	9.1	0.11	3.5	0.049	3.2	0.05
2-Chloronaphthalene (ug/l)	1600	1000	2500	1200	2560	1200
2-methyl-4,6-Dinitrophenol (ug/l)	765	13.4	56	2	88	2
Acenaphthene (ug/l)	990	670	190	130	401	200
Acrylonitrile[b] (ug/l)	0.66	0.059	15	0.061	0.50	0.05
Aldrin[b] (ng/l)	0.071	0.071	0.0014	0.0014	0.10	0.097
alpa-BHC[b] (ug/l)	0.013	0.0039	0.00084	0.00073	0.0099	0.0034
Anthracene (ug/l)	40,000	8,300	800	570	16,000	1780
Benzene[b] (ug/l)	51	0.66	51	0.66	51	0.66
Benzo(a) Anthracene[b] (ug/l)	0.018	0.0038	0.0028	0.0027	0.37	0.04
Benzo(a) Pyrene[b] (ug/l)	0.018	0.0038	0.00028	0.00027	0.037	0.004
Benzo(b) Fluoranthene[b] (ug/l)	0.018	0.0038	0.0028	0.0027	0.37	0.04
Benzo(k) Fluoranthene[b] (ug/l)	0.018	0.0038	0.028	0.027	3.7	0.41
beta-BHC[b] (ug/l)	0.046	0.014	0.029	0.011	0.035	0.012
Bromoform[b] (ug/l)	140	4.3	240	7.2	480	7.3
Butylbenzyl Phthalate (ug/l)			0.22	0.22	10	6.5
Carbon tetrachloride[b] (ug/l)	4.4	0.25	10	0.5	6.2	0.44
Chlordane[b] (ng/l)	0.46	0.46	0.6	0.59	1.6	1.6
Chlorobenzene (mg/l)	21	0.68	1.7	0.12	3138	130
Chloroform[b] (ug/l)	470	5.7	4800	66	4310	66
Chrysene[b] (ug/l)	0.018	0.0038	0.28	0.27	37	4
DDT[b] (ng/l)	0.024	0.024	0.05	0.05	0.44	0.44
Dibenzo(a,h)Anthracene[b] (ug/l)	0.018	0.0038	0.00028	0.00027	0.037	0.004
Dichlorobromomethane[b] (ug/l)	17	0.55	56	0.96	63	0.97
Dieldrin[b] (ng/l)	0.071	0.071	0.0022	0.0022	0.11	0.10
Diethyl Phthalate (ug/l)			1400	1100	18,000	4100
Dimethyl Phthalate (ug/l)			4000	3800	450,000	58000
Di-n-Butyl Phthalate (ug/l)			60	50	1800	490
Dioxin (2,3,7,8- TCDD)[b] (pg/l)	0.014	0.013	0.014	0.013	0.014	0.013
Endrin (ng/l)	2.3	2.3	64	63	0.49	0.46
Ethylbenzene (mg/l)	29	3.1	0.26	0.094	0.95	0.13
Fluoranthene (ug/l)	370	300	43	37	56	46
Fluorene (ug/l)	5300	1100	130	90	2500	270
gamma-BHC[b] (ug/l)	0.063	0.019	9.1	8.2	146	51
Heptachlor[b] (ng/l)	0.21	0.21	0.011	0.0011	0.18	0.17
Hexachlorobenzene[b] (ng/l)	0.77	0.72	0.15	0.15	0.91	0.89
Indeno(1,2,3-cd)Pyrene[b] (ug/l)	0.018	0.0038	0.0028	0.0027	0.37	0.04
Methoxychlor (ug/l)	0.03	0.03	0.04	0.03	0.53	0.53
Methyl Bromide (ug/l)	1500	47	25000	130	8620	131
Methylene Chloride[b] (ug/l)	590	4.6	2700	17	4489	17
PCB[b] (ng/l)	0.045	0.044	0.045	0.044	0.045	0.044
Phenol	4,600,000	4000	570,000	4000	690,000	4000
2-Chlorophenol	400	120	1700	33	60	21
2,4-Dichlorolphenol	790	93	120	17	119	17
2,4-Dimethylphenol	2300	540	5300	130	345	96
2,4-Dinitrophenol	14000	70	740	13	2155	13
Pentachlorophenol	8.2	0.28	0.07	0.04	1.84	0.08
Pyrene (ug/l)	4000	830	60	40	1616	178
Tetrachloroethylene[b] (ug/l)	8.85	0.8	59	13	126	14
Toluene[b] (mg/l)	200	6.8	1.1	0.061	1.47	0.06
Toxaphene[b] (ng/l)	0.73	0.73	1.5	1.4	0.56	0.55
Trichloroethylene[b] (ug/l)	81	2.7	14	0.6	15	0.64
Vinyl chloride[b] (chloroethene) (ug/l)	525	2	3.4	0.022	5	0.02

Override by current WV human health criteria

Attachment B

United States
Environmental Protection
Agency

Office of Water
(4304T)

EPA-822-R-02-012
November 2002

EPA

National Recommended Water Quality Criteria: 2002

Human Health Criteria Calculation Matrix

Notices

This document contains information regarding the calculation of the human health criteria contained in the document entitled, *National Recommended Water Quality Criteria: 2002*. This document provides: cancer potency factors (q1*s); reference doses (RfDs); relative source contributions (RSCs); fish intake values; and equations used to derive the human health criteria in the aforementioned compilation.

This document is not a regulation and cannot substitute for the Clean Water Act or Environmental Protection Agency (EPA) regulations. Thus, the criteria in the calculation matrix cannot impose legally binding requirements on EPA, states, authorized tribes or the regulated community.

NRWQC: HUMAN HEALTH CRITERIA CALCULATION MATRIX (November 2002)

Priority Pollutants

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
1	Antimony 77440 36 0	RfD = 4E-4 BCF = 1 FI = 6.5	14/4300	IRIS 02/01/91	RfD = 4E-4 RSC= 40% [a] BCF = 1 FI = 17.5	2000	5.6/640	IRIS 02/01/91
2	Arsenic 7440 38 2	q1* = 1.75 [9] BCF = 44 (for oysters) FI = 6.5	0.018/.14	57FR60848	q1* used = 1.75 [9] BCF = 44 FI = 6.5	1980	0.018/0.14	57FR60848
3	Berylium 7440 41 7	q1* = 4.3 BCF = 19	------	IRIS 09/01/92	----	NA	-----	------
4	Cadmium 7440 43 9	RfD = 0.001(food) RfD= 0.0005(water)	------	IRIS 02/01/94	RfD = 1E-3 (food) RfD= 0.0005(water) RSC = 25%	NA	-------	------
5	Chromium (III) 16065 83 1	RfD withdrawn BCF = 16	------	IRIS 03/01/88	1.5E+0	NA	-------	-------
5a	Chromium (VI) 18540 29 9	RfD = 5E-3 BCF = 16	------	IRIS 12/01/96	3E-3	NA	------	-------
6	Copper 7440508	WQC based on DW Action level BCF = 36	1300/ --	AWQC ADDENDUM 1989 DRAFT final lead/copper rule 57 FR 26460	AWQC ADDENDUM 1989 DRAFT final lead/copper rule 57 FR 26460	Drinking water regulation	1,300/ --	WQC based on DW Action level

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
7	Lead 7439921	WQC based on old Drinking water MCL	-------	Lead/Copper Rule 57 FR 26460	------	NA	-------	-------
8	Mercury 7439976	RfD = 1E-4 BCF = 3760-9000 (PBCF = 7342.6) FI = 18.7	0.050/0.051	62 FR42160	Methylmercury CAS No. 22967926 RfD = 1E-4 ng/kg BW-day RSC = 2.7E-5 mg/kg BW-day (subtracted from RfD to account for marine fish consumption) FI = 17.5	2000	0.3 mg/kg	EPA 823-R-01-001
9	Nickel	RfD = 2E-2 BCF = 47 FI = 6.5	610/4600	IRIS 12/01/96 for Nickel, soluble salts used	RfD = 2E-2 BCF = 47 FI = 6.5	1980 (Undergoing Major reassessment, no revision)	610/4,600	IRIS12/01/96
10	Selenium 7782492	RfD = 5E-3 BCF =4.8 (1988 Addendum used) FI = 6.5	170/11,000[12]	IRIS 09/01/91	RfD = 5E-3 BCF =4.8 (1988 Addendum used) FI = 17.5	2000	170/4,200	IRIS 09/01/91
11	Silver 7440224	RfD = 5E-3 BCF = 0.5	------	IRIS 12/01/96	RfD = 5E-3 BCF = 0.5	NA	------	-------
12	Thallium[5] 7440280	RfD = 6.8E-5[6] (RFD LISTED IS FOR THALLIUM SULFATE) BCF = 116 FI = 6.5	1.7/6.3	IRIS 09/01/90	RfD = 6.8E-5 [6,10,b] (RFD LISTED IS FOR THALLIUM (I) SULFATE 7446-18-6) BCF = 116 RSC = 20% (not used) FI = 6.5	1980	1.7/6.3	IRIS 09/01/90
13	Zinc 7440666	RfD = 3E-1 BCF = 47 FI = 6.5	9100/69,000[12]	IRIS 10/01/92	RfD = 3E-1 BCF = 47 FI = 17.5	2000	7,400/26,000	IRIS 10/01/92

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
14	Cyanide 57125	RfD = 2E-2 BCF = 1 FI = 6.5	700/220,000	IRIS 02/01/93	RfD = 2E-2[10] BCF = 1 RSC = 20% [c] (not used) FI = 6.5	1980	700/220,000	IRIS 02/01/93
15	Asbestos 1332214	Based on drinking water MCL	7 million Fibers/L	DW MCL 56 FR 3526 1/30/91	Based on drinking water MCL		7 million Fibers/L	DW MCL 56 FR 3526 01/30/91
16	2,3,7,8-TCDD(Dioxin) 1746016	q1* = 1.56E+5 BCF = 5000 (q1* no longer listed on IRIS) FI = 6.5	1.3E-8/ 1.4E-8	1984 AWQC Document EPA 440/5-84-007	q1* = 1.56E+5 BCF = 5000 (q1* no longer listed on IRIS) FI = 17.5	2000	5.0E-9/5.1E-9	1984 AWQC Document EPA 440/5-84-007 + 2000 Methodology
17	Acrolein 107028	ADI = 15.6 ug/kg/day BCF = 215 FI = 6.5	320/780	1980 AWQC document EPA 440/5-80-016	ADI = 15.6 ug/kg/day (or 0.0156 mg/kg/day) BCF = 215 FI = 17.5	2000	190/290	1980 AWQC document EPA 440/5-80-016
18	Acrylonitrile 107131	q1* = 5.4E-1 BCF = 30 FI = 6.5	0.059/0.66	IRIS 01/01/91	q1* = 5.4E-1 BCF = 30 FI = 17.5	2000	0.051/0.25	IRIS 01/01/91
19	Benzene 71432	q1* = 2.9E-2 BCF = 5.2 FI = 6.5	1.2/71	IRIS 02/01/94	q1* = 1.5E-2 to 5.5E-2 BCF = 5.2 FI = 17.5	2000	0.61 - 2.2/14 - 51	IRIS 01/19/00
20	Bromoform 75252	q1* = 7.9E-3 BCF = 3.75 based on chloroform FI = 6.5	4.3/360	IRIS 01/01/91	q1* = 7.9E-3 BCF = 3.75 (based on chloroform) FI = 17.5	2000	4.3/140	IRIS 01/01/91
21	Carbon Tetrachloride 56235	q1* = 1.3E-1 BCF = 18.75 FI = 6.5	0.25/4.4	IRIS 06/01/91	q1* = 1.3E-1 BCF = 18.75 FI = 17.5	2000	0.23/1.6	IRIS 06/01/91

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
22	Chlorobenzene 108907	RfD = 2E-2 BCF = 10.3 FI = 6.5	680/21,000	IRIS 07/01/93	RfD = 2E-2[10] BCF = 10.3 RSC = 20 % [d] (not used) FI =6.5	1980	680/21,000	IRIS 07/01/93
23	Chlorodi-bromomethane 124481	q1* = 8.4E-2 BCF = 3.75 based on chloroform FI = 6.5	0.41/34	IRIS 01/01/92	q1* = 8.4E-2[11] RfD = 2E-2 (not used) BCF = 3.75 (based on chloroform) RSC = 80% [k] (not used) FI = 17.5	2000	0.40/13	IRIS 01/01/92
24	Chloroethane 75003	-------	--------	----------	------	NA-	------	------
25	2-Chloroethyl-vinyl Ether 110758	-------	---------	----------	---------	NA	-------	-------
26	Chloroform 67663	q1* = 6.1E-3 BCF = 3.75 FI = 6.5	5.7/470	IRIS 03/01/91	q1* = 6.1E-3 BCF = 3.75 FI = 6.5 (RfD = 1E-2; IRIS 10/19/01-not used)[4]	1980 (Undergoing Major reassessment, no revision)	5.7/470	IRIS 03/01/91
27	Dichloro-bromomethane 75274	q1* = 6.2E-2 BCF = 3.75 FI = 6.5	0.56/46	IRIS 03/01/93	q1* = 6.2E-2 BCF = 3.75 FI = 17.5	2000	0.55/17	IRIS 03/01/93
28	1,1-Dichloro-ethane 75343	q1* = 9.1	------	-----	--------	NA	------	-----
29	1,2-Dichloro-ethane 107062	q1* = 9.1E-2 BCF = 1.2 FI = 6.5	0.38/99	IRIS 01/01/91	q1* = 9.1E-2 BCF = 1.2 FI = 17.5	2000	0.38/37	IRIS 01/01/91

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
30	1,1-Dichloro-ethylene 75354	q1* = 6E-1 RfD = 9E-3 BCF = 5.6 FI = 6.5	0.057/3.2	IRIS 02/01/98	q1* = 6E-1[10] FI = 6.5 BCF = 5.6 (RfD = 5E-2 IRIS 08/13/02-not used) RSC = 20 % [e] (not used)	2000	0.057/3.2	IRIS 02/01/98
31	1,2-Dichlor-propane 78875	q1* = 6.7E-2 BCF = 4.1 (q1* not on IRIS, but verified at 6.7E-2) FI = 6.5	0.52/39	Draft IRIS Coversheet; DW reg. 56 FR 3526 1/30/91	q1* = 6.7E-2 BCF = 4.1 (q1* not on IRIS, but verified at 6.7E-2) FI = 17.5	2000	0.50/15	Draft IRIS Coversheet; DW reg. 56 FR 3526 1/30/91
32	1,3-Dichloro-propylene 542756	RfD = 3E-4 (low) BCF = 1.9 FI = 6.5	10 /1700	IRIS 10/01/90	RfD = 3E-4[10] BCF = 1.9 FI = 6.5 (q1* = 0.1/ RfD = 3E-2 IRIS 05/25/00-not used)	1980	10/1,700	IRIS 10/01/90
33	Ethyl-benzene 100414	RfD = 1E-1 (low) BCF = 37.5 FI = 6.5	3100/29,000	IRIS 06/01/91	RfD = 1E-1[10] BCF = 37.5 RSC = 20% [f] (not used) FI =6.5	1980	3,100/29,000	IRIS 06/01/91
34	Methyl-Bromide 74839	RfD = 1.4E-3 BCF = 3.75 Chloroform BCF used FI = 6.5	48/4000	IRIS 07/01/91	RfD = 1.4E-3 BCF = 3.75 (Chloroform BCF used) FI = 17.5	2000	47/1,500	IRIS 07/01/91
35	Methyl-Chloride 74873	q1* = 6.1E-3 (chloroform q1* and BCF used) BCF = 3.75 FI = 6.5	-----	IRIS 03/01/91	-------	--------	--------	------

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
36	Methylene-Chloride 75092	q1* = 7.5E-3 BCF = 0.9 FI = 6.5	4.7/1600	IRIS 02/01/95	q1* = 7.5E-3 BCF = 0.9 FI = 17.5	2000	4.6/590	IRIS 02/01/95
37	1,1,2,2-Tetrachloro-ethane 79345	q1* = 2E-1 BCF = 5 FI = 6.5	0.17/11	IRIS 02/01/94	q1* = 2E-1 BCF = 5 FI = 17.5	2000	0.17/4.0	IRIS 02/01/94
38	Tetrachloro-ethylene 127184	q1* = 3.98E-2 BCF = 30.6 FI = 6.5	0.8/8.85	1980 AWQC DOCUMENT EPA 440/5-80-073	q1* = 3.98E-2 BCF = 30.6 FI = 17.5	2000	0.69/3.3	1980 AWQC DOCUMENT EPA 440/5-80-073 & 2000 FI
39	Toluene 108883	RfD = 2E-1 BCF = 10.7 FI = 6.5	6800/200,000	IRIS 04/01/94	RfD = 2E-1[10] BCF = 10.7 RSC = 20% [g] (not used) FI = 6.5	1980	6,800/200,000	IRIS 04/01/94
40	1,2-Trans-Dichloro-ethylene 156605	RfD = 2E-2 BCF = 1.58 FI = 6.5	700/140,000	IRIS 01/01/89	RfD = 2E-2[10] BCF = 1.58 RSC = 20% [h] (not used) FI = 6.5	1980	700/140,000	IRIS 01/01/89
41	1,1,1-Tri-chloroethane 71556	RfD = 9E-2 BCF = 5.6 RfD withdrawn 08/01/91	--------	IRIS 09/01/90	------	NA	-------	------
42	1,1,2-Trichloro-ethane 79005	q1* = 0.057 RfD = 0.004 BCF = 4.5 FI = 6.5	0.60/42	IRIS 07/01/94	q1* = 0.057[11] RfD = 4E-3 BCF = 4.5 RSC = 20% [i] FI = 17.5	2000 (based on q1* even though RSC and RfD are are available)	0.59/16	IRIS 02/01/1994
43	Trichloro-ethylene 79016	q1* = 1.26E-2 BCF = 10.6 RfD under rev q1* withdrawn FI = 6.5	2.7/81	1980 AWQC DOCUMENT EPA 440/5-80-077	q1* = 1.26E-2 BCF = 10.6 FI = 17.5	1980 AWQC DOCUMENT EPA 440/5-80-077 & 2000 FI	2.5/30	1980 AWQC DOCUMENT EPA 440/5-80-077 & 2000 FI

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
44	Vinyl Chloride 75014	q1* = 1.74E-2 BCF = 1.17 FI = 6.5	2.0/525	1980 AWQC DOCUMENT EPA 440/5-80-078	q1* = 1.74E-2[10] (q1* = 1.4 LMS exposure from birth/RfD = 3E-3 IRIS 08/07/00- not used) BCF = 1.17 FI = 6.5	1980	2.0/530	1980 AWQC DOCUMENT EPA 440/5-80-078
45	2-Chlorophenol 95578	RfD = 5E-3 BCF = 134 FI = 6.5	120/400	IRIS 07/01/93	RfD = 5E-3 BCF = 134 FI = 17.5	2000	81/150	IRIS 07/01/93
46	2,4-Dichloro-phenol 120832	RfD = 3E-3 BCF = 40.7 FI = 6.5	93/790	IRIS 06/30/88	RfD = 3E-3 BCF = 40.7 FI = 17.5	2000	77/290	IRIS 06/30/88
47	2,4-Dimethyl-phenol 105679	RfD = 2E-2 BCF = 93.8 FI = 6.5	540/2300	IRIS 11/01/90	RfD = 2E-2 BCF = 93.8 FI = 17.5	2000	380/850	IRIS 11/01/90
48	2-Methyl-4,6-Dinitro-phenol (cresol) 534521	(0.039 mg/kg/day)/100 BCF = 5.5 FI = 6.5	13.4/765	1980 AWQC DOCUMENT EPA 440/5-80-063	(0.039 mg/kg/day)/100 BCF = 5.5 FI = 17.5	2000	13/280	1980 AWQC DOCUMENT EPA 440/5-80-063
49	2,4-Dinitro-phenol 51285	RfD = 2E-3 BCF = 1.5 FI = 6.5	70/14,000	IRIS 07/01/91	RfD = 2E-3 BCF = 1.5 FI = 17.5	2000	69/5,300	IRIS 07/01/91
50	2-Nitrophenol 88755	BCF = 2.33	----------	----------	--------	NA	------	-----
51	4-Nitrophenol 100027	BCF = 3.31	----------	----------	------	NA	-------	------
52	3-Methyl-4-Chlorophenol 59507	RfD = 3E-2 (medium) q1* = 1.2E-1	----------	IRIS MAY 1995	RfD = 3E-2 (medium) q1* = 1.2E-1	NA	-------	------

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
53	Pentachloro-phenol 87865	q1* = 0.12 BCF = 11 FI = 6.5	0.28/8.2	IRIS 07/01/93	q1* = 0.12 RfD = 3E-2 (not used) BCF = 11 FI = 17.5	2000	0.27/3.0	IRIS 07/01/93
54	Phenol 108952	RfD = 6E-1 BCF = 1.4 FI = 6.5	21,000/ 4,600,000	IRIS 02/01/90	RfD = 6E-1 BCF = 1.4 FI = 17.5	2000	21,000/1,700,000	IRIS 02/01/90
55	2,4,6-Trichlor-phenol 88062	q1* = 0.011 BCF = 150 FI = 6.5	2.1/6.5	IRIS 02/01/94	q1* = 0.011 BCF = 150 FI = 17.5	2000	1.4/2.4	IRIS 02/01/94
56	Acenaphthene 83329	RfD = 6E-2 BCF = 242 FI = 6.5	1200/2700	IRIS 04/01/94	RfD = 6E-2 BCF = 242 FI = 17.52	2000	670/990	IRIS 04/01/94
57	Acenaphthylene 208968	benzo (a) pyrene (BaP) q1* and BCF used	----------	1980 AWQC document EPA/5-80-069	--------	NA	-------	------
58	Anthracene 120127	RfD = 3E-1 BCF = 30 (BaP BCF used) FI = 6.5	9600/110,000	IRIS 07/01/93	RfD = 3E-1 BCF = 30 (BaP BCF used) FI = 17.5	2000	8,300/40,000	IRIS 07/01/93
59	Benzidine 92875	q1* = 230 BCF = 87.5 FI = 6.5	0.00012/ 0.00054	IRIS 02/01/95	q1* = 230 RfD = 3E-3 (not used) BCF = 87.5 FI = 17.5	2000	0.000086/0.00020	IRIS 02/01/95
60	Benzo(a)-Anthracene 56553	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 6.5	0.0044/0.049	IRIS 11/01/94 for CAS # 205992 was used	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 17.5	2000	0.0038/0.018	IRIS 11/01/94 for CAS # 205992 was used
61	Benzo(a)-Pyrene 50328	q1* = 7.3E+0 BCF = 30 FI = 6.5	0.0044/0.049	IRIS 11/01/94	q1* = 7.3E+0 BCF = 30 FI = 17.5	2000	0.0038/0.018	IRIS 11/01/94

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
62	Benzo(b)-Fluoranthene 205992	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 6.5	0.0044/0.049	IRIS 11/01/94 for CAS # 205992 was used	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 17.5	2000	0.0038/0.018	IRIS 11/01/94 for CAS # 205992 was used
63	Benzo(ghi)-Perylene 191242	BCF = 30 (BaP =7.3E+0, BCF)	----------	----------	------	NA	-------	-------
64	Benzo(k)-Fluoranthene 207089	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 6.5	0.0044/0.049	IRIS 11/01/94 for CAS # 205992 was used	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 17.5	2000	0.0038/0.018	IRIS 11/01/94 for CAS # 205992 was used
65	Bis(2-Chloro-ethoxy)-Methane 111911	BCF = 0.64	----------	IRIS 3/1/91	------	NA	------	IRIS 3/1/91
66	Bis(2-Chloro-ethyl) Ether 111444	q1* = 1.1 BCF = 6.9 FI = 6.5	0.031/1.4	IRIS 02/01/94	q1* = 1.1 BCF = 6.9 FI = 17.5	2000	0.030/0.53	IRIS 02/01/94
67	Bis(2-Chloro-isopropyl)-Ether 108-60-1 (changed from 3963829)	RfD = 4E-2 BCF = 2.47 FI = 6.5	1400/170,000	IRIS 08/01/90	RfD = 4E-2 BCF = 2.47 FI = 17.5	2000	1,400/65,000	IRIS 08/01/90
68	Bis(2-Ethylhexyl)-Phthalate 117817	q1* = 0.014 BCF = 130 FI = 6.5	1.8/5.9	IRIS 02/01/93	q1* = 0.014 BCF = 130 FI = 17.5	2000	1.2/2.2	IRIS 02/01/93
69	4-Bromo-phenyl Phenyl-Ether 101553	BCF = 1640	--------		------	NA	------	-------
70	Butylbenzyl phthalate 85687	RfD = 2E-1 BCF = 414 FI = 6.5	3000/5200	IRIS 02/01/93	RfD = 2E-1 BCF = 414 FI = 17.5		1,500/1,900	IRIS 02/01/93

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
71	2-Chloro-naphthalene 91587	RFD = 8E-2 BCF = 202 FI = 6.5	1700/4300	IRIS 11/01/90	RFD = 8E-2 BCF = 202 FI = 17.5	2000	1,000/1,600	IRIS 11/01/90
72	4-Chloro-Phenyl Phenyl Ether 7005723	BCF = 1200	---------	----------	-------	NA	------	------
73	Chrysene 218019	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 6.5	0.0044/0.049	IRIS 11/01/94 for CAS # 205992 was used	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 17.5	2000	0.0038/0.018	IRIS 11/01/94 for CAS # 205992 was used
74	Dibenzo(a,h) Anthracene 53703	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 6.5	0.0044/0.049	IRIS 11/01/94 for CAS # 205992 was used	q1* = 7.3E+0 (BaP q1* used) BCF =30 FI = 17.5	2000	0.0038/0.018	IRIS 11/01/94 for CAS # 205992 was used
75	1,2-Dichloro-benzene 95501	RfD = 9E-2 BCF = 55.6 FI = 6.5	2700/17,000	IRIS 03/01/91	RfD = 9E-2[10] BCF = 55.6 RSC = 20% [j] (not used) FI = 6.5	1980	2,700/17,000	IRIS 03/01/91
76	1,3-Dichloro-benzene 541731	ADI = 1.34E-2 (ADI for 1,2-DCB used) BCF = 55.6 FI = 6.5	400/2600	1980 AWQC DOC EPA 440/5-80-039	ADI = 1.34E-2 (ADI for 1,2-DCB used) BCF = 55.6 FI = 17.5	2000	320/960	1980 AWQC DOC EPA 440/5-80-039
77	1,4-Dichloro-benzene 106467	ADI = 1.34E-2 (ADI for 1,2-DCB used) BCF = 55.6 FI = 6.5	400/2600	1980 AWQC DOCUMENT EPA 440/5-80-039	ADI = 1.34E-2[10] (ADI for 1,2-DCB used) BCF = 55.6 RSC = 20% [j] (not used) FI = 6.5	1980	400/2,600	1980 AWQC DOCUMENT EPA 440/5-80-039
78	3,3'-Dichloro-benzidine 91941	q1* = 0.45 BCF = 312 FI = 6.5	0.04/0.077	IRIS 07/01/93	q1* = 0.45 BCF = 312 FI = 17.5	2000	0.021/0.028	IRIS 07/01/93

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
79	Diethyl Phthalate 84662	RfD = 8E-1 BCF = 73 FI = 6.5	23,000/ 120,000	IRIS 02/01/93	RfD =8E-1 BCF = 73 FI = 17.5	2000	17,000/44,000	IRIS 02/01/93
80	Dimethyl Phthalate 131113	ADI = 10 BCF = 36 FI = 6.5	313,000/ 2,900,000	1980 AWQC document EPA 440/5-80-067	ADI = 10 BCF = 36 FI = 17.5	2000	270,000/1,100,000	1980 AWQC document EPA 440/5-80-067 & 2000 FI
81	Di-n-Butyl Phthalate 84742	RfD = 1E-1 BCF = 89 FI = 6.5	2700/12,000	IRIS 08/01/90	RfD = 1E-1 BCF = 89 FI = 17.5	2000	2,000/4,500	IRIS 08/01/90
82	2,4-Dinitro-toluene 121142	q1* = 3.11E-1 BCF = 3.8 FI = 6.5	0.11/9.1	1980 AWQC document EPA 440/5-80-045	q1* = 3.11E-1[11] RfD = 2E-3 (not used) BCF = 3.8 FI = 17.5	2000	0.11/3.4	1980 AWQC document EPA 440/5-80-045 & 2000 FI
83	2,6-Dinitro-toluene 606202	----------	---------	----------	-------	NA	------	-----
84	Di-n-Octyl Phthalate 117840	----------	---------	----------	---------	NA	--------	------
85	1,2-Diphenyl-hydrazine 122667	q1* = 0.8 BCF = 24.9 FI = 6.5	0.040/0.54	IRIS 01/01/91	q1* = 0.8 BCF = 24.9 FI = 17.5	2000	0.036/0.20	IRIS 01/01/91
86	Fluoranthene 206440	RfD = 4E-2 BCF = 1150 FI = 6.5	300/370	IRIS 07/01/93	RfD = 4E-2 BCF = 1150 FI = 17.5	2000	130/140	IRIS 07/01/93
87	Fluorene 86737	RfD = 4E-2 BCF = 30 BaP BCF used FI = 6.5	1300/14,000	IRIS 11/01/90	RfD = 4E-2 BCF = 30 (BaP BCF used) FI = 17.5	2000	1,100/5,300	IRIS 11/01/90

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
88	Hexachloro-benzene 118741	q1* = 1.6 BCF = 8690 FI = 6.5	0.00075/ 0.00077	IRIS 11/01/96	q1* = 1.6[11] RfD = 8E-4 (not used) BCF = 8690 FI = 17.5	2000	0.00028/0.00029	IRIS 11/01/96
89	Hexachloro-butadiene 87683	q1* = 0.078 BCF = 2.78 FI = 6.5	0.44/50	IRIS 04/01/91	q1* = 0.078 BCF = 2.78 FI = 17.5	2000	0.44/18	IRIS 04/01/91
90	Hexachloro-cyclo-pentadiene 77474	RfD = 7E-3 BCF = 4.34 FI = 6.5	240/17,000	IRIS 09/01/90	RfD = 7E-3[10] BCF = 4.34 RSC = 20% [a] (not used) FI = 6.5 (RfD = 6E-3 IRIS 07/05/01-not used)	1980	240/17,000	IRIS 09/01/90
91	Hexachloro-ethane 67721	q1* = 0.014 BCF = 86.9 FI = 6.5	1.9/8.9	IRIS 02/01/94	q1* = 0.014 RfD = 1E-3 (not used) BCF = 86.9 FI = 17.5	2000	1.4/3.3	IRIS 02/01/94
92	Indeno(1,2,3-cd) Pyrene 193395	q1* = 7.3E+0 (BaP q1* used) BCF = 30 FI = 6.5	0.0044/0.049	IRIS 11/01/94 for CAS # 205992 was used	q1* = 7.3E+0 (BaP q1* used) BCF = 30 FI = 17.5	2000	0.0038/0.018	IRIS 11/01/94 for CAS # 205992 was used
93	Isophorone 78591	q1* = 9.5E-4 BCF = 4.38 FI = 6.5	36/2600	IRIS 11/01/92	q1* = 9.5E-4[11] RfD = 2E-1 (not used) BCF = 4.38 FI = 17.5	2000	35/960	IRIS 11/01/92
94	Naphthalene 91203	BCF = 10.5	----------	----------	-------	NA	--------	-------
95	Nitrobenzene 98953	RfD = 5E-4 BCF = 2.89 FI = 6.5	17/1900	IRIS 01/01/91	RfD = 5E-4 BCF = 2.89 FI = 17.5	2000	17/690	IRIS 01/01/91

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
96	N-Nitrosodi-methylamine 62759	q1* = 51 BCF = 0.026 FI = 6.5	0.00069/8.1	IRIS 07/01/93	q1* = 51 BCF = 0.026 FI = 17.5	2000	0.00069/3.0	IRIS 07/01/93
97	N-Nitrosodi-n-Propylamine 621647	q1* = 7.0 BCF = 1.13 FI = 6.5	0.005/1.4	IRIS 07/01/93	q1* = 7.0 BCF = 1.13 FI = 17.5	2000	0.0050/0.51	IRIS 07/01/93
98	N-Nitrosodi-phenylamine 86306	q1* = 0.0049 BCF = 136 FI = 6.5	5.0/16	IRIS 07/01/93	q1* = 0.0049 BCF = 136 FI = 17.5	2000	3.3/6.0	IRIS 07/01/93
99	Phenanthrene 85018	No RfD listed No q1* listed	----------	----------	----------	NA	--------	--------
100	Pyrene 129000	RfD = 3E-2 BCF = 30 (BaP BCF used) FI = 6.5	960/11,000	IRIS 07/01/93	RfD = 3E-2 BCF = 30 (BaP BCF used) FI = 17.5	2000	830/4,000	IRIS 07/01/93
101	1,2,4-Trichloro-benzene 120821	RfD = 1E-2 BCF = 114 FI = 6.5	260/940[12]	IRIS 11/01/96	RfD = 1E-2[10] BCF = 114 RSC = 20% [a] (not used) FI = 6.5	1980	260/940	IRIS 11/01/96
102	Aldrin 309002	q1* = 17 BCF = 4670 FI = 6.5	0.00013/ 0.00014	IRIS 07/01/93	q1* = 17[11] RfD = 3E-5 (not used) BCF = 4670 FI = 17.5	2000	0.000049/0.000050	IRIS 07/01/93
103	alpha-BHC 319846	q1* = 6.3 BCF = 130 FI = 6.5	0.0039/0.013	IRIS 07/01/93	q1* = 6.3 BCF = 130 FI = 17.5	2000	0.0026/0.0049	IRIS 07/01/93
104	beta-BHC 319857	q1* = 1.8 BCf = 130 FI = 6.5	0.014/0.046	IRIS 01/01/91	q1* = 1.8 BCf = 130 FI = 17.5	2000	0.0091/0.017	IRIS 07/01/1993

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
105	gamma-BHC 58899 lindane	q1* = 1.3 (Not listed on IRIS) BCF = 130 FI = 6.5	0.019/0.063	1980 AWQC DOCUMENT EPA 440/5-80-054	q1* = 1.3 (Not listed on IRIS)[10] BCF = 130 FI = 6.5 (RfD = 3E-4 IRIS 03/01/88- not used) RSC = 20% [1] (not used)	1980	0.019/0.063	1980 AWQC DOCUMENT EPA 440/5-80-054
106	delta-BHC 319868	BCF = 130	----------	----------	-------	NA	--------	------
107	Chlordane 57749	q1* = 3.5E-1 BCF = 14100 FI = 6.5	0.0021/0.0022	IRIS 02/07/98	q1* = 3.5E-1[11] RfD = 5E-4 (not used) BCF = 14100 FI = 17.5	2000	0.00080/0.00081	IRIS 02/07/98
108	4,4'-DDT 50293	q1* = 0.34 BCF = 53600 (one BCF applies for DDT, DDE and DDE) FI = 6.5	0.00059/ 0.00059	IRIS 05/01/91	q1* = 0.34[11] RfD = 5E-4 (not used) BCF = 53600 (one BCF applies for DDT, DDE and DDE) FI = 17.5	2000	0.00022/0.00022	IRIS 05/01/91
109	4,4'-DDE 72559	q1* = 0.34 BCF = 53600 FI = 6.5	0.00059/ 0.00059	IRIS 08/22/88	q1* = 0.34 BCF = 53600 (one BCF applies for DDT, DDE and DDE) FI = 17.5	2000	0.00022/0.00022	IRIS 08/22/88
110	4,4'-DDD 72548	q1* = 0.24 BCF = 53600 FI = 6.5	0.00083/ 0.00084	IRIS 08/22/88	q1* = 0.24 BCF = 53600 FI = 17.5	2000	0.00031/0.00031	IRIS 08/22/88
111	Dieldrin 60571	q1* = 16 BCF = 4670 FI = 6.5	0.00014/ 0.00014	IRIS 01/01/91	q1* = 16[11] RfD = 5E-5 (not used) BCF = 4670 FI = 17.5	2000	0.000052/0.000054	IRIS 07/01/1993

	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
112	alpha-Endosulfan 959988	BCF = 270 RfD = 6E-3 RfD for endosulfan used FI = 6.5	110/240	IRIS 10/1/94 ENDOSULFAN #115297 WAS USED	RfD = 6E-3 (RfD for endosulfan used) BCF = 270 FI = 17.5	2000	62/89	IRIS 10/1/94 ENDOSULFAN #115297 WAS USED
113	beta-Endosulfan 33213659	RfD = 6E-3 (RfD for endosulfan used) BCF = 270 FI = 6.5	110/240	IRIS 10/01/94 ENDOSULFAN #115297 WAS USED	RfD = 6E-3 (RfD for endosulfan used) BCF = 270 FI = 17.5	2000	62/89	IRIS 10/01/94 ENDOSULFAN #115297 WAS USED
114	Endosulfan Sulfate 1031078	RfD = 6E-3 (RfD for endosulfan used) BCF = 270 FI = 6.5	110/240	IRIS 10/1/94 ENDOSULFAN #115297 WAS USED	RfD = 6E-3 (RfD for endosulfan used) BCF = 270 FI = 17.5	2000	62/89	IRIS 10/01/94 ENDOSULFAN #115297 WAS USED
115	Endrin 72208	RfD = 3E-4 BCF = 3970 FI = 6.5	0.76/0.81	IRIS 09/07/88	RfD = 3E-4[10] BCF = 3970 RSC = 20% [b] (not used) FI = 6.5	1980	0.76/0.81	IRIS 04/01/1991
116	Endrin Aldehyde 7421934	RfD = 3E-4 (RfD for Endrin used) BCF = 3970 FI = 6.5	0.76/0.81	IRIS 04/01/91 for CAS # 72208 was used	RfD = 3E-4 (RfD for Endrin used) BCF = 3970 FI = 17.5	2000	0.29/0.30	IRIS 04/01/91 for CAS # 72208 was used
117	Heptachlor 76448	q1* = 4.5 BCF = 11200 FI = 6.5	0.00021/ 0.00021	IRIS 07/01/93	q1* = 4.5[11] RfD = 5E-4 (not used) BCF = 11200 FI = 17.5	2000	0.000079/0.000079	IRIS 07/01/93
118	Heptachlor Epoxide 1024573	q1* = 9.1 BCF = 11200 (heptachor BCF used) FI = 6.5	0.00010/ 0.00011	IRIS 07/01/93	q1* = 9.1[11] RfD = 1.3E-5 (not used) BCF = 11200 (heptachor BCF used) FI = 17.5	2000	0.000039/0.000039	IRIS 07/01/93

‹	Chemical (CAS number)	Basis for 1998 nrwqc: q1* or RfD/ADI and BCF	1998 nrwqc (ug/l) w +o/ o only	Reference Cite[3]	Basis for 2002 nrwqc: q1*/ RfD/ADI, RSC and BCF[1,7,8]	Methodology: 2000 or 1980[2]	2002 nrwqc (ug/l) For Consumption of : Water + organism/ Organism Only	Reference Cite[3]
119	PCBs	q1* =2 (total PCBs/congener/ isomer) BCF = 31200 FI = 6.5	0.00017/ 0.00017	IRIS 06/01/97 for CASRN 1336-36-3	q1* = 2 (total PCBs/ congener/isomer) BCF = 31200 FI = 17.5	2000	0.000064/0.000064	IRIS 06/01/97 for CASRN 1336-36-3
120	Toxaphane 8001352	q1* = 1.1 BCF = 13100 FI = 6.5	0.00073/ 0.00075	IRIS 01/01/91	q1* = 1.1 BCF = 13100 FI = 17.5	2000	0.00028/0.00028	IRIS 01/01/91

FOOTNOTES :

1. IRIS values as of May 17, 2002 are presented. IRIS information is presented in some cases even though it may not be used to calculate criteria. All units are as follows: q1* = per mg/kg-day; RfD = mg/kg-d; BCF = L/kg; and FI = 17.5 g/day (unless otherwise noted).

2. Calculations are based on the following methodologies: *Guidelines and Methodologies Used in the Preparation of Health Effects Assessment Chapters of the Consent Decree Water Criteria Documents* (45FR79347) and *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (2000), EPA-822-B-00-004, October 2000).

3. Reference cite refers to an IRIS coversheet, AWQC criterion document or other document which serves as the basis for the criterion.

4. Although a new RfD is available in IRIS, the surface water criteria will not be revised until the National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) is completed, since public comment on the relative source contribution (RSC) for chloroform is anticipated.

5. In IRIS, EPA has listed thallium sulfate, not thallium alone. The thallium RfD included in the matrix is based on: NOAL = 0.25 mg TL_2SO_4/kg-d; UF = 3000; fraction TL in TL_2SO_4 = 0.81.

6. Original 1980 ADIs were expressed as mg/day. These have been converted to mg/kg-day to make them comparable to present day RfDs. All q1*s are in kg-day/mg or per mg/kg-day.

7. The fish tissue bioconcentration factor (BCF) from the 1980 criteria documents was retained unless otherwise noted. No BAFs were derived for this effort.

8. Criteria based on carcinogenicity (q1*), reflect 10^{-6} risk.

9. The q1* of 1.75 mg/kg-d was derived from the risk per unit concentration in drinking water from IRIS: $5x10^{-5}$ risk per ug/L in drinking water.

10. This criterion was not revised as part of this effort. EPA has published revisions for this criterion in the **Federal Register** and is soliciting scientific views on the revised value.

11. Although a q1* and RfD are available in IRIS, the q1*was used to derive the criterion because it resulted in the more stringent criterion.

12. These criteria were not published or promulgated in the NTR or CTR. These criteria were calculated based on the RfD presented in IRIS.

References for Relative Source Contribution (RSC)

a. FR 57 (138), July 17, 1992
b. FR 55 (143), July 25, 1990
c. Cyanide Health Advisory, March 31, 1987.
d. FR 56 (20), January 30, 1991
e. 1,1-dichloroethylene Health Advisory, March 31, 1987
f. Ethylbenzene Health Advisory, March 31, 1987
g. Toluene (Draft) Health Advisory, October 1993
h. FR 54 (97), May 22, 1989
i. 1,1,2-trichloroethane Health Advisory, September 1, 1989
j. Ortho-, meta- and para-dichlorobenzenes Health Advisory, March 31, 1987
k. FR 59 (145) July 29, 1994
l. Lindane Health Advisory, March 31, 1987.

1980 Methodology Calculations

Using cancer potency, q1*:

For consumption of water and organisms:

$$AWQC\ [\mu g/L] = \frac{10^{-6} \bullet 70\ kg \bullet 1000\ \mu g/mg}{q1^*\ [kg\text{-}d/mg]\ (2\ L/d + (0.0065\ kg/d \bullet BCF\ [L/kg]))}$$

For consumption of organisms only:

$$AWQC\ [\mu g/L] = \frac{10^{-6} \bullet 70\ kg \bullet 1000\ \mu g/mg}{q1^*\ [kg\text{-}d/mg] \bullet 0.0065\ kg/d \bullet BCF\ [L/kg]}$$

U sing Reference Dose:

F or consumption of water and organisms:

$$AWQC\ [\mu g/L] = \frac{Rf\ D\ [mg/kg\text{-}d] \bullet 70\ kg \bullet 1000\ \mu g/mg}{2\ L/d + (0.0065\ kg/d \bullet BCF\ [L/kg])}$$

F or consumption of organisms only:

$$AWQC\ [\mu g/L] = \frac{RfD\ [mg/kg\text{-}d] \bullet 70\ kg \bullet 1000\ \mu g/mg}{0.0065\ kg/d \bullet BCF\ [L/kg]}$$

AWQC = Ambient water quality criteria = national recommended water quality criteria
q1* = Cancer potency factor kg-d/mg or per mg/kg-day
RfD = Reference dose mg/kg-d
DI = Drinking water intake 2 L/day
BW = Human body weight 70 kg
FI = Fish intake 0.0065 kg/day
BCF = Bioconcentration factor L/kg

2000 Methodology Calculations

Linear Approach

Using cancer potency, q1*:

For consumption of water and organisms:

$$AWQC\ [\mu g/L] = \frac{(10^{-6}/q1^*) \bullet 70\ kg \bullet 1000\ \mu g/mg}{(2\ L/d + (0.0175\ kg/d \bullet BCF\ [L/kg]))}$$

For consumption of organisms only:

$$AWQC\ [\mu g/L] = \frac{(10^{-6}/q1^*) \bullet 70\ kg \bullet 1000\ \mu g/mg}{0.0175\ kg/d \bullet BCF\ [L/kg]}$$

Using Reference Dose:

For consumption of water and organisms:

$$AWQC\ [\mu g/L] = [\ RfD\ [mg/kg\text{-}d] \bullet RSC * (70\ kg/\ 2\ L/d + (0.0175\ kg/d \bullet BCF\ [L/kg])] \bullet 1000\ \mu g/mg$$
or (- RSC)

For consumption of organisms only:

$$AWQC\ [\mu g/L] = [RfD\ [mg/kg\text{-}d] \bullet RSC \bullet (70\ kg/(0.0175\ kg/d \bullet BCF\ [L/kg]))] \bullet 1000\ \mu g/mg$$
(- RSC)

Nonlinear Approach (Presented for information only- no criteria in matrix based on nonlinear approach currently)
For consumption of water and organisms:

$$AWQC\ [ug/L] = POD/UF \bullet RSC \bullet (BW/DI + (FI \bullet BCF)$$

For consumption of organisms only:

$$AWQC\ [ug/L] = POD/UF \bullet RSC \bullet * (BW/(FI \bullet BCF)$$

AWQC = Ambient water quality criteria = national recommended water quality criteria
q1* = Cancer potency factor kg-d/mg or per mg/kg-day
RSD = Risk specific dose 10^{-6}/q1* mg/kg-day
RfD = Reference dose mg/kg-d
DI = Drinking water intake 2 L/day
BW = Human body weight 70 kg
FI = Fish intake 0.0175 kg/day
BCF = Bioconcentration factor L/kg
UF = Uncertainty factor (unitless)
RSC = Relative source contribution (percentage of subtraction)
POD = Point of departure mg/kg-day

NRWQC: HUMAN HEALTH CRITERIA CALCULATION MATRIX (November 2002)

NON PRIORITY POLLUTANTS

	Chemical (CAS number)	Gold Book or Criteria Document Value (ug/L) w + o/ o only	Basis (q1* or RfD/ADI) and BCF	1998 nrwqc (ug/L) w + o/o	Reference Cite	Basis (q1* or RfD/ADI) and BCF[1,2]	Methodology 2000 or 1980	2002 nrwqc (ug/L) w + o/ o only	Reference Cite[3]
6	Barium	1,000/---	RfD = 7E-2 (08/01/90) not used	1,000/---	Gold Book	RfD = 7E-2 (01/20/1999) not used	pre-1980	1,000/---	Gold Book
10	Chlorophenoxy Herbicide (2,4,5,-TP) 93721	10,---	RfD = 8E-3 (09/07/88) not used	10/---	Gold Book	RfD = 8E-3 (09/07/88) not used RSC = 20% [a]	pre-1980	10/---	Gold Book
11	Chlorophenoxy herbicide (2,4-D) 94757	100/---	RfD = 1E-2 (05/05/88)	100/---	Gold Book	RfD = 1E-2 (05/05/88) RSC = 20% [b]	pre-1980	100/---	Gold Book
15	Ether, Bis (Chloromethyl) 542881	0.00000376/ 0.00184 (based on q1* = 9299.8)	q1* = 2.2E+2 BCF = 63 FI = 6.5	0.00013/ 0.00078	IRIS 01/01/91	q1* = 2.2E+2 BCF = 63 FI = 17.5	2000	0.00010/ 0.00029	IRIS 01/01/91
20	Iron 7439896	300/---	---	300/---	Gold Book	----	pre-1980	300/---	Gold Book
22	Manganese 7439965	50/100	RfD = 1.4E-1 (01/01/93) not used	50/100	Gold Book	RfD = 1.4E-1 (05/01/1996) not used	pre-1980	50/100	Gold Book
23	Methoxychlor 72435	100/---	RfD = 5E-3 (08/01/91) not used	100/---	Gold Book	RfD = 5E-3 (08/01/91) RSC = 20 % [c,d] (not used)	pre-1980	100	Gold Book
25	Nitrates 14797558	10,000/---	1.6E+0 (10/01/91) not used	10,000/---	Gold Book	RfD = 1.6E+0 (10/01/91) not used	pre-1980	10,000/---	Gold Book
26	Nitrosamines	0.0008/1.24	B_{II} = 43.46 BCF = 0.20 (q1* = 1.5E+2 07/01/93 not used)	0.0008/1.24	EPA 440/5-80-064	B_{II} = 43.46 BCF = 0.20 (q1* = 1.5E+2 07/01/93 not used)	pre-1980	0.0008/1.24	EPA 440/5-80-064

	Chemical (CAS number)	Gold Book or Criteria Document Value (ug/L) w + o/ o only	Basis (q1* or RfD/ADI) and BCF	1998 nrwqc (ug/L) w + o/o	Reference Cite	Basis (q1* or RfD/ADI) and BCF[1,2]	Methodology 2000 or 1980	2002 nrwqc (ug/L) w + o/ o only	Reference Cite[3]
27	Dinitrophenols 25550587	70/14,300	BCF = 1.51 RfD = 0.002 FI = 6.5	70/14,300	EPA 440/5-80-063	BCF = 1.51 RfD = 2E-3 FI = 17.5	2000	69/5,300	EPA 440/5-80-063 & 2000 FI
28	Nitrosodibutylamine,N 924163	0.0064/0.587	q1* = 5.43 BCF = 3.38 FI = 6.5	0.0064/0.587	EPA 440/5-80-064	q1* = 5.43 BCF = 3.38 FI = 17.5	2000	0.0063/0.22	EPA 440/5-80-064 & 2000 FI
29	Nitrosodiethylamine,N 55185	0.0008/1.24	B_{II} = 43.46 BCF = 0.20 (q1* = 1.5E+2 07/01/93 not used)	0.0008/1.24	EPA 440/5-80-064	B_{II} = 43.46 BCF = 0.20 (q1* = 1.5E+2 07/01/93 not used)	pre-1980	0.0008/1.24	EPA 440/5-80-064
30	Nitrosopyrrolidine,N 930552	0.016/91.9	q1* = 2.13 BCF = 0.055 FI = 6.5	0.016/91.9	EPA 440/5-80-064	q1* = 2.13 BCF = 0.055 FI = 17.5	2000	0.016/34	EPA 440/5-80-064 & 2000 FI
34	Pentachlorobenzene 608935	74/85 (based on ADI = 1.17)	RfD = 8E-4 BCF = 2,125 FI = 6.5	3.5/4.1	IRIS 03/01/88	RfD = 8E-4 BCF = 2,125 FI = 17.5	2000	1.4/1.5	IRIS 03/01/88
38	Solids Dissolved and Salinity	250,000/---	---	250,000/---	Gold Book	-----	pre-1980	250,000/---	Gold Book
43	Tetrachlorobenzene, 1,2,4,5- 95943	38/48 (based on ADI = 0.35)	RfD = 3E-4 BCF = 1,125 FI = 6.5	2.3/2.9	IRIS 03/01/91	RfD = 3E-4 BCF = 1,125 FI = 17.5	2000	0.97/1.1	IRIS 03/01/91
45	Trichlophenol,2,4,5 95954	2,600/9800 (based on ADI = 7)	RfD = 1E-1 BCF = 110 FI = 6.5	2,600/9800	IRIS 03/01/88	RfD = 1E-1 BCF = 110 FI = 17.5	2000	1,800/3,600	IRIS 03/01/88

FOOTNOTES:

1. Criteria based on carcinogenicity (q1*), reflect 10^{-6} risk.
2. The fish tissue bioconcentration factor (BCF) from the 1980 criteria documents was retained unless otherwise noted. No BAFs were derived for this effort.
3. Reference cite refers to an IRIS coversheet, AWQC criterion document or other document which serves as the basis for the criterion.

References for Relative Source Contribution (RSC)

a. Silvex (2,4,5-TP) Health Advisory 1988
b. 2,4-dichlorophenoxyacetic acid (2,4-D) Health Advisory, March 31, 1987
c. FR 56 (20), January 30, 1991
d. Methoxychlor Health Advisory, March 31, 1987

	Current WV Human Health Criteria		2018 DEP Proposed Criteria		2019 WVMA Proposed Criteria	
	C	A	C	A	C	A
1,1,1- trichloroethane[b] (mg/l)		12	370	13	577	13
1,1,2,2-tetrachloroethane (ug/l)	11	0.17	6	0.2	8	0.2
1,1-dichloroethylene[b] (ug/l)	3.2	0.03	34000	330	14,000	326
1,2-dichlorobenzene (mg/l)	17	2.7	7	2	9	2
1,2-dichloroethane[b] (ug/l)	99	0.035	1400	10	2040	10
1,3-dichlorobenzene (mg/l)	2.6	0.4	0.027	0.009	0.06	0.01
1,4-dichlorobenzene (mg/l)	2.6	0.4	1.8	0.4	2.0	0.4
2,4-dinitrotoluene[b] (ug/l)	9.1	0.11	3.5	0.049	3.2	0.05
2-Chloronaphthalene (ug/l)	1600	1000	2500	1200	2560	1200
2-methyl-4,6-Dinitrophenol (ug/l)	765	13.4	56	2	88	2
Acenaphthene (ug/l)	990	670	190	130	401	200
Acrylonitrile[b] (ug/l)	0.66	0.059	15	0.061	0.50	0.05
Aldrin[b] (ng/l)	0.071	0.071	0.0014	0.0014	0.10	0.097
alpa-BHC[b] (ug/l)	0.013	0.0039	0.00084	0.00073	0.0099	0.0034
Anthracene (ug/l)	40,000	8,300	800	570	16,000	1780
Benzene[b] (ug/l)	51	0.66	51	0.66	51	0.66
Benzo(a) Anthracene[b] (ug/l)	0.018	0.0038	0.0028	0.0027	0.37	0.04
Benzo(a) Pyrene[b] (ug/l)	0.018	0.0038	0.00028	0.00027	0.037	0.004
Benzo(b) Fluoranthene[b] (ug/l)	0.018	0.0038	0.0028	0.0027	0.37	0.04
Benzo(k) Fluoranthene[b] (ug/l)	0.018	0.0038	0.028	0.027	3.7	0.41
beta-BHC[b] (ug/l)	0.046	0.014	0.029	0.011	0.035	0.012
Bromoform[b] (ug/l)	140	4.3	240	7.2	480	7.3
Butylbenzyl Phthalate (ug/l)			0.22	0.22	10	6.5
Carbon tetrachloride[b] (ug/l)	4.4	0.25	10	0.5	6.2	0.44
Chlordane[b] (ng/l)	0.46	0.46	0.6	0.59	1.6	1.6
Chlorobenzene (mg/l)	21	0.68	1.7	0.12	3138	130
Chloroform[b] (ug/l)	470	5.7	4800	66	4310	66
Chrysene[b] (ug/l)	0.018	0.0038	0.28	0.27	37	4
DDT[b] (ng/l)	0.024	0.024	0.05	0.05	0.44	0.44
Dibenzo(a,h)Anthracene[b] (ug/l)	0.018	0.0038	0.00028	0.00027	0.037	0.004
Dichlorobromomethane[b] (ug/l)	17	0.55	56	0.96	63	0.97
Dieldrin[b] (ng/l)	0.071	0.071	0.0022	0.0022	0.11	0.10
Diethyl Phthalate (ug/l)			1400	1100	18,000	4100
Dimethyl Phthalate (ug/l)			4000	3800	450,000	58000
Di-n-Butyl Phthalate (ug/l)			60	50	1800	490
Dioxin (2,3,7,8- TCDD)[b] (pg/l)	0.014	0.013	0.014	0.013	0.014	0.013
Endrin (ng/l)	2.3	2.3	64	63	0.49	0.46
Ethylbenzene (mg/l)	29	3.1	0.26	0.094	0.95	0.13
Fluoranthene (ug/l)	370	300	43	37	56	46
Fluorene (ug/l)	5300	1100	130	90	2500	270
gamma-BHC[b] (ug/l)	0.063	0.019	9.1	8.2	146	51
Heptachlor[b] (ng/l)	0.21	0.21	0.011	0.0011	0.18	0.17
Hexachlorobenzene[b] (ng/l)	0.77	0.72	0.15	0.15	0.91	0.89
Indeno(1,2,3-cd)Pyrene[b] (ug/l)	0.018	0.0038	0.0028	0.0027	0.37	0.04
Methoxychlor (ug/l)	0.03	0.03	0.04	0.03	0.53	0.53
Methyl Bromide (ug/l)	1500	47	25000	130	8620	131
Methylene Chloride[b] (ug/l)	590	4.6	2700	17	4489	17
PCB[b] (ng/l)	0.045	0.044	0.045	0.044	0.045	0.044
Phenol	4,600,000	4000	570,000	4000	690,000	4000
2-Chlorophenol	400	120	1700	33	60	21
2,4-Dichlorolphenol	790	93	120	17	119	17
2,4-Dimethylphenol	2300	540	5300	130	345	96
2,4-Dinitrophenol	14000	70	740	13	2155	13
Pentachlorophenol	8.2	0.28	0.07	0.04	1.84	0.08
Pyrene (ug/l)	4000	830	60	40	1616	178
Tetrachloroethylene[b] (ug/l)	8.85	0.8	59	13	126	14
Toluene[b] (mg/l)	200	6.8	1.1	0.061	1.47	0.06
Toxaphene[b] (ng/l)	0.73	0.73	1.5	1.4	0.56	0.55
Trichloroethylene[b] (ug/l)	81	2.7	14	0.6	15	0.64
Vinyl chloride[b] (chloroethene) (ug/l)	525	2	3.4	0.022	5	0.02

Override by current WV human health criteria