

For Interested Party Review – August 2008 Draft

3745-1-01 Purpose and applicability.

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

(A) Purpose and objective. It is the purpose of these water quality standards, Chapter 3745-1 of the Administrative Code, to:

- (1) Establish minimum water quality requirements for all surface waters of the state, thereby protecting public health and welfare;
- (2) Enable the present and planned uses of Ohio's water for public water supplies, industrial and agricultural needs, propagation of fish, aquatic life and wildlife, and recreational purposes;
- (3) Enhance, improve and maintain water quality as provided under the laws of the state of Ohio, section 6111.041 of the Revised Code, the federal Clean Water Act, 33 U.S.C. section 1251 et seq., and rules adopted thereunder; and
- (4) Further the overall objective of the Clean Water Act "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

(B) Goals. Consistent with national goals set forth in the Clean Water Act, all surface waters in Ohio shall provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the water unless the director determines the goal is not attainable for a specific water body. If the director determines that a water body cannot reasonably attain these goals using the available tests and criteria allowed under the Clean Water Act, then one of the following steps shall be taken:

- (1) The director shall evaluate the water body's designated beneficial uses and, where uses are not attainable, propose to change the designated uses to the best designations that can be attained; or
- (2) The director shall grant temporary variances from compliance with one or more water quality criteria applicable by this chapter pursuant to rule 3745-33-07 of the Administrative Code.

(C) Overview of this chapter.

- (1) Beneficial use designations.
 - (a) Beneficial use designations describe existing or potential uses of water

bodies. They take into consideration the use and value of water for public water supplies, protection and propagation of aquatic life, recreation in and on the water, agricultural, industrial and other purposes. This chapter assigns beneficial use designations to surface waters or the state. Examples of beneficial use designations include public water supply, primary contact recreation, and aquatic life uses (e.g., warmwater habitat, exceptional warmwater habitat, and coldwater habitat).

- (b) There may be more than one use designation assigned to a water body. Whenever two or more use designations apply to the same water body, all criteria associated with each use designation apply.
- (c) Beneficial use designations are defined in rule 3745-1-07 of the Administrative Code and are assigned in rules 3745-1-08 to 3745-1-32 of the Administrative Code. Attainment of use designations is based on specific numeric and narrative water quality criteria.

(2) Water quality criteria.

- (a) Water quality criteria are narrative statements and numeric values that support beneficial uses. Except as otherwise allowed by paragraph (E) of this rule, these criteria are the minimum water quality targets to attain in surface waters of the state.
- (b) Numeric water quality criteria for chemicals and bacteria are used in conjunction with the appropriate stream design flows set forth in rule 3745-2-05 of the Administrative Code for the purposes of establishing water quality based effluent limits through wasteload allocation calculations, and establishing load allocations through total maximum daily loads.
- (c) Numeric biological water quality criteria provide a direct measure of attainment of several aquatic life uses. See rule 3745-1-43 of the Administrative Code for a discussion of the application and interpretation of biological criteria.
- (d) Water quality criteria are in rules 3745-1-04, 3745-1-31, 3745-1-32, 3745-1-40, 3745-1-41, 3745-1-42, 3745-1-43, 3745-1-51 and 3745-1-52 of the Administrative Code. Additional water quality criteria may be calculated using the procedures in rules 3745-1-36 to 3745-1-39 of the Administrative Code. Provisions for calculating site-specific modifications to water quality criteria are in rule 3745-1-35 of the Administrative Code.

(3) Antidegradation provisions.

- (a) The antidegradation provisions describe the conditions under which water quality may be lowered in surface waters. Existing beneficial uses must be maintained and protected. Water quality better than that needed to protect existing uses must be maintained unless, after public notification and participation, lower quality is deemed necessary to allow important economic or social development (existing uses must still be protected).
 - (b) The antidegradation rules assign categories of high quality water (e.g., superior high quality water, outstanding state water, and category 3 wetland) to water bodies that possess exceptional ecological or recreational values. Those high quality waters are protected with additional restrictions on the degree to which water quality may be lowered.
 - (c) Provisions addressing antidegradation are in rules 3745-1-05 and 3745-1-54 of the Administrative Code.
 - (4) The other rules in this chapter address definitions (rule 3745-1-02 of the Administrative Code), analytical methods and citations for documents incorporated by reference (rule 3745-1-03 of the Administrative Code), mixing zone provisions (rule 3745-1-06 of the Administrative Code), and provisions specific to wetlands (rules 3745-1-50 to 3745-1-54 of the Administrative Code).
- (D) General provisions.
- (1) Chemical, physical and biological conditions of any surface waters of the state shall not impair existing and designated beneficial uses of downstream water bodies.
 - (2) These water quality standards apply to all surface waters of the state except as provided in paragraph (E) of this rule. Compliance schedules may be granted pursuant to rule 3745-33-05 of the Administrative Code.
- (E) Temporary exceptions. The following exceptions apply only to the specific water quality criteria involved in each case for a reasonable period of time as determined by the director.
- (1) Whenever chemicals are applied for control of aquatic plants or animals, notice must be given to the director before chemicals are applied. The director, upon receiving such notice, may order that chemicals not be applied if he concludes that the proposed application would pose an unreasonable danger to human or aquatic life. The application of pesticides registered under the Federal Insecticide, Fungicide and Rodenticide Act (7 U.S.C. 136 et seq.) are permitted without notification to the director when:

- (a) The pesticide is applied consistent with label instructions; and
 - (i) The application is to a pond with a surface area equal to or less than five acres;
 - (ii) The application is not within one mile upstream of a public water supply intake or within one mile of a reservoir public water supply intake; and
 - (iii) The application is not to any wetland, borrow pit, quarry or water body used for public swimming; or
 - (b) The pesticide is applied under the direction of a local health department or other government agency in a mosquito abatement program.
- (2) Whenever dredging or construction activities occur on or near water bodies or during the period of time when the aftereffects of dredging or construction activities degrade water quality and such activities have been authorized by the United States army corps of engineers or by a 401 water quality certification or an isolated wetland permit issued by the Ohio environmental protection agency.
- (3) Whenever coal remining permits are issued pursuant to section 301(p) of the act. This exception applies to pH, iron and manganese for the duration of the remining activity. This exception applies only if: there is a demonstrated potential for improved water quality from the remining operation; and no degradation of existing instream conditions occurs.

Replaces 3745-1-01

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Date

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3745-1-02 Definitions.

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

(A) Acronyms and abbreviations used in Chapter 3745-1 of the Administrative Code shall be defined as listed below.

AAC	Acute aquatic criterion
AAV	Acute aquatic value
ACR	Acute-chronic ratio
ADE	Acceptable daily exposure
BAF	Bioaccumulation factor
BCC	Bioaccumulative chemical of concern
BCF	Bioconcentration factor
BSAF	Biota-sediment accumulation factor
BW	Body weight
CAC	Chronic aquatic criterion
CAV	Chronic aquatic value
CBOD ₅	Five-day carbonaceous biochemical oxygen demand
CCC	Criterion continuous concentration
C.F.R.	Code of federal regulations
CMC	Criterion maximum concentration
DOC	Dissolved organic carbon
ECBP	Eastern corn belt plains ecoregion
EC ₅₀	Median effective concentration
EOLP	Erie/Ontario lake plain ecoregion
EPA	Environmental protection agency
FACR	Final acute-chronic ratio

FAV	Final acute value
FCM	Food-chain multiplier
FCV	Final chronic value
FPV	Final plant value
GMAV	Genus mean acute value
GMCV	Genus mean chronic value
HCC	Human cancer criterion
HCV	Human cancer value
HELP	Huron/Erie lake plain ecoregion
HNC	Human noncancer criterion
HNV	Human noncancer value
IMZM	Inside mixing zone maximum
IP	Interior plateau ecoregion
IRIS	Integrated risk information system
K_{ow}	Octanol-water partition coefficient
LC ₅₀	Median lethal concentration
ln	Natural logarithm
LOAEL	Lowest observed adverse effect level
log	Base ten logarithm
MF	Membrane filter
MPN	Most probable number
NIPDWR	National interim primary drinking water regulations
NOAEL	No observed adverse effect level
NPDES	National pollutant discharge elimination system
OMZA	Outside mixing zone average
OMZM	Outside mixing zone maximum
POC	Particulate organic carbon

POTW	Publicly owned treatment works
q ₁ *	Cancer slope factor
RAD	Risk associated dose
RSC	Relative source contribution
<u>RTI</u>	<u>Residence time index</u>
S	Soluble
SACR	Secondary acute-chronic ratio
SAF	Secondary acute factor
SAR	Structure-activity relationship
SAV	Secondary acute value
SMAV	Species mean acute value
SMCV	Species mean chronic value
T	Total
TD	Test dose
temp	Temperature
TL	Trophic level
TR	Total recoverable
UF	Uncertainty factor
U.S.C.	United States Code
WAP	Western Allegheny plateau ecoregion
WV	Wildlife value

(B) Technical words used in Chapter 3745-1 of the Administrative Code shall be defined as listed below.

- (1) "Acceptable daily exposure" or "ADE" means an estimate of the maximum daily dose of a substance which is not expected to result in adverse noncancer effects to the general human population, including sensitive subgroups.
- (2) "Act" means the federal Water Pollution Control Act (commonly referred to as the Clean Water Act), 33 U.S.C. 1251 et seq. ~~(as amended)~~.

- (3) "Acute aquatic criterion" or "AAC" means the Ohio EPA ~~estimation~~ estimate of the highest ~~instream~~ concentration of a ~~chemical~~ material in the water column to which an aquatic ~~organisms~~ community can be exposed ~~for a brief period of time~~ briefly ~~without causing mortality~~ resulting in an unacceptable effect.
- (4) "Acute-chronic ratio" or "ACR" means a standard measure of the acute toxicity of a material divided by an appropriate measure of the chronic toxicity of the same material under comparable conditions.
- (5) "Acute toxicity" means adverse effects that result from an acute exposure and occur within any short observation period which begins when the exposure begins, and usually does not constitute a substantial portion of the life span of the organism.
- (6) "Adverse effect" means any deleterious effect to organisms due to exposure to a substance. This includes effects which are or may become debilitating, harmful or toxic to the normal functions of the organism, but does not include non-harmful effects such as tissue discoloration alone or the induction of enzymes involved in the metabolism of the substance.
- (7) "Ambient water temperature" means the spatial (longitudinal, lateral and vertical) and temporal water temperature measured in the receiving body of water prior to a specific waste heat discharge, and is outside the influence of any thermal mixing zone.
- (8) "Average temperature" represents the arithmetic mean of multiple daily average temperatures ~~over a consecutive fifteen or thirty day period~~.
- (9) "Baseline BAF" means:
 - (a) For organic chemicals, a BAF that is based on the concentration of freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism; and
 - (b) For inorganic chemicals, a BAF that is based on the wet weight of the tissue.
- (10) "Baseline BCF" means:
 - (a) For organic chemicals, a BCF that is based on the concentration of freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism; and

- (b) For inorganic chemicals, a BCF that is based on the wet weight of the tissue.
- (11) "Bioaccumulation" means the net accumulation of a substance by an organism as a result of uptake from all environmental sources.
- (12) "Bioaccumulation factor" or "BAF" means the ratio (in l/kg) of a substance's concentration in the tissue of an aquatic organism to its concentration in the ambient water, in situations where both the organism and its food are exposed and the ratio does not change substantially over time.
- (13) "Bioaccumulative chemical of concern" or "BCC" is any chemical that has the potential to cause adverse effects which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor greater than one thousand, after considering metabolism and other physicochemical properties that might enhance or inhibit bioaccumulation, calculated in accordance with the methodology in rule 3745-1-37 of the Administrative Code. Chemicals with half-lives of less than eight weeks in the water column, sediment, and biota are not BCCs. The minimum BAF information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the BSAF methodology. The minimum BAF information needed to define an inorganic chemical, including an organometal, as a BCC is either a field-measured BAF or a laboratory-measured BCF. Bioaccumulative chemicals of concern include, but are not limited to, chlordane, 4,4'-DDD (p,p'-DDD, 4,4'-TDE, p,p'-TDE), 4,4'-DDE (p,p'-DDE), 4,4'-DDT (p,p'-DDT), dieldrin, hexachlorobenzene, hexachlorobutadiene (hexachloro-1,3-butadiene), hexachlorocyclohexanes (BHCs), alpha-hexachlorocyclohexane (alpha-BHC), beta-hexachlorocyclohexane (beta-BHC), delta-hexachlorocyclohexane (delta-BHC), lindane (gamma-hexachlorocyclohexane, gamma-BHC), mercury, mirex, octachlorostyrene, PCBs (polychlorinated biphenyls), pentachlorobenzene, photomirex, 2,3,7,8-TCDD (dioxin), 1,2,3,4-tetrachlorobenzene, 1,2,4,5-tetrachlorobenzene, and toxaphene.
- (14) "Bioconcentration" means the net accumulation of a substance by an aquatic organism as a result of uptake directly from the ambient water through gill membranes or other external body surfaces.
- (15) "Bioconcentration factor" or "BCF" means the ratio (in l/kg) of a substance's concentration in the tissue of an aquatic organism to its concentration in the ambient water, in situations where the organism is exposed through the water only and the ratio does not change substantially over time.

- (16) "Biota-sediment accumulation factor" or "BSAF" means the ratio (in kg of organic carbon/kg of lipid) of a substance's lipid-normalized concentration in the tissue of an aquatic organism to its organic carbon-normalized concentration in surface sediment, in situations where the ratio does not change substantially over time, both the organism and its food are exposed, and the surface sediment is representative of average surface sediment in the vicinity of the organism.
- (17) "°C" means degree(s) Celsius.
- (18) "Carcinogen" means a substance which causes an increased incidence of benign or malignant neoplasms, or substantially decreases the time to develop neoplasms, in animals or humans. The classification of carcinogens is discussed in rule 3745-1-38 of the Administrative Code.
- (19) "Chronic aquatic criterion" or "CAC" means the Ohio EPA ~~estimation~~ estimate of the highest ~~instream~~ concentration of a ~~chemical~~ material in the water column to which an aquatic organisms community can be exposed indefinitely without ~~causing~~ resulting in an unacceptable effects effect (e.g., an adverse effects effect on growth or reproduction).
- (20) "Chronic toxicity" means concurrent and delayed adverse effects that occur only as a result of a chronic exposure. Chronic exposure is exposure of an organism for any long period or for a substantial portion of its life span.
- (21) "Cold water fauna" means the species of aquatic life adapted to cool (19-22°C) or cold (15-18°C) thermal regimes and other special stream habitat conditions found in perennial flowing water associated with the out flowing of shallow or deep water aquifers, perched springs or natural seeps. Indicators of cold water fauna in Ohio include, but are not limited to, the organisms listed in table 7-2 of rule 3745-1-07 of the Administrative Code.
- ~~(21) "Coldwater fish" means those species of fish that thrive in relatively cold water. These species include, but are not limited to, salmon and trout (Salmonidae), and may include sculpins (Cottidae), and certain minnow (Cyprinidae) species.~~
- (22) "Confluence" means the point where two or more bodies of water flow together.
- (23) "Criteria" mean elements of water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular designated use.

- ~~(24)~~ "Criterion continuous concentration" or "CCC" means an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.
- ~~(25)~~ "Criterion maximum concentration" or "CMC" means an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.
- ~~(26)~~(24) "Daily average temperature" means the arithmetic mean of multiple temperature measurements to be taken at least once per hour during a twenty-four-hour day.
- (25) "Daily maximum temperature" means the highest temperature observed in a twenty-four-hour day.
- ~~(27)~~(26) "Degradation" means a lowering of the existing water quality in the surface waters of the state.
- ~~(28)~~(27) "Depuration" means the loss of a substance from an organism as a result of any active or passive process.
- ~~(29)~~(28) "Designated use" means a beneficial use of the surface waters of the state, established by the water quality standards, assigned in Chapter 3745-1 of the Administrative Code for a water body or segment whether or not that use is being attained. Specific designated uses are defined in rule 3745-1-07 of the Administrative Code.
- ~~(30)~~(29) "Director" means the director of the Ohio environmental protection agency.
- ~~(31)~~(30) "Discharge" means the addition of any pollutant to the waters of the state from a point source.
- (31) "Ditch maintenance program" means the pattern of regular inspection, maintenance and repair of drainage improvements authorized and carried out pursuant to petition ditch laws under Chapter 1515., 6131., 6133., or 6137. of the Revised Code.
- (32) "Drought" means the condition of severe or extreme soil dryness as measured by values of minus 3.0 or less on the Palmer drought severity index published weekly by the national oceanic and atmospheric administration. Information about the Palmer drought severity index is available on the internet at <http://drought.unl.edu/whatis/indices.htm#pdsi>.

- ~~(32)~~(33) "E. coli" means Escherichia coli, a specific bacterial species included in the fecal coliform bacteria group, the presence of which in surface waters has been correlated with gastrointestinal illness in swimmers.
- ~~(33)~~(34) "EC₅₀" means the median effective concentration and is a statistically or graphically estimated concentration that is expected to cause one or more specified effects in fifty per cent of a group of organisms under specified conditions.
- (35) "Endangered species" means: a native Ohio plant species listed or designated by the Ohio department of natural resources as endangered pursuant to section 1518.01 of the Revised Code; and an animal species listed or designated as endangered by the Ohio department of natural resources pursuant to section 1531.25 of the Revised Code; and any plant or animal species that is native to Ohio or that migrates or is otherwise reasonably likely to occur within the state and which has been listed as endangered pursuant to section 4 of the Endangered Species Act, 16 U.S.C. 1531 et seq.
- (36) "Epilimnion" means the uppermost (warmest and least dense) layer of water in a thermally stratified lake with relatively uniform water chemistry and temperature above the metalimnion. This layer is subject to thorough mixing by wind and convection currents.
- ~~(34)~~(37) "Estuary" means the section of a lake Erie tributary near the mouth where tributary and lake Erie waters mix. This area is characterized by flow reversals and seiche influences and is generally located between the farthest downstream riffle of the tributary and lake Erie proper. All tributaries of estuaries shall be considered estuaries below the lake Erie mean high water level.
- (38) "Existing use" means a beneficial use actually attained in the water body on or after November 28, 1975 regardless of the beneficial uses designated for the water body in this chapter. Beneficial uses are those set out in rule 3745-1-07 of the Administrative Code. For aquatic life uses defined by this chapter "actually attained" means meeting the biological criteria associated with the use, or meeting the chemical criteria if no biological criteria are applicable, on a permanent or recurring basis on or after November 28, 1975. For non-aquatic life uses "actually attained" means meeting the bacteria or chemical criteria for the use on or after November 28, 1975, or confirming that the use as defined by this chapter existed on a permanent or recurring basis on or after November 28, 1975.
- ~~(35)~~(39) "°F" means degree(s) Fahrenheit.

~~(36)~~ "Fecal coliform" means the portion of the coliform group of bacteria which is present in the intestinal tract of warmblooded animals, and is evidence of the presence of human or animal wastes.

~~(37)~~(40) "Final acute value" or "FAV" means:

- (a) A calculated estimate of the concentration of a test material such that ninety-five per cent of the genera (with which acceptable acute toxicity tests have been conducted on the material) have higher GMAVS; or
- (b) The SMAV of an important and/or critical species, if the SMAV is lower than the calculated estimate.

~~(38)~~(41) "Final chronic value" or "FCV" means:

- (a) A calculated estimate of the concentration of a test material such that ninety-five per cent of the genera (with which acceptable chronic toxicity tests have been conducted on the material) have higher GMCVS;
- (b) The quotient of an FAV divided by an appropriate acute-chronic ratio; or
- (c) The SMCV of an important and/or critical species, if the SMCV is lower than the calculated estimate or the quotient, whichever is applicable.

~~(39)~~(42) "Final plant value" or "FPV" means the lowest plant value obtained with an important aquatic plant species in an acceptable toxicity test for which the concentrations of the test material were measured and the adverse effect was biologically important.

~~(40)~~(43) "Food-chain multiplier" or "FCM" Means the ratio of a BAF to an appropriate BCF. A food-chain multiplier is meant to account for accumulation of a chemical up the food chain attributable to predation (i.e., between successive trophic levels).

~~(41)~~(44) "Genus mean acute value" or "GMAV" means the geometric mean of the SMAVs for the genus.

~~(42)~~(45) "Genus mean chronic value" or "GMCV" means the geometric mean of the SMCVS for the genus.

~~(43)~~(46) "Geometric mean" means the Nth root of the product of N quantities.

- ~~(44)~~(47) "Great Lakes system" means all the streams, rivers, lakes and other bodies of water within the drainage basin of the Great Lakes within the United States.
- ~~(48)~~ "Historically channelized watercourse" means the portion of a watercourse, exclusive of adjacent wetlands, on which drainage improvements were constructed pursuant to Chapter 1515., 6131., or 6133. of the Revised Code, or were constructed under a similar state law that preceded any of those chapters. A drainage improvement is defined in divisions (C)(2) to (C)(4) of section 6131.01 of the Revised Code. If historical records cannot be located, then visual observations of side cast spoil banks in an upland landscape with supporting land surface elevation surveys may suffice as evidence that the watercourse was historically channelized.
- ~~(45)~~(49) "Human cancer criterion" or "HCC" is a human cancer value for a pollutant that meets the minimum data requirements for tier I as specified in rule 3745-1-38 of the Administrative Code.
- ~~(46)~~(50) "Human cancer value" or "HCV" is the maximum ambient water concentration of a substance at which a lifetime of exposure from either: drinking the water, consuming fish from the water, and water-related recreation activities; or consuming fish from the water, and water-related recreation activities, will represent a plausible upper-bound risk of contracting cancer of one in one hundred thousand using the exposure assumptions specified in the methodologies for the development of human health criteria and values in rule 3745-1-38 of the Administrative Code.
- ~~(47)~~(51) "Human noncancer criterion" or "HNC" is a human noncancer value for a pollutant that meets the minimum data requirements for tier I as specified in rule 3745-1-38 of the Administrative Code.
- ~~(48)~~(52) "Human noncancer value" or "HNV" is the maximum ambient water concentration of a substance at which adverse noncancer effects are not likely to occur in the human population from lifetime exposure from either: drinking the water, consuming fish from the water, and water-related recreation activities; or consuming fish from the water and water-related recreation activities, using the methodologies for the development of human health criteria and values in rule 3745-1-38 of the Administrative Code.
- (53) "Hypolimnion" means the bottommost (coolest and most dense) layer of water in a thermally stratified lake with relatively uniform temperature below the metalimnion. This layer is not subject to mixing by wind or convection currents.

(54) "Lacustrary" means a freshwater estuary where river and lake waters mix, especially near large bodies of fresh water such as the great lakes. These lacustraries are slack water that can ebb and flow as lake seiches affect water levels and are generally located between the farthest downstream riffle of the tributary and lake Erie proper. All tributaries of lacustraries shall be considered lacustraries below the lake Erie mean high water level.

(55) "Lake" means a surface water of the state that is a natural or constructed pooled or impounded body of water. "Lakes" include ponds, reservoirs, upground reservoirs and impounded stream segments with hydraulic residence time index (RTI) values of 0.5 or greater. "Lakes" do not include wetlands or water bodies designated in rules 3745-1-08 to 3745-1-30 of the Administrative Code as modified warmwater habitat - impounded. The RTI value is determined using the following equation:

$$\text{RTI} = (\text{SA} / \text{DA}) \times 1000$$

Where:

DA = drainage area above the dam; and

SA = Surface area of the lake.

~~(49)~~(56) "Lake Erie drainage basin" means all the streams, rivers, lakes and other bodies of water within the drainage basin of lake Erie and within the United States.

~~(50)~~(57) "LC₅₀" means the median lethal concentration and is a statistically or graphically estimated concentration that is expected to be lethal to fifty per cent of a group of organisms under specified conditions.

~~(51)~~(58) "Linearized multistage model" means a conservative mathematical model for cancer risk assessment. This model fits linear dose-response curves to low doses. It is consistent with a no-threshold model of carcinogenesis, i.e., exposure to even a very small amount of the substance is assumed to produce a finite increased risk of cancer.

~~(52)~~(59) "Lowest observed adverse effect level" or "LOAEL" means the lowest tested dose or concentration of a substance which results in an observed adverse effect in exposed test organisms when all higher doses or concentrations result in the same or more severe effects.

~~(53) "Maximum daily temperature" means the highest temperature observed in a twenty four hour day.~~

- ~~(60)~~ "Metalimnion" means the density transition layer typically creating a thermally stratified lake by preventing the mixing of the entire lake depth. This layer is defined by a temperature change of greater than or equal to one degree Celsius with each one meter change in depth. The layer above this layer is the epilimnion and the layer below is the hypolimnion.
- ~~(54)~~~~(61)~~ "Micrograms per liter (ug/l)" means the micrograms of substance per liter of solution, and is equivalent to 10^{-9} kilograms per liter or parts per billion, assuming unit density.
- ~~(55)~~~~(62)~~ "Milligrams per kilogram (mg/kg)" means the milligrams of substance per kilogram of weight.
- ~~(56)~~~~(63)~~ "Milligrams per liter (mg/l)" means the milligrams of substance per liter of solution, and is equivalent to 10^{-6} kilograms per liter or parts per million, assuming unit density.
- ~~(57)~~~~(64)~~ "Mine drainage" means surface or groundwater flowing through or from mines and mine sites. It is usually characterized by concentrations of acidity or alkalinity, various heavy metals, sulfates, and dissolved solids.
- ~~(58)~~~~(65)~~ "Mixing zone" means an area of a water body contiguous to a treated or untreated wastewater discharge. The discharge is in transit and progressively diluted from the source concentration to the receiving system concentration. The mixing zone is a place where wastewater and receiving water mix, not a place where wastes are treated.
- ~~(59)~~~~(66)~~ "Nanograms per liter (ng/l)" means the nanograms of substance per liter of solution, and is equivalent to 10^{-12} kilograms per liter or parts per trillion, assuming unit density.
- ~~(60)~~~~(67)~~ "Natural conditions" mean those conditions that are measured outside the direct or otherwise obvious influence of human activities.
- ~~(61)~~~~(68)~~ "No observed adverse effect level" or "NOAEL" means the highest tested dose or concentration of a substance which results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.
- ~~(62)~~~~(69)~~ "Nonpoint source" means any source of pollutants other than those defined as point sources.

- ~~(63)~~(70) "Octanol-water partition coefficient" or " K_{ow} " means the ratio of the concentration of a substance in the N-octanol phase to its concentration in the aqueous phase in an equilibrated two-phase octanol-water system. For $\log K_{ow}$, the log of the octanol-water partition coefficient is a base ten logarithm.
- ~~(64)~~(71) "Ohio river drainage basin" means all the streams, rivers, lakes and other bodies of water within the drainage basin of the Ohio river.
- ~~(65)~~(72) "pH" means the negative logarithm of the hydrogen ion activity concentrations when expressed as moles per liter or $\text{pH} = -\log(\text{H}^+)$.
- ~~(66)~~(73) "Picograms per liter (pg/l)" means the picograms of substance per liter of solution, and is equivalent to 10^{-15} kilograms per liter or parts per quadrillion, assuming unit density.
- ~~(67)~~(74) "Point source" means any discernible, confined or discrete conveyance from which a pollutant is or may be discharged to the surface waters of the state.
- ~~(68)~~(75) "Pollutant" means sewage, industrial waste or other waste as defined by divisions (B) to (D) of section 6111.01 of the Revised Code.
- (76) "Public water system" means the same as defined in rule 3745-81-01 of the Administrative Code.
- ~~(69)~~(77) "Receiving waters" mean the surface waters of the state into which point and nonpoint sources flow.
- ~~(70)~~(78) "Relative source contribution" or "RSC" means the factor (percentage) used in calculating a HNV or HNC to account for all sources of exposure to a contaminant. The RSC reflects the per cent of total exposure which can be attributed to surface water through water intake and fish consumption.
- ~~(71)~~(79) "Representative aquatic species" mean those organisms, either natural or introduced, which presently exist or have existed in the surface waters of the state prior to July 1, 1977, with the exception of those banned species outlined in rule 1501:31-19-01 of the Administrative Code. In addition, it may include any species that are legally introduced into the surface waters of the state. Aquatic species designated as representative shall satisfy one or more of the following:
- (a) Species which are particularly vulnerable to the existing or proposed environmental impact in question;

- (b) Species which are commercially or recreationally valuable;
- (c) Species which are threatened, rare, or endangered;
- (d) Species which are critical to the structure and function of the aquatic community;
- (e) Species whose presence is causally related to the existing or proposed environmental impact under examination;
- (f) Species that are potentially capable of becoming localized nuisance species; or
- (g) Species that are representative of the ecological, behavioral, and physiological requirements and characteristics of species determined in paragraphs ~~(B)(71)(a)~~ (B)(79)(a) to ~~(B)(71)(f)~~ (B)(79)(f) of this rule, but which themselves may not be representative.

~~(72)~~(80) "Risk associated dose" or "RAD" means a dose of a known or presumed carcinogenic substance in (mg/kg)/day which, over a lifetime of exposure, is estimated to be associated with a plausible upper bound incremental cancer risk equal to one in one hundred thousand.

(81) "RTI" means residence time index. See "lake."

~~(73)~~(82) "Slope factor" or "Q₁*" means the incremental rate of cancer development calculated through use of a linearized multistage model or other appropriate model. It is expressed in (mg/kg/day) of exposure to the chemical in question.

~~(74)~~(83) "Species mean acute value" or "SMAV" means the geometric mean of the results of all acceptable flow-through acute toxicity tests (for which the concentrations of the test material were measured) with the most sensitive tested life stage of the species. For a species for which no such result is available for the most sensitive tested life stage, the SMAV is the geometric mean of the results of all acceptable acute toxicity tests with the most sensitive tested life stage.

~~(75)~~(84) "Species mean chronic value" or "SMCV" means the geometric mean of the results of all acceptable life-cycle and partial life-cycle toxicity tests with the species; for a species of fish for which no such result is available, the SMCV is the geometric mean of all acceptable early life-stage tests.

- (85) "Stream" means a water body having a channel with well defined bed and banks, either natural or artificial, that confine and conduct continuous or periodical flowing water.
- ~~(76)~~(86) "Structure-activity relationship" or "SAR" means a mathematical relationship between a property (i.e., biological activity or response) of a chemical and a number of descriptors of the chemical. These descriptors are chemical or physical characteristics obtained experimentally or predicted from the structure of the chemical.
- ~~(77)~~(87) "Surface waters of the state" or "water bodies" mean all streams, lakes, reservoirs, ponds, marshes, wetlands or other waterways which are situated wholly or partially within the boundaries of the state, except those private waters which do not combine or effect a junction with natural surface or underground waters. Waters defined as sewerage system, treatment works or disposal system in section 6111.01 of the Revised Code are not included.
- ~~(78)~~(88) "Thermal mixing zone" means that portion of a water body into which waste heat is discharged and assimilated, and within which the average and maximum daily average temperatures do not apply, except as prescribed by this chapter.
- ~~(79) "Threatened or endangered species" mean those species of the state's biota which are threatened with statewide extirpation or national extinction, as listed in rule 1501:31-23-01 of the Administrative Code or 50 C.F.R. 17 or that are listed as endangered or threatened under section 4 of the Endangered Species Act, 16 U.S.C. 1531 et seq. (as amended).~~
- (89) "Threatened species" means: a native Ohio plant species listed or designated by the Ohio department of natural resources as threatened with extirpation pursuant to section 1518.01 of the Revised Code; and an animal species listed or designated as threatened with statewide extinction by the Ohio department of natural resources pursuant to section 1531.25 of the Revised Code; and any plant or animal species that is native to Ohio or that migrates or is otherwise reasonably likely to occur within the state and which has been listed as threatened pursuant to section 4 of the Endangered Species Act, 16 U.S.C. 1531 et seq.
- ~~(80)~~(90) "Threshold effect" means an effect of a substance for which there is a theoretical or empirically established dose or concentration below which the effect does not occur.
- ~~(81)~~(91) "Tier I criteria" mean numeric values derived by use of the tier I methodologies specified in rules 3745-1-36, 3745-1-38 and 3745-1-39 of the

Administrative Code, that either have been adopted as numeric criteria into a water quality standard or are used to implement narrative water quality criteria.

~~(82)~~(92) "Tier II values" mean numeric values derived by use of the tier II methodologies specified in rules 3745-1-36 and 3745-1-38 of the Administrative Code that are used to implement narrative water quality criteria.

~~(83)~~(93) "Toxic substances" mean any substances which can cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological or reproductive malfunction or physical deformities in any organism or its offspring, or which can become poisonous after concentration in the food chain or in combination with other substances.

~~(84)~~(94) "Tributary" means a stream flowing into a larger body of water.

~~(85)~~(95) "Uncertainty factor" or "UF" means one of several numeric factors used in operationally deriving criteria from experimental data to account for the quality or quantity of the available data.

~~(86)~~(96) "Uptake" means acquisition of a substance from the environment by an organism as a result of any active or passive process.

~~(87)~~(97) "Use attainability analysis" means a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological, and economic factors.

~~(88)~~(98) "Warmwater fish" means those species of fish that inhabit relatively warm water. These species include, but are not limited to, bass, crappies and ~~sunfish~~ panfish (Centrarchidae), and catfish (Ictaluridae), and may include certain suckers (Catostomidae), minnows (Cyprinidae), and perch and darter (Percidae) species.

~~(89)~~(99) "Water quality standards" means the rules set forth in Chapter 3745-1 of the Administrative Code establishing stream use designations and water quality criteria protective of such uses for the surface waters of the state.

~~(90)~~(100) "Wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration that are sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. "Wetlands" includes swamps, marshes, bogs, and similar areas that are delineated in accordance with the 1987 United States army corps of engineers wetland delineation

~~manual and any other procedures and requirements adopted by the United States army corps of engineers for delineating wetlands.~~

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For Interested Party Review – August 2008 Draft

3745-1-03 **Analytical methods and availability of documents.**

(A) Analytical methods.

- (1) All methods of analysis used in applying any of the chemical-specific and bacteriological criteria in this chapter shall be in accordance with those prescribed in 40 C.F.R. 136, "Manual of Ohio EPA Laboratory Standard Operating Procedures, Volumes I, II and III," and "Standard Methods for the Examination of Water and Wastewater," as cited in paragraph (B) of this rule.
- (2) All methods of sample collection and preservation used in applying any of the chemical-specific and bacteriological criteria in this chapter shall be in accordance with "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices" as cited in paragraph (B) of this rule.
- (3) Methods for conducting whole-effluent toxicity tests shall be in accordance with those prescribed in 40 C.F.R. 136 and "Manual of Ohio EPA Laboratory Standard Operating Procedures, Volume IV," as cited in paragraph (B) of this rule.
- (4) Mixing zones for thermal discharges will be determined in accordance with "Guidelines for the Submittal of Demonstrations Pursuant to Sections 316(a) and 316(b) of the Clean Water Act and Chapter 3745-1 of the Administrative Code," as cited in paragraph (B) of this rule.
- (5) Methods, data collection and data analysis requirements for applying the biological criteria in rule 3745-1-07 of the Administrative Code shall be in accordance with "Biological Criteria for the Protection of Aquatic Life," and "Manual of Ohio EPA Laboratory Standard Operating Procedures, Volumes I, II, III and IV," as cited in paragraph (B) of this rule.

(B) Availability of documents. The following documents are cited in this chapter.

- (1) Code of Federal Regulations (CFR) references. The Code of Federal Regulations can generally be found in public libraries, and can be viewed electronically online at <http://www.gpoaccess.gov/cfr/index.html> and purchased by writing to: "Superintendent of Documents. Attn: New Orders, PO Box 371954, Pittsburgh, PA 15250-7954." The regulations listed in this paragraph are those effective ~~June 1, 2007~~ July 1, 2008.
 - (a) 40 C.F.R. 124.8, "Procedures for Decisionmaking, Subpart A - General Program Requirements - Fact Sheet."

- (b) 40 C.F.R. 124.56, "Procedures for Decisionmaking, Subpart D - Specific Procedures Applicable to NPDES Permits - Fact Sheets."
 - (c) 40 C.F.R. 131, "Water Quality Standards."
 - (d) 40 C.F.R. 131.10, "Designation of Uses."
 - (e) 40 C.F.R. 132, "Water Quality Guidance for the Great Lakes System."
 - ~~(d)~~(f) 40 C.F.R. 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants."
 - ~~(e)~~(g) 40 C.F.R. 230.10, "Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material - Restrictions on discharge."
 - ~~(f)~~(h) 40 C.F.R. 400 to 471, "Subchapter N - Effluent Guidelines and Standards."
 - ~~(g)~~(i) 50 C.F.R. 17, "Endangered and Threatened Wildlife and Plants."
- (2) Federal statute references. These laws can generally be found in public libraries, and can be viewed electronically online at <http://www.gpoaccess.gov/uscode/index.html> and purchased by writing to: "Superintendent of Documents. Attn: New Orders, PO Box 371954, Pittsburgh, PA 15250-7954." The laws listed in this paragraph are those as amended through ~~June 1, 2007~~ July 1, 2008.
- (a) "Federal Water Pollution Control Act (commonly referred to as the Clean Water Act)," 33 U.S.C. 1251 et seq.
 - (b) "Endangered Species Act," 16 U.S.C. 1531 et seq.
 - (c) "Federal Insecticide, Fungicide and Rodenticide Act," 7 U.S.C. 136 et seq.
 - (d) "Safe Drinking Water Act," 42 U.S.C. 300f et seq.
 - (e) "Rivers and Harbors Act of 1899," 33 U.S.C. 401 et seq.
- (3) Other references. The availability of these documents is provided with each paragraph.
- (a) "Biological Criteria for the Protection of Aquatic Life." These documents are available on the internet at <http://www.epa.state.oh.us/dsw/bioassess/BioCriteriaProtAqLife.html>.

- (i) "Biological Criteria for the Protection of Aquatic Life: Volume I: The Role of Biological Data in Water Quality Assessment, Ohio EPA, Ecological Assessment Section, Division of Water Quality Planning & Assessment, July 24, 1987, updated February 15, 1988."
- (ii) "Biological Criteria for the Protection of Aquatic Life: Volume II: Users Manual for Biological Field Assessment of Ohio Surface Waters, Ohio EPA, Ecological Assessment Section, Division of Water Quality Planning & Assessment, October 30, 1987, updated January 1, 1988, amended September 30, 1989, updated November 8, 2006."
- (iii) "Biological Criteria for the Protection of Aquatic Life: Volume III: Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities, Ohio EPA, Ecological Assessment Section, Division of Water Quality Planning & Assessment, September 30, 1989, updated November 8, 2006."
- (iv) "The Qualitative Habitat Evaluation Index [QHEI]: Rationale, Methods, and Application, Ohio EPA, Ecological Assessment Section, Division of Water Quality Planning & Assessment, November 6, 1989."
- (v) "Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI), Ohio EPA Technical Bulletin EAS/2006-06-1, Ohio EPA, Division of Surface Water, June 2006."
- (b) "Corps of Engineers Wetlands Delineation Manual, U.S. Army Corps of Engineers, Wetlands Research Program Technical Report Y-87-1, January 1987." This document is available on the internet at <http://www.lrh.usace.army.mil/permits/wetlands/>.
- (c) "Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams, Ohio EPA Division of Surface Water, September 2002 (Final Version 1.0)." This document is available on the internet at <http://www.epa.state.oh.us/dsw/wqs/headwaters/index.html>.
- ~~(e)~~(d) "Guidance for Water Quality-based Decisions and the TMDL Process, U.S. EPA Office of Water, EPA 440/4-91-001, April 1991." This document is available on the internet at <http://www.epa.gov/waterscience/pc/watqual.html>.
- ~~(d)~~(e) "Guidelines for Carcinogen Risk Assessment, Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, DC, EPA/630/P-

03/001F, March 2005." This document is available on the internet at <http://www.epa.gov/iris/backgr-d.htm>.

~~(e)~~(f) "Guidelines for the Submittal of Demonstrations Pursuant to Sections 316(a) and 316(b) of the Clean Water Act and Chapter 3745-1 of the Administrative Code, Ohio Environmental Protection Agency, Division of Industrial Wastewater, September 30, 1978." This document is available on the internet at <http://www.epa.state.oh.us/dsw/guidance/guidance.html>.

~~(f)~~(g) "Manual of Ohio EPA Laboratory Standard Operating Procedures, Volumes I, II, III and IV, 2002." These documents are available from "Ohio EPA, Division of Environmental Services, 8995 East Main Street, Building #22, Reynoldsburg, Ohio 43068."

~~(g)~~(h) "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices—~~2006~~ 2008, Ohio EPA, Division of Surface Water, Division of Environmental Services." This document is available on the internet at http://www.epa.state.oh.us/dsw/document_index/docindx.html.

~~(h)~~(i) "Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency, Washington, DC, EPA-822-B-00-004, October 2000." This document is available on the internet at <http://www.epa.gov/waterscience/criteria/humanhealth/method/index.html>.

(j) "Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), Technical Support Document Volume 2: Development of National Bioaccumulation Factors, Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency, Washington, DC, EPA-822-R-03-030, December 2003." This document is available on the internet at <http://www.epa.gov/waterscience/criteria/humanhealth/method/index.html>.

(k) "Pollution Control Standards for discharges to the Ohio River, 2006 Revision, Ohio River Valley Water Sanitation Commission." This document is available on the internet at <http://www.orsanco.org/>.

~~(i)~~(l) "Recommendations for and Documentation of Biological Values for Use in Risk Assessment (U.S. EPA, 1988), EPA/600/6-87/008." This document is available on the internet at <http://www.epa.gov/iris/backgr-d.htm>.

~~(j)~~(m) "Registry of Toxic Effects of Chemical Substances (National Institute for Occupational Safety and Health, Cincinnati, Ohio, July 1997)." This

document is available on the internet at <http://0-www.cdc.gov.mill1.sjlibrary.org/niosh/97-119.html>.

~~(k)~~(n) "Standard Methods for the Examination of Water and Wastewater, 21st Edition, American Public Health Association, American Water Works Association and Water Environment Federation, 2005." This document is available on the internet at <http://www.standardmethods.org/>.

~~(h)~~(o) "Standard Practice for Conducting Bioconcentration Tests with Fishes and Saltwater Bivalve Molluscs. Standard E 1022. Molluscs. Designation E 1022 - 84. Pages 606-622. American Society for Testing and Materials, Philadelphia, PA. (1990)." This document is available on the internet at www.astm.org.

~~(m)~~(p) "Water Quality Standards Handbook, U.S. EPA Office of Water, EPA-823-B-94-005, August 1994." This document is available on the internet at <http://www.epa.gov/waterscience/standards/policy.htm>.

~~(n)~~(q) "The Wildlife Exposure Factors Handbook (U.S. EPA, 1993), EPA/600/R-93/187." This document is available on the internet at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=2799>.

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For Interested Party Review – August 2008 Draft

3745-1-04 **Criteria applicable to all waters.**

The following general water quality criteria shall apply to all surface waters of the state including mixing zones. To every extent practical and possible as determined by the director, these waters shall be:

- (A) Free from suspended solids or other substances that enter the waters as a result of human activity and that will settle to form putrescent or otherwise objectionable sludge deposits, or that will adversely affect aquatic life;
- (B) Free from floating debris, oil, scum and other floating materials entering the waters as a result of human activity in amounts sufficient to be unsightly or cause degradation;
- (C) Free from materials entering the waters as a result of human activity producing color, odor or other conditions in such a degree as to create a nuisance;
- (D) Free from substances entering the waters as a result of human activity in concentrations that are toxic or harmful to human, animal or aquatic life and/or are rapidly lethal in the mixing zone;
- (E) Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae;
- (F) Free from public health nuisances associated with raw or poorly treated sewage or manure. A public health nuisance shall be deemed to exist when the conditions set forth in paragraph (F)(1) or (F)(2) of this rule are demonstrated.
 - (1) An inspection conducted by, or under the supervision of, Ohio EPA or a sanitarian registered under Chapter 4736. of the Revised Code documents odor, color ~~and/or~~ or other visual manifestations of raw or poorly treated sewage; and water samples exceed one thousand thirty E. coli counts per one hundred milliliters in two or more samples when five or fewer samples are collected, or in more than twenty per cent of the samples when more than five samples are taken.
 - ~~(a) Water samples exceed five thousand fecal coliform counts per one hundred milliliters (either MPN or MF) in two or more samples when five or fewer samples are collected, or in more than twenty per cent of the samples when more than five samples are taken; or~~
 - ~~(b) Water samples exceed five hundred seventy six E. coli counts per one hundred milliliters in two or more samples when five or fewer samples are collected, or in more than twenty per cent of the samples when more than five samples are taken.~~

- (a) For the purposes of applying paragraph (F)(1) of this rule the collection of water samples shall adhere to the following specifications:
 - (i) The samples shall be collected when flow is representative of steady state dry weather conditions, i.e., base flow or delayed flow;
 - (ii) The samples shall be collected at least two hours apart; and
 - (iii) The samples shall be collected over a time period not to exceed thirty days.
 - (b) Paragraph (F)(1) of this rule may be used by the appropriate authorities to document the existence of unsanitary conditions as described in section 6117.34 of the Revised Code, but does not preclude the use of other evidence of unsanitary conditions for the purposes described in section 6117.34 of the Revised Code.
- ~~(2) Paragraph (F)(1) of this rule may be used by the appropriate authorities to document the existence of unsanitary conditions as described in section 6117.34 of the Revised Code, but does not preclude the use of other evidence of unsanitary conditions for the purposes described in section 6117.34 of the Revised Code.~~
- (2) An inspection conducted by, or under the supervision of, Ohio EPA, Ohio department of agriculture, or a sanitarian registered under Chapter 4736. of the Revised Code documents odor, color or other visual manifestations of manure and water samples exceed one thousand thirty E. coli counts per one hundred milliliters in two or more samples when five or fewer samples are collected, or in more than twenty per cent of the samples when more than five samples are taken.
- (a) Representative water samples shall be collected during or shortly after manure laden runoff reaches surface waters of the state.
 - (b) Wherever possible, three or more locations shall be sampled:
 - (i) A point upstream from the suspected point or points of manure entry;
 - (ii) A point in the receiving water immediately adjacent to the suspected source of manure; and
 - (iii) A point downstream from the suspected point or points of manure entry.

~~(G) For the purposes of applying paragraph (F) of this rule the collection of water samples shall adhere to the following specifications:~~

~~(1) The samples shall be collected when flow is representative of steady state dry weather conditions, i.e., base flow or delayed flow, and~~

~~(2) The samples shall be collected at least two hours apart, and~~

~~(3) The samples shall be collected over a time period not to exceed thirty days.~~

~~(H)(G) Nothing in paragraph (F) or (G) of this rule shall limit or otherwise change the applicability of paragraphs (A) to (E) of this rule.~~

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3745-1-07 **Beneficial use designations.**

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

[Comment: Water quality criteria designed to protect beneficial uses are in rules 3745-1-40 to 3745-43 of the Administrative Code.]

- (A) Pursuant to section 6111.042 of the Revised Code, this rule sets forth the beneficial uses recognized as present and planned uses of Ohio's surface waters in a manner consistent with the act, and rules adopted thereunder. All the beneficial uses in this rule, except for secondary contact recreation, modified warmwater habitat, limited warmwater habitat and limited resource water meet the goals of the act. Water bodies designated secondary contact recreation, modified warmwater habitat and limited resource water have been the subject of use attainability analyses and have been found to be incapable of meeting the goals of the act. Water bodies designated limited warmwater habitat will undergo use attainability analyses and will be redesignated other aquatic life habitats. No additional water bodies will be designated limited warmwater habitat.
- (B) This rule designates waters as having beneficial uses based upon the definitions provided in paragraphs (C) to (H) of this rule. Additional use designations for individual water bodies are found in rules 3745-1-08 to 3745-1-32 of the Administrative Code.
- (C) Water supply use designations. Water quality criteria designed to protect these beneficial uses are in rule 3745-1-40 of the Administrative Code.
- (1) Public water supply. These are waters that, with conventional filtration treatment and disinfection as defined in rule 3745-81-01 of the Administrative Code, will be suitable for human intake and meet federal regulations for drinking water. The following water bodies are designated public water supply:
- (a) All water bodies designated public water supply in rules 3745-1-08 to 3745-1-32 of the Administrative Code;
- (b) All publicly owned lakes and reservoirs;
- (c) All privately owned lakes and reservoirs used as water sources for public water systems;

criteria for the protection of the general water based recreation use shall protect the visual aesthetic qualities of the water and reduce potential human health risks associated with the coincidental consumption of chemical contaminants present in sport caught fish.

- (3) Bathing waters. These are waters that, during the recreation season, are heavily used for swimming. The bathing water use applies to all water bodies where a lifeguard or bathhouse facilities are present, and to any additional water bodies designated bathing waters in rules 3745-1-08 to 3745-1-32 of the Administrative Code.
- (4) Primary contact recreation. These are waters that, during the recreation season, are suitable for one or more full-body contact recreation activities such as, but not limited to, wading, swimming, boating, water skiing, canoeing, kayaking, and scuba diving. Three classes of primary contact recreation use are defined to reflect differences in the observed and potential frequency and intensity of usage.
- (a) Class A primary contact recreation. These are waters that support, or potentially support, frequent primary contact recreation activities. The following water bodies are designated as class A primary contact recreation waters:
- (i) All water bodies defined as lakes and having publicly or privately improved access points; and
- (ii) All water bodies listed in table 7-1 of this rule.

[Comment: The streams and rivers listed in table 7-1 of this rule are popular paddling streams with public access points developed, maintained, and publicized by governmental entities.]

Table 7-1. Popular paddling streams with identified public access points designated class A primary contact recreation. The class A designation extends from the most upstream identified public access point to the mouth. (From "Boating On Ohio Streams," Ohio department of natural resources, division of watercraft. The description of these areas is on the Ohio department of natural resources website at <http://www.dnr.state.oh.us/watercraft/areas/tabid/2306/default.aspx>.)

<u>Water body name</u>	<u>Flows into</u>	<u>Drainage basin</u>
<u>Alum creek</u>	<u>Big Walnut creek</u>	<u>Scioto</u>
<u>Ashtabula river</u>	<u>Lake Erie</u>	<u>Ashtabula</u>
<u>Auglaize river</u>	<u>Maumee river</u>	<u>Maumee</u>
<u>Big Darby creek</u>	<u>Scioto river</u>	<u>Scioto</u>
<u>Big Walnut creek</u>	<u>Scioto river</u>	<u>Scioto</u>
<u>Black river</u>	<u>Lake Erie</u>	<u>Black</u>
<u>Black river, East branch</u>	<u>Black river</u>	<u>Black</u>
<u>Black river, West branch</u>	<u>Black river</u>	<u>Black</u>
<u>Blanchard river</u>	<u>Auglaize river</u>	<u>Maumee</u>
<u>Buck creek</u>	<u>Mad river</u>	<u>Great Miami</u>
<u>Caesar creek</u>	<u>Little Miami river</u>	<u>Little Miami</u>
<u>Captina creek</u>	<u>Ohio river</u>	<u>Central Ohio tributaries</u>
<u>Chagrin river</u>	<u>Lake Erie</u>	<u>Chagrin</u>
<u>Conneaut creek</u>	<u>Lake Erie</u>	<u>Ashtabula</u>
<u>Conotton creek</u>	<u>Tuscarawas river</u>	<u>Muskingum</u>
<u>Cuyahoga river</u>	<u>Lake Erie</u>	<u>Cuyahoga</u>
<u>Deer creek</u>	<u>Scioto river</u>	<u>Scioto</u>
<u>Duck creek</u>	<u>Ohio river</u>	<u>Central Ohio tributaries</u>
<u>Four-Mile/Talawanda creek (Fourmile creek)</u>	<u>Great Miami river</u>	<u>Great Miami</u>
<u>Grand river</u>	<u>Lake Erie</u>	<u>Grand</u>
<u>Great Miami river</u>	<u>Ohio river</u>	<u>Great Miami</u>
<u>Greenville creek</u>	<u>Stillwater river</u>	<u>Great Miami</u>
<u>Hocking river</u>	<u>Ohio river</u>	<u>Hocking</u>
<u>Huron river</u>	<u>Lake Erie</u>	<u>Huron</u>
<u>Huron river, East branch</u>	<u>Huron river</u>	<u>Huron</u>
<u>Huron River, West branch</u>	<u>Huron river</u>	<u>Huron</u>

<u>Water body name</u>	<u>Flows into</u>	<u>Drainage basin</u>
<u>Killbuck creek</u>	<u>Walhonding river</u>	<u>Muskingum</u>
<u>Kokosing river</u>	<u>Walhonding river</u>	<u>Muskingum</u>
<u>Licking river</u>	<u>Muskingum river</u>	<u>Muskingum</u>
<u>Licking river, South fork</u>	<u>Licking river</u>	<u>Muskingum</u>
<u>Licking river, North fork</u>	<u>Licking river</u>	<u>Muskingum</u>
<u>Little Beaver creek</u>	<u>Ohio river</u>	<u>Little Beaver</u>
<u>Little Miami river, East fork</u>	<u>Little Miami river</u>	<u>Little Miami</u>
<u>Little Miami river</u>	<u>Ohio river</u>	<u>Little Miami</u>
<u>Little Muskingum river</u>	<u>Ohio river</u>	<u>Central Ohio tributaries</u>
<u>Little Scioto river (Marion co.)</u>	<u>Scioto river</u>	<u>Scioto</u>
<u>Loramie creek</u>	<u>Great Miami river</u>	<u>Great Miami</u>
<u>Mad river</u>	<u>Great Miami river</u>	<u>Great Miami</u>
<u>Mahoning river</u>	<u>Ohio river</u>	<u>Mahoning</u>
<u>Mahoning river, West branch</u>	<u>Mahoning river</u>	<u>Mahoning</u>
<u>Maumee river</u>	<u>Maumee bay</u>	<u>Maumee</u>
<u>Mohican river</u>	<u>Walhonding river</u>	<u>Muskingum</u>
<u>Mohican river, Black fork</u>	<u>Mohican river</u>	<u>Muskingum</u>
<u>Mohican river, Clear fork</u>	<u>Mohican river</u>	<u>Muskingum</u>
<u>Mohican river, Lake fork</u>	<u>Mohican river</u>	<u>Muskingum</u>
<u>Muskingum river</u>	<u>Ohio river</u>	<u>Muskingum</u>
<u>Ohio Brush creek</u>	<u>Ohio river</u>	<u>Southwest Ohio tributaries</u>
<u>Olentangy river</u>	<u>Scioto river</u>	<u>Scioto</u>
<u>Ottawa river</u>	<u>Auglaize river</u>	<u>Maumee</u>
<u>Paint creek</u>	<u>Scioto river</u>	<u>Scioto</u>
<u>Paint creek, North fork</u>	<u>Paint creek</u>	<u>Scioto</u>
<u>Portage river</u>	<u>Lake Erie</u>	<u>Portage</u>
<u>Portage river, Middle branch</u>	<u>Portage river</u>	<u>Portage</u>
<u>Portage river, North branch</u>	<u>Portage river</u>	<u>Portage</u>
<u>Pymatuning creek</u>	<u>Shenango river</u>	<u>Mahoning</u>
<u>Raccoon creek</u>	<u>Ohio river</u>	<u>Southeast Ohio tributaries</u>
<u>Rocky fork creek (Rocky fork)</u>	<u>Paint creek</u>	<u>Scioto</u>
<u>Rocky river, East branch</u>	<u>Rocky river</u>	<u>Rocky</u>

<u>Water body name</u>	<u>Flows into</u>	<u>Drainage basin</u>
<u>Rocky river</u>	<u>Lake Erie</u>	<u>Rocky</u>
<u>Rocky river, West branch</u>	<u>Rocky river</u>	<u>Rocky</u>
<u>Salt creek</u>	<u>Scioto river</u>	<u>Scioto</u>
<u>Sandusky river</u>	<u>Sandusky bay</u>	<u>Maumee</u>
<u>Sandy creek</u>	<u>Tuscarawas river</u>	<u>Muskingum</u>
<u>Scioto Brush creek</u>	<u>Scioto river</u>	<u>Scioto</u>
<u>Scioto Brush creek, North fork</u>	<u>Scioto brush creek</u>	<u>Scioto</u>
<u>Scioto Brush creek, South fork</u>	<u>Scioto brush creek</u>	<u>Scioto</u>
<u>Scioto river</u>	<u>Ohio river</u>	<u>Scioto</u>
<u>St. Joseph river</u>	<u>Maumee river</u>	<u>Maumee</u>
<u>St. Marys river</u>	<u>Maumee river</u>	<u>Maumee</u>
<u>Stillwater river</u>	<u>Great Miami river</u>	<u>Great Miami</u>
<u>Straight creek</u>	<u>Ohio river</u>	<u>Southwest Ohio tributaries</u>
<u>Sugar creek</u>	<u>Tuscarawas river</u>	<u>Muskingum</u>
<u>Sunfish creek</u>	<u>Ohio river</u>	<u>Central Ohio tributaries</u>
<u>Symmes creek</u>	<u>Muskingum river</u>	<u>Muskingum</u>
<u>Tiffin river</u>	<u>Maumee river</u>	<u>Maumee</u>
<u>Tinkers creek</u>	<u>Cuyahoga river</u>	<u>Cuyahoga</u>
<u>Tuscarawas river</u>	<u>Muskingum river</u>	<u>Muskingum</u>
<u>Twin creek</u>	<u>Great Miami river</u>	<u>Great Miami</u>
<u>Vermilion river</u>	<u>Lake Erie</u>	<u>Vermilion</u>
<u>Walhonding river</u>	<u>Muskingum river</u>	<u>Muskingum</u>
<u>White Oak creek (Whiteoak creek)</u>	<u>Ohio river</u>	<u>Southwest Ohio tributaries</u>
<u>Whitewater river</u>	<u>Great Miami river</u>	<u>Great Miami</u>
<u>Wills creek</u>	<u>Muskingum river</u>	<u>Muskingum</u>
<u>Wills creek, Seneca fork</u>	<u>Wills creek</u>	<u>Muskingum</u>

- (b) Class B primary contact recreation. These are waters that support, or potentially support, occasional primary contact recreation activities. All surface waters of the state are designated as class B primary contact recreation unless otherwise designated as bathing waters, class A primary contact recreation, class C primary contact recreation or secondary contact recreation.
 - (c) Class C primary contact recreation. These are water bodies that support, or potentially support, infrequent primary contact recreation activities such as, but not limited to, wading. The following water bodies are designated class C primary contact recreation:
 - (i) All water body segments with drainage areas less than 3.1 square miles and meeting the definition of historically channelized watercourse, unless they are specifically designated a different recreational use in rules 3745-1-08 to 3745-1-30 of the Administrative Code;
 - (ii) All water bodies specifically designated class C primary contact recreation in rules 3745-1-08 to 3745-1-30 of the Administrative Code.
 - (5) Secondary contact recreation. These are water bodies that, for reasons of limited access, result in minimal exposure potential to water borne pathogens because the waters are rarely used for water based recreation such as, but not limited to, wading. These waters are situated in remote, sparsely populated areas, or otherwise have restricted access points, thereby greatly limiting the potential for water based recreation activities. Waters designated secondary contact recreation are identified in rules 3745-1-08 to 3745-1-30 of the Administrative Code
- (E) Base aquatic life use designation.
- (1) These are waters conducive to the survival, protection and propagation of fish and other aquatic species that naturally, or through intentional introduction and management by resource agencies, inhabit surface waters of the state. Other wildlife species that depend upon aquatic resources are likewise afforded protection.
 - (2) The designation of base aquatic life use shall apply to all water bodies that are not otherwise designated under the tiered aquatic life use system described in paragraph (F) of this rule.

- (3) Water quality criteria designed to protect this beneficial use are in rule 3745-1-42 of the Administrative Code.
- (F) Tiered aquatic life use designations. Ten subcategories of aquatic life uses are currently utilized by Ohio EPA in its regulatory and water quality management work. Water quality criteria designed to protect these beneficial uses are in rules 3745-1-42 and 3745-1-43 of the Administrative Code.
- (1) Warmwater habitat.
- (a) Common meaning – This term usually describes and applies to the typical rivers, streams and creeks found throughout all areas of Ohio. This stream habitat typically has at least some natural features and it supports healthy, well balanced populations of fish and other aquatic life.
- (b) Technical definition – These are waters capable of supporting and maintaining a balanced, integrated, adaptive community of warmwater aquatic organisms having a species composition, diversity, and functional organization comparable to the twenty-fifth percentile of the identified reference sites within each of the following ecoregions: the interior plateau ecoregion, the Erie/Ontario lake plains ecoregion, the western Allegheny plateau ecoregion and the eastern corn belt plains ecoregion. For the Huron/Erie lake plains ecoregion, the comparable species composition, diversity and functional organization are based upon the ninetieth percentile of all sites within the ecoregion.
- (c) Specific water bodies designated warmwater habitat are identified in rules 3745-1-08 to 3745-1-32 of the Administrative Code.
- (2) Exceptional warmwater habitat.
- (a) Common meaning – This term usually describes and applies to the rivers, streams and creeks in Ohio that possess unique or special features that set them apart from other warmwater streams. The stream habitat typically has mostly natural features and it supports highly diverse or unusual populations of fish and other aquatic life.
- (b) Technical definition – These are waters capable of supporting and maintaining an exceptional or unusual community of warmwater aquatic organisms having a species composition, diversity, and functional organization comparable to the seventy-fifth percentile of the identified reference sites on a statewide basis.

(c) Specific water bodies designated exceptional warmwater habitat are identified in rules 3745-1-08 to 3745-1-32 of the Administrative Code.

(3) Modified warmwater habitat.

(a) Common meaning – This term usually describes and applies to the rivers, streams and creeks in Ohio that have been highly modified by human activities and because of this cannot support well balanced populations of fish and other aquatic life. The alteration of the stream habitat must be irretrievable and considered permanent over a time scale of at least fifty years.

(b) Technical definition – These are waters that have been the subject of a use attainability analysis and have been found to be incapable of supporting and maintaining a balanced, integrated, adaptive community of warmwater organisms due to irretrievable modifications of the physical habitat. Such modifications are of a long-lasting duration (i.e., fifty years or longer) and may include the following examples:

(i) Extensive stream channel modification activities permitted under sections 401 and 404 of the act or Chapter 6131. of the Revised Code;

(ii) Extensive sedimentation resulting from abandoned mine land runoff; and

(iii) Extensive permanent impoundment of free-flowing water bodies.

(c) Each water body designated modified warmwater habitat will be listed in the appropriate use designation rule (rules 3745-1-08 to 3745-1-32 of the Administrative Code) and will be identified by ecoregion and type of physical habitat modification as listed in the modified warmwater habitat biological criteria table in rule 3745-1-43 of the Administrative Code. The modified warmwater habitat designation can be applied only to those waters that do not attain the warmwater habitat biological criteria in rule 3745-1-43 of the Administrative Code because of irretrievable modifications of the physical habitat. All water body segments designated modified warmwater habitat will be reviewed on a triennial basis (or sooner) to determine whether the use designation should be changed.

(4) Coldwater habitat.

(a) Common meaning – This term usually describes and applies to the rivers, streams and creeks in Ohio that maintain cooler summer water temperatures and thus are able to support different species of aquatic life than are found in warmwater streams. The stream habitat typically has mostly natural features and a year-round connection to ground water.

(b) Technical definitions –

(i) Coldwater habitat inland trout streams. These are waters that support trout stocking and management under the auspices of the Ohio department of natural resources, division of wildlife, excluding waters in lake run stocking programs, lake or reservoir stocking programs, experimental or trial stocking programs, and put and take programs on waters without, or without the potential restoration of, natural cold water attributes of temperature and flow. The director shall designate these waters in consultation with the director of the Ohio department of natural resources.

(ii) Native cold water fauna streams. These are waters capable of supporting populations of native cold water fauna as defined in rule 3745-1-02 of the Administrative Code. Cold water fauna include, but are not limited to, the organisms listed in table 7-2 of this rule. The director shall designate these waters based upon results of use attainability analyses that determine that combinations of these species are present in significant numbers, or could be present in significant numbers if chemical water quality were not limiting. Streams assigned this designated use shall meet these criteria:

(a) Streams with drainage areas greater than or equal to 1.0 square mile must have one or more of the following:

(i) A native population of brook trout;

(ii) Populations of two species of cold water fish, and organisms from two taxa of primary cold water macroinvertebrates; or

(iii) Organisms from four taxa of cold water macroinvertebrates.

(b) Streams with a drainage areas less than 1.0 square mile must have one or both of the following:

(i) One reproducing population of a species of cold water vertebrate; or

(ii) Organisms from four taxa of cold water macroinvertebrates.

(iii) Specific water bodies designated coldwater habitat are identified in rules 3745-1-08 to 3745-1-32 of the Administrative Code.

Table 7-2. Cold water fauna native to Ohio waters. All macroinvertebrate taxa, except those taxa marked with an asterisk, are primary cold water indicators. The taxa marked with an asterisk are secondary cold water indicators. Secondary cold water indicators are common in coldwater habitats but are adapted to a wider range of environmental conditions than the primary cold water indicators.

<u>Vertebrates - Fish</u> <u>American brook lamprey (<i>Lampetra appendix</i>)</u> <u>Brook stickleback (<i>Culaea inconstans</i>)</u> <u>Brook trout (<i>Salvelinus fontinalis</i>)</u> <u>Central bigmouth shiner (<i>Notropis dorsalis dorsalis</i>)</u> <u>Central mottled sculpin (<i>Cottus bairdi bairdi</i>)</u> <u>Central mudminnow (<i>Umbra limi</i>)</u> <u>Longnose dace (<i>Rhinichthys cataractae</i>)</u> <u>Northern brook lamprey (<i>Ichthyomyzon fossor</i>)</u> <u>Redside dace (<i>Clinostomus elongatus</i>)</u> <u>Southern redbelly dace (<i>Phoxinus erythrogaster</i>)</u> <u>Western tongue-tied minnow (<i>Exoglossum laurae hubbsi</i>)</u>
<u>Vertebrates - Salamanders</u> <u>Cave salamander (<i>Eurycea lucifuga</i>)</u> <u>Kentucky spring salamander (<i>Gyrinophilus porphyriticus duryi</i>)</u> <u>Long-tailed salamander (<i>Eurycea longicauda</i>)</u> <u>Midland mud salamander (<i>Pseudotriton montanus diasticus</i>)</u> <u>Northern red salamander (<i>Pseudotriton ruber ruber</i>)</u> <u>Northern spring salamander (<i>Gyrinophilus porphyriticus porphyriticus</i>)</u> <u>Northern two-lined salamander (<i>Eurycea bislineata bislineata</i>)</u> <u>Southern two-lined salamander (<i>Eurycea bislineata cirrigera</i>)</u>
<u>Macroinvertebrates – Crustacea (crustaceans)</u> <u>Gammarus minus*</u>

<u>Macroinvertebrates – Diptera (true flies)</u>	
<u>Dicranota sp.</u>	<u>Heterotrissocladius marcidus</u>
<u>Pedicia sp.</u>	<u>Metriocnemus eurynotus</u>
<u>Thaumalea americana</u>	<u>Parachaetocladius sp.</u>
<u>Apsectrotanypus johnsoni</u>	<u>Parametriocnemus sp.*</u>
<u>Brundiniella eumorpha</u>	<u>Psilometriocnemus triannulatus</u>
<u>Macropelopia decedens</u>	<u>Rheocricotopus eminellobus</u>
<u>Meropelopia sp.*</u>	<u>Thienemanniella boltoni</u>
<u>Radotanypus florens</u>	<u>Polypedilum (Polypedilum) albicorne</u>
<u>Trissopelopia ogemawi</u>	<u>Polypedilum (Polypedilum) aviceps</u>
<u>Zavrelimyia sp.*</u>	<u>"Constempellina" n. sp. 1</u>
<u>Diamesa sp.</u>	<u>Micropsectra sp.*</u>
<u>Pagastia orthogonia</u>	<u>Neostempellina reissi</u>
<u>Odontomesa ferringtoni</u>	<u>Neozavrelia sp. 1</u>
<u>Prodiamesa olivacea</u>	<u>Paratanytarsus n. sp. 1</u>
<u>Brillia parva</u>	<u>Stempellinella boltoni</u>
<u>Chaetocladius piger</u>	<u>Zavrelia n. sp. 1</u>
<u>Corynoneura n. sp. 5</u>	<u>Chelifera sp.</u>
<u>Eukiefferiella devonica group</u>	<u>Clinocera (Clinocera) sp.</u>
<u>Heleniella sp.</u>	
<u>Macroinvertebrates – Ephemeroptera (mayflies)</u>	
<u>Ameletus sp.</u>	<u>Maccaffertium modestum</u>
<u>Baetis tricaudatus</u>	<u>Habrophlebiodes sp.</u>
<u>Epeorus sp.</u>	<u>Dannella simplex</u>
<u>Maccaffertium ithaca</u>	<u>Litobrancha recurvata</u>
<u>Macroinvertebrates – Megaloptera (alderflies, dobsonflies, fishflies)</u>	
<u>Nigronia fasciatus</u>	
<u>Macroinvertebrates – Odonata (dragonflies and damselflies)</u>	
<u>Boyeria grafiana</u>	
<u>Lanthus parvulus*</u>	
<u>Macroinvertebrates – Plecoptera (stoneflies)</u>	
<u>Peltoperla sp.</u>	<u>Leuctra sp.</u>
<u>Amphinemura sp.</u>	<u>Eccoptura xanthenes</u>
<u>Soyedina sp.</u>	<u>Sweltsa sp.</u>
<u>Macroinvertebrates – Trichoptera (caddisflies)</u>	
<u>Dolophilodes sp.</u>	<u>Oligostomis sp.</u>
<u>Wormaldia sp.</u>	<u>Frenesia sp.</u>
<u>Ceratopsyche slossonae</u>	<u>Goera sp.</u>
<u>Ceratopsyche ventura</u>	<u>Lepidostoma sp.</u>
<u>Diplectrona sp.</u>	<u>Psilotreta indecisa</u>
<u>Parapsyche sp.</u>	<u>Psilotreta rufa</u>
<u>Rhyacophila sp. (excluding R. lobifera)</u>	<u>Molanna sp.</u>
<u>Glossosoma sp.</u>	

- (5) Seasonal salmonid habitat. These are water bodies capable of supporting the passage of salmonids from October to May and are water bodies large enough to support recreational fishing. This use is in effect the months of October to May and applies in addition to any other applicable aquatic life habitat use designations. Specific water bodies designated seasonal salmonid habitat are identified in rules 3745-1-08 to 3745-1-32 of the Administrative Code.
- (6) Limited resource water. These are waters that have been the subject of a use attainability analysis and have been found to lack the potential for any resemblance of any other aquatic life habitat as determined by the biological criteria in rule 3745-1-43 of the Administrative Code. The use attainability analysis must demonstrate that the extant fauna is substantially degraded and that the potential for recovery of the fauna to the level characteristic of any other aquatic life habitat is realistically precluded due to natural background conditions or irretrievable human-induced conditions. For water bodies in the lake Erie drainage basin, the designation of water bodies as limited resource waters shall include demonstrations that the “outside mixing zone average” water quality criteria and values and chronic whole effluent toxicity levels are not necessary to protect the designated uses and aquatic life pursuant to rule 3745-1-35 of the Administrative Code. Specific water bodies designated limited resource water are identified in rules 3745-1-08 to 3745-1-30 of the Administrative Code. All water body segments designated limited resource water will be reviewed on a triennial basis (or sooner) to determine whether the use designation should be changed. Waters designated limited resource water will be assigned one or more of the following causative factors. These causative factors will be listed as comments in rules 3745-1-08 to 3745-1-30 of the Administrative Code.
- (a) Acid mine drainage. These are surface waters that display one or more of these characteristics:
- (i) Sustained pH values below 4.1 s.u.;
 - (ii) Intermittently acidic conditions of sufficient magnitude and duration to suppress biological performance below modified warmwater habitat biological criteria; or
 - (iii) Intermittently acidic conditions combined with severe streambed siltation of sufficient magnitude and duration to suppress biological performance below modified warmwater habitat biological criteria.

(b) Small drainageway maintenance. These are highly modified surface water drainageways (usually less than three square miles in drainage area) that do not possess the stream morphology and habitat characteristics necessary to support any other aquatic life habitat use. Opportunity for improved habitat conditions must be restricted by the operations of a ditch maintenance program as defined in rule 3745-1-02 of the Administrative Code.

(c) Other specified conditions.

(7) Limited warmwater habitat.

(a) These are waters that were temporarily designated in the 1978 water quality standards as not meeting specific warmwater habitat criteria. Water quality criteria for the support of this use designation are the same as the criteria for the warmwater habitat use designation. However, individual criteria are varied on a case-by-case basis and supersede the criteria for the warmwater habitat where applicable. Any exceptions from warmwater habitat criteria apply only to specific criteria during specified time periods or flow conditions. The adjusted criteria and conditions for specified water bodies are denoted as comments in rules 3745-1-08 to 3745-1-30 of the Administrative Code. Water bodies currently designated limited warmwater habitat will undergo use attainability analyses and will be redesignated other aquatic life habitats. No additional water bodies will be designated limited warmwater habitat.

(b) Specific water bodies designated limited warmwater habitat are identified in rules 3745-1-08, 3745-1-13, 3745-1-16 and 3745-1-24 of the Administrative Code.

(8) Lake habitat.

(a) These are natural or constructed pooled or impounded bodies of water, excluding lake Erie, that meet the definition of lake in rule 3745-1-02 of the Administrative Code.

(b) All inland water bodies meeting the definition of lake in rule 3745-1-02 of the Administrative Code are designated lake habitat. Water quality standards applicable to lake Erie are described in rule 3745-1-31 of the Administrative Code.

(9) Primary headwater habitat.

- (a) Common meaning and importance – These are the networks of small springs, seeps, and streams that, at a minimum, contribute either perennial or seasonal water flow to downstream channel segments. Very often these water bodies are too small to appear on maps of 1:24,000 scale. Primary headwater habitats perform valuable hydrological and ecological functions. High quality primary headwaters often harbor unique populations of insects and amphibians and provide a critical habitat for salamanders. Collectively, these habitats exert strong influences on the chemical, physical and biological quality of downstream waters and on the beneficial uses that larger waters support.
- (b) Waters designated primary headwater habitat – All water body segments with drainage areas less than 1.0 square mile, unless site-specific data confirm that the drainage area for a water body should be different and that alternative drainage area is identified in rule.
- (c) Assignment of primary headwater habitat classes – For purposes of reviewing applications for authorizations required by Chapter 6111. of the Revised Code, the classification system for primary headwater habitats in paragraph (D)(9)(d) of this rule shall be applied if the director believes that such information will be useful in the review process. The classification system is intended to assist in efforts that will avoid, minimize and mitigate the effects of the regulated activity upon the following: the physical habitat conditions of the stream channel; the chemical, physical and biological integrity of the primary headwater habitat; and the existing uses and designated uses of the immediate segment and of downstream stream segments. The assignment of primary headwater class shall be done at the time of project review.

[Comment: A stream mitigation rule package is under development to establish standard protocols for assessing impact and assigning mitigation credit for projects that impact streams. The assessment protocol includes using this classification system for primary headwater streams.]

- (d) Technical classification system for primary headwater habitats - Each primary headwater habitat water body may be classified using the evaluation methods described in "Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams." The director shall consider all pertinent data and information collected by Ohio EPA, an applicant for authorization of an activity regulated under Chapter 6111. of the Revised Code, or a third party. The assignment of primary headwater class does

not require a water quality standard rulemaking under Chapter 119. of the Revised Code.

(i) Class I primary headwater habitat.

(a) These streams are normally dry for much of the year. These streams have little or no aquatic life potential, except seasonally when flowing water is present for short time periods following precipitation or snow melt. Primary headwater habitats assigned to class I may be typified by one or more of the following characteristics:

(i) No significant aquatic habitat;

(ii) No significant aquatic wildlife use; and

(iii) Limited or no potential to achieve higher primary headwater class functions.

(b) Many of the functions of class I primary headwater habitats can be replaced by storm water control best management practices.

(ii) Class II primary headwater habitat.

(a) These streams are normally intermittent but may have perennial flow. They may exhibit moderately diverse communities of warm water adapted native fauna present either seasonally or on an annual basis. The native fauna is characterized by species of vertebrates (temperature facultative species of amphibians and headwater pioneering species of fish) and/or benthic macroinvertebrates. Pool depth and water volume are normally insufficient to support the biological criteria associated with other sub-categories of aquatic life described in this rule. Prevailing temperature conditions in class II primary headwater habitats prevent establishment of class III biology and function.

(b) Many of the functions of class II primary headwater habitats can normally be replaced by storm water control best management practices and the use of stream habitat restoration and mitigation techniques.

(iii) Class III primary headwater habitat.

- (a) These streams are fed by ground water and support a cold water fauna meeting one or more of the following criteria:

 - (i) At least one species of fish listed in table 7-2 of this rule;
 - (ii) A reproducing population at least one species of salamander listed in table 7-2 of this rule; or
 - (iii) Organisms from four taxa of macroinvertebrates listed in table 7-2 of this rule.

- (b) Primary headwater habitats assigned to class III may be typified by some or all of the following characteristics:

 - (i) High levels of biodiversity;
 - (ii) Fauna adapted to cool or cold water;
 - (iii) Perennial water flow;
 - (iv) Course grained substrates;
 - (v) Presence of rare or endangered species; and
 - (vi) High functional values.

- (c) The functions of class III primary headwater habitats can rarely be replaced on a highly disturbed project site through installation of storm water control best management practices and stream habitat restoration and mitigation techniques. Therefore, avoidance of impact is highly preferred whenever feasible and practical. If impacts cannot be avoided, then the project applicant must demonstrate that class III primary headwater habitats are locally and regionally abundant and, as part of an overall mitigation plan, submit a viable watershed management plan that ensures their protection.

- (iv) Modified primary headwater habitats.

 - (a) Class I and class II primary headwater habitats may be further classified as modified habitats if they:

- (i) Are historically channelized watercourses;
- (ii) Have permanent structures to impound free-flowing water; or
- (iii) Otherwise have human induced channel modifications that are of long-lasting duration.

(b) Modified primary headwater habitats may include, but are not limited to, streams dominated by native species and streams that, because of long-lasting channel modifications, have a limited potential for increased functional values.

(10) Wetland. All water bodies meeting the definition of wetland in rule 3745-1-02 of the Administrative Code are designated the wetland use.

(G) Drainage use designations.

[Comment: The terms ditch maintenance program and historically channelized watercourse are defined in rule 3745-1-02 of the Administrative Code.]

(1) Upland drainage.

- (a) These are water bodies constructed in the upland areas of watersheds to drain the landscapes of excess water during wet periods.
- (b) The upland drainage use designation shall apply to all water body segments that:
 - (i) Are historically channelized watercourses;
 - (ii) Have an average gradient of less than 0.30 per cent; and
 - (iii) Drain less than 3.1 square miles.

(2) Water conveyance.

- (a) These are water bodies constructed or modified from naturally occurring stream channels to convey excess water during flood events and to drain the landscapes of excess water during wet periods.
- (b) The water conveyance use designation shall apply to all water body segments that:

- (i) Are historically channelized watercourses;
 - (ii) Drain 3.1 square miles or more;
 - (iii) Are under a ditch maintenance program; and
 - (iv) Are designated in rules 3745-1-08 to 3745-1-30 of the Administrative Code for one of the following subcategories of aquatic life use: warmwater habitat, modified warmwater habitat, or limited resource water.
- (3) There are no chemical, bacteria or biological criteria designed for the drainage use designations.
- [Comment: The criteria in rule 3745-1-04 of the Administrative Code, applicable to all waters, and the criteria associated with any other assigned beneficial use designations apply to these water bodies.]
- (4) All waters assigned a drainage use designation and meeting the conditions of division (C) of section 6111.12 of the Revised Code shall be subject to an abbreviated antidegradation review under rule 3745-1-05 of the Administrative Code.

(H) Navigation.

- (1) These are water bodies that support commercial navigation or recreational boating and are subject to periodic maintenance of essential navigation features pursuant to authorization granted by the United States Congress under the Rivers and Harbors Act of 1899. This beneficial use category recognizes the importance of these water bodies to Ohio's commercial, industrial and recreational interests.
- (2) The objective of the navigation use designation is to protect ships and their crews and to maintain water quality that will not restrict or prevent navigation.
- (3) There are no chemical, bacteria or biological criteria designed for the navigation use designation.
- [Comment: The criteria in rule 3745-1-04 of the Administrative Code, applicable to all waters, and the criteria associated with any other assigned beneficial use designations apply to these water bodies.]
- (4) The navigation use shall be maintained in a fashion that is compatible with attainment of all other designated beneficial uses assigned to the water body

unless a use attainability analysis determines that another use or uses are precluded because of navigation. One or more of the criteria for removal of a use allowed under federal water quality standard regulations, 40 C.F.R. 131.10 must be satisfied.

(5) The navigation use shall apply to the water bodies in table 7-3 of this rule.

Table 7-3. Water bodies assigned the navigation use designation.

<u>Ashtabula harbor</u>	<u>Cleveland harbor</u>	<u>Conneaut harbor</u>
<u>Cooley canal</u>	<u>Fairport harbor</u>	<u>Huron harbor</u>
<u>Lorain harbor</u>	<u>Muskingum river</u>	<u>Ohio river</u>
<u>Port Clinton harbor</u>	<u>Put-in-Bay harbor</u>	<u>Rocky river harbor</u>
<u>Sandusky harbor</u>	<u>Toledo harbor</u>	<u>Toussaint river</u>
<u>Vermilion harbor</u>	<u>West harbor</u>	

Replaces 3745-1-07

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For Interested Party Review – August 2008 Draft

3745-1-31 Lake Erie standards.

- (A) Lake Erie is designated exceptional warmwater habitat, superior high quality water, public water supply, agricultural water supply, industrial water supply and bathing waters, and will meet the criteria set forth in, or derived in accordance with, ~~rules 3745-1-01 to 3745-1-07 of the Administrative Code, rule 3745-1-33 of the Administrative Code, and rules 3745-1-36 to 3745-1-39 of the Administrative Code~~ this chapter for those designations. However, criteria set forth in this rule supersede ~~the above rules~~ the criteria for those designations where applicable. These criteria apply outside the mixing zone.
- (B) Temperature.
- (1) There shall be no water temperature changes as a result of human activity that cause mortality, long-term avoidance or exclusion from habitat, or adversely affect the reproductive success of representative aquatic species.
 - (2) At no time shall water temperature exceed the average or daily maximum temperatures indicated in paragraphs (A) and (B) of table 31-1 of this rule.
 - (3) The temperature of the hypolimnetic waters of lake Erie shall not exceed at any time the daily maximum temperatures indicated in paragraph (C) of table 31-1 of this rule.
- (C) Effective January 1, 2011, open lake disposal of dredge material in Ohio waters of the western lake Erie basin shall be limited to a maximum of fifty thousand cubic yards per applicant per any twelve month period. The western lake Erie basin is the area of lake Erie west of a line drawn from Pelee point, Canada to Scott point on Catawba island. All applicants wishing to dispose of dredge material in Ohio waters of the western lake Erie basin in the amounts limited by this paragraph shall seek authorization in accordance with Chapter 3745-32 and rule 3745-1-05 of the Administrative Code.

Table 31-1. Temperature criteria.

(A) Lake Erie western basin - includes the area of lake Erie west of a line drawn from Pelee point, Canada to Scott point on Catawba island. Shown as degrees fahrenheit and (celsius).

	Jan. <u>1-31</u>	Feb. <u>1-29</u>	Mar. <u>1-15</u>	Mar. <u>16-31</u>	Apr. <u>1-15</u>	Apr. <u>16-30</u>	May <u>1-15</u>	May <u>16-31</u>	June <u>1-15</u>
Average:	-	-	-	-	-	53 (11.7)	59 (15.0)	65 (18.3)	75 (23.9)
Daily Maximum:	35 (1.7)	38 (3.3)	39 (3.9)	45 (7.2)	51 (10.6)	56 (13.3)	64 (17.8)	72 (22.2)	78 (25.6)
	June <u>16-30</u>	July <u>1-31</u>	Aug. <u>1-31</u>	Sept. <u>1-15</u>	Sept. <u>16-30</u>	Oct. <u>1-15</u>	Oct. <u>16-31</u>	Nov. <u>1-30</u>	Dec. <u>1-31</u>
Average:	80 (26.7)	83 (28.3)	83 (28.3)	78 (25.6)	76 (24.4)	66 (18.9)	60 (15.6)	53 (11.7)	-
Daily Maximum:	83 (28.3)	85 (29.4)	85 (29.4)	83 (28.3)	81 (27.2)	71 (21.7)	65 (18.3)	58 (14.4)	46 (7.8)

(B) Lake Erie central basin - includes the area of lake Erie east of a line drawn from Pelee point, Canada to Scott point on Catawba island to the Pennsylvania-Ohio state line. Shown as degrees fahrenheit and (celsius).

	Jan. <u>1-31</u>	Feb. <u>1-29</u>	Mar. <u>1-15</u>	Mar. <u>16-31</u>	Apr. <u>1-15</u>	Apr. <u>16-30</u>	May <u>1-15</u>	May <u>16-31</u>	June <u>1-15</u>
Average:	-	-	-	-	43 (6.1)	53 (11.7)	59 (15.0)	63 (17.2)	75 (23.9)
Daily Maximum:	35 (1.7)	38 (3.3)	39 (3.9)	45 (7.2)	48 (8.9)	56 (13.3)	63 (17.2)	72 (22.2)	78 (25.6)
	June <u>16-30</u>	July <u>1-31</u>	Aug. <u>1-31</u>	Sept. <u>1-15</u>	Sept. <u>16-30</u>	Oct. <u>1-15</u>	Oct. <u>16-31</u>	Nov. <u>1-30</u>	Dec. <u>1-31</u>
Average:	80 (26.7)	83 (28.3)	83 (28.3)	76 (24.4)	71 (21.7)	66 (18.9)	58 (14.4)	48 (8.9)	-
Daily Maximum:	83 (28.3)	85 (29.4)	85 (29.4)	81 (27.2)	76 (24.4)	71 (21.7)	63 (17.2)	53 (11.7)	46 (7.8)

- (C) Seasonal daily maximum temperature limitations for the hypolimnetic regions of lake Erie. Shown as degrees fahrenheit and (celsius).

<u>Month</u>	<u>Daily Maximum</u>
January	44 (6.7)
February	44 (6.7)
March	44 (6.7)
April	47 (8.3)
May	51 (10.6)
June	54 (12.2)
July	59 (15.0)
August	59 (15.0)
September	55 (12.8)
October	46 (7.8)
November	41 (5.0)
December	38 (3.3)

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For Interested Party Review – August 2008 Draft

3745-1-32 **Ohio river standards.**

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

The Ohio river is designated warmwater habitat, public water supply, agricultural water supply, industrial water supply and bathing waters, and will meet the most stringent criteria set forth in, or derived in accordance with, this chapter and the Ohio river valley water sanitation commission (ORSANCO) publication "Pollution Control Standards for discharges to the Ohio River."

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3745-1-35 **Site-specific modifications to criteria and values.**

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

- (A) Requirements for site-specific modifications to criteria and values. Criteria and values adopted in, or developed pursuant to, this chapter may be modified on a site-specific basis to reflect local environmental conditions in accordance with the following provisions. Any such modifications shall be protective of designated uses and aquatic life, wildlife and human health and be submitted to the U.S. EPA for approval. Any site-specific modifications shall be based on a sound scientific rationale. In addition, any site-specific modifications that result in less stringent criteria shall not be likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of such species' critical habitat. More stringent modifications shall be developed to protect threatened or endangered species, where such modifications are necessary to ensure that water quality is not likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such species' critical habitat. More stringent modifications may also be developed to protect candidate (C1) species being considered by the United States Fish and Wildlife Service for listing under section 4 of the Endangered Species Act (16 U.S.C. Section 1531 et seq., ~~as amended~~), where such modifications are necessary to protect such species.
- (B) Aquatic life.
- (1) Aquatic life criteria or values may be modified on a site-specific basis to provide an additional level of protection where the toxicity or exposure potential is greater than the toxicity or exposure potential assumptions used to derive the criteria or values in question.
 - (2) Less stringent site-specific modifications to chronic or acute aquatic life criteria or values may be developed when:
 - (a) The local water quality characteristics (such as, but not limited to, pH, hardness, temperature or color) lessen the biological availability or toxicity of a pollutant; or
 - (b) The sensitivity of the aquatic organisms species that occur at the site differs from the species actually tested in developing the criteria. The phrase "occur at the site" includes the species, genera, families, orders, classes, and phyla that: are usually present at the site; are present at the site only seasonally due to migration; are present intermittently because they

periodically return to or extend their ranges into the site; were present at the site in the past and are not currently present at the site due to degraded conditions but are expected to return to the site when conditions improve; are present in nearby bodies of water and are not currently present at the site due to degraded conditions but are expected to be present at the site when conditions improve. The taxa that "occur at the site" cannot be determined merely by sampling downstream and/or upstream of the site at one point in time. "Occur at the site" does not include taxa that were once present at the site but cannot exist at the site now due to permanent physical alteration of the habitat at the site resulting, for example, from dams.

- (3) Less stringent modifications also may be developed to acute and chronic aquatic life criteria or values to reflect local physical and hydrological conditions.
- (4) Less stringent modifications to the whole effluent toxicity level for limited resource waters, as specified in rule 3745-2-09 of the Administrative Code, may be applied. Documentation provided by the permittee or independently available to the director shall show that the modification, not to exceed 1.0 acute toxic unit, is protective of the resident aquatic community.
- (5) Any modifications to protect threatened or endangered aquatic species required by paragraph (A) of this rule may be accomplished using either of the two following procedures:
 - (a) If the species mean acute value (SMAV) for a listed or proposed species, or for a surrogate of such species, is lower than the calculated final acute value (FAV), such lower SMAV may be used instead of the calculated FAV in developing site-specific modified criteria; or
 - (b) The site-specific criteria may be calculated using the recalculation procedure for site-specific modifications described in chapter 3 of the "U.S. EPA Water Quality Standards Handbook, ~~Second Edition~~ Revised (1994)".

(C) Wildlife.

- (1) Wildlife water quality criteria may be modified on a site-specific basis to provide an additional level of protection where the toxicity or exposure potential is greater than the toxicity or exposure potential assumptions used to derive the criteria in question.
- (2) Less stringent site-specific modifications to wildlife water quality criteria may be developed provided that:

- (a) The modification demonstration addresses both the mobility of prey organisms and wildlife populations in defining the site for which the modification is developed;
 - (b) The modification reflects a site-specific bioaccumulation factor; and
 - (c) There is a showing that:
 - (i) Any increased uptake of the toxicant by prey species utilizing the site will not cause adverse effects in wildlife populations; and
 - (ii) Wildlife populations utilizing the site or downstream waters will continue to be fully protected.
- (3) Any modification to protect threatened or endangered wildlife species required by paragraph (A) of this rule must consider both the mobility of prey organisms and wildlife populations in defining the site for which criteria are developed, and may be accomplished by using the following recommended method:
- (a) Use the methodology contained in rule 3745-1-39 of the Administrative Code, substituting appropriate species-specific toxicological, epidemiological, or exposure information, including changes to the BAF;
 - (b) Use an interspecies uncertainty factor of one where epidemiological data are available for the species in question. If necessary, species-specific exposure parameters can be derived in accordance with rule 3745-1-39 of the Administrative Code;
 - (c) Apply an intraspecies uncertainty factor (to account for protection of individuals within a wildlife population) in the denominator of the effect part of the wildlife equation contained in rule 3745-1-39 of the Administrative Code in a manner consistent with the other uncertainty factors described in rule 3745-1-39 of the Administrative Code; and
 - (d) Compare the resulting wildlife value for the species in question to the two class-specific wildlife values which were previously calculated, then select the lowest of the three as the site-specific modification.
- (D) Bioaccumulation factors.
- (1) BAFs may be modified on a site-specific basis, pursuant to the methodology contained in rule 3745-1-37 of the Administrative Code, to larger values where reliable data show that local bioaccumulation is greater than the basin-wide

value.

- (2) BAFs may be modified on a site-specific basis, pursuant to the methodology contained in rule 3745-1-37 of the Administrative Code, to lower values if:
 - (a) The fraction of the total chemical that is freely dissolved in the ambient water is different than that used to derive the system-wide BAFs (i.e., the concentrations of particulate organic carbon and the dissolved organic carbon are different than those used to derive the system-wide BAFs);
 - (b) Input parameters of the Gobas model, such as the structure of the aquatic food web and the disequilibrium constant, are different at the site than those used to derive the system-wide BAFs;
 - (c) The per cent lipid of aquatic organisms that are consumed and occur at the site is different than that used to derive the system-wide BAFs; or
 - (d) Site-specific field-measured BAFs or biota-sediment accumulation factor (BSAFs) are determined.
- (3) Any more stringent modifications to protect threatened or endangered species required by paragraph (A) of this rule shall be derived using procedures set forth in the methodology contained in rule 3745-1-37 of the Administrative Code.

(E) Human health.

- (1) Human health criteria or values may be modified on a site-specific basis to provide an additional level of protection where the toxicity or exposure potential is greater than the toxicity or exposure potential assumptions used to derive the criteria or values in question. Human health criteria or values shall be modified on a site-specific basis to provide additional protection appropriate for highly exposed subpopulations.
- (2) Less stringent site-specific modifications to human health criteria or values may be developed when:
 - (a) Local fish consumption rates are lower than the rate used to derive human health criteria or values under rule 3745-1-38 of the Administrative Code (this option shall not be available for water bodies subject to a fish consumption advisory); and/or
 - (b) A site-specific BAF is derived which is lower than that used to derive human health criteria or values under rule 3745-1-38 of the Administrative Code.

- (F) Notification requirements. When the director proposes a site-specific modification to a criterion or value as allowed or required in paragraph (A) of this rule, the director shall notify the other Great Lakes states of such a proposal and, for less stringent criteria, supply appropriate justification.
- (G) Notwithstanding paragraphs (A) to (F) of this rule, any chemical-specific criterion listed in this chapter or derived pursuant to rule 3745-1-36, 3745-1-37, 3745-1-38 or 3745-1-39 of the Administrative Code may be modified for a particular surface water body or segment if specific information is provided to the director which shows either of the following:
- (1) That all, or portions, of the data used to derive the criterion are inapplicable or not relevant to that surface water body or segment; or
 - (2) That the otherwise applicable criterion is more or less stringent than necessary to protect human health, aquatic life, wildlife or agricultural use.

In such cases, the director may adopt a less or more stringent site-specific criterion if it can be scientifically justified based on new toxicological data or site-specific conditions of water quality, pollutant bioavailability, resident species, or human exposure.

- (H) Within the lake Erie drainage basin, paragraph (G) of this rule applies only when it results in modifications at least as protective as modifications resulting from paragraphs (A) to (F) of this rule.

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For Interested Party Review – August 2008 Draft

3745-1-36 Methodologies for development of aquatic life criteria and values.

All pollutants or combinations of pollutants, for which aquatic life criteria have not been adopted in ~~rule 3745-1-07 of the Administrative Code~~ this chapter, shall not exceed the water quality criteria or values derived using the procedures contained in this rule.

(A) Tier I acute aquatic criterion (AAC) and tier II acute aquatic value (AAV). This criterion and value apply outside the mixing zone to all aquatic life habitat use designations. This criterion and value shall be expressed as the quantity of chemical per liter of water (e.g., mg/l or ug/l). Paragraphs (A)(1) to (A)(3) of this rule shall be used to calculate the tier I AAC when acute toxicity data are available for species in at least eight families. Paragraph (A)(4) of this rule shall be used to calculate the tier II AAV when there are not enough toxicity data to use the procedures in paragraphs (A)(1) to (A)(3) of this rule but there is at least one EC₅₀ or LC₅₀ value for a species in one of the following three genera of the family Daphnidae: Ceriodaphnia sp., Daphnia sp., or Simocephalus sp.

(1) The procedures in paragraphs (A)(1) to (A)(3) of this rule shall be used to calculate the tier I AAC when LC₅₀ or EC₅₀ data for at least one species of freshwater animal in at least the eight different families identified in paragraphs (A)(1)(a) to (A)(1)(h) of this rule are included:

- (a) The family Salmonidae in the class Osteichthyes;
- (b) One other family (preferably a commercially or recreationally important warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish);
- (c) A third family in the phylum Chordata (e.g., fish, amphibian);
- (d) A planktonic crustacean (e.g., a cladoceran, copepod);
- (e) A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish);
- (f) An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge);
- (g) A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca);
- (h) A family in any order of insect or any phylum not already represented.

(2) When data are not available to show that acute toxicity to two or more species is similarly related to a water quality characteristic (e.g., hardness, pH or

temperature), the tier I AAC shall be calculated using the procedures in paragraphs (A)(2)(a) to (A)(2)(i) of this rule.

- (a) For each species for which at least one acute value is available, the species mean acute value (SMAV) shall be calculated as the geometric mean of the results of all acceptable flow-through acute toxicity tests in which the concentrations of test material were measured with the most sensitive tested life stage of the species. For a species for which no such result is available, the SMAV shall be calculated as the geometric mean of all acceptable acute toxicity tests with the most sensitive tested life stage, i.e., results of flow-through tests in which the concentrations were not measured and results of static and renewal tests based on initial concentrations (nominal concentrations are acceptable for most test materials if measured concentrations are not available) of test material.
- (b) For each genus for which one or more SMAVs are available, the genus mean acute value (GMAV) shall be calculated as the geometric mean of the SMAVs available for the genus.
- (c) The GMAVs shall be ordered from high to low.
- (d) Ranks (R) shall be assigned to the GMAVs from "one" for the lowest to "N" for the highest. If two or more GMAVs are identical, successive ranks are arbitrarily assigned.
- (e) The cumulative probability (P), shall be calculated for each GMAV as $R / (N + 1)$.
- (f) The four GMAVs shall be selected which have cumulative probabilities closest to 0.05. (If there are fewer than fifty-nine GMAVs, these will always be the four lowest GMAVs.
- (g) Using the four selected GMAVs and Ps, the final acute value (FAV) shall be calculated as:

$$S^2 = \frac{\Sigma (\ln GMAV)^2 - \frac{(\Sigma (\ln GMAV))^2}{4}}{\Sigma (P) - \frac{(\Sigma (\sqrt{P}))^2}{4}}$$

$$L = \frac{\Sigma (\ln GMAV) - S(\Sigma (\sqrt{P}))}{4}$$

$$A = S(\sqrt{0.05}) + L$$

$$FAV = e^A$$

- (h) If, for a commercially, recreationally or ecologically important species, the geometric mean of the acute values from flow-through tests in which the concentrations of test material were measured is lower than the calculated FAV, then that geometric mean shall be used as the FAV instead of the calculated FAV.
- (i) The AAC shall be calculated by dividing the FAV by two.
- (3) When enough data are available to show that acute toxicity to two or more species is similarly related to a water quality characteristic (e.g., hardness, pH or temperature), the tier I FAV shall be calculated using the procedures in paragraphs (A)(3)(a) to (A)(3)(l) of this rule or using an analysis of covariance. The two methods are equivalent and produce identical results. If two or more factors affect toxicity, multiple regression analysis shall be used.
- (a) For each species for which comparable acute toxicity values are available at two or more different values of the water quality characteristic, a least squares regression of the acute toxicity values on the corresponding values of the water quality characteristic shall be performed to obtain the slope and its ninety-five per cent confidence limits for each species. Because the best documented relationship is that between hardness and acute toxicity of metals and a log-log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this method. For relationships based on other water quality characteristics, such as pH or temperature, no transformation or a different transformation might fit the data better, and appropriate changes shall be made as necessary throughout this method.

- (b) Data for each species shall be evaluated as to whether or not they are relevant, taking into account the range and number of the tested values of the water quality characteristic and the degree of agreement within and between species. If useful slopes are not available for at least one fish and one invertebrate, or if the available slopes are too dissimilar, or if too few data are available to adequately define the relationship between acute toxicity and the water quality characteristic, the AAC shall be calculated using the procedures in paragraph (A)(2) of this rule, using the results of tests conducted under conditions and in waters similar to those commonly used for toxicity tests with the species.
- (c) For each species, the geometric mean of the available acute values shall be calculated and then each of the acute values for a species shall be divided by the mean for the species. This calculation normalizes the acute values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.
- (d) The values of the water quality characteristic shall be similarly normalized for each species individually using the procedure in paragraph (A)(3)(c) of this rule.
- (e) Individually for each species a least squares regression of the normalized acute values on the water quality characteristic shall be performed. The resulting slopes and ninety-five per cent confidence limits will be identical to those obtained in paragraph (A)(3)(a) of this rule. If, however, the data are actually plotted, the line of best fit for each individual species will go through the point 1, 1 in the center of the graph.
- (f) All the normalized data shall be treated as if they were for the same species and a least squares regression of all the normalized acute values on the corresponding normalized values of the water quality characteristic is performed to obtain the pooled acute slope, V , and its ninety-five per cent confidence limits. If all of the normalized data are actually plotted, the line of best fit will go through the point 1, 1 in the center of the graph.
- (g) For each species the geometric mean, W , of the acute toxicity values and the geometric mean, X , of the values of the water quality characteristic shall be calculated. (These were calculated in paragraphs (A)(3)(c) and (A)(3)(d) of this rule.)
- (h) For each species the natural logarithm (\ln), Y , of the SMAV at a selected value, Z , of the water quality characteristic shall be calculated using the equation:

$$Y = \ln W - V(\ln X - \ln Z).$$

- (i) For each species the SMAV at Z shall be calculated using the equation:

$$\text{SMAV} = e^Y.$$

- (j) The FAV shall be obtained by using the procedures described in paragraphs (A)(2)(b) to (A)(2)(g) of this rule.

- (k) If, for a commercially or recreationally important species the geometric mean of the acute values at Z from flow-through tests in which the concentrations of the test material were measured is lower than the FAV at Z, then the geometric mean shall be used as the FAV instead of the FAV.

- (l) The final acute equation shall be written as:

$$\text{FAV} = e^{(V[\ln(\text{water quality characteristic})] + A - V[\ln Z])},$$

Where:

V = pooled acute slope, and A = ln (FAV at Z). Because V, A, and Z are known, the FAV can be calculated for any selected value of the water quality characteristic.

- (m) For any value of Z, the AAC shall be calculated by dividing the FAV by two.

(4) Tier II values.

- (a) If the required data to derive the tier I AAC in paragraphs (A)(1) to (A)(3) of this rule are not present in the acute toxicity data base and at least one EC₅₀ or LC₅₀ value is available for a species in one of the following three genera of the family Daphnidae - Ceriodaphnia sp., Daphnia sp., or Simocephalus sp., a tier II secondary acute value (SAV) shall be calculated by dividing the lowest GMAV in the data base by the secondary acute factor (SAF) (see table 36-1 of this rule) corresponding to the number of satisfied minimum data requirements listed in the tier I methodology (see paragraph (A)(1) of this rule).

- (b) The tier II AAV equals the SAV divided by two.

- (c) If appropriate, the AAV shall be made a function of a water quality characteristic in a manner similar to that described in paragraph (A)(3) of this rule.

(B) Tier I chronic aquatic criterion (CAC) and tier II chronic aquatic value (CAV). This criterion and value apply outside the mixing zone to all aquatic life habitat use designations except the limited resource water use designation. This criterion and value shall be expressed as the quantity of chemical per liter of water (e.g., mg/l or ug/l). Paragraphs (B)(1) and (B)(2) of this rule are used to calculate the tier I CAC. Paragraphs (B)(3) and (B)(4) of this rule shall be used to calculate the tier II CAV when there are not enough toxicity data to use the method in paragraphs (B)(1) and (B)(2) of this rule.

- (1) If chronic values are available for species in eight families as described in paragraph (A)(1) of this rule, a species mean chronic value (SMCV) shall be calculated for each species for which at least one chronic value is available by calculating the geometric mean of the results of all acceptable life-cycle and partial life-cycle toxicity tests with the species; for a species of fish for which no such result is available, the SMCV shall be the geometric mean of all acceptable early life-stage tests. Appropriate genus mean chronic values (GMCVs) shall also be calculated. A GMCV shall be the geometric mean of the SMCVs for the genus. The CAC shall be obtained using the procedure contained in paragraphs (A)(1) to (A)(3) of this rule, substituting CAC for FAV, SMCV for SMAV and GMCV for GMAV.
- (2) If chronic data for a chemical are not available for at least eight freshwater species meeting the requirements in paragraph (A)(1) of this rule, the CAC shall be calculated by dividing the FAV by a final acute-chronic ratio (FACR).
 - (a) Acute-chronic ratio (ACRs) are required for at least one species of aquatic animal in at least three different families provided that of the three species:
 - (i) At least one is a fish;
 - (ii) At least one is an invertebrate; and
 - (iii) At least one species is an acutely sensitive freshwater species (the other two may be saltwater species).
 - (b) For each chronic value for which at least one corresponding appropriate acute value is available, an ACR shall be calculated using the chronic value for the denominator and using the geometric mean of the results of all acceptable flow-through (except static is acceptable for daphnids and midges) acute tests in the same dilution water in which the concentrations are measured for the numerator. For fish, the acute test(s) shall be conducted with juveniles. The acute test(s) should be part of the same study as the chronic test. If acute tests were not conducted as part of the same

study, but were conducted as part of a different study in the same laboratory and dilution water, then they may be used. If no such acute tests are available, results of acute tests conducted in the same dilution water in a different laboratory may be used. If no such acute tests are available, an ACR shall not be calculated.

- (c) For each species, the species mean ACR shall be calculated as the geometric mean of all ACRs available for that species. If the minimum ACR data requirements (as described in paragraph (B)(2)(a) of this rule) are not met with freshwater data alone, saltwater data may be used along with the freshwater data.
- (d) For some materials, the ACR seems to be the same for all species, but for other materials the ratio seems to increase or decrease as the SMAV increases. Thus the FACR shall be obtained in the following ways.
 - (i) If the species mean ACR seems to increase or decrease as the SMAVs increase, the FACR shall be calculated as the geometric mean of the ACRs for species whose SMAVs are close to the FAV.
 - (ii) If no major trend is apparent and the ACRs for all species are within a factor of ten, the FACR shall be calculated as the geometric mean of all of the species mean ACRs.
 - (iii) If the most appropriate species mean ACRs are less than 2.0, the FACR shall be assumed to be 2.0.
- (e) ~~The FCV~~ final chronic value (FCV) shall be calculated by dividing the FAV by the FACR.
- (f) If the SMCV of a commercially or recreationally important species is lower than the calculated ~~CAC~~ FCV, then that SMCV shall be used as the ~~CAC~~ FCV instead of the calculated ~~CAC~~ FCV.
- (g) The CAC is the lower of the FCV and the final plant value determined in paragraph (C) of this rule.

(3) Secondary acute-chronic ratio.

- (a) If fewer than three acceptable experimentally determined ACRs are available for the chemical, the secondary acute-chronic ratio (SACR) shall be determined using enough assumed ACRs of eighteen so that the total number of ACRs equals three. Calculate the SACR as the geometric mean

of the three ACRs. If no experimentally determined ACRs are available, the SACR shall be eighteen.

(4) Tier II chronic aquatic value.

(a) ~~The CAV~~ (secondary chronic value (SCV)) shall be calculated using one of the following equations:

(i) ~~CAV-SCV~~ = $FAV \div SACR$ (Use FAV from paragraph (A) of this rule and use SACR from paragraph (B)(3) of this rule);

(ii) ~~CAV-SCV~~ = $SAV \div FACR$ (Use SAV from paragraph (A)(4) of this rule and use FACR from paragraph (B)(2) of this rule); or

(iii) ~~CAV-SCV~~ = $SAV \div SACR$ (Use SAV from paragraph (A)(4) of this rule and use SACR from paragraph (B)(3) of this rule).

(b) If appropriate, the ~~CAV-SCV~~ shall be made a function of a water quality characteristic in a manner similar to that described in paragraph (A)(3) of this rule.

(c) If the SMCV of a commercially or recreationally important species is lower than the calculated ~~CAV-SCV~~, then that SMCV shall be used as the ~~CAV-SCV~~ instead of the calculated ~~CAV-SCV~~.

(g) The CAV is the lower of the SCV and the final plant value determined in paragraph (C) of this rule.

(C) Final plant value (FPV). ~~This value applies in place of the CAC or CAV if it is lower than the CAC or CAV.~~ Results of at least one acceptable test with a freshwater algae or vascular plant is required. If plants are among the aquatic organisms most sensitive to the material, results of a test with a plant in another phylum (division) shall also be available.

(1) A plant value shall be the result of a ninety-six-hour test conducted with an alga or a chronic test conducted with an aquatic vascular plant. A test of the toxicity of a metal to a plant shall not be used if the medium contained an excessive amount of a complexing agent, such as EDTA, that might affect the toxicity of the metal. Concentrations of EDTA above two hundred micrograms per liter shall be considered excessive.

(2) The FPV shall be obtained by selecting the lowest result from a test with an important aquatic plant species in which the concentrations of test material are measured and the endpoint is biologically important.

(D) Application of criteria and values.

- (1) The FAV and SAV shall be applied as maximum concentrations inside the mixing zone.
- (2) The AAC and AAV shall be applied as maximum concentrations outside the mixing zone.
- (3) The CAC, and CAV, ~~and FPV if available~~ shall be applied as ~~thirty day~~ average concentrations outside the mixing zone.

Table 36-1.

Secondary acute factors

Number of minimum data requirements satisfied	Secondary acute factor
1.....	21.9
2 and neither requirement includes the family Salmonidae.....	13.0
2 and one requirement includes the family Salmonidae.....	7.9
3.....	8.0
4.....	7.0
5.....	6.1
6.....	5.2
7.....	4.3

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Certification

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For Interested Party Review – August 2008 Draft

3745-1-37 Methodology for deriving bioaccumulation factors.

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

(A) The purpose of this rule is to describe procedures for deriving bioaccumulation factors (BAFs) to be used in the calculation of lake Erie drainage basin human health tier I criteria and tier II values and wildlife tier I criteria. A subset of the human health BAFs are also used to identify the chemicals that are considered bioaccumulative chemicals of concern (BCCs). Procedures for deriving BAFs to be used in the calculation of statewide human health criteria are in "Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), Technical Support Document Volume 2: Development of National Bioaccumulation Factors, Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency, Washington, DC, EPA-822-R-03-030, December 2003."

(B) Review and selection of data.

(1) Field-measured BAFs. The following procedural and quality assurance requirements shall be met for field-measured BAFs.

(a) ~~The filed~~ field studies used shall be limited to those conducted in the Great Lakes system with fish in trophic levels three and/or four.

(b) The trophic level of the fish species shall be determined.

(c) The site of the field study shall not be so unique such that the BAF cannot be extrapolated to other locations where the criteria and values will apply.

(d) For organic chemicals, the per cent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BAF.

(e) The concentration of the chemical in the water shall be measured in a way that can be related to particulate organic carbon (POC) and/or dissolved organic carbon (DOC) and shall be relatively constant during the steady-state time period.

(f) For organic chemicals with $\log K_{ow}$ greater than four, the concentrations of POC and DOC in the ambient water shall be either measured or reliably estimated.

(g) For inorganic and organic chemicals, BAFs shall be used only if they are expressed on a wet weight basis; BAFs reported on a dry weight basis

cannot be converted to wet weight unless a conversion factor is measured or reliably estimated for the tissue used in the determination of the BAF.

- (2) Field-measured biota-sediment accumulation factors (BSAFs). The following procedural and quality assurance requirements shall be met for field-measured BSAFs.
 - (a) The field studies used shall be limited to those conducted in the Great Lakes system with fish in trophic levels three and/or four.
 - (b) Samples of surface sediments shall be from locations where there is net deposition of fine sediment (zero to one centimeter is ideal) and that are representative of average surface sediments in the vicinity of the organism.
 - (c) The K_{ow} s used shall be of acceptable quality as described in paragraph (B)(6) of this rule.
 - (d) The site of the field study shall not be so unique such that the resulting BAF cannot be extrapolated to other locations where the criteria and values will apply.
 - (e) The trophic level of the fish species shall be determined.
 - (f) The per cent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BAF.
- (3) Laboratory-measured BCFs. The following procedural and quality assurance requirements shall be met for laboratory-measured BCFs.
 - (a) The test organism shall not be diseased, unhealthy, or adversely affected by the concentration of the chemical.
 - (b) The total concentration of the chemical in the water shall be measured and shall be relatively constant during the steady-state time period.
 - (c) The organisms shall be exposed to the chemical using a flow-through or renewal procedure.
 - (d) For organic chemicals, the per cent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BCF.
 - (e) For organic chemicals with $\log K_{ow}$ greater than four, the concentrations of POC and DOC in the test solution shall be either measured or reliably estimated.

- (f) Laboratory-measured BCFs should be determined using fish species, but BCFs determined with molluscs and other invertebrates may be used if Appropriate appropriate.
- (g) In a bioconcentration test, if laboratory-measured BCFs increase or decrease as the concentration of the chemical increase in the test solutions, the BCF measured at the lowest test concentration that is above concentrations existing in the control water shall be used (i.e., a BCF shall not be calculated from a control treatment). The concentrations of an inorganic chemical in a bioconcentration test shall be greater than normal background levels and greater than levels required for normal nutrition of the test species if the chemical is a micronutrient, but below levels that adversely affect the species.
- (h) For inorganic and organic chemicals, BCFs shall be used only if they are expressed on a wet weight basis. BCFs reported on a dry weight basis cannot be converted to wet weight unless a conversion factor is measured or reliably estimated for the tissue used in the determination of the BAF.
- (i) BCFs for organic chemicals may be based on measurement of radioactivity only when the BCF is intended to include metabolites or when there is confidence that there is no interference due to metabolites.
- (j) The calculation of the BCF shall address growth dilution.
- (k) Other aspects of the methodology used shall be similar to those described in "Standard Practice for Conducting Bioconcentration Tests with Fishes and Saltwater Bivalve Molluscs. Standard E 1022. American Society for Testing and Materials, Philadelphia, PA. (1990)".
- (4) Predicted BCFs. The following procedural and quality assurance requirements shall be met for predicted BCFs.
- (a) The K_{ow} used shall be of acceptable quality as described in paragraph (B)(5) of this rule.
- (b) The predicted baseline BCF shall be calculated using the equation
- $$\text{Predicted baseline BCF} = K_{ow}$$
- Where:
- $$K_{ow} = \text{octanol-water partition coefficient.}$$

(5) Octanol-water partition coefficient (K_{ow}).

(a) The value of K_{ow} used for an organic chemical shall be determined by giving priority to the experimental and computational techniques used as shown in table 37-1 of this rule.

(b) A value of K_{ow} that seems to be different from the others may be considered an outlier and not used. The value of K_{ow} used for an organic chemical shall be either the geometric mean of the available K_{ows} with highest priority or the arithmetic mean of the available $\log K_{ows}$ with the highest priority. Because it is an intermediate value in the derivation of a BAF, the values used for the K_{ow} and $\log K_{ow}$ of a chemical shall not be rounded to fewer than three significant digits after the decimal point.

(C) Baseline BAFs shall be derived using the following four methods, which are listed from most preferred to least preferred.

(1) A measured baseline BAF for an organic or inorganic chemical derived from a field study of acceptable quality.

(2) A predicted baseline BAF for an organic chemical derived using field-measured BSAFs of acceptable quality.

(3) A predicted baseline BAF for an organic or inorganic chemical derived from a BCF measured in a laboratory study of acceptable quality and ~~a~~ an FCM.

(4) A predicted baseline BAF for an organic chemical derived from a K_{ow} of acceptable quality and ~~a~~ an FCM.

For comparative purposes, baseline BAFs shall be derived for each chemical by as many of the four methods as available data allow.

(D) Calculation of baseline BAFs for organic chemicals.

(1) Lipid normalization.

(a) It is assumed that BAFs and BCFs for organic chemicals can be extrapolated on the basis of per cent lipid from one tissue to another and from one aquatic species to another in most cases.

(b) Because BAFs and BCFs for organic chemicals are related to the per cent lipid, it does not make any difference whether the tissue sample is whole body or edible portion, but both the BAF (or BCF) and the per cent lipid

must be determined for the same type of tissue. The per cent lipid of the tissue should be measured during the BAF or BCF study, but in some cases it may be reliably estimated from measurements on tissue from other organisms. If per cent lipid is not reported for the test organisms in the original study, it may be obtained from the author. In the case of a laboratory study, lipid data for the same or a comparable laboratory population of test organisms that were used in the original study may be used.

- (c) The lipid-normalized concentration (C_l) of a chemical in tissue is defined using the equation

$$C_l = \frac{C_b}{f_l}$$

Where:

C_b = concentration of the organic chemical in the tissue of aquatic biota (either whole organism or specified tissue) expressed in micrograms per gram; and

f_l = fraction of the tissue that is lipid.

- (2) Bioavailability. By definition, baseline BAFs and BCFs for organic chemicals, whether measured or predicted, are based on the concentration of the chemical that is freely dissolved in the ambient water in order to account for bioavailability. For the purposes of this rule, the relationship between the total concentration of the chemical in the ambient water (i.e., that which is freely dissolved plus that which is sorbed to particulate organic carbon or to dissolved organic carbon) to the freely dissolved concentration of the chemical in the ambient water shall be calculated using the equation

$$C_w^{fd} = (f_{fd}) (C_w^t)$$

Where:

C_w^{fd} = freely dissolved concentration of the organic chemical in the ambient water;

C_w^t = total concentration of the organic chemical in the ambient water; and

f_{fd} = fraction of the total chemical in the ambient water that is freely dissolved.

The fraction of the total chemical in the ambient water that is freely dissolved (f_{fd}), shall be calculated using the equation

$$f_{fd} = \frac{1}{1 + \frac{(\text{DOC}) (K_{ow})}{10} + (\text{POC}) (K_{ow})}$$

Where:

DOC = concentration of dissolved organic carbon, expressed as kilograms of dissolved organic carbon per liter of water;

K_{ow} = octanol-water partition coefficient of the chemical; and

POC = concentration of particulate organic carbon, expressed as kilograms of particulate organic carbon per liter of water.

- (3) Food-chain multiplier (FCM). In the absence of a field-measured BAF or a predicted BAF derived from a BSAF, a FCM shall be used to calculate the baseline BAF for trophic levels three and four from a laboratory-measured or predicted BCF. For an organic chemical, the FCM used shall be derived from table 37-2 of this rule using the chemical's log K_{ow} and linear interpolation. ~~A~~ An FCM greater than 1.0 applies to most organic chemicals with a log K_{ow} of four or more. The trophic level used shall take into account the age or size of the fish species consumed by the human, avian or mammalian predator.
- (4) Calculation of a baseline BAF from a field-measured BAF. A baseline BAF shall be calculated from a field-measured BAF using the equation

$$\text{Baseline BAF} = \left[\frac{\text{Measured BAF}_T^t}{f_{fd}} - 1 \right] \left(\frac{1}{f_l} \right)$$

Where:

BAF_T^t = Baf based on total concentration in tissue and water;

f_l = Fraction of the tissue that is lipid; and

f_{fd} = Fraction of the total chemical that is freely dissolved in the ambient water.

The trophic level to which the baseline BAF applies is the same as the trophic level of the organisms used in the determination of the field-measured BAF. For each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one measured baseline BAF is available for a

given species. For each trophic level, the geometric mean of the species mean measured baseline BAFs shall be calculated. If a baseline BAF based on a measured BAF is available for either trophic level three or four, but not both, a measured baseline BAF for the other trophic level shall be calculated using the ratio of the FCMs that are obtained by linear interpolation from table 37-2 of this rule for the chemical.

(5) Calculation of a baseline BAF from a field-measured BSAF.

- (a) A baseline BAF for organic chemical "i" shall be calculated from a field-measured BSAF of acceptable quality using the equation

$$\mathbf{(Baseline\ BAF)_i = (Baseline\ BAF)_r \cdot \frac{(BSAF)_i \cdot (K_{ow})_i}{(BSAF)_r \cdot (K_{ow})_r}}$$

Where:

$(BSAF)_i$ = BSAF for chemical "i";

$(BSAF)_r$ = BSAF for the reference chemical "r";

$(K_{ow})_i$ = octanol-water partition coefficient for chemical "i"; and

$(K_{ow})_r$ = octanol-water partition coefficient for the reference chemical "r".

- (b) A BSAF shall be calculated using the equation

$$\mathbf{BSAF = \frac{C_l}{C_{soc}}}$$

Where:

C_l = the lipid-normalized concentration of the chemical in tissue; and

C_{soc} = the organic carbon-normalized concentration of the chemical in sediment.

- (c) The organic carbon-normalized concentration of a chemical in sediment (C_{soc}), shall be calculated using the equation

$$\mathbf{C_{soc} = \frac{C_s}{f_{oc}}}$$

Where:

C_s = concentration of chemical in sediment (expressed as micrograms per gram sediment); and

f_{oc} = fraction of the sediment that is organic carbon.

- (d) Predicting BAFs from BSAFs requires data from a steady-state (or near steady-state) condition between sediment and ambient water for both a reference chemical "r" with a field-measured BAF_{ℓ}^{fd} and other chemicals "N=i" for which BSAFs are to be determined.
- (e) The trophic level to which the baseline BAF applies is the same as the trophic level of the organisms used in the determination of the BSAF. For each trophic level, a species mean baseline BAF shall be calculated as the geometric mean if more than one baseline BAF is predicted from BSAFs for a given species. For each trophic level, the geometric mean of the species mean baseline BAFs derived using BSAFs shall be calculated.
- (f) If a baseline BAF based on a measured BSAF is available for either trophic level three or four, but not both, a baseline BAF for the other trophic level shall be calculated using the ratio of the FCMs that are obtained by linear interpolation from table 37-2 of this rule for the chemical.
- (6) Calculation of a baseline BAF from a laboratory-measured BCF. A baseline BAF for trophic level three and a baseline BAF for trophic level four shall be calculated from a laboratory-measured BCF of acceptable quality and a an FCM using the equation

$$\text{Baseline BAF} = (\text{FCM}) \left[\frac{\text{Measured BCF}_T^t}{f_{fd}} - 1 \right] \left(\frac{1}{f_{\ell}} \right)$$

Where:

BCF_T^t = BCF based on total concentration in tissue and water;

f_{ℓ} = fraction of the tissue that is lipid;

f_{fd} = fraction of the total chemical in the test water that is freely dissolved; and

FCM = the food-chain multiplier obtained from table 37-2 of this rule by linear interpolation for trophic level three or four, as necessary.

For each trophic level, a species mean baseline BAF shall be calculated as the geometric mean if more than one baseline BAF is predicted from laboratory-measured BCFs for a given species. For each trophic level, the geometric mean of the species mean baseline BAFs based on laboratory-measured BCFs shall be calculated.

- (7) Calculation of a baseline BAF from an octanol-water partition coefficient. A baseline BAF for trophic level three and a baseline BAF for trophic level four shall be calculated from a K_{ow} of acceptable quality and a an FCM using the equation

$$\begin{aligned} \text{Baseline BAF} &= (\text{FCM}) (\text{predicted baseline BCF}) \\ &= (\text{FCM}) (K_{ow}) \end{aligned}$$

Where:

FCM = the food-chain multiplier obtained from table 37-2 of this rule by linear interpolation for trophic level three or four, as necessary; and

K_{ow} = octanol-water partition coefficient.

(E) Human health and wildlife BAFs for organic chemicals.

- (1) To calculate human health and wildlife BAFs for an organic chemical, the K_{ow} of the chemical shall be used with a POC concentration of 0.00000004 kg/l and a DOC concentration of 0.000002 kg/l to yield the fraction freely dissolved (f_{fd}) using the equations

$$\begin{aligned} f_{fd} &= \frac{1}{1 + \frac{(\text{DOC}) (K_{ow})}{10} + (\text{POC}) (K_{ow})} \\ &= \frac{1}{1 + \frac{(0.000002 \text{ kg/L}) (K_{ow})}{10} + (0.00000004 \text{ kg/L}) (K_{ow})} \\ &= \frac{1}{1 + (0.00000024 \text{ kg/L}) (K_{ow})} \end{aligned}$$

- (2) The human health BAFs for an organic chemical shall be calculated using the equations.

- (a) For trophic level three

$$\text{Human health BAF}_{\text{TL3}}^{\text{HH}} = [(\text{baseline BAF}) (0.0182) + 1] (f_{\text{fd}})$$

and

- (b) For trophic level four

$$\text{Human health BAF}_{\text{TL4}}^{\text{HH}} = [(\text{baseline BAF}) (0.0310) + 1] (f_{\text{fd}})$$

Where:

0.0182 and 0.0310 are the standardized fraction lipid values for trophic levels three and four, respectively, that are used to derive human health criteria and values pursuant to rule 3745-1-38 of the Administrative Code.

- (3) The wildlife BAFs for an organic chemical shall be calculated using the following equations:

- (a) For trophic level three:

$$\text{Wildlife BAF}_{\text{TL3}}^{\text{WL}} = [(\text{baseline BAF}) (0.0646) + 1] (f_{\text{fd}})$$

- (b) For trophic level four:

$$\text{Wildlife BAF}_{\text{TL4}}^{\text{WL}} = [(\text{baseline BAF}) (0.1031) + 1] (f_{\text{fd}})$$

Where:

0.0646 and 0.1031 are the standardized fraction lipid values for trophic levels three and four, respectively, that are used to derive wildlife criteria pursuant to rule 3745-1-39 of the Administrative Code.

- (F) Human health and wildlife BAFs for inorganic chemicals.

- (1) For inorganic chemicals, the baseline BAFs for trophic levels three and four are both assumed to equal the BCF determined for the chemical with fish, i.e., the FCM is assumed to be 1.0 for both trophic levels three and four. However, a an FCM greater than 1.0 might be applicable to some metals, such as mercury, if, for example, an organometallic form of the metal biomagnifies.

(2) BAFs for human health criteria and values.

- (a) Measured BAFs and BCFs used to determine human health BAFs for inorganic chemicals shall be based on edible tissue of freshwater fish unless it is demonstrated that whole-body BAFs or BCFs are similar to edible-tissue BAFs or BCFs. BCFs and BAFs based on measurements of aquatic plants and invertebrates should not be used in the derivation of human health criteria and values.
- (b) If one or more field-measured baseline BAFs for an inorganic chemical are available from studies conducted in the Great Lakes system with the edible tissue of fish:
 - (i) For each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one measured BAF is available for a given species; and
 - (ii) For each trophic level, the geometric mean of the species mean measured baseline BAFs shall be used as the human health BAF for that chemical.
- (c) If an acceptable measured baseline BAF is not available for an inorganic chemical and one or more acceptable edible-portion laboratory-measured BCFs are available for the chemical, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times ~~a~~ an FCM. The FCM shall be 1.0 unless chemical-specific biomagnification data support using a multiplier other than 1.0. The predicted baseline BAF shall be used as the human health BAF for that chemical.

(3) BAFs for wildlife criteria.

- (a) Measured BAFs and BCFs used to determine wildlife BAFs for inorganic chemicals shall be based on whole-body freshwater fish and invertebrate data unless it is demonstrated that edible-tissue BAFs or BCFs are similar to whole-body BAFs or BCFs.
- (b) If one or more field-measured baseline BAFs for an inorganic chemical are available from studies conducted in the Great Lakes system with whole body fish or invertebrates:
 - (i) For each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one measured BAF is available for a given species;

- (ii) For each trophic level, the geometric mean of the species mean measured baseline BAFs shall be used as the wildlife BAF for that chemical; and
- (iii) If an acceptable measured baseline BAF is not available for an inorganic chemical and one or more acceptable whole-body laboratory-measured BCFs are available for the chemical, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a an FCM. The FCM shall be 1.0 unless chemical-specific biomagnification data support using a multiplier other than 1.0. The predicted baseline BAF shall be used as the wildlife BAF for that chemical.
- (G) Final review. For both organic and inorganic chemicals, human health and wildlife BAFs for both trophic levels shall be reviewed for consistency with all available data concerning the bioaccumulation, bioconcentration, and metabolism of the chemical. BAFs derived in accordance with this methodology shall be modified if changes are justified by available data.

Table 37-1. Priorities for K_{ow} experimental and computational techniques for organic chemicals.

Priority		Technique
$\text{Log } K_{ow} \leq 4.0$	$\text{Log } K_{ow} > 4.0$	
1	1	Slow-stir
1	1	Generator-column
1	4	Shake-flask
2	2	Reverse-phase liquid chromatography on C18 chromatography packing with extrapolation to zero per cent solvent
3	3	Reverse-phase liquid chromatography on C18 chromatography packing without extrapolation to zero per cent solvent
4	5	Calculated by the CLOGP program (a computer program available from Pomona college)

Table 37-2. Food-chain multipliers for trophic levels 2, 3 and 4.

Log K _{ow}	Trophic level 2	Trophic level 3 ¹	Trophic level 4	Log K _{ow}	Trophic level 2	Trophic level 3 ¹	Trophic level 4
2.0	1.000	1.005	1.000	6.0	1.000	10.556	15.996
2.5	1.000	1.010	1.002	6.1	1.000	11.337	17.783
3.0	1.000	1.028	1.007	6.2	1.000	12.064	19.907
3.1	1.000	1.034	1.007	6.3	1.000	12.691	21.677
3.2	1.000	1.042	1.009	6.4	1.000	13.228	23.281
3.3	1.000	1.053	1.012	6.5	1.000	13.662	24.604
3.4	1.000	1.067	1.014	6.6	1.000	13.980	25.645
3.5	1.000	1.083	1.019	6.7	1.000	14.223	26.363
3.6	1.000	1.103	1.023	6.8	1.000	14.355	26.669
3.7	1.000	1.128	1.033	6.9	1.000	14.388	26.669
3.8	1.000	1.161	1.042	7.0	1.000	14.305	26.242
3.9	1.000	1.202	1.054	7.1	1.000	14.142	25.468
4.0	1.000	1.253	1.072	7.2	1.000	13.852	24.322
4.1	1.000	1.315	1.096	7.3	1.000	13.474	22.856
4.2	1.000	1.380	1.130	7.4	1.000	12.987	21.038
4.3	1.000	1.491	1.178	7.5	1.000	12.517	18.967
4.4	1.000	1.614	1.242	7.6	1.000	11.708	16.749
4.5	1.000	1.766	1.334	7.7	1.000	10.914	14.388
4.6	1.000	1.950	1.459	7.8	1.000	10.069	12.050
4.7	1.000	2.175	1.633	7.9	1.000	9.162	9.840
4.8	1.000	2.452	1.871	8.0	1.000	8.222	7.798
4.9	1.000	2.780	2.193	8.1	1.000	7.278	6.012
5.0	1.000	3.181	2.612	8.2	1.000	6.361	4.519
5.1	1.000	3.643	3.162	8.3	1.000	5.489	3.311
5.2	1.000	4.188	3.873	8.4	1.000	4.683	2.371
5.3	1.000	4.803	4.742	8.5	1.000	3.949	1.663
5.4	1.000	5.502	5.821	8.6	1.000	3.296	1.146
5.5	1.000	6.266	7.079	8.7	1.000	2.732	0.778
5.6	1.000	7.096	8.551	8.8	1.000	2.246	0.521
5.7	1.000	7.962	10.209	8.9	1.000	1.837	0.345
5.8	1.000	8.841	12.050	9.0	1.000	1.493	0.226
5.9	1.000	9.716	13.964				

¹ The FCMs for trophic level 3 are the geometric mean of the FCMs for sculpin and alewife.

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For Interested Party Review – August 2008 Draft

3745-1-38 **Methodologies for development of human health criteria and values for the lake Erie drainage basin.**

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

(A) This rule applies to water bodies located in the lake Erie drainage basin. All pollutants or combinations of pollutants, for which human health ambient water quality criteria for the protection of the public water supply use or water quality criteria for the protection of the general water based recreation use - consumption of sport caught fish have not been adopted in rule 3745-1-07 or 3745-1-33 of the Administrative Code this chapter, shall not exceed the statewide water quality criteria or values derived using the procedures contained in this rule "Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency, Washington, DC, EPA-822-B-00-004, October 2000".

(B) However, if the criteria or values derived using the procedures contained in paragraphs (D) to (G) of this rule are more restrictive than the statewide criteria derived under paragraph (A) of this rule, the criteria or values derived using the procedures contained in paragraphs (D) to (G) of this rule shall apply to water bodies located in the lake Erie drainage basin.

(C) The criteria derived pursuant to this rule are available on the Ohio EPA website <http://www.epa.state.oh.us/dsw/wqs/criteria.html>.

~~(A)~~(D) General provisions.

(1) The purpose of paragraphs (D) to (F) of this rule is to describe procedures for calculating human health criteria and values that provide protection of humans from unacceptable exposure to toxicants through consumption of contaminated fish and drinking water and from ingesting water as a result of participation in water-oriented recreational activities, in accordance with 40 C.F.R. 132, "Water Quality Guidance for the Great Lakes System."

(2) Level of protection. The criteria and values developed shall provide a level of protection likely to be without appreciable risk of carcinogenic and/or noncarcinogenic effects. Ambient criteria and values for single carcinogens shall not be set at a level representing a lifetime upper-bound incremental risk greater than one in one hundred thousand of developing cancer using the hazard assessment techniques and exposure assumptions described in this rule. Criteria and values affording protection from noncarcinogenic effects shall be established at levels that, taking into account uncertainties, are considered likely

to be without an appreciable risk of adverse human health effects (i.e., acute, subchronic and chronic toxicity including reproductive and developmental effects) during a lifetime of exposure, using the risk assessment techniques and exposure assumptions described in this rule.

- (3) Two-tiered classification. Chemical concentration levels in surface water protective of human health shall be derived based on either a tier I or tier II classification. The two tiers are primarily distinguished by the amount of toxicity data available for deriving the concentration levels and the quantity and quality of data on bioaccumulation.

~~(B)~~(E) Minimum data requirements. The best available toxicity data on the adverse health effects of a chemical and the best data on bioaccumulation factors shall be used when developing human health tier I criteria or tier II values. The best available toxicity data shall include data from well-conducted epidemiologic and/or animal studies which provide, in the case of carcinogens, an adequate weight of evidence of potential human carcinogenicity and, in the case of noncarcinogens, a dose-response relationship involving critical effects biologically relevant to humans. Such information shall be obtained from the U.S. EPA integrated risk information system (IRIS) database, scientific literature, and other informational databases, studies and reports containing adverse health effects data of adequate quality for use in this rule, when available. Strong consideration shall be given to the most currently available guidance provided by IRIS in deriving criteria or values, supplemented with any recent data not incorporated into IRIS. The best available bioaccumulation data shall include data from field studies and well-conducted laboratory studies.

- (1) Carcinogens.

- (a) Tier I human cancer criteria (HCC) and tier II human cancer values (HCV) shall be derived using the methodologies described in paragraph ~~(C)~~(F)~~(1)~~ of this rule when there is adequate evidence of potential human carcinogenic effects for a chemical. The U.S. EPA classification system for chemical carcinogens, which is described in "Guidelines for Carcinogen Risk Assessment, Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, DC, EPA/630/P-03/001F, March 2005," shall be used in determining whether adequate evidence of potential carcinogenic effects exists. Carcinogens are classified, depending on the weight of evidence, as carcinogenic to humans, likely to be carcinogenic to humans, or having suggestive evidence of carcinogenic potential. The human evidence shall be considered inadequate and therefore the chemical cannot be classified as a human carcinogen, if any of the following conditions exists:

- (i) There is little or no pertinent information;

- (ii) Some studies provide evidence of carcinogenicity but other studies of equal quality with animals of the same sex and strain are negative;
 - (iii) There are negative results that are not sufficiently robust for the descriptor "not likely to be carcinogenic to humans;"
 - (iv) There is animal evidence that demonstrates lack of carcinogenic effect in both sexes in well-designed and well-conducted studies in at least two appropriate animal species (in the absence of other animal or human data suggesting a potential for cancer effects);
 - (v) There is convincing and extensive experimental evidence showing that the only carcinogenic effects observed in animals are not relevant to humans;
 - (vi) There is convincing evidence that carcinogenic effects are not likely by a particular exposure route; or
 - (vii) There is convincing evidence that carcinogenic effects are not likely below a defined dose range.
- (b) Chemicals are described as "carcinogenic to humans" when either: there is convincing epidemiological evidence of a causal association between human exposure and cancer; or when all of the following conditions are met:
- (i) There is strong evidence of an association between human exposure and either cancer or the key precursor events of a chemical's mode of action but not enough for a causal association;
 - (ii) There is extensive evidence of carcinogenicity in animals;
 - (iii) The mode or modes of carcinogenic action and associated precursor events have been identified in animals, and
 - (iv) There is strong evidence that the key precursor events that precede the cancer response in animals are anticipated to occur in humans and progress to tumors, based on biological information.
- (c) Chemicals described as "likely to be carcinogenic to humans" include chemicals for which the weight of evidence is adequate to demonstrate carcinogenic potential to humans but does not reach the weight of evidence for the descriptor "carcinogenic to humans." Chemicals with weight of

evidence demonstrating carcinogenic potential to humans can include, but are not limited to:

- (i) Chemicals for which a plausible association is demonstrated between human exposure and cancer, in most cases with some supporting biological, experimental evidence, though not necessarily carcinogenicity data from animal experiments;
 - (ii) Chemicals that tested positive for carcinogenicity in animal experiments in more than one species, sex, strain, site, or exposure route, with or without evidence of carcinogenicity in humans;
 - (iii) Chemicals for which positive tumor study results are demonstrated that raise additional biological concerns beyond that of a statistically significant result, for example, a high degree of malignancy or an early age of onset;
 - (iv) Chemicals for which a rare animal tumor response in a single experiment is demonstrated that is assumed to be relevant to humans;
or
 - (v) Chemicals for which positive tumor study results are demonstrated that are strengthened by other lines of evidence, for example, either plausible association between human exposure and cancer or evidence that the chemical or an important metabolite causes events generally known to be associated with tumor formation likely to be related to tumor response in this case.
- (d) "Suggestive evidence of carcinogenic potential" is evidence used to describe chemicals where the weight of evidence is suggestive of carcinogenicity; a concern for potential carcinogenic effects in humans is raised, but the data are judged not sufficient for a stronger conclusion. Chemicals with weight of evidence suggestive of carcinogenicity can include, but are not limited to:
- (i) Chemicals with studies that show a small, and possibly not statistically significant, increase in tumor incidence observed in a single animal or human study that does not reach the weight of evidence for the descriptor "likely to be carcinogenic to humans;"
 - (ii) Chemicals with studies that show a small increase in a tumor with a high background rate in that sex and strain, when there is some but insufficient evidence that the observed tumors may be due to intrinsic

factors that cause background tumors and not to the chemical being assessed;

- (iii) Chemicals with evidence of a positive response in a study whose power, design, or conduct limits the ability to draw a confident conclusion, but where the carcinogenic potential is strengthened by other lines of evidence; or
 - (iv) Chemicals with studies that show a statistically significant increase at one dose only, but no significant response at the other doses and no overall trend.
- (e) Tier I. Weight of evidence of potential human carcinogenic effects sufficient to derive a HCC shall generally include chemicals that are carcinogenic to humans and likely to be carcinogenic to humans and can include, on a case-by-case basis as determined by the director, chemicals with suggestive evidence of carcinogenic potential if studies have been well-conducted when compared to studies used in classifying chemicals that are carcinogenic to humans or likely to be carcinogenic to humans. The decision to use data on a chemical with suggestive evidence of carcinogenic potential for deriving tier I criteria shall be a case-by-case determination. In determining whether to derive a HCC, additional evidence that shall be considered includes but is not limited to available information on mode of action, such as mutagenicity/genotoxicity (determinations of whether the chemical interacts directly with DNA), structure activity, and metabolism.
- (f) Tier II. Weight of evidence of chemicals with effects suggestive of carcinogenic potential sufficient to derive a HCV shall include those chemicals with suggestive evidence of carcinogenic potential for which there are, at a minimum, data sufficient for quantitative risk assessment, but for which data are inadequate for tier I criterion development due to a tumor response of marginal statistical significance or inability to derive a strong dose-response relationship. In determining whether to derive tier II human cancer values, additional evidence that shall be considered includes but is not limited to available information on mode of action such as mutagenicity/genotoxicity (determinations of whether the chemical interacts directly with DNA), structure activity and metabolism. As with the use of data on chemicals with suggestive evidence of carcinogenic potential in developing tier I criteria, the decision to use data on chemicals with suggestive evidence of carcinogenic potential to derive tier II values shall be made on a case-by-case basis by the director.

(2) Noncarcinogens.

- (a) All available toxicity data shall be evaluated considering the full range of possible health effects of a chemical, i.e., acute/subacute, chronic/subchronic and reproductive/developmental effects, in order to best describe the dose-response relationship of the chemical, and to calculate human noncancer criteria (HNC) and human noncancer values (HNV) which will protect against the most sensitive endpoint(s) of toxicity. Paragraphs ~~(B)(2)(b)~~ (E)(2)(b) and ~~(B)(2)(e)~~ (E)(2)(c) of this rule provide the minimum data sets necessary to calculate HNC and HNV, respectively.
- (b) Tier I. The minimum data set sufficient to derive an HNC shall include at least one well-conducted epidemiologic study or animal study. A well-conducted epidemiologic study for an HNC must quantify exposure level(s) and demonstrate positive association between exposure to a chemical and adverse effect(s) in humans. A well-conducted study in animals must demonstrate a dose response relationship involving one or more critical effect(s) biologically relevant to humans. The duration of a study should span multiple generations of exposed test species or at least a major portion of the lifespan of one generation. By the use of uncertainty adjustments, shorter term studies (such as ninety-day subchronic studies) with evaluation of more limited effect(s) may be used to extrapolate to longer exposures or to account for a variety of adverse effects. For an HNC developed pursuant to this rule, such a limited study must be conducted for at least ninety days in rodents or ten per cent of the lifespan of other appropriate test species and demonstrate a no observable adverse effect level (NOAEL). Chronic studies of one year or longer in rodents or fifty per cent of the lifespan or greater in other appropriate test species that demonstrate a lowest observable adverse effect level (LOAEL) may be sufficient for use in tier I criterion derivation if the effects observed at the LOAEL were relatively mild and reversible as compared to effects at higher doses. This does not preclude the use of a LOAEL from a study (of chronic duration) with only one or two doses if the effects observed appear minimal when compared to effect levels observed at higher doses in other studies.
- (c) Tier II. When the minimum data for deriving tier I criteria are not available to meet the tier I data requirements, a more limited database may be considered for deriving tier II values. As with tier I criteria, all available data shall be considered and shall address a range of adverse health effects with exposure over a substantial portion of the lifespan (or multiple generations) of the test species. With the use of appropriate uncertainty factors to account for a less extensive database, the minimum data sufficient to derive a tier II value shall include a NOAEL from at least one well-conducted short-term repeated dose study. This study shall be of at least twenty-eight days duration, in animals demonstrating a dose-response, and involving effects biologically relevant to humans. Data from studies of

longer duration (greater than twenty-eight days) and LOAELS from such studies (greater than twenty-eight days) may be more appropriate in some cases for derivation of tier II values. Use of a LOAEL shall be based on consideration of the following information: severity of effect, quality of the study and duration of the study.

(3) Bioaccumulation factors (BAFs).

- (a) Tier I for carcinogens and noncarcinogens. To be considered a tier I cancer or noncancer human health criterion, along with satisfying the minimum toxicity data requirements of paragraphs ~~(B)(1)~~ (E)(1) and ~~(B)(2)~~ (E)(2) of this rule, a chemical shall have the following minimum bioaccumulation data. For all organic chemicals either: A field-measured BAF; a BAF derived using the BSAF methodology; or a BAF less than one hundred twenty-five regardless of how the BAF was derived. For all inorganic chemicals, including organometals such as mercury, either: a field-measured BAF; or a laboratory-measured BCF.
- (b) Tier II for carcinogens and noncarcinogens: a chemical is considered a tier II cancer or noncancer human health value if it does not meet either the minimum toxicity data requirements of paragraph ~~(B)(1)~~ (E)(1) or ~~(B)(2)~~ (E)(2) of this rule or the minimum bioaccumulation data requirements of paragraph ~~(B)(3)(a)~~ (E)(3)(a) of this rule.

~~(C)~~(F) Principles for development of tier I criteria or tier II values. The fundamental components of the procedure to calculate tier I criteria or tier II values are the same. However, certain aspects of the procedure designed to account for short-duration studies or other limitations in data are more likely to be relevant in deriving tier II values than tier I criteria.

(1) Carcinogens.

- (a) A non-threshold mechanism of carcinogenesis shall be assumed unless biological data adequately demonstrate the existence of a threshold on a chemical-specific basis.
- (b) All appropriate human epidemiologic data and animal cancer bioassay data shall be considered. Data specific to an environmentally appropriate route of exposure shall be used. Oral exposure should be used preferentially over dermal and inhalation since, in most cases, the exposure routes of greatest concern are fish consumption and drinking water/incidental ingestion. The risk associated does shall be set at a level corresponding to an incremental cancer risk of one in one hundred thousand. If acceptable human epidemiologic data are available for a chemical, they shall be used to derive

the risk associated dose. If acceptable human epidemiologic data are not available, the risk associated dose shall be derived from available animal bioassay data. Data from a species that is considered most biologically relevant to humans is preferred where all other considerations regarding quality of data are equal. In the absence of data to distinguish the most relevant species, data from the most sensitive species tested, i.e., the species showing a carcinogenic effect at the lowest administered dose, shall be used.

- (c) When animal bioassay data are used and a non-threshold mechanism of carcinogenicity is assumed, the data shall be fitted to a linearized multistage model. The upper-bound ninety-five per cent confidence limit on risk (or, the lower ninety-five per cent confidence limit on dose) at the one in one hundred thousand risk level shall be used to calculate a risk associated dose (RAD). Other models, including modifications or variations of the linear multistage model, which are more appropriate to the available data may be used where scientifically justified.
- (d) If the duration of the study is significantly less than the natural lifespan of the test animal, the slope may be adjusted on a case-by-case basis to compensate for latent tumors which were not expressed. In the absence of alternative approaches which compensate for study durations significantly less than lifetime, the process described in "Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency, Washington, DC, EPA-822-B-00-004, October 2000" shall be used.
- (e) A species scaling factor shall be used to account for differences between test species and humans. It shall be assumed that milligrams per surface area per day is an equivalent dose between species. All doses presented in mg/kg body weight shall be converted to an equivalent surface area dose by raising the mg/kg dose to the two-thirds power. However, if adequate pharmacokinetic and metabolic studies are available, these data may be factored into the adjustment for species differences.
- (f) Additional data selection and adjustment decisions must also be made in the process of quantifying risk. Consideration shall be given to tumor selection for modeling. All doses shall be adjusted to give an average daily dose over the study duration. Adjustments in the rate of tumor response shall be made for early mortality in test species. The goodness-of-fit of the model to the data shall also be assessed.

- (g) When a linear, non-threshold dose response relationship is assumed, the RAD shall be calculated using the equation

$$\text{RAD} = \frac{0.00001}{q_1^*}$$

Where:

RAD = risk associated dose in milligrams of toxicant per kilogram body weight per day (mg/kg/day);

0.00001 (1×10^{-5}) = incremental risk of developing cancer equal to one in one hundred thousand; and

q_1^* = slope factor (mg/kg/day)⁻¹.

- (h) If human epidemiologic data and/or other animal biological data indicate that a chemical causes cancer through a threshold mechanism, the risk associated dose may be calculated using a method which assumes that a threshold mechanism is operative.

(2) Noncarcinogens.

- (a) Noncarcinogens shall generally be assumed to have a threshold dose or concentration below which no adverse effects should be observed. Therefore, the tier I criterion or tier II value shall be the maximum water concentration of a substance at or below which a lifetime exposure from drinking the water, consuming fish caught in the water, and ingesting water as a result of participating in water-related recreation activities is likely to be without appreciable risk of deleterious effects. For some noncarcinogens, there may not be a threshold dose below which no adverse effects are observed. Chemicals acting as genotoxic teratogens and germline mutagens are thought to possibly produce reproductive and/or developmental effects via a genetically linked mechanism which may have no threshold. Other chemicals also may not demonstrate a threshold. Criteria and values for these types of chemicals shall be established on a case-by-case basis using appropriate assumptions reflecting the likelihood that no threshold exists.
- (b) All appropriate human and animal toxicologic data shall be reviewed and evaluated. To the maximum extent possible, data most specific to the environmentally relevant route of exposure shall be used. Oral exposure data should be used preferentially over dermal and inhalation since, in most cases, the exposure routes of greatest concern are fish consumption and drinking water/incidental ingestion. When acceptable human data are not

available (e.g., well-conducted epidemiologic studies), animal data from species most biologically relevant to humans shall be used. In the absence of data to distinguish the most relevant species, data from the most sensitive animal species tested, i.e., the species showing a toxic effect at the lowest administered dose (given a relevant route of exposure), shall be used.

- (c) Minimum data requirements are specified in paragraph ~~(B)(2)~~ (E)(2) of this rule. The experimental exposure level representing the highest level tested at which no adverse effects were demonstrated (NOAEL) from studies satisfying the provisions of paragraph ~~(B)(2)~~ (E)(2) of this rule shall be used for criteria calculations. In the absence of a NOAEL, the LOAEL from studies satisfying the provisions of paragraph ~~(B)(2)~~ (E)(2) of this rule may be used if it is based on mild and reversible effects.
- (d) Uncertainty factors shall be used to account for the uncertainties in predicting acceptable dose levels for the general human population based upon experimental animal data or limited human data.
 - (i) An uncertainty factor of ten shall be used when extrapolating from valid experimental results from studies on prolonged exposure to average healthy humans. This ten-fold factor is used to protect sensitive members of the human population.
 - (ii) An uncertainty factor of one hundred shall be used when extrapolating from valid results of long-term studies on experimental animals when results of studies of human exposure are not available or are inadequate. In comparison to paragraph ~~(C)(2)(d)(i)~~ (F)(2)(d)(i) of this rule, this represents an additional ten-fold uncertainty factor in extrapolating data from the average animal to the average human.
 - (iii) An uncertainty factor of up to one thousand shall be used when extrapolating from animal studies for which the exposure duration is less than chronic, but greater than ninety days length, or when other significant deficiencies in study quality are present, and when useful long-term human data are not available.
 - (iv) An uncertainty factor of up to three thousand shall be used when extrapolating from animal studies for which the exposure duration is less than twenty-eight days.
 - (v) An additional uncertainty factor of between one and ten may be used when deriving a criterion from a LOAEL. The level of additional uncertainty applied shall depend upon the severity and the incidence of the observed adverse effect.

(vi) An additional uncertainty factor of between one and ten may be applied when there are limited effects data or incomplete sub-acute or chronic toxicity data (e.g., reproductive/developmental data). The level of quality and quantity of the experimental data available as well as structure-activity relationships shall be used to determine the factor selected.

(vii) When deriving an uncertainty factor in developing a tier I criterion or tier II value, the total uncertainty, as calculated following the guidance of paragraphs ~~(C)(2)(d)(i)~~ (F)(2)(d)(i) to ~~(C)(2)(d)(vi)~~ (F)(2)(d)(vi) of this rule, shall not exceed ten thousand for tier I criteria and thirty thousand for tier II values.

(e) All study results shall be converted, as necessary, to the standard unit for acceptable daily exposure of milligrams of toxicant per kilogram of body weight per day (mg/kg/day). Doses shall be adjusted for continuous exposure.

(3) Criteria and value derivation.

(a) Carcinogens. The tier I HCC and tier II HCV shall be calculated using the equation

$$HCV = \frac{RAD \times BW}{WC + [(FC_{TL3} \times BAF_{TL3}^{HH}) + (FC_{TL4} \times BAF_{TL4}^{HH})]}$$

Where:

HCV = human cancer value in milligrams per liter (mg/l);

RAD = risk associated dose in milligrams toxicant per kilogram body weight per day (mg/kg/day) that is associated with a lifetime incremental cancer risk equal to one in one hundred thousand;

BW = weight of an average human (seventy kilograms);

WC = per capita water consumption (two liters/day for surface waters designated as public water supplies and 0.01 liters/day for surface waters not designated as public water supplies);

FC_{TL3} = mean consumption of trophic level three of regionally caught freshwater fish (0.0036 kilogram/day);

FC_{TL4} = mean consumption of trophic level four of regionally caught freshwater fish (0.0114 kilogram/day);

BAF_{TL3}^{HH} = bioaccumulation factor for edible portion of trophic level three fish, as derived using the BAF methodology contained in rule 3745-1-37 of the Administrative Code; and

BAF_{TL4}^{HH} = bioaccumulation factor for edible portion of trophic level four fish, as derived using the BAF methodology contained in rule 3745-1-37 of the Administrative Code.

- (b) Noncarcinogens. The tier I HNC or tier II HNV shall be calculated using the equation

$$HNV = \frac{ADE \times BW \times RSC}{WC + [(FC_{TL3} \times BAF_{TL3}^{HH}) + (FC_{TL4} \times BAF_{TL4}^{HH})]}$$

Where:

HNV = human noncancer value in milligrams per liter (mg/l);

ADE = acceptable daily exposure in milligrams toxicant per kilogram body weight per day (mg/kg/day);

RSC = relative source contribution factor of 0.8. An RSC derived from actual exposure data may be developed using the methodology outlined in "Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency, Washington, DC, EPA-822-B-00-004, October 2000;"

BW = weight of an average human (seventy kilograms);

WC = per capita water consumption (two liters/day for surface waters designated as public water supplies and 0.01 liters/day for surface waters not designated as public water supplies);

FC_{TL3} = mean consumption of trophic level three fish by regional sport fishers of regionally caught freshwater fish (0.0036 kilogram/day);

FC_{TL4} = mean consumption of trophic level four fish by regional sport fishers of regionally caught freshwater fish (0.0114 kg/day);

BAF_{TL3}^{HH} = human ~~Health~~ health bioaccumulation factor for edible portion of trophic level three fish, as derived using the BAF methodology contained in rule 3745-1-37 of the Administrative Code; and

BAF_{TL4}^{HH} = human health bioaccumulation factor for edible portion of trophic level four fish, as derived using the BAF methodology contained in rule 3745-1-37 of the Administrative Code.

~~(D)~~(G) Application of criteria and values. The HCC, HCV, HNC and HNV shall be applied as ~~thirty day~~ average concentrations outside the mixing zone.

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R.C. 119.032 rule review date: 10/5/2012

Certification

Date

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For Interested Party Review – August 2008 Draft

3745-1-39 **Methodology for the development of wildlife criteria for the lake Erie drainage basin.**

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

This rule applies to water bodies located in the lake Erie drainage basin. This rule establishes a methodology which is required when developing tier I wildlife criteria for bioaccumulative chemicals of concern (BCCs).

(A) General provisions

- (1) A tier I wildlife criterion is the concentration of a substance which is likely to, if not exceeded, protect avian and mammalian wildlife populations inhabiting the lake Erie drainage basin from adverse effects resulting from the ingestion of water and aquatic prey taken from surface waters of the lake Erie drainage basin. These criteria are based on existing toxicological studies of the substance of concern and quantitative information about the exposure of wildlife species to the substance through food and water consumption. Separate avian and mammalian values are developed using taxonomic class-specific toxicity data and exposure data for five representative wildlife species. The wildlife species selected are representative of avian and mammalian species resident in the Great Lakes basin which are likely to experience the highest exposures to bioaccumulative contaminants through the aquatic food web; they are the bald eagle, herring gull, belted kingfisher, mink, and river otter.
- (2) Rule 3745-1-35 of the Administrative Code describes the procedures for calculating site-specific wildlife criteria.
- (3) The term "wildlife value" (WV) is used to denote the value for each representative species which results from using the equation in this rule, the value obtained from averaging species values within a class, or any value derived from application of the site-specific procedure provided in rule 3745-1-35 of the Administrative Code. The WVs calculated for the representative species are used to calculate taxonomic class-specific WVs. The WV is the concentration of a substance which, if not exceeded, should better protect the taxon in question.
- (4) "Tier I wildlife criterion," or "tier I criterion" is used to denote the number derived from data meeting the tier I minimum database requirements, and which will be protective of the two classes of wildlife.

(B) Calculation of wildlife values for tier I criteria.

- (1) Equation for avian and mammalian wildlife values. Tier I wildlife values for BCCs shall be calculated using the equation

$$WV = \frac{\frac{TD}{UF_A \times UF_S \times UF_L} \times Wt}{W + \sum (F_{TLi} \times BAF_{TLi}^{WL})}$$

Where:

WV = wildlife value in milligrams of substance per liter (mg/l);

TD = test dose in milligrams of substance per kilograms per day (mg/kg-d) for the test species. This shall be either a NOAEL or a LOAEL;

UF_A = uncertainty factor for extrapolating toxicity data across species (unitless). A species-specific UF shall be selected and applied to each representative species, consistent with the equation;

UF_S = UF for extrapolating from subchronic to chronic exposures (unitless);

UF_L = UF for LOAEL to NOAEL extrapolations (unitless);

WT = average weight in kilograms (kg) for the representative species;

W = average daily volume of water consumed in liters per day (l/d) by the representative species;

F_{TLi} = average daily amount of food consumed from trophic level I in kilograms per day (kg/d) by the representative species; and

BAF_{TLi}^{WL} = bioaccumulation factor for wildlife food in trophic level I in liters per kilogram (l/kg), developed using the BAF methodology contained in rule 3745-1-37 of the Administrative Code. For consumption of piscivorous birds by other birds (e.g., herring gull by eagles), the BAF shall be derived by multiplying the trophic level three BAF for fish by a biomagnification factor to account for the biomagnification from fish to the consumed birds.

- (2) Identification of representative species for protection. For bioaccumulative chemicals, piscivorous species are identified as the focus of concern for wildlife criteria development in the Great Lakes. Three avian species (eagle, kingfisher and herring gull) and two mammalian species (mink and otter) serve as representative species for protection. The TD obtained from toxicity data for each taxonomic class shall be used to calculate WVs for each of the five representative species.

- (3) Calculation of avian and mammalian wildlife values and tier I criterion derivation. The avian WV is the geometric mean of the WVs calculated for the three representative avian species. The mammalian WV is the geometric mean of the WVs calculated for the two representative mammalian species. The lower of the mammalian and avian WVs shall be selected as the tier I criterion.

(C) Parameters of the effect component of the wildlife criteria methodology.

- (1) Definitions. The following definitions provide additional specificity and guidance in the evaluation of toxicity data and the application of this rule.
 - (a) Acceptable endpoints. For the purpose of wildlife criteria derivation, acceptable subchronic and chronic endpoints are those which affect reproductive or developmental success, organismal viability or growth, or any other endpoint which is, or is directly related to, parameters that influence population dynamics.
 - (b) Chronic effect. An adverse effect that is measured by assessing an acceptable endpoint and results from continual exposure over several generations, or at least over a significant part of the test species' projected life span or life stage.
 - (c) Subchronic effect. An adverse effect, measured by assessing an acceptable endpoint, resulting from continual exposure for a period of time less than that deemed necessary for a chronic test.
- (2) Minimum toxicity database for tier I criteria development. A TD value is required for criterion calculation. To derive a tier I criterion for wildlife, the data set shall provide enough data to generate a subchronic or chronic dose-response curve for any given substance for both mammalian and avian species. In reviewing the toxicity data available which meet the minimum data requirements for each taxonomic class, the following order of preference shall be applied to select the appropriate TD to be used for calculation of individual WVs. Data from peer-reviewed field studies of wildlife species take precedence over other types of studies, where such studies are of adequate quality. An acceptable field study shall be of subchronic or chronic duration, provide a defensible, chemical-specific dose-response curve in which cause and effect are clearly established, and assess acceptable endpoints as defined in this document. When acceptable wildlife field studies are not available, or determined to be of inadequate quality, the needed toxicity information may come from peer-reviewed laboratory studies. When laboratory studies are used, preference shall be given to laboratory studies with wildlife species over traditional laboratory animals to reduce uncertainties in making interspecies extrapolations. All available laboratory data and field studies shall be reviewed to corroborate the final tier I criterion, to assess the reasonableness of the toxicity value used, and to assess the appropriateness of any UFs which are applied. When evaluating

the studies from which a test dose is derived in general, the following requirements shall be met.

- (a) The mammalian data shall come from at least one well-conducted study of ninety days or greater designed to observe subchronic or chronic effects as defined in this document.
 - (b) The avian data shall come from at least one well-conducted study of seventy days or greater designed to observe subchronic or chronic effects as defined in this rule.
 - (c) In reviewing the studies from which a TD is derived for use in calculating a WV, studies involving exposure routes other than oral may be considered only when an equivalent oral daily dose can be estimated and technically justified because the criteria calculations are based on an oral route of exposure.
 - (d) In assessing the studies which meet the minimum data requirements, preference shall be given to studies which assess effects on developmental or reproductive endpoints.
- (3) Selection of TD data. In selecting data to be used in the derivation of WVs, the evaluation of acceptable endpoints, as defined in paragraph (C)(1) of this rule, shall be the primary selection criterion. All data not part of the selected subset may be used to assess the reasonableness of the toxicity value and the appropriateness of the UFs which are applied.
- (a) If more than one TD value is available within a taxonomic class, based on different endpoints of toxicity, that TD which is likely to reflect best potential impacts to wildlife populations through resultant changes in mortality or fecundity rates shall be used for the calculation of WVs.
 - (b) If more than one TD is available within a taxonomic class, based on the same endpoint of toxicity, the TD from the most sensitive species shall be used.
 - (c) If more than one TD based on the same endpoint of toxicity is available for a given species, the TD for that species shall be calculated using the geometric mean of those TDs.
- (4) In those cases in which a TD is available in units other than milligrams of substance per kilograms per day (mg/kg/d), the following procedures shall be used to convert the TD to the appropriate units prior to calculating a WV.
- (a) If the TD is given in milligrams of toxicant per liter of water consumed by the test animals (mg/l), the TD shall be multiplied by the daily average

volume of water consumed by the test animals in liters per day (l/d) and divided by the average weight of the test animals in kilograms (kg).

- (b) If the TD is given in milligrams of toxicant per kilogram of food consumed by the test animals (mg/kg), the TD shall be multiplied by the average amount of food in kilograms consumed daily by the test animals (kg/d) and divided by the average weight of the test animals in kilograms (kg).

(5) Drinking and feeding rates.

- (a) When drinking and feeding rates and body weight are needed to express the TD in milligrams of substance per kilograms per day (mg/kg/d), they shall be obtained from the study from which the TD was derived. If not already determined, body weight, and drinking and feeding rates shall be converted to a wet weight basis.
- (b) If the study does not provide the needed values, the values shall be determined from appropriate scientific literature. For studies done with domestic laboratory animals, either the "Registry of Toxic Effects of Chemical Substances—(National Institute for Occupational Safety and Health, Cincinnati, Ohio, July 1997)", or "Recommendations for and Documentation of Biological Values for Use in Risk Assessment—(U.S. EPA, 1988), EPA/600/6-87/008" shall be consulted. When these references do not contain exposure information for the species used in a given study, either the allometric equations in this rule or the exposure estimation methods presented in chapter 4 of "The Wildlife Exposure Factors Handbook—(U.S. EPA, 1993), EPA/600/R-93/187", should be applied to approximate the needed feeding or drinking rates. The choice of the methods described in this paragraph is at the discretion of the director.

- (c) For mammalian species, the general allometric equations are:

$$(i) F = 0.0687 \times (Wt)^{0.82}$$

Where:

F = feeding rate of mammalian species in kilograms per day (kg/d) dry weight.

Wt = average weight in kilograms (kg) of the test animals.

$$(ii) W = 0.099 \times (Wt)^{0.90}$$

Where:

W = drinking rate of mammalian species in liters per day (l/d).

Wt = average weight in kilograms (kg) of the test animals.

(d) For avian species, the general allometric equations are:

$$(i) F = 0.0582 (Wt)^{0.65}$$

Where:

F = feeding rate of avian species in kilograms per day (kg/d) dry weight.

Wt = average weight in kilograms (kg) of the test animals.

$$(ii) W = 0.059 \times (Wt)^{0.67}$$

Where:

W = drinking rate of avian species in liters per day (l/d).

Wt = average weight in kilograms (kg) of the test animals.

- (6) LOAEL to NOAEL extrapolations (UF_L). In those cases in which a NOAEL is unavailable as the TD and a LOAEL is available, the LOAEL may be used to estimate the NOAEL. If used, the LOAEL shall be divided by an UF to estimate a NOAEL for use in deriving WVs. The value of the UF shall not be less than one and shall not exceed ten, depending on the dose-response curve and any other available data, and is represented by UF_L in the equation expressed in paragraph (B)(1) of this rule.
- (7) Subchronic to chronic extrapolations (UF_s). In instances where only subchronic data are available, the TD may be derived from subchronic data. In such cases, the TD shall be divided by an UF to extrapolate from subchronic to chronic levels. The value of the UF shall not be less than one and shall not exceed ten, and is represented by UF_s in the equation expressed in paragraph (B)(1) of this rule. This factor shall be used when assessing highly bioaccumulative substances where toxicokinetic considerations suggest that a bioassay of limited length underestimates chronic effects.
- (8) Interspecies extrapolations (UF_A).
- (a) The selection of the UF_A shall be based on the available toxicological data and on available data concerning the physicochemical, toxicokinetic, and toxicodynamic properties of the substance in question and the amount and quality of available data. This value is a UF that is intended to account for differences in toxicological sensitivity among species.

- (b) For the derivation of tier I criteria, a UF_A shall not be less than one and shall not exceed one hundred, and shall be applied to each of the five representative species, based on existing data and the director's best professional judgement. The value of UF_A may differ for each of the representative species.
- (c) For tier I wildlife criteria, the UF_A shall be used only for extrapolating toxicity data across species within a taxonomic class, except as provided in this paragraph. The tier I UF_A is not intended for interclass extrapolations because of the poorly defined comparative toxicokinetic and toxicodynamic parameters between mammals and birds. However, an interclass extrapolation employing a UF_A may be used for a given chemical if it can be supported by a validated biologically-based dose-response model or by an analysis of interclass toxicological data, considering acceptable endpoints, for a chemical analog that acts under the same mode of toxic action.

(D) Parameters of the exposure component of the wildlife criteria methodology

- (1) Drinking and feeding rates of representative species. The body weights (Wt), feeding rates (F_{TLi}), drinking rates (W), and trophic level dietary composition (as food ingestion rate and per cent in diet) for each of the five representative species are presented in table 39-1 of this rule.
- (2) BAFs. The methodology for development of bioaccumulation factors is in rule 3745-1-37 of the Administrative Code. Trophic level three and four BAFs are used to derive WVs because these are the trophic levels at which the representative species feed.

(E) Application of criteria. The wildlife criterion shall be applied as a thirty-day ~~a thirty-day~~ average concentration outside the mixing zone.

Table 39-1. Exposure parameters for the five representative species identified for protection.

Species	Adult body weight	Water ingestion rate	Food ingestion rate of prey in each trophic level	Trophic level of prey
Units	kg	l/day	kg/day	Per cent of diet
Mink	0.80	0.081	TL3: 0.159 Other: 0.0177	TL3: 90 % Other: 10 %
Otter	7.4	0.600	TL3: 0.977 TL4: 0.244	TL3: 80 % TL4: 20 %
Kingfisher	0.15	0.017	TL3: 0.0672	TL3: 100 %
Herring gull	1.1	0.063	TL3: 0.192 TL4: 0.0480 Other: 0.0267	<u>Fish: 90 %</u> TL3: 80 % TL4: 20 % <u>Other: 10 %</u>
Bald eagle	4.6	0.160	TL3: 0.371 TL4: 0.0929 PB: 0.0283 Other: 0.0121	<u>Fish: 92 %</u> TL3: 80 % TL4: 20 % <u>Birds: 8 %</u> PB: 70 % Non-aquatic: 30 %

Note: TL3 = trophic level 3 fish
 TL4 = trophic level 4 fish
 PB = piscivorous birds
 Other = non-aquatic birds and mammals

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Certification

Date

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For Interested Party Review – August 2008 Draft

3745-1-40 Water quality criteria for water supply use designations.

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

[Comment: For definitions of the use designations, see rule 3745-1-07 of the Administrative Code. For all other definitions, see rule 3745-1-02 of the Administrative Code.]

(A) Public water supply. Criteria associated with the public water supply use designation apply within five hundred yards of surface water intakes for public water systems. The criteria listed in this rule apply as "outside mixing zone maximums" for nitrate-N and nitrite-N and as "outside mixing zone averages" for all other chemicals. For the purpose of setting water quality based effluent limits, these criteria shall be met after the effluent and the receiving water are reasonably well mixed as provided in rules 3745-2-05 and 3745-2-08 of the Administrative Code. The following criteria apply to the public water supply use designation:

- (1) Ambient water quality criteria based on maximum contaminant levels (MCLs), developed under the Safe Drinking Water Act, in table 40-1 of this rule. The ambient criteria are the same as the MCLs, unless higher criteria would result in meeting the MCLs after conventional filtration technology and disinfection as defined in rule 3745-81-01 of the Administrative Code; and
- (2) Ambient water quality criteria developed under the Clean Water Act, in table 40-2 of this rule. Additional Clean Water Act criteria are calculated pursuant to rule 3745-1-38 and are available on the Ohio EPA website <http://www.epa.state.oh.us/dsw/wqs/criteria.html>. For any pollutant for which it is demonstrated that the methodology in rule 3745-1-38 of the Administrative Code is not scientifically defensible, the director may apply an alternative methodology acceptable under 40 C.F.R. 131 when developing water quality criteria.

Table 40-1. Water quality criteria for the protection of the public water supply use designation – ambient water quality criteria based on MCLs. Unless otherwise noted, the criteria are the maximum contaminant levels (MCLs) developed under the Safe Drinking Water Act.

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>Criteria (OMZA)</u> ³
<u>Alachlor</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>2.0</u>
<u>Antimony</u>	<u>TR</u>	<u>µg/l</u>	<u>6.0</u>
<u>Arsenic</u>	<u>TR</u>	<u>µg/l</u>	<u>10</u>
<u>Asbestos</u>	<u>T</u>	<u>Mf/l</u>	<u>7.0</u>
<u>Atrazine</u>	<u>T</u>	<u>µg/l</u>	<u>3.0</u>
<u>Barium</u>	<u>T</u>	<u>µg/l</u>	<u>2000</u>
<u>Benzene</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>5.0</u>
<u>Benzo(a)pyrene (PAHs)</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.20</u>
<u>Beryllium</u>	<u>TR</u>	<u>µg/l</u>	<u>4.0</u>
<u>Bromate</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>10</u>
<u>Cadmium</u>	<u>TR</u>	<u>µg/l</u>	<u>5.0</u>
<u>Carbofuran</u>	<u>T</u>	<u>µg/l</u>	<u>40</u>
<u>Carbon tetrachloride</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>5.0</u>
<u>Chloramines (as Cl2)</u>	<u>T</u>	<u>µg/l</u>	<u>4000</u>
<u>Chlordane</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>2.0</u>
<u>Chlorine (as Cl2)</u>	<u>T</u>	<u>µg/l</u>	<u>4000</u>
<u>Chlorine dioxide (as ClO2)</u>	<u>T</u>	<u>µg/l</u>	<u>800</u>
<u>Chlorite</u>	<u>T</u>	<u>µg/l</u>	<u>1000</u>
<u>Chlorobenzene</u>	<u>T</u>	<u>µg/l</u>	<u>100</u>
<u>Chromium</u>	<u>TR</u>	<u>µg/l</u>	<u>100</u>
<u>Cyanide</u>	<u>F</u>	<u>µg/l</u>	<u>200</u>
<u>2,4-D</u>	<u>T</u>	<u>µg/l</u>	<u>70</u>
<u>Dalapon</u>	<u>T</u>	<u>µg/l</u>	<u>200</u>
<u>1,2-Dibromo-3-chloropropane (DBCP)</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.20</u>
<u>o-Dichlorobenzene</u>	<u>T</u>	<u>µg/l</u>	<u>600</u>
<u>p-Dichlorobenzene</u>	<u>T</u>	<u>µg/l</u>	<u>75</u>
<u>1,2-Dichloroethane</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>5.0</u>
<u>1,1-Dichloroethylene</u>	<u>T</u>	<u>µg/l</u>	<u>7.0</u>

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>Criteria (OMZA)</u> ³
<u>cis-1,2-Dichloroethylene</u>	<u>T</u>	<u>µg/l</u>	<u>70</u>
<u>trans-1,2-Dichloroethylene</u>	<u>T</u>	<u>µg/l</u>	<u>100</u>
<u>Dichloromethane</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>5.0</u>
<u>1,2-Dichloropropane</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>5.0</u>
<u>Di(2-ethylhexyl)adipate</u>	<u>T</u>	<u>µg/l</u>	<u>400</u>
<u>Di(2-ethylhexyl)phthalate</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>6.0</u>
<u>Dinoseb</u>	<u>T</u>	<u>µg/l</u>	<u>7.0</u>
<u>Dioxin (2,3,7,8-TCDD)</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.000030</u>
<u>Diquat</u>	<u>T</u>	<u>µg/l</u>	<u>20</u>
<u>Endothall</u>	<u>T</u>	<u>µg/l</u>	<u>100</u>
<u>Endrin</u>	<u>T</u>	<u>µg/l</u>	<u>2.0</u>
<u>Ethylbenzene</u>	<u>T</u>	<u>µg/l</u>	<u>700</u>
<u>Ethylene dibromide</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.050</u>
<u>Glyphosate</u>	<u>T</u>	<u>µg/l</u>	<u>700</u>
<u>Haloacetic acids (HAA5)</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>60</u>
<u>Heptachlor</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.40</u>
<u>Heptachlor epoxide</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.20</u>
<u>Hexachlorobenzene</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>1.0</u>
<u>Hexachlorocyclopentadiene</u>	<u>T</u>	<u>µg/l</u>	<u>50</u>
<u>Lead</u>	<u>TR</u>	<u>µg/l</u>	<u>15</u>
<u>Lindane</u>	<u>T</u>	<u>µg/l</u>	<u>0.20</u>
<u>Mercury (inorganic)</u>	<u>TR</u>	<u>µg/l</u>	<u>2.0</u>
<u>Methoxychlor</u>	<u>T</u>	<u>µg/l</u>	<u>40</u>
<u>Nitrate-N</u>	<u>T</u>	<u>mg/l</u>	<u>10^a</u>
<u>Nitrite-N</u>	<u>T</u>	<u>mg/l</u>	<u>1.0^a</u>
<u>Oxamyl (Vydate)</u>	<u>T</u>	<u>µg/l</u>	<u>200</u>
<u>Pentachlorophenol</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>1.0</u>
<u>Phosphorus</u>	<u>T</u>	<u>--</u>	<u>b</u>
<u>Picloram</u>	<u>T</u>	<u>µg/l</u>	<u>500</u>
<u>Polychlorinated biphenyls (PCBs)</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.50</u>
<u>Selenium</u>	<u>TR</u>	<u>µg/l</u>	<u>50</u>
<u>Silver</u>	<u>TR</u>	<u>µg/l</u>	<u>100</u>

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>Criteria (OMZA)</u> ³
<u>Simazine</u>	<u>T</u>	<u>µg/l</u>	<u>4.0</u>
<u>Styrene</u>	<u>T</u>	<u>µg/l</u>	<u>100</u>
<u>Tetrachloroethylene</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>5.0</u>
<u>Thallium</u>	<u>TR</u>	<u>µg/l</u>	<u>2.0</u>
<u>Toluene</u>	<u>T</u>	<u>µg/l</u>	<u>1000</u>
<u>Total Trihalomethanes (TTHMs)</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>80</u>
<u>Toxaphene</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.30</u>
<u>2,4,5-TP (Silvex)</u>	<u>T</u>	<u>µg/l</u>	<u>50</u>
<u>1,2,4-Trichlorobenzene</u>	<u>T</u>	<u>µg/l</u>	<u>70</u>
<u>1,1,1-Trichloroethane</u>	<u>T</u>	<u>µg/l</u>	<u>200</u>
<u>1,1,2-Trichloroethane</u>	<u>T</u>	<u>µg/l</u>	<u>5.0</u>
<u>Trichloroethylene</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>5.0</u>
<u>Uranium</u> ⁴	<u>TR</u>	<u>µg/l</u>	<u>30</u>
<u>Vinyl chloride</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>2.0</u>
<u>Xylenes</u>	<u>T</u>	<u>mg/l</u>	<u>10</u>

¹ F = free; T = total; TR = total recoverable.

² Mf/l = million fibers per liter; mg/l = milligrams per liter (parts per million); µg/l = micrograms per liter (parts per billion).

³ OMZA = outside mixing zone average.

⁴ Carcinogen.

^a This criterion applies as an outside mixing zone maximum.

^b Total phosphorus as P shall be limited to the extent necessary to prevent nuisance growths of algae, weeds, and slimes that result in taste or odor problems. In areas where such nuisance growths exist, phosphorus discharges from point sources determined significant by the director shall not exceed a daily average of one milligram per liter as total P, or such stricter requirements as may be imposed by the director.

Table 40-2. Water quality criteria for the protection of the public water supply use designation – ambient water quality criteria developed under the Clean Water Act. In general, the criteria in this table were developed using U.S. EPA national guidance. However, if criteria developed using the procedures in 40 C.F.R. 132, "Water Quality Guidance for the Great Lakes System" were more stringent, those more stringent criteria are listed for the Lake Erie basin. Additional Clean Water Act criteria are calculated pursuant to rule 3745-1-38 of the Administrative Code and are available on the Ohio EPA website <http://www.epa.state.oh.us/dsw/wqs/criteria.html>.

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>Criteria (OMZA)</u> ³	
			<u>ORB</u>	<u>LEB</u>
<u>Benzene</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>6.2</u>	
<u>Chlordane</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.00089</u>	<u>0.00025</u>
<u>Chlorobenzene</u>	<u>T</u>	<u>µg/l</u>	<u>110</u>	
<u>Cyanides</u>	<u>T</u>	<u>µg/l</u>	<u>150</u>	
<u>DDT</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.00019</u>	<u>0.00015</u>
<u>Dieldrin</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.000011</u>	<u>0.0000065</u>
<u>2,4-Dimethylphenol</u>	<u>T</u>	<u>µg/l</u>	<u>110</u>	
<u>2,4-Dinitrophenol</u>	<u>T</u>	<u>µg/l</u>	<u>14</u>	
<u>Hexachlorobenzene</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.00047</u>	<u>0.00045</u>
<u>Hexachloroethane</u>	<u>T</u>	<u>µg/l</u>	<u>1.5</u>	
<u>Lindane</u>	<u>T</u>	<u>µg/l</u>	<u>0.11</u>	
<u>Mercury</u>	<u>TR</u>	<u>µg/l</u>	<u>0.012</u>	<u>0.0031</u>
<u>Methylene chloride</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>46</u>	
<u>Polychlorinated biphenyls (PCBs)</u> ⁵	<u>T</u>	<u>µg/l</u>	<u>0.000017</u>	<u>0.000015</u>
<u>2,3,7,8-TCDD (Dioxin)</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>6.8E-10^a</u>	<u>6.5E-10^a</u>
<u>Toluene</u>	<u>T</u>	<u>µg/l</u>	<u>500</u>	
<u>Toxaphene</u> ⁴	<u>T</u>	<u>µg/l</u>	<u>0.000066</u>	
<u>Trichloroethylene</u> ⁵	<u>T</u>	<u>µg/l</u>	<u>40</u>	<u>29</u>

¹ T = total; TR = total recoverable.

² µg/l = micrograms per liter (parts per billion).

³ OMZA = outside mixing zone average; ORB = Ohio river drainage basin; LEB = lake Erie drainage basin.

⁴ Criteria for this chemical are based on a carcinogenic endpoint.

⁵ The LEB criterion for this chemical is based on a carcinogenic endpoint.

^a This criterion applies to all 2,3,7,8-TCDD equivalents as specified in rule 3745-2-07 of the Administrative Code.

(B) Agricultural water supply. Criteria associated with the agricultural water supply use designation apply as "outside mixing zone averages". For the purpose of setting water quality based effluent limits, these criteria shall be met after the effluent and the receiving water are reasonably well mixed as provided in rules 3745-2-05 and 3745-2-08 of the Administrative Code. Criteria associated with the agricultural water supply use designation are in table 40-3 of this rule.

Table 40-3. Water quality criteria for the protection of the agricultural water supply use designation.

<u>Chemical</u>	<u>Form¹</u>	<u>Units²</u>	<u>Criterion (OMZA)³</u>
<u>Arsenic</u>	<u>TR</u>	<u>µg/l</u>	<u>100</u>
<u>Beryllium</u>	<u>TR</u>	<u>µg/l</u>	<u>100</u>
<u>Cadmium</u>	<u>TR</u>	<u>µg/l</u>	<u>50</u>
<u>Chromium</u>	<u>TR</u>	<u>µg/l</u>	<u>100</u>
<u>Copper</u>	<u>TR</u>	<u>µg/l</u>	<u>500</u>
<u>Fluoride</u>	<u>T</u>	<u>µg/l</u>	<u>2000</u>
<u>Iron</u>	<u>TR</u>	<u>µg/l</u>	<u>5000</u>
<u>Lead</u>	<u>TR</u>	<u>µg/l</u>	<u>100</u>
<u>Mercury</u>	<u>TR</u>	<u>µg/l</u>	<u>10</u>
<u>Nickel</u>	<u>TR</u>	<u>µg/l</u>	<u>200</u>
<u>Nitrate-N + Nitrite-N</u>	<u>T</u>	<u>mg/l</u>	<u>100</u>
<u>Selenium</u>	<u>TR</u>	<u>µg/l</u>	<u>50</u>
<u>Zinc</u>	<u>TR</u>	<u>µg/l</u>	<u>25,000</u>

¹ T = total; TR = total recoverable.

² mg/l = milligrams per liter (parts per million); µg/l = micrograms per liter (parts per billion).

³ OMZA = outside mixing zone average.

(C) Industrial water supply. Criteria for the support of this use designation will vary with the type of industry involved. No criteria are currently in effect.

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For Interested Party Review – August 2008 Draft

3745-1-41 Water quality criteria for recreation use designations.

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

[Comment: For definitions of the use designations, see rule 3745-1-07 of the Administrative Code. For all other definitions, see rule 3745-1-02 of the Administrative Code.]

(A) General water based recreation use. The criteria associated with the general water based recreation use designation apply as "outside mixing zone" or "inside mixing zone maximum." For the purpose of setting water quality based effluent limits, the criteria that apply "outside mixing zone" shall be met after the effluent and the receiving water are reasonably well mixed as provided in rules 3745-2-05 and 3745-2-08 of the Administrative Code. The criteria listed as "inside mixing zone maximum" shall be applicable as end of pipe maximum effluent limits or as criteria to be met within a short distance of the effluent pipe except as provided in rule 3745-2-08 of the Administrative Code.

(1) To support the conditions under paragraphs (B), (C) and (E) of rule 3745-1-04 of the Administrative Code, the criteria in table 41-1 of this rule shall apply as maximum values not to be exceeded.

Table 41-1. Water quality criteria for the protection of the general water based recreation use - visual aesthetic qualities.

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>Criteria (IMZM)</u> ³	<u>Criteria (OMZM)</u> ³
<u>MBAS (foaming agents)</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>0.50</u>
<u>Oil & grease</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>10</u> ^a
<u>Phosphorus</u>	<u>T</u>	<u>mg/l</u>	<u>b</u>	<u>b</u>

¹ T = total.

² mg/l = milligrams per liter (parts per million).

³ IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum.

^a Surface waters shall be free from floating oils and shall at no time produce a visible sheen or color film. Levels of oils or petrochemicals in the sediment or on the banks of a watercourse which cause deleterious effects to the biota will not be permitted.

^b Total phosphorus as P shall be limited to the extent necessary to prevent nuisance growths of algae, weeds, and slimes that result in a violation of the water quality criteria set forth in paragraph (E) of rule 3745-1-04 of the Administrative Code. In areas where such nuisance growths exist, phosphorus discharges from point sources determined significant by the director shall not exceed a daily average of one milligram per liter as total P, or such stricter requirements as may be imposed by the director.

- (2) To reduce potential human health risks associated with the coincidental consumption of chemical contaminants present in sport caught fish, the criteria in table 41-2 of this rule shall apply as average values outside mixing zones. Additional criteria are calculated pursuant to rule 3745-1-38 of the Administrative Code and are available on the Ohio EPA website <http://www.epa.state.oh.us/dsw/wqs/criteria.html>.

Table 41-2. Water quality criteria for the protection of the general water based recreation use - consumption of sport caught fish. In general, the criteria in this table were developed using U.S. EPA national guidance. However, if criteria developed using the procedures in 40 C.F.R. 132, "Water Quality Guidance for the Great Lakes System" were more stringent, those more stringent criteria are listed for the Lake Erie basin. Additional criteria are calculated pursuant to rule 3745-1-38 of the Administrative Code and are available on the Ohio EPA website <http://www.epa.state.oh.us/dsw/wqs/criteria.html>.

Chemical	Form ¹	Units ²	Criteria (OMZA) ³	
			ORB	LEB
Benzene ⁴	T	µg/l	200	160
Chlordane ⁴	T	µg/l	0.00089	0.00025
Chlorobenzene	T	µg/l	850	
Cyanides	T	µg/l	17,000	
DDT ⁴	T	µg/l	0.00019	0.00015
Dieldrin ⁴	T	µg/l	0.000011	0.0000065
2,4-Dimethylphenol	T	µg/l	2,400	
2,4-Dinitrophenol	T	µg/l	800	
Hexachlorobenzene ⁴	T	µg/l	0.00048	0.00045
Hexachloroethane	T	µg/l	1.9	
Lindane	T	µg/l	0.11	
Mercury	TR	µg/l	0.012	0.0031
Methylene chloride ⁴	T	µg/l	4,000	2,600
Polychlorinated biphenyls (PCBs) ⁵	T	µg/l	0.000017	0.000015
2,3,7,8-TCDD (Dioxin) ⁴	T	µg/l	6.8E-10 ^a	6.5E-10 ^a
Toluene	T	µg/l	4,900	
Toxaphene ⁴	T	µg/l	0.000066	
Trichloroethylene ⁵	T	µg/l	570	370

¹ T = total; TR = total recoverable.

² µg/l = micrograms per liter (parts per billion).

³ OMZA = outside mixing zone average; ORB = Ohio river drainage basin; LEB = Lake Erie drainage basin.

⁴ Criteria for this chemical are based on a carcinogenic endpoint.

⁵ The LEB criterion for this chemical is based on a carcinogenic endpoint.

^a This criterion applies to all 2,3,7,8-TCDD equivalents as specified in rule 3745-2-07 of the Administrative Code.

(B) Recreation use subcategories.

- (1) To reduce potential human health risks associated with exposure to pathogens in surface waters of the state, the E. coli criteria in table 41-3 of this rule shall apply inside and outside the mixing zone.
- (2) Compliance with the E. coli criteria shall be based on the seasonal geometric mean if more than one measurement is available and on the single sample maximum if only one measurement is available. The single sample maximum criteria shall also be used for the issuance of beach advisories and may be used in other circumstances if the director determines that, based on the magnitude, duration or frequency of exceedences, it is necessary to protect the designated use.

Table 41-3. Statewide numerical criteria for the protection of recreation use subcategories.

<u>Subcategory</u>	<u>E. coli (colony counts per 100 ml)</u>	
	<u>Seasonal geometric mean</u>	<u>Single sample maximum</u>
<u>Bathing water</u>	<u>126</u>	<u>235</u>
<u>Class A primary contact recreation</u>	<u>126</u>	<u>298</u>
<u>Class B primary contact recreation</u>	<u>161</u>	<u>523</u>
<u>Class C primary contact recreation</u>	<u>206</u>	<u>940</u>
<u>Secondary contact recreation</u>	<u>1030</u>	<u>1030</u>

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3745-1-42 Water quality criteria for the base aquatic life use designation.

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

[Comment: For definitions of the use designation, see rule 3745-1-07 of the Administrative Code. For all other definitions, see rule 3745-1-02 of the Administrative Code.]

- (A) The chemical specific criteria listed in this rule apply as "outside mixing zone" or "inside mixing zone maximum." For the purpose of setting water quality based effluent limits, the criteria which apply "outside mixing zone" shall be met after the effluent and the receiving water are reasonably well mixed as provided in rules 3745-2-05 and 3745-2-08 of the Administrative Code. The criteria listed as "inside mixing zone maximum" shall be applicable as end of pipe maximum effluent limits or as criteria to be met within a short distance of the effluent pipe except as provided in rule 3745-2-08 of the Administrative Code. Possible exceptions regarding the application of these criteria may apply as described in paragraph (B) of rule 3745-1-43 of the Administrative Code dealing with biological criteria.
 - (B) Additional chemical-specific criteria applicable to lake Erie are in rule 3745-1-31 of the Administrative Code. Additional chemical-specific criteria applicable to the Ohio river are in rule 3745-1-32 of the Administrative Code.
 - (C) Additional aquatic life and wildlife chemical-specific criteria may be calculated as described in rules 3745-1-36 and 3745-1-39 of the Administrative Code, respectively. For any pollutant for which it is demonstrated that a methodology or procedure in rules 3745-1-36 and 3745-1-39 of the Administrative Code is not scientifically defensible, the director may apply an alternative methodology or procedure acceptable under 40 C.F.R. 131 when developing water quality criteria.
 - (D) Protection of aquatic life - whole-effluent approach. Whole-effluent toxicity levels shall be applied in accordance with rules 3745-2-09 and 3745-33-07 of the Administrative Code.
 - (E) Base aquatic life use.
- (1) Water quality criteria for the protection of aquatic life are in tables 42-1 to 42-5 of this rule.
- (2) Water quality criteria for the protection of the terrestrial wildlife are in table 42-6 of this rule.

Table 42-1. Water quality criteria for the protection of aquatic life. Additional aquatic life criteria are calculated pursuant to rule 3745-1-36 of the Administrative Code and are available on the Ohio EPA website <http://www.epa.state.oh.us/dsw/wqs/criteria.html>.

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>IMZM</u> ³	<u>OMZM</u> ³	<u>OMZA</u> ³
<u>Ammonia-N</u>	<u>T</u>	<u>mg/l</u>	<u>See table 42-2 of this rule.</u>		
<u>Arsenic</u>	<u>D</u> ⁵	<u>µg/l</u>	<u>680</u>	<u>340</u>	<u>150</u>
<u>Arsenic</u>	<u>TR</u> ⁶	<u>µg/l</u>	<u>680</u>	<u>340</u>	<u>150</u>
<u>Cadmium</u> ⁷			<u>See table 42-3 of this rule.</u>		
<u>Chloride</u>	<u>T</u>	<u>mg/l</u>	<u>1700</u>	<u>860</u>	<u>230</u>
<u>Chlorine</u>	<u>R</u>	<u>µg/l</u>	<u>38</u>	<u>19</u>	<u>11</u>
<u>Chlorpyrifos</u>	<u>T</u>	<u>µg/l</u>	<u>0.17</u>	<u>0.083</u>	<u>0.041</u>
<u>Chromium</u> ⁷			<u>See table 42-3 of this rule</u>		
<u>Chromium VI</u>	<u>D</u>	<u>µg/l</u>	<u>31</u>	<u>16</u>	<u>11</u>
<u>Copper</u> ⁷			<u>See table 42-3 of this rule.</u>		
<u>Cyanide (Lake Erie drainage basin)</u>	<u>free</u>	<u>µg/l</u>	<u>44</u>	<u>22</u>	<u>5.2</u>
<u>Cyanide (Ohio river drainage basin)</u>	<u>free</u>	<u>µg/l</u>	<u>92</u>	<u>46</u>	<u>12</u>
<u>Diazinon</u>	<u>T</u>	<u>µg/l</u>	<u>0.34</u>	<u>0.17</u>	<u>0.17</u>
<u>Dieldrin</u>	<u>T</u>	<u>µg/l</u>	<u>0.47</u>	<u>0.24</u>	<u>0.056</u>
<u>Dissolved oxygen</u> ⁴	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>4.0</u>	<u>5.0</u>
<u>Dissolved solids</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>--</u>	<u>1500</u> ^a
<u>Endrin</u>	<u>T</u>	<u>µg/l</u>	<u>0.17</u>	<u>0.086</u>	<u>0.036</u>
<u>Lead</u> ⁷			<u>See table 42-3 of this rule.</u>		
<u>Lindane</u>	<u>T</u>	<u>µg/l</u>	<u>1.9</u>	<u>0.95</u>	<u>--</u>
<u>Mercury</u>	<u>D</u> ⁵	<u>µg/l</u>	<u>2.9</u>	<u>1.4</u>	<u>0.77</u>
<u>Mercury</u>	<u>TR</u> ⁶	<u>µg/l</u>	<u>3.4</u>	<u>1.7</u>	<u>0.91</u>
<u>Nickel</u> ⁷			<u>See table 42-3 of this rule.</u>		
<u>Nonylphenol</u>	<u>T</u>	<u>µg/l</u>	<u>55</u>	<u>28</u>	<u>6.6</u>
<u>Parathion</u>	<u>T</u>	<u>µg/l</u>	<u>0.13</u>	<u>0.065</u>	<u>0.013</u>
<u>Pentachlorophenol</u> ⁸			<u>See table 42-4 of this rule.</u>		
<u>pH</u>	<u>--</u>	<u>s.u.</u>	<u>--</u>	<u>--</u>	<u>6.5-9.0</u>
<u>Selenium</u>	<u>D</u> ⁵	<u>µg/l</u>	<u>--</u>	<u>--</u>	<u>4.6</u>

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>IMZM</u> ³	<u>OMZM</u> ³	<u>OMZA</u> ³
<u>Selenium</u>	<u>TR</u> ⁶	<u>µg/l</u>	<u>--</u>	<u>--</u>	<u>5.0</u>
<u>Temperature</u>			<u>See table 42-5 of this rule.</u>		
<u>Tributyultin</u>	<u>T</u>	<u>µg/l</u>	<u>0.92</u>	<u>0.46</u>	<u>0.072</u>
<u>Zinc</u> ⁷			<u>See table 42-3 of this rule.</u>		

¹ D = dissolved; R = total residual; T = total; TR = total recoverable.

² mg/l = milligrams per liter (parts per million); µg/l = micrograms per liter (parts per billion); s.u. = standard units.

³ IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum; OMZA = outside mixing zone average.

⁴ For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average.

⁵ These criteria are implemented by multiplying them by a translator approved by the director pursuant to rule 3745-2-04 of the Administrative Code.

⁶ These criteria apply in the absence of a translator approved by the director pursuant to rule 3745-2-04 of the Administrative Code.

⁷ These criteria are water hardness dependent.

⁸ These criteria are water pH dependent.

^a Equivalent 25°C specific conductance value is 2400 micromhos/cm.

Table 42-2.
(A) Outside mixing zone maximum total ammonia-nitrogen criteria (mg/l).

pH	6.5	6.7	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.8	9.0	
Temp. (°C)																							
0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.7	10.6	8.4	6.7	5.4	4.3	3.4	2.7	1.8	1.1	
1	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.5	10.5	8.3	6.6	5.3	4.2	3.4	2.7	1.7	1.1	
2	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.3	10.3	8.2	6.5	5.2	4.2	3.3	2.7	1.7	1.1	
3	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.2	8.1	6.5	5.2	4.1	3.3	2.6	1.7	1.1	
4	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	10.1	8.0	6.4	5.1	4.1	3.3	2.6	1.7	1.1	
5	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.9	9.9	7.9	6.3	5.0	4.0	3.2	2.6	1.7	1.1	
6	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.7	9.8	7.8	6.3	5.0	4.0	3.2	2.6	1.7	1.1	
7	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.6	9.7	7.8	6.2	5.0	4.0	3.2	2.6	1.7	1.1	
8	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.5	9.6	7.7	6.1	4.9	3.9	3.2	2.5	1.7	1.1	
9	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.4	9.6	7.6	6.1	4.9	3.9	3.1	2.5	1.7	1.1	
10	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.3	9.5	7.6	6.0	4.8	3.9	3.1	2.5	1.6	1.1	
11	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.2	9.4	7.5	6.0	4.8	3.9	3.1	2.5	1.6	1.1	
12	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.1	9.3	7.5	6.0	4.8	3.8	3.1	2.5	1.6	1.1	
13	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.1	9.3	7.4	5.9	4.8	3.8	3.1	2.5	1.7	1.1	
14	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.0	9.2	7.4	5.9	4.7	3.8	3.1	2.5	1.7	1.1	
15	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.9	10.9	9.2	7.4	5.9	4.7	3.8	3.1	2.5	1.7	1.1	
16	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.8	10.9	9.2	7.3	5.9	4.7	3.8	3.1	2.5	1.7	1.2
17	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.8	10.8	9.1	7.3	5.9	4.7	3.8	3.1	2.5	1.7	1.2
18	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.7	10.8	9.1	7.3	5.8	4.7	3.8	3.1	2.5	1.7	1.2	
19	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.7	10.8	9.1	7.3	5.8	4.7	3.8	3.1	2.5	1.7	1.2	
20	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.7	10.7	9.1	7.3	5.8	4.7	3.8	3.1	2.5	1.7	1.2	
21	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	10.7	9.1	7.3	5.8	4.7	3.8	3.1	2.6	1.7	1.2	
22	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	10.7	9.0	7.3	5.9	4.7	3.8	3.1	2.6	1.8	1.3	
23	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	10.7	9.1	7.3	5.9	4.7	3.9	3.2	2.6	1.8	1.3	
24	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	10.7	9.1	7.3	5.9	4.8	3.9	3.2	2.6	1.8	1.3	
25	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	10.7	9.1	7.3	5.9	4.8	3.9	3.2	2.6	1.9	1.3	
26	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.8	10.0	8.5	6.8	5.5	4.5	3.7	3.0	2.5	1.8	1.3	
27	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.8	11.0	9.4	8.0	6.4	5.2	4.2	3.5	2.8	2.4	1.7	1.2
28	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	10.3	8.8	7.5	6.0	4.9	4.0	3.3	2.7	2.2	1.6	1.2
29	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.9	11.2	9.6	8.2	7.0	5.7	4.6	3.7	3.1	2.5	2.1	1.5	1.1	
30	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.5	9.0	7.7	6.6	5.3	4.3	3.5	2.9	2.4	2.0	1.5	1.1	

Table 42-2.
(B) Outside mixing zone 30-day average total ammonia-nitrogen criteria (mg/l).

pH	6.5	6.7	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.8	9.0
Temp. (°C)																						
	<u>The following criteria apply during the months of December to February:</u>																					
0-10	13.0	13.0	13.0	12.6	11.7	10.7	9.7	8.6	7.6	6.6	5.6	4.8	4.0	3.3	2.8	2.3	1.9	1.5	1.2	1.0	0.7	0.5
11	13.0	13.0	12.4	11.6	10.8	9.9	8.9	8.0	7.0	6.1	5.2	4.4	3.7	3.1	2.6	2.1	1.7	1.4	1.2	0.9	0.6	0.4
12	13.0	12.6	11.5	10.8	10.0	9.2	8.3	7.4	6.5	5.6	4.8	4.1	3.4	2.9	2.4	2.0	1.6	1.3	1.1	0.9	0.6	0.4
13	12.3	11.6	10.6	10.0	9.2	8.5	7.7	6.8	6.0	5.2	4.5	3.8	3.2	2.7	2.2	1.8	1.5	1.2	1.0	0.8	0.6	0.4
14	11.4	10.8	9.8	9.3	8.6	7.9	7.1	6.3	5.6	4.8	4.2	3.5	3.0	2.5	2.1	1.7	1.4	1.1	0.9	0.8	0.5	0.4
15	10.6	10.0	9.1	8.6	8.0	7.3	6.6	5.9	5.2	4.5	3.9	3.3	2.8	2.3	1.9	1.6	1.3	1.1	0.9	0.7	0.5	0.3
16	9.8	9.3	8.5	8.0	7.4	6.8	6.1	5.5	4.8	4.2	3.6	3.0	2.6	2.1	1.8	1.5	1.2	1.0	0.8	0.7	0.5	0.3
17	9.1	8.6	7.8	7.4	6.8	6.3	5.7	5.1	4.5	3.9	3.3	2.8	2.4	2.0	1.7	1.4	1.1	0.9	0.8	0.6	0.4	0.3
18	8.5	8.0	7.3	6.9	6.4	5.8	5.3	4.7	4.2	3.6	3.1	2.6	2.2	1.8	1.5	1.3	1.1	0.9	0.7	0.6	0.4	0.3
19	7.9	7.4	6.8	6.4	5.9	5.4	4.9	4.4	3.9	3.3	2.9	2.4	2.1	1.7	1.4	1.2	1.0	0.8	0.7	0.5	0.4	0.3
20	7.3	6.9	6.3	5.9	5.5	5.0	4.6	4.1	3.6	3.1	2.7	2.3	1.9	1.6	1.3	1.1	0.9	0.8	0.6	0.5	0.4	0.3
	<u>The following criteria apply during the months of March to November:</u>																					
10	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.0	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
11	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.0	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
12	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.0	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
13	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
14	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
15	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
16	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
17	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2
18	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2
19	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2
20	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2
21	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.5	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
22	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.6	1.4	1.2	0.9	0.8	0.6	0.5	0.4	0.3	0.2	0.2
23	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.5	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2	0.2
24	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.4	1.2	1.0	0.8	0.7	0.5	0.4	0.4	0.3	0.2	0.1
25	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.3	1.1	1.0	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.1
26	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.1
27	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.0	0.8	0.7	0.5	0.4	0.4	0.3	0.2	0.2	0.1
28	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.1	0.9	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1
29	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.0	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1
30	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1

Table 42-3. Water quality criteria for the protection of aquatic life for water hardness dependent criteria.

A. Dissolved criteria shall be calculated as the total recoverable criteria multiplied by the conversion factor. Criteria at example values of water hardness are in table 42-3B of this rule.

<u>Chemical</u>	<u>Total Recoverable Criteria ($\mu\text{g/l}$)</u>	<u>Dissolved Criteria Conversion Factor</u>
<u>Cadmium</u>		
<u>IMZM</u> ³	$\frac{e^{(1.0166 [\ln H] - 3.231)}}{e^{(0.7409 [\ln H] - 4.719)}}$	$\frac{1.136672 - [(\ln H) \times 0.041838]}{1.101672 - [(\ln H) \times 0.041838]}$
<u>OMZM</u> ³	$\frac{e^{(1.0166 [\ln H] - 3.924)}}{e^{(0.7409 [\ln H] - 4.719)}}$	$\frac{1.136672 - [(\ln H) \times 0.041838]}{1.101672 - [(\ln H) \times 0.041838]}$
<u>OMZA</u> ³	$\frac{e^{(1.0166 [\ln H] - 3.231)}}{e^{(0.7409 [\ln H] - 4.719)}}$	$\frac{1.136672 - [(\ln H) \times 0.041838]}{1.101672 - [(\ln H) \times 0.041838]}$
<u>Chromium</u>		
<u>IMZM</u> ³	$\frac{e^{(0.819 [\ln H] + 4.4187)}}{e^{(0.819 [\ln H] + 3.7256)}}$	$\frac{0.316}{0.316}$
<u>OMZM</u> ³	$\frac{e^{(0.819 [\ln H] + 3.7256)}}{e^{(0.819 [\ln H] + 3.7256)}}$	$\frac{0.316}{0.316}$
<u>OMZA</u> ³	$\frac{e^{(0.819 [\ln H] + 0.6848)}}{e^{(0.819 [\ln H] + 3.7256)}}$	$\frac{0.860}{0.316}$
<u>Copper</u>		
<u>IMZM</u> ³	$\frac{e^{(0.9422 [\ln H] - 1.007)}}{e^{(0.8545 [\ln H] - 1.702)}}$	$\frac{0.960}{0.960}$
<u>OMZM</u> ³	$\frac{e^{(0.9422 [\ln H] - 1.700)}}{e^{(0.8545 [\ln H] - 1.702)}}$	$\frac{0.960}{0.960}$
<u>OMZA</u> ³	$\frac{e^{(0.9422 [\ln H] - 1.007)}}{e^{(0.8545 [\ln H] - 1.702)}}$	$\frac{0.960}{0.960}$
<u>Lead</u>		
<u>IMZM</u> ³	$\frac{e^{(1.273 [\ln H] - 0.3619)}}{e^{(1.273 [\ln H] - 4.003)}}$	$\frac{1.46203 - [(\ln H) \times 0.145712]}{1.46203 - [(\ln H) \times 0.145712]}$
<u>OMZM</u> ³	$\frac{e^{(1.273 [\ln H] - 1.055)}}{e^{(1.273 [\ln H] - 4.003)}}$	$\frac{1.46203 - [(\ln H) \times 0.145712]}{1.46203 - [(\ln H) \times 0.145712]}$
<u>OMZA</u> ³	$\frac{e^{(1.273 [\ln H] - 0.3619)}}{e^{(1.273 [\ln H] - 4.003)}}$	$\frac{1.46203 - [(\ln H) \times 0.145712]}{1.46203 - [(\ln H) \times 0.145712]}$
<u>Nickel</u>		
<u>IMZM</u> ³	$\frac{e^{(0.846 [\ln H] + 2.948)}}{e^{(0.846 [\ln H] + 0.0584)}}$	$\frac{0.998}{0.998}$
<u>OMZM</u> ³	$\frac{e^{(0.846 [\ln H] + 2.255)}}{e^{(0.846 [\ln H] + 0.0584)}}$	$\frac{0.998}{0.998}$
<u>OMZA</u> ³	$\frac{e^{(0.846 [\ln H] + 2.948)}}{e^{(0.846 [\ln H] + 0.0584)}}$	$\frac{0.997}{0.998}$
<u>Zinc</u>		
<u>IMZM</u> ³	$\frac{e^{(0.8473 [\ln H] + 1.577)}}{e^{(0.8473 [\ln H] + 0.884)}}$	$\frac{0.978}{0.978}$
<u>OMZM</u> ³	$\frac{e^{(0.8473 [\ln H] + 0.884)}}{e^{(0.8473 [\ln H] + 0.884)}}$	$\frac{0.978}{0.978}$
<u>OMZA</u> ³	$\frac{e^{(0.8473 [\ln H] + 1.577)}}{e^{(0.8473 [\ln H] + 0.884)}}$	$\frac{0.986}{0.978}$

B. Water quality criteria for the protection of aquatic life for water hardness dependent criteria.

Chemical	Form ¹	Units ²	Criteria ⁶			
			100	200	300	400
<u>Cadmium</u>						
<u>IMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>4.0</u>	<u>7.9</u>	<u>12</u>	<u>15</u>
<u>OMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>2.0</u>	<u>3.9</u>	<u>5.9</u>	<u>7.7</u>
<u>OMZA</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>0.25</u>	<u>0.40</u>	<u>0.53</u>	<u>0.64</u>
<u>Cadmium</u>						
<u>IMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>4.3</u>	<u>8.6</u>	<u>13</u>	<u>17</u>
<u>OMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>2.1</u>	<u>4.3</u>	<u>6.5</u>	<u>8.7</u>
<u>OMZA</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>0.27</u>	<u>0.45</u>	<u>0.61</u>	<u>0.76</u>
<u>Chromium</u>						
<u>IMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>1100</u>	<u>2000</u>	<u>2800</u>	<u>3500</u>
<u>OMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>570</u>	<u>1000</u>	<u>1400</u>	<u>1800</u>
<u>OMZA</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>74</u>	<u>130</u>	<u>180</u>	<u>230</u>
<u>Chromium</u>						
<u>IMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>3600</u>	<u>6400</u>	<u>8900</u>	<u>11000</u>
<u>OMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>1800</u>	<u>3200</u>	<u>4400</u>	<u>5600</u>
<u>OMZA</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>86</u>	<u>150</u>	<u>210</u>	<u>270</u>
<u>Copper</u>						
<u>IMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>27</u>	<u>52</u>	<u>76</u>	<u>99</u>
<u>OMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>13</u>	<u>26</u>	<u>38</u>	<u>50</u>
<u>OMZA</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>9.0</u>	<u>16</u>	<u>23</u>	<u>29</u>
<u>Copper</u>						
<u>IMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>28</u>	<u>54</u>	<u>79</u>	<u>100</u>
<u>OMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>14</u>	<u>27</u>	<u>39</u>	<u>52</u>
<u>OMZA</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>9.3</u>	<u>17</u>	<u>24</u>	<u>30</u>
<u>Lead</u>						
<u>IMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>190</u>	<u>410</u>	<u>630</u>	<u>840</u>
<u>OMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>97</u>	<u>200</u>	<u>310</u>	<u>420</u>
<u>OMZA</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>5.1</u>	<u>11</u>	<u>16</u>	<u>22</u>
<u>Lead</u>						
<u>IMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>240</u>	<u>590</u>	<u>990</u>	<u>1400</u>
<u>OMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>120</u>	<u>300</u>	<u>500</u>	<u>710</u>
<u>OMZA</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>6.4</u>	<u>16</u>	<u>26</u>	<u>37</u>
<u>Nickel</u>						
<u>IMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>940</u>	<u>1700</u>	<u>2400</u>	<u>3000</u>
<u>OMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>470</u>	<u>840</u>	<u>1200</u>	<u>1500</u>
<u>OMZA</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>52</u>	<u>93</u>	<u>130</u>	<u>170</u>
<u>Nickel</u>						
<u>IMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>940</u>	<u>1700</u>	<u>2400</u>	<u>3000</u>
<u>OMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>470</u>	<u>840</u>	<u>1200</u>	<u>1500</u>
<u>OMZA</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>52</u>	<u>94</u>	<u>130</u>	<u>170</u>

Chemical	Form ¹	Units ²	Criteria ⁶			
			100	200	300	400
<u>Zinc</u>						
<u>IMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>230</u>	<u>420</u>	<u>590</u>	<u>760</u>
<u>OMZM</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>120</u>	<u>210</u>	<u>300</u>	<u>380</u>
<u>OMZA</u> ³	<u>D</u> ⁴	<u>µg/l</u>	<u>120</u>	<u>210</u>	<u>300</u>	<u>380</u>
<u>Zinc</u>						
<u>IMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>240</u>	<u>430</u>	<u>610</u>	<u>780</u>
<u>OMZM</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>120</u>	<u>220</u>	<u>300</u>	<u>390</u>
<u>OMZA</u> ³	<u>TR</u> ⁵	<u>µg/l</u>	<u>120</u>	<u>220</u>	<u>300</u>	<u>390</u>

¹ D = dissolved; TR = total recoverable.

² µg/l = micrograms per liter (parts per billion).

³ IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum; OMZA = outside mixing zone average.

⁴ These criteria are implemented by multiplying them by a translator approved by the director pursuant to rule 3745-2-04 of the Administrative Code.

⁵ These criteria apply in the absence of a translator approved by the director pursuant to rule 3745-2-04 of the Administrative Code.

⁶ Numeric criteria are presented at example water hardnesses. The equations can be used to calculate numeric criteria at any water hardness up to 400 mg/l CaCO₃. "e" = the base e exponential function. "ln H" = the natural logarithm of the water hardness. The criteria at a water hardness of 400 mg/l CaCO₃ are used for water hardnesses above 400 mg/l CaCO₃.

Table 42-4. Water quality criteria for the protection of aquatic life for pH dependent criteria.

Chemical	Form ¹	Units ²	Equation	Criteria ⁴			
				6.5	7.5	8.0	9.0
<u>Pentachlorophenol</u>							
<u>IMZM</u> ³	<u>T</u>	<u>µg/l</u>	$e^{(1.005 [\text{pH}] - 4.176)}$	<u>11</u>	<u>29</u>	<u>48</u>	<u>130</u>
<u>OMZM</u> ³	<u>T</u>	<u>µg/l</u>	$e^{(1.005 [\text{pH}] - 4.869)}$	<u>5.3</u>	<u>14</u>	<u>24</u>	<u>65</u>
<u>OMZA</u> ³	<u>T</u>	<u>µg/l</u>	$e^{(1.005 [\text{pH}] - 5.134)}$	<u>4.0</u>	<u>11</u>	<u>18</u>	<u>50</u>

¹ T = total.

² µg/l = micrograms per liter (parts per billion).

³ IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum; OMZA = outside mixing zone average.

⁴ Numeric criteria are presented at example water pH. The equations can be used to calculate numeric criteria at any water pH between 6.5 and 9.0. "e" = the base e exponential function.

Table 42-5. Temperature criteria.

(A) General Ohio river basin - includes all waters of the state within the boundaries of the Ohio river basin, excluding the Ohio river and those water bodies or water body segments as designated in paragraphs (B) to (F) of this table. Shown as degrees fahrenheit and (celsius).

	Jan. 1-31	Feb. 1-29	Mar. 1-15	Mar. 16-31	Apr. 1-15	Apr. 16-30	May 1-15	May 16-31	June 1-15
Average:	47 (8.3)	47 (8.3)	51 (10.0)	54 (12.2)	59 (15.0)	65 (18.3)	67 (19.4)	70 (21.1)	74 (23.3)
<u>Daily</u> Maximum:	52 (11.1)	52 (11.1)	56 (13.3)	59 (15.0)	65 (18.3)	70 (21.1)	73 (22.8)	76 (24.4)	80 (26.7)
	June 16-30	July 1-31	Aug. 1-31	Sept. 1-15	Sept. 16-30	Oct. 1-15	Oct. 16-31	Nov. 1-30	Dec. 1-31
Average:	82 (27.8)	82 (27.8)	82 (27.8)	82 (27.8)	73 (22.8)	71 (21.7)	65 (18.3)	60 (15.6)	47 (8.3)
<u>Daily</u> Maximum:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	78 (25.6)	76 (24.4)	70 (21.1)	65 (18.3)	52 (11.1)

(B) Lower great Miami river - Steele dam in Dayton (river mile 81.3) to the confluence with the Ohio river. Shown as degrees fahrenheit and (celsius).

	Jan. 1-31	Feb. 1-29	Mar. 1-15	Mar. 16-31	Apr. 1-15	Apr. 16-30	May 1-15	May 16-31	June 1-15
Average:	49 (9.4)	49 (9.4)	53 (11.9)	56 (13.3)	59 (15.0)	65 (18.3)	67 (19.4)	70 (21.1)	75 (23.9)
<u>Daily</u> Maximum:	54 (12.2)	54 (12.2)	58 (14.4)	61 (16.1)	68 (20.0)	74 (23.3)	77 (25.0)	79 (26.1)	83 (28.3)
	June 16-30	July 1-31	Aug. 1-31	Sept. 1-15	Sept. 16-30	Oct. 1-15	Oct. 16-31	Nov. 1-30	Dec. 1-31
Average:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	78 (25.6)	71 (21.7)	66 (18.9)	63 (17.2)	49 (9.4)
<u>Daily</u> Maximum:	89 (31.7)	89 (31.7)	89 (31.7)	89 (31.7)	83 (28.3)	76 (24.4)	71 (21.7)	68 (20.0)	54 (12.2)

(C) Scioto river - Griggs dam in Columbus (river mile 136) to the confluence with the Ohio river. Shown as degrees fahrenheit and (celsius).

	Jan. 1-31	Feb. 1-29	Mar. 1-15	Mar. 16-31	Apr. 1-15	Apr. 16-30	May 1-15	May 16-31	June 1-15
Average:	47 (8.3)	47 (8.3)	51 (10.6)	54 (12.2)	59 (15.0)	62 (16.7)	67 (19.4)	72 (22.2)	75 (23.9)
<u>Daily</u> Maximum:	52 (11.1)	52 (11.1)	56 (13.3)	59 (15.0)	65 (18.3)	70 (21.1)	75 (23.9)	79 (26.1)	82 (27.8)
	June 16-30	July 1-31	Aug. 1-31	Sept. 1-15	Sept. 16-30	Oct. 1-15	Oct. 16-31	Nov. 1-30	Dec. 1-31
Average:	83 (28.3)	83 (28.3)	83 (28.3)	83 (28.3)	75 (23.9)	71 (21.7)	65 (18.3)	58 (14.4)	47 (8.3)
<u>Daily</u> Maximum:	87 (30.6)	87 (30.6)	87 (30.6)	87 (30.6)	80 (26.7)	76 (24.4)	70 (21.1)	63 (17.2)	52 (11.1)

(D) Hocking river - entire mainstem. Shown as degrees fahrenheit and (celsius).

	Jan. 1-31	Feb. 1-29	Mar. 1-15	Mar. 16-31	Apr. 1-15	Apr. 16-30	May 1-15	May 16-31	June 1-15
Average:	45 (7.2)	45 (7.2)	51 (10.6)	56 (13.3)	59 (15.0)	65 (18.3)	67 (19.4)	70 (21.1)	74 (23.3)
<u>Daily</u> Maximum:	50 (10.0)	50 (10.0)	56 (13.3)	61 (16.1)	66 (18.9)	70 (21.1)	73 (22.8)	76 (24.4)	80 (26.7)
	June 16-30	July 1-31	Aug. 1-31	Sept. 1-15	Sept. 16-30	Oct. 1-15	Oct. 16-31	Nov. 1-30	Dec. 1-31
Average:	83 (28.3)	83 (28.3)	83 (28.3)	83 (28.3)	77 (25.0)	65 (18.3)	62 (16.7)	58 (14.4)	45 (7.2)
<u>Daily</u> Maximum:	87 (30.6)	87 (30.6)	87 (30.6)	87 (30.6)	82 (27.8)	70 (21.1)	67 (19.4)	63 (17.2)	50 (10.0)

(E) Muskingum river - entire mainstem. Shown as degrees fahrenheit and (celsius).

	Jan. 1-31	Feb. 1-29	Mar. 1-15	Mar. 16-31	Apr. 1-15	Apr. 16-30	May 1-15	May 16-31	June 1-15
Average:	45 (7.2)	45 (7.2)	53 (11.7)	53 (11.7)	58 (14.4)	65 (18.3)	68 (20.0)	72 (22.2)	76 (24.4)
<u>Daily</u> Maximum:	50 (10.0)	50 (10.0)	58 (14.4)	58 (14.4)	63 (17.2)	70 (21.1)	74 (23.3)	77 (25.0)	84 (28.9)
	June 16-30	July 1-31	Aug. 1-31	Sept. 1-15	Sept. 16-30	Oct. 1-15	Oct. 16-31	Nov. 1-30	Dec. 1-31
Average:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	80 (26.7)	73 (22.8)	67 (19.4)	62 (16.7)	47 (8.3)
<u>Daily</u> Maximum:	89 (31.7)	89 (31.7)	89 (31.7)	89 (31.7)	85 (29.4)	77 (25.0)	72 (22.2)	67 (19.4)	52 (11.1)

(F) Mahoning river - Leavitt road dam (river mile 46.1) to the Ohio- Pennsylvania state line (river mile 12.6). Shown as degrees fahrenheit and (celsius).

	Jan. 1-31	Feb. 1-29	Mar. 1-15	Mar. 16-31	Apr. 1-15	Apr. 16-30	May 1-15	May 16-31	June 1-15
Average:	47 (8.3)	47 (8.3)	50 (10.0)	54 (12.2)	59 (15.0)	65 (18.3)	68 (20.0)	73 (22.8)	77 (25.0)
<u>Daily</u> Maximum:	53 (11.7)	53 (11.7)	57 (13.9)	61 (16.1)	65 (18.3)	70 (21.1)	76 (24.4)	79 (26.1)	84 (28.9)
	June 16-30	July 1-31	Aug. 1-31	Sept. 1-15	Sept. 16-30	Oct. 1-15	Oct. 16-31	Nov. 1-30	Dec. 1-31
Average:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	78 (25.6)	73 (22.8)	67 (19.4)	60 (15.6)	51 (10.6)
<u>Daily</u> Maximum:	89 (31.7)	89 (31.7)	89 (31.7)	89 (31.7)	83 (28.3)	77 (25.0)	72 (22.2)	66 (18.9)	55 (12.8)

(G) General lake Erie basin - includes all surface waters of the state within the boundaries of the lake Erie drainage basin, excluding lake Erie and those water bodies as designated in paragraphs (H) to (K) of this table. Shown as degrees fahrenheit and (celsius).

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
<u>Average:</u>	44 (6.7)	44 (6.7)	48 (8.9)	51 (10.6)	54 (12.2)	60 (15.6)	64 (17.8)	66 (18.9)	72 (22.2)
<u>Daily</u> <u>Maximum:</u>	49 (9.4)	49 (9.4)	53 (11.7)	56 (13.3)	61 (16.1)	65 (18.3)	69 (20.6)	72 (22.2)	76 (24.4)
	<u>June</u> <u>16-30</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
<u>Average:</u>	82 (27.8)	82 (27.8)	82 (27.8)	82 (27.8)	75 (23.9)	67 (19.4)	61 (16.1)	54 (12.2)	44 (6.7)
<u>Daily</u> <u>Maximum:</u>	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	80 (26.7)	72 (22.2)	66 (18.9)	59 (15.0)	49 (9.4)

(H) Lake Erie tributary lacustuaries - includes all lake Erie tributary lacustuaries and adjacent areas of lake Erie within the lake breakwaters. Shown as degrees fahrenheit and (celsius).

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
<u>Average:</u>	-	-	-	-	-	-	-	-	-
<u>Daily</u> <u>Maximum:</u>	52 (11.1)	52 (11.1)	55 (12.8)	55 (12.8)	59 (15.0)	63 (17.2)	66 (18.9)	76 (24.4)	82 (27.8)
	<u>June</u> <u>16-30</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
<u>Average:</u>	84 (28.9)	84 (28.9)	84 (28.9)	84 (28.9)	-	-	-	-	-
<u>Daily</u> <u>Maximum:</u>	88 (31.1)	88 (31.1)	88 (31.1)	88 (31.1)	84 (28.9)	75 (23.9)	70 (21.1)	65 (18.3)	55 (12.8)

(I) Maumee river - Ohio-Indiana state line to Maumee river lacustuary. Shown as degrees fahrenheit and (celsius).

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
<u>Average:</u>	45 (7.2)	45 (7.2)	47 (8.3)	53 (11.7)	58 (14.4)	61 (16.1)	67 (19.4)	70 (21.1)	75 (23.9)
<u>Daily</u> <u>Maximum:</u>	50 (10.0)	50 (10.0)	52 (11.1)	58 (14.4)	63 (17.2)	68 (20.0)	72 (22.2)	76 (24.4)	80 (26.7)
	<u>June</u> <u>16-30</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
<u>Average:</u>	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	80 (26.7)	71 (21.7)	65 (18.3)	58 (14.4)	45 (7.2)
<u>Daily</u> <u>Maximum:</u>	89 (31.7)	89 (31.7)	89 (31.7)	89 (31.7)	85 (29.4)	76 (24.4)	70 (21.1)	63 (17.2)	50 (10.0)

(J) Maumee bay - includes all waters of the state known as Maumee bay including the Maumee river lacustuary and the lacustuary portions of all tributaries entering Maumee bay to the lake Erie mean high water level. Shown as degrees fahrenheit and (celsius).

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
<u>Average:</u>	47 (8.3)	47 (8.3)	48 (8.9)	50 (10.0)	52 (11.1)	57 (13.9)	61 (16.1)	65 (18.3)	71 (21.7)
<u>Daily</u> <u>Maximum:</u>	52 (11.1)	52 (11.1)	53 (11.7)	54 (12.2)	59 (15.0)	63 (17.2)	63 (18.9)	76 (24.4)	77 (25.0)
	<u>June</u> <u>16-30</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
<u>Average:</u>	83 (29.3)	83 (28.3)	83 (28.3)	83 (28.3)	75 (23.9)	69 (20.6)	64 (17.8)	59 (15.0)	47 (8.3)
<u>Daily</u> <u>Maximum</u>	87 (30.6)	87 (30.6)	87 (30.6)	87 (30.6)	80 (26.7)	74 (23.3)	69 (20.6)	64 (17.8)	52 (11.1)

(K) Sandusky bay - includes all waters of the state known as Sandusky bay including the Sandusky river lacustuary and the lacustuary portions of all tributaries entering Sandusky bay to the lake Erie mean high water level. Shown as degrees fahrenheit and (celsius).

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
<u>Average:</u>	47 (8.3)	47 (8.3)	48 (8.9)	50 (10.0)	52 (11.1)	57 (13.9)	63 (17.2)	68 (20.0)	74 (23.3)

<u>Daily</u> <u>Maximum:</u>	<u>52</u> <u>(11.1)</u>	<u>52</u> <u>(11.1)</u>	<u>53</u> <u>(11.7)</u>	<u>55</u> <u>(12.8)</u>	<u>57</u> <u>(13.9)</u>	<u>62</u> <u>(16.7)</u>	<u>68</u> <u>(20.0)</u>	<u>73</u> <u>(22.8)</u>	<u>79</u> <u>(26.1)</u>
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	<u>June</u> <u>16-30</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
<u>Average:</u>	83 (28.3)	83 (28.3)	83 (28.3)	83 (28.3)	75 (23.9)	69 (20.6)	64 (17.8)	59 (15.0)	47 (8.3)

<u>Daily</u> <u>Maximum:</u>	<u>87</u> <u>(30.6)</u>	<u>87</u> <u>(30.6)</u>	<u>87</u> <u>(30.6)</u>	<u>87</u> <u>(30.6)</u>	<u>80</u> <u>(26.7)</u>	<u>74</u> <u>(23.3)</u>	<u>69</u> <u>(20.6)</u>	<u>64</u> <u>(17.8)</u>	<u>52</u> <u>(11.1)</u>
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Table 42-6. Water quality criteria for the protection of wildlife. Additional wildlife criteria for the Lake Erie Basin may be calculated pursuant to rule 3745-1-39 of the Administrative Code and will be available on the Ohio EPA website <http://www.epa.state.oh.us/dsw/wqs/criteria.html>.

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>Criteria (OMZA)</u> ³	
			<u>LEB</u>	<u>ORB</u>
<u>DDT</u>	<u>T</u>	<u>µg/l</u>	<u>0.000011</u> ^a	<u>--</u>
<u>Mercury</u>	<u>TR</u>	<u>µg/l</u>	<u>0.0013</u>	<u>--</u>
<u>Polychlorinated biphenyls (PCBs)</u>	<u>T</u>	<u>µg/l</u>	<u>0.00012</u>	<u>0.001</u> ^b
<u>2,3,7,8-TCDD</u>	<u>T</u>	<u>µg/l</u>	<u>3.1E-9</u>	<u>--</u>

¹ T = total; TR = total recoverable.

² µg/l = micrograms per liter (parts per billion).

³ OMZA = outside mixing zone average; LEB = Lake Erie drainage basin; ORB = Ohio river drainage basin.

^a This criterion applies to the sum of DDT and metabolites.

^b In addition, any whole sample of any representative aquatic organisms shall not exceed 0.64 mg/kg (wet weight).

Replaces Part of 3745-1-07

Effective:

R.C. 119.032 rule review date:

Certification

Date

Promulgated Under: R.C. 119.03

Statutory Authority: R.C. 6111.041

Rule Amplifies: R.C. 6111.041

Prior Effective Dates: 2/14/1978, 4/4/1985, 8/19/1985, 4/30/1987, 5/1/1990, 4/26/1997, 10/31/1997, 7/31/1998, 7/31/1999, 2/22/2002, 12/30/2002

For Interested Party Review – August 2008 Draft

3745-1-43 **Water quality criteria for the tiered aquatic life use designations.**

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules and federal statutory provisions referenced in this rule, see rule 3745-1-03 of the Administrative Code.]

[Comment: For definitions of the use designations, see rule 3745-1-07 of the Administrative Code. For all other definitions, see rule 3745-1-02 of the Administrative Code.]

(A) In addition to the base aquatic life use designation in rule 3745-1-42 of the Administrative Code, ten tiered aquatic life uses are currently utilized by Ohio EPA in its regulatory and water quality management work. One or more of these tiered aquatic life uses typically apply to water bodies shown on maps with a 1:24,000 scale.

- (1) Warmwater habitat. See paragraph (D)(1) of this rule.
- (2) Exceptional warmwater habitat. See paragraph (D)(2) of this rule.
- (3) Modified warmwater habitat. See paragraph (D)(3) of this rule.
- (4) Coldwater habitat. See paragraph (D)(4) of this rule.
- (5) Seasonal salmonid habitat. See paragraph (D)(5) of this rule.
- (6) Limited resource water. See paragraph (D)(6) of this rule.
- (7) Limited warmwater habitat. See paragraph (D)(7) of this rule.
- (8) Lake habitat. See paragraph (D)(8) of this rule.
- (9) Primary headwater habitat. See paragraph (D)(9) of this rule.
- (10) Wetland. See paragraph (D)(10) of this rule.

(B) Biological criteria.

- (1) Three tiers of aquatic life uses have numeric biological criteria: warmwater habitat; exceptional warmwater habitat; and modified warmwater habitat. Biological criteria are in tables 43-1, 43-2 and 43-5 of this rule. The biological criteria associated with warmwater habitat or exceptional warmwater habitat may apply to waters designated as native cold water fauna streams if that fact is noted in the appropriate use designation rule (rules 3745-

1-08 to 3745-1-30 of the Administrative Code) in the comment column. Biological criteria and the exceptions to chemical-specific or whole-effluent criteria allowed by paragraph (B) of this rule do not apply to any other use designations.

- (2) Biological criteria are applied differently than the other criteria. Biological criteria cannot be applied to discharge effluents in the manner done for individual chemicals and cannot be applied to the property of whole effluent toxicity.
- (3) Biological criteria presented in tables 43-1, 43-2 and 43-5 of this rule provide a direct measure of attainment of each respective subcategory of aquatic life use and the specific water quality goals established pursuant to the Clean Water Act. The information derived from this direct measure of attainment may be used in the context of a more complete and robust assessment of current and projected environmental conditions relative to the protection of aquatic life and uses. Adjustment to the applicable chemical criteria, modeling techniques, exposure assumptions and other related factors can be considered by the director in arriving at appropriate risk management decisions regarding the protection of aquatic life.
- (4) The measurement, assessment and interpretation of biological data associated with the criteria shall meet the following requirements.

 - (a) The attributes of species composition, diversity and functional organization shall be measured using the index of biotic integrity, the modified index of well-being and the invertebrate community index as defined in "Biological Criteria for the Protection of Aquatic Life: Volume II, Users Manual for Biological Field Assessment of Ohio Surface Waters." However, a narrative macroinvertebrate assessment of aquatic life use attainment may be used in lieu of the invertebrate community index at sampling stations if the invertebrate community index is not available, or is deemed inappropriate for use, and the applicable index of biotic integrity and modified index of well-being are available for the same stations.
 - (b) Episodes of stream desiccation. Biological criteria presented in tables 43-1, 43-2 and 43-5 of this rule shall not be applicable in situations, as determined by the director, where desiccation of the stream bed, as a result of drought or other natural phenomena, is of such an extent and magnitude that a water body so affected lacks the reasonable potential to support aquatic life, due to the absence of suitable aqueous habitat. This temporary exclusion of the applicability of biocriteria in desiccated streams is limited to the observed time period of desiccation and its attendant after effects, as determined by the director.

[Comment: The designation of tiered aquatic life uses is determined by the potential of the water body to support an aquatic community in years with normal precipitation.]

- (c) Limit of calibration – Except in circumstances documented through site specific data collection and use attainability analyses, biological criteria shall not apply at stream locations where the drainage area is less than 1.0 square mile. If the stream is designated upland drainage, the drainage area cut off point for the applicability of biological criteria is 3.1 square miles.

Where site specific data are available at locations with drainage areas below the limit of calibration thresholds, the director shall consider that data, along with all available information on sampling methods, specialized habitats, prevailing environmental conditions and other factors that influence biological criteria scoring, to determine if biological criteria should apply and to determine the existing use to protect under rule 3745-1-05 of the Administrative Code.

[Comment: Water bodies designated in rules 3745-1-08 to 3745-1-32 of the Administrative Code for tiered aquatic life uses with applicable biological criteria shall retain those designated tiered aquatic life uses while subject to the limit of calibration thresholds.]

- (d) Demonstrated attainment of the applicable biological criteria in a water body will take precedence over the application of selected chemical-specific aquatic life or whole-effluent criteria associated with these uses when the director, upon considering appropriately detailed chemical, physical and biological data, finds that one or more chemical-specific or whole-effluent criteria are inappropriate. In such cases the options which exist include:
- (i) The director may develop, or a discharger may provide for the director's approval, a justification for a site-specific water quality criterion according to methods described in "Water Quality Standards Handbook, U.S. EPA Office of Water";
 - (ii) The director may proceed with establishing water quality based effluent limits consistent with attainment of the designated use and the factors listed in paragraph (B)(3) of this rule.
- (e) Demonstrated nonattainment of the applicable biological criteria in a water body will cause the director to seek and establish, if possible, the cause of the nonattainment. The director shall evaluate the existing designated use and, where not attainable, propose to change the designated use. Where the designated use is attainable and the cause of

the nonattainment has been established, the director shall, wherever necessary and appropriate, implement regulatory controls or make other recommendations regarding water resource management to restore the designated use. Additional regulatory controls to reduce a pollutant responsible for the nonattainment shall not be imposed on point sources that are meeting the chemical-specific aquatic life criteria for that pollutant and whole-effluent criteria unless:

- (i) The point sources are shown to be the primary contributing cause of the nonattainment;
- (ii) The application of additional or alternate treatment or technology can reasonably be expected to lead to attainment of the designated use; and
- (iii) The director has given due consideration to the factors specified in division (J) of section 6111.03 of the Revised Code.

Nothing in this paragraph shall be construed to prevent the director from imposing regulatory controls on point sources for pollutants that do not have chemical-specific aquatic life criteria. Nothing in this paragraph shall prevent the director from imposing regulatory controls on point sources to meet non aquatic life use water quality criteria.

- (C) The chemical specific criteria listed in this rule apply as "outside mixing zone" or "inside mixing zone maximum." For the purpose of setting water quality based effluent limits, the criteria that apply "outside mixing zone" shall be met after the effluent and the receiving water are reasonably well mixed as provided in rules 3745-2-05 and 3745-2-08 of the Administrative Code. The criteria listed as "inside mixing zone maximum" shall be applicable as end of pipe maximum effluent limits or as criteria to be met within a short distance of the effluent pipe except as provided in rule 3745-2-08 of the Administrative Code. Possible exceptions regarding the application of these criteria may apply as described in paragraph (B) of this rule.

(D) Water quality criteria that apply in addition to, or in lieu of, the base aquatic life use criteria in rule 3745-1-42 of the Administrative Code are found in this paragraph.

(1) Warmwater habitat. In addition to the base aquatic life use criteria in rule 3745-1-42 of the Administrative Code, the warmwater habitat biological criteria in table 43-1 of this rule apply.

Table 43-1. Biological criteria for warmwater habitat. Description and derivation of indices and ecoregions are contained in "Biological Criteria for the Protection of Aquatic Life: Volume II, Users Manual for Biological Field Assessment of Ohio Surface Waters." These criteria do not apply to the Ohio river, Ohio river backwaters, lakes or lake Erie lacustraries.

<u>Index</u> <u>Sampling site</u>	<u>Ecoregion¹</u>				
	<u>ECBP</u>	<u>EOLP</u>	<u>HELP</u>	<u>IP</u>	<u>WAP</u>
<u>Index of biotic integrity (fish)</u>					
<u>Boat sites²</u>	<u>42</u>	<u>40</u>	<u>34</u>	<u>38</u>	<u>40</u>
<u>Wading sites²</u>	<u>40</u>	<u>38</u>	<u>32</u>	<u>40</u>	<u>44</u>
<u>Headwater sites³</u>	<u>40</u>	<u>40</u>	<u>28</u>	<u>40</u>	<u>44</u>
<u>Modified index of well-being (fish)⁴</u>					
<u>Boat sites²</u>	<u>8.5</u>	<u>8.7</u>	<u>8.6</u>	<u>8.7</u>	<u>8.6</u>
<u>Wading sites²</u>	<u>8.3</u>	<u>7.9</u>	<u>7.3</u>	<u>8.1</u>	<u>8.4</u>
<u>Invertebrate community index</u> <u>(macroinvertebrates)</u>					
<u>Artificial substrate samplers²</u>	<u>36</u>	<u>34</u>	<u>34</u>	<u>30</u>	<u>36</u>

¹ ECBP = eastern corn belt plains ecoregion. EOLP = Erie/Ontario lake plain ecoregion. HELP = Huron/Erie lake plain ecoregion. IP = interior plateau ecoregion. WAP = western Allegheny plateau ecoregion.

² Sampling methods descriptions are found in the "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices."

³ Modification of the IBI that applies to sites with drainage areas less than twenty square miles.

⁴ Does not apply to sites with drainage areas less than twenty square miles.

(2) Exceptional warmwater habitat. The water quality criteria in this paragraph apply in lieu of or in addition to the water quality criteria for the base aquatic life use in rule 3745-1-42 of the Administrative Code.

(a) The exceptional warmwater habitat biological criteria in table 43-2 of this rule apply.

Table 43-2. Biological criteria for exceptional warmwater habitat. Description and derivation of indices and ecoregions are contained in "Biological Criteria for the Protection of Aquatic Life: Volume II, Users Manual for Biological Field Assessment of Ohio Surface Waters." These criteria do not apply to the Ohio river, Ohio river backwaters, lakes or lake Erie lacustuaries.

<u>Index</u>	<u>All Ecoregions ¹</u>
<u>Sampling site</u>	
<u>Index of biotic integrity (fish)</u>	
<u>Boat sites ²</u>	<u>48</u>
<u>Wading sites ²</u>	<u>50</u>
<u>Headwater sites ³</u>	<u>50</u>
<u>Modified index of well-being (fish) ⁴</u>	
<u>Boat sites ²</u>	<u>9.6</u>
<u>Wading sites ²</u>	<u>9.4</u>
<u>Invertebrate community index (macroinvertebrates)</u>	
<u>Artificial substrate samplers ²</u>	<u>46</u>

¹ Ohio ecoregions consist of eastern corn belt plains (ECBP), Erie/Ontario lake plain (EOLP), Huron/Erie lake plain (HELP), interior plateau (IP), and western Allegheny plateau (WAP).

² Sampling methods descriptions are found in the "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices."

³ Modification of the IBI that applies to sites with drainage areas less than twenty square miles.

⁴ Does not apply to sites with drainage areas less than twenty square miles.

- (b) The criteria in table 43-3 of this rule apply in lieu of the base aquatic life use criteria for those chemicals.

Table 43-3. Exceptional warmwater habitat criteria.

<u>Chemical</u>	<u>Form¹</u>	<u>Units²</u>	<u>IMZM³</u>	<u>OMZM³</u>	<u>OMZA³</u>
<u>Ammonia-N</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>Table 43-4</u>	<u>Table 43-4</u>
<u>Dissolved oxygen⁴</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>5.0</u>	<u>6.0</u>
<u>pH</u>	<u>--</u>	<u>s.u.</u>	<u>--</u>	<u>--</u>	<u>a</u>
<u>Temperature</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>b</u>	<u>b</u>

¹ T = total.

² mg/l = milligrams per liter (parts per million); s.u. = standard units.

³ IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum; OMZA = outside mixing zone average.

⁴ For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average.

^a pH is to be 6.5-9.0, with no change within that range attributable to human-induced conditions.

^b At no time shall the water temperature exceed the temperature which would occur if there were no temperature change attributable to human activities.

Table 43-4.

(A) Exceptional warmwater habitat and lake habitat outside mixing zone maximum total ammonia-nitrogen criteria (mg/l).

pH	6.5	6.7	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.8	9.0
Temp. (°C)																						
0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	10.9	9.3	7.8	6.6	5.2	4.2	3.3	2.6	2.1	1.7	1.1	0.7
1	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.4	10.7	9.1	7.7	6.5	5.2	4.1	3.3	2.6	2.1	1.7	1.1	0.7
2	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	10.6	9.0	7.6	6.4	5.1	4.1	3.2	2.6	2.1	1.6	1.1	0.7
3	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.4	8.9	7.5	6.3	5.0	4.0	3.2	2.5	2.0	1.6	1.1	0.7
4	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.9	10.3	8.8	7.4	6.2	5.0	4.0	3.2	2.5	2.0	1.6	1.0	0.7
5	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.8	10.2	8.7	7.3	6.2	4.9	3.9	3.1	2.5	2.0	1.6	1.0	0.7
6	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.6	10.1	8.6	7.3	6.1	4.9	3.9	3.1	2.5	2.0	1.6	1.0	0.7
7	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.5	9.9	8.5	7.2	6.0	4.8	3.8	3.1	2.5	2.0	1.6	1.0	0.7
8	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.4	9.8	8.4	7.1	6.0	4.8	3.8	3.0	2.4	2.0	1.6	1.0	0.7
9	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.9	11.3	9.8	8.3	7.1	5.9	4.7	3.8	3.0	2.4	1.9	1.6	1.0	0.7
10	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.8	11.2	9.7	8.3	7.0	5.9	4.7	3.7	3.0	2.4	1.9	1.6	1.0	0.7
11	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.7	11.1	9.6	8.2	6.9	5.8	4.7	3.7	3.0	2.4	1.9	1.5	1.0	0.7
12	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	11.0	9.5	8.1	6.9	5.8	4.6	3.7	3.0	2.4	1.9	1.5	1.0	0.7
13	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.5	10.9	9.4	8.1	6.8	5.8	4.6	3.7	2.9	2.4	1.9	1.5	1.0	0.7
14	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.4	10.8	9.4	8.0	6.8	5.7	4.6	3.7	2.9	2.4	1.9	1.5	1.0	0.7
15	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.3	10.8	9.3	8.0	6.8	5.7	4.6	3.6	2.9	2.4	1.9	1.5	1.0	0.7
16	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	10.7	9.3	7.9	6.7	5.7	4.5	3.6	2.9	2.4	1.9	1.5	1.0	0.7
17	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	10.7	9.2	7.9	6.7	5.6	4.5	3.6	2.9	2.4	1.9	1.5	1.0	0.7
18	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.6	9.2	7.9	6.7	5.6	4.5	3.6	2.9	2.4	1.9	1.6	1.0	0.7
19	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.6	9.2	7.9	6.7	5.6	4.5	3.6	2.9	2.4	1.9	1.6	1.1	0.7
20	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	10.5	9.2	7.8	6.7	5.6	4.5	3.6	2.9	2.4	1.9	1.6	1.1	0.8
21	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	10.5	9.1	7.8	6.6	5.6	4.5	3.6	2.9	2.4	1.9	1.6	1.1	0.8
22	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	10.5	9.1	7.8	6.6	5.6	4.5	3.6	2.9	2.4	1.9	1.6	1.1	0.8
23	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.9	10.5	9.1	7.8	6.6	5.6	4.5	3.6	2.9	2.4	2.0	1.6	1.1	0.8
24	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.9	10.5	9.1	7.8	6.6	5.6	4.5	3.6	3.0	2.4	2.0	1.6	1.1	0.8
25	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.9	10.5	9.1	7.8	6.6	5.6	4.5	3.7	3.0	2.4	2.0	1.6	1.1	0.8
26	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.5	11.1	9.8	8.5	7.3	6.2	5.3	4.2	3.4	2.8	2.3	1.9	1.5	1.1	0.8
27	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.7	10.4	9.1	7.9	6.8	5.8	4.9	4.0	3.2	2.6	2.1	1.8	1.5	1.0	0.8
28	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.9	9.7	8.5	7.4	6.4	5.4	4.6	3.7	3.0	2.5	2.0	1.7	1.4	1.0	0.7
29	13.0	13.0	13.0	13.0	13.0	12.4	11.3	10.2	9.1	8.0	6.9	6.0	5.1	4.3	3.5	2.8	2.3	1.9	1.6	1.3	0.9	0.7
30	13.0	13.0	13.0	13.0	12.6	11.6	10.6	9.5	8.5	7.5	6.5	5.6	4.8	4.1	3.3	2.7	2.2	1.8	1.5	1.2	0.9	0.7

Table 43-4.

(B) Exceptional warmwater habitat and lake habitat outside mixing zone average total ammonia-nitrogen criteria (mg/l).

pH	6.5	6.7	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.8	9.0
Temp. (°C)																						
	<u>The following criteria apply during the months of December to February:</u>																					
0-10	13.0	13.0	13.0	12.6	11.7	10.7	9.7	8.6	7.6	6.6	5.6	4.8	4.0	3.3	2.8	2.3	1.9	1.5	1.2	1.0	0.7	0.5
11	13.0	13.0	12.4	11.6	10.8	9.9	8.9	8.0	7.0	6.1	5.2	4.4	3.7	3.1	2.6	2.1	1.7	1.4	1.2	0.9	0.6	0.4
12	13.0	12.6	11.5	10.8	10.0	9.2	8.3	7.4	6.5	5.6	4.8	4.1	3.4	2.9	2.4	2.0	1.6	1.3	1.1	0.9	0.6	0.4
13	12.3	11.6	10.6	10.0	9.2	8.5	7.7	6.8	6.0	5.2	4.5	3.8	3.2	2.7	2.2	1.8	1.5	1.2	1.0	0.8	0.6	0.4
14	11.4	10.8	9.8	9.3	8.6	7.9	7.1	6.3	5.6	4.8	4.2	3.5	3.0	2.5	2.1	1.7	1.4	1.1	0.9	0.8	0.5	0.4
15	10.6	10.0	9.1	8.6	8.0	7.3	6.6	5.9	5.2	4.5	3.9	3.3	2.8	2.3	1.9	1.6	1.3	1.1	0.9	0.7	0.5	0.3
16	9.8	9.3	8.5	8.0	7.4	6.8	6.1	5.5	4.8	4.2	3.6	3.0	2.6	2.1	1.8	1.5	1.2	1.0	0.8	0.7	0.5	0.3
17	9.1	8.6	7.8	7.4	6.8	6.3	5.7	5.1	4.5	3.9	3.3	2.8	2.4	2.0	1.7	1.4	1.1	0.9	0.8	0.6	0.4	0.3
18	8.5	8.0	7.3	6.9	6.4	5.8	5.3	4.7	4.2	3.6	3.1	2.6	2.2	1.8	1.5	1.3	1.1	0.9	0.7	0.6	0.4	0.3
19	7.9	7.4	6.8	6.4	5.9	5.4	4.9	4.4	3.9	3.3	2.9	2.4	2.1	1.7	1.4	1.2	1.0	0.8	0.7	0.5	0.4	0.3
20	7.3	6.9	6.3	5.9	5.5	5.0	4.6	4.1	3.6	3.1	2.7	2.3	1.9	1.6	1.3	1.1	0.9	0.8	0.6	0.5	0.4	0.3
	<u>The following criteria apply during the months of March to November:</u>																					
10	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.3	1.1	0.9	0.7	0.5	0.4	0.4	0.2	0.2
11	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.3	1.1	0.8	0.7	0.5	0.4	0.4	0.2	0.2
12	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.3	1.1	0.8	0.7	0.5	0.4	0.4	0.2	0.2
13	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.8	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
14	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
15	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.5	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
16	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.5	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
17	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.5	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
18	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.5	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
19	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.5	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
20	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.5	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
21	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.7	1.4	1.2	1.0	0.8	0.6	0.5	0.4	0.3	0.2	0.2
22	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.6	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2	0.2
23	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.4	1.2	1.0	0.8	0.7	0.5	0.4	0.4	0.3	0.2	0.1
24	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.3	1.1	1.0	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.1
25	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.1
26	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.0	0.8	0.7	0.6	0.4	0.4	0.3	0.2	0.2	0.1
27	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.1	0.9	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1
28	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.0	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1
29	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1
30	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.8	0.7	0.5	0.4	0.4	0.3	0.2	0.2	0.1	0.1

(3) Modified warmwater habitat. The water quality criteria in this paragraph apply in lieu of or in addition to the water quality criteria for the base aquatic life use in rule 3745-1-42 of the Administrative Code.

(a) The modified warmwater habitat biological criteria in table 43-5 of this rule apply.

Table 43-5. Biological criteria for modified warmwater habitat. Description and derivation of indices and ecoregions are contained in "Biological Criteria for the Protection of Aquatic Life: Volume II, Users Manual for Biological Field Assessment of Ohio Surface Waters." These criteria do not apply to the Ohio river, Ohio river backwaters, lakes or lake Erie lacustuaries.

(A) Modified warmwater habitat - channel modification.

<u>Index</u> <u>Sampling site</u>	<u>Ecoregion¹</u>	
	<u>HELP</u>	<u>All other ecoregions</u>
<u>Index of biotic integrity (fish)</u>		
<u>Boat sites²</u>	<u>20</u>	<u>24</u>
<u>Wading sites²</u>	<u>22</u>	<u>24</u>
<u>Headwater sites³</u>	<u>20</u>	<u>24</u>
<u>Modified index of well-being (fish)⁴</u>		
<u>Boat sites²</u>	<u>5.7</u>	<u>5.8</u>
<u>Wading sites²</u>	<u>5.6</u>	<u>6.2</u>
<u>Invertebrate community index</u> <u>(macroinvertebrates)</u>		
<u>Artificial substrate samplers²</u>	<u>22</u>	<u>22</u>

(B) Modified warmwater habitat – impounded.

<u>Index</u> <u>Sampling site</u>	<u>Ecoregion¹</u>	
	<u>HELP</u>	<u>All other ecoregions</u>
<u>Index of biotic integrity (fish)</u>		
<u>Boat sites²</u>	<u>22</u>	<u>30</u>
<u>Wading sites²</u>	<u>--</u>	<u>--</u>
<u>Headwater sites³</u>	<u>--</u>	<u>--</u>
<u>Modified index of well-being (fish)⁴</u>		
<u>Boat sites²</u>	<u>5.7</u>	<u>6.6</u>
<u>Wading sites²</u>	<u>--</u>	<u>--</u>
<u>Invertebrate community index</u> <u>(macroinvertebrates)</u>		
<u>Artificial substrate samplers²</u>	<u>--</u>	<u>--</u>

(C) Modified warmwater habitat - mine affected.

<u>Index</u> <u>Sampling site</u>	<u>Ecoregion</u> ¹	
	<u>WAP</u>	<u>All other ecoregions</u>
<u>Index of biotic integrity (fish)</u>		
<u>Boat sites</u> ²	<u>24</u>	<u>--</u>
<u>Wading sites</u> ²	<u>24</u>	<u>--</u>
<u>Headwater sites</u> ³	<u>24</u>	<u>--</u>
<u>Modified index of well-being (fish)</u> ⁴		
<u>Boat sites</u> ²	<u>5.4</u>	<u>--</u>
<u>Wading sites</u> ²	<u>5.5</u>	<u>--</u>
<u>Invertebrate community index</u> <u>(macroinvertebrates)</u>		
<u>Artificial substrate samplers</u> ²	<u>30</u>	<u>--</u>

¹ Ohio ecoregions consist of eastern corn belt plains (ECBP), Erie/Ontario lake plain (EOLP), Huron/Erie lake plain (HELP), interior plateau (IP), and western Allegheny plateau (WAP).

² Sampling methods descriptions are found in the "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices."

³ Modification of the IBI that applies to sites with drainage areas less than twenty square miles.

⁴ Does not apply to sites with drainage areas less than twenty square miles.

(b) The criteria in table 43-6 of this rule apply in lieu of the base aquatic life use criteria for those chemicals.

Table 43-6. Modified warmwater habitat criteria.

<u>Chemical</u>	<u>Form</u> ¹	<u>Units</u> ²	<u>IMZM</u> ³	<u>OMZM</u> ³	<u>OMZA</u> ³
<u>Ammonia-N</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>a</u>	<u>Table 43-7</u>
<u>Dissolved oxygen</u> ⁴	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>3.0</u> ^b	<u>4.0</u> ^b

¹ T = total.

² mg/l = milligrams per liter (parts per million).

³ IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum; OMZA = outside mixing zone average.

⁴ For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average.

^a The modified warmwater habitat OMZM ammonia criteria are the same as the base aquatic life use OMZM ammonia criteria in rule 3745-1-42 of the Administrative Code.

^b The dissolved oxygen minimum at any time criterion for modified warmwater habitats in the Huron/Erie lake plain ecoregion, as identified in rules 3745-1-08 to 3745-1-30 of the Administrative Code, is 2.5 mg/l.

Table 43-7.
Modified warmwater habitat outside mixing zone average total ammonia-nitrogen criteria (mg/l).

pH	6.5	6.7	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.8	9.0	
Temp. (°C)																							
	<u>The following criteria apply during the months of December to February:</u>																						
0-10	13.0	13.0	13.0	12.6	11.7	10.7	9.7	8.6	7.6	6.6	5.6	4.8	4.0	3.3	2.8	2.3	1.9	1.5	1.2	1.0	0.7	0.5	
11	13.0	13.0	12.4	11.6	10.8	9.9	8.9	8.0	7.0	6.1	5.2	4.4	3.7	3.1	2.6	2.1	1.7	1.4	1.2	0.9	0.6	0.4	
12	13.0	12.6	11.5	10.8	10.0	9.2	8.3	7.4	6.5	5.6	4.8	4.1	3.4	2.9	2.4	2.0	1.6	1.3	1.1	0.9	0.6	0.4	
13	12.3	11.6	10.6	10.0	9.2	8.5	7.7	6.8	6.0	5.2	4.5	3.8	3.2	2.7	2.2	1.8	1.5	1.2	1.0	0.8	0.6	0.4	
14	11.4	10.8	9.8	9.3	8.6	7.9	7.1	6.3	5.6	4.8	4.2	3.5	3.0	2.5	2.1	1.7	1.4	1.1	0.9	0.8	0.5	0.4	
15	10.6	10.0	9.1	8.6	8.0	7.3	6.6	5.9	5.2	4.5	3.9	3.3	2.8	2.3	1.9	1.6	1.3	1.1	0.9	0.7	0.5	0.3	
16	9.8	9.3	8.5	8.0	7.4	6.8	6.1	5.5	4.8	4.2	3.6	3.0	2.6	2.1	1.8	1.5	1.2	1.0	0.8	0.7	0.5	0.3	
17	9.1	8.6	7.8	7.4	6.8	6.3	5.7	5.1	4.5	3.9	3.3	2.8	2.4	2.0	1.7	1.4	1.1	0.9	0.8	0.6	0.4	0.3	
18	8.5	8.0	7.3	6.9	6.4	5.8	5.3	4.7	4.2	3.6	3.1	2.6	2.2	1.8	1.5	1.3	1.1	0.9	0.7	0.6	0.4	0.3	
19	7.9	7.4	6.8	6.4	5.9	5.4	4.9	4.4	3.9	3.3	2.9	2.4	2.1	1.7	1.4	1.2	1.0	0.8	0.7	0.5	0.4	0.3	
20	7.3	6.9	6.3	5.9	5.5	5.0	4.6	4.1	3.6	3.1	2.7	2.3	1.9	1.6	1.3	1.1	0.9	0.8	0.6	0.5	0.4	0.3	
	<u>The following criteria apply during the months of March to November:</u>																						
10	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	2.9	2.5	2.1	1.7	1.3	1.1	0.9	0.7	0.6	0.4	0.2
11	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	2.9	2.5	2.1	1.7	1.3	1.1	0.8	0.7	0.6	0.4	0.2
12	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	2.9	2.4	2.1	1.6	1.3	1.1	0.8	0.7	0.5	0.4	0.2
13	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	2.9	2.4	2.0	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.2
14	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.9	2.4	2.0	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.2
15	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.8	2.4	2.0	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.3
16	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.8	2.4	2.0	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.3
17	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.8	2.4	2.0	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.3
18	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.8	2.4	2.0	1.6	1.3	1.0	0.8	0.7	0.6	0.4	0.3
19	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.8	2.4	2.0	1.6	1.3	1.0	0.8	0.7	0.6	0.4	0.3
20	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	2.8	2.4	2.0	1.6	1.3	1.0	0.8	0.7	0.6	0.4	0.3
21	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.6	2.2	1.9	1.5	1.2	1.0	0.8	0.6	0.5	0.4	0.3
22	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.4	2.1	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.3	0.2
23	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.3	1.9	1.6	1.3	1.0	0.8	0.7	0.6	0.5	0.3	0.2
24	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.1	1.8	1.5	1.2	1.0	0.8	0.6	0.5	0.4	0.3	0.2
25	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.0	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2
26	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.6	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2
27	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.7	1.5	1.2	1.0	0.8	0.7	0.5	0.4	0.4	0.3	0.2
28	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.6	1.4	1.2	0.9	0.8	0.6	0.5	0.4	0.3	0.2	0.2
29	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.5	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2	0.2
30	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.4	1.2	1.0	0.8	0.7	0.5	0.5	0.4	0.3	0.2	0.2

- (4) Coldwater habitat. The water quality criteria in table 43-8 of this rule apply in lieu of the water quality criteria for the base aquatic life use in rule 3745-1-42 of the Administrative Code.

Table 43-8. Coldwater habitat criteria.

<u>Chemical</u>	<u>Form¹</u>	<u>Units²</u>	<u>IMZM³</u>	<u>OMZM³</u>	<u>OMZA³</u>
<u>Ammonia-N</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>Table 43-9</u>	<u>Table 43-9</u>
<u>Cyanide (Ohio river drainage basin)</u>	<u>free</u>	<u>µg/l</u>	<u>45</u>	<u>22</u>	<u>5.2</u>
<u>Dissolved oxygen⁴</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>6.0</u>	<u>7.0</u>
<u>pH</u>	<u>--</u>	<u>s.u.</u>	<u>--</u>	<u>--</u>	<u>a</u>
<u>Temperature</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>b</u>	<u>b</u>

¹ T = total.

² mg/l = milligrams per liter (parts per million); µg/l = micrograms per liter (parts per billion); s.u. = standard units.

³ IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum; OMZA = outside mixing zone average.

⁴ For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average.

^a pH is to be 6.5-9.0, with no change within that range attributable to human-induced conditions.

^b At no time shall the water temperature exceed the temperature which would occur if there were no temperature change attributable to human activities.

Table 43-9.

(A) Coldwater habitat and seasonal salmonid habitat outside mixing zone maximum total ammonia-nitrogen criteria (mg/l).

pH	6.5	6.7	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.8	9.0	
Temp. (°C)																							
0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	10.9	9.3	7.8	6.6	5.2	4.2	3.3	2.6	2.1	1.7	1.1	0.7	
1	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.4	10.7	9.1	7.7	6.5	5.2	4.1	3.3	2.6	2.1	1.7	1.1	0.7	
2	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	10.6	9.0	7.6	6.4	5.1	4.1	3.2	2.6	2.1	1.6	1.1	0.7	
3	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.4	8.9	7.5	6.3	5.0	4.0	3.2	2.5	2.0	1.6	1.1	0.7	
4	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.9	10.3	8.8	7.4	6.2	5.0	4.0	3.2	2.5	2.0	1.6	1.0	0.7	
5	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.8	10.2	8.7	7.3	6.2	4.9	3.9	3.1	2.5	2.0	1.6	1.0	0.7	
6	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.6	10.1	8.6	7.3	6.1	4.9	3.9	3.1	2.5	2.0	1.6	1.0	0.7	
7	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.5	9.9	8.5	7.2	6.0	4.8	3.8	3.1	2.5	2.0	1.6	1.0	0.7	
8	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.4	9.8	8.4	7.1	6.0	4.8	3.8	3.0	2.4	2.0	1.6	1.0	0.7	
9	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.9	11.3	9.8	8.3	7.1	5.9	4.7	3.8	3.0	2.4	1.9	1.6	1.0	0.7	
10	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.8	11.2	9.7	8.3	7.0	5.9	4.7	3.7	3.0	2.4	1.9	1.6	1.0	0.7	
11	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.7	11.1	9.6	8.2	6.9	5.8	4.7	3.7	3.0	2.4	1.9	1.5	1.0	0.7	
12	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	11.0	9.5	8.1	6.9	5.8	4.6	3.7	3.0	2.4	1.9	1.5	1.0	0.7	
13	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.5	10.9	9.4	8.1	6.8	5.8	4.6	3.7	2.9	2.4	1.9	1.5	1.0	0.7	
14	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.4	10.8	9.4	8.0	6.8	5.7	4.6	3.7	2.9	2.4	1.9	1.5	1.0	0.7	
15	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.3	10.8	9.3	8.0	6.8	5.7	4.6	3.6	2.9	2.4	1.9	1.5	1.0	0.7	
16	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	10.7	9.3	7.9	6.7	5.7	4.5	3.6	2.9	2.4	1.9	1.5	1.0	0.7	
17	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	10.7	9.2	7.9	6.7	5.6	4.5	3.6	2.9	2.4	1.9	1.5	1.0	0.7	
18	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.6	9.2	7.9	6.7	5.6	4.5	3.6	2.9	2.4	1.9	1.6	1.0	0.7	
19	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.1	10.6	9.2	7.9	6.7	5.6	4.5	3.6	2.9	2.4	1.9	1.6	1.1	0.7	
20	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	10.5	9.1	7.8	6.7	5.6	4.5	3.6	2.9	2.4	1.9	1.6	1.1	0.8	
21	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.6	11.2	9.8	8.5	7.3	6.2	5.2	4.2	3.4	2.7	2.2	1.8	1.5	1.0	0.7	
22	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.7	10.4	9.1	7.9	6.8	5.8	4.9	3.9	3.2	2.6	2.1	1.7	1.4	1.0	0.7	
23	13.0	13.0	13.0	13.0	13.0	13.0	12.2	10.9	9.7	8.5	7.4	6.3	5.4	4.6	3.7	3.0	2.4	1.9	1.6	1.3	0.9	0.6	
24	13.0	13.0	13.0	13.0	13.0	12.4	11.3	10.2	9.1	7.9	6.9	5.9	5.0	4.3	3.4	2.8	2.2	1.8	1.5	1.2	0.9	0.6	
25	13.0	13.0	13.0	13.0	12.6	11.6	10.6	9.5	8.4	7.4	6.4	5.5	4.7	4.0	3.2	2.6	2.1	1.7	1.4	1.2	0.8	0.6	
26	13.0	13.0	13.0	12.6	11.7	10.8	9.9	8.9	7.9	6.9	6.0	5.2	4.4	3.7	3.0	2.4	2.0	1.6	1.3	1.1	0.8	0.6	
27	13.0	13.0	12.4	11.7	10.9	10.1	9.2	8.3	7.4	6.5	5.6	4.8	4.1	3.5	2.8	2.3	1.9	1.5	1.2	1.0	0.7	0.5	
28	13.0	12.7	11.6	10.9	10.2	9.4	8.6	7.7	6.9	6.0	5.2	4.5	3.9	3.3	2.6	2.1	1.7	1.4	1.2	1.0	0.7	0.5	
29	12.6	11.9	10.8	10.2	9.5	8.8	8.0	7.2	6.4	5.6	4.9	4.2	3.6	3.1	2.5	2.0	1.6	1.3	1.1	0.9	0.7	0.5	
30	11.8	11.1	10.1	9.5	8.9	8.2	7.5	6.8	6.0	5.3	4.6	4.0	3.4	2.9	2.3	1.9	1.5	1.3	1.1	0.9	0.6	0.5	

Table 43-9.
(B) Coldwater habitat outside mixing zone 30-day average total ammonia-nitrogen criteria (mg/l).

pH	6.5	6.7	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.8	9.0
Temp. (°C)																						
0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.1	1.8	1.5	1.2	0.9	0.8	0.6	0.5	0.4	0.2	0.2
1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.1	1.8	1.5	1.2	0.9	0.7	0.6	0.5	0.4	0.2	0.2
2	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.1	1.7	1.5	1.2	0.9	0.7	0.6	0.5	0.4	0.2	0.2
3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.0	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.0	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
5	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.0	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
6	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.0	1.7	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.2
7	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.4	0.4	0.2	0.2
8	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.4	1.1	0.9	0.7	0.6	0.4	0.4	0.2	0.2
9	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.3	1.1	0.9	0.7	0.6	0.4	0.4	0.2	0.2
10	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.3	1.1	0.9	0.7	0.5	0.4	0.4	0.2	0.2
11	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.3	1.1	0.8	0.7	0.5	0.4	0.4	0.2	0.2
12	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.9	1.6	1.3	1.1	0.8	0.7	0.5	0.4	0.4	0.2	0.2
13	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.8	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
14	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.6	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
15	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.8	1.5	1.3	1.0	0.8	0.7	0.5	0.4	0.4	0.2	0.2
16	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.7	1.4	1.2	1.0	0.8	0.6	0.5	0.4	0.3	0.2	0.2
17	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.6	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2	0.1
18	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.5	1.2	1.0	0.8	0.7	0.5	0.4	0.4	0.3	0.2	0.1
19	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.4	1.2	1.0	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.1
20	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.1
21	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.0	0.8	0.7	0.5	0.4	0.4	0.3	0.2	0.2	0.1
22	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.1	0.9	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1
23	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.0	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.1	0.1
24	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	0.8	0.7	0.6	0.4	0.4	0.3	0.2	0.2	0.1	0.1
25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1
26	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1
27	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1
28	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1
29	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1
30	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1

- (5) Seasonal salmonid habitat. During the time this use is in effect (October 1 to May 31) there shall be no discharge of chlorine into these waters and the maximum ammonia criteria are the values listed in table 43-9(A) of this rule for the coldwater habitat use designation.
- (6) Limited resource water. The water quality criteria in this paragraph apply in lieu of the water quality criteria for the base aquatic life use in rule 3745-1-42 of the Administrative Code.
- (a) Except as identified in paragraph (E)(6)(b) of this rule, the outside mixing zone average criteria do not apply.
- (b) The criteria in table 43-11 of this rule apply in lieu of the base aquatic life use criteria for those chemicals.

Table 43-11. Limited resource water criteria.

<u>Chemical</u>	<u>Form¹</u>	<u>Units²</u>	<u>IMZM³</u>	<u>OMZM³</u>	<u>OMZA³</u>
<u>Dissolved oxygen⁴</u>	<u>T</u>	<u>mg/l</u>	<u>--</u>	<u>2.0</u>	<u>3.0</u>
<u>pH</u>	<u>--</u>	<u>s.u.</u>	<u>--</u>	<u>--</u>	<u>6.5-9.0^a</u>
<u>Temperature</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>98(37)</u>	<u>94(34)</u>

¹ T = total.

² mg/l = milligrams per liter (parts per million); s.u. = standard units.

³ IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum; OMZA = outside mixing zone average.

⁴ For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average.

^a Acid mine drainage streams over sandstone geotype are exempt from the pH criterion.

- (7) Limited warmwater habitat. Water quality criteria for the support of this use designation are the same as the criteria for the warmwater habitat use designation. However, individual criteria are varied on a case-by-case basis and supersede the criteria for warmwater habitat where applicable. Any exceptions from warmwater criteria apply only to specific criteria during specified time periods or flow conditions. The adjusted criteria and conditions for specified stream segments are denoted as comments in rules 3745-1-08 to 3745-1-30 of the Administrative Code.

(8) Lake habitat.

- (a) The water quality criteria in table 43-12 of this rule apply in lieu of or in addition to the water quality criteria for the protection of the base aquatic life use in rule 3745-1-42 of the Administrative Code.
- (b) For the purposes of the water quality criteria in table 43-12 of this rule, the following four lake types are recognized.
- (i) Dugout lake is a lake formed by the accumulation of rainfall or ground water in a hole excavated in an upland area including, but not limited to, borrow pits, ponds, and quarries.
- (ii) Impoundment is a lake formed by an impoundment structure, such as a dam, within a flowing body of water such that the normal water flow is interrupted, resulting in a residence time index of 0.5 or greater.
- (iii) Natural lake is a lake formed without human intervention, including, but not limited to, kettle lakes formed from glacial outwash.
- (iv) Upground reservoir is a lake constructed of earthen dikes separate from the water source primarily used to store drinking water. Surface water or ground water is pumped into the lake to fill the basin.

Table 43-12. Lake habitat criteria. All criteria are outside mixing zone averages unless specified differently.

Parameter Lake type	Form ¹	Units ²	Statewide criteria	Ecoregional criteria				
				ECBP	EOLP	HELP	IP	WAP
Ammonia	T	mg/l	Table 43-4	--	--	--	--	--
Chlorophyll a ³								
Dugout lakes	T	µg/l	8.0	--	--	--	--	--
Impoundments	T	µg/l	--	9.5	9.5	9.5	9.5	6.2
Natural lakes	T	µg/l	9.5	--	--	--	--	--
Upground reservoirs	T	µg/l	6.0	--	--	--	--	--
Dissolved oxygen ⁴								
All lake types	T	mg/l	5.0 OMZM 6.0 OMZA	--	--	--	--	--
Nitrogen ³								
Dugout lakes	T	µg/l	450	--	--	--	--	--
Impoundments	T	µg/l	--	815	790	815	815	350
Natural lakes	T	µg/l	650	--	--	--	--	--
Upground reservoirs	T	µg/l	1,150	--	--	--	--	--
pH								
All lake types	--	s.u.	a	--	--	--	--	--
Phosphorus ³								
Dugout lakes	T	µg/l	24	--	--	--	--	--
Impoundments	T	µg/l	--	32	32	32	32	13
Natural lakes	T	µg/l	32	--	--	--	--	--
Upground reservoirs	T	µg/l	24	--	--	--	--	--
Secchi disk transparency ⁵								
Dugout lakes	--	m	1.35	--	--	--	--	--
Impoundments	--	m	--	1.04	1.04	1.04	1.04	2.38
Natural lakes	--	m	1.04	--	--	--	--	--
Upground reservoirs	--	m	2.68	--	--	--	--	--
Temperature								
All lake types	--	--	b	--	--	--	--	--

¹ T = total.

² m = meters; mg/l = milligrams per liter (parts per million); µg/l = micrograms per liter (parts per billion); s.u. = standard units.

³ These criteria apply from May through October in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.

⁴ For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average. The dissolved oxygen criteria apply in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.

⁵ These criteria apply as minimum values from May through October.

^a pH is to be 6.5-9.0, with no change within that range attributable to human-induced conditions.

^b At no time shall the water temperature exceed the average or maximum temperature that would occur if there were no temperature change attributable to human activities.

(9) Primary headwater habitat.

(a) Except as stated in paragraph (D)(9)(b) of this rule, the water quality criteria in rule 3745-1-42 of the Administrative Code apply to water bodies designated primary headwater habitat.

(b) Class III. The water quality criteria for the coldwater habitat use (see paragraph (D)(4) of this rule) apply to primary headwater habitats assigned class III pursuant to paragraph (F)(9) of rule 3745-1-07 of the Administrative Code.

(10) Wetland. The water quality criteria in rule 3745-1-42 of the Administrative Code apply.

Replaces Part of 3745-1-07

Effective:

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Certification

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