3745-1-06 **Mixing zone demonstration and sizing requirements.**

[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) Non-thermal mixing zones. Pursuant to this chapter, where necessary to attain or maintain the use designation for a surface water by these water quality standards, the director may establish, as a term of a discharge permit issued pursuant to Chapter 3745-33 of the Administrative Code or a permit to install issued pursuant to Chapter 3745-42 of the Administrative Code, a mixing zone applicable to the non-thermal constitutants of the point source discharge authorized by such permit.

(B) Thermal mixing zones. Pursuant to this chapter, the director may establish, as a term of a discharge permit issued pursuant to Chapter 3745-33 of the Administrative Code or a permit to install issued pursuant to Chapter 3745-42 of the Administrative Code, a mixing zone applicable to the thermal component of the point source discharge authorized by such permit.

(C) For the purpose of establishing a mixing zone other than as specified in rule 3745-2-05 of the Administrative Code, a mixing demonstration, subject to review by Ohio EPA, shall be performed in accordance with this rule. This rule describes general requirements for all demonstrations, requirements specific to area of initial mixing (AIM) demonstrations, and requirements for sizing acute and chronic mixing zones, and criteria necessary to establish mixing zones for bioaccumulative chemicals of concern (BCCs).

(D) Mixing zone demonstrations may be conducted for any of the following situations:

(1) To justify water quality based effluent limits (WQBELs) greater than the inside mixing zone maximum (IMZM) criteria for aquatic life and WQBELs greater than 1.0 TU_a for whole effluent toxicity pursuant to rule 3745-2-09 of the Administrative Code by use of an AIM.

(2) For application of a percentage of the stream design flow other than the default value selected by procedures in rule 3745-2-05 of the Administrative Code.

(3) For application of more than ten parts lake water to one part effluent when determining wasteload allocations (WLAs) for discharges to lake Erie or non-flowing waters.

(4) For application of a mixing zone for BCCs to existing dischargers after November 15, 2010.

(5) In other situations at the director's discretion.

(E) All mixing zone demonstrations shall fulfill the following:

(1) Describe the amount of dilution occurring at stream design flow conditions, or other conditions found to be most critical with respect to effluent and receiving water mixing, at the boundaries of the proposed mixing zone and the size, shape and location of the area of mixing, including the manner in which diffusion and dispersion occur.

(2) For sources discharging to lake Erie or other non-flowing waters, define the location where discharge-induced mixing ceases.

(3) Document the substrate character and geomorphology within the mixing zone.

(4) Demonstrate that the mixing zone does not interfere with or block passage of fish or aquatic life.

(5) Demonstrate that the mixing zone will not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of such species' critical habitat.

(6) Demonstrate that the mixing zone does not extend to drinking water intakes.

(7) Demonstrate that the mixing zone would not otherwise interfere with the designated or existing uses of the receiving water or downstream waters.

(8) Document background water quality concentrations.

(9) Demonstrate that the mixing zone does not promote undesirable aquatic life or result in a dominance of nuisance species.

(10) Provide that by allowing additional mixing/dilution, all of the following:

(a) Pollutants will not settle to form objectionable deposits.

(b) Floating debris, oil, scum, and other matter in concentrations that form nuisances will not be produced.

(c) Objectionable color, odor, taste or turbidity will not be produced.

(11) Demonstrate whether or not adjacent mixing zones overlap.

(12) Demonstrate whether organisms would be attracted to the area of mixing as a result of the effluent character.

(13) Demonstrate whether the habitat supports endemic or naturally occurring species.

(14) Demonstrate that the mixing zone does not substantially interfere with the migratory routes, natural movements, survival, reproduction, or growth, or increase the vulnerability to predation, of any representative aquatic species.

(15) Demonstrate that the mixing zone does not interfere with or prevent the recovery of an aquatic community or species population that could reasonably be expected when previously limiting water quality conditions improve.

(16) Demonstrate that the mixing zone does not include any bathing area where bathhouses or lifeguards are provided.

(17) Conditions within the mixing zone shall not be injurious to human health, in the event of a temporary exposure during recreation, such that scalding or burns would result.

(F) The mixing zone demonstration shall be submitted to Ohio EPA for review and comment. Following receipt of Ohio EPA's comments, the applicant shall resubmit the demonstration, if necessary, addressing Ohio EPA's comments.

(G) For sources discharging to lake Erie or other non-flowing waters, any adjustment to the dilution ratio shall be limited to the dilution available in the area where discharge-induced mixing occurs.

(H) The mixing zone demonstration shall be based on the assumption that a pollutant does not degrade within the proposed mixing zone, unless both of the following:

(1) Scientifically valid field studies or other relevant information demonstrate that degradation of the pollutant is expected to occur under the full range of environmental conditions expected to be encountered.

(2) Scientifically valid field studies or other relevant information address other factors that affect pollutants in the water column including, but not limited to, resuspension of sediments, chemical speciation and biological and chemical transformation.

(I) An AIM demonstration shall be preceded by the submittal of the following to Ohio EPA:

(1) The discharger shall complete a pollution prevention alternatives assessment and show that application of cost-effective pollution prevention practices, where practical and possible, will not preclude the need for an AIM. Applicable pollution prevention practices shall be in place, or planned for implementation, before modification or installation of a discharge structure for an approved AIM.

(2) The discharger shall show that improved treatment, where practical and

possible, will not preclude the need for an AIM, or that the cost of such treatment would be economically detrimental to the discharger and its community. The assessments shall include a cost/benefit analysis that represents the costs and benefits of the AIM to the environment, receiving water biota, and the citizens of Ohio as well as to the discharger and local residents.

(3) The discharger shall explain how an AIM and discharge structure may impact the environment in and around the proposed site. The discharger shall point out endangered species, important habitats and recreational uses of the area and any potential impact to them. The discharger shall also address the impact of the construction process on the environment.

(4) The discharger shall submit proposed site and structure information for Ohio EPA's use in determining habitat-related restrictions.

(J) If a discharger has submitted information relating to any requirements of paragraph (I) of this rule, or suitable substitutes, during the permit process, then the director may waive one or more of the related AIM prerequisites.

(K) An AIM shall be limited to the space around the discharge structure according to the following restrictions:

(1) An AIM shall not extend beyond both of the following radial distances from the discharge port:

(a) A default value of five times the natural receiving water depth (prior to construction) at the discharge point under stream design flow conditions (critical low depth for lakes).

(b) A default value of fifty times the length scale factor for the discharge port (the length scale factor is the square root of the port cross-sectional area).

(2) The director may accept scientifically defensible field measurements, related studies or computer modeling results defining the area that is uninhabitable (or produces a reasonable minimum exposure time) to aquatic and benthic organisms from the discharger in lieu of the discharger complying with the default values contained in paragraph (K)(1) of this rule. This site-specific information shall be used in conjunction with restrictions in paragraphs (K)(3) and (K)(4) of this rule to size the AIM.

(3) An AIM shall be limited to the point where any discharge plume contacts the receiving water surface, bank, or bottom or contacts another discharge plume (mixture of effluent and receiving water) from the same discharge structure. An AIM shall also be limited to the point where any discharge plume decreases in center-line velocity (velocity at the geometric center of the

plume) to 0.5 meters per second or a minimum center-line velocity, determined through a scientifically defensible demonstration, above which native fish species and other aquatic life are unable or unlikely to inhabit.

(4) An AIM shall not contact or block access to important aquatic habitat areas including, but not limited to, tributaries, inlets, bays, wetlands, spawning grounds, and important feeding areas.

(5) General location and structural restrictions. The discharge structure producing the AIM shall not: be exposed above the water surface under stream design flow or historical low-level conditions except at the bank; significantly alter the natural currents and erosion and deposition patterns of the receiving water; or cause significant bottom scouring.

(6) Location and structural restrictions for mixing zones containing an AIM in streams and rivers.

(a) The distance between the edge of the AIM and any other discharge or AIM in the receiving water shall equal or exceed five times the local stream width or one hundred meters, whichever is greater.

(b) The distance between the edge of an AIM and any intake of a drinking water source shall equal or exceed ten times the local stream width or two hundred meters, whichever is greater. The discharger shall demonstrate that the effluent plume will not impact an intake under any flow condition.

(c) The director may accept field measurements, scientific studies and computer modeling studies, in lieu of the discharger complying with the minimum distances contained in paragraphs (K)(6)(a) and (K)(6)(b) of this rule to size the AIM.

(7) Location and structural restrictions for mixing zones containing an AIM in lake Erie or non-flowing waters.

(a) The distance between the edge of the AIM and any other discharge or AIM in the receiving water shall equal or exceed two hundred meters.

(b) The distance between the edge of an AIM and any intake of a drinking water source shall equal or exceed five hundred meters. The discharger shall also demonstrate that the effluent plume will not impact the intake under any variation in current or lake level.

(c) The director may accept field measurements, scientific studies and computer modeling studies from the discharger in lieu of the discharger complying with the minimum distances contained in paragraphs (K)(7)(a) and (K)(7)(b) of this rule to size the AIM.

(d) The AIM discharge point should be located as far as reasonably possible from shore, in deep water. Structures sited close to shore or in shallow water shall be more strictly limited.

(8) Construction or modification of the discharge structure producing the AIM shall not:

(a) Permanently alter the natural physical characteristics of the receiving water such as depth, width, cross-section, and slope.

(b) Permanently expose erodible sediments or alter the natural bed materials.

(c) Permanently alter bank and riparian characteristics.

(d) Impact or damage important areas or habitats.

(9) Discharge flow and velocity requirements for structures producing the AIM.

(a) The both of the following waste flow velocities shall be maintained from each port of the discharge structure under all discharge and ambient conditions:

(i) At least 2.5 meters per second daily average velocity.

(ii) 1.75 meters per second minimum velocity at any time.

(b) The director may accept scientifically defensible studies from the discharger indicating that alternative discharge velocities will sufficiently discourage habitability or minimize exposure times within the AIM in lieu of the discharger complying with paragraph (K)(9)(a) of this rule.

(c) The discharge structure shall be designed such that any discharge to the receiving water may completely cease if the waste flow is insufficient to maintain the required velocities. It shall also be designed such that changes in waste flow can be accommodated quickly, without major changes to the structure and without bypassing the discharge structure.

(L) For flowing streams, acute mixing zones and chronic mixing zones shall be sized on a case-by-case basis at the director's discretion using any appropriate restrictions listed in paragraphs (D), (F), (G) and (H) of this rule.

(M) For lake Erie or non-flowing waters, acute mixing zones and chronic mixing zones shall be sized according to both of the following:

(1) Acute mixing zones shall be sized on a case-by-case basis.

(2) Chronic mixing zones shall be sized on a case-by-case basis and at the director's discretion using any appropriate restrictions listed in paragraphs (D), (F), (G) and (H) of this rule. Specific restrictions include all of the following:

(a) A mixing zone shall not extend to within one hundred meters of a drinking water intake unless the director accepts a scientifically defensible demonstration from the discharger indicating that the mixing zone can safely extend closer to the intake.

(b) The maximum dilution available from the mixing zone to meet chronic criteria shall be fifty parts lake water to one part effluent or the dilution available within sixty meters, whichever is smaller, unless the director accepts a scientifically valid demonstration from the discharger indicating that an alternative dilution ratio is appropriate.

(c) The mixing zone shall not extend beyond the point where discharge induced mixing occurs.

(N) Mixing zones shall not be established by Ohio EPA for BCCs, beyond the dates established in rule 3745-2-05 of the Administrative Code, unless one of the following exceptions is met:

(1) Exception for water conservation. Mixing zones may be granted beyond November 15, 2010 for existing discharges if the discharger demonstrates that failure to grant a mixing zone would preclude water conservation measures that would lead to overall load reductions in BCCs, even though higher concentrations of BCCs exist in the effluent.

(2) Exception for technical and economic considerations. The director may grant mixing zones beyond November 15, 2010 for existing discharges upon the request of a discharger subject to all of the following limited circumstances:

(a) The discharger is in compliance with its existing NPDES permit and the act and the discharger had reduced the loading of the BCC for which a mixing zone is requested to the maximum extent possible.

(b) The availability and feasibility of additional controls for reducing BCCs for the discharger have been considered as well as the economic impact on the affected communities that would occur if the mixing zone were eliminated.

(c) Any mixing zone exceptions granted: do not result in less stringent limitations than those existing on December 30, 2002; are not likely to jeopardize the continued existence or critical habitat of any endangered or threatened species; protect all designated and existing uses of the receiving water; and meet all applicable criteria and values at the edge

of or, as appropriate, within the mixing zone.

(d) Any mixing zone exceptions granted shall be reevaluated for each successive permit application in which a mixing zone for the BCCs is sought, shall ensure that the discharger has developed and conducted a pollutant minimization program for the BCCs, and that alternative means for reducing BCCs elsewhere in the watershed have been evaluated.

(O) Thermal mixing zones.

(1) The director may establish as a term of a discharge permit issued pursuant to Chapter 3745-33 of the Administrative Code, or a permit to install issued pursuant to Chapter 3745-42 of the Administrative Code, a mixing zone applicable to the thermal component of the point source discharge authorized by such permit. A thermal mixing zone, which allows dilution and cooling of a waste heat discharge, shall be considered a region in which organism response to temperature is time-dependent.

(a) Exposure to temperatures in a thermal mixing zone shall not cause an irreversible response that results in deleterious effects to the wildlife and aquatic life representative of the receiving waters.

(b) The daily average temperature in a thermal mixing zone at the point nearest to the discharge that is accessible to the resident aquatic organisms shall not exceed the temperatures in table 1 of this rule at the corresponding ambient temperature.

(c) At ambient temperatures of fifty-nine degrees Fahrenheit (fifteen degrees Celsius) and above, the daily average temperature in a thermal mixing zone shall be determined on a case-by-case basis.

(2) Thermal mixing zone size limitations shall be established by the director pursuant to paragraph (O)(1) of this rule in accordance with paragraph (C) of this rule for all point source discharges subject to permit.

(3) Any request for a thermal mixing zone in one of the following waters shall be preceded by an evaluation of treatment alternatives that would preclude the need for a mixing zone. This evaluation shall include a cost benefit analysis that presents the costs and benefits of the mixing zone to the environment, receiving water biota, and the citizens of Ohio, as well as to the discharger and local residents. The provisions of this paragraph do not apply to demonstrations conducted under Section 316(a) of the act.

(a) Any stream designated coldwater habitat.

(b) Any stream designated exceptional warmwater habitat.

(c) Any lake other than lake Erie

The thermal mixing zone shall not cause an increase in pathogens that would contribute to an impairment of a designated use in any area of the water body outside the mixing zone; nor shall the thermal mixing zone cause nuisance growths, colors or odors from harmful, toxic, invasive or noxious organisms.

(4) Any thermal mixing zone request involving a new or expanded discharge must also evaluate other discharge alternatives as required by rule 3745-1-05 of the Administrative Code.

(5) Discharges of closed-cycle cooling blowdown with a flow of less than five per cent of the 7Q10 of the receiving water body are exempt from paragraph (O)(1) of this rule.

Table 1. Temperature

(a) Daily average temperatures of thermal mixing zones for all waters other than lake Erie at corresponding ambient temperatures as required in paragraph (O)(1) of this rule. Shown as degrees Fahrenheit and (Celsius).

Ambient - °F (°C)	Daily average temperature -°F (°C)	Ambient - °F (°C)	Daily average temperature -°F (°C)
32 (0)	50 (10.0)	48 (8.9)	71 (21.7)
33 (0.6)	50 (10.0)	49 (9.4)	73 (22.8)
34 (1.1)	50 (10.0)	50 (10.0)	75 (23.9)
35 (1.7)	51 (10.6)	51 (10.6)	76 (24.4)
36 (2.2)	52 (11.1)	52 (11.1)	78 (25.6)
37 (2.8)	54 (12.2)	53 (11.7)	79 (26.1)
38 (3.3)	55 (12.8)	54 (12.2)	81 (27.2)
39 (3.9)	57 (13.9)	55 (12.8)	83 (28.3)
40 (4.4)	58 (14.4)	56 (13.3)	85 (29.4)
41 (5.0)	60 (15.6)	57 (13.9)	86 (30.0)
42 (5.6)	62 (16.7)	58 (14.4)59 (15) and above - daily	88 (31.1)
43 (6.1)	63 (17.2)	average limit will be determined on a case-by-case basis pursuant to paragraphs (O)(1) and (O)(2) of this rule.	
44 (6.7)	65 (18.3)		
45 (7.2)	66 (18.9)		
46 (7.8)	68 (20.0)		
47 (8.3)	70 (21.1)		

(b) Daily average temperatures of thermal mixing zones for lake Erie at corresponding ambient temperatures as required in paragraph (O)(1) of this rule. Shown as degrees Fahrenheit and (Celsius).

Ambient - °F (°C)	Daily average temperature -°F (°C)	Ambient - °F (°C)	Daily average temperature -°F (°C)
32 (0)	52 (11.1)	48 (8.9)	68 (20.0)
33 (0.6)	52.5 (11.4)	49 (9.4)	70 (21.1)
34 (1.1)	53.5 (11.9)	50 (10.0)	71 (21.7)
35 (1.7)	54.4 (12.4)	51 (10.6)	73 (22.8)
36 (2.2)	55 (12.8)	52 (11.1)	75 (23.9)
37 (2.8)	56 (13.3)	53 (11.7)	77 (25.0)
38 (3.3)	57 (13.9)	54 (12.2)	78 (25.6)
39 (3.9)	58 (14.4)	55 (12.8)	80 (26.7)
40 (4.4)	59 (15)	56 (13.3)	82 (27.8)
41 (5.0)	59.5 (15.3)	57 (13.9)	84 (28.9)
42 (5.6)	60 (15.6)	58 (14.4) 59 (15) and above - daily average	86 (30.0)
43 (6.1)	61 (16.1)	limit will be determined on a case-by-case basis pursuant to paragraphs (O)(1) and (O)(2) of this rule.	
44 (6.7)	62 (16.7)		
45 (7.2)	63 (17.2)		
46 (7.8)	65 (18.3)		
47 (8.3)	66 (18.9)		

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