State of Arkansas

Continuing Planning Process

Division of Environmental Quality
Office of Water Quality

2025 Edition

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Introductory Notes

- The Antidegradation *Implementation Methodology* is available as a separate document.
- All names and hyperlinks included in this document are subject to clerical and administrative updates as necessary.

Chapter

1

Chapter 1 Water Quality Management Program

The Continuing Planning Process (CPP) is required by the Clean Water Act (CWA) § 303(e)[1], 40 C.F.R. § 130.5[2], and Ark. Code Ann. § 8-4-208(a). Arkansas developed and obtained approval of the CPP on January 24, 1983. Subsequent modifications were made in July 1989, November 1991, April 1993, January 1995, and June 1999.

The general purpose of the CPP is to describe the principal operational procedures of the state of Arkansas's water quality management programs and permits. The U.S. Environmental Protection Agency (EPA) encourages states to review and revise their existing CPP as necessary. CPP review is not mandated in a certain timeframe. However, EPA does have authority to approve the CPP.

EPA recommends the use of a water quality-based approach in order to meet CWA goals. That is, an increased effort is directed toward those impaired waters not attaining water quality, not supporting one or more designated/existing uses, or with one or more completed Total Maximum Daily Loads (TMDLs). The Arkansas Department of Energy and Environment, Division of Environmental Quality (DEQ) has been revising its water quality management program to better identify water quality issues; to develop the means by which those issues can be resolved; and to better define Arkansas's water quality standards (WQS) that protect the designated/existing uses of the state's waters. Arkansas's WQS are set forth in 8 CAR Part 21, formerly Arkansas Pollution Control and Ecology Commission (APC&EC) Rule 2.[3]

The State may determine the format of its CPP as long as the minimum requirements of the CWA and 40 C.F.R. § 130.5(b) are met. According to 40 C.F.R. § 130.5(b), the following processes must be described in each State CPP, and the State may include other processes at its discretion. The nine specific 40 C.F.R. § 130.5(b) requirements and the respective locations in which the requirements are covered in this document are shown in Table 1-1:

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[1] 33 U.S.C. § 1313(e).
[2] 44 C.F.R. § 130.5 is included by reference in 8 CAR Part 25, formerly Arkansas Pollution Control & Ecology Commission Rule 6.
[3] Act 662 of the 2019 regular session of the General Assembly established the Code of Arkansas Rules. The rules promulgated by the Arkansas Pollution Control and Ecology Commission are now codified in Title 8 of the Code of Arkansas Rules.

Table 1-1: Continuing Planning Process Minimum Requirements Based on 40 C.F.R. § 130.5(b)	
Requirement	Location in this document
The process for developing effluent limitations and schedules of compliance at least as stringent as those required by CWA sections 301(b) (1) and (2), 306 and 307, and at least as stringent as any requirements contained in applicable water quality standards in effect under authority of section 303 of the CWA.	Chapters 1–7 (all sections)
The process for incorporating elements of any applicable area-wide waste treatment plans under section 208, and applicable basin plans under section 209 of the CWA.	Section 1.22
The process for developing total maximum daily loads (TMDLs) and individual water quality-based effluent limitations for pollutants in accordance with section 303(d) of the CWA and 40 C.F.R. § 130.7(a).	Section 1.7 Section 4.22 Section 7.4
The process for updating and maintaining Water Quality Management (WQM) plans, including schedules for revision.	Chapter 3 (all sections) Section 7.6
The process for assuring adequate authority for intergovernmental cooperation in the implementation of the State WQM program.	Section 1.15
The process for establishing and assuring adequate implementation of new or revised water quality standards, including schedules of compliance, under section 303(c) of the CWA.	Section 1.2 Section 1.17 Section 7.2 Section 7.3
The process for assuring adequate controls over the disposition of all residual waste from any water treatment processing.	Section 1.14
The process for developing an inventory and ranking, in order of priority of needs for construction of waste treatment works required to meet the applicable requirements of sections 301 and 302 of the CWA.	Section 1.16
The process for determining the priority of permit issuance.	Section 1.18

1.1 Background

Section 303 of the CWA requires plans for the establishment of effluent limitations and schedules of compliance; identification of those waters within the state for which technology-based effluent limits would not be stringent enough to attain applicable WQS and a priority ranking system for these "water quality limited" waterbodies; and establishment of Total Maximum Daily Loads (TMDLs) for the water quality limited waterbodies.

The initial wasteload allocations (WLAs) or more recent wasteload studies provide the effluent limits necessary for the design of wastewater treatment plants. These permits are issued or updated as necessary to ensure that WQS are met.

The compliance monitoring and enforcement program ensures that permitted facilities are meeting the requirements of their permits. Compliance monitoring is performed by DEQ district field inspectors or other qualified staff. These field inspectors also investigate complaints, respond to chemical spills, and take samples for the fixed Ambient Water Quality Monitoring Network.

DEQ's Water Quality Monitoring Networks provide monitoring data for trend analysis, provide water quality data for the Integrated Water Quality Monitoring and Assessment Report (305(b) Report), and serve as a "flag" to implement more intensive sampling as necessary.

The 305(b) Report is compiled biennially as required by the CWA and is a comprehensive assessment of the State's water quality. The 303(d) list summarizes the causes and sources of pollution for those waters not attaining water quality standards. The Integrated Report is a combined reporting of the 305(b) Report and 303(d) list.

A TMDL establishes the maximum amount of a pollutant allowed in a waterbody while still meeting water quality standards and serves as a tool for restoring water quality. Components of a TMDL are the allocations of the load to point and nonpoint sources of pollution; loading for future growth in the watershed; and a margin of safety.

1.2 Water Quality Standards (8 CAR Part 21) Establishment and Revision

Water Quality Standards (WQS) serve as the cornerstone of states' water quality management programs and consist of three basic elements:

- Antidegradation Policy – Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected (Arkansas's Antidegradation Implementation Methodology is available as a separate document).
- Designated Uses – Extraordinary Resource Waters, Ecologically Sensitive Waterbody, Natural and Scenic Waterways, Primary Contact Recreation, Secondary Contact Recreation, Aquatic Life, Domestic Water Supply, Industrial Water Supply, Agricultural Water Supply, and other uses.

- Criteria – Characteristics that are protective of the designated uses (both narrative statements and numeric magnitude).

A fourth element is typically included at the discretion of the State:

- General policies used in the implementation of WQS (mixing zones, zones of passage, flow applicability policies, variances, etc.).

States and tribes promulgate WQS in order to achieve CWA Section 101(a) "fishable/swimmable" objectives, which are to restore and maintain the chemical, physical, and biological integrity of the Nation's waters, and, wherever attainable, achieve a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water. In establishing WQS, states are also instructed to consider the value of other water uses.

CWA programs including NPDES, TMDL, 401 Certification, Section 404 Permitting, and 305(b) and 303(d) assessment and reporting rely upon the water quality standards (WQS) as the basis for achieving the goals of the CWA.

In Arkansas, WQS are established pursuant to the provisions of Sub-Chapter 2 of the Arkansas Water and Air Pollution Control Act (Act 472 of the Acts of Arkansas for 1949, as amended; Ark. Code Ann. § 8-4-101 *et seq.*), promulgated as Arkansas Pollution Control and Ecology Commission (APC&EC) Rule 2, and codified in 8 CAR Part 21.

The WQS are reviewed and amended or updated as appropriate at a minimum of every three years in accordance with 40 C.F.R. § 131.20. In addition, the APC&EC may be petitioned by any party to amend the WQS at any time in accordance with Arkansas Code § 8-4-202(c).

1.3 Biological Integrity

1.3.1 Implementation

It is the expressed goal of the CWA and the Arkansas Water and Air Pollution Control Act to protect the biological integrity of the waters of the state. Implementation of this goal is provided for in 8 CAR § 21-405. Aquatic biota must be maintained in order to support the designated aquatic life uses. Revision of existing water quality standards or establishment of any new water quality standards must ensure protection of biological integrity and ensure that further degradation does not occur. Biological integrity must be maintained in order to support the designated aquatic life uses. All surface waters of the state have been designated to support aquatic life uses in accordance with 8 CAR § 21-302, unless specifically removed through the Use Attainability Analysis (UAA) process outlined in 40 C.F.R. § 131.10(g), 8 CAR § 21-303, and 8 CAR § 21-306.

1.3.2 Aquatic Life Verification Procedures

8 CAR § 21-505 includes several specifications as to when the ecoregion dissolved oxygen (DO) criteria apply to waterbodies. These specifications include:

- In streams with watersheds of less than ten square miles (<10 mi^2), it is assumed that insufficient water exists to support aquatic life during the critical season (as defined in 8 CAR § 21-106). During this time, a DO criteria of two milligrams per liter (2 mg/L) will apply to prevent nuisance conditions. However, field verification is required in areas suspected of having significant groundwater flows or enduring pools that may support unique aquatic biota (as defined in 8 CAR § 21-106). In such waters the critical season criteria for the next size category of stream shall apply.

- All streams with watersheds of less than ten square miles (<10 mi^2) are expected to support aquatic life during the non-critical season (as defined in 8 CAR § 21-106) when stream flows, including discharges, equal or greater than one cubic foot per second (1 cfs). However, when site verification indicates that aquatic life exists at flows below one cubic foot per second (1 cfs), such aquatic biota will be protected by the non-critical season standard.

- Also in streams with watersheds of less than ten square miles (<10 mi^2), where waste discharges are one cubic foot per second (1 cfs) or more, streams are assumed to provide sufficient water to support aquatic life and, therefore, must meet the dissolved oxygen criteria of the next size category of streams.

<u>Evaluation Process</u>

Any entity is eligible to collect information on presence/absence of aquatic biota. DEQ will make the final determination of the presence/absence of aquatic biota in small watershed streams, which is different than determining the support/nonsupport status of the aquatic life designated use. Even though physical characteristic information such as instream conductivity, water temperature, and stream flow is preferred information, it is not necessary.

For this purpose, it is only necessary to document if aquatic biota are present in the waterbody. A variety of documentation techniques can be used such as taking pictures, collection and preservation, or an extensive aquatic life investigation following the DEQ Wadeable Stream Sampling Protocols. It is necessary to ensure that all available habitat types are sampled (riffle, run, pool, glide). However, more thorough investigations increase the confidence level of decision makers when making a final determination of the presence/absence of aquatic biota in a waterbody. At any level of investigation, the minimum information required includes:

- Name of the waterbody
- County in which it is located

- Descriptive location, e.g. at Highway 1 approximately XX miles south of Little Rock
- Global Positioning System (GPS) coordinates
- Watershed size
- Name of the investigator(s)
- Name and address of entity that performed the evaluation
- Phone number of the investigator
- Email address of the investigator
- Sample collection method (picture, seine, net, etc.)
- Available water quality information such as temperature, flow, conductivity
- Macroinvertebrate community data, common and/or scientific names
- Fish community data, common and/or scientific names
- Other aquatic biota presence, common and/or scientific names
- Other information that may be required by DEQ

1.4 Integrated Reporting: 305(b) and 303(d) List

Section 305(b) of the CWA requires states to perform a comprehensive assessment of the state's water quality, which is to be reported to Congress every two years. In addition, Section 303(d) of the CWA requires states to prepare a list of impaired waters on which TMDLs or other corrective actions must be implemented. Current EPA guidance recommends producing an integrated report combining requirements of the CWA for Sections 305(b) reporting and 303(d) submissions. The combined report is the *Integrated Water Quality Monitoring and Assessment Report.* This report is prepared using the *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b), and 314 of the CWA* (EPA 2006) and supplements.

The 305(b) Report summarizes the conditions of the surface and groundwaters of the state. The condition of the waters is determined by the extent of designated use support and WQS attainment. Physical, chemical, and biological data are used in the support and attainment decision making process. Numerous sources of data are combined and assessed during this process. The waters that are either not attaining one or more water quality criteria, or not supporting one or more designated uses are placed on the 303(d) list and prioritized for restoration activities. These activities may be, but are not limited to, implementation of TMDLs, revision of NPDES permit limits, implementation of nonpoint source management practices, and/or alternative approaches to control pollution.

Highest priority waters for implementation of pollution controls include those with the most serious water quality problems and those with the most valuable designated uses, such as existing domestic water supplies, Extraordinary Resource Waters, Natural and Scenic Waterways, and Ecologically Sensitive Waterbodies. A complete list of the priority criteria is found in the most current Integrated Report (305(b)/303(d)).

For more information on the Integrated Report, visit the DEQ water quality planning webpage.

1.5 Wetlands Protection

Through the CWA, regulatory authority for the protection of wetlands has been delegated to the EPA (Section 401) and the U.S. Army Corps of Engineers USACE (Section 404). EPA has since delegated Section 401 (Water Quality Certifications) responsibilities to states or authorized tribes. Refer to Section 1.8 of this document for a more detailed explanation. Additionally, activities occurring in the waters of the state which may cause an exceedance of a standard must be evaluated and covered by a Short Term Activity Authorization (STAA) as established in 8 CAR § 21-305 and Ark. Code Ann. § 8-4-234. Refer to Section 1.9 of this document for more information on STAAs.

1.6 Groundwater Protection Program

The goal of the Groundwater Protection Program is to document existing groundwater quality and to identify groundwater quality trends and anthropogenic impacts on drinking, agricultural, industrial, and other groundwater supplies. This is accomplished by long-term monitoring, working with other offices of DEQ, and other state and federal agencies in formulating groundwater protection policies, and other means, including but not limited to the requirements to monitor groundwater quality at permitted facilities to identify potential adverse effects.

The current goal of DEQ’s groundwater monitoring program is to have an established groundwater monitoring network within each fresh-water aquifer system in the state and to report groundwater quality by individual aquifer systems. The program monitors approximately 250 wells and springs for ambient groundwater quality and potential sources of contamination. Monitoring areas are sampled on an approximately three-year revolving basis. The resulting data is intended to be used for analysis of groundwater quality trends in support of contamination prevention strategies. The ambient monitoring program may include sampling of volatile and semi-volatile compounds at selected sites such as row-crop agricultural areas of the Mississippi Embayment and the South Central Plain.

Office of Water Quality personnel assist groundwater remediation projects, as needed, with other DEQ Offices such as Office of Land Resources. In the absence of statewide groundwater standards, federal Maximum Contaminant Levels (MCLs), Human Health Medium-Specific Screening Levels, and Health Advisory Limits (HALs) are used to establish groundwater remediation goals.

The Groundwater Protection Program provides funding assistance to other state groundwater protection programs such as the Wellhead Protection Program implemented by the Arkansas Department of Health (ADH). Program personnel also offer technical assistance to researchers investigating potential sources of contamination such as pesticides, confined animal feeding operations, and salt-water intrusion. These preventive endeavors include joint efforts with universities and other state and federal agencies.

1.7 Total Maximum Daily Load (TMDL)

States are required to develop TMDLs (or implement alternative actions) to address water quality impairment(s). TMDL is the maximum amount of a pollutant that can occur in a waterbody with the waterbody still attaining water quality standards.

DEQ follows EPA guidance and methods when developing TMDLs and submits them to EPA for review and approval in accordance with § 303(d) of the CWA and EPA's implementing regulations (40 C.F.R. § 130.7). DEQ consults the EPA 'Region 6 TMDL checklist' to ensure all required documentation is submitted to EPA with the corresponding rationale for the TMDL decisions. TMDLs are calculated using the following formula:

$$\mathrm{TMDL} = \Sigma\mathrm{WLA} + \Sigma\mathrm{LA} + \mathrm{MOS} + \mathrm{FG}$$

Where:

WLA	=	Waste Load Allocation – the allowable discharge of a pollutant from regulated point sources
LA	=	Load Allocation – the contribution of a pollutant from non-regulated sources, typically nonpoint and background
MOS	=	Margin of Safety – a portion of the TMDL that is retained to help to ensure that implementation of the TMDL will result in water quality standards attainment
FG	=	Future Growth – optional portion of the TMDL capacity retained to accommodate new or increased sources of loading that may occur

For more information visit the following link:

https://www.adeq.state.ar.us/water/planning/integrated/tmdl/

1.8 401 Water Quality Certifications

The CWA authorizes each state through 40 C.F.R. Part 121 to issue a 401 Water Quality Certification (401 Certification) for any project that needs a Federal 404 Permit. The 401 Certification is verification by the state that the project will not violate water quality standards. DEQ works with applicants to avoid and minimize impacts to water quality and instream habitat.

The USACE is responsible for issuing permits for activities involving the discharge of dredged or fill materials to waters of the United States (WOTUS) pursuant to Section 404 of the CWA. DEQ is not delegated primacy for the issuance or enforcement of Section 404 permits but does review the permits for purposes of state certification, state certification with conditions, waiver, or denial under CWA Section 401.

A 401 Certification is needed for the placement of dredge and fill materials in WOTUS. Examples include but are not limited to: large construction projects (i.e., residential development construction, shopping centers, etc.), streambank stabilization projects, and road construction projects. WOTUS are defined at 40 C.F.R. § 120.2. The permitting and certification process is shared between DEQ and the USACE.

For projects that fall under a USACE general nationwide permit and are not on Extraordinary Resources Waters, Ecologically Sensitive Waterbodies, or Natural and Scenic Waterways, a general 401 Water Quality Certification is issued along with the 404 Permit. DEQ has determined that these projects have minimum long-term impact on waters of the state. USACE general nationwide permits and general 401 certifications are issued every 5 years and conditions for individual permit requirements may change as the permit renews. Refer to the most current general 401 certification for details.

For projects that do not meet the qualifications for a general nationwide permit, a public notice is issued by USACE. The applicant is responsible for requesting an Individual 401 Water Quality Certification from DEQ for these projects.

Individual 401 water quality certifications are required for projects that have the potential to impact Extraordinary Resource Waters, Ecologically Sensitive Waterbodies, or Natural and Scenic Waterways of the state.

1.9 Short Term Activity Authorization (STAA)

Projects occurring in a waterbody require a Short Term Activity Authorization (STAA). A STAA allows for an individual or entity to perform activities that may cause a temporary water quality violation of Arkansas Water Quality Standards. Any activity, including but not limited to, the entry of machinery, debris and gravel removal, culvert and bridge construction/demolition, utility and pipeline repair, and other activities conducted in any water that might temporarily cause a violation of Arkansas Water Quality Standards (8 CAR Part 21), must be authorized by the DEQ director through a STAA. This authorization does not grant an applicant permission to supersede any other state or federal permitting requirements. A STAA must be obtained prior to beginning in-stream work, excluding emergency activities (an activity needed to prevent an immediate risk to health, life, property, or environment). The length of each STAA’s authorization period will not exceed more than twelve months. If the covered activity is not completed in the time frame designated in the STAA, the applicant must apply for a new STAA.

STAAs authorized on waters designated as Extraordinary Resource Waters (ERWs), Ecologically Sensitive Waterbodies (ESWs), Natural and Scenic Waterways (NSWs), those waters on the impaired waterbodies list (303(d)) for turbidity, or with a TMDL for turbidity may have additional sampling requirements depending on the scope of the project.

1.10 Use Attainability Analysis (UAA)

A UAA is a structured scientific assessment of the factors affecting the attainment of uses specified in Section 101(a)(2) of the CWA (the fishable/swimmable uses). The factors to be considered in such an analysis include the physical, chemical, biological, and economic use removal criteria described in EPA’s water quality standards regulation (40 C.F.R. §§ 131.10(g)(1)–(6)).

For each proposal to modify or remove a fishable/swimmable use, a written report will be submitted to the Director of DEQ. This requirement is driven by 40 C.F.R. § 131.10(j) of the Water Quality Standards Rule, which requires states to conduct a UAA whenever: (1) the state designates or has designated uses that do not include the uses specified in Section 101(a)(2) of the CWA; or (2) the state wishes to remove a designated use that is specified in Section 101(a)(2) of the CWA or adopt subcategories of uses specified in Section 101(a)(2) that require less stringent criteria.

1.11 Temporary Variance from Water Quality Standards

A temporary water quality standards variance (WQS variance) is a time-limited designated use and criteria for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable condition during the term of the WQS variance. Procedures for obtaining a temporary WQS variance must be in accordance with 8 CAR § 21-309 and 40 C.F.R. § 131.14. EPA maintains resources for the development and submission of temporary variances available through their website: https://www.epa.gov.

1.12 Source Control

1.12.1 Point Source Controls

Point sources are controlled by the National Pollutant Discharge Elimination System (NPDES) permit program. The state NPDES permit program authority was delegated to Arkansas by the EPA on November 1, 1986. Total maximum daily loads (TMDLs, Section 1.7), state water quality standards (WQS, Section 1.2), and the Water Quality Management Plan (WQMP, Chapter 3) are the primary tools within the NPDES program that facilitate point source control.

In addition to the NPDES permits program, DEQ also administers the issuance of permits for the construction or physical modification to a wastewater treatment or disposal system. DEQ requires: (1) a permit to be obtained prior to construction or alteration of the treatment system; (2) submission of an acceptable application showing the character of the waste; and (3) submission of plans and specifications concerning the method of treatment to ensure that WQS will not be violated.

1.12.2 Non-Point Source Controls

The Arkansas Department of Agriculture (ADA) administers the Nonpoint Source Pollutant Management Plan with an emphasis on funding Best Management Practices (BMPs) in priority watersheds. More information can be found on the website:
https://www.anrc.arkansas.gov/

1.12.3 Pretreatment Program

As part of the delegated authority under the state NPDES permit program, DEQ administers the Pretreatment Program to control the introduction of pollutants into a publicly owned treatment works (POTW) by industrial contributors or users of the POTW. Pursuant to the requirements of 40 C.F.R. Part 403, DEQ employs the following mechanisms of pollution control:

(1) applies categorical pretreatment standards for industrial users,
(2) applies pretreatment requirements in terms and conditions of NPDES permits issued to POTWs,
(3) requires information regarding the new introduction or substantial change in volume or character of pollutants into POTWs,
(4) makes determinations on requests for POTW pretreatment program approval and pollutant removal allowances,
(5) makes determinations on categorization of industrial users and requests for fundamentally different factors variances,
(6) applies recording, reporting, and monitoring requirements for industrial users, and
(7) conducts Pretreatment Compliance Inspections (PCIs) and Pretreatment Audits on those POTWs with approved pretreatment programs.

1.12.4 Watershed-Specific Requirements

Watershed-specific rulemaking requirements are discussed in Section 7.5. Currently, the following watershed-specific requirements are applicable:

As per 8 CAR Part 25, Rules For State Administration Of The National Pollutant Discharge Elimination System (NPDES), 8 CAR § 25-601, all surface discharges of wastewater in the Lake Maumelle Basin are prohibited, with the exception of discharges permitted under the NPDES stormwater discharge program.

As per 8 CAR § 25-602, the Director shall not issue a permit or coverage pursuant to 8 CAR Part 25 for a Confined Animal Feeding Operation (CAFO) in the Buffalo National River Watershed (USGS HUC 11010005) with: (1) 750 or more swine weighing 55 pounds or more; or (2) 3,000 or more swine weighing less than 55 pounds.

1.13 No-Discharge (Land Application and Subsurface) Permits

Under the authority of Ark. Code Ann. § 8-4-203, "No-Discharge" permits are issued for waste disposal systems that do not discharge to waters of the state. These permits may include land application of waste or treated wastewater, waste storage facilities, and underground injection wells (subsurface wastewater disposal systems (8 CAR Part 26 Arkansas Underground Injection Control Code)).

Land application of wastewater treatment biosolids is subject to the requirements in 40 C.F.R. Part 503; however, DEQ has the authority to establish more stringent requirements. In cooperation with the ADH, DEQ issues permits under the authority of 8 CAR Part 26 to facilities that utilize subsurface wastewater disposal, such as septic tanks and leach fields. Regulatory jurisdiction of a subsurface wastewater disposal system depends on the type and volume of waste.

1.14 Residual Management

Any person or entity engaged in domestic wastewater collection, or treatment processes where domestic wastewater treatment facility solids, biosolids derived products, water treatment residuals, and industrial waste are generated and subsequently land applied or disposed, is required to have either a valid NPDES, No-Discharge, or a Solid Waste Disposal permit that covers this activity.

It is the responsibility of the permittee and licensee to ensure the proper handling of all domestic wastewater treatment facility solids, biosolids, and domestic septage. Transportation of domestic treatment facility wastewater solids, biosolids, and septage to domestic wastewater treatment facilities; permitted septage pits, ponds, or lagoons; or solids land application sites shall be achieved in a manner which prevents leaking or spilling of the solids onto highways, streets, roads, waterways, or other land surfaces.

1.15 Intergovernmental Cooperation

The authority that DEQ has under the CWA allows DEQ to develop effective lines of communication and cooperation with other local, state (Department of Parks, Heritage, and Tourism and Arkansas Department of Health), and federal agencies (U.S. Fish and Wildlife/Conway Field Office, U.S. Army Corps of Engineers, and Environmental Protection Agency Region 6) in order to implement water quality management programs. DEQ coordinates day-to-day intergovernmental relations with municipalities and state and local agencies that become involved with water quality issues and various projects. A 1986 memorandum of agreement (modified in 1995) between DEQ and EPA Region 6 outlines the relationship between the agencies as they work together to protect the environment and health and safety of the citizens of the state.

Arkansas is authorized to administer federal programs under the CWA. Various grants and state funds, as well as program permitting fees, supplement the federal grant monies received through the CWA Section 106 funding.

DEQ has Memoranda of Agreement or Understanding with many other state and federal agencies including the Missouri Department of Natural Resources, the Oklahoma Department of Energy and Environment, EPA Region 6, the Arkansas Department of Health (ADH), and the Arkansas Department of Agriculture (ADA) that addresses a cooperative agreement concerning the Upper White River Watershed. DEQ coordinates with the ADH on review of plans, specifications, and permits for domestic wastewater treatment systems, locating water supply intakes in relation to wastewater discharges in streams and rivers, and monitoring of wells. Section 319 funds under the CWA are used for programs and projects for non-point source management. Section 319 funds support the implementation of the Arkansas Nonpoint Source Management Program that is administered by the ADA. Funding proposals are used to ensure that the most appropriate projects are selected for funding.

1.16 Construction of Waste Treatment Works

The Construction Assistance Revolving Loan Fund Program (created by Ark. Code Ann. § 15-5-900 *et. seq.*) is a major source of federal funds that provides for the construction of wastewater treatment projects, as well as sewage treatment plants, pumping stations, collection systems, interceptor sewers, rehabilitation of sewer systems, and the control of combined sewer overflows.

The ADA administers a program of loans and refinancing for various wastewater treatment needs in the State of Arkansas.

1.17 Compliance Schedules

"Compliance schedule" or "schedule of compliance" is a schedule of remedial measures included in a permit or an order, including an enforceable sequence of interim requirements (for example, actions, operations, or milestone events) leading to compliance with an effluent limit or other conditions. At a minimum, schedules of compliance must follow requirements in 40 C.F.R. § 122.47.

- Permitting. The primary means to be used for controlling municipal, non-municipal, and industrial waste discharges shall be through the issuance of waste discharge permits. Waste discharge permits, whether issued pursuant to the National Pollutant Discharge Elimination System (NPDES) or otherwise, must be written so the authorized discharges will meet the water quality standards. No waste discharge permit can be issued that causes or has the reasonable potential to cause or contribute to a violation of water quality criteria, except as provided in the schedule of compliance. Permittees discharging treated wastes in compliance with the terms and conditions of permits are not subject to civil and criminal penalties on the basis that the discharge violates water quality standards.
- General allowance for compliance schedules. Permits and orders issued by DEQ for existing discharges may include a schedule for achieving compliance with effluent limits and water quality standards that apply to:
    - Aquatic life uses; and
    - Uses other than aquatic life.
- Schedules of compliance shall be developed to ensure final compliance with all water quality-based effluent limits and the water quality standards as soon as practicable. DEQ will decide whether to issue schedules of compliance on a case-by-case basis. Schedules of compliance may not be issued for new discharges. Examples of schedules of compliance that may be issued include, but are not limited to:
    - Construction of necessary treatment capability;
    - Implementation of necessary BMPs; and

  - o Completion of necessary water quality studies related to implementation of permit requirements to meet effluent limits.
- For the period of time during which compliance with water quality standards is deferred, interim effluent limits shall be formally established, based on the best professional judgment of DEQ. Interim effluent limits may be numeric or nonnumeric, or both.
- Prior to establishing a schedule of compliance, DEQ shall require the discharger to evaluate the possibility of achieving water quality standards via non-construction changes (e.g., facility operation, pollution prevention). Schedules of compliance shall require compliance with the specified requirements as soon as practicable. Compliance schedules shall generally not exceed the term of any permit unless DEQ determines that a longer time period is needed to comply with the applicable water quality standards.
- DEQ may authorize compliance schedules in accordance with EPA regulations if:
  - o The permittee is not able to meet its waste load allocation in the TMDL solely by controlling and treating its own effluent;
  - o The permittee has made significant progress to reduce pollutant loading during the term of the permit; and
  - o The permittee is meeting all of its requirements under the TMDL as soon as possible; and Actions specified in the compliance schedule are sufficient to achieve water quality standards as soon as possible.

1.18 Determining the Priority of Permit Issuance

1.18.1 Individual Permits

Timely issuance of NPDES permits is crucial to ensuring that appropriate effluent limits and other conditions are in force for each discharger**.** There are many factors that affect the time period for issuing a permit. These factors include, but are not limited to: the characteristics of the discharge; the characteristics of the receiving stream; whether or not DEQ has an acceptable model for the receiving stream or Waste Management Plan (WMP); whether or not DEQ has water quality data on the receiving stream; the location of the discharge in relationship to drinking water intakes, the location of land application area; whether or not a public hearing must be held; the work load of DEQ at the time of application; etc. Therefore, the time it takes to issue a permit can vary greatly between permit applications. DEQ can never guarantee any permit applicant a certain time period for making a permit decision. General priority for issuance of individual permits not on hold by EPA or for other reasons is:

1. Construction permits
2. New major facilities
3. New minor facilities
4. Modifications of active permits

5. Expiring or administratively continued major facilities
6. Expiring or administratively continued minor facilities

1.18.2 General Permits

Table 1-2: NPDES Timeline for Issuing or Renewing a General Permit

Step	Minimum Days Prior to Expiration
Notice of intent to renew or issue	365*
Public notice	365
Public hearing (if necessary)	180
Issue permit decision	180**

* The Division’s notice of intent to renew/not renew a general permit is required to be published by Ark. Code Ann. § 8-4-203(m)(5)(A)(i) at least 365 days before the expiration of the general permit.
** Reissuance of a general permit is required by Ark. Code Ann. § 8-4-203(m)(5)(B) at least 180 days prior to its expiration date.

1.19 Enforcement Branch

DEQ issues two types of permits for wastewater treatment facilities. National Pollutant Discharge Elimination System (NPDES) permits require wastewater dischargers to monitor and regulate levels of pollutants discharged from their facilities to the waters of the state by maintaining compliance with required discharge quantities and/or concentrations (effluent limits) for pollutants. The NPDES program relies heavily on self-monitoring and self-reporting by the permittee to determine compliance with effluent limits. In addition to the NPDES program, DEQ’s State No-Discharge permits are issued to facilities that treat wastewater but do not have a point-source discharge to the waters of the state, such as drip irrigation treatment systems.

DEQ Office of Water Quality’s Enforcement Branch is responsible for the tracking and enforcement of both “discharge” and “no discharge” waste systems, as well as relevant regulatory or statutory violations. The Enforcement Branch tracks all self-monitoring reports and Non-Compliance Reports (inspection reports, compliance schedule event reports, Discharge Monitoring Reports (DMRs), etc.) required by permits and/or enforcement actions. DMR data is entered into a federally-maintained national data base system known as the Integrated Compliance Information System (ICIS).

The enforcement program relies on well-developed compliance monitoring systems designed to identify and correct violations, help establish an enforcement presence, collect evidence needed to support enforcement actions where there are identified violations, and help target and rank enforcement priorities.

The Enforcement Branch monitors compliance and is responsible for initiating the appropriate level of enforcement action against facilities that have No-Discharge state-issued permits, unpermitted facilities, and NDPES major and minor facilities, including stormwater dischargers permitted to discharge into the waters of the state, coverage under general permits, and industrial users of publicly owned treatment works (POTWs) in cities without an approved local pretreatment program.

An enforcement action is any informal or formal action taken to address the failure to comply with applicable statutes, regulations, rules, plans, policies, or enforcement orders. The Enforcement Branch addresses violations through a variety of mechanisms, including an informal “enforcement action” in the form of a letter stating DEQ is aware of the violation. Corrective courses of action are strongly suggested. Formal enforcement actions are taken if the violation is not resolved or if the violation is deemed Significant Non-Compliance (SNC).

DEQ Office of Water Quality’s Enforcement Branch implements and enforces water quality laws, regulations, rules, policies, and plans to protect the waters of the state. Timely and consistent enforcement is critical to the success of the water quality program and to ensure that the people of Arkansas have clean water. The goal of the Enforcement Branch is to protect and enhance the quality of the waters of the state by defining an enforcement process that addresses water quality problems in the most efficient, effective, and consistent manner.

1.20 Wastewater Operator Licensing Program

DEQ Office of Water Quality’s SEEK Branch employees oversee the Wastewater Operator Licensing Program, traveling the state to test and license operators of municipal and industrial wastewater treatment plants. Certain wastewater treatment plants must have a licensed operator to make operational decisions for the plant. The operator must be licensed at an equal or greater classification than the plant’s classification score. Requirements for the licensing of wastewater treatment plant operators are established by 8 CAR Part 22. Facilities that do not have a “wastewater treatment plant” as defined in Ark. Code Ann. § 8-5-201 are not required to have a licensed operator. DEQ posts training opportunities and maintains a database of licensed wastewater operators in the state.

1.21 Compliance Branch

The field inspectors will conduct timely complaint and compliance site visit inspections and document their findings. Specific activities occurring during the inspections should be documented clearly and reported after the inspection. The field inspectors will not provide site-specific interpretive technical assistance or legal assistance during compliance inspections. Upon completion of an inspection, the field inspectors shall communicate with the Permits Branch regarding permit issues or unpermitted site determinations as necessary prior to sending the inspection report to the facility.

1.22 State and Area-wide Agencies/Planning

DEQ uses state funds, permit fee funds, grant funds from CWA Section 106, and the following methods to ensure a holistic approach to water quality management:

- Annual negotiations with EPA
- Bi-annual development of the Integrated Water Quality Monitoring and Assessment Report (Integrated Report, or 305(b) Report)
- TMDL development and implementation schedule (included in the Integrated Report)
- Implementation of the CWA
- Water Quality Management Plan (208 Plan) updates
- Water Quality Standards triennial review

DEQ has been designated as the state planning agency on matters pertaining to water quality and will conduct planning on the state level.

The APC&EC establishes rules for the prevention, control, and abatement of new or existing water pollution. DEQ’s Office of Water Quality conducts and coordinates various planning programs initially prescribed under CWA Sections 208 and 209. These programs continue as part of the CPP as mandated under CWA Section 303(e).

In instances of multi-agency planning programs, such as CWA Section 208, DEQ will serve as the reviewing arm of the Office of the Governor in the certification process. CWA Section 208(a)(2) requires that the governor of each state identify areas within the state which, as a result of urban-industrial concentrations or other factors, have substantial water quality control problems, including those areas which are located in two (2) or more states. DEQ will coordinate the public participation activities and will provide assistance when possible. Under CWA Section 208, states are required to designate areawide waste treatment management planning agencies and develop plans that include the identification and construction of treatment works needed to meet municipal and industrial needs for a design period of at least 20 years.

Chapter

2

CHAPTER 2 TECHNOLOGY-BASED EFFLUENT LIMITATIONS

2.1 Introduction

Effluent limits specify the amount of pollutants that may be discharged from a permitted facility. Technology-based effluent limitations (TBELs) are based on a technology that is available to treat the pollutants at a reasonable cost pursuant to 40 C.F.R. § 122.44(a). TBELs can include numeric or narrative limitations. This chapter discusses TBELs, while Chapter 4 discusses water quality-based limitations (WQBELs) that are based on the effect of the pollutants in the receiving water pursuant to 40 C.F.R. § 122.44(d).

Figure 2.1 illustrates the general process for developing effluent limitations in an NPDES permit.

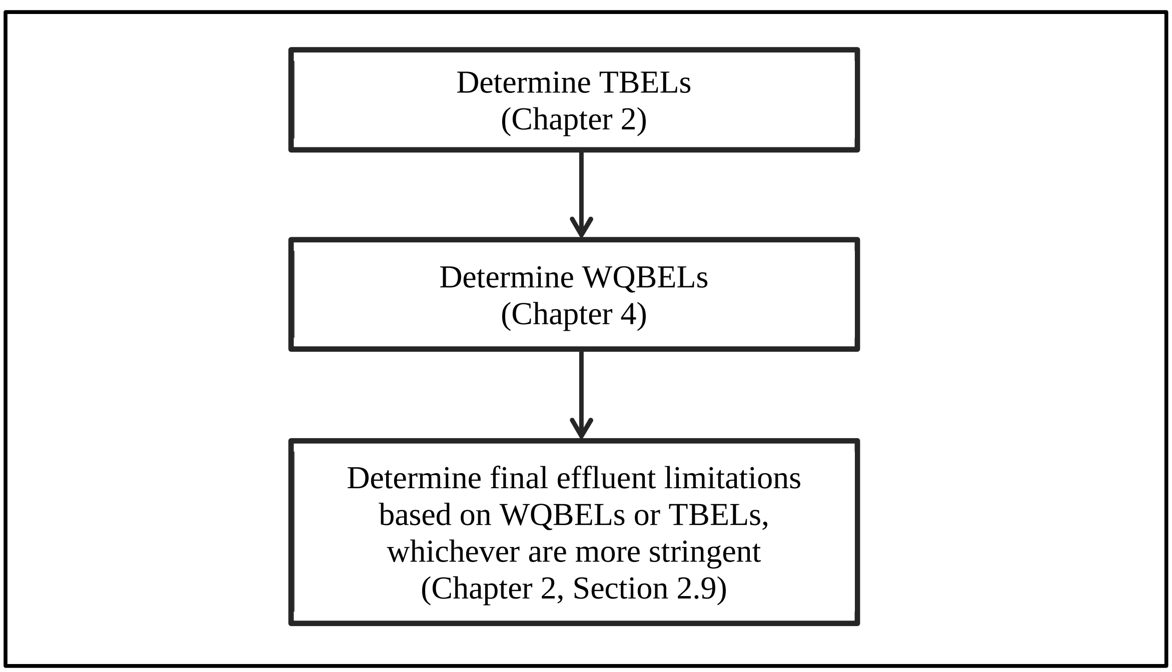

Figure 2.1: NPDES Permit Effluent Limits Development Process Overview

There are currently federal effluent limitation guidelines (ELGs) for 56 industrial categories for industrial dischargers. The effluent guidelines for industrial dischargers are summarized in 40 C.F.R. Parts 405–471. For municipal dischargers there are TBELs set forth in 40 C.F.R. Part 133 that are most commonly referred to as the secondary treatment regulations.

There are two general approaches to deriving TBELs. A permit engineer can use the applicable ELGs to derive TBELs, or the permit engineer may use Best Professional Judgement (BPJ) in establishing site-specific TBELs if there are no ELGs applicable for a particular industrial category.

2.2 Levels of Control Technologies in ELGs

The basis for each level of control technology listed below are discussed in more detail in Chapter 5, Section 5.2.1.1 of EPA's NPDES Permit Writers' Manual dated September 2010.

- BPT: Best Practicable Control Technology currently available. BPT is the first level of technology-based effluent controls for direct dischargers and is applicable to all types of pollutants (conventional, non-conventional, and toxic (priority) pollutants). See CWA §§ 301(b)(1)(A) and 304(b)(1)(B).
- BCT: Best Conventional Control Technology. BCT is the level of treatment that succeeds BPT and is only for conventional pollutants. See CWA §§ 301(b)(2)(E) and 304(b)(4).
- BAT: Best Available Technology Economically Achievable. BAT is applicable to non-conventional and toxic (priority) pollutants. See CWA §§ 301(b)(2)(A), (C), (D), and (F), and 304(b)(2).
- NSPS: New Source Performance Standards. NSPS is applicable to all types of pollutants. The statutory deadline for meeting NSPS requirements is known as the "new source date." The new source date depends on the applicable ELG. See CWA § 306.
- PSES: Pretreatment Standards for Existing Sources. PSES are designed to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs, including incompatibility with the POTW's chosen biosolids disposal methods. PSES for indirect dischargers are technology-based and are analogous to BAT requirements. See CWA § 307(b).
- PSNS: Pretreatment Standards for New Sources. PSNS have the same function as PSES and are issued at the same time as NSPS. PSNS for indirect dischargers are technology-based and are analogous to NSPS requirements. See CWA § 307(c).

NOTE: When applying applicable BPT, BCT, and BAT requirements, permit writers do not have the authority to extend the statutory deadlines in an NPDES permit; thus, all applicable technology-based requirements (i.e., effluent guidelines and case-by-case limitations based on BPJ) must be applied in NPDES permits without the benefit of a compliance schedule. In *addition, though NSPS do not have specific dates as compliance deadlines, they are effective on the date the new source begins discharging. A schedule of compliance can be added to a permit for implementation of PSES or PSNS in accordance with the preamble to EPA's 2015 WQS regulation revision.*

2.3 Using ELGs

Use of ELGs should consider the following:

2.3.1 Categorize the Discharger

To use the effluent guidelines, it is necessary to know what kinds of processes are being performed at the facility being permitted. There are several sources of information available to a permit engineer to learn about an industry to determine the applicable ELG:

A. Table of existing point source categories. Existing point source categories are arranged in alphabetical order and are cross referenced to applicable 40 C.F.R. sections. This table is Exhibit 5-11 in the EPA 2010 NPDES Permit Writers' Manual and subsequent updates.
B. SIC code and/or NAICS code for the facility. Some ELGs base their applicability upon the SIC code of the facility (e.g. organic chemical manufacturing). Permit rating worksheets (MRAT) may be used as a tool to help determine applicable ELGs based on SIC code.
C. EPA's ELG Development Documents. These published documents contain information about the industrial processes that were considered when EPA developed the ELG.
D. EPA has industry experts located in Washington, D.C. and in the regional offices. EPA lists these experts in the training manual for the permit writing course and on the EPA website. The following link to the EPA website contains the most recent contact information of the contacts for each ELG: https://www.epa.gov/eg/forms/contact-us-about-effluent-guidelines
E. A site visit of the facility being permitted can be helpful in determining the type of process and applicable ELGs. The site visit is most valuable if the permit engineer has done some background work before the site visit.

2.3.2 Determine Whether Existing or New Source Standards Apply

BPT, BCT, and BAT are applicable to existing sources. NSPS is applicable to new sources. The permit writer will determine which standard is applicable to the facility and the permit decisions will be documented in the fact sheet or statement of basis. See Section 5.2.2.4 of EPA 2010 Permit Writers' Manual for more details on making this determination.

2.3.3 Determine Representative Production Rate

Most of the EPA effluent guidelines are mass-based and expressed in terms of allowable pollutant discharge per unit of production (i.e., production normalized) as opposed to flow normalized effluent guidelines that are expressed as concentration limits. Determining production-based limits requires the establishment of a representative production rate. The objective in determining the production for a facility is to develop a single estimate of the long-term average daily production that can reasonably be expected to prevail during the next permit term (In most cases, this is not the design production rate). A representative production rate will be established using the past 3 to 5 years. Using the highest year of production might be an appropriate and reasonable measure of production if this value is representative of the actual production expected to occur during the next permit term (see NPDES Permit Writers' Manual Exhibit 5-14). In evaluating gross production figures, the number of production days should be considered to derive a production unit per day value. The "average daily production" will be calculated for each of the past 3 to 5 years, and then the highest "average daily production" may be used to apply the effluent guideline. The derivation of the effluent guidelines incorporates an allowance for the daily and monthly variations. For renewal permits, if it is determined that the representative production rate is within 20% of the production rate used in the previous permit, then the limits may remain unchanged or be adjusted based on a new production rate. If the permittee knows that there will be a significant (20% or greater) increase in production sometime during the course of the new permit, tiered limits may be implemented in a permit to be effective at the time production changes (see Section 2.4.1 below). Alternatively, the permit may be modified before the time of production changes.

2.4 Derive TBELs

The final calculations of the TBELs are performed using the applicable effluent guidelines and production rates. The following subsections describe various processes used for calculating TBELs.

2.4.1 Tiered Discharge Limitations

If production rates are expected to change significantly during the life of the permit, tiered limits may be included as allowed by 40 C.F.R. § 122.45(b)(2)(ii)(A)(i). These limits would become effective when production exceeds a threshold value, such as during seasonal production variations. Tiered limits should be used only after careful consideration and only when a substantial increase or decrease in production is likely to occur. Generally, up to a 20 percent fluctuation in production is considered to be within the range of normal variability, while changes in production higher than 20 percent could warrant consideration of tiered limitations.

Permit writers will detail in the permit the thresholds and time frames when each tier applies, measures of production, and special reporting requirements. Special reporting requirements include provisions such as the following:

- The facility notifying the DEQ a specified number of business days before the month it expects to be operating at a higher level of production and the duration this level of production is expected to continue.

- The facility reporting, in the discharge monitoring report, the level of production and the limitation and standards applicable to that level.

A discussion of the rationale and requirements for any tiered limitations will be provided in the fact sheet or statement of basis for the permit.

The following example illustrates application of tiered limitations.

Example:

A permittee submits a renewal application with highest production of 50,000 lbs/year. However, the permittee believes that in the next two years their production will increase to 80,000 lbs/year. The permittee could have five sets of limits (Tiers) as follows (20%, 40%, 60%, 80%, and 100% of a production rate of 80,000 lbs/year):

- Tier 1 for production of less than or equal to 16,000 lbs/year
- Tier 2 for production of between 16,001 and 32,000 lbs/year
- Tier 3 for production of between 32,001 and 48,000 lbs/year
- Tier 4 for production of between 48,001 and 56,000 lbs/year
- Tier 5 for production of between 56,001 and 80,000 lbs/year

The effluent limitations for each tier would be calculated based on the highest production within each tier (i.e., 16,000 lbs/year for Tier 1, 32,000 lbs/year for Tier 2, etc.).

2.4.2 Multiple Regulated Processes

If a facility operates multiple processes where each process is covered by a different effluent guideline subcategory, the appropriate technology-based effluent limits for the combined processes can be determined using the building block approach. The building block approach involves determining the technology-based mass limit for each individual process/subcategory, and then combining all the individual calculated mass limits into one mass limit. Exhibit 5-18 on Page 5-36 of the 2010 Permit Writers' Manual provides an example building block approach for applying effluent guidelines.

The building block approach can be applied in other circumstances as well. Other situations where the building block approach may be applied are discussed in Sections 2.4.3, 2.4.4, and 2.4.5 below.

2.4.3 Mixture of Mass-Based and Concentration-Based Requirements

The limitations in effluent guidelines for some pollutants are production-normalized, mass-based limitations in some subparts and concentration-based limitations in other subparts. When all the wastewater streams go to the same treatment system, the permit writer would need to convert the concentration-based limitations to mass-based limitations so they could be combined with the production-normalized, mass-based limitations and applied to the combined wastewater streams.

2.4.4 Mixture of Different Concentration-Based Requirements

Some facilities could have multiple operations that are each subject to different concentration-based requirements for the same pollutant but with wastewater streams that combine before treatment. In such a case, a flow-weighted concentration-based limitation may be established as the TBEL for the combined wastewater streams. Alternatively, the concentration-based requirements may be converted to equivalent mass-based requirements using flow data and then the mass-based requirements may be combined into a single limitation for the combined wastewater streams.

2.4.5 Mixture of Regulated and Unregulated Wastewater Streams

In some cases, wastewater streams containing a pollutant regulated by an ELG can combine with other wastewater streams containing a pollutant not regulated by an ELG. In these cases, the permit writer could use BPJ to establish a TBEL for the unregulated wastewater stream(s) and calculate a final TBEL for the combined wastewater stream. For example, if one of the wastewater streams contributing to an industrial facility's discharge is sanitary wastewater, the permit writer could use BPJ to apply the secondary treatment standards for domestic wastewater and calculate BOD_5 (5-day biochemical oxygen demand) mass limitations for that wastewater stream using the concentration-based requirements and an estimate of the flow rate that is expected to represent the flow rate during proposed permit term. A final TBEL for BOD_5 could then be calculated for the combined sanitary and process wastewater streams by combining the two mass limitations using the building block approach.

2.5 Mass and Concentration Limits

Most of the technology-based effluent limitations for industrial facilities are expressed in terms of allowable mass of pollutant per unit of production. In some instances, it is inappropriate to express effluent limitations in terms of mass. This includes, but is not limited to, limitations for pH, temperature, radiation, or in those cases where the mass of the pollutant discharged cannot be related to a measure of operation (for example, if stormwater is commingled with process water). Concentration limits in addition to mass limits are appropriate in some cases to discourage the reduction in treatment efficiency during low flow periods and require proper operation of treatment units at all times. Supplementing mass-based limitations with concentration-based limitations may be especially appropriate where the requirements in the effluent guidelines are flow-normalized (i.e., the effluent guidelines include a concentration requirement but direct the permit writer to calculate a mass-based TBEL using the concentration requirement and the wastewater flow).

2.6 Internal Outfalls

The NPDES regulations at 40 C.F.R. § 122.45(h) provide authorization to identify internal outfalls when effluent limitations at the final outfall are impractical or infeasible. These internal compliance points might be necessary to ensure proper treatment of persistent, bioaccumulative, and toxic pollutants that are discharged in concentrations below analytical detection levels at the final effluent outfall or other pollutants that may be diluted by flows (e.g., cooling water) not containing the pollutant in detectable amounts. Some effluent guidelines may require the use of internal outfalls unless the effluent limitation is adjusted based on the dilution ratio of the process wastewater to the wastewater flow at the compliance point. Examples of effluent guidelines with required internal compliance points include the Metal Finishing effluent guidelines (40 C.F.R. Part 433) and the Pulp, Paper, and Paperboard effluent guidelines (40 C.F.R. Part 430). Accordingly, any internal outfall monitoring should be identified that might be required by the applicable ELG and appropriate monitoring requirements be included in the final permit.

2.7 Technology-Based Limitations for Publicly Owned Treatment Works (POTWs)

TBELs for POTWs are set forth in 40 C.F.R. Part 133. POTWs represent the largest category of dischargers requiring NPDES permits. The federal regulations at 40 C.F.R. § 403.3 define a POTW as a treatment works that is owned by a state or municipality, which includes any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature, and also includes sewers, pipes, and other conveyances only if they convey wastewater to a POTW treatment plant. Please note that additional state regulatory requirements for small domestic discharges are included in 8 CAR Part 25.

2.7.1 Secondary Treatment Standards

Table 2-1 summarizes the secondary treatment standards specified in 40 C.F.R. § 133.102 for BOD_5 (5-day biochemical oxygen demand), $CBOD_5$ (5-day carbonaceous biochemical oxygen demand), TSS (total suspended solids), and pH.

Note: Both BOD_5 and $CBOD_5$ standards are shown, but the permit may contain either of these parameters and is not required to contain both.

Table 2-1: Secondary Treatment Standards

Parameter	Monthly Average	7-day Average
BOD_5	30 mg/l	45 mg/l
$CBOD_5$	25 mg/l	40 mg/l
TSS	30 mg/l	45 mg/l
pH	Within the limits of 6.0 – 9.0 s.u.[4]	

[4] Unless the POTW demonstrates that: (1) inorganic chemicals are not added to the wastestream as part of the treatment process; and (2) contributions from industrial sources do not cause the pH of the effluent to be less than 6.0 s.u. or greater than 9.0 s.u.

BOD_5 (or $CBOD_5$) and TSS removal (concentration)	Not less than 85%

2.7.2 Equivalent to Secondary Treatment Standards

Some biological treatment technologies, such as trickling filters or waste stabilization ponds, are capable of achieving significant reductions in BOD_5 (or $CBOD_5$) and TSS but might not consistently achieve the secondary treatment standards for these parameters. In 1984, EPA promulgated regulations at 40 C.F.R. § 133.105 that include alternative standards that apply to facilities using "equivalent to secondary treatment." If the permit limits are adjusted to these equivalent to secondary treatment standards, the limits cannot be less stringent than the requirements in 40 C.F.R. §§ 133.105(a–e). Furthermore, permit limits may be more stringent if the facility can meet the requirements in 40 C.F.R. §§ 133.105(f)(1–2). A facility must meet all three of the following criteria in 40 C.F.R. § 133.101(g) to qualify for application of these alternative standards:

Criteria #1 – Consistently Exceeds Secondary Treatment Standards: The BOD_5 (or $CBOD_5$) and TSS effluent concentrations consistently achievable through proper operation and maintenance exceed the secondary treatment standards. The term "effluent concentrations consistently achievable through proper operation and maintenance" is defined in 40 C.F.R. § 133.101(f) as:

1) For a given parameter, the 95^{th} percentile value for the monthly average effluent quality achieved by a treatment works in a period of at least 2 years, excluding values attributable to upsets, bypasses, operational errors, or other unusual conditions; and
2) A 7-day average value equal to 1.5 times the monthly average value derived in item 1 above.

Criteria #2 – Principal Treatment Process: The principal treatment process must be a trickling filter or waste stabilization pond (i.e., the largest percentage of BOD and TSS removal is from a trickling filter or waste stabilization pond system).

Criteria #3 – Provides Significant Biological Treatment: The treatment works provides significant biological treatment of municipal wastewater. The regulations at 40 C.F.R. § 133.101(k) define significant biological treatment as using an aerobic or anaerobic biological treatment process in a treatment works to consistently achieve a monthly average of at least 65 percent removal of BOD_5.

Each facility should be considered on a case-by-case basis to determine whether it meets these three criteria. If the facility has made substantial changes in its operations or treatment process during the current permit term, best professional judgement (BPJ) may be employed to use data for a period that is representative of the discharge at the time the permit is being drafted. Facilities that do not meet all three criteria are not eligible for equivalent to secondary standards. For such facilities, secondary treatment standards apply.

Table 2-2: Equivalent to Secondary Treatment Standards		
Parameter	Monthly Average	7-day Average
BOD_5	45 mg/l	65 mg/l
$CBOD_5$	40 mg/l	60 mg/l
TSS	45 mg/l	65 mg/l
pH	Within the limits of 6.0 – 9.0 s.u.[4]	
BOD_5 (or $CBOD_5$) and TSS removal (concentration)	Not less than 65%	

2.7.3 Adjusted TSS Requirements for Waste Stabilization Ponds

In accordance with EPA regulations adopted in 1974, and revised in 1984, states can adjust the allowable TSS concentration for waste stabilization ponds upward from those specified in the equivalent to secondary treatment standards to conform to TSS concentrations achievable with waste stabilization ponds. 40 C.F.R. § 133.103(c) defines "TSS concentrations achievable with waste stabilization ponds" as the effluent concentration achieved 90 percent of the time within a state that are achieving the levels of effluent quality for BOD_5 specified in the equivalent to secondary treatment standards. To qualify for an adjustment up to as high as the maximum concentration allowed, a facility must use a waste stabilization pond as its principal process for secondary treatment and its operation data must indicate that it cannot achieve the equivalent to secondary treatment standards. EPA published approved adjusted TSS requirements for Arkansas in the September 20, 1984 federal register. The adjusted TSS requirement for Arkansas is 90 mg/l based on a monthly average. Permit writers should note that Arkansas has developed an adjusted TSS standard for waste stabilization ponds consistent with 40 C.F.R. § 133.103(c), and the regulations would allow uniform application of that standard to POTWs where waste stabilization ponds are the principal process used for secondary treatment and operation and maintenance data indicate that the equivalent to secondary treatment standards for TSS cannot be achieved.[5]

For new stabilization pond systems where no data yet exists to evaluate Criteria #1 in Section 2.7.2, the secondary treatment standard for BOD_5 or $CBOD_5$ (30 mg/l or 25 mg/l, respectively, for the monthly average) and the adjusted TSS equivalent to secondary standards for TSS (90 mg/l monthly average) are applied, if the water quality model supports these limits. At the next permit renewal, the effluent data should be evaluated to determine if the facility is still eligible for continuing the adjusted TSS standard or if lower limits are required.

[5] 2010 NPDES Permit Writers' Manual, pg. 5–9, Section 5.1.3.4.

2.8 Mass Limits for POTWs

40 C.F.R. § 122.45(b)(1) requires using the design flow of a POTW to calculate mass limitations. The following equation is used to calculate the mass limit of a POTW:

$$\text{Mass (lb/day)} = \text{Design Flow (MGD)} \times \text{Concentration (mg/l)} \times 8.34$$

2.9 TBELs vs. WQBELs

The permit development process for both POTWs and industrial dischargers consists of deriving TBELs as required in 40 C.F.R. § 122.44(a), then a determination whether, after application of the TBELs, the discharge will cause, have the reasonable potential to cause, or contribute to an excursion above a narrative or numeric criterion within a state water quality standard (WQS). If it is determined that the TBELs will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, WQBELs, which are more stringent than the TBELs, are developed as required in 40 C.F.R. § 122.44(d). The permit includes final effluent limitations, which represent the more stringent of the TBELs and WQBELs that implement all applicable technology and water quality standards in the permit. The permit's fact sheet or statement of basis documents the decision-making process for deriving the TBELs and/or WQBELs and establishing permit conditions pursuant to 40 C.F.R. §§ 124.7, 124.8, and 124.56.

Chapter

3

Chapter 3 WATER QUALITY MANAGEMENT PLAN (WQMP)

DEQ maintains a WQMP in accordance with Section 208 of the CWA. These requirements are codified in 40 C.F.R. § 130.6. The terms WQMP and 208 Plan refer to the same document, and these terms are used interchangeably throughout this chapter.

At minimum, the following items are included in the WQMP:

1) Permittee's name
2) Permit number
3) Planning segment where the discharge is located
4) Receiving stream
5) Monthly average (unless otherwise specified) effluent limits for parameters derived with a model (BOD_5, $CBOD_5$, TSS, NH_3-N, DO (Instantaneous Minimum))
6) Effluent flow limits (if applicable) based upon a Hydrograph Controlled Release (HCR)
7) Monthly average (unless otherwise specified) effluent limits for Total Phosphorus and/or Nitrate+Nitrite-Nitrogen (NO_3+NO_2-N), if applicable
8) Instantaneous Maximum effluent limits for Total Residual Chlorine (TRC) and/or Peracetic Acid residual (PAA), if applicable
9) Other parameters based on studies
10) Approximate area of watershed at outfall location
11) 7Q10 flow of applicable receiving stream
12) Link to latest WQMP Summary report/modeling analysis
13) Total Loads established by TMDL for each Assessment Unit consisting of Total Maximum Daily Load, Wasteload Allocation, Load Allocation, Margin of Safety, and Future Growth; and individual permit limits (wasteload allocation) established by TMDL.
14) Latest dates of the following actions: 208 Plan update public notices, 208 updates sent to EPA for technical review, 208 updates technically accepted by EPA, Governor Certifications sent to EPA, and EPA approval of Governor's Certification.

3.1 Updating the WQMP

The WQMP will be updated to add new facility information or revise existing facility information as necessary. The procedures in this section should be followed to ensure that the WQMP (if applicable) is consistent with permits. 208 Plan reviews may include a previous model or an updated model to ensure compliance with the in-stream DO standards listed in 8 CAR § 21-505. 208 Plan reviews may also use 8 CAR Part 25 or a TMDL. Modeling can be performed by DEQ staff or a qualified person of the permit applicant's choice. Modeling results must be technically accepted by EPA Region 6 in accordance with the procedures in this section.

Wasteload allocations (WLAs) for facilities with discharge flows less than or equal to 0.1 million gallons per day (MGD), which are developed using Streeter-Phelps modeling using reaction rates discussed in Section 3.3 of this CPP or WLAs from 8 CAR Part 25, will be considered technically acceptable without EPA Region 6 technical review.

WLAs which are developed using Streeter-Phelps modeling for facilities with discharge flows greater than 0.1 MGD are included in a WQMP update package and will be submitted to EPA Region 6 via email for technical review. EPA may acknowledge via email to DEQ the receipt of a submitted WQMP update package and the status of its review. EPA will provide a technical review response to these submittals to DEQ within 30 days of receipt of a complete WQMP update package. If an EPA response is not received within 30 days, the WLA(s) will be considered technically acceptable as submitted. Technically acceptable WQMP updates for individual facility WLAs derived using Streeter-Phelps modeling, and any other 208 updates that involve updates to effluent limits contained in the 208 Plan, will be public noticed for a 30-day comment period when the draft permit is public noticed, either in the same public notice or a separate public notice. Following the completion of the public notice for the WQMP update, responding to any comments received, and receiving technical acceptance from EPA Region 6 for any changes from the originally submitted update, DEQ will perform the WQMP update, at which time the WLAs included in the WQMP update will be immediately effective for use in the permit. The final step in the WQMP update process consists of the DEQ Director, on behalf of the Governor, sending a Governor certification letter to EPA Region 6 seeking formal approval for the list of WQMP updates that were public noticed and made since the previous Governor certification.

The procedures stated above will not apply to situations concerning development of a TMDL for an impaired waterbody. In cases where a TMDL is developed and public noticed, the public notice may also include the proposed WQMP update to include the associated allocations set forth in the TMDL. When the TMDL is approved by EPA, the TMDL is to be automatically incorporated into the WQMP with the associated WLAs for applicable facilities. The approval of the TMDL will be considered equivalent to technical acceptance of a WQMP update and formal approval (Governor certification). Consequently, approved TMDLs will be immediately effective for implementation in NPDES permits and not be required to be included in the Governor certifications.

3.2 Developing Oxygen Demanding Water Quality Effluent Limitations

Effluent limits for all oxygen demanding wastewater discharges shall be developed to maintain the DO standards (8 CAR § 21-505) for the receiving waters and to meet requirements listed in 8 CAR Part 25. Limits shall include total suspended solids (TSS) (for most discharges) and BOD_5 (or $CBOD_5$ if there is an ammonia limit). Ammonia nitrogen (NH_3-N) and effluent DO limits shall be included, if applicable. Effluent concentrations from water quality models will be utilized as the discharger's monthly average limits for BOD_5 (or $CBOD_5$) and NH_3-N (if applicable) and instantaneous minimum DO for typical situations where the assimilative capacity is based on modeling at critical conditions (7Q10).

3.2.1 Reservoirs/Lakes

Effluent limits for domestic wastewater discharging directly to a lake or reservoir are mandated in 8 CAR § 25-401. The DO standard for lakes and reservoirs is promulgated in 8 CAR § 21-505.

3.2.2 Streams and Rivers

Effluent limits for oxygen demanding sources discharging to a stream are determined via DO modeling. The instream DO standards for receiving streams are promulgated in 8 CAR § 21-505.

3.3 Guidance for DO Modeling

General guidance for DO modeling can be found in the following documents (or latest revisions):

- "Memorandum of Agreement Between U.S. Environmental Protection Agency and Arkansas Department of Environmental Quality" (MOA), located in Appendix D of the 2000 CPP, concerning dissolved oxygen modeling procedures. This document is incorporated into this CPP in Sections 3.3.1 through 3.3.9.
- "Technical Guidance Manual for Developing Total Maximum Daily Loads, Book 2: Streams and Rivers, Part 1: Biochemical Oxygen Demand/Dissolved Oxygen and Nutrients/Eutrophication," EPA 823/B-97-002, March 1997.
- "Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling (Second Edition)," EPA/600/3-85-040, June 1985.
- Textbooks or other published literature.
- Observed site-specific input values, if available.
- Sections 3.3.1 through 3.3.12 of this CPP document.
- EPA's Water Quality Models and Tools website, currently located at: https://www.epa.gov/water-research/methods-models-tools-and-databases-water-research#models.

Specific values of model coefficients that are presented in the following subsections of this CPP are from the MOA referenced above. These values are general guidance (not absolute requirements) to be considered along with the 1997 and 1985 EPA modeling documents listed above. Alternative site-specific coefficient values may be considered on a case-by-case basis with appropriate justification.

3.3.1 Carbonaceous Decay Rates ($\boldsymbol{K_d}$)

CBOD Decay Rates (K_d rates) (at 20 °C) of 0.5–0.8 per day will be used in small streams (7Q10 < 100 cfs) with generally rocky substrates. The higher values within the range may be assigned to streams with high stream slopes. Decay rates of 0.3–0.4 per day will be used for small streams with sandy substrates. Values less than 0.3 per day will be used in larger streams or rivers (7Q10 > 100 cfs) due to dilution ratios. Recommended K_d values (at 20 °C) for larger streams or rivers based on level of treatment are 0.2 per day for secondary treatment and 0.1 per day for advanced treatment. Deviations from these rates may be allowed with appropriate justification such as BOD time series data for that discharge or for similar discharges. See Table 3-1 for substrate information related to ecoregion. Site-specific stream studies may also be used to determine decay rates. The K_d rates given above fall within the range of values given in Table 3-17 of "Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling" manual [EPA/600/3-85/040] (EPA 1985).

3.3.2 Reaeration Rates ($\boldsymbol{K_a}$)

Reaeration rates (K_a rates) used in computer modeling can be derived from numerous formulas, most of which incorporate stream depth and velocity, or stream velocity and slope. The "Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling" manual [EPA/600/3-85/040] (EPA 1985) provides guidance on reaeration equations, including ranges of depths and velocities for which different equations are recommended. Numerous equations for estimating a stream's reaeration rate have been developed and are presented in the 1985 EPA manual. Reaeration rates used in computer modeling can be either manually entered or computed using an equation presented in the 1985 EPA manual. The O'Connor-Dobbins formula, using stream depth and velocity, and the Tsivoglou formula, incorporating stream slope and velocity, are two of the most commonly used equations used to derive reaeration rates. Any deviations from using reaeration rates derived from these equations will be justified on a case-by-case basis in the documentation submitted to EPA. In addition, all reaeration rates greater than 12/day (at 20°C) will be justified by inclusion of pertinent stream data such as stream slope, velocity, or other factors that might create a higher K_a. In most situations the reaeration rate will be less than or equal to 12/day (at 20°C).

The Tsivoglou formula, one of the commonly used equations, was developed by E.C. Tsivoglou and is shown in the equation below:

$$K_a = 16.38(C)(Slope)(Velocity)$$

Where:

K_a	=	Reaeration rate at 20 °C (1/day)
C	=	Escape Coefficient
	=	0.11 when stream flow < 10 cfs
	=	0.079 when stream flow ≥ 10 cfs and < 25 cfs
	=	0.054 when stream flow ≥ 25 cfs
$Slope$	=	Stream slope (feet/mile)
$Velocity$	=	Stream velocity (feet/second)

Another commonly used equation for estimating a stream's reaeration rate is the O'Connor-Dobbins formula shown in the following equation:

$$K_a = \frac{12.9U^{0.5}}{H^{1.5}}$$

Where:

K_a	=	Reaeration rate at 20 °C (1/day)
U	=	Stream velocity (feet/second)
H	=	Stream depth (feet)

3.3.3 Nitrogenous Decay Rates ($\boldsymbol{K_n}$)

Nitrogenous Decay Rates (K_n) used in modeling will generally be in the 0.3–0.4 per day range for most Arkansas streams (shallow, rocky bottom substrate). K_n values of 0.1–0.2 per day will generally be used in streams which have large flows, high stream depths, or sand, silts or clay substrates. This range of values is based on typical range of literature values shown in Table 3-20, page 3-70, of "Technical Guidance Manual for Performing Waste Load Allocations," September 1983, EPA. Deviations from these rates may be allowed with appropriate justification such as nitrogenous BOD (NBOD) time series data, instream calibration data for the waterbody of interest, or approved modeling for similar waterbodies. See Table 3-1 for substrate information related to ecoregion. Site-specific stream studies may also be used to determine decay rates.

3.3.4 Sediment Oxygen Demand (SOD) Rates

SOD, also known as benthal oxygen demand, is a function of the amount of total suspended solids (TSS) in the water column. TSS eventually settles to the substrate and the sediments consume oxygen. The SOD rate also depends on water temperature. Table 3-1 provides the SOD demand for most Arkansas streams based on projected instream TSS after mixing with effluent and the type of substrate at various water temperatures. These SOD values are corrected to the temperature used in the model using the Arrhenius relationship shown in Section 3.3.5 if the model used does not convert automatically. For example, the MultiSMP model does not convert automatically and the user must correct these SOD rates to the modeled temperature for input into the model. Site-specific stream studies may also be used to determine SOD rates.

Table 3-1: Sediment Oxygen Demand (SOD) ($g/m^2/day$) for Various Temperatures and Ecoregions[5]

Rocky Substrate[4]						**Applicable Ecoregions[6]**
TSS[1]	SOD_{20}	SOD_{22}	SOD_{29}	SOD_{30}	SOD_{31}	Ozark Highlands Boston Mountains Ouachita Mountains
15[2]	0.3	0.34	0.51	0.54	0.57	
20[2]	0.5	0.56	0.84	0.90	0.95	
30[2]	1.0	1.12	1.69	1.79	1.90	
45[3]	1.4	1.57	2.37	2.51	2.66	
90[3]	1.8	2.02	3.04	3.22	3.42	
Mixed Substrate						Arkansas Valley South Central Plains
TSS[1]	SOD_{20}	SOD_{22}	SOD_{29}	SOD_{30}	SOD_{31}	
15[2]	0.4	0.45	0.68	0.72	0.76	
20[2]	0.7	0.79	1.18	1.25	1.33	
30[2]	1.3	1.46	2.20	2.33	2.47	
45[3]	1.6	1.80	2.70	2.87	3.04	
90[3]	1.9	2.13	3.21	3.40	3.61	
Sandy Substrate[4]						Arkansas Valley South Central Plains Mississippi Alluvial Plain
TSS[1]	SOD_{20}	SOD_{22}	SOD_{30}	SOD_{31}	SOD_{32}	
15[2]	0.5	0.56	0.90	0.95	1.01	
20[2]	0.8	0.90	1.43	1.52	1.61	
30[2]	1.5	1.69	2.69	2.85	3.0	
45[3]	1.8	2.02	3.22	3.42	3.62	
90[3]	2.0	2.25	3.58	3.80	4.02	

1 Projected TSS instream after mixing.
2 TSS values are from MOA with EPA (contained in 2000 CPP) concerning dissolved oxygen modeling. SOD values for rocky substrate are the lower end of range given in the MOA. SOD values for sandy substrate are the upper end of range given in the MOA.
3 These TSS concentrations (45 mg/l – 90 mg/l) are outside of the range given in the MOA, so the corresponding SOD values are estimated based on the precedent set by previous models included in the WQMP. For TSS values other than the specific TSS values shown, the SOD rate may be estimated using interpolation.
4 SOD values given in this table are the lower and upper ends of the recommended range. SOD values between the upper and lower values are acceptable based on nature of substrate.
5 Deviations from these rates may take place in situations of high instream dilution, which significantly reduces the impact of the benthal (sediment) deposits on oxygen consumption. In these situations, justification on a case-by-case basis will be provided in the documentation submitted to EPA.
6 Applicable ecoregions are based on the general characteristics of waterbodies within each ecoregion (Rocky, Gravel, or Mixed). A different substrate type may be used based on site specific observations of the particular stream in question.

3.3.5 Temperature

Temperature affects the rate at which reactions proceed. In accordance with 8 CAR § 21-505, models are performed at maximum allowable temperature standards given in 8 CAR § 21-502 for the critical season and at 22°C during the primary season. Reaction rates are generally expressed in units of 1/day at 20°C. If the reactions are occurring at a temperature other than 20°C, then the reaction rates must be corrected for the new temperature. The most commonly used expression to adjust reaction rates for temperature is the modified Arrhenius relationship shown in the equation below:

$$K_T = (K_{20°C})\Theta^{(T-20)}$$

Where:

K_T	=	Reaction rate at the new temperature (1/day)
$K_{20°C}$	=	Reaction rate at 20 °C (1/day)

The Θ values for each of the reaction rates vary slightly from reference to reference, but those used in the MultiSMP modeling analysis are 1.024 for K_a, 1.047 for K_d, and 1.080 for K_n. Sediment oxygen demand rates are manually entered into MultiSMP for the stream temperature being modeled because MultiSMP does not automatically temperature-correct the SOD rate.

3.3.6 Effect of Aquatic Plants on Dissolved Oxygen (DO)

Effects on DO due to the presence of aquatic plants (e.g., algae or macrophytes) are usually not considered. However, the difference between total daily productivity and total daily respiration (P-R) can be directly input to some models such as MultiSMP. In other models such as QUAL-TX and LA-QUAL, constant concentrations of chlorophyll *a* can be specified. Appropriate documentation is needed to include the effects of aquatic plants on DO. In lieu of documentation, the modeler may consider zero effects of photosynthesis/respiration to be a conservative input to the model.

3.3.7 Model Uncertainty

An allowance of 0.2 mg/l DO depression below the water quality criterion is acceptable to account for uncertainty in a steady state uncalibrated dissolved oxygen model.

3.3.8 Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)

Carbonaceous biochemical oxygen demand ($CBOD_5$) is a measure of oxygen demand in receiving waters. Most oxygen-demanding discharges have permit limits for $CBOD_5$ or BOD_5. These limits are either technology-based limits from federal effluent limitation guideline (ELG) or water quality-based limits from DO modeling, whichever are more stringent. The model commonly used to predict the dissolved oxygen deficit from $CBOD_5$ is the Streeter-Phelps equation. However, other modeling software could be used.

3.3.9 Ultimate CBOD ($CBOD_u$) to 5-day $CBOD_5$ Ratio

The effluent $CBOD_u$ to $CBOD_5$ ratio is required in dissolved oxygen modeling to convert model output (as $CBOD_u$) to permit limits (as $CBOD_5$). The ratio typically used is 2.3 for municipal/domestic wastewater based on the range of values reported in Appendix A of "Technical Guidance Manual for Developing Total Maximum Daily Loads, Book 2: Streams and Rivers, Part 1: Biochemical Oxygen Demand/Dissolved Oxygen and Nutrients/Eutrophication," EPA 823/B-97-002, March 1997.

The $CBOD_u$ to $CBOD_5$ ratio of industrial wastewater is highly dependent on the type of industry manufacturing processes, treatment schemes or operation, and other factors. For industrial wastewater, the $CBOD_u$ to $CBOD_5$ ratio used in the model is typically derived from previously approved models for the facility, actual test data of the facility effluent, data from a similar type of process from another facility, or published document(s) for that industry.

3.3.10 Model Theory

At the outfall, CBOD of the river/wastewater mixture (L_0) is given by:

$$L_0 = \frac{Q_r L_r + Q_w L_w}{Q_r Q_w}$$

Where:

L_0 = Ultimate CBOD at the point of waste discharge
Q_r = Flow in the river upstream of the discharge
L_r = Ultimate CBOD of the river water
Q_w = Flow of the wastewater from the discharge
L_w = Ultimate CBOD in the discharged wastewater

As time passes (i.e., the water moves downstream) the oxygen content of the river water is consumed in the same way oxygen is consumed in the CBOD test. CBOD (L_0) in a river at time (t) is given by:

$$L_t = L_0 * e^{(-K_d t)}$$

where K_d is the deoxygenation constant that can be adjusted for temperature using the modified Arrhenius equation shown in Section 3.3.5. If an average velocity or flow is known, the CBOD for a given distance downstream and how much DO remains can be calculated, which depends both on the rate of deoxygenation (K_n and K_d) and on the rate of reoxygenation or reaeration (K_a).

3.3.11 Streeter-Phelps Equation:

The modeling is based on the Streeter-Phelps dissolved oxygen deficit equation and the organic demand found in the waterbody sediment. The equation below shows the Streeter-Phelps relationship with the additional components to account for nitrification and SOD:

$$D_t = DO_{sat} - DO_t$$

$$D_t = \left(\frac{K_d \times \mathrm{CBOD_u}}{K_a - K_d}\right)\left(e^{-K_d \times t} - e^{-K_a \times t}\right) + \left(\frac{K_n \times \mathrm{NBOD_u}}{K_a - K_n}\right)\left(e^{-K_n \times t} - e^{-K_a \times t}\right) + \left(\frac{\mathrm{SOD}}{K_a \times H}\right)\left(1 - e^{-K_a \times t}\right) + D_0 \times e^{-K_a \times t}$$

Where:

D_t	=	Dissolved oxygen deficit (mg/l) at location downstream with travel time of t (days)
DO_{sat}	=	Dissolved oxygen concentration at saturation (mg/l)
DO_t	=	Dissolved oxygen concentration (mg/l) at location downstream with travel time of t (days)
$\mathrm{CBOD_u}$	=	Ultimate carbonaceous BOD of the stream immediately after mixing (mg/l)
$\mathrm{NBOD_u}$	=	Ultimate nitrogenous BOD immediately after mixing (mg/l)
	=	$4.57 \times$ Ammonia Nitrogen (mg/l)
K_a	=	Reaeration rate (1/day)
K_d	=	CBOD decay rate (1/day)
K_n	=	NBOD decay rate (1/day)
SOD	=	Sediment oxygen demand (g/m^2/day)
H	=	Average water depth (m)
D_0	=	Dissolved oxygen deficit immediately after mixing (mg/l)

The impact of CBOD is determined at the critical stream flow condition. The critical stream flow condition is usually the 7-day average low flow with a recurrence interval of 10 years (7Q10).

To plot DO versus distance downstream, the following equation is used at each point:

$$D_t = DO_{sat} - DO_t$$

The resulting plot is called an oxygen sag curve.

Since the instream CBOD decreases as time goes on, at some point, the rate of deoxygenation becomes less than the rate of reaeration. At this point the DO reaches a minimum (called the critical point or DO sag point). Downstream of the critical point, reaeration begins to occur faster than deoxygenation, so the DO begins increasing.

Using calculus and the Streeter-Phelps equation, critical time or distance can be solved iteratively:

$$\left(\frac{K_d \times \mathrm{CBOD_u}}{K_a - K_d}\right) K_d e^{-K_d \times t_c} + \left(\frac{K_n \times \mathrm{NBOD_u}}{K_a - K_n}\right) K_n e^{-K_n \times t_c} = \left(\frac{K_d \times \mathrm{CBOD_u}}{K_a - K_d} + \frac{K_n \times \mathrm{NBOD_u}}{K_a - K_n} + \frac{\mathrm{SOD}}{K_a - 1} - D_0\right) K_a e^{-K_a \times t_c}$$

K_a	=	Reaeration rate (1/day)
K_d	=	CBOD decay rate (1/day)
K_n	=	NBOD decay rate (1/day)
D_0	=	Dissolved oxygen deficit immediately after mixing (mg/l)
t_c	=	Time (days)
$NBOD_u$	=	Ultimate nitrogenous BOD immediately after mixing (mg/l)
$CBOD_u$	=	Ultimate carbonaceous BOD of the stream immediately after mixing (mg/l)
SOD	=	Sediment Oxygen Demand (g/m^2/day)

3.3.12 Stream Hydraulic Values (Velocity, Width, and Depth)

Stream hydraulic values to input into the model are commonly derived using power function equations. Power functions may be developed relating flow with velocity, depth, and width. These equations take on the form as follows:

$$\text{Velocity} = aQ^d$$

$$\text{Depth} = bQ^e$$

$$\text{Width} = cQ^f$$

Where:

a, b, c are coefficients for the stream
d, e, f are exponents defining the basic relationships

Recognizing that stream flow is the product of cross-sectional area and velocity, and that cross-sectional area is the product of width and depth, it can be shown that the sum of the exponents, $d + e + f = 1$, and that the product of the coefficients, $a \times b \times c = 1$. Using these relationships, the hydraulic values (velocity, width, and depth) used in modeling are normally calculated using one of the following sets of power function equations. The appropriate set of equations is chosen based on expected stream depth or width at the given streamflow. Field verification or aerial photo software such as Google Earth or equivalent can be used to estimate the expected stream width at the discharge location under evaluation to help choose an appropriate set of equations that best represent the stream.

Equation Set 1 (Small Streams with Q < 0.31 cfs):

Velocity (fps) $= 0.085Q^{0.6}$
Depth (ft) $= 0.751Q^{0.3}$
Width (ft) $= 15.665Q^{0.1}$

Where:

Q = Streamflow (cfs), including discharger

Equation Set 2 (Slow and Deep Streams with Q > 0.31 cfs):

Velocity (fps) $= 0.025396Q^{0.5}$
Depth (ft) $= 0.8523684Q^{0.4}$
Width (ft) $= 46.1963Q^{0.1}$

Where:

Q = Streamflow (cfs), including discharger

Equation Set 3 (Streams with below average velocity and depth with Q > 0.31 cfs):

Velocity (fps) $= 0.0491357Q^{0.5}$
Depth (ft) $= 0.659186Q^{0.4}$
Width (ft) $= 30.8741Q^{0.1}$

Where:

Q = Streamflow (cfs), including discharger

Equation Set 4 (Streams with average velocity and depth with Q > 0.31 cfs):

Velocity (fps) $= 0.07232Q^{0.5}$
Depth (ft) $= 0.5677Q^{0.4}$
Width (ft) $= 24.355Q^{0.1}$

Where:

Q = Streamflow (cfs), including discharger

Equation Set 5 (Streams that are slightly faster and shallower than average with Q > 0.31 cfs):

Velocity (fps) $= 0.0739796Q^{0.5}$
Depth (ft) $= 0.5353916Q^{0.4}$

Width (ft) $= 25.2474Q^{0.1}$

Where:

Q = Streamflow (cfs), including discharger

Equation Set 6 (Streams that are faster and shallower than average with Q > 0.31 cfs):

Velocity (fps) $= 0.088886Q^{0.5}$
Depth (ft) $= 0.492814Q^{0.4}$
Width (ft) $= 22.8288Q^{0.1}$

Where:

Q = Streamflow (cfs), including discharger

Equation Set 7 (Fastest and shallowest streams with Q > 0.31 cfs)

Velocity (fps) $= 0.114282Q^{0.5}$
Depth (ft) $= 0.4352519Q^{0.4}$
Width (ft) $= 20.104Q^{0.1}$

Where:

Q = Streamflow (cfs), including discharger

The following hydraulic equations may be used for the following larger rivers (generally > 100 cfs):

Equation Set 8 (Arkansas River):

Velocity (fps) $= 0.01Q^{0.5}$
Depth (ft) $= 0.1667Q^{0.4}$
Width (ft) $= 600Q^{0.1}$

Where:

Q = Streamflow (cfs), including discharger

Equation Set 9 (Ouachita River, Black River, White River, Red River):

Velocity (fps) $= 0.04526Q^{0.4}$
Depth (ft) $= 0.7Q^{0.27}$
Width (ft) $= 31.5657Q^{0.33}$

Where:

Q = Streamflow (cfs), including discharger

3.4 Total Suspended Solids (TSS)

Total suspended solids (TSS) can cause turbidity/reduced clarity in waterbodies and it can also impact the benthic environment if it settles. The organic portion of TSS can create an oxygen demand in the water column or on the bottom of the stream if it settles. Oxygen demand from TSS in the water column will already be accounted for by BOD analyses of unfiltered samples. In order to comply with WQS, TSS limits may be necessary in the permit. TSS limits in the permit are as follows:

1) For domestic wastewater, DEQ will typically issue TSS limits 1–2 times the BOD_5 limits. Minimum and maximum TSS limits issued will be 15 mg/l and 30 mg/l, except in special cases such as discharge to a large stream where dilution ratios are greater than 100:1, or in cases where higher limits have previously been set in a prior permit and the dissolved oxygen model supports the previously set TSS limits based on the corresponding sediment oxygen demand (SOD) value from Section 3.3.4 that is used in the model.

2) For municipal (POTW) wastewater, the secondary treatment regulations in 40 C.F.R. Part 133 will be followed to establish permit limits for TSS, provided that the dissolved oxygen model supports the secondary treatment TSS limits based on the corresponding sediment oxygen demand (SOD) value from Section 3.3.4 that is used in the model. For more details on this subject, see Section 2.7.

3) For industrial wastewater, TSS limits will be set on a case-by-case basis.

3.5 Ammonia Nitrogen (NH_3-N)

Ammonia nitrogen permit limits will be set to the most stringent of the following three quantities: (1) technology-based limits (if applicable); (2) effluent concentrations necessary to meet instream dissolved oxygen standards based on dissolved oxygen model projections; or (3) concentrations necessary to prevent instream toxicity based on 8 CAR § 21-512. Ammonia toxicity calculations are discussed in more detail in Chapter 4.

3.6 Effluent Limitations in WQMP

The effluent limitations in the WQMP normally represent the monthly average limits, except for dissolved oxygen (normally expressed as an instantaneous minimum) and total residual chlorine (normally expressed as an instantaneous maximum). Any deviations from these standard practices will be noted in the WQMP for that particular limit.

Chapter
4

Chapter 4 WATER QUALITY-BASED EFFLUENT LIMITATIONS

Effluent limits may be based on the technology which is available to treat the pollutants at a reasonable cost (technology-based) pursuant to 40 C.F.R. § 122.44(a), or they may be based on the effect of the pollutants in the receiving water (water quality-based) pursuant to 40 C.F.R. § 122.44(d), whichever is more stringent. Water-quality based effluent limitations can include numeric or narrative limitations. Technology-based effluent limitations (TBELs) are covered in Chapter 2. Figure 4.1 illustrates the general process for developing effluent limitations in an NPDES permit.

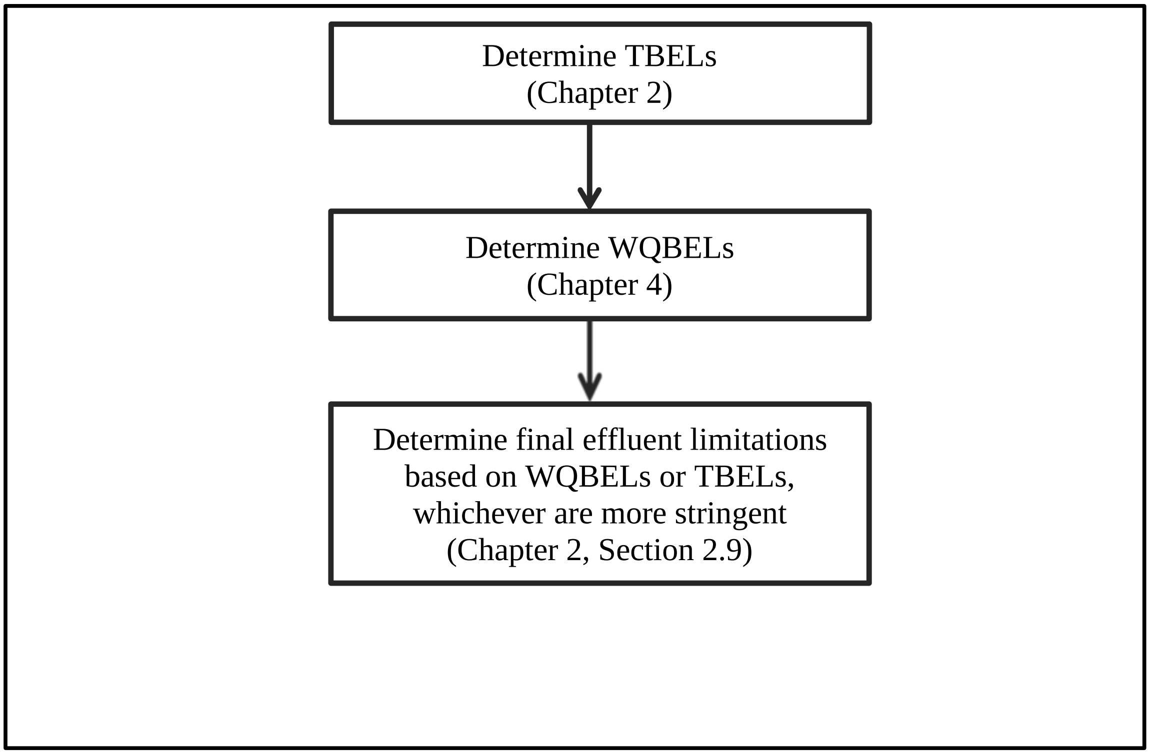

Figure 4.1: NPDES Permit Effluent Limits Development Process Overview

This chapter discusses the development of water quality-based effluent limits pursuant to 8 CAR Parts 21 and 25. The majority of this chapter includes methods for developing limits in unimpaired waters or those without TMDLs. Additional considerations may be necessary in accordance with Section 4.22.

4.1 Water Quality Standards and Criteria

Any discharge to waters of the state must meet the requirements of Arkansas's Water Quality Standards (WQS), as amended. Water quality standards are provisions of 8 CAR Part 21 effective for CWA purposes once approved by EPA that describe the desired condition of a waterbody, the level of protection, or mandate how the desired condition will be expressed or established for such waters in the future. Water quality standards have three components:

- Designated uses of the waterbody,
- Criteria to protect designated uses, and
- Antidegradation requirements

Water quality criteria (referred to as "criteria") are the basis for water quality effluent limits that are included in NPDES permits. Criteria can be numeric (e.g., the maximum pollutant concentration levels permitted in a waterbody) or narrative (e.g., criteria that describe the desired conditions of a waterbody being "free from" certain negative conditions).

Water quality effluent limits are based on in-stream water quality criteria. The conversion from water quality criteria to effluent limits considers the receiving water flows available for dilution, mixing zone restrictions, upstream concentrations of substances, and the variability associated with the parameter discharged. Many of the numeric criteria values are dependent on other water quality parameters such as pH, temperature, and hardness. Water quality criteria may be based on acute and chronic aquatic life criteria or human health criteria.

The types of pollutants addressed are:

- Toxic pollutants: sometimes referred to as "priority pollutants." EPA identified 129 pollutants from the 65 families of pollutants specified in Section 307(a) of the CWA. These pollutants are listed at 40 C.F.R. Part 423, Appendix A.
- Conventional pollutants: the five pollutants as defined by Section 304(a)(4) of the CWA and listed at 40 C.F.R. § 401.16. These are:
- Biochemical oxygen demand (BOD_5) or other oxygen demands
- Total suspended solids (non-filterable) (TSS)
- pH
- fecal coliform bacteria (FCB) or *E. coli*
- oil and grease (O&G)
- Nonconventional pollutants: any pollutant not already defined as a toxic or conventional pollutant.

4.2 Post-Third Round NPDES Permit Implementation Strategy

Over the history of the NPDES permit program, EPA has focused on two primary concepts to abate the discharge of pollutants. First, EPA has utilized a technology-based control approach. This was reflected in permits originally issued with requirements for secondary treatment (municipalities) and BPT (industries). More recently, permits have required implementation of the BCT, BAT (industries), and pretreatment program development (municipalities). Secondly, EPA has addressed water quality as impacted primarily by conventional (or oxygen demanding) parameters. This has occurred through the use of specific state WQS (and the resulting Water Quality Management Plans) for specific pollutants. EPA Region 6 moved into the "third round" of NPDES permits in 1987. The focus of these "post BAT" permits was to move beyond the first two phases of control and ensure that adequate controls are being implemented to confirm that human health and aquatic life are being adequately protected on a site-specific receiving stream basis. EPA Region 6 developed its third-round policy on March 11, 1987, adopted a strategy to implement this policy on April 1, 1987, and revised this policy on October 31, 1989. On October 1, 1992, and in support of the National Policy, EPA Region 6 adopted a policy for Post Third Round NPDES permitting. DEQ has adopted EPA Region 6 *"Post-Third Round Permitting Strategy"* as an implementation procedure. The following sections describe the strategy used to ensure that a discharge meets the requirements of these procedures.

4.3 Analytical Method Sensitivity and Reporting

For the purposes of this document, "Minimum Quantitation Limit" (MQL) is synonymous with the following terms related to analytical method sensitivity: "minimum quantification limit," "minimum level,"[6] "quantitation level," "reporting limit," "level of quantitation," and "limit of quantitation."

Minimum Quantitation Limit (MQL) refers to either the sample concentration corresponding to the lowest calibration point in a method **or** a multiple of the method detection limit (approximately 3 × method detection limit), whichever is higher. At the MQL, the lab can confidently qualitate and quantitate a target analyte. Any values below the MQL are considered "estimated."

The method detection limit is defined as "the minimum concentration of a substance that can be measured and reported with 99% confidence that the measured concentration is distinguishable from method blank results."[7] In other words, the method detection limit is the lowest concentration at which the lab can determine a substance is present. However, the lab cannot accurately quantify the amount present at the method detection limit concentration. The method detection limit is a statistical determination using results of analysis of replicate samples spiked at very low values and this limit may vary from lab to lab.

[6] Term for Minimum Quantitation Limit (MQL) as used in the 40 C.F.R.
[7] Appendix B to 40 C.F.R. Part 136, Method Update Rule, August 7, 2017.

"Sufficiently sensitive" EPA approved analytical methods capable of detecting and quantifying pollutants at, or below, the Required Minimum Quantitation Limit (MQL) are mandatory. An EPA approved method is considered "sufficiently sensitive" where one of the following criteria (A, B, or C) is met:

A. The laboratory Achieved MQL ≤ the Required MQL; or
B. The laboratory Achieved MQL > the Required MQL, but the amount of the pollutant in a facility's discharge is high enough that the method detects and quantifies the level of the pollutant; or
C. The method has the lowest MQL of the analytical methods approved under 40 C.F.R. Part 136 or required under any applicable effluent limit guideline (ELG) found in 40 C.F.R. Parts 400 through 471 for the measured parameter.

When there is no analytical method that has been approved under 40 C.F.R. Part 136, and is not otherwise required by the Director, the applicant may use any suitable method but shall provide a description of the method. When selecting a suitable method, other factors such as a method's precision, accuracy, or resolution, may be considered when assessing the performance of the method.

4.4 Minimum Quantitation Limits (MQLs)

Table 4-1 lists the Minimum Quantitation Limits (MQLs) based on 40 C.F.R. Part 136. The MQL is defined as the lowest concentration at which a particular substance can be quantitatively measured. Although the listed MQLs are the lowest concentrations required to be used in the calibration of a measurement system, they are not necessarily the minimum acceptable sensitivity. They were chosen to be appropriate for a scan of all pollutants present in a discharge and do not represent the most sensitive analysis that may be achieved for a particular pollutant (volatile and semi volatile organics).

Table 4-1: Minimum Quantitation Limits (MQLs)

Metals and Cyanide		MQL (µg/l)
Aluminum	(Total Recoverable)	2.5 [2]
Antimony	(Total Recoverable)	60 [1]
Arsenic	(Total Recoverable)	0.5 [1]
Beryllium	(Total Recoverable)	0.5 [1]
Cadmium	(Total Recoverable)	0.5 [2]
Chromium	(Total Recoverable)	10 [1]
Chromium	(3+)	10 [1]
Chromium, dissolved	(6+)	10 [1]
Copper	(Total Recoverable)	0.5 [2]
Lead	(Total Recoverable)	0.5 [2]
Mercury	(Total Recoverable)	0.005 [1]
Molybdenum	(Total Recoverable)	30 [9]
Nickel	(Total Recoverable)	0.5 [1]

Table 4-1: Minimum Quantitation Limits (MQLs)		
Selenium	(Total Recoverable)	5 [1]
Silver	(Total Recoverable)	0.5 [2]
Thallium	(Total Recoverable)	0.5 [1]
Zinc	(Total Recoverable)	20 [1]
Phenols	(Total Recoverable)	5
Cyanide	(Total Recoverable)	10 [1]
Dioxin		**MQL (µg/l)**
2,3,7,8-Tetrachloro-dibenzo-p-dioxin (TCDD)		0.00001
Volatile Compounds		**MQL (µg/l)**
Acrolein[4]		50
Acrylonitrile[4]		20
Benzene[4]		10
Bromoform[5]		10
Carbon Tetrachloride[5]		2
Chlorobenzene[5]		10
Chlorodibromomethane[5]		10
Chloroethane[6]		50
2-Chloroethyl vinyl ether[4]		10
Chloroform[5]		10
Dichlorobromomethane[5]		10
1,1-Dichloroethane[5]		10
1,2-Dichloroethane[5]		10
1,1-Dichloroethylene[5]		10
1,2-Dichloropropane[5]		10
1,3-Dichloropropylene[5]		10
Ethylbenzene[5]		10
Methyl Bromide [Bromomethane][6]		50
Methyl Chloride [Chloromethane][6]		50
Methylene Chloride[5]		20
1,1,2,2-Tetrachloroethane[5]		10
Tetrachloroethylene[5]		10
Toluene[5]		10
1,2-trans-Dichloroethylene[5]		10
1,1,1-Trichloroethane[5]		10
1,1,2-Trichloroethane[5]		10
Trichloroethylene[5]		10
Vinyl Chloride[5]		10
Acid Compounds		**MQL (µg/l)**
2-Chlorophenol		10
2,4-Dichlorophenol[5]		10
2,4-Dimethylphenol[7]		10
4,6-Dinitro-o-Cresol [2 methyl 4,6-dinitrophenol][8]		50
2,4-Dinitrophenol[5]		50
2-Nitrophenol[6]		20

Table 4-1: Minimum Quantitation Limits (MQLs)	
4-Nitrophenol[5]	50
p-Chloro-m-Cresol [4 chloro-3-methylphenol][5]	10
Pentachlorophenol[5]	5
Phenol[5]	10
2,4,6-Trichlorophenol[5]	10
Base/Neutral Compounds	**MQL (μg/l)**
Acenaphthene	10
Acenaphthylene[5]	10
Anthracene[5]	10
Benzidine[4]	50
Benzo(a)anthracene[5]	5
Benzo(a)pyrene[5]	5
3,4-Benzofluoranthene[5]	10
Benzo(ghi)perylene[6]	20
Benzo(k)fluoranthene[5]	5
Bis(2-chloroethoxy) methane[5]	10
Bis(2-chloroethyl) ether[5]	10
Bis(2-chloroisopropyl) ether[5]	10
Bis(2-ethylhexyl) phthalate[5]	10
4-Bromophenyl phenyl ether[5]	10
Butyl benzyl phthalate[5]	10
2-Chloronapthalene[5]	10
4-Chlorophenyl phenyl ether[5]	10
Chrysene[5]	5
Dibenzo (a,h) anthracene[6]	5
1,2-Dichlorobenzene[5]	10
1,3-Dichlorobenzene[5]	10
1,4-Dichlorobenzene[5]	10
3,3'-Dichlorobenzidine[6]	5
Diethyl Phthalate[5]	10
Dimethyl Phthalate[5]	10
Di-n-Butyl Phthalate[5]	10
2,4-Dinitrotoluene[5]	10
2,6-Dinitrotoluene[5]	10
Di-n-octyl Phthalate[5]	10
1,2-Diphenylhydrazine[4]	20
Fluoranthene[5]	--
Fluorene[5]	10
Hexachlorobenzene[5]	5
Hexachlorobutadiene[5]	10
Hexachlorocyclopentadiene[5]	10
Hexachloroethane[6]	20
Indeno (1,2,3-cd) pyrene (2,3-ophenylene pyrene)	5
Isophorone[5]	10
Naphthalene[5]	10
Nitrobenzene[5]	10

Table 4-1: Minimum Quantitation Limits (MQLs)	
N-nitrosodimethylamine[6]	50
N-nitrosodi-n-propylamine[6]	20
N-nitrosodiphenylamine[6]	20
Phenanthrene[5]	10
Pyrene[5]	10
1,2,4-Trichlorobenzene[5]	10
Pesticides	**MQL (µg/l)**
Aldrin	0.01
Alpha-BHC[7]	0.05
Beta-BHC[7]	0.05
Gamma-BHC (Lindane)[7]	0.05
Delta-BHC[7]	0.05
Chlordane[7]	0.2
4,4'-DDT[7]	0.02
4,4'-DDE (p,p-DDX)[7]	0.1
4,4'-DDD (p,p-TDE)[7]	0.1
Dieldrin[7]	0.02
Alpha-endosulfan[7]	0.01
Beta-endosulfan[7]	0.02
Endosulfan sulfate[7]	0.1
Endrin[7]	0.02
Endrin aldehyde[7]	0.1
Heptachlor[7]	0.01
Heptachlor epoxide (BHC-hexachlorocyclohexane)	0.01
Chlorpyrifos	0.07
PCB-1242	0.2
PCB-1254	0.2
PCB-1221	0.2
PCB-1232	0.2
PCB-1248	0.2
PCB-1260	0.2
PCB-1016	0.2
Toxaphene[7]	0.3
Cyanotoxins	**MQL (µg/l)**
Microcystin	0.1 [10]
Cylindrospermopsin	0.04 [10]

[1] CRDL (Contract Required Detection Level).

[2] Method 200.8, 213.2, 239.2, 220.2, 272.2.

[3] Dioxin National Strategy.

[4] No CRQL (Contract Required Quantitation Limit) established.

[5] CRQL basis, equivalent to ML (Minimum Level).

[6] ML basis, higher than CRQL.

[7] CRQL basis, no ML established.

[8] CRQL basis, higher than ML.

[9] Based on ×3.3 Instrument Detection Level published in 40 C.F.R. Part 136, Appendix C.

[10] Based on Abraxis Test Kit User Guides.

4.5 Screening Factors and Reasonable Potential

Screening factors or multipliers are used to compensate for small data sets. Larger data sets are more desirable because they are generally less variable and more representative of the discharge than smaller data sets. DEQ typically makes reasonable potential determinations for toxic pollutants based on the 95th percentile of effluent concentrations. There is high uncertainty in calculating a 95th percentile from 20 or fewer data points. Therefore, a screening factor is used to estimate the 95th percentile when 20 or fewer representative samples are available.

Either the Region 6 Approach or the TSD Method (see Sections 4.5.1 and 4.5.2 below) will be used to estimate the 95th percentile. When no other information is available, the data sets are assumed to be log-normally distributed with a Coefficient of Variation (CV) of 0.6 based on EPA's guidance in the Technical Support Document (TSD) [EPA 505/2-90-001 March 1991]. The CV may be calculated if at least 10 representative effluent samples are available. The CV of a data set is calculated as the standard deviation of the data set divided by the mean of the data set.

The estimated 95th percentile will be used to calculate an IWC, and the estimated IWC will be compared against applicable water quality criteria (see Section 4.8). When this estimated IWC exceeds an applicable water quality criterion, DEQ will determine that either:

A. Additional data is needed to evaluate reasonable potential for the parameter. A monitoring and reporting requirement will be added to the permit to collect additional data. Reasonable potential will be evaluated during the next permit renewal; or
B. The discharge shows reasonable potential to cause or contribute to an exceedance of water quality criteria.

DEQ will consider the following factors when determining whether additional data is needed, or reasonable potential can be established by a small data set:

- The IWC calculated from the maximum sample value (before applying a screening factor) compared to the water quality criteria;
- Sample variance;
- Number of non-detect samples; and
- Other relevant information.

If 21 or more representative facility-specific effluent samples are available, the 95th percentile of the data set will be used to determine reasonable potential. Use of a screening factor is not needed in this situation.

During development of draft NPDES permits, permit writers will document the steps taken and methods selected to evaluate the available data, including any other factors taken into consideration to reach the permit decision applicable to reasonable potential analysis, effluent limitations, and/or monitoring requirements.

4.5.1 USEPA Region 6 Approach (for Effluent Data Sets of 20 or Fewer Values)

If 20 or fewer representative effluent samples are available, the Region 6 Approach for Determining Reasonable Potential may be used. Region 6 developed a procedure to extrapolate limited data sets to better evaluate the potential for the higher effluent concentrations to exceed State water quality criteria. This method yields an estimate of a selected upper percentile value. If one assumes the population of effluent concentrations to fit a lognormal distribution, the relationship of the percentile to the geometric mean is given by:

$$C_p = C_{geomean} \times e^{(Z_p \times \sigma - 0.5 \times \sigma^2)}$$

where Z_p is the normal distribution factor at the p^{th} percentile and

$$\sigma^2 = \ln{(CV^2 + 1)}$$

To calculate the estimate of the 95^{th} percentile, the specific relationship becomes:

$$C_{95} = C_{geomean} \times e^{(1.645 \times \sigma - 0.5 \times \sigma^2)}$$

If CV is assumed to be 0.6, $\sigma^2 = 0.307$

Therefore, the ratio of the estimated 95th percentile to the geometric mean is calculated as follows:

$$\frac{C_{95}}{C_{geomean}} = e^{(1.645 \times 0.307 - 0.5 \times 0.307^2)} = 2.13$$

A single effluent value or the geometric mean of a group of values is multiplied by the screening factor of 2.13 to yield the estimate of the 95th percentile value.

4.5.2 TSD Method (for Effluent Data Sets of 10 – 20 Values)

If 10 to 20 representative effluent samples are available, the TSD Method (detailed in Chapter 3.3.2 of the Technical Support Document (TSD) [EPA 505/2-90-001 March 1991]) may be used. DEQ will typically implement this method using a confidence level of 95%. In this method, the maximum value of a data set is assumed to represent the p^{th} percentile of the population:

$$p = (1 - 0.95)^{1/n}$$

where n is the number of samples.

Because of the high uncertainty in estimating the percentile of the maximum value of less than 10 samples at 95% confidence, the TSD method will not typically be used when n is less than 10.

The ratio of the 95th percentile to the pth percentile can be calculated using the below formula:

$$\frac{C_{95}}{C_p} = \frac{e^{(1.645 \times \sigma - 0.5 \times \sigma^2)}}{e^{(Z_p \times \sigma - 0.5 \times \sigma^2)}}$$

Table 4-2 is copied from the TSD and provides the results of the above equation for sample sizes (n) of 10 through 20 and coefficients of variation (CV) of 0.1 through 2.0. When no other information is available, the data sets are assumed to be log-normally distributed with a Coefficient of Variation (CV) of 0.6, based on EPA’s guidance in the Technical Support Document (TSD) [EPA 505/2-90-001 March 1991]. The CV may be calculated if at least 10 representative effluent samples are available. The CV of a data set is calculated as the standard deviation of the data set divided by the mean of the data set.

The maximum value of a data set is multiplied by the screening factor to yield the estimate of the 95th percentile value.

Table 4-2: TSD Method Screening Factors[8]

		Coefficient of Variation (CV)																			
		0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**	**1.1**	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**2.0**
Number of Samples (n)	**10**	1.1	1.2	1.3	1.5	1.6	1.7	1.9	2.0	2.2	2.3	2.4	2.6	2.7	2.8	3.0	3.1	3.2	3.3	3.4	3.6
	11	1.1	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2.1	2.2	2.3	2.4	2.5	2.7	2.8	2.9	3.0	3.1	3.2	3.3
	12	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.0
	13	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.8	2.9
	14	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.6	2.7
	15	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.5
	16	1.1	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.4
	17	1.1	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.3
	18	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2
	19	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.0	2.0	2.0	2.1	2.1
	20	1.1	1.1	1.2	1.2	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9	1.9	2.0	2.0	2.0

4.6 False Positives

Data submitted and certified on a discharge monitoring report is presumed to be valid data. However, it is possible for lab, sampling, data entry, or other errors to produce false positive results that come to light only after results are reported. In such a case, the permittee may submit an amended discharge monitoring report with an explanation of the evidence. If the permittee can demonstrate, to the Division's satisfaction, that the result is truly a false positive, it may be removed from the permittee's record, and the reasonable potential (RP) analysis may continue without further consideration of the known false positive result.

4.7 Non-Representative Data or Data Determined to be Inappropriate

Non-representative data or data determined to be inappropriate should not be used in the evaluation process. Examples of such situations include: data points representing statistical outliers (any data greater than the average plus or minus 2 standard deviations), data collected prior to significant changes in inputs or processes, data collected greater than four and a half years prior to the date of evaluation, inappropriate laboratory or method Quality Assurance/Quality Control (QA/QC), use of a non-accredited laboratory, use of unapproved sampling and analytical methods, and insufficient analytical sensitivity. In general, data will not be discarded unless it is determined to be non-representative or inappropriate for any of the reasons stated above. If data are determined not to be or are no longer representative of the permitted discharge, the basis of that determination is documented in the fact sheet or statement of basis.

[8] Technical Support Document for Water Quality-Based Toxics Control (March 1991), Table 3-2.

4.8 Evaluation of Toxic Effluent Data

The toxic concentration of each effluent pollutant after mixing with the receiving stream flow is compared with the applicable state water quality standards (WQS) established in 8 CAR Part 21. For evaluating toxic substances not listed in 8 CAR Part 21, other EPA literature values may be considered as appropriate.

The steps in Table 4-3 show the sequence of activities and calculations required to conduct a reasonable potential analysis on reported effluent data:

Table 4-3: Sequence of Activities and Calculations Required to Conduct a Reasonable Potential Analysis on Reported Effluent Data

Step 1 Identify substances	Examine the effluent monitoring record and identify those substances for which instream criteria exist (i.e., WQS).
Step 2 Calculate effluent statistics	Determine number of data points and follow procedure given in Section 4.5.1 or 4.5.2.
Step 3 Calculate receiving water flow statistics	Generate or obtain receiving water flow statistics for 7Q10 and Long-Term Average Flow (critical conditions). Use applicable percentage of flow for applicable mixing zone (MZ) and zone of initial dilution (ZID).
Step 4 Estimate upstream substance concentrations	Obtain data for upstream concentrations (if available). Typically use the geometric mean of data set.
Step 5 Mass balance equation	Use the mass balance equation to calculate an instream waste concentration (IWC) at the edge of the chronic mixing zone and at the edge of the acute zone of initial dilution (ZID) for each identified substance
Step 6 Compare IWC calculated result with criteria value	Compare the calculated values with the corresponding criteria. If any are exceeded, consider deriving a permit limit for that parameter and document in the fact sheet or statement of basis.

4.8.1 Reasonable Potential Calculations

If RP to cause an instream excursion above the numeric water quality standard is determined to be shown, the permit must contain effluent limits for the pollutant based on 40 C.F.R. § 122.44(d)(1)(iii)[9].

Calculate the pollutant IWC, as shown in the following equation:

$$IWC = \frac{(C_e \times Q_e) + (C_b \times Q_b)}{(Q_e + Q_b)}$$

Where:

C_e = Pollutant concentration in the effluent (mg/l)
C_b = Pollutant concentration upstream (mg/l)
Q_e = Effluent flow (cfs) [Note: cfs = MGD × 1.547]
Q_b = fraction of upstream flow (cfs) based on MZ and ZID

1. Evaluate and calculate effluent concentration $\boldsymbol{C_e}$ (Section 4.8.2).
2. Evaluate and calculate upstream water quality $\boldsymbol{C_b}$ (Section 4.9).
3. Effluent flow $\boldsymbol{Q_e}$ (Section 4.13.1).
4. Fraction of upstream flow (based on chronic mixing zone and acute zone of initial dilution $\boldsymbol{Q_b}$ (Section 4.12.1).

4.8.2 Effluent Toxic Data Evaluation

An important step (1st step) in performing a reasonable potential evaluation is to ensure that data used to characterize effluent and receiving water quality is defensible and is representative.

Concentrations reported as total recoverable can be converted to the dissolved form or dissolved WQ toxic criteria can be converted to total recoverable by use of the translator formula (see Section 4.10.5).

It is the intent for applicants and permittees to use analytical methods capable of detecting and measuring the pollutants at or below the required minimum quantitation limits (MQLs) shown in Table 4-1. On the Priority Pollutant Scan (PPS) form, EPA application form, or DEQ electronic application form, the permittee will enter the laboratory's "Achieved MQL," which may be lower than the required MQL.

[9] 40 C.F.R. § 122.44(d)(1)(iii) is included by reference in 8 CAR Part 25.

The following scenarios should be considered during a reasonable potential evaluation:

Non-detect results that meet the required MQL

Laboratories sometimes report “Non-detect (ND)” rather than “less than (<) achieved MQL” values (e.g. “ND” rather than “< 10 µg/l”). When this situation occurs and the entire data set consists of only a single ND or all values in the data set are ND, no further evaluation is necessary. The same procedure is used when all values in the dataset are “< achieved MQL” and the achieved MQL is less than or equal to the required MQL.

Example 1 for Zinc:

Table 4-4A: Reasonable Potential Evaluation Example for Non-Detect Results that Meet the Required MQL

Required MQL	Achieved MQL	Reported Value	Evaluation
20 µg/l	10 µg/l	ND	No further evaluation is necessary
20 µg/l	10 µg/l	< 10 µg/l	No further evaluation is necessary

Non-detect results that do not meet the required MQL

When the applicant reports “ND” or “less than (<) achieved MQL” (such as < 40 µg/l), but the achieved MQL was greater than or equal to the required MQL: no judgement regarding the presence of analyte in the sample can be made. The sample could contain no target analyte at all or could contain an amount just below the MQL. Given this uncertainty, DEQ may require additional samples that meet the required MQL. “ND” or “< achieved MQL” samples where the achieved MQL was greater than or equal to the required MQL are discarded from analysis if the applicant resamples and provides new results that meet the required MQL. If the applicant does not provide additional samples, the analytical results of “ND” or “< achieved MQL” samples that do not meet the required MQL are considered to be equal to the achieved MQL for evaluation purposes.

<u>Example 2 for Zinc:</u>

Table 4-4B: Reasonable Potential Evaluation Example for Non-Detect Results that Do Not Meet the Required MQL			
Required MQL	**Achieved MQL**	**Reported Value**	**Evaluation**
20 µg/l	40 µg/l	ND	Assume present at the MQL (40 µg/l) or require resampling
20 µg/l	40 µg/l	< 40 µg/l	Assume present at the MQL (40 µg/l) or require resampling

When the applicant reports the actual value, equal to or above the achieved MQL (such as 12 µg/l), the reported value will be used in evaluation.

<u>Example 3 for Zinc:</u>

Table 4-4C: Reasonable Potential Evaluation Example for Reported Values Above or Equal to the Achieved MQL			
Required MQL	**Achieved MQL**	**Reported Value**	**Evaluation**
20 µg/l	20 µg/l	20 µg/l	use 20 µg/l
20 µg/l	10 µg/l	12 µg/l	use 12 µg/l

If the data set consists of a mixture of non-detect results and detected values, then the non-detect results (provided that the achieved MQL is less than or equal to the required MQL) are considered to be ½ the achieved MQL and used in conjunction with the detected values for evaluation purposes.

<u>Example 4 for Zinc:</u>

Table 4-4D: Reasonable Potential Evaluation Example for Mixed Reported Values			
Required MQL	**Achieved MQL**	**Reported Value**	**Evaluation**
20 µg/l	10 µg/l	ND	use 5 µg/l
		< 10 µg/l	use 5 µg/l
		10 µg/l	use 10 µg/l
		12 µg/l	use 12 µg/l

Table 4-4E summarizes how the results are evaluated for the various scenarios shown in Tables 4-4A through 4-4D:

Table 4-4E: Zinc Scenario Summary

Ex.	Required MQL	Achieved MQL	Reported Value	Evaluation
1	20 µg/l	10 µg/l	ND or <10 µg/l	No further evaluation is necessary
2	20 µg/l	40 µg/l	< 40 µg/l	Assume present at the achieved MQL (40 µg/l) or require resampling
3	20 µg/l	10 µg/l	10 µg/l	10 µg/l
			12 µg/l	12 µg/l
4	20 µg/l	10 µg/l	Data set of the following results when a geometric mean is calculated:	Use:
			ND	5 µg/l (1/2 the achieved MQL)
			< 10 µg/l	5 µg/l (1/2 the achieved MQL)
			10 µg/l	10 µg/l
			12 µg/l	12 µg/l

Office of Water Quality should consider best engineering judgment for situations that do not fit any of the scenarios shown in Table 4-4E.

4.8.3 Additional Data Evaluation

In most situations, a singular datum will be available for the initial screening and DEQ will have to assume that the available datum is representative of the effluent characteristics of the respective pollutant. In some cases, the evaluation will result in the inclusion of the limit in the draft permit. If prior to finalization of the permit, the permittee submits additional data, the new data will be reviewed and the draft limit will be reevaluated. Additional monitoring may be required in the permit to be evaluated during the next permit renewal or as specified in the permit.

4.9 Upstream Receiving Water Toxic Data Evaluation

For upstream data, calculate the geometric mean of the data set for evaluation of reasonable potential. At least 5 years of data, if available, should be used.

4.10 State Numerical Aquatic Toxicity Criteria Calculations

The APC&EC has adopted specific numeric criteria for protection of aquatic life acute and chronic toxicity in 8 CAR § 21-508. Most dissolved metals shall be calculated based on a water-effect ratio (WER) and total hardness. Certain toxic substances shall be calculated based on pH.

Note: 40 C.F.R. § 122.45(c) requires that effluent limits for metals in NPDES permits be expressed as total recoverable, unless:

1) an applicable effluent standard or limitation has been promulgated under the CWA and specifies the limitation for the metal in the dissolved or valent or total form; or
2) in establishing permit limitations on a case-by-case basis under § 125.3, it is necessary to express the limitation on the metal in the dissolved or valent or total form to carry out the provisions of the CWA; or
3) all approved analytical methods for the metal inherently measure only its dissolved form (e.g., hexavalent chromium).

4.10.1 Water-Effect Ratio (WER)

A water-effect ratio (WER) of 1 is assigned to the criteria calculation equation. To be assigned a value other than 1, the permittee must provide DEQ an adequate study or studies to support the use of a different value. The WER may be used to adjust the criteria to a site-specific value. If the ultra-clean analysis and source examination still indicates the permittee cannot comply with the limits, the permittee may perform a site-specific water-effect ratio. See 40 C.F.R. § 131, "Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; State Compliance."

The WER approach compares bioavailability and toxicity of a specific pollutant in a receiving water and in laboratory test water. It involves running toxicity tests for at least two species, measuring LC50 for the pollutant using the local receiving water collected from the site where the criterion is being implemented, and laboratory toxicity testing water made comparable to the site water in terms of chemical hardness. The ratio between site water and lab water LC50 is used to adjust the state acute and chronic criteria to site specific values.

The WER is computed as a specific pollutant's acute or chronic value measured in water from the site covered by the standard, divided by the respective acute or chronic toxicity value in laboratory water. The acute value used is the LC50 generated by standard toxicity testing protocol. More simply, the WER is the LC50 of receiving stream-effluent mix (site water) versus the LC50 of laboratory water. An LC50 is the concentration of a toxicant (metal) which is lethal to 50% of the test organisms.

4.10.1.1 Requirements for Development of Water-Effect Ratio (WER)

Each WER determined must be specific for a single pollutant. For Aluminum, Copper, Cadmium, Mercury, Nickel, Lead, Silver, and Zinc, a WER is not accepted. For these pollutants, a biotic ligand model (BLM) or multiple linear regression (MLR) for site-specific criteria development should be used. See Sections 4.10.2 and 4.10.3.

A permittee who elects to do a WER study must submit a study plan for review before conducting the study to the Water Quality Planning Branch of the DEQ Office of Water Quality. In some waterbodies there may be no practical advantage in conducting the study. The guidance for conducting a study to establish a WER can be found on the EPA website. Submission of the final report for WER determination should be at least 12 months prior to the effective date of final permit limits to allow for review by DEQ and submission to EPA for review and comments. If comments are not received from EPA on the WER within 60 days of submission, the facility may proceed with the third-party rulemaking process. Any changes to the final limits will be handled through the permit major modification and revision process of 8 CAR Part 21.

Note: WERs are only relevant to metals.

4.10.2 Biotic Ligand Model (BLM) for Site-Specific Criteria Development for Copper and Other BLM Metals as Available

The BLM is a metal bioavailability model that uses the latest science and information on water chemistry conditions in a waterbody to calculate a site-specific water quality criterion for Copper and other BLM metals as available. The scientific basis of the BLM is that toxicity is primarily related to the amount of metal bound to a biochemical receptor on an organism (e.g., gill membrane on a fish). Many water quality characteristics can affect the bioavailability, and thus the toxicity, of the toxic metal of interest.

The ambient water quality input parameters needed to run the BLM model are given as follows:

- Temperature (measured in the field)
- pH (measured in the field)
- Dissolved organic carbon (DOC)
- Major cations (calcium, magnesium, sodium, and potassium)
- Major anions (sulfate and chloride)
- Alkalinity
- Sulfide
- Humic Acid

Each BLM model run results in a single instantaneous criterion based on a single data set of inputs. An instantaneous criterion is a "snapshot in time" (i.e., it is a criterion that reflects the water chemistry at one specific instant in time and at one specific location). Because some of the BLM input parameters are known to vary seasonally, DEQ recommends that multiple data sets of inputs be used which reflect the seasonal variability of the input parameters over the course of all seasons. At a minimum, samples of all BLM input parameters should be taken once per month for a twelve-month period in the waterbody of interest in order to derive a site-specific criterion that is representative of seasonal variations. BLM samples should be taken after complete mixing. Additional sampling could be conducted upstream and the site-specific criteria could be based on the more stringent of the upstream or downstream sample results. If the water quality parameters and BLM-derived criteria are relatively constant over a range of seasonal and flow conditions, then using the geometric mean of all BLM-derived instantaneous criteria may be appropriate. Conversely, if a waterbody exhibits significant seasonal variations in the input parameters and BLM-derived instantaneous criteria, then it may be best to develop seasonal criteria using seasonal geometric means. If no seasonal pattern is identified in the input parameters and BLM-derived instantaneous criteria, then it may be appropriate to calculate site-specific criteria as a lower percentile of the instantaneous criteria.

DEQ strongly encourages any facility that plans to pursue development of site-specific criteria to first submit a BLM sampling plan to the Planning Branch of the Office of Water Quality for review and approval prior to beginning the sampling. Although DOC is not a regulated contaminant, there are several scientifically defensible methods available to measure DOC, such as EPA Method 415.3, as well as methods developed by ASTM International and *Standard Methods for the Examination of Water and Wastewater*.

BLM Model Software and User Manual can be viewed and downloaded from the following link:

https://www.windwardenv.com/biotic-ligand-model/

4.10.3 Multiple Linear Regression (MLR) for Site-Specific Criteria for Aluminum and Other MLR Metals as Available

The MLR is a metal bioavailability model that can be used to calculate a site-specific water quality criterion for metals. MLR models normalize the toxicity data and provide a range of acceptable values. MLR models are empirically-based, statistically derived approaches to incorporating toxicity modifying factors (TMF) to predict metal toxicity across a range of water chemistries where there are direct measurements of the influence of water chemistry on metal toxicity.

The ambient water quality input parameters needed to run an MLR model are given as follows:

- pH (measured in the field)
- Total hardness
- Dissolved organic carbon (DOC)

DEQ strongly encourages any facility that plans to pursue development of site-specific criteria to first submit a MLR sampling plan to the Planning Branch of the Office of Water Quality for review and approval prior to beginning the sampling.

MLR Aluminum Criteria Calculator (xlsm) and R Code can be viewed and downloaded from the EPA website.

4.10.4 Other Scientifically Defensible Approaches for Development of Site-Specific Aquatic Toxicity Criteria

Other scientifically defensible approaches for development of site-specific toxicity criteria may be employed.

DEQ strongly encourages any facility that plans to pursue development of site-specific criteria to first submit a sampling plan to the Planning Branch of the Office of Water Quality for review and approval prior to beginning the sampling.

4.10.5 Conversion Factors and Translators for Metal Criteria

8 CAR § 21-508 establishes numerical criteria for toxic pollutants. Dissolved metal criteria is converted to total metal using the translator mechanism that utilizes the statewide partition coefficient outlined below prior to comparison with the IWC calculated using total metal effluent data.

Dissolved metals WQS established in 8 CAR § 21-508 will be converted to total metal values by the use of statewide linear partition coefficients for streams and lakes, based on site-specific TSS values/measurements (Delos et., al, 1984, *Technical Guidance for Performing Wasteload Allocation Book II: Streams and Rivers. Chapter 3: Toxic Substances, for U.S. Environmental Protection Agency* (EPA-440/4-84-022). This translator mechanism involves determining a linear partition coefficient for the metal of concern and using this to determine the fraction of metal dissolved so that the dissolved metal ambient criteria may be eventually translated to a total metal effluent limit. The mechanism has been adopted and is widely used in other states within the region. TSS (mg/l) is a variable within the conversion function.

4.10.5.1 Linear Partition Coefficient Formula

The linear partition coefficient formula for streams and lakes is as follows:

$$K_p = K_{po} \times TSS^{\alpha}$$

Then,

$$\frac{C}{C_T} = \left(\frac{1}{(1 + (K_p)(TSS)(10^{-6})}\right)$$

Where:

K_p	=	Linear partition coefficient
K_{po}	=	Obtained from Table 4-5
α	=	Obtained from Table 4-5
TSS	=	Total Suspended Solids (mg/l)
$\frac{C}{C_T}$	=	Fraction of metal dissolved
C_d	=	Dissolved criteria value for metal in WQS

Therefore;

$$\frac{C}{C_T} = \left(\frac{1}{(1 + (K_{po})(TSS^{(1+\alpha)})(10^{-6})}\right)$$

Then,

$$\textbf{Total Metal} = \frac{C_d}{\left(\frac{C}{C_T}\right)}$$

Table 4-5: Linear Partition Coefficients for Priority Metals in Streams and Lakes[10]

Metal	Streams		Lakes	
	K_{po}	α	K_{po}	α
Arsenic	0.48×10^6	-0.73	0.48×10^6	-0.73
Cadmium	4.00×10^6	-1.13	3.52×10^6	-0.92
Chromium[11]	3.36×10^6	-0.93	2.17×10^6	-0.27
Copper	1.04×10^6	-0.74	2.85×10^6	-0.90

[10] Delos, C. G., W. L. Richardson, J. V. DePinto, R. B. Ambrose, P. W. Rogers, K. Rygwelski, J. P. St. John, W. J. Shaughnessey, T. A. Faha, W.N. Christie. Technical Guidance for performing Waste Load Allocations, Book II: Streams and Rivers. Chapter 3: Toxic Substances, for the U. S. Environmental Protection Agency. (EPA-440/4-84-022).

[11] Linear partition coefficients shall not apply to the Chromium VI numerical criterion. The approved analytical method for Chromium VI measures only the dissolved form. Therefore, permit limits for Chromium VI shall be expressed in the dissolved form.

Table 4-5: Linear Partition Coefficients for Priority Metals in Streams and Lakes[10]				
Metal	**Streams**		**Lakes**	
	K_{po}	α	K_{po}	α
Lead[12]	2.80×10^6	-0.80	2.04×10^6	-0.53
Mercury	2.90×10^6	-1.14	1.97×10^6	-1.17
Nickel	0.49×10^6	-0.57	2.21×10^6	-0.76
Silver[13]	2.40×10^6	-1.03	Assume equal to stream	
Zinc	1.25×10^6	-0.70	3.34×10^6	-0.68

Note: A reopener clause shall be placed in the permit in the event the permittee develops a site-specific partition coefficient. The permit may be reopened to include the revised permit limits based on a site-specific partition coefficient. In cases where no partitioning coefficient is available, direct application of the standard is used unless a site-specific partitioning coefficient is developed.

4.11 Upstream Variability

Some criteria vary with other chemical or physical parameters. The aquatic life criteria for some metals in freshwater vary with hardness of the receiving water. The criteria for ammonia vary with temperature and pH. The following receiving stream hardness, pH, and TSS shall be used for calculations as necessary:

4.11.1 Hardness

Hardness is based on Table 4-6 on the following pages. Alternative site-specific hardness data may be considered on a case-by-case basis.

[12] Reference page 18 of EPA memo dated March 3, 1992, from Margaret J. Staiskowski (WH-586) to Water Management Division Directors, Region I-IX.
[13] Texas Environmental Advisory Council, 1994.

Table 4-6: Mean Hardness by Receiving Stream and Ecoregion			
Stream Values		**Monitoring Station ID**	**Monitoring Period**
Arkansas River	122 mg/l	ARK0033 ARK0030 ARK0030B ARK0046 ARK0048	1995-2023
Red River	178mg/l	RED0025 RED0046 RED0045 RED0009	1995-2023
Ouachita River	24 mg/l	OUA0006 OUA006A OUA0008B OUA0021 OUA0030	1995-2023
White River (Beaver Lake dam to mouth)	133 mg/l	WHI0047 WHI0029 WHI0036	1995-2023
Beaver Lake	65 mg/l	LWHI013A LWHI013B LWHI013C	1999-2019
White River (from headwaters to Beaver Lake dam)	25 mg/l	WHI0106 WHI0106B	1995-2023
St. Francis River	107 mg/l	FRA0008 FRA0013 FRA0036	1995-2023

Table 4-6: Mean Hardness by Receiving Stream and Ecoregion			
Ecoregion Values			
South Central Plains	18 mg/l, use 25 mg/l[14]	OUA0028 OUA0170 UWLGC02 OUA0169 UWFRE01 OUA0043 OUA0167 OUA0166	1995-2023
Ouachita Mountains	36 mg/l	UWSFO01 RED0031 OUA0023 OUA0026 OUA0193 OUA0186	1995-2023
Arkansas Valley	20 mg/l, use 25 mg/l[14]	UWNCC02 ARK0057 ARK0034 UWCCR01	1995-2023
Boston Mountains	16 mg/l, use 25 mg/l[14]**Error! Bookmark not defined.**	ARK0008 ARK0042 ARK0114 ARK0119 ARK0150 UWAFK01	1995-2023
Ozark Highlands	116 mg/l	UWTMC01 WHI0116 WHI0071 WHI0009A ARK0004A WHI0137	1995-2023
Mississippi Alluvial Plain	91 mg/l	FRA0012 WHI0026 WHI0074 UWVGC01	1995-2023

[14] Based on 40 C.F.R. § 131.36(c)(4)(i), the minimum hardness allowed in calculating criteria for metals shall not be less than 25 mg/l, as calcium carbonate, even if the actual ambient hardness is less than 25 mg/l.

4.11.2 pH

The pH values for toxicity evaluation of pentachlorophenol or any other pH-dependent toxic substances will be based on the ecoregion values as stated in Tables 4-10 and 4-11 (see Section 4.15.4). Alternative site-specific pH data may be considered on a case-by-case basis after this data has been submitted to DEQ for review and approval.

4.11.3 TSS

The TSS for the toxics reasonable potential evaluation will be based on Table 4-7 shown below based on the discharger location. An alternative TSS value may be allowed on a case-by-case basis.

Table 4-7: TSS Values to Use in Toxics Reasonable Potential Evaluation

Discharge Location	TSS (mg/l)
Ouachita Mountains Ecoregion	2.0
Ozark Highlands Ecoregion	2.5
Boston Mountains Ecoregion	1.3
Arkansas Valley Ecoregion	3.0
South Central Plains Ecoregion	5.5
Mississippi Alluvial Plain Ecoregion	8.0
Arkansas River (Fort Smith to Dardanelle L&D)	12.0
Arkansas River (Dardanelle L&D to Terry L&D)	10.5
Arkansas River (Terry L&D to L&D No. 5)	8.3
Arkansas River (L&D No. 5 to mouth)	9.0
White River (above Beaver Lake)	Use Ozark Highlands Ecoregion Value
White River (below Bull Shoals Lake to Black River)	3.3
White River (from Black River to mouth)	18.5
St. Francis River	18.0
Ouachita River (above Caddo River)	Use Ouachita Mountains Ecoregion Value
Ouachita River (below Caddo River)	Use South Central Plains Ecoregion Value
Red River	33.0

4.12 Mixing Zone (MZ) and Zone of Initial Dilution (ZID)

A mixing zone is an area where an effluent discharge undergoes mixing with the receiving waterbody. For toxic discharges, a zone of initial dilution (ZID) is applied within the mixing zone for evaluation of acute toxicity. Acute toxicity shall not exist at, or beyond, the edge of the ZID. Chronic toxicity shall not exist at, or beyond, the edge of the mixing zone.

Where mixing zones are allowed, the effects of wastes on the receiving stream shall be determined after the wastes have been thoroughly mixed with the mixing zone volume.

Mixing zones are not allowed for the parameters of bacteria or oil and grease (the water quality criteria must be met at end of pipe). Mixing zones are not allowed for a waste parameter when the upstream concentration of that waste parameter exceeds the specific criteria for that waste parameter.

Lakes and reservoirs shall be evaluated using the jet-mix model or other appropriate models on a case-by-case basis. Mixing zones shall not prevent the free passage of fish or significantly affect aquatic ecosystems.

A mixing zone shall not include any domestic water supply intake.

4.12.1 Stream Mixing Zone Determination

Where mixing zones are allowed, the effects of wastes on the receiving stream shall be determined after the wastes have been thoroughly mixed with the stream water. Outfall structures should be designed to minimize the extent of mixing zones to ensure rapid and complete mixing. Mixing zone determination procedure is as follows:

4.12.1.1 Large Streams (7Q10 ≥ 100 cfs)

For aquatic life toxic substances in larger streams (those with 7Q10 flows equal to or greater than 100 cfs), the mixing zone shall not exceed 1/4 (25%) of the cross-sectional area and critical flow volume of the stream. The remaining 3/4 (75%) of the stream shall be maintained as a zone of passage for swimming and drifting organisms and shall remain of such quality that stream ecosystems are not significantly affected.

4.12.1.2 Small Streams (7Q10 < 100 cfs)

In smaller streams (7Q10 flows less than 100 cfs), no more than 2/3 (67%) of the cross-sectional area and/or critical flow volume of smaller streams should be devoted to mixing zones, thus leaving at least 1/3 (33%) of the cross-sectional area free as a zone of passage for swimming and drifting organisms and shall remain of such quality that stream ecosystems are not significantly affected.

4.12.1.3 Mixing Zone for Chronic Aquatic Life Toxicity (Stream Volumetric Flow-Based Calculations)

- Large Streams (7Q10 ≥ 100 cfs): 25% of the critical flow
  - (0.25 × 7Q10)
- Small Streams (7Q10 < 100 cfs): 67% of the critical flow
  - (0.67 × 7Q10)

4.12.2 ZID (Zone of Initial Dilution) Determination

Calculations for ZID for acute aquatic toxicity and other pollutants with exception of WET (See Chapter 6) are as follows.

4.12.2.1 ZID for Acute Aquatic Life Toxicity (Stream Volumetric Flow Based Calculations)

Large streams listed below,

- with diffuser: 13% of the critical flow
- without diffuser: 6% of the critical flow

  - Mississippi River
  - Arkansas River
  - White River below confluence of Black River
  - Ouachita River below confluence of Little Missouri River
  - Red River

Large streams (7Q10 ≥ 100 cfs) not listed above,

- with or without diffuser: 13% of the critical flow

Small Streams (7Q10 < 100 cfs):

- with or without diffuser: 33% of the critical flow

4.12.3 Lake Mixing Zone and ZID Calculations

Because of the dilution generated by the entrainment of ambient fluid in lakes and reservoirs, the concentration of the contaminant diminishes with distance from the end of discharge pipe. This situation occurs when a fluid is discharged in the environment through a pipe located on the bank of a lake or reservoir, or submerged in a lake or reservoir.[15] In lakes and reservoirs, Mixing Zone and ZID will be determined by using the jet mix equation below. Mixing Zone and ZID for lakes and reservoirs may be considered on a case-by-case basis by site-specific studies.

The following jet mix equation[16] shall be used for Mixing Zone and ZID for lakes and reservoirs:

$$PE = \frac{500 \times D}{X}$$

[15] Section 9.2 of "Environmental Fluid Mechanics," January 2019, Thayer School of Engineering, Dartmouth College. A link to this document is shown below:
https://cushman.host.dartmouth.edu/books/EFM/chap9.pdf

[16] Derived from equation number 9.8 in Section 9.2 of "Environmental Fluid Mechanics," January 2019, Thayer School of Engineering, Dartmouth College. A link to this document is given below:
https://cushman.host.dartmouth.edu/books/EFM/chap9.pdf

Where:

PE	=	Percent effluent at distance X (e.g. a calculated 5 percent effluent = dilution factor of 0.05)
D	=	Discharge pipe diameter (ft)
X	=	Distance from end of discharge pipe (ft)
	=	[Aquatic life criteria] 25 ft for acute criteria (ZID), and 100 feet for chronic criteria (mixing zone)
	=	[Human health criteria] 200 ft for mixing zone
	=	[TP or NO_3+NO_2-N criteria] 200 ft for mixing zone

4.12.4 Critical Flows

Critical flow is the flow volume used as the upstream dilution flow contribution in calculating concentrations of pollutants from permitted discharges and may be adjusted for mixing zones. The following critical flows are applicable:

Table 4-8: Critical Flows

For	**Critical Flow**
Seasonal Aquatic Life	1 cfs minus the design flow of any point source discharge (may not be less than zero (0))
Human Health	Harmonic mean flow (if available) or long-term average flow if harmonic mean flow is not available. 3×(7Q10 flow) may be used when site-specific harmonic mean or long-term average is not available.
Minerals	8 CAR § 21-511(a) Site Specific Mineral Criteria: harmonic mean flow for listed streams without asterisk; 4 cfs for listed streams with asterisk. • 8 CAR § 21-511(c) Domestic Water Supply: 7Q10.
Metals and Conventional Pollutants	7Q10

4.13 Flow Calculations

The following definitions shall be used for calculations including facility and stream flow:

4.13.1 Effluent Flow

Table 4-9: Effluent Flow	
Facility	**Effluent Flow**
POTW or domestic wastewater	Design flow of the facility or other appropriate flow determined on a case-by-case basis.
Industrial wastewater	Highest monthly average flow occurring in the most recent two-year period of record. If a significant seasonal variability in flow is present, a seasonal regulatory effluent flow may be calculated for a particular season of the year. Allowances should be made to account for expected fluctuations in production and resulting discharge levels over the life of the permit. Another reasonable flow may be used at the discretion of DEQ. Additionally, the design flow of the treatment system could be used if actual flow data is determined to be not representative, or if no actual data exists.

4.13.2 Stream Flow

For calculations of permit limits, all flows and data collected throughout the year, including elevated flows due to rainfall events, must be taken into account. The following subsection describes the typical methods of stream flow determinations.

4.13.2.1 Long Term Average Stream Flow

In order to establish a long-term average flow value that represents both the high and the low end of long-term streamflow oscillations, no less than 10 years of daily streamflow data from a gaging station or other flow measurement method is generally used to calculate the long-term average. The long-term average is typically the arithmetic mean. USGS StreamStats web-based program can also be used to get a long-term average flow for select gaged sites.

When site-specific data is unavailable, the long-term average stream flow may be assumed to be equal to 3 times the 7Q10 stream flow.

4.13.2.2 7Q10 Stream Flow

A flow volume equal to the lowest mean daily discharge during seven (7) consecutive days of a year which, on the average, has a recurrence interval of 10 years. A 7Q10 (also written as Q7-10) value is typically based on the latest USGS low flow document (Low-flow Characteristics and Regionalization of Low-Flow Characteristics for Selected Streams in Arkansas, USGS Scientific Investigations Report 2008-5065). USGS

StreamStats web-based program can also be used. The 7Q10 may be updated based on additional gage data that has been verified but not yet published in an updated low flow document. The 7Q10 can be calculated manually using log-Pearson Type III probability statistics or by inputting stream flow data into EPA's DFLOW (a computerized tool for low flow analysis). Other technically approvable means of determining 7Q10 may be considered. A minimum of 10 years of daily streamflow data is generally used to calculate the 7Q10. The 7Q10 may be calculated on an annual or a seasonal basis.

4.13.2.3 Harmonic Mean Flow

Harmonic mean flow is a type of mean flow calculated by summing the reciprocals of individual flow measurements, then dividing the sum by the number of measurements.

4.13.2.3.1 Gaging Station

Data for calculating the harmonic mean flow may be obtained from a USGS gaging station. A minimum of 10 years of daily streamflow measurements is generally used to calculate a harmonic mean flow. The following equation is used to calculate harmonic mean flow:

$$\text{harmonic mean flow} = \left(\frac{\sum_{i=1}^{N_T - N_0} \frac{1}{Q_i}}{N_T - N_0} \right)^{-1} \times \left(\frac{N_T - N_0}{N_T} \right)$$

Where:

Q_i = Non-zero flow
N_T = Total number of flow values
N_0 = Number of zero flow values

This equation calculates harmonic mean flow using a correction factor to account for zero flows in the same manner in which EPA's DFLOW program functions. USGS StreamStats web-based program can also be used to get harmonic mean flow for select gaged sites.

4.13.2.3.2 Ungaged Site

Stream flow statistics are often needed at ungaged sites, where no stream flow data are available to compute the statistics. USGS StreamStats may be used to obtain estimates of stream flow statistics for ungaged sites. StreamStats provides tools and base maps useful for verifying the accuracy of the basin delineations and for correcting them, if necessary. StreamStats for Arkansas can be used to estimate flows for small streams. Alternative method calculations may be allowed with DEQ approval.

4.13.2.3.3 Known 7Q10

By knowing low flow (7Q10) and average flow, harmonic mean flow may be calculated as follows:[17]

$$Q_{hm} = [1.194 \times (Q_{am})^{0.473}] \times [(7Q10)^{0.552}]$$

Where:

Q_{hm}	=	Harmonic flow
Q_{am}	=	Arithmetic mean

A minimum of 10 consecutive years of flow data must be obtained to develop an accurate harmonic mean.

4.13.3 Stream Flow Applicable to Stormwater Only Discharges

For discharges of stormwater only in individual NPDES permits where the receiving stream is ephemeral or intermittent, the ratio of stormwater discharge to stream flow may be determined on a case-by-case basis.

4.14 Water Quality Based Toxic Effluent Limit Calculations

Water quality-based toxic effluent limits are calculated by the two-value WLA process (Acute long-term average (LTA) and Chronic LTA). The WLAs are numbers not to be exceeded in the receiving stream in order to protect aquatic life.

DEQ uses an estimate of variability (coefficient of variation (CV)) for these parameters in the effluent to define a distribution of values with an LTA such that there is a ten percent probability of exceedance of the WLA (90% probability basis). Effluent limits for each parameter are derived from the more limiting of the acute LTA or the chronic LTA. The 95th percentile (0.05 probability) is used in calculating the monthly average limit and the 99th percentile (0.01 probability) is used in calculating the 7-day average or daily maximum limit.

The following subsection describes the process of deriving effluent limitations for toxics:

4.14.1 Aquatic Life Effluent Limits

Limits are calculated based on the procedure recommended in the March 1991 EPA TSD (Box 5-2, page 100 of 1991 TSD).

Step 1: Calculate acute and chronic water quality criteria as total recoverable for the aquatic life toxicity WQS in 8 CAR § 21-508 based on hardness, pH (as applicable), WER, or BLM. 40 C.F.R. § 122.45(c) requires that effluent limits for

[17] Technical Support Document (TSD) for Water Quality-based Toxics Control [EPA 505/2-90-001 March 1991].

metals in NPDES permits be expressed as total recoverable, with a few exceptions (see note in Section 4.10). The translator is used to predict the dissolved fraction to total recoverable amount that will occur in the receiving water from the total recoverable metal in the effluent (see Section 4.10.5).

Step 2: Calculate chronic wasteload allocation ($\mathrm{WLA_c}$)

$$\mathrm{WLA_c} = \frac{\left(\left(\mathrm{WQS} \times (Q_e + Q_b)\right) - (Q_b \times C_b)\right)}{Q_e}$$

Where:

Q_e	=	Effluent discharge flow (cfs)
Q_b	=	0.25 × critical flow for large streams (7Q10 ≥ 100 cfs)
	=	0.67 × critical flow for small streams (7Q10 < 100 cfs)
C_b	=	Upstream concentration (mg/l)
WQS	=	Chronic aquatic toxicity standards (Step 1)

Step 3: Calculate acute wasteload allocation ($\mathrm{WLA_a}$)

$$\mathrm{WLA_a} = \frac{\left(\left(\mathrm{WQS} \times (Q_e + Q_b)\right) - (Q_b \times C_b)\right)}{Q_e}$$

Where:

Q_e	=	Effluent discharge flow (cfs)
Q_b [18]	=	0.13 × critical flow for large streams (7Q10 ≥ 100 cfs)
	=	0.33 × critical flow for small streams (7Q10 < 100 cfs)
C_b	=	Upstream concentration (mg/l)
WQS	=	Acute aquatic toxicity standards (Step 1)

Step 4: Calculate the long-term averages ($\mathrm{LTA_a}$ and $\mathrm{LTA_c}$) which will comply with the wasteload allocations $\mathrm{WLA_a}$ and $\mathrm{WLA_c}$. Aquatic toxicity criterion LTAs are calculated on a 90 percent probability basis. Whether the receiving water is a stream or lake, toxicity criterion LTAs are calculated in the same fashion. Assume the following:

[18] **Exceptions for Selected Large Streams:**

- 0.06 × critical flow in the Mississippi River, Arkansas River, White River (below confluence with Black River), Ouachita River (below confluence with Little Missouri River), and Red River.
- 0.13 × critical flow if high-rate diffuser is used in the Mississippi River, Arkansas River, White River (below confluence with Black River), Ouachita River (below confluence with Little Missouri River), and Red River.

1) Effluent concentrations are described by a log normal probability distribution (the logarithm of the effluent concentrations is normally distributed).
2) The coefficient variance (CV) of the effluent concentrations is 0.6 (CV = Standard Deviation / Mean).
3) The effluent should satisfy the WLA (90th percentile probability basis)

$$\text{LTA}_a = \text{WLA}_\text{a} \times e^{\left((0.5\times\sigma^2)-(z\times\sigma)\right)}$$

Where:

LTA_a	=	Acute LTA
σ^2	=	$\ln((\text{CV})^2 + 1)$
CV	=	0.6
z	=	1.282 for 90th percentile probability basis

So,

σ^2	=	0.307
σ	=	0.554

$$\text{LTA}_\text{a} = \text{WLA}_\text{a} \times e^{\left((0.5\times0.307)-(1.282\times0.554)\right)}$$

$$\mathbf{LTA_a = 0.57 \times WLA_a}$$

$$\text{LTA}_\text{c} = \text{WLA}_\text{c} \times e^{\left((0.5(\sigma_4)^2-(z\times\sigma_4)\right)}$$

Where:

LTA_c	=	Chronic LTA
$(\sigma_4)^2$	=	$\ln\left(\frac{(\text{CV})^2}{4} + 1\right)$
CV	=	0.6
z	=	1.282 for 90th percentile probability basis

So,

$(\sigma_4)^2$	=	$\ln\left(\frac{(0.6)^2}{4} + 1\right) = 0.08617$
σ_4	=	0.2935

$$\text{LTA}_\text{c} = \text{WLA}_\text{c} \times e^{\left((0.5\times0.08617)-(1.282\times0.2935)\right)}$$

$$\mathbf{LTA_c = 0.72 \times WLA_c}$$

In summary:

$$\mathbf{LTA_a = 0.57 \times WLA_a}$$

$$\mathbf{LTA_c = 0.72 \times WLA_c}$$

Step 5: Select the smaller LTA of the $\mathrm{LTA_a}$ or $\mathrm{LTA_c}$ from Step 4 (limiting LTA) to use in step 6 to calculate the maximum daily effluent limit (MDL) and the monthly average effluent limit (AML).

Step 6: Determine the LTA multiplier to calculate monthly average limit (AML) based on the 95th percentile. A minimum of four samples per month will be used in this calculation. The LTA multiplier is dependent on the number of samples per month. For four samples per month (see Section 5.5.3 on page 107 of the March 1991 EPA TSD), an LTA multiplier of 1.55 is appropriate (see calculation below). If the number of samples per month is greater than four, use the default LTA multiplier of 1.55 or recalculate the LTA multiplier for the correct number of samples per month (see Table 5-2 on page 103 of the March 1991 EPA TSD). Assume CV of 0.6 or calculate CV if 11 or more data points are available and 95th percentile probability basis for monthly average.

$$\mathrm{AML} = \mathrm{LTA} \times e^{\left((z \times \sigma_n) - (0.5(\sigma_n)^2\right)}$$

Where:

AML	=	Monthly Average Limit
$(\sigma_n)^2$	=	$\ln\left(\frac{(\mathrm{CV})^2}{n} + 1\right)$
CV	=	0.6
z	=	1.645 for 95$^{\text{th}}$ percentile probability basis

<u>Example calculation for $n = 4$:</u>

$$(\sigma_4)^2 = \ln\left(\frac{(0.6)^2}{4} + 1\right) = 0.086$$

$$\sigma_4 = 0.293$$

$$\mathrm{AML} = \mathrm{LTA} \times e^{\left((1.645 \times 0.293) - (0.5 \times 0.086)\right)}$$

$$\mathbf{AML = LTA \times 1.55}$$

Maximum Daily Limit

Calculate maximum daily limit (MDL) based on the 99th percentile:

$$\mathbf{MDL = LTA \times e^{\left((z \times \sigma_n) - (0.5(\sigma_n)^2\right)}}$$

Where:

MDL	=	Maximum Daily Limit

$(\sigma_n)^2 \quad = \quad \ln\left(\frac{(CV)^2}{n} + 1\right)$
CV $= \quad 0.6$
$z \quad = \quad 2.326$ for 99th percentile probability basis

Example calculation for $n = 1$:

$$(\sigma_1)^2 = \ln\left(\frac{(0.6)^2}{1} + 1\right) = 0.307$$

$$\sigma_1 = 0.554$$

$$\text{MDL} = \text{LTA} \times e^{((2.326\times0.554)-(0.5\times0.307))}$$

$$\mathbf{MDL = LTA \times 3.11}$$

In summary:

$$\mathbf{AML = LTA \times 1.55}*$$
$$\mathbf{MDL = LTA \times 3.11}*$$

* These values can be obtained from Table 5.2 of the 1991 TSD.

4.14.2 Human Health Effluent Limits

8 CAR § 21-508 establishes specific human health criteria for certain pollutants. If there is a reasonable potential for a discharge to cause an instream excursion above any of these human health criteria, the permit must include an effluent limit for the pollutant.

Note: Limits are calculated based on the procedure recommended in the latest EPA TSD.

Step 1: Calculate wasteload allocation (WLA).

$$\text{WLA} = \frac{\left(\left(\text{WQS} \times (Q_e + Q_b)\right) - (Q_b \times C_b)\right)}{Q_e}$$

Where:

Q_e = Effluent discharge flow (cfs)
Q_b = Harmonic mean flow or long-term average flow (if harmonic mean flow unavailable)
C_b = Upstream concentration (mg/l)

Step 2: Calculate monthly average (AML) and daily maximum (MDL) final limitations:

1) Permit limits are set at the 99th percentile for the MDL and the 99th percentile for the AML
2) Four (4) samples per month
3) CV = 0.6

$$\mathrm{AML} = \mathrm{WLA}$$

$$\mathrm{MDL} = \mathrm{AML} \times \left(\frac{\mathrm{MDL}}{\mathrm{AML}}\right)$$

Where:

$\frac{\mathrm{MDL}}{\mathrm{AML}}$ = Maximum Daily Limit to Monthly Average Limit ratio from Table 5-3, p. 106 of TSD[19] for 99% probability

Note: Use four (4) samples or less, (MDL/AML) = 1.64

$$\mathrm{MDL} = \mathrm{AML} \times 1.64$$

In summary:

$$\mathbf{AML = WLA}$$
$$\mathbf{MDL = AML \times 1.64}$$

4.14.3 Mercury

The chronic aquatic life criterion for mercury is based on accumulation of methylmercury in aquatic organisms. If effluent conditions for mercury are warranted to address the chronic aquatic life criterion (chronic WLA drives the condition), then the permit may include alternative conditions to address mercury which may be applicable based on TMDL implementation strategies.

4.15 Other Specific Pollutants - Conventional and Nonconventional

This section addresses bacteria, dissolved oxygen, pH, turbidity, temperature, minerals, ammonia, total suspended solids, biochemical oxygen demand, and nutrients.

[19] Technical Support Document (TSD) for Water Quality-based Toxics Control [EPA 505/2-90-001 March 1991].

4.15.1 Bacteria Limits

For permitting purposes, the primary and secondary contact seasons are defined in 8 CAR Part 21. Water quality-based bacteria limits are determined in accordance with 8 CAR § 21-507.

4.15.2 Biochemical Oxygen Demand Limits

Biochemical Oxygen Demand (BOD_5) or Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) is a measure of oxygen demand in receiving waters. Most oxygen-demanding discharges have permit limits for BOD_5 or $CBOD_5$. These limits are either technology-based limits or water quality-based limits from DO modeling, whichever are more stringent. The model used to predict dissolved oxygen deficit from BOD_5 is based on the Streeter-Phelps equation. BOD_5 or $CBOD_5$ limits in the permit are discussed in Chapter 3.

4.15.3 Total Suspended Solids (TSS) Limits

To comply with WQS narrative criteria or any applicable effluent limitation guideline, TSS limits may be necessary in the permit. These limits are based on technology-based limits from an effluent limitation guideline, DO modeling using the corresponding sediment oxygen demand (SOD) rate (see Section 3.3.4), or 8 CAR Part 25, whichever is more stringent. DEQ memos or permit writer judgment may be used to establish TSS limits for facilities that do not discharge domestic wastewater and are not subject to ELGs. TSS limits in the permit are discussed in Chapter 3.

4.15.4 Ammonia Nitrogen (NH_3-N) Toxicity Limits

Ammonia nitrogen permit limits will be set to the most stringent of the following three quantities: (1) technology-based limits (if applicable); (2) effluent concentrations input into DO model simulations; or (3) concentrations necessary to prevent toxicity based on 8 CAR § 21-512. Effluent concentrations in DO model projections are discussed in Chapter 3.

Toxicity based ammonia-nitrogen limits (hereafter ‘ammonia’) will be calculated based on 8 CAR § 21-512, which is based on pH and temperature. The following tables provide instream ammonia criteria (after mixing) that were calculated using average seasonal values of pH from the 1987 Ecoregion Study of least-disturbed streams and temperature values based on 8 CAR § 21-502 standards for different ecoregions and different seasons. Alternative site-specific pH and temperature data may be considered on a case-by-case basis after this data has been submitted to DEQ for review and approval. Daily maximum or weekly average permit limits for ammonia should be based on maintaining an instream ammonia concentration (after mixing) no higher than the values listed as 4-day averages in Tables 4-10A, 4-10B, 4-11A, and 4-11B. Monthly average limits should be based on maintaining an instream ammonia concentration (after mixing) no higher than the 30-day averages in Tables 4-10A, 4-10B, 4-11A, and 4-11B. Calculations of instream ammonia concentrations after mixing should be done using the upstream flow conditions specified in Section 4.13.2.2 of the CPP. The calculations for the primary season can be based on seasonal or monthly 7Q10 flows rather than annual 7Q10 flows by using USGS Scientific Investigations Report 2008-5065 "Low-Flow Characteristics and Regionalization of Low-Flow Characteristics for Selected Streams in Arkansas."

Table 4-10A: (Minor Permits) Instream Value for Ammonia after Mixing[20]

Fish Early Life Stages Normally Present: *Critical Season (April to October)*

Stream	Temp (°C)	pH	4-day avg (mg/l)	30-day avg (mg/l)
Arkansas River	32	7.6	3.2	3.2
Arkansas Valley	31	6.7	5.6	5.6
Boston Mountains	31	6.9	5.3	5.3
Mississippi Alluvial Plain (Least-Altered)	30	7.1	5.2	5.2
Mississippi Alluvial Plain (Channel-Altered)	32	7.1	4.6	4.6
South Central Plains	30	6.6	6.1	6.1
Ouachita Mountains	30	7.1	5.2	5.2
Ouachita River (Little Missouri confluence to Mouth)	32	6.7	5.2	5.2
Ozark Highlands	29	7.6	3.9	3.9
St. Francis River	32	7.2	4.4	4.4
Red River	32	7.5	3.5	3.5
White River (Dam #1 to Mouth)	32	7.7	2.9	2.9

Table 4-10B: (Minor Permits) Instream Value for Ammonia after Mixing[20]

Fish Early Life Stages Normally Absent: *Primary Season (November to March)*

Stream	Temp (°C)	pH	4-day avg (mg/l)	30-day avg (mg/l)
Arkansas River	14	7.6	10.3	10.3
Arkansas Valley	14	6.7	16.7	16.7
Boston Mountains	14	6.9	15.8	15.8
Mississippi Alluvial Plain (Least-Altered)	14	7.1	14.7	14.7
Mississippi Alluvial Plain (Channel-Altered)	14	7.1	14.7	14.7
South Central Plains	14	6.6	17	17
Ouachita Mountains	14	7.1	14.7	14.7
Ouachita River (Little Missouri confluence to Mouth)	14	6.7	16.7	16.7
Ozark Highlands	14	7.6	10.3	10.3
St. Francis River	14	7.2	13.9	13.9

[20] These criteria values are from 8 CAR § 21-512 and 2005 Implementation Memo.

Red River	14	7.5	11.3	11.3
White River (Dam #1 to Mouth)	14	7.7	9.3	9.3

Table 4-11A: (Major Permits) Instream Value for Ammonia after Mixing[21]

Fish Early Life Stages Normally Present: *Critical Season (April to October)*

Stream	Temp (°C)	pH	4-day avg (mg/l)	30-day avg (mg/l)
Arkansas River	32	7.6	3.2	1.3
Arkansas Valley	31	6.7	5.6	2.2
Boston Mountains	31	6.9	5.3	2.1
Mississippi Alluvial Plain (Least-Altered)	30	7.1	5.2	2.1
Mississippi Alluvial Plain (Channel-Altered)	32	7.1	4.6	1.8
South Central Plains	30	6.6	6.1	2.4
Ouachita Mountains	30	7.1	5.2	2.1
Ouachita River (Little Missouri confluence to Mouth)	32	6.7	5.2	2.1
Ozark Highlands	29	7.6	3.9	1.6
St. Francis River	32	7.2	4.4	1.7
Red River	32	7.5	3.5	1.4
White River (Dam #1 to Mouth)	32	7.7	2.9	1.2

Table 4-11B: (Major Permits) Instream Value for Ammonia after Mixing[21]

Fish Early Life Stages Normally Absent: *Primary Season (November to March)*

Stream	Temp (°C)	pH	4-day avg (mg/l)	30-day avg (mg/l)
Arkansas River	14	7.6	10.3	4.1
Arkansas Valley	14	6.7	16.7	6.7
Boston Mountains	14	6.9	15.8	6.3
Mississippi Alluvial Plain (Least-Altered)	14	7.1	14.7	5.9
Mississippi Alluvial Plain (Channel-Altered)	14	7.1	14.7	5.9
South Central Plains	14	6.6	17	6.8
Ouachita Mountains	14	7.1	14.7	5.9
Ouachita River (Little Missouri confluence to Mouth)	14	6.7	16.7	6.7
Ozark Highlands	14	7.6	10.3	4.1
St. Francis River	14	7.2	13.9	5.6
Red River	14	7.5	11.3	4.5
White River (Dam #1 to Mouth)	14	7.7	9.3	3.7

21 These criteria values are from 8 CAR § 21-512 and 2005 Implementation Memo.

The following information must be considered to calculate the ammonia toxicity limit in the permit:

Q_b	=	Critical upstream flow of receiving stream
	=	7Q10 cfs × 0.25 for large streams (7Q10 ≥ 100 cfs)
	=	7Q10 cfs × 0.67 for small streams (7Q10 < 100 cfs)
Q_e	=	Facility effluent flow (cfs)
C_b	=	Upstream concentration (mg/l), based on average value recorded at monitoring station in DEQ's most current 305(b) Report
C_e	=	Effluent concentration (mg/l) = permit limit
IWC	=	Chronic ammonia toxicity criterion (from Tables 4-10 or 4-11)

The following mass balance formula can used to calculate the permit limits:

$$\text{IWC} = \frac{\left((C_e \times Q_e) + (C_b \times Q_b)\right)}{Q_e + Q_b}$$

When rearranged, the formula can be used to solve for the effluent concentration, C_e:

$$C_e = \frac{\left(\text{IWC} \times (Q_b + Q_e) - (C_b \times Q_b)\right)}{Q_e}$$

Example:
A minor facility discharges wastewater with an average flow of 0.5 MGD to Clear Creek in the Boston Mountains with an ammonia limit (dissolved oxygen-based limit) of 5 mg/l (year-round) and upstream flow (7Q10) of 0.2 cfs. What is the permit limit for ammonia?

Solution:

Q_b	=	Critical upstream flow of receiving stream
	=	0.2 cfs × 0.67 = 0.13 cfs
Q_e	=	Facility effluent flow (cfs) = 0.5 MGD = 0.77 cfs
C_b	=	Upstream concentration (mg/l) = 0 mg/l (assumed in this example)
C_e	=	Effluent concentration (mg/l) = permit limit
IWC	=	Chronic ammonia toxicity criterion (from Tables 4-10 or 4-11)
	=	IWC for the Boston Mountains (daily max) from Tables 4-10A and 4-10B for a minor permit
	=	5.3 mg/l (April – October) and 15.8 mg/l (November – March)

For minor permits, the monthly average is set equal to the daily maximum. Rearranging the Mass Balance Equation to solve for allowable limits:

$$\text{IWC} = \frac{\left((C_e \times Q_e) + (C_b \times Q_b)\right)}{Q_e + Q_b}$$

$$C_e = \frac{\left(\text{IWC} \times (Q_e + Q_b) - (C_b \times Q_b)\right)}{Q_e}$$

April - October:

$$C_e = \frac{\left(5.3 \times (0.77 + 0.13) - (0 \times 0.13)\right)}{0.77} = 6.2 \text{ mg/l}$$

November - March:

$$C_e = \frac{\left(15.8 \times (0.77 + 0.13) - (0 \times 0.13)\right)}{0.77} = 18.5 \text{ mg/l}$$

From the Streeter-Phelps DO model, the DO-based ammonia limits are as follows:

$$\text{Monthly Average} = 5 \text{ mg/l (year} - \text{round)}$$
$$\text{Daily Maximum} = 5 \times 1.5 = 7.5 \text{ mg/l (year} - \text{round)}$$

Therefore, ammonia nitrogen limits in the permit would be as follows:

	Monthly Average (mg/l)	Daily Maximum (mg/l)
April – October	5	6.2
November – March	5	7.5

4.15.5 Total Phosphorus (TP)

All point source discharges into the watershed of waters officially listed on Arkansas's impaired waterbody list (303(d) list) for total phosphorus as the major cause shall have monthly average discharge permit limits based on 8 CAR § 21-509. WLAs included in a TMDL will be evaluated and limits will be determined in accordance with the terms and assumptions in the TMDL, or other relevant information and data that would support a more protective limit. Additionally, waters in nutrient surplus watersheds as determined by Act 1061 of 2003, codified at Ark. Code Ann. § 15-20-1104 and Arkansas Natural Resources Commission Title 22, and subsequently designated nutrient surplus watersheds may have TP limits included in the permit.

To establish a database of point source loadings of nutrients to waters of the state, NPDES permit requirements will include monitoring for total phosphorus (TP) with frequency at least once per month for a minimum of three (3) years for the following facilities:

1) All major municipal facilities;
2) All minor municipals with food processing plants as significant industrial users;
3) All food processing facilities;
4) All other non-municipal facilities with significant organic waste in process water; and
5) Other facilities as necessary at DEQ's discretion.

4.15.6 Nitrate + Nitrite – Nitrogen (NO_3 + NO_2-N)

In order to establish a database of point source loadings of nutrients to waters of the state, NPDES permit requirements will include monitoring for NO_3 + NO_2-N with frequency of at least once per month for a minimum of three (3) years for the following facilities:

1) All major municipal facilities;
2) All minor municipals with food processing plants as significant industrial users;
3) All food processing facilities;
4) All other non-municipal facilities with significant organic waste in process water; and
5) Other facilities as necessary at the DEQ Director's discretion.

8 CAR Part 25 also limits discharges to 10 mg/l of NO_3 + NO_2-N for discharges which enter groundwater (losing streams).

4.15.7 Total Residual Chlorine (TRC)

Unless determined by a site-specific study, the concentrations at the edge of the mixing zone will be calculated by multiplying the highest daily maximum reported value for the last two (2) years for TRC by critical dilution as follows:

$$(\text{Effluent concentration}) \times \left(\frac{\text{Critical Dilution \%}}{100}\right) = \text{IWC}$$

To determine critical dilution for the equation above, refer to Chapter 6. This IWC value should be less than or equal to the criteria. Otherwise, BMP requirements or limits will be included in the permit.

Note: Manganese causes interferences in the total residual chlorine when using N, N-diethyl-p-phenylenediamine (DPD) reagents.

4.15.8 pH

Most permits have pH limits of 6.0 – 9.0 standard units (s.u.). However, pH outside of this range is allowed if, after mixing with the receiving stream at critical flow conditions, the resulting mixture is within the range of 6.0 – 9.0 s.u. Also, in accordance with 40 C.F.R. § 133.102(c): "The effluent values for pH shall be maintained within the limits of 6.0 to 9.0 unless the publicly owned treatment works demonstrates that: (1) Inorganic chemicals are not added to the waste stream as part of the treatment process; and (2) contributions from industrial sources do not cause the pH of the effluent to be less than 6.0 or greater than 9.0." When a permittee requests pH limits outside the range of 6.0 – 9.0 s.u., the pH effects of a point source discharge in the receiving stream after mixing will be evaluated during any permitting decision to allow an expanded pH range.

4.15.9 Dissolved Oxygen (DO)

Unless otherwise justified, all permitted DO limits are normally implemented as an instantaneous minimum as determined by the Streeter-Phelps model. For facilities with limits not based on the Streeter-Phelps model, the DO limit is set at the water quality standard for that receiving water to ensure that the discharge will not cause or contribute to a violation of the DO standard.

4.15.10 Minerals (Cl, SO_4, and TDS)

Site Specific Mineral Quality Criteria and Domestic Water Supply Criteria can be found in 8 CAR § 21-511(a) and (c), respectively. From these standards, only chlorides (Cl), sulfates (SO_4), and total dissolved solids (TDS) have specific numerical value. 8 CAR § 21-511(b) contains ecoregion benchmark values which are intended to be used for development of site-specific criteria if necessary for the particular waterbody being evaluated.

The following expression is used to evaluate the mineral Instream Waste Concentration (IWC):

$$\text{IWC} = \frac{\left((C_e \times Q_e) + (C_b \times Q_b)\right)}{Q_e + Q_b}$$

Where:

Q_b	=	Upstream flow of receiving stream
	=	Harmonic mean flow for streams listed in 8 CAR § 21-511(a) without an asterisk, or
	=	4 cfs for streams listed in 8 CAR § 21-511(a) with an asterisk, or
	=	7Q10 for domestic water supply criteria
Q_e	=	Effluent discharge flow (cfs)
C_b	=	Upstream concentration (mg/l) based on Table 4-12
C_e	=	Reported geometric mean mineral concentration in effluent (mg/l)
IWC	=	Instream waste concentration (mg/l); $\text{IWC}_{\text{stream}}$ will reference IWCs for comparison with Stream Mineral values. $\text{IWC}_{\text{drink}}$ will reference IWCs for comparison with the Domestic Water Supply criteria.

4.15.10.1 Upstream Values for Minerals

The upstream value to be used in determining final effluent limits as follows:

4.15.10.1.1 Small Streams (7Q10 Less than 100 cfs)

The upstream value to be used in determining final effluent limits for small streams (7Q10 less than 100 cfs) is the arithmetic mean concentration by ecoregion as follows:

Table 4-12: Mineral Upstream Values					
Ecoregion	**Chlorides**	**Sulfates**	**TDS**	**Monitoring Station ID**	**Monitoring Period**
South Central Plains	5	12	84	OUA0028 OUA0170 UWLGC02 OUA0169 UWFRE01 OUA0043 OUA0167 OUA0166	1995-2023
Ouachita Mountains	2	6	59	UWSFO01 RED0031 OUA0023 OUA0026 OUA0193 OUA0186	1995-2023
Arkansas Valley	5	6	58	UWNCC02 ARK0057 ARK0034 UWCCR01	1995-2023
Boston Mountains	2	3	36	ARK0008 ARK0042 ARK0114 ARK0119 ARK0150 UWAFK01	1995-2023
Ozark Highlands	10	11	161	UWTMC01 WHI0116 WHI0071 WHI0009A ARK0004A WHI0137	1995-2023
Mississippi Alluvial Plain	19	11	178	FRA0012 WHI0026 WHI0074 UWVGC01	1995-2023

If an upstream monitoring station or site-specific data exist, available data may be used as an alternative to the table above.

4.15.10.1.2 Large Streams (7Q10 Equal to or Greater than 100 cfs)

The upstream value to be used in determining final effluent limits for large streams is the mean concentration of the closest upstream station for at least the last ten years if available.

4.15.10.2 Minerals Limits Determination

If DEQ has determined from the submitted effluent test results for minerals that RP exists for either aquatic life site specific mineral water quality criteria (8 CAR § 21-511(a)) or domestic water supply criteria (8 CAR § 21-511(c)), then limits will be calculated to protect the designated use for which RP exists. Limits for minerals can be calculated as follows:

$$C_e = \frac{\left(\text{IWC} \times (Q_b + Q_e) - (C_b \times Q_b)\right)}{Q_e}$$

C_e = Based on stream mineral values the limit will be utilized as the monthly average concentration limitation. The maximum daily discharge limits will be 1.5 to 2 times greater than the monthly average.[22]

4.15.11 Temperature

Temperature in the water quality standards is limited in two ways. Each waterbody classification has an upper temperature limit and a maximum allowable temperature rise above natural temperature outside of the mixing zone. The point of compliance with the temperature standards is at critical conditions. The critical condition for maximum allowable temperature is the period of the year when the natural average temperature of the receiving water is the highest. The evaluation of maximum temperature rise should consider the period of the year when the natural average temperature of the receiving water is the lowest. If any reasonable potential analysis by DEQ indicates a potential violation of water quality standards, then the permit should contain a water-quality temperature limit that protects the criteria in 8 CAR § 21-502, as necessary.

4.16 Maximum Daily Limit (MDL) Determination

A maximum daily limit (MDL) represents the absolute maximum allowable load or concentration of a substance that a facility may release into a receiving stream in one day. This limit may be based on water quality constraints, or sector-specific or case-specific technology considerations. The value is typically represented by the 99th percentile of existing or required performance.

[22] Page 104 of Section 5.4.2 of TSD for Water Quality-Based Toxics Control EPA 505/2-90-001 March 1991.

Permit engineers typically multiply the monthly average limits by 1.5 – 2 (more information can be found in the 2010 NPDES Permit Writers' Manual and the TSD) to derive the daily maximum limits. For ammonia toxicity, the maximum daily limit is determined from monthly average criteria given in 8 CAR § 21-512 multiplied by 2.5.

4.17 Average Monthly Limit (AML) Determination

Because it is difficult and sometimes impractical to continuously monitor the effluent to ensure compliance with the MDL, the concept of Average Monthly Limit (AML) is used. The AML represents the maximum averaged load or concentration of a substance that a facility may release into a receiving stream over a specified time period. Typically, this value represents the 95th percentile of existing or required performance. The value of the AML can also vary based on monitoring frequency.

The average value of a number of samples is related to the number of samples taken and the variability of the data. The more samples taken, the closer the result should be to the population (or true) mean. Similarly, the lower the variability of the data for a given sample size, the closer the result should be to the long-term mean. These relationships are used to develop an Average Monthly Limit.

It is important to account for these relationships because the values that are occurring between those times that samples are taken is predicted by understanding the shape of the population distribution. The general equation for determining Average Monthly Limit percentiles is:

$$\text{AML} = \text{LTA} + z\left(\frac{s^2}{n}\right)^{0.5}$$

Where:

AML	=	Average Monthly Limit
LTA	=	Long Term Average (mean)
n	=	Number of samples per month
s	=	Standard deviation
z	=	z score for the normal distribution
	=	1.64 for the 95th percentile

The above equation can be used for the calculation of Average Monthly Limits except lognormal distribution assumptions are usually followed and thus the functional equation becomes:

$$\text{AML} = \text{LTA} \times e^{\left((z \times s_n) - (0.5(s_n)^2)\right)}$$

Where:

AML	=	Average Monthly Limit
LTA	=	Long Term Average (mean)
s_n^2	=	$\ln\left(\frac{(\text{CV})^2}{n} + 1\right)$

n = Number of samples per month
z = z score for the normal distribution
= 1.64 for the 95th percentile

4.18 Mass Limitations Calculations

Mass limits are calculated based on the following formula:

$$\text{Mass limits (lbs/day)} = \text{Concentration (mg/l)} \times \text{Flow (MGD)} \times 8.34$$

4.19 Permit Limits Less than Minimum Quantitation Limit (MQL)

If the calculated permit limit for any pollutant is less than the MQL (see Chapter 4.3 of this document for explanation of MQLs), the calculated value is used as the permit limit and a footnote is added to specify that the MQL will be used to determine compliance.

4.20 Effluent Limitations where Average Upstream Level Exceeds WQS

If the average upstream value exceeds the WQS criteria, then the permit is issued with a water quality-based limitation equivalent to the WQS at the end of the pipe. This allows for a permit that does not contribute to or cause an exceedance of a WQS (40 C.F.R. § 122.44(d)(1)(iii)[23]). The permit may include a reopener clause to allow permit modification if, as a result of a UAA, WQS are revised.

4.21 Hydrograph Controlled Release (HCR) Systems

In Hydrograph Controlled Release (HCR) systems, the facility is authorized to discharge only when the stream flow is sufficient to ensure that the instream water quality criteria, as listed in 8 CAR Part 21, is not exceeded. In an HCR system, treated effluent under an individual NPDES permit is discharged in conjunction with a determined minimum upstream stream flow (or ratio) which is sufficient to maintain instream water quality criteria after mixing. During periods when stream flow is above this determined minimum stream flow or ratio, treated effluent may be discharged proportionally as appropriate to maintain the instream criteria. For stormwater discharges, an HCR or upstream stream flow to stormwater discharge ratio should be determined using event duration basis rather than instantaneous measurements.

An HCR system is not a wastewater treatment system. However, HCR systems can be a very cost-effective alternative to upgrading an existing treatment system or building a new treatment system. The development and use of HCR systems shall be on a case-by-case basis after DEQ approval of appropriate technical and engineering design information submitted by the permittee to characterize operation of the system.

[23] 40 C.F.R. § 122.44(d)(1)(iii) is included by reference in 8 CAR Part 25.

4.22 Special Considerations for Impairments and TMDLs

If a facility discharges a pollutant of concern directly to an impaired stream, an effluent limit must be considered for the parameter causing the impairment in order to prevent the pollutant from causing or contributing to the impairment of the receiving waters.

WLAs included in a TMDL will be evaluated and limits will be determined in accordance with the terms and assumptions in the TMDL, or other relevant information and data that would support a more protective limit.

Chapter

5

Chapter 5 MONITORING AND SAMPLING REQUIREMENTS

This chapter presents guidance and provides the technical references and statutory references which a permit engineer should consider when establishing the monitoring conditions for frequency of sampling, sample types, sampling locations and the analytical methods in a wastewater discharge permit for specific pollutants. Whole Effluent Toxicity (WET) monitoring and sampling requirements are discussed in Chapter 6.

This chapter helps the permit engineer determine what methods to follow to establish monitoring conditions in a permit. The monitoring and reporting conditions section of an NPDES permit generally includes specific requirements for the following items:

- Monitoring locations
- Monitoring frequencies
- Sample type.

In accordance with 40 C.F.R. § 122.44, permits must establish monitoring requirements that demonstrate the permittee achieves compliance with all effluent limitations and permit requirements.

5.1 Monitoring Location

The permit engineer is responsible for determining the most appropriate monitoring location(s) and indicating the location(s) in the permit. Ultimately, the permittee is responsible for providing a safe and accessible sampling point that is representative of the discharge [40 C.F.R. § 122.41(j)(1)].

The permit engineer should consider the following questions when selecting a monitoring location:

- Is the monitoring location on the facility's property?
- Is the monitoring location accessible to the permittee and the permitting authority?
- Will the results be representative of the targeted wastestream?
- Is monitoring at internal points needed?
- Is the monitoring location following the final treatment unit?

5.2 Monitoring Frequency

To establish a monitoring frequency, the permit engineer should consider the variability of the concentration of various parameters by reviewing effluent data for the facility (e.g., from discharge monitoring reports [DMRs]) or, without actual data, information from similar dischargers. A highly variable discharge should require more frequent monitoring than a discharge that is relatively consistent over time (particularly in terms of flow and pollutant concentration). Other factors that should be considered when establishing appropriate monitoring frequencies include the following:

- Compliance history
- Cost of monitoring
- Location of the discharge
- Nature of the pollutants.

To ensure representative monitoring, permit conditions could be included to require monitoring on the same day, week, or month for parameters that might be correlated in some way. For example, coordinating the monitoring requirements for parameters such as pathogens and chlorine or metals and pH can provide information for both compliance assessment and determination of treatment efficacy.

5.3 Type of Samples

The permit engineer must specify the sample type for all parameters required to be monitored in the permit. The permit engineer should determine the sample type on the basis of the characteristics of each specific discharge. Certain sample collection and storage requirements are identified as part of the analytical methods specified in 40 C.F.R. Part 136. The three common sample types are grab, composite, and continuous.

5.3.1 Grab Sample

A grab sample is an individual sample collected in less than 15 minutes time. It represents more or less “instantaneous” conditions. Grab samples are appropriate when the flow and characteristics of the wastestream being sampled are relatively constant. A grab sample is appropriate when a sample is needed to:

- Monitor an effluent that does not discharge on a continuous basis.
- Provide information about instantaneous concentrations of pollutants at a specific time.
- Corroborate composite samples.
- Monitor parameters not amenable to compositing (e.g., temperature).

Grab samples must be used for pH, temperature, cyanide, total phenols, total residual chlorine (TRC), oil and grease (O&G), fecal indicator bacteria (FIB), sulfide, and volatile organic compounds [40 C.F.R. §§ 122.21 (g)(7) and 403.12(g)(3)].

5.3.2 Composite Sample

Composite samples might provide a more representative measure of the discharge of pollutants over a given period than grab samples. Composite samples are collected over time, either by continuous sampling or by mixing discrete samples, and represent the average characteristics of the wastestream during the sample period.

Composite samples are collected either manually or with automatic samplers. “Composite sample” is a mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four (4) effluent portions collected at equal time intervals (but not closer than one hour apart) during operational hours, within the 24-hour period, and combined proportional to flow or a sample collected at more frequent intervals proportional to flow over the 24-hour period.

5.3.3 Continuous Monitoring

Continuous monitoring is another option for a limited number of parameters such as total organic carbon (TOC), temperature, pH, conductivity, fluoride, and dissolved oxygen. Continuous monitoring may be required on a case-by-case basis. The environmental significance of the variation of any parameter in the effluent should be compared to the cost of continuous monitoring equipment available for that parameter.

5.4 Recommendation of Permit Frequency and Sample Type Requirements

The following tables[24] are recommended for use in setting monitoring frequencies and sample types in individual NPDES discharge permits. It should be noted that grab samples may be specified in place of composite samples if the facility is a pond system with greater than 24-hour retention time at the maximum flow.

[24] DEQ memo dated July 31, 2023, *Recommended Monitoring Frequencies for NPDES Permits*, or most recent update thereof.

Table 5-1A: Recommended Frequency and Sample Type				
Flow (MGD)	Flow		$CBOD_5$ or BOD_5, COD, TSS, and NH_3-N	
	Measurement Frequency	Sample Type	Measurement Frequency	Sample Type
0 to 0.05	2/week	Instantaneous	1/quarter	Grab
>0.05 to 0.10	2/week	Instantaneous	1/month	Grab
>0.10 to 0.50	5/week	Instantaneous	2/month	Grab
>0.50 to 1.0	1/day	Totalizing Meter	3/month	Composite
>1.0 to 5.0	1/day	Totalizing Meter	3/week	Composite
>5.0 to 10.0	1/day	Totalizing Meter	5/week	Composite
>10.0	1/day	Totalizing Meter	1/day	Composite
variable	2/week[25]	Instantaneous	1/month[24]	Grab

Table 5-1B: Recommended Frequency and Sample Type[26]		
Flow (MGD)	DO, TRC, Temperature, Bacteria, O&G, and pH	
	Measurement Frequency	Sample Type
0 to 0.05	1/quarter	Grab
>0.05 to 0.10	1/month	Grab
>0.10 to 0.50	2/month	Grab
>0.50 to 1.0	3/month	Grab
>1.0 to 5.0	3/week	Grab
>5.0 to 10.0	5/week	Grab
>10.0	1/day	Grab
variable	1/month[24]	Grab

Table 5-1C: Recommended Frequency and Sample Type for Nutrients		
Pollutant	Measurement Frequency	Sample Type
Nutrients (design flow 0.5 MGD or less, or variable flow)	Case-by-case	Grab
Nutrients (design flow greater than 0.5 MGD)	Case-by-case	Composite

[25] DMRs must be submitted even when no discharge occurs during the monitoring period.
[26] 40 C.F.R. § 122.21(g)(7) requires grab samples for pH, temperature, cyanide, total phenols, total residual chlorine, oil & grease, and bacteria. Grab samples are also required for dissolved oxygen based on the potential to change rapidly over time.

Table 5-1D: Recommended Frequency and Sample Type for Toxic Pollutants (metals, organics, etc.)[27]		
Guidelines	Measurement Frequency	Sample Type
Pollutants with a reporting requirement based on recommended criteria for Aquatic Life or Human Health (consumption of organism only) where there is no applicable state water quality standard	1/quarter (first 4 quarters of permit only)	Composite[28]
Pollutants limited based on a Total Maximum Daily Load (TMDL) or other study when the facility does not show reasonable potential to cause or contribute to an impairment of state water quality standards	1/quarter	Composite[27]
Pollutants limited based on any of the following: a. Reasonable potential to cause or contribute to an impairment of the state water quality standard; b. Reasonable potential to cause or contribute to an exceedance of the Maximum Contaminant Level (MCL) specified by the National Primary Drinking Water Regulations (NPDWR); or c. Effluent Limitation Guidelines (ELGs)	Case-by-case[29]	Composite[27]
Cyanide and Total Phenols	Follow above guidelines	Grab

[27] For minor municipal and minor non-municipal domestic facilities, the recommended monitoring frequencies for toxic pollutants are once/quarter (design flow 0.05 MGD or less) or once/month (design flow greater than 0.05 MGD and less than 1.0 MGD) unless the factors in footnotes 27 or 28 justify alternate frequencies.
[28] May be specified as grab samples for facilities with variable flow, pond systems with greater than 24-hour detention time, facilities with a design flow of 0.5 MGD or less that do not show reasonable potential to cause or contribute to an exceedance of a water quality standard for the toxic pollutant, or when required to minimize contamination in low-level pollutant analysis.
[29] Frequency will be determined on a case-by-case basis taking into account design flow, average flow, mass of pollutant discharged, type of wastewater, frequency of discharge, receiving waters, potential to cause or contribute to an impairment of water quality standards, and other relevant factors.

5.5 Monitoring Frequency Reductions (Excluding WET Testing)

The reduction of monitoring frequency for demonstrated good performance may be applied through permit renewal, through major modification of the permit, or through a monitoring frequency reduction condition in the permit. The monitoring frequency is reduced from baseline frequency. The baseline monitoring frequency is the original frequency established in the permit.[30] The monitoring frequency reduction decision-making process is presented in the following sections.

WET Testing monitoring frequency reductions are discussed separately in Chapter 6.

5.5.1 Decision-Making Process

The following framework may be used to determine if a particular facility is eligible for reductions and, if so, the amount of these reductions.

- The guidance applies to both major and minor individual NPDES permits for direct discharges.
- Each facility's enforcement history is analyzed to assess eligibility for reductions under the guidance.
- The monitoring frequency for a given parameter may be reduced from the baseline frequency only once for a facility, unless significant modifications to the facility have occurred.
- For each existing eligible facility, the compliance history for each parameter for which a monitoring reduction is requested is examined for any violations during the past two years. In the event there are less than 24 data points available in the past two years, the review shall include more than two years of data so that a minimum of 24 data points are used in the review. No reduction in monitoring frequency is allowed for a given parameter if there has been a limit exceedance for that parameter in the most recent two years of data or 24 data points (see preceding sentence).
- New permittees should go through one permit cycle (5 years) before being eligible for consideration for reduced monitoring.
- Monitoring reduction for effluent data which has not been continuously reported over the two-year period, interrupted or discontinuous data, intermittent, short-term, and batch discharges must be considered on a case-by-case basis. These will require performance data for a minimum of 24 data points.

[30] DEQ memo dated April 13, 2022, *OWQ Monitoring Frequency Reduction Guidelines* or most recent update thereof.

5.5.2 Procedures

Monitoring reduction may be granted during the permit term at the request of the permittee and as appropriate using the following evaluation procedure:

1. Calculate long-term average (mean) effluent concentration for the pollutant of concern (POC) during the past two years (minimum 24 data points).
2. Calculate ratio as a percentage of long-term average effluent concentration for the past 24 data points (Step 1) to monthly average concentration limit of POC in the existing permit.
3. pH - pH is a logarithmic parameter. Therefore, the evaluation procedure will be on a case-by-case basis, based on the best engineering judgement of the permit writer, taking into account compliance history for pH, and the reduction in monitoring frequencies of other parameters for the subject facility.
4. Dissolved Oxygen (DO) – DO limits are based on a minimum concentration instead of monthly average. Therefore, best engineering judgement should be used for determining the appropriate reduction in monitoring frequency. The permit engineer should take into consideration the monitoring frequencies for other oxygen demanding parameters in determining the appropriate frequency for DO.
5. Permit writers may use their best engineering judgment when making a final decision on monitoring frequency reductions. However, reduced monitoring frequencies in the tables are minimums, and monitoring may not be reduced to less frequent than noted in Tables 5-2 and 5-3.

Table 5-2: Recommended Monitoring Frequency Reductions

Baseline Monitoring Frequency	Ratio of Long-Term Average of Effluent to Monthly Average Limit				
	100-76% CV<0.2	75-66%	65-50%	49-25%	<25%
1/day	6/week	5/week	4/week	3/week	1/week
6/week	5/week	4/week	3/week	2/week	1/week
5/week	4/week	4/week	3/week	2/week	1/week
4/week	No Reduction	3/week	2/week	1/week	1/week
3/week	No Reduction	No Reduction	2/week	1/week	1/week
2/week	No Reduction	No Reduction	1/week	2/month	1/month
1/week	No Reduction	No Reduction	No Reduction	2/month	1/month
2/month	No Reduction	No Reduction	1/month	1/2 months	1/quarter
1/month	No Reduction	No Reduction	1/2 months	1/quarter	1/6 months

5.5.3 Residency Criteria for Continued Participation

Permittees are expected to maintain the performance levels that were used as the basis for granting monitoring reductions. To remain eligible for these reductions, the permittee should have no significant noncompliance (SNC) violations of effluent limitations for the parameters for which reductions have been granted, have submitted all required DMRs, and have not been subject to recent formal enforcement action. The permitting authority may require increased monitoring for facilities that are subject to formal enforcement actions or do not maintain exemplary performance levels. This information will be reviewed during permit renewals or at any other point during the permit cycle.

Chapter

6

Chapter 6 WHOLE EFFLUENT TOXICITY

Whole effluent toxicity (WET) is the total toxicity of an effluent measured directly with a toxicity test. WET testing is necessary because the Office of Water Quality cannot develop water quality criteria for every one of the thousands of possible toxic pollutants in wastewater discharges. WET testing is also the only method available to a permit engineer for assessing the toxic interaction of pollutants in wastewater.[31] The goal of the WET rule is the eventual elimination of the discharge of toxics in toxic amounts.

WET requirements are established for all DEQ discharges classified as majors (e.g., ≥ 1.0 MGD design flow or MRAT ≥ 80). WET requirements may also be applied on a case-by-case basis to minor dischargers with a known or suspected toxic potential. Considerations that may be warranted include, but are not limited to, industry type, synergistic effects of multiple toxic pollutants, and unknown variability of process changes.

EPA's current Policy on Independent Applicability precludes overriding one form of aquatic protection with another, e.g. WET requirements cannot be precluded on the basis that a biological survey did not find impairment to the aquatic community.[32]

6.1 WET Options (Acute or Chronic)

WET is evaluated for a reasonable potential to violate the water quality standards based on one of the following:

6.1.1 Acute WET

If the facility discharges to a large stream (7Q10 ≥ 100 cfs) ***and*** the dilution ratio, i.e., the ratio of the upstream flow, 7Q10, to the discharge flow, Q_e, is greater than or equal to 100:1 ([7Q10: Q_e] ≥ 100:1), acute WET testing is required.

An acute test is conducted over a period of 48 hours (*Pimephales promelas* and *Daphnia pulex*) and the endpoint is lethality. This endpoint is expressed as the No Observed Effect Concentration (NOEC). The NOEC is defined as the greatest

[31] 8 CAR § 21-408.
[32] EPA Final Policy on Biological Assessments and Criteria, dated August 13, 1991.

effluent dilution at and below which toxicity that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Acute test failure is defined as a demonstration of a statistically significant lethal effect at test completion to a test species at or below the critical dilution.

6.1.2 Chronic WET

If the facility discharges to small stream (7Q10 < 100 cfs), or the dilution ratio is less than 100:1 ([7Q10: Q_e] < 100:1), then chronic WET testing is required.

A chronic test is conducted over a period of 7 days (*Ceriodaphnia dubia* and *Pimephales promelas*) and the endpoint measured is lethality and sub-lethal effects; for example, changes in reproduction or growth. This endpoint is expressed as the No Observed Effect Concentration (NOEC). The NOEC is the greatest effluent dilution at and below which toxicity (lethal or sub-lethal) that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Chronic lethal test failure is defined as a demonstration of a statistically significant lethal effect at test completion to a test species at or below the critical dilution. Chronic sub-lethal test failure is defined as a demonstration of a statistically significant sub-lethal effect (i.e., growth or reproduction) at test completion to a test species at or below the critical dilution.

6.2 Critical Dilution (CD)

Critical dilution (low flow dilution, also known as percent effluent) must be calculated by using the following formula:

6.2.1 Acute Toxicity

For Large Streams (7Q10 ≥ 100 cfs):

$$\mathrm{CD} = \left(\frac{Q_e}{Q_e + (0.25 \times 0.1 \times 7\mathrm{Q}10)}\right) \times 100$$

For Small Streams (7Q10 < 100 cfs):

$$\mathrm{CD} = \left(\frac{Q_e}{Q_e + (0.67 \times 0.1 \times 7\mathrm{Q}10)}\right) \times 100$$

6.2.2 Chronic Toxicity

For Large Streams (7Q10 ≥ 100 cfs):

$$\text{CD} = \left(\frac{Q_e}{Q_e + (0.25 \times 7\text{Q}10)}\right) \times 100$$

For Small Streams (7Q10 < 100 cfs):

$$\text{CD} = \left(\frac{Q_e}{Q_e + (0.67 \times 7\text{Q}10)}\right) \times 100$$

6.3 Dilution Series

Tables 6-1A or 6-1B will be used to determine the dilution series[33].

After determining the critical dilution (CD), find that number in column 4 of Table 6-1A or in column 5 of Table 6-1B. The dilution series is established in the row that number appears in. For example, for a CD of 30%, the series from Table 6-1A would be 13%, 17%, 23%, 30%, and 40%, plus the required 0% control. For CD of 75% or less, Table 6-1A ensures that there will be only one (1) dilution above the CD, which aids the statistical analysis. Another example for a facility with CD of 76%, the series from Table 6-1B would be 24%, 32%, 43%, 57%, and 76%, plus the required 0% control. For facilities with CDs equal to or less than 1%, the CD will be set as 1% in the permit.

[33] According to EPA Region 6, implementation of WET Permitting Strategy (May 2005) for sub-lethal limits at the 80% effluent level is no longer appropriate. The limit at the critical dilution is applicable to both lethal and sub-lethal endpoints.

Table 6-1A 0.75 Dilution Series for CD of 75% or less

Control (0%)	1	2	3	4 (CD)	5
0	0.4	0.6	0.8	1.0	1.3
0	0.8	1.1	1.5	2.0	2.7
0	1.3	1.7	2.3	3.0	4.0
0	1.7	2.3	3.0	4.0	5.3
0	2.1	2.8	3.8	5.0	6.7
0	2.5	3.4	4.5	6.0	8.0
0	3	4	5	7	9
0	3	5	6	8	11
0	4	5	7	9	12
0	4	6	8	10	13
0	5	6	8	11	15
0	5	7	9	12	16
0	5	7	10	13	17
0	6	8	11	14	19
0	6	8	11	15	20
0	7	9	12	16	21
0	7	10	13	17	23
0	8	10	14	18	24
0	8	11	14	19	25
0	8	11	15	20	27
0	9	12	16	21	28
0	9	12	17	22	29
0	10	13	17	23	31
0	10	14	18	24	32
0	11	14	19	25	33
0	11	15	20	26	35
0	11	15	20	27	36
0	12	16	21	28	37
0	12	16	22	29	39
0	13	17	23	30	40
0	13	17	23	31	41
0	14	18	24	32	43
0	14	19	25	33	44
0	14	19	26	34	45
0	15	20	26	35	47
0	15	20	27	36	48
0	16	21	28	37	49
0	16	21	29	38	51
0	16	22	29	39	52
0	17	23	30	40	53
0	17	23	31	41	55
0	18	24	32	42	56
0	18	24	32	43	57
0	19	25	33	44	59

Table 6-1A 0.75 Dilution Series for CD of 75% or less

Control (0%)	1	2	3	4 (CD)	5
0	19	25	34	45	60
0	19	26	35	46	61
0	20	26	35	47	63
0	20	27	36	48	64
0	21	28	37	49	65
0	21	28	38	50	67
0	22	29	38	51	68
0	22	29	39	52	69
0	22	30	40	53	71
0	23	30	41	54	72
0	23	31	41	55	73
0	24	32	42	56	75
0	24	32	43	57	76
0	24	33	44	58	77
0	25	33	44	59	79
0	25	34	45	60	80
0	26	34	46	61	81
0	26	35	47	62	83
0	27	35	47	63	84
0	27	36	48	64	85
0	27	37	49	65	87
0	28	37	50	66	88
0	28	38	50	67	89
0	29	38	51	68	91
0	29	39	52	69	92
0	30	39	53	70	93
0	30	40	53	71	95
0	30	41	54	72	96
0	31	41	55	73	97
0	31	42	56	74	99
0	32	42	56	75	100

Table 6-1B 0.75 Dilution Series for CD of 76% to 100%

Control (0%)	1	2	3	4	5 (CD)
0	24	32	43	57	76
0	24	32	43	58	77
0	25	33	44	59	78
0	25	33	44	59	79
0	25	34	45	60	80
0	26	34	46	61	81
0	26	35	46	62	82
0	26	35	47	62	83
0	27	35	47	63	84
0	27	36	48	64	85
0	27	36	48	65	86
0	28	37	49	65	87
0	28	37	50	66	88
0	28	38	50	67	89
0	28	38	51	68	90
0	29	38	51	68	91
0	29	39	52	69	92
0	29	39	52	70	93
0	30	40	53	71	94
0	30	40	53	71	95
0	30	41	54	72	96
0	31	41	55	73	97
0	31	41	55	74	98
0	31	42	56	74	99
0	32	42	56	75	100

6.4 Recommendation of Permit Frequency and Sample Type Requirements

The following tables are used as a guideline and provide an overview of the considerations involved in determining appropriate measurement for NPDES permit frequencies and sample collection type requirements, and how to properly incorporate the appropriate requirements in an NPDES permit based on permitted effluent flow (MGD). It also provides guidance to the public and to the regulated community on how DEQ intends to exercise its discretion in implementing its policy.

Table 6-2: Frequency and Sample Type Requirements for WET Testing

Facility Type	WET History	Measurement Frequency	Sample Type*
Major facilities	New outfall or no failures for at least 5 years.	1/quarter	24-hr composite
Major facilities	Occasional failures in the last 5 years.	1/quarter	24-hr composite
Major or Minor	Frequent failures in the last 5 years.	1/two months	24-hr composite
Major or Minor	Substantial number of failures in the last 5 years.	1/month	24-hr composite
Minor facilities	New outfall or a history of at least one failure.	1/quarter	24-hr composite
Minor	No failures for at least 5 years.	1/six months	24-hr composite

*Grab sample can be approved for stormwater only discharges and intermittent discharge scenarios.

WET testing frequencies for facilities with a history of WET testing failures and WET limit violations will be determined on a case-by-case basis and may be more frequent than stated above. WET testing frequencies for facilities discharging into sensitive environments will be determined on a case-by-case basis and may be more frequent than stated above.

6.4.1 Monitoring Reductions

New facilities and new outfalls at existing facilities will not be eligible for reduced WET monitoring until three (3) consecutive years of WET testing have been completed.

ARG790000 facilities will not be eligible for reduced WET monitoring until six (6) consecutive months of passing WET testing have been completed.

Facilities with new WET limits will not be eligible for reduced monitoring until one permit cycle (five years) is completed.

For acute WET testing, the monitoring frequency will not be reduced to a frequency of less than once per year for the less sensitive species (usually the *Pimephales promelas*) and not less than twice per year for the more sensitive species (usually the *Daphnia pulex*).

For chronic WET testing, the monitoring frequency will not be reduced to a frequency of less than twice per year for both species. Monitoring frequency reductions for facilities with no violations over a minimum of two years are shown in Table 6-3.

Table 6-3: Performance Based Monitoring Frequency Reductions for WET

Test Type	Current Frequency	Potential Reduced Frequency
Acute	1/month	1/two months or 1/quarter
Acute	1/two months	1/quarter
Acute	1/quarter	1/six months for the more sensitive species 1/year for the less sensitive species
Acute	1/six months	1/year for the less sensitive species No reduction for the more sensitive species
ARG790000 Acute	1/month	1/six months
Chronic	1/month	1/two months or 1/quarter
Chronic	1/two months	1/quarter
Chronic	1/quarter	1/six months
Chronic	1/six months	No Reduction

WET testing frequency reductions expire when the permit expires. Facilities must revert back to the original WET testing frequency that is stated in the permit.

For administratively continued facilities where permit renewal was held up by no fault of the permittee, the following language regarding WET testing frequency reduction applies after permit renewal:

The permittee may apply for a testing frequency reduction upon the successful completion of the first four consecutive quarters of testing after the expiration date of the previous permit, for one or both test species, provided that all of the following conditions are met:

i. The permittee tested quarterly upon the expiration date of that permit, and
ii. The issuance of the renewed permit was not delayed by any fault of the permittee, and
iii. No lethal or sub-lethal effects are demonstrated at or below the critical dilution for the first four consecutive quarters of testing after the expiration date of the previous permit.

If any of the above conditions are not met, standard WET testing frequency reduction conditions apply.

6.4.2 NPDES Permitted Fish Hatchery/Aquaculture Facility WET

WET testing is not required for NPDES permitted fish hatcheries and aquaculture facilities that have a design flow of less than 1 MGD.

WET testing is required for NPDES permitted fish hatcheries and aquaculture facilities that have a design flow of greater than or equal to 1 MGD. Fish hatcheries and aquaculture facilities shall perform one (1) WET test during the permit term. Sampling of the effluent for this WET test shall be performed when the facility is administering disease control chemicals (DCC).

The results of the test shall be submitted to the Water Quality Planning Branch of the Office of Water Quality for review. The report shall include:

A. Start date of DCC administration.
B. End date of DCC administration.
C. A description, including the name, of the DCC.
D. The amount of DCC administered.
E. The location of DCC administration (i.e., tank or raceway).
F. The name of the personnel administering the DCC.

If the final results of WET testing show that toxicity exists in the discharge, the permit may be reopened to include additional WET testing requirements or limits.

6.5 Whole Effluent Toxicity Permit Limit Determination

The EPA has developed a statistical approach to better characterize the effects of effluent variability and to make more certain the process of deciding whether to require an effluent limit. EPA’s approach to project an estimated maximum concentration for the effluent combines knowledge of effluent variability, as estimated by a coefficient of variation, with the uncertainty due to limited data. The estimated maximum concentration is calculated as the upper bound of the expected lognormal distribution of effluent concentrations at a high confidence level. The projected effluent concentration after consideration of dilution can then be compared to an appropriate water quality criterion to determine the potential for exceeding that criterion and the need for an effluent limit.

An effluent has “reasonable potential” to exceed a receiving water quality standard if it cannot be demonstrated with a high level of confidence that the upper bound of the lognormal distribution of effluent concentrations is below the receiving water criteria at specified low-flow conditions. The procedure outlined below requires that test’s NOEC values be converted to Toxic Units (TUs) in order to perform the following calculations (TU = 100/NOEC). However, it is not necessary for permittees to report test results in TUs. EPA Region 6 has elected to use reasonable potential multiplying factor values from Table 3-2 of the EPA Technical Support Document, the 99% confidence level, and 95% probability basis (see Table 6-4 at end of this chapter). EPA Region 6 has developed a computer application to perform these calculations. Where there have been no test failures (lethal or sub-lethal) in the previous five years, the default finding is that reasonable potential (RP) does not exist, and WET limits are not required. However, WET monitoring may be required.

6.5.1 Reasonable Potential Calculations Using Effluent Data Only

EPA recommends finding that a permittee has "reasonable potential" to exceed a receiving water quality standard if it cannot be demonstrated with a high confidence level that the upper bound of the lognormal distribution of effluent concentrations is below the receiving water criteria at specified low-flow conditions.

Step 1: Convert the past five years of NOEC to TU $\left(\mathrm{TU} = \frac{100}{\mathrm{NOEC}}\right)$.

Step 2: Determine the number of total observations (n).

Step 3: Determine the highest TU value observed in the effluent (C_e).

Step 4: Determine the CV for the data set:

If $n \leq 10$

The CV is estimated to equal 0.6. For less than 10 data points, the uncertainty in the CV is too large to calculate a standard deviation or mean with sufficient confidence.

If $n > 10$

The CV is calculated as standard deviation ÷ mean of the past five years data.

Step 5: Determine Reasonable Potential Multiplying Factor (RPMF) from Table 6-4, based on number of samples in a five-year period (n) in step 2 and the CV in Step 4.

Step 6: Calculate receiving water concentration (RWC) in $\mathrm{TU_c}$ or $\mathrm{TU_a}$ as follows:

RWC = C_e (Step 3) × RPMF (Step 5) × proposed critical dilution of the permit/100

$$\mathrm{RWC} = C_e \times \mathrm{RPMF} \times \frac{\mathrm{CD}}{100}$$

Step 7: Compare the projected maximum RWC to the applicable standard (criteria maximum concentration [CMC], criteria continuous concentration [CCC]) or (100 ÷ critical dilution)). If RWC is less than (100 ÷ critical dilution), reasonable potential does not exist.

Example:
Consider the following results of toxicity measurements of an effluent with the critical dilution of 100%. Calculate RWC:

	1	2	3	4	5	6	7	8	9	10	11	12
NOEC	56	32	100	75	75	42	100	100	75	32	100	100

Step 1: Convert NOEC to TU $\left(\text{TU} = \frac{100}{\text{NOEC}}\right)$

	1	2	3	4	5	6	7	8	9	10	11	12
NOEC	56	32	100	75	75	42	100	100	75	32	100	100
TU	1.79	3.13	1.0	1.33	1.33	2.38	1.0	1.0	1.33	3.13	1.0	1.0

Step 2: Number of data, $n = 12$

Step 3: Highest TU, $C_e = 3.13$

Step 4: $\text{CV} = \frac{\text{Standard Deviation}}{\text{Mean}} = \frac{27.4}{73.9} = 0.4$

Step 5: From Table 6-4, $\text{RPMF} = 1.4$ for $\text{CV} = 0.4$ and $n = 12$

Step 6: $\text{RWC} = C_e \times \text{RPMF} \times \frac{\text{CD}}{100} = 3.13 \times 1.4 \times \left(\frac{100}{100}\right) = 4.4\ \text{TU}$

Step 7: $\text{RWC} = 4.4\ \text{TU} > 1\ \text{TU}$, reasonable potential (RP) exists, permit requires WET monitoring and WET limit.

When using EPA Region 6’s RP calculation spreadsheet, the following apply:

- Calculate RP using the CD for the revised permit.
- When a NOEC of 0 is reported, use ½ the lowest dilution used for that test for RP calculations.

6.5.1.1 Whole Effluent Toxicity Permit Limit Implementation

WET limits are <u>not</u> required to be added when:

- there are less than 10 data points and no failures were noted during the permit cycle even if the calculation spreadsheet notes RP;
- failure(s) are shown to be unrepresentative or are no longer representation of the permitted discharge and documentation is provided in the fact sheet/statement of basis; or
- toxicity reduction evaluation (TRE) or other documented corrective actions have eliminated previous effluent toxicity.

WET Limits are required when:

- representative data shows one or more unexplained failures during the permit cycle and the calculation spreadsheet notes RP; or
- a TRE is inconclusive or does not result in elimination of effluent toxicity.

WET limits are implemented as follows:

- For acute WET tests, a finding of RP with any unexplained lethal failures reported requires an acute limit for that species.
- For chronic WET tests, a finding of RP with any unexplained lethal and/or sub-lethal failures reported requires a chronic limit for that species.
- For chronic limits, the facility will report the lowest NOEC value for survival or growth for *Pimephales promelas* or survival or reproduction for *Ceriodaphnia dubia*.
- Limits will be reported using the parameter codes listed in the permit.

When the effluent fails the chronic endpoint below the required limit (i.e., a violation), increased frequency testing[34] for the affected species is required and will increase to monthly until such time compliance with the limit is demonstrated for a period of three consecutive months.

- If conducting increased frequency testing due to a limit failure (i.e., a violation) (demonstration of significant toxic effects at or below the limit) the results will be reported on an unscheduled DMR based on the permit.

[34] **Increased frequency test**: a test conducted after a limit violation for a permittee with WET limits. Increased frequency tests are conducted monthly until such time compliance with WET limit is demonstrated for a period of three consecutive months. Increased frequency tests are reported on a DMR based on the permit. Increased frequency test reports must be provided to DEQ.

6.6 Conditions Specific to WET Monitoring Requirements

6.6.1 Lethality Failures

The permittee shall conduct a total of three retests[35] for any species that demonstrates significant lethal effects at or below the critical dilution in a valid test. The retests shall be conducted monthly during the next three consecutive months. If any of the retests demonstrates significant lethal effects at or below the critical dilution, persistent toxicity is confirmed, and the permittee shall initiate toxicity reduction evaluation (TRE) requirements.

6.6.2 Sub-lethal Failures

The permittee shall conduct a total of three retests for any species that demonstrates significant sub-lethal effects at or below the critical dilution in a valid test. The retests shall be conducted monthly during the next three consecutive months. If any two of the three retests demonstrate significant sub-lethal effects, persistent toxicity is confirmed, and the permittee shall initiate TRE requirements. Persistent toxicity can also be confirmed by a pattern of toxicity demonstrated by multiple significant sub-lethal effects.

6.6.3 Retest Codes

If conducting retests due to a test failure (demonstration of significant toxic effects at or below the critical dilution), the parameter codes listed in the permit will be used.

6.7 Toxicity Reduction Evaluation (TRE)

Within 90 days of confirming persistent toxicity (at least two lethal failures and/or at least three sub-lethal failures in a consecutive four-month period), the permittee shall submit a Toxicity Reduction Evaluation (TRE) Action Plan and Schedule for conducting a TRE. The TRE Action Plan shall specify the approach and methodology to be used in performing the TRE. A TRE is an investigation intended to determine those actions necessary to achieve compliance with water quality-based effluent limits by reducing an effluent's toxicity to an acceptable level. A TRE is defined as a stepwise process which combines toxicity testing and analyses of the physical and chemical characteristics of a toxic effluent to identify the constituents causing effluent toxicity and/or treatment methods which will reduce the effluent toxicity. The goal of the TRE is to maximize the reduction of the toxic effects of effluent at the critical dilution.

[35] **Retest**: a test conducted after a lethal or sub-lethal failure at or below the critical dilution for a permittee with WET monitoring only. Retests are conducted monthly during the next three consecutive months after the test failure. These are reported via retest codes on the DMR. If retests are not conducted because there were no failures, the permittee will report NODI 9 for the retest codes. Retest reports must be provided to DEQ.

The permittee shall initiate the TRE Action Plan within 30 days of plan and schedule submittal. The permittee shall assume all risks for failure to achieve the required toxicity reduction.

The permittee shall submit a quarterly TRE Activities Report, with the DMR in the months of January, April, July, and October, containing information on toxicity reduction evaluation activities.

The permittee shall submit a Final Report on TRE Activities no later than 28 months from confirming toxicity in the retests, which provides information pertaining to the specific control mechanism selected that will, when implemented, result in reduction of effluent toxicity to no significant toxicity at the critical dilution. The report will also provide a specific corrective action schedule for implementing the selected control mechanism.

Quarterly testing during the TRE is a minimum monitoring requirement. EPA recommends that permittees required to perform a TRE not rely on quarterly testing alone to ensure success in the TRE, and that additional screening tests be performed to capture toxic samples for identification of toxicants. Failure to identify the specific chemical compound causing toxicity test failure will normally result in a permit limit for whole effluent toxicity limits per federal regulations at 40 C.F.R. § 122.44(d)(1)(v).

6.8 Concurrent Chemical-Specific Sampling and Analysis

DEQ may require concurrent chemical-specific analyses on samples collected for WET testing purposes where there is reason to believe the chemical(s) may cause or contribute to WET. Permittees must submit the results of concurrent chemical-specific testing with the WET test report. Permittees must collect sufficient sample volumes for the testing laboratory to perform concurrent chemical-specific testing in addition to the WET testing.

6.9 WET Test Review Process

Test review is an important part of the overall quality assurance program and is necessary for ensuring that all test results are reported accurately. Test review should be conducted on each test by both the testing laboratory and the regulatory authority.

When permit-required WET tests are conducted, the following review process will be carried out for submitted tests.

A. Results will be examined to verify the sample was maintained at the proper temperature from time of collection to arrival at the testing laboratory. Also, results will be examined to determine if the sample meets the test initiation and renewal holding time.

B. Results will be examined to verify if the test meets the test duration requirements.

   a. Tests (48-hour tests): ± 2 hours from the time the test was initiated, minimum of 46 to a maximum of 50 hours after initiation.

b. Chronic *Pimephales promelas* tests (7-day tests = 168 hours): ± 2 hours from the time the test was initiated, minimum of 166 hours to a maximum of 170 hours.
c. Chronic *Ceriodaphnia dubia* tests: test is terminated when 60% or more of the surviving control females have produced their third brood OR at the end of 8 days (192 hours), whichever occurs first. The acceptable window of termination for 8 days is a minimum of 190 hours to a maximum of 194 hours.

C. Evaluate the test results for the effluent to verify that the laboratory met the test acceptability criteria (TAC) as specified in the test method. All invalid tests must be repeated with a newly collected sample, as specified in the permit. A repeat test[36] must be completed within the reporting period.

D. Results will be examined based on the "Summary of Test Conditions and TAC" section for the specific method to determine whether the required and recommended test conditions were met.

E. Statistical results will be examined to verify that the recommended flowcharts for statistical analysis were followed. Any deviation from the recommended flowcharts for selection of statistical methods should be noted in the data report.

F. The concentration-response relationships of the tests will be examined. These are reviewed to ensure that calculated test results are interpreted appropriately. All WET test results (from multi-concentration tests) reported under the NPDES program will be reviewed and reported according to EPA guidance on the evaluation of concentration-response relationship (see EPA. 2000. *Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing* (40 C.F.R. Part 136[37]) EPA 821-B00-004).

G. Results of the associated reference toxicant test and current control chart will be reviewed.

H. The within-test variability of individual tests will be reviewed. Permits requiring sub-lethal endpoints will be reviewed and variability criteria will be applied as described in the method manuals section on test review (see EPA. 2002. *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. EPA 821-R-02-013, Section 10.2, and EPA. 2002. *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*. EPA 821-R-02-012, Sec. 12-2).

I. DEQ will then approve the test as a pass, fail, or invalid for each endpoint.

[36] **Repeat test**: a test conducted after a previous test is deemed invalid by DEQ. Invalid tests are not test failures or limit violations; however, the test report must be provided to DEQ. Repeat tests must be conducted within the same monitoring period, otherwise the permittee will have to report NODI E on their DMR.
[37] 40 C.F.R. Part 136 is included by reference in 8 CAR Part 25.

Table 6-4. Reasonable Potential Multiplying Factors: 99% Confidence Level and 95% Probability Basis

Samples	Coefficient of Variation																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
1	1.4	1.9	2.6	3.6	4.7	6.2	8.0	10.1	12.6	15.5	18.7	22.3	26.4	30.8	35.6	40.7	46.2	52.1	58.4	64.9
2	1.3	1.6	2.0	2.5	3.1	3.8	4.6	5.4	6.4	7.4	8.5	9.7	10.9	12.2	13.6	15.0	16.4	17.9	19.5	21.1
3	1.2	1.5	1.8	2.1	2.5	3.0	3.5	4.0	4.6	5.2	5.8	6.5	7.2	7.9	8.6	9.3	10.0	10.8	11.5	12.3
4	1.2	1.4	1.7	1.9	2.2	2.6	2.9	3.3	3.7	4.2	4.6	5.0	5.5	6.0	6.4	6.9	7.4	7.8	8.3	8.8
5	1.2	1.4	1.6	1.8	2.1	2.3	2.6	2.9	3.2	3.6	3.9	4.2	4.5	4.9	5.2	5.6	5.9	6.2	6.6	6.9
6	1.1	1.3	1.5	1.7	1.9	2.1	2.4	2.6	2.9	3.1	3.4	3.7	3.9	4.2	4.5	4.7	5.0	5.2	5.5	5.7
7	1.1	1.3	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.5	4.7	4.9
8	1.1	1.3	1.4	1.6	1.7	1.9	2.1	2.3	2.4	2.6	2.8	3.0	3.2	3.3	3.5	3.7	3.9	4.0	4.2	4.3
9	1.1	1.2	1.4	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.8	2.9	3.1	3.2	3.4	3.5	3.6	3.8	3.9
10	1.1	1.2	1.3	1.5	1.6	1.7	1.9	2.0	2.2	2.3	2.4	2.6	2.7	2.8	3.0	3.1	3.2	3.3	3.4	3.6
11	1.1	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2.1	2.2	2.3	2.4	2.5	2.7	2.8	2.9	3.0	3.1	3.2	3.3
12	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.0
13	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.8	2.9
14	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.6	2.7
15	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.5
16	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.4
17	1.1	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.3
18	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2
19	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.0	2.0	2.0	2.1	2.1
20	1.1	1.2	1.2	1.3	1.4	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.8	1.8	1 9	1.9	2.0	2.0	2.0	

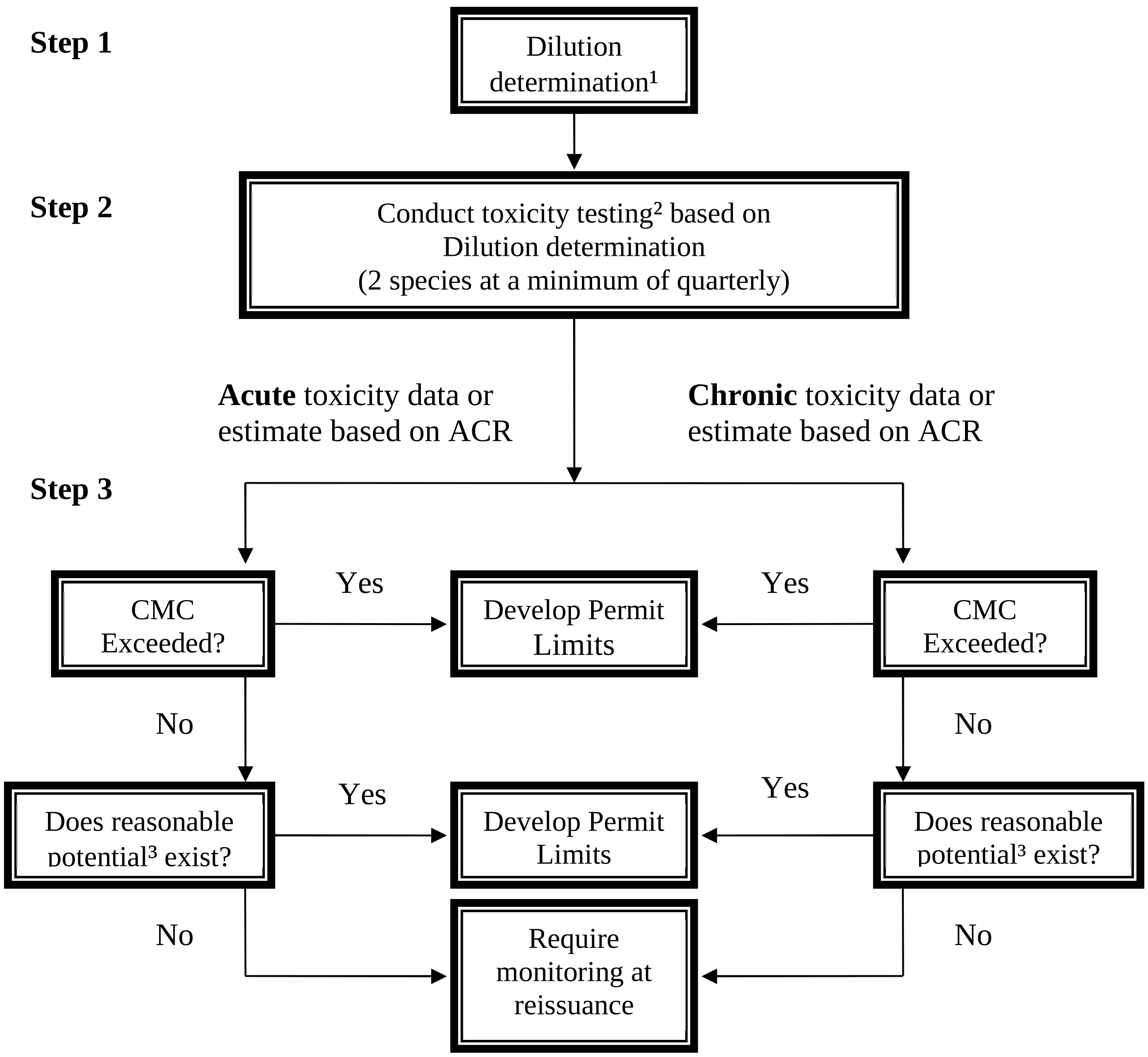

Figure 6.1: Flow Chart for Determination of WET Limitations

[1] Dilution determination should be performed for critical flows and any applicable mixing zones.

[2] Toxicity Testing recommendations:

a) Dilution > 100:1, acute testing check CMC only
b) Dilution ≤ 100:1, conduct chronic testing, check CCC with data and CMC using acute data or ACR

[3] Reasonable potential: Use procedures above.

Chapter

7

Chapter 7 PUBLIC PARTICIPATION AND NOTICE

The Office of Water Quality works with the Office of Operations and Outreach of DEQ to help Arkansans participate in the environmental decision-making processes. As part of Arkansas's public participation program, DEQ utilizes its website (https://www.adeq.state.ar.us), statewide newspaper advertisements, and public meetings to facilitate public participation.

DEQ will implement a public participation program as a basic part of the planning process. The following will be part of the public participation program in Arkansas. Procedures soliciting public participation during the development of TMDLs for watersheds and WLAs for wastewater treatment facilities, Water Quality Management Plan (WQMP), and draft permits are described in the specific chapter. In addition to the requirements under the federal CWA, 8 CAR Part 11 – *Administrative Procedures* provides the framework for public participation.

The public participation program is an active program designed to seek out those who can provide useful inputs and those who will be affected by the planning process.

The public participation program will include provisions for disseminating information to the public. Data and information available to planners is easily accessible to the public. Depositories of documents and data will be clearly identified and remain open for public use at generally convenient times.

Relevant information will be provided as required by EPA public participation guidelines (40 C.F.R. Part 25) in order to assist the public in understanding and responding to water quality programs. Lengthy documents or complex technical materials that relate to significant decisions will be summarized for public and media uses in the form of fact sheets or newsletters and will be used to provide notice that the materials are available at DEQ's central offices or at other convenient locations. Relevant information and evidence, when submitted by citizens, will be respectfully considered.

A current list of interested persons and organizations to be notified concerning significant actions taken or anticipated will be maintained.

Anyone with email capability can sign up for free, automatic delivery of news releases, regulatory notices, program updates, and other postings to DEQ's website by subscribing to the email list at the following website:

https://www.adeq.state.ar.us/poa/pi/emaillists.aspx.

In instances of multi-agency planning programs, such as CWA Section 208 Areawide Waste Treatment Planning, DEQ will serve as the reviewing arm of the Office of the Governor in the certification process. DEQ will coordinate the public participation activities and will provide assistance when possible.

To access the DEQ Office of Water Quality website, go to: https://www.adeq.state.ar.us/water

This website provides answers to frequently asked questions, information on water quality, inspections, enforcement actions, definitions, permits, and CWA questions. Permit information can be obtained using several different search options, including permit number, facility name, or DEQ Facility Identification Number (AFIN) at the following website:
https://www.adeq.state.ar.us/home/pdssql/pds.aspx

To access Arkansas's rules, go to: https://www.adeq.state.ar.us/regs

To access EPA Region 6, go to: https://www.epa.gov/aboutepa/epa-region-6-south-central

7.1 Public Notice of the Individual Permit Application[38]

As required by Ark. Code Ann. § 8-4-203(d), public notice of an administratively complete application for a permit shall be published in a newspaper of general circulation in the county in which the proposed facility or activity is to be located, or, for a statewide permit, in a newspaper of statewide circulation. Any interested person may request a public hearing on the application by giving DEQ a written request within ten (10) business days of the publication of the notice.

7.2 Public Notice of the Individual Draft Permit

As required by Ark. Code Ann. § 8-4-203(e) and as applicable under 40 C.F.R. § 124.10, notice of the draft permitting decision shall be published in a newspaper of general circulation in the county in which the facility or activity proposed to be permitted is located, or, for a statewide permit, in a newspaper of statewide circulation. When DEQ causes the notice to be published, the notice may be combined with other notices of permitting decisions.

The public notice describes the procedures for the formulation of final determinations and shall provide for a public comment period of 30 days. During this period, any interested persons may submit written comments on the permit and may request a public hearing to provide verbal or written comments on the draft decision during the hearing. A request for a public hearing shall be in writing and shall state the nature of the issue(s) proposed to be raised in the hearing.

[38] Public notice of the permit application is required by Arkansas state law, but is not a federal requirement.

Prior to the close of the public comment period, the Director may extend the period for written public comments for up to an additional twenty (20) calendar days, through a public notice, if exceptional circumstances warrant.

A copy of the permit and public notice will be sent via email to the USACE, the Regional Director of the U.S. Fish and Wildlife Service, Department of Parks, Heritage and Tourism, the EPA, and the Arkansas Department of Health.

7.3 Public Notice of General Permits

Public notice and participation procedures must meet requirements specified by 8 CAR Part 11 and those specified in the Arkansas Air and Water Pollution Control Act. Additional participation procedures may be specified within the general permit.

7.4 Public Notice of TMDLs (New, Modified, or Withdrawn)

TMDLs are required to have a public review process under 40 C.F.R. § 130.7. Public participation opportunities for TMDLs in Arkansas are in compliance with 40 C.F.R. Part 25 and 8 CAR Part 11.

Prior to or upon publication of public notice of a draft TMDL, DEQ will notify all affected NPDES permittees, non-point sources identified in the TMDL, affected local governments (cities, counties), municipalities, and other relevant stakeholders.

Public notice will occur through a newspaper of statewide circulation and/or through DEQ’s website. The notice will contain agency staff contact information. A statement should be included that any interested person may request a public hearing on the proposed TMDL by giving DEQ a written request within 30 calendar days of the publication of the notice.

Additionally, the public notice will also include the proposed WQMP update (208 Plan update) to include the associated allocations set forth in the TMDL. When the TMDL is approved by EPA, the TMDL is to be automatically incorporated into the WQMP with the associated WLAs for applicable facilities. The approval of the TMDL will be considered equivalent to technical acceptance of a WQMP update and formal approval (Governor certification). Consequently, approved TMDLs will be immediately effective for implementation in NPDES permits and not be required to be included in the Governor certifications.

A request for a public hearing shall be received in writing or e-mail and shall state reasons for the necessity of a public hearing. A public hearing may be held at the DEQ Director’s discretion.

Prior to the close of the public comment period, the Director may extend the period for written public comments for up to an additional 20 calendar days, through a public notice, if exceptional circumstances warrant.

Written public comments will be accepted by either regular mail or e-mail until the end of the public comment period as specified in the public notice. E-mail comments must be sent to the e-mail address specified in the public notice.

DEQ shall make available the draft TMDL and other material relevant to the draft TMDL for inspection on the DEQ website and shall make available for reproduction at the DEQ North Little Rock office during the public comment period.

After the public notice period has expired, DEQ shall consider all comments received as a result of the public notice and may revise the draft TMDL as it considers appropriate.

Prior to the public comment period, DEQ may solicit from EPA a precursory review of any TMDL. EPA, upon request, may review and submit to DEQ its comments, objections, or recommendations on the draft TMDL. Comments received from EPA on the draft TMDL may be incorporated before the public notice period; however, if comments are not received from EPA on the draft TMDL, DEQ will proceed with the public notice process. Comments received during the 30-day public notice period will be responded to for each issue raised and will be included with the draft TMDL. A copy of the draft TMDL, the public notice announcement, the attachments, response to comments, and any other applicable materials included in the TMDL checklist will be submitted to EPA Region 6. Upon receipt of the draft TMDL, EPA will have 30 days to approve or disapprove the TMDL. When the TMDL is approved by EPA, the TMDL is to be automatically incorporated into the WQMP with the associated WLAs for applicable facilities. The approval of the TMDL will be considered equivalent to technical acceptance of a WQMP update and formal approval (Governor certification). Consequently, approved TMDLs will be immediately effective for implementation in NPDES permits and not be required to be included in the Governor certifications.

7.5 Public Participation and Notice of WQS (Promulgated as 8 CAR Part 21) for Triennial Review

DEQ follows the steps below to accomplish the review and public participation and notice requirements for WQS rulemaking:

- Stakeholder meeting(s) to solicit informal feedback from the public
- Approval by the Governor of Arkansas
- Approval of initiation of rulemaking by the APC&EC
- Notice of Public Hearing (at least 45 days prior to the hearing date), notice of public comment period on the proposed rule, and notice of availability of proposed amendments to 8 CAR Part 21 and documentation of analysis supporting all WQS amendments recommended
- Public Hearing
- Consideration and response to public comments
- Approval of proposed 8 CAR Part 21 by APC&EC

- Review and approval of 8 CAR Part 21 by Committees of the Arkansas General Assembly
- Certification that the WQS in 8 CAR Part 21 were adopted pursuant to state law
- Submittal of 8 CAR Part 21 and documentation of analysis supporting all WQS amendments to EPA Region 6

7.6 Public Notice of WQMP (208 Plan) Updates

DEQ will follow the procedure given in Chapter 3 of this document for submittal of proposed 208 Plan updates to EPA for technical acceptance. Technically acceptable WQMP updates for individual facility effluent limits will be public noticed for a 30-day comment period when the draft permit is public noticed, either in the same public notice or a separate public notice. Following the completion of the public notice for the WQMP update, responding to any comments received, and receiving technical acceptance from EPA Region 6 for any changes from the originally submitted update, DEQ will perform the WQMP update, at which time the individual permit limits included in the WQMP update will be immediately effective for use in the permit. The final step in the WQMP update process consists of the DEQ Director, on behalf of the Governor, sending a Governor certification letter to EPA Region 6 listing the WQMP updates that occurred since the most recent Governor certification for final approval.

The procedures stated above will not apply to development of a TMDL for an impaired waterbody. In cases where a TMDL is developed and public noticed, the public notice will also include the proposed WQMP update to include the associated allocations set forth in the TMDL. When the TMDL is approved by EPA, the TMDL is to be automatically incorporated into the WQMP with the associated WLAs for applicable facilities. The approval of the TMDL will be considered equivalent to technical acceptance of a WQMP update and formal approval (Governor certification). Consequently, approved TMDLs will be immediately effective for implementation in NPDES permits and not be required to be included in the Governor certifications.

7.7 Public Notice of Individual 401 Certification

Public notice of an administratively complete request for a 401 water quality certification for projects that have the potential to impact ERWs, ESWs, or NSWs, shall be published once in a newspaper of general circulation in the county in which the proposed activity is located for a 30-day comment period. If there are no comments or concerns that need to be addressed at the close of the comment period, a final 401 certification will be provided to the applicant and the USACE project manager.