

Environmental
Compliance
Navigator

2024™

Presented by

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NPDES Overview

Jeff Kissell

September 10, 2024



Bright ideas.
Sustainable change.



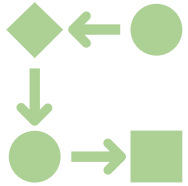
Jeffrey Kissell

(jkissell@ramboll.com)



- MS Water Resource Engineering
- BS Civil Engineering
- PE in Tennessee
- Focus: industrial water / wastewater process & operations
- Ask me about...
 - evaluating / troubleshooting existing treatment systems
 - evaluating treatment technology options
 - treatability testing
 - process design
 - treatment system operations

What you will learn



How NPDES permit limits are generated

i.e., where do the numbers come from?



Options for negotiating / justifying alternative limits



What happens if you can't meet your permit limits

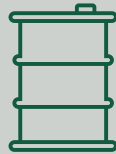
Clean Water Act

1972

Objective:

- Restore, Protect, and Maintain the Chemical, Physical & Biological Integrity of Surface Waters
- Fishable / Swimmable Point and Non-point Discharges

What is a Point Source?



Point Source (defined very broadly in CWA) is any discernible, confined and discrete conveyance (such as a pipe, ditch, channel, tunnel, conduit, discrete fissure, or container). It also included concentrated animal feeding operations.



Agricultural stormwater discharges and return flow from irrigated agriculture are not considered “point sources.”

What is a Nonpoint Source?

- Nonpoint source pollutants result from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification. As the runoff moves, it picks up and carries away natural and human-made pollutants and deposits them into lakes, rivers, wetlands, coastal water, and ground waters.



What is NPDES?



Created by the CWA



The NPDES permit program addresses water pollution by regulating point sources that discharge pollutants to Waters of the United States.



The CWA prohibits anybody from discharging pollutants through a point source into a Water of the United States unless they have an NPDES permit.

What is a Permit?

A license granting permission to do something which would otherwise be illegal

There is no right to a permit, and it is revocable for cause, such as noncompliance

The NPDES permit is a license to discharge--NOT to violate water quality standards

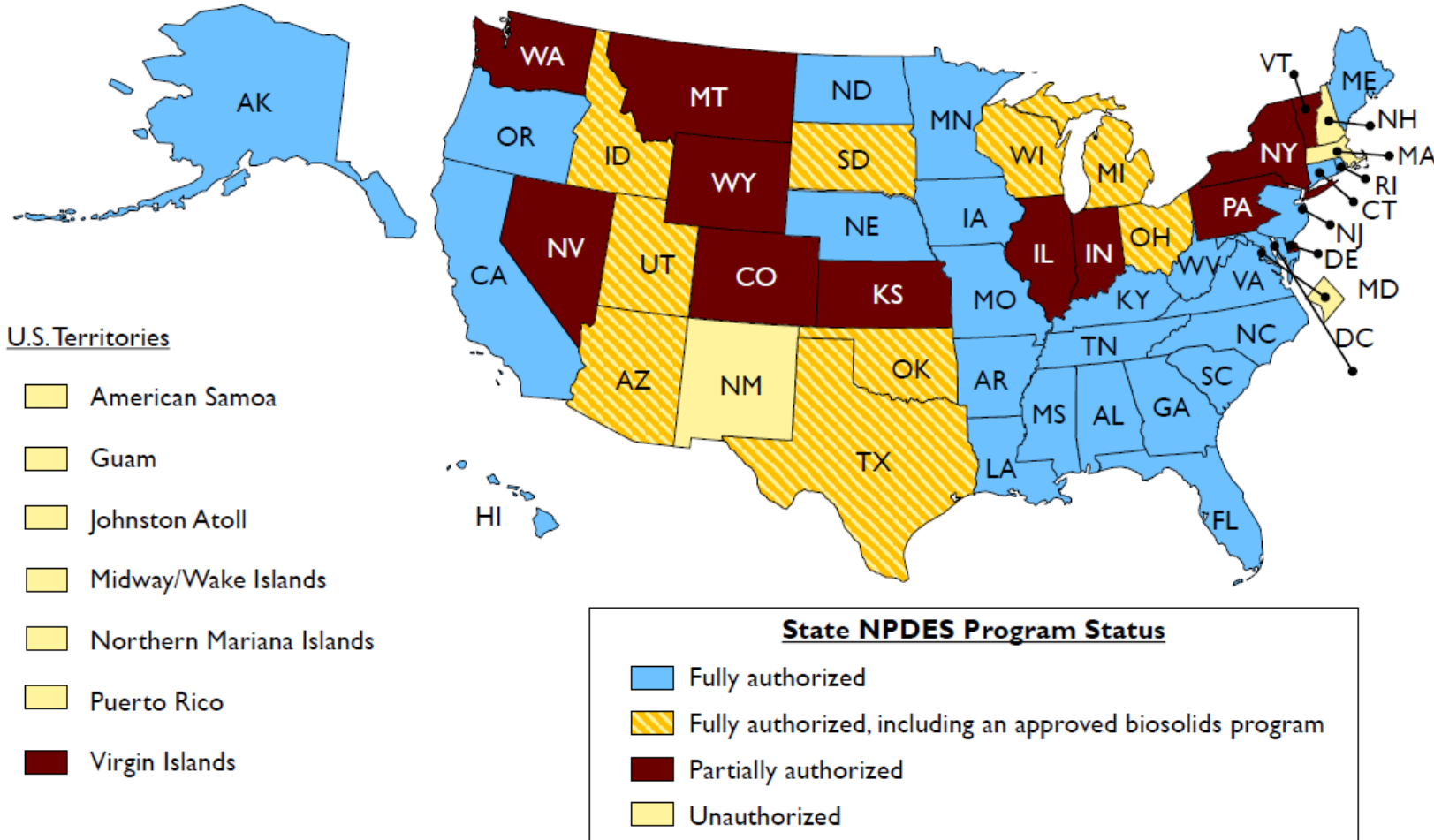
Who issues NPDES permits? NPDES Authority

- States / Tribes / Territories with approved programs
 - States or Tribe
 - Issues permits
 - Conducts compliance and monitoring activities
 - Enforces
 - USEPA role is oversight
 - Grants
 - Administrative
 - Technical and legal support and training
 - Enforcement as necessary
- States / Tribes / Territories without approved program
 - USEPA issues permits
 - USEPA conducts compliance and monitoring activities
 - USEPA enforces



NPDES Program Authorizations

(as of July 2019)



Example NPDES application process

Applicant submits complete NPDES permit application forms

1

Agency develops the draft NPDES permit and supporting documents

Antidegradation analysis may be required as part of the issuance process

2

Government-to-government consultation

3

NEPA Review Process

The extent of the NEPA analysis depends on the project

This step may take 6 months or longer

4

Example NPDES application process

Endangered Species Act Consultation
with the U.S. Fish & Wildlife Service

This step may take several months

5

401 certification

This step may take 60 days or longer

6

Draft permit and supporting
documents are put on Public Notice

The permit must be on Public Notice for a minimum
of 30 days

7

Respond to public comments (if any)
and issue final permit

8

What's in an NPDES permit?



The permit contains:

Facility information

Limits on what can be discharged

Where water can be discharged
(outfalls)

Requirements for monitoring and
reporting

Special provisions



Permit fact sheet

Types of limits



Numerical limits

Concentration and/or loading
Monthly average, daily max, weekly average, annual...



Narrative criteria

E.g., “free of objectionable color, odor, taste, and turbidity.”



Other

e.g., Whole Effluent Toxicity (WET)

Effluent Limitations

Effluent limitations of pollutants to receiving waters serve as the primary mechanism in NPDES permits for controlling discharges

Two types of limits:

Technology-Based Effluent Limitations (TBELs)

→ Limits based on the technology available to control the pollutants

Water Quality-Based Effluent Limitations (WQBELs)

→ Limits that are protective of water quality standards of the receiving water

TBELs & WQBELs

TBELs aim to prevent pollution by requiring a minimum level of treatment of pollutants for point source discharges based on available treatment technologies, while allowing the discharges to use any available control technique to meet the limits.

TBELs are developed independently of the potential impact of a discharge on the receiving water, which is addressed through **WQBELs**.





TBELs

Based on what you do

- Typically, mass-based limits
- Industry specific
- Need to look at every applicable production process (they can get very specific)

Standards for newer facilities are typically more stringent

- “Existing” versus “new” defined by set date in ELG

Most stringent limits usually apply

Can be more or less stringent than WQBELs

May also be TBELs for indirect discharges

TBELs for municipal discharges

Secondary Treatment Standards

Parameter	30-Day Average	7-Day Average
BOD ₅ / CBOD ₅	30 / 25 mg/L	45 / 40 mg/L
TSS	30 mg/L	45 mg/L
pH	6.0 - 9.0 s.u.	
Percent Removal	85% (monthly average) for BOD ₅ / TSS	

TBELs for industrial Facilities

Effluent Limitation Guidelines (ELGs)

- BPT: Best Practicable Control Technology Currently Available
- BCT: Best Conventional Pollutant Control Technology
- BAT: Best Available Control Technology Economically Achievable
- NSPS: New Source Performance Standards

Industry specific

- Based on industrial category (SIC codes)
- Limits based on production processes and production capacity

Best Professional Judgment (BPJ)

Direct Discharger vs Indirect Discharger

How are ELGs developed?

Example: Organic Chemicals, Plastics and Synthetic Fibers (OCPSF) category

- Promulgated in 1987

1983 survey sent to 2,840 facilities and corporate HQs

- 940 OCPSF facilities identified
- EPA selected 21 facilities that met the editing criteria to be deemed to be BPT for the industry

EPA selected to regulate the industry using:

- Conventional pollutants BOD₅, TSS and pH, as well as relevant priority pollutants and metals.
- Activated sludge biological treatment selected as the BPT technology

How are TBELs calculated?

- PART 420—IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY
 - Subpart I—Acid Pickling Subcategory
 - (a) Sulfuric acid pickling (spent acid solutions and rinse waters)
- (1) Rod, wire and coil.

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days
	Kg/kg (pounds per 1,000 lb) of product	
TSS	0.0818	0.0350
O&G ¹	0.0350	0.0117
Lead	0.000526	0.000175
Zinc	0.000701	0.000234
pH	(2)	(2)

¹The limitations for oil and grease shall be applicable when acid pickling wastewaters are treated with cold rolling wastewaters.

²Within the range of 6.0 to 9.0.

Also BAT, NSPS,...

Pollutant or pollutant property	BAT effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days
	Kg/kkg (pounds per 1,000 lb) of product	
Chromium	0.00213	0.000852
Nickel	0.00192	0.000638

Pollutant or pollutant property	New source performance standards	
	Maximum for any 1 day	Average of daily values for 30 consecutive days
	kg/kkg (pounds per 1,000 lb) of product	
TSS	0.0146	0.00626
O&G*	0.00626	0.00209
Lead	0.0000939	0.0000313
Zinc	0.000125	0.0000417
pH	(¹)	(¹)

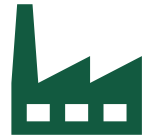
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¹Within the range of 6.0 to 9.0.

TBELs



They can get very specific



Need to look at every applicable production process



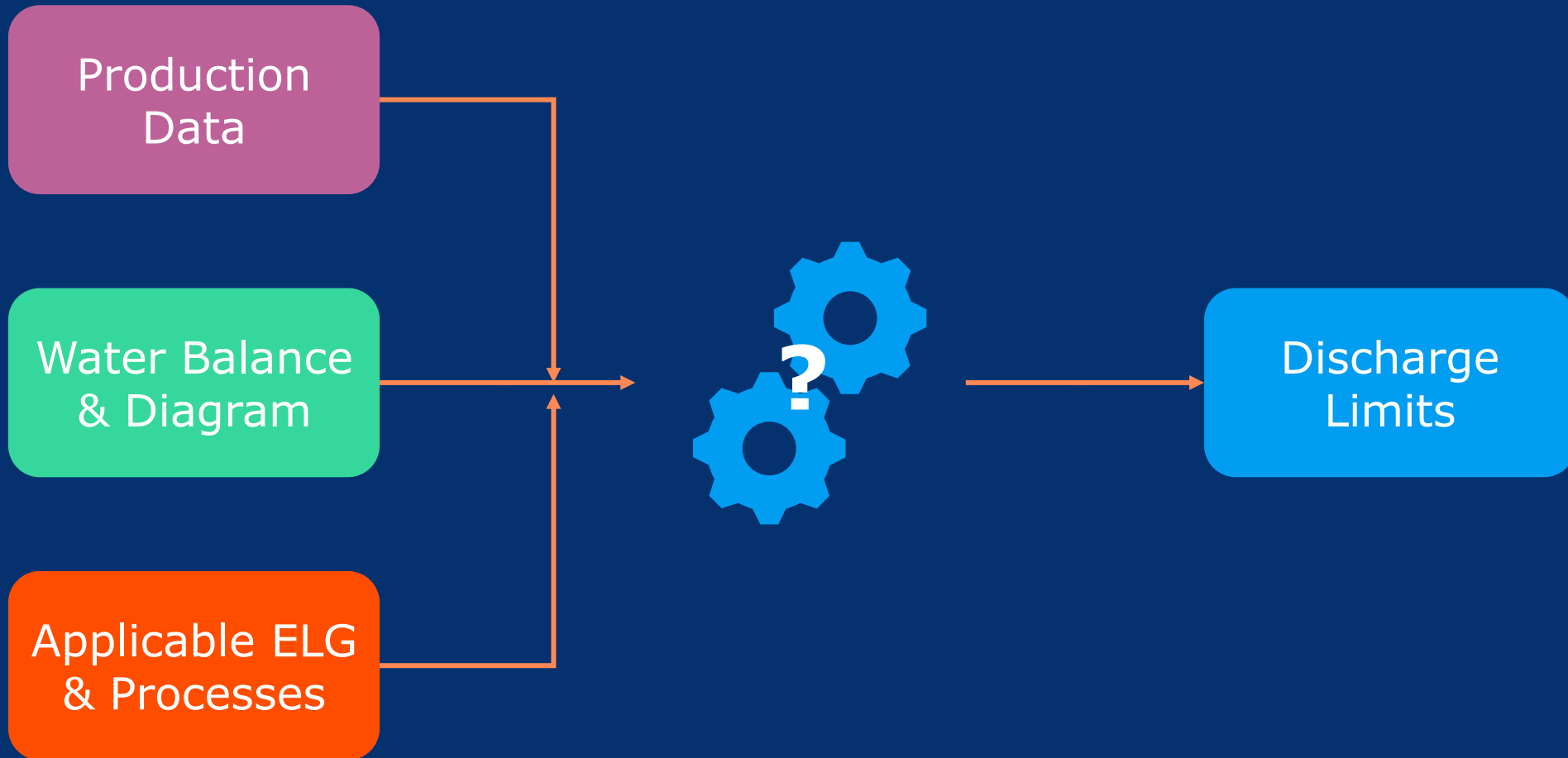
Standards for newer facilities are typically more stringent

"Existing" versus "new" defined by set date in ELG



Can be more or less stringent than WQBELs

The more stringent of the calculated limits is usually applied



There may also be TBELs for indirect discharges

Pollutant or pollutant property	Pretreatment standards for existing sources	
	Maximum for any 1 day	Average of daily values for 30 consecutive days
	Kg/kgg (pounds per 1,000 lb) of product	
Lead	0.000526	0.000175
Zinc	0.000701	0.000234

Pollutant or pollutant property	Pretreatment standards for new sources	
	Maximum for any 1 day	Average of daily values for 30 consecutive days
	Kg/kgg (pounds per 1,000 lb) of product	
Lead	0.0000939	0.0000313
Zinc	0.000125	0.0000417


WQBELS

- Based on protecting the receiving stream
- Typically, concentration-based
- Not discharger / industry specific



CWA reminder

The purpose of CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.



Section 401 authorizes States to establish Water Quality Standards.

Water Quality Standards

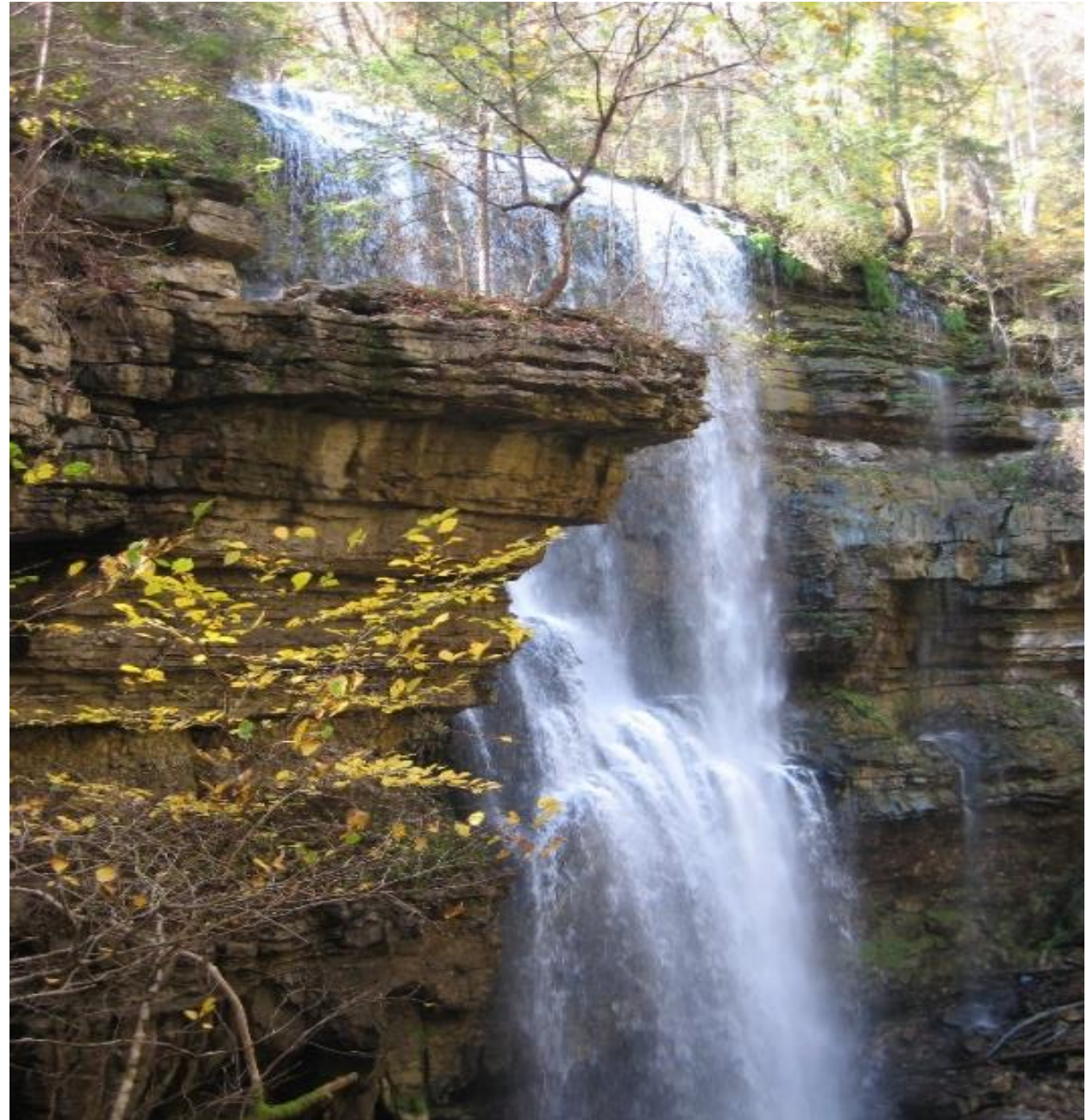
Water Quality Standards (WQS) are provisions of state, territorial, authorized tribal or federal law approved by USEPA that describe the condition of a water body and the means by which that condition will be protected or achieved.



Water Quality Standards

Water Quality Standards are established to protect human health and aquatic life

Water Quality Standards form a legal basis for controlling pollutants entering the Waters of the United States.



WQS Core Components

Designated Uses - aquatic life, drinking water, etc.

Ambient Criteria - to protect designated uses

Antidegradation /
Antibacksliding Requirements

Categories of Designated Uses



- Protection and propagation of fish, shellfish, and wildlife



- Recreation (both in and on the water)

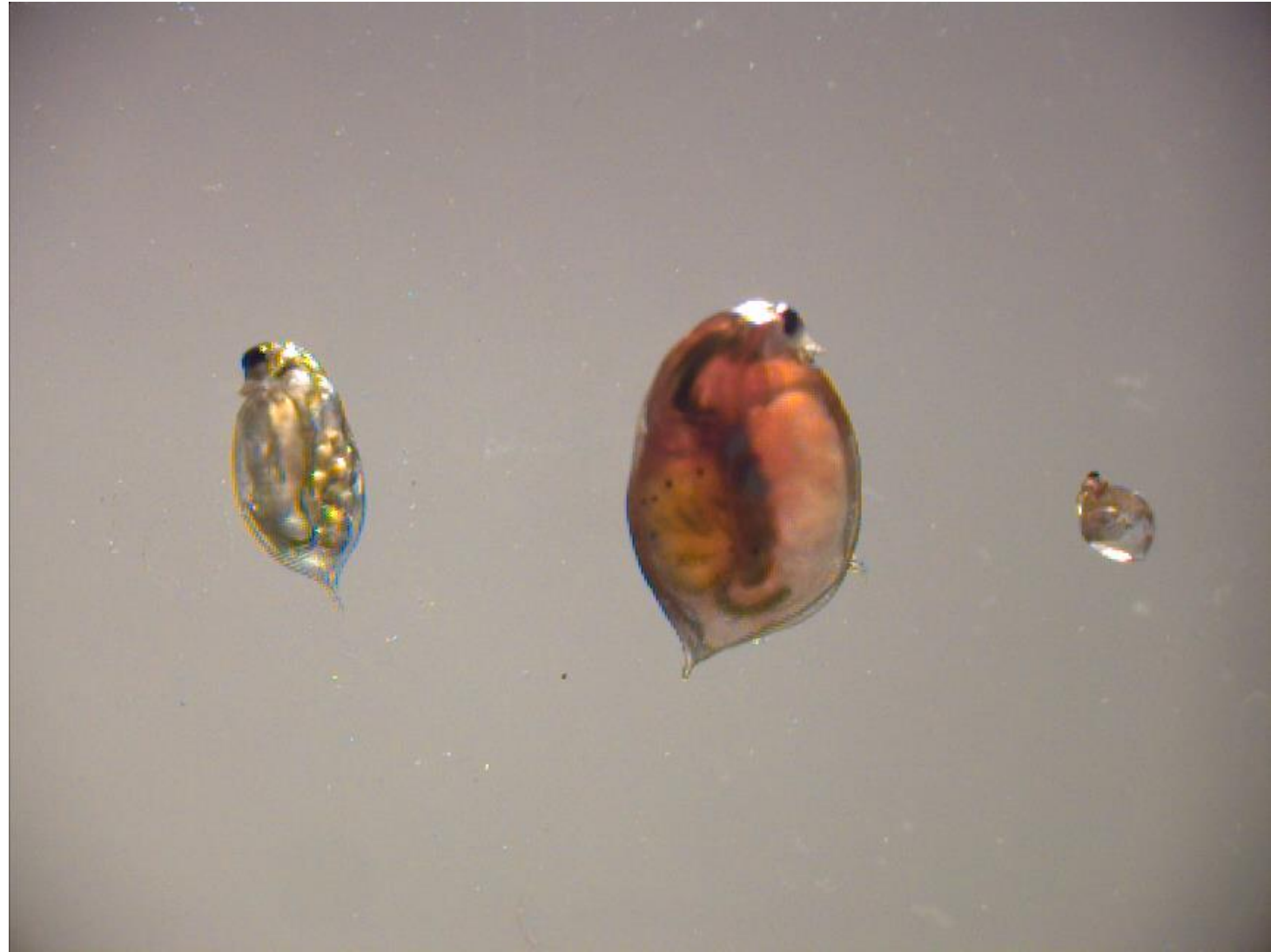
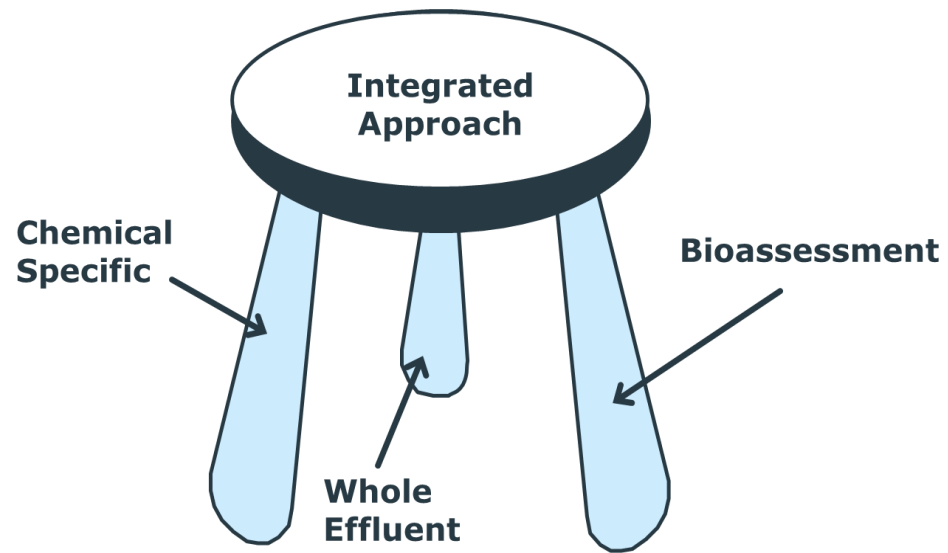


- Public Drinking Water Supply



- Agricultural, industrial, navigational, and other purposes

Integrated Approach to Water Quality-Based Toxics Control



Antidegradation Requirements

Protect	Protect existing uses
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Protect	Protect waters that are of higher quality than necessary to support CWA goals
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Protect	Protect waters identified as Outstanding National Resource Waters (ONRWs).
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WQBELs

1

WQBELs and WQS are related, but not the same thing

2

WQBEL is an effluent limit designed to assure that the receiving stream does not violate (exceed) WQS

3

Allows for dilution in the receiving stream

4

Considers background concentrations in the receiving stream

Need A Limit?

Reasonable Potential to Exceed (RPE)?

Best Professional Judgment (BPJ), e.g.

- Source and Nature of Discharge
- Believed Present?

Believed Present

Projected Effluent Quality (PEQ)

Preliminary Effluent Limits (PEL)

- Applicable Criteria and Designated Uses
- Mixing Zone Implementation

If $PEQ > PEL$, then permit limit necessary

No Reasonable Potential = No WQBEL

So, no Effluent Limitation Unless TBEL



“Reasonable Potential”

- Limitations must control all pollutants or pollutant parameters that are or may be discharged at a level which will cause, have reasonable potential to cause, or contribute to an excursion above any state water quality standard
- 40 CFR §122.44(d)(1)(i)

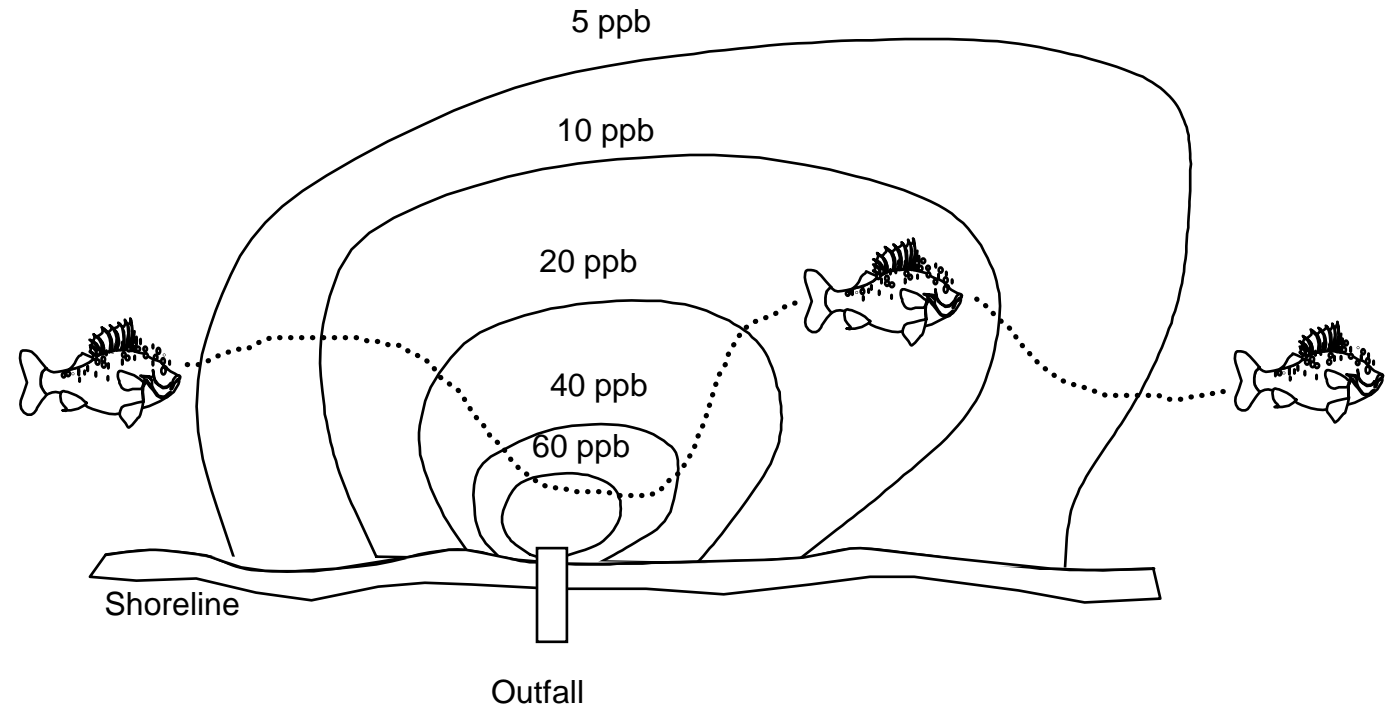
Is Dilution the Solution?

- CWA does not require water quality criteria to be attained at the point of discharge
- States have the discretion to allow for dilution
- States should specify any conditions on dilution allowances as part of their water quality standards
- The State should account for dilution of the effluent in the receiving water, where appropriate, when establishing WQBELs



Mixing Zones

- Acute and Chronic
- Based on your outfall type / structure
 - Channel, submerged pipe, multiport diffuser,...
- You won't get the whole creek
- Modeling or dye study
 - Cornell Mixing Zone Expert System (CORMIX)



I can't meet my proposed permit limit



Mixing Zones

- Multiport diffusers



Site-Specific Limits

- Dissolved Metals Translator (DMT)
- Water-Effect Ratio
- Biotic Ligand Model
- Tissue-based limits



Variances

Mixing Zones



USEPA is taking steps to ban the use of mixing zones for toxic chemicals



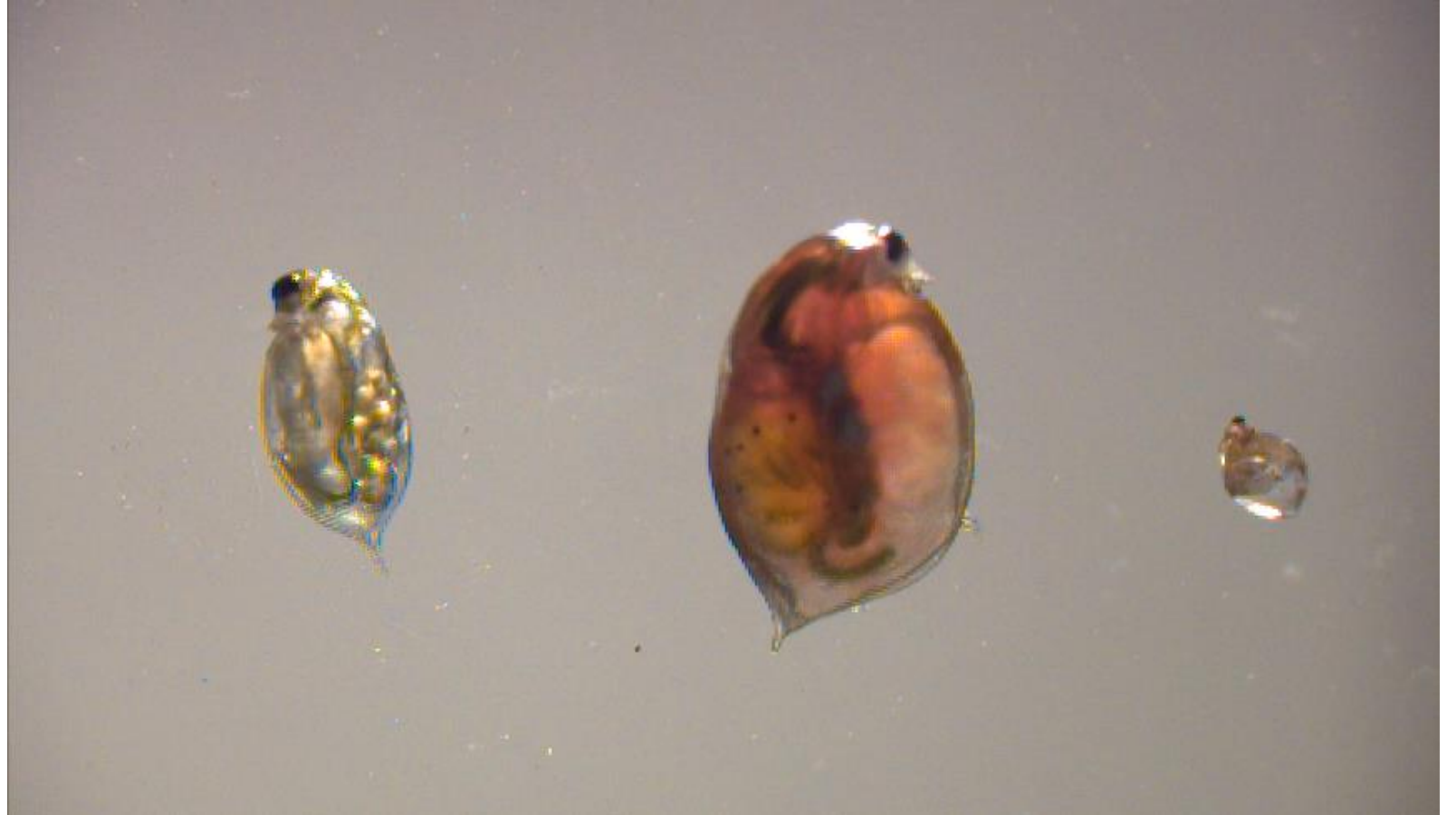
The Great Lakes Initiative (GLI) bans the discharge of twenty-two bioaccumulative chemicals (BCCs)



Ohio River Valley Water Sanitation Commission (ORSANCO) goal to eliminate mixing zones for BCCs

Site-Specific Limits

- USEPA Procedures allow for consideration of site-specific water quality factors and resident species sensitivity in modifying criteria (1984)



Dissolved Metals Translator (DMT)

Conc. Total /
Conc. Dissolved =
DMT = Multiplier
for Criteria

Dissolved
Translator can be
used for non-
metals too

Some dissolved
materials are not
toxic, so consider
WER

Water-Effect Ratio

- $WER = \text{Site water LC50} / \text{Lab Water LC50}$
- Factors altering chemical toxicity
 - pH
 - Hardness, Alkalinity
 - TOC, DOC
 - TSS
 - TDS and ion ratios – alter chloride and sulfate toxicity
 - Unknowns in site water that critters like
- Seasonal Data Needs



Tissue-Based Limits

- Example: WV aquatic life criterion for selenium

Parameter	B1, B4 (Warmwater Fisheries & Wetlands)		B2 (Trout Waters)	
	Acute	Chron	Acute	Chron
Selenium ($\mu\text{g/L}$) Water Column Concentration		5		5
Selenium ($\mu\text{g/g}$) (based on instantaneous measurement) Fish Whole-Body Concentration or Fish Muscle (skinless, boneless fillet)		x		x
Selenium ($\mu\text{g/g}$) Fish Egg/Ovary Concentration (based on instantaneous measurement)		15.8		15.8

Variances

- Short-term fix for non-compliance – buys time to add treatment or process change
- Must provide evaluation of treatment options and costs
- Typically, 5 years--must be renewed



Variance Example



Major Midwestern city

2 POTWs, 150 MGD each



GLI

Mercury limit: 1.3 ng/L



Feasibility of compliance in 2001



Cost of compliance

The receiving stream doesn't meet WQS?

Waters with Unavailable Parameters

Formerly / otherwise referred to as "impaired"



A body of water is considered impaired if it fails to meet one or more of its designated uses



In waters with unavailable parameters, new or increased discharges of a substance causing impairment will not be allowed



Total Maximum Daily Load Program

- The Total Maximum Daily Load (TMDL) Program is an important component of the Clean Water Act framework to restore and protect our Nation's waters. The program is comprised of a two-part process:
 - States identify waters that are impaired or in danger of becoming impaired (threatened)
 - For these waters, states calculate and allocate pollutant reduction levels necessary to meet approved water quality standards

TMDL Overview

01

All contributing sources of pollutants (point & nonpoint) are identified

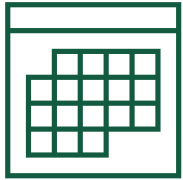
02

Each source is allocated an allowable load

03

This considers and often requires a reduction in their pollutant discharge in order to help solve the problem (impairment)

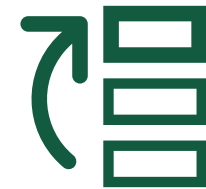
TMDLs



Typically, annual mass limits



**TMDL usually defined as
reduction from selected baseline
year**



**Dischargers can usually sell /
trade credits for excess removal
to other facilities that cannot
meet their limits**

Use Support Categories

1

Waters are fully supporting of all designated uses

2

Waters are fully supporting of some designated uses

3

Waters are not assessed for any use due to insufficient or outdated data

4

Waters are impaired, but a TMDL has not been completed or is not required

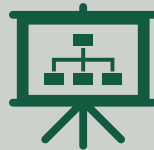
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Waters identified as non supporting one or more designated uses. Moderately or highly impaired by pollution and need to have a TMDL developed

Objective of a TMDL



The objective of a TMDL is to determine the loading capacity of the waterbody and to allocate that load among different pollutant sources so that the appropriate controls can be taken and water quality standards achieved.



Waste Load Allocation (WLA)

Components of a TMDL

- WLAs are assigned to each point source discharge
- Load Allocations (LAs) are assigned to nonpoint sources
- WLAs and LAs are established so that predicted receiving water concentrations do not exceed water quality criteria

TOTAL MAXIMUM DAILY LOAD (TMDL)

for

E. Coli

in the

Lower Cumberland (Cheatham Lake) Watershed

(HUC 05130202)

Cheatham, Davidson, Robertson, Sumner, and Williamson

Counties, Tennessee

FINAL

Prepared by:

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
6th Floor L & C Tower
401 Church Street
Nashville, TN 37243-1534

Submitted April 1, 2008
Approved by EPA Region 4 – April 15, 2008

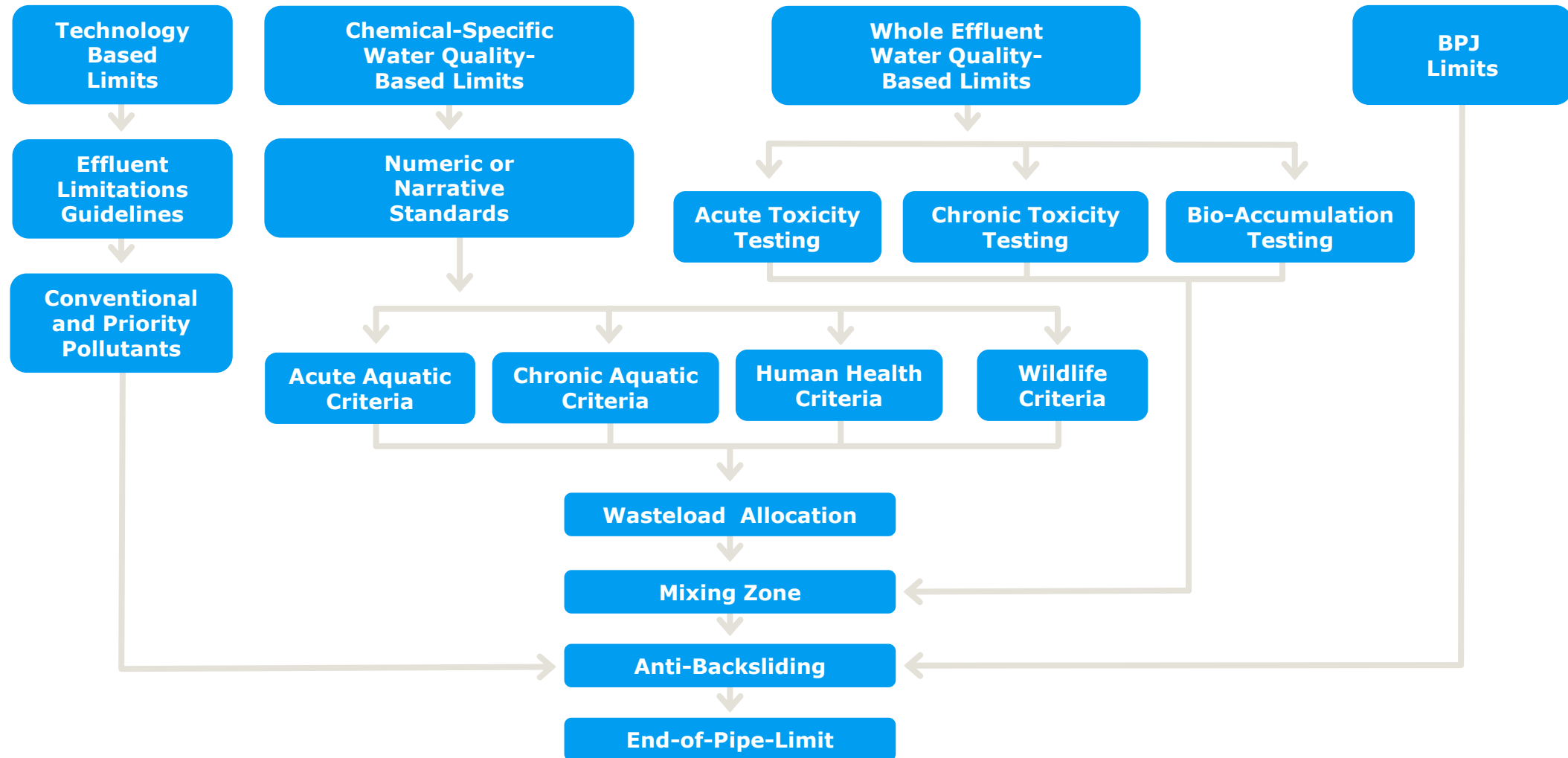


TMDL Example

- Chesapeake Bay
 - 64,000-square-mile watershed
- Pollution control measures to fully restore the Bay and its tidal rivers in place by 2025
 - 25 % reduction in N
 - 24 % reduction in P
 - 20 % reduction in sediment



Developing Discharge Limits



What happens if I violate my permit?

- Enforcement
- Penalties
 - Informal (e.g., NOV)
 - Civil Administrative Actions
 - Compliance Order
 - Penalty
 - Civil Judicial Actions
 - Criminal Actions
- Compliance schedules



How Long are NPDES Permits in effect?

The CWA limits the length of NPDES permits to five years.

- NPDES permits can be renewed (reissued) at any time after the permit holder applies.
- NPDES permits can be administratively extended if the facility reapplies more than 180 days before the permit expires, and EPA or the state regulatory agency that issued the original permit does not renew the permit before its expiration date through no fault of the permittee.

This may sound complicated, but...

- Many other countries use a one-size-fits-all approach
- E.g., Singapore Allowable Limits for Trade Effluent Discharge to Watercourse or Controlled Watercourse

	Items of Analysis	Watercourse	Controlled Watercourse
	(Units in milligram per litre or otherwise stated)		
1	Temperature of discharge	45°C	45°C
2	Colour	7 Lovibond Units	7 Lovibond Units
3	pH Value	6 - 9	6 - 9
4	BOD (5 days at 20°C)	50	20
5	COD	100	60
6	Total Suspended Solids	50	30
7	Total Dissolved Solids	-	1000
8	Chloride (as chloride ion)	-	250
9	Sulphate (as SO ₄)	-	200
10	Sulphide (as sulphur)	0.2	0.2
11	Cyanide (as CN)	0.1	0.1
12	Detergents (linear alkylate sulphonate as methylene blue active substances)	15	5
13	Grease and Oil	10 (Total)	1 (Total)
		10 (Hydrocarbons)	
14	Arsenic...		

Questions...

Bright
ideas.
Sustainable
change.

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Contacts:



Jeffrey Kissell, PE

E: jkissell@ramboll.com

P: (615) 277-7537