

Technology-based Effluent Limitations for Publicly-Owned Treatment Works (POTWs)



NPDES Permit Writers' Course
Online Training Curriculum



Presenters

- *David Hair*
Environmental Engineer
US Environmental Protection Agency
Washington, DC
- *Greg Currey*
Environmental Engineer
Tetra Tech, Incorporated
Fairfax, Virginia



Technology- and Water Quality-based Effluent Limitations

	Technology-based Effluent Limitations (TBELs)	Water Quality-based Effluent Limitations (WQBELs)
→ Goal or Policy:	▪ Zero Discharge of Pollutants	▪ Fishable and Swimmable Waters ▪ No Toxics in Toxic Amounts
→ Standards:	▪ Technology	▪ Water Quality
→ NPDES Regulations:	▪ 40 CFR 122.44(a), (e) ▪ 40 CFR 125.3	▪ 40 CFR 122.44(d)

Develop **TBELs** (derived from technology standards) for all applicable pollutants of concern. Develop **WQBELs** where TBELs are not adequate to meet water quality standards in the receiving water.

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Technology-based Requirements

- Technology-based requirements:
 - establish performance-based level of pollutant controls
 - provide equity among dischargers within categories
- Technology-based treatment requirements under CWA Section 301(b) represent the minimum level of control that must be imposed in a permit [§ 125.3(a)]



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Technology-based Effluent Limitations

- National technology-based standards
 - secondary treatment standards for POTWs
 - effluent guidelines for certain categories of non-POTWs (industrial discharges)
- In the absence of national standards
 - technology-based requirements developed on a case-by-case basis
- Technology-based requirements are implemented in NPDES permits through technology-based effluent limitations (TBELs)

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POTW and Non-POTW

- POTWs are treatment works owned by a state or municipality
 - include devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature
 - Definition at § 403.3(q)
- Non-POTWs include all other facilities and are often called “non-municipals” or “industrials”



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Technology-based Requirements in NPDES Permits for POTWs

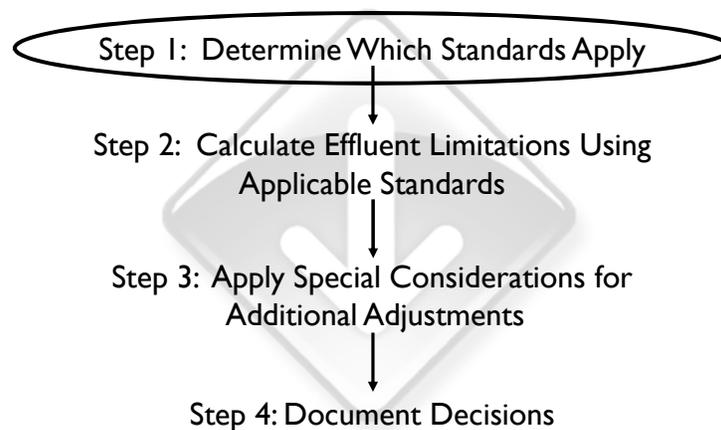
- Secondary treatment standards are found in 40 CFR Part 133
- §§ 122.44(a) and 125.3 require NPDES permits for POTWs to include technology-based effluent limitations based on secondary treatment standards



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Applying Technology-based Standards for POTWs in NPDES Permits



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Step I: Determine Which Standards Apply

- Secondary treatment standards
- Equivalent to secondary standards
 - state-adjusted equivalent to secondary standards

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Secondary Treatment Standards – § 133.102

Parameter	30-Day Average	7-Day Average
→ 5-Day Biochemical Oxygen Demand (BOD ₅)	30 mg/L (25 mg/L 5-day Carbonaceous BOD [CBOD ₅])	45 mg/L (40 mg/L CBOD ₅)
→ Total Suspended Solids (TSS)	30 mg/L	45 mg/L
→ Removal	85% BOD ₅ (or CBOD ₅) and TSS	—
→ pH	Maintained within the limits of 6.0 – 9.0 standard units*	

* Unless the POTW demonstrates that inorganic chemicals are not added to waste stream as part of treatment process and that contributions from industrial sources do not cause pH to be out of the specified range

Note: Compliance Deadline was 7/1/88

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Step 1: Determine Which Standards Apply

- Secondary treatment standards
- Equivalent to secondary standards
 - state-adjusted equivalent to secondary standards

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Equivalent to Secondary Standards – § 133.105

- Federal regulations allow adjustments to the secondary treatment requirements for BOD₅ and TSS for **equivalent to secondary** facilities
- Facilities with certain types of treatment processes might qualify
 - trickling filters
 - waste stabilization ponds
- Facilities must meet the eligibility criteria in § 133.10(g)



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Equivalent to Secondary Standards – § 133.105

Parameter	30-Day Average	7-Day Average
BOD ₅	Not to exceed 45 mg/L (40 mg/L CBOD ₅)	Not to exceed 65 mg/L (60 mg/L CBOD ₅)
TSS	Not to exceed 45 mg/L	Not to exceed 65 mg/L
Removal	As low as 65% BOD ₅ (or CBOD ₅) and TSS	—
pH	Maintained within the limits of 6.0 – 9.0 standard units	

* Unless the POTW demonstrates that inorganic chemicals are not added to waste stream as part of treatment process and that contributions from industrial sources do not cause pH to be out of the specified range

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Step I: Determine Which Standards Apply

- Secondary treatment standards
- Equivalent to secondary standards
 - state-adjusted equivalent to secondary standards

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State Adjustments to BOD₅ and TSS Requirements

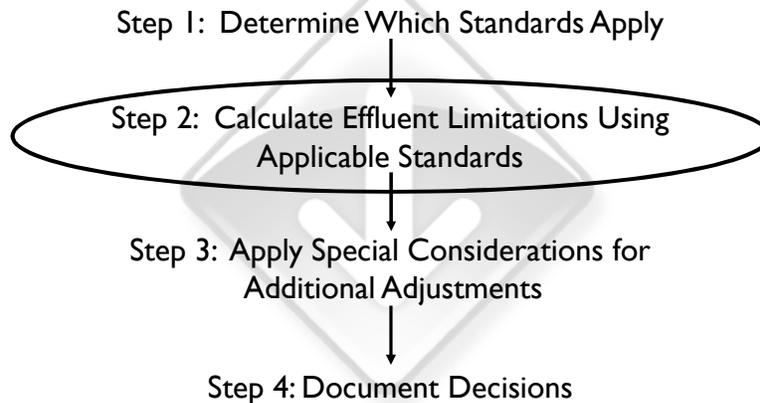
States, territories, and tribes may further adjust the maximum concentration standards for equivalent to secondary facilities:

- special adjustment to **TSS** requirements for **ponds** (from 1977 regulations) [§ 133.103(c)]
- Alternative State Requirements (ASRs) to address climatic or geographic conditions and their effects on performance [§ 133.105(d)]
 - trickling filters – BOD₅ and TSS
 - waste stabilization ponds – BOD₅

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Applying Technology-based Standards for POTWs in NPDES Permits



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Step 2: Calculate Effluent Limitations Using Applicable Standards

- Limits expressed as **average monthly and average weekly** limits for POTWs unless impracticable [§ 122.45(d)(2)]
- BOD₅ and TSS limits should be **concentration-based** (at a minimum) because secondary treatment standards are expressed in concentration units [§ 122.45(f)(1)(ii)]
- Often supplemented by **mass loading limitations**

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Step 2: Calculate Effluent Limitations Using Applicable Standards (continued)

- **Percent removal permit requirement** for BOD₅ and TSS **must be included** (with some exceptions for dilute influent)
 - Compliance determined based on monthly average removal efficiency calculated using influent and effluent concentrations [§ 133.101]

$$\text{Percent Removal} = \frac{\text{Monthly average influent conc.} - \text{Monthly average effluent conc.}}{\text{Monthly average influent conc.}} \times 100$$

Diagrammatic arrows: A downward arrow points from the text above to the first 'Monthly average influent conc.' in the numerator. A downward arrow points from the text above to the second 'Monthly average effluent conc.' in the numerator. A downward arrow points from the text above to the '100' in the denominator. An upward arrow points from the text below to the denominator.

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Effluent Limitations Calculated from Secondary Treatment Standards

Parameter	Average Monthly Limitation	Average Weekly Limitation
BOD ₅	30 mg/L (25 mg/L CBOD ₅)	45 mg/L (40 mg/L CBOD ₅)
TSS	30 mg/L	45 mg/L
BOD ₅ and TSS Percent Removal (concentration)	≥ 85%	—
pH	Must be maintained within the limits of 6.0 – 9.0 standard units at all times.	

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Applying Equivalent to Secondary and State-Adjusted Standards

- Except for TSS adjustment for ponds, equivalent to secondary and state-adjusted standards for BOD₅ and TSS are **maximum** (“up to”) values
- Actual limitations should be based on **performance capability** [§ 133.105(f)] considering at least two years of data for existing facilities [§ 133.101(f)] and design capability and site-specific conditions for new facilities
- **Examples:** If an *equivalent to secondary* facility can meet an average monthly BOD₅ limitation of:
 - 40 mg/L – set average monthly limit at 40 mg/L
 - 50 mg/L – set average monthly limit at 45 mg/L

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Mass Loading Limitations

- Use **design flow** of POTW to calculate mass loading limitations if used to supplement concentration limitations [§ 122.45(b)]
- Example mass loading limitation calculation:
 - POTW Design Flow = **5.00 mgd**
 - BOD₅ Average Monthly Limitation = **30 mg/L**
 - BOD₅ Average Monthly Mass Loading Limitation =
(5.00 MGD)(30 mg/L)(8.34*) = 1,250 lbs/day

* 8.34 is the conversion factor for converting to lbs/day



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Applying Technology-based Standards for POTWs in NPDES Permits

Step 1: Determine Which Standards Apply



Step 2: Calculate Effluent Limitations Using Applicable Standards



Step 3: Apply Special Considerations for Additional Adjustments



Step 4: Document Decisions

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Step 3: Additional Adjustments

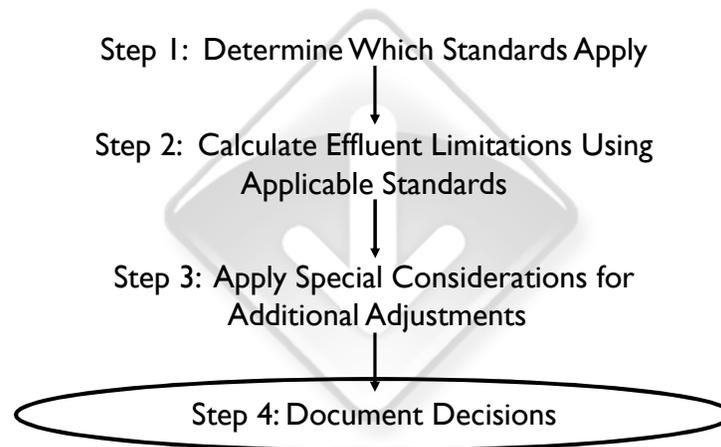


- Pollutant parameter substitution
 - substitution of CBOD₅ for BOD₅ [§ 133.102(a)(4)]
 - substitution of COD or TOC for BOD₅ [§ 133.104(b)]
- Special considerations for certain influent characteristics
 - modification of BOD₅ and TSS requirements for POTWs with large industrial contributions [§ 133.103(b)]
- Modification of percent removal requirement for some POTWs
 - adjustment or deletion for POTWs with less concentrated influent received from combined sewers during wet weather [§ 133.103(a)]
 - adjustment or substitution of mass limit for POTWs with less concentrated influent from separate sewer systems or from combined sewers during dry weather [§ 133.103(d), § 133.103(e)]

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Applying Technology-based Standards for POTWs in NPDES Permits



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Step 4: Document Decisions



- Document in the fact sheet or statement of basis:
 - Statutory and regulatory citations
 - How you determined which standards apply
 - How you characterized the POTW's past performance (if equivalent to secondary or adjusted standards apply)
 - How you calculated effluent limitations (concentration and, if applicable, mass)

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Feedback and Other Presentations

Questions or comments?

npdeswebtraining@tetrattech.com

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