Indiana Fish Story: A §316(b) Compliance Tale

Presented by:

Julia Wozniak, EA Engineering and Kari Maxwell, Citizens Energy

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Outline of Topics to be Covered

- Introduction to the §316(b) Rule and its history
- Applicability and Requirements
- Overview of Impingement and Entrainment
- EA's background and Intro to Citizens
- Citizens Energy—History and Involvement with §316(b) at the Perry K Steam Plant
- Agency Interaction and review of prior submitted information
- Summary of current NPDES-permit required studies
- Brief Review of EA's extensive experience with §316(b)
- Next Steps for Citizens
- Wrap-Up: Lessons Learned, Expectations for Industrial Cooling Water Users

Cooling Water Intake Regulations

***According to USEPA*, withdrawal of cooling water from Waters of the United States (WOTUS) for power production and other industrial purposes:**

- **Accounts for over half of all water withdrawn in the U.S. each year**
- **Removes and kills billions of aquatic organisms each year**
- **Impacts primarily early life stages of fish and shellfish**

Clean Water Act §316(b) Rule

- The only USEPA rule that applies to facility water INTAKES
- Applies to COOLING WATER intakes only; not those specifically for domestic/potable water sources or other water uses
- Designed to provide protections for Fish and Shellfish
- Federal Rule with wide applicability, implemented by State Permitting Authority; States may be more stringent

Rule Applicability Criteria:

- The facility is an existing power plant or industrial / manufacturing facility that is a point source regulated through an NPDES permit;
- The facility has a cumulative (1 or more CWIS) design intake flow of greater than two million gallons per day (MGD) withdrawn from waters of the United States; and,
- Greater than or equal to 25% of the actual water the facility withdraws is used exclusively for cooling water purposes.
- *Facilities that do not meet all of these conditions may still be subject to best professional judgement (BPJ) requirements established by their permitting authority*

EPA's Definition of Cooling Water:

- Cooling water means water used for contact or non-contact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The intended use of the cooling water is to absorb waste heat rejected from the process or processes used, or from auxiliary operations on the facility's premises

- Cooling water obtained from a public water system, reclaimed water from wastewater treatment facilities or desalination plants, treated effluent from a manufacturing facility, or cooling water that is used in a manufacturing process either before or after it is used for cooling as process water, is not considered cooling water for the purposes of calculating the percentage of a facility's intake flow that is used for cooling purposes

50+ Years of CWA §316(b) Rule History:

1972: Congress passes Clean Water Act (CWA) and §316(b)--regulating Cooling Water Intake Structure (CWIS) impacts to aquatic life

1976: EPA publishes regulations which mainly applied to power plant cooling water intakes--challenged by utilities

1977: US Court of Appeals for 4th Circuit remands rule

1979: EPA withdraws rule; NPDES permitting authorities left to implement §316(b) on a case-by-case basis, using Best Professional Judgement (BPJ)

16 Years go by…

1995: Under a Consent Decree brought by NGOs, USEPA begins developing §316(b) regulations establishing national performance standards for electric generating plants and manufacturers

- **Phase I (2001): New facilities: Electric generating plants and Manufacturers**
- **Phase II (2004) : Existing large electric generating plants and other industrial facilities withdrawing at least 50 MGD of cooling water (Remanded and subsequently Suspended)**
- **Phase III (2006): Other existing facilities (Also Remanded)**
  - Small electric generating plants
  - Industries and Manufacturers Withdrawing < 50 MGD
  - New offshore and coastal oil and gas extraction facilities

Another 16 Years go by…

§316(b) History, continued

2011: Proposed *existing* facilities rule published--Combined Phase II rule (large electric generating facilities) with parts of what had been Phase III rule (small electric generating and all manufacturing facilities)

—New trigger is ANY facility taking >2MGD of cooling water

- Includes Large HVAC systems in Commercial or Residential Buildings, as well as Manufacturers with Industrial Boilers that have WOTUS cooling water sources

2012: EPA publishes two Notices of Data Availability--Summary of new information and data received on impingement and entrainment and Survey on preferred method for estimating economic value associated with ecosystem improvements

May 2014: Formal consultation under Endangered Species Act (ESA) Section 7 concluded with issuance of joint U.S. Fish and Wildlife Service-National Marine Fisheries Service biological opinion. (T&E species impact review)

August 2014: Final Existing Facility rule published with Effective Date of October 14, 2014

Now, almost TEN years later, states and facilities are still working on implementation of the Rule…

Purpose of the Rule:

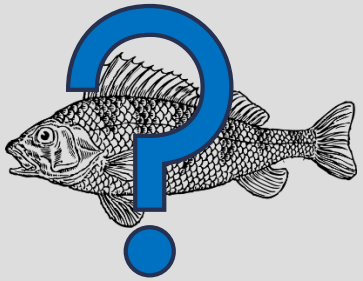
- Minimize Adverse Environmental Impacts (AEI) from Impingement and Entrainment of aquatic organisms resulting from use of Cooling Water Intake Structures (CWIS)

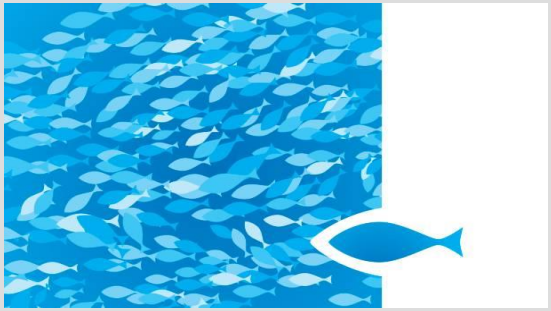
What is Adverse Environmental Impact?

- §316(b) does not provide a written definition of "Adverse Environmental Impact" (AEI)

- Pre-Phase II and Final Rule:
  - AEI was determined by state regulatory agencies based on Population-Level Impacts; controls were required when determined to be necessary, based on documented effects

- Final Rule:
  - One fish impinged or entrained = AEI?





Types of Impact:

- **Impingement** means entrapment of any life stages of fish and shellfish on the outer part of an intake structure or against a screening device during periods of intake water withdrawal (Includes those organisms collected or retained on a sieve with maximum distance in the opening of 0.56 inches—equivalent to 3/8" mesh)

- **Entrainment** means any life stages of fish and shellfish in the intake water flow entering and passing through a cooling water intake structure and into a cooling water system, including the condenser or heat exchanger

Impingement:

Source: Delaware.sierraclub.org

Source: EA

Source: EA

Source: Riverkeeper.org

Entrainment:

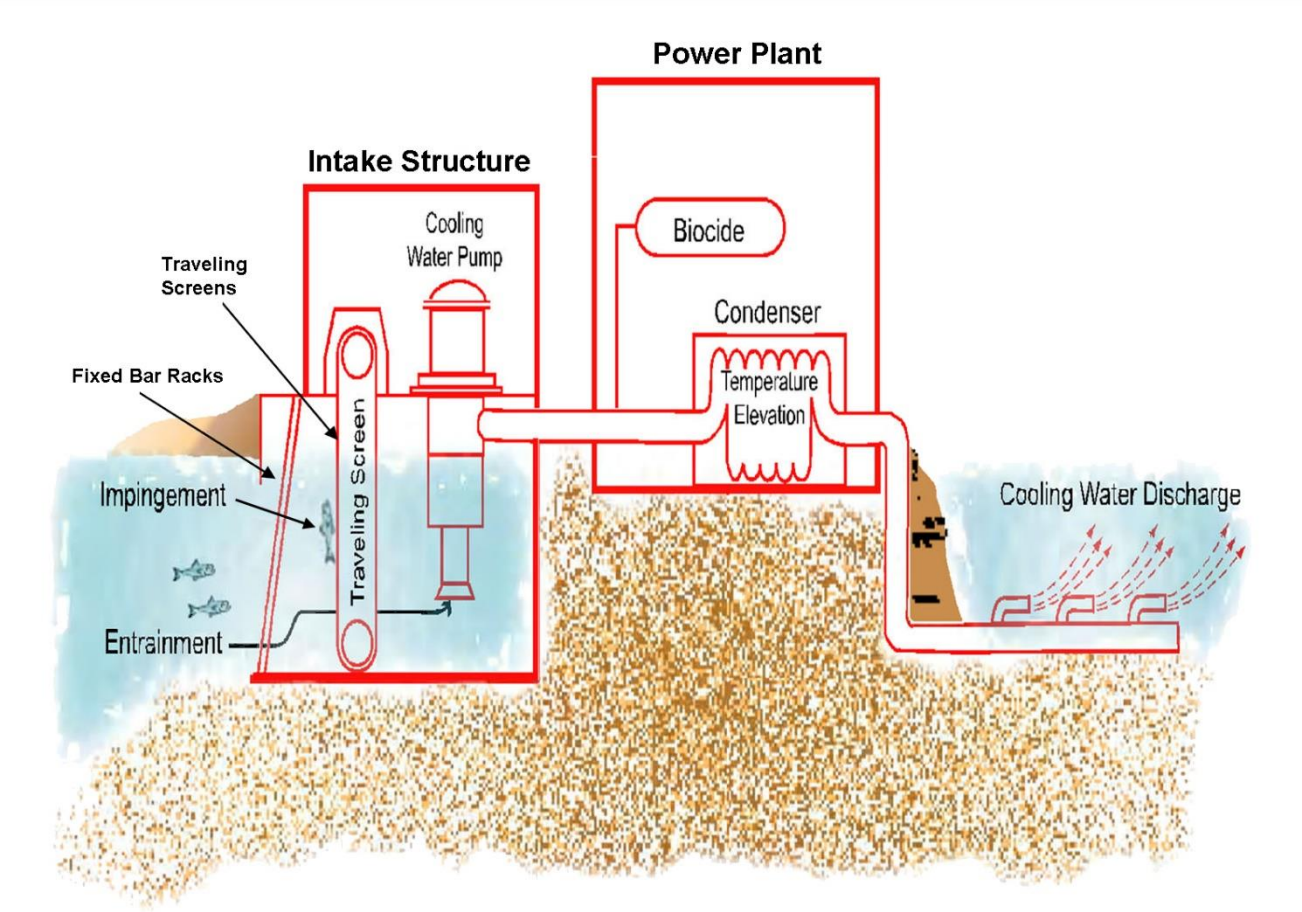
Source:
News.nationalgeographic.com

Source: irrec.ifas.ufl.edu

Source: EA

Source: EA

Typical Water Intake System:



Number of Facilities Covered by the Rule:

EPA Region	Total Facility Count	Facilities with Flow > 125 mgd
1	62	44
2	95	60
3	122	64
4	207	93
5	251	156
6	176	72
7	53	15
8	38	17
9	28	10
10	36	31
All U.S.	**1065**	**562**

- At Final Rule issuance (2014), USEPA estimated that a total of 521 manufacturing facilities would be impacted, with the remainder (544) being power plants

State	Power Generation	Manufacturing
IL	33	9
IN	24	10
MI	34	17
MN	20	5
OH	28	30
WI	24	51
	129	**122**

Types of Manufacturing Facilities Covered by the Rule:

- Paper Mills
- Chemical Companies
- Steel /Aluminum Mills /Foundries
- Oil Refineries
- Packaging /Container Manufacturers
- Recycling/Resource Recovery
- Grain Processing/Milling
- Sugar Refining
- Lumber Mills

- In addition, any large building that uses surface water for HVAC cooling purposes and meets the other three criteria is subject to the 316(b) Rule

"(r)" requirements – 40 CFR §122.21(r):

Information required with the NPDES permit renewal application

- All facilities under the Rule are required to submit:
  - Source water physical data
  - Cooling water intake structure data

- Which other "r" requirements are needed depends on intake flow
  - All facilities with actual intake flow >2 MGD must submit (r)(2) through (r)(8)
  - Facilities with actual intake flow >125 MGD also must submit (r)(9) through (r)(13)—APPLIES MOSTLY TO LARGE POWER GENERATORS

- Waivers for "r" requirements may be granted if:
  - Intake is on a manmade lake/reservoir that is stocked and managed by a state or federal natural resource agency and no threatened/endangered species or critical habitat are present

"(r)" Reports – 40 CFR §122.21(r): Required for all 316(b) facilities*

Section	Study Name	Study Contents
(r)(2)	Source water physical data	Water body description, hydrology, chemistry, area of influence of the intake structure
(r)(3)	Cooling water intake structure data	Configuration of intake flows, water balance diagram, typical operations
(r)(4)	Source water baseline biological characterization data	Species present, susceptibility to impingement and entrainment, spawning periods, seasonal patterns; Threatened and Endangered species documentation
(r)(5)	Cooling water system data	Configuration of cooling water system; water reuse
(r)(6)	Intended method of compliance with impingement mortality standard	Select impingement mortality compliance path, option-specific info (e.g.—monitoring plan for BTA, documentation of velocity); Performance Optimization Study
(r)(7)	Existing entrainment performance studies	Previous studies on technology efficacy, studies from other facilities, other entrainment studies
(r)(8)	Operational Status	Age, utilization, past upgrades

"(r)" Report Requirements (>125 MGD)

Section	Study Name	Study Contents
(r)(9)	Entrainment characterization study	Entrainment data collection plan and two years of monitoring data
(r)(10)	Comprehensive technical feasibility and cost evaluation study	Evaluate feasibility of all technologies, engineering/social cost estimates
(r)(11)	Benefits valuation study	Monetized losses from impingement and entrainment, other benefit categories
(r)(12)	Non-water quality and other environmental impacts study	Energy penalty, thermal, air emissions, safety, reliability, etc.
(r)(13)	Peer review of (r)(10), (11), and (12)	External peer review of Feasibility, Costs, Benefits, and Environmental Impact Studies; Must notify Director of reviewers; Director may disapprove and/or require additional reviewers

Entrainment Controls

- Reduce cooling water volume withdrawn
- Install specialized intake screens (as small as 0.5 mm mesh)
- Retrofit to a Closed Cycle Recirculating cooling system

- *Site-specific BTA* determined by regulator based on actual or potential impact (Wide discretion allowed for state decision-making)

Entrainment BTA Determination for Facilities with <125 MGD Cooling Water Flow

- Determined on a case-by-case basis
- Older existing data or that from nearby facilities may be used to provide supporting information
- Site-specific biological assemblage/waterbody specific conditions must be considered
- Seasonal limitations on cooling water intake volume may be sufficient for some facilities, depending upon species involved
- Permitting authority still needs to address “must” and “may” factors under §125.98(f), even without (r)(9)-(13) information; they have the right to ask for whatever additional data they believe necessary

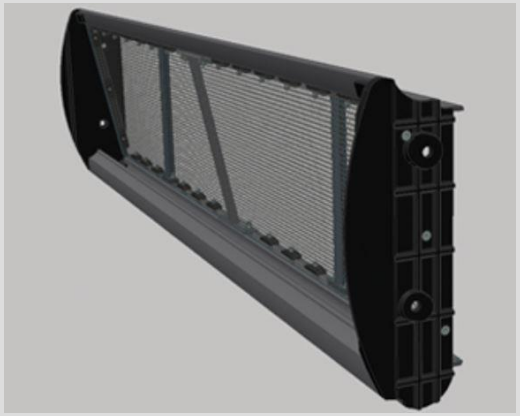
Seven Impingement Control Options §125.94(b):

Compliance Alternative	Technology Basis
Pre-Approved Technology; no on-going biological compliance monitoring	Closed-Cycle Recirculating System
	Design Intake Velocity <0.5 fps
	Existing Off-Shore Velocity Cap
Streamlined compliance alternative; no on-going biological compliance monitoring beyond two-year optimization studies	Actual Intake Velocity < 0.5 fps
	Modified Traveling Screens with Fish Return System
	System of Technologies
12-Month Performance Standard of No More Than 24% Mortality	As Demonstrated Through On-Going Biological Monitoring

Impingement Controls

- Fine Mesh Screen/Off-Shore Intake

- Modified Traveling Screen System



- Fish Return System

- Optimization Studies

citizens energy group

A Few "Off-Ramps" Are Also Provided by the Rule for Impingement (§125.94(c)(10)(11)(12):

- **Reuse of other water for cooling purposes**. ***The impingement mortality standard does not apply to that portion of cooling water that is process water, gray water, wastewater, reclaimed water, or other waters reused as cooling water in lieu of water obtained by marine, estuarine, or freshwater intakes.***

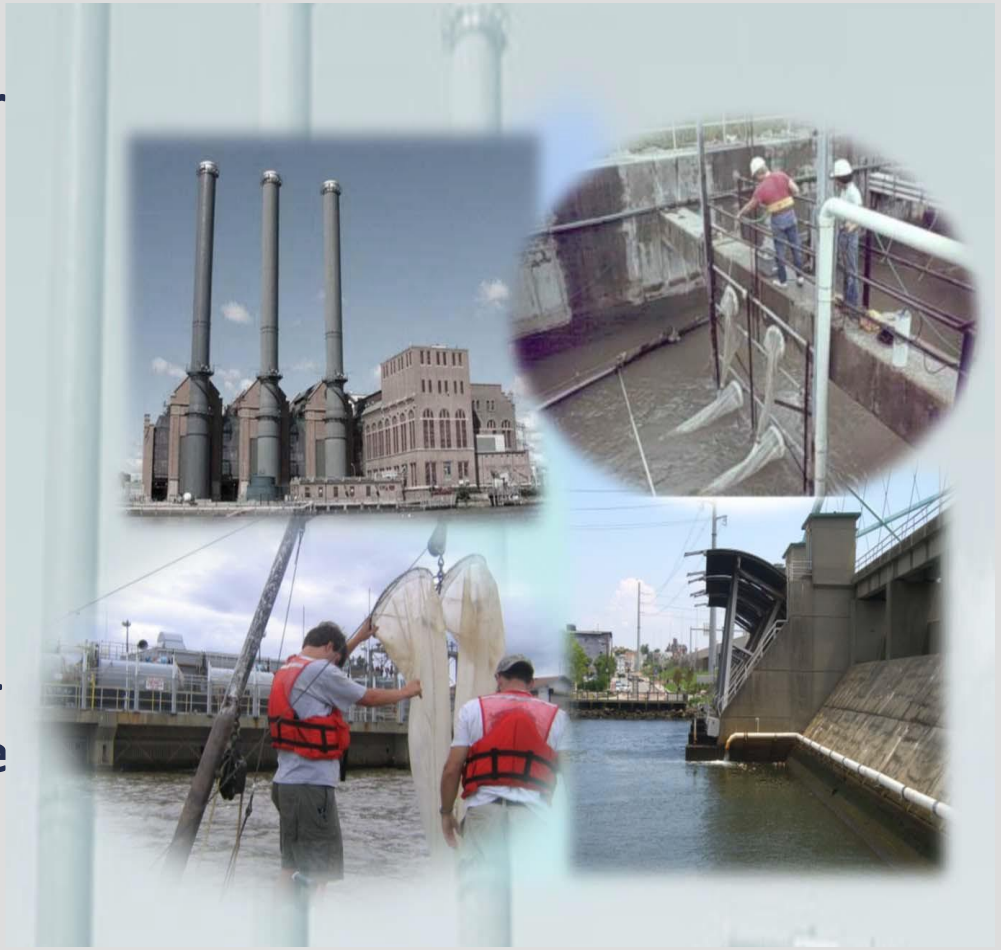
- ***De minimis* rate of impingement**. ***In limited circumstances, rates of impingement may be so low at a facility that additional impingement controls may not be justified.*** **This determination is to be made by the state regulator and no other guidance on what constitutes "*de minimis*" is provided in the Rule**

- **Low-capacity utilization power generating units.** **If an existing facility has a cooling water intake structure used for one or more existing electric generating units, each with an annual average capacity utilization rate of less than 8% averaged over a 24-month block contiguous period, less stringent requirements for impingement mortality for that cooling water intake structure may be requested.**

EA's Experience with 316(b)

- Since our founding in 1973, EA has remained a perennial leader in designing and conducting studies to demonstrate §316(a) and §316(b) compliance

- In the past 50 years, EA has supported more than 160 utility and industrial facilities nationwide in addressing water-related issues, particularly those arising from the intake and discharge of cooling water



CASE STUDY: Citizens Energy
Perry K Steam Plant

C.C. Perry K Steam Plant—Indianapolis, IN

- Original plant and boilers (long since removed) constructed in 1893 to provide electricity to the Edison electric light circuit to Union Station
- Primary output shifted to steam at the turn of the 20th century to meet the demands of the growing industrial users in SW downtown Indianapolis (pharma manufacturing and corn product refining)
- Today: Second largest district steam system in the United States, with ~200 customers of the downtown system, including commercial and industrial facilities, college campus and numerous hospitals
- Steam sold to chilled water business to drive chillers that provide district cooling

Location of Perry K Plant on the White River

Buried concrete inlet canal that brings water from the Screen House to the softener at Perry K

Perry K Steam Plant (NW corner of South & West Streets)

Perry K and the Clean Water Act

- Wastewater regulated through NPDES Permit No. IN0004677; Administered by the Indiana Department of Environmental Management (IDEM)
- *316(a) Thermal:* Complies with state water quality standards without variances
- *316(b):* No prior permit requirements, until Final Rule was issued
  - CWIS meets applicability criteria under existing facilities rule:
    - >2 MGD cooling water flow
    - >25% of intake flow used for cooling
    - Operations regulated by an NPDES Permit
- Perry K is *not* subject to the Steam Electric ELG
  - Principal reason for Perry K is to support the district steam system
  - There is no interconnected steam "grid" for reliability – steam must be produced to meet customer demand on a real-time basis

Cooling Water Use at Perry K

- 100% surface water used at the plant – have a connection to public water system to use in emergency situations
- Source water used for once through cooling water and boiler water
- Boiler water treated through hot process water softener, anthracite filtration and zeolite polishing before entering the boilers
  - 7 boilers capable of producing approximately 1.9 million pounds per hour of steam
  - Natural gas primary fuel for all boilers; Boilers #17 and #18 have oil-firing capability for emergency

316(b) Facts for Perry K

- Facility uses once-through cooling water for steam generation process
- Cooling Water Source: White River
  - A Water of the U.S. and also an Urbanized Stream
  - Annual mean flow of 1,594 cfs
  - $Q_{7,10}$: 69 cfs
- Design Intake Flow: 42.3 MGD (65.43 cfs)
  - Multiple intake pumps, but not all can be used at any given time, therefore limiting overall cooling water withdrawal capacity
- Actual Intake Flow: 14.76 MGD (9.54 cfs)
  - only 4% of annual mean flow of the White River
- Intake Velocity: <0.5 fps at design flow

Perry K NPDES 316(b) History

- Under the Final 316(b) Rule, a facility must submit information required by 40 CFR 122.21(r)(6): Chosen Method(s) of Compliance with Impingement Mortality (IM) Standard

- This submittal was originally made by Citizens concurrent with the July 2016 Perry K Plant NPDES permit renewal application. Section 122.21(r)(2) through (r)(8) information, **including the results of a year-long impingement study conducted in 2013-2014**, was provided to the Indiana Department of Environmental Management (IDEM).

- The information obtained during this study showed that the existing facility cooling water intake structure (CWIS) configuration and operation met the criteria to be considered under **§125.94(c)(11)—*De minimis* rate of impingement**

- In IDEM's 2016 BPJ determination, they fundamentally agreed, based on the information provided at that time, that the existing configuration and operation of the Perry K CWIS was compliant with the intent of the Final Rule, in that it represented a BPJ determination of BTA for the minimization of adverse environmental impacts.

Perry K NPDES 316(b) History

- HOWEVER, the official response from IDEM was that they were ***"…unable at this time to determine whether a 'de minimis' determination is appropriate"***

- Additional information was submitted to IDEM to provide support for both a BTA Entrainment decision (June 2019), as well as further support for a *de minimis* determination

- Discussions were held with IDEM staff during the permit renewal process to try to limit 316(b) requirements based on submitted information without much success

- No technical explanation has ever been provided by IDEM as to why the *de minimis* exemption could not be granted for the Perry K Plant, other than the fact that they did not want to support it ("*You can do better*")

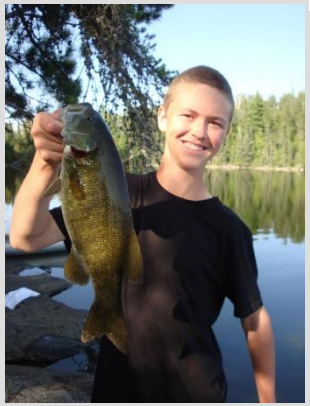
2013-2014 Impingement Study

- A total of 11 fish with a combined weight of 3.2 ounces was collected over an entire year; six common species
- Extrapolated values, based on AIF, were 109 fish, weighing a total of 3.38 pounds
- No federal or state threatened or endangered species were found
- Extrapolated Impingement numbers show collection dominated by Bluegill (35%) and by Gizzard Shad (25%), which is considered as an invasive species in the state of Indiana

Perry K Impingement Results:

3 ounces of fish is equivalent to:

3.38 pounds of fish is equivalent to:



But IDEM still doesn't consider this to be *de minimis*!

EA Retained to Assist Citizens with Perry K 316(b)

- EA's 316(b) expertise spans the development and implementation of the Existing Facilities §316(b) Rule
- EA has performed 316(b)-related work in 14 different states, at over 180 different facilities on various source waters
- EA's expertise includes the design of site-specific study plans, execution of field work, laboratory identification and processing, report preparation, and continuing technical support, along with state/federal regulatory negotiation
- EA primary goal is to serve clients' 316(b) compliance needs by applying sound science to meet regulatory requirements in the most cost-effective manner possible

Perry K NPDES Permit Requirements

- IDEM recommended that Perry K go with Option 6—A "System of Technologies" approach to Impingement compliance
  - This option required an additional year of impingement data, as well as a year of entrainment data, even though the facility already met the low flow percentage test and had demonstrated minimal impingement
  - These requirements were incorporated into the subsequent NPDES Permit—issued January 1, 2022
- Study Plans were required to be submitted and approved by IDEM prior to the initiation of work
  - Submitted for review: July 2023
  - "Tentative" approval: December 2023
  - Study Start date: January 2023 (IM)/April 2023 (Ent)
  - Final approval: May 2023 (AFTER studies began!)

Field Work Site: CWIS

Impingement Sampling Set-Up

36 individual 24-hour samples taken throughout the course of the year; photos of basket required by IDEM to be taken during each event prior to processing

Entrainment Sampling Set-Up

Water is pumped from intake canal through 3/8” mesh strainer and put into 335µm net—fish eggs and larvae are retained, preserved, and identified in EA’s laboratory

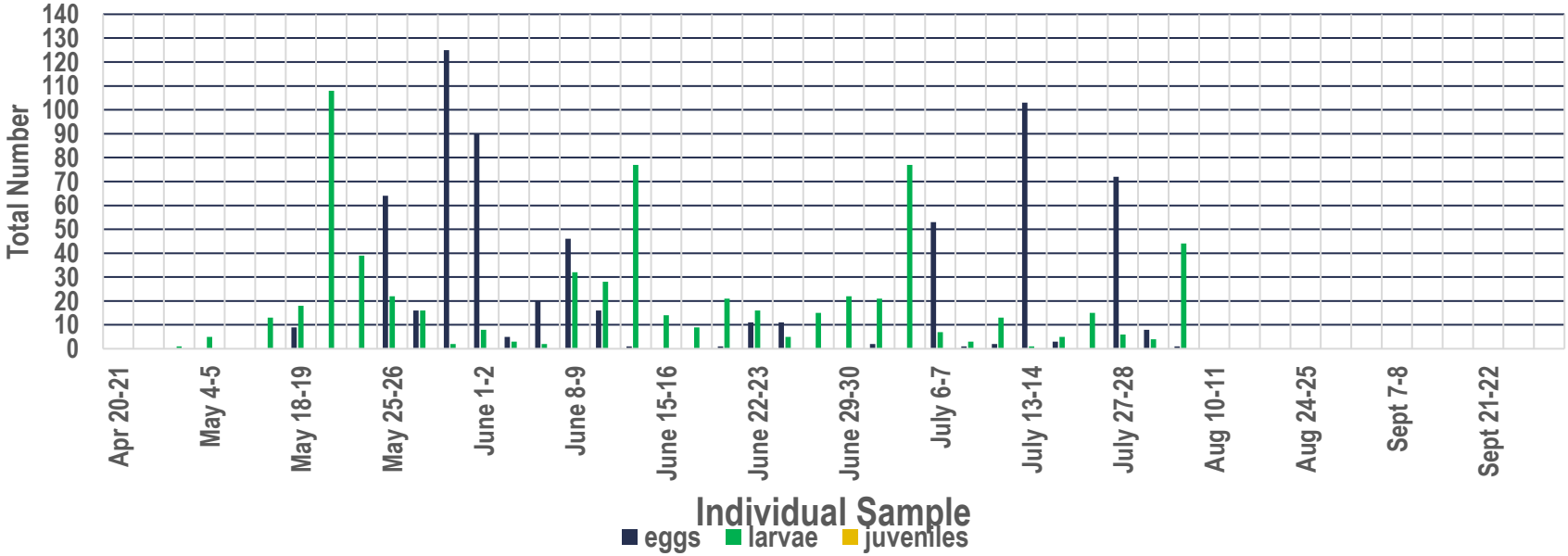
16 sample events with three depth-integrated diurnal samples per date from April through September 2023 for a total of 48 individual samples

The Impingement "Catch", Thus Far:

- After 25 individual 24-hour sampling events, under a variety of river, weather, and facility operating conditions, a total of NINE fish have been collected---along with an abundance of Chinese Mystery Snails (an invasive species)

Preliminary Entrainment Results:

- **With 36 of a total of 48 individual samples sorted and counted, the following results have been obtained:**



- **Numbers are extremely low, as anticipated**
- **Taxonomic identification is pending, but no state or federal threatened or endangered species are expected**

What's Next for Perry K Regarding §316(b)?

- Final Impingement Technology Optimization Report is due 90 days after last sampling event (~March 2024)
- Final Entrainment Report is due 36 months from the approval of the study plan (May 2026)
- Any request for reduced 316(b) information for the next permit renewal needs to be submitted by June 2025 (before the Entrainment report is due)
- Current NPDES Permit expires December 31, 2026
- New permit must contain IDEM's final determination on Entrainment BTA, as well as an agency opinion regarding Perry K's impingement mortality optimization status
- BEST CASE: Perry K's CWIS will be found to be BTA for both Impingement and Entrainment with no additional technologies or operational measures needed

Similar Case Studies

- EA was responsible for all aspects of §316(b) requirements for a large midwestern independent power producer with seven facilities on four different waterways:
  - OUTCOME:
    - 1 *de minimis* determination (with more than 450 fish per year; no T&E species)
    - 1 BTA compliance determination for impingement and entrainment (closed-cycle facility)
    - 1 Low capacity utilization determination for impingement/entrainment BTA based on low flow volume
    - 4 facility closures before 316(b) decisions were made by regulator

Similar Case Studies

- EA developed and executed a year-long impingement study for large corn-processing industry, along with required r reports
  - OUTCOME:
    - *De minimis* determination for impingement (342 organisms), no T&E species
    - BTA determination for entrainment, based on low flow in proportion to source water

- EA has worked on many other 316(b) studies for various industries across the country, but most final compliance determinations are still pending with state regulators
    - Many NPDES permits are held up by 316(b) decisions
    - Some facilities are also facing other concurrent challenges that could lead to additional closures

316(b) Lessons Learned

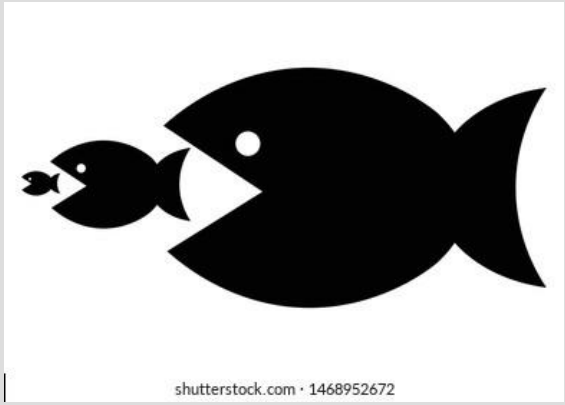
- Every state regulatory agency handles 316(b) differently, even though they are all bound by the same federal rule baseline requirements
- Even though the Rule allows for state flexibility and the power to make BPJ decisions, some state regulators are hesitant, even when provided with an abundance of supporting information
- Some states require additional studies to delay the decision-making process—this often places an unwarranted financial burden on permittees in order to obtain additional information that is not always necessary to make an informed decision
- The regulator can continue to ask for whatever they feel is needed, but there should be strong technical and/or regulatory basis for these requests

If your facility falls under the Rule, Know Your Timeline

- Driven by NPDES permit renewal date in relation to 2014 Rule issuance date
- Prioritizes evaluation of entrainment minimization, followed by pre-selected impingement mortality controls
- Compliance must be implemented "*as soon as practicable*"
- Individual facility schedules are subject to negotiation OR are fixed, depending on the permit renewal date
- All newly issued permits must have 316(b) requirements included

Considering a New Facility That Uses Cooling Water?

- The Phase I 316(b) Rule requires that new facilities with WOTUS source water be designed at the outset to be fully compliant for impingement and entrainment control
  - Through-screen intake velocity of <0.5 fps
  - Intake flow commensurate with closed cycle cooling
  - Impingement and Entrainment studies to demonstrate no impact
  - Velocity measurements to document <0.5 fps
- Many additional on-going reporting requirements
- NO FREE LUNCH!



Know the Rule and take advantage of options and outs where you can:

- Can cooling water system be considered “closed-cycle”?
- Is the through-screen intake velocity <0.5 fps?
- Does facility already employ a fish protection technology that it can take credit for?
- Can credit be taken for seasonal flow reduction or system shutdown?
- Are impingement rates so low as to be considered *“de minimis”*?
- Can credit be taken for operating at less than the design intake flow (AIF<24% of DIF)

Work with Your Regulators:

- Review all language in the NPDES permit that discusses §316(b); if unclear, ask questions
- You are responsible for complying with §316(b) requirements, if applicable to your facility, even if there is nothing specifically stated in your current NPDES permit
- Talk to your permit writer: early and often (if needed)
- Obtain concurrence on what is expected to be submitted at permit renewal regarding §316(b)—DO THIS EARLY
- Make a plan / engage expert assistance, if necessary
- Don't wait until permit renewal time; regulators are also bound by rule requirements and need to ensure that they are met

§316(b) Decisions should be based on Sound Biological Data

Costly decisions will be driven by the results of facility impingement and entrainment data, as well as knowledge of the source water biological community:

- **Need for Control Technology**
- **Selection of Site-Specific BTA**
- **Cost –Benefit Analyses**

If your facility does not fall under the Rule:

If you are unsure if your facility is subject to §316(b) requirements:

- Don't assume that it's not
- Do your homework--Visit the USEPA website: https://www.epa.gov/cooling-water-intakes

- Don't interpret the rule requirements in a vacuum
- Do ask your permit writer or other knowledgeable source for guidance (It's a "new" rule for everyone)

- Don't panic if you find you are late in getting the required information together

- Do make a plan and discuss with a qualified consultant and/or your regulatory authority as soon as possible


Questions?

Thank You!

Julia Wozniak
jwozniak@eaest.com
EA Engineering, Science, and Technology, Inc., PBC

Kari Maxwell
Kmaxwell@citizensenergygroup.com
Citizens Energy Group