**FENOC**™
FirstEnergy Nuclear Operating Company

Perry Nuclear Power Plant
P.O. Box 97
10 Center Road
Perry, Ohio 44081

David B. Hamilton
Vice President

440-280-5382

July 27, 2016
L-16-235

Mr. Michael W. Stevens
Division of Surface Water
Northeast District Office
Ohio Environmental Protection Agency
2110 East Aurora Road
Twinsburg, OH 44087-1967

Subject: Perry Nuclear Power Plant (PNPP) NPDES Permit Renewal Application - Permit No. 3IB00016*JD

Enclosed are completed Form 1, Form 2C, and Form 2F applications for the FirstEnergy Nuclear Operating Company (FENOC) Perry Nuclear Power Plant (PNPP) National Pollutant Discharge Elimination System (NPDES) Permit renewal. These forms are submitted 180 days prior to expiration of the existing permit in accordance with OAC 3745-33-04. Also enclosed is a check for $200.00 for payment of the application fee.

The following items are pertinent to the application and/or permit renewal:

- Please note there is not data for Outfall 601, because there was no discharge.
- The information requested under 40 CFR 122.21(r) in accordance with the 316(b) rules is enclosed.
- The monitoring requirements for Selenium, Zinc, and Copper on Outfall 004 (and subsequent intake) are based on the last permit finding that they are in the group four risk assessment classification. New data can be seen on form 2C that the subsequent concentrations are lower, and we request removal of Selenium, Zinc, and Copper from the permit.

If you have any questions or concerns, please contact Daniel Havalo, FENOC Environmental Engineering, at (330) 315-6714 or by email at DHavalo@FirstEnergyCorp.com.

Sincerely,

David B. Hamilton
Vice President

C001
NRR

Enclosures

A) NPDES Renewal Forms 1, 2C, 2F and Antidegradation Addendum
B) 40 CFR §122.21(r)(2-8) NPDES Application Requirements for Facilities With Cooling Water Intake Sturctures.

cc: Daniel Havalo
NRC Region III
NRC Resident Inspector
NRR Project Manager
NRC Document Control Desk (Docket No. 50-440)

**Enclosure A**
**L-16-235**

**NPDES Renewal Forms 1, 2C, 2F and Antidegradation Addendum**

Please type. Do not complete by hand.

| FORM 1 GENERAL | EPA | U.S. ENVIRONMENTAL PROTECTION AGENCY **GENERAL INFORMATION** *Consolidated Permits Program* *(Read the "General Instructions" before starting)* | **I. EPA I.D. NUMBER** OH0063461 |
|---|---|---|---|

| LABEL ITEMS | | |
|---|---|---|
| **II. EPA I.D. NUMBER** | Ohio EPA does not provide labels. Enter this information in items I, III, V and VI. | If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear),* please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI*(except VI-B which must be completed regardless).* Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected. |
| **III. FACILITY NAME** | | |
| **VI. FACILITY MAILING ADDRESS** | | |
| **VI. FACILITY LOCATION** | | |

## II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through G to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of **bold-faced terms.**

| SPECIFIC QUESTIONS | MARK 'X' YES | NO | FORM ATTACHED | SPECIFIC QUESTIONS | MARK 'X' YES | NO | FORM ATTACHED |
|---|---|---|---|---|---|---|---|
| A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.?** (FORM 2A) | ☐ | ☒ | ☐ | B. Does or will this facility*(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.?** (FORM 2B) | ☐ | ☒ | ☐ |
| C. Is this a facility which currently results in to **discharges waters of the U.S.** other than those described in A or B above? (FORM 2C) | ☒ | ☐ | ☒ | D. Is this a proposed facility (*other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.?** (FORM 2D) | ☐ | ☒ | ☐ |
| E. Is this a facility which does not discharge process **wastewater?** (FORM 2E) | ☐ | ☒ | ☐ | F. Is this a facility which discharges stormwater associated with industrial activity? (FORM 2F) | ☒ | ☐ | ☒ |
| G. Do you generate **sewage sludge** that is ultimately regulated by Part 503? Do you generate **sewage sludge** that is sent to another **facility** for treatment or blending? Do you process or derive material from **sewage sludge** that is disposed in a manner subject to Part 503? (FORM 2S) | ☐ | ☒ | ☐ | | | | |

## III. NAME OF FACILITY

Perry Nuclear Power Plant

## IV. FACILITY CONTACT

| A. NAME & TTILE *(last, first, title)* | B. PHONE *(area code & no.)* |
|---|---|
| Killing, Randall, Supervisor, Nuclear Chemistry | (440) 280 - 7370 |

## V. FACILITY MAILING ADDRESS

**A. STREET OR P.O. BOX**

10 Center Road

| B. CITY OR TOWN | C. STATE | D. ZIP CODE | |
|---|---|---|---|
| Perry | OH | 44081 | |

## VI. FACILITY LOCATION

**A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER**

10 Center Road

**B. COUNTY NAME**

Lake

| C. CITY OR TOWN | D. STATE | E. ZIP CODE | F. COUNTY CODE (if known) |
|---|---|---|---|
| Perry | OH | 44081 | 43 |

## VII. SIC CODES (4-digit, in order of priority)

| | | | |
|---|---|---|---|
| A. FIRST | | B. SECOND | |
| 4911 | (specify) Electric Generation | | (specify) |
| C. THIRD | | D. FOURTH | |
| | (specify) | | (specify) |

## VIII. OPERATOR INFORMATION

| | | | | |
|---|---|---|---|---|
| A. NAME | | | | B. Is the name listed in Item VIII-A also the owner? |
| FirstEnergy Nuclear Operating Company (FENOC) | | | | ☐ YES ☒ NO |
| C, STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.) | | | D. PHONE (area code & no.) | |
| F = FEDERAL M = PUBLIC (other than federal or state)<br>S = STATE O = OTHER (specify)<br>P = PRIVATE | P | (specify) | (330) 384-5100 | |
| E. STREET OR P.O. BOX | | | | |
| 76 South Main Street | | | | |
| F. CITY OR TOWN | G. STATE | H. ZIP CODE | IX. INDIAN LAND | |
| Akron | OH | 44308 | Is this facility located on Indian lands?<br>☐ YES ☒ NO | |

## X. EXISTING ENVIRONMENTAL PERMITS

| | | |
|---|---|---|
| A. NPDES (Discharges to surface water) | D. PSD (Air emissions from proposed sources) | |
| 3IB00016*JD | | |
| B. UIC (Underground injection of fluids) | E. OTHER (specify) | |
| | P0111998 | (specify) PTIO (Air) |
| C. RCRA (Hazardous waste) | F. OTHER (specify) | |
| OHD025673518 | | (specify) |

## XI. MAP

Attach to this application a topographical map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers, and other surface water bodies in the map area. See instructions for precise requirements.

## XII. NATURE OF BUSINESS (provide a brief description)

Generation, transmission, and distribution of electricity for sale

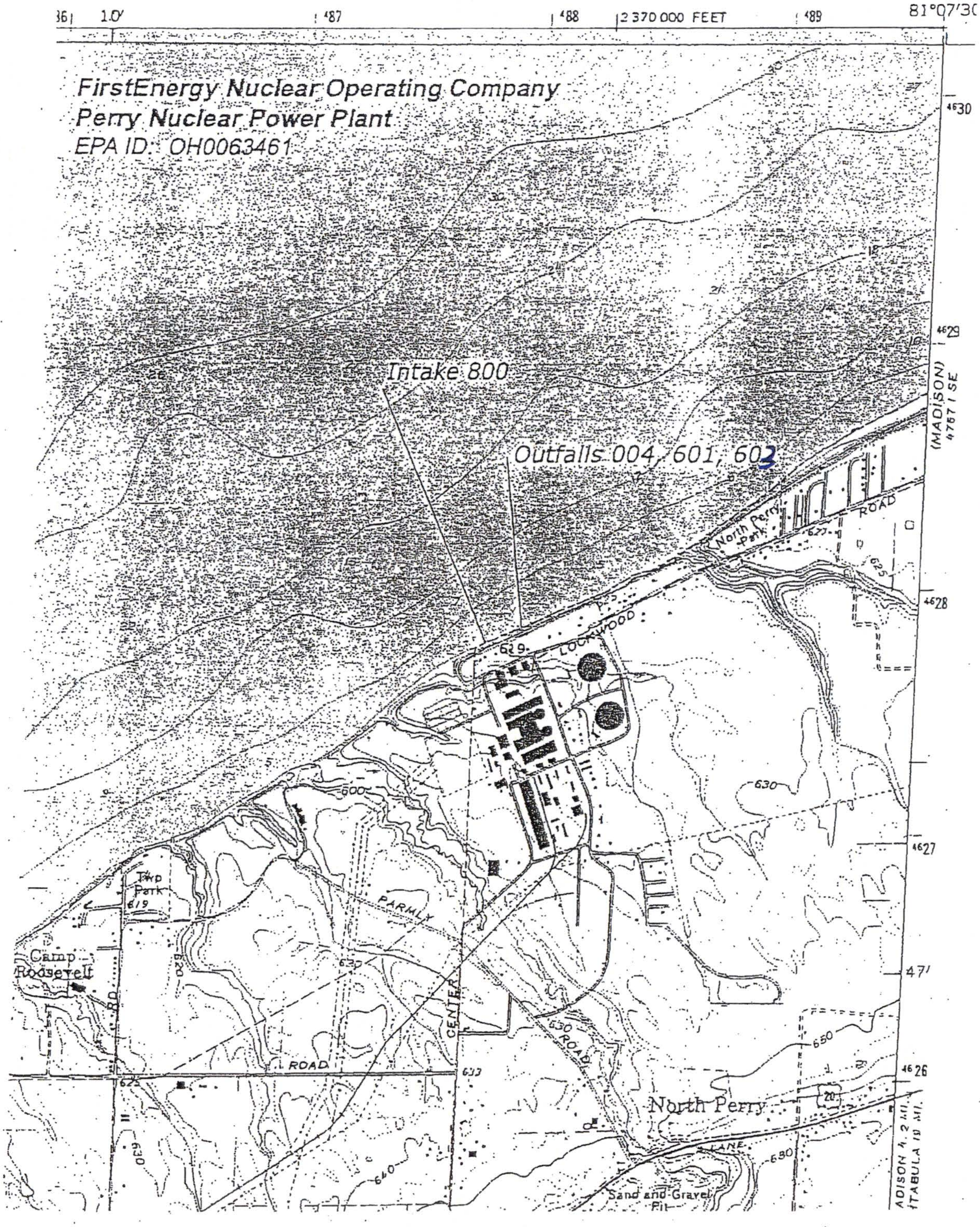
## XIII. CERTIFICATION (see instructions)

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. Name & Official Title | B. Signature | C. Date Signed |
|---|---|---|
| David Hamilton<br>Site VP - Perry Nuclear Power Plant | | 7.27.2016 |

**COMMENTS FOR OFFICIAL USE ONLY**

PERRY QUADRANGLE
OHIO—LAKE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Please print or type in the unshaded areas only.

EPA I.D. Number (copy from Item 1 of Form 1)
OH0063461

Form Approved.
OMB No. 2040-0086.
Approval expires 3-31-98.

FORM **2C** NPDES

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER
**EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURE OPERATIONS**
*Consolidated Permits Program*

## I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water.

| A. OUTFALL NUMBER (list) | B. LATITUDE | | | C. LONGITUDE | | | D. RECEIVING WATER *(name)* |
|---|---|---|---|---|---|---|---|
| | 1. Deg | 2. Min | 3. Sec | 1. Deg | 2. Min | 3. Sec | |
| 800 | 41 | 48 | 15 | 81 | 8 | 30 | Intake - Lake Erie |
| 004 | 41 | 48 | 33 | 81 | 8 | 54 | Lake Erie |
| 601 | 41 | 48 | 0 | 81 | 8 | 45 | Lake Erie via outfall 004 |
| 603 | 41 | 48 | 5 | 81 | 8 | 42 | Lake Erie via outfall 004 |
| | | | | | | | |

## II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (*e.g., for certain mining activities*), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

| 1. OUT-FALL NO. (list) | 2. OPERATION(S) CONTRIBUTING FLOW | | 3. TREATMENT (Description or List codes from Table 2C-1) | | |
|---|---|---|---|---|---|
| | a. OPERATION (*list*) | b. AVERAGE FLOW (*include units*) | a. DESCRIPTION | b. LIST CODES FROM TABLE 2C-1 | |
| 004 | Plant Discharge | 79.3 MGD | Chlorine Treatment | 5-F | |
| | | | Decholorination | 2-E | |
| | | | Discharge to Surface Water | 4-A | |
| | | | | | |
| 601 | Regenerant Neutralization | 20000 gpd | Neutralization | 2-K | |
| | | | | | |
| | | | | | |
| 603 | Reverse Osmosis Reject Water | 6000 gpd | | | |
| | | | | | |
| | | | | | |
| | | | | | |

OFFICIAL USE ONLY *(effluent guidelines sub-categories)*


CONTINUE ON NEXT PAGE

CONTINUED FROM THE FRONT

C. Except for storm runoff, leaks, or spills, are any of the discharges described in Items II-A or B be intermittent or seasonal?

☒ YES (*complete the following table*) ☐ NO (*go to Section III*)

| 1. OUTFALL NUMBER (*list*) | 2. OPERATION(s) CONTRIBUTING FLOW (*list*) | 3. Frequency | | 4. Flow | | | | |
|---|---|---|---|---|---|---|---|---|
| | | a. DAYS PER WEEK (*specify average*) | b. MONTHS PER YEAR (*specify average*) | a. FLOW RATE (*in mgd*) 1. LONG TERM AVERAGE | a. FLOW RATE (*in mgd*) 2. MAXIMUM DAILY | B. TOTAL VOLUME (*specify with units*) 1. LONG TERM AVERAGE | B. TOTAL VOLUME (*specify with units*) 2. MAXIMUM DAILY | c. DURATION (*in days*) |
| 004 | Liquid Radwaste | 1 | 11 | 0.04 | 0.07 | | | |
| 601 | Regen. Neutralization | 0 | 0 | 0.02 | 0.21 | | | |
| 603 | RO Reject | 6 | 11 | 0.006 | 0.16 | | | |

## III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?

☒ YES (*complete Item III-B*) ☐ NO (*go to Section IV*)

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?

☐ YES (*complete Item III-C*) ☒ NO (*go to Section IV*)

C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.

| 1. AVERAGE DAILY PRODUCTION | | | 2. AFFECTED OUTFALLS (*list outfall numbers*) |
|---|---|---|---|
| a. QUANTITY PER DAY | b. UNITS OF MEASURE | c. OPERATION, PRODUCT, MATERIAL, ETC. (*specify*) | |
| Not applicable | | | |

## IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operations of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.

☐ YES (*complete the following table*) ☒ NO (*go to Item IV-B*)

| 1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC. | 2. AFFECTED OUTFALLS | | 3. BRIEF DESCRIPTION OF PROJECT | 4. FINAL COMPLIANCE DATE | |
|---|---|---|---|---|---|
| | a. NO. | b. SOURCE OF DISCHARGE | | a. REQUIRED | b. PROJECTED |
| Not applicable | | | | | |

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs (*or other environmental projects which may affect your discharges*) you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.


CONTINUE ON NEXT PAGE

☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

| CONTINUED FROM PAGE 2 | EPA ID Number (copy from Item 1 of Form 1)<br>OH0063461 | |
|---|---|---|

**V. INTAKE AND EFFLUENT CHARACTERISTICS**

A, B, & C: See instructions before proceeding – Complete one set of tables for each outfall – Annotate the outfall number in the space provided.
NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in your possession.

| 1. POLLUTANT | 2. SOURCE | 1. POLLUTANT | 2. SOURCE |
|---|---|---|---|
| Not applicable | | | |

**VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS**

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES (*list all such pollutants below*) ☒ NO (*go to Item VI-B*)


CONTINUE ON NEXT PAGE

Not applicable

## VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on a receiving water in relation to your discharge within the last 3 years?

☐ YES *(identify the test(s) and describe their purposes below)* ☒ NO *(go to Item VIII)*

Not applicable

## VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☒ YES *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* ☐ NO *(go to Section IX)*

| A. NAME | B. ADDRESS | C. TELEPHONE *(area code & no.)* | D. POLLUTANTS ANALYZED *(list)* |
|---|---|---|---|


CONTINUE ON NEXT PAGE

| | | | |
|---|---|---|---|
| EA Group | 7118 Industrial Park Blvd.<br>Mentor, OH 44060 | 440-951-3514 | Fecal, Surfactants, BOD5, VOCs,Semi-VOCs |
| Test America | 4101 Shuffel St. NW<br>North Canton, OH 44720 | 330-966-8296 | Low level Mercury |

**IX. CERTIFICATION**

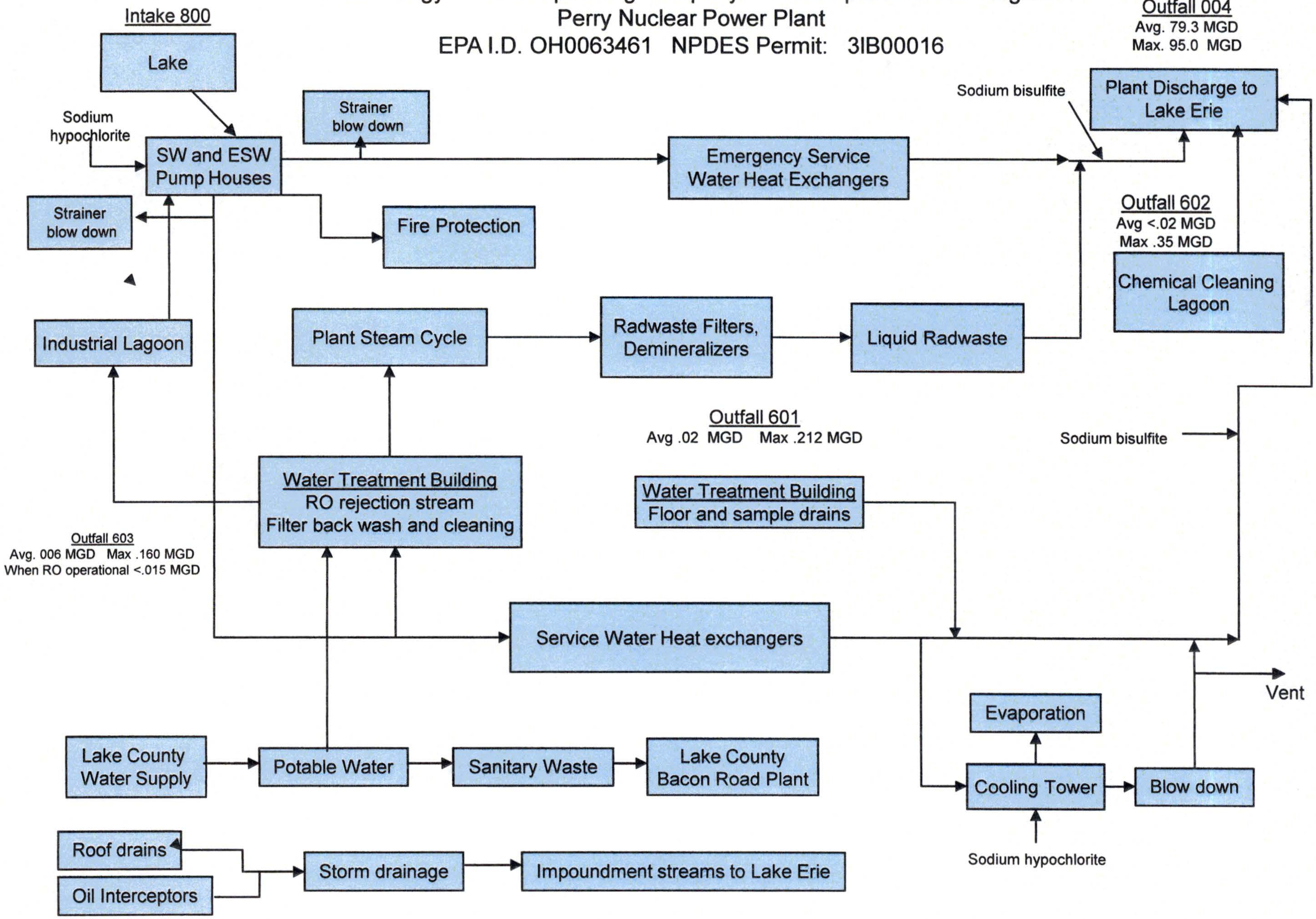
*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

| A. NAME & OFFICIAL TITLE (*type or print*) | B. PHONE NO (*area code & no.*) |
|---|---|
| DAVID HAMILTON SITE VICE PRESIDENT | 440.280.5382 |
| C. SIGNATURE | D. DATE SIGNED |
| | 7.27.2016 |


CONTINUE ON NEXT PAGE

# Form 2C- Part II, A- Water Flow Diagram

## First Energy Nuclear Operating Company- NPDES process flow diagram
## Perry Nuclear Power Plant
## EPA I.D. OH0063461 NPDES Permit: 3IB00016



PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (*use the same format*) instead of completing these pages. SEE INSTRUCTIONS.

EPA I.D. NUMBER (*copy from Item 1 of Form 1*)
OH0063461

V. INTAKE AND EFFLUENT CHARACTERISTICS (*continued from page 3 of Form 2-C*)

[redacted]

OUTFALL NO.
004

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

| 1. POLLUTANT | 2. EFFLUENT | | | | | | | 3. UNITS (*specify if blank*) | | 4. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| a. Biochemical Oxygen Demand (*BOD*) | <3.0 | --- | | | | | 1 | mg/L | kg/day | | | |
| b. Chemical Oxygen Demand (*COD*) | 15.01 | 3074 | | | | | 1 | mg/L | kg/day | | | |
| c. Total Organic Carbon (*TOC*) | 4.111 | 842 | | | | | 1 | mg/L | kg/day | | | |
| d. Total Suspended Solids (*TSS*) | <4 | --- | | | | | 1 | mg/L | kg/day | | | |
| e. Ammonia (*as N*) | <0.2 | --- | | | | | 1 | mg/L | kg/day | | | |
| f. Flow | VALUE 54.1 | | VALUE | | VALUE | | 2 | MGD | | | | |
| g. Temperature (*winter*) | VALUE 12.5 | | VALUE | | VALUE | | 4 | °C | | VALUE | | |
| h. Temperature (*summer*) | VALUE Not applicable | | VALUE | | VALUE | | | °C | | VALUE | | |
| i. pH | MINIMUM 8.63 | MAXIMUM 8.81 | MINIMUM | | | | 4 | STANDARD UNITS | | | | |

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. BELIEVED PRESENT | b. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | (1) CONCEN-TRATION | (2) MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| a. Bromide (24959-67-9) | | X | <0.475 | --- | | | | | 1 | mg/L | kg/day | | | |
| b. Chlorine, Total Residual | | X | <0.011 | --- | | | | | 4 | mg/L | kg/day | | | |
| c. Color | X | | 13 | --- | | | | | 1 | --- | --- | | | |
| d. Fecal Coli | X | | 1 | --- | | | | | 4 | #/dL | --- | | | |
| e. Fluoride (16984-48-8) | X | | 0.068 | 13.9 | | | | | 1 | mg/L | kg/day | | | |

 CONTINUE ON NEXT PAGE

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| f. Nitrate-Nitrite (*as N*) | X | | 0.546 | 112 | | | | | 1 | mg/L | kg/day | | | |

ITEM V-B CONTINUED FROM FRONT

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. BELIEVED PRESENT | b. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| g. Nitrogen, Total Organic (*as* | X | | 0.426 | 87.2 | | | | | 1 | mg/L | kg/day | | | |
| h. Oil and Grease | | X | <1.4 | --- | | | | | 4 | mg/L | kg/day | | | |
| i. Phosphorus (as P), Total (7723-14-0) | X | | 0.186 | 38.1 | | | | | 1 | mg/L | kg/day | | | |
| j. Radioactivity | | | | | | | | | | | | | | |
| (1) Alpha, Total | | | | | | Not | Applicable | | | | | | | |
| (2) Beta, Total | | | | | | Not | Applicable | | | | | | | |
| (3) Radium, Total | | | | | | Not | Applicable | | | | | | | |
| (4) Radium 226, Total | | | | | | Not | Applicable | | | | | | | |
| k. Sulfate (*as $SO_4$*) (14808-79-8) | X | | 31.6 | 6471 | | | | | 1 | mg/L | kg/day | | | |
| l. Sulfide (*as S*) | | X | <0.1 | --- | | | | | 1 | mg/L | kg/day | | | |
| m. Sulfite (*as $SO_3$*) (14265-45-3) | | X | <1 | --- | | | | | 1 | mg/L | kg/day | | | |
| n. Surfactants | X | | 0.06 | 12 | | | | | 1 | mg/L | kg/day | | | |
| o. Aluminum, Total (7429-90-5) | X | | 0.242 | 49.6 | | | | | 1 | mg/L | kg/day | | | |
| p. Barium, Total (7440-39-3) | X | | 0.0326 | 6.68 | | | | | 1 | mg/L | kg/day | | | |
| q. Boron, Total (7440-42-8) | X | | 0.0394 | 8.07 | | | | | 1 | mg/L | kg/day | | | |
| r. Cobalt, Total (7440-48-4) | | X | <0.005 | --- | | | | | 1 | mg/L | kg/day | | | |
| s. Iron, Total (7439-89-6) | X | | 0.359 | 73.5 | | | | | 1 | mg/L | kg/day | | | |
| t. Magnesium, Total (7439-95-4) | X | | 12.5 | 2560 | | | | | 1 | mg/L | kg/day | | | |
| u. Molybdenum, Total (7439-98-7) | X | | 0.0016 | 0.33 | | | | | 1 | mg/L | kg/day | | | |
| v. Manganese, Total (7439-96-5) | X | | 0.0083 | 1.7 | | | | | 1 | mg/L | kg/day | | | |
| w. Tin, Total (7440-31-5) | | X | <0.02 | --- | | | | | 1 | mg/L | kg/day | | | |
| x. Titanium, Total (7440-32-6) | X | | 0.0031 | 0.63 | | | | | 1 | mg/L | kg/day | | | |


CONTINUE ON NEXT PAGE

CONTINUED FROM PAGE 3 OF FORM 2-C

| EPA I.D. NUMBER *(copy from Item 1 of Form 1)* | OUTFALL NUMBER |
|---|---|
| OH0063461 | 004 |

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (*secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions*), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (*all 7 pages*) for each outfall. See instructions for additional details and requirements.

| 1. POLLUTANT AND CAS NO. *(if available)* | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE *(optional)* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE *(if available)* | | c. LONG TERM AVRG. VALUE *(if available)* | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| METALS, CYANIDE, AND TOTAL PHENOLS | | | | | | | | | | | | | | | |
| 1M. Antimony, Total (7440-36-0) | | X | | 0.000273 | 0.06 | | | | | 1 | mg/L | kg/dy | | | |
| 2M. Arsenic, Total (7440-38-2) | | X | | 0.0011 | 0.23 | | | | | 1 | mg/L | kg/dy | | | |
| 3M. Beryllium, Total (7440-41-7) | | | X | <0.00022 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 4M. Cadmium, Total (7440-43-9) | | | X | <0.000175 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 5M. Chromium, Total (7440-47-3) | | X | | 0.000452 | 0.09 | | | | | 1 | mg/L | kg/dy | | | |
| 6M. Copper, Total (7440-50-8) | | X | | 0.0052 | 1.06 | | | | | 1 | mg/L | kg/dy | | | |
| 7M. Lead, Total (7439-92-1) | | | X | <0.00052 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 8M. Mercury, Total (7439-97-6) | | X | | 0.00002 | 4.1e-3 | | | | | 1 | mg/L | kg/dy | | | |
| 9M. Nickel, Total (7440-02-0) | | X | | 0.0019 | 0.39 | | | | | 1 | mg/L | kg/dy | | | |
| 10M. Selenium, Total (7782-49-2) | | | X | <0.000535 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 11M. Silver, Total (7440-22-4) | | | X | <0.000325 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 12M. Thallium, Total (7440-28-0) | | | X | <0.000175 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 13M. Zinc, Total (7440-66-6) | | X | | 0.0083 | 1.7 | | | | | 1 | mg/L | kg/dy | | | |
| 14M. Cyanide, Total (57-12-5) | | | X | <0.01 | --- | | | | | 4 | mg/L | kg/dy | | | |
| 15M. Phenols, Total | | X | | 11 | 2.25 | | | | | 4 | ug/L | kg/dy | | | |
| DIOXIN | | | | | | | | | | | | | | | |
| 2,3,7,8-Tetra-chlorodibenzo-P-Dioxin (1764-01-6) | | | | DESCRIBE RESULTS<br>Not Applicable | | | | | | | | | | | |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| 1. POLLUTANT AND CAS NO. *(if available)* | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE *(optional)* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE *(if available)* | | c. LONG TERM AVRG. VALUE *(if available)* | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – VOLATILE COMPOUNDS | | | | | | | | | | | | | | | |
| 1V. Accrolein (107-02-8) | | | X | <5 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2V. Acrylonitrile (107-13-1) | | | X | <5 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3V. Benzene (71-43-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4V. Bis (*Chloro-methyl*) Ether (542-88-1) | | | | | | | Not | Applicable | | | | | | | |
| 5V. Bromoform (75-25-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6V. Carbon Tetrachloride (56-23-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7V. Chlorobenzene (108-90-7) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8V. Chlorodi-bromomethane (124-48-1) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 9V. Chloroethane (75-00-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10V. 2-Chloro-Ethylvinyl Ether (110-75-8) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 11V. Chloroform (67-66-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 12V. Dichloro-bromomethane (75-27-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 13V. Dichloro-difluoromethane (75-71-8) | | | | | | | Not | Applicable | | | | | | | |
| 14V. 1,1-Dichloro-Ethane (75-34-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 15V. 1,2-Dichloro-ethane (107-06-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 16V. 1,1-Dichloro-Ethylene (75-35-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 17V. 1,2-Dichloro-Propane (78-87-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 18V. 1,3-Dichloro-Propylene (542-75-6) | | | X | <2 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 19V. Ethylbenzene (100-41-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 20V. Methyl Bromide (74-83-9) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 21V. Methyl Chloride (74-87-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |

CONTINUED FROM PAGE 8

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSE |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| **GC/MS FRACTION – VOLATILE COMPOUNDS (*continued*)** | | | | | | | | | | | | | | | |
| 22V. Methylene Chloride (75-09-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 23V. 1,1,2,2-Tetrachloroethane (79-34-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 24V. Tetrachloro-Ethylene (127-18-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 25V. Toluene (108-88-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 26V. 1,2-Trans-Dichloroethylene (156-60-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 27V. 1,1,1-Trichloro-Ethane (71-55-6) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 28V. 1,1,2-Trichloro-Ethane (79-00-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 29V Trichloro-Ethylene (79-01-6) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 30V. Trichloro-fluoromethane (75-69-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 31V. Vinyl Chloride (75-01-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| **GC/MS FRACTION – ACID COMPOUNDS** | | | | | | | | | | | | | | | |
| 1A. 2-Chlorophenol (95-57-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2A. 2,4-Dichloro-Phenol (120-83-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3A. 2,4-Dimethyl Phenol (105-67-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4A. 4,6-Dinitro-O-Cresol (534-52-1) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 5A. 2,4-Dinitrophenol (51-28-5) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6A. 2-Nitrophenol (88-75-5) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7A. 4-Nitrophenol (100-02-7) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8A. P-Chloro-M-Cresol (59-50-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 9A. Pentachloro-Phenol (87-86-5) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10A. Phenol (108-95-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11A. 2,4,6-Trichloro-Phenol (88-05-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |

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| 1. POLLUTANT AND CAS NO. *(if available)* | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE *(optional)* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE *(if available)* | | c. LONG TERM AVRG. VALUE *(if available)* | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSE |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS | | | | | | | | | | | | | | | |
| 1B. Acenaphthene (83-32-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2B. Acenaphtylene (208-96-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3B. Anthracene (120-12-7 | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4B. Benzidine (92-87-5) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 5B. Benzo *(a)* Anthracene (56-55-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6B. Benzo *(a)* Pyrene (50-32-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7B. 3,4-Benzo-fluoranthene (205-99-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8B. Benzo *(ghi)* Perylene (191-24-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 9B. Benzo *(k)* Fluoranthene (207-08-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10B. Bis *(2-Chloro-ethoxy)* Methane (111-91-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 11B. Bis *(2-Chloro-ethyl)* Ether (111-44-4) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 12B. Bis *(2-Chloroisopropyl)* Ether (102-80-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 13B. Bis *(2-Ethyl-hexyl)* Phthalate (117-81-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 14B. 4-Bromophenyl Phenyl Ether (101-55-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 15B. Butyl Benzyl Phthalate (85-68-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 16B. 2-Chloro-naphthalene (91-58-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 17B. 4-Chlorophenyl Phenyl Ether (7005-72-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 18B. Chrysene (218-01-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 19B. Dibenzo *(a,h)* Anthracene (53-70-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 20B. 1,2-Dichloro-Benzene (95-50-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |


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| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21B. 1,3-Di-chloro-Benzene (541-73-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |

CONTINUED FROM PAGE 10

| 1. POLLUTANT AND CAS NO. *(if available)* | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE *(optional)* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE *(if available)* | | c. LONG TERM AVRG. VALUE *(if available)* | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSE |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)* | | | | | | | | | | | | | | | |
| 22B. 1,4-Dichloro-Benzene (106-46-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 23B. 3,3-Dichloro-Benzidine (91-94-1) | | | X | <20 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 24B. Diethyl Phthalate (84-66-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 25B. Dimethyl Phthalate (131 -11-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 26B. Di-N-Butyl Phthalate (84-74-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 27B. 2,4-Dinitro-Toluene (121-14-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 28B. 2,6-Dinitro-Toluene (606-20-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 29B. Di-N-Octyl Phthalate (117-84-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 30B. 1,2-Diphenyl-Hydrazine (*as Azo-benzene*) (122-66-7) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 31B. Fluoranthene (206-44-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 32B. Fluorene (86-73-7 | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 33B. Hexachloro-benzene (118-74-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 34B. Hexachloro-butadiene (87-68-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 35B. Hexachloro-cyclopentadiene (77-47-4) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 36B Hexachloro-ethane (67-72-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 37B. Indeno (*1,2,3-cd*) Pyrene (193-39-5) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 38B. Isophorone (78-59-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 39B. Naphthalene (91-20-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 40B. Nitrobenzene (98-95-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 41B. N-Nitro-sodimethylamine (62-75-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42B. N-Nitrosodi-N-Propylamine (621-64-7) | | | X | | --- | | | | | 1 | ug/L | kg/dy | | | |

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| 1. POLLUTANT AND CAS NO. *(if available)* | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE *(optional)* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE *(if available)* | | c. LONG TERM AVRG. VALUE *(if available)* | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)* | | | | | | | | | | | | | | | |
| 43B. N-Nitro-sodiphenylamine (86-30-6) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 44B. Phenanthrene (85-01-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 45B. Pyrene (129-00-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 46B. 1,2,4-Trichloro-Benzene (120-82-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| GC/MS FRACTION – PESTICIDES | | | | | | | | | | | | | | | |
| 1P. Aldrin (309-00-2) | | | | | | | Not | Applicable | | | | | | | |
| 2P. α-BHC (319-84-6) | | | | | | | Not | Applicable | | | | | | | |
| 3P. β-BHC (319-85-7) | | | | | | | Not | Applicable | | | | | | | |
| 4P. γ-BHC (58-89-9) | | | | | | | Not | Applicable | | | | | | | |
| 5P. δ-BHC (319-86-8) | | | | | | | Not | Applicable | | | | | | | |
| 6P. Chlordane (57-74-9) | | | | | | | Not | Applicable | | | | | | | |
| 7P. 4,4'-DDT (50-29-3) | | | | | | | Not | Applicable | | | | | | | |
| 8P. 4,4'-DDE (72-55-9) | | | | | | | Not | Applicable | | | | | | | |
| 9P. 4,4'-DDD (72-54-8) | | | | | | | Not | Applicable | | | | | | | |
| 10P. Dieldrin (60-57-1) | | | | | | | Not | Applicable | | | | | | | |
| 11P. α-Enosulfan (115-29-7) | | | | | | | Not | Applicable | | | | | | | |
| 12P. β-Endosulfan (115-29-7) | | | | | | | Not | Applicable | | | | | | | |
| 13P. Endosulfan Sulfate (1031-07-8) | | | | | | | Not | Applicable | | | | | | | |
| 14P. Endrin (72-20-8) | | | | | | | Not | Applicable | | | | | | | |
| 15P. Endrin Aldehyde (7421-93-4) | | | | | | | Not | Applicable | | | | | | | |


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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16P. Heptachlor (76-44-8) | | | | | | | Not | Applicable | | | | | | | |

CONTINUED FROM PAGE 12

| EPA I.D. NUMBER (*copy from Item 1 of Form 1*) | OUTFALL NUMBER |
|---|---|
| OH0063461 | 004 |

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – PESTICIDES (*continued*) | | | | | | | | | | | | | | | |
| 17P. Heptachlor Epoxide (1024-57-3) | | | | | | | Not | Applicable | | | | | | | |
| 18P. PCB-1242 (53469-21-9) | | | | | | | Not | Applicable | | | | | | | |
| 19P. PCB-1254 (11097-69-1) | | | | | | | Not | Applicable | | | | | | | |
| 20P. PCB-1221 (11104-28-2) | | | | | | | Not | Applicable | | | | | | | |
| 21P. PCB-1232 (11141-16-5) | | | | | | | Not | Applicable | | | | | | | |
| 22P. PCB-1248 (12672-29-6) | | | | | | | Not | Applicable | | | | | | | |
| 23P. PCB-1260 (11096-82-5) | | | | | | | Not | Applicable | | | | | | | |
| 24P. PCB-1016 (12674-11-2) | | | | | | | Not | Applicable | | | | | | | |
| 25P. Toxaphene (8001-35-2) | | | | | | | Not | Applicable | | | | | | | |

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (*use the same format*) instead of completing these pages. SEE INSTRUCTIONS.

EPA I.D. NUMBER (*copy from Item 1 of Form 1*)
OH0063461

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

OUTFALL NO.
603

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

| 1. POLLUTANT | 2. EFFLUENT | | | | | | | 3. UNITS (*specify if blank*) | | 4. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| a. Biochemical Oxygen Demand (*BOD*) | 7.5 | 0.21 | | | | | 1 | mg/L | kg/day | | | |
| b. Chemical Oxygen Demand (*COD*) | 25.17 | 0.70 | | | | | 1 | mg/L | kg/day | | | |
| c. Total Organic Carbon (*TOC*) | 10.1 | 0.28 | | | | | 1 | mg/L | kg/day | | | |
| d. Total Suspended Solids (*TSS*) | <4 | --- | | | | | 1 | mg/L | kg/day | | | |
| e. Ammonia (*as N*) | 0.079 | 0.0022 | | | | | 1 | mg/L | kg/day | | | |
| f. Flow | VALUE 0.000732 | | VALUE | | VALUE | | 1 | MGD | | | | |
| g. Temperature (*winter*) | VALUE 9.31 | | VALUE | | VALUE | | 4 | °C | | VALUE | | |
| h. Temperature (*summer*) | VALUE Not Applicable | | VALUE | | VALUE | | | °C | | VALUE | | |
| i. pH | MINIMUM 8.21 | MAXIMUM 9.09 | MINIMUM | | | | 4 | STANDARD UNITS | | | | |

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. BELIEVED PRESENT | b. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | (1) CONCEN-TRATION | (2) MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| a. Bromide (24959-67-9) | X | | 0.681 | 0.019 | | | | | 1 | mg/L | kg/day | | | |
| b. Chlorine, Total Residual | X | | 0.27 | 0.007 | | | | | 4 | mg/L | kg/day | | | |
| c. Color | X | | 20 | --- | | | | | 1 | --- | --- | | | |
| d. Fecal C oli | | X | <1 | --- | | | | | 1 | #/dL | --- | | | |
| e. Fluoride (16984-48-8) | X | | 0.366 | 0.010 | | | | | 1 | mg/L | kg/day | | | |
| f. Nitrate-Nitrite (*as N*) | X | | 1.666 | 0.046 | | | | | 1 | mg/L | kg/day | | | |


CONTINUE ON NEXT PAGE

ITEM V-B CONTINUED FROM FRONT

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. BELIEVED PRESENT | b. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| g. Nitrogen, Total Organic (as | X | | 1.22 | 0.034 | | | | | 1 | mg/L | kg/day | | | |
| h. Oil and Grease | | X | <1.4 | --- | | | | | 4 | mg/L | kg/day | | | |
| i. Phosphorus (as P), Total (7723-14-0) | X | | 0.271 | 0.008 | | | | | 1 | mg/L | kg/day | | | |
| j. Radioactivity | | | | | | | | | | | | | | |
| (1) Alpha, Total | | | | | | Not | Applicable | | | | | | | |
| (2) Beta, Total | | | | | | Not | Applicable | | | | | | | |
| (3) Radium, Total | | | | | | Not | Applicable | | | | | | | |
| (4) Radium 226, Total | | | | | | Not | Applicable | | | | | | | |
| k. Sulfate (*as $SO_4$*) (14808-79-8) | X | | 95.1 | 2.63 | | | | | 1 | mg/L | kg/day | | | |
| l. Sulfide (*as S*) | | X | <0.1 | --- | | | | | 1 | mg/L | kg/day | | | |
| m. Sulfite (*as $SO_3$*) (14265-45-3) | | X | <1 | --- | | | | | 1 | mg/L | kg/day | | | |
| n. Surfactants | X | | 0.09 | 0.0025 | | | | | 1 | mg/L | kg/day | | | |
| o. Aluminum, Total (7429-90-5) | X | | 0.0252 | 0.0007 | | | | | 1 | mg/L | kg/day | | | |
| p. Barium, Total (7440-39-3) | X | | 0.0827 | 0.0023 | | | | | 1 | mg/L | kg/day | | | |
| q. Boron, Total (7440-42-8) | X | | 0.0881 | 0.0024 | | | | | 1 | mg/L | kg/day | | | |
| r. Cobalt, Total (7440-48-4) | X | | 0.0006 | 2e-5 | | | | | 1 | mg/L | kg/day | | | |
| s. Iron, Total (7439-89-6) | X | | 0.0277 | 0.0008 | | | | | 1 | mg/L | kg/day | | | |
| t. Magnesium, Total (7439-95-4) | X | | 37 | 1.03 | | | | | 1 | mg/L | kg/day | | | |
| u. Molybdenum, Total (7439-98-7) | X | | 0.0063 | 0.0002 | | | | | 1 | mg/L | kg/day | | | |
| v. Manganese, Total (7439-96-5) | X | | 0.0025 | 0.0001 | | | | | 1 | mg/L | kg/day | | | |
| w. Tin, Total (7440-31-5) | | X | <0.02 | --- | | | | | 1 | mg/L | kg/day | | | |
| x. Titanium, Total (7440-32-6) | X | | 0.0002 | 1e-5 | | | | | 1 | mg/L | kg/day | | | |


CONTINUE ON NEXT PAGE

CONTINUED FROM PAGE 3 OF FORM 2-C

| EPA I.D. NUMBER (*copy from Item 1 of Form 1*) | OUTFALL NUMBER |
|---|---|
| OH0063461 | 603 |

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (*secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions*), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (*all 7 pages*) for each outfall. See instructions for additional details and requirements.

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| METALS, CYANIDE, AND TOTAL PHENOLS | | | | | | | | | | | | | | | |
| 1M. Antimony, Total (7440-36-0) | | X | | 0.000679 | 2e-5 | | | | | 1 | mg/L | kg/dy | | | |
| 2M. Arsenic, Total (7440-38-2) | | X | | 0.0029 | 1e-4 | | | | | 1 | mg/L | kg/dy | | | |
| 3M. Beryllium, Total (7440-41-7) | | | X | <0.00022 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 4M. Cadmium, Total (7440-43-9) | | | X | <0.000175 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 5M. Chromium, Total (7440-47-3) | | | X | <0.000375 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 6M. Copper, Total (7440-50-8) | | X | | 0.0044 | 1e-4 | | | | | 1 | mg/L | kg/dy | | | |
| 7M. Lead, Total (7439-92-1) | | | X | <0.00052 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 8M. Mercury, Total (7439-97-6) | | X | | 0.00001 | 3e-7 | | | | | 1 | mg/L | kg/dy | | | |
| 9M. Nickel, Total (7440-02-0) | | X | | 0.0046 | 1e-4 | | | | | 1 | mg/L | kg/dy | | | |
| 10M. Selenium, Total (7782-49-2) | | | X | <0.000535 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 11M. Silver, Total (7440-22-4) | | | X | <0.000325 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 12M. Thallium, Total (7440-28-0) | | | X | <0.000175 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 13M. Zinc, Total (7440-66-6) | | X | | 0.0106 | 3e-4 | | | | | 1 | mg/L | kg/dy | | | |
| 14M. Cyanide, Total (57-12-5) | | | X | <0.01 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 15M. Phenols, Total | | X | | 14 | 4e-4 | | | | | 1 | ug/L | kg/dy | | | |
| DIOXIN | | | | | | | | | | | | | | | |
| 2,3,7,8-Tetra-chlorodibenzo-P-Dioxin (1764-01-6) | | | | DESCRIBE RESULTS Not Applicable | | | | | | | | | | | |

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| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – VOLATILE COMPOUNDS | | | | | | | | | | | | | | | |
| 1V. Accrolein (107-02-8) | | | X | <5 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2V. Acrylonitrile (107-13-1) | | | X | <5 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3V. Benzene (71-43-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4V. Bis (*Chloro-methyl*) Ether (542-88-1) | | | | | | | Not | Applicable | | | | | | | |
| 5V. Bromoform (75-25-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6V. Carbon Tetrachloride (56-23-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7V. Chlorobenzene (108-90-7) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8V. Chlorodi-bromomethane (124-48-1) | | X | | 2 | 5e-5 | | | | | 1 | ug/L | kg/dy | | | |
| 9V. Chloroethane (75-00-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10V. 2-Chloro-Ethylvinyl Ether (110-75-8) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 11V. Chloroform (67-66-3) | | X | | 13 | 4e-4 | | | | | 1 | ug/L | kg/dy | | | |
| 12V. Dichloro-bromomethane (75-27-4) | | X | | 7.2 | 2e-4 | | | | | 1 | ug/L | kg/dy | | | |
| 13V. Dichloro-difluoromethane (75-71-8) | | | | | | | Not | Applicable | | | | | | | |
| 14V. 1,1-Dichloro-Ethane (75-34-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 15V. 1,2-Dichloro-ethane (107-06-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 16V. 1,1-Dichloro-Ethylene (75-35-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 17V. 1,2-Dichloro-Propane (78-87-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 18V. 1,3-Dichloro-Propylene (542-75-6) | | | X | <2 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 19V. Ethylbenzene (100-41-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 20V. Methyl Bromide (74-83-9) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 21V. Methyl Chloride (74-87-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |


CONTINUE ON NEXT PAGE

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| 1. POLLUTANT AND CAS NO. *(if available)* | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE *(optional)* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE *(if available)* | | c. LONG TERM AVRG. VALUE *(if available)* | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSE |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – VOLATILE COMPOUNDS *(continued)* | | | | | | | | | | | | | | | |
| 22V. Methylene Chloride (75-09-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 23V. 1,1,2,2-Tetrachloroethane (79-34-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 24V. Tetrachloro-Ethylene (127-18-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 25V. Toluene (108-88-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 26V. 1,2-Trans-Dichloroethylene (156-60-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 27V. 1,1,1-Trichloro-Ethane (71-55-6) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 28V. 1,1,2-Trichloro-Ethane (79-00-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 29V Trichloro-Ethylene (79-01-6) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 30V. Trichloro-fluoromethane (75-69-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 31V. Vinyl Chloride (75-01-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| GC/MS FRACTION – ACID COMPOUNDS | | | | | | | | | | | | | | | |
| 1A. 2-Chlorophenol (95-57-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2A. 2,4-Dichloro-Phenol (120-83-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3A. 2,4-Dimethyl Phenol (105-67-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4A. 4,6-Dinitro-O-Cresol (534-52-1) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 5A. 2,4-Dinitrophenol (51-28-5) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6A. 2-Nitrophenol (88-75-5) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7A. 4-Nitrophenol (100-02-7) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8A. P-Chloro-M-Cresol (59-50-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 9A. Pentachloro-Phenol (87-86-5) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10A. Phenol (108-95-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 11A. 2,4,6-Trichloro-Phenol (88-05-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |



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| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSE |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS | | | | | | | | | | | | | | | |
| 1B. Acenaphthene (83-32-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2B. Acenaphtylene (208-96-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3B. Anthracene (120-12-7 | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4B. Benzidine (92-87-5) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 5B. Benzo (*a*) Anthracene (56-55-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6B. Benzo (*a*) Pyrene (50-32-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7B. 3,4-Benzo-fluoranthene (205-99-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8B. Benzo (*ghi*) Perylene (191-24-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 9B. Benzo (*k*) Fluoranthene (207-08-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10B. Bis (*2-Chloro-ethoxy*) Methane (111-91-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 11B. Bis (*2-Chloro-ethyl*) Ether (111-44-4) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 12B. Bis (*2-Chloroisopropyl*) Ether (102-80-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 13B. Bis (*2-Ethyl-hexyl*) Phthalate (117-81-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 14B. 4-Bromophenyl Phenyl Ether (101-55-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 15B. Butyl Benzyl Phthalate (85-68-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 16B. 2-Chloro-naphthalene (91-58-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 17B. 4-Chlorophenyl Phenyl Ether (7005-72-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 18B. Chrysene (218-01-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 19B. Dibenzo (*a,h*) Anthracene (53-70-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 20B. 1,2-Dichloro-Benzene (95-50-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 21B. 1,3-Di-chloro-Benzene (541-73-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |


CONTINUE ON NEXT PAGE

CONTINUED FROM PAGE 10

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSE |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS (*continued*) | | | | | | | | | | | | | | | |
| 22B. 1,4-Dichloro-Benzene (106-46-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 23B. 3,3-Dichloro-Benzidine (91-94-1) | | | X | <20 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 24B. Diethyl Phthalate (84-66-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 25B. Dimethyl Phthalate (131 -11-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 26B. Di-N-Butyl Phthalate (84-74-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 27B. 2,4-Dinitro-Toluene (121-14-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 28B. 2,6-Dinitro-Toluene (606-20-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 29B. Di-N-Octyl Phthalate (117-84-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 30B. 1,2-Diphenyl-Hydrazine (*as Azo-benzene*) (122-66-7) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 31B. Fluoranthene (206-44-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 32B. Fluorene (86-73-7 | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 33B. Hexachloro-benzene (118-74-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 34B. Hexachloro-butadiene (87-68-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 35B. Hexachloro-cyclopentadiene (77-47-4) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 36B Hexachloro-ethane (67-72-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 37B. Indeno (*1,2,3-cd*) Pyrene (193-39-5) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 38B. Isophorone (78-59-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 39B. Naphthalene (91-20-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 40B. Nitrobenzene (98-95-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 41B. N-Nitro-sodimethylamine (62-75-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 42B. N-Nitrosodi-N-Propylamine (621-64-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |

CONTINUED FROM THE FRONT

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS (*continued*) | | | | | | | | | | | | | | | |
| 43B. N-Nitro-sodiphenylamine (86-30-6) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 44B. Phenanthrene (85-01-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 45B. Pyrene (129-00-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 46B. 1,2,4-Trichloro-Benzene (120-82-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| GC/MS FRACTION – PESTICIDES | | | | | | | | | | | | | | | |
| 1P. Aldrin (309-00-2) | | | | | | | Not | Applicable | | | | | | | |
| 2P. α-BHC (319-84-6) | | | | | | | Not | Applicable | | | | | | | |
| 3P. β-BHC (319-85-7) | | | | | | | Not | Applicable | | | | | | | |
| 4P. γ-BHC (58-89-9) | | | | | | | Not | Applicable | | | | | | | |
| 5P. δ-BHC (319-86-8) | | | | | | | Not | Applicable | | | | | | | |
| 6P. Chlordane (57-74-9) | | | | | | | Not | Applicable | | | | | | | |
| 7P. 4,4'-DDT (50-29-3) | | | | | | | Not | Applicable | | | | | | | |
| 8P. 4,4'-DDE (72-55-9) | | | | | | | Not | Applicable | | | | | | | |
| 9P. 4,4'-DDD (72-54-8) | | | | | | | Not | Applicable | | | | | | | |
| 10P. Dieldrin (60-57-1) | | | | | | | Not | Applicable | | | | | | | |
| 11P. α-Enosulfan (115-29-7) | | | | | | | Not | Applicable | | | | | | | |
| 12P. β-Endosulfan (115-29-7) | | | | | | | Not | Applicable | | | | | | | |
| 13P. Endosulfan Sulfate (1031-07-8) | | | | | | | Not | Applicable | | | | | | | |
| 14P. Endrin (72-20-8) | | | | | | | Not | Applicable | | | | | | | |
| 15P. Endrin Aldehyde (7421-93-4) | | | | | | | Not | Applicable | | | | | | | |
| 16P. Heptachlor (76-44-8) | | | | | | | Not | Applicable | | | | | | | |


CONTINUE ON NEXT PAGE

CONTINUED FROM PAGE 12

| EPA I.D. NUMBER (*copy from Item 1 of Form 1*) | OUTFALL NUMBER |
|---|---|
| OH0063461 | 603 |

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – PESTICIDES (*continued*) | | | | | | | | | | | | | | | |
| 17P. Heptachlor Epoxide (1024-57-3) | | | | | | | Not | Applicable | | | | | | | |
| 18P. PCB-1242 (53469-21-9) | | | | | | | Not | Applicable | | | | | | | |
| 19P. PCB-1254 (11097-69-1) | | | | | | | Not | Applicable | | | | | | | |
| 20P. PCB-1221 (11104-28-2) | | | | | | | Not | Applicable | | | | | | | |
| 21P. PCB-1232 (11141-16-5) | | | | | | | Not | Applicable | | | | | | | |
| 22P. PCB-1248 (12672-29-6) | | | | | | | Not | Applicable | | | | | | | |
| 23P. PCB-1260 (11096-82-5) | | | | | | | Not | Applicable | | | | | | | |
| 24P. PCB-1016 (12674-11-2) | | | | | | | Not | Applicable | | | | | | | |
| 25P. Toxaphene (8001-35-2) | | | | | | | Not | Applicable | | | | | | | |

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (*use the same format*) instead of completing these pages. SEE INSTRUCTIONS.

EPA I.D. NUMBER (*copy from Item 1 of Form 1*)
OH0063461

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

OUTFALL NO.
800 - Intake

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

| 1. POLLUTANT | 2. EFFLUENT | | | | | | | 3. UNITS (*specify if blank*) | | 4. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| a. Biochemical Oxygen Demand (*BOD*) | <3 | --- | | | | | 1 | mg/L | kg/day | | | |
| b. Chemical Oxygen Demand (*COD*) | 4.856 | 994 | | | | | 1 | mg/L | kg/day | | | |
| c. Total Organic Carbon (*TOC*) | 2.754 | 564 | | | | | 1 | mg/L | kg/day | | | |
| d. Total Suspended Solids (*TSS*) | 4 | 819 | | | | | 1 | mg/L | kg/day | | | |
| e. Ammonia (*as N*) | <0.2 | --- | | | | | 1 | mg/L | kg/day | | | |
| f. Flow | VALUE 54.1 | | VALUE | | VALUE | | 1 | MGD | | | | |
| g. Temperature (*winter*) | VALUE 8.33 | | VALUE | | VALUE | | | °C | | VALUE | | |
| h. Temperature (*summer*) | VALUE Not Applicable | | VALUE | | VALUE | | | °C | | VALUE | | |
| i. pH | MINIMUM 8.71 | MAXIMUM 9.43 | MINIMUM | | | | 4 | STANDARD UNITS | | | | |

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. BELIEVED PRESENT | b. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | (1) CONCEN-TRATION | (2) MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| a. Bromide (24959-67-9) | | X | <0.1 | --- | | | | | 1 | mg/L | kg/day | | | |
| b. Chlorine, Total Residual | X | | 0.07 | 14.3 | | | | | 4 | mg/L | kg/day | | | |
| c. Color | X | | 13 | --- | | | | | 1 | units | --- | | | |
| d. Fecal Coli | | X | <1 | --- | | | | | 4 | #/dL | | | | |
| e. Fluoride (16984-48-8) | X | | 0.028 | 5.73 | | | | | 1 | mg/L | kg/day | | | |
| f. Nitrate-Nitrite (*as N*) | X | | 0.404 | 82.7 | | | | | 1 | mg/L | kg/day | | | |


CONTINUE ON NEXT PAGE

ITEM V-B CONTINUED FROM FRONT

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. BELIEVED PRESENT | b. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSES | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| g. Nitrogen, Total Organic (*as* | X | | 0.274 | 56.1 | | | | | 1 | mg/L | kg/day | | | |
| h. Oil and Grease | | X | <1.4 | --- | | | | | 4 | mg/L | kg/day | | | |
| i. Phosphorus (as P), Total (7723-14-0) | X | | 0.032 | 6.55 | | | | | 1 | mg/L | kg/day | | | |
| j. Radioactivity | | | | | | | | | | | | | | |
| (1) Alpha, Total | | | | | | Not | Applicable | | | | | | | |
| (2) Beta, Total | | | | | | Not | Applicable | | | | | | | |
| (3) Radium, Total | | | | | | Not | Applicable | | | | | | | |
| (4) Radium 226, Total | | | | | | Not | Applicable | | | | | | | |
| k. Sulfate (*as $SO_4$*) (14808-79-8) | X | | 25.6 | 5242 | | | | | 1 | mg/L | kg/day | | | |
| l. Sulfide (*as S*) | | X | <0.1 | --- | | | | | 1 | mg/L | kg/day | | | |
| m. Sulfite (*as $SO_3$*) (14265-45-3) | | X | <1 | --- | | | | | 1 | mg/L | kg/day | | | |
| n. Surfactants | X | | 0.06 | 12.3 | | | | | 1 | mg/L | kg/day | | | |
| o. Aluminum, Total (7429-90-5) | X | | 0.171 | 35.0 | | | | | 1 | mg/L | kg/day | | | |
| p. Barium, Total (7440-39-3) | X | | 0.0238 | 4.87 | | | | | 1 | mg/L | kg/day | | | |
| q. Boron, Total (7440-42-8) | X | | 0.0667 | 13.7 | | | | | 1 | mg/L | kg/day | | | |
| r. Cobalt, Total (7440-48-4) | | X | <0.005 | --- | | | | | 1 | mg/L | kg/day | | | |
| s. Iron, Total (7439-89-6) | X | | 0.274 | 56.1 | | | | | 1 | mg/L | kg/day | | | |
| t. Magnesium, Total (7439-95-4) | X | | 9.09 | 1861 | | | | | 1 | mg/L | kg/day | | | |
| u. Molybdenum, Total (7439-98-7) | X | | 0.0024 | 0.49 | | | | | 1 | mg/L | kg/day | | | |
| v. Manganese, Total (7439-96-5) | X | | 0.0081 | 1.66 | | | | | 1 | mg/L | kg/day | | | |
| w. Tin, Total (7440-31-5) | | X | <0.02 | --- | | | | | 1 | mg/L | kg/day | | | |
| x. Titanium, Total (7440-32-6) | X | | 0.0021 | 0.43 | | | | | 1 | mg/L | kg/day | | | |


CONTINUE ON NEXT PAGE

CONTINUED FROM PAGE 3 OF FORM 2-C

| EPA I.D. NUMBER (*copy from Item 1 of Form 1*) | OUTFALL NUMBER |
|---|---|
| OH0063461 | 800 - Intake |

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (*secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions*), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (*all 7 pages*) for each outfall. See instructions for additional details and requirements.

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| METALS, CYANIDE, AND TOTAL PHENOLS | | | | | | | | | | | | | | | |
| 1M. Antimony, Total (7440-36-0) | | X | | 0.000189 | 0.038 | | | | | 1 | mg/L | kg/dy | | | |
| 2M. Arsenic, Total (7440-38-2) | | X | | 0.000879 | 0.180 | | | | | 1 | mg/L | kg/dy | | | |
| 3M. Beryllium, Total (7440-41-7) | | | X | <0.00022 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 4M. Cadmium, Total (7440-43-9) | | | X | <0.000175 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 5M. Chromium, Total (7440-47-3) | | | X | <0.000375 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 6M. Copper, Total (7440-50-8) | | X | | 0.0032 | 0.66 | | | | | 1 | mg/L | kg/dy | | | |
| 7M. Lead, Total (7439-92-1) | | | X | <0.00052 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 8M. Mercury, Total (7439-97-6) | | X | | 0.00001 | 0.002 | | | | | 1 | mg/L | kg/dy | | | |
| 9M. Nickel, Total (7440-02-0) | | X | | 0.0015 | 0.31 | | | | | 1 | mg/L | kg/dy | | | |
| 10M. Selenium, Total (7782-49-2) | | | X | <0.000535 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 11M. Silver, Total (7440-22-4) | | | X | <0.000325 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 12M. Thallium, Total (7440-28-0) | | | X | <0.000175 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 13M. Zinc, Total (7440-66-6) | | | X | <0.00347 | --- | | | | | 1 | mg/L | kg/dy | | | |
| 14M. Cyanide, Total (57-12-5) | | | X | <0.01 | --- | | | | | 4 | mg/L | kg/dy | | | |
| 15M. Phenols, Total | | X | | 11 | 2.25 | | | | | 4 | ug/L | kg/dy | | | |
| DIOXIN | | | | | | | | | | | | | | | |
| 2,3,7,8-Tetra-chlorodibenzo-P-Dioxin (1764-01-6) | | | | DESCRIBE RESULTS Not Applicable | | | | | | | | | | | |

CONTINUED FROM THE FRONT

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – VOLATILE COMPOUNDS | | | | | | | | | | | | | | | |
| 1V. Accrolein (107-02-8) | | | X | <5 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2V. Acrylonitrile (107-13-1) | | | X | <5 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3V. Benzene (71-43-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4V. Bis (*Chloro-methyl*) Ether (542-88-1) | | | | | | | Not | Applicable | | | | | | | |
| 5V. Bromoform (75-25-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6V. Carbon Tetrachloride (56-23-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7V. Chlorobenzene (108-90-7) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8V. Chlorodi-bromomethane (124-48-1) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 9V. Chloroethane (75-00-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10V. 2-Chloro-Ethylvinyl Ether (110-75-8) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 11V. Chloroform (67-66-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 12V. Dichloro-bromomethane (75-27-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 13V. Dichloro-difluoromethane (75-71-8) | | | | | | | Not | Applicable | | | | | | | |
| 14V. 1,1-Dichloro-Ethane (75-34-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 15V. 1,2-Dichloro-ethane (107-06-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 16V. 1,1-Dichloro-Ethylene (75-35-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 17V. 1,2-Dichloro-Propane (78-87-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 18V. 1,3-Dichloro-Propylene (542-75-6) | | | X | <2 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 19V. Ethylbenzene (100-41-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 20V. Methyl Bromide (74-83-9) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 21V. Methyl Chloride (74-87-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |


CONTINUE ON NEXT PAGE

CONTINUED FROM PAGE 8

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – VOLATILE COMPOUNDS (*continued*) | | | | | | | | | | | | | | | |
| 22V. Methylene Chloride (75-09-2) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 23V. 1,1,2,2-Tetrachloroethane (79-34-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 24V. Tetrachloro-Ethylene (127-18-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 25V. Toluene (108-88-3) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 26V. 1,2-Trans-Dichloroethylene (156-60-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 27V. 1,1,1-Trichloro-Ethane (71-55-6) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 28V. 1,1,2-Trichloro-Ethane (79-00-5) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 29V Trichloro-Ethylene (79-01-6) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 30V. Trichloro-fluoromethane (75-69-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 31V. Vinyl Chloride (75-01-4) | | | X | <1 | --- | | | | | 1 | ug/L | kg/dy | | | |
| GC/MS FRACTION – ACID COMPOUNDS | | | | | | | | | | | | | | | |
| 1A. 2-Chlorophenol (95-57-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2A. 2,4-Dichloro-Phenol (120-83-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3A. 2,4-Dimethyl Phenol (105-67-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4A. 4,6-Dinitro-O-Cresol (534-52-1) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 5A. 2,4-Dinitrophenol (51-28-5) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6A. 2-Nitrophenol (88-75-5) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7A. 4-Nitrophenol (100-02-7) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8A. P-Chloro-M-Cresol (59-50-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 9A. Pentachloro-Phenol (87-86-5) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10A. Phenol (108-95-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 11A. 2,4,6-Trichloro-Phenol (88-05-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |

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CONTINUED FROM THE FRONT

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS | | | | | | | | | | | | | | | |
| 1B. Acenaphthene (83-32-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 2B. Acenaphtylene (208-96-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 3B. Anthracene (120-12-7 | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 4B. Benzidine (92-87-5) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 5B. Benzo (*a*) Anthracene (56-55-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 6B. Benzo (*a*) Pyrene (50-32-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 7B. 3,4-Benzo-fluoranthene (205-99-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 8B. Benzo (*ghi*) Perylene (191-24-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 9B. Benzo (*k*) Fluoranthene (207-08-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 10B. Bis (*2-Chloro-ethoxy*) Methane (111-91-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 11B. Bis (*2-Chloro-ethyl*) Ether (111-44-4) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 12B. Bis (*2-Chloroisopropyl*) Ether (102-80-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 13B. Bis (*2-Ethyl-hexyl*) Phthalate (117-81-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 14B. 4-Bromophenyl Phenyl Ether (101-55-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 15B. Butyl Benzyl Phthalate (85-68-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 16B. 2-Chloro-naphthalene (91-58-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 17B. 4-Chlorophenyl Phenyl Ether (7005-72-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 18B. Chrysene (218-01-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 19B. Dibenzo (*a,h*) Anthracene (53-70-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 20B. 1,2-Dichloro-Benzene (95-50-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 21B. 1,3-Di-chloro-Benzene (541-73-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |

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CONTINUED FROM PAGE 10

| 1. POLLUTANT AND CAS NO. *(if available)* | 2. MARK "X" a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | 3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION | (2) MASS | b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION | (2) MASS | c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION | (2) MASS | d. NO. OF ANALYSE | 4. UNITS a. CONCEN-TRATION | b. MASS | 5. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION | (2) MASS | b. NO. OF ANALYSES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS *(continued)* | | | | | | | | | | | | | | | |
| 22B. 1,4-Dichloro-Benzene (106-46-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 23B. 3,3-Dichloro-Benzidine (91-94-1) | | | X | <20 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 24B. Diethyl Phthalate (84-66-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 25B. Dimethyl Phthalate (131-11-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 26B. Di-N-Butyl Phthalate (84-74-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 27B. 2,4-Dinitro-Toluene (121-14-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 28B. 2,6-Dinitro-Toluene (606-20-2) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 29B. Di-N-Octyl Phthalate (117-84-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 30B. 1,2-Diphenyl-Hydrazine (*as Azo-benzene*) (122-66-7) | | | X | <50 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 31B. Fluoranthene (206-44-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 32B. Fluorene (86-73-7 | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 33B. Hexachloro-benzene (118-74-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 34B. Hexachloro-butadiene (87-68-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 35B. Hexachloro-cyclopentadiene (77-47-4) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 36B Hexachloro-ethane (67-72-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 37B. Indeno (*1,2,3-cd*) Pyrene (193-39-5) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 38B. Isophorone (78-59-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 39B. Naphthalene (91-20-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 40B. Nitrobenzene (98-95-3) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 41B. N-Nitro-sodimethylamine (62-75-9) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 42B. N-Nitrosodi-N-Propylamine (621-64-7) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |

CONTINUED FROM THE FRONT

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS (*continued*) | | | | | | | | | | | | | | | |
| 43B. N-Nitro-sodiphenylamine (86-30-6) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 44B. Phenanthrene (85-01-8) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 45B. Pyrene (129-00-0) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| 46B. 1,2,4-Trichloro-Benzene (120-82-1) | | | X | <10 | --- | | | | | 1 | ug/L | kg/dy | | | |
| GC/MS FRACTION – PESTICIDES | | | | | | | | | | | | | | | |
| 1P. Aldrin (309-00-2) | | | | | | | Not | Applicable | | | | | | | |
| 2P. α-BHC (319-84-6) | | | | | | | Not | Applicable | | | | | | | |
| 3P. β-BHC (319-85-7) | | | | | | | Not | Applicable | | | | | | | |
| 4P. γ-BHC (58-89-9) | | | | | | | Not | Applicable | | | | | | | |
| 5P. δ-BHC (319-86-8) | | | | | | | Not | Applicable | | | | | | | |
| 6P. Chlordane (57-74-9) | | | | | | | Not | Applicable | | | | | | | |
| 7P. 4,4'-DDT (50-29-3) | | | | | | | Not | Applicable | | | | | | | |
| 8P. 4,4'-DDE (72-55-9) | | | | | | | Not | Applicable | | | | | | | |
| 9P. 4,4'-DDD (72-54-8) | | | | | | | Not | Applicable | | | | | | | |
| 10P. Dieldrin (60-57-1) | | | | | | | Not | Applicable | | | | | | | |
| 11P. α-Enosulfan (115-29-7) | | | | | | | Not | Applicable | | | | | | | |
| 12P. β-Endosulfan (115-29-7) | | | | | | | Not | Applicable | | | | | | | |
| 13P. Endosulfan Sulfate (1031-07-8) | | | | | | | Not | Applicable | | | | | | | |
| 14P. Endrin (72-20-8) | | | | | | | Not | Applicable | | | | | | | |
| 15P. Endrin Aldehyde (7421-93-4) | | | | | | | Not | Applicable | | | | | | | |
| 16P. Heptachlor (76-44-8) | | | | | | | Not | Applicable | | | | | | | |


CONTINUE ON NEXT PAGE

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EPA I.D. NUMBER (*copy from Item 1 of Form 1*): OH0063461

OUTFALL NUMBER: 800 - Intake

| 1. POLLUTANT AND CAS NO. (*if available*) | 2. MARK "X" | | | 3. EFFLUENT | | | | | | | 4. UNITS | | 5. INTAKE (*optional*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a. TESTING REQUIRED | b. BELIEVED PRESENT | c. BELIEVED ABSENT | a. MAXIMUM DAILY VALUE | | b. MAXIMUM 30 DAY VALUE (*if available*) | | c. LONG TERM AVRG. VALUE (*if available*) | | d. NO. OF ANALYSE | a. CONCEN-TRATION | b. MASS | a. LONG TERM AVERAGE VALUE | | b. NO. OF ANALYSES |
| | | | | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | (1) CONCENTRATION | (2) MASS | | | | (1) CONCENTRATION | (2) MASS | |
| GC/MS FRACTION – PESTICIDES (*continued*) | | | | | | | | | | | | | | | |
| 17P. Heptachlor Epoxide (1024-57-3) | | | | | | | Not | Applicable | | | | | | | |
| 18P. PCB-1242 (53469-21-9) | | | | | | | Not | Applicable | | | | | | | |
| 19P. PCB-1254 (11097-69-1) | | | | | | | Not | Applicable | | | | | | | |
| 20P. PCB-1221 (11104-28-2) | | | | | | | Not | Applicable | | | | | | | |
| 21P. PCB-1232 (11141-16-5) | | | | | | | Not | Applicable | | | | | | | |
| 22P. PCB-1248 (12672-29-6) | | | | | | | Not | Applicable | | | | | | | |
| 23P. PCB-1260 (11096-82-5) | | | | | | | Not | Applicable | | | | | | | |
| 24P. PCB-1016 (12674-11-2) | | | | | | | Not | Applicable | | | | | | | |
| 25P. Toxaphene (8001-35-2) | | | | | | | Not | Applicable | | | | | | | |

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Please print or type in the unshaded areas only.

EPA ID Number (copy from Item 1 of Form 1)
OH0063461

Form Approved. OMB No. 2040-0086
Approval expires 5-31-92

FORM **2F** NPDES

EPA

U.S. Environmental Protection Agency
Washington, DC 20460

# Application for Permit to Discharge Storm Water Discharges Associated with Industrial Activity

**Paperwork Reduction Act Notice**

Public reporting burden for this application is estimated to average 28.6 hours per application, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate, any other aspect of this collection of information, or suggestions for improving this form, including suggestions which may increase or reduce this burden to: Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, or Director, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

## I. Outfall Location

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water.

| A. Outfall Number (*list*) | B. Latitude | | | C. Longitude | | | D. Receiving Water (*name*) |
|---|---|---|---|---|---|---|---|
| | Deg | Min | Sec | Deg | Min | Sec | |
| 005 | 41 | 47 | 58 | 81 | 9 | 17 | Lake Erie |
| 006 | 41 | 48 | 5 | 81 | 9 | 5 | Lake Erie |
| 007 | 41 | 48 | 21 | 81 | 8 | 29 | Lake Erie |
| | | | | | | | |
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## II. Improvements

A. Are you now required by any Federal, State, or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.

| 1. Identification of Conditions, Agreements, Etc. | 2. Affected Outfalls | | 3. Brief Description of Project | 4. Final Compliance Date | |
|---|---|---|---|---|---|
| | number | source of discharge | | a. req. | b. proj. |
| Not applicable | | | | | |
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B: You may attach additional sheets describing any additional water pollution (or other environmental projects which may affect your discharges) you now have under way or which you plan. Indicate whether each program is now under way or planned, and indicate your actual or planned schedules for construction.

## III. Site Drainage Map

Attach a site map showing topography (or indicating the outline of drainage areas served by the outfalls(s) covered in the application if a topographic map is unavailable) depicting the facility including: each of its intake and discharge structures; the drainage area of each storm water outfall; paved areas and buildings within the drainage area of each storm water outfall, each known past or present areas used for outdoor storage of disposal of significant materials, each existing structural control measure to reduce pollutants in storm water runoff, materials loading and access areas, areas where pesticides, herbicides, soil conditioners and fertilizers are applied; each of its hazardous waste treatment, storage or disposal units (including each area not required to have a RCRA permit which is used for accumulating hazardous waste under 40 CFR 262.34); each well where fluids from the facility are injected underground; springs, and other surface water bodies which received storm water discharges from the facility.

## IV. Narrative Description of Pollutant Sources

A. For each outfall, provide an estimate of the area (include units) of imperious surfaces (including paved areas and building roofs) drained to the outfall, and an estimate of the total surface area drained by the outfall.

| Outfall Number | Area of Impervious Surface *(provide units)* | Total Area Drained *(provide units)* | Outfall Number | Area of Impervious Surface *(provide units)* | Total Area Drained *(provide units)* |
|---|---|---|---|---|---|
| 005 | 1,817,915 sq. ft. | 0.6 sq. mi. | | | |
| 006 | 661,365 sq. ft. | 0.07 sq. mi. | | | |
| 007 | 761,915 sq. ft. | 0.76 sq. mi. | | | |

B. Provide a narrative description of significant materials that are currently or in the past three years have been treated, stored or disposed in a manner to allow exposure to storm water; method of treatment, storage, or disposal; past and present materials management practices employed to minimize contact by these materials with storm water runoff; materials loading and access areas, and the location, manner, and frequency in which pesticides, herbicides, soil conditioners, and fertilizers are applied.

No significant materials are stored in a manner that would allow exposure to stormwater. Storage is either indoors or in water tight containers, if outdoors. The Plant Spill Prevention Control and Countermeasure Plan (SPCC) and Chemical Control Program procedures are the primary site directives for control of significant materials. Materials loading and access is either indoors or, if outdoors, done only with materials in water tight containers. Herbicides are applied by spot application each year to the gravel yard areas and landscape beds. No soil conditioners or fertilizers are applied.

C. For each outfall, provide the location and a description of existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and a description of the treatment the storm water receives, including the schedule and type of maintenance for control and treatment measures and the ultimate disposal of any solid or fluid wastes other than by discharge.

| Outfall Number | Treatment | List Codes from Table 2F-1 |
|---|---|---|
| 005 | Impoundment structures with concrete barriers | 1-U |
| 006 | Impoundment structures, concrete barriers, dikes, skimmer plates | 1-U |
| 007 | Impoundment structures, concrete barriers, dikes, skimmer plates | 1-U |

## V. Nonstormwater Discharges

A. I certify under penalty of law hat the outfall(s) covered by this application have been tested or evaluated for the presence of nonstormwater discharges, and that all nonstormwater discharged from these outfall(s) are identified in either an accompanying Form 2C or From 2E application for the outfall.

| Name and Official Title *(type or print)* | Signature | Date Signed |
|---|---|---|
| DAVID HAMILTON<br>SITE VICE PRESIDENT | | 7.27.2016 |

B. Provide a description of the method used, the date of any testing, and the onsite drainage points that were directly observed during a test.

Not applicable

## VI. Significant Leaks or Spills

Provide existing information regarding the history of significant leaks or spills of toxic or hazardous pollutants at the facility in the last three years, including the approximate date and location of the spill or leak, and the type and amount of material released.

08/12/2015 - Lake Erie - Spill of about 55 gallons or less of Biocide. Spill occurred about 1130 due to a mechanical failure of the feed line. Spill was reported to OEPA

**Continued from Page 2**

| EPA ID Number (copy from Item 1 of Form 1) |
|---|
| OH0063461 |

## VII. Discharge Information

A, B, C, & D: See instructions before proceeding. Complete one set of tables for each outfall. Annotate the outfall number in the space provided. Table VII-A, VII-B, VII-C are included on separate sheets numbers VII-1 and VII-2.

E. Potential discharges not covered by analysis – is any toxic pollutant listed in table 2F-2, 2F-3, or 2F-4, a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ Yes (*list all such pollutants below*) ☒ No (*go to Section IX*)

## VIII. Biological Toxicity Testing Data

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on a receiving water in relation to your discharge within the last 3 years?

☐ Yes (*list all such pollutants below*) ☒ No (*go to Section IX*)

## IX. Contract Analysis Information

Were any of the analyses reported in Item VII performed by a contract laboratory or consulting firm?

☒ Yes (*list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below*) ☐ No (*go to Section X*)

| A. Name | B. Address | C. Area Code & Phone No. | D. Pollutants Analyzed |
|---|---|---|---|
| EA Group | 7118 Industrial Park Blvd., Mentor, OH 44060 | 440-951-3514 | BOD5 |

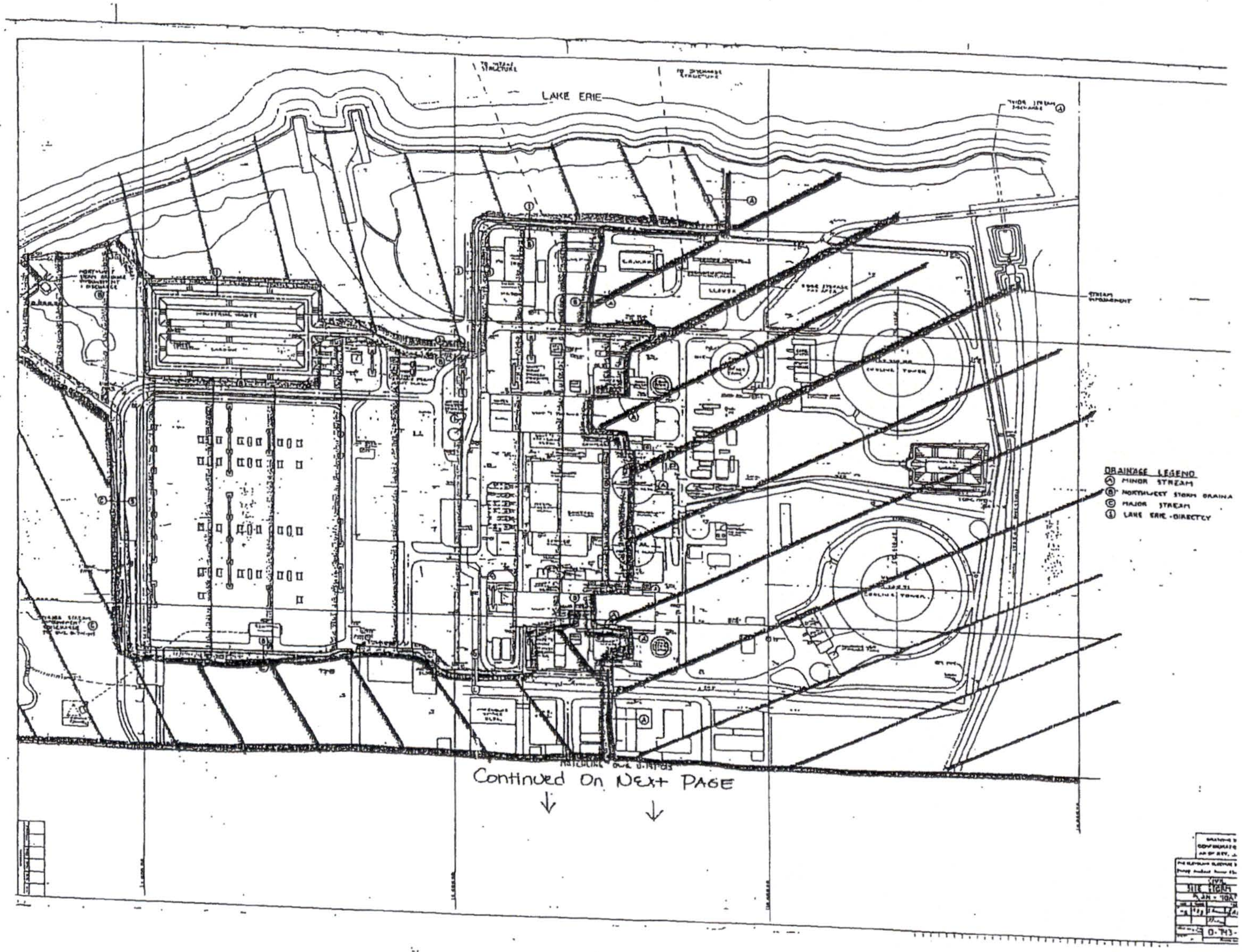
## X. Certification

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

| A. Name & Official Title (type or print) | B. Phone No. |
|---|---|
| DAVID HAMILTON SITE VICE PRESIDENT | 440.280.5382 |
| C. Signature | D. Date Signed |
| | 7-27-2016 |

EPA ID: OH0063461

- S.W. Outfall 005
- S.W. Outfall 006
- S.W. Outfall 007
- Lake Erie (direct)

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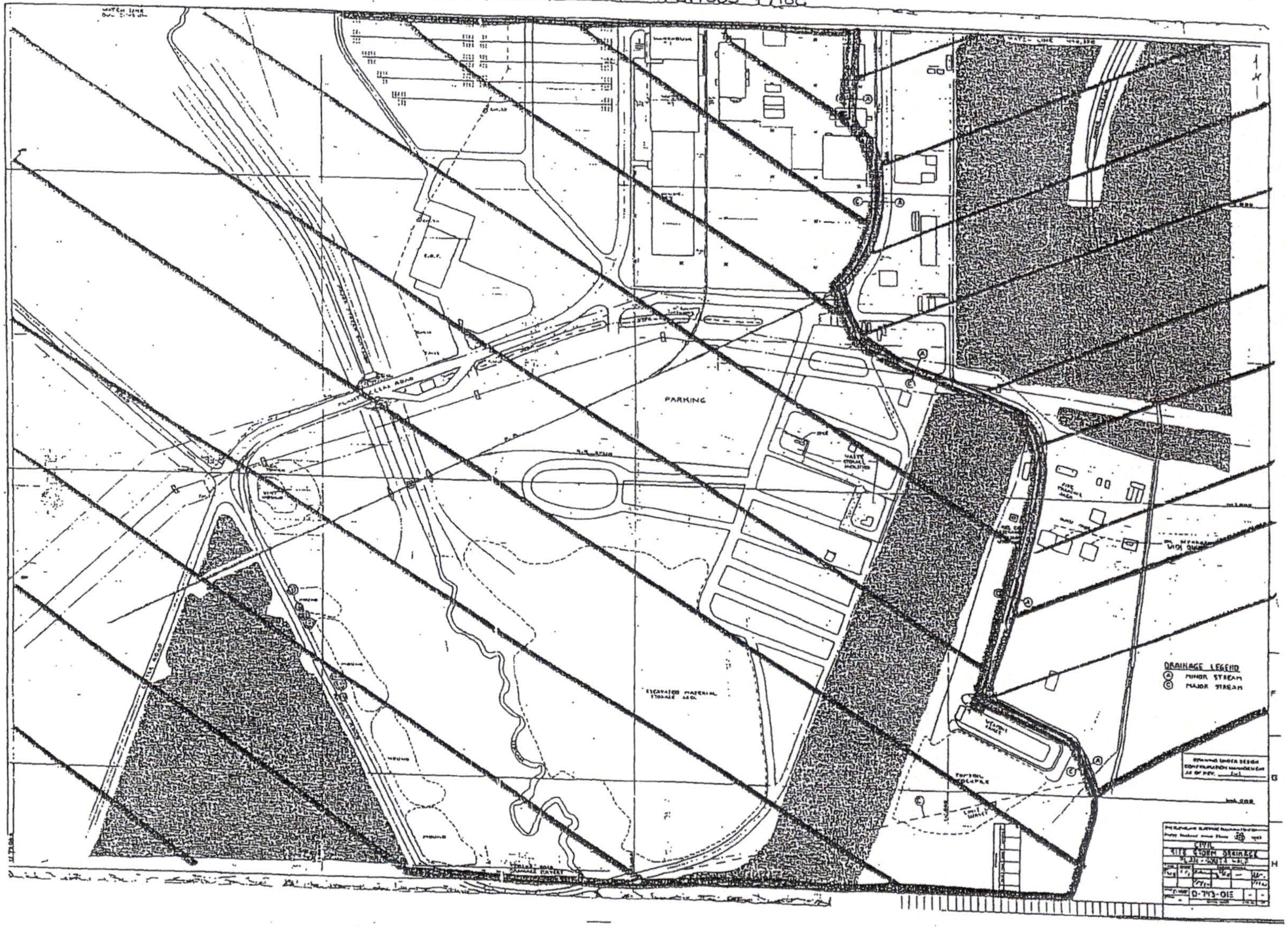

**VII. Discharge Information (Continued from page 3 of Form 2F)**

Part A – You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

| Pollutant and CAS Number (if available) | Maximum Values (include units) | | Average Values (include units) | | Number of Storm Events Sampled | Sources of Pollutants |
|---|---|---|---|---|---|---|
| | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | | |
| Oil and Grease | <1.4 mg/L | N/A | Non-Detect | | 2 | |
| Biological Oxygen Demand (BOD5) | 5.4 mg/L | | 5.4 mg/L | | 1 | |
| Chemical Oxygen Demand (COD) | 23.14 mg/L | | 17.05 mg/L | | 2 | |
| Total Suspended Solids (TSS) | 36 mg/L | | 24 mg/L | | 2 | |
| Total Nitrogen | 0.898 | | N/A | | 1 | |
| Total Phosphorus | 0.05 mg/L | | 0.03 mg/L | | 2 | |
| pH | Minimum 8.71 | Maximum 8.96 | Minimum | Maximum | 2 | |

Part B – List each pollutant that is limited in an effluent guideline which the facility is subject to or any pollutant listed in the facility's NPDES permit for its process wastewater (if the facility is operating under an existing NPDES permit). Complete one table for each outfall. See the instructions for additional details and requirements.

| Pollutant and CAS Number (if available) | Maximum Values (include units) | | Average Values (include units) | | Number of Storm Events Sampled | Sources of Pollutants |
|---|---|---|---|---|---|---|
| | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | | |
| NO2/NO3 | 0.5956 mg/L | | 0.4938 mg/L | | 2 | |
| Copper | 0.0018 mg/L | | 0.0009 mg/L | | 2 | |
| Nickel | 0.0027 mg/L | | 0.0023 mg/L | | 2 | |
| Selenium | <0.0011 mg/L | | Non-Detect | | 2 | |
| Zinc | 0.0414 mg/L | | 0.0322 mg/L | | 2 | |

**VII. Discharge Information (Continued from page 3 of Form 2F)**

Part A – You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

| Pollutant and CAS Number *(if available)* | Maximum Values *(include units)* | | Average Values *(include units)* | | Number of Storm Events Sampled | Sources of Pollutants |
|---|---|---|---|---|---|---|
| | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | | |
| Oil and Grease | <1.4 mg/L | N/A | N/A | | 1 | |
| Biological Oxygen Demand (BOD5) | 140 mg/L | | N/A | | 1 | |
| Chemical Oxygen Demand (COD) | 187.7 mg/L | | 123.4 mg/L | | 2 | |
| Total Suspended Solids (TSS) | 38 mg/L | | 31 mg/L | | 2 | |
| Total Nitrogen | 12.2 mg/L | | N/A | | 1 | |
| Total Phosphorus | 4.24 mg/L | | 2.64 mg/L | | 2 | |
| pH | Minimum 8.47 | Maximum 8.53 | Minimum | Maximum | 2 | |

Part B – List each pollutant that is limited in an effluent guideline which the facility is subject to or any pollutant listed in the facility's NPDES permit for its process wastewater (if the facility is operating under an existing NPDES permit). Complete one table for each outfall. See the instructions for additional details and requirements.

| Pollutant and CAS Number *(if available)* | Maximum Values *(include units)* | | Average Values *(include units)* | | Number of Storm Events Sampled | Sources of Pollutants |
|---|---|---|---|---|---|---|
| | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | | |
| NO2/NO3 | <0.00154 mg/L | | Non-Detect | | 2 | |
| Copper | 0.0072 mg/L | | 0.0036 mg/L | | 2 | |
| Nickel | 0.0027 mg/L | | 0.0014 mg/L | | 2 | |
| Selenium | <0.0011 mg/L | | Non-Detect | | 2 | |
| Zinc | 0.161 mg/L | | 0.118 mg/L | | 2 | |

**VII. Discharge Information (Continued from page 3 of Form 2F)**

Part A – You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

| Pollutant and CAS Number *(if available)* | Maximum Values *(include units)* | | Average Values *(include units)* | | Number of Storm Events Sampled | Sources of Pollutants |
|---|---|---|---|---|---|---|
| | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | | |
| Oil and Grease | <1.4 mg/L | N/A | Non-Detect | | 2 | |
| Biological Oxygen Demand (BOD5) | 3.3 mg/L | | N/A | | 1 | |
| Chemical Oxygen Demand (COD) | 25.17 mg/L | | 19.08 mg/L | | 2 | |
| Total Suspended Solids (TSS) | 8 mg/L | | 6 mg/L | | 2 | |
| Total Nitrogen | 0.670 mg/L | | N/A | | 1 | |
| Total Phosphorus | 0.164 mg/L | | 0.105 mg/L | | 2 | |
| pH | Minimum 9.26 | Maximum 9.31 | Minimum | Maximum | | |

Part B – List each pollutant that is limited in an effluent guideline which the facility is subject to or any pollutant listed in the facility's NPDES permit for its process wastewater (if the facility is operating under an existing NPDES permit). Complete one table for each outfall. See the instructions for additional details and requirements.

| Pollutant and CAS Number *(if available)* | Maximum Values *(include units)* | | Average Values *(include units)* | | Number of Storm Events Sampled | Sources of Pollutants |
|---|---|---|---|---|---|---|
| | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | | |
| NO2/NO3 | 1.0131 mg/L | | 0.68 mg/L | | 2 | |
| Copper | 0.0054 mg/L | | 0.003 mg/L | | 2 | |
| Nickel | <0.002 mg/L | | Non-Detect | | 2 | |
| Selenium | <0.001 mg/L | | Non-Detect | | 2 | |
| Zinc | 0.0288 mg/L | | 0.0266 mg/L | | 2 | |

Part C - List each pollutant shown in Table 2F-2, 2F-3, and 2F-4 that you know or have reason to believe is present. See the instructions for additional details and requirements. Complete one table for each outfall.

| Pollutant and CAS Number *(if available)* | Maximum Values *(include units)* | | Average Values *(include units)* | | Number of Storm Events Sampled | Sources of Pollutants |
|---|---|---|---|---|---|---|
| | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | Grab Sample Taken During First 20 Minutes | Flow-Weighted Composite | | |
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Part D – Provide data for the storm event(s) which resulted in the maximum values for the flow weighted composite sample.

| 1. Date of Storm Event | 2. Duration of Storm Event *(in minutes)* | 3. Total rainfall during storm event *(in inches)* | 4. Number of hours between beginning of storm measured and end of previous measurable rain event | 5. Maximum flow rate during rain event *(gallons/minute or specify units)* | 6. Total flow from rain event *(gallons or specify units)* |
|---|---|---|---|---|---|
| 05/13/16 | 66 | 0.37 | >148 hours | 83,500 gpm | 5,500,000 gallons |
| 06/05/16 | 125 | 0.42 | >120 hours | 50,000 gpm | 6,300,000 gallons |

7. Provide a description of the method of flow measurement or estimate.

Rational Method

# Antidegradation Addendum
## Division of Surface Water

OhioEPA

In accordance with Ohio Administrative Code (OAC) 3745-1-05 Antidegradation, additional information may be required to complete your application for a permit to install (PTI) or National Pollutant Discharge Elimination System (NPDES) permit. For any application that may result in an increase in the level of pollutant being discharged (NPDES and/or PTI) or for which there might be an activity taking place within a stream bed, the processing of the permit(s) may be required to go through procedures as outlined in the antidegradation rule. The rule outlines procedures for public notification and participation as well as the procedures pertaining to the levels of review necessary. The levels of review necessary depend on the degradation being considered/requested. The rule also outlines exclusion from portions of the application and review requirements and waivers that the Director may grant as specified in Section OAC 3745-1-05(D) of the rule. Please complete the following questions. The answers provided will allow the Ohio EPA to determine if additional information is needed. **<u>All projects that require both an NPDES and PTI should submit both applications simultaneously to avoid going through the antidegradation process separately for each permit.</u>**

| **A. General Information** | |
|---|---|
| **Applicant:** | Perry Nuclear Power Plant |
| **Facility Owner:** | FirstEnergy Nuclear Operating Company |
| **Facility Location *(city & county)*:** | Perry, Lake County |
| **Application or Plans Prepared by:** | Dan Havalo |
| **Project Name:** | NPDES Renewal Application |
| **NPDES Permit No. *(if applicable)*:** | 3IB00016*JD |

| **B. Antidegradation Applicability** | |
|---|---|
| **Is the application for? *(check as many as apply)*** | |
| ☐ | Application with no direct surface water discharge *(Projects that do not meet the applicability section of OAC 3745-1-05(B)(1))*. Examples include on-site disposal, extensions of sanitary sewers, spray irrigation, indirect discharge to POTW, etc. **Complete Section E.** |
| ☒ | Renewal NPDES application or PTI application with no requested increase in loading of currently permitted pollutants. **Complete Section E.** |
| ☐ | PTI and NPDES application for a new wastewater treatment works that will discharge to a surface water. **Complete Sections C & E.** |
| ☐ | PTI and/or NPDES application for an expansion/modification of an existing wastewater treatment works discharging to a surface water that will result in any of the following:<br>• Addition of any pollutant no currently in the discharge; or<br>• An increase in mass or concentration of any pollutant currently in the discharge; or<br>• An increase in any current pollutant limitation in terms of mass or concentration.<br>**Complete Sections C & E.** |
| ☐ | PTI application that involves placement of fill or installation of any portion of a sewerage system (i.e., sanitary sewers, pump stations, WWTP, etc.) within 150 feet of a stream bed. **Please provide information requested on the stream evaluation addendum and complete Section E.** |
| ☐ | Initial NPDES application for an existing treatment works with a wastewater discharge prior to October 1, 1996. **Complete Sections D & E.** |
| ☐ | Renewal NPDES application or modification to an effective NPDES permit that will result in any of the following:<br>• A new permit limitation for a pollutant that previously had no limitation; or<br>• An increase in any mass or concentration limitation of any pollutant that currently has a limitation.<br>**Complete Sections C and E.** |

## C. Antidegradation Information

**1.** Does the PTI and/or NPDES permit application meet an exclusion as outlined by OAC 3745-1-05(D)(1) of the Antidegradation rule?

| | |
|---|---|
| ☐ Yes. **Complete Question C.2.** | ☐ No. **Complete Questions C.3 and C.4.** |

**2.** For projects that would be eligible for exclusions provide the following information:

a. Provide justification for the exclusion.
b. Identify the substances to be discharged, including the amount of regulated pollutants to be discharged in terms of mass and concentration.
c. A description of any construction work, fill or other substances to occur or be placed in or near a stream bed.

**3.** Are you requesting a waiver as outlined by OAC 3745-1-05(D)(2-7) of the Antidegradation rule? ☐ No ☐ Yes
If you wish to pursue one of the waivers, please identify the waiver and submit the necessary information to support the request. Depending on the waiver requested, the information required under question C.4. may be required to complete the application.

**4.** For all projects that do not qualify for an exclusion, a report must accompany this application evaluating the preferred design alternative, non-degradation alternatives, minimal degradation alternatives, and mitigative techniques/measures for the design and operation of the activity. The information outlined below should be addressed in this report. If a waiver is requested, this section is still required.

a. Describe the availability, cost effectiveness and technical feasibility of connecting to existing central or regional sewage collection and treatment facilities, including long range plans for sewer service outlined in state or local water quality management planning documents and applicable facility planning documents.

b. List and describe all government and/or privately sponsored conservation projects that may have been or will be specifically targeted to improve water quality or enhance recreational opportunities on the affected water resource.

c. Provide a brief description of all treatment/disposal alternatives (preferred, non-degradation, minimal degradation and mitigative technique/measure) evaluated for this application and their respective operational and maintenance needs.

**At a minimum, the following information must be included in the report for each alternative evaluated.**

d. Outline of the treatment/disposal system evaluated, including the costs associated with the equipment, installation, and continued operation and maintenance.

e. Identify the substances to be discharged, including the amount of regulated pollutants to be discharged in terms of mass and concentration.

f. Describe the reliability of the treatment/disposal system, including but not limited to the possibility of recurring operation and maintenance difficulties that would lead to increased degradation.

g. Describe any impacts to human health and the overall quality and value of the water resource.

h. Describe and provide an estimate of the important social and economic benefits to be realized through this proposed project. Include the number and types of jobs created and tax revenues generated.

i. Describe environmental benefits to be realized through this proposed project.

j. Describe and provide an estimate of the social and economic benefits that may be lost as a result of this project. Include the impacts on commercial and recreational use of the water resource.

k. Describe the environmental benefits lost as a result of this project. Include the impact on the aquatic life, wildlife, threatened or endangered species.

l. Describe any construction work, fill or other structures to occur or be placed in or near a stream bed.

m. Provide any other information that may be useful in evaluating this application.

| D. Discharge Information | |
|---|---|
| **1.** For treatment/disposal systems constructed pursuant to a previously issued Ohio EPA PTI, provide the following information: | |
| **PTI Number:** | |
| **PTI Issuance Date:** | |
| **Initial Date of Discharge:** | |

**2.** Has the appropriate NPDES permit application form been submitted including representative effluent data?
☐ Yes **Go to Section E.** ☐ No **See below.**

**If no, submit the information as applicable under a or b as follows:**

a. For entities discharging process wastewater, attach a completed NPDES 2C form.

b. For entities discharging wastewater of domestic origin, attach the results of a least one chemical analysis of the wastestream for all pollutants for which authorization to discharge is being requested and a measurement of the daily volume (gallons per day) of wastewaters being discharged.

**E.** Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information is, to be best of my knowledge and belief, true, accurate and complete.

**This section must be signed by the same responsible person who signed the accompanying permit application or certification as per 40 C.F.R. 122.22.**

| | |
|---|---|
| **Signature:** | [signature] |
| **Date:** | 7-27-2016 |

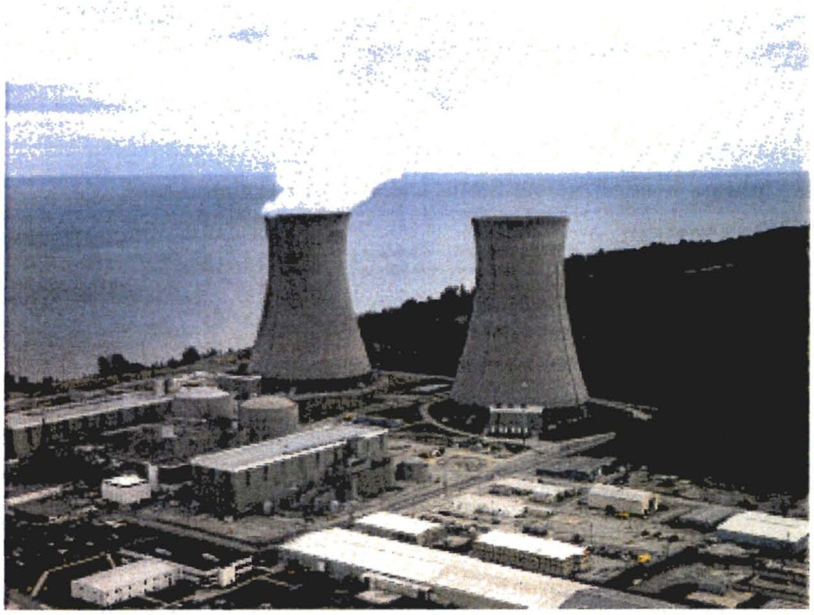
**Enclosure B**
**L-16-235**

**40 CFR §122.21(r)(2-8) NPDES Application Requirements for Facilities With Cooling Water Intake Sturctures.**

# 40 CFR §122.21(r)(2-8) NPDES
# Application Requirements for Facilities with Cooling Water Intake Structures

**FirstEnergy Perry Nuclear Generating Station**

**Perry, OH**



Prepared By:

AECOM Conshohocken
625 West Ridge Pike, Suite E-100
Conshohocken, PA 19428

July 2016

**40 CFR §122.21(r)(2-8) NPDES APPLICATION REQUIREMENTS FOR FACILITIES WITH COOLING WATER INTAKE STRUCTURES**

# Table of Contents

## List of Tables



## List of Figures

**40 CFR §122.21(r)(2-8) NPDES APPLICATION REQUIREMENTS FOR FACILITIES WITH COOLING WATER INTAKE STRUCTURES**

# 1.0 INTRODUCTION

## 1.1 REGULATORY REQUIREMENT

40 CFR §122.21(r) contains National Pollutant Discharge Elimination System (NPDES) application requirements for facilities with cooling water intake structures. §122.21(r)(1)(ii) states that all existing facilities must submit to the Director for review the information required under paragraphs (r)(2) and (3), and applicable provisions of (r)(4), (5), (6), (7), and (8) of §122.21. This information consists of physical, biological, and operational data for each cooling water source, cooling water intake structure (CWIS), and cooling water system utilized at the facility.

This document is intended to:

- Fulfill the regulatory requirement for submittal of §122.21(r)(2-8) information for the Perry Nuclear Generating Station (Perry), an existing facility subject to the 2014 Existing Facilities Rule; and
- Be submitted in support of the Perry NPDES permit renewal application.

## 1.2 FACILITY DESCRIPTION AND REGULATORY STATUS

Perry, located in Perry, Lake County, Ohio, is owned and operated by FirstEnergy Corporation (FirstEnergy). The facility is a single generating unit station, powered by a boiling water reactor, and has a Net Dependable Capacity (NDC) of 1,268 megawatts (MW) of electricity (FirstEnergy 2012). It is located on a 1,100 acre site, on the southern shore of Lake Erie. Approximately 850 acres of the land on the site are certified as an Urban Wildlife Sanctuary (FirstEnergy 2012).

### *1.2.1 LAKE ERIE INTAKE*

Perry withdraws cooling water from Lake Erie from an offshore cooling water intake structure (CWIS[1]) for service water supply and cooling tower makeup as part of the closed-cycle cooling water system. Lake Erie also serves as the ultimate heat sink. The CWIS consists of two offshore, multiport intake structures with circular end caps located approximately 2,650 feet (ft) offshore (FirstEnergy 2015). There are no trash racks installed on the offshore intake (USNRC 1982).

### *1.2.2 REGULATORY STATUS*

Perry is subject to the requirements of the Existing Facilities Rule at §122.21(r) since it meets the following three criteria stated in §125.91(a):

- The facility is a point source;
- The facility uses or proposes to use one or more cooling water intake structures with a cumulative design intake flow (DIF) of greater than 2 million gallons per day (MGD) to withdraw water from waters of the United States; and
- Twenty-five percent or more of the water the facility withdraws on an AIF (actual intake flow) basis is used exclusively for cooling purposes.

[1] To accommodate the unlikely event that the CWIS is rendered inoperable, an onshore safety-class emergency service water pumphouse can draw water from Lake Erie through either the submerged intakes or through a redundant water supply via a cross tie tunnel with the discharge tunnel (FirstEnergy 2015). The alternate intake structure is smaller, but has similar design features, such as a two traveling water screens (FirstEnergy 2015). The emergency intake structure supports the safe shutdown and subsequent cooldown after a postulated loss of the intake structure (FirstEnergy 2015).

## 40 CFR §122.21(r)(2-8) NPDES APPLICATION REQUIREMENTS FOR FACILITIES WITH COOLING WATER INTAKE STRUCTURES

# 2.0 §122.21(r)(2) - SOURCE WATER PHYSICAL

## 2.1 SOURCE WATERBODY NARRATIVE DESCRIPTION

*Regulatory requirement at §122.21(r)(2)(i): "A narrative description and scaled drawings showing the physical configuration of all source water bodies used by your facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports your determination of the waterbody type where each cooling water intake structure is located."*

Perry withdraws cooling water from the central basin of Lake Erie. The central basin is the largest of the three Lake Erie basins, with a surface area of 6,246 square miles ($mi^2$) (16,177 square kilometers [$km^2$]) and a volume of 79 trillion gallons (299.2 cubic kilometers [$km^3$]) (Cooper et al. 1981). The average depth in the central basin is 60.7 ft (18.5 meters) with a maximum depth of 84 ft (25.6 meters) (Cooper et al. 1981).

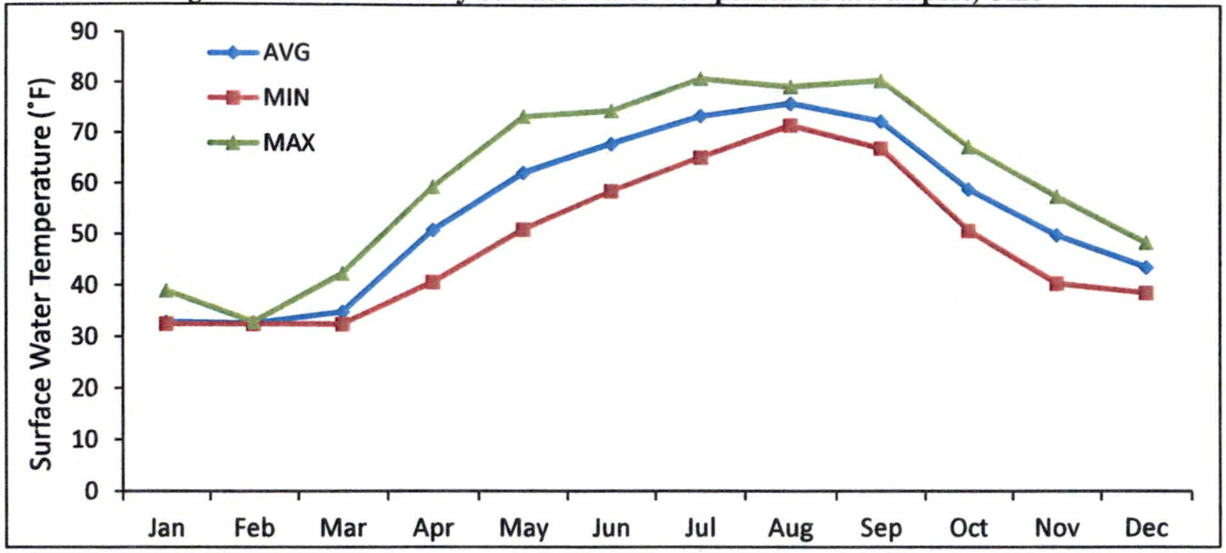
Lake Erie surface water temperatures are lowest in January and peak in August. The lake surface partially freezes in winter but is rarely completely covered with ice (USNRC 1982). Thermal stratification of the lake typically occurs in June and oxygen saturation of the lower level approaches 0% by August (Cooper et al. 1981). Thermal stratification regularly occurs in the eastern and central basins, but is rare in the western basin due to its shallow waters (NYSDEC 2005). Multiple water quality parameters including surface water temperature and dissolved oxygen (DO) have been monitored at eight locations in the central basin since 1999 (FTG 2015). Each station is sampled every two weeks from May through September. Mean summer surface temperatures in the central basin ranged from 68.9 °F (2009) to 75.4°F (2012). Surface water temperatures were only collected from offshore stations. In 2014, the mean summer surface water temperature in the central basin was 67.3°F, which was the lowest recorded summer temperature since the program began (FTG 2015).

DO levels less than 2.0 milligrams per liter (mg/L) are a concern in the central basin and are a limiting factor to the distribution of fish (FTG 2015). Low DO occurs almost annually offshore and occasionally inshore. Low DO has been observed as early as mid-June and can persist until late September, when fall turnover remixes the water column. In the central basin during the 2014 sampling, lower level water DO fell below 2.0 mg/L on only one occasion at an offshore station (FTG 2015).

A National Oceanographic and Atmospheric Association (NOAA) buoy, located at Fairport, Ohio, approximately 7.5 miles southwest of Perry, records surface water temperature and water level data (NOAA 2016a). Five years of water level data, from January 1, 2010 to December 31, 2015, show little fluctuation in water levels. The highest water levels occur during the summer months, and peaked on July 15, 2015 at 573.63 International Great Lakes Datum (IGDL). The lowest water levels are recorded during the winter, with the lowest recorded water level of 570.05 IGDL occurring on February 15, 2011. The average water level during the five year period was 571.56 IGDL (NOAA 2016a).

Annual surface water temperature data are only available for 2015 (NOAA 2016a). The lowest recorded temperature occurred on multiple days in January, February, and March at 32.5°F and water temperatures peaked at 81°F in July (NOAA 2016a). Temperature data from 2015 are provided in Figure 2-1.

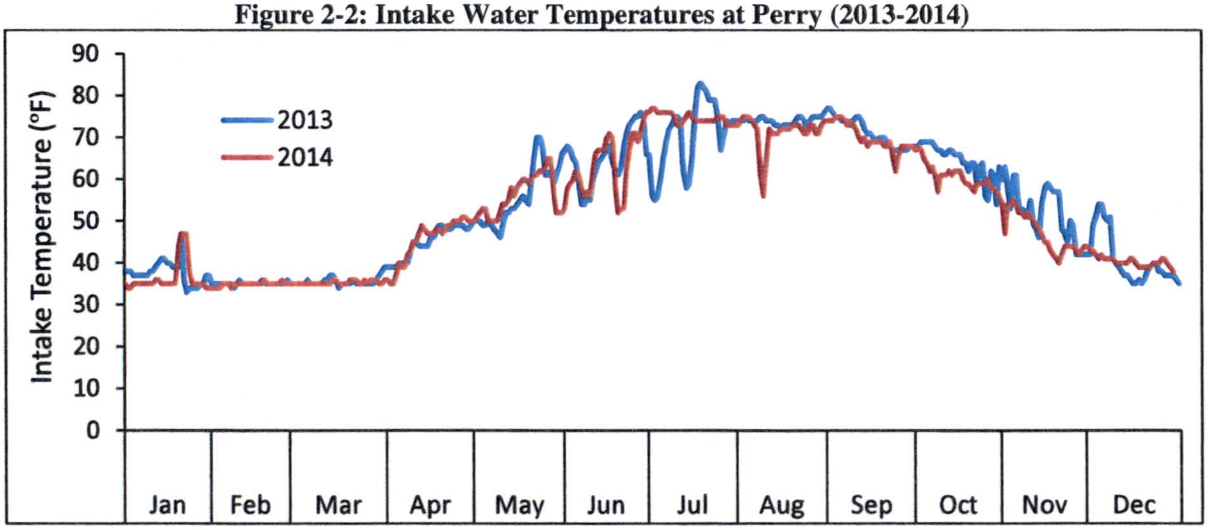
**Figure 2-1: 2015 Monthly Surface Water Temperatures at Fairport, Ohio**




Source: NOAA (2016a)

Additionally, daily temperatures recorded at the Perry intake from January 2013 to January 2015 were provided by FirstEnergy. These data are shown in Figure 2-2, below.

**Figure 2-2: Intake Water Temperatures at Perry (2013-2014)**




Source: Service Water Inlet Lake Temperature data provided by FirstEnergy

## 2.2 HYDROLOGICAL AND GEOMORPHOLOGICAL FEATURES

*Regulatory requirement at §122.21(r)(2)(ii): "Identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods you used to conduct any physical studies to determine your intake's area of influence within the waterbody and the results of such studies."*

### *2.2.1 HYDROLOGY AND GEOMORPHOLOGY*

Eighty percent of the total water flow into Lake Erie is from the Detroit River which originates in the upper Great Lakes (NYSDEC 2005). Precipitation is relatively higher in Lake Erie than other regions in the area, due to the lake effect, and constitutes 11% of total water flow. The remaining 9% of flow is from tributary streams in Michigan, Ohio, Pennsylvania, New York, and Ontario. Lake Erie waters have the shortest residence time of all the Great Lakes at 2.6 years. Water leaves Lake Erie in the eastern basin via the Niagara River and the Welland Canal (NYSDEC 2005).

The central basin of Lake Erie is separated from the western basin by a chain of islands stretching from Marblehead, Ohio northward to Point Pelee, Ontario and from the eastern basin by a relatively shallow sand and gravel bar extending between Erie, Pennsylvania and Long Point, Ontario (Cooper et al. 1981).

Surface currents in the central basin are influenced by prevailing southwesterly winds (Cooper et al. 1981). Bottom currents act as a return flow over the basin, flowing in the opposite direction of the wind driven surface currents. More than two-thirds of the benthos in the central basin is covered by mud but a narrow strip of sand and gravel occurs along most of the shoreline and reaches its peak width of approximately 5 miles between Cleveland and Fairport, Ohio. Perry is approximately 8 miles southwest of Fairport, Ohio. In the central basin, the bottom slopes away from the shoreline at a much greater rate than in the western basin, resulting in the limitation of spawning areas for fish to a narrow band along the shoreline (Cooper et al. 1981).

The shoreline of Lake Erie in Painesville, Ohio, approximately 7 miles southwest of Perry, is a moderate bluff shoreline with depths of less than 50 ft and typically sand-starved nearshore areas (Goforth et al. 2002). Substrates in this area are variable, but are principally comprised of sparse sandy areas with exposed cobbles, boulders, and clay, up to 20 ft offshore. In the summer of 2000, substrates were characterized using side scan sonar and consisted of 61% thin layer sand over clay, 23% sand, and 16% cobble/boulder glacial deposits. The substrate stability is considered low. Sand loss at Painesville was monitored from 1999 to 2000 and a loss of 30% was observed (Goforth et al. 2002).

Turbidity in the central basin is low compared to the Western Basin due to its larger size and lack of high silt loaded tributaries (Cooper et al. 1981). The mean summer Secchi depth in the central basin is 15 ft, compared to 7.5 ft in the Western Basin (FTG 2015).

Available bathymetry of Lake Erie (Attachment A) shows that within approximately half a mile of the shoreline near Perry, the lake bottom drops to 30 ft then gradually deepens to a maximum depth of 79 ft approximately 12.5 miles offshore.

### *2.2.2 AREA OF INFLUENCE*

No physical studies were performed to determine Perry's intake area of influence within the waterbody. A desktop analysis was performed to define the approximate area of influence within the 0.5 feet per second (fps) velocity contour. The U.S. Environmental Protection Agency (USEPA) considers this velocity to be BTA for intake structures because fish have the swimming ability to overcome this velocity and avoid impingement. Based on the physical dimensions of the end caps and the DIF, the velocities have been computed[2] at the face of the end caps[3]. Based on these calculations, the maximum velocity at the face of the end caps is approximately 0.23 fps. Thus, the hydraulic zone of influence does not extend beyond the face of the end caps into Lake Erie.

Calculations on the Area of Influence are provided in Section 10 – see Attachment B.

## 2.3 LOCATIONAL MAPS

*Regulatory requirement at §122.21(r)(2)(iii): "Locational maps."*

Locational maps identifying the Lake Erie intake structures are provided in Attachment A.

[2] Using Velocity = Flow / Area

[3] The end caps are located at least 13 ft below the low water elevation for navigation purposes, so are submerged at all times.

# 3.0 §122.21(r)(3) - Cooling Water Intake Structure Data

## 3.1 Narrative Description of Cooling Water Intake Structure

*Regulatory requirement at §122.21(r)(3)(i): "A narrative description of the configuration of each of your cooling water intake structures and where it is located in the water body and in the water column"*

The Perry CWIS serves to supply a continuous supply of water from Lake Erie to its generating unit and cooling towers. The Perry CWIS consists of two offshore intake structures with circular end caps located approximately 2,650 ft offshore (FirstEnergy 2015). Each end cap has eight ports around the perimeter of the structure, raised off the lake bottom by about 3-ft, with approximate port dimensions of 3.6-ft high and 12-ft wide (FirstEnergy 2015; USNRC 1982). The end caps are 36-ft in diameter (FirstEnergy 2015). The end caps' downshafts each connect to an underground tunnel which converges at a T-junction equidistant by approximately 100 ft from both intakes (CEI 1986). There are no trash racks installed on the offshore intake; however, insert channels have been constructed if trash racks become necessary (USNRC 1982). The end caps provide water via an underground tunnel to a pumphouse that incorporates two traveling water screens.

In Lake Erie, the low water elevation is approximately 570 ft (') 6 inches (") Mean Sea Level (MSL). Because of localized differences in the bathymetry, the elevation of the lake bottom and the top of the end cap is slightly different between the two intakes. The lake bottom near the first end cap is 548'-10" MSL, and the top of the end cap is 555'-11" MSL (CEI 1974; CEI 1977). The lake bottom near the second end cap is 549'-10" MSL, and the top of the end cap is 556'-11" MSL (CEI 1974; CEI 1977). The end caps are located at least 13 ft below the low water elevation for navigation purposes.

The pumphouse is an onshore structure and receives water from the end caps in Lake Erie. Water enters the pumphouse in a forebay with a width of 64'-0" (Perry Undated). The low water inside the pumphouse is 567'-4" MSL, and the invert elevation is 544'-7" MSL (Envirex 1976a).

Water enters the end caps and travels through an underground, 10-ft diameter intake tunnel to both onshore service water and emergency service water pumphouses, where the water passes through two traveling water screens with 8-foot wide baskets, 3/8-inch square mesh openings, and 14 gauge (0.080-inch diameter) Washburn & Moen screen (Envirex 1976a; Envirex 1976b; USNRC 1982). Water is then suctioned through pumps to the service and emergency service water systems.

The pumphouse serves as a sump to supply the pumps identified in Table 3-1.

**Table 3-1: Perry Pump Design Capacities**

| Pumps Operating in Each Bay | Number of Pumps in CWIS | Rated Capacity per Pump |
|---|---|---|
| Service Water Pumps A–D | 4, Up to 3 Operating | 33.8 MGD (23,500 GPM) |
| Emergency Service Water Pump – Loops A and B | 2, Emergency Only | 18.6 MGD (12,900 GPM) |
| Emergency Service Water Pump – Loop C | 1, Emergency Only | 1.3 MGD (900 GPM) |
| Diesel Fire Service Pump | 1, Emergency Only | 3.6 MGD (2,500 GPM) |
| Motor Fire Service Pump | 1, Emergency Only | 3.6 MGD (2,500 GPM) |
| Fire Service Jockey Pump | 1, Emergency Only | 0.072 MGD (50 GPM) |

FirstEnergy (2016a)

The DIF, which takes into account operations of the pumps and other factors, are stated in Section 3.3. The traveling water screens use screen wash pumps; however, these pumps draw from the service water discharge line. In addition, the makeup water for the cooling tower is drawn from the service water discharge line after traversing the service water strainers. Because the screen wash and makeup water pumps are not directly drawing water from the waterbody, these pumps are not included in either Table 3-1 or Section 3.3.

## 3.2 Latitude and Longitude of Cooling Water Structure

*Regulatory requirement at §122.21(r)(3)(ii): "Latitude and longitude in degrees, minutes and seconds for each of your cooling water structure"*

The CWIS includes of two end caps with the tunnels joining at a T-junction. The approximate coordinates[4] for the end caps and the T-junction are as follows:

- Intake Structure 1 – latitude 41° 48' 32.56" North and longitude 81° 09' 10.30" West
- Intake Structure 2 – latitude 41° 48' 31.16" North and longitude 81° 09' 10.35" West
- T-Junction – latitude 41° 48' 31.84" North and longitude 81° 09' 09.39" West

## 3.3 Cooling Water Intake Structure Operation

*Regulatory requirement at §122.21(r)(3)(iii): "A narrative description of the operation of each of your cooling water intake structures, including design intake flows, daily hours of operation number of days of the year in operation and seasonal changes, if applicable"*

Perry is a baseload nuclear generating facility that operates at all times of the year except during scheduled maintenance. Planned outages occur once every 24 months. The CWIS operates to provide a continuous supply of water for non-contact cooling of the condensers.

The maximum number of intake pumps that normally operate consist of three service water pumps. In case of an emergency, two emergency service water pumps for Loops A and B and one emergency service water pump for Loop C can be operated. There are minor seasonal changes in pumping operations, which includes operating two service water pumps in the winter and three in the summer (FirstEnergy 2016b). The pumphouse also includes two pumps that are not included in the DIF: the fire service pumps and one fire jockey pump that are only used for fire suppression. There are also screen wash and cooling tower makeup pumps that draw water from the service water discharge line.

The total DIF[5] with up to three service water pumps operating is 101.5 MGD (70,500 GPM). The AIF, calculated as the average of all monthly flow totals[6] from 2013 through mid-April 2016, is approximately 54.6 MGD (37,933 GPM) as shown in Table 3-2. Table 3-2 also includes yearly average intake withdrawal rates. The maximum AIF from this data is 101.2 MGD (70,296 GPM)[6].

[4] The geodetic coordinates have been converted from State Plane Coordinates (SPC) (Northing and Easting using zone Ohio North 3401 and NAD27). The coordinates are based on the SPC of the centerline of the downshafts of the end caps and the centerline of the T-junction (CEI 1986).

[5] The system has been designed so that the maximum flow of approximately 102,250 GPM can be adequately handled if the emergency service water and the normal service water systems are operating simultaneously. However, operating all pumps simultaneously is not typical and is considered to be extremely rare.

[6] Flow data included both negative values and values greater than the DIF; these values are assumed to be erroneous and have been removed from the dataset (FirstEnergy 2016c).

**Table 3-2: Actual Intake Flow and Yearly Average Withdrawals**

| Year | Withdrawal Rate (MGD) |
|---|---|
| 2013 | 61.3 |
| 2014 | 53.5 |
| 2015 | 50.6 |
| **2016*** | **49.5** |
| **Actual Intake Flow** | **54.6** |

* January 2016 through mid-April 2016
Source: FirstEnergy (2016c)

## 3.4 WATER BALANCE

*Regulatory requirement at §122.21(r)(3)(iv): "A flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges"*

A schematic diagram showing the flow distribution and water balance that includes all sources of water to Perry is provided in Attachment C.

## 3.5 ENGINEERING DRAWINGS

*Regulatory requirement at §122.21(r)(3)(v): "Engineering drawings of the cooling water intake structure"*

Engineering drawings of the cooling water intake structure are provided in Attachment C.

# 4.0 §122.21(r)(4) - Source Water Baseline Biological Characterization Data

Source water baseline biological characterization data were compiled from multiple sources to prepare this report. The rationale for their inclusion is explained below.

- Fisheries community surveys of the central basin of Lake Erie were available from multiple sources (Cooper et al. 1981; FTG 2015; Goforth et al. 2002; ODW 2015).
  - FTG (2015) and ODW (2015) provide data regarding population trends of forage and sport species located within the central basin of Lake Erie.
  - Goforth et al. (2002) provides shallow water seine and nearshore gillnet survey catch data from Painesville, Ohio.
  - Cooper et al. (1981) provides ichthyoplankton data and abundancies from collections throughout the central basin of Lake Erie.
  - ODW (2015) provides information on commercial and recreational fisheries that is used to complement the list of taxa in the vicinity of the CWIS.
- Impingement and entrainment data collected at fossil-fueled power plants on Lake Erie located within a 50-mile radius of Perry (USNRC 1982) are used to describe the species potentially impinged or entrained at Perry because no station-specific impingement or entrainment studies were performed.

## 4.1 Unavailable Data

*Regulatory requirement at §122.21(r)(4)(i): "A list of the data in paragraphs (r)(4)(ii) through (vi) of this section that are not available and efforts made to identify sources of the data."*

Impingement data from Perry were not provided or found. However, impingement data are available from facilities located within the central basin and were used to assess potential impingement at Perry (USNRC 1982, ERA 1987). Impingement data from the following stations were reviewed:

- Eastlake Power Station (Eastlake) was included because it is relatively close to Perry, approximately 18 miles southwest, and can provide a list of species potentially susceptible to impingement.
- Ashtabula C Power Plant (Ashtabula C) was reviewed because it is relatively close (20 miles northeast) and has a submerged offshore intake similar to Perry. However, impingement rates may be different because Ashtabula C had a higher water withdrawal volume and intake flow velocity.
- Davis-Besse Nuclear Power Station (Davis-Besse) was included despite its greater distance to Perry because it uses a closed-cycle recirculating system with natural-draft cooling towers, has low water volume requirements, low intake flow velocities, and a submerged offshore intake structure, similar to Perry.

These impingement data are all over 30 years old, and the ecology of Lake Erie has changed substantially due to the introduction of exotic species such as Dreissenid mussels and round goby. More recent data from fisheries community studies in the central basin of Lake Erie are used to supplement the older impingement and entrainment data.

Entrainment data from Perry were also not available. Historical entrainment data were found for facilities located within the central basin of Lake Erie near Perry, including Eastlake, Ashtabula A&B, and

Ashtabula C (Cooper et al. 1981). Ashtabula C uses closed-cycle cooling with an offshore CWIS, similar to Perry, and therefore those data are likely most representative of potential entrainment at Perry. Entrainment data from all three facilities were reviewed to better identify species susceptible to entrainment at Perry.

## 4.2 Taxa in the Vicinity of the CWIS

*Regulatory requirement at §122.21(r)(4)(ii): "A list of species (or relevant taxa) for all life stages and their relative abundance in the vicinity of the cooling water intake structure."*

### 4.2.1 *Juvenile and Adult Fisheries Data*

Surveys near Perry were conducted in 1974 using gill nets, bottom trawls, and beach seines (NUS 1975). Gill net and bottom trawl collections were conducted in the area of the future intake and discharge locations. Those collections indicated the species most likely to be effected by operations were freshwater drum, yellow perch, emerald shiner, spottail shiner, rainbow smelt, white sucker, common carp, and gizzard shad. Beach seine collections during the 1974 survey concluded that the nearshore areas near Perry were dominated by emerald shiner and juvenile alewife (NUS 1975).

The Ohio Department of Natural Resources (ODNR) regularly evaluates the fisheries of Lake Erie via bottom trawling and gill net surveys. Surveys are used to assess the relative abundance of sport and forage species in Lake Erie. Bottom trawling surveys in the central basin in Ohio began in 1990 in order to assess age-0 percid (walleye and yellow perch) and forage fish abundance and distributions (FTG 2015). Data from the Ohio Division of Wildlife (ODW) focuses on sport fishes, while the Forage Task Group (FTG) data focuses on forage species (FTG 2015; ODW 2015). The area of Lake Erie where Perry is located is referred to as Ohio East (FTG 2015) or District 3 (ODW 2015). These areas encompass the central basin of Lake Erie between Fairport Harbor and the Pennsylvania state line (FTG 2015; ODW 2015). In 2014, 12 trawl tows were completed in the Ohio East/District 3 region. Relative abundance indices for fish collected were calculated as the arithmetic mean catch-per-hectare-trawled (Table 4-1) (FTG 2015; ODW 2015).

**Table 4-1: Relative Abundance of Percid and Forage Species in the Central Basin**

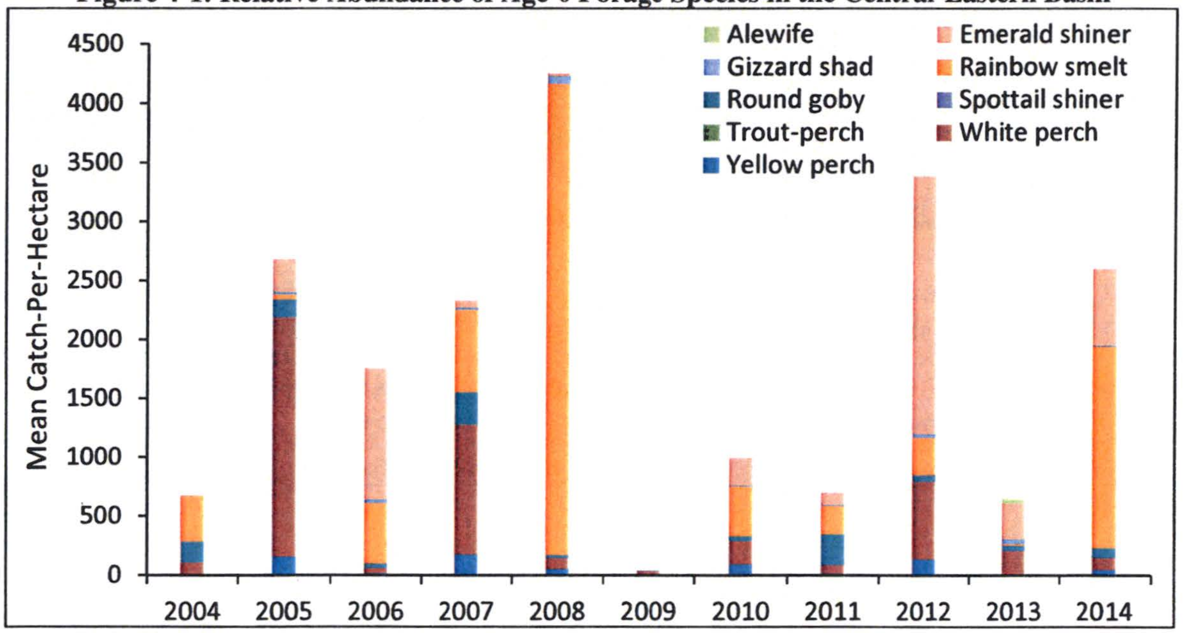
| Common Name | Scientific Name | Mean Relative Abundance (2004-2014) | | Mean Relative Abundance (2013) | | Mean Relative Abundance (2014) | |
|---|---|---|---|---|---|---|---|
| | | Age-0 | Age-1 | Age-0 | Age-1 | Age-0 | Age-1 |
| Alewife | *Alosa pseudoharengus* | 3.9 | - | 36.1 | - | 0 | - |
| Emerald shiner | *Notropis atherinoides* | 431.6 | 320.7 | 306.2 | 8.4 | 650.1 | 333.5 |
| Gizzard shad | *Dorosoma cepedianum* | 20.7 | - | 39.5 | - | 7.3 | - |
| Rainbow smelt | *Osmerus mordax* | 664.8 | 301.7 | 12.8 | 485.6 | 1,709.50 | 15 |
| Round goby | *Neogobius melanostomus* | 106.2 | 108.3 | 45.8 | 46.3 | 86.2 | 89.1 |
| Spottail shiner | *Notropis hudsonius* | 0.2 | 1.7 | 0 | 2.9 | 0 | 0 |
| Trout-perch | *Percopsis omiscomaycus* | 1.3 | 13 | 0 | 1 | 0.6 | 0.4 |
| White perch | *Morone americana* | 453.1 | 106.7 | 200.1 | 546.9 | 99.4 | 4.4 |

| Common Name | Scientific Name | Mean Relative Abundance (2004-2014) | | Mean Relative Abundance (2013) | | Mean Relative Abundance (2014) | |
|---|---|---|---|---|---|---|---|
| | | Age-0 | Age-1 | Age-0 | Age-1 | Age-0 | Age-1 |
| Yellow perch | *Perca flavescens* | 66.1 | 59.3 | 8.9 | 109.5 | 49.1 | 24.2 |

Source: FTG (2015)

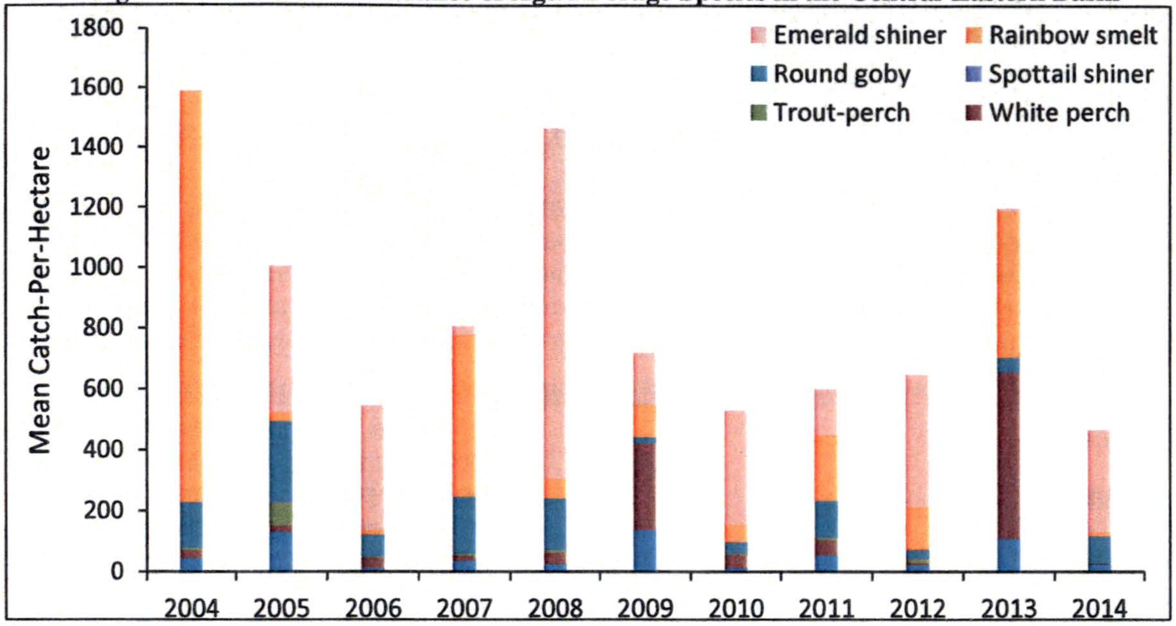
Forage species collections from May through October 2014 were similar to 2013 results, and were above the 25 year average (FTG 2015). Soft-rayed and clupeid species showed declines, but were offset by increases in rainbow smelt densities. Yellow perch densities increased, offsetting the decrease in white perch densities (FTG 2015). Relative abundance of percid and forage fish species collected during fall surveys in the central-eastern section of the central basin are shown in Figure 4-1, and Figure 4-2.

**Figure 4-1: Relative Abundance of Age-0 Forage Species in the Central-Eastern Basin**




Source: FTG (2015)

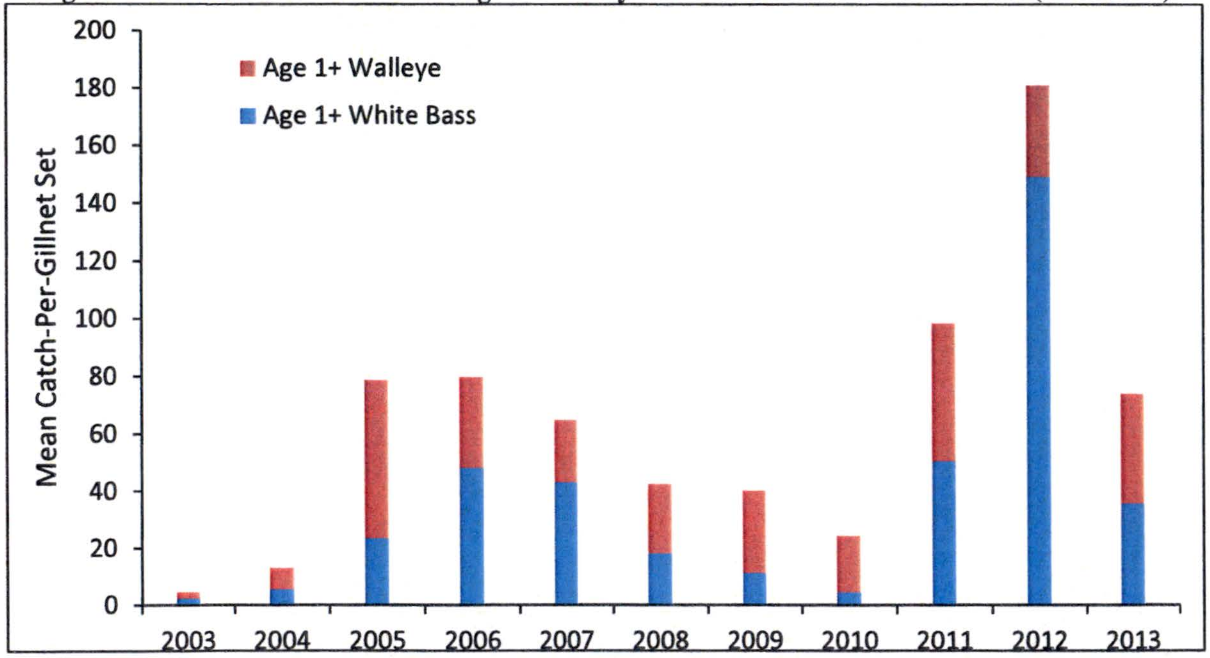
**Figure 4-2: Relative Abundance of Age-1 Forage Species in the Central-Eastern Basin**




Source: FTG (2015)

Gillnet surveys conducted each fall focus on age-1+ white bass and walleye (ODW 2015). Relative abundance indices of age-1+ walleye and white bass are calculated as the mean of catch per gill net set. Due to weather related issues, no gillnets were set in District 3 in 2014. Data from previous years are provided in Figure 4-3. Smallmouth bass gillnet surveys are conducted in September of each year since 2006 (ODW 2015). Smallmouth bass collection data are listed in Table 4-2.

**Figure 4-3: Relative Abundance of Age 1+ Walleye and White Bass from District 3 (2003-2013)**




Source: ODW (2015)

**Table 4-2: Smallmouth Bass Collected from District 3 (2006-2014)**

| Year | Number Collected | Average Age | Average Depth (feet) | Average Temperature (F°) |
|---|---|---|---|---|
| 2006 | 26 | 5.9 | 11.2 | 22.1 |
| 2007 | 46 | 3.6 | 25.3 | 23.7 |
| 2008 | 81 | 5.2 | 21.0 | 21.1 |
| 2009 | 25 | 3.6 | 16.1 | 22.2 |
| 2010 | 87 | 3.7 | 21.7 | 23.5 |
| 2011 | 69 | 3.2 | 22.3 | 19.1 |
| 2012 | 96 | 3.5 | 23.6 | 22.2 |
| 2013 | 53 | 4.9 | 24.3 | 19.4 |
| 2014 | 13 | 7.0 | 21.7 | 19.3 |
| **Mean** | **60.4** | **4.2** | **20.7** | **21.7** |

Source: ODW (2015)

Trawl data for age-0 and age 1+ fish in District 3 are provided for August and September collections from 1995 to 2014 (ODW 2015). Data are listed in Table 4-3 for the top 15 species collected in District 3. Figure 4-4 through Figure 4-7 show population trends of commonly collected species within District 3 (ODW 2015).

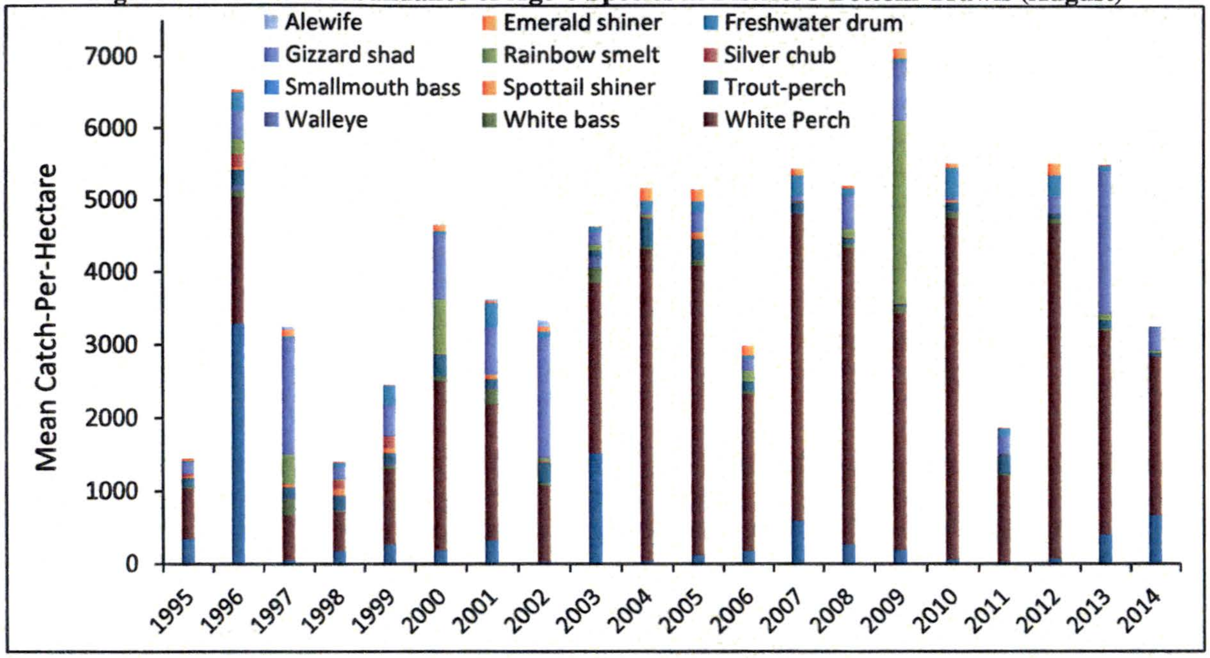
**Table 4-3: 20-Year Average Densities of Species Collected from District 3 Trawl Surveys**

| Common Name | 20 Year Average Catch-Per-Hectare | | | |
|---|---|---|---|---|
| | Age-0 | | Age-1+ | |
| | August | September | August | September |
| Alewife | 3.2 | 5.5 | 0.1 | 0.1 |
| Emerald shiner | 6.9 | 363.4 | 0.9 | 273.8 |
| Freshwater drum | 0 | 1.2 | 23.8 | 11.5 |
| Gizzard shad | 5.6 | 31.2 | 1 | 0.4 |
| Lake whitefish | 0.4 | 0.4 | 0.2 | 0.4 |
| Rainbow smelt | 260.4 | 940.5 | 1,100.70 | 351.5 |
| Round goby | 38.5 | 101.1 | 289.6 | 114.4 |
| Silver chub | 0 | 0 | 0 | 0.4 |
| Smallmouth bass | 0.7 | 0.5 | 0 | 0 |
| Spottail shiner | 0.1 | 1.6 | 0.3 | 3.6 |
| Trout perch | 9.7 | 3.1 | 20.6 | 12.1 |
| Walleye* | 0.1 | 0.4 | 1.40 | 1 |
| White bass* | 5.5 | 46.1 | 2 | 5.8 |
| White perch* | 536.7 | 282.6 | 129.50 | 74.8 |
| Yellow perch* | 360 | 48.9 | 101.6 | 41.2 |

*Species are only reported as age-0 and age-1

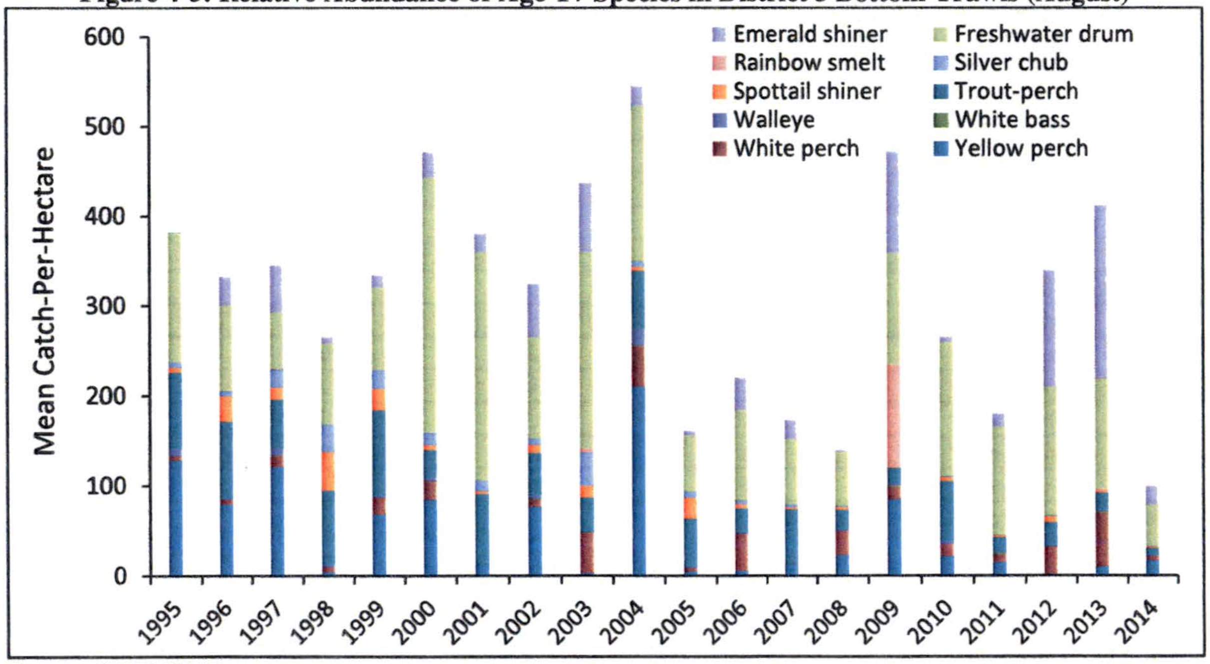
Source: ODW (2015)

**Figure 4-4: Relative Abundance of Age-0 Species in District 3 Bottom Trawls (August)**



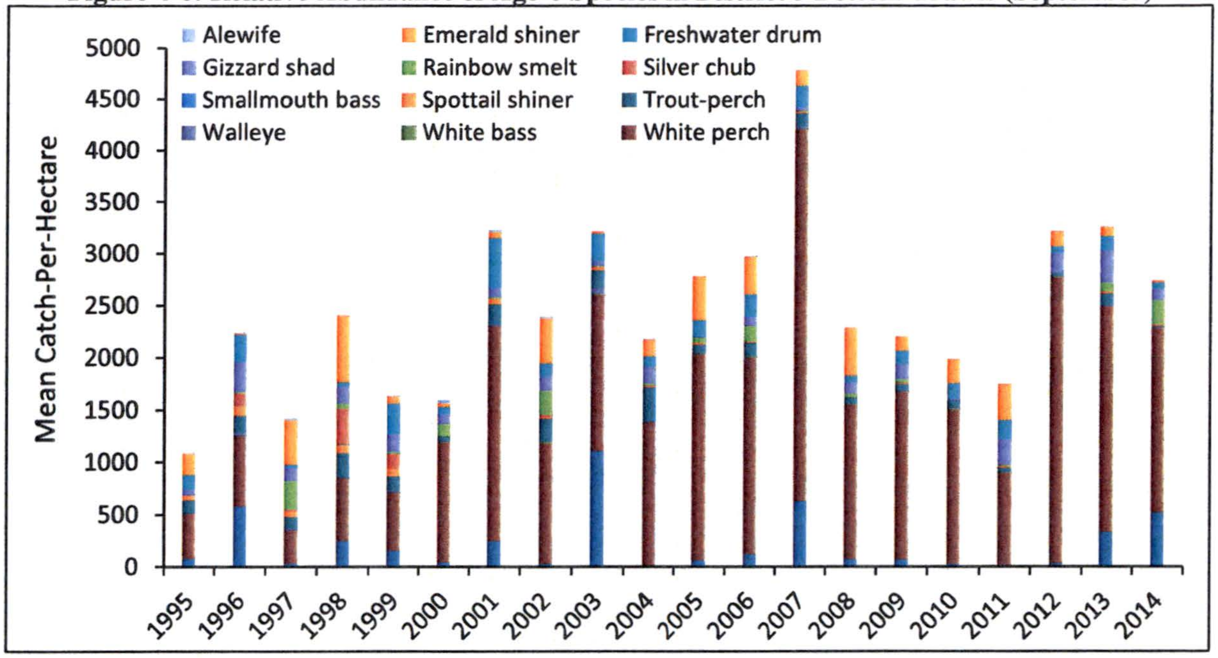

Source: ODW (2015)

**Figure 4-5: Relative Abundance of Age-1+ Species in District 3 Bottom Trawls (August)**



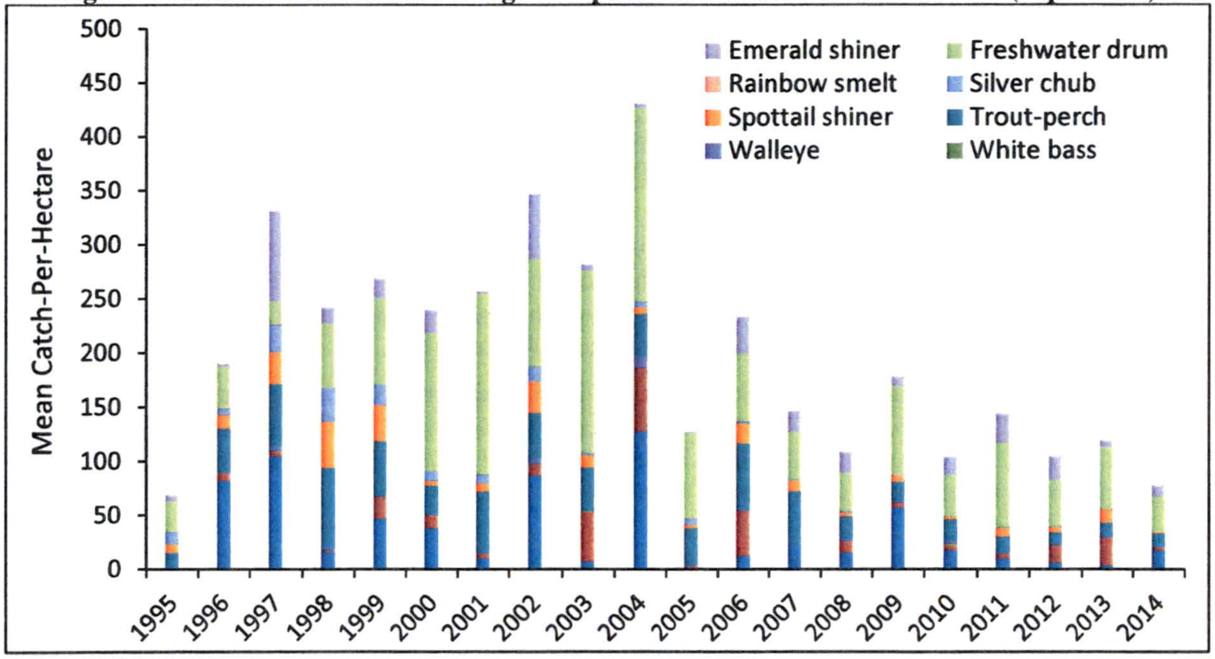

Source: ODW (2015)

**Figure 4-6: Relative Abundance of Age-0 Species in District 3 Bottom Trawls (September)**




Source: ODW (2015)

**Figure 4-7: Relative Abundance of Age-1+ Species in District 3 Bottom Trawls (September)**




Source: ODW (2015)

Nearshore fisheries community sampling was also conducted near Painesville, Ohio on June 7 and October 3, 2000 (Goforth et al. 2002). Sampling efforts were part of a larger project that involved sampling nearshore communities of Lake Erie and Lake Michigan. Fish were collected via beach seines and gill nets. Beach seine sampling was done in shallow waters (< 1 meter) after dusk on October 3, 2000. Gill nets were anchored at 3 meter depths perpendicular to the shoreline and fished after sunset for a maximum period of four hours on June 7, 2000 (Goforth et al. 2002).

The shallow water (<3 feet deep) fish community was dominated by emerald shiner (Goforth et al. 2002). Seven species were collected via beach seine, including rainbow trout and round goby which are non-native species. Rainbow trout are a stocked species and round goby are an invasive species. The mean catch per unit effort (CPUE ±1SE) for all species collected via beach seine was 11.7 ± 9.4 fish per haul (Goforth et al. 2002).

Nearshore (<10 feet deep) collections had a high CPUE compared to shallow water sites (Goforth et al. 2002). Seven species were collected and white bass, channel catfish, and freshwater drum were considered abundant. White bass was the only species collected in both beach seines and gill nets. The average CPUE (±1SE) for all species collected via gill nets was 10.1 ± 1.9 fish per haul (Goforth et al. 2002). Thirteen species representing nine families were collected overall. Data are listed in Table 4-4.

**Table 4-4: Nearshore Fisheries Sampling near Painesville, Ohio**

| Common Name | Scientific Name | Feeding Guild | Mean Relative Abundance (±1SE) | Mean CPUE (N per haul ± 1SE) |
|---|---|---|---|---|
| Channel catfish | *Ictalurus punctatus* | Piscivore | 0.26 ± 0.06 | 2.56 ± 0.11 |
| Common carp | *Cyprinus carpio* | Benthivore | 0.1 ± 0.1 | 0.1 ± 0.1 |
| Emerald shiner | *Notropis atherinoides* | Planktivore | 0.55 ± 0.45 | 3.0 ± 1.2 |
| Freshwater drum | *Aplodinotus grunniens* | Benthivore | 0.32 ± 0.16 | 3.56 ± 2.22 |
| Gizzard shad | *Dorosoma cepedianum* | Planktivore | 0.021 ± 0.002 | 0.21 ± 0.02 |
| Rainbow smelt | *Osmerus mordax* | Piscivore | 0.2 ± 0.2 | 0.3 ± 0.4 |
| Rainbow trout | *Oncorhynchus mykiss* | Piscivore | 0.2 ± 0.2 | 0.3 ± 0.4 |
| Round goby | *Neogobius melanostomus* | Benthivore | 0.19 ± 0.19 | 3.7 ± 4.5 |
| Spottail shiner | *Notropis hudsonius* | Planktivore | 0.17 ± 0.17 | 3.3 ± 4.1 |
| Walleye | *Stizostedion vitreum* | Piscivore | 0.09 ± 0.06 | 0.98 ± 0.79 |
| White bass | *Morone chrysops* | Planktivore | 0.29 ± 0.16 (G)<br>N/A (S) | 2.59 ± 1.03 (G)<br>0.7 ± 0.8 (S) |
| White perch | *Morone americana* | Planktivore | 0.2 ± 0.2 | 0.3 ± 0.4 |
| Yellow perch | *Perca flavescens* | Piscivore | 0.01 ± 0.01 | 0.11 ± 0.11 |

Source: Goforth et al. (2002)

The benthic habitat of Fairport Harbor at the mouth of the Grand River, approximately 8 miles southwest of Perry, was also evaluated during an invasive species survey conducted in 2001 (Baker 2001). SCUBA surveys indicated no presence of benthic fish other than the invasive round goby. It is likely round goby out compete logperch, channel darter, and sculpin species (Baker 2001).

Lastly, steelhead, a lake run rainbow trout, is stocked in the Grand River and lake trout is stocked directly in Lake Erie (ODW 2015). The ODNR stocked 90,009 yearling steelhead in the Grand River in 2015 (ODNR 2016a). 41,194 yearling lake trout were stocked at Fairport Harbor in April 2015 and 40,924 fingerlings were released at Fairport Harbor in October 2015 (ODW 2016).

### *4.2.2 Ichthyoplankton Data*

The USNRC (1982) describes areas of the central basin near Perry as nursery habitats for some species and states that spawning occurs in the vicinity of Perry. Ichthyoplankton studies were conducted near Perry in 1974 (USNRC 1982). Collections of eggs and larvae were conducted from April to August. Seventeen fish taxa were collected (USNRC 1982). Ichthyoplankton taxa collected near Perry in 1974 are listed in Table 4-5.

**Table 4-5: Ichthyoplankton Collected in the Vicinity of Perry (1974)**

| Common Name | Eggs Collected (%) | Larvae Collected (%) |
|---|---|---|
| Freshwater drum | 24 | 1 |
| Yellow perch | 9 | 0.3 |
| Trout perch | 9 | - |
| Rainbow smelt | 3 | 8 |
| Cyprinids | 2 | 76 |
| Alewife & gizzard shad | - | 0.7 |
| Unidentified | 53 | 14 |

Source: USNRC (1982)

Additionally, nearshore ichthyoplankton sampling was conducted in the central basin during eight events from May 2 through August 9, 1978 (Cooper et al. 1981). Sampling was conducted in transects at ten locations. Each transect was to the shoreline and composed of three stations of varying depths. Twenty-eight larval fish taxa, representing 14 families were collected. Approximately 82% of larval fish collected was composed of three taxa: emerald shiner (34.3%), clupeid species (30.5%), and spottail shiner (17.6%; Cooper et al. 1981).

Larval clupeid, carp/goldfish, spottail shiners, trout perch, and yellow perch densities were significantly higher in shallow waters (3-7 ft deep). Emerald shiners and rainbow smelt were collected primarily in deeper water (Cooper et al. 1981). Freshwater drum were not as common in the eastern half of the central basin because they spawn in waters less than 39 ft deep, which is limited east of Cleveland where Perry is located. High densities of yellow perch in the eastern third of the central basin can be attributed to fish using sandy habitats near harbor break walls for spawning (Cooper et al. 1981). Average densities of taxa collected are listed in Table 4-6.

**Table 4-6: Ichthyoplankton Taxa Collected in the Central Basin (1978)**

| Taxa | Average Density (Larvae/100m$^3$) | Total Catch (%) | Volume Weighted Abundance | Total Abundance (%) |
|---|---|---|---|---|
| Emerald shiner | 32.3 | 34.28 | 4.28E+09 | 54.14 |
| Clupeidae | 28.42 | 30.53 | 1.51E+09 | 19.07 |
| Spottail shiner | 16.37 | 17.58 | 8.32E+08 | 10.53 |
| Freshwater drum | 3.92 | 4.21 | 1.07E+08 | 1.36 |
| Rainbow smelt | 3.40 | 3.66 | 4.28E+08 | 5.42 |
| Carp | 2.85 | 3.06 | 1.26E+08 | 1.59 |
| Yellow perch | 1.25 | 1.34 | 1.09E+08 | 1.38 |
| Trout perch | 1.00 | 1.01 | 9.75E+07 | 1.00 |
| Johnny darter | 0.80 | 0.84 | 1.12E+08 | 1.40 |
| Logperch | 0.74 | 0.79 | 5.23E+07 | 0.66 |
| Mottled sculpin | 0.47 | 0.50 | 5.89E+07 | 0.68 |
| Cyprinidae | 0.46 | 0.48 | 1.04E+07 | 1.23 |
| *Notropis* spp. | 0.25 | 0.26 | N/A | N/A |
| Percidae | 0.20 | 0.21 | 3.40E+07 | 0.44 |
| *Lepomis* spp. | 0.07 | 0.06 | 1.89E+06 | 0.02 |
| Unidentified larvae | 0.07 | 0.08 | N/A | N/A |
| Striped shiner | 0.06 | 0.06 | 7.65E+06 | 0.10 |
| White sucker | 0.05 | 0.04 | 1.65E+06 | 0.02 |
| Walleye | 0.04 | 0.04 | 5.69E+06 | 0.07 |
| White bass | 0.03 | 0.03 | 1.92E+06 | 0.02 |
| Rock bass | 0.02 | 0.03 | N/A | N/A |
| Burbot | 0.02 | 0.03 | 2.58E+06 | 0.03 |

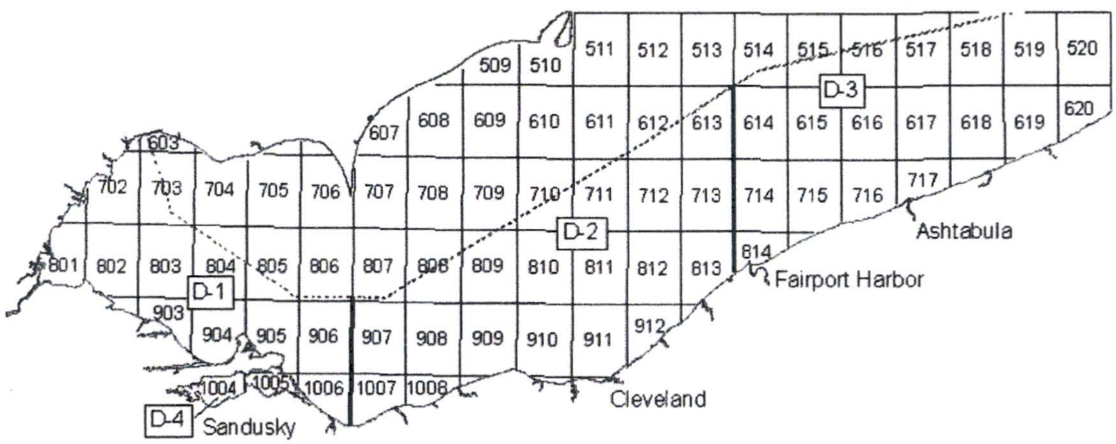
| Taxa | Average Density (Larvae/100m$^3$) | Total Catch (%) | Volume Weighted Abundance | Total Abundance (%) |
|---|---|---|---|---|
| Golden shiner | 0.02 | 0.02 | 2.67E+05 | <0.01 |
| *Pomoxis* spp. | 0.01 | 0.02 | 1.43E+06 | 0.18 |
| Sauger | 0.01 | 0.02 | 1.14E+06 | 0.01 |
| Quillback carpsucker | 0.01 | < 0.01 | 5.55E+05 | <0.01 |
| Black crappie | 0.01 | < 0.01 | 2.16E+07 | 0.27 |
| Smallmouth bass | 0.01 | < 0.01 | N/A | N/A |
| Gizzard shad/alewife | N/A | N/A | 1.51E+09 | 19.07 |
| Greenside darter | N/A | N/A | 2.59E+05 | <0.01 |

Source: Cooper et al. (1981)

### *4.2.3 Commercial and Recreational Fisheries*

Perry is located in the central-eastern basin, designated as District 3 of Lake Erie for fisheries management purposes (Figure 4-8; ODW 2015).

**Figure 4-8: Districts Utilized by Ohio DNR for Fisheries Management of Lake Erie**




#### 4.2.3.1 Commercial Fisheries

Lake Erie is host to multiple commercial fisheries. In District 3, 267,230 pounds (lbs) were landed in 2014, representing approximately 6% of the total commercial landings from Lake Erie (ODW 2015). District 3 commercial landings data from 2014 are listed in Table 4-7.

**Table 4-7: Commercial Fisheries Landings in District 3 (2014)**

| Common Name | Total Landed in District 3 (lbs) | Total Landed in Lake Erie (lbs) | District 3 Species Composition of Lake Erie Landings (%) |
|---|---|---|---|
| Burbot | 73 | 110 | 66.4 |
| Yellow perch | 265,963 | 1,546,147 | 17.2 |
| Lake whitefish | 1,148 | 34,731 | 3.3 |
| White bass | 20 | 942,460 | <0.01 |
| White perch | 26 | 652,359 | <0.01 |

Source: ODW (2015)

#### 4.2.3.2 Recreational Fisheries

The ODNR categorizes recreational fisheries into two sectors; private boat and charter boat operations (ODW 2015). District 3 recreational landings data for 2014 are listed in Table 4-8.

**Table 4-8: Recreational Fisheries Landings in District 3 (2014)**

| Common Name | Private Boat (lbs) | Charter Boat (lbs) | Total Landed in District 3 (lbs) | Total Landed in Lake Erie (lbs) | District 3 Species Composition of Lake Erie Landings (%) |
|---|---|---|---|---|---|
| Steelhead | 13,035 | 1,520 | 14,555 | 16,751 | 86.9 |
| Yellow perch | 680,422 | 33,552 | 713,974 | 1,368,377 | 52.2 |
| White bass | 46,485 | 1,865 | 48,350 | 115,851 | 41.7 |
| White perch | 4,697 | 129 | 4,826 | 17,580 | 27.5 |
| Walleye | 1,015,143 | 145,768 | 1,160,911 | 5,063,065 | 22.9 |
| Smallmouth bass | 2,555 | 0 | 2,555 | 23,378 | 10.9 |
| Freshwater drum | 361 | 0 | 361 | 3,607 | 10.0 |
| Channel catfish | 579 | 0 | 579 | 36,076 | 1.6 |

Source: ODW (2015)

### 4.2.4 *NON-INDIGENOUS SPECIES*

The Rule states that the removal of invasive species via impingement or entrainment may be beneficial to the local ecosystem (79 FR 48432, August 15, 2014). The ecology of Lake Erie has been substantially impacted by the introduction of numerous aquatic organisms. Many species, especially those of the Family Salmonidae, were purposely introduced to create a recreational fishery. Species such as round goby were unintentionally introduced, and have greatly affected the populations of native species via predation on native fish eggs and young, and competition for resources. Table 4-9 lists non-indigenous fish species that have been collected in Lake Erie (USGS 2012).

**Table 4-9: Non-Indigenous Fish Occuring in Lake Erie**

| Common Name | Scientific Name | Year First Collected | Status |
|---|---|---|---|
| Alewife* | *Alosa pseudoharengus* | 1931 | Established |
| American eel | *Anguilla rostrata* | 1844 | Established, Failed, Unknown |
| Atlantic salmon | *Salmo salar* | 1873 | Failed |
| Bighead carp | *Hypophthalmichthys nobilis* | 1995 | Unknown |
| Bigmouth buffalo | *Ictiobus cyprinellus* | 1957 | Established |
| Brown trout | *Salmo trutta* | 1939 | Stocked, Established |
| Chain pickerel | *Esox niger* | 1985 | Established |
| Chinook salmon | *Oncorhynchus tshawytscha* | 1873 | Stocked, Failed, Established |
| Coho salmon* | *Oncorhynchus kisutch* | 1933 | Established, Failed, Stocked |
| Common carp* | *Cyprinus carpio* | 1942 | Established |
| Freshwater tubenose goby | *Proterorhinus semilunaris* | 1997 | Established |
| Ghost shiner | *Notropis buchanani* | 1997 | Collected |
| Goldfish | *Carassius auratus* | 1925 | Unknown, Established |
| Orangespotted sunfish | *Lepomis humilis* | 1948 | Established |
| Pink salmon | *Oncorhynchus gorbuscha* | 1979 | Established |
| Rainbow smelt* | *Osmerus mordax* | 1935 | Collected, Established |
| Rainbow trout* | *Oncorhynchus mykiss* | 1981 | Established |
| Redear sunfish | *Lepomis microlophus* | 1986 | Established |
| Round goby | *Neogobius melanostomus* | 1993 | Established |
| Rudd | *Scardinius erythrophthalmus* | 1994 | Established, Failed, Unknown |

| Common Name | Scientific Name | Year First Collected | Status |
|---|---|---|---|
| Sea lamprey | *Petromyzon marinus* | 1921 | Established |
| Sockeye salmon | *Oncorhynchus nerka* | 1969 | Stocked |
| Suckermouth minnow | *Phenacobius mirabilis* | 1950 | Established |
| Threespine stickleback | *Gasterosteus aculeatus* | 1990 | Collected, Established |
| Western mosquitofish | *Gambusia affinis* | 1986 | Established |
| White perch* | *Morone americana* | 1953 | Established |

Source: USGS (2012)
* Species that have been impinged or entrained at nearby facilities.

## 4.3 Species and Life Stages Susceptible to Impingement & Entrainment

*Regulatory requirement at §122.21(r)(4)(iii): "Identification of the species and life stages that would be most susceptible to impingement and entrainment. Species evaluated should include the forage base as well as those most important in terms of significance to commercial and recreational fisheries."*

Susceptibility to impingement or entrainment is dependent on a number of biotic and abiotic factors, as shown in Table 4-10.

**Table 4-10: Factors Effecting Susceptibility to Impingement or Entrainment**

| Category | Factor Type | Factors | Source |
|---|---|---|---|
| Impingement | Abiotic Factors | Water temperature, dissolved oxygen, turbidity, CWIS design, and intake velocities | Baker (2007) |
| | Biotic Factors | Swimming ability, body shape, size, diel and seasonal movements, and health of the organism | Baker (2007) |
| Entrainment | Abiotic Factors | Intake location, water volume used for cooling, velocity at intake, and screen mesh size | Graham et al. (2008) |
| | Biotic Factors | Organism size, swimming ability, swimming behavior (pelagic or benthic) diurnal behavior, and spawning habitat | Graham et al. (2008) |

### *4.3.1 Impingement*

A comparative review of impingement at five fossil-fueled power plants on Lake Erie located within a 50-mile radius of Perry was conducted by the USNRC from 1977 to 1978 (USNRC 1982). Impingement loss estimates at four of the facilities were 10 to 53 times greater than the fifth facility, the Ashtabula C Power Plant (Ashtabula C), which uses a submerged offshore intake (USNRC 1982). Results from Ashtabula C are likely the most representative of potential impingement at Perry, as both facilities use a submerged offshore intake. Eight species (freshwater drum, yellow perch, emerald shiner, spottail shiner, rainbow smelt, white sucker, common carp, and gizzard shad) composed 95% of the impingement at Ashtabula C (Appl. Biol. 1979e). Five percent (11,000) of the fish impingement were commercial and recreational species. No trout or salmon species were impinged (Appl. Biol. 1979e).

Impingement rates at Perry would likely be similar to impingement rates at Davis-Besse Nuclear Power Station (Davis-Besse) (USNRC 1982). Davis-Besse uses a closed-cycle recirculating system with natural-draft cooling towers, low water volume requirements, low intake flow velocities, and a submerged offshore intake structure, which is similar to Perry. Based on the 1978-79 study at Davis-Besse, species affected by impingement at Perry would be rough and forage species of fish common to the central basin. Habitat near Perry is not considered a unique spawning or nursery area for fishes (USNRC 1982). Estimated annual impingement losses for Lake Erie facilities in a 50-mile radius of Perry from the late 1970s are listed in Table 4-11.

**Table 4-11: Estimated Annual Impingement at Lake Erie Power Plants**

| Power Plant | Intake Flow (cfs) | Intake Flow (MGD) | Number of Fish |
|---|---|---|---|
| Avon Lake | 1,290 | 834 | 5,070,000 |
| Lake Shore | 629 | 407 | 3,640,000 |
| Eastlake | 1,169 | 756 | 11,700,000 |
| Ashtabula A&B | 443 | 286 | 2,270,000 |
| Ashtabula C | 346 | 224 | 222,000 |
| Davis-Besse | 62 | 40 | 6,610 (1978) |
| | | | 4,390 (1979) |

cfs = cubic feet per second
MGD = Million gallons per day
Table source: USNRC (1982)
Data sources: Appl. Biol. (1979a, b, c, d, e); NUREG-0720 (USNRC 1980); Reutter and Herdendorff (1980)

Species-specific impingement data are available from Eastlake Power Station, located approximately 18 miles southeast of Perry. The magnitude and relative abundance of impinged species are likely dissimilar to Perry due to the differences in CWIS and operations at each station (i.e., the offshore intake at Perry compared to the shoreline intake at Eastlake) but species susceptible to impingement at Eastlake may be susceptible to impingement at Perry, due to close proximity of the power stations on the water body. Impingement studies were conducted from March 3 to October 28, 1983 (ERA 1987). Sampling collected 13,343 fish representing 27 species and 13 families although final results excluded gizzard shad. Gizzard shad were excluded from this study because their high impingement rates in winter and spring were attributed to natural seasonal mortality. These high seasonal mortality events result in large impingement events of moribund gizzard shad. Gizzard shad were estimated to account for approximately 77% of total impingement (ERA 1987). After the removal of gizzard shad, 97.6% of the remaining impinged species were rainbow smelt, freshwater drum, emerald shiner, spottail shiner, white bass, and white perch. Impingement peaked in the spring and continued to decrease through autumn. Species impinged at Eastlake are listed in Table 4-12.

**Table 4-12: Impingement at Eastlake Power Station (1983)**

| Common Name | Scientific Name | Individuals Impinged | Impingement Composition (%) | Estimated Impingement Morality (%) |
|---|---|---|---|---|
| Rainbow smelt | *Osmerus mordax* | 6,664 | 49.95 | 7.78 |
| Freshwater drum | *Aplodinotus grunniens* | 1,792 | 13.43 | 20.54 |
| Emerald shiner | *Notropis atherinoides* | 1,767 | 13.24 | 52.86 |
| Spottail shiner | *Notropis hudsonius* | 1,465 | 10.98 | 6.21 |
| White bass | *Morone chrysops* | 777 | 5.82 | 33.20 |
| White perch | *Morone americana* | 557 | 4.17 | 68.40 |
| Alewife | *Alosa pseudoharengus* | 116 | 0.87 | 5.17 |
| Trout-perch | *Percopsis omiscomaycus* | 79 | 0.59 | 10.13 |
| Yellow perch | *Perca flavescens* | 48 | 0.36 | 31.25 |
| Logperch | *Percina caprodes* | 30 | 0.22 | 33.33 |
| White crappie | *Pomoxis annularis* | 7 | 0.05 | - |
| Coho salmon | *Oncorhynchus kisutch* | 6 | 0.04 | - |
| White sucker | *Catostomus commersonii* | 5 | 0.04 | - |
| Mottled sculpin | *Cottus bairdii* | 4 | 0.03 | - |

| Common Name | Scientific Name | Individuals Impinged | Impingement Composition (%) | Estimated Impingement Morality (%) |
|---|---|---|---|---|
| Rock bass | *Ambloplites rupestris* | 4 | 0.03 | - |
| Bluegill sunfish | *Lepomis macrochirus* | 3 | 0.02 | - |
| Rainbow trout | *Oncorhynchus mykiss* | 3 | 0.02 | - |
| Channel catfish | *Ictalurus punctatus* | 3 | 0.02 | - |
| Stonecat | *Noturus flavus* | 3 | 0.02 | - |
| Walleye | *Sander vitreus* | 2 | 0.01 | - |
| Carp | *Cyprinus carpio* | 2 | 0.01 | - |
| Smallmouth bass | *Micropterus dolomieu* | 1 | 0.01 | - |
| Yellow bullhead | *Ameiurus natalis* | 1 | 0.01 | - |
| Brook stickleback | *Culaea inconstans* | 1 | 0.01 | - |
| Largemouth bass | *Micropterus salmoides* | 1 | 0.01 | - |
| Longnose dace | *Rhinichthys cataractae* | 1 | 0.01 | - |

Source: ERA (1987)

### 4.3.2 *ENTRAINMENT*

The comparative review of power plants near Perry made by USNRC (1982) included a determination of potential entrainment impacts from studies conducted between April 1977 and April 1978. Like impingement, entrainment at Perry was expected to be similar to the Ashtabula C Power Plant. Additionally, USNRC (1982) concluded that entrainment rates at Perry would be minimal, similar to those at Davis-Besse (USNRC 1982). In lieu of site-specific entrainment rates, annual entrainment estimates at the plants included in the comparative review are provided in Table 4-13.

**Table 4-13: Estimated Annual Entrainment at Lake Erie Power Plants**

| Power Plant | Intake Flow (cfs) | Number of Eggs | Number of Larvae |
|---|---|---|---|
| Avon Lake | 1,290 | 37,000,000 | 316,000,000 |
| Lake Shore | 629 | 36,000,000 | 7,000,000 |
| Eastlake | 1,169 | 84,700,000 | 98,300,000 |
| Ashtabula A&B | 443 | 14,200,000 | 37,500,000 |
| Ashtabula C | 346 | 1,400,000 | 5,900,000 |
| Davis-Besse | 62 | 44,300 (1978) | 6,310,000 (1978) |
| | | 101,000 (1979) | 20,600,000 (1979) |

Table source: USNRC (1982)

Data sources: Appl. Biol. (1979a, b, c, d, e); NUREG-0720 (USNRC 1980); Reutter and Herdendorff (1980)

Perry is located in between the Ashtabula C and Eastlake Power Stations. Ashtabula C is approximately 20 miles northeast of Perry, while Eastlake is 18 miles southwest. The entrained taxa at Perry are likely to be similar to those entrained at Ashtabula C because both stations have offshore intakes within the central basin of Lake Erie (USNRC 1982). Entrainment at Eastlake will vary in magnitude and composition of entrainment, but susceptible taxa will likely be similar. Data from the Ashtabula C and Eastlake entrainment studies in 1978 were summarized by Cooper et al. (1981). Six-hour stratified samples were taken in the intake channel behind the traveling screens (in-plant collections) and in the immediate area of the intake (field collections). Estimated entrainment based on in-plant and field estimates at Ashtabula C were 3,810,000 and 51,200,000 larvae, respectively. Estimated entrainment based on in-plant and field estimates at Eastlake were 79,300,000 and 54,000,000 larvae, respectively. Estimates for Ashtabula C would represent 0.9% (in-plant) and 20.3% (field collections) of estimated entrainment in the central basin of Lake Erie. Eastlake would represent 18.5% (in-plant) and 21.4% (field collections) of estimated entrainment in the central basin of Lake Erie (Cooper et al. 1981).

Field collections at Ashtabula C collected 14 taxa, four of which composed approximately 93% of field collections: emerald shiner (60%), Johnny darter (15%), clupeids (11%), and rainbow smelt (6%). Field collections at Eastlake collected 10 taxa, dominated by four taxa: rainbow smelt (41%), emerald shiner (25%), clupeids (17 %), and spottail shiner (11%) (Cooper et al. 1981).

In-plant collections at Ashtabula C collected 10 taxa. Four taxa (shiner species, rainbow smelt, yellow perch, and clupeids) composed over 65% of the in-plant entrainment samples. In-plant collections at Eastlake collected 11 taxa, dominated by unidentified larvae (28%), shiner species (28%), common carp (19%), cyprinids (11%), and rainbow smelt (5.8%) (Cooper et al. 1981).

Four taxa (burbot, Johnny darter, *Lepomis* spp., and mottled sculpin_ were collected at Ashtabula C, but not at Eastlake. A single species, white sucker, was collected at Eastlake, but not at Ashtabula C (Cooper et al. 1981).

Entrained species through offshore intakes in the central basin can be compared to species entrained in shoreline intakes by comparing entrainment results from Ashtabula C (offshore intake) to Ashtabula A&B (shoreline intake) (Table 4-14). In-plant entrainment collections at the shoreline intakes were dominated by common carp (29%), shiner species (26%), cyprinid species (23%), unidentifiable larvae (10%), and clupeids (4.6%). Collections at the offshore intake of Ashtabula C (in-plant collections) were dominated by shiner species (31%) but did not collect any common carp, the dominant shoreline taxa. The offshore intake collections also did not collect mottled sculpin, white bass, white sucker, or Percidae larvae. Only one taxon was collected offshore, but not at the shoreline intake: *Lepomis* spp. (Cooper et al. 1981).

Field collections from Ashtabula A&B and Ashtabula C were both dominated by emerald shiner. Again, only *Lepomis* spp. was collected offshore, but not at the shoreline intake. However, in-plant estimates of entrainment are more likely to be representative of actual entrainment than field collections (Cooper et al. 1981).

Relative abundance of entrained taxa from in-plant and field-collected data from Ashtabula C, Ashtabula A&B, and Eastlake are summarized in Table 4-14.

**Table 4-14: Entrainment at Central Basin Power Stations near Perry (1978)**

| Taxa | Ashtabula C (offshore intake) | | Ashtabula A&B (shoreline intake) | | Eastlake Entrainment (shoreline intake) | |
|---|---|---|---|---|---|---|
| | In-Plant Entrainment Estimates (%) | Field Collection Entrainment Estimates (%) | In-Plant Entrainment Estimates (%) | Field Collection Entrainment Estimates (%) | In-Plant Entrainment Estimates (%) | Field Collection Entrainment Estimates (%) |
| Burbot | - | 0.14 | - | 0.10 | - | - |
| Carp | - | 0.26 | 28.82 | 1.79 | 18.78 | 0.77 |
| Clupeids | 5.38 | 10.93 | 4.58 | 13.27 | 2.07 | 17.07 |
| Cyprinidae | 1.32 | - | 22.50 | - | 11.33 | - |
| Emerald shiner | - | 60.33 | - | 41.77 | - | 24.64 |
| Freshwater drum | - | 0.41 | - | 1.16 | - | 0.23 |
| Johnny darter | - | 15.46 | - | 7.99 | - | - |
| *Lepomis* sp. | 1.78 | 0.06 | - | - | - | - |

| Taxa | Ashtabula C (offshore intake) | | Ashtabula A&B (shoreline intake) | | Eastlake Entrainment (shoreline intake) | |
|---|---|---|---|---|---|---|
| | In-Plant Entrainment Estimates (%) | Field Collection Entrainment Estimates (%) | In-Plant Entrainment Estimates (%) | Field Collection Entrainment Estimates (%) | In-Plant Entrainment Estimates (%) | Field Collection Entrainment Estimates (%) |
| Logperch | 3.30 | 0.29 | 2.13 | 3.07 | 2.96 | - |
| Mottled sculpin | - | 2.46 | 0.16 | 10.10 | - | - |
| Percidae | - | 0.83 | 0.90 | 4.18 | 0.45 | 0.12 |
| Rainbow smelt | 21.51 | 5.97 | 0.15 | 5.84 | 5.81 | 40.58 |
| Shiners | 31.47 | - | 25.66 | - | 28.23 | - |
| Spottail shiner | - | 0.65 | - | 5.40 | - | 10.78 |
| Trout perch | 2.73 | 0.66 | 1.41 | 3.11 | 0.45 | 4.08 |
| Walleye | 1.67 | - | 0.73 | - | - | 0.14 |
| White bass | - | - | 0.39 | - | - | - |
| White sucker | - | - | 0.15 | - | 1.07 | - |
| Yellow perch | 6.79 | 1.55 | 2.61 | 2.23 | 0.82 | 1.59 |
| Unidentifiable | 24.05 | - | 9.81 | - | 28.35 | - |

Source: Cooper et al. (1981)

## 4.4 Periods of Reproduction, Recruitment, and Peak Abundance

*Regulatory requirement at §122.21(r)(4)(iv): "Identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak abundance for relevant taxa."*

The species described below were selected due to their high abundance; they were one of the top five most abundant species in local ichthyoplankton, impingement, or central basin community sampling (Cooper et al. 1981; ERA 1987; FTG 2015; Goforth et al. 2002; ODW 2015). While abundant in older entrainment and impingement surveys, alewife has been replaced by gizzard shad, as recent surveys indicate a much greater abundance and occurrence of gizzard shad than alewife in the central basin.

**Common Carp** – Common carp typically spawn in water temperatures that range from 64°F to 73°F. In northern climates, spawning occurs between May and June (Edwards and Twomey 1982). In warmer waters, spawning may occur over a prolonged period of time, but spawning activity decreases or ceases completely if water temperatures are less than 64°F or greater than 79°F. Spawning in Lake Erie peaks in late-May to early-June, but may extend into August (USFWS 1982). Intake water temperatures at Perry indicate spawning likely begins in late-May (Figure 2-2). Common carp spawn over areas of submerged vegetation at depths of less than 1.5 ft (Edwards and Twomey 1982). In the central basin, they typically spawn within vegetated, shallow protected areas such as harbors and river mouths (USFWS 1982).

Females lay between 500 and 600 eggs at a time (Becker 1983). Fecundity is variable, depending on the size of the female, with small females producing an average of 56,400 eggs, while an older, larger female may lay upwards of 1 million eggs. Eggs are demersal and adhesive, and stick to debris and plants, or sink to the bottom (Becker 1983). Eggs hatch after approximately 3-16 days, dependent on temperature. At 68°F, eggs will hatch in 3-5 days. After hatching, larvae attach to or lie near vegetation for an average of two days. The yolk-sac is fully absorbed after 4-5 days. After approximately 18 days, larvae will move into deeper, but still vegetated waters, remaining there for the remainder of the summer. Young common carp will leave the safety of the vegetated areas at a length of 3 to 4 inches (Becker 1983). Larvae have been collected near Perry in early June and July (NUS 1975). Prolarvae were most abundant in July 1974 at a water temperature of 68°F (NUS 1975).

**Emerald shiner** – Emerald shiner spawning in Lake Erie occurs from mid to late-June to mid-August (USFWS 1982). In the central basin, emerald shiners spawn in June and July within the quiet waters of rivers and harbors, but also 0.5-1.5 miles offshore (USFWS 1982). Spawning behavior is triggered once water temperatures reach 72°F, which occurs near Perry during late-June (Figure 2-2; Becker 1983). Large schools spawn offshore at night in 7 to 20 ft of water, 1 to 2 ft from the surface (Becker 1983).

Individuals may spawn multiple times during the spawning season. The demersal, non-adhesive eggs are typically laid over gravel and hatch between 24 to 36 hours. Larvae are approximately 1/8-inch long after hatching and reach 1/3-inch in 11 days. After hatching, prolarvae remain near the bottom for 72 to 96 hours, after which the larvae become free-swimming and begin to occupy the upper 6.5 ft of the water column in large schools (Becker 1983). Larvae are most abundant in open, clear offshore waters (USFWS 1982). Prolarvae have been collected as far offshore as five miles, and post-larvae have been collected as far as 10 miles offshore. Larvae were abundant near Perry in late June and early July of 1974 (NUS 1975). Young of year emerald shiners move offshore and disperse throughout the lake once they reach lengths of 2 inches during the summer, and return in large schools in the fall (USFWS 1982). Young of year emerald shiners were abundant along the shoreline near Perry in late-August 1974 (NUS 1975).

**Freshwater drum** – Freshwater drum spawning typically occurs between May and late-June at water temperatures between 66°F and 72°F (Wallus and Simon 2006). Intake water temperatures at Perry indicate spawning is likely to begin in June (Figure 2-2). Movement into spawning areas may start as early as April when water temperatures reach 43°F (USFWS 1982). In the central basin, freshwater drums prefer to spawn in the slack water of lower rivers and harbors, and are broadcast spawners (Becker 1983; USFWS 1982).

Fecundity in Lake Erie ranges from 43,000 to 508,000 eggs. Eggs are approximately 1/32-inch in diameter, pelagic, float near the water's surface, and hatch between 24 to 48 hours (Becker 1983). The vertical distribution of eggs in the water column is uniform during the day, but is denser towards the bottom at night (Wallus and Simon 2006). Egg abundance peaks in the early summer (Wallus and Simon 2006).

Larvae are approximately 1/10-inch long after hatching and remain at the water's surface until they develop horizontal swimming abilities (Becker 1983). Horizontal swimming behavior begins six days after hatching; at approximately 1/3-inch in length (Becker 1983; Wallus and Simon 2006). Yolk-sac larvae are abundant near the surface during the day and post yolk-sac larvae are more abundant near the surface at night. Once fish reach 1-inch in length, behavior is strictly benthic (Becker 1983).

Freshwater drum eggs were collected from June through August 1974 near Perry, and were most abundant on July 12 (NUS 1975). Eggs occurred almost exclusively in the upper portion of the water column, and were most abundant at offshore and middle stations. Eggs were present as early as June 12, but larvae were not collected until July 12. Prolarvae were collected mostly near the bottom (NUS 1975).

**Gizzard shad** – Gizzard shad spawning occurs from late April or early May to early August (Becker 1983). Gonads begin to ripen when water temperatures reach 44.6°F to 50°F (Williamson and Nelson 1985). Spawning activity begins when water temperatures reach 59.9°F to 61.7°F, and peaks from 66.2°F to 69.8°F. The maximum spawning temperature recorded for gizzard shad is 80.6°F (Williamson and Nelson 1985). Intake water temperature data at Perry indicate spawning is likely to begin mid-May (Figure 2-2). Observations of spawning within Lake Erie described spawning habitat as sandy, rocky bars in 2-4 ft of water (Becker 1983). In the central basin, they mainly spawn within harbors and rivers near breakwalls and dock pilings over *Cladophora* beds (USFWS 1982). Gizzard shad may also migrate into Lake Erie tributaries to spawn (Becker 1983). Spawning is random, occurs near the surface at night, and involves large schools (Becker 1983; Etnier and Starnes 2001).

Average fecundity is 300,000 eggs per female per year (Etnier and Starnes 2001). Eggs are demersal and adhesive (Becker 1983). Eggs are approximately 1/32-inch in diameter and will hatch into 1/8-inch long larvae in 36-95 hours in water temperatures from 61°F to 80°F, respectively (Becker 1983). After one day, larvae reach approximately 1/6-inch (Williamson and Nelson 1985). The yolk-sac is absorbed in 2-3 days (Williamson and Nelson 1985). Three to four days after hatching, swimming behavior includes upward swimming and downward settling. Larvae are either negatively geotaxic, positively phototaxic, or both. They tend to occur closer to the surface until they reach approximately 4 weeks old, and then move into deeper waters. Larvae will occur closer to the surface in turbid waters (Williamson and Nelson 1985). After three to four days, fish display horizontal swimming behaviors, but are generally poor swimmers for several weeks after hatching, until they reach a length of approximately 1 inch (Becker 1983; Williamson and Nelson 1985). Prolarvae and early post-larvae were collected near Perry in 1974 (NUS 1975). Juveniles 1.1 inches to 2.6 inches long were numerous nearshore during July and August (NUS 1975).

**Logperch** – Logperch spawning occurs between April and July in water 4 inches to 6.5 ft deep (Becker 1983). They are broadcast spawners that lay their eggs in sand in lake shallows, or in gravel/sand in swift currents (Page 1983). When spawning in lakes, males congregate over spawning areas, which is required to maintain a spawning state (Becker 1983). Unlike logperch found in streams, males in lakes are not territorial. Females will approach the school of males at the spawning site during the early morning through the early evening to lay eggs over multiple pits. Females return to deeper waters at night and bury eggs in sand or gravel substrates in order to protect eggs against predation (Becker 1983). Multiple males may fertilize the eggs (Page and Burr 1991).

The average fecundity during spawning season is 2,000 eggs. Females lay 10-20 eggs at a time over multiple pits (Becker 1983). Eggs hatch in about 8 days at 61.7°F and between 5-7 days at 69.8°F to 73.4°F. Logperch appearance after hatching is very similar to adults; there is no intermediate stage. In Lake Opinicorn, Ontario, free-swimming logperch measure approximately 1/4-inch in length, and peak in abundance between late May and early June at 1/2-inch long (Becker 1983). Young logperch prefer dense beds of vegetation (Becker 1983).

Logperch larvae were the most abundant percid larvae within the vicinity of Perry from early-May to mid-July in 1974 (NUS 1975). Abundance peaked in late June at a water temperature of 59°F. Prolarvae were collected in July, which indicated an extended spawning season in the area (NUS 1975).

**Rainbow smelt** – Rainbow smelt spawning typically occurs between late March and early May, and is triggered when water temperatures reach 40°F (Becker 1983). Intake water temperature data at Perry indicate spawning is likely to begin in April (Figure 2-2). Spawning near Perry was recorded to begin late-April or early-May at water temperatures between 48°F - 50°F (NUS 1975). Eggs have been collected near Perry in May and young of year were present between May and late-August (NUS 1975). They spawn in almost every creek and harbor along the Ohio shoreline, as well as along the shore of Lake Erie over gravel and sandbars up to 10-12 ft deep (USFWS 1982). Rainbow smelt migrate into rivers or into the shallow waters of the lake (averaging <2 ft deep) over a two week period (Becker 1983). Spawning occurs at night. The average fecundity is 31,338 eggs. The demersal and adhesive eggs are less than 1/16-inch in diameter after fertilization. Between 20-30 days, the eggs hatch into larvae approximately 1/4-inch long. The mortality rate of the delicate and transparent larvae after hatching is extremely high (Becker 1983). Young of year rainbow smelt, 1 to 1.5-inches long, occur along gravelly beaches and outside of harbors in the fall (USFWS 1982).

**Round goby** – Round goby spawn from April through September in their native range, located in the Ponto-Caspian region of Eurasia (Kornis 2011). In the Detroit River, gravid females and breeding colored males have been collected as late as November. Spawning is triggered by water temperatures reaching 48-79°F. Round goby spawn multiple times during the season, approximately once every 3-4 weeks. The season can be extended as a result of warm water temperatures. Males build nests under overhanging hard substrates and guard the nest and eggs. The males do not feed during spawning, resulting in mortality of most spawning males (Kornis 2011).

The average fecundity from Detroit River females is 198 eggs, but a single nest may contain up to 10,000 eggs from 4-6 females (Kornis 2011). Hatching rates are as high as 95%. Eggs are demersal, adhesive, and large, approximately 1/8-inch in diameter. Larvae are nocturnally pelagic, feeding at or near the surface at night (Kornis 2011).

**Spottail shiner** – Spottail shiner spawning may begin as early as late May and extend into early September (Becker 1983). Favorable spawning temperatures are 70°F -75°F (Becker 1983). Intake water temperature data at Perry indicate spawning is likely to begin by late-June (Figure 2-2). Spawning in Lake Erie was recorded to begin in mid-June and was completed by mid-July 1958 (Wells and House 1974). Spawning may occur earlier or later, depending on the rate that Lake Erie warms (Wells and House 1974). In 1974, spawning occurred during a short period in June (NUS 1975). In the central basin, spottail shiners spawn over gravel on the beaches and within quiet river mouths (USFWS 1982).

Spottail shiners are fractional spawners (Becker 1983). They commonly spawn at five day intervals (Wells and House 1974). Spawning occurs in the morning, but may continue into the afternoon. Eggs are deposited in between the crevices of rocks, logs, and other debris. They also spawned at a depth of 15 ft over a power plant intake crib in 30 ft of water in Lake Michigan (Wells and House 1974). Males do not appear to protect eggs or larvae, but defend spawning territory (Becker 1983). Females have been recorded depositing 169 to 945 eggs per spawning interval, for an average total of approximately 7,500 eggs per season. Eggs were recorded to hatch after 5 days at 71.6°F. Eggs are demersal and adhesive, measuring 1/16-inch in diameter. Eggs that fall out of the crevices are often ingested by males (Becker 1983). Larvae hatched in early and mid-June of 1960 when water temperatures were 68°F (USFWS 1982). Larvae in the central basin are most abundant over gravel beaches (USFWS 1982). Larvae have been collected in the vicinity of Perry in June 1974, but in relatively low numbers (NUS 1975).

**Trout perch** – Trout perch spawning in Lake Erie occurs from May through August, peaking in mid to late-June (USFWS 1982). Spawning occurs in water temperatures between 60°F-68°F (Becker 1983). Intake water temperature data at Perry indicate spawning is likely to begin in late May (Figure 2-2). Trout perch spawn primarily over sand bars, occasionally gravel, and are reported to spawn over pebbled beaches near river mouths in Lake Erie (Becker 1983; USFWS 1982). They are random spawners and do not build nests nor protect their young (Becker 1983). The 1/16-inch diameter eggs hatch in approximately 6.5 days. Yolk-sac larvae develop on or within spawning substrates between 10 and 200 ft in Lake Erie (Wallus and Simon 2006). The major hatching period in Lake Erie is the first half of June at approximately 68°F (Comm. Fish. Rev 1961). Larvae are less than 1/4-inch long at hatching and yolk-sac absorption is complete after 4-5 days (Becker 1983). Year class abundance is often affected by wind-associated mortality due to wave action on the eggs or newly hatched larvae. Post-yolk sac larvae and juveniles remain demersal and most commonly occur between 10-20 ft deep. Young of year typically occur in waters no deeper than 30 ft. In Lake Erie, juveniles range from 2/3-inch to 1.4-inches long by mid-August and first year growth is terminated at an average total length of 3.3-inches by the end of October. Trout-perch will remain nearshore, close to their spawning ground on beaches, in river mouths, harbors, and bays until the late summer when they move offshore to deeper waters (Wallus and Simon 2006).

Eggs, prolarvae, and postlarvae have been collected near Perry, indicating that spawning occurs in the vicinity (NUS 1975). Approximately 40% of eggs collected in mid-May were trout-perch eggs. Prolarvae were present in May and June (NUS 1975).

**White bass** – White bass spawning occurs between late-April and June when water temperature reach 54.5°F -79°F (Becker 1983). Spawning activity peaks between water temperatures of 62.4°F -72.7°F. Intake water temperature data at Perry indicate spawning is likely to begin in late-May (Figure 2-2). White bass prefer to spawn in the running waters of tributary streams, but will spawn within the windswept shores of lakes in 2-7 ft of water (Becker, 1983). White bass are known to enter all Lake Erie tributaries within the central basin to spawn, but some spawning also occurs in the open lake (USFWS 1982). They spawn at the surface, preferably over sand, gravel, rubble or rock substrate, but may also spawn over aquatic plants or debris (Becker 1983). Spawning occurs during the day and night. Older fish spawn earlier in the spawning season, while the numbers of young fish spawning increase later in the season. White bass do not build nests or provide parental care to young (Becker 1983).

The average fecundity of white bass is 565,000 eggs (Becker 1983). The adhesive, demersal eggs are approximately 1/32-inch to diameter, and hatch between 41-45 hours. Larvae are nearly 1-inch long at hatching. Swimming behavior after hatching involves active swimming to the surface, followed by passive sinking to the bottom. Larvae swim to the surface once they touch bottom. Horizontal swimming behavior begins approximately 4 days after hatching. The yolk-sac is fully absorbed after 8 days. Larvae between 1/6-inch to 1/3-inch long are planktonic and occur in nearshore waters 3-6 ft below the surface. Larvae longer than 1/3-inch occur in 6-13 ft of water and continue to move into deeper waters as they grow (Becker 1983). Larvae occurring in Lake Erie often range between 1/2 to 1-inch long within harbors and over beaches (USFWS 1982). Larvae smaller than 1/2-inch only occur in the tributaries that white bass have spawned within (USFWS 1982). It is likely that larvae smaller than 1/2-inch occurring in Lake Erie are the product of spawning within Lake Erie. A few larvae were collected near Perry on July 12, 1974 at a water temperature of 68°F (NUS 1975).

**White perch** – In landlocked waters, white perch spawn in both rivers and reservoirs (Zuerlein 1981). They migrate from deep to shallow waters when water temperatures reach 59°F-68°F. They show no preference for habitat types during spawning (Zuerlein 1981). In lakes, spawning occurs in waters between 0 and 5 ft deep, and is triggered by warming temperatures, typically occurring between April and May in freshwaters (Stanley and Danie 1983). Intake water temperature data at Perry indicate spawning is likely to begin by late-May (Figure 2-2).

Females broadcast adhesive, demersal eggs (Mansueti 1961). Spawning occurs over 10-21 days, with activity peaking at dusk (Stanley and Danie 1983). Eggs adhere to each other in a cluster and attach to debris or detritus, and currents may result in semi-pelagic incubation. Fecundity compared to other moronids is high in white perch. Fecundity of white perch collected in Lake Ontario ranged from 21,180 to 234,342 eggs. Eggs are approximately 1/32-inch and hatch as soon as 30 hours in 68°F water or as late as 108 hours in 59°F waters (Stanley and Danie 1983).

Newly hatched prolarvae are between 1/16-inch and 1/8-inch long (Stanley and Danie 1983). Larvae remain near the spawning site for 4-13 days. Swimming ability is limited to vertical movements, and may be subject to larval drift via currents. They occur throughout the water column, but behavior becomes increasingly demersal as they grow. Juveniles occur in areas 8 to 12 ft deep with muddy, silty, or vegetated substrates. Juveniles show schooling behavior, and may venture offshore during the day, and return inshore at night (Stanley and Danie 1983).

**Yellow perch** – Yellow perch spawning in Lake Erie occurs along shallow shorelines and tributaries when water temperatures reach 44°F-58°F (USFWS 1982). Water temperatures at the Perry intake reach this range by late April (Figure 2-2). Spawning behavior may be triggered by photoperiod, rising water temperatures, and/or completion of maturation (Krieger et al. 1983). Eggs will not ripen unless adults are exposed to an extended period of winter water temperatures of 50°F to ensure maturation of the gonads (Krieger et al. 1983).

Yellow perch are random spawners that do not protect their eggs or larvae (Becker 1983). They are known to spawn over various substrates. Spawning occurs at night in waters between 2-10 ft deep. Eggs are released in a gelatinous, semi-buoyant string typically within sheltered areas containing aquatic vegetation or debris. The strands float freely until they are tangled in debris or vegetation (Becker 1983). Egg strands can reach up to 7 ft long with up to 210,000 eggs, but are typically much shorter and average approximately 28,000 eggs per strand (Mecozzi 2008). Hatching occurs in 8-10 days, but can take up to a month, depending on water temperatures and other conditions (Mecozzi 2008). Incubation within Lake Erie averages two weeks (USFWS 1982). Strong year classes are attributed to warm temperatures, as increased aquatic vegetation leads to greater recruitment success (Krieger et al. 1983). Hatching in Lake Erie occurs as early as the first week of May into July (USFWS 1982). Larvae occur in the lake from June to August within shallow, inshore areas (USFWS 1982).

Prolarvae are approximately 1/4-inch long at hatching and immediately swim to the surface and remain planktonic for 3-4 weeks within the upper 3-4 ft of the water column (Becker 1983). Yolk-sac absorption is completed approximately 3-5 days after hatching (Mecozzi 2008). Once larvae reach approximately 1-inch in length, they will gradually move into littoral habitats similar to those of adults, but shallower (Becker 1983; Krieger et al. 1983). Juveniles have a higher temperature tolerance during the summer which ranges from 68°F-73.4°F (Krieger et al. 1983). A large number of ripe adults were collected in 1974 in the vicinity of Perry between May 17 and May 22 at water temperatures of 48°F-63°F (NUS 1975). Eggs were collected on May 11, 1974, and small numbers of larvae were collected from May to July (NUS 1974).

## 4.5 Seasonal and Daily Activities

*Regulatory requirement at §122.21(r)(4)(v): "Data representative of the seasonal and daily activities (e.g., feeding and water column migration) of biological organisms in the vicinity of the cooling water intake structure."*

Site-specific studies of the seasonal and daily activities of biological organisms in the vicinity of the Perry intake have not been performed. Limited historical information is available from ichthyoplankton surveys in Lake Erie near Perry and impingement studies from nearby facilities. To supplement these data, a literature search was made for information regarding the commonly found species in the central basin of Lake Erie.

### *4.5.1 Seasonal Ichthyoplankton Data*

Data collected by Cooper et al. (1981) included seasonality of ichthyoplankton collected in the central basin of Lake Erie. Collections occurred between May 2 and August 9, 1978. All species were still collected at the final sampling event on August 9, 1978 (Cooper et al. 1981). Data regarding seasonal peaks and first occurrence of larval species collected can be found in Table 4-15.

**Table 4-15: Ichthyoplankton Seasonality in the Central Basin (1978)**

| Taxa | Date of First Collection | Peak Abundance | Peak Density (#/100m$^3$) | Notes |
|---|---|---|---|---|
| Carp/goldfish | 24-May | 6-July | 11.30 | - 89% collected from 0-1 meters |
| Clupeidae | 25-May | 19-June | Not reported | - 60% collected west of Cleveland |
| Emerald shiner | 16-June | 21-July | 195.00 | - Most abundant larval species in the central basin |
| Freshwater drum | 25-May | 18-July | 23.80 | - 86.7% collected west of Cleveland |
| Logperch | 19-May | 25-May | 2.01 | - Uniform distribution throughout the basin and depths tested |
| Rainbow smelt | 20-May | 5-July | 14.60 | - 72% collected offshore, but no significant differences between inshore and offshore abundances |
| Spottail shiner | 16-June | 27-June | 54.00 | - 94% collected from 0-3 ft |
| Trout perch | 23-May | 11-June | 11.75 | - 83.3% collected east of Cleveland |
| Yellow perch | 11-May | 19-June | 6.20 | - 87% collected were prolarvae |

Source: Cooper et al. (1981)

### 4.5.2 SEASONAL IMPINGEMENT DATA

Impingement seasonality data are available from Eastlake (ERA 1987). Certain behaviors such as inshore migrations or movement within the water column on a daily or seasonal basis may increase the likelihood of impingement. Table 4-16 lists the seasonality of peak impingement at Eastlake.

**Table 4-16: Seasonality of Top Ten Species Impinged at Eastlake**

| Common Name | Peak Impingement | Notes |
|---|---|---|
| Alewife | April, May, and June | - Impingement corresponded with spawning period |
| Emerald shiner | March and April | - Lowest rate of impingement occurred during September and October |
| Freshwater drum | May and June | - Greater than 80% of all individuals collected during the peak period |
| Logperch | May and June | - 70% of all individuals collected during the peak period |
| Rainbow smelt | May | - 78% of individuals collected in May<br>- Secondary peak impingement occurred in August (6.9%) |
| Spottail shiner | March, April, and May | - Greater than 85% of all individuals collected during the peak period<br>- Peaks correspond with reported spawning period |
| Trout-perch | April, May, and June | - Peak in impingement corresponds with spawning period |
| White bass | October, May, and June | - 41.6% of all individuals collected in October; typical fall mortality of small YOY<br>- 30.8% of all individuals collected in May and June were spawning and post-spawn adults |
| White perch | April and May | - Smaller second peak in impingement occurred in August<br>- Lowest rate of impingement occurred in the fall |
| Yellow perch | June | - 27.1% of all individuals collected in June<br>- Relatively few individuals impinged in the fall |

Source: ERA (1987)

### 4.5.3 GENERAL SEASONAL AND DAILY ACTIVITY INFORMATION

The species described below were selected due to their high abundance; they were one of the top five most abundant species in local ichthyoplankton, impingement, or central basin community sampling (Cooper et al. 1981; ERA 1987; Goforth et al. 2002, FTG 2015; ODW 2015). While abundant in older entrainment and impingement surveys, alewife has been replaced by gizzard shad because recent surveys indicate a much greater abundance and occurrence of gizzard shad than alewife in the central basin.

**Common carp** – Common carp are native to Asia, but have been introduced to waters of every continent except Antarctica (Edwards and Twomey 1982). They prefer habitats that are relatively warm, well-vegetated with sluggish currents over mud or silt substrates (Edwards and Twomey 1982). They are rarely reported at depths deeper than 100 ft (Becker, 1983). They are opportunistic feeders, foraging on any available food source such as littoral fauna, benthic fauna, worms, insect larvae, algae, and detritus (Edwards and Twomey 1982). They are extremely tolerant of turbidity, as long as it is not forage limiting. Adults are tolerant of low dissolved oxygen levels common in warm waters. If dissolved oxygen levels are less than 0.5 mg/L, adults may gulp surface air for respiration (Edwards and Twomey 1982). Common carp do little feeding in water below 50°F, and none from 35.1°F to 40.1°F (Becker 1983).

Increased temperatures lead to increased activity, including leaping out of the water. Carp may move extensive distances, and have migrated as far as 674 miles over 28 months (Becker 1983).

Common carp exhibit diel periodicity when waters begin to warm (Benito et al. 2015). At night they occur in deeper waters and activity is limited but during the day they occur in shallow waters, less than three meters deep, and activity peaks. During cooler water temperatures activity levels and depth remain constant throughout the day. Juvenile common carp are known to spend more time swimming in the water column at night than during the day (Rahman and Meyer 2009). It is believed that carp occur in deeper waters during the winter, and move into more shallow waters as water temperatures increase (Benito et al. 2015).

**Emerald shiner** – Emerald shiner inhabit the surface to mid-depths of large waterbodies (Becker 1983). They frequent open waters and do not require vegetation and prefer water temperatures near 77°F. They most commonly occur in clear water between 2 and 5 ft deep over sandy substrates. They rarely penetrate the thermocline, typically at 36 to 49 ft deep, during the summer and their behavior is primarily pelagic. Emerald shiners tend to remain in the middle of the water column or near the bottom in clear water, during the day. They occur near the surface at night during the summer to feed on midges and other small insects. During the spring, emerald shiners may travel into the warmer waters of Lake Erie tributaries, returning to the lake by mid-June (Becker 1983).

**Freshwater drum** – Freshwater drum inhabit large rivers, lakes, and impoundments (Becker 1983). They prefer warm, sluggish, open water areas over muddy substrates in lakes. They are a schooling species and rarely occur in shallow, vegetated areas. They prefer turbid waters, but may occur in clear waters. In the Great Lakes, adults primarily occur from the shallows to depths of 39 to 59 ft. They are benthic feeders, and will feed during all times of the day (Becker 1983). Freshwater drum typically feed on benthic invertebrates such as cladocerans and mollusks and may turn to piscivorous behavior, feeding on small fish and fish eggs (Hardisty 2007). Young of year fish show some planktonic behavior, as their diet primarily consists of planktonic cladocerans. During the winter, they remain in deeper waters and exhibit limited feeding and movement (Becker 1983). As waters warm in the spring, they move closer inshore to shallower waters and retreat to deeper waters in the fall as water temperatures begin to fall. During the summer months, freshwater drum will move into waters less than 5 ft deep at twilight to feed. They are a hardy fish, but may show signs of distress at temperatures greater than 78°F. Freshwater drum are often the host of multiple unionoid mussel species glochidia (Becker 1983).

**Gizzard shad** – Gizzard shad occur in numerous types of water bodies (Becker 1983). Populations occurring in lakes or reservoirs are found in both the littoral and limnetic zones. They are primarily a pelagic species, inhabiting waters at or near the surface, but have been collected at depths of up to 108 ft. Adults feed in both the limnetic zone and near the benthos. This is evident by the occurrence of both plankton and sand in their digestive system. The sand in the digestive tract is believed to be used to aid in grinding food (Becker 1983).

In Lake Erie, gizzard shad are most abundant in the shallow western basin over muddy substrates, particularly in protected bays and the mouths of tributaries (Miller 1960). Their abundance is greatest in the late summer/early-fall due to the addition of young of the year fish. Juveniles tend to prefer habitats close to shore in shallow waters. Young of year tend to form compact schools after hatching, but dissipate by the fall (Miller 1960). Fish begin to move into deeper waters once temperatures in the fall reach less than 55.4°F (Williamson and Nelson 1985). During the winter, gizzard shad migrate into the deep portions of lakes, or may overwinter in sheltered coves with refugia provided by spring-fed streams (Williamson and Nelson 1985).

Gizzard shad behavior and abundance tend to be facilitated by water temperatures. Populations can be significantly affected by cold winters, resulting in high mortality rates. Mortality events typically occur when water temperatures fall below 38°F, primarily effecting juvenile fish. Older shad are susceptible to mortality when exposed to temperatures below 38°F for an extended period of time, or if water temperatures fall below 36°F. Warm winter water temperatures often correlate with increases in gizzard shad populations. Even when temperatures are moderate, sudden changes, even if only by a few degrees, can disrupt equilibrium and swimming capabilities. Loss of equilibrium or mortality occurs from sudden rises in temperature, as well as sudden drops. The preferred temperature range is from 71.6°F-84.2°F, with a maximum tolerance of 93.2°F and lethal threshold of 97.7°F (Williamson and Nelson 1985).

Populations may be most dense in areas of high turbidity (Williamson and Nelson 1985). Higher catch rates were observed within the turbid Sandusky Bay of Lake Erie than in areas of low turbidity. However, individual shad collected from more turbid waters are generally smaller and spawn earlier than those in clear waters. Distribution is also influenced by dissolved oxygen levels. They are absent from waters with less than dissolved oxygen levels of $\leq 2$ mg/L and only occur above the thermocline during the summer months (Williamson and Nelson 1985).

**Logperch** – The Great Lakes are in the northernmost portion of the logperches range (Page and Burr 1991). Logperch are found in freshwater benthic habitats, primarily in the shallow waters of rivers and creeks (Page 1983). They are also found in large rivers, lakes, and reservoirs. They are not a schooling species and are often found individually or in small groups (Burkhead 2005). They demonstrate a unique feeding behavior compared to other darter species, where they utilize their snouts to flip and forage under small rocks (Hatch 1983). In clear water during sunny days, logperch will retreat into deeper waters or find shelter within the sand or under rocks (Becker 1983). Foraging occurs during the day, and logperch remain inactive on the bottom at night (Becker 1983). Site fidelity is high as logperch tend to remain near spawning grounds and have been recorded up to 1 mile from their original capture point due to foraging (Burkhead 2005). Juveniles feed on small zooplankton such as rotifers and copepods, and adults feed primarily on aquatic insects, supplementing their diet with small snails and fish eggs (Page 1983).

**Rainbow smelt** – Rainbow smelt are an anadromous marine species. After multiple attempts of introduction into the region, a freshwater stock from Maine was introduced and established in Crystal Lake, Michigan in 1912 (Becker 1983). They spread from Crystal Lake into the Great Lakes, including Lake Erie. Rainbow smelt typically inhabit waters from 59 to 85 ft deep, but have been recorded at depths from 46 to 210 ft. Adults will move into shallow inshore waters during the spring to spawn. In Lake Michigan, they occur at depths from 16 to 59 ft and move to deeper water as inshore waters warm. Schooling behavior begins when smelt reach 3/4-inch in length (Buckley 1989). Schools move into shallow waters at night, retreating to deeper waters during the day. Schools of juvenile smelt begin to move offshore as water temperatures begin to decrease in the fall (Buckley 1989).

Smelt prefer water temperatures in the range of 43°F to 56°F. Peak feeding occurs at 50°F (Becker 1983). Rainbow smelt primarily feed on crustaceans (Becker 1983). They will consume large numbers of fish when inshore, and are known to be highly cannibalistic; however, feeding does not typically occur during the spawning season. As rainbow smelt age, their presence becomes increasingly bottom oriented rather than pelagic. Age-0 fish are pelagic and inhabit the upper layers of the water column until the fall or late summer, when they move towards the bottom. Age-I fish occur at the mid-levels of the water column or near the thermocline. Age-II fish and older primarily occur near the bottom of the water column (Becker 1983).

**Round goby** – Round gobies are native to the Ponto-Caspian region of Eurasia, but have become established as one of the most abundant fishes in the Great Lakes (Kornis 2011). They entered the region via transoceanic vessels releasing ballast water into the Great Lakes. It is believed that water in the Dnieper River in the Ukraine was ballasted at night, when larval and juvenile round gobies are feeding near the surface, and the ballast was released into the Great Lakes which allowed their introduction. Round gobies are a sedentary benthic species that lack a swim bladder and have a limited home range. Lake Erie has the highest populations of round gobies in the Great Lakes. Populations have fallen over the last 5 to 10 years, likely due to the population reaching equilibrium after rapid expansion (Kornis 2011).

Round gobies have a wide thermal tolerance ranging from 30°F to 86°F (Kornis 2011). The optimum temperature for round gobies is 79°F. They occur and feed in rocky habitats. Juveniles are more abundant in sandy habitat, as adults are believed to displace them to sub-optimal habitat. They prefer waters 2.3 to 9.8 ft deep, away from the shallow surf zone (Kornis 2011). During the winter, they move into deeper waters (Kornis 2011).

**Spottail shiner** – Spottail shiners are native to the Great Lakes, and are particularly abundant within their shallows (Wells and House 1974). In Lake Erie, spottail shiners are important forage for walleye, and to a lesser extent, white bass. They prefer shallow, warm water and occur in midwater during the day and closer to the surface at night (Becker 1983; Wells and House 1974). They tolerate a wide variety of habitats, but are most numerous in turbid waters (Becker 1983). Larger individuals tend to occur in deeper waters than younger, smaller individuals (Wells and House 1974). During the late spring and summer, they typically occur in waters 42 ft or shallower at temperatures of approximately 55.4°F. During the winter, they most commonly occur at 102 ft, and no deeper than 150 ft. Many spottail shiners that occur near the shoreline are likely young of year, as one seining event in Lake Erie collected 693 spottail shiners, 664 of which were young of year (Wells and House 1974).

**Trout-perch** – Trout perch prefer shallow to intermediate waters of the Great Lakes and avoid shallow, mud filled bays (Becker 1983). They often occur near or within tributary streams, especially during spawning. They prefer clear water and sandy substrates. Trout perch are a seldom seen species that remain in deeper waters during the day and move into shallow shoreline waters at night. Even where abundant, specimen collection is difficult, except for shoreline seines at night and bottom trawls during the day. Seasonally, trout perch concentrate in deeper waters during the colder months, and move into shallower waters as water temperature increases. They prefer waters from 50°F to 61°F. Populations may shift into deeper waters due to sudden increases in water temperature during the summer months (Becker 1983).

**White bass** – White bass occur in open, clear to turbid waters of lakes (Becker 1983). They are most abundant in waters less than six meters deep and prefer sandy or muddy substrates (Becker 1983). They are opportunistic feeders and form large schools at the surface to search for prey (Hamilton and Nelson 1984). White bass occurrence is not habitat driven, but driven by forage availability. Diet varies seasonally due to prey availability and current life stage. Juveniles less than 1.5-inches long commonly feed on macroinvertebrates, while larger white bass are piscivorous, preferring clupeids as prey. Adult diets will shift to macroinvertebrates or zooplankton if there is a lack of forage fish. Production is highest in areas of large clupeid populations (Hamilton and Nelson 1984).

White bass activity peaks, from the early spring to the fall, at the surface during the early morning and late afternoon (Becker 1983). They can often be found near floating vegetation or other emergent structures with little movement at night. Older bass occur primarily in the pelagic zone, while younger bass will be found in the littoral zone. Young white bass prefer sandy beaches. White bass occur near the bottom during the winter, but are primarily found near the surface during the summer. White bass also appear to have a strong homing tendency to a specific spawning ground (Becker 1983).

**White perch** – White perch are native to the Atlantic Slope drainages from the St. Lawrence River, south to the Pee Dee River, South Carolina (Fuller et al. 2016). They first entered Lake Ontario due to the construction of the Erie Canal, and then accessed Lake Erie in 1953 via the Welland Canal (Fuller et al. 2016). Habitat preferences are level bottoms with silty substrates, but they may also occur over mud, sand and clay substrates (Stanley and Danie 1983). They commonly occur in open water, but utilize deeper water as daytime shelter. White perch move from 13 to 30 ft during the day to waters 3 to 4 ft deep at night. Seasonal movements are influenced primarily by temperature. Warming temperatures in the spring trigger inshore migrations, while falling temperatures in the fall result in offshore migrations, occasionally in large schools. After spawning, fish may retreat to deeper waters. Summer movements are local and random, rarely covering more than 12 miles. White perch overwinter in waters averaging 40 to

60 ft deep, but occur as deep as 131 ft. Most white perch mature at age-II, or at 2.8 to 3.1 inches for males and 3.5 to 3.9 inches for females (Stanley and Danie 1983).

**Yellow perch** – Yellow perch are associated with shoreline habitats of lakes and reservoirs where moderate amounts of vegetation are present (Krieger et al. 1983). Yellow perch are very tolerant fish that can adjust to a variety of conditions (Mecozzi 2008). They prefer sluggish currents or slack water habitats (Krieger et al. 1983). They are most common in clear waters, and are found in decreasing densities as turbidity increases (Krieger et al. 1983). They can tolerate a pH range of 3.9 to 9.5, but the optimum range is 6.5 to 8.5 for reproductive success. The preferred temperature range during growing season is between 63.7°F and 77.0°F (Krieger et al. 1983). Yellow perch are known to survive periods of low dissolved oxygen when other species such as bluegill, bass, and walleye die (Mecozzi 2008). They prefer sluggish currents or slack water habitats (Krieger et al. 1983). Lifespans are approximately seven years, and they reach maturity at the age of two or three (Mecozzi 2008). Yellow perch are active primarily during the day and form spindle shaped schools of 50 to 200 or more fish. Schools can be found at various depths, but feeding primarily occurs near the bottom. During the day, yellow perch are active in deeper water, but move nearshore to shallower depths at night. They display a behavior at night where the schools disperse and fish lay on the bottom motionless until daylight, when the school reforms and moves into deeper water. Yellow perch primarily feed on aquatic insects and zooplankton, but include small fish in their diet as they grow larger (Mecozzi 2008).

## 4.6 Threatened, Endangered, and Other Protected Species

*Regulatory requirement at §122.21(r)(4)(vi): "Identification of all threatened, endangered, and other protected species that might be susceptible to impingement and entrainment at your cooling water intake structures."*

The Rule requires that the USEPA or state permitting authority transmit permit applications to the appropriate Field Office of the United State Fish and Wildlife Service (USFWS) and/or Regional Office of the National Marine Fisheries Service (NMFS) for review. The Services have the ability to recommend control measures, monitoring and reporting of take and other impacts to listed species and critical habitats. The Rule specifically addresses federally listed threatened and endangered (T&E) species. However, state-listed species are included for completeness. The federally and state-listed aquatic species that may be present near the intake were identified based on review of the USFWS Information, Planning, and Conservation System (IPaC) online database and ODNR online databases (USFWS 2016, ODNR 2016b). The results are summarized in Table 4-17.

**Table 4-17: Threatened and Endangered Aquatic Species Potentially Near Perry**

| Category | Species | Scientific Name | Status | Source | Susceptible to Impingement or Entrainment |
|---|---|---|---|---|---|
| **Federally Listed Species** | snuffbox mussel | *Epioblasma triquetra* | E | USFWS (2016) | Likely extirpated (77 FR 8641), |
| | salamander mussel | *Simpsonaias ambigua* | Under Review | USFWS (2016) | No record of occurrence near Perry |
| **Federal Critical Habitat** | None | None | N/A | USFWS (2016) | N/A |
| **State-Listed Species** | American eel | *Anguilla rostrata* | T | OSU (2016) | No record of occurrence near Perry |
| | Eastern pondmussel | *Ligumia nasuta* | E | ODNR (2016c) | |
| | Fawnsfoot | *Truncilla donaciformis* | T | FOC (2013) ODNR (2016c) | |
| | Threehorn wartyback | *Obliquaria reflexa* | T | ODNR (2016c) | |

## 4.7 Public Participation and Agency Consultation

*Regulatory requirement at §122.21(r)(4)(vii): "Documentation of any public participation or consultation with Federal or State agencies undertaken in development of the plan."*

No public participation or consultation with Federal or State agencies related to CWA Section 316(b) was undertaken during the development of the §122.21(r) reports.

## 4.8 Supplemental Field Studies

*Regulatory requirement at §122.21(r)(4)(viii): "If you supplement the information requested in paragraph (r)(4)(i) of this section with data collected using field studies, supporting documentation for the Source Water Baseline Biological Characterization must include a description of all methods and quality assurance procedures for sampling, and data analysis including a description of the study area; taxonomic identification of sampled and evaluated biological assemblages (including all life stages of fish and shellfish); and sampling and data analysis methods. The sampling and/or data analysis methods you use must be appropriate for a quantitative survey and based on consideration of methods used in other biological studies performed within the same source water body. The study area should include, at a minimum, the area of influence of the cooling water intake structure."*

Not Applicable – No supplemental field studies have been performed, or are proposed, as part of this §122.21(r)(4) Source Water Baseline Biological Characterization report.

## 4.9 Regulatory Requirement

*Regulatory requirement at §122.21(r)(4)(ix): "In the case of the owner or operator of an existing facility or new unit at an existing facility, the Source Water Baseline Biological Characterization Data is the information in paragraphs (r)(4)(i) through (xii) of this section."*

Regulatory requirement cited for informational purposes only. No response necessary.

## 4.10 Protective Measures and Stabilization Activities Near the Intake

*Regulatory requirement at §122.21(r)(4)(x): "For the owner or operator of an existing facility, identification of protective measures and stabilization activities that have been implemented, and a description of how these measures and activities affected the baseline water condition in the vicinity of the intake."*

The CWIS at Perry uses offshore intakes located approximately 2,650-ft from shore at depths of 20.7 and 21.7-ft at low water elevation. Intakes were constructed to provide at least 13-ft of clearance from the water's surface to avoid obstruction of navigation. No protective or stabilizing activities are implemented at these intakes. Low AIF, low intake velocities, and the large volume of water available in Lake Erie demonstrate that protective and/or stabilization activities are not necessary and that the present CWIS configuration and operations do not affect the baseline water conditions.

## 4.11 Fragile Species

*Regulatory requirement at §122.21(r)(4)(xi): "For the owner or operator of an existing facility, a list of fragile species, as defined at 40 CFR 125.92(m), at the facility. The applicant need only identify those species not already identified as fragile at 40 CFR 125.92(m). New units at an existing facility are not required to resubmit this information if the cooling water withdrawals for the operation of the new unit are from an existing intake."*

Fragile species are defined in 40 CFR §125.92(m) as…

> "*...a species of fish or shellfish that has an impingement survival rate of less than 30 percent even when the BTA technology of modified traveling screens are in operation.*"

Fragile species listed in the Rule include, but are not limited to: alewife, American shad, Atlantic herring, Atlantic long-finned squid, Atlantic menhaden, bay anchovy, blueback herring, bluefish, butterfish, gizzard shad, grey snapper, hickory shad, menhaden, rainbow smelt, round herring, and silver anchovy (79 FR 48432, August 15, 2014).

Fragile species at risk of impingement at Perry were determined by species collected during studies near Perry (Cooper et al. 1981; ERA 1987; FTG 2015; ODW 2015; USFWS 1982; USNRC 1982). Fragile species at risk for impingement at Perry include alewife, gizzard shad, and rainbow smelt. While no impingement data are available for Perry, data are available from the nearby Eastlake (ERA 1987). Gizzard shad dominated impingement, but most gizzard shad impinged were considered either moribund or dead at the time of impingent. The impingement of large numbers of dead or moribund gizzard shad is attributed to natural mortality events caused by low and/or sudden changes in water temperature (ERA 1987). Impinged gizzard shad are primarily young of year, which are more sensitive to low water temperature and sudden changes in water temperatures than adults (ERA 1987). Therefore, any gizzard shad impinged at Perry would likely be due to natural mortality.

Alewife impingement at Eastlake was less than 1% of total impingement when gizzard shad was excluded (ERA 1987). Rainbow smelt composed approximately half of the total impingement at Eastlake (ERA 1987). Both alewife and rainbow smelt are non-native species to the Lake Erie basin (USGS 2012).

A list of non-fragile species provided by the USEPA (2014) was compared to the species impinged at the nearby Eastlake and Ashtabula facilities (Appl. Biol. 1979e, ERA 1987), species collected in the nearshore communities of the central basin of Lake Erie (Goforth et al. 2002), and District 3 trawl surveys (ODW 2015). All species collected (other than those listed above as fragile species) were listed as non-fragile species, except brook stickleback, coho salmon, lake whitefish, and yellow bullhead. Impingement mortality data at intakes similar to Perry are not available for these species.

## 4.12 Incidental Take Exemption or Authorization

*Regulatory requirement at §122.21(r)(4)(xii): "For the owner or operator of an existing facility that has obtained incidental take exemption or authorization for its cooling water intake structure(s) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, any information submitted in order to obtain that exemption or authorization may be used to satisfy the permit application information requirement of paragraph 40 CFR 125.95(f) if included in the application."*

Perry has not obtained an incidental take exemption of authorization for its cooling water intake structures from the USFWS or NMFS, nor is one believed to be required.

# 5.0 §122.21(r)(5) - Cooling Water System Data

## 5.1 Narrative Description of Cooling Water System

*Regulatory requirement at §122.21(r)(5)(i): "A narrative description of the operation of the cooling water system and its relationship to cooling water intake structures; the proportion of the design intake flow that is used in the system; the number of days of the year the cooling water system is in operation and seasonal changes in the operation of the system, if applicable; the proportion of design intake flow for contact cooling, non-contact cooling, and process uses; a distribution of water reuse to include cooling water reused as process water, process water reused for cooling, and the use of gray water for cooling; a description of reductions in total water withdrawals including cooling water intake flow reductions already achieved through minimized process water withdrawals; a description of any cooling water that is used in a manufacturing process either before or after it is used for cooling, including other recycled process water flows; the proportion of the source waterbody withdrawn (on a monthly basis)"*

Perry is a base-load facility that normally operates year-round to produce electrical power, with the exception of scheduled outages (approximately once every 24 months for several weeks duration) for refueling and planned maintenance activities. In general, the cooling water system operates to support electrical generation. Perry employs a closed-cycle cooling system for condenser water cooling.

Water from the service water pump discharge line is utilized for circulating water makeup to the cooling tower basin (FirstEnergy 2015). Water is directed to the circulating water system to replace losses due to evaporation and blowdown. Circulating water flows from the condensers to one 516-foot high natural draft, hyperbolic cooling tower with counter flow design; concentrated dissolved solids in the system are maintained at a design of 2.5 cycles of concentration by discharging water from the cooling tower to the blowdown system (FirstEnergy 2015). Lake water chemistry restricts Perry's cycle of concentration to 2.5. The blowdown water is added to the service water discharge flow and conveyed through a discharge tunnel to Lake Erie.

Depending on atmospheric conditions, makeup flow can be up to 25,000 GPM and blowdown can be up to 10,000 GPM (FirstEnergy 2016a). Evaporation from the cooling tower can be up to 15,000 GPM.

## 5.2 Design and Engineering Calculations

*Regulatory requirement at §122.21(r)(5)(ii): "Design and engineering calculations prepared by a qualified professional and supporting data to support the description required by paragraph (r)(5)(i) of this section"*

### *5.2.1 Design Intake Flow*

The DIF is provided in Section 3.3.

### *5.2.2 Through- Screen Velocity*

The through-screen velocity has been calculated at the screens under low water elevation for both DIF and AIF. These are listed in Table 5-1.

**Table 5-1: Through-Screen Velocities**

| | | Low Water Elevation |
|---|---|---|
| Water Elevation | | 567'-4" MSL |
| Pumphouse Floor Elevation | | 544'-7" MSL |
| Water Depth | | 22'-9" |
| Through-Screen Velocity | DIF | 0.72 fps |
| | Maximum AIF | 0.72 fps |

Through-screen velocity calculations are provided in Section 10.0 as Attachment B - Calculations.

### 5.2.3 *Percent Reduction in Cooling Water Flow*

While Perry has two cooling towers, only one is utilized for the operating unit as part of the circulating water system (USNRC 1982). The natural draft, hyperbolic cooling tower is 516 ft high, and the water is counter flow with the air to cool water for reuse (FirstEnergy 2015). Due to the operation of the cooling tower, cooling water intake flow reductions are achieved through minimized makeup water withdrawals when compared to plant circulating water flow. Additional flow reduction is recognized during plant outages and planned maintenance activities. The cooling tower is operated at a design of 2.5 cycles of concentration with a circulating water flow rate of approximately 545,400 GPM (785 MGD) from three 185,000 GPM (266.4 MGD) pumps (FirstEnergy 2016a; USNRC 1982). The percent reduction in flow[7] is listed in Table 5-2.

**Table 5-2: Percent Reduction in Flow[7]**

| Total Makeup Water | Percent Flow Reduction |
|---|---|
| DIF – 101.5 MGD | 87.1% |
| AIF – 54.6 MGD | 93.0% |

Percent reduction in flow calculations are provided in Section 10.0 as Attachment B - Calculations.

The original once-through design for Perry called for a withdraw rate of approximately 1,150,000 GPM (1,656 MGD), however Perry was constructed with a closed cycle cooling tower. When comparing the current DIF of 101.5 MGD to the previous, once-through withdrawal rate of 1,656 MGD, Perry has reduced the intake flow by 93.9%.

### 5.2.4 *Proportion of the Source Waterbody Withdrawn*

The volume of Lake Erie is estimated to be approximately 116 cubic miles ($1.28 \times 10^{14}$ gallons; NOAA 2016b). The design volume of water withdrawn on a daily basis at Perry is 101.5 million gallons ($1.015 \times 10^{8}$ gallons), which is approximately 0.0001% of the volume of Lake Erie. The withdrawal of water at Perry is a *de minimis* withdrawal from the waterbody.

## 5.3 Existing Impingement and Entrainment Technologies

*Regulatory requirement at §122.21(r)(5)(ii): "Description of existing impingement and entrainment technologies or operational measures and a summary of their performance, including but not limited to reductions in impingement mortality and entrainment due to intake location and reductions in total water withdrawals and usage"*

[7] The percent reduction in flow has been calculated as: $1 - \frac{\text{Total Makeup Water Flow}}{\text{Cooling Tower Circulating Water Flow}}$

## 40 CFR §122.21(r)(2-8) NPDES APPLICATION REQUIREMENTS FOR FACILITIES WITH COOLING WATER INTAKE STRUCTURES

Perry operates a closed-cycle cooling system as defined in §125.92 to minimize make-up flows, and blowdown rates. The original once-through design for Perry called for a withdraw rate of approximately 1,150,000 GPM (1,656 MGD), however Perry was constructed with a closed cycle cooling tower. As such, Perry meets BTA standards for impingement mortality in §125.94(c)(1) and BTA for entrainment under Best Professional Judgment. In addition to operation of the closed-cycle cooling system, Perry utilizes end caps located approximately 2,650-feet offshore with velocities at the end caps of approximately 0.23 fps. The location is greater than the minimum of 800 feet offshore required by the rule at 40 CFR §125.92(v).

# 6.0 §122.21(r)(6) - CHOSEN METHOD OF COMPLIANCE WITH IMPINGEMENT MORTALITY STANDARD

*Regulatory requirement at §122.21(r)(6): "The owner or operator of the facility must identify the chosen compliance method for the entire facility; alternatively, the applicant must identify the chosen compliance method for each cooling water intake structure at its facility. The applicant must identify any intake structure for which a BTA determination for Impingement Mortality under 40 CFR 125.94 (c)(11) or (12) is requested."*

Perry uses one 516-foot high natural draft, hyperbolic cooling tower for closed-cycle cooling. Therefore, Perry achieves the national BTA standard for impingement mortality at §125.94(c)(1) by operating a closed-cycle recirculating system. Additionally, Perry has a through-screen velocity (TSV) based on DIF or AIF less than 0.5 fps at the end caps. The Rule defines the entry point to the cooling water intake structure at §125.92(f)] "extends from the point at which water is first withdrawn from waters of the United States up to, and including the intake pumps." The Rule at §125.94(c)(3) allows compliance for intakes without screens requiring the maximum intake velocity perpendicular to the opening of the intake to not exceed 0.5 fps during minimum ambient source water surface elevations. Calculations of the TSVs at the end caps are approximately 0.23 fps based on DIF, and thus does not exceed 0.5 fps. This is a pre-approved technology and does not have any monitoring requirements. Finally, Perry uses two multiport, offshore intake structures with circular end caps located approximately 2,650-feet offshore. The location is greater than the minimum of 800 feet offshore required by the rule at 40 CFR §125.92(v). The two multiport, circular intake structures do not employ the use of bar screens at the face of the intake. Per the regulations at §125.92(v), in order to be considered an offshore velocity cap, "the velocity cap must use bar screens or otherwise exclude marine mammals, sea turtles, and other large aquatic organisms." Perry is located in a fresh waterbody that does not contain marine animals, and bar screens may not be necessary. For this report the intake structures have been referred to as "end caps", however given the lack of marine animals they will function the same as velocity caps at Perry.

# 7.0 §122.21(r)(7) - ENTRAINMENT PERFORMANCE STUDIES

*Regulatory requirement at §122.21(r)(7): "The owner or operator of an existing facility must submit any previously conducted studies or studies obtained from other facilities addressing technology efficacy, through-facility entrainment survival, and other entrainment studies. Any such submittals must include a description of each study, together with underlying data, and a summary of any conclusions or results. Any studies conducted at other locations must include an explanation as to why the data from other locations are relevant and representative of conditions at your facility. In the case of studies more than 10 years old, the applicant must explain why the data are still relevant and representative of conditions at the facility and explain how the data should be interpreted using the definition of entrainment at 40 CFR 125.92(h)."*

No entrainment surveys were conducted at Perry previously because the station uses cooling towers which are parts of the closed-cycle recirculating system as defined in 40 CFR 125.83. The suspended CWA Section 316(b) Phase II Rule for existing facilities stated that closed-cycle recirculating systems were deemed to have met the applicable performance standards for both impingement mortality and entrainment and were not required to demonstrate further the achievement of performance standards.

USNRC (1982) conducted a comparative review of entrainment at five fossil-fueled power plants on Lake Erie located within a 50-mile radius of Perry between 1977 and 1978. Entrainment at Perry was expected to be similar to the Ashtabula C Power Plant because both stations have a submerged offshore intake. Based on the low number of eggs and larvae collected during entrainment sampling at Ashtabula C and the lower water withdrawal requirements at Perry, UNRC (1982) concluded that entrainment impacts should be insignificant.

Davis-Besse is a nuclear power station that uses a closed-cycle recirculating system with natural-draft cooling towers, low water volume requirements, low intake flow velocities, and a submerged offshore intake structure, on the southern shore of Lake Erie, similar to Perry. However, the one preoperational and one operational entrainment characterization study performed at Davis-Besse were completed in 1977 and 1978. These old data may not be representative of the current fish community in Lake Erie.

Historical entrainment data are available from Eastlake, a power station approximately 18 miles southwest of Perry. However, the data do not likely reflect current entrainment at Perry because they are nearly 40 years old and Eastlake uses once-through cooling and a shoreline intake.

No other studies addressing entrainment reduction technology efficacy, through-facility entrainment survival, or other entrainment studies applicable to Perry are available.

# 8.0 §122.21(r)(8) - Operational Status

## 8.1 Narrative Description of Power Production

*Regulatory requirement at §122.21(r)(8)(i): "For power production or steam generation, descriptions of individual unit operating status including age of each unit, capacity utilization rate (or equivalent) for the previous 5 years, including any extended or unusual outages that significantly affect current data for flow, impingement, entrainment, or other factors, including identification of any operating unit with a capacity utilization rate of less than 8 percent averaged over a 24-month block contiguous period, and any major upgrades completed within the last 15 years, including but not limited to boiler replacement, condenser replacement, turbine replacement, or changes to fuel type"*

Perry began commercial operation in 1986 and is a base-load nuclear plant that normally operates year-round to produce electrical power, with the exception of scheduled outages. Scheduled outages for refueling and planned maintenance occur every two years for a duration of several weeks. Based on annual operations from 2010 through 2015, Perry's average net facility capacity utilization rate was 89.05%. In general, the submerged surface water withdrawal system operates to support electrical generation with minor seasonal changes. Seasonal changes include operating two service water pumps in the winter and three in the summer.

A turbine upgrade was completed in 2013.

Values for the unit capacity factors are listed in Table 8-1 for the last five years. These values are based on net electrical generation. The factors are year-end values from December of each year.

**Table 8-1: Capacity Utilization Factors**

| Year | Capacity Utilization Factors |
|---|---|
| 2010 | 97.77% |
| 2011 | 78.89% |
| 2012 | 96.31% |
| 2013 | 77.78% |
| 2014 | 96.25% |
| 2015 | 87.30% |
| **Average** | 89.05% |

FirstEnergy (2016a)

## 8.2 Descriptions of Uprates and USNRC Relicensing

*Regulatory requirement at §122.21(r)(8)(ii): "Descriptions of completed, approved, or scheduled uprates and Nuclear Regulatory Commission relicensing status of each unit at nuclear facilities"*

A power uprate was completed between 2000 and 2001. The current Perry license (Docket Number 05000440) was issued November 13, 1986 and expires in March 18, 2026.

## 8.3 New Unit Plans and Schedules

*Regulatory requirement at §122.21(r)(8)(v): "Descriptions of plans or schedules for any new units planned within the next 5 years"*

There are no plans or schedules for new units at Perry within the next five years.

# 9.0 REFERENCES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**40 CFR §122.21(r)(2-8) NPDES APPLICATION REQUIREMENTS FOR FACILITIES WITH COOLING WATER INTAKE STRUCTURES**

# 10.0 ATTACHMENTS

Attachment A – Locational Maps

- AECOM. 2016. Figure 1. Perry Nuclear Generating Station – Aerial Map.
- AECOM. 2016. Figure 2. Perry Nuclear Generating Station – Topographic Map.
- AECOM. 2016. Figure 3. Perry Nuclear Generating Station – Navigation Map.
- NOAA. 1998. Bathymetry of Lake Erie and Lake Saint Clair.

Attachment B – Calculations

- AECOM. 2016. Area of Influence Calculations. FirstEnergy, Perry Nuclear Power Plant. June 2016.
- AECOM. 2016. Through-Screen Velocities. FirstEnergy, Perry Nuclear Power Plant. June 2016.
- AECOM. 2016. Percent Flow Reduction Calculations. FirstEnergy, Perry Nuclear Power Plant. June 2016.

Attachment C – Drawings and Schematics

- Cleveland Electric Illuminating Company, Perry Nuclear Power Plant. Final Plant Site Topography, Rev G.
- Cleveland Electric Illuminating Company, Perry Nuclear Power Plant. Offshore Multiport Intake Structure, Rev I. 1978.
- Cleveland Electric Illuminating Company, Perry Nuclear Power Plant. Plan and Profile Intake Tunnel, Rev E. Nov 1986.
- Perry Nuclear Power Plant. Final Plant Layout Service Water Pump House. Drawing 015-0015-00000.
- Envirex. Cleveland Electric Illuminating Company, Perry Nuclear Power Plant. General Arrangement of Two Rex Four Post Type Traveling Water Screen 8'-0 Basket. Drawing H84217-1. 1976.
- Envirex. Cleveland Electric Illuminating Company, Perry Nuclear Power Plant. Notes and Specifications for Rex Traveling Water Screen. Drawing H84217-3. 1976.
- Perry Nuclear Power Plant. Water Flow Diagram. Revised March 29, 2016.

# ATTACHMENT A
# LOCATIONAL MAPS


| | | |
|---|---|---|
| AECOM | Job: 60416388 | Figure 1<br>Perry Nuclear Generating Station - Aerial Map |
| | Prepared by: Marie Tarnowski | |
| 625 West Ridge Pike, Suite E-100<br>Conshohocken, PA 19428<br>Phone: (215) 367-2500 Fax: (215) 367-1000 | Checked by: | 1,000 500 0 1,000 Feet<br>1 inch = 900 feet |
| | Date: 3/7/2016 | |

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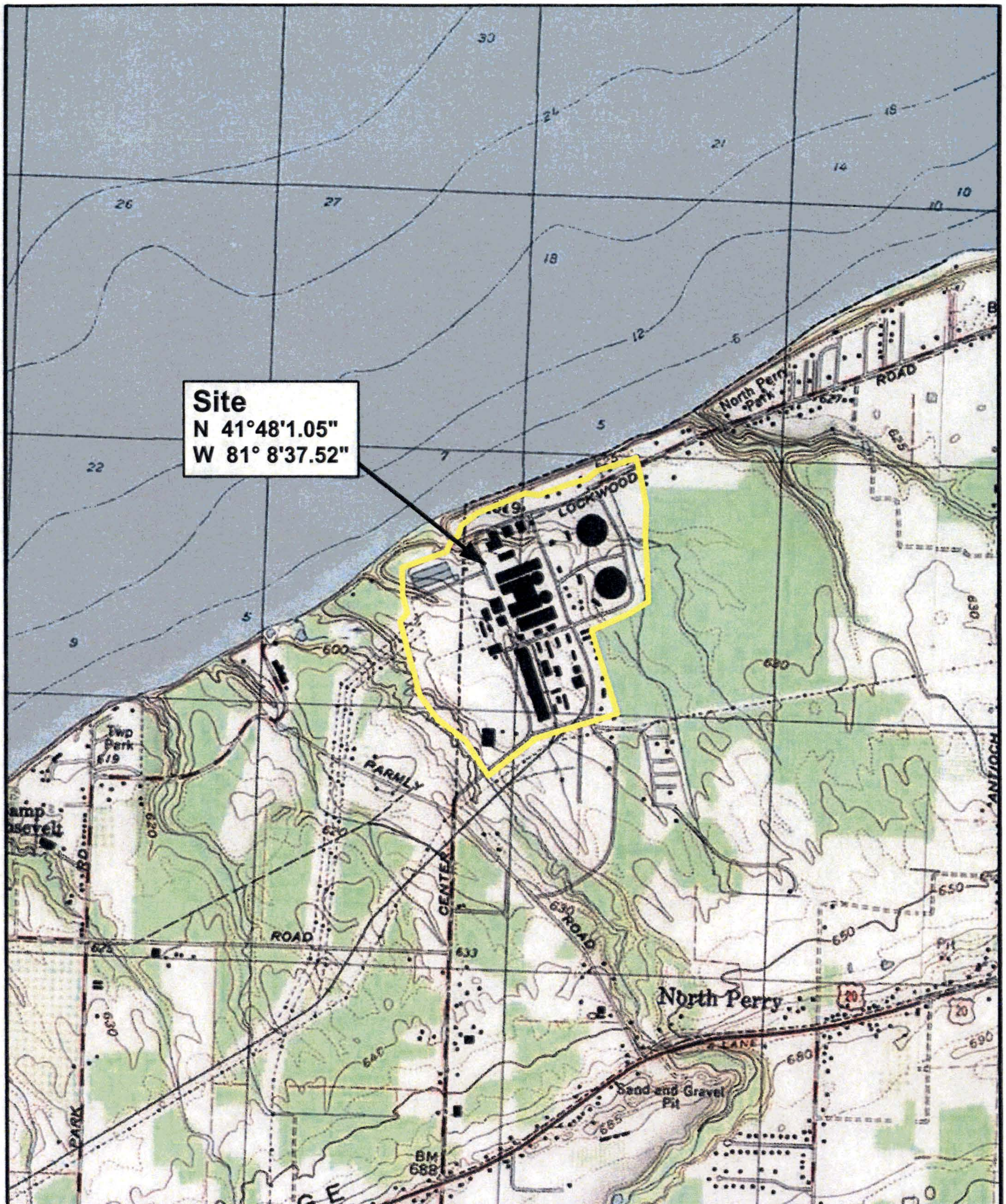
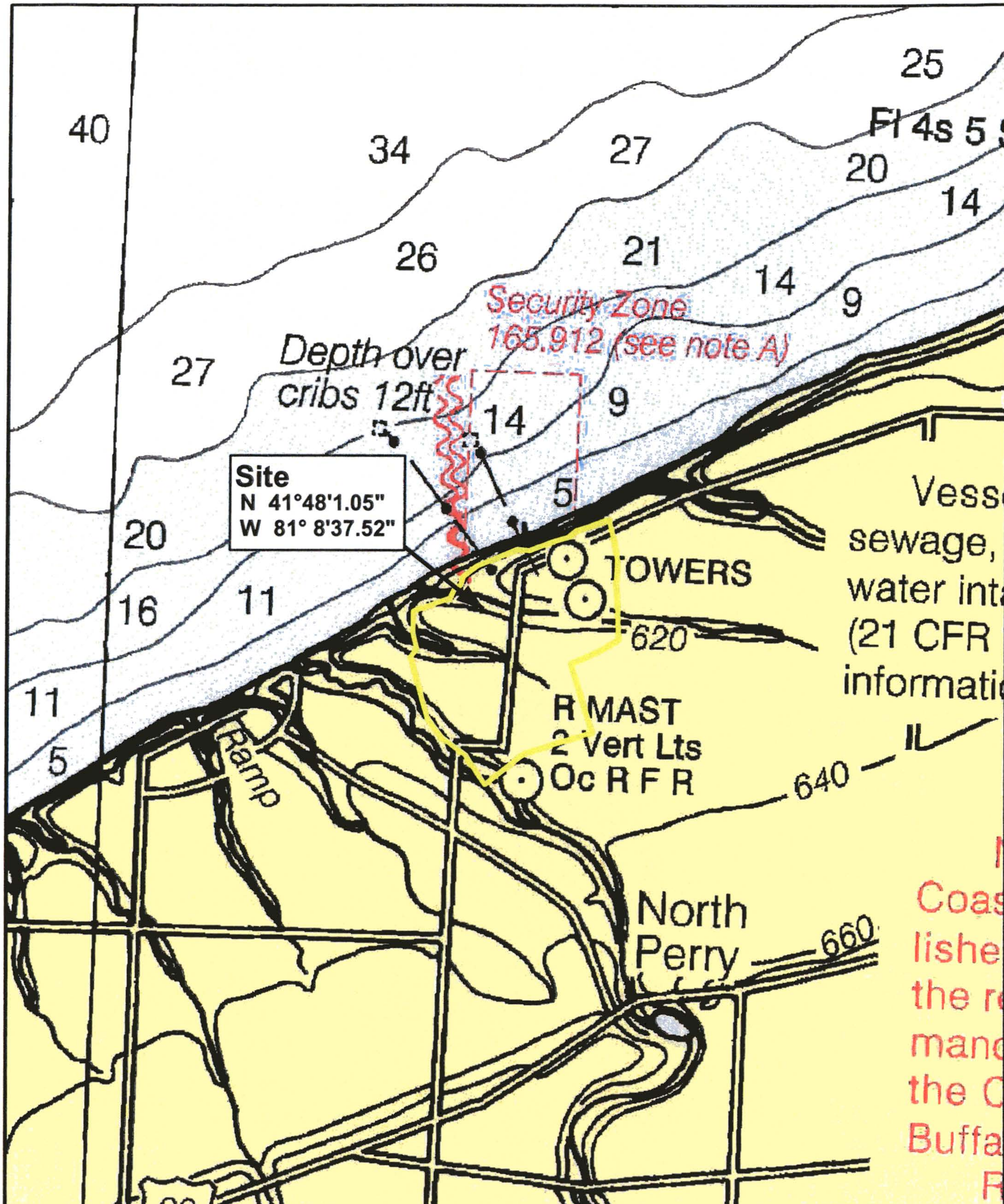



| AECOM | Job: 60416388 | Figure 2 Perry Nuclear Generating Station Topographic Map |
|---|---|---|
| | Prepared by: Marie Tarnowski | |
| 625 West Ridge Pike, Suite E-100 Conshohocken, PA 19428 Phone: (215) 367-2500 Fax: (215) 367-1000 | Checked by: | 2,000 1,000 0 2,000 Feet |
| | Date: 3/7/2016 | 1 inch = 1,692 feet |

S:\Projects\Private-Sector\FirstEnergy\20000579_316b_Fleet\Data\Plant Info\Perry\122.21r\Locational Maps




| AECOM | Job: 60416388 | Figure 3<br>Perry Nuclear Generating Station<br>Navigation Map |
|---|---|---|
| | Prepared by: Marie Tarnowski | |
| 625 West Ridge Pike, Suite E-100<br>Conshohocken, PA 19428<br>Phone: (215) 367-2500 Fax: (215) 367-1000 | Checked by: | 2,400 1,200 0 2,400 Feet |
| | Date: 3/7/2016 | 1 inch = 2,033 feet |

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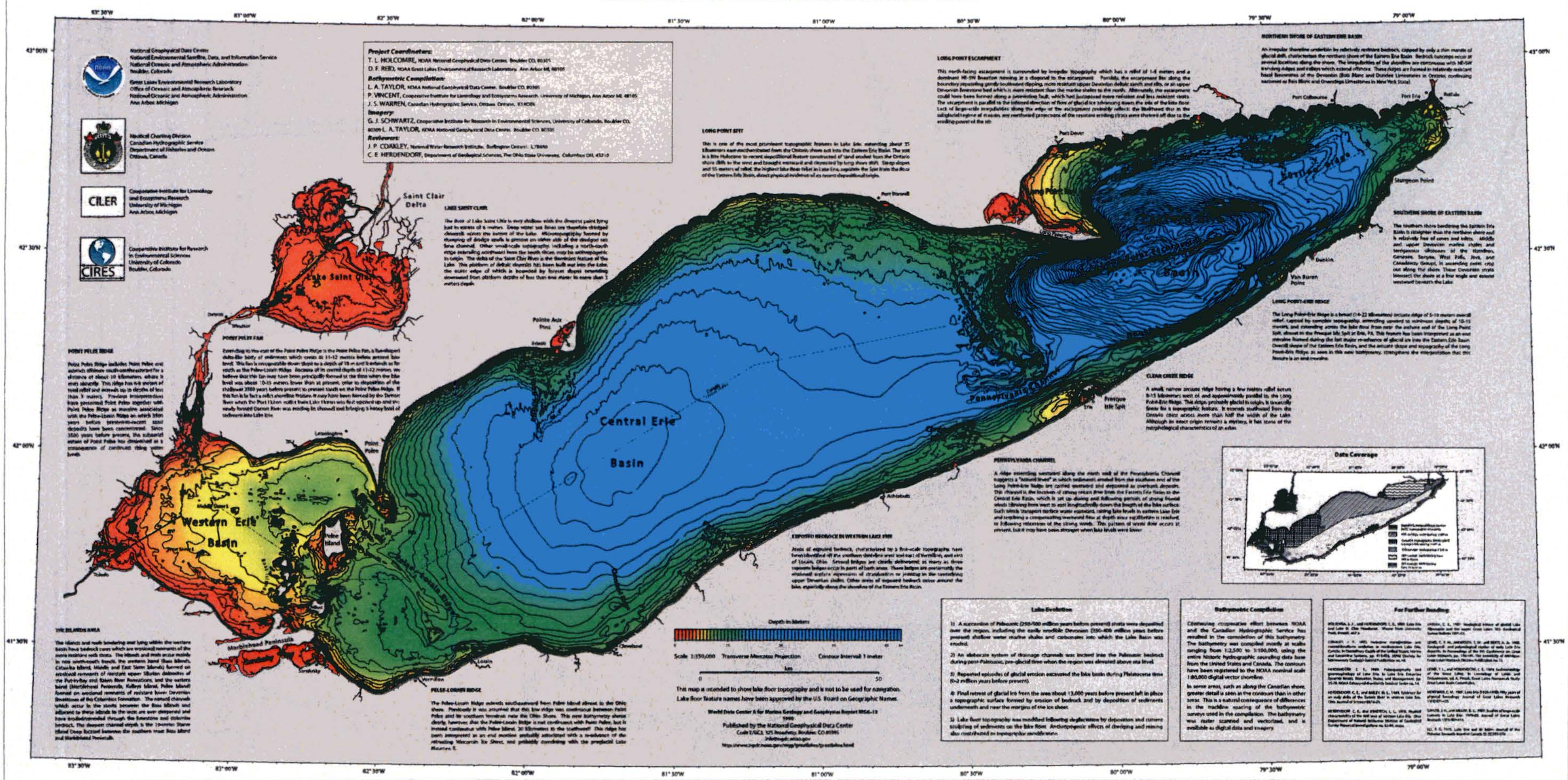
# BATHYMETRY OF LAKE ERIE AND LAKE SAINT CLAIR



# ATTACHMENT B
# CALCULATIONS

# FirstEnergy
# Perry Nuclear Power Plant

## Area of Influence Calculations

**Design Inputs:**

| | | | |
|---|---|---|---|
| Design Intake Flow | 101.5 | Million Gallons per Day, MGD | (Ref 1) |
| | 157.1 | Cubic Feet per Second, CFS | |
| Actual Intake Flow | 101.2 | MGD | (Ref 2) |
| | 156.6 | CFS | |
| Number of Intakes | 2 | Velocity caps | (Ref 3, 4) |
| Openings per Intake | 8 | Openings per cap | (Ref 5) |
| Width of Each Opening | 12 | Feet, FT | (Ref 3, 5) |
| Height of Each Opening | 3.6 | FT | (Ref 3, 5) |
| Area of Each Opening | 43 | Square Feet, SQ FT | (Calculated) |
| Open Area per End Cap | 346 | SQ FT | (Calculated) |
| Total Open Area | 691 | SQ FT | (Calculated) |

**Assumptions:**

1. All pumps, screens, and ports are in continuous service and function similarly.
2. Flow rates are pump design maximum and are most conservative.
3. DIF does not include screen wash water or fire service water use.

**References:**


1. FirstEnergy. 2016. Electronic communication between FirstEnergy and AECOM staff. 11 Feb 2016.
2. FirstEnergy. 2016. Daily service water flow from January 2013 through 18 Apr 2016.
3. USNRC. 1982. Final Environmental Statement related to the operation of Perry Nuclear Power Plant, Units 1 and
4. Cleveland Electric Illuminating Company. 1986. Dwg No. D-726-201. Rev E. Plan and Profile: Intake Tunnel. Perry Nuclear Power Plant. 11 Nov 1986.
5. Cleveland Electric Illuminating Company. 1986. Dwg No. D-726-210. Rev M. Offshore Multiport Intake Structure. Perry Nuclear Power Plant. 11 Nov 1986.


**Calculation:**

Area of Each Opening = (Opening Width x Opening Height)

Total Open Area = (Area of Each Opening x Number of Openings per Intake) x (Number of Intakes)

Area of Influence = (Withdrawal Rate) / (Total Open Area)

| | |
|---|---|
| **Design Intake Flow - Velocity at Front of Intake** | **0.23 FPS** |
| **Actual Intake Flow - Velocity at Front of Intake** | **0.23 FPS** |

**Prepared By:**


**AECOM**
Conshohocken, PA
June 2016

**AECOM**
Conshohocken, PA

**FirstEnergy**
**Perry Nuclear Power Plant**
**CWA 316(b)**

**THROUGH-SCREEN VELOCITIES**

**PREPARED FOR**

**FirstEnergy**
**Perry Nuclear Power Plant**

| | |
|---|---|
| **Prepared By:** | **Date:** |
| Wade Cope<br>Staff Engineer | 6/23/2016 |
| **Reviewed By:** | **Date:** |
| Ishan Jain<br>Staff Engineer | 6/23/2016 |
| **Approved By:** | **Date:** |
| Joella Posey<br>Principal Engineer | 6/23/2016 |

| Rev. | Date | Prepared by | Reviewed by | Approved by |
|---|---|---|---|---|
| 0 | 6/23/2016 | WC | IJ | JP |
| | | | | |

**CWA 316 (b) Project**

**THROUGH-SCREEN VELOCITIES**

**Calculation Purpose:**

1. Calculate the design and actual through-screen velocities for the cooling water intake structure.
2. Determine if CWA 316(b) performance standards for impingement mortality are met.

**Calculation Objectives:**

1. Identify the screen physical parameters and intake flow rates.
2. Calculate the proportion of open screen area to screen surface area.
3. Calculate the design and actual through-screen velocities.

**System Description:**
Perry Nuclear Power Plant's cooling water intake structure (CWIS) serves to provide a supply of water from Lake Erie to the facility. The CWIS includes the use of two end caps approximately 2,650-feet away from shore, a tunnel between the end caps and the onshore screenhouse, as well as two traveling water screens. The end caps are circular with a 36-foot diameter; the openings are 12-feet wide by approximately 3.6-feet high. The end caps are submerged under low water conditions. Water passes through the caps to a tunnel, which transports water into the onshore screenhouse. The screenhouse incorporates the use of two traveling water screens, each with 8-foot wide baskets and 3/8-inch square mesh openings.

**Calculation Methodology:**

The through-screen velocity will be calculated using the following formulas adapted from Pankrantz, 1988.

V = Q / WD * OA * TW * K **(Formula 1)**

where:

Q = flow rate in gallons per minute (gpm)
V = through-screen velocity in feet per second (fps)
WD = water depth in feet (ft)
OA = proportion of screen open area to total screen area
TW = nominal screen tray width in ft
K = constant = 396 for through-flow screen, or 740 for dual-flow screen

and OA = (W x L) / ((W + D) * (L + d)) **(Formula 2)**

where:

d = screen horizontal (shute) wire diameter in inches (in)
D = screen vertical (warp) wire diameter (in)
W = width of screen opening (in)
L = vertical length of screen opening (in)

Impingement mortality standard will be met if the through-screen velocity is equal to or less than 0.5 feet per second.

**CWA 316 (b) Project**
**THROUGH-SCREEN VELOCITIES**

**Design Inputs:**

| 1. a. Design Intake Flow | | | (Rated Capacity) | Operating | | |
|---|---|---|---|---|---|---|
| Design Water Withdrawal Rate | 101.5 | MGD | | 70,500 | GPM | |
| Service Water Pump | 33.8 | MGD | (23,500) | 23,500 | GPM | (Ref 1) |
| Service Water Pump | 33.8 | MGD | (23,500) | 23,500 | GPM | (Ref 1) |
| Service Water Pump | 33.8 | MGD | (23,500) | 23,500 | GPM | (Ref 1) |
| Emergency Service Water Pump Loops A and B | - | MGD | (12,900) | - | GPM | (Ref 1) |
| Emergency Service Water Pump Loops A and B | - | MGD | (12,900) | - | GPM | (Ref 1) |
| Emergency Service Water Pump Loop C | - | MGD | (900) | - | GPM | (Ref 1) |
| Diesel Fire Service Pump | - | MGD | (2,500) | - | GPM | (Ref 1) |
| Motor Fire Service Pump | - | MGD | (2,500) | - | GPM | (Ref 1) |
| Fire Service Jockey Pump | - | MGD | (50) | - | GPM | (Ref 1) |
| Total | 101.5 | MGD | | 70,500 | GPM | |
| | 157.1 | CFS | | | | |
| **1. b. Actual Intake Flow** | | | | | | |
| Actual Intake Flow | 101.2 | MGD | | 70,296 | GPM | (Ref 2) |
| | 156.6 | CFS | | | | |

| | | | |
|---|---|---|---|
| 2. Number of screens | 2 | | (Ref 3) |
| 3a. Design Water Withdrawal Rate (per screen) | 35,250 | GPM | |
| 3b. Actual Water Withdrawal Rate (per screen) | 35,148 | GPM | |
| 4. Screen Width | 8.0 | feet | (Ref 4) |
| 5. Floor Elevation - at TWS | 544.6 | feet | (Ref 3) |
| Floor Elevation - in forebay | 544.6 | feet | (Ref 3) |
| 6. Waterbody Elevation -high in screenhouse | 575.3 | feet | (Ref 4) |
| Waterbody Elevation -low in screenhouse | 567.3 | feet | (Ref 4) |
| 7. Water Height (Depth) -TWS high WL | 30.8 | feet | (Calculated) |
| Water Height (Depth) -TWS low WL | 22.8 | feet | (Calculated) |
| Water Height (Depth) -in forebay high WL | 30.8 | feet | (Calculated) |
| Water Height (Depth) -in forebay low WL | 22.8 | feet | (Calculated) |
| 8. Mesh Size (Square) | 0.375 | inch | (Ref 5) |
| 9. Wire Size - shute and warp | 14 | Gauge W&M | (Ref 5) |
| 10. Wire Width | 0.080 | inch | (Ref 5) |
| 11. Intake Width | 64 | feet | (Ref 3) |
| 12. TWS Port Width | 9.2 | feet | (Ref 3) |

**Assumptions:**

1. No changes to as-built configuration after dates of references used.
2. All intake screens are normally in service.
3. The constant for Formula 1 includes units conversion (gpm to cfs) and screen efficiency factors.
4. The design flow is conservative assuming that all pumps are operating 24 hours per day.
5. The actual intake flow is based on average flow from the references.
6. The wire size is Washburn & Moen gauge.
7. Forebay velocity is just outside of TWS ports in screenhouse.
8. Intake, screen, and TWS port widths are estimated from the references.
9. Water elevation inside screenhouse is not the same as waterbody. Screenhouse is onshore.
10. Design intake flow does not include fire service or screen wash pumps.

**References Used:**


1) FirstEnergy. 2016. Electronic communication between FirstEnergy and AECOM staff. 11 Feb 2016.
2) FirstEnergy. 2016. Daily service water flow from January 2013 through 18 Apr 2016.
3) Perry Nuclear Power Plant. Dwg No. 015-0015-00000. Final Plant Layout Service Water Pump House.
4) Envirex. 1976. Dwg: H84217-1. General Arrangement of Two Rex Four Post Type Traveling Water Screen 8'-0 Basket. 1976.
5) Envirex. 1976. Dwg: H84217-3. Notes and Specifications for Rex Traveling Water Screen. 1976.

**CWA 316 (b) Project**

**THROUGH-SCREEN VELOCITIES**

**Summary and Conclusions:**

**Design Intake Flow:**

| | | |
|---|---|---|
| 1. The calculated design through-screen velocity for the CWIS is | **0.53 fps** | (HighWL) |
| | **0.72 fps** | (Low WL) |
| 2. The calculated velocity in the forebay of the intake structure is | **0.08 fps** | (HighWL) |
| | **0.11 fps** | (Low WL) |
| 3. The calculated velocity in each TWS port is | **0.28 fps** | (HighWL) |
| | **0.38 fps** | (Low WL) |

**Actual Intake Flow:**

| | | |
|---|---|---|
| 1. The calculated actual through-screen velocity for the CWIS is | **0.53 fps** | (HighWL) |
| | **0.72 fps** | (Low WL) |
| 2. The calculated velocity in the forebay of the intake structure is | **0.08 fps** | (HighWL) |
| | **0.11 fps** | (Low WL) |
| 3. The calculated velocity in each TWS port is | **0.28 fps** | (HighWL) |
| | **0.38 fps** | (Low WL) |

**CWA 316 (b) Project**

**THROUGH-SCREEN VELOCITIES**

**Calculations:**

**1. Screen Physical Parameters and Intake Flow Rates**

**Formulas Used:**
none

**Given:**

| | DIF | | AIF | |
|---|---|---|---|---|
| Q= | 35,250 | GPM per screen | 35,148 | GPM per screen |
| D=d= | 0.0800 | in | 0.0800 | in |
| W=L= | 0.375 | in | 0.375 | in |
| high WD= | 30.8 | ft | 30.8 | ft |
| low WD= | 22.8 | ft | 22.8 | ft |
| K= | 396 | | 396 | |
| TW= | 8.0 | ft | 8.0 | ft |

**Calculate:**
N/A

**2. Proportion of Open Screen Area to Total Screen Area**

**Formulas Used:**
Formula 2

**Given:**
screen parameters as above

**Calculate:**

OA = (W x L) / ((W + D) * (L + d)) = **0.6793**

**3. Through-screen Velocities**

**Formulas Used:**
Formula 1

**Given:**
screen parameters as above and calculated screen open area proportion

**Calculate:**

V = Q / WD * OA * TW * K =

| DIF | | | AIF | | |
|---|---|---|---|---|---|
| **0.53** | fps | high WL | **0.53** | fps | high WL |
| **0.72** | fps | low WL | **0.72** | fps | low WL |

CWA 316 (b) Project

THROUGH-SCREEN VELOCITIES

**Calculations:**

**4. Velocity in Forebay**

**Formulas Used:**

Area at Face of Intake Structure = (Intake Width) x (Water Depth)
Velocity = (Withdrawal Rate) / (Area at Face of Intake Structure)

**Given:**

parameters as in input section

**Calculate:**

| | DIF | | | AIF | | |
|---|---|---|---|---|---|---|
| Area of Intake Structure = | 1968 | $ft^2$ | high WL | 1968 | $ft^2$ | high WL |
| Velocity = | 0.08 | fps | | 0.08 | fps | |
| | 1456 | $ft^2$ | low WL | 1456 | $ft^2$ | low WL |
| | 0.11 | fps | | 0.11 | fps | |

**5. Velocity in Traveling Water Screen Port**

**Formulas Used:**

Area of TWS Port = (TWS Port Width) x (Water Depth)
Velocity = (Withdrawal Rate) / (Area of TWS Port)

**Given:**

parameters as in input section

**Calculate:**

| | DIF | | | AIF | | |
|---|---|---|---|---|---|---|
| Area of TWS Port = | 282 | $ft^2$ | high WL | 282 | $ft^2$ | high WL |
| Velocity = | 0.28 | fps | | 0.28 | fps | |
| | 209 | $ft^2$ | low WL | 209 | $ft^2$ | low WL |
| | 0.38 | fps | | 0.38 | fps | |

# FirstEnergy
# Perry Nuclear Power Plant

## Percent Flow Reduction Calculation

**Design Inputs:**

| | | | | |
|---|---|---|---|---|
| Plant Circulating Water (CW) Flow: | 784.8 | MGD | Design | (Ref 1) |
| | 545,000 | gpm | Averge Circ. Water flow | (Ref 1) |
| Total Make-Up (MU) Water: | 101.5 | MGD | Design Intake Flow | (Ref 2) |
| | 54.6 | MGD | Actual Intake Flow | (Ref 3) |

**Assumptions:**

1. All pumps, screens, and ports are in continuous service and function similarly.
2. Flow rates are pump design maximum and are most conservative.
3. Plant CW Flow and DIF does not include screen wash water or fire service water use.

**References:**


1. USNRC. 1982. Final Environmental Statement related to the operation of Perry Nuclear Power Plant, Units 1 and 2. Docket Nos. 50-440 and 50-441. Office of Nuclear Reactor Regulation. NUREG-0884, August 1982.
2. FirstEnergy. 2016. Electronic communication between FirstEnergy and AECOM staff. 11 Feb 2016.
3. FirstEnergy. 2016. Daily service water flow from January 2013 through 18 Apr 2016.


**Calculation:**

MU Water as a Percent of Plant CW = (Total MU Water / Plant CW) X 100
Percent Reduction = 100% - MU Water as a Percent of Plant CW

**Design Intake Flow**

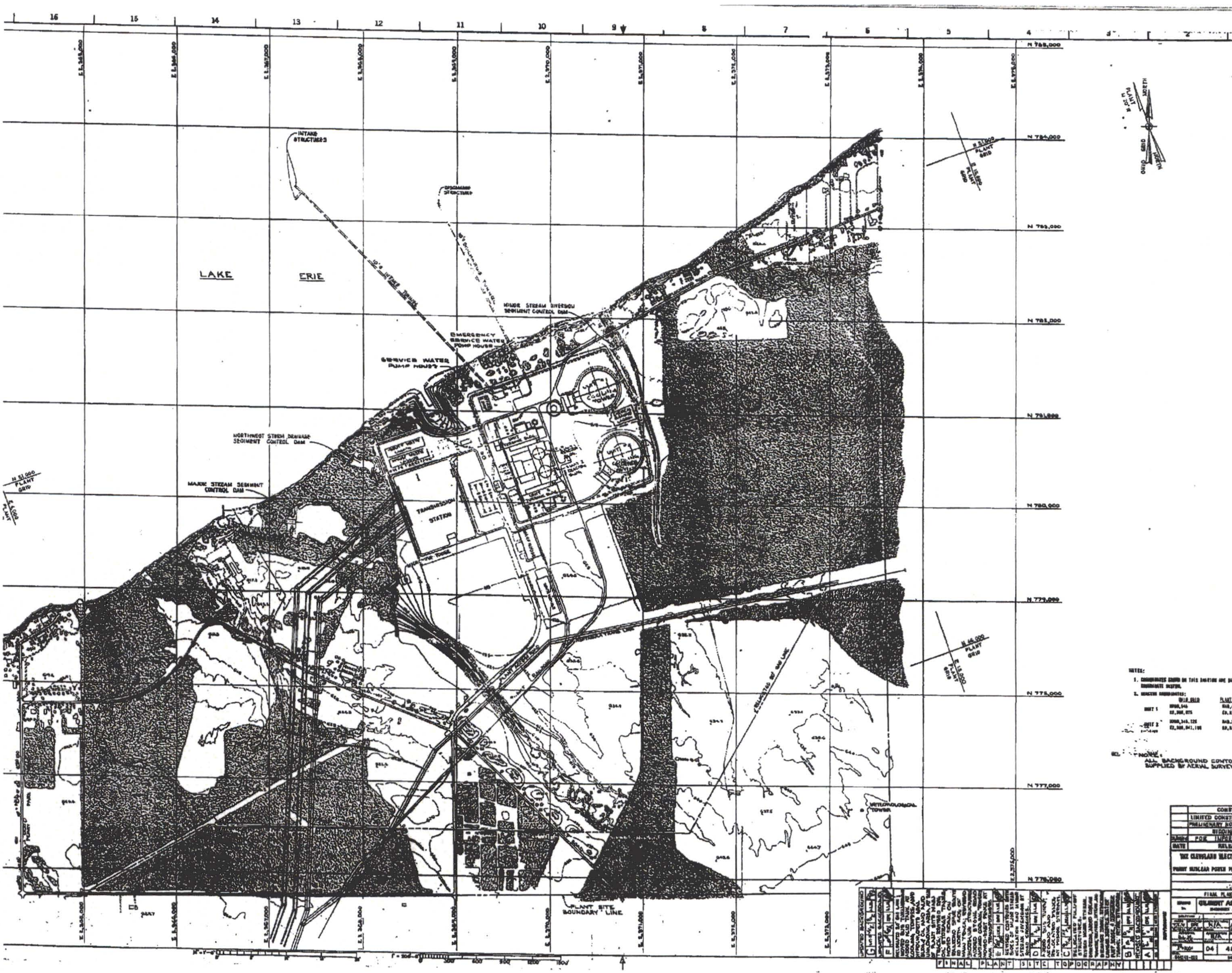
| | |
|---|---|
| MU Water as a Percent of Plant CW: | 12.9% |
| **Percent Reduction:** | **87.1%** |

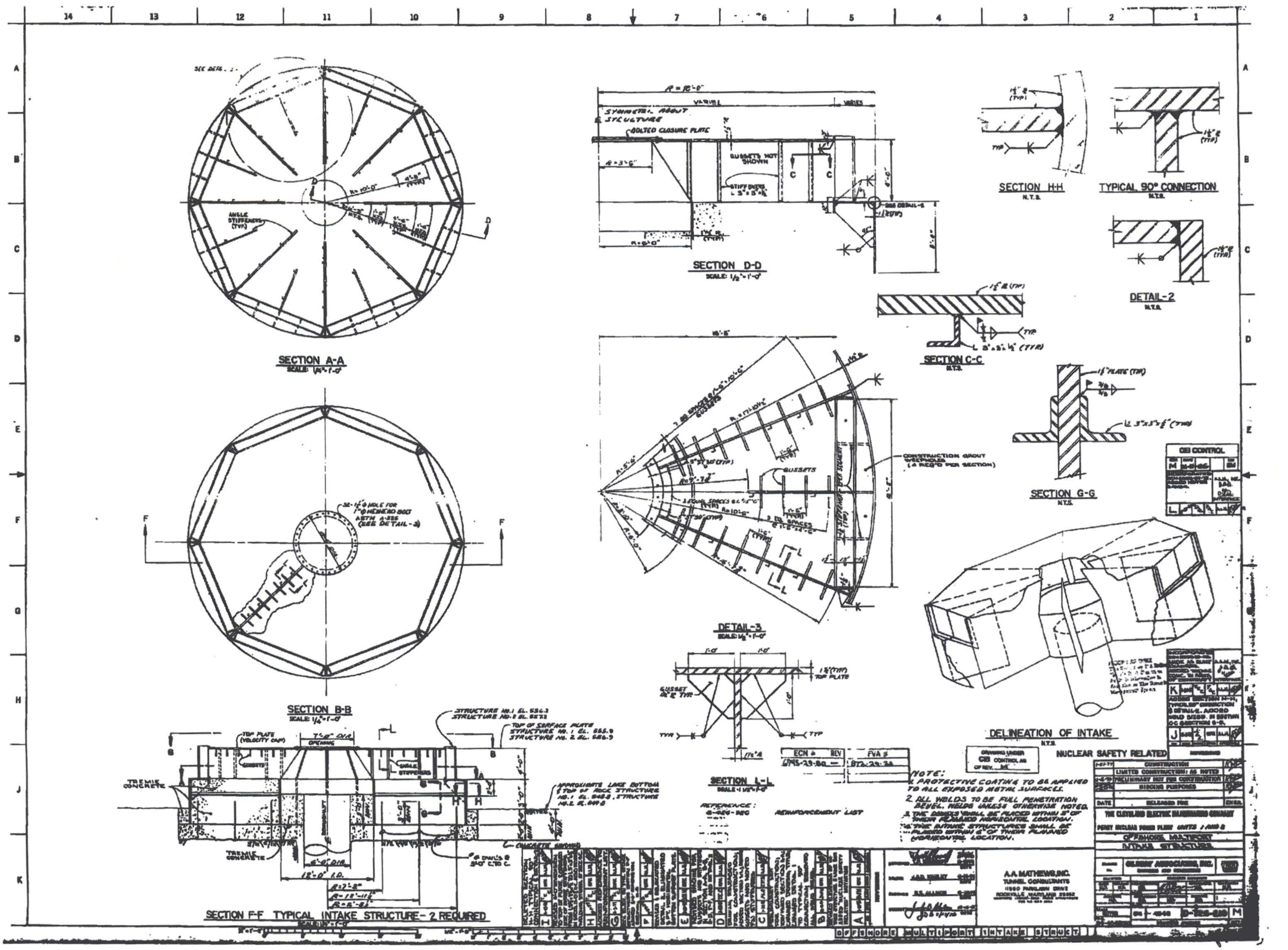
**Actual Intake Flow**

| | |
|---|---|
| MU Water as a Percent of Plant CW: | 7.0% |
| **Percent Reduction:** | **93.0%** |

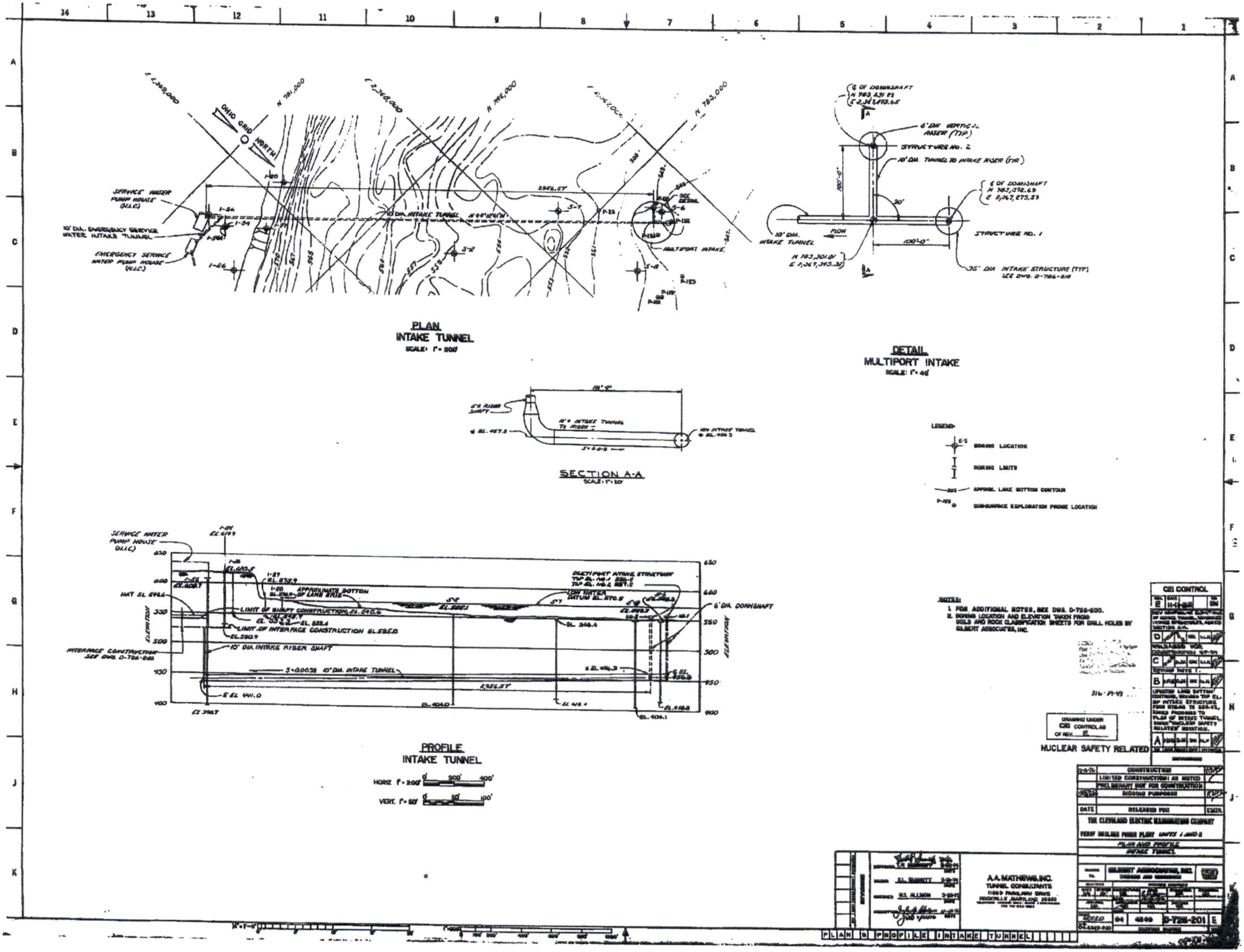
**Prepared By:**


**AECOM**
Conshohocken, PA
June 2016

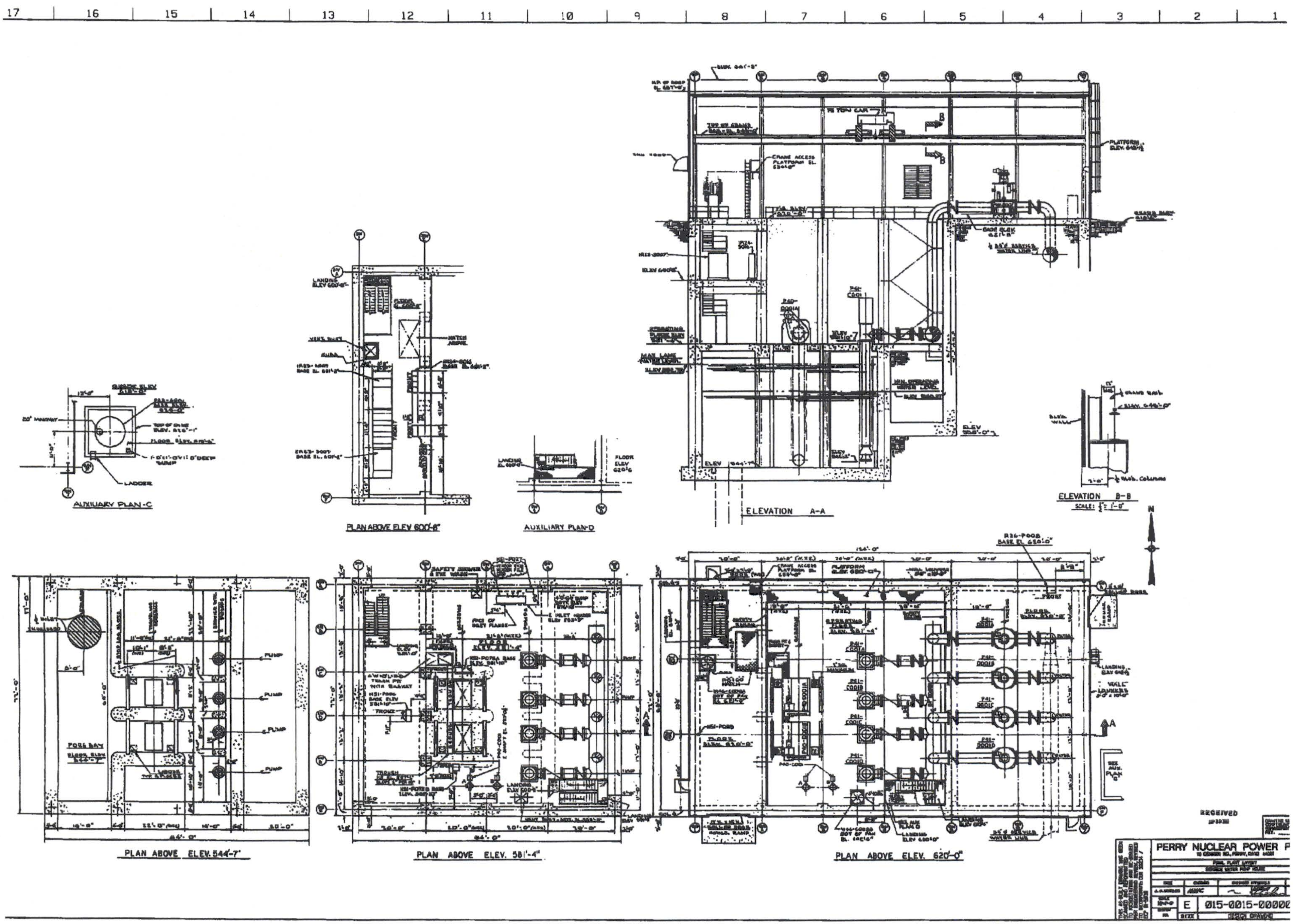

LAKE
ERIE
INTAKE STRUCTURES
DISCHARGE STRUCTURE
MINOR STREAM DIVERSION SEDIMENT CONTROL DAM
EMERGENCY SERVICE WATER PUMP HOUSE
SERVICE WATER PUMP HOUSE
NORTHWEST STREAM DRAINAGE SEDIMENT CONTROL DAM
MAJOR STREAM SEDIMENT CONTROL DAM
TRANSMISSION STATION
METEOROLOGICAL TOWER
PLANT SITE BOUNDARY LINE
PLANT NORTH
N 785,000
N 784,000
N 783,000
N 782,000
N 781,000
N 780,000
N 779,000
N 778,000
N 777,000
N 776,000
NOTES:
NOTE: ALL BACKGROUND CONTOURS SUPPLIED BY AERIAL SURVEYS
THE CLEVELAND ELECTRIC
FINAL PLANT SITE TOPOGRAPHY

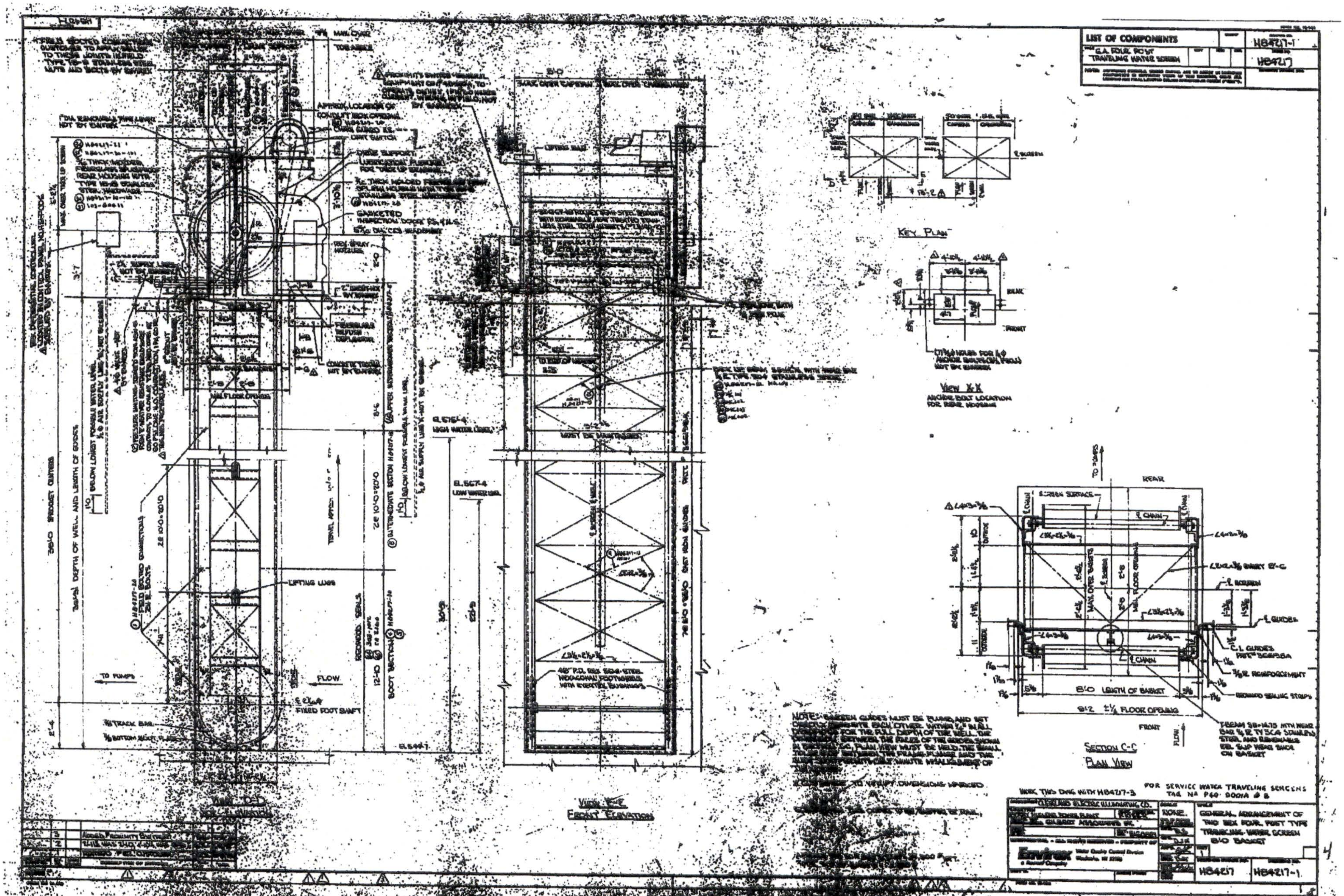


SECTION A-A
SCALE: 1/4"=1'-0"
SECTION B-B
SCALE: 1/4"=1'-0"
SECTION D-D
SCALE: 1/2"=1'-0"
SECTION H-H
N.T.S.
TYPICAL 90° CONNECTION
N.T.S.
DETAIL-2
N.T.S.
SECTION C-C
N.T.S.
SECTION G-G
N.T.S.
DETAIL-3
SCALE: 1/2"=1'-0"
SECTION L-L
SCALE: 1 1/2"=1'-0"
DELINEATION OF INTAKE
N.T.S.
SECTION F-F TYPICAL INTAKE STRUCTURE - 2 REQUIRED
NUCLEAR SAFETY RELATED
CEI CONTROL
ANGLE STIFFENERS (TYP)
BOLTED CLOSURE PLATE
GUSSETS NOT SHOWN
SYMMETRICAL ABOUT ℄ STRUCTURE
CONSTRUCTION GROUT WEEPHOLES (4 REQ'D PER SECTION)
GUSSETS
TREMIE CONCRETE
TOP PLATE (VELOCITY CAP)
OPENING
STRUCTURE NO. 1 EL. 586.3
STRUCTURE NO. 2 EL. 587.3
TOP OF SURFACE PLATE
STRUCTURE NO. 1 EL. 585.9
STRUCTURE NO. 2 EL. 586.9
APPROXIMATE LAKE BOTTOM & TOP OF ROCK STRUCTURE NO. 1 EL. 568.8, STRUCTURE NO. 2 EL. 569.8
REFERENCE:
REINFORCEMENT LIST
NOTE:
1. PROTECTIVE COATING TO BE APPLIED TO ALL EXPOSED METAL SURFACES.
2. ALL WELDS TO BE FULL PENETRATION BEVEL WELDS UNLESS OTHERWISE NOTED.
3. THE DOWELS SHALL BE PLACED WITHIN 3" OF THEIR PLANNED HORIZONTAL LOCATION.
4. THE INTAKE STRUCTURES SHALL BE PLACED WITHIN 6" OF THEIR PLANNED HORIZONTAL LOCATION.
ECN # | REV | FVA #
6745-23-80
CONSTRUCTION
LIMITED CONSTRUCTION: AS NOTED
PRELIMINARY NOT FOR CONSTRUCTION
BIDDING PURPOSES
DATE
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNITS 1 AND 2
OFFSHORE MULTIPORT INTAKE STRUCTURE
GILBERT ASSOCIATES, INC.
A.A. MATHEWS, INC.
TUNNEL CONSULTANTS
OFFSHORE MULTIPORT INTAKE STRUCT

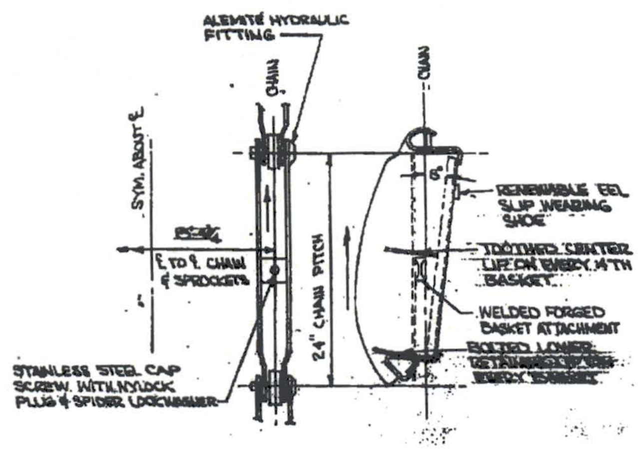


PLAN
INTAKE TUNNEL
SCALE: 1" = 200'
OHIO GRID NORTH
SERVICE WATER PUMP HOUSE (U.L.C.)
10' DIA. EMERGENCY SERVICE WATER INTAKE TUNNEL
EMERGENCY SERVICE WATER PUMP HOUSE (U.L.C.)
10' DIA. INTAKE TUNNEL
MULTIPORT INTAKE
DETAIL
MULTIPORT INTAKE
SCALE: 1" = 40'
6' DIA. VERTICAL RISER (TYP.)
STRUCTURE NO. 2
STRUCTURE NO. 1
10' DIA. TUNNEL TO INTAKE RISER (TYP.)
10' DIA. INTAKE TUNNEL
FLOW
35' DIA. INTAKE STRUCTURE (TYP.) SEE DWG. D-726-210
SECTION A-A
LEGEND:
BORING LOCATION
BORING LIMITS
APPROX. LAKE BOTTOM CONTOUR
SUBSURFACE EXPLORATION PROBE LOCATION
NOTES:
1. FOR ADDITIONAL NOTES, SEE DWG. D-726-200.
2. BORING LOCATION AND ELEVATION TAKEN FROM SOILS AND ROCK CLASSIFICATION SHEETS FOR DRILL HOLES BY GILBERT ASSOCIATES, INC.
PROFILE
INTAKE TUNNEL
SERVICE WATER PUMP HOUSE (U.L.C.)
APPROXIMATE BOTTOM OF LAKE ERIE
LIMIT OF SHAFT CONSTRUCTION
LIMIT OF INTERFACE CONSTRUCTION
10' DIA. INTAKE RISER SHAFT
INTERFACE CONSTRUCTION SEE DWG. D-726-200
10' DIA. INTAKE TUNNEL
MULTIPORT INTAKE STRUCTURE
LOW WATER DATUM
6' DIA. DOWNSHAFT
ELEVATION
2,956.57'
HORIZ. 1" = 200'
VERT. 1" = 50'
CEI CONTROL
DRAWING UNDER CEI CONTROL AS OF REV. E
NUCLEAR SAFETY RELATED
CONSTRUCTION
LIMITED CONSTRUCTION: AS NOTED
PRELIMINARY NOT FOR CONSTRUCTION
BIDDING PURPOSES
DATE
RELEASED FOR
ENGR.
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNITS 1 AND 2
PLAN AND PROFILE
INTAKE TUNNEL
GILBERT ASSOCIATES, INC.
A.A. MATHEWS, INC.
TUNNEL CONSULTANTS
11000 PARKLAWN DRIVE
ROCKVILLE, MARYLAND 20852
R.S. ALLISON
NOTED
4549
D-726-201 E
PLAN & PROFILE INTAKE TUNNEL


ELEVATION A-A
ELEVATION B-B
AUXILIARY PLAN-C
PLAN ABOVE ELEV 600'-6"
AUXILIARY PLAN-D
PLAN ABOVE ELEV. 544'-7"
PLAN ABOVE ELEV. 581'-4"
PLAN ABOVE ELEV. 620'-0"
PUMP
FORE BAY
RECEIVED
PERRY NUCLEAR POWER P
E
015-0015-00000

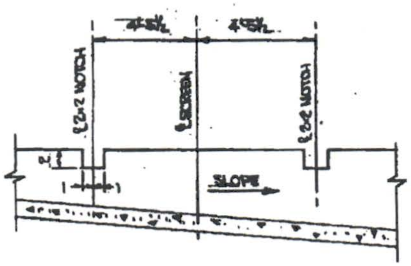

LIST OF COMPONENTS
G.A. FOUR POST TRAVELING WATER SCREEN
H84217-1
H84217
KEY PLAN
VIEW X-X
ANCHOR BOLT LOCATION FOR REAR HOUSING
SECTION C-C
PLAN VIEW
REAR
FRONT
FLOW
TO PUMPS
8'-0 LENGTH OF BASKET
9'-2 ±1/4 FLOOR OPENING
VIEW E-E
FRONT ELEVATION
LIFTING LUGS
FIXED FOOT SHAFT
BOOT SECTION
INTERMEDIATE SECTION
38'-0 SPROCKET CENTERS
DEPTH OF WELL AND LENGTH OF GUIDES
EL. 567-4 LOW WATER LEVEL
EL. 576-4 HIGH WATER LEVEL
FOR SERVICE WATER TRAVELING SCREENS TAG No P60-D001A & B
WORK THIS DWG WITH H84217-3
CLEVELAND ELECTRIC ILLUMINATING CO.
GENERAL ARRANGEMENT OF TWO SEX FOUR POST TYPE TRAVELING WATER SCREEN 8'-0 BASKET
NONE
Envirex
H84217
H84217-1

H84217-3




DIRECTION OF TRAVEL FOR CHAIN & BASKETS WHEN FACING FRONT OF SCREEN


DIRECTION OF TRAVEL OF #RX1245 DRIVE CHAIN




VIEW B-B
NOTCHING OF CONCRETE REFUSE TROUGH

NOTE #1
THE CHAINS SHOULD BE ASSEMBLED OVER THE SPROCKETS, TO TRAVEL IN THE DIRECTION SHOWN. THE LARGE LIP OF THE BASKET ACTS AS A LIFTING SHELF, AND HENCE, IT IS AT THE BOTTOM, AS THE BASKET TRAVELS UPWARD. WHEN THE BASKETS ARE ERECTED ON THE CHAINS, THEY SHOULD BE BALANCED OR SOME MEANS PROVIDED FOR SNUBBING THE HEADSHAFT.

NOTE #2
THE SPRAY SYSTEM FOR ONE SCREEN WILL INCLUDE 14 REX SPRAY NOZZLES HAVING A TOTAL DISCHARGE OF 412 G.P.M. AT A LINE PRESSURE OF 80 P.S.I., OF 458 G.P.M. AT A LINE PRESSURE OF 100 P.S.I., SPRAY NOZZLES WILL BE HEAT TREATED TYPE 416 STAINLESS STEEL (24) 401-191-3
(24) H84217-6 MK100
(25) H84217-6 MK101

NOTE #3
44 BASKETS REQUIRED FOR ONE SCREEN. 24"P x 8-0 LG. #14 W&M (.080 DIA.) TY 304 STAINLESS STEEL WIRE SCREEN CLOTH WITH 3/8 SQ OPENINGS.
(26) #CL3265PPP REX CHABELCO CHAIN (503-1352-82 & 202)
116 LINEAR FEET OF CHAIN REQUIRED FOR ONE SCREEN.
BASKET WIRE CLAMP BARS TO BE TYPE 304 STAINLESS STEEL
BASKET WIRE BOLTS TO BE TYPE 18-8 STAINLESS STEEL

NOTE #4
EACH SCREEN WILL PASS APPROXIMATELY 70,500 G.P.M. AT LOW WATER DEPTH OF 22.75 FT IN THE INTAKE CHAMBER, THROUGH A CLEAN SCREEN SURFACE AT A VELOCITY OF 1.513 FPS. CUSTOMER TO PROVIDE LEVEL BASE ON WHICH REX SCREEN WILL REST. CUSTOMER TO PROVIDE PROTECTIVE GRILLAGE AT MOUTH OF INTAKE, IF REQUIRED.

| LIST OF COMPONENTS | | | | | H84217-3 |
|---|---|---|---|---|---|
| NOTES & SPECIFICATIONS FOR REX TRAVELING WATER SCREEN | 1 | | | | H84217 |
| NOTE: REFERENCE SYMBOLS, WHERE SHOWN, ARE TO ASSIST IN LOCATING COMPONENTS IN DIFFERENT VIEWS OF THIS DRAWING ONLY. ALL LENGTHS ARE FINAL LENGTHS UNLESS SPECIFIED AS ROUGH ("REF"). | | | | | |

DRIVE COMPONENTS:
(23) REDUCER: FALK 100 FZ (H84217-2)
RATIO 342.2:1 OUTPUT SPEED 4.9/1.2 RPM APPROX.
MOTOR: GENERAL ELECTRIC 7½/1⅞ HP 1800/450 RPM 460 VOLTS 3 PHASE 60 HERTZ TEFC ENCLOSURE 2 SPEED, 2 WINDING, CONSTANT TORQUE, CLASS "B" INSULATION
COUPLING: FAST FORGED STEEL
DRIVE SPROCKET: #RX1245-18 T-10.62 P.D. CAST STEEL SPROCKET WITH DOUBLE SHEAR PIN DEVICE & LIMIT SWITCH
DRIVEN SPROCKET: #RX1245-42 T 54.36 P.D. CAST STEEL SPROCKET
(27) DRIVE CHAIN: #RX1245 REX CHABELCO
CHAIN GUARD: 14 GA STEEL WITH OIL RESERVOIR
CONTROL PANEL NO. HSI-P006 PER SP-315-4549-00
MOTOR STARTERS: NOT BY ENVIREX
CHAIN TENSION [illegible] WITH LOAD [illegible] ON EACH SCREEN.
[illegible]
CONTROL [illegible]
[illegible] WITH 2 N.O. & 2 N.C. CONTACTS.

PAINT NOTE:
BRASS, BRONZE, STAINLESS OR GALVANIZED MATERIAL WILL NOT BE PAINTED.
CHAINS WILL RECEIVE A COATING OF SLUSHING COMPOUND.
HEAD & FOOT SHAFTING WILL BE GIVEN A SHOP COAT OF MOBIL ARMA 633. MOTORS, REDUCERS, WILL REMAIN MANUFACTURER'S STANDARD PAINT.

FIBERGLASS PARTS SUCH AS FRONT & REAR SPLASH HOUSINGS WILL BE MANUFACTURER'S STANDARD GRAY GEL-COAT COLOR. CAST IRON GUIDES IF REQUIRED WILL NOT BE PAINTED OR COATED.
BEFORE SHIPMENT WE WILL PREPARE METAL SURFACES ACCORDING TO OUR STANDARD SHOP PROCEDURE AND APPLY KOPPERS BITUMASTIC NO. 50, DRY FILM THICKNESS 16 MILS, TO THE MAIN FRAMES, CROSS SUPPORTS, HEADSECTION, BASKET FRAMES, SPRAY PIPE, HEAD SPROCKETS, FOOTWHEELS, TAKE UP BEARINGS, CAPSTANS, AND DRIVE AND DRIVEN SPROCKETS.
CHAINGUARD TO BE GIVEN ONE SHOP COAT OF BROWN ZINC CHROMATE IRON OXIDE PRIMER.

WORK THIS DWG WITH H84217-4

FOR SERVICE WATER TRAVELING SCREENS
TAG No P40-D001A & B

| REV. | | DESCRIPTION OF REVISION | BY | DATE |
|---|---|---|---|---|
| 2 | | REVISED PAINT NOTE | BLS | 4-7-78 |
| 1 | | REVISED PER CUSTOMER | BLS | 12-12-76 |

| | | |
|---|---|---|
| CUSTOMER: CLEVELAND ELEC. ILLUMINATING CO. | SCALE: NONE | TITLE: NOTES & SPECIFICATIONS FOR REX TRAVELING WATER SCREEN |
| PERRY NUCLEAR POWER PLANT | | |
| GILBERT ASSOCIATES INC. | BLS | |
| | DJK | |
| CONFIDENTIAL – ALL RIGHTS RESERVED – PROPERTY OF Envirex Water Quality Central Division Waukesha, WI 53186 a Rexnord Company | DJK | H84217 |
| | | H84217-3 |