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December 26, 1978

EF2 - 43669

Mr. Ronald L. Ballard, Chief
Environmental Projects Branch 1
Division of Site Safety and Environmental Analysis
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Ballard:

Subject: Enrico Fermi Atomic Power Plant, Unit 2,
Docket No. 50-341
Responses to NRC Environmental Review Questions

Enclosed are 20 copies of Detroit Edison's responses to the NRC's Environmental Review Questions enclosed in your letters of September 22, 1978 and November 30, 1978.

This information will be filed as Appendix A.4, Supplement 5 to the Environmental Report (Operating License) in January 1979.

With these responses, we anticipate that review of the Environmental Report and preparation of the Draft Environmental Statement will continue as scheduled.

Sincerely,

Wayne H. Jens

EFM/WHJ/dk
Enclosures

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## A.4 RESPONSES TO NRC ENVIRONMENTAL REVIEW QUESTIONS

Reference: 1. NRC letter Septembe: 22, 1978
2. NRC letter November 30, 1978

SITE LOCATION AND LAYOUT

1. (Section 2.1) Provide a more legible reproduction of Figure 2.1-4. (September 22, 1978)

RESPONSE

In accordance with NRC procedure RPOP 514, Revision 2, three (3) copies of Figure 2.1-4 "Aerial View of Fermi Site" are being submitted. This is a recent photograph taken in April 1978.

HYDROLOGY AND WATER USE

1. (Section 2.5.1.1) Supply the records of runoff from Swan Creek (p. 2.5-3). (September 22 1978)

1. (Section 2.5.1.1) Supply the available records of runoff from Swan Creek (p.2.5-3). (November 30, 1978)

RESPONSE

Refer to response to Question 1, Chemical Characteristics, (September 22, 1978).

HYDROLOGY AND WATER USE

2. (Section 5.1.1) If water is or will be withdrawn by the Fermi 2 intake, for use at the Fermi 1 site, what percentage of the total water withdrawn will be used at Fermi 1? Volume per unit time? What is the use of the water withdrawn for the Fermi 1 site? (September 22, 1978)

RESPONSE

None of the water withdrawn by Fermi 1 will be used by Fermi 2 when the plant is in operation. Conversely, none of the water withdrawn by Fermi 2 will be used by the Fermi 1 plant.

CHEMICAL CHARACTERISTICS

1. (Section 2.5.2.1.1) Supply chemical data for Swan Creek similar to those presented in Table 2.5.2. Describe the measurements and resulting data which support the statement that Swan Creek water ranges from hard to very hard. (p. 2.5-6) Supply evidence to support the statement on p. 2.5-7 of the ER-OL: "Free chlorine has not been identified (in stream water in the vicinity of the site) due to its unstable nature." Supply dissolved oxygen data for Swan Creek. (p. 1.5-7). (September 22, 1978)

1. (Section 2.5.2.1.1) If available supply chemical data for Swan Creek similar to those presented in Table 2.5.2. Describe the measurements and the resulting data which support the statement that Swan Creek water ranges from hard to very hard. (p.2.5-6). Supply evidence to support the statement on p. 2.5-7 of the ER-OL: "Free chlorine has not been identified (in stream water in the vicinity of the site) due to its unstable nature." (November 30, 1978).

RESPONSE

Tables 1 and 2 represent the most recent chemical data available for Swan Creek.

The data on Swan Creek water hardness are presented in Tables 3 and 4. Most data points fall within the USGS degrees of hardness listed on p. 2.5-6 as hard (121-180 mg/l) to very hard (greater than 180 mg/l). These results are consistent with data presented in Table 2.5-2 for other Michigan streams tributary to Lake Erie.

Free chlorine would not be found in stream water in the vicinity of the site. Due to its unstable nature, it would combine with other chemicals in the water.

Table 1

Analyses of Samples Collected at Miscellaneous Sites*
Chemical Analyses, Water Year 1971
(Note-Values Prefaced by the Letter "E" are Estimates)

| ATE | TIME | INSTANTANEOUS DISCHARGE (CFS) | DISSOLVED SILICA (SiO2) (MG/L) | DISSOLVED IRON (FE) (UG/L) | DISSOLVED CALCIUM (CA) (MG/L) | DISSOLVED MAGNESIUM (MG) (MG/L) | DISSOLVED SODIUM (NA) (MG/L) | DISSOLVED POTASSIUM (K) (MG/L) | BICARBONATE (HCO3) (MG/L) | CARBONATE (CO3) (MG/L) | DISSOLVED SULFATE (SO4) (MG/L) | DISSOLVED CHLORIDE (CL) (MG/L) | DISSOLVED FLUORIDE (F) (MG/L) | DISSOLVED NITRATE (NO3) (MG/L) | TOTAL ORTHO PHOSPHOROUS (P) (MG/L) | DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L) | HARDNESS (CA, MG) (MG/L) | NON CARBONATE HARDNESS (MG/L) | SPECIFIC CONDUCTANCE (MICROMHOS) | PH (UNITS) | TEMPERATURE (DEG C) | COLOR (PLATINUM COBALT UNITS) | TURBIDITY (JTU) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 04175508 - N. BR. SWAN C AT CARLETON DR. AT WALTZ, MI. (LAT 42 05 37 LONG 083 23 02.01) | | | | | | | | | | | | | | | | | | | | | |
| ug. 5 | | | | | | | | | | | | | | | | | | | | | | | |
| 971 | 1230 | .01 | - | - | - | - | - | 249 | 0 | E130 | 190 | - | E2.0 | - | - | 286 | 82 | 1500 | 8.1 | 17.5 | 35 | 0 |
| | | 04175512 - SWAN C AT GRAFTON RD NR CARLETON, MI. (LAT 4204 22 LONG 083 22 52) | | | | | | | | | | | | | | | | | | | | | |
| ept. 1 | | | | | | | | | | | | | | | | | | | | | | | |
| 1971 | 1035 | .08 | - | - | - | - | - | 176 | 0 | E85 | 84 | - | E5.5 | - | - | 220 | 76 | 500 | 7.1 | - | 20 | 4 |
| | | 04175516 - L. SWAN C AT SWEITZER RD NR CARLETON, MI. (LAT 42 02 28 LONG 083 20 45) | | | | | | | | | | | | | | | | | | | | | |
| ept. 1 | | | | | | | | | | | | | | | | | | | | | | | |
| 971 | 0950 | <.01 | - | - | - | - | - | 178 | 0 | E600 | 52 | - | E1.8 | - | - | 882 | 736 | 1500 | 8.1 | - | 40 | 6 |
| | | 04175517 - SWAN C AT BRANDON RD AT NEWPORT, MI. (LAT 42 00 12 LONG 083 18 02) | | | | | | | | | | | | | | | | | | | | | |
| ug. 31 | | | | | | | | | | | | | | | | | | | | | | | |
| 1971 | - | <.01 | - | - | - | - | - | 173 | 0 | E750 | 135 | - | E5.5 | - | - | 1060 | 918 | 2000 | 7.8 | 21.0 | 25 | 13 |

ater Resources Data for Michigan, 1971," Part 2, Water Quality Records, U.S. Department of Interior, Geological Survey

Table 2

Analyses of Samples Collected at Miscellaneous Sites
Chemical Analyses, Water Years 1972 to 1973*
(Note–Analyses Prefaced by the Letter "E" are Estimates Based on Field Analyses)

| TE | TIME | INSTANTANEOUS DISCHARGE (CFS) | DISSOLVED SILICA (SIO2) (MG/L) | DISSOLVED CALCIUM (CA) (MG/L) | DISSOLVED MAGNESIUM (MG) (MG/L) | DISSOLVED SODIUM (NA) (MG/L) | BICARBONATE (HCO3) (MG/L) | ALKALINITY AS CACO3 (MG/L) | DISSOLVED SULFATE (SO4) (MG/L) | DISSOLVED CHLORIDE (CL) (MG/L) | DISSOLVED FLUORIDE (F) (MG/L) | TOTAL NITRATE (N) (MG/L) | DISSOLVED NITRATE (N) (MG/L) | TOTAL ORTHO PHOSPHORUS (P) (MG/L) | DISSOLVED ORTHO PHOSPHORUS (P) (MG/L) | DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L) | HARDNESS (CA, MG) (MG/L) | NON CARBONATE HARDNESS (MG/L) | SPECIFIC CONDUCTANCE (MICROPHOS) | PH (UNITS) | TEMPERATURE (DEG C) | COLOR (PLATINUM COBALT UNITS) | TURBIDITY (JTU) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| y 23 | | | | | | | 04175155 - SWAN C AT SUMPTER RD NR CARLETON, MICH. (LAT 42 04 39 LONG 083 28 51.01) | | | | | | | | | | | | | | | | |
| 972 | 1735 | 4.4 | -- | -- | -- | -- | 254 | 208 | E120 | 58 | -- | E.52 | -- | -- | -- | -- | 356 | 150 | 700 | 7.7 | 11.5 | 70 | 3 |
| y 23 | | | | | | | 04175170 - DISBROW DR AT CARLETON WEST RD NR CARLETON, MICH. (LAT 42 05 05 LONG 083 25 53.01) | | | | | | | | | | | | | | | | |
| 972 | 1745 | 2.0 | -- | -- | -- | -- | 178 | 146 | E110 | 68 | -- | E.70 | -- | -- | -- | -- | 284 | 140 | 590 | 8.0 | 15.0 | 80 | 4 |
| h 15 | | | | | | | 04175172 - SWAN C AT CARLETON WEST RD NR CARLETON, MICH. (LAT 42 04 29 LONG 083 25 52.01) | | | | | | | | | | | | | | | | |
| 73 | 0805 | -- | 7.1 | 90 | 21 | 9.4 | 202 | 166 | 76 | 40 | .3 | 0.6 | -- | -- | -- | 414 | 310 | 140 | 600 | 7.3 | -- | 35 | 40 |
| y 24 | | | | | | | 04175180 - SWAN C AT GRAFTON RD NR CARLETON, MICH. (LAT 42 04 22 LG. 083 22 52.011 | | | | | | | | | | | | | | | | |
| 972 | 1820 | 7.4 | -- | -- | | -- | 250 | 205 | E100 | 63 | -- | E1.9 | -- | -- | -- | -- | 374 | 170 | 725 | 7.7 | 18.5 | 40 | 4 |
| y 16 | | | | | | | | | | | | | | | | | | | | | | | |
| 973 | 1120 | 1.6 | 7.1 | 110 | 20 | 22 | 228 | 187 | 130 | 65 | .6 | .66 | -- | -- | -- | 452 | 360 | 170 | 669 | 7.5 | 20.0 | 15 | 4 |
| y 24 | | | | | | | 04175195 - N B SWAN C AT CARLETON WEST RD NR WALTZ, MICH. (LAT 42 07 11 LONG 083 25 17.01) | | | | | | | | | | | | | | | | |
| 972 | 0940 | 3.2 | -- | -- | -- | -- | 250 | 205 | E90 | 70 | -- | E.32 | -- | -- | -- | -- | 342 | 140 | 700 | 8.0 | 18.5 | 50 | 1 |
| y 24 | | | | | | | 04175207 - N B SWAN C AT NEWBURG RD NR CARLETON, MICH. (LAT 42 04 45 LONG 083 22 03.01) | | | | | | | | | | | | | | | | |
| 972 | 0405 | 3.6 | -- | -- | -- | -- | 216 | 177 | E130 | 79 | -- | E6.3 | -- | -- | -- | -- | 334 | 160 | 740 | 7.4 | 18.5 | 50 | 2 |
| y 16 | | | | | | | | | | | | | | | | | | | | | | | |
| 973 | 1040 | .63 | 8.5 | 110 | 19 | 28 | 258 | 212 | 62 | 94 | .3 | .56 | -- | -- | -- | 514 | 350 | 140 | 787 | 7.5 | 19.0 | 25 | 5 |
| y 24 | | | | | | | 04175225 - L SWAN C AT SWEITZER RD NR CARLETON, MICH. (LAT 42 02 28 LONG 083 20 45.01 | | | | | | | | | | | | | | | | |
| 972 | 0900 | 1.2 | -- | -- | -- | -- | 186 | 153 | E190 | 48 | -- | E12 | -- | -- | -- | -- | 384 | 230 | 725 | 7.5 | 18.0 | 40 | 7 |
| y 16 | | | | | | | | | | | | | | | | | | | | | | | |
| 973 | 1235 | .12 | 9.9 | 110 | 27 | 14 | 270 | 221 | 110 | 44 | .4 | .79 | -- | -- | -- | 492 | 390 | 160 | 710 | 7.6 | 19.0 | 30 | 5 |
| y 23 | | | | | | | 04175235 - SWAN C AT BRANDON RD AT NEWPORT, MICH. (LAT 42 00 12 LONG 083 18 02.01) | | | | | | | | | | | | | | | | |
| 972 | 1425 | 18 | -- | -- | -- | -- | 248 | 203 | E120 | 67 | -- | E2.3 | -- | -- | -- | -- | 392 | 180 | 760 | 7.8 | 24.5 | 70 | 5 |

ater Resources Data for Michigan, 1972-1973," Part 2, Water Quality Records, U.S. Department of Interior, Geological Survey.

## Table 3. Chemical Analyses of USGS Monitored Michigan Streams[a]

| Station No. | Station Name | Location | Drainage area (sq mi) | Date sampled | Time | Chemical Analysis (mg/l) Discharge (cfs) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Hardness as $CaCO_3$ Ca Mg | Hardness as $CaCO_3$ Noncarbonate | Specific conductance (micromhos at 25°C) | pH | Water temperature °F | Water temperature °C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STREAMS TRIBUTARY TO LAKE ERIE** | | | | | | | | | | | | | | | | |
| 4-1695 | Huron River at Commerce. | SE ¼ sec. 10, T. 2 N., R. 8 E. | 49.6 | Apr. 6 | 1515 | 86.3 | 216 | 3 | 24 | 17 | 207 | 27 | 410 | 8.4 | – | – |
| | | | | Aug. 16 | 0850 | 13.7 | 225 | 3 | 29 | 25 | 224 | 36 | 560 | 8.3 | – | – |
| 1700 | Huron River at Milford. | SE ¼ sec. 9, T. 2 N., R. 7 E. | 125 | Apr. 6 | 1420 | 173 | 229 | 3 | 38 | 26 | 232 | 41 | 470 | 8.3 | – | – |
| | | | | Aug. 17 | 1340 | 39.4 | 232 | 4 | 31 | 29 | 228 | 32 | 480 | 8.5 | 73 | 23.0 |
| 1705 | Huron River near New Hudson | NE ¼ sec. 1, T. 1 N., R. 6 E. | 143 | Apr. 6 | 1220 | 46.8 | 223 | 4 | 33 | 26 | 222 | 36 | 465 | 8.4 | – | – |
| | | | | Aug. 17 | 1445 | 40.3 | 198 | 0 | 25 | 26 | 190 | 28 | 410 | 7.7 | 79 | 26.0 |
| 1715 | Ore Creek near Brighton. | NW ¼ sec. 12, T. 1 N., R. 5 E. | 31.0 | Mar. 31 | 1630 | 34.7 | 218 | 3 | 28 | 15 | 220 | 39 | 400 | 8.4 | – | – |
| | | | | Aug. 17 | 1710 | 4.38 | 249 | 0 | 17 | 20 | 222 | 18 | 450 | 7.7 | – | – |
| 1720 | Huron River at Hamburg. | Sec. 24, T. 1 N., R. 5 E. | 299 | Mar. 31 | 1555 | 382 | 214 | 3 | 52 | 27 | 240 | 62 | 500 | 8.4 | – | – |
| 1725 | Portage River near Pinckney. | SW ¼ sec. 34, T. 1 N., R. 4 E. | 79.0 | Mar. 31 | 1115 | 120 | 201 | 4 | 88 | 14 | 274 | 106 | 530 | 8.4 | 46 | 8.0 |
| | | | | Aug. 18 | 1010 | 2.13 | 185 | 0 | 72 | 15 | 228 | 76 | 485 | 8.2 | – | – |
| 1730 | Huron River near Dexter | SE ¼ sec. 13, T. 1 S., R. 4 E. | 506 | Mar. 31 | 1235 | 854 | 202 | 0 | 62 | 24 | 242 | 76 | 488 | 8.2 | 41 | 5.0 |
| | | | | Aug. 18 | 1300 | 81.8 | 210 | 0 | 45 | 26 | 220 | 48 | 465 | 8.2 | – | – |
| 1735 | Mill Creek near Dexter | SE ¼ sec. 18, T. 2 S., R. 5 E. | 134 | Apr. 26 | 1000 | 116 | 307 | 0 | 111 | 27 | 384 | 132 | 755 | 8.2 | 48 | 9.0 |
| | | | | Aug. 22 | 1530 | 17.4 | 243 | 5 | 66 | 34 | 270 | 66 | 700 | 8.5 | 68 | 20.0 |
| 1745 | Huron River at Ann Arbor | NW¼ sec. 28, T. 2 S., R. 6 E. | 711 | Apr. 21 | 0025 | 668 | 230 | 3 | 75 | 22 | 276 | 85 | 520 | 8.3 | 52 | 11.0 |
| | | | | Aug. 22 | 1700 | 81.4 | 220 | 0 | 51 | 28 | 236 | 56 | 520 | 8.2 | 72 | 22.0 |
| 1757 | River Raisin near Tecumseh. | NE¼ sec. 21, T. 6 S., R. 4 E. | 266 | Apr. 17 | 1530 | 404 | 253 | 0 | 64 | 12 | 274 | 67 | 500 | 8.2 | 61 | 16.0 |
| | | | | Aug. 14 | 1210 | 14.2 | 212 | 4 | 52 | 17 | 238 | 56 | 545 | 8.5 | – | – |
| 1760 | River Raisin near Adrian. | NW ¼ sec. 5, T. 7 S., R. 4 E. | 455 | Apr. 17 | 1245 | 597 | 245 | 4 | 80 | 16 | 294 | 91 | 545 | 8.4 | 60 | 15.5 |
| | | | | Aug. 14 | 1200 | 47.9 | 273 | 0 | 73 | 28 | 302 | 78 | 640 | 8.0 | – | – |
| 1765 | River Raisin near Monroe, on Ida Maybee Road. | On Ida Maybee Road | 1034 | Apr. 4* | 1605 | 3110 | 178 | 4 | 86 | 28 | 280 | 127 | 561 | 8.4 | – | – |
| | | | | Aug. 15 | 0930 | 66.9 | 168 | 0 | 130 | 38 | 268 | 130 | 690 | 7.6 | – | – |

*Laboratory analysis.

(a) A. W. Wood, Chemical Quality of Michigan Streams, USGS Circular 634, 1970

## Table 4. Chemical Analysis For Minor Streams Tributary to Lake Erie[a]

| Stream | Index No. on Map | Date | (cfs) | (cfsm) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Nitrate ($NO_3$) | Hardness as $CaCO_3$ Carbonate | Hardness as $CaCO_3$ Noncarbonate | Specific Conductance (micromhos) | pH | Temperature °C | Color Platinum Cobalt Scale | Turbidity (ITU) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ecorse River | | 8/31/71 | .002 | | 154 | .0 | 96 | 120 | 2.7 | 280 | 150 | 650 | 7.7 | 20.5 | 90 | 7 |
| | +10 | 5/ 5/72 | 1.67 | | 232 | .0 | 170 | 250 | .5 | 440 | 250 | 1,600 | 7.5 | 9.0 | 30 | 4 |
| Ecorse River | | 8/31/71 | .33 | | 183 | .0 | 88 | 330 | 1.8 | 220 | 74 | 1,300 | 8.1 | 19.5 | 60 | 4 |
| | +11 | 5/ 5/72 | 4.72 | | 258 | .0 | 200 | 300 | 1.2 | 490 | 280 | 1,800 | 7.6 | 10.0 | 50 | 15 |
| South Branch | | 8/31/71 | 1.10 | | 163 | .0 | 70 | 130 | 2.6 | 230 | 92 | 750 | 7.7 | 21.0 | 10 | 1 |
| Ecorse River | +12 | 5/ 5/72 | 5.13 | | 261 | .0 | 160 | 270 | 10. | 490 | 270 | 1,700 | 7.9 | 10.0 | 40 | 5 |
| Frank and Poet | | 8/31/71 | .06 | | 198 | .0 | 210 | 210 | 2.5 | 380 | 210 | 1,200 | 7.1 | 20.0 | 60 | 35 |
| Drain | +13 | 5/ 5/72 | 19.3 | | 134 | .0 | 100 | 120 | .6 | 200 | 94 | 800 | 7.9 | 12.0 | 50 | 20 |
| Frank and Poet | | 8/31/71 | .51 | | 154 | .0 | 90 | 110 | 3.5 | 240 | 110 | 700 | 8.0 | 21.0 | 30 | 4 |
| Drain | +14 | 5/ 5/72 | 20.7 | | 241 | .0 | 210 | 430 | 1.6 | 460 | 260 | 1,500 | 8.0 | 13.5 | 70 | 15 |
| Blakely Drain | | 8/31/71 | .07 | | 198 | .0 | 240 | 62 | 2.2 | 290 | 130 | 500 | 8.1 | 20.5 | 20 | 10 |
| | +15 | 5/ 5/72 | 6.78 | | 196 | .0 | 240 | 110 | 12. | 370 | 210 | 700 | 8.2 | 15.5 | 40 | 5 |
| Marsh Creek | | 8/31/71 | .73 | | 139 | .0 | 100 | 120 | 5.2 | 240 | 130 | 750 | 7.7 | 20.0 | 50 | 2 |
| | +16 | 5/ 5/72 | 17.1 | | 224 | .0 | 190 | 300 | 11. | 410 | 220 | 1,200 | 7.9 | 11.5 | 50 | 10 |
| Brownstone Creek | | 8/31/71 | .08 | | 156 | .0 | 180 | 230 | 4.0 | 310 | 170 | 1,100 | 8.0 | 19.5 | 40 | 15 |
| | +17 | 5/ 5/72 | 4.42 | | 224 | .0 | 180 | 390 | 8.0 | 380 | 200 | 1,360 | 7.9 | 12.0 | 60 | 10 |
| Bradshaw Drain | | 9/ 1/71 | 1.02 | | 188 | .0 | 96 | 31 | .1 | 260 | 100 | 540 | 7.6 | 18.0 | 0 | 0 |
| | +18 | 5/24/72 | 3.89 | | 256 | .0 | 120 | 61 | 2.0 | 360 | 150 | 700 | 7.5 | 6.5 | 70 | 8 |
| Swan Creek | | 9/ 1/71 | 0 | 0 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | +19 | 5/23/72 | 4.38 | | 254 | .0 | 120 | 58 | 2.3 | 360 | 150 | 700 | 7.7 | 11.5 | 70 | 3 |
| Disbrow Drain | | 9/ 1/71 | .08 | | 210 | .0 | 110 | 87 | 2.3 | 300 | 130 | 750 | 8.0 | 18.5 | 60 | 7 |
| | +20 | 5/23/72 | 1.97 | | 178 | .0 | 110 | 68 | 3.1 | 280 | 140 | 590 | 8.0 | 15.0 | 80 | 4 |
| Swan Creek | | 9/ 1/71 | .08 | | 176 | .0 | 85 | 34 | 5.5 | 220 | 76 | 500 | 7.1 | --- | 20 | 4 |
| | +21 | 5/24/72 | 7.38 | | 250 | .0 | 130 | 63 | 8.5 | 370 | 170 | 725 | 7.7 | 18.5 | 40 | 4 |
| North Branch | | 9/ 1/71 | 0 | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Swan Creek | +22 | 5/24/72 | 3.18 | | 250 | .0 | 93 | 70 | 1.4 | 340 | 140 | 700 | 8.0 | 18.5 | 40 | 1 |
| North Branch | | 9/ 1/71 | 0 | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Swan Creek | +23 | 5/24/72 | 3.62 | | 216 | .0 | 130 | 79 | 28. | 330 | 160 | 740 | 7.4 | 18.5 | 50 | 2 |
| Little Swan | | 9/ 1/71 | 0 | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | +24 | 5/24/72 | 1.22 | | 186 | .0 | 220 | 48 | 52. | 380 | 230 | 725 | 7.5 | 18.0 | 40 | 7 |
| Swan Creek | | 8/31/71 | 0 | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | +25 | 5/23/72 | 18.5 | | 248 | .0 | 120 | 67 | 10. | 380 | 180 | 760 | 7.8 | 24.5 | 70 | 5 |
| Little Swan Creek | +26 | 5/23/72 | .22 | | 230 | .0 | 250 | 51 | 42. | 450 | 260 | 850 | 7.8 | 21.5 | 70 | 3 |
| Stony Creek | +27 | 8/31/71 | 0 | | 237 | .0 | 56 | 64 | 2.2 | 260 | 70 | 600 | 8.0 | 20.0 | 10 | 3 |
| Sugar Creek | | 8/31/71 | 0 | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | +28 | 5/24/72 | 2.49 | | 262 | .0 | 130 | 66 | 24. | 380 | 160 | 790 | 7.8 | --- | 50 | 2 |

Note: Chemical analysis in milligrams per liter (mg/l).

[a] W. W. Wood, Chemical Quality of Michigan Streams, USGS Circular 634, 1970.

CHEMICAL CHARACTERISTICS

2. (Section 2.5.3.3) What "standard techniques" were used to perform the chemical analyses of the groundwater (Table 2.5-8 and 2.5-9)? (September 22, 1978)

2. (Section 2.5.3.3) What "standard techniques" were used to perform the chemical analyses of the groundwater (Tables 2.5-8 and 2.5-9)? (November 30, 1978)

RESPONSE

Groundwater analyses (Tables 2.5.8 and 2.5.9) were performed according to the "Standard techniques" described in the APHA-AWWA-WPCF, "Standard methods for the Examination of Water and Waste Water," 12th Edition.

APHA - American Public Health Association
AWWA - American Water Works Association
WPCF - Water Pollution Control Foundation

## CHEMICAL CHARACTERISTICS

3. (Section 3.6.1) Provide the basis for the assumption of a chlorine demand of 2-3 ppm for Lake Erie water. (September 22, 1978)

3. (Section 3.6.1) Provide the basis for the assumption of a chlorine demand of 2-3 ppm for Lake Erie water. (November 30, 1978)

## RESPONSE

This question was responded to in Supplement 1, June 1975, page 3.6-3. The discussion was deleted in Supplement 4, February 1978 as no longer applicable to the effluent limitations placed on Fermi 2 under NPDES Permit No. MI 0037028 (Table 5.4-2) issued November 28, 1977. New effluent limitations have been established by the Michigan Water Resources Commission which will be outlined in a revision to the present permit.

The chlorine demand of Lake Erie water is estimated to be 2-3 ppm, based on an average value of 2.4 ppm chlorine demand measured by the Monroe Water Department for the 12 months ending June 30, 1974. The minimum and maximum values recorded for this period were 0.83 and 6.2 ppm, respectively. In addition, at the Davis-Besse site, Toledo Edison measured an average chlorine demand of 2.4 ppm on samples collected at least monthly over the period of November 1968 to July 1971. The minimum value observed by Toledo Edison was 0.3 ppm, while the maximum was 7.8 ppm.

CHEMICAL CHARACTERISTICS

4. (Section 3.6.1) Provide a discussion of the variability of the chlorine demand of Lake Erie water in the site vicinity to support the proposed grab sample method of chlorination control as opposed to continuous monitoring (September 22, 1978).

RESPONSE

This question was responded to in Supplement 1, June 1975, page 3.6-3. The information was deleted in Supplement 4, February 1978, in deference to NPDES Permit No. MI 0037028 (Table 5.4-2) which in Part I.A.1 specifies grab sample and amperometric titration. In addition, 40 CFR 136 specifies an iodimetric titration with either a starch-iodide or amperometric end point.

CHEMICAL CHARACTERISTICS

5. (Section 3.6.1) Provide estimates for the total chlorine average concentrations anticipated in the blowdown. Explain the bases for the estimates (September 22, 1978)

4. (Section 3.6.1) Provide estimates for the total chlorine average concentrations anticipated in the blowdown. Explain the bases for the estimates (November 30, 1978)

RESPONSE

Refer to the response to Question 8, Chemical Characteristics, September 22, 1978.

CHEMICAL CHARACTERISTICS

5. (Section 3.6.1) What chlorination procedure will be used in the circulating water and general service water systems? In particular, in what form will the chlorinating agent be shipped to and stored at the plant site, e.g., as $Cl_2$ or NaOCl and in what quantities? What dechlorination techniques will be used, if necessary, to achieve the applicable limitations on chlorine in the effluent as described in Part 1, Section A.1 of the NPDES (MI 0037028, revised 10/27/78)? (November 30, 1978)

RESPONSE

Refer to response to Question 8, Chemical Characteristics, September 22, 1978.

CHEMICAL CHARACTERISTICS

6. (Section 5.4.1) Provide the basis for requiring such a long chlorination period for the circulating water system condensers (one hour for each condenser half) since the incoming water will be chlorinated continuously in the service water system (September 22, 1978)

RESPONSE

Refer to the response to Question 2, Chemical Characteristics, September 22, 1978.

CHEMICAL CHARACTERISTICS

6. If a dechlorinating system will be used, what techniques will be used to monitor and control the possible discharge of excess dechlorinating agent? (November 30, 1978).

RESPONSE

Refer to response to Question 8, Chemical Characteristics, September 22, 1978.

## CHEMICAL CHARACTERISTICS

7. (Section 6.2.2.1) The statement on chlorine concentration in the plant blowdown is not consistent with the statement in Section 3.6.1. Resolve the discrepancy in expected chlorine content in the blowdown (September 22, 1978).

## RESPONSE

This question was responded to in Supplement 1, June 1975, page 6.2-15. The information was deleted in Supplement 4, February 1978 in deference to the effluent limitations set forth in NPDES Permit MI 0037028 (Table 5.4-2).

CHEMICAL CHARACTERISTICS

7. Would increasing the cycles of concentration during system chlorination eliminate the need for manual dechlorination by allowing a greater amount of time for natural chlorine dissipation? If so, why isn't this being done instead of manual dechlorination? (November 30, 1978).

RESPONSE

Refer to response to Question 8, Chemical Characteristics, September 22, 1978.

CHEMICAL CHARACTERISTICS

8. (Section 3.6.1) Tentative free chlorine guidelines have been proposed by the applicant, and have been discussed with the state Water Quality Division. The applicant should by now have prepared a tentative chlorination procedure. Discuss the details of this procedure, (p. 3.6-2) (September 22, 1978).

RESPONSE

Total residual chlorine (TRC) effluent limitations have been recently established by the Michigan Water Resources Commission (MWRC). NPDES Permit No. MI 0037028 (operating) is being modified to reflect these limitations, Copies of the revised permit will be made available to the NRC following final approval by EPA and the MWRC.

The essential requirements are

| | |
|---|---|
| Total Residual Chlorine | 0.2 mg/l daily average<br>0.3 mg/l daily maximum |
| Sampling frequency | 5 times weekly, 3 grab samples equally spaced during each treatment |
| Total discharge time | 160 min/day |

Dechlorinating agents shall be limited to 1.5 times the stoichiometric quantity required for the chlorine applied.

Based on the TRC effluent limitations, a tentative chlorination scheme has been developed for Fermi 2.

| | |
|---|---|
| General Service Water System | Shock treated at 5 ppm for 1 hour each day* |
| Circulating Water System | Shock treated at 5 ppm for 1 hour each day* (30 minutes for each half of condenser). |

*Treatments will be concurrent

The chlorine will be received and stored as $Cl_2$ in 1-ton cylinders. A bank of cylinders will be maintained in the Fermi 1 pump house to feed the Fermi 2 GSWS; a bank of 12 cylinders will be maintained in the Fermi 2 circulating water pump house for the CWS. Approximating a useage rate of 1500 lb $Cl_2$ per day, 5 to 6 replacement cylinders will be required weekly (refer to response to Question 15, Chemical Characteristics, November 30, 1978).

Calculations based on a chlorine demand of approximately 2 ppm for Lake Erie water indicate that the daily average maximum values of 0.2 mg/l and 0.3 mg/l TRC can be met. However, there are indications that TRC may perisit in the blowdown from the circulating water reservoir for longer than 160 minutes.

Data from the Fermi 1 potable water plant show that chloramine concentrations can be as high as 0.4 mg/l two (2) hours after chlorination. This is particularly true during the winter months when the water is cooler and there is less exposure. Thus it could be possible for TRC to persist in the Fermi 2 blowdown beyond the 160 min/day. This cannot be confirmed until operating

data from the plant is available. As a precaution, a standby dechlorination system using sodium sulfite will be installed at the decant pumps in the CWPH. The dechlorination system will be employed only if the TRC persists in the blowdown 120 minutes after application. (The 120 minutes is subject to change should actual operation require). This procedure will minimize the use of dechlorinating agent and will result in the addition of insignificant quantities of sulfate to the blowdown. Since there are no Federal or State limitations on sulfate, the dechlorinating agent has been limited to 1.5 times the stiochiometric quantity of chlorine applied.

At this time, the parameters for the dechlorination system have not been defined and a system has not been designed. Until such time as more definitive, representative operating data are collected, a temporary manual operation will be used consisting of a portable tank, manual mixing of the bulk sodium sulfite solution, and gravity feed either into the CWR or at the suction side of the decant pumps.

Interruption of the discharge flow from the CWR to take Erie was considered as an alternative; however, discontinuous operation of the discharge flow is inconsistent with respect to statements made in response to Question 9 (September 22, 1978) and Question 6 (November 3, 1978), Aquatic Ecology, and the effect of thermal shock on fish.

## CHEMICAL CHARACTERISTICS

9. (Section 6.1) What is the rationale for the proposed sampling frequency in the monitoring program for heavy metals? Mercury levels appear to be elevated in the sediments around the plant. Please assess the potential for the resuspension of mercury-laden sediment due to the operation of the plant (September 22, 1978).

8. (Section 6.1) What is the rationale for the proposed sampling frequency in the monitoring program for heavy metals? Mercury levels appear to be elevated in the sediments around the plant. Please assess the potential for the resuspension of mercury-laden sediment due to the operation of the plant (November 30, 1978).

## RESPONSE

The response to a portion of the above question was provided in Supplement 1, June 1975, Appendix A.2, Item 350.13, pages A.2-23, 24 and 26.

The rationale for the sampling frequency for heavy metals both in the water column (monthly) and in the sediments (quarterly) is based on the very minute quantities of these metals that would be in the Fermi 2 effluent as shown in Section 3.3, Table 3.3-1 which would result in no apparent increase as a result of the discharge.

As described Section 5.1.2, the thermal discharge is a surface plume. As such, it would not cause resuspension of sediments in the vicinity of the plant.

## CHEMICAL CHARACTERISTICS

10. (Section 3.6.2) With what materials does the circulating water system come into contact? Is there likely to be sufficient corrosion from these sources to measurably affect the total dissolved solids in the effluent. (p. 3.6-27 and 3.6-13) (September 22, 1978).

9. (Section 3.6.2) With what materials does the circulating water system come into contact? Is there likely to be sufficient corrosion from these sources to measurably affect the total dissolved solids in the effluent? (p. 3.6-2 and 3.6-3) (November 30, 1978).

## RESPONSE

The circulating water comes in contact with the condenser, the circulating water pipes, and the cooling tower baffles. The composition of these systems is listed below:

CONDENSER

| | |
|---|---|
| Admiralty | 96% |
| Copper/Nickel | 4% |
| Admiralty Type Alloy | 443 |
| Copper | 10-73% |
| Tin | 0.9 to 1.2% |
| Lead | 0.07% |
| Iron | 0.06% |
| Arsenic | 0.02 to 0.10% |
| Zinc | Approximately 28 to 30% |

CIRCULATING WATER PIPES

ASTM - 150 - Type 5 Cement (sulfate resistant)

| | |
|---|---|
| Tricalcium Silicate | 40% |
| Dicalcium Silicate | 40% |
| Tricalcium Aluminate | 4%* |
| Tetracalcium Aluminoferrite | 9%* |

* The last two items are mixed to stated proportions to a maximum of 20% of the total composition

COOLING TOWER BAFFLES

Transite

15% asbestos

85% cement

As shown in Section 3.3, Table 3.3-1 there is no measurable effect from these sources on the total dissolved solids in the effluent. In addition, sulfuric acid is added to the system to control pH to essentially neutral, reducing corrosion to a minimum.

CHEMICAL CHARACTERISTICS

11. (Sections 3.6.3and 3.6.5) What is the source of information in Tables 3.6-1 and 3.6.2? Provide a copy of missing page 3.6-13 with Table 3.6-3, laundry wastes (September 22, 1978)

10. (Sections 3.6-3 and 3.6-5) What is the source of information in Tables 3.6-1 and 3.6-2? Provide a copy of missing page 3.6-13 with Table 3.6-3, laundry wastes (November 30, 1978)

RESPONSE

Section 3.6, Table 3.6-1 is based on manufacturer's recommended regeneration cycle as described on pages 3.6-3, 3.6-4, and 3.6-5 of Supplement 4, February 1978.

Section 3.6, Table 3.6-2, Auxiliary Boiler Blowdown was deleted in Supplement 4, February 1978 as no longer appropriate as an effluent stream from Fermi 2 directly to the environment. As shown in Figure 3.3-1, Section 3.3, the boiler blowdown is routed through the Fermi 1 waste water basin and through the sewer to the Monroe Sewage Treatment Plant.

Section 3.6, Table 3.6-3, Laundry Wastes, was deleted in Supplement 4, February 1978, since it is part of the radwaste system effluent stream. The estimated discharge is 3840 gallons per day, or 0.03% of the 10,000 gpm blowdown. A biodegradable, nonphosphate detergent and non-chlorine containing germicidal agent will be used.

CHEMICAL CHARACTERISTICS

12. (Section 5.4.5) It is stated that dissolved oxygen does not decrease as the water passes through the turbine condenser in "similar situations." Supply actual examples of "similar situations," with data such as water flow rates, temperatures, and oxygen concentrations. (p. 5.4-6) (September 22, 1978).

11. (Section 5.4.5) It is stated that dissolved oxygen does not decrease as the water passes through the turbine condenser in "similar situations." Supply actual examples of "similar siturations," with data such as water flow rates, temperatures, and oxygen concentrations. (p. 5.4-6) (November 30, 1978).

RESPONSE

The Applicant has no "actual examples of similar situations." The phrase "similar situations" is inappropriate as used in present context.

In a closed cycle system, such as Fermi 2, where natural draft cooling towers are an integral part of the system there would be no overall effect on the dissolved oxygen in the effluent. Should a decrease in dissolved oxygen occur in the condenser, the oxygen content would again reach saturation passing through the cooling towers and circulating water reservoir from where it is discharged to Lake Erie.

CHEMICAL CHARACTERISTICS

13. (Section 6A-2.3.4.4) What is the reason for the implied limitation of pH values to numbers from 0 to 14? (p. 8A. 2-10) (September 22, 1978).

12. (Section 6A-2.3.4.4) What is the reason for the implied limitation of pH values to numbers from 0 to 14? (p. 6A.2-10) (November 30, 1978).

RESPONSE

The Technical Specifications in Appendix 6A are no longer appropriate and will be resubmitted as required prior to receipt of the Operating License.

At present pH limitations for effluent discharges are established as 6.0 to 9.0 in NPDES Permit No. MI 0037028, Table 5.4-2, Supplement 4, February 1978.

CHEMICAL CHARACTERISTICS

14. (Section 3.3.2.2) Supply the material composition of the condenser and other heat exchanger surfaces subject to corrosion. (p. 3.3-3). An average corrosion rate of 0.107 mils/yr is identified (on p. 3.3-3) as representative of other Detroit Edison plants. Supply initial composition and pH of the water at those plants. Are the corrodable materials comparable to the Fermi 2 materials? Describe any water treatment programs to reduce corrosion at existing Detroit Edison facilities.

What portion of the sewage transported by the Frenchtown Township sewer line is predicted to be from Fermi 2? What percentage of the sewage treated at the Monroe sewage treatment facility is predicted to be from Fermi 2? (p. 3.3-3)

Supply the non-radioactive chemical composition of the water from the liquid radwaste system. (p. 3.3-4) (September 22, 1978)

13. (Section 3.3.2.2) Supply the material composition of the condenser and other heat exchanger surfaces subject to corrosion. (p. 3.3- 3). An average corrosion rate of 0.107 mils/yr is identified (on p. 3.3-3) as representative of other Detroit Edison plants. Supply initial composition and pH of the water at those plants. Are the corrodable materials comparable to the Fermi-2 materials? Describe any water treatment programs to reduce corrosion at existing Detroit Edison facilities.

What portion of the sewage transported by the Frechtown Township sewer line is predicted to be from Fermi-2? What percentage of the sewage treated at the Monroe sewage treatment facility is predicted to be from Fermi-2? (p. 3.3-3).

Supply the non-radioactive chemical composition of the water from the liquid radwaste system (p.3.3-4) (November 30, 1978).

RESPONSE

Refer to response to Question 10, Chemical Characteristics, September 22, 1978, for the material composition of the condenser. The two main heat exchangers are Admiralty ASTM B111.

The 0.107 mil/year was calculated for the water side of the Fermi 2 condenser based on measurements made in 1973 on Admiralty metal condenser tubes that had been in service at Edison's Trenton Channel Power Plant for 49 years.

The Trenton Channel Plant is situated on the west bank of the Trenton Channel of the Detroit River about 7 miles north of Lake Erie. No water quality data are available for this portion of the river; however, there are effluents from industrial complexes upstream. PMA alkalinity readings taken at the plant during 1972 showed a typical A alkalinity of -8 to -9.

Edison has no water treatment program for the water side of the condenser.

Since the Frenchtown Township sewage system is an integral part of the Monroe sewage system, it is not possible to predict that portion which is due to Fermi 2. The Monroe Sewage Treatment Plant presently treats between 12,000,000 and 15,000,000 gallons

of sewage per day. The 10,000 gallons of sewage per day anticipated from Fermi 2 under normal operating conditions represents less than 0.1% of the total treated.

The water from the liquid radwaste system is distillate from the evaporators.

CHEMICAL CHARACTERISTICS

14. In section 3.1 of the ER it is noted that the reduction in the surface area of the circulating water reservoir from 50 to 5.5 acres is a resultof "the safety related decision not to use the circulating water reservoir as the ultimate heat sink." Please elaborate on the rationale for this decision (November 30, 1978)

RESPONSE

Refer to the response to Question 5, Heat Dissipation System, September 22, 1978.

## CHEMICAL CHARACTERISTICS

15. Provide a list of the anticipated monthly chemical usage at the plant and indicate any expected seasonal variations in such usage. (November 30, 1978).

## RESPONSE

As noted in Section 3.6 of the ER(OL), the following systems will require chemical treatment:

- Chlorination of the General service (GS) and circulating water (CW) systems
- Sodium sulfite as dechlorinating agent as necessary
- Sulfuric acid addition to circulating water to control pH to essentially neutral
- Sulfuric acid and sodium hydroxide to regenerate the demineralizer

Table 1 shows the anticipated chemical usage for the above systems.

TABLE 1 - CHEMICAL USAGE

| Chemical | System | Daily Max. lb. | Monthly Usage, lb.[a] Max. | Summer Avg. | Winter Avg. |
|---|---|---|---|---|---|
| $Cl_2$(as gas)[b] | GSW, CW | 1132 | 33,960 | 33,960 | 33,960 |
| $Na_2SO_3$[c] | Blowdown | 2547 | 76,410 | 76,410 | 76,410 |
| $H_2SO_4$ | CW | 6480 | 194,426 | 177,144 | 147,620 |
| $H_2SO_4$ | Demineralizer[d] | 340 | 1,360 | 1,360 | 1,360 |
| NaOH | Demineralizer[d] | 278 | 1,112 | 1,112 | 1,112 |

(a) Based on 30-day month and Table 3.4-1, Section 3.4

(b) CWS requires 93% of $Cl_2$ used; therefore, the seasonal variation for flow of GSW is negiglible. Variation in usage in CWS will not be known until facility is operational. Calculations based on Figure 3.3-1, Section 3.3 (20,000 gpm blowdown).

(c) Assumes dechlorinating agent is added to the maximum allowable (NPDES Permit No. MI 0037028), 1.5 times the stoichiometric amount of $Cl_2$. Until the plant becomes operational and the chlorination procedures are finalized, the exact quantity used will not be known. It is anticipated it will be less than that shown.

(d) These numbers are based on daily regeneration once per week, 4 weeks per month.

CHEMICAL CHARACTERISTICS

16. A clay-lined chemical holding pond divided into three sections was observed during the site visit. Please indicate it on Figure 3.1-2, Site Plot Plan, and describe its function (November 30, 1978).

RESPONSE

There is one holding pond on the Fermi 2 site that is divided into three compartments having maximum volumes of 330,000 gallons, 490,000 gallons, and 164,000 gallons. The 164,000-gallon compartment is for emergency oil dump throughout the life of the plant. This compartment will be pumped out as necessary and the liquids hauled offsite by a licensed industrial waste disposal form.

The other two compartments will be used for chemical cleaning wastes during construction. At this time there is no anticipated use of these compartments during plant operation.

## CHEMICAL CHARACTERISTICS

17. Provide a list of chemical solution streams which will be routed to any chemical holding or treatment ponds. Include the chemical compositions of the respective solution streams, i.e., provide the pH and identify the major components and potentially toxic minor components. In addition, include the anticipated quantities of such solutions and the anticipated holding times in the respective ponds. Describe the ultimate disposal of chemicals routed to holding or treatment ponds. (November 30, 1978).

## RESPONSE

Refer to response to Question 19, November 30, 1978.

## CHEMICAL CHARACTERISTICS

18. For the purpose of evaluating the potential for storage from the circulating water reservoir and any holding or treatment ponds, provide data about the pond lining material and the underlying soils. (November 30, 1978).

## RESPONSE

Data on the circulating water reservoir and chemical holding pond are listed below:

| | CWR | Chem. Pond |
|---|---|---|
| Bottom Elevation | 562' 0" | 566' 6" |
| Bottom Clay Thickness | 4' | 8' 6" |
| Side Clay Thichness* | 14' | 16' 6" |
| Test Boring No. | 60 | 42 |

*Sides consist of clay core faced with stone riprap.

Table 1 shows a typical analysis indicating the subsurface profile of the CWR and chemical holding pond. Logs of borings 42 and 60 are included for information purposes.

TABLE 1 - GENERALIZED SUBSURFACE PROFILE

| | Chem. Pond | CWR |
|---|---|---|
| Test Boring | 42 | 60 |
| Sample Elevation, ft | 563.3 | 566.0 |
| Transverse Shear, psf | - | 274 |
| One-half Unconfined Compression, psf | - | 97.5 |
| Water by Dry Weight, % | - | 26.1 |
| Dry Unit Weight, pcf | - | 97.5 |
| Volumetric, % | - | - |
| Solids | - | 58.5 |
| Water | - | 40.8 |
| Air | - | +0.7 |
| Atterberg Limits | - | - |
| Shrinkage | 14 | 15 |
| Plastic | 18 | 22 |
| Liquid | 29 | 36 |
| Gradation, % | - | - |
| Clay | 47 | 63 |
| Silt | 32 | 31 |
| Limestone | 13 | 03 |
| Medium Sand | 05 | 02 |
| Coarse Sand | 03 | 01 |
| Gravel | 00 | 00 |

LOG OF SUBSURFACE PROFILE

CLASSIFICATIONS BY: S&FA (B.S.I.)

Ground Surface Elev = 573.8 Ft.

PENETRATION RESISTANCE & CORE RECOVERY

PENETRATION RESISTANCE *

| ELEVATION IN FEET | | | Penetration Resistance * (0 10 20 30 40 60 80 100) | No. |
|---|---|---|---|---|
| 570 | | PEAT. (Pt) | 11/8" | |
| | | Soft Brn. SILTY CLAY, w/Some Sd. & Grav. (CL) | | 4 |
| | | Med. Brn. & Gr. SILTY CLAY, w/Some Sand & Gravel. (CL) | | 2 |
| | | Hard Brn. & Gr. SILTY CLAY, w/Some Sand, Little Gravel (CL) | | 20 |
| 560 | | Hard Gray SANDY VERY SILTY CLAY, w/Some Gravel & Rock Frags. (CL-ML) | TOP/ROCK EL. 559.0 | |
| | | Hard Gray DOLOMITE, Some Dk.Gr.Bands. Trace SHALE, Vugs <1/8, <1/32-1/16". Fissured, 60-90°, up to 3/8" Few Vert. Fractures. | | 1 |
| 550 | | Evidence of re-drilling, both runs. | | 4 |

9' 4-in casing used.
Hole grouted; 2 bags cement.

GROUND WATER INFO:
Drill water loss at El. 553.9 followed by artesian flow at rate of 0.42 gpm.
Artesian flow of 0.42 gpm to 574.5± after completion.
W.L. after grouting = El. 570.8

0 20 40 60 80 100

NOTE: % ROCK CORE RECOVERY

LOCATION: N-6855; E-4305
TOTAL DEPTH: 23'4"
BORING STARTED: 1-23-59
BORING COMPLETED: 1-23-59

ALL ROCK DESCRIPTIONS ARE AS EDITED BY BRAND, N. & JOSEPHS (U/M), BASED UPON VISUAL EXAMINATION OF CORE SAMPLES ALL REVIEWED BY DR. L. BROWN (PURDUE)

INSPECTOR: B.S. Imber (S&FA)
DRILLER: J. Pugh
CONTRACTOR: Raymond Concrete Pile Div.
▽ WATER LEVEL in hole at indicated number of hours after completion of boring
9 feet of casing in place

SOIL AND FOUNDATIONS ASSOCIATES
29563 NORTHWESTERN HIGHWAY
SOUTHFIELD, MICHIGAN 48075

LOG OF TEST BORING NO 42

ENRICO FERMI ATOMIC POWER PLANT
UNIT NO. 2
LAGOONA BEACH, MICHIGAN

LOG OF SUBSURFACE PROFILE

CLASSIFICATIONS BY: S&FA (Soil)

Water Surface Elev. = 573.0 Ft.

PENETRATION RESISTANCE & CORE RECOVERY

PENETRATION RESISTANCE *

| ELEVATION IN FEET | | | No |
|---|---|---|---|
| | WATER. G.S.El.571.0 | | |
| 570 | Dark Gray PEAT, w/Some Fibers. | Pt | <1 |
| | Soft Brown & Gray SILTY CLAY | CL | 4 |
| | Stiff Brown SILTY CLAY, w/Silt Lenses, w/Some Sand, Little Gravel. | CL | 15 |
| 560 | Hard Gray (w/Some Brown) F.SANDY V.SILTY CLAY, w/Little Gravel | CL-ML | 63 |
| | Stiff Gray F.SANDY SILTY CLAY, w/Little Gravel & Rock Frags. | CL-ML | 26 |
| | V.Hard Gray F.SANDY SILTY CLAY, w/Little Gravel & Rock Frags. | CL-ML | 87 |
| 550 | TOP/ROCK EL.546.0 | | |
| | Med.Hd.Gr.DOLOMITE, w/Tr.SHALE, Few CLAY Sms., Fractures, V.Close.Horiz. | | |
| | Hard Gr.DOLOMITE, w/SHALE Seams. Fragmented (Re-drilled). | | |
| 540 | | | |

9' 4-inch casing used.

Hole grouted; 1 bag cement.

NOTE:
No artesian flow observed for two-day period between drilling and grouting.

% ROCK CORE RECOVERY

NOTE: ALL ROCK DESCRIPTIONS ARE AS EDITED BY BRAUN & JOSEPHSON (U/M), BASED UPON VISUAL EXAMINATION OF ROCK CORES. ALL REVIEWED BY DR. L. BROWN (PURDUE)

LOCATION: N-8400; E-5600
TOTAL DEPTH: 32' 0"
BORING STARTED: 9-23-68
BORING COMPLETED: 9-25-68
J.O.Wanzeck (S&FA)
INSPECTOR: B.S.Imber (S&FA)
DRILLER: M. Suff
CONTRACTOR: Raymond Concrete Pile Div.
▽ WATER LEVEL in hole at indicated number of hours after completion of boring
____ feet of casing in place. Not observed

SOIL AND FOUNDATIONS ASSOCIATES
29563 NORTHWESTERN HIGHWAY
SOUTHFIELD, MICHIGAN 48075

LOG OF TEST BORING NO. 60

ENRICO FERMI ATOMIC POWER PLANT
UNIT NO. 2
LAGOONA BEACH, MICHIGAN

CHEMICAL CHARACTERISTICS

19. Section 3.6.4 of ER Supplement 1 (June 1975) describes a pre-operationsl cleaning and flushing program, This section has been deleted from Supplement 4 (February 1978) although such a pre-operational cleaning and flushing program was mentioned during the site visit. Provide a description of the planned pre-operational cleaning and flushing program, including the identity and quantity of each of the chemicals used, the time period of such use, and the ultimate disposal of the chemicals used (November 30, 1978).

RESPONSE

The pre-operational flushing and cleaning program was deleted from the Environmental Report (Operating License) in Supplement 4, February 28 because it is associated with the construction phase of the plant under construction permit No. CPPR 87. In addition, NPDES Permit No. MI 0039110 was issued April 4, 1978 for discharges from the construciton site. The construction permit covers all discharges during construction and is in addition to operating NPDES Permit No. MI 0037028. Copies of this permit were transmitted to the NRC on April 26, 1978, EF2-40175.

The systems to be chemically claimed are relatively by small. One system volume will be approximately 220,000 gallons.

The chemical cleaning operation as presently envisioned will consist of the following stages:

1. High velocity flush using one system volume of demineralized water.

2. Degreasing solvent using 3 to 1 ratio of trisodium/disodium phosphate and 0.1% surfactant followed by demineralized water flush.

3. Mill scale removal using Dow Industrial Services Vertan 661 process (6% chelating agent - tetra ammoniated EDTA) with pH adjustment using citric acid followed by demineralized water flush.

4. Passivation solution consisting of hydrazine/ammonia followed by demineralized water flush.

Other chemical formulations are being investigated in relation to the Fermi 2 piping system and may be substituted for the above.

The cleaning operation is a continuous high velocity procedure where each step consists of one system volume of cleaning solution followed by one or more system volumes of demineralized water flush (displacement). The first three steps require only 4.5 days to complete.

Since this is a continuous operation, immediate disposal of the liquid waste is required. The disposal scheme has not been firmly established; however, to meet the time constraints and the conditions of NPDES Permit No. MI 0039110 any combination of the following disposal methods is viable:

Use of appropriate compartments of the chemical holding pond in combination with any one or several of the following

- Truck offsite by a licensed industrial liquid waste disposal contractor
- Truck to Monroe Sewage Treatment Plant

- Pump to Monroe Sewage Treatment Plant via Fermi 1 sewer system

The introduction of the various chemical constituants has been discussed with the Monroe personnel and all disposal will be carried out in close liason with the plant.

The time frame involved with passivation will be established at a future date in response to startup requirements for systems.

EF-2-ER(OL) Permit No. MI 0039110

MICHIGAN WATER RESOURCES COMMISSION

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et seq; the "Act"), and the Michigan Water Resources Commission Act, as amended, (Act 245, Public Acts of 1929, as amended, the "Michigan Act"),

THE DETROIT EDISON COMPANY

(Sole operator and principal owner) is authorized to discharge from the Enrico Fermi Atomic Power Plant, Unit 2, construction site located at

6400 Dixie Highway
Newport, Michigan 48166

to receiving waters named Swan Creek and Lake Erie in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I and II hereof.

This permit shall become effective on the date of commencement of any discharge authorized herein.

This permit and the authorization to discharge shall expire five years from the effective date. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit such information and forms as are required by the Michigan Water Resources Commission no later than 180 days prior to the date of expiration of this permit.

This permit is based on the company's application numbered MI 0039110, dated July 7, 1977, as amended, and shall supersede any and all Orders of Determination, Stipulation, or Final Orders of Determination previously adopted by the Michigan Water Resources Commission.

Issued this 4th day of April, 1978, for the Michigan Water Resources Commission.

Robert J. Courchaine

Robert J. Courchaine
Executive Secretary

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Effluent Limitations (Demineralizer Regeneration Wastes)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge demineralizer regeneration wastes, a low volume waste source, through outfall (see Footnote a.). Such discharge shall be limited and monitored by the permittee prior to discharge as specified below:

| Effluent Characteristic | Discharge Limitations kg/day (lbs/day) Daily Average | Discharge Limitations kg/day (lbs/day) Daily Maximum | Discharge Limitations Concentrations Daily Average | Discharge Limitations Concentrations Daily Maximum | Monitoring Requirements Measurement Frequency | Monitoring Requirements Sample Type |
|---|---|---|---|---|---|---|
| Flow, $M^3$/Day (MGD) | | | | | Per Occurrence | |
| Total Suspended Solids | | | 30 mg/l | 100 mg/l | Weekly per Occurrence | Grab |
| Oil and Grease | | | 15 mg/l | 20 mg/l | Monthly per Occurrence | Grab |

a. The permittee shall notify the Executive Secretary of the Michigan Water Resources Commission of the exact location of the outfall, in writing, at least 30 days prior to the commencement of discharges therefrom.

b. The pH shall not be less than 6.0 nor greater than 9.0. The pH shall be monitored as follows: Weekly per Occurrence; grab.

c. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

d. The discharge shall not contain oil or other substances in amounts sufficien to create a visible film or sheen on the receiving waters.

e. Samples taken in compliance with the monitoring requirements above shall be taken prior to discharge to the waters of the State.

2. Final Limitations (Leak/Hydrostatic Testing)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge waters from leak testing; hydrostatic testing; and preoperational testing as required for nuclear power plant systems and equipment through outfall (see Footnote a). Such discharges shall be limited and monitored by the permittee as specified below:

| Effluent Characteristic | Discharge Limitations kg/day (lbs/day) Daily Average | Discharge Limitations kg/day (lbs/day) Daily Maximum | Discharge Limitations Concentrations Daily Average | Discharge Limitations Concentrations Daily Maximum | Monitoring Requirements Measurement Frequency | Monitoring Requirements Sample Type |
|---|---|---|---|---|---|---|
| Flow, $M^3$/Day (MGD) | | | | | Per occurrence | |

a. The permittee shall notify the Executive Secretary of the Michigan Water Resources Commission of the exact location of the outfall and the nature of the discharge, in writing, at least 30 days prior to the commencement of discharge therefrom.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken prior to discharge to the water of the State.

3. Final Limitations (Flushing and Passivation)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge wastewater from flushing and passivation operations as required for nuclear power plans systems and equipment through outfall (see Footnote a). Such discharges shall be limited and monitored by the permittee as specified below:

| Effluent Characteristic | Discharge Limitations kg/day (lbs/day) Daily Average | Discharge Limitations kg/day (lbs/day) Daily Maximum | Other Limitations Daily Average | Other Limitations Daily Maximum | Monitoring Requirements Measurement Frequency | Monitoring Requirements Sample Type |
|---|---|---|---|---|---|---|
| Flow, $M^3$/Day (MGD) | | | | | Per Occurrence | |
| Ammonia (as N) | | | | | Per Occurrence | Grab |
| Hydrazine ($NH_2NH_2$) | | | | | Per Occurrence | Grab |
| Oil and Grease | | | 15 mg/l | 20 mg/l | Monthly per Occurrence | Grab |
| Total Suspended Solids | | | 30 mg/l | 100 mg/l | Per Occurrence | Grab |
| Total Iron | | | | 1 mg/l | Per Occurrence | Grab |
| Total Copper | | | | 1 mg/l | Per Occurrence | Grab |
| Total Phosphorus (as P) | | | | 1 mg/l | Per Occurrence | Grab |

a. The permittee shall notify the Executive Secretary of the Michigan Water Resources Commission of the exact location of the outfall and the nature of the discharge, in writing, at least 30 days prior to the commencement of discharge therefrom.

b. The pH shall not be less than 6.5 nor greater than 9.5. The pH shall be monitored as follows: per occurrence; grab.

c. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

d. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

e. Samples taken in compliance with the monitoring requirements above shall be taken prior to discharge to Fermi I Cooling Water Canal with exception of pH which shall be monitored at the Overflow Canal prior to discharge to the Swan Creek.

4. Final Limitations (Chemical Rinse Water)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge waste water from chemical rinsing operations as required for nuclear power plant systems and equipment through outfall (see Footnote a). Such discharges shall be limited and monitored by the permittee as specified below:

| Effluent Characteristic | Discharge Limitations kg/day (lbs/day) Daily Average | Discharge Limitations kg/day (lbs/day) Daily Maximum | Discharge Limitations Concentrations Daily Average | Discharge Limitations Concentrations Daily Maximum | Monitoring Requirements Measurement Frequency | Monitoring Requirements Sample Type |
|---|---|---|---|---|---|---|
| Flow, $M^3$/Day (MGD) | | | | | Per Occurrence | |
| Oil and Grease | | | 15 mg/l | 20 mg/l | Monthly per Occurrence | Grab |
| Total Suspended Solids | | | 30 mg/l | 100 mg/l | Per Occurrence | Grab |
| Total Iron | | | | 1 mg/l | Per Occurrence | Grab |
| Total Copper | | | | 1 mg/l | Per Occurrence | Grab |

a. The permittee shall notify the Executive Secretary of the Michigan Water Resources Commission of the exact location of the outfall and the nature of the discharge, in writing, at least 30 days prior to the commencement of discharge therefrom.

b. The pH shall not be less than 6.5 nor greater than 9.5. The pH shall be monitored as follows: per occurrence; grab.

c. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

d. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

e. Samples taken in compliance with the monitoring requirements above shall be taken prior to discharge to Fermi I Cooling Water Canal WITH exception of pH which shall be monitored at the Overflow Canal prior to discharge to the Swan Creek.

5. Final Limitations (Stormwater)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge point source storm water runoff through outfall 001C. Such discharge shall be limited and monitored by the permittee as specified.

| Effluent Characteristic | Discharge Limitations kg/day (lbs/day) Daily Average | Daily Maximum | Concentrations Daily Average | Daily Maximum | Monitoring Requirements Measurement Frequency | Sample Type |
|---|---|---|---|---|---|---|

The discharge is limited to stormwater runoff only.

6. Final Limitations (construction site dewatering)

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge point source construction site dewatering through outfall (see Footnote a). Such discharge shall be limited and monitored by the permittee as specified below:

| Effluent Characteristic | Discharge Limitations kg/day (lbs/day) Daily Average | Daily Maximum | Concentrations Daily Average | Daily Maximum | Monitoring Requirements Measurement Frequency | Sample Type |
|---|---|---|---|---|---|---|
| Oil and Grease | | | 15mg/l | 20mg/l | monthly | Grab |

a. The permittee shall notify the Executive Secretary of the Michigan Water Resources Commission of the exact location of the outfall, in writing, at least 30 days prior to the commencement of discharge therefrom.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating add settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

PART I

B. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Reporting

The permittee shall submit monitoring reports containing results obtained during the previous month and shall be postmarked no later than the 10th day of the month following each completed report period. The first report shall be submitted within 90 days of the date of issuance of this permit.

3. Definitions

a. The daily average discharge is defined as the total discharge by weight, or concentration if specified, during a calendar month divided by the number of days in the month that the production or commercial facility was operating. When less than daily sampling is required, the daily average discharge shall be determined by the summation of the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.

b. The daily maximum discharge means the total discharge by weight, or concentration if specified, during any calendar day.

c. The Regional Administrator is defined as the Region V Administrator, U.S. EPA, located at 230 South Dearborn, 13th Floor, Chicago, Illinois 60604.

d. The Michigan Water Resources Commission is located in the Stevens T. Mason Building. The mailing address is Box 30028, Lansing, Michigan 48909.

4. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses;

d. the analytical techniques or methods used; and

e. The results of all required analyses.

6. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Monthly Operating Report. Such increased frequency shall also be indicated.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Michigan Water Resources Commission.

C. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified herein upon the effective date of this permit.

2. The permittee shall comply with the requirements of Section 10, Part II-A in accordance with the following:

a. Submit plans for approval to the Chief of the Water Quality Division necessary to comply with the primary power provision of Section 10 in Part II on or before N/A.

b. The permittee shall comply with the requirements of items 10a or 10b contained in Part II on or before N/A. Not withstanding the preceding sentence the permittee shall at all times halt, reduce, or otherwise control production in order to protect the waters of the State of Michigan upon the reduction or loss of the primary source of power.

3. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

PART II

A. MANAGEMENT REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. Containment Facilities

The permittee shall provide approved facilities for containment of any accidental losses of concentrated solutions, acids, alkalies, salts, oils, or other polluting materials in accordance with the requirements of the Michigan Water Resources Commission Rules, Part 5.

3. Operator Certification

The permittee shall have the waste treatment facilities under the direct supervision of an operator certified by the Michigan Water Resources Commission, as required by Section 6a of the Michigan Act.

4. Noncompliance Notification

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

5. Spill Notification

The permittee shall immediately report any spill or loss of any product, by-product, intermediate product, oils, solvents, waste material, or any other polluting substance which occurs to the surface or groundwaters of the state by calling the Department of Natural Resources 24 hour Emergency Response telephone number (517) 373-7660; and, the permittee shall within ten (10) days of the spill or loss provide the State with a full written explanation as to the cause and discovery of the spill or loss, clean up and recovery measures taken, preventative measures to be taken, and schedule of implementation.

6. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible, all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

7. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

8. By-passing

Any diversion from or by-pass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Michigan Water Resources Commission and the Regional Administrator, in writing, of such diversion or by-pass.

9. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed from or resulting from treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters, or the entry of toxic or harmful contaminants thereof onto the groundwaters in concentrations or amounts detrimental to the groundwater resource.

10. Power Failures

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. Provide an alternative power source sufficient to operate facilities utilized by permittee to maintain compliance with the effluent limitations and conditions of this permit which provision shall be indicated in this permit by inclusion of a specific compliance date in each appropriate "Schedule of Compliance for Effluent Limitations",
or

b. Upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit, the permittee shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

B. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the Executive Secretary of the Michigan Water Resources Commission, the Regional Administrator an/or their authorized representatives, upon the presentation of the credentials and subject to applicable requirements of federal and state law:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Michigan Water Resources Commission and the Regional Administrator.

3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Act and Rule 2128 of the Water Resources Commission Rules, Part 21, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State Water Pollution Control Agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act and Sections 7 and 10 of the Michigan Act.

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully, all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. Toxic Pollutants

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. Civil and Criminal Liability

Except as provided in permit conditions on "By-passing" (Part II, A-8) and Power Failures" (Part II, A-10), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond his control, such as accidents, equipment breakdowns, or labor disputes.

7. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee may be subject under Section 311 of the Act.

8. State Laws

Nothing in this permit shall be construed to preclude the instutition of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor infringement of Federal, State or local laws or regulations, nor does it obviate the necessity of obtaining such permits or approvals from other units of government as may be required by law.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

CHEMICAL CHARACTERISTICS

20. Explain the background for the proposed substantial reduction in the size of the holding pond, and the consequent new proposal for a smaller pond plus the construction and operation of a chemical dechlorination system to remove residual chlorine values (November 30, 1978).

RESPONSE

Refer to responses to Question 5, Heat Dissipation System, and Question 8, Chemical Characteristics, September 22, 1978.

AQUATIC ECOLOGY

1. (Section 2.7.1.1). Provide a discussion of the effects of the plant on important fish populations, based on the spawning and distribution information presented on the important species in Lake Erie.

   Provide quantitative estimates of the effects on important species through entrainment and local increases in temperature (September 22, 1978).

1. (Section 2.7.1.1). Provide a discussion of the effects of the plant on important fish populations, based on the spawining and distribution information presented on the important species in Lake Erie.

   Provide quantitative estimates of the effects on important species or families through entrainment and local increases in temperature (November 30, 1978).

RESPONSE

The effects of entrainment are addressed in response to Question 2. The effects of local increases in temperature on selected fishes are herein addressed. Selected life history information are summarized in Table 1 to provide information for the analyses.

The temperature differential at the Enrico Fermi Unit 2 discharge may range from 25 to 42 F. Because of mixing, however, the 3 F isotherm occupies an extremely small area primarily at the surface. (See Section 5.1). The selected species, (See Question 2),

the alewife, gizzard shad, carp, emerald shinner, white bass, yellow perch, and logperch, may potentially be slightly affected by the small area with the relatively high $\Delta T$. The species that broadcast their eggs near the surface, e.g., the emerald shiner and white bass, may be affected for a slightly larger area from the surface plume. However, since the eggs of most of the species at the site are adhesive and/or demersal (Table 1), the surface plume should have little or no significant effect.

The habitats for spawning, nursery, and adults (Table 1) are common and plentiful in the Western Basin and thus the minor displacement from the immediate discharge area will not significantly affect the Western Basin fish populations.

Cold shock should not be a problem near the discharge. The plume is small and thus will not attract numerous fishes. In the event of plant shut down, there will be no sudden temperature reduction, since the discharge from the circulating water reservoir will allow a gradual reduction in the plume $\Delta T$.

Lethal, preferred, and upper avoidance temperatures are summarized for fishes of Lake Erie found near Fermi 2 in Tables 5.1-6 and 5.1-6a of the Enrico Fermi 2. Environmental Report (Operating License). Similar to the effects during spawning, the effects during nonspawning periods will also be minimal. Fish will avoid the immediate discharge vicinity during summer months, an area that will amount to only a very few acres. The fishes will generally occupy areas of their preferred temperatures and avoid other temperatures, so heat shock should not be a problem. The minimal reduction of less than 18 acres ($3^{o}F$ isotherm) from the 811,000-acre area of the Western Basin will not affect the fish populations with regard to nursery or adult habitats.

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## Table 1. Life History Information for Selected Species

| Species | Spawning Period | Spawning Temperature (F) | Spawning Behavior | Habitat: Spawning | Habitat: Nursery | Adult | Eggs |
|---|---|---|---|---|---|---|---|
| Alewife | mid-March-August[1] | 55-60[2,3] | Upstream migration Anadromous[4,7] Eggs broadcast at random[5] Inshore migration[6] | Ponds, sluggish stretches of streams[3] Shallow beaches[6] | Spawning grounds[6] Protected areas[6] Deep water[6] | Open waters[6] | Demersal[6] Non-adhesive[5] |
| Gizzard shad | mid-March-August[8] June-July[9] | 63-73[9] 50-70[8] 64-75[11] 62[7] 67[10] | Eggs broadcast[8] | Sloughs, ponds, lakes, large rivers[8] sand, gravel, boulder bar[9] Shallow shores[10] | Littoral and limautic areas[11] Shallow water[11] | Same as nursery[11] Deepwater in winter[11] | Adhesive[8,12] Semi-bouyant[8] Demersal[12] |
| Carp | April-August[1] June-July[12] March-May[6] | 62.6-82.4[6] 65-72[13] 66[7] | Eggs scattered over submerged plants and debris[2,4,12,14] | Shallow water[2,6] Over plants[15] | Low gradient warm, streams[15] Shallow zones[17] | Warm waters, mudbottomed large streams[16] | Adhesive[6] Demersal[6] |
| Emerald shiner | Until mid-August[10] July-August[18] June-August[12] | 68.0-80.6[1] | Eggs released near surface, in open water[19] over a bottom of sand or firm mud[17] | Near shore[6] | Inshore waters[6] | Open waters[6] Offshore[6] | Demersal[6,17] |
| White bass | May[12] March-May[21] April-June[24] | 60[12] 58-75[20,24] 53-55[21] 53[7] | Migrate to shallows and tributaries[6,24] Eggs scattered at or near surface[7,24] | Near surface or midwater[6,17] 1 to 3 ft[21] Shoreline[21] Sand and rock shores[7] | Shore areas[22] | Offshore[21] Deeper waters[24] surface[24] | Demersal[6,24] Adhesive[6,24] |
| Yellow perch | February-March[23] February-July[1] April-May[24] | 35.6-51[23] 44-54[24] | Eggs laid in accordian-like gelatinous ribbons[24] No parental cane[6,24] Migration to shore shallows or tributaries[6] | Near shore[24] On sand, gravel, or rubble bottom[6,24] on vegetations[24] 5-10 ft[24] | Weedy areas[24] Shallow to medium depths[24] Shore areas[22] | Same as nursery | Semibouyant[6] Ribbons adhesive[6] Non-adhesive[5] |
| Logperch | June + 6 April-July[25] | >64[26] | Migration to sandy inshore shallows[6] Eggs buried in sand[25] | Sandy inshore shallows[6] Lake shores[25] Stream riffles[25] | Sand, gravel or rocky beaches | Deepwater, off-shore[6,25] same as nursery[25] | Adhesive[26] Demersal[26] |

[1]Brown, 1976
[2]Carlander, 1969
[3]Bigelow and Schroeder, 1953
[4]Academy of Natural Sciences of Philadelphia, 1977
[5]Mansueti, 1956 - Mansucti
[6]Scott and Crossman, 1973
[7]Committee on Water Quality Criteria, 1973
[8]Miller, 1960
[9]Bodola, 1966
[10]Langlois, 1954
[11]Jester and Jensen, 1973
[12]Breder and Rosen, 1966
[13]Jester, 1974
[14]Walburg and Nichols, 1967
[15]Trautman, 1957
[16]Eddy and Underhill, 1943
[17]Pflieger, 1975
[18]Fish, 1932
[19]Gray, 1942
[20]Chadwick et al., 1966
[21]Webb and Moss, 1968
[22]Parkhurst, 1971
[23]Muncy, 1962
[24]Raney, 1965
[25]Winn, 1958
[26]Cooper, 1978

AQUATIC ECOLOGY

2. (Section 2.7.1.1 and Appendix A.2). The effect of the plant on the important fish populations through entrainment is inadequately discussed. Item 350.4 specifically requests quantitative estimates on a species basis for entrainment and local temperature increases. The discussion of the effect of local temperature increases, although non-quantitative, is marginally adequate. However, the discussion regarding entrainment impact is not acceptable. Numeric estimates must be made on a species basis. These estimates were not provided in Subsection 5.1.3, or in Section 5.2, 5.4, or 5.5. (September 22, 1978).

1. The effect of the plant on the important fish populations through entrainment is inadequately discussed. Item 350.4 specifically requests quantitative estimates on a species basis for entrainment and local temperature increases. The discussion of the effect of local temperature increases, although non-quantitative, is marginally adequate. However, the discussion regarding entrainment impact is not acceptable. Numeric estimates must be made on a species or family basis. These estimates were not provided in Subsection 5.1.3, or in Sections 5.2, 5.4, or 5.5 (November 30, 1978).

RESPONSE

Quantitative estimates of the effects of entrainment at the Fermi 2 intake were made using the May 1976 through April 1977 oblique tow ichthyoplankton data from inshore station (5)

of transect C (across the mouth of the intake channel (Table 10-25, Appendix 2C, Supplement 4). The equations used were adapted from Potter et. al. (1978). To make the estimates, it was assumed that the densities and composition of ichthyoplankton collected would be representative of the densities and composition throughout the month. The average monthly flow rate at the intake was used to project the volume of water used as influent per 24-hour period during each month (Table 1).

The following equation was used to make each 24-hour estimate of entrainment for each taxon ($T_{24}$):

$$T_{24} = V_a(T/100)$$

where

- V = the average influent volume ($m^3$) per 24-hour day for each month
- a = the months
- T = The number of specimens of each taxon per 100 $m^3$ on each sample date for that month

The estimates of the number of each taxon entrained per month ($T_{mo}$) were calculated as follows:

$$T_{mo} = \sum_{e=1}^{m} d_e (T_{24})$$

where

- e = the number of 24-hour estimates per month
- d = the number of days in month represented by a 24-hour estimate
- $T_{24}$ = the estimated number of each taxon entrained per 24 hours.

Monthly totals were made by summing the $T_{mo}$ for each month; the total yearly estimate was made by summing the monthly totals by month and taxon.

## SELECTED SPECIES

The USEPA (1977) defined representative species as: 1) species with high yield to commercial or sport fisheries, 2) species that are important links in food chains, 3) species having large biomass in the existing ecosystem (desireable species), and 4) rare and endangered species. These criteria were used herein to select representative fishes for the Fermi 2 entrainment evaluation.

No rare or endangered species were collected during the study program (Department of the Interior 1977). Sport and commercially important species include the carp, goldfish, channel catfish, white bass, gizzard shad, freshwater drum, yellow perch, and logperch. The gizzard shad, alewife, and emerald shiner are important links in the food chain. Several of the above species represent large proportions of fish biomass in Lake Erie. For the following discussion the carp, white bass, and yellow perch were selected, representing sport and commercial fishing importance and/or significant biomass. The alewife, gizzard shad, and emerald shiner were selected as representing forage fish. The logperch is included as another important species based on its percentage in the following entrainment estimate.

## ENTRAINMENT PER YEAR

An estimated 19,360,485 ichthyoplankton could be entrained by the Fermi 2 intake per year (Table 2). Some 83.8% of the fish larvae were clupeids (76% were gizzard shad, 1.8% were alewife, and 5.9% were either gizzard shad or alewife (Table 2).

Approximately 16.2% or 3,135,835 larvae of all other species were found. Larvae of the emerald shiner (7.1%) white bass (1.7%), yellow perch (1.0%), and logperch (2.1%) were the only other taxa representing more than 1% ( 200,000 larvae) of the annual estimate. Eggs accounted for less than 0.5% of the entrainment estimate. This is a conservative estimate since it is based on a 100% plant capacity factor. The actual capacity factor is estimated to be 75%.

If each species is to maintain the same relative abundance in the system then the same relative numbers must survive from generation to generation (Everhart, Eipper, Youngs, 1975). Some variability between years should be expected when fish life spans, year class strength variability, and environmental effects on populations survival are considered.

The numbers of fish larvae potentially entrained at Fermi 2 may be translated into the potential number of adults that they represent (equivalent adults) if survival rates from larvae to adult developmental stages can be determined. Since survival data from larva to adult are not available for the species considered here, and vary greatly among years and locations, gross estimates were calculated using the equivalent adults method of Horst (1977). This method is an indirect approach whereby larva to adult survival is calculated from fecundity, egg to larva survival, and egg to adult survival. For these purposes, a worst case (100%) mortality of entrained organisms is assumed. The following description of the model is from Horst (1977).

This model is derived from the simple difference equation of population dynamics

$$N_{t=1} = \quad F\, N_t$$

where

$N_t$ = the number of fish in population at time t
R = the rate of population growth, which describes the change in the number in individuals in the population between successive time intervals
t = time measured in years or generations

If the population is at equilibrium, in one generation the eggs produced by a breeding pair will be reduced to two breeding adults:

$$2 = S_{EA} \cdot F$$

where

$S_{EA}$ = survival from egg to adult
F = the fecundity of a female during her life

This equation may also be expressed as:

$$S_{EA} = 2/F$$

The survivorship from egg to adult is equal to the product of the survivorship from egg to larvae ($S_{EL}$) and the survivorship from larvae to adult ($S_{LA}$):

$$S_{EA} = S_{EL} \cdot S_{LA}$$

Combining the above equations allows calculation for $S_{LA}$:

$$S_{LA} = \frac{2}{S_{EL} \cdot F}$$

The number of adults which would have survived from larvae to adult equals the number of larvae entrained multiplied by the survivorship $S_{LA}$, assuming no density-dependent compensatory alteration in survivorship.

Several assumptions are made. These include (1) the population is in equilibrium with regard to numbers and age distribution, (2) the life time of a fish in the population is representative of the population (mean generation time), (3) there are equal numbers of each sex, and (4) losses of larvae are instantaneous.

The fecundity of female during her life (F) is calculated from:

$$F = \sum_{i=1}^{G} f_i$$

where

$G$ = the mean generation time

$f_i$ = the average fecundity of a female during each year of her life

The above equation (E) does not come from Horst (1977). G is determined subjectively to be midwat between the age of sexual maturity and loss of reproductive capability (Potter 1978).

Survival rates from eggs to larvae ($S_{EL}$) may vary greatly within a species among populations and years. It is assumed that $S_{EL}$ from other locations are representative of Lake Erie. Where specific $S_{EL}$ are lacking it is assumed that $S_{EL} = 0.25$ in species characterized by parental care and $S_{EL} = 0.005$ in species lacking parental care. Selection of the first value was influenced by Clady's (1970) observation of greater than 25% survival from

egg to larval stage of the smallmouth bass and the latter value by Rothchild's (1961) observation of 0.5% survival of rainbow smelt eggs.

Alewife

An estimated 358,651 larval alewife could be entrained annually (Table 3). This represents an estimated loss to the system of 79 adult alewife (Table 3). Since alewife are abundant in the region, and are commerically harvested, the annual loss of 79 adults would not have a significant effect on the Western Basin population.

Gizzard Shad

An estimated 14,717,498 gizzard shad larvae could be entrained annually, resulting in a reduction of 5,887 adults annually from the breeding population (Table 3). As noted for the alewife, the gizzard shad is very abundant in most areas of the Western Basin, and is commercially harvested (695,402 fish in 1977), thus reductions should not affect the Western Basin population.

Carp

Some 177,289 carp larvae could be entrained annually resulting in a loss of 3 adult carp (Table 3). Carp are harvested in large numbers from Lake Erie (550,400 fish in 1977) and the annual loss of 3 additional adults would not be noticed.

Emerald Shiner

An estimated 1,379,185 emerald shiner larvae could be entrained annually (Table 3). The loss of potential adult emerald shiner

equals 16,551. The emerald shiner is very abundant in the vicinity of the Fermi 2 plant, and in the Western Basin in general (Baker and Scholl 1972). Scott and Crossman (1973) reported that in all probability emerald shiner populations fluctuated widely in abundance from year to year, and that these fluctuations have been characteristic of the populations for over 50 years. Since the emerald shiner is cropped significantly by predators (including man) the loss of 16,500 additional adults from the Western Basin population will probably not be significant.

White Bass

An estimated 323,068 larval white bass could be entrained annually resulting in the potential loss of 356 white bass adults (Table 3). Commercial landings of the white bass in Lake Erie during 1977 were 1,326,558 fish. The additional reduction of 356 adults as a result of entrainemnt should be an insignificant impact on the Western Basin white bass population.

Yellow Perch

The potential loss of 178 adult yellow perch was calculated from the estimated 204,003 larvae that might be entrained by the Fermi 2 intake annually. Since this is obviously a low number in relation to the reported abundance (3,428,176 fish in 1977 commercial landings). The impact on the Lake Erie population will be minimal.

Logperch

The potential loss of 53,674 adult logperch would result from the entrainment of 412,874 larvae. Logperch are commonly preyed upon by lake trout, walleye, and northern pike (Scott and Crossman 1973) but are probably of lesser importance as

a forage fish than the emerald shiner, alewife, and gizzard shad. Reductions of the logperch population as a result of entrainment may reduce the local population near the power plant intake somewhat, but will not affect the populations of predator fishes nearby nor the logperch population of the Western Basin.

Summary

Forage fishes, in particular, the logperch and emerald shiner, made up most of the potential adult fish loss as a result of entrainement of larvae. These losses, however, should not significantly alter the fish community structure near the power plant or in the Western Basin.

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TABLE 1

AVERAGE MONTHLY FLOW RATE[1]

AT THE FERMI 2 INTAKE

| Month | gpm | $m^3$/min | $m^3$/day |
|---|---|---|---|
| April | 21700 | 82.13 | 118267.2 |
| May | 22500 | 85.16 | 122630.4 |
| June | 24100 | 91.22 | 131356.8 |
| July | 27000 | 102.20 | 147168.0 |
| August | 27000 | 102.20 | 147168.0 |
| September | 25000 | 94.62 | 136252.8 |

[1] calculated rate

Table 2

Estimates of Monthly and Annual Entrainment
of Ichthyoplankton
at the Fermi 2 Intake

| | MAY, 1976 | JUNE, 1976 | JULY, 1976 | AUGUST, 1976 | SEPT., 1976 | APRIL, 1977 | TOTAL | % |
|---|---|---|---|---|---|---|---|---|
| DARTERS | – | 4,729 | 2,649 | – | – | – | 7,378 | 0.04 |
| SUCKERS | 6,622 | – | – | – | – | 4,612 | 11,234 | 0.06 |
| CRAPPIE | – | 7,619 | 4,268 | 6,402 | – | – | 18,289 | 0.09 |
| SUNFISH | – | – | 17,219 | – | – | – | 17,219 | 0.09 |
| BROOK SILVERSIDE | – | – | – | 20,530 | – | | 20,530 | 0.11 |
| WHITE PERCH | – | 15,500 | 8,683 | – | – | – | 24,183 | 0.12 |
| SPOTTAIL SHINER | 46,170 | 14,187 | 12,141 | – | – | – | 72,498 | 0.37 |
| FRESHWATER DRUM | – | 60,293 | 76,572 | | – | – | 136,865 | 0.71 |
| CARP | 32,558 | 62,920 | 54,438 | 27,373 | – | – | 177,289 | 0.92 |
| RAINBOW SMELT | 65,117 | 113,099 | 8,609 | – | – | – | 186,825 | 0.96 |
| YELLOW PERCH | 77,073 | 6,830 | – | – | – | 120,100 | 204,003 | 1.05 |
| WHITE BASS | 17,475 | 245,769 | 59,824 | – | – | – | 323,068 | 1.67 |
| LOGPERCH | 72,107 | 169,581 | 117,985 | 53,201 | – | – | 412,874 | 2.13 |
| EMERALD SHINER | – | 111,259 | 78,956 | 1,188,970 | – | – | 1,379,185 | 7.12 |
| EGGS, UNIDENTIFIABLE | 61,806 | – | – | – | – | – | 61,806 | 0.32 |
| UNIDENTIFIABLE | – | 76,187 | – | 6,402 | – | – | 82,589 | 0.43 |
| SUBTOTAL | 378,928 | 887,973 | 441,344 | 1,302,878 | | 124,712 | 3,135,835 | 16.2 |
| ALEWIFE EGGS | – | – | 4,709 | – | – | – | 4,709 | 0.02 |
| ALEWIFE | – | 132,145 | 19,426 | 185,211 | 21,869 | – | 358,651 | 1.85 |
| CLUPRIDHE | – | 197,429 | 43,046 | 903,317 | – | – | 1,143,792 | 5.91 |
| GIZZARD SHAD | 100,618 | 9,569,607 | 4,757,205 | 290,068 | – | – | 14,717,498 | 76.02 |
| SUBTOTAL | 100,618 | 9,899,181 | 4,824,386 | 1,378,596 | 21,869 | | 16,224,650 | 83.8 |
| TOTAL | 479,546 | 10,787,154 | 5,253,589 | 2,693,615 | 21,869 | | 19,360,485 | 100.0 |

## Table 3

### Calculation of Potential Adult Fish Loss Due to Entrainment of Fish Larvae at the Enrico Fermi Unit 2 Intake

| Species | G[a] | F[b] | $S_{EA}$[c] | $S_{EL}$[d] | $S_{LA}$[e] | Estimated No. Larvae Entrained | No. Adults Lost | 1977 Angler and commercial Harvest, No., Western Basin | % Harvest Lost |
|---|---|---|---|---|---|---|---|---|---|
| Alewife | 5[l] | 30,000[l] | $6.16 \times 10^{-5}$ | 0.300[f] | $2.2 \times 10^{-4}$ | 358,651 | 79 | – | |
| Gizzard shad | 4[l] | 1,000,000[l] | $2.0 \times 10^{-6}$ | 0.005[g] | $4.0 \times 10^{-4}$ | 14,717,498 | 5,887 | 695 402 | 0.85 |
| Carp | 6[l] | 400,000[l] | $5.0 \times 10^{-6}$ | 0.34[h] | $1.5 \times 10^{-5}$ | 177,289 | 3 | 550,400 | 0.0005 |
| Emerald shiner | 2[l,m] | 1,700[l] | $1.2 \times 10^{-3}$ | 0.100[i] | $1.2 \times 10^{-2}$ | 1,379,185 | 16,551 | – | |
| White bass | 4[n] | 600,000[n] | $3.3 \times 10^{-6}$ | 0.003[j] | $1.1 \times 10^{-3}$ | 323,068 | 356 | 1,326,558 | 0.03 |
| Yellow perch | 4[q] | 30,000[o] | $6.7 \times 10^{-5}$ | 0.077[k] | $8.7 \times 10^{-4}$ | 204,003 | 178 | 3,428,176 | 0.005 |
| Logperch | 2[p] | 3,000[n,p] | $6.7 \times 10^{-4}$ | 0.005[g] | $1.3 \times 10^{-1}$ | 412,874 | 53,674 | – | |

[a]Mean generation time
[b]Mean life time fecundity
[c]Survival from egg to adult
[d]Survival from egg to larva
[e]Survival from larva to adult
[f]Edsall (1970)
[g]Assumed value
[h]Nikolskii (1969)
[i]Assumed using Reed (1958)
[j]Assumed using Poigar (1977)
[k]Clady (1975, 1976)
[l]Assumed from Carlander (1969)
[m]Assumed from Pflieger (1975)
[n]Scott and Crossman (1973)
[o]Sheri (1968)
[p]Winn (1958)
[q]VanVooren and Davies (1974)

AQUATIC ECOLOGY

2. (Section 2.7.1) Discuss the importance of the portion of Lake Erie potentially affected by the operation of the plant (i.e., the shore zone 3 miles either side of the plant) as a fish breeding ground and nursery area (November 30, 1978)

RESPONSE

Ichthyoplankton in the vicinity of the Fermi 2 site are discussed in Appendix 2C, pp. 2C-24 through 2C-38, Supplement 4, February 1978.

Additionally, refer to Sections 5.1.1 and 5.1.2 for a description of the operation of the intake and discharge systems. Since the plume from the closed cycle cooling system at Fermi 2 is less than 18 acres (3 F isotherm), it is not expected that 3 miles of Lake Erie shoreline will be affected by plant operation.

AQUATIC ECOLOGY

3. (Section 2.7.1) Provide evidence that indicates there are no important fish breeding grounds west of the barrier beaches in the western basin of Lake Erie. What fishes are known to breed in the vicinity of the intake? (September 22, 1978).

RESPONSE

Presently, there are no barrier beaches in the vicinity of the Fermi Site. The area west of the "barrier beach" is now land.

Evidence of fish breeding in the vicinity of the intake was assumed by presence of fish eggs and/or larvae in ichthyo collections near the intake. Evidence of breeding was grouped into common or uncommon breeding based on number of times eggs and/or larvae were collected and their relative densities (no/100 $m^2$). Species that apparently breed commonly near the intake include the alewife, gizzard shad, carp, longperch, and freshwater drum. Other species, that apparently breed uncommonly near the intake but to a far lesser degree include the rainbow smelt, emerald shiner, spottail shiner, brook silversides, white bass, sunfish, darters, and yellow perch.

AQUATIC ECOLOGY

4. (Section 2.7.1) Provide a summary of the fish impingement records for the Monroe power plant and Fermi Unit No. 1. (September 22, 1978).

3. (Section 2.7.1) Provide a summary of the fish impingment records for the Monroe power plant and Fermi Unit No. 1. (November 30, 1978).

7. Please supply complete impingement summary records for Trenton Channel Power Station (November 30, 1978).

RESPONSE

In accordance with NRC procedure RPOP 514, Revision 2, three (3) copies each of the following documents are submitted:

Monroe Power Plant: Study Report on Cooling Water Intake

Enrico Fermi Power Plant, Unit 1: Study Report on Cooling Water Intake

Trenton Channel Power Plant: Study Report on Cooling Water Intake

AQUATIC ECOLOGY

5. (Section 2.7.1.2) The discussion of the increasingly rapid eutrophication of Lake Erie is incomplete in that no conclusion is drawn as to the contribution that the plant will make to this phenomenon. Discuss the plant's role relative to the eutrophication of the western basin of Lake Erie (September 22, 1978).

RESPONSE

Operation of the Fermi 2 plant is not expected to have an effect on eutrophication of Lake Erie. Discharges from the plant will not provide additional nutrients to the lake water since there are no phosphorous or nitrogen compounds used or produced by the plant. The phosphate and nitrate concentration in the discharge will increase by the same magnitude as other dissolved solids as a result of evaporation. The discharged water will be rapidly diluted and distributed in the lake. The area containing dissolved solids concentrations 20 percent over that of the ambient will be less than 2.4 acres (Section 5.1.2.2.5).

A recent study (PLUARG, 1978) of the International Joint Commission indicates that the major single constituent in the problems of eutrophication is phosphorus. The PLUARG study also points out that the major phosphorus loads to Lake Erie are from direct municipal sewage treatment plants and tributaries entering the lake. Industrial loading contributed less than 3% of the total.

During operation of the plant, 100 percent of the aquatic organisms entrained in the cooling system will be lost. The impact of this loss on the ecosystem is discussed in Section 5.1.3. The contribution of these dead organisms to the BOD concentration of the discharge water may cause slight changes in the immediate vicinity of the discharge area, however, the overall impact on the eutrophication of Lake Erie should be undetectable.

There will be less dissolved oxygen in the cooling water discharge will take place since oxygen is less soluble at higher temperatures. Operation during the month of April represents the worst case when the lake water temperatures have not increased as rapidly as the air temperature. The minimum dissolved oxygen concentration during this period will be about 6.5 ppm while the ambient lake concentration will be around 9.0 ppm. The lower dissolved oxygen concentration in the discharge will have no impact on biotic productivity since the discharge will mix rapidly with water in the receiving body thereby decreasing temperature and picking up oxygen from the diluting water and atmosphere.

No thermally induced shift in the phytoplankton species composition or population is anticipated to occur in the immediate vicinity of the discharge or in the lake as a whole. Nor is a shift in dominance from green algae and diatoms to less desirable blue green algae expected to occur due to plant operation. The expected slight increase in local ambient water temperature is not sufficient to produce a significant shift in species composition.

## REFERENCE

Internationl Joint Commission, 1978, PLUARG. Environmental Management Strategy for the Great Lakes System. Windsor, Ontario.

AQUATIC ECOLOGY

6. (Section 2.7.1.2 and Appendix A.2-Item 350.5) In the discussion on Eutrophic Impact in Subsection 5.1.2.2.6 it is stated that "the discharge water will be rapidly diluted and distributed in the lake." What is the basis for this statement? Since the bottom does not slope much and the water is shallow in the vicinity of the plant it would seem that the rates of water exchange between the water body adjacent to the plant and Lake Erie as a whole would be relatively slow. Can calculations be made which compare this exchange rate to the volume rate of discharge to the lake? Provide proper revised text for Item 250.5 (September 22, 1978).

RESPONSE

For circular submerged jets the work by J.O. Hinge and B.C. Vander Hegge Zigen[1] showed that the distribution of temperature and material (salinity dissolved solids, etc) in a turbulent jet were approximately the same although somewhat different than the momentum distribution. Abraham[2] developed the equation

$$\frac{S - S_w}{S_o - S_w} = \frac{1}{2C_3} \frac{D_o}{x} \left[ e^{-\frac{1}{2C_4^2} \frac{r^2}{x^2}} \right] \qquad (1)$$

to express the distribution of salinity. The temperature and dissolved solids distribution can be expressed in a similar manner.

$$\frac{T - T_w}{T_o - T_w} = \frac{D - D_w}{D_o - D_w} = \frac{-1}{2C_3} \frac{D_o}{x} \left[ e^{\frac{-1}{2C_4^2} \frac{r^2}{x^2}} \right] \quad (2)$$

where

$S, T, D,$ = Salinity, Temperature, or dissolved solids at any point in the discharge plume.

$S_o, T_o, D_o$ = Salinity, Temperature, or dissolved solids of the jet at the discharge point.

$S_w, T_w, D_w$ = Salinity, Temperature, or dissolved solids of the receiving water

$D_o$ = diameter of jet ($4R_H$)

$x$ = horizontal coordinate along the jet axis

$r$ or $y$ = horizontal coordinate normal to the jet axis

$F$ = Densimetric Froude number

$R_H$ = hydraulic radius of discharge ($D_o/4$)

Jen et al [3] experimentally showed that surface jets follow similar dilution equations with $C_3 = 0.071$ and $\frac{1}{2}c_4^2$ being replaced by $K F_\Delta^{\frac{1}{2}}$. The best fit to available data is obtained when $k = 2.13$..

Along the centerline of a discharge, i,e, (r=o) EQ.2 becomes

$$\frac{T - T_w}{T_o - T_w} = \frac{D - D_w}{D_o - D_w} = \frac{1}{2C_3} \frac{D_o}{x} \qquad (3)$$

For the Enrico Fermi Atomic Power Plant Environmental Report the parameter $4R_H$ was substituted for $D_o$ and a conservative value of 35 for $\frac{1}{2}c_3$ was selected (a large value for $\frac{1}{2}c_3$ is conservative in that the plume will be longer and the dilution less rapid than for small valves of $\frac{1}{2}c_3$). The value of 35 was selected based on prototype temperature data from the Ginna, Point Beach, and Waukegan power plants. Thus, the relationship for temperature and dissolved solids distribution along the centerline becomes

$$\frac{\Delta D_m}{\Delta D_o} = \frac{\Delta T_m}{\Delta T_o} = 140 \frac{RH}{x} \qquad (4)$$

where $\Delta$ indicates the difference between ambient and the plume (i.e. $D_o - D_w = \Delta D_o$) and m subscript refers to plume centerline values. EQ.4 is plotted in Figure 5.1-12 of the Environment Report.

For the final design of the decant line and using Case 3 of the Environmental Report as an example (Discharge = 20,000 gpm, $T_w = 58^\circ F$, $T_o = 89.9^\circ F$ and $D_o = 190$ ppm).

The value of $R_H$ is 0.68 and Eq. 4 becomes

$$x = 95.2 \frac{\Delta T_o}{\Delta T_m} \text{ or } x = 95.2 \frac{\Delta D_o}{\Delta D_m} \qquad (5a, 5b)$$

The values in Table 1 were calculated using Eqs. 5a and 5b.

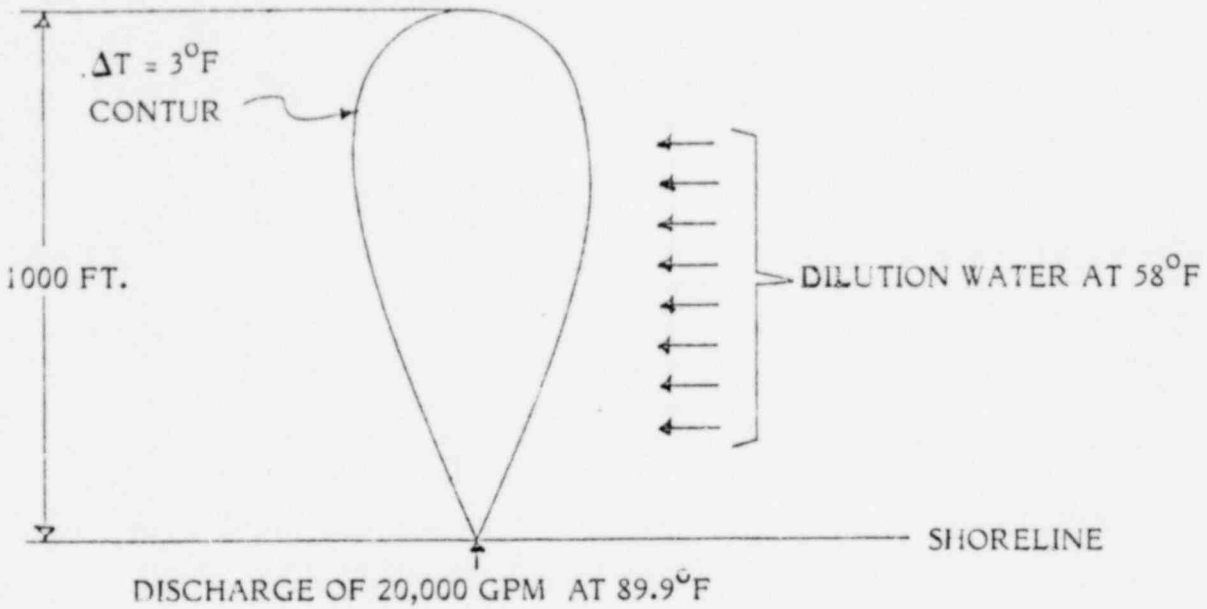
TABLE 1

Temperature and dissolved solids concentrates as a function of distance along the center line of the plume.

| Distance, (ft) | $\Delta T_o$ (°F) | $\Delta T_m$ (pp,) | $\Delta D_o$ (pp) | $\Delta D_m$ (ppm) |
|---|---|---|---|---|
| 0 | 31.9 | 31.9 | 190 | 190 |
| 250 | 31.9 | 12.1 | 190 | 72 |
| 500 | 31.9 | 6.1 | 190 | 36 |
| 750 | 31.9 | 4.0 | 190 | 29 |
| 1000 | 31.9 | 3.0 | 190 | 18 |

From Table 1 it can be seen that the discharge concentration of either temperature or dissolved solids will be reduced to 50 percent within 200 feet of the discharge point and to 10 percent within 1000 feet of the discharge point. This rapid decrease in concentration of either temperature or dissolved solids justifies the statement. "The discharge water will be rapidly diluted and distributed in the lake."

The lake bottom at the discharge location slopes away from the shoreline at an approximate slope of 1:180. The water depth 1,000 feet offshore of the discharge point would be 7 feet. Refering to the sketch below which depicts Case 3, an extreme case; (i.e. large discharge and $\Delta T$, lower than existing MWL of 572, and dilution from one side of the plume) the latteral velocity required to provide the required plume dilution water would be approximately 0.1 foot per second.




For a lake level of 575 feet, a discharge of 10,000 gpm, a $\Delta T$ of 31.9°F, and entrainment of dilution water from both sides of the plume (Case 5 in the Environmental Report) the required lateral velocity would be less than 0.02 fps to dilute the plume to a T of 3°F. Typical values for the lateral velocity at the Fermi power plant site range between 0.4 and 1.0 fps.

Thus, the volume rate of "fresh dilution" water available to decrease the temperature and dilute the dissolved solids in the plume is approximately ten times greater than that required.

## REFERENCES

1. Hinze, J.O., and van der Hegge Zinjnen, B.C., "Heat and Mass Transfer in Turbulent Mixing Zone of an Axially Symmetrical Jet," Proceedings, 7th Internatl. Congrss for Applied Mechanics, London, England, Part 1, Vol. 2, 1948, pp. 286-299.

2. Abraham, G., "Jet Diffusion in Liquid of Greater Density," Journal of the Hydraulics Division, ASCE, Vol. 86, No. HY6, Proc. Paper 2506, June, 1960, pp. 1-13.

3. Jen, Y. Wiegel, R.L. and Mobarek, I., "Surface Discharges of Horizontal Warm-Water Jet", Journal Power Division, Proceedings, ASCE, Volume 92, No. Po2, pp 1-29, April, 1966.

AQUATIC ECOLOGY

7. (Appendix 2C) Define the term "temporary hardness" as it is used on page 2C-3 (September 22, 1978).

4. (Appendix 2C) Define the term "temporary hardness" as it is used on page 2C-3 (November 30, 1978).

RESPONSE

Temporary hardness refers to the hardness constitutents which can be simply removed from waters (e.g., carbonates). For example, by boiling water which contains bicarbonates of calcium and magnesium causes these to precipitate as non-soluable salts. Permanent hardness refers to hardness resulting from sulfates, chlorides, or nitrates of calcium and magnesium which can be removed only by more rigorous softening techniques.

AQUATIC ECOLOGY

8. (Appendix 2C) Provide a written description for interpretation of the percent composition graph in Figure 2 given on Page 2C-77. The relationship between the plotted lines and the various shaded areas is quite confusing (September 22, 1978).

5. (Appendix 2C) Provide a written description for interpretation of the percent composition graph in Figure 2 given on Page 2C-77. The relationship between the plotted lines and the various shaded areas is quite confusing (November 30, 1978).

RESPONSE

The percent composition graph on page 2C-77 provides two components of the composition of phytoplankton in Lake Erie. On a data by date basis, the graph read vertically provides the percent composition of each taxon or any combination of taxa. For instance, May indicates that approximately 16% of the phytoplankton were Microflagellates, 2% were Others, 64% were Chrysophyta, 17% were Chlorophyta, and 1% was Cyanaphyta. Cumulatively these total 100% of the composition. Comparisons based on percent composition between months are also possible. For example, 64% of the phytoplankton were Chrysophyta in May, while they were only 8% in July.

AQUATIC ECOLOGY

8. Given that the requirements of the NPDES Permit are now known, please detail the chlorination scheme proposed for the plant circulating water system. How often do you anticipate using the manual dechlorination system. What quantities of soluble sulfates will be discharged into Lake Erie as a result of system use? Will they exceed federal EPA standards? (November 30, 1978).

RESPONSE

Refer to response to Question 8, Chemical Characteristics, September 22, 1978.

AQUATIC ECOLOGY

9. (Section 5.1) The ER-OL does not clearly address the $\Delta T$ from the reservoir into Lake Erie. What is the expected $\Delta T$ during worst case conditions into Lake Erie? Will this temperature cause a possible cold shock effect to fish during the winter? If so, what is the proposed mitigative action? (September 22, 1978).

6. (Section 5.1) The ER-OL does not clearly address the $\Delta T$ from the reservoir into Lake Erie. What is the expected $\Delta T$ during worst case conditions into Lake Erie? Will this temperature cause a possible cold shock effect to fish during the winter? If so, what is the proposed mitigative action? (November 30, 1978).

RESPONSE

Tables 5.1-4 (Section 5.1) and 10.3-1 (Section 10.3) show the worst case conditions for the $\Delta T$ of the blowdown from the reservoir to Lake Erie. Cases 2 and 4 in Table 5.4-1 were used for the plume analysis presented in Section 5.1.

Subsection 5.1.3.4, page 5.1-15, Supplement 4, February 1978 discusses the effect of cold shock to fish during the winter and spring.

AQUATIC ECOLOGY

10. (Section 6.1) Is the pre-operational program presented in Section 6.1 of the ER-OL Supplement 4, February 1978, the program that will be implemented beginning January 1979 as a one year study beginning one year before fuel loading (September 22, 1978).

RESPONSE

The pre-operational aquatic monitoring program is outlined below.

INTRODUCTION

A pre-operational aquatic monitoring program will be initiated approximately 1 year prior to fuel load. The program is specifically designed for the closed cycle cooling system at the Fermi 2 site located on the Western Basin of Lake Erie. It will provide results that can be compared with the 1976-1977 baseline study, as well as with a program that will be conducted during the initial years of operation.

SAMPLING LOCATION

Figure 1 presents the configuration of the sampling locations. Transects A, B, and C are perpendicular to the Lake Erie shoreline, extending 3500 to 4000 feet into Lake Erie. Stations 1 through 6 are located on the three transects, two per transect: the odd numbers (1, 3, 5) are inshore, the even numbers (2, 4, 6) are offshore. Station 7 is in the intake canal immediately in front of the Fermi 2 intake. Station 7A is located downstream of the trash racks where the intake water enters the general service water pumphouse.

## SAMPLING SCHEDULE

The pre-operational sampling at Stations 1 through 7 will consist of a 1-year program of weekly, biweekly, and monthly intervals from January through December, weather, lake conditions, and ice cover permitting. The parameters measured during this period and sampling schedule are shown in Table 1.

## PARAMETERS

### WATER QUALITY

Discrete water samples will be collected at each sampling station coincident with ichthyoplankton sampling and analyzed for the following:

| | |
|---|---|
| pH | Suspended Solids |
| Dissolved Oxygen | Dissolved Solids |
| Temperature | Conductivity |
| Transparency | Total Hardness |
| Total Alkalinity | |

### FISHERIES POPULATION STUDIES

Every 30 days, weather and lake conditions permitting, fish population will be sampled. Fish will be collected with gill nets, otter trawls, and beach seines, where possible. Six-panel experimental gill nets (mesh sizes 13 to 89 mm) will be used at Stations 2, 4, 6, and 7. Nets will be set on the bottom, perpendicular to the shoreline with the largest mesh located offshore, for 24 hours. A 4.9 m otter trawl (1/4 inch mesh) will be towed parallel to shore for 5 minutes. Seining will be accomplished at Stations 1, 3, 5, and 7 with a 12.1 m bag seine (3/16 inch mesh).

Captured fish will be identified and measured in millimeters. All viable fish will be released with the exception of those which could not be readily identified in the field or those retained for voucher collection. Fish not positively identified in the field will be sent to the laboratory for identification.

ICHTHYOPLANKTON

Ichthyoplankton samples will be taken once a week at Stations 1 through 7 during the anticipated spawning season, April through September. During the remaining months the schedule shown in Table 1 will be followed.

Duplicate samples, surface and bottom, will be collected at Stations 1 through 7. Net samples will be collected using 0.5 m diameter conical plankton nets of 505 micron mesh. Two 3-minute tows will be made at each station, where possible.

Demersal and adhesive eggs will be collected at Stations 1 through 7 using a 1.46 $m^3$/minute (385 gpm) pump attached to a 0.073 $m^2$ stationary bottom sampler.

At Station 7A between the trash rack and the pumphouse, ichthyoplankton will be collected once a week during the anticipated spawning season and on the schedule shown in Table 1. Duplicate diurnal samples will be taken, three per day and three per night, using a conical plankton net and/or a submersible pump, whichever can best be handled at the pumphouse.

The ichthyoplankton samples will be sorted and the eggs and larvae will be identified to the lowest possible taxon. Eggs will be evaluated as to condition; larvae will be separated into various developmental stages.

FISH IMPINGEMENT

An impingement study will be conducted to investigate the number and species of fish that are impinged on the traveling screens. The traveling screens will be periodically rotated and backwashed to remove any material that will be collected. Impinged fish will be collected over a 24-hour period once a week (Table 1) and the species composition and total weight will be determined. One sample per month will be taken and the length and weight of each fish determined. For unusually large collections, sub-sampling will be employed.

All viable fish will be returned to the lake.

TABLE 1

FERMI 2
SCHEDULE OF PRE-OPERATIONAL ECOLOGICAL MONITORING PROGRAM[a]

| Parameter | Jan. | Feb. | Mar. | Apr. | May | Jun. | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Chemistry | X | X | X | X | X | X | X | X | X | X | X | X |
| Fish (adult) | X | X | X | X | X | X | X | X | X | X | X | X |
| Ichthyoplankton[b] | X | X | XX[c] | XXXX[d] | XXXX[d] | XXXX[d] | XXXX[d] | XXXX[d] | XXXX[d] | X | X | X |
| Fish Impingement[b] | (once/week) | | | | | | | | | | | |

(a) Sampling will be done at the specified intervals weather, lake conditions, and ice cover permitting.

(b) During pre-operational testing of the plant, these parameters will be sampled in conjunction with the operation of the general service water pumps and traveling screens whenever feasible.

(c) biweekly

(d) weekly

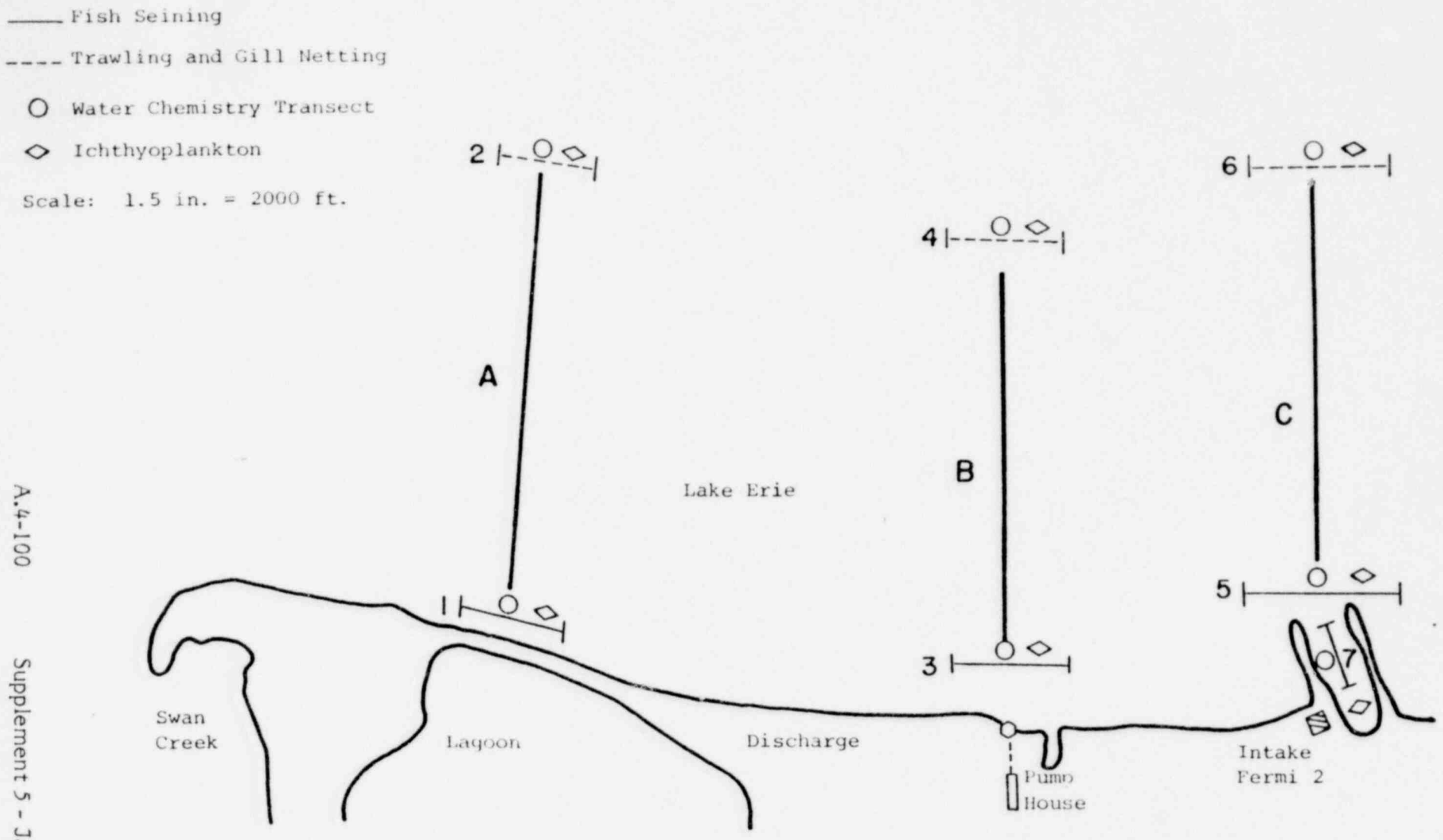



FIGURE 1

PREOPERATIONAL MONITORING
ENRICO FERMI (UNIT 2) SAMPLING STATIONS AND TRANSECTS

AQUATIC ECOLOGY

11. (Section 6.2) Please provide 8 copies of pp. 6.2-18 and 6.2-19. These are missing from some copies of the ER (September 22, 1978).

RESPONSE

Pages 6.2-18 and 6.2-19 were deleted in Supplement 4, February 1978. The information previously on these pages is on pages 6.2-16 and 6.2-17 of Supplement 4.

HEAT DISSIPATION SYSTEM

1. (Section 3.4) There is missing information between pages 3.4-4 and 3.4-5 in some copies of the ER. Please provide 8 extra copies of the latest supplement pages (September 22, 1978).

RESPONSE

In accordance with NRC procedure RPOP 514, Revision 2, three (3) copies of page 3.4-4a, Supplement 1, June 1975, are being submitted. In addition, eight (8) copies were submitted under separate cover to the Environmental Project Manager.

HEAT DISSIPATION SYSTEM

2. (Section 3.4) Explain the increase in need for makeup water compared to that discussed in the Environmental Report, Construction Phase (September 22, 1978).

RESPONSE

The quantity of makeup water, 31,500 gpm, as discussed in the Environmental Report, Construction Phase, was based on a system that incorporated a 50-acre pond that was designed as a residual heat removal complex with a decant capability of 6,000 or 12,000 gpm. The present system incorporates a 5.5 acre circulating water reservoir with a decant capability of 10,000 or 20,000 gpm.

Section 3.3, Figure 3.3-1, Schematic of Proposed Water Flow - Daily Average Values, is the most recent basis for makeup water requirements. The figure is based on the maximum blowdown rate of 20,000 gpm.

HEAT DISSIPATION SYSTEM

3. (Section 3.4) What were the major factors considered in the design change of the discharge structure? Please summarize information related to costs, engineering feasibility and environmental impact (September 22, 1978).

RESPONSE

The original design change from an offshore to an onshore discharge was suggested by the Regional Engineer, Bureau of Water Management, Michigan Department of Natural Resources (MDNR) in January 1974. In January 1975, the onshore discharge concept was approved by the MDNR as indicated in Appendix A.2 page A.2-25.

Detailed information on the onshore discharge is presented in Section 10.3, Supplement 4, February 1978.

HEAT DISSIPATION SYSTEM

4. (Section 3.4) Will the two mechanical draft cooling towers of the RHR complex be used continuously? If not, when will they be used and what will be the typical duty-cycle? Provide any available estimates of fogging and icing effects from these units. If the units will not be used continuously, will they be tested periodically during long periods of non-use? What is the design heat rejection of these units? (September 22, 1978).

RESPONSE

The mechanical draft cooling towers associated with the RHR Complex will not be used continuously. Surveillance testing of the fans and valves will be performed every 92 days or less. The towers will be operated whenever it is necessary to cool the ultimate heat sink, such as during extended reactor shutdown cooling. The estimated usage is expected to be about 15 hours every 3 months, or 60 hours per year. Because of the low estimated usage, no estimates of fogging or icing effects have been made.

The design heat rejection rate per tower is 160 million BTU per hour at 76$^{o}$F wet bulb.

HEAT DISSIPATION SYSTEM

5. (Section 3.4) Since FES-CP several parameters of the circulating water reservoir appear to have changed: Area, 50 acres to 5.5 acres; volume, 230 x $10^6$ gal. to 27.5 x $10^6$ gal.; and holdup time of circulating water, 4.5 hours to 1.0 hours. What are the major objectives of the design alternations? Will the alternations result in increased discharge levels of chlorine to Lake Erie? Explain (September 22, 1978).

RESPONSE

The initial concept of Fermi 2 included a 50-acre open-cut pond with sloping sides armored with rip-rap, to serve as a basin for the two natural draft cooling towers, and also to act as a 180-day reservoir for the RHR Service Water (RHRSW) system. Special provisions were to be incorporated in the construction of the reservoir embankments to assure stability during seismic events, and a separate, seismically qualified pump house was provided for the RHRSW pumps. The design water levels and pump elevations were chosen to assure that the water supply would not be lost and to prevent flooding of the pumps. A barrier was provided on the Lake Erie shoreline to protect the pond and the pumphouse from storms on the lake.

The reliability of the RHR pond during violent storm and flood conditions was questioned in the USAEC/DOL review of the Fermi 2 PSAR. A general discussion of deficiencies in the design was conducted in a meeting with the USAEC/DOL on

June 24, 1971. On February 2, 1972, Edison was advised that certain questions raised concerning the RHR "pond" in the June 24, 1971 meeting were as yet unresolved, and this subject would therefore become an "open item" in the staff safety evaluation. Close proximity to Lake Erie and the consequent possibility of flood damage was the major concern.

As a result of discussions with consultants, Edison concluded that the open-cut pond might possibly become filled with silt by wave action from Lake Erie during postulated extreme storm conditions. No amount of shore protection could be provided at a reasonable cost to guarantee that silting would not occur. Consequently Edison decided to abandon the pond concept in favor of a protected, seismically qualified structure, away from Lake Erie, that would be capable of withstanding all foreseen and/or postulated meteorological and accidental events, and meet the requirements of the AEC General Design Criteria, 10CFR50 Appendix A; and additionally AEC Regulatory Guide 1.27.

The 50-acre reservoir was then reduced to 5.5 acrea since the large volume of water was no longer required as the ultimate heat sink.

At the time the 50-acre reservoir was part of the Fermi 2 system design, the chlorine dosage for the system was established by maintaining free residual chlorine levels of 0.5 to 0.75 ppm at the outlet of the condenser water box and the general service water system. It was anticipated that after traveling through the cooling towers and retention in the reservoir, the blowdown to Lake Erie would be at a level of approximately 0.1 ppm free residual chlorine (Supplement II to Applicants Environmental Report, Construction Phase, Question 25, December 1971).

Since that time, total residual chlorine effluent limitations have been established by the Michigan Water Resources Commission as part of the NPDES permit program. These limitations have resulted in a reevaluation of the chlorination scheme for Fermi 2 as described in the response to Question 8, Chemical Characteristics (September 22, 1978). Establishment of the new limitations would have resulted in such a reevaluation had the 50-acre reservoir been retained.

HEAT DISSIPATION SYSTEM

6. (Section 5.1) Cooling tower drift estimates appear to be much larger than state-of-the-art. What is the vendor's warranty?

RESPONSE

The vendor's warranty on the drift rate for the natural draft cooling towers is 0.1%.

HEAT DISSIPATION SYSTEM

7. (Section 6.1) Refer to the statement on page 6.1-26 of the ER-OL, Good agreement between model (LVPM-3) predictions and field observations..." Provide model validation evidence in support of this statement. This 1973 study consisted of only 15 observations. If more recent data are available, please provide a summary of the data and conclusions (September 22, 1978).

RESPONSE

NUS Corporation submitted an IBM-360 object module of the NUS LVPM computer code to Dr. H.J. Policastro at Argonne National Laboratory (ANL) for use in their model validation work.(a) A recent conversation with Dr. Policastro indicated that comparison of the LVPM model plume rise with field data showed very good agreement.(b)

During the latter part of 1974, the LVPM program was used to calculate vertical profiles of plume temperature and mixing ratio based on preliminary field data collected at Florida Power & Light's Turkey Point Plant. These field data were collected under the direction of EPA, NERC, Corvallis, Oregon. The model-calculated plume profiles were sent to Mr. Larry Winiarski of EPA (c). They showed reasonable agreement with the observed plume profiles. With permission from Mr. Winiarski, these model predictions were sent to J.E. Carson of ANL on October 15, 1974(d).

The LVPM predictions were verified against field data for natural draft cooling towers, including the TVA studies at the Paradise Plant and the IIT Studies at the Keystone Plant. These verifications are described in Section III of NUS-TM-S-184 (July, 1974), three (3) copies of which are being submitted in accordance with NRC procedure RPOP 514, Revision 2.

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(a) Letter, G. Fisher, NUS Corporation to A.J. Policastro, ANL, ESD-77-316(AQ), August 22, 1977.

(b) Policastro, A.J., ANL, personal communication, Fisher, G., NUS Corporation, September 27, 1978.

(c) Letter, Taylor, J.H, NUS Corporation to Winiarski, L., USEPA, ESD-74-1035(AQ), October 4, 1974.

(d) Letter, Taylor, J.H., NUS Corporation to Carson, J.E., ANL, ESD-74-1090(AQ), October 15, 1974.

## OTHER GENERAL ENVIRONMENTAL MATTERS FOR DISCUSSION

A. Review of Pre-operational Monitoring Program (September 22, 1978).

### RESPONSE

The pre-operational program for aquatic monitoring is discussed in the response to Question 8, Aquatic Ecology (September 22, 1978).

The pre-operational radiological monitoring program and the infrared vegetation surveillance program are described in Sections 6.1.5 and 6.1.4 of the Applicants Environmental Report (Operating License Stage).

OTHER GENERAL ENVIRONMENTAL MATTERS FOR DISCUSSION

B. Discussion of Plant Design Alernatives (Chapter 10 of the ER-OL) (September 22, 1978.).

RESPONSE

Since the issuance of the Final Environmental Statement in July 1972, there has been no change in identifiable plant systems or components having a significant bearing on the environmental impact evaluation, other than a revision to the design of the discharge facility for the circulating water reservoir blowdown. Considerations leading to the choice of the onshore discharge configuration are discussed in Section 10.3. No discussions have been included for other sections of Chapter 10, since they remain unchanged from those presented in the Final Environmental Statement in July 1972.

OTHER GENERAL ENVIRONMENTAL MATTERS FOR DISCUSSION

C. Environmental Technical Specifications (September 22, 1978).

RESPONSE

The Environmental Technical Specifications will be written and filed within a time frame that is appropriate for a fuel load date of June 1980.

SOCIAL IMPACT

1. (Section 8.1) Provide the following information by year from 1978 to 1990 and by job classification (i.e., welders, masons, office personnel, etc)(Septebmer 22, 1978).

   a. Number of construction workers
   b. Number of operational employees.

1. (Section 8.1) Provide the following information by year from 1978 to 1990 and by job classification (i.e., welders, masons, office personnel, etc)(November 30, 1978).

   a. Number of construction workers
   b. Number of operational employees

RESPONSE

a. Table 1, Construction Workers, shows the projected number of workers through 1981.

b. Table 2, Operational Employees, shows the projected number of employees through 1990.

TABLE 1 - CONSTRUCTION WORKERS

| CRAFT | 1978 | 1979 | 1980 | *1981 |
|---|---|---|---|---|
| Laborers | 265 | 270 | 121 | 26 |
| Ironworkers | 62 | 55 | 5 | 0 |
| Bricklayers | 0 | 6 | 0 | 0 |
| Carpenters | 234 | 135 | 72 | 14 |
| Cement Finishers | 16 | 22 | 14 | 2 |
| Painters | 11 | 81 | 43 | 12 |
| Millwrights | 40 | 22 | 12 | 4 |
| Boilermakers | 104 | 35 | 17 | 11 |
| Pipefitters | 663 | 572 | 162 | 63 |
| Pipe Welders | 16 | 22 | 7 | 6 |
| Insulators | 2 | 41 | 16 | 17 |
| Sheet Metal | 46 | 6 | 2 | 2 |
| Electrician | 394 | 404 | 141 | 63 |
| Linemen | 16 | 2 | 1 | 0 |
| Equipment Operators | 60 | 42 | 21 | 6 |
| Field Engineers | 2 | 2 | 2 | 1 |
| Teamsters (Daniel) | 29 | 31 | 22 | 14 |
| Teamsters | 35 | 36 | 28 | 8 |
| Elevator Operators | 1 | 1 | 1 | 1 |
| Tile Setters | 3 | 2 | 0 | 0 |
| Trasel Grinders | 1 | 1 | 0 | 0 |
| | 2000 | 1788 | 687 | 250 |
| Non-Manual | 950 | 874 | 462 | 332 |

*Craft support for power ascension stage

TABLE 2

OPERATIONAL EMPLOYEES

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Supervisory Staff | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Office Personnel | 8 | 9 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Engineers | 30 | 30 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Technicians | 20 | 20 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| Supervisors (Includes Shift Supervisors) | 10 | 15 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Supervising Operators | 18 | 15 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Operators | 12 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Instrument Repairmen | 6 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| General Mechanics | -- | 10 | 36 | 36 | 36 | 3 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Apprentices | -- | -- | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Pipe Coverers | -- | -- | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Painters | -- | -- | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Handymen | -- | 5 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Janitors | 1 | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Security Personnel | 12 | 24 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Stores Personnel | 4 | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| SUB TOTAL | 129 | 183 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 |
| Contractors | 67 | 50 | 25 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 196 | 233 | 282 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 |

SOCIAL IMPACT

2. (Section 8.1) Provide an estimate of the following information for currently employed construction workers (September 22, 1978).

   a. Place of residence
   b. Number of children
   c. The number of workers who moved to the general area because of the job

2. (Section 8.1) Provide an estimate of the following information for currently employed construction workers (November 30, 1978).

   a. Place of residence
   b. Number of children
   c. The number or workers who moved to the general area because of the job.

RESPONSE

a. Place of residence

Count taken as of October 1978 showed

| | |
|---|---|
| Monroe County | 607 |
| Michigan - out of county | 525 |
| Out of State | 1023 |
| TOTAL | 2155 |

b. Number of children

Over the past 9 months, approximately 220 children were moved into Monroe County.

c. The number of workers who moved to the general area because of the job.

Over the past 9 months, 673 construction workers moved into Monroe County.

SOCIAL IMPACT

3. (Section 8.1) Estimate the number of operational workers who will be hired from the local area and where those who will be hired from areas will reside (September 22, 1978).

3. (Section 8.1) Estimate the number of operational workers who will be hired from the local area and where those who will be hired from other areas will reside. Provide the following information about operational workers:

a. Number and/or percentage of current employees who will transfer jobs to work at Fermi 2.
b. Of the remaining operational employees, how many will be hired from the local area as compared to those who will have to move to the area?
c. How many of these "new" employees have been hired? (November 30, 1978)

RESPONSE

For the purpose of this answer, the "local area" is considered to be the County of Monroe.

Based on present trends, about 40 new employes will be hired from the local area and 20 present Detroit Edison employees living locally will hire into the plant.

Of the remaining 75 employees to be hired, it is estimated that 10 will be from out of state and 3 of these will move into Monroe

County. The remaining 65 will be present Detroit Edison employees, mostly from areas surrounding Monroe County. About 15 of the 65 will move to be closer to the plant, but only 5 of the 15 will actually move to Monroe County.

Summarizing -- of the estimated final "operating complement" of 257, the following will probably reside in Monroe County:

| | |
|---|---|
| Present employes at the plant | 17 |
| New hires from Monroe residents | 40 |
| Transfers from Monroe residents | 20 |
| New out of State hires | 3 |
| Transfers from other DECo facilities | 5 |
| Estimated Monroe County Residents | 85 |

With reference to where those who will be hired from other areas will reside, it is our experience that the majority choose to stay in or move to the Wayne County towns of Southgate, Trenton, Woodhaven, Grosse Ile, Rockwook, Flatrock, etc., and even further afield such as Plymouth and Canton Township.

LAND USE

1. (Section 2.2) Please provide a loan copy of Reference 7, Section 2.2 of the ER-OL (Complan: 2000, Comprehensive Development Plan for Monroe County (September 22, 1978).

1. (Section 2.2) Please provide a loan copy of Reference 7, Section 2.2 of the ER-OL (Complan: 2000, Comprehensive Development Plan Monroe County (November 30, 1978).

RESPONSE

At the Fermi 2 site visit on October 31, 1978, the following documents were loaned to the Argonne National Laboratory review team:

1. COMPLAN: 2000
2. Monroe County: Year 2000 Comprehensive General Development Plan

Please be advised that COMPLAN: 2000 has been superceded by the three volume plan as Monroe County's future land use plan.

LAND USE

2. (Section 4.1) Update the figures in column 2 and Table IV- 1 of the CP-FES incorporating the additional 30 acres and any other changes in plans since the publication of the document (September 22, 1978).

2. (Section 4.1) Update the figures in column 2 and Table IV-1 of the CP-FES incorporating the additional 30 acres and any other changes in plans since the publication of the document (November 30, 1978).

RESPONSE

There has been essentially no further disturbance to the Fermi Site due to construction activities since the Final Environmental Statement (FES), July 1972. Most of the changes that have occurred and continue to occur are a result of fluctuations in the level of Lake Erie. This can effect the lagoon areas, the type of cover growth, and the beaches.

As a result of the above, the general site features as they will be after construction are listed in Table 1 in a somewhat different format than shown in FES Table IV-1. The Fermi Site is essentially divided into two areas.

- NORTH AREA - North of Enrico Fermi Drive is occupied by the Fermi 2 plant, its cooling towers, circulating water reservoir, onsite transmission lines, parking lots, roads, etc. The remaining marshes, lagoons, cover types, and fill areas will remain in their present natural state.

- SOUTH AREA - South of Enrico Fermi Drive which consists of marsh, lagoon, various cover types, the quarry lake, and the dredged material storage basin. This 400-acre area may be made available for controlled public access.

Lake Erie and Swan Creek are treated separately and comprise about 130 acres within the site boundary, exclusive of the north and south area.

TABLE 1

TYPICAL FERMI 2 SITE FEATURES

1120 ACRES; 1.75 SQUARE MILES

| Description | Percentage | | |
|---|---|---|---|
| | South Area | North Area | Total Site |
| 1. South Area | | | 35.7 |
| o Dredged Materials Basin | 8.5 | - | 0.9 |
| o Peakers, met tower, Fermi 1 associated buildings | 5.5 | - | 2.0 |
| o Quarry Lake | 5.0 | - | 1.8 |
| o Misc. Construction Disturbance | 8.0 | - | 2.9 |
| o Marsh, Lagoon, Thickets, Woodlots, etc. | 79.0 | - | 28.2 |
| 2. North Area | | | 52.7 |
| o Fermi 2 plant | - | 22.0 | 11.6 |
| o Fermi 1 plant | - | 2.5 | 1.3 |
| o Misc. Construction Disturbance, Lay-down, parking, revegetated fill | - | 16.9 | 8.9 |
| o Marsh, Lagoon, Thickets, Woodlots, etc. | - | 58.5 | 30.8 |
| 3. Water | | | |
| Lake Erie and Swan Creek | | 11.6 | 11.6 |
| | | 100.06 | 100.0 |

ECONOMIC CONSIDERATIONS

1. (Section 1.1) Please provide a recent bond prospectus that describes Fermi Unit No. 2 (September 22, 1978).

1. (Section1.1) Please provide a recent bond prospectus that describes Fermi Unit No. 2 (Novmeber 30, 1978).

RESPONSE

In accordance with NRC procedure RPOP 514, Revision 2, three (3) copies each of the following information is being submitted:

Prospectus General and refunding mortgage bonds Series PP.

Preliminary Prospectus, General and refunding mortgage bonds Series RR.

FORECASTING

1. (Section 1.1.2.1) The applicant should also provide the methodology and results of forecasts from its Planning Department as it incorporates analyses from its other departments (ER, 1.1-9). The applicant should provide the following reports of critiques of the DE forecast procedures (ER, 1.1-12 and 13) (September 22, 1978).

1. Section 1.1.2.1) The applicant should also provide the methodology and results of forecasts from its Planning Department as it incorporates analyses from its other departments (ER, 1.1-9). The applicant should provide the following reports of critiques of the DE forecast procedures (ER, 1.1-12 and 13):

   a. The review of the Michigan Public Service Commission Staff (Touche Ross team).
   b. Review of the NERA organization
   c. The review of Theodore Barry and Associates.
   d. Latest available studies performed by DE on its own initiative or requested by the Michigan Public Service Commission on energy use of the auto industry or other major industiral users in the DE service area (November 30, 1978).

RESPONSE

The basic methodology and result of Edison's latest official load forecast is described in the report "Forecast Electric Energy Use and Demand, 1979-1993," September 1978. Three (3) copies of this report are being submitted in accordance with NRC procedure RPOP 514, Revision 2.

a. The review of the Michigan Public Service Commission Staff (Touche Ross team).

In accordance with NRC procedure RPOP 514, Revision 2, three (3) copies of the MPSC - Touche Ross evaluation are being submitted.

b. Review of the NERA organization.

In accordance with NRC procedure RPOP 514, Revision 2, three (3) copies of the NERA review are being submitted.

c. The review of Theodore Barry and Associates.

In accordance with NRC procedure RPOP 514, Revision 2, three (3) copies of the section of the Theodore Barry report pertaining to load forecasting are being submitted.

d. Lastest available studies performed by DE on its own initiative or requested by the Michigan Public Service Commission on energy use of the auto industry or other major industrial users in the DE Service area.

The studies performed by Edison on energy use in the auto industry and other major industries are described in Section IIIV of "Forecast Electric Energy Use and Demand 1979-1993," September 1978.

ENERGY CONSERVATION

1. (Section 9.0) The applicant should provide any Michigan Public Service Commission ordered studies and results of experiments, rate design changes, or demonstration projects that bear on energy conservation that have been performed or are underway since 1974 (September 22, 1978).

RESPONSE

In accordance with procedure RPCP 514, Revision 2, three (3) copies each of the following documents are being provided.

1. Project to Demonstrate Potential Energy Savings from Industrial Customers - Federal Energy Administration, The Detroit Edison Company and Michigan Public Service Commission.

2. Residential Electricity Elasticities in the Lower Peninsular of Michigan. Volume 1, Equitable Environmental Health, Inc.

3. Experimental Domestic Time-of-Day Report - Rate Department.

4. Interruptible Air-Conditioning Rate Filing - MPSC: Testimony, Exhibits, Working Papers and Appendices.

5. Generic Hearings to Determine the Effectiveness of Interrupting Specified Electric Services with Respect

to Load Management by Major Michigan Electric Utilities. MPSC Filing - Testimony and Exhibits Parts 1 and 2.

6. Testimony and Final MPSC Order - U-5174: Implementation of a Home Insulation Plan.

7. Application of The Detroit Edison Company for Authority to Implement a Customer Information Program - U-5914.

8. MPSC pronouncements in The Matter of the Establishment on the Commission's own Motion of Residential Conservation Program Standards - U-5900.

SYSTEM RELIABILITY

1. (Section 1.13) Provide a copy of the Michigan Electric Coordination System agreement and any non-legal document that may clarify the agreement (if necessary) (September 22, 1978).

RESPONSE

In accordance with RPOP 514, Revison 2, three (3) copies of the referencd document are being provided.

SYSTEM RELIABILITY

2. (Section 1.1.3) Provide loss of load probability calculations, results of studies from ECAR, or other documentation of its choice of a 22 percent reserve margin (September 22, 1978).

1. (Section 1.1.3) Provide loss of load probability calculations, results of studies from ECAR, or other documentation of its choice of a 22 percent reserve margin (November 30, 1978).

RESPONSE

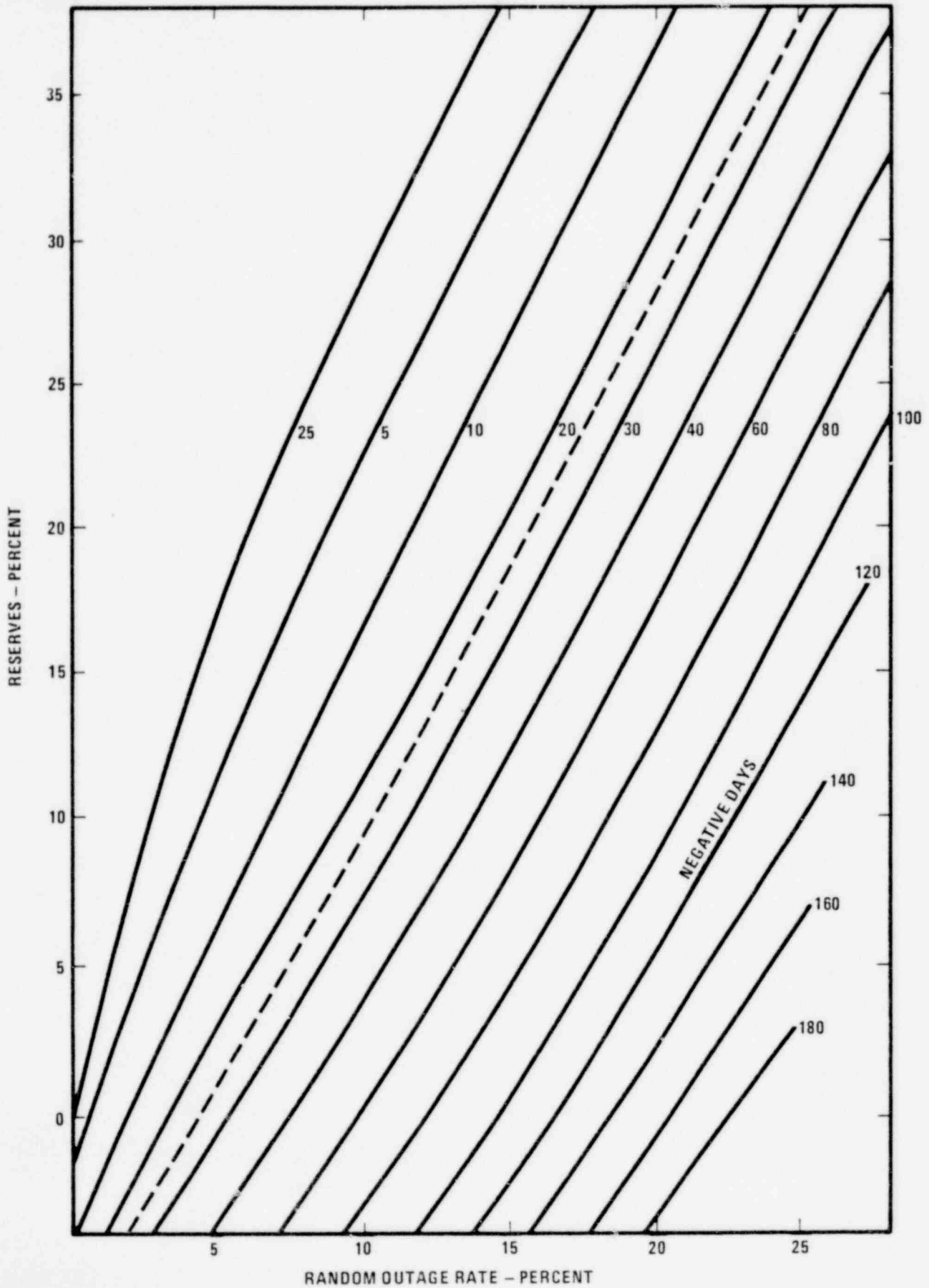
The reserve requirement of 20-22% was determined using a negative-day criterion of 25 negative days per year and the forecasted generating unit random outage rates. Parameters related to reserve requirements are developed through the use of the attached set of curves which represent the computer output of multiple runs of the "Distribution of Capacity Margins" program (See Table 1 and Figure 1).

The 25 negative-day criterion assumes that capacity in the range of 25 to 30% of our peak load is available from our interconnections on a perfectly reliable basis. This results in meeting a loss of load probability index of once in 10 years.

## Reserve Analysis – Detroit Edison Company

| | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Summer Cap, MW | 8584 | 8584 | 8584 | 8584 | 8584 | 8584 | 8584 | 8584 | 8584 | 8584 | 8584 |
| Greenwood 1, MW | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 | 780 |
| Enrico Fermi 2, MW | | | 874 | 874 | 874 | 874 | 874 | 874 | 874 | 874 | 874 |
| Belle River 1, MW | | | | | | 676 | 676 | 676 | 676 | 676 | 676 |
| Belle River 2, MW | | | | | | | 676 | 676 | 676 | 676 | 676 |
| Ludington 5 & 6, MW | | | | | | 153 | 153 | 153 | 153 | 153 | 306 |
| Greenwood 2, MW | | | | | | | | | | | 1208 |
| EF 2 Buy-back, MW | | | 198 | 178 | 158 | 138 | 119 | 99 | 79 | 59 | 40 |
| Total Net Capability, MW | 9364 | 9364 | 10436 | 10416 | 10396 | 11205 | 11862 | 11842 | 11822 | 11802 | 13144 |
| Peak Load, MW | 7313 | 7612 | 7852 | 7855 | 8154 | 8492 | 8830 | 9163 | 9476 | 9834 | 10159 |
| Reserve, MW | 2051 | 1752 | 2584 | 2561 | 2242 | 2713 | 3032 | 2679 | 2346 | 1968 | 2985 |
| Reserve, % | 28.0 | 23.0 | 32.9 | 32.6 | 27.5 | 31.9 | 34.3 | 29.2 | 24.8 | 20.0 | 29.4 |
| *Equivalent Availability, % | 77 | 78 | 76 | 78 | 79 | 78 | 78 | 79 | 78 | 78 | 77 |
| Scheduled Outage Factor, % | 7 | 6 | 8 | 7 | 7 | 8 | 7 | 6 | 8 | 8 | 8 |
| Random Outage Rate, % | 17 | 17 | 17 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 17 |
| Negative Days | 15 | 22 | 7 | 16 | 11 | 7 | 5 | 9 | 16 | 25 | 11 |
| Negative Day Goal | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Reserve Required, MW | 1594 | 1659 | 1711 | 1555 | 1614 | 1681 | 1748 | 1814 | 1876 | 1947 | 2214 |
| Reserve Required, % | 21.8 | 21.8 | 21.8 | 19.8 | 19.8 | 19.8 | 19.8 | 19.8 | 19.8 | 19.8 | 21.8 |
| Purchase Required, % | (6.2) | (1.2) | (11.1) | (12.8) | (7.7) | (12.1) | (14.5) | (9.4) | (5.0) | (0.2) | (7.6) |
| Purchase Required, MW | (456) | (93) | (872) | (1005) | (627) | (1027) | (1280) | (861) | (474) | (20) | (772) |

*It includes the effects of partial outages and deratings.


RESERVES – PERCENT
35
30
25
20
15
10
5
0
25
5
10
20
30
40
60
80
100
120
140
160
180
NEGATIVE DAYS
5
10
15
20
25
RANDOM OUTAGE RATE – PERCENT

BENEFITS AND COSTS

2. (Section 8.2) Provide analyses to support the position that economic savings dictate the issuance of a license (see ER Section 1.3). The applicant should rely on the Wein Automatic System Planing Package to show system production costs in the 1981-1985 period with and without Fermi 2 in service. The analysis should be performed for varying growth rates in energy requirements (i.e., the applicant's official forecast and one 50% lower to show the sensitivity of these cost estimates to load growth). Data for each operating unit or grouping similar O & M costs (variable and fixed), forced outage rates, scheduled maintenance, and other relevant operating characteristics (September 22, 1978).

1. (Section 8.2) Provide analyses to support the position that economic savings dictate the issuance of a license (see ER section 1.3). The applicant should rely on the Wein Automatic System Planning Package to show system production costs in the 1981-85 period with and without Fermi 2 in service. The analysis should be performed for varying growth rates in energy requirements (i.e., the applicant's official forecast and one 50% lower to show the sensitivity of these cost estimates to load growth). Data for each operating unit or grouping similar O & M costs (variable and fixed), forced outage rates, scheduled maintenance, and other relevant operating characteristics (November 30, 1978).

RESPONSE

The requested analysis was performed on a computer program called PROMOD. PROMOD was developed by Energy Management

Associated which uses probabilistic theory in simulating economic dispatch of plants and peakers in order to determine fuel consumption and production costs. PROMOD is used to determine the Detroit Edison Company official production cost projections used in rate case testimony.

The Wein Automatic System Planning Package is used to determine future generation expansion and mix patterns. It is not used for detailed production cost analysis.

Three (3) copies of the resultant computer runs from PROMOD are being submitted in accordance with NRC procedure RPOP 514, Revision 2. The output contains all the information requested except the fixed operation and maintenance which is not included in these preduction runs.

A summary containing the Michigan Pool fuel savings with Fermi 2 in service versus Fermi 2 out of service is tabulated below:

Fermi 2 out of service versus Fermi 2 inservice

| Year | Annual Fuel Savings ($ x $10^6$) Projected Load Growth | Annual Fuel Savings ($ x $10^6$) 50% of Projected Load Growth |
|---|---|---|
| 1981 | 113.2 | 101.0 |
| 1982 | 93.0 | 80.8 |
| 1983 | 118.6 | 100.1 |
| 1984 | 150.7 | 110.2 |
| 1985 | 105.2 | 85.5 |

SYSTEM RELIABILITY

3. (Section 1.1.3) Provide a copy of the Interconnection Agreement with MCP members (July 6, 1976) (September 22, 1978)

RESPONSE

In accordance with NRC procedure RPOP 514, Revision 2, three (3) copies of the referenced document are being provided.

## BENEFITS AND COSTS

1. (Section 8.1) Provide more detailed data on the annual and total primary benefits from Fermi 2. Table 8..-1 "Benefits from the Proposed Facility" is not consistent with estimated generated electricity of Fermi 2, shown on pages 8.1-2 and 8.1-3 (September 22, 1978)

## RESPONSE

The value shown on page 8.1-2 for annual electricity generated is incorrect, due to a typographical error. The correct value is shown in Table 8.1-1 on page 8.1-1 and is obtained in the following way:

Electricity generated = 874 MW x .70 capacity factor
x 8760 hr. per year

= $5.36 \times 10^6$ MWh per year
or $5.36 \times 10^9$ kWh per year

The annual primary benefit in 1981 is computed by determining sales (output minus losses) $5.36 \times 10^9$ kWh = $4.98 \times 10^9$ kWh times price 3.98¢/kWH = $198,204,000 in 1981 (Edison only).

The tota' primary benefit in 1981 is computed by escalating the Edison 198 million in 1981 by 4% for 40 years and present worthing each annual revenue at 10.6% to 1981. The Cooperatives' revenues were held constant at 42 million per year (no escalation) and each annual revenue present worthed back to 1981 at 9%. The total present worth values for Edison and the Cooperatives were summed to yield 3.28 billion in 1981.

BENEFITS AND COSTS

3. (Section 8.2.1) Provide a more detained breakdown of the primary internal cost for Fermi 2. Data should be presented showing capital cost of plant, fuel cost, operating and maintenance cost, NRC fees, decommissioning cost, research and development cost and other relevant costs. Annual costs are defined in mills/kwh or millions of dollars per year and present worth values are defined in millions of dollars (i.e., fuel cost, data should show the most recent projected fuel cost, including a resources depletion factor) (September 22, 1978).

2. (Section 8.2.1) Provide a more detained breakdown of the primary internal cost for Fermi 2. Data should be presented showing capital cost of plant, fuel cost, operating and maintenance cost, NRC fees, decommissioning cost, research and developement cost and other relevant costs. Annual costs are defined in mills/kwh or millions of follars per year and persent worth values are defined in millions of dollars (i.e., fuel cost, data should show the most recent projected fuel cost, including a resources depletion factor) (November 30, 1978).

RESPONSE

The data shown in the tabulation on page 8.2-3 is in the process of being updated and is not ready for filing at this time.

ARCHEOLOGICAL SURVEY

1. Has an archeological survey been conducted at the site inland and along the shore? If available provide the survey results including a description of the survey method (November 30, 1978).

RESPONSE

No changes or additional information has been made available since that stated on pages II-7 and II-8 of the AEC Final Environmental Statement, Construction Permit Stage, July 1972.