NUREG-75/031

# DRAFT ENVIRONMENTAL STATEMENT

related to the proposed operation of

# DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1

TOLEDO EDISON COMPANY AND

CLEVELAND ELECTRIC ILLUMINATING COMPANY

Docket Number 50-346

Published: April 1975

OFFICE OF NUCLEAR REACTOR REGULATION

UNITED STATES NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C.

## SUMMARY AND CONCLUSIONS

This Environmental Statement was prepared by the U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation (the staff) in accordance with 10 CFR §51.23(e). This Summary and Conclusions reflects the staff's evaluation and position. The staff's basic evaluation is presented in the Final Environmental Statement, Construction Permit Stage (FES-CP) for the Davis-Besse Nuclear Power Station Unit 1 issued in March 1973. Changes in staff evaluation due to the development of new information, results of preoperational programs, or plant design changes are addressed in this Environmental Statement.

1. This action is administrative.

2. The proposed action is the issuance of an operating license to the Toledo Edison Company and the Cleveland Electric Illuminating Company for the startup and operation of the Davis-Besse Nuclear Power Station Unit 1 (the station) located near Port Clinton in Ottawa County, Ohio (Docket No. 50-346).

   The station will use a pressurized water reactor (PWR) to produce about 2772 megawatts thermal (MWt) to generate a net electrical output of 906 megawatts electrical (MWe). The steam condenser for the turbine will be cooled by water circulated through a single hyperbolic natural-draft cooling tower. Makeup water for the cooling tower will be taken from Lake Erie and the tower blowdown will be discharged into Lake Erie.

3. Summary of environmental impacts and adverse environmental effects:

   Attendant with the furnishing of electrical energy, and the benefits to be derived therefrom, the proposed facility will cause certain adverse environmental effects. The more significant of these effects are listed below:

   a. The total site area is 954 acres of which 160 acres have been removed from production of grain crops and converted to industrial use. Approximately 600 acres of the area is marshland which will be maintained as a wildlife refuge.

   b. The disturbance of the lake shore and lake bottom during construction of the station water intake and discharge pipes resulted in temporary turbidity, silting, and destruction of bottom organisms. Since completion of these activities, evidence of improvement in turbidity and transparency measurements, and the reestablishment of the bottom organism has been obtained.

   c. Because of the location of the station in a migratory bird flyway and close proximity to bird refuges, there is a possibility of occasional occurrences in which birds are killed by flying into the station structures. Results of the monitoring program to date have not revealed any significant bird kills.

   d. The cooling tower blowdown and service water which the station discharges to Lake Erie, via a submerged jet, will be heated no more than 20°F above the ambient lake water temperature. Although some small fish and plankton in the discharge water plume will be disabled as a result of thermal shock, exposure to chlorine and buffeting, few adult fish will be affected. The thermal plume resulting from the maximum thermal discharge is calculated to have an area of less than one acre within the 3°F isotherm (above lake ambient).

   e. The station's natural-draft cooling tower has a visual impact on the surrounding areas. There is a possibility that the cooling tower may augment natural fog (estimated to be 1 hour/year compared with 831 hours/year natural) within several miles of the station particularly in the winter months.

   f. Approximately 101 miles of transmission lines have been constructed, primarily over existing farmland, requiring about 1800 acres of land for the rights-of-way. Land use will essentially be unchanged since only the land required for the base of the towers is removed from production. Herbicides will not be used to maintain the rights-of-way.

g. It is calculated that the station may discharge approximately 0.3 curies per year of mixed isotopes in liquid wastes excluding tritium and 350 curies per year of tritium to Lake Erie. (The previous staff calculations were 5 curies per year of mixed isotopes in liquid waste and 1,000 curies of tritium.) Approximately 3345 curies per year of gaseous radioactive wastes may be discharged to the atmosphere. (Compared to 3,000 curies, previously calculated.)

h. The risk associated with accidental radiation exposure is very low.

i. No significant environmental impacts are anticipated from normal operational releases of radioactive materials. The estimated dose to the population within 50 miles from operation of the plant is 4.4 man-rem/yr, which is less than the normal fluctuations in the 234,000 man-rem/yr background dose this population would receive.

j. The metorological, hydrological, biological and radiological monitoring programs initiated in the station's vicinity will provide data on the impact of the plant and be of interest to the scientific community, particularly in regard to the ecology of Lake Erie.

4. The following Federal, State and local agencies have been requested to comment on the Draft Environmental Statement:

Advisory Council on Historic Preservation
Department of Agriculture
Department of the Army, Corps of Engineers
Department of Commerce
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of Interior
Department of Transportation
Environmental Protection Agency
Federal Energy Administration
Federal Power Commission
Great Lakes Basin Commission
Governor of the State of Ohio (State Clearinghouse)
Ohio Environmental Protection Agency
Ohio Department of Health
Ohio Power Siting Commission
Ottawa County Commission

5. This Environmental Statement was made available to the public, to the Council on Environmental Quality, and to other specified agencies in April 1975.

6. On the basis of the analysis and evaluation set forth in this statement, and after weighing the environmental, economic, technical and other benefits of the Davis-Besse Nuclear Power Station Unit 1 against environmental costs and considering available alternatives at the construction stage, it is concluded that the action called for under NEPA and 10 CFR Part 51, is the issuance of an operating license for Unit 1 of the Davis-Besse Nuclear Power Station subject to the following conditions for the protection of the environment:

(A) License Conditions

Before engaging in a operational activity not evaluated by the Commission, the applicant will prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not evaluated, or that is significantly greater than that evaluated in this Environmental Statement, the applicant shall provide a written evaluation of such activities and obtain prior approval of the Director, Office of Nuclear Reactor Regulation for the activities.

(B) Significant Technical Specification Requirements

(1) The applicant will carry out the environmental monitoring programs outlined in Section 6 of this Statement. A comprehensive program to monitor fish eggs and larvae entrained by the operation of the station and a comprehensive program to determine impingement of fish at the intake structure of the station shall be included.

(2) A study shall be conducted to determine the extent to which the intake canal supports a fish population and thus contributes to impingement losses should be determined. The details of this study shall be included in the Environmental Technical Specifications.

(3) Continued monitoring of bird impactions on the cooling towers and other station structures will be required.

(4) Special studies to determine the offsite sound levels during station operations and to determine the effectiveness of the bubble screen installed at the intake crib to reduce impingement losses will be required.

(5) If other harmful effects or evidence of irreversible damage are detected, the applicant will provide to the staff an analysis of the problem and a proposed course of action to alleviate the problem.

(C) Other Conditions

The staff requires that the data from the upgraded meteorological program be submitted prior to final staff approval of Environmental Technical Specifications.

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## FOREWORD

This environmental statement was prepared by the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, in accordance with the Commission's regulation, 10 CFR Part 51, which implements the requirements of the National Environmental Policy Act of 1969 (NEPA).

NEPA states, among other things, that it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice.
- Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Further, with respect to major Federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of NEPA calls for preparation of the detailed statement on:

(i) the environmental impact of the proposed action;

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented;

(iii) alternatives to the proposed action;

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and,

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

An environmental report accompanies each application for a construction permit or a full-power operating license. A public announcement of the availability of the report is made. Any comments by interested persons on the report are considered by the staff. In conducting the required NEPA review, the staff meets with the applicant to discuss items of information in the environmental report, to seek new information from the applicant that might be needed for an adequate assessment, and generally to ensure that the staff has a thorough understanding of the proposed project. In addition, the staff seeks information from other sources that will assist in the evaluation and visits and inspects the project site and surrounding vicinity. Members of the staff may meet with State and local officials who are charged with protecting State and local interests. On the basis of all the foregoing and other such activities or inquiries as are deemed useful and appropriate, the staff makes an independent assessment of the considerations specified in Section 102(2)(C) of the NEPA and 10 CFR Part 51.

This evaluation leads to the publication of a draft environmental statement, prepared by the Office of Nuclear Reactor Regulation, which is then circulated to Federal, State and local government agencies for comment. A summary notice is published in the Federal Register of the availability of the applicant's environmental report and the draft environmental statement. Interested persons are requested to comment on the proposed action and the draft statement. Interested persons are also invited to comment on the draft statement. Comments should be addressed to the Director, Division of Reactor Licensing, at the address shown in the last paragraph of this Foreword.

After receipt and consideration of comments on the draft statement, the staff prepares a final environmental statement, which includes a discussion of questions and objections raised by the comments and the disposition thereof; a final benefit-cost analysis, which considers and balances the environmental effects of the facility and the alternatives available for reducing or avoiding adverse environmental effects with the environmental, economic, technical, and other benefits of the facility; and a conclusion as to whether--after the environmental, economic, technical, and other benefits are weighed against environmental costs and after available alternatives have been considered, the action called for, with respect to environmental issues, is the issuance or denial of the proposed permit or license or its appropriate conditioning to protect environmental values. This final environmental statement and the safety evaluation report prepared by the staff are submitted to the Atomic Safety and Licensing Board for its consideration in reaching a decision on the application.

This environmental review deals with the impact of operation of Davis-Besse Unit 1. Assessments that are found in this statement supplement those described in the Final Environmental Statement (FES-CP) that was issued in March 1973 in support of continuation of the construction permit for Unit 1. The information to be found in the various sections of this Statement updates the FES-CP in four ways: (1) by identifying differences between environmental effects of operation (including those which would enhance as well as degrade the environment) currently projected and the impacts that were described in the preconstruction review; (2) by reporting the results of studies that had not been completed at the time of issuance of the FES-CP and which were under mandate from the AEC/NRC staff to be completed before initiation of the operational review; (3) by evaluating the applicant's preoperational monitoring program; and factoring the results of this program into the design of the post-operational surveillance program and into the development of Environmental Technical Specifications; and (4) by identifying studies being performed by the applicant that will yield additional information relevant to the environmental impacts of operating the Davis-Besse Nuclear Power Station, Unit 1.

The staff recognized the difficulty a reader would encounter in trying to establish the conformance of this review with the requirements of the National Environmental Policy Act with only "updating information." Consequently a copy of the FES-CP accompanies the draft of this statement when it is being circulated for comment by interested agencies and individuals. In addition, introductory paragraphs in each section of the Statement will summarize both the extent of "updating" and the degree to which the staff considers the subject to be adequately reviewed.

Effective January 19, 1975, activities under the U.S. Atomic Energy Commission regulatory program were assumed by the U.S. Nuclear Regulatory Commission in accordance with the Energy Reorganization Act of 1974. Any references to the Atomic Energy Commission (AEC) contained herein should be interpreted as Nuclear Regulatory Commission (NRC).

Single copies of this statement may be obtained from and comments should be addressed to the Office of Nuclear Reactor Regulation, Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Reactor Licensing. If there are any questions regarding the contents of this statement, the NRC Environmental Project Manager, Hugh Thompson, may be contacted (301-443-6950).

# 1. INTRODUCTION

## 1.1 STATUS OF PROJECT

The Toledo Edison Company (TEC) and the Cleveland Electric Illuminating Company (CEIC) are both privately owned public utility companies engaged in supplying electrical energy to the public. These two companies, hereafter referred to as the applicant, will jointly own the Davis-Besse Nuclear Power Station (the station) as tenants in common, with TEC having a 52.5% share of ownership and CEIC owning the remaining 47.5%. TEC is responsible for the design, construction and operation of the station. Both companies are members of the Central Area Power Coordination Group (CAPCO), a group of four electric utilities in Ohio and Pennsylvania that pool their generating and transmission capabilities, to benefit from the economy and increased reliability of large-scale operation. CAPCO has an installed generating capacity of about 12,000 megawatts electric (MWe) in 1975. The Davis-Besse Station is the fourth generating facility constructed under the CAPCO group agreement.

The station is being constructed on a 954-acre tract, located in northwestern Ohio on the shore of Lake Erie in Ottawa County, about 21 miles east of Toledo, Ohio. The site terrain is relatively flat and contains about 600 acres of marshland, the remainder being, or having been, marginal farmland. The site has a 7500-foot frontage on Lake Erie, and is generally only slightly higher than the normal lake water level.

The station will have a net electrical capacity of 906 MWe and will utilize a pressurized water reactor (PWR) supplied by the Babcock & Wilcox Company. The construction permit application had indicated an initial, electrical output of 872 MWe with an ultimate capability of 906 MWe. The FES-CP evaluated the environmental impacts of the higher power level but evaluated the benefits at the lower power level. Thus, as a result of the applicant's request for 906 MWe operating license, the only change is an increase in the benefits of the proposed action. Most of the heat from the turbine steam condenser will be dissipated to the atmosphere by means of a natural-draft cooling tower, 493 feet high and 415 feet in diameter. Water for the station will be drawn from Lake Erie via a submerged intake crib and a pipe buried under the lake bottom. Construction at the station is now over 80% complete and the current schedule calls for startup by early 1976.

## 1.2 STATUS OF REVIEWS AND APPROVALS

On August 1, 1969, the applicant filed for all necessary AEC licenses to construct and operate the station. On September 10, 1970, an AEC exemption was granted allowing the applicant to do below-grade work before issuance of the construction permit. The Advisory Committee on Reactor Safeguards (ACRS) reported favorably on the application on August 20, 1970, and the AEC completed the construction permit review and issued its formal Safety Evaluation Report on November 2, 1970. The construction permit stage public hearing before an Atomic Safety and Licensing Board (ASLB) was held on December 8-10, 1970. This hearing was contested and subsequent sessions were held, with the final one finishing on February 12, 1971. A favorable decision was reached by the ASLB on March 23, 1971, and Construction Permit No. CPPR-80 was issued by the AEC on March 24, 1971.

As required by the Commission's implementation of the National Environmental Policy Act (NEPA) outlined in 10 CFR Part 50, Appendix D (now 10 CFR Part 51), an Environmental Report (ER) was submitted on August 3, 1970. On November 5, 1971, the applicant submitted a two-volume Environmental Report Supplement.

The Atomic Safety and Licensing Board Hearings as to whether the construction of the Davis-Besse Station should be suspended until the final NEPA review had been completed was held on May 2-4, 1972 and subsequent sessions were held July 7-8, 1972. The ASLB decision that construction should not be suspended pending completion of the NEPA review was issued July 13, 1972.

The Commission's NEPA review related to the continuation of the construction permit for the Davis-Besse Station was completed and the Final Environmental Statement was issued in March 1973. The environmental hearing related to the continuation of the construction permit was held before an Atomic Safety and Licensing Board on July 23-26, 1973 and a subsequent session was held August 6-7, 1973. The ASLB's initial decision that the construction permit should be continued was issued September 14, 1973.

On March 30, 1973, the applicant's Final Safety Analysis Report and the Environmental Report - Operating License Stage was docketed. The Environmental Report - Operating License Stage was a one page document indicating that there were no changes from their previous Environmental Report (ER), as supplemented and amended. On December 20, 1974, the applicant submitted a one volume supplement to the ER which updated the status of the project and superseded the previous one page ER.

The following is a history of the Federal, State, and local permits that have been applied for by the applicant and which have either been received or are pending:

1.2.1 Federal

| | Permit | Status |
|---|---|---|
| a. | U.S. Atomic Energy Commission Construction Permit No. CPPR-80. | Received on March 24, 1971 |
| b. | Army Corps of Engineers permit for dredging a temporary barge channel. | Received on August 4, 1972 |
| c. | Army Corps of Engineers permit to construct offshore facilities (submerged water intake, intake pipe, discharge pipe, and rockfills) under the Rivers and Harbors Act of 1899. | Received March 27, 1973 |
| d. | Federal Aviation Administration approval for station (without cooling tower) | Received May 21, 1970 |
| e. | Federal Aviation Administration approval for cooling tower. | Received August 11, 1971 |

1.2.2 State of Ohio

| | Permit | Status |
|---|---|---|
| a. | Ohio Department of Industrial Relations approval of plans and specifications and building permit. | Received October 20, 1970 |
| b. | Ohio Department of Health permit for potable water supply to be used during construction period. | Received November 9, 1971 |
| c. | Ohio Department of Health permit for sewage treatment plant for construction period, and also for completed station. | Received June 21, 1971 |
| d. | Ohio Department of Health permit for installation of building sanitary and drain systems. | Received July 27, 1971 |
| e. | State Water Quality Certification (Federal Water Pollution Control Act Section 21(b)) | Received March 21, 1972 |
| f. | Federal Water Pollution Control Act Amendments Section 402 Discharge Permit (NPDES Permit) | Proposed permit received. It becomes effective June 30, 1975. |

| | | |
|---|---|---|
| g. | Ohio Turnpike Commission permit for turnpike crossing with transmission line. | Received May 26, 1971 |
| h. | Ohio State Highway Department permits for transmission line crossings of state highways. | Received March 3, 1971 |
| i. | State Department of Highways permits for grade crossing of state highways for railroad spur. | Received August 3, 1971 |

1.2.3 Local

| | Permit | Status |
|---|---|---|
| a. | Ottawa County building permit | Received October 14, 1970 |
| b. | Ottawa County Engineer permits for grade crossings of roads and highways for railroad spur. | Received August 30, 1971 |
| c. | City of Oregon building permit and certificate of occupancy for transmission lines. | Received January 19, 1973 |

1.2.4 Public Hearings

| | Hearings | Date |
|---|---|---|
| a. | Atomic Safety and Licensing Board (ASLB) Construction permit hearings. | Commenced December 8, 1970 - finished February 12, 1971 |
| b. | Ohio Water Pollution Control Board hearing. | July 28 & 29, 1971 |
| c. | Atomic Safety and Licensing Board (ASLB) hearings as to whether the construction of Davis-Besse should be suspended until the final NEPA review. | May 2-4, 1972 |
| d. | Atomic Safety and Licensing Board (ASLB) hearing re-opened to receive additional evidence relating to environmental effects that may occur subsequent to NEPA review and relating to environmental effects of operation of the plant. | July 7 & 8, 1972 |
| e. | Atomic Safety and Licensing Board decision that construction should not be suspended pending completion of the NEPA review. | July 13, 1972 |
| f. | Atomic Safety and Licensing Board (ASLB) Environmental hearing | Commenced July 23, 1973 finished August 7, 1973 |
| g. | Atomic Safety and Licensing Board decison that the construction permit should be continued. | September 14, 1973 |

# 2. THE SITE

## Resumé

The staff has revisited the site to determine if there have been any significant changes at the Davis-Besse site which would alter the staff's evaluation presented in the FES-CP stage issued in March 1973. Information concerning changes in population projections, development of Lake Erie Water Quality Standards, identification of new endangered or rare species, the results of preoperational surveys, and the background noise levels has been evaluated by the staff since issuance of the FES-CP and are addressed in the following sections.

## 2.1 SITE LOCATION

The description of the site location in the FES-CP stage is still valid.

## 2.2 DEMOGRAPHY AND LAND USE

### 2.2.1 Residential

There has been a downward revision in the population projections for the 50-mile area surrounding the site. The principal reason for the revision is that the FES-CP projections were made by the applicant prior to the availability of the 1970 census data. The new projections used the revised net migration patterns experiment over the last decade and the revised birth and death rates. Table 2.1 shows a comparison between the population projections between the FES-CP and more recent projections. The projections within 20 miles of the site are only slightly decreased with the large decreases occurring outside the 20-mile radius for the year 2000 and beyond.

TABLE 2.1

COMPARISON OF POPULATION PROJECTIONS WITHIN 50 MILES

| Radius (in miles) | Cumulation Populations - FES-CP[1] 1980 | 2000 | Recent Projections[2] 1980 | 2000 |
|---|---|---|---|---|
| 5 | 2,328 | 3,258 | 1,571 | 1,743 |
| 10 | 15,902 | 22,662 | 17,740 | 19,672 |
| 20 | 121,143 | 175,969 | 116,223 | 132,927 |
| 30 | 829,022 | 1,197,552 | 747,284 | 873,874 |
| 40 | 1,397,422 | 2,279,251 | 1,111,970 | 1,307,325 |
| 50 | 2,672,070 | 4,252,844 | 2,224,772 | 2,621,603 |

### 2.2.2 Industrial Population and Land Use - Zoning

The description presented in the FES-CP stage is still valid. As stated therein, the only industries within five miles of the site are located in Erie Industrial Park. While there have been some changes in industrial firms located there, Table 2.3 in the FES-CP is representative of the type industries located there. The estimated employment is now 900 instead of 850.

### 2.2.3 Agriculture Land Uses

The general description of the agriculture land uses in the vicinity of the site is still valid. Table 2.2 reflects the typical changes that will occur in acreage under cultivation. (Compare with Table 2.4 in the FES-CP.)

Table 2.2[3]
Agriculture Land Use for Ottawa County-1973

| Crop | Acres |
|---|---|
| Corn | 11,409 |
| Wheat | 13,109 |
| Soybeans | 37,348 |
| Hay | 12,058 |
| Alfalfa | 8,840 |
| Small Grain | 5,939 |

2.2.4 Recreation and Conservation Areas

The description presented in the FES-CP stage is still valid except for the identification and location of campgrounds within ten miles of the site. Table 2.3 identifies the present campgrounds.

TABLE 2.3[4]

Campgrounds Within Ten Miles of The Site

| Name | Distance Direction | Attendance/Spaces |
|---|---|---|
| KOA- Paradise Acres | 2 SSE | 6600 car nights/yr. |
| Camp Sabroski | 4 WSW | 3004/yr. |
| E&C Camp Site | 2 SSE | 5 spaces |
| Anderson's Camp | 2 SSE | 6 spaces |
| East Side Marina | 2 WNW | 43 spaces |
| Turtle Point Marina | 2 WNW | 44 spaces |

2.2.5 Hospitals, Schools, Military Installations

The description presented in the FES-CP stage is still valid.

2.2.6 Transportation

The description presented in the FES-CP stage is still valid, except that State Route 2 has been widened at the point of intersection with Township Road 216 to provide turning and passing lanes at the site entrance.

2.3 HISTORIC AND NATURAL LANDMARKS

The information presented in the FES-CP stage is still valid.

2.4 GEOLOGY

The information presented in the FES-CP stage is still valid.

2.5 HYDROLOGY

2.5.1 Lake Erie Water Quality

The applicant supplied a summary of water quality data taken during the period of November 1968 to October 1970 and it was reproduced as Table 2.11 in the FES-CP. Additional data have been taken as part of a pre-operational environmental monitoring program. A summary of these water analyses is presented in Table 2.4.[5] Further discussion of the water quality may be found in reference 5.

The applicants' 1974 Semi-Annual Reports[6,7] of the pre-operational environmental montioring program have not revealed any significant changes in Lake Erie water quality in the vicinity of Locust Point from the 1972 and 1973 records with the exception of improvement in water conductivity, transparency and turbidity. This is believed due to the cessation of activities on the lake bottom related to the installation of the intake and discharge structures. Figures 2-1 through 2-3 illustrate the Lake Erie water quality parameter trends for the period 1972-1974.[7]

### 2.5.2 Groundwater

The information in the FES-CP stage is still valid.

### 2.5.3 Water Quality Standards

The water quality standards applicable to Lake Erie have been recently changed and are contained in Ohio EPA Regulation EP-1[8] adopted by the state on January 8, 1975. This regulation contains both general standards which recognize specific criteria for Lake Erie uses such as public water supply, industrial water supply, maintenance of aquatic life, recreation and specific standards for a number of physical and chemical parameters in the lake. A significant provision in the regulation is that the near shore area (from the lake shoreline outward for a distance of approximately 2100 ft) in the Magee Marsh Area (which encompasses the entire plant site) has been designated as an "excepted area" where only the General Standards of Regulation EP-1-02 apply.

## 2.6 METEROLOGY

The general description of the site meteorology is still valid. (See Section 6.1.1 for a description of the upgraded meteorological measurement program and staff evaluation concerning site suitability.)

TABLE 2.4[5]

WATER ANALYSES

| | Lake Erie Site Samples* | Lake Erie Site Samples (FES-CP)** |
|---|---|---|
| Calcium (Ca) | 42 | 45 |
| Magnesium (Mg) | 9 | 11 |
| Sodium (Na) | 15 | 12 |
| Chloride (CL) | 22 | 22 |
| Nitrate ($NO_3$) | 6 | 12 |
| Sulfate ($SO_4$) | 41 | 37 |
| Phosphate ($PO_4$) | 0.3 | 1.5 |
| Silica ($SiO_2$) | 1.0 | 2 |
| Alkalinity as $CaCo_3$ | 98 | 101 |
| Suspended Solids | 28 | 131 |
| Dissolved Solids | 234 | 225 |
| Dissolved Oxygen** | 10 | 10 |
| B. O. D. | 2 | - |
| pH | 8.1 | 8.1 |

* Average of samples from April 20, 1971, through February 12, 1974, taken 2700 ft from shore at approximately 7 ft water depth 3 ft from the lake bottom.

** Average of samples from November 1968 to October 1970 taken 50 to 100 ft from shore.

General Note:

All values mg/l except pH.

FIGURE 2 - 1[7]

TRENDS IN MEAN MONTHLY TEMPERATURE, DISSOLVED OXYGEN, AND HYDROGEN IONS MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1974

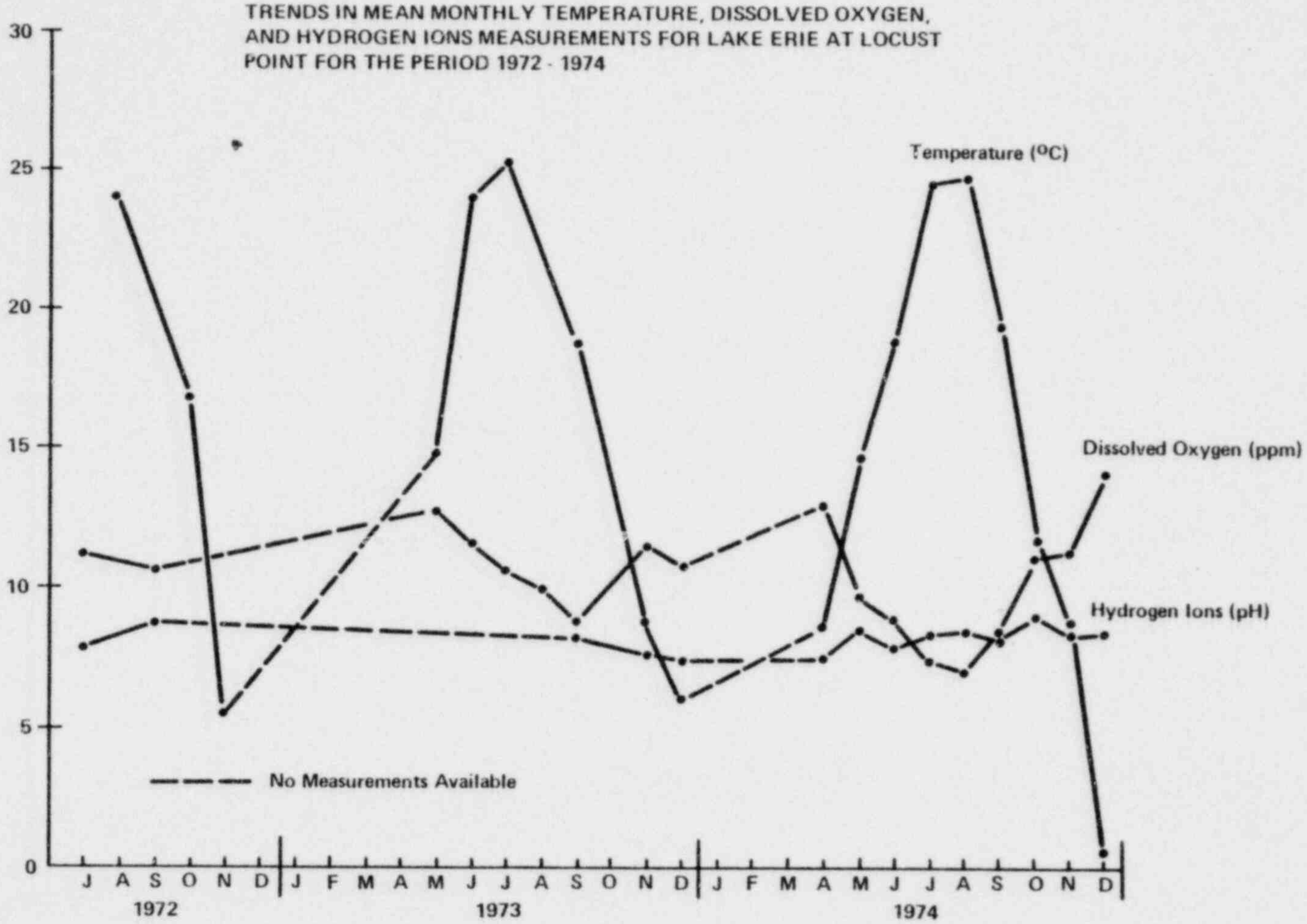


FIGURE 2 - 2

TRENDS IN MEAN MONTHLY TRANSPARENCY AND PHOSPHORUS MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1974

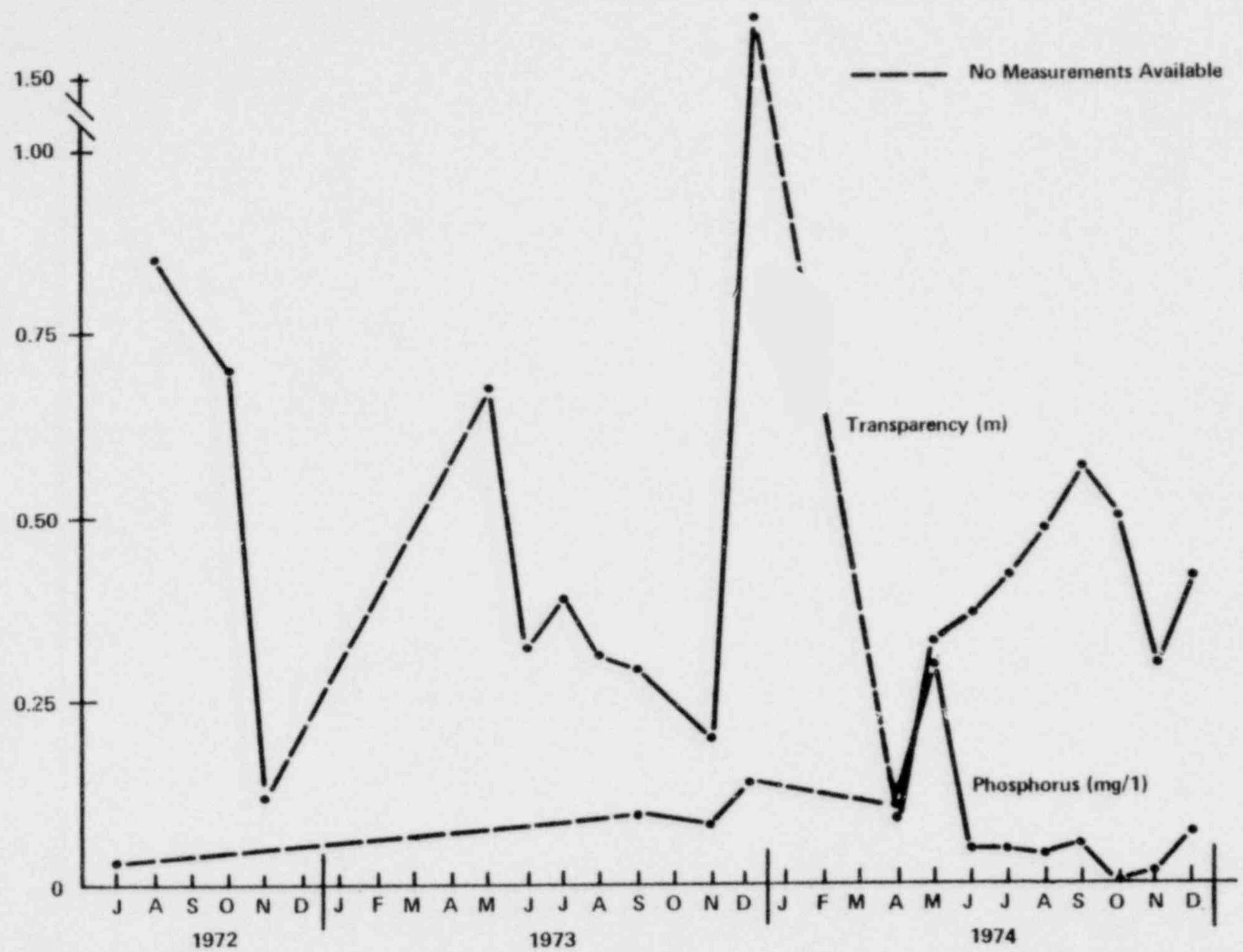
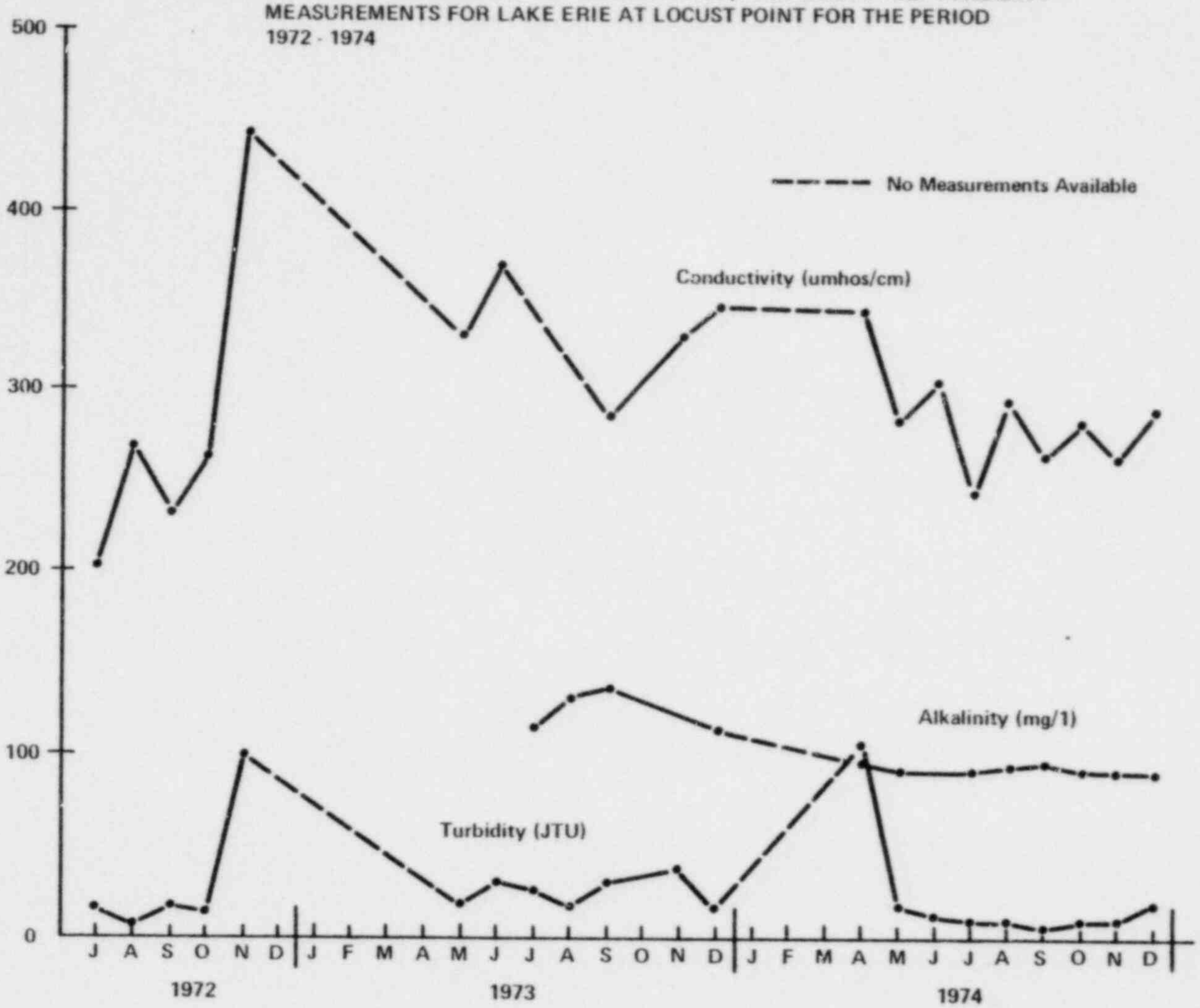


FIGURE 2 - 3

TRENDS IN MEAN MONTHLY CONDUCTIVITY, ALKALINITY AND TURBIDITY MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1974



## 2.7 ECOLOGY

### 2.7.1 Aquatic Ecology

#### 2.7.1.1 Phytoplankton

The applicant initiated comprehensive and quantitative monitoring of phytoplankton in April 1974. Recent data verify qualitative observations made in the ER-CP (App. C.), FSAR (App. 2B), and FES-CP. Phytoplankton populations were highest in fall and spring and lowest in summer (See Table 2.5). Species density and diversity among 12 sampling stations did not correlate consistently with depth or distance from shore. This probably resulted from variable winds, currents, and wave action, rather than inadequate sampling. Diatoms, especially Melosira sp., Asterionella sp., Tabellaria sp., and Fragilaria sp. comprised 95% and 99% of the phytoplankton during April and the May bloom, respectively (see Table 2.5). The green algae Pediastrum sp. and, to lesser degrees, Asterionella sp., Melosira sp., and Microcystis sp. were abundant in June, when the phytoplankton was divided almost equally between diatoms and green algae. Although blue-green algae were not collected, they are expected to be present in measurable numbers in the heated effluent of the plant. An extensive consideration of the seasonal composition and dynamics of phytoplankton populations at the Davis-Besse site appears in the ER-CP for Units 2 & 3.

#### 2.7.1.2 Zooplankton

Substantial differences in techniques and stations used to sample zooplankton at Locust Point preclude direct comparison of data collected prior to 1973. Consistent methodology has been used to collect monthly samples at the site since May 1973, although sampling stations differed slightly between 1973 and 1974. The populations of 1974 were probably more representative of a "typical" year, since dredging for the intake and discharge pipelines undoubtedly affected the 1973 populations. Rotifers, copepods, and cladocerans dominated in both years, peaking in late spring or summer and declining in late autumn (See Table 2.6). Changes in abundance of zooplankton in 1974 correlated well with fluctuations in phytoplankton abundance. The rotifer populations were the largest of the major groups and showed the greatest variability between years. Copepod populations were very similar in 1973 and 1974. The applicant identified 39 taxa (23 rotifera, 7 copepoda, and 9 cladocera) in 1973. Taxa occurring in more than 50% of the year's samples included (1) Rotifera: Asplanchna Priodonta (70.7%), Brachinous angularis (ul.4%), Keratella cochlearis (97.1%). and Polyarthasp. (98.6%); (2) Copepoda: Diaptomus sp. (64.3%), Cyclops sp. (75.7%), immature cyclopoids (100.0%), and nauplii (100.0%); (3) Cladocera: Bosmina sp. (98.6%), and Daphnia retrocurva (71.4%). The largest zooplankton populations in 1974 were found closest to shore, most likely indicating that they were concentrated at the surface. Lower densities of zooplankton obtained by vertical tows at deeper stations probably reflect dilution of surface water by bottom water. Patterns in abundance and distribution of zooplankton are discussed in greater detail in the ER-CP for Davis-Besse Units 2 & 3.

#### 2.7.1.3 Ichthyoplankton

Ichthyoplankton was sampled in the immediate vicinity of the intake and discharge structures on one occasion in May and June of 1973 and monthly from July through November of 1974. Preliminary data support results of previous studies which indicate that the immediate site is not an important spawning area. The largest number of individuals taken in any one sample at the site was 453 in 1973 and 3824 in 1974 (Table 2.7). Over 13,000 individuals were taken by similar methods at Sandusky Bay (a known spawning area). Eggs and larvae of yellow perch*, gizzard shad, walleye, and smallmouth bass dominated the samples in 1973. However, the results of the 1974 study indicate an absence of yellow perch, walleye, and smallmouth bass and are predominantly emerald shiner and gizzard shad.

#### 2.7.1.4 Benthos

The spatial and temporal distributions and life histories of benthic organisms found at the Davis-Besse site are discussed in more detail in the FSAR (App. B) for Unit 1 and the ER-CP for Units 2 & 3. Benthic monitoring programs conducted in 1973 and 1974 did not identify additional species of concern nor major differences in the occurrence and distribution of dominant taxa, except recolonization of areas affected by dredging in 1973. Oligocheates and chironmids dominated the benthos in 1973 and 1974, being more abundant in 1974 (Table 2.8). This probably

*For scientific names, see: Bailey, R.M. (chrmn). 1970. A list of common and scientific names of fishes from the United States and Canada (3rd ed.) Amer. Fish. Soc., Spec. Pub. 6, 150p.

## TABLE 2.5

**MEAN NUMBERS OF PHYTOPLANKTERS PER STATION SAMPLED (1974)**
**– IN NO. CELLS/L –**

| TAXA | April 16 | May 22 | June 19 | July 17 | Aug 22 | Sept 10 | Oct 9 | Nov 7 |
|---|---|---|---|---|---|---|---|---|
| BACILLARIOPHYCEAE | | | | | | | | |
| (Diatoms) | | | | | | | | |
| Asterionella sp. | 1735 | 1600 | 351 | 11 | 2 | 2 | 65 | 105 |
| Centric diatom | | | | 10 | | 0 | 49 | 63 |
| Cyclotella sp. | 4 | | | 2 | | 43 | 0 | 0 |
| Cymatopleura sp. | 14 | 25 | 3 | | 6 | 0 | 6 | 9 |
| Fragilaria sp. | 435 | 4556 | 63 | | 21 | 38 | 368 | 2160 |
| Gyrosigma sp. | 1 | | | 2 | 6 | 6 | 5 | 10 |
| Melosira sp. | 3990 | 85597 | 350 | 235 | 719 | 754 | 3500 | 3238 |
| Naviculoid | 12 | | 21 | 9 | 16 | 43 | 58 | 123 |
| Stephanodiscus sp. | | | | 1 | | 0 | 1710 | 4720 |
| Surirella sp. | | 12 | 19 | 4 | | 0 | 1 | 7 |
| Synedra sp. | 5 | 23 | | 2 | | 20 | 21 | 39 |
| Tabellaria sp. | 1335 | 6259 | 61 | 6 | 2 | 1 | 18 | 86 |
| Unidentified Diatom | | | | | | | 55 | |
| CHLOROPHYCEAE | | | | | | | | |
| (Green Algae) | | | | | | | | |
| Actinastrum sp. | | | | | | 9 | 58 | 34 |
| Ankistrodesmus sp. | | | | | | | 36 | 17 |
| Binuclearia sp. | | | | | | 22 | 384 | 628 |
| Chlamydomonas sp. | | | | | | 38 | | |
| Closteriopsis sp. | 43 | 11 | | 2 | 25 | 0 | 185 | 822 |
| Closterium sp. | | | | | | 245 | 10 | 23 |
| Coelastrum sp. | | 3 | | 62 | | 58 | 32 | 21 |
| Cosmarium sp. | | | | 4 | | 4 | 5 | 11 |
| Crucigenia sp. | | | | | | | 24 | |
| Crucigeniella sp. | | | | | | 4 | | |
| Dictyosphaerium sp. | | | | | | 6 | 111 | 124 |
| Dimorphococcus sp. | | | | | | | 9 | 8 |
| Eudorina sp. | | | | 61 | 107 | 19 | 3 | 0 |
| Lagerheimia sp. | | | | | | | 3 | |
| Micractinium sp. | 2 | | | | | 0 | 55 | 35 |
| Mougeotia sp. | 6 | | | | 2 | 935 | 4140 | 17770 |
| Oocystis sp. | | | | | | | 47 | |
| Pandorina sp. | 2 | 12 | 27 | 26 | | 64 | 47 | 33 |
| Pediastrum sp. | 37 | 399 | 841 | 774 | 557 | 1400 | 1992 | 1351 |
| Platydorina sp. | | | | | | 6 | | |
| Rhizoclonium sp. | | | | 3 | | | 2 | 0 |
| Scenedesmus sp. | 1 | 9 | 10 | 7 | 9 | 29 | 113 | 162 |
| Selenastrum sp. | | | | | | | 3 | |
| Spirogyra sp. | 4 | | 3 | | | 0 | 0 | 0 |
| Staurastrum sp. | | | 5 | 82 | 90 | 83 | 74 | 123 |
| Ulothrix sp. | | | | | | | | 3 |
| Volvox sp. | 7 | 5 | 19 | 3 | 3 | 1 | 33 | 4 |
| CHRYSOPHYCEAE | | | | | | | | |
| Dinobryon sp. | | | | | | | 3 | |
| DINOPHYCEAE | | | | | | | | |
| (Dinoflagellates) | | | | | | | | |
| Ceratium hirundinella | 3 | 14 | 6 | 1757 | 17 | 23 | 11 | 3 |
| Glenodinium sp. | | | | 41 | | 0 | 0 | 0 |
| Peridinium sp. | | | | | | 14 | | |
| EUGLENOPHYCEAE | | | | | | | | |
| Euglena sp. | | | | | | 8 | 23 | 26 |
| Trachelomonas sp. | | | | 4 | | 0 | 4 | 0 |
| MYXOPHYCEAE | | | | | | | | |
| (Blue-green algae) | | | | | | | | |
| Anabaena sp. | | | | 7 | 8 | 23 | 93 | 29 |
| Aphanizomenon sp. | | | | 204 | | 1547 | 5444 | 1322 |
| Chroococcus sp. | | | | 61 | 14 | 46 | 22 | 23 |
| Merismopedia sp. | | | | 2 | | 0 | 0 | 0 |
| Microcystis sp. | | | 99 | 39 | 13 | 265 | 307 | 124 |
| Spirulina sp. | | | | | | | | |
| Unidentified Bacteria | 182 | | | | | 0 | | 5 |
| Unidentified Phytoplankter | | | | 56 | | 0 | | 0 |
| TOTAL | 7860 | 98517 | 2092 | 3461 | 1604 | 5751 | 18232 | 33499 |

Data averaged over all stations sampled

10

**TABLE 2.6**

**MEAN NUMBERS OF ZOOPLANKTERS PER STATION SAMPLED (1974)**
**– IN NO. OF ORGANISMS CELLS/L –**

| TAXA | April 18 | May 22 | June 10 | July 17 | Aug 22 | Sept 12 | Oct 9 | Nov 7 |
|---|---|---|---|---|---|---|---|---|
| ROTIFERA | | | | | | | | |
| Asplanchna girodi | 0.3 | | | | | | | |
| A. priodonta | 0.0 | 2.2 | 1.8 | 2.6 | 57.3 | 29.8 | 3.1 | 2.2 |
| Brachionus angularis | 9.0 | 3.7 | 8.8 | 25.4 | 46.4 | 3.1 | 2.2 | 1.1 |
| B. calyciflorus | 3.7 | 5.2 | | 0.3 | 0.1 | 1.0 | 6.3 | 27.4 |
| B. havanaensis | | | 0.1 | 0.2 | 1.3 | 1.0 | 0.1 | |
| B. (Platyias) patulus | | | | | | 0.2 | | |
| B. urceolaris | 1.2 | 0.1 | | | | | 0.0 | |
| Chromogaster ovalis | 1.0 | | | | | 2.3 | | 0.0 |
| Conochiloides sp. | | | 34.9 | 7.3 | 0.3 | 0.2 | 5.8 | 2.2 |
| Euchlanis sp. | | | | | | 0.1 | 0.0 | 0.0 |
| Filinia terminalis | 1.8 | 12.7 | 0.4 | 5.4 | 0.7 | 0.3 | 0.3 | 0.1 |
| Hexarthra mira | | | | | | 0.4 | 0.1 | |
| Kellicottia longispina | 0.6 | 4.6 | 3.2 | | | | | 0.1 |
| Keratella cochlearis | 3.1 | 155.0 | 26.1 | 18.8 | 11.8 | 21.5 | 12.4 | 50.2 |
| K. quadrata | 3.9 | 35.4 | 8.1 | 1.1 | 2.0 | 0.5 | 1.0 | 2.3 |
| Lecane (Monostyla) bulla | | | | | | | 0.0 | |
| L. (Monostyla) lunaris | | | | 0.0 | | 0.1 | | |
| Notholca squamula | 0.5 | 13.1 | | | | | | |
| Ploesoma sp. | | | | | | | 0.3 | |
| Polyarthra sp. | 5.8 | 73.1 | 128.5 | 512.8 | 106.5 | 215.0 | 37.1 | 23.1 |
| Pompholyx sulcata | | | | | | 1.1 | | |
| Synchaeta sp. | 1.8 | | | | | | 0.1 | 0.1 |
| Testudinella sp. | 0.1 | | | | | | | |
| Trichocerca cylindrica | | 0.0 | | 0.4 | | 0.7 | 0.2 | |
| T. multicrinis | | 1.1 | 7.1 | 0.2 | 11.8 | 8.2 | 0.1 | |
| Unidentified Rotifer A | 0.1 | 1.8 | | | 2.7 | 24.1 | 0.3 | 27.5 |
| Unidentified Rotifer B | | | | | | 2.0 | | |
| COPEPODA | | | | | | | | |
| Calanoid copepods | | | | | | | | |
| Diaptomus sp. | 0.5 | 15.5 | 13.1 | 5.1 | 1.0 | 0.5 | 1.0 | 0.6 |
| Eurytemora sp. | | | | | | | | 0.0 |
| Immatures | 0.1 | 5.2 | 1.3 | 2.4 | 0.7 | 1.3 | 4.2 | 1.0 |
| Cyclopoid copepods | | | | | | | | |
| Cyclops sp. | 1.2 | 12.4 | 115.1 | 55.0 | 18.4 | 3.2 | 1.4 | 1.5 |
| Mesocyclops sp. | 0.1 | 0.4 | 0.1 | 0.0 | 0.4 | 0.1 | 0.1 | 0.0 |
| Tropocyclops prasinus | | | | | | | | 0.1 |
| Immatures | 1.3 | 18.4 | 13.8 | 27.9 | 9.3 | 8.1 | 6.5 | 5.3 |
| Nauplius | 28.5 | 180.7 | 259.1 | 123.6 | 48.1 | 78.8 | 59.3 | 15.0 |
| CLADOCERA | | | | | | | | |
| Bosmina sp. | 0.0 | 3.3 | 155.7 | 49.1 | 17.0 | 19.0 | 54.3 | 7.4 |
| Ceriodaphnia sp. | | | | | 0.0 | 0.3 | | |
| Chydorus sp. | 0.1 | 0.1 | 0.1 | | 0.0 | 4.8 | 12.8 | 15.1 |
| Daphnia galeata | | | 0.1 | 0.4 | 0.0 | 0.0 | | |
| D. pulex | 0.0 | 10.5 | 0.1 | 0.3 | | | | |
| D. retrocurva | | | 74.5 | 137.8 | 2.9 | 2.2 | 0.1 | |
| Diaphanosoma sp. | | | | 0.0 | 0.0 | 1.4 | 0.2 | |
| Holopedium sp. | | | 0.0 | 0.2 | 0.1 | 1.2 | | |
| Leptodora kindtii | | | 0.1 | 0.2 | 0.1 | 0.2 | | |
| PROTOZOA | | | | | | | | |
| Acineta sp. | 0.1 | | | | | | | |
| Amphileptus sp. | 0.1 | | | | | | | |
| Difflugia sp. | | | | 69.0 | 26.9 | 99.3 | 42.2 | 15.9 |
| Ophryodendron sp. | 0.1 | | | | | | | |
| Staurophrya sp. | 5.6 | | | | | | | |
| Vorticella sp. | | | | | | | 0.6 | 0.5 |
| Zoothamnium sp. | | | | | | 0.4 | 0.8 | 0.4 |
| TOTAL | 75.1 | 522.3 | 787.8 | 1131.8 | 394.5 | 553.0 | 259.2 | 256.0 |

Data averaged over all stations sampled

TABLE 2.7 [11]

ICHTHYOPLANKTON COLLECTED AT LOCUST POINT
JULY - NOVEMBER, 1974

| Date | Species | Length (mm) Range | Nos. of Individuals Collected | | | |
|---|---|---|---|---|---|---|
| | | | Sta. 8 (Intake) | | Sta. 12 (Discharge) | |
| | | | Surface | Bottom | Surface | Bottom |
| July 10, 1974 | | | | | | |
| | Goldfish | 6.5 | | | 1 | |
| | Gizzard Shad | 7-18 | 6 | 8 | 45 | 39 |
| | Emerald Shiner | 8-18 | 3815 | 8 | 549 | 10 |
| | Subtotal | | 3821 | 16 | 595 | 49 |
| August 10, 1974 | | | | | | |
| | Alewife | 18 | | | 1 | |
| | Emerald Shiner | 9-17 | 3 | | 1 | 1 |
| | Subtotal | | 3 | 0 | 2 | 1 |
| September 12, 1974 | | | | | | |
| | Brook Silverside | 47 | | | 1 | |
| | Emerald Shiner | 52-53 | | | 3 | |
| | Subtotal | | 0 | 0 | 4 | 0 |
| October 16, 1974 | | | | | | |
| | Emerald Shiner | 28-57 | | | 8 | 1 |
| | Subtotal | | 0 | 0 | 8 | 1 |
| November 26, 1974 | | | | | | |
| | Emerald Shiner | 46-85 | | | | 56 |
| | Subtotal | | 0 | 0 | 0 | 56 |
| TOTAL | | | 3824 | 16 | 609 | 107 |

## TABLE 2.8[12]

### BENTHIC MACROINVERTEBRATE POPULATIONS AT LOCUST POINT – 1974 MONTHLY MEANS – IN NO./M² –

| TAXA | April 17-18 | May 22-23 | June 19-20 | July 17 | Aug 14 | Sept 5 | Oct 10 | Nov 7 |
|---|---|---|---|---|---|---|---|---|
| COELENTERATA | | | | | | | | |
| Hydra sp. (budding polyp) | 2 | 7 | 54 | | 1 | 0 | 4 | 8 |
| Hydra sp. (single polyp) | | 5 | 68 | | 1 | 1 | 11 | 11 |
| NEMATODEA | | | | | | 3 | 4 | |
| ANNELIDA | | | | | | | | |
| Hirudinea | | | | | | | | |
| Helobdella elongata | | | | | | 2 | 2 | |
| H. stagnalis | | 1 | | | 1 | | 2 | 0 |
| Oligochaeta (unidentified) | | | | 21 | | | | |
| Immatures (hair setae) | 3 | | | 5 | 1 | | 4 | 1 |
| Immatures (no hair setae) | 1168 | 1109 | 634 | 688 | 1071 | 941 | 670 | 750 |
| Branchiura sowerbyi | 13 | 14 | 6 | 2 | 7 | 12 | 14 | 15 |
| Limnodrilus cervix | | 4 | 3 | 7 | 39 | 21 | 3 | 10 |
| L. claparedeianus | 1 | 10 | 33 | 15 | 22 | 11 | 4 | 6 |
| L. claparedeianus-cervix | | 1 | | 1 | 1 | 13 | 5 | 11 |
| L. hoffmeisteri | 0 | 3 | | | | | | |
| L. maumeensis | | 1 | | 0 | 1 | 1 | | 1 |
| L. udekemianus | 2 | 10 | | | | | | |
| Nais sp. | | | | | | | 1 | 5 |
| Potamothrix moldaviensis | 9 | 0 | 21 | 24 | 31 | 11 | 11 | |
| P. vejdovskyi | 2 | 1 | | | | | | |
| Stylaria sp. | | | | | | 0 | 7 | |
| ARTHROPODA | | | | | | | | |
| Cladocera | | | | | | | | |
| Leptodora kindtii | | | 16 | 136 | 40 | 165 | 14 | 0 |
| Amphipoda | | | | | | | | |
| Gammarus fasciatus | 3 | 0 | 9 | 13 | 6 | 10 | 22 | 35 |
| Hyalella azteca | | | | 1 | | | | |
| Decapoda | | | | | | | | |
| Orconectes sp. | | | 0 | | | | | |
| Chironomidae | | | | | | | | |
| Chironomus (chironomus) sp. | 111 | 40 | 69 | 29 | 199 | 67 | 45 | 23 |
| Chironomus pupa | | 0 | | | | | | |
| Coelotanypus sp. | | | | | 20 | 2 | 3 | 1 |
| Cricotopus sp. | | | | | | | | 1 |
| Cryptochironomus sp. | 4 | 6 | 3 | 3 | 8 | 2 | 13 | 17 |
| Polypedilum sp. | | 1 | 1 | 1 | | | 1 | |
| Procladius sp. | 23 | 18 | 32 | 6 | 57 | 8 | 12 | 31 |
| Procladius pupa | | 2 | 0 | 1 | 0 | | | |
| Pseudochironomus sp. | 0 | 1 | 0 | | | 1 | | |
| Tanypodinae pupa | | 1 | | | | | | |
| Tanytarsus sp. | 8 | | 508 | 52 | 17 | 202 | 160 | 52 |
| Tanytarsus pupa | | | 2 | | | | | |
| Ephemeroptera | | | | | | | | |
| Caenis sp. | | 2 | | 1 | | 0 | | |
| Trichoptera | | | | | | | | |
| Hydropsychidae | 0 | | | | | | | |
| MOLLUSCA | | | | | | | | |
| Gastropoda | | | | | | | | |
| Bulimus sp. | 0 | 0 | 0 | | | | | |
| Pelecypoda | | | | | | | | |
| Amblema plicata | | 1 | | | 2 | | 1 | |
| Sphaerium sp. | | 3 | 1 | 3 | 2 | 2 | 1 | 3 |
| Station Total | 1355 | 1216 | 1039 | 954 | 1527 | 1543 | 1209 | 592 |

Data averaged over all stations sampled

reflects recolonization of areas disturbed by dredging and the ability of oligocheates and chironmids to burrow out when buried by sediment and dredge spoil. The size and diversity of most benthic populations tended to be highest from 500 to 1000 feet offshore and were correlated with substrate composition.

#### 2.7.1.5 Fishes

Use of experimental gill nets, shore seines, and otter trawls at Locust Point since 1973 has provided data which verify descriptive statements in the FES-CP. Discussions of earlier studies of fish populations in western Lake Erie appear in the FSAR (App. 2B) for Unit 1 and the ER-CP for Units 2 & 3. Differences in the use, selectivities, and efficiencies of sampling gear preclude ranking of species collected in 1973 and 1974. Catches, by gear, for 1973 appear in Table 2.9. Forage fishes, especially gizzard shad, alewife, and spottail and emerald shiners, were generally more abundant in catches than game fishes, regardless of sampling gear. Catches in early spring were dominated by adult fishes, while young-of-the-year of several species, most notably alewife, gizzard shad, emerald shiner, and white bass were taken in increasing numbers throughout summer. Otter trawls were towed between the intake and discharge structures and caught mostly freshwater drum, yellow perch, channel catfish, and spottail shiner. Gill nets were set parallel to the intake and discharge pipelines. Gizzard shad, yellow perch, and alewife were the prominent species captured. Shore seining at the site identified gizzard shad, white bass, alewife, and emerald and spottail shiners as the predominant species. Data collected from April through November of 1974 showed that fewer game fishes, especially yellow perch, and more forage species, especially gizzard shad, seemed to be present at Locust Point than in 1973; but this is not believed to be a result of plant construction. Lower catches of game fishes elsewhere in the lake by the Center for Lake Erie Research indicate a general lakewide decline in abundance. The precise cause of the increase of forage populations is not known. Trawls taken in the intake canal in 1974 revealed the presence of white crappie, brown bullhead, goldfish, channel catfish, blackcrappie, and gizzard shad.

### 2.7.2 Terrestrial Ecology

The FES-CP described the physiographic setting, and the major biota of the site and its environs (FES-CP page 2-40). Additional detailed description of biota and soils is found in the applicant's Environmental Report, CP stage, for Davis-Besse Units 2 and 3.

Since the previous review, new information on threatened or endangered species has been made available (applicant's ER-Units 2-3). Most of those so designated were birds, however, one mammal, the Indiana bat, and two reptiles the spotted turtle and smooth green snake could occur at the site although no observations have actually been made. A list of threatened, declining, or endangered species of birds which occur in the region is presented in Table 2.10. Only the American Peregrine Falcon is listed as endangered in the United States.

## 2.8 BACKGROUND RADIOLOGICAL CHARACTERISTICS

The information presented in the FES-CP is still valid. The results of the preoperational radiological monitoring program[13] support the staff's previous evaluation that the tritium levels would be lower than the 1,100 pCi/l mean value reported in the small scale study.

## 2.9 OTHER ENVIRONMENTAL FEATURES

### ENVIRONMENTAL NOISE SURVEY

The applicant conducted a background noise survey in the site vicinity during May 16-18, 1974 (ER Suppl. p2.9-1). The survey included both daytime and nighttime periods with sampling distances ranging from less than one-half mile to 1.8 miles from the site. Major outdoor construction activities for Unit No. 1 had been completed prior to the survey, and although some construction activities were still ongoing at the time of the survey, the survey results are primarily indicative of the existing sound conditions in the site vicinity without plant presence.

TABLE 2.9

RANKINGS BY NUMBER AND BIOMASS OF MAJOR SPECIES TAKEN BY OTTER TRAWL, GILL NET AND SHORE SEINE AT DAVIS-BESSE SITE, JUNE-NOV., 1973

| | |
|---|---|
| OTTER TRAWL | |
| Freshwater drum (250) | Carp (8081g) |
| Yellow perch (170) | Yellow perch (7802g) |
| Channel catfish (143) | Channel catfish (6920g) |
| Spottail shiner (117) | Freshwater drum (4540g) |
| All species (996) | All species (4540g) |
| GILL NET | |
| Gizzard shad (852) | Yellow perch (20,555g) |
| Yellow perch (812) | Gizzard Shad (49,202g) |
| Alewife (495) | Carp (31,877g) |
| Freshwater drum (182) | Freshwater drum (21,886g) |
| All species (2596) | All species (193, 880g) |
| SHORE SEINE | |
| Emerald shiner (1124) | Carp (3751g) |
| Alewife (237) | Emerald shiner (3709g) |
| Spottail shiner (129) | Gizzard shad (1462g) |
| White bass (127) | Spottail shiner (997g) |
| All species (1715) | All species (11, 465g) |

g = grams

TABLE 2.10 [14]

BIRDS IN THE REGION OF THE DAVIS-BESSE SITE CONSIDERED TO BE DECLINING, RARE, OR ENDANGERED

| Common Name | Status* | Potential of Occurring on Site** |
|---|---|---|
| Double-crested Cormorant | D | G |
| Great Egret | R | G |
| Black-crowned Night Heron | D | G |
| Least Bittern | R | P |
| Hooded Merganser | R | G |
| Sharp-shinned Hawk | R - D | P |
| Cooper's Hawk | R - D | P |
| Bald Eagle | R | P |
| Marsh Hawk | D | P |
| Osprey | B | P |
| American Peregrine Falcon | E | P |
| American Kestrel | D | G |
| King Rail | R | G |
| Black Rail | R | P |
| Piping Plover | D | P |
| Common Tern | R | G |
| Least Tern | D | P |
| Barn Owl | R | P |
| Bewick's Wren | R - D | P |
| Short-billed Marsh Wren | R | P |
| Loggerhead Shrike | R - D | G |
| Prothonotary Warbler | R | P |
| Yellow Warbler | D | G |
| Pine Warbler | R | G |
| Orchard Oriole | R | P |

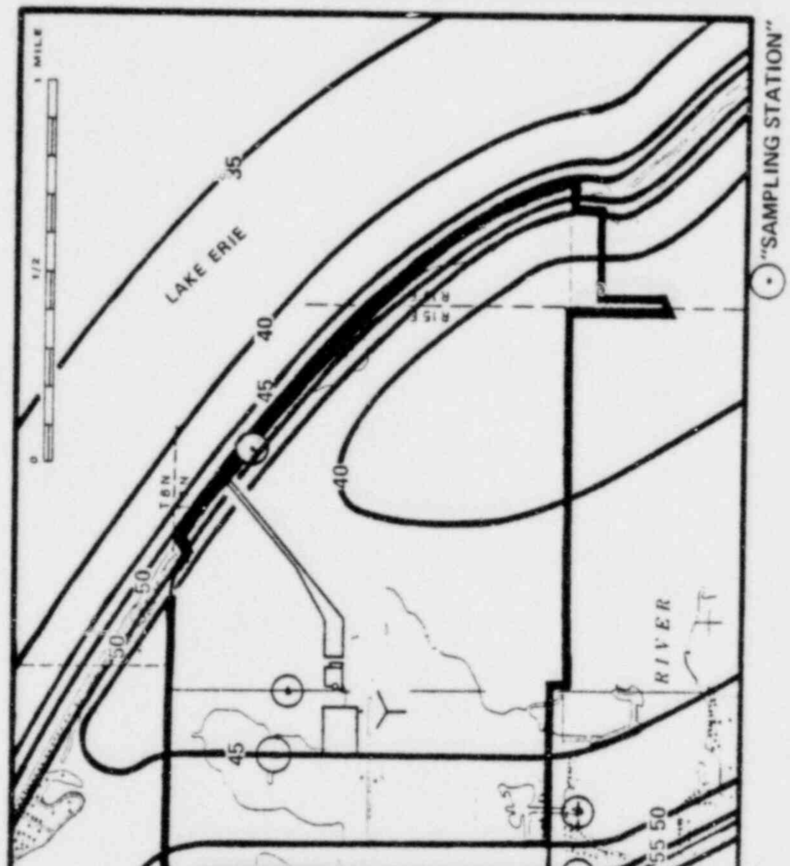
*D = Listed as declining in Audubon Blue list

R = Listed as rare and endangered in Ohio

E = Listed as endangered in the United States

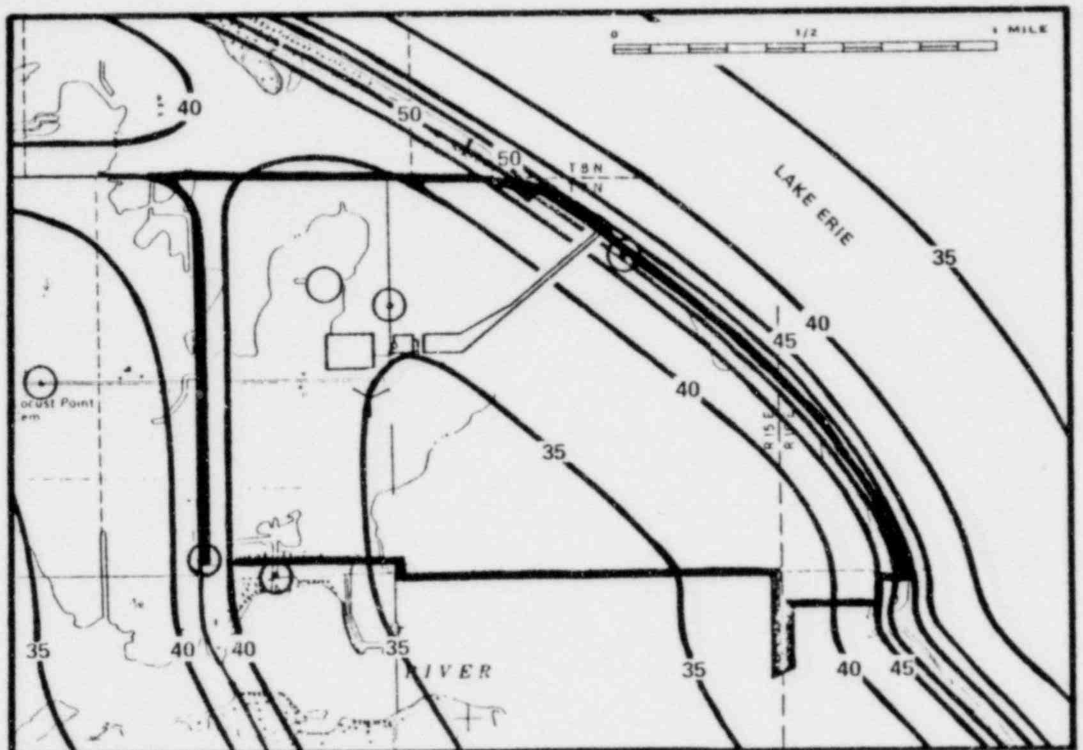
**G = Good, P = Poor

The L50 sound pressure levels (the sound pressure levels exceeded 50% of the time during the sampling period) of the various sampling stations were used to construct daytime and nighttime A-weighted sound level contours for the site vicinity. In constructing the contours, the highest L50 level for the period for each sampling location was used. These are shown in Figures 2.4 (daytime) and 2.5 (nighttime). The overall daytime average L50 for all sampling periods was 50dBA, while the corresponding nighttime average was 42dBA. (See Section 5.4.2 for additional staff evaluation.)




DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 DAYTIME NOISE LEVEL CONTOURS (dBA)

FIGURE 2-4 15




⊙ "SAMPLING STATION"

DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 NIGHTTIME
NOISE LEVEL CONTOURS (dBA)

FIGURE 2 - 5 [15]

## References


1. U.S. Atomic Energy Commission, Environmental Statement on Davis-Besse Nuclear Power Station Unit 1, Docket No. 50-346, March 1973, p. 2-13.

2. Toledo Edison Company, Davis-Besse Nuclear Power Station Unit Nos. 2 and 3, Environmental Report, Construction Permit Stage, vols. 1, 2 and 3 Docket Nos. 50-500 and 50-501, issued August 30, 1974, p. 2.2-7.

3. Ibid., Response to General Question 2.

4. Ibid., p. 2.2-10.

5. Ibid., p. 2.5-31

6. Toledo Edison Company, Semiannual Preoperational Monitoring Report Unit 1, Vols. I & IA, January 1974 - June 1974, issued August 30, 1974.

7. Toledo Edison Company, Semiannual Preoperational Monitoring Report Unit 1, Vol II, July 1974 - December 1974, issued February 28, 1975, Aquatic p. 53.

8. Ohio EPA, Regulation EP-1, Water Quality Standards, January 8, 1975.

9. Op. Cit., Ref. 7, p. 8.

10. Ibid, p. 10.

11. Ibid., p. 31.

12. Ibid., p. 12.

13. Op. Cit., Ref. 7, Radiological p. 16.

14. Op. Cit., Ref. 2, p. 2.7-[illegible].

15. Ibid., p. 2.9-1.

# 3. THE STATION

Résumé

There have been minor changes in the design of the station since the issuance of the FES-CP. These minor changes include the relocation of the chlorine injection connection in the condenser cooling water system and the increase in the intake area of the intake crib, and are described in the following sections. Since the issuance of the FES-CP, the staff has updated the parameters which are used to evaluate the radioactive waste treatment system based on more recent information. The results of the new evaluation of the radioactive waste treatment system are included in Section 3.4.

## 3.2 EXTERNAL APPEARANCE

The description of the external appearance presented in the FES-CP is still valid. Figure 3.1 is a more recent photograph of the site.

## 3.2 REACTOR AND STEAM-ELECTRIC SYSTEM

The description of the reactor and steam-electric system is still valid.

## 3.3 HEAT DISSIPATION SYSTEMS

### 3.3.1 Cooling Tower

The description of the cooling tower presented in the FES-CP is still valid. The design and water flow sequence of the main circulating water system has not been changed.

### 3.3.2 Other Cooling Water Systems

The general description of the other cooling water systems presented in the FES-CP is still valid. Figure 3.2 is a flow diagram for the service water system, Figure 3.3 is a flow diagram for the closed condenser cooling water system and Figure 3.4 is the station water use and discharge diagram. The water use flow values has been slightly revised in Figure 3.3 to indicate the new estimates of flows based on the site meteorology results. The slight increase in flow rates has been evaluated by the staff and the principal change identified is related to the cooling tower drift as discussed in Section 5.4.3.

Intake Crib, Intake Pumps on Screens, and Discharge Structure

The description of the basic design and location of the intake pumps and screen and discharge structure presented in FES-CP is still valid. The applicant has doubled the area of the slots in the top of the wooden octagonal intake crib. Thus, the maximum intake velocity at the intake crib as shown in Figure 3.6 of the FES-CP has been decreased to approximately 0.25 fps at the design maximum intake flow rate of 42,000 gpm and approximately 0.12 at the nominal design flow rate of approximately 21,000 gpm. The expected average intake flow rate is approximately 16,700 gpm, which will produce an intake velocity of approximately 0.10 fps. An air bubble screen has been installed around the perimeter of the intake crib to discourage the entrance of fish. There have been no changes to the design of the discharge structure from the Davis-Besse Nuclear Power Station. The locations and configurations of the intake and discharge structures are shown in Figure 3.6 of the FES-CP.

### 3.3.3 Thermal Discharges to Lake Erie

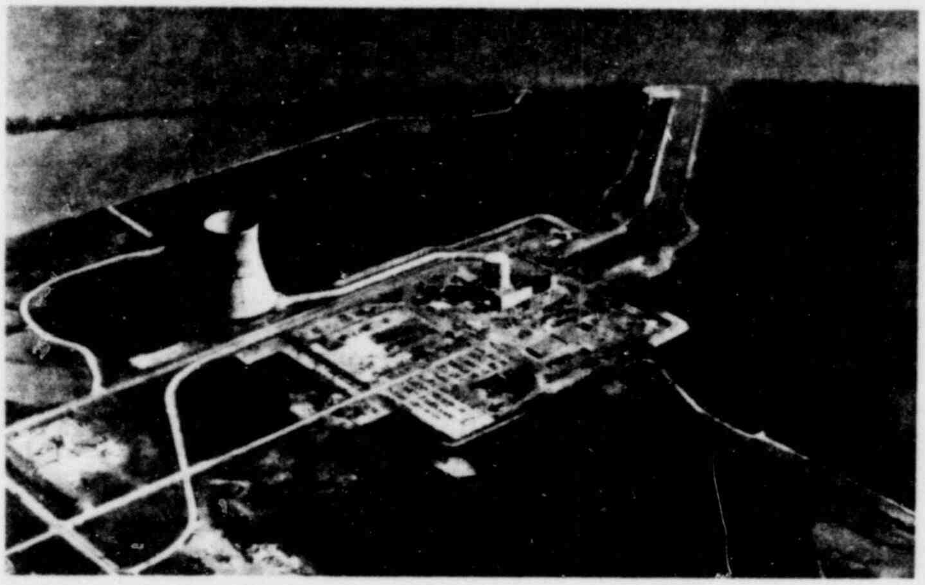
The general description of the thermal discharge to Lake Erie presented in the FES-CP is still valid.

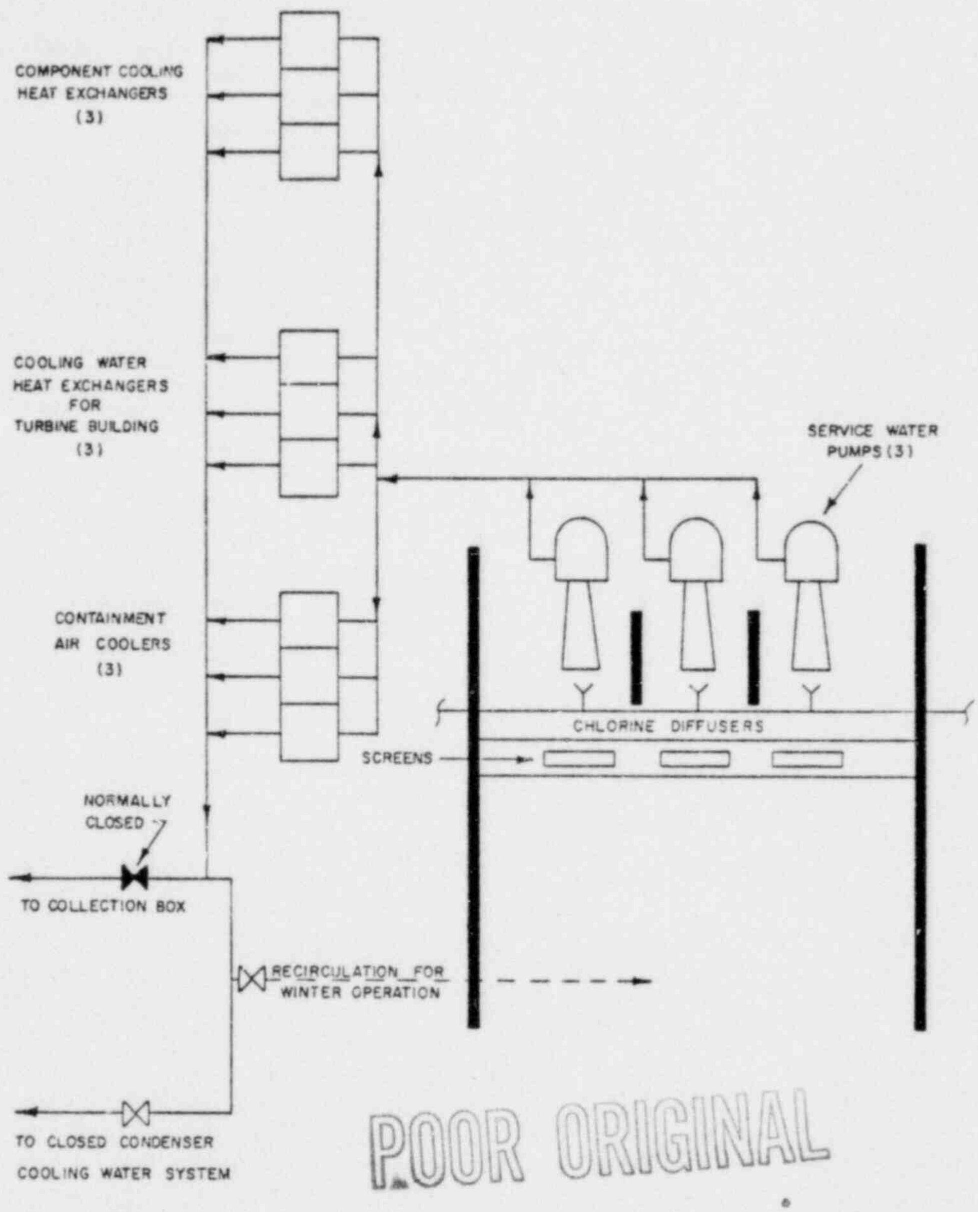
## 3.4 RADIOACTIVE WASTE TREATMENT

The radwaste systems described in Section 3 of the FES-CP have not been modified in the applicant's Final Safety Analysis Report (FSAR).

FIGURE 3 - 1

AERIAL VIEW OF THE SITE SHOWING UNIT NO. 1

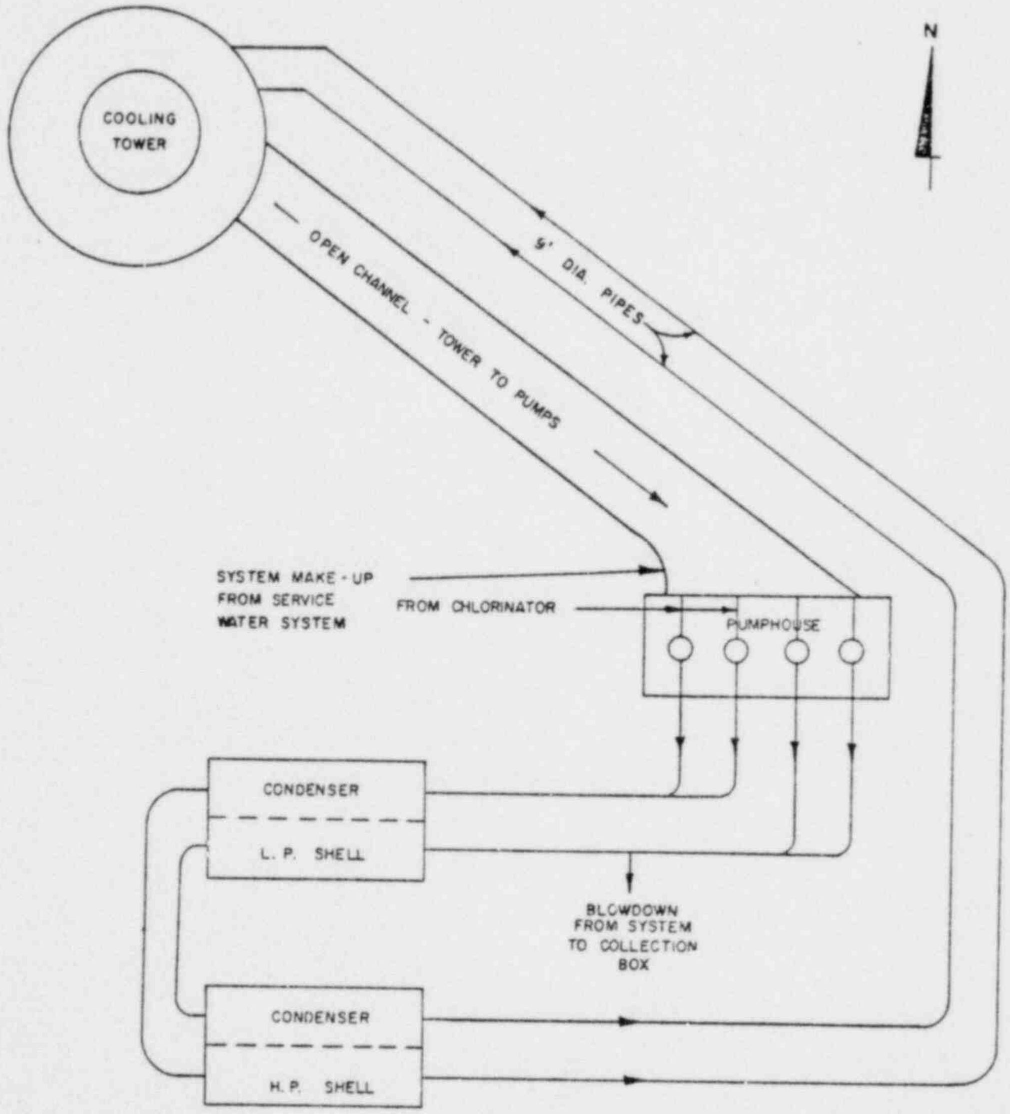






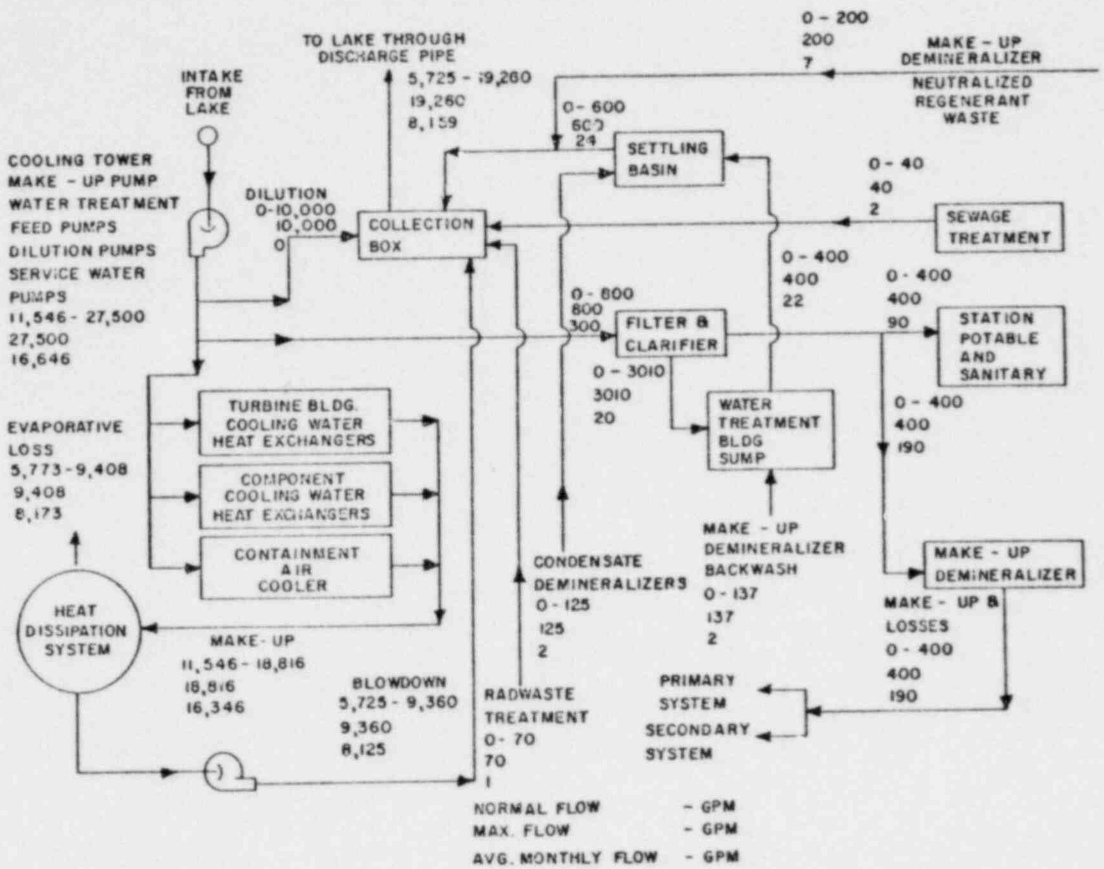

DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 SERVICE WATER SYSTEM

FIGURE 3 - 2 [1]




DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 CLOSED CONDENSER COOLING WATER SYSTEM

FIGURE 3 - 3 [2]




DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 UNIT WATER USE AND DISCHARGE DIAGRAM

3

FIGURE 3 - 4

The parameters which the staff uses in the evaluation of radwaste systems, however, have been updated to reflect more recent information, since the FES-CP was issued. The parameters and their bases are given in Draft Regulatory Guide 1.BB, "Calculation of Releases of Radioactive Materials in Liquid and Gaseous Effluents from Pressurized Water Reactors (PWR's)", Docket No. RM-50-2. The staff used these parameters (listed in Table 3.1) in our evaluation of the liquid and gaseous source terms for the Davis-Besse Nuclear Power Station. The liquid source term calculated using the parameters in the FES-CP was 5 curies/yr, excluding tritium, and 1000 curies/yr of tritium. The gaseous source term was 2943 curies/yr of noble gases and 0.12 curies/yr of I-131. The liquid source term calculated using the current parameters is 0.3 curies/yr excluding tritium, and 350 curies/yr of tritium, and the gaseous source term is 3345 curies/yr of noble gases and 0.52 curies/yr of I-131. An isotopic listing of the staff's calculated liquid and gaseous radioactive source terms is given in Tables 3.2 and 3.3 respectively. Based on the updated evaluation, the staff concludes that the radwaste treatment systems are acceptable and meet "as low as practicable" guidelines in accordance with 10 CFR Part 50.34a, as previously concluded.

## 3.5 CHEMICAL AND BIOCIDES

### 3.5.1 Plant Chemical Usage

In addition to the chemicals identified for use at the plant in the FES-CP, the applicant has identified the following chemicals to be used in systems from which there will be no routine releases: boric acid (reactor coolant system), lithium hydroxide (reactor coolant system), and organic corrosion inhibitor (turbine building closed cooling water system) and morpholine (building closed heating system). These chemicals are typical of those used in reactor and high purity water systems. Releases of these chemicals to the environment is only expected to occur if at all, through system pipe and heat exhanger leaks. Resultant concentrations in the plant discharge are expected to be very small. If any of these systems were examined for maintenance purposes, the coolant would be collected, saved for reuse or disposed of in an approved, controlled manner. Other newly identified chemicals to be used in the systems whose discharges reach Lake Erie are: calcium hydroxide (water treatment system), sodium aluminate (water treatment system) and sodium sulfite (cooling water system). Concentrations of the various ions in the discharge as a result of the use of these chemicals are given in Tables 3.4 and 3.5.

The use of chlorine in the plant has been changed from that reported earlier. The service water system will be chlorinated continuously to a free residual chlorine level of 0.5 ppm rather than in four 30 minute periods, except during unit shutdown, when the service water system discharge goes directly to the collection box and then to Lake Erie, in which case the chlorination will be limited to 2 hrs/day (ER Supp, p. 3.6-5). The injection point for chlorination of the closed condenser cooling water system has been moved from immediately upstream of the condensers to immediately upstream of the closed circulating water system pumps (ER supp. p. 3.6-5). The intakes of any two of the four pumps will be chlorinated simultaneously. Other uses of chlorine remain as previously stated in the FES-CP. Control of the discharge of residual chlorine will be accomplished by removal of closed cooling water system blowdown from the discharge of the two pumps whose intakes are not currently being chlorinated (requiring a complete circuit of the chlorinated cooling water prior to release, thereby allowing degradation of existing residual from sunlight exposure, removal in the cooling tower and through action of chlorine demanding substances in the makeup and dilution waters). Total residual chlorine in the discnarge prior to mixing with dilution flow will be held to less than 0.5 ppm.

### 3.5.2 Chemical Discharge

The following systems will normally discharge effluents through the collection box to Lake Erie (unchanged from FES-CP):

1. Blowdown from the closed condenser cooling water system
2. Service water discharge (during unit shutdown)
3. Neutralized regenerant waste from makeup demineralizers
4. Pumped effluent from the settling basin (water treatment system backwash effluent)
5. Sewage treatment plant effluent
6. Processed liquid radwast effluents
7. Dilution water from Lake Erie.

Table 3.1 Principal Parameters and Conditions Used in Calculating Releases of Radioactive Material in Liquid and Gaseous Effluents from Davis-Besse Nuclear Station, Unit 1

| | |
|---|---|
| Reactor Power Level (MWt) | 2772 |
| Plant Capacity Factor | 0.80 |
| Failed Fuel | 0.25%[a] |
| Primary System | |
| Mass of Coolant (lbs) | $5.09 \times 10^5$ |
| Letdown Rate to MPS (gmp) | 45 |
| Shim Bleed Rate (gpm) | 1.65 |
| Leakage to Secondary System (lbs/day) | 110 |
| Leakage to Containment Vessel (lbs/day) | 240 |
| Leakage to Auxiliary Buildings (lbs/day) | 160 |
| Frequency of Degassing for Cold Shutdowns (per year) | 2 |
| Secondary System | |
| Steam Flow Rate (lbs/hr) | $1.18 \times 10^7$ |
| Mass of Steam/Steam Generator (lbs) | $5.0 \times 10^3$ |
| Mass of Liquid/Steam Generator (lbs) | $4.9 \times 10^4$ |
| Secondary Coolant Mass (lbs) | $2.93 \times 10^6$ |
| Rate of Steam Leakage to Turbine Building (lbs/hr) | 1700 |
| Fraction of Feedwater Processed through Condensate Demineralizers | 0.67 |
| Dilution Flow (gpm) | 11,000 |
| Containment Vessel Volume($ft^3$) | $2.83 \times 10^6$ |
| Annual Frequency of Containment Purges | 4 |
| Iodine Partition Factors (gas/liquid | |
| Leakage to Containment Building | 0.1 |
| Leakage to Auxiliary Building | 0.001 |
| Steam Leakage to Turbine Building | 1 |
| Steam Generator (carry over) | 1.0 |
| Main Condenser/Air Ejector | 0.00005 |

Decontamination Factors (Liquid Wastes)

| | CLRWS | MLRWS |
|---|---|---|
| I | $1 \times 10^4$ | $1 \times 10^4$ |
| Cs, Rb | $2 \times 10^4$ | $1 \times 10^5$ |
| Mo, Tc | $1 \times 10^5$ | $1 \times 10^6$ |
| Y | $1 \times 10^4$ | $1 \times 10^6$ |
| Others | $1 \times 10^5$ | $1 \times 10^5$ |

| | All Nuclides Except Iodine | Iodine |
|---|---|---|
| MLRWS Evaporator DF | $10^4$ | $10^3$ |
| CLRWS Evaporator DF | $10^3$ | $10^2$ |

| | Cation[(b)] | Anions[(b)] | Cs, Rb |
|---|---|---|---|
| MPS Mixed Bed Demineralizer DF | 10 | 10 | 2 |
| MPS Cation Demineralizer DF | $10^2$ | 1 | 10 |
| Condensate Demineralizer DF | $10^3$ | $10^3$ | 10 |
| CLRWS Primary Demineralizer ($H^+BO^3$) DF | 10 | 10 | 2 |
| Evaporator Condensate Polishing Deminerlizers ($H^+OH^-$) DF | 10 | 10 | 10 |

| Removal by Plateout | Removal Factor |
|---|---|
| Mo, Tc | $10^2$ |
| Y | 10 |
| Charcoal Filter DF( Gaseous Radwaste System, Air Ejector release) | 10 |

(a) This value is constant and corresponds to 0.25% of the operating power fission product source term.

(b) Does not include Cs, Mo, Y, Rb, Tc.

TABLE 3.2

CALCULATED RELEASE OF RADIOACTIVE MATERIAL FOR
LIQUID EFFLUENT FROM THE DAVIS-BESSE NUCLEAR STATION UNIT 1

| RADIONUCLIDE | NORMALIZED Ci/yr |
|---|---|
| **ACTIVATION-CORROSION PRODUCTS** | |
| Na-24 | 0.00003 |
| P-33 | 0.00003 |
| Cr-51 | 0.00011 |
| Mn-54 | 0.0010 |
| Mn-56 | 0.00059 |
| Fe-55 | 0.00011 |
| Fe-59 | 0.00006 |
| Co-58 | 0.0048 |
| Co-60 | 0.0088 |
| Ni-63 | 0.00001 |
| Nb-92 | 0.00002 |
| Mo-99 | 0.00045 |
| Te-99m | 0.00043 |
| W-187 | 0.00012 |
| Np-239 | 0.00001 |
| **Fission Products** | |
| Br-82 | 0.00003 |
| Rb-88 | 0.00043 |
| Sr-89 | 0.00001 |
| Y-90 | 0.00002 |
| Y-91 | 0.034 |
| Y-93 | 0.00001 |
| Mo-99 | 0.047 |
| Tc-99m | 0.045 |
| Te-127m | 0.00001 |
| Te-127 | 0.00002 |
| Te-129m | 0.00006 |
| Te-129 | 0.00004 |
| I-130 | 0.00012 |
| Te-131m | 0.00004 |
| I-131 | 0.048 |
| Te-132 | 0.00065 |
| I-132 | 0.0009 |
| I-133 | 0.012 |
| Cs-84m | 0.00002 |
| Cs-134 | 0.017 |
| I-135 | 0.002 |
| Cs-136 | 0.00088 |
| Cs-137 | 0.025 |
| Ba-137m | 0.0012 |
| Ba-140 | 0.00001 |
| All others | 0.00012 |
| TOTAL (except tritium) | 0.3 |
| Tritium | 350 |

TABLE 3.3

CALCULATED RELEASES OF RADIOACTIVE MATERIAL AND GASEOUS EFFLUENT FROM DAVIS-BESSE NUCLEAR STATION UNIT 1
(Ci/Yr)

| Radionuclide | Decay Tanks | Containment Vessel | Auxiliary Building | Turbine Building | Air Ejector Off-gas | Total |
|---|---|---|---|---|---|---|
| Kr-83m | a | a | 2 | a | 2 | 4 |
| Kr-85m | a | a | 8 | a | 8 | 16 |
| Kr-85 | 760 | 10 | 5 | a | 5 | 780 |
| Kr-87 | a | a | 4 | a | 4 | 8 |
| Kr-88 | a | a | 14 | a | 14 | 28 |
| Kr-89 | a | a | a | a | a | a |
| Xe-131m | 12 | 2 | 6 | a | 6 | 26 |
| Xe-133m | a | 1 | 15 | a | 15 | 31 |
| Xe-133 | 22 | 180 | 1100 | 2 | 1100 | 2400 |
| Xe-135m | a | a | a | a | a | a |
| Xe-135 | a | a | 23 | a | 23 | 46 |
| Xe-137 | a | a | a | a | a | a |
| Xe-138 | a | a | 3 | a | 3 | 6 |
| I-131 | a | 0.5 | 0.019 | 0.004 | 0.0014 | 0.52 |
| I-133 | a | 0.07 | 0.023 | 0.005 | 0.0017 | 0.10 |

NOTE: "a" appearing in the table indicates release is less than 1.0 Ci/yr for noble gas, 0.001 Ci/yr for I.

TABLE 3.4

MAXIMUM CHEMICAL DISCHARGE COMPOSITION UNIT 1

| | Cooling Tower Blowdown | Dilution Flow | Neutralized Regenerant Wastes | Settling Basin Effluent | Sewage Treatment Plant | Discharge To Lake Erie |
|---|---|---|---|---|---|---|
| Flow (gpm) | 8,350 | 10,000 | 200 | 600 | 40 | 19,260 |
| pH | 8.0 | 8.0 | 7.0 | 9.6 | 9.6 | 8.0 |
| Calcium (Ca) | 108 | 54 | 324 | 15 | 15 | 79 |
| Magnesium (Mg) | 18 | 9 | 61 | 9 | 9 | 13 |
| Sodium (Na) | 24 | 12 | 2,205 | 12 | 12 | 40 |
| Chloride (Cl) | 80 | 40 | 273 | 40 | 40 | 60 |
| Nitrate ($NO_3$) | 14 | 7 | 25 | 7 | 7 | 10 |
| Sulfate ($SO_4$) | 244 | 58 | 5,100 | 58 | 58 | 191 |
| Phosphate ($PO_4$) | 2 | 1 | 6 | 1 | 1 | 1 |
| Silica ($SiO_2$) | 2 | 1 | 31 | 1 | 1 | 2 |
| Total Alkalinity as $CaCO_3$ | 80 | 107 | 52 | 29 | 29 | 92 |
| Suspended Solids | 50 | 37 | 5 | 5 | 15 | 41 |
| Dissolved Solids | 572 | 289 | 8,077 | 172 | 172 | 488 |
| BOD | 2 | 1 | 1 | 1 | 14 | 1 |
| Dissolved Oxygen | 7 | 10 | 9 | 9 | 0 | 9 |

All values in mg/l except pH

This table represents the maximum concentrations corresponding to the worst ambient lake water chemical conditions at times of high dilution flow. The total flow to Lake Erie includes 70 gpm (maximum) of processed effluents from nuclear areas. This waste stream contains essentially zero dissolved solids and has a pH of 7.0.

Although calculations assume all these maximums occurring at the same time, it is highly unlikely to happen. If it did occur, it would be for only a short period of time.

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**TABLE 3.5**

**AVERAGE CHEMICAL DISCHARGE COMPOSITIONS UNIT 1**

| | Cooling Tower Blowdown | Dilution Flow | Neutralized Regenerant Wastes | Settling Basin Effluent | Sewage Treatment Plant | Discharge To Lake Erie |
|---|---|---|---|---|---|---|
| Flow (gpm) | 8,125* | 0 | 7 | 24 | 2 | 8,159 |
| pH | 8.0 | | 7.0 | 9.6 | 9.6 | 8.0 |
| Calcium (Ca) | 84 | | 481 | 15 | 15 | 84 |
| Magnesium (Mg) | 18 | | 114 | 9 | 9 | 18 |
| Sodium (Na) | 30 | | 1,784 | 15 | 15 | 31 |
| Chloride (Cl) | 44 | | 300 | 22 | 22 | 44 |
| Nitrate ($NO_3$) | 12 | | 42 | 6 | 6 | 12 |
| Sulfate ($SO_4$) | 174 | | 4,890 | 41 | 41 | 178 |
| Phosphate ($PO_4$) | 0.6 | | 3 | 0.6 | 0.6 | 0.6 |
| Silica ($SiO_2$) | 2 | | 5 | 1 | 1 | 2.0 |
| Total Alkalinity as $CaCO_3$ | 100 | | 89 | 29 | 29 | 100 |
| Suspended Solids | 45 | | 5 | 5 | 15 | 45 |
| Dissolved Solids | 465 | | 7,708 | 139 | 139 | 470 |
| BOD | 4 | | 2 | 2 | 14 | 4 |
| Dissolved Oxygen | 7 | | 9 | 9 | 0 | 7 |

All values in mg/l except pH

This table represents the average annual concentrations and flows. The total flow to Lake Erie includes 1 gpm of processed effluent from the nuclear area. This waste stream contains essentially zero dissolved solids and has a pH of 7.0.

*Average cooling tower blowdown was computed using blowdown flows for February thru December. The flow for January was not used because of abnormally cold weather, during the period which onsite meterological data was collected, resulting in an unrepresentative blowdown flow.

The chemical waste composition resulting from simultaneous maximum flows from all systems is presented in Table 3.4. The annual average composition is presented in Table 3.5.

The estimated composition of the drift from the cooling tower (estimated to be 0.01% of the circulating water flow rate, containing 270 lbs of dissolved solids per day) is presented in Table 3.6. This table assumes a concentration factor of two, except for sulfate (increased more than two-fold by addition of sulfuric acid for alkalinity control) and bicarbonate (decreased to 100 mg/l by sulfuric acid addition).

## 3.6 SANITARY AND OTHER WASTE SYSTEMS

The Davis-Besse Nuclear Power Station will provide secondary sewage treatment which must meet all Ohio EPA standards for sewage treatment. The effluent will be continuously chlorinated (to a level of 0.5 ppm free residual chlorine) for fecal coliform organism control prior to mixing with other wastes in the collection box. With other releases at minimum and sewage plant releases at maximum (40 gpm), a dilution factor of greater than 200 will be realized before mixing in the lake. The auxiliary boiler blowdown, resulting from operation of a 175,000 lb per hour, 234 psig oil fired boiler will be discharged approximately once per year to a blowdown tank. The condensate from this tank will be discharged to the storm sewer system (to the Toussaint River). An estimated operation time of 725 hours per year (operation only during unit startup or shutdown), utilizing demineralized water and deaerated condensate from the main condensate system as feedwater, was used as the basis for estimating condensate composition as shown in Table 3.7.

## 3.7 TRANSMISSION LINES

The description of the transmission lines associated with Davis-Besse Unit 1 is as presented in FES-CP Section 3.7. The network as shown in Figure 3.10 of the FES-CP has been completed except for the construction of two towers bases at the Toussaint River crossing and the stringing of wire for approximately one mile of transmission line wire associated with those towers.

TABLE 3.6[6]

DISSOLVED SOLIDS DISCHARGED IN COOLING TOWER

| | Concentration in Drift (mg/l) | Percentage of Total | Deposits (lb/day) |
|---|---|---|---|
| Total Dissolved Solids | 465 | 100.0 | 270.0 |
| Calcium | 84 | 18.1 | 48.9 |
| Magnesium | 18 | 3.9 | 10.4 |
| Sodium | 30 | 6.5 | 17.4 |
| Chloride | 44 | 9.5 | 25.4 |
| Nitrate | 12 | 2.6 | 6.9 |
| Sulfate | 174 | 37.4 | 101.2 |
| Phosphate | 1 | 0.2 | 0.6 |
| Silica | 2 | 0.4 | 1.2 |
| Bicarbonate | 100 | 21.4 | 58.0 |

TABLE 3.7[7]

TYPICAL AUXILIARY BOILER FEEDWATER AND BLOWDOWN ANALYSES

| | Auxiliary Boiler Feedwater | Boiler Blowdown Water |
|---|---|---|
| Fe, max | 0.1 mg/l | 100 mg/l |
| Cu, max | 0.05 mg/l | 50 mg/l |
| $SiO_2$, max | 0.02 mg/l | 20 mg/l |
| Dissolved $O_2$ | 0.007 mg/l | 0.007 mg/l |
| Total Dissolved Solids and Suspended Solids, max | 10 mg/l | 500 mg/l |
| pH at 77°F | 9.3-9.5 | 9.3-9.5 |

## REFERENCES

1. Toledo Edison Company. Davis-Besse Nuclear Power Station Unit 1, Supplement to Applicant's Environmental Report, Operating License Stage, Docket No. 50-346.

2. Ibid., p. 3.4-9.

3. Ibid., p. 3.3-10.

4. Ibid., p. 3.6-8.

5. Ibid., p. 3.6-3.

6. Ibid., p. 3.6-13.

7. Ibid., p. 3.6-13.

# 4. ENVIRONMENTAL IMPACT OF SITE PREPARATION AND CONSTRUCTION


Résumé

Section 4 of the FES-CP described the environmental impacts that had taken place due to site preparation and construction through March 1973 and the staff's evaluation of those impacts. At that time, the station was approximately 45% complete. The following sections present additional information related to the continued construction of the facility.


As of March 1975, the construction of Unit No. 1 was over 80 percent complete. Commercial operation had been projected by the applicant for the spring of 1975, but now is projected for mid 1976. The applicant indicates that the original construction schedule has not been maintained due to a combination of the following:[1]

1. Receipt of a Construction Permit was five months later than the original schedule allowed for, delaying work on the containment vessel which was not included in the Construction Permit exemption.

2. The continuing evolution of NRC requirements has resulted in design changes to assure that the unit is acceptable for issuance of an Operating License. (Any change that would have altered the environmental impacts are addressed in this Environmental Statement.)

3. Delayed availability of materials and equipment for installation has been experienced. This is due in part to the complexity of the equipment; stringent quality assurance/quality control requirements; additional requirements of ASME code; the lack of basic material availability such as valve forgings, pump casing castings, and steel plate (particularly that associated with stainless steel tanks); and the lack of manufacturing space availability nationally during the period.

4. General unavailability of skilled craftsmen in critical areas contributed to schedule delay and decreased productivity. In particular, shortages of qualified pipe fitters and welders existed, and continues to exist, at various stages during the project.

5. Lower productivity than expected has transacted, due in part to cramped working quarters and to fulfillment of detailed quality assurance requirements. Rework resulting from design modification also contributed to lower productivity than originally expected.

6. The complexity of designing, procuring, and constructing a large nuclear unit has exceeded previous expectations, with a resulting lag in release of design/construction details in some areas.

## 4.1 EFFECT OF SITE PREPARATION ON TERRESTRIAL ECOLOGY

Construction of the station required the use of 56 acres of land for buildings exclusive of the cooling tower and 46 acres for borrow pits which will be filled with water for ponds. Habitats vital for important species were not preempted by construction nor was any other specially important natural resource. The major effects of construction, which consist primarily of removal of natural resources such as wildlife habitat and farmland and conversion to industrial use, have already taken place.

Marshes of the site are under control of the Bureau of Sport Fisheries and Wildlife and are being preserved for water fowl habitat. About 600 acres of the wildlife refuge marsh are under Bureau management. This is on balance a net benefit to wildlife of the area.

Acquisition of transmission right of way and corridor clearance is virtually complete. The staff assessment of route selection and impacts on biota remains unchanged from that of the FES-CP stage (p.4-1). No unacceptable adverse effects on biota are anticipated. Herbicides will not be used for corridor maintenance.

## 4.2 EFFECTS OF SITE PREPARATION ON WATER QUALITY

The staff has presented their analysis of the expected effects of construction of the temporary barge channel, the installation of the intake and discharge pipelines and the preparation of the main station area in the construction permit environmental review (CP FES pp. 4-2 thru 4-5). At that time, only short term effects on water quality in the plant vicinity were predicted. The results of the preoperational environmental monitoring program as reported in the semi-annual environmental monitoring reports covering the period from January 1, 1974 thru December 31, 1974,[2,3] indicate that there is evidence of improvement over data for 1973 in factors relating to turbidity in the Locust Point vicinity of Lake Erie. Conductivity has decreased, turbidity measurements have decreased and correspondingly, transparency has increased. As anticipated, these changes are related to the cessation of activities relating to the installation of the intake and discharge structures and pipelines.

## 4.3 EFFECT OF SITE PREPARATION AND CONSTRUCTION ON AQUATIC ECOLOGY

At the time the FES-CP for the Davis-Besse Nuclear Power Station Unit 1 was issued, the staff indicated that the construction of the barge channel for delivery of the reactor pressure vessel to the site, and dredging and backfilling of the trenches for the intake and discharge piping would produce some slight short-term damage to aquatic life in the immediate vicinity, but no lasting effects on the aquatic environment were expected. No additional site preparation or construction impacts on Lake Erie ecology beyond those mentioned above were identified during the OL review. The applicant's environmental monitoring of dredging and backfilling operations suggests that decreases in benthic populations occurred in the immediate vicinity during late spring and summer of 1973. Results from 1974 monitoring indicate recolonization of these areas by benthic organisms and the presence of populations greater than those measured in 1973 during construction. The staff concludes that temporary changes in benthic populations resulting from construction-related activities have not had a significant adverse impact on aquatic populations in the vicinity of the station.

## 4.4 EFFECTS ON THE COMMUNITY

Fuel loading is presently scheduled for 1976. The transmission system has been virtually completed and although the construction schedule has been extended approximately eighteen months, the impacts on the community presented in the FES-CP stage are still valid.

REFERENCES


1. Letter from L. Roe, Vice-President, Toledo Edison Company to E. G. Case, U. S. Nuclear Regulatory Commission, February 11, 1975.
2. Toledo Edison Company, Semiannual Pre-operational Monitoring Report Unit 1, Vols. I and IA, Jan. 1974 - June 1974, issued August 30, 1974.
3. Toledo Edison Company, Semiannual Pre-operational Monitoring Report Unit 1, Vol. II, July 1974 - December 1974, issued February 28, 1975.

# 5. ENVIRONMENTAL EFFECTS OF STATION OPERATION

Résumé

There have been two major changes related to the staff's evaluation of environmental effects of station operation since the issuance of the FES-CP. The radiological impact sections have seen completely revised due to the calculation of a new source term. Major changes to applicable water quality criteria for Lake Erie have been made, requiring a new staff evaluation of the ability of the station to meet the new criteria. These changes, as well as minor revisions, such as reduced intake velocity, are addressed in the following sections.

## 5.1 EFFECT ON LAND USE

The staff considered the environmental effects of station operation on land use in the FES-CP, Section 5.1. It was concluded that the station would produce a very small effect on land use, that the presence of the station would not affect access to Lake Erie, and that the cooling towers would have a visual impact in the surrounding area. The information relied on for those conclusions is still considered valid and the staff's conclusion remains unchanged.

## 5.2 EFFECT ON WATER USE

### 5.2.1 Water Flow Plan

The description of the water flow plan presented in the FES-CP is still valid.

### 5.2.2 Water Consumption

The estimate of consumptive use of water by the plant has been revised and is shown in Figure 3.4 based on updated meteorological information of the site. The evaporative loss in the cooling tower is expected to range from 5,773 gpm to 9,408 gpm with an average of 8,173 gpm (~17 cfs) depending on climatic conditions and plant load. This is below the previous estimate (FES-CP p. 5-2) of 9,225 gpm, (21 cfs), and will have no significant impact on the overall water balance of Lake Erie. There will be no use of groundwater by the station.

### 5.2.3 Thermal Discharges

The Ohio Environmental Protection Agency has recently revised the water quality standards for the State as published in Regulation EP-1.[1] These new standards became effective on January 8, 1975. A major change to the applicable water quality criteria for the Davis-Besse Nuclear Power Station is the allowable thermal discharge to Lake Erie. These new criteria appear in the Ohio EPA water quality standards Section EP-1-03(b)(4)(c). The acceptability of a thermal discharge in Ohio waters is determined after consideration of such factors as the acclimation temperatures for important aquatic species at various life stages and times of the year. The necessary information in these subject areas for the designated aquatic species have been presented by the applicant in the application to the State of Ohio for a discharge permit (FWCA Sec. 402). The Ohio EPA has indicated tentative acceptance that the applicant has successfully demonstrated that the thermal discharge does comply with the mixing zone provisions of regulation EP-1-03(B)(4)(c) by issuing a proposed National Pollutant Discharge Elimination System (NPDES) permit to the applicant (see Appendix B). There has been no change to the staff analysis of the temporal and spatial distribution of waste heat from the Davis-Besse Nuclear Power Station. The staff believes that the volume of water in Lake Erie subjected to small increases above lake ambient temperature ($\leq 5°F$) will result in small time-temperature exposures for both motile and planktonic aquatic species. Therefore, the staff believes that the station will operate within the revised standard's limitations.

### 5.2.4 Scouring of Lake Bottom

Because there have been no changes in the location or design of the discharge structure for the plant, there is no change in the staff assessment of little potential for scouring of the lake bottom due to discharge of plant effluent at a maximum of 6.4 fps over approximately 200 ft of riprap.

### 5.2.5 Chemical Effluents

The character of the routine chemical effluent from the Davis-Besse Nuclear Power Station has changed very little from that presented in the FES-CP. None of these changes (e.g., an expected pH of 8.0 vs. 7.3 in the FES-CP; an increase in total dissolved solids in the effluent from 427 ppm to 488 ppm) is sufficient to alter the previous staff assessment of the effects of the chemical release of the plant on lake water quality or water use. No detectable effect is expected.

The plant discharge, a submerged single slot jet diffuser, is located approximately 1200 ft. offshore, well within the excepted zone designated for Magee Marsh by the Ohio Water Quality Standards (see sec. 2.5.4). This zone extends approximately 2100 ft. offshore. The allowable mixing zone for the chemical discharge extends a maximum distance from the diffuser of one-tenth of the width of the near shore zone of the western basin of Lake Erie, which is the distance from the shoreline to the 18 foot depth contour line. This distance is approximately 4.9 nautical miles or 29772 ft. at the site vicinity. Thus, the allowable chemical mixing zone length is 2977 ft. The edge of the chemical mixing zone will then be beyond the boundary of the excepted area, but within the boundary of the near shore zone. Therefore, the chemical water quality standards that apply in the mixing zone are those of regulation EP-1-03(C)(1)(a) and those that apply at the edge of the mixing zone are contained in EP-1-07. Even though the discharge is in relatively shallow water (approx. 12 ft.), the chemical releases, being concentrated to approximately twice the ambient lake levels, will not violate the applicable standards for the mixing zone. Due to the large size of the mixing zone and the dilution of the releases by virtue of the jet type discharge, water quality standards outside the mixing zone will be met.

The staff has considered the compliance of the operation of the plant with recent EPA "Effluent Limitations and Guidelines for the Steam Electric Power Generating Point Source Category" (39 FR 36186). The applicable paragraphs of these guidelines are 423.12, and 423.13 (see Appendix C). The staff evaluation of the expected station performance with each subpart of these paragraphs is discussed below:

| Paragraph No. | Description of Compliance |
|---|---|
| 423.12(b)(1)<br>423.13(a) | The pH of Unit 1 discharges to Lake Erie will be 8.0 under all conditions. This is in compliance with this requirement. However, the proposed NPDES permit for Unit 1 indicates that there is no pH limitation on the discharge stream to the Toussaint River. Thus, waste streams such as the auxiliary boiler blowdown condensate, an infrequent and low volume waste source, are not presently controlled to meet the provisions of this part. |
| 423.12(b)(2)<br>423.13(b) | The applicant will comply with this provision by stipulation in the discharge permit. |
| 423.12(b))(3)<br>423.13(c) | The applicant will intercept all oil attempting to leave the facility through oil interceptors in all drains and expects to remove virtually all of it. The staff believes that the limitation on oil and grease will be met with the present system.<br><br>The staff believes that the limitation on TSS (total suspended solids) in the guidelines will be met by the individual plant systems that characteristically contain TSS in their effluent (e.g., sewage treatment effluent, settling basin effluent). |
| 423.12(b)(4)<br>423.13(d) | Not applicable. |
| 423.13(e) | Not applicable. |
| 423.12(b)(5)<br>423.13(f) | The applicant has stated that the initial plant startup cleaning solutions and wastes will not be discharged to the receiving waters, but will be trucked off site for disposal in an approved manner. Therefore, the applicant will comply with this requirement. (ER Suppl. 1 CP Stage p. 4-40).<br><br>Periodic cleaning of the steam generator and the service water system heat exchangers will be required. Although these processes are not specifically identified by the applicant, the staff believes that they would be treated in a similar manner to those startup wastes, thus complying with the limitations of this part. |

423.12(b)(6) 423.13(g) As stated earlier in Section 3.6, the applicant plans to discharge these wastes to the Toussaint River approximately once each year. Dilution of the condensate with water in the drainage ditch (i.e., river water) would be relied upon to bring the discharge concentrations within compliance prior to reaching the river. In the case of iron, this would require a 100 fold dilution for compliance. However, this practice is not allowed by paragraphs 423.12(b)(10) and 423.13(k). Therefore, a change in the operational procedures or the establishment of a treatment system will be required by the limitations of this part.

423.12(b)(7) 423.13(h) Not applicable.

423.12(b)(8) The applicant will periodically chlorinate the closed condenser circulating water system to maintain, during periods of chlorination, a maximum of 0.5 mg/l and an average of 0.2 mg/l free chlorine residual. Even without the expected degradation of free residual chlorine in the cooling tower circuit, this will comply with the limitations for chlorine releases of this part. The chlorination of the service water system will be controlled to a free residual chlorine level of 0.5 mg/l during normal operation of the plant. This residual is expected to degrade significantly during passage through the closed condenser circulating water system due primarily to chlorine demand in the system's waters and also exposure to sunlight in the cooling tower. This action is expected to bring the releases of free residual chlorine within the limitations of this part.

During unit shutdown, when the service water system discharge is directed to the collection box, chlorination will be limited to 2 hours per day to a level of 0.5 mg/l free residual chlorine maximum. However, this discharge will be controlled to comply with the limitations of this part by stipulation in the NPDES permit.

423.13(i) Since the applicant will not use any corrosion inhibitors at the plant, the limitations on corrosion inhibitors will be met.

423.12(b)(9) 423.13(j) The applicant plans to periodically chlorinate the closed condenser cooling water system (from which blowdown is removed) for up to four 30 minute periods per day.

Because of the time necessary to flush the closed condenser circulating water system by blowdown removal, chlorination of this system for the maximum time estimated may result in residual chlorine being discharged from the station for greater than two hours per day, which will not be in compliance with the provisions of this part.

Since the service water system is continuously chlorinated and this water reaches the receiving water after passing through the main condenser cooling circuit, the potential exists for residual chlorine to be discharged for a period greater than 2 hrs/day. The staff believes that the chlorine demand of the unchlorinated main condenser cooling water (1.4 mg/l ref: OL-ER Suppl. Table 3.3-1) will reduce the chlorine residual to an undetectable level.

423.13(k) The applicant will discharge blowdown from the cold side of the recirculation loop and thereby comply with this limitation.

No detectable effects on water quality or uses are expected due to effluent from the sewage treatment plant. The $BOD_5$ of the effluent will be below the State of Ohio limits and the effluent will be continuously chlorinated to control bacteria at an almost zero level.

## 5.3 COOLING TOWER EFFECTS

### 5.3.1 Choice of Cooling System

### 5.3.2 Possible Atmospheric Effects

### 5.3.3 Experience with Natural-Draft Cooling Towers

The information relied on for the discussion of the cooling tower, the atmospheric effects, and the experience with natural draft tower is still considered valid by the staff.

### 5.3.4 Predictions for the Station Cooling Tower

The only change in the predictions of the impacts of the station cooling tower operations is related to drift. This change is a result of the updated meteorological information for the site. The staff examined the possible effects of cooling tower drift in the FES-CP (p 5-10). No measurable effects on terrestrial biota were expected due to drift, fogging, or icing. A revised estimate of drift emission has since been made available which indicated a slightly higher level of emission than previously estimated although the assumed operating parameters of the tower have not changed. Drift emission is currently estimated to be about 270 pounds per day instead of 247 pounds per day as previously estimated. The staff's evaluation of the increased drift is still that there will be no adverse effect of drift on terrestrial biota.

## 5.4 EFFECT ON TERRESTRIAL ENVIRONMENT

The following information updates the staff's evaluation of terrestrial impacts due to station operation.

### 5.4.1 Wildlife

Loss of habitat and bird collision with cooling towers are the primary impacts of the plant on animals of the area. At the CP review, the staff did not find that the loss of habitat would be unacceptable to the biota since the site consists primarily of marsh areas, which are being protected, and farmland or disturbed woodlands. At the present stage of construction for Unit 1, the loss of habitat has been completed and no further alteration is expected.

The cooling tower is within major flyway of migratory song birds and waterfowl and some hazard of bird mortality due to impaction on the tower exists. The staff assessment of this possibility in the FES-CP stage concluded that birds were not likely to be killed in large numbers but that a few mortalities at varying intervals were likely. Since that assessment, the applicant has submitted data on impactions (Table 6.3). These results are consistent with the original assessment. A total of 157 birds mostly Warblers and Kingllets were killed on station structures during the migratory periods of 1972-1973. During the 9-week autumn migratory season in 1974, 342 dead birds were recovered.[19] Eighty-two percent were recovered from the cooling tower, 15.5% from Unit 1 structures and 2.8% from the meteorological tower. Warblers and Kinglets were again the most frequently affected. The increase in bird numbers may not be due to increased numbers of collisions since the applicant increased his frequency of collection in 1974. Studies show that scavengers (raccoons, skunks, foxes, etc.) may take up to 88% of the fallen birds if they are not collected quickly after they fall. All counts to date are, therefore, probably underestimates of true collision frequency.

Two species which appear on the list of rare, declining or endangered birds (Table 2.10) have thus far collided; these are the Yellow Warber (6 impactions) and the Pine Warbler (7 impactions). These species do not appear on the U.S. Department of Interior list of endangered species. While it is generally undesirable to adversely affect these species, the staff notes that the number involved is small and reliable methods for prevention of impactions are not available. No waterfowl have collided with the tower. Mortalities in the number reported do not constitute a threat to the species involved, and continued monitoring will be required until the long term impacts have been established.

The waterfowl which utilize the site are an important wildlife resource. Navare Marsh, which is the principal waterfowl habitat on site, has been protected from construction effects and is, for the benefit of waterfowl, under the management by the Bureau of Sport Fisheries and Wildlife. This arrangement gives reasonable assurance that there will be no unacceptable adverse effects of the plant on waterfowl resulting from any further construction of Unit 1 and the subsequent operation of the station.

### 5.4.2 Noise

The staff has reviewed the predictive technique utilized by the applicant for estimating noise levels in the plant vicinity during operation (see ER Suppl. sec 6.2.6) as well as the baseline noise measurements (see ER Suppl. sec 2.9).

The staff agrees with the applicant that the predictive technique employed is conservative in that no sound attenuation was accounted for by intervening structures, meteorological conditions or topographical features in estimating population exposure levels. Thus the predicted increase in numbers of permanent and non-permanent area residents exposed to higher than "acceptable" (ref. 2, 3) levels could be expected to be lessened somewhat. The applicant's predictions (see

Figures 5.1 and 5.2) indicate that the current number of permanent area residents experiencing daytime background sound levels in excess of both the HUD "acceptable" noise level of 45dBA[2] and the EPA "identified level" for public health and welfare of 55dBA[3] will be increased by approximately 10% and 8%, (26 and 4) respectively. The corresponding nighttime exposure increases will be 29 residents (compared to 0 residents for preoperational conditions) for the HUD guidelines and no increase for the EPA "identified level".

Because response to subhearing loss or annoyance levels of noise is subjective in nature and because of variables not accounted for in the applicant's analysis such as the presence of attenuating conditions which may or may not mitigate the effects, the staff will require the applicant to confirm the predictions made concerning operational noise levels in the site vicinity. The requirement for this special study will be set forth in the Environmental Technical Specifications.

### 5.4.3 Transmission Rights of Way

#### Herbicides

The applicant plans no use of herbicides for transmission corridor maintenance. No adverse effects are therefore anticipated.

#### Ozone

The staff considered possible adverse effects of ozone along transmission line in the FES-CP stage (p. 12-27 comment 10C). It was concluded at that stage that no adverse effects due to ozone generation could be anticipated. The information relied on for that conclusion is still considered valid and the staff conclusion at this stage remains unchanged.

#### Effects of Induced Currents

The question of electrostatically induced currents in metal structures near EHV transmission line rights-of-way was not addressed at the CP stage except in reference to possible effects on railway signal and communication circuits. Recent information indicates that electrostatic effects in fences, metal buildings, and motor vehicles are also possible but do not present hazards of lethal electric shock to humans or animals. However, shock ranging from "barely perceptible" to "real jolt" has been received from metal structures and vehicles beneath EHV lines. A fire hazard may exist if vehicles are refueled beneath EHV lines.

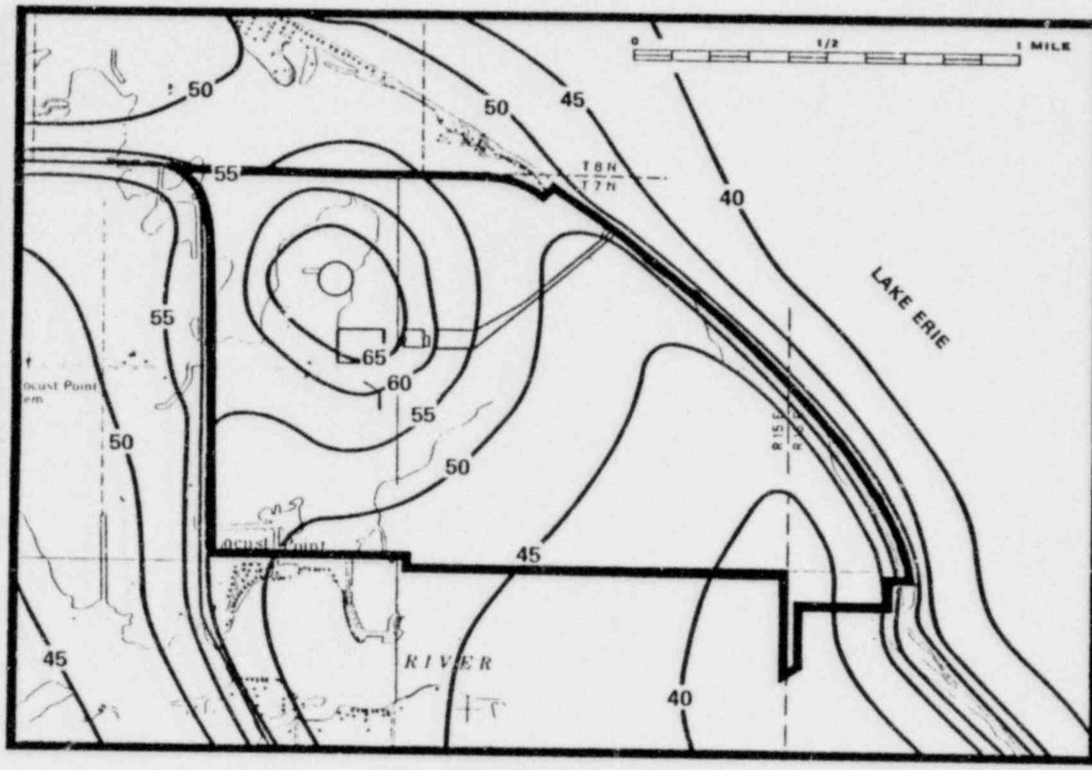
The staff concludes that electrostatic induction could cause inconvenience and varying degree of nuisance to residents who live near the corridors but there is no likelihood of mortality caused by electrocution of persons or animals from the applicant's lines.

## 5.5 EFFECTS ON AQUATIC ENVIRONMENT

### 5.5.1 Intake Effects

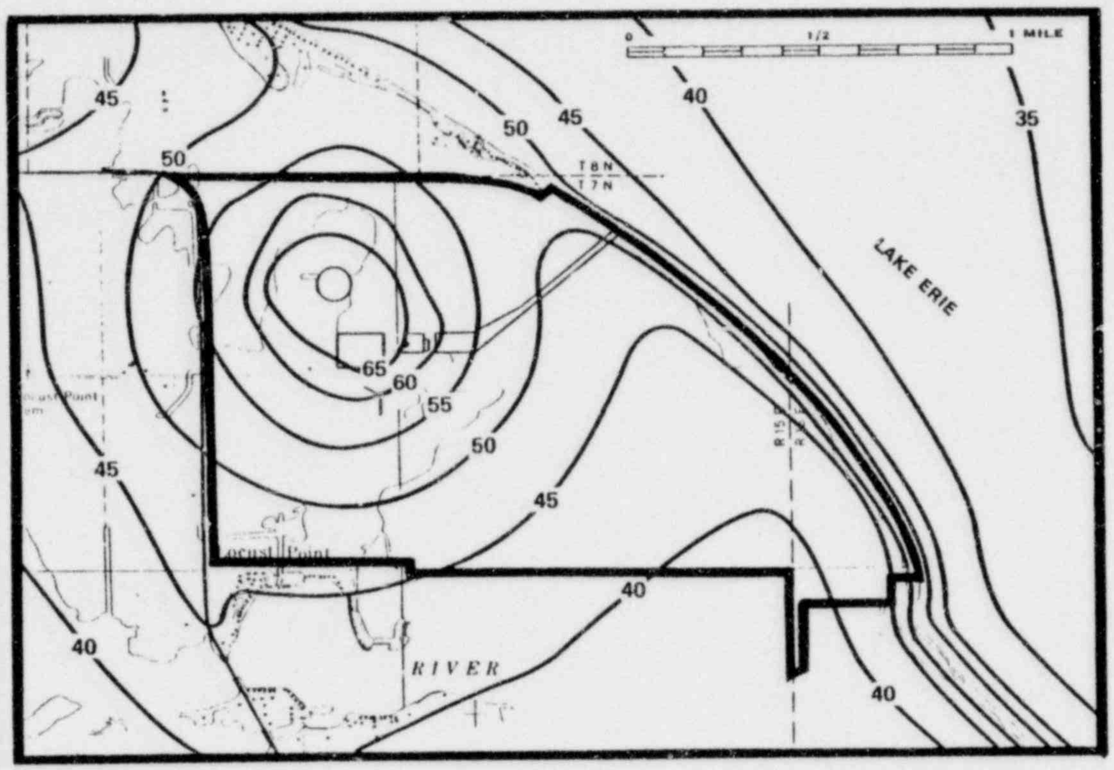
#### Inpingement of Fishes

The vertical downflow through the slots in the intake crib will be a maximum of 0.25 feet/second at the design intake flow of about 42,000 gpm.[4] The actual velocity which will be experienced at the expected intake flow of approximately 21,000 gpm will be about 0.12 feet/second. These low intake velocities do not entirely eliminate the potential for impingement. It is questionable whether the bubble screen which have been installed at the intake crib will be effective in deflecting fishes. The applicant's preoperational aquatic monitoring program and experience gained at similar nuclear power plants indicate that emerald shiner, spottail shiner, gizzard shad and alewife will be impinged in greatest numbers. Survival of fishes washed from the traveling screens and sluiced through a trough to the holding basin is not expected to be high, based on low survival rates experienced at other nuclear power plants along the Great Lakes. The staff expects that impingement losses at the plant will not significantly affect the fisheries of Lake Erie. The staff will require and evaluate future monitoring of fishes in the lake and intake canal to ensure that unacceptable impingement losses are not incurred. The effect of the marsh control pumps on the abundance and distribution of fishes in the vicinity of the site will be investigated as appropriate.




DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 DAYTIME OPERATION SOUND LEVEL CONTOURS (dBA)

FIGURE 5 - 1 [20]




DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 NIGHTTIME OPERATIONAL SOUND LEVEL CONTOURS (dBA)

20

FIGURE 5 - 2

### 5.5.2 Station Passage Effects

Entrainment of Plankton and Fish Life-Stages

Phytoplankton, zooplankton, and fish eggs, larvae and young small enough to pass through the 1/4"-mesh openings of the traveling screens will either be retained by the 1/16"-mesh strainers following the cooling tower makeup and service water pumps or continue on through the condensor. On the average an organism will spend about 20 hours in the station, during which time it will go through periods of chlorination and several trips through the condensor and pumps. It is assumed that all organisms entrained within the Davis-Besse Unit 1 heat dissipation system will be killed by a combination of mechanical, thermal and biocidal effects.[4,5,6] The staff does not agree with the approach used by the applicant to assess potential impacts which may result from entrainment losses at the station. A comparison of the number of organisms entrained in the intake volume of the plant at design flow with an assumed homogenous distribution of the same organisms in the calculated flow through the western basin of Lake Erie and in the volume of the entire lake does not provide a valid assessment of regional impact. However, the staff expects that entrainment losses will not significantly alter local populations of plankton and fishes at the Davis-Besse Site. This conclusion is based on (1) the low fish egg and larval densities at the site which indicate that it is not a major spawning area, (2) the distribution of known spawning areas along the southwest shore of Lake Erie, (3) the offshore location of the intake crib, and (4) the relatively small volume of water withdrawn from the lake by the plant. The staff will require the applicant to monitor phytoplankton, zooplankton, and ichthyoplankton at the site to verify this evaluation. This monitoring program will be included in the Environmental Technical Specifications which becomes part of the operating license.

### 5.5.3 Discharge Effects

Scouring

Approximately one-half acre of lake bottom in the immediate vicinity of the discharge jet has been covered with riprap, permanently altering the benthic community. The riprap extends approximately 200 feet out from the discharge structure beyond the influence of an induced current of 0.5 fps, thus preventing scouring of sediments.[4] Benthic organisms which have recolonized the area associated with the discharge facility will experience induced currents when the plant becomes operative. The areas experiencing currents in excess of 0.1 and 0.5 fps will be 0.014 and 0.086 acres, respectively.[4] Epibenthic organisms presently inhabiting the area of induced discharge currents of 0.5 fps or greater may be swept clear and deposited on nearby areas. The discharge structure and its induced currents should have no discernible effect on the benthic ecology of the western basin of Lake Erie or the Lake as a whole. The staff considers the disruption of a small amount of benthic habitat to be acceptable when compared to the prevention of continuous scouring of sediments which would otherwise result at the discharge.

Thermal Discharge

Water from the station collecting basin will be discharged into Lake Erie. This effluent generally will be warmer than Lake Erie, except for a few days in fall when it will likely be a few degrees cooler.[4] Under conditions of maximum heat discharge ($138 \times 10^6$ BTU/hr) the plume of water warmer than 3°F above ambient will cover about 0.9 acres.[4] Approximately 4 acres will be contained within the 1°F isotherm.[6] Residence time within the 1°F isotherm usually will be less than 15 minutes, but may be as long as one hour. Thermal effects caused by entrainment of phytoplankton, zooplankton, and fish eggs and larvae in the discharge plume are not expected to measurably alter the aquatic populations in the western basin of Lake Erie or the Lake as a whole. The slight increase in temperature experienced for a short time by entrained organisms will not induce significant shifts in species composition or abundance in these areas.

Thermal Shock

Fishes will be attracted to the perimeter of the thermal plume during winter and early spring.[4,6] The high velocity of the discharge and natural avoidance reaction of most fishes to lethal temperatures will discourage them from residing in the immediate vicinity of the discharge jet. Most of the small plume area where fish could congregate will be only a few degrees above Lake ambient temperatures. It is unlikely that these fishes would be killed by cold shock if the station shutdown suddenly.

Chemical Discharge

The total dissolved solids concentration in the discharge water will be about twice that of Lake Erie water because of evaporation loss of water in the cooling tower.[6] The constituents of the dissolved solids will be essentially the same as those of lake water (Table 2.4). Their concentrations in the discharge water will be reduced rapidly by dilution with entrained lake water. Concentrations of dissolved solids greater than 15% above ambient will be confined to an area less than one acre at a discharge rate of 19,260 gpm.[4] Mortalities resulting from exposure of aquatic biota to dissolved solids concentrations approximately double lake ambient are not expected to have a discernible effect on the local aquatic biota. Total dissolved solid levels in Lake Erie varied by a factor greater than 4 in 1974[3]. Free chlorine in the discharge water will be kept to a minimum and total residual chlorine is predicted by the applicant to be at or below prediction and that a total residual chlorine concentration of 0.5 mg/l maximum in the discharge for short periods of time will not significantly alter aquatic populations at the Davis-Besse Site. The staff evaluated the effect on the aquatic environment from discharging chlorine at the 0.5 mg/l level in FES-CP. This level is allowed by the new EPA guidelines. In that evaluation the staff estimated that a toxic zone within 50 feet of the discharge could be produced during the intermittent discharges. Due to the high discharge velocity of the blowdown, the staff concluded that no adult fish would likely be subjected to toxic concentrations, but that there could be a sublethal effect on the reproductive capacity of scuds (amphypods), which is not considered to be an important food source at the site. The staff's previous evaluation that there will be aquatic ecology due to the intake of lake water and discharge of heated, sometimes chlorinated, water will be negligible is unchanged. In addition, the staff has evaluated the applicant's proposal to continuously chlorinate the service water system. This water reaches Lake Erie after passing through the main condenser cooling circuit. The staff believes that the chlorine demand of the unchlorinated main condenser cooling water will reduce the chlorine residual to an undetectable level and that the aquatic impact resulting will be negligible.

## 5.6 RADIOLOGICAL IMPACT ON BIOTA OTHER THAN MAN

### 5.6.1 Exposure Pathways

The pathways by which biota other than man may receive radiation doses in the vicinity of a nuclear power station are shown in Figure 5.3. Two comprehensive reports[7,8] have been concerned with radioactivity in the environment and these pathways. They can be read for a more detailed explanation of the subjects that will be discussed below. Depending on the pathway beign considered, terrestrial and aquatic organisms will receive either approximately the same radiation doses as man or somewhat greater doses. Although no guidelines have been established for desirable limits for radiation exposure to species other than man, it is generally agreed that the limits established for humans are also conservative for these species.[9]

### 5.6.2 Radioactivity in the Environment

The quantities and species of radionuclides expected to be discharged annually by Davis-Besse 1 Nuclear Station in liquid and gaseous effluents have been estimated by the staff and are given in Tables 3.2 and 3.3, respectively. The basis for these values is discussed in Section 3.5. For the determination of doses to biota other than man, specific calculations are done primarily for the liquid effluents. The liquid effluent quantities, when diluted in Davis-Besse 1 Nuclear Station discharge, would produce an average gross activity concentration, excluding tritium of 0.013 picocuries per milliliter in the plant discharge areas. Under the same conditions, the tritium concentration would be 15 picocuries/ml. Additional discussion concerning liquid dilution is presented in Section 5.7.

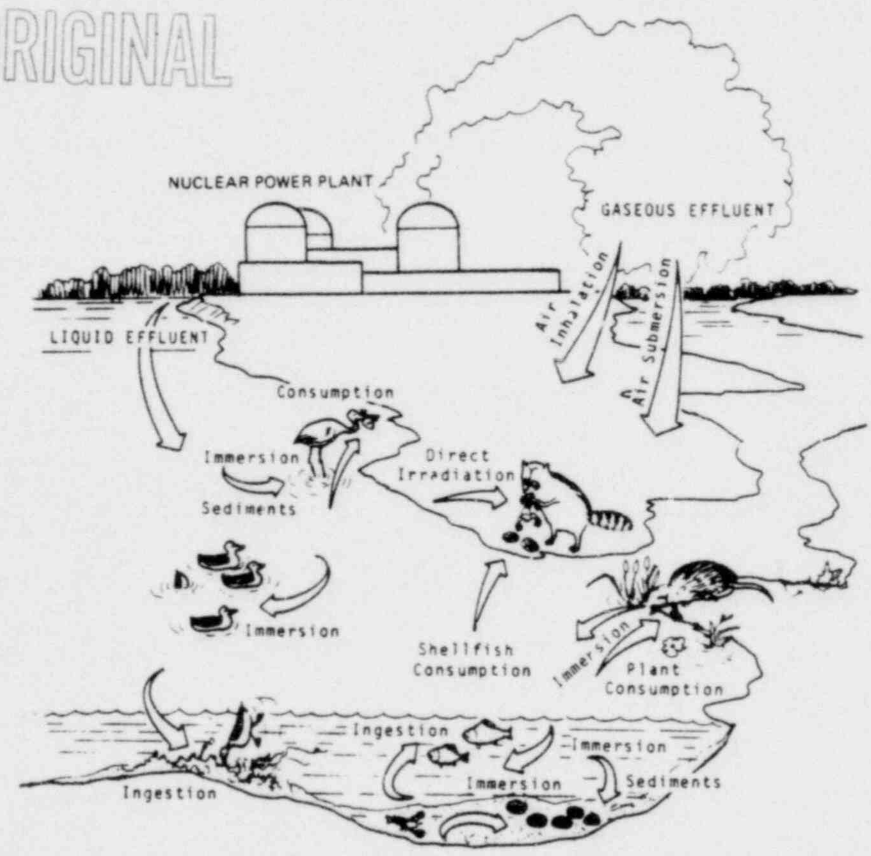
Doses to terrestrial animals such as rabbits or deer due to the gaseous effluents are quite similar to those calculated for man (Section 5.3). For this reason, both the gaseous effluent concentrations at locations of interest and the dose calculations for gaseous effluents are discussed in detail in Section 5.7.

### 5.6.3 Dose Rate Estimates

The annual radiation doses to both aquatic and terrestrial biota including man were estimated on the assumption of constant concentrations of radionuclides at a given point in both the water and air. Referring to Figure 5.4, radiation dose has both internal and external components. External components originate from immersion on surfaces, in distant volumes of air and water, in equipment, etc. Internal exposures are a result of ingesting and breathing radioactivity.

Doses will be delivered to aquatic organisms living in the water containing radionuclides discharged from the power station. This is principally a consequence of physiological mechanisms that concentrate a number of elements that can be present in the aqueous environment. The extent to which elements are concentrated in fish, invertebrates, and aquatic plants upon uptake or ingestion has been estimated. Values of relative biological accumulation factors (ratio of concentration of nuclide in organisms to that in the aqueous environment) of a number of waterborne elements for several organisms are provided in Table 5.1.

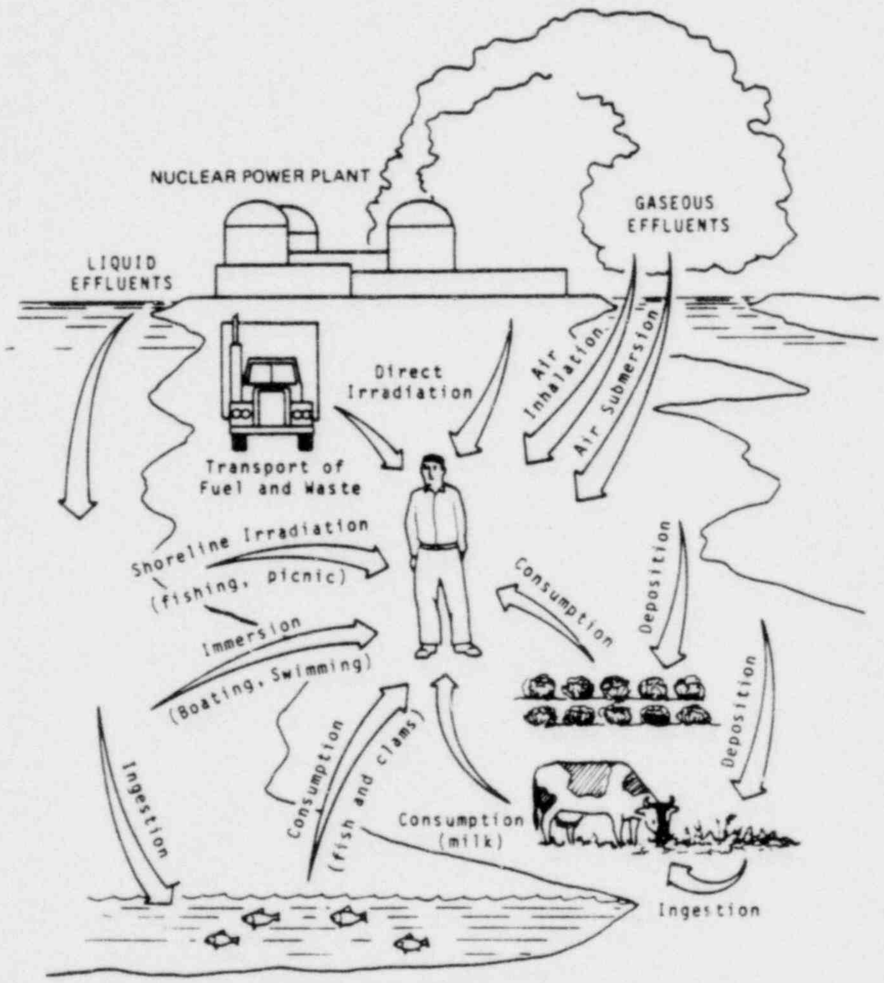





EXPOSURE PATHWAYS TO BIOTA OTHER THAN MAN

FIGURE 5-3

Doses to aquatic plants and fish living in the discharge region due to water uptake and ingestion (internal exposure) were calculated to be 37 and 7.6 mrads/year, respectively, for Davis-Besse 1 Nuclear Station operation. The discharge region concentrations were those given above and it was assumed that these organisms spent all of the year in water of maximum concentrations. All calculated doses are based on standard models.[10] The doses are quite conservative




EXPOSURE PATHWAYS TO MAN

FIGURE 5-4

TABLE 5.1

FRESHWATER BIOACCUMULATION FACTORS[12]

| ELEMENT | FISH | INVERTEBRATES | PLANTS |
|---|---|---|---|
| C | 4550 | 9100 | 4500 |
| Na | 100 | 200 | 500 |
| P | 100000 | 20000 | 500000 |
| Sc | 2 | 1000 | 10000 |
| Cr | 200 | 2000 | 4000 |
| Mn | 400 | 90000 | 10000 |
| Fe | 100 | 3200 | 1000 |
| Co | 50 | 200 | 200 |
| Ni | 100 | 100 | 50 |
| Zn | 2000 | 10000 | 20000 |
| Rb | 2000 | 1000 | 1000 |
| Sr | 30 | 100 | 500 |
| Y | 25 | 1000 | 5000 |
| Zr | 3 | 7 | 1000 |
| Nb | 30000 | 100 | 800 |
| Mo | 10 | 10 | 1000 |
| To | 15 | 5 | 40 |
| Ru | 10 | 300 | 2000 |
| Rh | 10 | 100 | 200 |
| Ag | 2 | 770 | 200 |
| Sn | 3000 | 1000 | 100 |
| Sb | 1 | 10 | 1500 |
| Te | 400 | 150 | 100 |
| I | 15 | 5 | 40 |
| Cs | 200 | 100 | 500 |
| Ba | 4 | 200 | 500 |
| La | 25 | 1000 | 5000 |
| Ce | 1 | 1000 | 4000 |
| Pm | 25 | 1000 | 5000 |
| No | 25 | 1000 | 5000 |
| Pm | 25 | 1000 | 5000 |
| Sm | 25 | 1000 | 5000 |
| Bu | 25 | 1000 | 5000 |
| Gd | 25 | 1000 | 5000 |
| W | 1200 | 10 | 1200 |
| Np | 10 | 400 | 300 |
| Pu | 4 | 100 | 350 |
| Am | 25 | 1000 | 5000 |
| Cm | 25 | 1000 | 5000 |

since it is highly unlikely that any of the mobile life forms will spend a significant portion of their life span in the maximum activity concentration of the discharge region. Both radioactive decay and additional dilution would reduce the dose at other points in the Lake.

External doses to terrestrial animals other than man are determined on the basis of gaseous effluent concentrations and direct radiation contributions at the locations where such animals may actually be present. Terrestrial animals in the environs of the station will receive approximately the same external radition doses as those calculated for man. Table 5.3 lists the doses due to the gaseous effluents.

An estimate can be made for the ingestion dose to a terrestrial animal such as a duck which is assumed to consume only aquatic vegetation growing in the water in the discharge region. The duck ingestion dose was calculated to be about 28 mrads/year, which represents an upper limit estimate since equilibrum was assumed to exist between the aquatic organisms and all radionuclides in water. A nonequilibrium condition for a radionuclide in an actual exposure situation would result in a smaller bioaccumulation and therefore in a smaller dose from internal exposure.

The literature relating to radiation effects on organisms is extensive, but very few studies have been conducted on the effects of contiuous low-level exposure to radiation from ingested radionuclides on natural aquatic or terrestrial populations. While the existence of extremely radiosensitive biota is possible and while increased radiosensitivity in organisms may result from environmental interactions, no biota have yet been discovered that show a sensitivity to radiation exposures as low as those anticipated in the area surrounding Davis-Besse 1 Nuclear Station. In the "Beir" report,[11] it is stated in summary that evidence to date indicates that no other living organisms are very much more radiosensitive than man, therefore, no detectable radiological impact is expected in the aquatic biota or terrestrial mammals as a result of the quantity of radionuclides to be released into Lake Erie and into the air by Davis-Besse 1 Nuclear Station.

## 5.7 RADIOLOGICAL IMPACT ON MAN

### 5.7.1 Exposure Pathways

Routine power generation by Davis-Besse 1 Nuclear Station will result in the release of small quantities of fission and activation products to the environment. This evaluation will provide dose estimates which can serve as a basis for a determination that releases to unrestricted areas are as low as practicable in accordance with 10 CFR Part 50 and within the limits specified in 10 CFR Part 20. The NRC staff has estimated the probable nuclide releases from Davis-Besse 1 Nuclear Station based upon experience with comparable operating reactors and evaluation of the radwaste system. These releases have been discussed in Section 3.4.

Estimations were made of radiation doses to man at and beyond the site boundary via the most significant pathways among those diagrammed in Fig. 5.4. The calculations are based on conservative assumptions regarding the dilutions of effluent gases and radionuclides in the liquid discharge, and the use by man of the plant surroundings. In general, radiation doses were calculated for an average individual, whether adult or infant, in terms of physiological parameters. However, the staff assumes that these individuals are exposed to the highest radioactivity concentrations or levels in the pathways under consideration.

Based upon experience at comparable operating nuclear power reactors, an estimate has been made of the occupational radiation exposures expected to result from plant operation (see Section 5.7.5.2).

### 5.7.2 Liquid Effluents

Expected nuclide releases in the liquid effluent have been calculated for Davis-Besse 1 Nuclear Station and are listed in Table 3.2. In the immediate vicinity of the Davis-Besse 1 Nuclear Station discharge, the gross activity concentration, exclusive of tritium, is estimated to be 0.013 picocuries/ml. Under the same conditions, the tritium concentration would be 15 picocuries/ml, as stated in Section 5.6.2.

During normal reactor operations, a fraction of the noble gases produced will be released in the liquid effluent and subsequently discharged into the Lake Erie. The NRC Office of Inspection and Enforcement has analyzed operating reactor radioactive liquid effluent for noble gas content and under conditions of highest annual average noble gas concentrations in the discharge water, no significant doses would be delivered to human beings.

Consumption of water represents one exposure pathway to the population. The nearest potable water intake that could be affected by the plant liquid effluents is at Port Clinton which is located 9 miles southeast of the site. Individual doses via this pathway are evaluated using standard dose models[10] and an assumed daily consumption of 1.2 liters. Other pathways of relative importance involve recreational use of Lake Erie in the vicinity of the discharge zone. Individual doses from consuming fish caught in the immediate discharge area were evaluated using the biological accumulation factors listed in Table 5.1 and standard models[10]. Swimming, boating, and fishing in the discharge region were also included in the evaluation. Table 5.2 summarizes the potential individual doses from the liquid effluents.

5.7.3 Gaseous Effluents

Radioactive effluents released to the atmosphere from the plant will result in the most significant radiation doses to the public. NRC staff estimates of the probable gaseous and particulate releases listed in Table 3.3 were used to evaluate average site meteorological conditions, assuming that releases occur at a constant rate. Radioactive gases are released near ground level from the plant. Thus, doses result from immersion in the dispersed radioactive gases.[13,14]

The primary food pathway to man involves the ingestion by dairy cows of radioiodine deposited onto grazing areas. Consumption of milk from these cows can result in exposure to the human thyroid. Doses to a child's thyroid which would result from consuming one liter of milk daily from a cow grazing six months annually were calculated for the nearest farm using recognized models.[13]

TABLE 5.2

ANNUAL INDIVIDUAL DOSES FROM LIQUID EFFLUENTS

| LOCATION | PATHWAY | DOSE (mrem/yr) TOTAL BODY | GI TRACT | THYROID | BONE |
|---|---|---|---|---|---|
| Coolant | Fish Ingestion | 1.7 | 0.091 | 0.35 | 1.3 |
| Discharge | Recreational Use of shoreline (500 hrs/yr) | 0.25 | | | |
| | Swimming (100 hrs/yr) | $3.0 \times 10^{-4}$ | | | |
| Region | Boating (100 hrs/yr) | $1.5 \times 10^{-4}$ | | | |
| Port Clinton | Water Ingestion | $3.8 \times 10^{-4}$ | $3.8 \times 10^{-4}$ | $1.0 \times 10^{-4}$ | $2.1 \times 10^{-5}$ |

Another food pathway to man of secondary importance involves the consumption of leafy vegetables subject to deposition of the radionuclides released to the atmosphere. The thyroid dose resulting from the consumption of leafy vegetables produced at the nearest farm or residence during the growing period was evaluated.

All doses due to gaseous effluents are summarized in Table 5.3.

5.7.4 Comparison of Calculated Dose with Proposed Appendix I Design Objectives

Table 5.4 shows the comparison of calculated doses from plant operation with proposed Appendix I design objectives. The critical pathway for this plant is the grass-cow-milk pathway, calculated at a location 2.5 miles WSW of the plant.

TABLE 5.3

ANNUAL INDIVIDUAL DOSES DUE TO GASEOUS EFFLUENTS

| LOCATION | X/Q (sec/m$^3$)[(a)] | DOSE (mrem/yr) TOTAL BODY | SKIN | THYROID |
|---|---|---|---|---|
| Nearest cow (2.5 mi WSW) | $1.8 \times 10^{-7}$ | 0.005 | 0.018 | 4.3[(b)] |
| Nearest farm (0.55 mi W) | $1.8 \times 10^{-6}$ | 0.062 | 0.20 | 0.76[(c)] |
| Nearest residence (0.55 mi SW) | $9.8 \times 10^{-7}$ | 0.033 | 0.11 | 0.42[(c)] |
| Nearest beach (2.0 mi NW) | $4.6 \times 10^{-7}$ | 0.012 | 0.044 | 0.30[(d)] |

[(a)] Meteorology Data: Onsite, 12/69-11/70, 20 ft winds.

[(b)] Infant thyroid dose from inhalation and milk consumption.

[(c)] Adult thyroid dose from inhalation and consumption of fresh leafy vegetables.

[(d)] Adult thyroid dose from inhalation.

TABLE 5.4

COMPARISON OF CALCULATED DOSES FROM DAVIS-BESSE 1 OPERATION WITH APPENDIX I DESIGN OBJECTIVE DOSES*

| CRITERION | PROPOSED APPENDIX I DESIGN OBJECTIVE | CALCULATED DOSES |
|---|---|---|
| A. Liquid Effluents | | |
| Due to total body or any organ from all pathways | 5 mrem/yr | 2.2 |
| B. Gaseous Effluents | | |
| Gamma Dose in air | 10 mrad/yr | 0.14 |
| Beta dose in air | 20 mrad/yr | 1.2 |
| Dose to total body of an individual | 5 mrem/yr | 0.033 |
| Dose to skin of an individual | 15 mrem/yr | 0.11 |
| C. Radioiodine and Particulates | | |
| Dose to any organ from all pathways | 15 mrem/yr | 4.3 |

*As presented in concluding statement of position of the Regulatory Staff, Docket No. RM-50-2, February 20, 1974, pp. 25-30, U. S. Atomic Energy Commission.

### 5.7.5 Direct Radiation

#### 5.7.5.1 Radiation from the Facility

The plant design includes specific shielding of the reactor, hold-up tanks, filters, demineralizers and other areas where radioactive materials may flow or be stored, primarily for the protection of plant personnel. Direct radiation from these sources is therefore not expected to be significant at the site boundary. Confirming measurement will be made as part of the applicant's environmental monitoring program after plant start-up. Low level radioactivity storage containers outside the plant are estimated to contribute less than .01 mrem/yr at the site boundary.

#### 5.7.5.2 Occupational Radiation Exposure

Based on a review of the applicant's safety analysis report, the staff has determined that individual occupational doses can be maintained within the limits of 10 CFR Part 20. Radiation dose limits of 10 CFR Part 20 are based on a thorough consideration of the biological risk of exposure to ionizing radiation. Maintaining radiation doses of plant personnel within these limits ensures that the risk associated with radiation exposure is no greater than those risks normally accepted by workers in other present day industries.[15] Using information compiled by the Commission[16] of past experience from operating nuclear reactor plants, it is estimated that the average collective dose to all on-site personnel at large operating nuclear plants will be approximately 450 man-rem per year per unit. The total dose for this plant will be influenced by several factors for which definitive numerical values are not available. These factors are expected to lead to doses to on-site personnel lower than estimated above. Improvements to the radioactive waste effluent treatment system to maintain off-site population doses as low as practicable may cause an increase to on-site personnel doses. If all other factors remain unchanged, however, the applicant's implementation of Regulatory Guide 8.8 and other guidance provided through the staff radiation protection review process is expected to result in an overall reduction of total doses from those currently experienced. Because of the uncertainty in the factors modifying the above estimate, a value of 450 man-rem will be used for the occupational radiation exposure for the 1 unit station.

### 5.7.6 Summary of Annual Radiation Doses

The combined dose (man-rem) due to gaseous effluents to all individuals living within a fifty mile radius of the plants was calculated using the projected 1980 population data furnished by the applicant.[17] Values for the man-rem dose at various distances from the plants are summarized in Table 5.5.

Presently, according to the applicant, about 730,000 people derive their drinking water from the lake within a 50 mile radius of the plant. The total exposure to this population was evaluated using the drinking water dose presented in Table 5.2 and applying appropriate dilution factors.

The cumulative dose resulting from the consumption of fish harvested in Lake Erie was estimated. It was conservatively assumed the regional fish catch of $2.2 \times 10^6$ kg was entirely consumed by the population within 50 miles of the plant. It was also assumed that this entire quantity of fish was harvested from an area where the effluent dilution factor was 1000.

The usage of Lake Erie and its shoreline for recreational purposes within 50 miles of the site was estimated to be $2.2 \times 10^6$, $4.5 \times 10^6$, and $8.9 \times 10^6$ man-hrs/yr for swimming, boating, and recreational use of the shoreline, respectively.

The population dose from all sources including natural background, cloud immersion, drinking water ingestion, consumption of fish, recreation, transportation, and occupational exposure is summarized in Table 5.6.

### 5.7.7 Evaluation of Radiological Impact

The average annual dose from gaseous effluents to persons living in unrestricted areas within 50 miles of the plant is less than 0.1 mrem/yr as shown in Table 5.5. Maximum individual doses due to liquid and gaseous effluent releases are less than 5 mrem/yr as seen in Tables 5.2 and 5.3. These values are only a few percent of the natural background exposure of 0.105 rem/yr,[18] are below the normal variation in background dose, and represent no measurable radiological impact.

Using conservative assumptions, the total man-rem in unrestricted areas from all effluent pathways received by the estimated 1980 population of 2,225,000 persons who will live within a fifty mile radius of Davis-Besse 1 Nuclear Station, would be about 4.4 man-rem per year; by comparison, an annual total of about 234,000 man-rem is delivered to the same population as a result of the average natural background dose rate of about 0.105 rem per year in the vicinity of Davis-Besse 1 Nuclear Station.

The 450 man-rem estimated as occupational on-site exposure is a small percentage of the annual total of about 234,000 man-rem delivered to the 1980 population living within a 50 mile radius of Davis-Besse 1 Nuclear Station.

TABLE 5.5

CUMULATIVE POPULATION, ANNUAL CUMULATIVE DOSE, AND AVERAGE ANNUAL TOTAL BODY DOSE DUE TO GASEOUS EFFLUENTS IN SELECTED ANNULI ABOUT THE PLANT

| CUMULATIVE RADIUS (MILES) | CUMULATIVE POPULATION | ANNUAL CUMULATIVE DOSE (MAN-REM) | AVERAGE ANNUAL DOSE (MILLIREM) |
|---|---|---|---|
| 1 | 141 | 0.0085 | 0.060 |
| 2 | 460 | 0.013 | 0.028 |
| 3 | 807 | 0.014 | 0.017 |
| 4 | 1092 | 0.015 | 0.014 |
| 5 | 1571 | 0.016 | 0.010 |
| 10 | 17740 | 0.027 | 0.0015 |
| 20 | 116223 | 0.054 | 0.0005 |
| 30 | 747314 | 0.16 | 0.0002 |
| 40 | 1111999 | 0.21 | 0.0002 |
| 50 | 2224801 | 0.37 | 0.0002 |

TABLE 5.6

SUMMARY OF ANNUAL TOTAL BODY DOSES TO THE POPULATION WITHIN 50 MILES

| CATEGORY | POPULATION DOSE (man-rem/yr) |
|---|---|
| Natural Environmental Radioactivity | 234,000 |
| Nuclear Plant Operation | |
| Plant Work Force | 450 |
| General Public | |
| Gaseous cloud | 0.37 |
| Drinking water | 0.71 |
| Fish ingestion | 0.31 |
| Recreation (Fishing, Swimming, Boating) | 0.01 |
| Transportation of Nuclear Fuel and Radioactive wastes (see Section 5.10) | 3 |

Effluents from plant operation will then be an extremely minor contributor to the radiation dose that persons living in the area normally receive from natural background radiation. The estimated radiation doses to individuals and to the population from normal operation of the station support the conclusion in Section 3.4 that the releases of radioactive materials in liquid and gaseous effluents are as low as practicable.

## 5.8 EFFECTS ON THE COMMUNITY

The staff considered the environmental effects of station operation in the community in the FES-CP, Section 5.8. It was concluded that the size of the operating staff was sufficiently small as to have an insignificant effect on the local economy, that the taxes on the station will greatly benefit the local school district, and that since there are no zoning regulations in the area, the extent to which industrial development would occur was under the authority of the local authorities. The information relied on for that conclusion is still considered valid and the staff's conclusion at this stage remains unchanged.

## 5.9 TRANSPORTATION OF RADIOACTIVE MATERIAL

The transportation of cold fuel to a reactor, or irradiated fuel from the reactor to a fuel reprocessing plant, and of solid radioactive wastes from the reactor to burial grounds is within the scope of the NRC report entitled, "Environmental Survey of Transportation of Radioactive Materials to and From Nuclear Power Plants." The environmental effects of such transportation are summarized in Table 5.7.

## 5.10 EFFECTS OF THE URANIUM FUEL CYCLE

The environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low-level wastes and high-level wastes are within the scope of the NRC report entitled, "Environmental Survey of the Uranium Fuel Cycle."[18] The contribution of such environmental effects are summarized in Table 5.8.

Table 5.7 Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor[a]

| Normal Conditions of Transport | |
|---|---|
| | Environmental Impact |
| Heat (per irradiated fuel cask in transit) | 250,000 Btu/hr |
| Weight (governed by Federal or State restrictions) | 73,000 lb per truck; 100 tons per cask per rail car. |
| Traffic density | |
| Truck | Less than 1 per day |
| Rail | Less than 3 per month |

| Exposed Population | Estimated Number of Persons Exposed | Range of Doses to Exposed Individuals[b] (per reactor year) | Cumulative Dose to Exposed Population (per reactor year)[c] |
|---|---|---|---|
| Transportation workers | 200 | 0.01 to 300 millirem | 4 man-rem |
| General public | | | |
| Onlookers | 1,100 | 0.003 to 1.3 millirem | 3 man-rem |
| Along route | 600,000 | 0.0001 to 0.06 millirem | |

| Accidents in Transport | |
|---|---|
| | Environmental Risk |
| Radiological effects | Small[d] |
| Common (nonradiological) causes | 1 fatal injury in 100 reactor years; 1 nonfatal injury in 10 reactor years; $475 property damage per reactor year. |

[a]Data supporting this table are given in the Commission's "Environmental Survey of Transportation of Radioactive Materials To and From Nuclear Power Plants," WASH-1238, December 1972.

[b]The Federal Radiation Council has recommended that the radiation doses from all sources of radiation other than natural background and medical exposures should be limited to 5000 millirem per year for individuals as a result of occupational exposure and should be limited to 500 millirem per year for individuals in the general population. The dose to individuals due to average natural background radiation is about 130 millirem per year.

[c]Man-rem is an expression for the summation of whole-body doses to individuals in a group. Thus, if each member of a population group of 1000 people were to receive a dose of 0.001 rem (1 millirem), or if two people were to receive a dose of 0.5 rem (500 millirem) each, the total man-rem in each case would be 1 man-rem.

[d]Although the environmental risk of radiological effects stemming from transportation accidents is currently incapable of being numerically quantified, the risk remains small regardless of whether it is being applied to a single reactor or a multireactor site.

From Federal Register, Volume 40, Number 3, pp. 1005-1009, Monday, Jan. 6, 1975.

Table 5.8 . Summary of Environmental Considerations for Uranium Fuel Cycle (normalized to model LWR annual fuel requirement)

| Natural resource use | Total | Maximum effect per annual fuel requirement of model 1,000-MWe LWR |
|---|---|---|
| Land (acres) | | |
| Temporarily committed | 63 | |
| Undisturbed area | 45 | |
| Disturbed area | 18 | Equivalent to 90 MWe coal-fired power plant |
| Permanently committed | 4.6 | |
| Overburden moved (millions of megatons) | 2.7 | Equivalent to 90 MWe coal-fired power plant |
| Water (millions of gallons) | | |
| Discharged to air | 156 | ≈2% model 1000 MWe LWR with cooling tower |
| Discharged to water bodies | 11,040 | |
| Discharged to ground | 123 | |
| Total | 11,319 | <4% of model 1000 MWe LWR with once through cooling |
| Fossil fuel | | |
| Electrical energy (thousands of MW-hour) | 317 | <5% of model 1000 MWe LWR output |
| Equivalent coal (thousands of megatons) | 115 | Equivalent to the consumption of a 45 MWe coal fired power plant |
| Natural gas (millions of scf) | 92 | <0.2% of model 1000-MWe energy output |
| Effluents chemical (megatons) | | |
| Gases (including entrainment)[a] | | |
| $SO_2$ | 4,400 | |
| $NO_2$[b] | 1,177 | Equivalent to emissions from 45 MWe coal fired plant for a year |
| Hydrocarbons | 12.5 | |
| CO | 28.7 | |
| Particulates | 1,156 | |
| Other gases | | |
| F | 0.72 | Principally from $UF_6$ production enrichment and reprocessing. Concentration within range of state standards below level that has effects on human health |
| Liquids | | |
| $SO_4$ | 10.3 | From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constitutents that require dilution and the flow of dilution water are: $NH_3$ - 600 cfs; $NO_3$ - 20 cfs; Fluoride - 70 cfs |
| $NO_3$ | 26.7 | |
| Fluoride | 12.9 | |
| $Ca^{2+}$ | 5.4 | |
| Cl | 8.6 | |
| $Na^+$ | 16.9 | |
| $NH_3$ | 11.5 | |
| Fe | 0.4 | |
| Tailings solutions (thousands of megatons) | 240 | From mills only no significant effluents to environment |
| Solids | 91,000 | Principally from mills no significant effluents to environment |
| Effluents radiological (curies) | | |
| Gases (including entrainment) | | |
| Rn 222 | 75 | Principally from mills maximum annual dose rate < 4% of average natural background within 5 miles of mill. Results in 0.06 man rem per annual fuel requirement |
| Ra 226 | 0.02 | |
| Th 230 | 0.02 | |
| Uranium | 0.032 | Principally from fuel reprocessing plants whole body dose is 6 man rem per annual fuel requirements for population within 50 mile radius. This is <0.007% of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/year has been included in fission products and transuranics total |
| Tritium (thousand) | 16.7 | |
| Kr 85 (thousands) | 350 | |
| I 129 | 0.0024 | |
| I 131 | 0.024 | |
| Fission products and transuranics | 1.01 | |
| Liquids | | |
| Uranium and daughters | 2.1 | Principally from milling included in tailings liquor and returned to ground - no effluents, therefore no effect on environment |
| Ra 226 | 0.0034 | From $UF_6$ production concentration 5% of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements |
| Th 230 | 0.0015 | |
| Th 234 | 0.01 | From fuel fabrication plants concentration 10% of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR |
| Ru 106 | 0.15[c] | From reprocessing plants maximum concentration 4% of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR |
| Tritium (thousands) | 2.5 | |
| Solids (buried) | | |
| Other than high level | 601 | All except 1 Ci comes from mills included in tailings returned to ground – no significant effluent to the environment. 1 Ci from conversion and fuel fabrication is buried |
| Effluents – thermal (billions of Btu) | 3,360 | <7% of model 1000-MWe LWR |
| Transportation (man rem) exposure of workers and general public | 0.334 | |

[a]Estimated effluents based upon combustion of equivalent coal for power generation.

[b]1.2% from natural gas use and process.

[c]Cs 137 (0.075 Ci/AFR) and Sr 90 (0.004 Ci/AFR) are also emitted.

Source: *Federal Register*, Docket 74–9076, filed April 19, 1974, 8:45 am.

References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6. Toledo Edison Company and Cleveland Electric Illuminating Company: Applicant's Environmental Report - Construction Permit Stage, Davis-Besse Nuclear Power Station Unit No. 1, 1970, Appendix C.

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12. Thompson, S. E., C. A. Burton, D. J. Quinn, and Y. C. Ng, "Concentration Factors of Chemical Elements in Edible Aquatic Organisms," UCRL-50564 Rev. 1 (1972).

13. Attachment to concluding statement of position of the Regulatory staff public rule making hearing on: Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Practicable" for Radioactive Material in Light Water Cooled Nuclear Power Reactors, Docket No. RM-50-2, February 20, 1974.

14. E. H. Slade, Ed., "Meteorology and Atomic Energy, 1968," TID-24190.

15. "Implications of Commission Recommendations that Doses be Kept As Low As Readily Achievable," ICRP Publication 22 (1973).

16. Murphy, T. D., "A Compilation of Occupational Radiation Exposure From Light Water Cooled Nuclear Power Plants: 1969-1973," U.S.A.E.C., WASH-1311 (May 1974).

17. Applicant's Environmental Report, Section 2.2.

18. Oakley, Donald T., "Natural Radiation Exposure in the United States," CRP/SID 72-1, Office of Rad. Prog., U.S.E.P.S., June 1972.

19. Davis-Besse Nuclear Power Station Pre-operational Monitoring Report, July 1974 - December 1974. TE&CEI.

20. Toledo Edison Company, Davis-Besse Nuclear Power Station Units Nos. 2 & 3, Environmental Report, Vol I, Docket Nos. 50-500, 50-501, p. 5.7-1.

## 6. EFFLUENT AND ENVIRONMENTAL MEASUREMENT AND MONITORING PROGRAMS

Résumé

The continuation of Construction Permit No. CPPR-80 was conditioned, in part, on the following:

- A comprehensive, preoperational environmental monitoring program shall be established to provide an adequate baseline for measuring the operational impact of the station.

- A monitoring program shall be established to record any kills due to birds hitting the cooling tower and other station structures, placing emphasis on observations during adverse weather conditions and during the spring and fall migratory seasons.

The following sections have been revised to address those two requirements and to update the entire section in general.

### 6.1 METEOROLOGICAL PROGRAM

The current onsite meteorological program, operational since August 1974, includes the use of a 340 ft. tower and a 35 ft. satellite tower. These towers are about 2000 feet southwest of the nearest containment building. The 35 ft. tower is used only for wind speed and direction measurements at the 35 foot level. All other measurements are made on the 340 foot tower, with measurement levels at 35, 250 and 340 feet.

On the 340 foot tower, wind speed and direction are measured at the 250- and 340 foot levels. Ambient dry bulb temperatures are measured at 35 and 340 feet. Vertical temperature difference measurements are made between the 35 and 250 foot levels and between the 35 and 340 foot levels. Precipitation is measured at ground level. The instruments meet the recommendations and intent of Safety Guide 23, Onsite Meteorological Programs.

A meteorological program consisting of a 300 foot tower was initiated in October 1968. Wind speed and direction are measured at the 20, 100 and 300 ft. levels; vertical temperature gradient is measured between 145 ft. and 5 ft. and between 297 ft. and 145 ft., dewpoint temperature is measured at 5 ft. This tower was instrumented prior to the issuance of Safety Guide 23. The construction of Unit 1 structures and a change in grade elevation subsequent to November 1970 impacted the wind speed and direction data being measured at this tower. However, data collected during the period December 1969 through November 1970 were not effected by the Unit 1 structures and the change in grade elevation. To meet the requirement of Safety Guide 23, the applicant has constructed the new 340 foot tower in a location which minimizes the interference from the station structures. The applicant will make a correlation study of one year of temperature lapse rate data between the 300 ft. and 340 ft. towers to determine the effect that the two ponds which are between the reactor structure and the new tower may have on the temperature measurements at the new tower location.

One full year of onsite data from the new meteorological program will not be available until late 1975. The applicant submitted data from the 300 ft. tower for the period December 1969 through November 1970. These data were in the form of joint frequency distributions of wind speed and direction at the 20 ft. level by atmospheric stability (defined by the vertical temperature gradient between 145 ft. and 5 ft.). Data recovery for this period was 82%. These data are the only data available at this time. The lower level temperature sensor at 5 ft. increases the number of extremely unstable and extremely stable stability classes recorded. These increases would tend to compensate each other in the calculation of annual average relative concentration (X/Q) values. The staff has performed an interim evaluation of annual average relative concentration values using these data. A Gaussian diffusion model with adjustments for building wake effects, described in Regulatory Guide 1.42, was used to make estimates of relative concentration values at various distances and directions as specified in Section 5. The staff is presently waiting for additional information on the accuracy of the delta-T measurement during the period December 1969 through November 1970. The staff will use the one year of onsite data from the new program, and the correlation study of delta-T as measured on the 300 ft. and 340 ft. towers, to verify the relative concentration values presented herein. At this time, there is no reason to suspect that the relative concentration values presented in this document will increase sufficiently to change the conclusions on site and design suitability; however, the staff requires that the data from the upgraded meteorological program be submitted prior to final staff approval of the Environmental Technical Specifications to verify this. The staff estimates that this can be accomplished by October 1975.

## 6.2 AQUATIC MONITORING

### 6.2.1 Preoperational Monitoring

On August 30, 1974, the applicant submitted his preoperational environmental monitoring program designed to provide the baseline for measuring the operational impact of the station. This submittal fulfills condition 9a of the Summary and Conclusions of the FES-CP. Preoperational environmental monitoring at the station prior to this proposal has been described previously.[1,2,3,4] The current program at Davis-Besse began in spring of 1974 and consists of biological sampling at 25 stations: 18 along 4 transects in the open lake, 2 stations in the intake canal, 2 stations in the marshes, and 3 along the shoreline (Figure 6-1). The specific grouping of stations to evaluate potential operational impacts and the major biological groups sampled are as follows:

- Control west transect extends north from the shore-end of the intake pipeline and consists of sampling stations located at 500 ft. (Station 1), 1000 ft. (Station 2), 2000 ft. (Station 3) and 3000 ft. (Station 4) from the shoreline.

- Intake transect stations are located 500 ft. (Station 5), 1000 ft. (Station 6), 2000 ft. (Station 7), 3000 ft. (Station 8 proposed intake) and 4000 ft. (Station 9) from the shore.

- Discharge transect stations are at 500 ft. (Station 10), 1000 ft. (Station 11), 1500 ft. (Station 12, proposed discharge), 2000 ft. (Station 13) and 3000 ft. (Station 14) from shore. Additional stations are at 500 ft. north of Station 12 (Station 15) and 500 ft. south of Station 12 (Station 16).

- Control east transect runs parrallel to the intake, about 2500 ft. east of the intake, with stations at 500 ft. (Station 17) and 1000 ft. (Station 18) from the shore.

- Stations 19 and 20 are located in the intake canal, 1000 and 2500 ft. from the shoreline respectively. Stations 21 and 22 are located in the marshes while 23, 24 and 25 are on the shoreline at the intersection of the intake conduit and 1500 ft. on either side.

Plankton

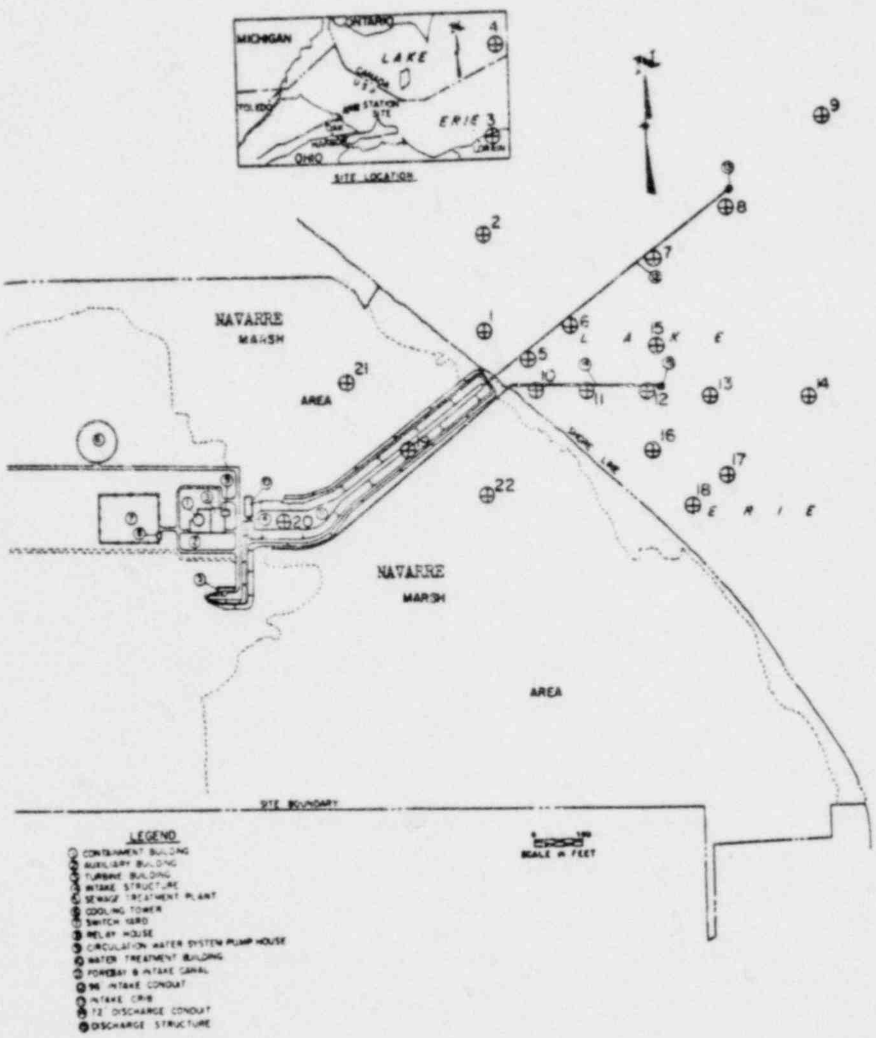
Plankton is sampled monthly during ice free periods (usually April through November) at 12 stations, 10 in the open lake (stations 1, 3, 6, 8, 10, 12, 13, 14 and 18) and 2 in the intake canal (stations 19 and 20). Duplicate vertical tows, bottom to surface, are taken at each of the stations with a Wisconsin plankton net. Phyto- and zoo-plankton numbers and generic composition are determined.

Benthos

Three replicate samples are taken monthly (usually April through November) at stations 1-20 with a Ponar grab sampler. Samples are sieved through a U. S. #40 sieve, preserved in formalin and returned to the laboratory for analyses. Individuals are identified usually to genus and to species when possible and reported as number of organisms per $m^2$.

Fish

Fish populations are sampled from April through November, weather permitting, by four methods: gill nets, shore seines, otter trawls and hoop nets. Two 125 ft. x 6 ft. (bar mesh range 1/2" - 2") gill nets are set parallel to and near the intake and discharge (stations 8 and 12) and fished for approximately 24 hours. Shore seining is conducted monthly at stations 23, 24 and 25 using a 100 ft. bag seine. Duplicate hauls are made at each station. Four 5-minute otter trawls are taken monthly between the intake crib and discharge structure. Two samples are taken monthly at Stations 21 and 22 using 25 ft. diameter, 1" bar mesh hoop nets. The nets are fished for approximately 24 hours. Twice a year, spring and fall, the intake canal is trawled for fish.




AQUATIC SAMPLING LOCATIONS

FIGURE 6 - 1 5

Fish collected by gill nets, seines, trawls and hoop nets are identified, weighed and measured. A representative number of structures are examined to establish food habits.

Ichthyoplankton eggs and larvae are collected monthly from April through November using a 0.75-meter oceanographic plankton net. Five-minute tows, surface and near bottom, in the vicinity of the intake and discharge are made. Ichthyoplankton are identified and enumerated as part of this program. Results of this program so far support the results of previous studies which indicate that the immediate site is not an important spawning area.

### 6.2.2 Operational Monitoring

The applicant plans to continue the preoperational monitoring studies as the operational program for measuring potential station impacts. The staff concurs with this approach but will require that the applicant provide additional program elements to evaluate the magnitude of entrainment and impingement losses at the station. The essential aspects of the preoperational monitoring program, any staff approved recommended changes in details of the program and these additional studies required above will be incorporated into the Environmental Technical Specifications which are presently under review by the staff for the Davis-Besse Station.

## 6.3 CHEMICAL RELEASE MONITORING

### 6.3.1 Preoperational Monitoring

The applicant has been conducting a baseline water quality monitoring program in the plant vicinity. Twenty water quality parameters (see Table 6.1) have been measured monthly during the ice-free time at three stations, numbers 1, 8 and 12 (see Figure 6.1). While these field measurements were being made, samples for 14 laboratory analyses were taken from surface and bottom locations. These analyses were made as shown for the parameters numbered 7 through 20 on Table 6.1. The results of these determinations are presented in Section 2 of this statement.

### 6.3.2 Operational Monitoring

The proposed operational chemical monitoring program is similar to the preoperational program and is identical to that proposed in the FES-CP, with the exception that color determination has now been deleted. The parameters, method of analysis, and frequency of analysis is given in Table 6.2. These parameters will be measured in the plant discharge pipe. The staff is in agreement with the approach proposed by the applicant; however, modifications to the sampling frequency for certain parameters to correspond to the intermittent operation of some plant systems will be made in the Environmental Technical Specifications for plant operation. In addition, the applicant will be required to comply the Environmental Technical Specifications which will control the chemical discharges from the station.

In addition to plant chemical release monitoring, lake water quality will continue to be monitored by the applicant. This program is a continuation of the baseline water quality monitoring program with monthly analyses at stations 1, 8 and 12.

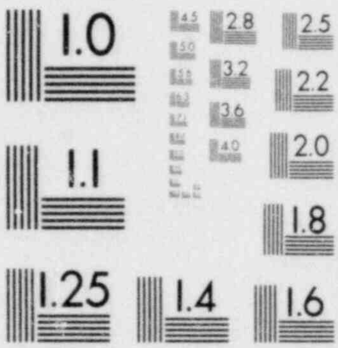
## 6.4 TERRESTRIAL ECOLOGICAL MONITORING

The preoperational bird monitoring program conducted at the site by the applicant fulfills condition 9c identified in the Summary and Conclusions of the FES-CP. The tabular results of this program are presented in Table 6.3. The staff's discussion has been presented previously in Section 2 and 5. The detailed results of this program are in the Davis-Besse 1 Semi-Annual Report July 1, 1974-December 31, 1974, Volume II.

A proposed ecological monitoring program of the terrestrial environment has been submitted (ER-Supplement). The objectives are to: a) monitor bird impactions on station structures, and b) monitor effects of cooling tower drift.

The bird monitoring program will consist of surveys around towers and other structures during the migratory seasons of the year. These will consist of monitoring during April and May in the spring and late August, September and October in the fall. The number and species of birds killed by impaction is proposed to be determined on a weekly basis. This program is conceptually adequate although changes in details may be recommended prior to the time environmental technical specifications are approved.

# IMAGE EVALUATION TEST TARGET (MT-3)

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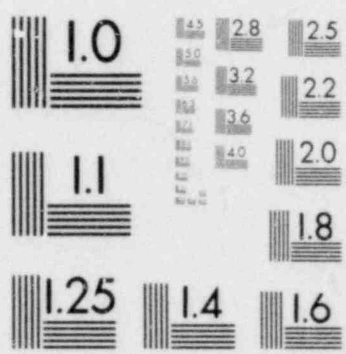
# MICROCOPY RESOLUTION TEST CHART

**IMAGE EVALUATION**
**TEST TARGET (MT-3)**

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**MICROCOPY RESOLUTION TEST CHART**

TABLE 6.1[6]

ANALYTICAL METHODS FOR WATER QUALITY DETERMINATIONS

| | Parameter | Units | Analytical Method |
|---|---|---|---|
| 1. | Temperature | °C | Std. Methods, 13th Ed., 162, (1971) |
| 2. | Dissolved oxygen | ppm | Std. Methods, 13th Ed., 218B (1971) |
| 3. | Conductivity | umhos/cm (25°C) | ASTM D1135-64 (1973) |
| 4. | Transparency | meters | Secchi disk (Welch, 1948) |
| 5. | Solar radiation | u amps | G. M. Mfg. & Instr. Corp., submarine photometer |
| 6. | Current | knots | HydroProducts, A-65 current meter |
| 7. | Calcium (Ca) | mg/l | Std. Methods, 13th Ed., 110C (1971) |
| 8. | Magnesium (Mg) | mg/l | Std. Methods, 13th Ed., 122B (1971) |
| 9. | Sodium (Na) | mg/l | ASTM D1428-64 (1973) |
| 10. | Chloride (Cl) | mg/l | Std. Methods, 13th Ed., 112B (1971) |
| 11. | Nitrate ($NO_3$) | mg/l | ASTM D992-71 (1973) |
| 12. | Sulfate ($SO_4$) | mg/l | ASTM D516-68C (1973) |
| 13. | Phosphorous (Total as P) | mg/l | Std. Methods, 13th Ed., 223F (1971) |
| 14. | Silico ($SHO_2$) | mg/l | ASTM D 859-68B (1973) |
| 15. | Alkalinity (total as $CaCo_3$) | mg/l | Std. Methods, 13th Ed., 102 (1971) |
| 16. | Biochemical oxygen demand | mg/l | Std. Methods, 13th Ed., 219 (1971) |
| 17. | Suspended solids | mg/l | Std. Methods, 13th Ed., 224C (1971) |
| 18. | Dissolves solids | mg/l | USEPA, Chem. Analysis, Water (1971) |
| 19. | Turbidity | F.T.U. | Std. Methods, 13th Ed., 163A (1971) |
| 20. | Hydrogen-ion conc. | pH units | ASTM D1293-65 (1973) |

TABLE 6.2 [7]

SAMPLING AND TESTING SCHEDULE FOR STATION DISCHARGE PIPE

| Parameter | Sample Type | Analytical Method |
|---|---|---|
| Weekly Tests | | |
| Chlorine Residual | Grab | Std. Methods, 13th Edition, 204A (1971) |
| Conductivity | Composite | ASTM D1123-64 |
| Dissolved Solids | " | Methods of Chemical Analysis of Water and Wastes, U. S. Environmental Protection Agency. P. 275 (1971) |
| Oxygen | Grab | Std. Methods 13th Edition, 218B (1971) |
| pH | " | ASTM D1293-65 |
| Phosphorous (as P) | Composite | Std. Methods, 13th Edition, 223F (1971) |
| Suspended Solids | " | Std. Methods, 13th Edition, 224C (1971) |
| Total Volatile Solids | " | Std. Methods, 13th Edition, 224B (1971) |
| Total Solids | " | Std. Methods, 13th Edition, 224 (1971) |
| Turbidity | " | Std. Methods, 13th Edition, 163A (1971) |
| Monthly Tests | | |
| Alkalinity (as $CaCO_3$) | Composite | Std. Methods, 13th Edition, 102 (1971) |
| Ammonia (as N) | " | Std. Methods, 13th Edition, 132B (1971) |
| Arsenic | " | Std. Methods, 13th Edition, 104A (1971) |
| B.O.D. | " | Std. Methods, 13th Edition, 219 (1971) |
| Calcium | " | Std. Methods, 13th Edition, 110C (1971) |
| Chlorides | " | Std. Methods, 13th Edition, 112B (1971) |
| Chromium | " | Std. Methods, 13th Edition, 117A (1971) |
| C.O.D. | " | Std. Methods, 13th Edition, 220 (1971) |
| Total Coliform | " | Std. Methods, 13th Edition, 406 (1971) |
| Total Hardness | " | Std. Methods, 13th Edition, 122B (1971) |
| Iron | " | Std. Methods, 13th Edition, 124A (1971) |
| Kjeldahl Nitrogen | " | Std. Methods, 13th Edition, 216 (1971) |
| Magnesium | " | (Difference Between Total Hardness & Calcium Hardness) |
| Manganese | " | Std. Methods, 13th Edition, 128B (1971) |
| Mercury | " | ASTM D 3223-73 |
| Nitrate (as N) | " | ASTM D992-71 |
| Oil & Grease | " | ASTM D2778-70 Using Carbon Tetrachloride |
| Organic Nitrogen | " | Std. Methods, 13th Edition, 215 (1971) |
| Potassium | " | ASTM D1428-64 |
| Sodium | " | ASTM D516-68, Method C |
| Sulfate | " | Std. Methods, 13th Edition, Method |
| Zinc | " | 165B (1971) |

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## TABLE 6.3

## SPECIES RECOVERED AT DAVIS - BESSE SITE DURING THREE CONSECUTIVE FALL SEASONS

| | Fall 1972 | | | | Fall 1973 | | | | Fall 1974 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CT | ST | MT | Total | CT | ST | MT | Total | CT | ST | MT | Total |
| Sora rail | | | | | | 1 | | 1 | | | | |
| Virginia rail | | | | | | | | | 1 | | | 1 |
| Common gallinule | | | | | | | | | | 1 | | 1 |
| Ring-billed gull | | | | | | 1 | | 1 | | | | |
| Yellowbellied flycatcher | | | | | | 1 | | 1 | 5 | 2 | | 7 |
| Least flycatcher | | | | | | | | | 2 | | | 2 |
| Acadian flycatcher | | | | | | | | | 1 | | | 1 |
| Domestic pigeon | | | | | | | | | 1 | | 1 | 2 |
| Red-breasted nuthatch | | | | | | | | | 1 | | | 1 |
| Brown creeper | | | | | 1 | | | 1 | 1 | 1 | | 2 |
| Long-billed marsh wren | | 1 | | 1 | | 1 | | 1 | | | | |
| House wren | | | | | | | | | 1 | | | 1 |
| Winter wren | | | | | | | | | 2 | | | 2 |
| Carolina wren | | | | | | | | | 2 | | | 2 |
| Gray catbird | | | | | | 1 | | 1 | | | | |
| Hermit thrush | | | | | | | | | 1 | | | 1 |
| Veery | | | | | | | | | 1 | | | 1 |
| Golden-crowned kinglet | | | | | 15 | 2 | | 17 | 44 | 9 | | 53 |
| Ruby-crowned kinglet | 1 | | | 1 | 16 | 7 | | 23 | 36 | 2 | | 38 |
| Solitary vireo | | | | | | | | | | 1 | | 1 |
| White-eyed vireo | | | | | | | | | | 1 | | 1 |
| Red-eyed vireo | | | | | | | | | 15 | 4 | | 19 |
| Philadelphia vireo | | 1 | | 1 | | | | | 2 | 1 | | 3 |
| Warbling vireo | | | | | | 1 | | 1 | | | | |
| Black & White warbler | | | | | | | | | 3 | | | 3 |
| Tennessee warbler | | | | | | 2 | | 2 | 3 | | | 3 |
| Nashville warbler | | | | | | 3 | | 3 | 7 | 2 | | 9 |
| Parula warbler | | | | | | | | | 1 | | | 1 |
| Yellow warbler | 1 | | 1 | 2 | | | | | 1 | | | 1 |
| Magnolia warbler | | | | | 3 | 7 | | 10 | 31 | 7 | 1 | 39 |
| Cape May warbler | | | | | | | | | 1 | | | 1 |
| Myrtle warbler | | 1 | | 1 | | 1 | | 1 | 2 | 1 | | 3 |
| Black-throated green warbler | | 1 | | 1 | 1 | 1 | | 2 | 16 | 3 | | 19 |
| Black-throated blue warbler | | | | | | | | | 5 | 3 | | 8 |
| Blackburnian warbler | | | | | | 1 | | 1 | 11 | 1 | | 12 |
| Chestnut-sided warbler | | | | | 1 | | | 1 | 8 | | | 8 |
| Bay-breasted warbler | | | | | | | | | 10 | 1 | 1 | 12 |
| Blackpol warbler | | | | | | 2 | | 2 | 5 | 3 | 1 | 9 |
| Pine warbler | | | | | 1 | 3 | | 4 | 3 | | | 3 |
| Ovenbird | | | | | 1 | 1 | | 2 | 6 | 1 | 1 | 8 |
| Kentucky warbler | | | | | | | | | 2 | | | 2 |
| Connecticut warbler | | | | | 1 | | | 1 | 1 | 1 | | 2 |
| Yellowthroat | 1 | 1 | | 2 | 2 | 1 | | 3 | 18 | 5 | | 23 |
| Wilson's warbler | | | | | 1 | | | 1 | 5 | | | 5 |
| Canada warbler | | | | | | | | | 2 | | | 2 |
| Redstart | | | | | | 4 | | 4 | 5 | | | 5 |
| Unidentified warbler | 1 | | | 1 | 1 | | | 1 | | | | |
| House sparrow | | | | | | | | | | | 2 | 2 |
| Savannah sparrow | | | | | | | | | 1 | | 1 | 2 |
| White-crowned sparrow | | | | | 1 | | | 1 | 1 | | | 1 |
| White-throated sparrow | | | | | | | | | 1 | 2 | | 3 |
| Song sparrow | | | | | | | | | 1 | | | 1 |
| Unidentified bird | | | | | 10 | 6 | | 16 | 13* | | | 13 |
| TOTAL BIRDS | 4 | 5 | 1 | 10 | 56 | 47 | - | 103 | 279 | 52 | 8 | 339 |
| Big brown bat | | | | | | 1 | | 1 | | | | |
| Red bat | | | | | | | | | 2 | | | 2 |
| Eastern pipistrel | | | | | | | | | | 1 | | 1 |
| TOTAL BIRDS & BATS | 4 | 5 | 1 | 10 | 56 | 47 | - | 103 | 281 | 53 | 8 | 342 |

CT=Cooling tower

ST=Unit 1 structures (including shield, turbine, and auxilliary buildings)

MT=Meteorological tower

*12 remains were found at CT on Oct. 15 after a major kill on Oct 13; access to CT was denied on Oct 13-14, and an unknown number of specimens was lost to scavengers.

Monitoring of the effects of cooling tower drift will be by ground level methods and by infrared aerial photography of the site and environs. The infrared aerial photography will be done once annually for a period of five years after start up of commercial operation. Ground level measurements as proposed by the applicant include measurement of solar radiation, temperature, humidity, evaporation, precipitation and soil temperature for a period of two years after startup of commercial operation. These are generally adequate plans for monitoring the effects of cooling tower drift although details may change prior to approval of Environmental Technical Specifications.

## 6.5 RADIOLOGICAL MONITORING

### 6.5.1 Preoperational Program

The applicant began conducting an offsite preoperational radiological monitoring program to provide for measurement of background radiation levels and radioactivity in the plant environs in July 1972. The preoperational program which provides a necessary basis for the operational radiological monitoring program, will also permit the applicant to train personnel, evaluate procedures, equipment and techniques, as indicated in Regulatory Guide 4.1.

A description of the applicant's program is summarized in Table 6.4. Table 6.5 describe the sampling locations. The applicant has provided a commitment to monitor the pathways discussed in Section 5.3.4. More detailed information on the applicant's radiological monitoring program is presented in Section 6.1 of the applicant's Environmental Report. A summary of the first two years' preoperational radiological data is contained in Section 2.8 of the ER.

The staff concludes that the preoperational monitoring program being conducted by the applicant will provide adequate baseline data for most environmental media (such as presented in Section 2.8 of the ER), which will assist in verifying radioactivity concentrations and related public exposures after plant operation. However, it is the staff's recommendation that the sampling and analysis schedule for the environmental media listed below needs to be augmented as indicated in order for the program to be considered complete:

1. Gamma spectral analyses should be performed on all composited samples on a routine basis which is independent of gross beta activity.

2. Iodine-131 analyses should be performed with a sensitivity of 0.5pCi/ℓ on all monthly milk samples collected during the grazing season which immediately precedes the projected fuel loading date of Davis-Besse Unit 1.

3. Soil samples should be collected at a frequency of once/3 years at all air sample locations and analyzed as indicated in the ER.

### 6.5.2 Operational Program

An operational offsite radiological monitoring program is conducted to measure radiation levels and radioactivity in the plant environs. It assists and provides backup support to the detailed effluent monitoring (as recommended by Regulatory Guide 1.21) which is needed to evaluate individual and population exposures and verify projected or anticipated radioactivity concentrations.

The applicant plans essentially to continue the preoperational program during the operating period. However, refinements may be made in the program to reflect changes in land use or preoperational monitoring experience.

An evaluation of the applicant's proposed operational monitoring program is being performed as part of the Environmental Technical Specification review. Details of the required monitoring program are being incorporated in the Technical Specifications, all of which will become part of the plant's operating license.

Table 6.4 Environmental Monitoring Program

| Type of Sample | | Locations and Sampling Points | Sample Frequency | Analyses |
|---|---|---|---|---|
| AIRBORNE PARTICULATES | T-1 | Site boundary near intake canal and Sand Beach NE direction | Weekly | Gross alpha<br>Gross beta |
| | T-2 | Site boundary beach E of station | | Note: Gamma spectral analysis when beta activity >10pCi/$m^3$ |
| | T-3 | Site boundary Toussaint River and storm drainage pt. outfall SE of station | | on quarterly composite of all filters |
| | T-4 | Site boundary, S of station near Locust Point and Toussaint River | | Gamma spectral analysis |
| | T-7 | Sand Beach, 0.9 mi. NNW of site | | |
| | T-8 | Earl Moore Farm | | |
| | T-9 | Oak Harbor | | |
| | T-10 | Erie Industrial Park | | |
| | T-11 | Port Clinton | | |
| | T-12 | Toledo | | |
| | T-23 | Put-in-Bay | | |
| | T-27 | Magee Marsh | | |
| AIRBORNE IODINE | T-1 | | Weekly | Gamma spectral analysis on charcoal canister for $^{131}I$ |
| | T-2 | | | |
| | T-3 | | | |
| | T-4 | | | |
| | T-7 | | | |
| | T-8 | | | |
| | T-9 | | | |
| | T-10 | | | |
| | T-11 | | | |
| | T-12 | | | |
| | T-23 | | | |
| | T-27 | | | |
| AMBIENT GAMMA RADIATION LEVELS | T-1 | | Monthly, Quarterly, and Annually | Gamma dose |
| | T-2 | | | |
| | T-3 | | | |
| | T-4 | | | |
| | T-5 | Main entrance to site | | |
| | T-6 | NW corner of site boundary | | |
| | T-7 | | | |
| | T-8 | | | |
| | T-9 | | | |
| | T-10 | | | |
| | T-11 | | | |
| | T-12 | | | |
| | T-14 | Township School | | |
| | T-15 | Lacarne | | |
| | T-23 | | | |
| | T-24 | Sandusky | | |
| | T-26 | Fostoria | | |
| | T-27 | Magee Marsh | | |

Table 6.4 Continued

| Type of Sample | | Locations and Sampling Points | Sample Frequency | Analyses |
|---|---|---|---|---|
| UNTREATED SURFACE WATER | T-1 | Water from station intake in lake opposite intake canal | Weekly Grab* Composited Monthly | Gross alpha and gross beta in dissolved and suspended fractions<br>Tritium |
| | T-2 | In lake east of station | | |
| | T-3 | In river opposite (storm drainage outfall in river) | | Note: Gamma spectral analysis when gross beta >10pCi/l. Radium determination when gross alpha >3pCi/l |
| | T-10 | Erie Industrial Park water intake | | |
| | T-11 | Port Clinton intake water | | |
| | T-12 | Toledo water intake | | On quarterly composite $^{90}Sr$, gamma spectral analysis |
| TREATED SURFACE WATER | T-10 | Erie Industrial Park tapwater | Weekly Grab Composited Monthly | Gross alpha and gross beta in dissolved and suspended fractions<br>Tritium |
| | T-11 | Port Clinton tapwater | | |
| | T-12 | Toledo tapwater | | |
| | T-28 | Unit 1 treated water supply | | Note: Gamma spectral analysis when gross beta >10pCi/l Radium determination when gross alpha >3pCi/l<br>On quarterly composite $^{90}Sr$, gamma spectral analysis |
| GROUND WATER | T-7 | Beach well-sand beach | Quarterly* | Gross alpha and gross beta in dissolved and suspended fractions<br>Tritium<br>$^{90}Sr$ and gamma spectral analysis |
| | T-13 | State roadside park | | |
| | T-18 | Hess Sunoco Garage | | |
| | T-27 | Magee Marsh | | Note: Gamma spectral analysis when gross beta >10pCi/l Radium determination when gross alpha >3pCi/l |
| PRECIPITATION | T-1<br>T-23 | | Monthly* Composite | Gross beta<br>Tritium<br>Note: gamma spectral analysis when gross beta >10pCi/l |
| BOTTOM SEDIMENTS | T-1<br>T-29<br>T-30 | | Quarterly* | Gross beta<br>Gross alpha<br>$^{90}Sr$<br>Gamma spectral analysis |
| FISH (Three species of fish, min.) | | Lake Erie in vicinity of site near T-1 | Quarterly * | Flesh-Gross beta<br>Gamma spectral analysis |
| | | Toussaint River near storm drainage outfall by T-3 | | Bone- $^{90}Sr$ |
| CLAMS (Flesh only) | | Lake Erie in vicinity of site near T-1 | Quarterly* | Gross beta<br>Gamma spectral analysis |

Table 6.4. Continued

| Type of Sample | Locations and Sampling Points | Sample Frequency | Analyses |
|---|---|---|---|
| FRUITS AND VEGETABLES | T-8<br>T-19 Miller Farm<br>T-25 Winter Farm | Semi-Annually | Edible portion<br>Gross beta<br>Gross alpha<br>Gamma spectral analysis<br>$^{90}Sr$ |
| MILK | T-8<br>T-20 Daup Farm<br>T-21 Haynes Farm<br>T-12 Toledo (milk processing plant)<br>T-24 Sandusky (milk processing plant) | Monthly | Gross beta<br>$^{89}Sr$<br>$^{90}Sr$<br>Gamma spectral analysis<br>Calcium |
| DOMESTIC MEAT | T-22 Peter Farm | Semi-Annually | Flesh-Gross beta<br>Gamma spectral analysis |
| WILDLIFE (min of two species) | Onsite | Semi-Annually | Flesh-Gross beta<br>Gamma spectral analysis<br>Bone- $^{90}Sr$ |
| SOILS | T-1 Beach sand<br>T-8<br>T-19<br>T-20 | Semi-Annually | Gross beta<br>Gamma spectral analysis<br>$^{90}Sr$ |
| WINE | T-16 Put-in-Bay Winery | Annually | Gross beta<br>Gross alpha<br>$^{90}Sr$<br>Gamma spectral analysis |
| ANIMAL FEED | T-8<br>T-21 | Semi-Annually | Gross alpha<br>Gross beta<br>$^{90}Sr$<br>Gamma spectral analysis |
| WATERFOWL | Vicinity of Site | Annually | Flesh-Gross beta<br>Gamma spectral analysis<br>Bone- $^{90}Sr$ |
| SMARTWEED | Vicinity of Site | Annually | Gross alpha<br>Gross beta<br>Gamma spectral analysis<br>$^{90}Sr$ |

*Except when ice conditions prohibit sampling

From ER, Table 6.1-5.

Table 6.5. Radiological Monitoring Program Sampling Locations

| Sampling Point | Location[a] |
|---|---|
| T-1 | Site boundary, NE of station, near intake canal |
| T-2 | Site boundary, E of station |
| T-3 | Site boundary, Toussaint River and storm drainage point outfall SE of station |
| T-4 | Site boundary, S of station, near Locust Point and Toussaint River |
| T-5 | Main entrance to site |
| T-6 | Site boundary, NW of station |
| T-7 | Sand beach, 0.9 mi NNW of site |
| T-8 | Earl Moore Farm, 3.2 mi WSW of site |
| T-9 | Oak Harbor, 6.8 mi SW of site |
| T-10 | Erie Industrial Park, 6.5 mi SE of site |
| T-11 | Port Clinton, 11.5 mi SE of site |
| T-12 | Toledo, 23.5 mi WNW of site |
| T-13 | State roadside park, 3.0 mi WNW of site |
| T-14 | Township school, 3.8 mi WSW of site |
| T-15 | Lacarne, 6.6 mi SSE of site |
| T-16 | Put-In-Bay Winery, 15.3 mi ENE of site |
| T-17 | Irv Fick's onsite well, 0.7 mi SW of station |
| T-18 | Hess Sunoco Garage, 1.3 mi S of site |
| T-19 | Miller Farm, 3.7 mi S of site |
| T-20 | Daup Farm, 5.4 mi SSE of site |
| T-21 | Haynes Farm, 3.6 mi SSW of site |
| T-22 | Peter Farm, 2.6 mi SW of site |
| T-23 | Put-In-Bay Lighthouse, 14.3 mi ENE of site |
| T-24 | Sandusky, 24.9 mi SE of site |
| T-25 | Winter Farm, 1.3 mi S of site |
| T-26 | Fost ria, 35.1 mi SW of site |
| T-27 | McGee Marsh, 5.3 mi WNW of site |
| T-28 | Unit 1 treated water supply, onsite |
| T-29 | Lake Erie, Intake Area, 1.5 mi NE of site |
| T-30 | Lake Erie, Discharge Area, 0.9 mi ENE of site |

[a]Distance measured from center of shield building of Unit No. 1.

From ER, Table 6.1-4.

# REFERENCES


1. Toledo Edison Company. Davis-Besse Nuclear Power Station Unit 1 Pre-operational Environmental Monitoring Programs, Semiannual Report, January 1, 1974, Volume I-A.

2. USAEC Directorate of Licensing. Final Environmental Statement related to the construction of Davis-Besse Nuclear Power Station. Docket No. 50-346. March 1973. Section 6.

3. Ohio Federal Aid Project F-41-R, "Environmental Evaluation of a Nuclear Power Plant." Job Progress Reports from 1970, 1971 and 1972; Job Completion Report - Research Completion Segment, 1972.

4. Letter from Charles E. Herdendorf, Ohio State University Center for Lake Erie Area Research, to P. Merry, ANL, July 3, 1972.

5. Toledo Edison Company, Davis-Besse Nuclear Power Station Unit 1, Supplement to Applicant's Environmental Report, Operating License Stage, Docket No. 50-346, issued December 20, 1974, p. 6.2-27.

6. Toledo Edison Company, Davis-Besse Nuclear Power Station Unit 1, Preoperational Environmental Monitoring Programs. Feb. 28, 1975, Aquatic p. 6.

7. Op. Cit., Ref. 5, p. 6.2-13.

8. Op. Cit., Ref. 6, Terrestrial, Bird Hazard p. 13.

# 7. ENVIRONMENTAL IMPACT OF POSTULATED PLANT ACCIDENTS

Résumé

The "Davis-Besse Nuclear Power Station, Unit-1 Supplement to Environmental Report - Operating License State" dated December 20, 1974 has been reviewed with respect to the environmental effects of plant accidents (Section 7.1). The results of this review are that the conclusions about environmental risks due to accidents remain as previously presented in the FES-CP stage. The transportation accident section has been updated to reflect the results of the Commission's "Environmental Survey of Transportation of Radioactive Materials To and From Nuclear Power Plants", WASH-1238.

## 7.1 FACILITY ACCIDENTS

The NRC is currently performing a study to assess more quantitatively the environmental risks due to accidents. The initial results of these efforts were made available for comment in draft form on August 20, 1974.* This study is called the Reactor Safety Study and is an effort to develop realistic data on the probabilities and sequences of accidents in water-cooled power reactors, in order to improve the quantification of available knowledge related to nuclear reactor accident probabilities. The Commission organized a special group of about 50 specialists under the direction of Professor Norman Rasmussen of MIT to conduct the study. The scope of the study has been discussed with EPA and described in correspondence with EPA which has been placed in the NRC Public Document Room (letter, Doub to Dominick, dated June 5, 1973).

As with all new information developed which might have an effect on the health and safety of the public, the results of these studies will be made public and will be assessed on a timely basis within the NRC regulatory process on generic or specific bases as may be warranted.

## 7.2 TRANSPORTATION ACCIDENTS

The transportation of cold fuel to the plant, of irradiated fuel from the reactor to a fuel reprocessing plant, and of solid radioactive wastes from the reactor to burial grounds is within the scope of the AEC report entitled, "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants, " December 1972. The environmental risks of accidents in transportation are summarized in Table 7.1.

TABLE 7.1[1]

ENVIRONMENTAL RISKS OF ACCIDENTS IN TRANSPORT OF FUEL AND WASTE TO AND FROM A TYPICAL LIGHT-WATER-COOLED NUCLEAR POWER REACTOR

| | Environmental Risk |
|---|---|
| Radiological effects . . . . . . . . . . . . . . | Small[2] |
| Common (nonradiological) causes. . . . . . . . . | 1 fatal injury in 100 years; 1 nonfatal injury in 10 years, $475 property damage per reactor year. |

[1]Data supporting this table are given in the Commission's "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," WASH-1238, dated December 1972.

[2]Although the environmental risk of radiological effects stemming from transportation accidents is currently incapable of being numerically quantified, the risk remains small regardless of whether it is being applied to a single reactor or a multireactor site.

* "Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants, Draft," WASH-1400, August 1974.

# 8. EVALUATION OF THE PROPOSED ACTION

Résumé

In the FES-CP the staff evaluated the projected demand of the applicant's and CAPCo's system. CAPCo has updated its projected system load and generating capacity and the applicant has requested an operating license power level of 906 MWe, which is the design output of the plant. The power level previously analyzed for benefits was 872 MWe. The new need for power section reflects this new information and the revised plant capacity.

## 8.1 THE NEED FOR POWER

Since the issuance of the FES-CP, changes in the projected system load and generating capacity have occurred. These changes are similar to changes that have occurred in other utility systems under today's economic and energy situation. Both the Toledo Edison Company and the Cleveland Electric Illuminating Company are members of the Central Area Power Coordination Group (CAPCo) (see Introduction). They have joined with the other members of CAPCo (Ohio Edison Company and Duquesne Light Company) to benefit from the economy of large scale generating plants and increased reliability through pooling their generating and transmission capabilities. The capacity of the station now has been scheduled to be added to the CAPCo generating system in 1976, without designation of the percentage of capacity going to the member companies. The generation from Davis-Besse Unit 1 is ultimately expected to be shared between the Toledo Edison Company and the Cleveland Electric Illuminating Company in proportion to the respective ownership of 52.5% and 47.5%.

The staff considered the impact of conservation of energy during the environmental hearings held after issuance of the FES-CP. Conservation of energy methods considered including impact of advertising, rate structure changes, changes in uses of electricity, changes in public attitude, and energy information significant enough to change the previous evaluation.

The staff looked at the CAPCo system projected demands for its evaluation. Tables 8.1 and 8.2 indicate the most recent projections by CAPCo and the applicant. As shown in Table 8.1, without Davis-Besse Unit 1 and in the face of the CAPCo's projected increase in demand, CAPCo's peak load reserve margin would be in the range of between 18.5 and 8.2 percent in the 1976-1978 period. This reserve margin is below the 20 percent reserve margin recommended by the Federal Power Commission for system reliability. The demand identified in Table 8.2 for TEC and CEIC will be meet by the CAPCO system generating capacity.

The Davis-Besse Nuclear Power Station Unit 1 will be a base load plant. The staff's estimate of the current baseload demand of the general service area of the CAPCo System is approximately 7,000 MWe which is approximately 8 times as large as the 906 MWe net capacity of Davis-Besse Unit 1. Comparing the projected operational and maintenance charges and the fuel charges projected for Davis-Besse Unit 1 and for other modern baseload plants in the applicants' system reveal that none of the exising baseload units are more economical for operating than Davis-Besse Unit 1. For example in 1977, the projected total operational and maintenance charges and fuel charges for Davis-Besse 1 are 4 mills/kwhr while the newest coal fired unit, Mansfield 2, has a projected cost of 16.7 mills/kwhr. The composite of the existing Bayshore units are projected to have a cost of 10.3 mills/kwhr in 1977.[1] The difference in costs between the coal fired units is that the Bayshore fuel cost were based on an existing coal contract and not the higher current contract levels. The air pollution intrinsic to the coal-fired plants make the Davis-Besse Station envionmentally preferred. (The CAPCo system is scheduled to include one additional nuclear unit of 885 MWe, Beaver Valley Unit 1, which will have a similar advantage as a baseload plant for CAPCo when Davis-Besse Unit 1 becomes available.)

The staff has considered the benefit to the public in substituting nuclear fuel for fossil fuel required to produce electrical energy for the CAPCO service area. The major fossil fuel used by the CAPCO companies is coal. As previously indicated, Davis-Besse Unit 1, which will be a baseload unit, is projected to be more economical and have less environmental impact than fossil fuel baseload units in the CAPCo generating system. This substitution will allow saving coal for future generations. Approximately 350 train loads of coal per year would be required to produce an equivalent amount of electrical energy.

Based on the above, it is the staff's evaluation that Davis-Besse Unit 1 is an optimal baseload plant for the CAPCo system and an operating license should be issued.

## 8.2 ADVERSE EFFECTS WHICH CANNOT BE AVOIDED

The staff has reassessed the physical, social, and economic impacts that can be attributed to the Davis-Besse Station. Until construction has been completed, some of the predicted adverse impacts of the construction phase will still be present. The applicant has planned a landscaping prog the plant site that will begin after commercial operation for those areas impacted by the construction of Unit 1. The staff has not identified any additional adverse effects other than those listed in the FES-CP, that will be caused by operation of the plant. As the result of the new source term calculated by the staff, the calculated radiological impact of 22 man-rem/year has been recalculated and is 4.4 man-rem/year. (See Section 5.7.) The evaluation of the radiological effects remains unchanged since this is an even smaller percentage of natural background than originally calculated. The applicant plans to discharge total residual chlorine at a maximum level of 0.5 mg/l. This was the level evaluated by the staff in the FES-CP and the conclusion set forth in Section 8.2.2 of the FES-CP are still valid.

## 8.3 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The evaluation presented in the FES-CP is still valid.

## 8.4 IRREVER. 'E AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

There has been no change in the staff's assessment of this impact since the earlier review except that the continuing escalation of costs has increased the dollar values of the materials used for constructing and fueling the plant. (See Section 11.)

TABLE 8.1[2]

CAPCO FORECAST OF PEAK DEMANDS

| Year | CAPCo Summer Peak Demand (MW) | CAPCo Summer Capability (MW) | Available Reserves (MW) | Available Reserves % of Peak Demand | Without Davis-Besse (%) |
|---|---|---|---|---|---|
| 1975 | 10785 | 12007 | 1222 | 11.3% | - |
| 1976 | 11442 | 14463 | 3021 | 26.4 | 18.5 |
| 1977 | 12368 | 15149 | 2781 | 22.5 | 15.2 |
| 1978 | 13186 | 15179 | 1993 | 15.1 | 8.2 |
| 1979 | 13186 | 15179 | 1177 | 8.4 | 0.2 |

TABLE 8.2[3]

CEIC AN TECO FORECAST OF PEAK DEMAND

| Year | CEIC Annual Peak Demand | TECO |
|---|---|---|
| 1975 | 3300 | 1328 |
| 1976 | 3460 | 1424 |
| 1977 | 3790 | 1600 |
| 1978 | 4050 | 1738 |
| 1979 | 4340 | 1829 |

## REFERENCES

1. Letter from L. Roe, Vice President Toledo Edison Company to G. Knighton, U.S. Nuclear Regulatory Commission, April 21, 1975.

2. Toledo Edison Company, Davis-Besse Nuclear Power Station Units No. 2 and 3, Environmental Report, Construction Permit Stage, Volume 1, Docket Nos. 50-500 and 50-501, issued August 30, 1974, p. P-iv.

3. Ibid. p. 1.1-9.

# 9. ALTERNATIVE ENERGY SOURCES AND SITES

## Resumé

In the FES-CP, the staff evaluated the alternative energy sources and sites. Alternative energy sources considered were the purchase of power from other companies, hydroelectric potential in the CAPCO service area, and fossil fired generating plants, including oil, natural gas, and coal fired plants. The staff also evaluated the applicant's site selection. There have been no major changes in the information relied upon by the staff for the previous evaluations that would require consideration of alternative energy sources and alternative sites at the operating license review stage. The staff's evaluation that the recommendation is the completion and operation of the station remains unchanged.

## 10. PLANT DESIGN ALTERNATIVES

### Résumé

In the FES-CP, the staff evaluated alternatives to the proposed plant design and concluded that the construction of the proposed design was acceptable. Included in our evaluation was an alternative method of operating the closed cycle cooling system, which was a method to minimize the discharge of chlorine into the receiving waters. At the time that environmental review was conducted, no chlorine discharge limitations had been established by EPA under the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500). The staff selected a conservative value of 0.1 ppm total residual chlorine as adequate for the protection of the environment and conditioned the continuation of the construction permit with a requirement that the objective of the station design be such that by careful operation the total residual chlorine concentration in the effluent would be 0.1 ppm or less, not to exceed 2 hours/day. (See FES-CP pg. iv). The method of operation proposed was one alternative which the staff believed would have resulted in meeting that requirement.

Since that time, the EPA has established chlorine limits (see 39 FR 36201), in accordance with Public Law 92-500, as indicated below.

" §423.15 Standard of Performance for New Sources

(i) The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown sources times the concentration listed in the following table:

| Effluent Characteristic | Maximum Concentration | Average Concentration |
|---|---|---|
| Free available chlorine | 0.5 mg/l | 0.2 mg/l. |
| | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
| Materials added for corrosion inhibition including but not limited to zinc, chromium, phosphorous. | No detectable amount. | No detectable amount. |

(j) Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the regional administrator or state, if the state has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination."

The staff previously evaluated the applicant's proposal to discharge total residual chlorine at the 0.5 mg/l level, and based on EPA recommendations, had imposed a limit of 0.1 mg/l. As a result of the establishment of this new limitation on chlorine, the previous staff requirement on chlorine is no longer applicable. Thus, the method of operating the cooling system identified in the FES-CP, Appendix B, will not be required.

The staff previous evaluation of the cooling system alternatives, the intake system alternatives, the discharge system alternatives, the sanitary waste system and the transmission system remain unchanged.

## 11. BENEFIT-COST SUMMARY

### Résumé

There have been minor changes in the cost benefit summary since issuance of the FES-CP. The benefits have increased due to an increase in unit rating from 872 MWe to 906 MWe and a small increase in employment. The environmental cost of the proposed plant has changed slightly in that the projected population dose has decreased while the expected discharge of chlorine has increased. The capital costs of the Davis-Besse Station Unit 1 have increased. These changes are discussed in following sections.

### 11.1 BENEFITS

Increasing the capacity of the station from 872 MWe to 906 MWe will result in an increase in the kilowatt-hours per year generated from approximately 6.1 billion to 6.3 billion and a proportinate increase in both income tax and sales tax revenue. The applicant now expects to have a permanent employment of 110 at the station. Thus, the benefits from the proposed action are slightly increased from those evaluated in the FES-CP.

### 11.2 ENVIRONMENTAL COSTS

The environmental cost of land use, water use, and biological effects previously evaluated remain basically unchanged. As a result of the new source term calculations (see Section 3.4), the calculated radiological dose has decreased from 22 man-rem per year to 4.4 man-rem per year. There will be a slight increase in the amount of chlorine discharged to the lake due to the applicant's change in chlorination scheduled for the service water system. The staff estimates that on the average, 15 pounds per day of may be discharged to th lake instead of the 13 pounds previously listed in Table 11.1 of the FES-CP. Thus, the staff's previous evaluation of the environmental cost remains essentially the same.

### 11.3 ENVIRONMENTAL COSTS OF THE URANIUM FUEL CYCLE

The contribution of environmental effects associated with the uranium fuel cycle are sufficiently small so as not to affect significantly the conclusion of the Cost-Benefit Balance.

### 11.4 INTERNAL COSTS

The primar internal costs of the station are: the capital cost of the facility, including both plant and transmission; the fuel cost; and the operation and maintenance costs.

The total capital cost of the Davis-Besse Station is presently estimated at approximately \$450 million.[1] Table 10.1 summarizes the major cost categories of the station. These cost estimates include provisions for escalation and contingencies incurred during the construction stage.

The power production cost, including both fuel and operation and maintenance costs, have been estimated by the applicant to be 4.0 mills per kWh. This estimate assumes a levelized plant factor of 75 percent over an estimated 40 year service life including expected escalation.

### 11.5 SUMMARY OF COST-BENEFIT

As the result of this second review of potential environmental impacts, the staff has been able to assess more accurately the problems that were associated with the construction phase and to review the previous evaluations of the effects of the plant's operations. No new information has been acquired that would alter the staff's previous position related to the overall balancing of the benefits of this plant versus the environmental costs (FES-CP, pg 11-2, 3). The staff's assessment of the changes in the plant operation identified in this Environmental Statement is that there will be an increase over the benefits found in the FES-CP resulting from the increased generating capacity, employment, and tax revenue, along with the decrease in population dose which more than offsets the potential increase in environmental cost due to increased chlorine discharged to Lake Erie. Consequently, it is the staff's conclusion that the benefit from this plant greatly outweighs the environmental impacts and that an operating license should be issued.

TABLE 11.1

CAPITAL COST OF THE DAVIS-BESSE NUCLEAR POWER STATION
(MILLIONS OF DOLLARS)

| | |
|---|---|
| Land and Land Rights | 3.5 |
| Structures and Improvements | 130.0 |
| Reactor Plant Equipment | 151.0 |
| Turbogenerator Units | 91.0 |
| Accessory Electrical Equipment | 49.0 |
| Miscellaneous Power Plant Equipment | 9.5 |
| Sub-Total - Steam Production Plant | 434.0 |
| Transmission Plant | 16.5 |
| TOTAL | 450.5 |

## 12. RESPONSES TO COMMENTS

(Reserved for responses)

## APPENDIX A. COMMENTS

(Reserved for comments)

JW



OhioEPA

OEPA Permit No. B 211 *AD

Application No. OH 0003786

OHIO ENVIRONMENTAL PROTECTION AGENCY

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 Ohio Water Pollution Control Act (Ohio Revised Code Chapter 6111),

Toledo Edison Company
Davis-Besse Nuclear Power Station

is authorized to discharge from a facility located at
State Route 2
Oak Harbor, Ohio

to receiving waters named

Toussaint River, Lake Erie and Navarre Marsh

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit shall become effective on June 30, 1975

This permit and the authorization to discharge shall expire at midnight, June 29, 1980. Permittee shall not discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the permittee shall submit such information and forms as are required by the Ohio EPA no later than 180 days prior to the above date of expiration.

Ned E. Williams, P.E.
Director

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4-1-74

OEPA-NPDES-7
8-19-74

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning June 30, 1975 and lasting until June 29, 1980 the permittee is authorized to discharge from outfall(s) serial number(s) 001 (discharge from collecting box)

Such discharges shall be limited and monitored by the permittee as specified below:

| EFFLUENT CHARACTERISTIC | DISCHARGE LIMITATIONS kg/day (lbs/day) Net Daily Avg | kg/day (lbs/day) Daily Max | Other Units (Specify) Daily Avg | Other Units (Specify) Daily Max | MONITORING REQUIREMENTS Measurement Frequency | Sample Type |
|---|---|---|---|---|---|---|
| FINAL LIMITATIONS | | | | | | |
| Flow-$M^3$/day (MGD) | - | - | - | - | daily | 24 hr total |
| Total Suspended Solids | - | 0.0(0.0) | - | - | daily* | grab |
| Free Available Chlorine | - | - | 0.2 mg/1 | 0.5 mg/1 | daily* | grab |
| Temperature | - | - | - | - | daily | continuous |
| Gross Beta Activity | - | - | - | 400 picocuries/liter | daily** | grab |
| Strontium 90 | - | - | - | 10 picocuries/liter | 2/month** | grab |
| Alpha Emitter Activity | - | - | - | 3 picocuries/liter | 2/month** | grab |

Temperature of discharge shall not exceed intake by more than 20°F. Thermal discharge shall be limited to cold side blowdo[wn]. Gross Beta Activity shall not exceed a concentration of 100 picocuries/liter at the perimeter of the mixing zone as defined by EP-1-03(B)(4)(b).

2. The pH shall not be less than 6.0 nor greater than 9.0 and shall be monitored daily grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at a point representative of discharge; in order to demonstrate compliance with net limitations, the permittee shall also monitor flow, total suspended solids, temperature (max.) of the intake canal (station 801) in the same manner as outfall 001; in addition, in order to demonstrate compliance with water quality standards, Gross Beta Activity shall be monitored on a monthly grab sample basis at the perimeter of the mixing zone (Station 901).

* daily excluding weekends and holidays
** during days discharged

5. Refer to Part III for additional reporting requirements.

OEPA Permit No. B 211 *AD

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning June 30, 1975 and lasting until June 29, 1980 the permittee is authorized to discharge from outfall(s) serial number(s) 003 (screenwash catch basin discharge)

Such discharges shall be limited and monitored by the permittee as specified below:

| EFFLUENT CHARACTERISTIC | DISCHARGE LIMITATIONS kg/day (lbs/day) | | Other Units (Specify) | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|
| FINAL LIMITATIONS | Daily Avg | Daily Max | Daily Avg | Daily Max | Measurement Frequency | Sample Type |
| Flow-$M^3$/day (MGD) | - | - | - | - | monthly | 24 hr total |
| Total Residual Chlorine | - | - | - | .5 mg/1 | monthly | grab |
| Total Suspended Solids | - | - | 30 mg/1 | 100 mg/1 | 4/month | grab |

2. The pH shall not be less than 6.0 nor greater than 9.0 and shall be monitored monthly grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at overflow from the screen wash catch basin.

5. Refer to Part III for additional reporting requirements.





PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning June 30, 1975 and lasting until June 29, 1980 the permittee is authorized to discharge from outfall(s) serial number(s) 002 (storm runoff, building drains)

Such discharges shall be limited and monitored by the permittee as specified below:

| EFFLUENT CHARACTERISTIC | DISCHARGE LIMITATIONS kg/day (lbs/day) | | Other Units (Specify) | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|
| FINAL LIMITATIONS | Daily Avg | Daily Max | Daily Avg | Daily Max | Measurement Frequency * | Sample Type |
| Flow-$M^3$/day (MGD) | - | - | - | - | 4/month | 24 hr total |
| Oil/Grease | - | - | 15 mg/1 | 30 mg/1 | 4/month | grab |
| Total Suspended Solids | - | - | - | 50 mg/1 | 4/month | 24 hr composite |

2. The pH shall not be less than NA nor greater than NA and shall be monitored NA

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): Oil/Grease: at discharge point into the drainage ditch
Total Suspended Solids: at discharge into Toussaint River
Flow: calculated

5. Refer to Part III for additional reporting requirements.

* During periods of rainfall

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning June 30, 1975 and lasting until June 29, 1980 the permittee is authorized to discharge from outfall(s) serial number(s) 602 (settling basin effluent)

Such discharges shall be limited and monitored by the permittee as specified below:

| EFFLUENT CHARACTERISTIC | DISCHARGE LIMITATIONS kg/day (lbs/day) | | Other Units (Specify) | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|
| FINAL LIMITATIONS | Daily Avg | Daily Max | Daily Avg | Daily Max | Measurement Frequency | Sample Type |
| Flow-$M^3$/day (MGD) | - | - | - | - | weekly | 24 hr total |
| Total Suspended Solids | - | - | 30 mg/l | 100 mg/l | weekly | 24 hr composite |

2. The pH shall not be less than 6.0 nor greater than 10.0 and shall be monitored weekly grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at overflow from settling basin.

5. Refer to Part III for additional reporting requirements.



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PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning June 30, 1975 and lasting until June 29, 1980 the permittee is authorized to discharge from outfall(s) serial number(s) 601 (sewage treatment)

Such discharges shall be limited and monitored by the permittee as specified below:

| EFFLUENT CHARACTERISTIC | DISCHARGE LIMITATIONS kg/day (lbs/day) | | Other Units (Specify) | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|
| FINAL LIMITATIONS | Daily Avg | Daily Max | Daily Avg | Daily Max | Measurement Frequency | Sample Type |
| Flow-$M^3$/day (MGD) | - | - | - | - | monthly | 24 hr total |
| Residual Chlorine, Total | - | - | .2 mg/l(min) | .5 mg/l(max) | monthly | grab |
| Total Suspended Solids | - | - | - | 45 mg/l | monthly | grab |
| $BOD_5$ | - | - | - | 45 mg/l | monthly | grab |

2. The pH shall not be less than 6.0 nor greater than 9.0 and shall be monitored monthly grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at discharge point of sewage treatment facility.

5. Refer to Part III for additional reporting requirements.

# PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning June 30, 1975 and lasting until June 29, 1980 the permittee is authorized to discharge from outfall(s) serial number(s) 603 (neutralized regenerate waste)

   Such discharges shall be limited and monitored by the permittee as specified below:

| EFFLUENT CHARACTERISTIC | DISCHARGE LIMITATIONS | | | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|
| | kg/day (lbs/day) | | Other Units (Specify) | | | |
| FINAL LIMITATIONS | Daily Avg | Daily Max | Daily Avg | Daily Max | Measurement Frequency | Sample Type |
| Flow-$M^3$/day (MGD) | - | - | - | - | weekly | 24 hr total |
| Total Suspended Solids | - | - | 30 mg/l | 100 mg/l | weekly | grab |

2. The pH shall not be less than 6.0 nor greater than 9.0 and shall be monitored weekly grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at discharge point of hold-up tank

5. Refer to Part III for additional reporting requirements.





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

   Monitoring data required by this permit shall be reported on the Ohio EPA report form (EPA- Surv- 1) on the monthly basis. Individual reports for each month are to be submitted no later than the 15th of the next month. Copies of the discharge monitoring report form must be signed and mailed to the District Office, Ohio EPA indicated below.

   Ohio Environmental Protection Agency
   Northwest District Office
   1035 Devlac Grove Drive
   Bowling Green, Ohio 43402

   Monitoring results obtained during the previous three months shall be summarized and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first quarterly report shall be submitted for the period ending June 30, 1975.

   U. S. Environmental Protection Agency
   Region V, Permit Branch
   230 South Dearborn, 13th Floor
   Chicago, Illinois 60604
   312/353-1475

3. Definitions

   a. "daily average" discharge

      i. Weight Basis - the "daily average" discharge means the total discharge by weight, during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, 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 on which the measurements were made.

      ii. Concentration Basis - the "daily average" concentration means the arithmetic average (weighted by flow value) of all the daily determinations of concentrations made during the calendar month. Daily determination of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the daily determination of concentration shall be the arithmetic average (weighted by flow value) of all the samples collected during the calendar month.

b. "daily maximum" discharge

i. Weight Basis - the "daily maximum" discharge means the highest discharge by weight during any calendar day.

ii. Concentration Basis - the "daily maximum" concentration means the highest daily concentration in any calendar month.

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 Discharge Monitoring Report Form (EPA No. 3320-1). 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. These periods will be extended during the course of any unresolved litigation, or when so requested by the Regional Administrator or the Ohio EPA.

C. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

N/A

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit a written report as to compliance (except for those dates requiring a written submittal such as reports, plans, etc.), or noncompliance. The report on noncompliance shall include the reason, an estimated date of compliance and the probability of meeting the next scheduled requirement. Reports should be submitted ot the Ohio EPA, District Office, ORE Representative.

N/A

(END OF PART I)





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. 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 Ohio EPA 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.

3. 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.

4. 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.

5. Bypassing

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) 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 Ohio EPA in writing of each such diversion or bypass.

6. 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.

7. Power Failures

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

a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if no date for implementation appears in Part I,

b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of one or more of the primary sources of power to the wastewater control facilities.





B. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow authorized representatives of the Ohio EPA and USEPA upon the presentation of credentials:

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 resonable 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

This permit cannot be transferred or assigned, nor shall a new owner or successor be authorized to discharge from this facility until the following requirements are met:

i. The permittee shall notify the succeeding owner or successor of the existence of this permit by a letter, a copy of which shall be forwarded to the Ohio EPA.

ii. The new owner or successor shall submit a letter to the Ohio EPA stating that he will comply with the requirements of the permit on this facility and receive confirmation and approval of the transfer from the Ohio EPA.

3. Availability of Reports

Except for data determined by the Ohio EPA to be entitled confidential status, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the district offices of the Ohio EPA. Effluent data and data on quality of receiving water 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 Ohio Revised Code Section 6111.99.

4. Permit Modification, Suspension, or Revocation

a. 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:

i. Violation of any terms or conditions of this permit,

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

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

b. The permittee may at any time apply to the Ohio EPA for modification of any part of this permit, provided that application for modification is received by the Ohio EPA at least sixty days before the date on which it is desired that the modification shall become effective.

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 "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

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 is or may be subject under Section 311 of the Act.

8. State Laws

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 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 any infringement of Federal, State or local laws or regulations.

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 circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

11. Reporting of Unauthorized Discharges

The permit holder shall within one (1) hour of discovery report to the Ohio EPA by calling 614-299-6336 and the proper Federal Authority any unauthorized discharge of untreated or partially treated sewage, industrial wastes or other wastes into the waters of the state or into publicly-owned treatment works, when such discharges result from pipeline breaks, equipment malfunctions or failures, operator errors, accidents, process interruptions, or power failures. The report shall include the remedial steps being taken, the names and telephone numbers of persons who have knowledge of the circumstances surrounding such discharge and the names and telephone numbers of persons who are responsible for the remedial steps being taken. Such report shall be confirmed in writing within one week after the date of such discharge. Within thirty (30) days after such discharge, the permit holder shall report to what extent permanent measures can be taken to prevent recurrence of such discharge, any such measures proposed to be taken shall be submitted to the Ohio EPA for approval within sixty (60) days of such discharge.

PART III

OTHER REQUIREMENTS

1. Monthly reports to Ohio EPA shall contain the following reporting codes and units.

| Effluent Characteristic | Reporting Code | Units Used in Reporting |
|---|---|---|
| Flow | 50050 | MGD |
| Flow | 00056 | GPD |
| Residue, Total NFlt | 00530 | mg/l |
| Chlorine, Free Available | 50064 | mg/l |
| Chlorine, Total Residue | 50060 | mg/l |
| pH | 00400 | S.U. |
| Water Temperature | H00011 | °F |
| Oil/Grease | 00550 | mg/l |
| $BOD_5$ | 00310 | mg/l |
| Beta, Total | 03501 | pc/l |
| Alpha, Total | 01501 | pc/l |
| Strontium 90 | 13501 | pc/l |

2. Condenser water may not be chlorinated longer than two hours per day.

3. There shall be no discharge of polychlorinated biphenol compounds such as those commonly used for transformer fluid.

4. Reports submitted to N.R.C. on Radwaste treatment discharge shall be submitted to OEPA. Also to be included are Gross beta activity, strontium 90, alpha emitter activity in picocuries/liter.

5. Sewage treatment discharge shall be tributary to the collection box at such time as the unit is on line. Subsequent discharge to Toussaint River shall be prohibited.

6. The discharge from the radwaste treatment system shall be bled into the collecting box at the lowest practical rate subject to plant operating conditions.

7. The mixing zone perimeter shall extend 0.4 miles from the point of discharge.

APPENDIX C



§ 423.11 Specialized definitions.

For the purpose of this subpart:

(a) Except as provided below, the general definitions, abbreviations and methods of analysis set forth in 40 CFR Part 401 shall apply to this subpart.

(b) The term "generating unit" shall mean any generating unit subject to the provisions of this part, except those units defined below as small or old.

(c) The term "small unit" shall mean any generating unit subject to the provisions of this part, except a unit defined below as old, of less than 25 megawatts rated net generating capacity or any unit which is part of an electric utility system with a total net generating capacity of less than 150 megawatts.

(d) The term "old unit" shall mean any generating unit subject to the provisions of this part, of 500 megawatts or greater rated net generating capacity which was first placed in service on or before January 1, 1970 and any generating unit of less than 500 megawatts rated net generating capacity which was first placed in service on or before January 1, 1974.

(e) The term "blowdown" shall mean the minimum discharge of recirculating water for the purpose of discharging materials contained in the water, the further buildup of which would cause concentrations in amounts exceeding limits established by best engineering practice.

(f) The term "free available chlorine" shall mean the value obtained using the amperometric titration method for free available chlorine described in "Standard Methods for the Examination of Water and Wastewater", page 112 (13th edition).

(g) The term "sufficient land" shall mean 100 sq m (1100 sq ft) or more per megawatt of nameplate generating capacity.

(h) The term "low volume waste sources" shall mean, taken collectively as if from one source, wastewater from all sources except those for which specific limitations are otherwise established in this subpart. Low volume wastes sources would include but are not limited to waste waters from wet scrubber air pollution control systems, ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, floor drainage, cooling tower basin cleaning wastes and blowdown from recirculating house service water systems.

(i) The term "ash transport water" shall mean water used in the hydraulic transport of either fly ash or bottom ash.

(j) The term "metal cleaning wastes" shall mean any cleaning compounds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and air preheater cleaning.

(k) The term "once through cooling water" shall mean water passed through the main cooling condensers in one or two passes for the purpose of removing waste heat from the generating unit.

(l) The term "recirculated cooling water" shall mean water which is passed through the main condensers for the purpose of removing waste heat from the generating unit, passed through a cooling device, other than a cooling pond or a cooling lake, for the purpose of removing such heat from the water and then passed again, except for blowdown, through the main condenser.

(m) The term "cooling pond" shall mean any manmade water impoundment which does not impede the flow of a navigable stream and which is used to remove waste heat from heated condenser water prior to returning the recirculated cooling water to the main condenser.

(n) The term "cooling lake" shall mean any manmade water impoundment which impedes the flow of a navigable stream and which is used to remove waste heat from heated condenser water prior to recirculating the water to the main condenser.

§ 423.12 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.

(a) In establishing the limitations set forth in this section, EPA took into account all information it was able to collect, develop and solicit with respect to factors (such as age and size of plant, utilization of facilities, raw materials, manufacturing processes, non-water quality environmental impacts, control and treatment technology available, energy requirements and costs) which can affect the industry subcategorization and effluent levels established. It is, however, possible that data which would affect these limitations have not been available and, as a result, these limitations should be adjusted for certain plants in this industry. An individual discharger or other interested person may submit evidence to the Regional Administrator (or to the State, if the State has the authority to issue NPDES permits) that factors relating to the equipment or facilities involved, the process applied, or other such factors related to such discharger are fundamentally different from the factors considered in the establishment of the guidelines. On the basis of such evidence or other available information, the Regional Administrator (or the State) will make a written finding that such factors are or are not fundamentally different for that facility compared to those specified in the Development Document. If such fundamentally different factors are found to exist, the Regional Administrator or the State shall establish for the discharger effluent limitations in the NPDES permit either more or less stringent than the limitations established herein, to the extent dictated by such fundamentally different factors. Such limitations must be approved by the Administrator of the Environmental Protection Agency. The Administrator may approve or disapprove such limitations, specify other limitations, or initiate proceedings to revise these regulations.

(b) The following limitations establish the quantity or quality of pollutants or pollutant properties, controlled by this section, which may be discharged by a point source subject to the provisions of this subpart after application of the best practicable control technology currently available:

(1) The pH of all discharges, except once through cooling water, shall be within the range of 6.0-9.0.

(2) There shall be no discharge of polychlorinated biphenol compounds such as those commonly used for transformer fluid.

(3) The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |

(4) The quality of pollutants discharged in ash transport water shall not exceed the quantity determined by multiplying the flow of ash transport water times the concentration listed in the following table:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |

(5) The quantity of pollutants discharged in metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of metal cleaning wastes times the concentration listed in the following table:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |
| Copper, Total | 1.0 mg/l | 1.0 mg/l |
| Iron, Total | 1.0 mg/l | 1.0 mg/l |

(6) The quantity of pollutants discharged in boiler blowdown shall not exceed the quantity determined by multiplying the flow of boiler blowdown times the concentration listed in the following table:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |
| Copper, Total | 1.0 mg/l | 1.0 mg/l |
| Iron, Total | 1.0 mg/l | 1.0 mg/l |





(7) The quantity of pollutants discharged in once through cooling water shall not exceed the quantity determined by multiplying the flow of once through cooling water sources times the concentration listed in the following table:

| Effluent Characteristic | Maximum Concentration | Average Concentration |
|---|---|---|
| Free available chlorine | 0.5 mg/l | 0.2 mg/l |

(8) The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown sources times the concentration listed in the following table:

| Effluent Characteristic | Maximum Concentration | Average Concentration |
|---|---|---|
| Free available chlorine | 0.5 mg/l | 0.2 mg/l |

(9) Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the regional administrator or State, if the State has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination.

(10) In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a)(1) through (10) of this section attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

§ 423.13 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable.

The following limitations establish the quantity or quality of pollutants or pollutant properties, controlled by this section, which may be discharged by a point source subject to the provisions of this subpart after application of the best available technology economically achievable:

(a) The pH of all discharges, except once through cooling water, shall be within the range of 6.0-9.0.

(b) There shall be no discharge of polychlorinated biphenol compounds such as those commonly used for transformer fluid.

(c) The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |

(d) The quantity of pollutants discharged in bottom ash transport water shall not exceed the quantity determined by multiplying the flow of bottom ash transport water times the concentration listed in the following table and dividing the product by 12.5:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |

(e) The quantity of pollutants discharged in fly ash sluicing shall not exceed the quantity determined by multiplying the flow of fly ash transport water times the concentration listed in the following table:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |

(f) The quantity of pollutants discharged in metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of metal cleaning wastes times the concentration listed in the following table:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |
| Copper, Total | 1.0 mg/l | 1.0 mg/l |
| Iron, Total | 1.0 mg/l | 1.0 mg/l |

(g) The quantity of pollutants discharged in boiler blowdown shall not exceed the quantity determined by multiplying the flow of boiler blowdown times the concentration listed in the following table:

| Effluent characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| TSS | 100 mg/l | 30 mg/l |
| Oil and Grease | 20 mg/l | 15 mg/l |
| Copper, Total | 1.0 mg/l | 1.0 mg/l |
| Iron, Total | 1.0 mg/l | 1.0 mg/l |

(h) The quantity of pollutants discharged in once through condenser water shall not exceed the quantity determined by multiplying the flow of once through condenser water sources times the concentration listed in the following table:

| Effluent Characteristic | Maximum Concentration | Average Concentration |
|---|---|---|
| Free available chlorine | 0.5 mg/l | 0.2 mg/l |

(i) The quantity of pollutants discharged from cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown times the concentration listed in the following table:

| Effluent Characteristic | Maximum Concentration | Average Concentration |
|---|---|---|
| Free available chlorine | 0.5 mg/l | 0.2 mg/l |

| Effluent Characteristic | Maximum for any one day | Average of daily values for thirty consecutive days shall not exceed |
|---|---|---|
| Zinc | 1.0 mg/l | 1.0 mg/l |
| Chromium | 0.2 mg/l | 0.2 mg/l |
| Phosphorus | 5.0 mg/l | 5.0 mg/l |
| Other corrosion inhibiting materials | Limit to be established on a case by case basis. | |

(j) Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the regional administrator or state, if the state has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination.

(k) In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a) through (j) of this section attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

(l) There shall be no discharge of heat from the main condensers except:

(1) Heat may be discharged in blowdown from recirculated cooling water systems provided the temperature at which the blowdown is discharged does not exceed at any time the lowest temperature of recirculating cooling water prior to the addition of the make-up water.

(2) Heat may be discharged in blowdown from recirculated cooling water systems which have been designed to discharge blowdown water at a temperature above the lowest temperature of recirculated cooling water prior to the addition of make-up water provided such recirculating cooling systems have been placed in operation or are under construction prior to the effective date of this regulation.

(3) Heat may be discharged where the owner or operator of a unit otherwise subject to this limitation can demonstrate that a cooling pond or cooling lake is used or is under construction as of the effective date of this regulation to cool