ARKANSAS NUCLEAR ONE
UNIT 1

LICENSE NO. DPR-51

APPENDIX B
TECHNICAL SPECIFICATIONS

MAY 2 1 1974

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

ENVIRONMENTAL TECHNICAL SPECIFICATIONS

LIST OF TABLES

ENVIRONMENTAL TECHNICAL SPECIFICATIONS

LIST OF FIGURES

1.0 DEFINITIONS

Listed below are terms used in these environmental technical specifications that could be considered as having a unique definition as applied to Arkansas Nuclear One-Unit 1.

1.1 Standard Methods

"Standard Method for the Examination of Water and Wastewater," 13th Edition, published by the American Public Health Association.

1.2 Gamma Isotopic Analysis

Identification of gamma emitters plus quantitative results for radionuclides attributable to the station that contribute a significant amount to the total activity of the sample.

1.3 Environmental Samples

Samples of soil, air, water, biota, or biological material collected outside of the plant buildings for the purpose of analysis.

1.4 Chlorine Demand

The amount of chlorine required to oxidize substances in the water which reduce free chlorine.

1.5 Free Available Chlorine Residual

Residual consisting of hypochlorite ions (OCI), hypochlorous acid (HOCI), or molecular chlorine (CL_2).

1.6 Combined Available Chlorine Residual

Residual consisting of mono-, di-, and trichloramines.

1.7 Total Available Chlorine Residual

Sum of free and combined available chlorine residuals.

1.8 RTD

Resistance Temperature Detector.

1.9 Radiation Monitor Checks, Tests, and Calibration

a. Check - Visual inspection of monitor readout.
b. Test - Use of check source to determine operability.
c. Calibrate - Use of known source to determine accuracy.

1.10 Equivalent Decay Time

Equivalent decay time is equal to holdup time plus one-half fill time with respect to waste gas decay tanks.

2.0 LIMITING CONDITIONS FOR OPERATION

2.1 Thermal

2.1.1 Maximum ΔT Across Condenser

Objective

To limit thermal stress to the aquatic ecosystem by limiting the maximum ΔT across the condenser during operation.

Specification:

a. The maximum differential temperature across the condenser shall not exceed 15°F during normal operation with all four circulating water pumps in operation.

b. If one or two circulating water pumps are out of service at any given time the maximum condenser ΔT shall not exceed 30°F; and Specification 2.1.2 of this Appendix shall be met.

Monitoring Requirement

The temperature differential across the condenser shall be monitored every hour utilizing the computer output of the condenser inlet and outlet temperature measurements. The range of these measurements shall be 0-150°F and their accuracy shall be ±0.5%.

If the plant computer is inoperable, the condenser inlet and outlet temperatures shall be monitored every two hours utilizing the condenser temperature recorder with a 0-150°F range and ±0.5% accuracy.

Bases

Maximum ΔT's of 15°F with 4 circulating water pumps operating (∿1700 cfs flow) and 30°F with 2 circulating water pumps operating will insure that the limits of the applicable water quality criteria will not be exceeded. The difference in temperature readings of the RTD's at the inlet and outlet of the condensers provides the ΔT across the condensers.

Specification 2.1.1.b allows maintenance to be performed on circulating water pumps when the Dardanelle Reservoir ambient temperature is such that Specification 2.1.2 will not be exceeded. Hydraulic model studies have shown that a 30°F ΔT at 850 cfs circulating waterflow will not result in adverse changes in the Dardanelle Reservoir isotherms when

compared to the isotherms resulting from a 15°F ΔT at 1700 cfs except on the surface of the discharge embayment.

2.1.2 Maximum Discharge Temperature

Objective

To limit thermal stress to the aquatic ecosystem by limiting the plant's maximum discharge water temperature.

Specification

The condenser discharge water temperature shall not exceed 105°F for more than two consecutive hours. If the water temperature exceeds 105°F for two hours an investigation of the situation will be undertaken and corrective action shall be taken to maintain the discharge water temperature at 105°F or less. One such corrective action would be a reduction in the plant power level unless there is an emergency need for the lost power. This emergency need would exist when a reduction in power would mean cutting off firm customers. If monitoring (see below) indicates that the temperature at the mouth of the discharge embayment is $\leq$ 105°F, the plant load will not be reduced.

Monitoring Requirements

Condenser discharge water temperature shall be monitored every hour utilizing the average of the computer output of the condenser discharge RTD readings. The RTD's have a 0-150°F range and an accuracy of ±0.5%.

If the plant computer is inoperable, the condenser discharge water temperature shall be monitored every two hours utilizing the condenser temperature recorder with a 0-150°F range and ±0.5% accuracy.

If the condenser discharge water temperature exceeds 105°F, plant personnel will be dispatched to the mouth of the discharge embayment to monitor the exit temperature from the embayment. Monitoring of the embayment will continue every two hours as long as the condenser outlet temperature remains at 105°F.

Bases

The 105°F maximum discharge water temperature limit is set to assure that the Dardanelle Reservoir temperature does not exceed

95°F as established by the applicable water quality criteria. The use of the condenser discharge RTD's provides the circulating water discharge temperature prior to mixing with the Dardanelle Reservoir water.

No credit was taken in the analyses and models of the circulating water system for heat exchange within the discharge embayment even though it is expected that the water temperature will be reduced in the embayment. Thus, the average temperature should be $\leq$105°F even when the temperature at the condenser discharge is greater.

2.1.3 Maximum BTU/hr

Not applicable.

2.1.4 Rate of Change of Discharge Temperature

Objective

To avoid thermal stress to the aquatic ecosystem due to sudden changes in water temperature.

Specification

In the event of a planned shutdown during the period November through April, the reactor power level shall be reduced to 0% at a rate such that the decrease in the condenser circulating water discharge temperature shall be $\leq$5°F/hr in order to avoid any adverse thermal impact on the aquatic environment in the discharge embayment. As the reduction in power level is made, the number of operating circulating water pumps will be reduced so as to limit the rate of decrease of the water temperature in the discharge embayment.

This limitation may be exceeded for brief periods as necessary to protect plant equipment and for certain safeguard operations which cannot be limited or negated by plant operation. These safeguard operations include automatic plant trips and compliance with safety-related technical specifications.

If after a few planned shutdowns at the specified rate, there are no detectable adverse effects on the discharge embayment environment, then future planned shutdowns may be conducted at slightly higher rates. The required monitoring shall be

conducted until it is established that there is no adverse environmental impact associated with plant shutdowns conducted at the higher rate. If there is adverse environmental impact detected, then future planned shutdowns will be conducted at slightly slower rates until a shutdown rate where there is no detectable adverse environmental impact is determined.

Monitoring Requirement

Condenser discharge water temperature will be monitored every hour during the power reduction utilizing the average of the computer output of the condenser discharge RTD readings. The RTD's have a 0-150°F range and an accuracy of ±0.5%.

If the plant computer is inoperable, the condenser discharge water temperature shall be monitored at least once per hour during the power reduction utilizing the condenser temperature recorder which has a 0-150°F range and a ±0.5% accuracy.

The aquatic environment of the discharge embayment will be watched during and immediately after planned shutdowns in order to detect any adverse environmental impacts on the embayment, which might occur. A record of the observations made, rate of temperature change, and appropriate data shall be maintained.

Bases

There has been no incidence of adverse environmental impact associated with any operating AP&L power plant. There is also a lack of data or evidence which would support a limiting rate of change of temperature for the specific species that might inhabit the discharge embayment. In view of this, a conservative rate of change, $\leq 5°/hr$, is specified. It is also conservative because the actual rate of change of the discharge embayment will be slower than the rate of change of the circulating water system. A reduction in circulating water flow will further decrease the rate of change of temperature in the discharge embayment.

2.1.5 Heat Treatment of Circulating Water System

Not Applicable.

2.1.6 Deicing Operations

Not Applicable.

2.2 Hydraulic

2.2.1 Intake Velocity

A study will be undertaken as described in Section 4.1.2 to determine means of limiting fish impingement on the traveling water screens.

2.2.2 Discharge Velocity

Not Applicable.

2.2.3 Flow Rate Restrictions

Not Applicable.

2.2.4 Reservoir Drawdown

Not Applicable.

2.3 Chemical

Objective (General)

To protect the local biota from lethal and sublethal effects of chemical discharges. To assure that the most sensitive use of the receiving medium by human populations is protected. To minimize degradation of the quality of the receiving medium.

Specification (General)

All plant chemical discharges except that from the plant sanitary system shall be diluted by the plant circulating water during release to assure that the stated objective can be achieved.

2.3.1 Biocides

Specification

a. Chlorine (Circulating Water System)

Chlorination of condenser cooling water shall be intermittent (1 to 2 hours each day or as may be necessary). Total available chlorine residual in the plant effluent shall be less than 0.1 mg/l. If the total available chlorine residual in the discharge canal exceeds 0.1 mg/l, the chlorine feed rate shall be reduced to a rate at which this specification can be met.

b. Chlorine (Sanitary Waste System)

The hypochlorinator of the sewage-treatment system shall be maintained so that the free available chlorine residual of the effluent shall not be greater than 0.1 mg/l at point of discharge to the embayment.

Monitoring Requirement

a. Chlorine (Circulating Water System)

Total available chlorine residual in the discharge canal shall be measured twice weekly during periods of chlorination. Analyses will be made according to Table 2-1.

b. Chlorine (Sanitary Waste System)

The sewage treatment effluent shall be checked monthly to ensure that the total available chlorine residual is not greater than 0.1 mg/l at point of discharge to the embayment. Analysis will be made according to Table 2-1.

Bases

The once-through circulating water flow taken from the Illinois Bayou arm of the Dardanelle Reservoir will pass through the turbine condenser and will be discharged into an 80-acre embayment of the Reservoir.

Analysis of the chlorine demand of the Arkansas River water (i.e., the amount of chlorine required to oxidize substances in the water which reduce free chlorine) range from 2 to 4 mg/l for a contact time of 10 minutes. Reaction of chlorine with the untreated dilution water during the 4 to 5 minutes required for the flow to reach the embayment should reduce the concentration of total available chlorine residual below 0.1 mg/l in the effluent. It is estimated that Unit 1 chlorine usage will be 330,000 lb/year.

2.3.2 Corrosion Inhibitors

Specification

There shall be no discharge of sodium nitrite to the plant discharge.

Monitoring Requirement

The closed cooling water system of the plant shall be sampled weekly to ascertain whether sodium nitrite leakage from these systems has occurred. Since sodium nitrite is subject to biodegradation, the test for nitrite nitrogen by Method 134 of Standard Methods will not conclusively establish whether leakage has occurred. Specific conductance will also be measured using Method 154 of Standard Methods. If nitrite nitrogen drops and specific conductance remains constant, no leakage will be presumed. If both nitrite and conductivity are lower than the previous weekly test, immediate samples of discharge canal will be taken and a report made according to Specification 5.6.2.

Bases

The closed cooling water systems are treated with sodium nitrite or sodium nitrite-based inhibitors. Under normal conditions, there will be no discharge of the sodium nitrite inhibitor to the plant discharge. Any leakage from these sytems would normally be undetectable by sampling the discharge canal. Sampling of individual closed water systems will be utilized for leak detection. Some inhibitor will be consumed in the protecting of the closed water systems. It is estimated that annual usage after initial charging of all systems will be 1500 lb/year.

2.3.3 Suspended and Total Dissolved Solids

Specification

Both the conductivity and the turbidity of the plant effluent in discharge canal shall not be more than 10% greater than that of the water in the intake canal.

If the specific conductivity of the effluent in the discharge canal is found to be 10% greater than that of the water in the intake canal, the water in the discharge canal shall be resampled and analyzed for total dissolved solids (TDS). If the TDS is increased more than that specified in Table 2-3 or if the turbidity of the effluent is found to be 10% greater than that of the intake water, then a report shall be made in accordance with Specification 5.6.2.

Monitoring Requirement

The turbidity and conductivity of water in the intake and discharge canals shall be determined weekly during periods of discharge. Analyses shall be made according to Table 2-1. Calibration curves relating conductivity to total dissolved solids shall be prepared monthly.

Bases

The plant is not expected to significantly contribute to suspended or total dissolved solids. Turbidity and conductivity are accepted methods for determining these two parameters. A 10% increase resulting from plant effluents will be considered significant.

2.3.4 pH

Specification

The pH of all discharges to the Dardanelle Reservoir shall be between 6.0 and 9.0. No single unit of discharge shall change the discharge canal water more than 0.5 pH unit.

Monitoring Requirement

The pH of the intake and discharge water shall be determined weekly during periods of discharge. Analysis shall be made according to Table 2-1.

2.3.5 Chemicals which Affect Water Quality

Specification

All chemical releases shall be maintained at the discharge canal to be less than those concentrations permitted by the Arkansas Department of Pollution Control and Ecology. See Table 2-3.

Monitoring Requirement

Monitoring of the water in the intake and discharge canal will be done by weekly sampling and analysis for conductivity, chloride, hardness, phosphate, sulfate, turbidity, ammonia, iron, manganese, copper, silica, boron, hydrazine and pH. Analyses will be made according to Table 2-1. If, after the

concentrations present in the intake canal are subtracted from those present in the discharge canal, the concentration of any of the chemical parameters listed in this specification equal or exceed the concentrations listed in Table 2-3 or Specification 4.1.1, a report will be made in accordance with Specification 5.6.2.

Bases

Concentrations will be limited to meet requirements of the regulatory agencies concerned. Table 3-1 lists concentrations of chemicals expected to be discharged and their concentrations now present in the lake water.

2.4 Radioactive Discharge

Objective

To define the limits and conditions for the controlled release of radioactive effluents to the environs to ensure that these releases are as low as practicable. These releases should not result in radiation exposures in unrestricted areas greater than a few percent of natural background exposure. The release rate for all effluent discharges should be within the limits specified in 10 CFR Part 20.

To assure that the release of radioactive material to unrestricted areas meet the as-low-as-practicable concept, the following objectives apply:

For liquid wastes:

a. The annual total quantity of radioactive materials in liquid waste, excluding tritium and dissolved gases, should not exceed 5 curies;

b. The annual average concentration of radioactive materials in liquid waste upon release from the Restricted Area, excluding tritium and dissolved noble gases, shall not exceed 2×10^{-8} µCi/ml; and

c. The annual average concentration of dissolved gases in liquid waste, upon release from the Restricted Area, shall not exceed 2×10^{-6} µCi/ml.

For gaseous wastes:

a. Averaged over a yearly interval, the release rate of noble gases and other radioactive isotopes, except I-131 and particulate radioisotopes with half-lives greater than eight days, discharged from the plant should result in a dose rate at the site boundary of less than 10 mrem to the whole body or any organ of an individual.

b. Averaged over a yearly interval, the release rate of I-131 and other particulate radioisotopes with half lives longer than eight days discharged from the plant should result in a dose in the unrestricted area of less than 15 mrem to the thyroid of a child through the grass-cow-milk chain.

2.4.1 Liquid Discharge

Specification

1. The rate of release of radioactive materials in liquid waste from the plant shall be controlled such that the instantaneous concentrations of radioactivity in liquid waste, upon release from the Restricted Area, do not exceed the values listed in 10 CFR 20, Appendix B, Table II, Column 2.

2. If the release of radioactive materials in liquid effluents, when averaged over a calendar quarter, exceeds 2.5 curies, the Licensee shall:

   a. Make an investigation to identify the causes for such release rates;

   b. Define and initiate a program of action to reduce such release rates to the design levels; and,

   c. Notify the Director, Directorate of Licensing within 30 days, identifying the causes and describing the proposed program of action to reduce such release rates.

3. The release rate of radioactive liquid effluents, excluding tritium and dissolved gases, shall not exceed 10 curies during any calendar quarter.

4. During release of liquid radioactive waste, the following conditions shall be met:

   a. At least two (2) condenser circulating water pumps shall be in operation to provide a minimum dilution flow of approximately 383,000 gpm in the discharge canal for the liquid waste effluent;

   b. The effluent control monitor shall be set to alarm and automatically close the waste discharge valve such that the requirements of Specification 2.4.1 are met; and,

c. The gross liquid waste activity and flow rate shall be continuously monitored and recorded during release. If this requirement cannot be met, continued release of liquid effluents shall be permitted only during the succeeding 48 hours provided that during this 48 hour period, two independent samples of each tank shall be analyzed and two station personnel shall independently check valving prior to the discharge.

5. The equipment installed in the liquid radioactive waste system shall be maintained and operated to process all liquids prior to their discharge when it appears that the projected cumulative discharge rate excluding tritium and dissolved noble gases, released during any calendar quarter will exceed 1.25 curies.

6. The maximum activity to be contained in one liquid radwaste tank that can be discharged directly to the environs (Treated Waste Monitor and Filtered Waste Monitor Tanks only), shall not exceed 10 curies.

Monitoring Requirements

1. Facility records shall be maintained of the radioactive concentrations and volume before dilution of each batch of liquid effluent released, and of the average dilution flow and length of time over which each discharge occurred.

2. Prior to release of each batch of liquid effluent, a sample shall be taken from that batch and analyzed in accordance with Table 2-2 to demonstrate compliance with Specification 2.4.1.

3. Radioactive liquid waste sampling and activity analysis shall be performed in accordance with Table 2-2.

4. The liquid effluent radiation monitors shall be calibrated at least quarterly by means of a known radioactive source. Each monitor shall be tested monthly and when discharging checked daily.

5. The performance of automatic isolation valves and discharge tank selection valves shall be checked annually.

Bases

Releases of radioactivity in liquid wastes within the design objective levels provide reasonable assurance that the resulting

annual exposure from liquid wastes to the whole body or any organ of an individual will not exceed 5 mrem per year. At the same time the Licensee is permitted the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the design objective levels but still within the concentration limits specified in 10 CFR 20. It is expected that using this operational flexibility under unusual operating conditions, the Licensee shall exert every effort to keep levels of radioactive materials as low as practicable and that annual releases will not exceed a small fraction of the annual average concentration limits specified in 10 CFR 20.

2.4.2 Gaseous Discharge

Specification

1. When the release rate of radioactive materials in gaseous wastes, averaged over a calendar quarter exceeds 4% of 2.4.2.3.a or 2% of 2.4.2.3.b, the licensee shall notify the Director, Directorate of Licensing within 30 days, identifying the causes of the excessive activity and describing the proposed program of action to reduce such releases to design objective levels.

2. The maximum activity to be contained in one Waste Gas Decay Tank shall be limited to 15,480 Ci.

3. a. The rate of release of radioactive materials and gaseous wastes from the plant (except I-131 and particulate radioisotopes with half lives greater than eight days) averaged over any one-hour period shall not exceed:

$$\sum \frac{Qi}{6.7 \times 10^{4} \frac{m^3}{sec} \; (MPC)i} \leq 1$$

Where Qi is the release rate in Ci/sec for isotope i and (MPC)i is the maximum permissible concentration of isotope i as defined in Appendix B, Table II, Column 1, 10 CFR Part 20.

b. The release rate of I-131 and particulates with half-lives greater than eight days released to the environs as part of airborne effluents, shall not exceed 0.96 μCi/sec.

4. a. The release rate of gross gaseous activity shall not exceed 16% of the values specified in 2.4.2.3.a when averaged over a calendar quarter.

b. The release rate of I-131 and particulates with half-lives greater than eight days shall not exceed 8% of the values specified in 2.4.2.3.b when averaged over a calendar quarter.

5. During release of radioactive gaseous wastes from the gaseous waste discharge header to the plant ventilation exhaust plenum, the following conditions shall be met:

   a. The gaseous radioactivity monitor, iodine and the particulate samplers in the plant vents shall be operating; and

   b. Automatic isolation devices capable of limiting gaseous release rates to within the values specified in 2.4.2.3.a shall be operating.

6. Radioactive gaseous wastes collected in the gas decay tanks shall be held up a minimum equivalent decay time of 45 days, except when the calculated activity concentration of each identified radioisotope of the site boundary is less than 1% of the MPC specified in 10 CFR Part 20, Appendix B, Table II, based on a χ/Q of 1.5×10^{-5}.

7. Purging of the reactor building shall be governed by the following conditions:

   a. Reactor building purge shall be through the high efficiency particulate filters and charcoal filters until the activity concentration is below the occupational limit inside the reactor building, at which time bypass may be initiated; and

   b. Reactor building purge shall be through the high efficiency particulate filters and charcoal filters whenever irradiated fuel is being handled or any objects are being handled over irradiated fuel in the reactor building.

8. Gases discharged through the unit vent shall be continuously monitored and recorded for gross (β,γ) activity.

   Whenever these monitors are inoperable, appropriate grab samples shall be taken and analyzed each shift. The monitor shall not be inoperable for more than 7 days.

Monitoring Requirement

1. Radioactive gaseous waste sampling and analysis shall be performed in accordance with Table 2-2.

2. All waste gas monitors shall be calibrated at least quarterly by means of a known radioactive source. Each monitor shall have an instrument channel test at least monthly and when discharging checked at least daily.

3. During power operation, the condenser vacuum pump discharge shall be continuously monitored for gross radiogas activity. The monitor shall not be inoperable for more than 7 days. Whenever this monitor is inoperable, grab samples shall be taken and analyzed for gross radioactivity daily.

4. Records shall be maintained and reports of the sampling and analysis results shall be submitted in accordance with Specification 5.6.

5. The Waste Gas Decay Tank effluent monitor shall be tested prior to any release of radioactive gas from a decay tank and shall be calibrated at refueling intervals.

Bases:

It is expected that the releases of radioactive materials and gaseous wastes will be kept within the design objective levels and will not exceed on an instantaneous basis the dose rate limits specified in 10 CFR 20.

These levels provide reasonable assurance that the resulting annual exposure from noble gases to the whole body or any organ of an individual will not exceed 10 mRem per year. At the same time the Licensee is permitted the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided a dependable source of power under ususual operating conditions which may temporarily result in releases higher than the design objective levels but still within the concentration limits specified in 10 CFR 20. It is expected that using this operational flexibility under unusual operating conditions, the Licensee shall exert every effort to keep levels of radioactive materials and gaseous wastes as low as practicable and that annual releases will not exceed a small fraction of the annual average concentration limits specified in 10 CFR 20. These efforts shall include consideration of meteorological conditions during releases.

TABLE 2-1

ANALYTICAL METHODS*

Parameter	"Standard Methods" Number	Detection Limit
Ammonia	132B	0.005 mg/1
Boron	107A	0.1 mg/1
Chloride	112B	0.5 mg/1
Chlorine	114F or 114B	0.01 mg/1
Dissolved Oxygen	218F	0.1 mg/1
Hardness	122B	1 mg/1
Hydrazine	Hall Laboratories Procedure 241-B	0.002 mg/1
Iron	Hall Laboratories Procedure 208-F or	0.005 mg/1
	Hach Colorimeter Model DR and 1, 10 phenanthroline	0.1 mg/1
Manganese	128C	0.005 mg/1
pH	144A	0.1-13.9 pH Units
Phosphate	223D or Hall Laboratories Procedure 126F	0.2 mg/1
Soluble Silica	Hall Laboratories Procedure 100-F or Silica Molybdate Method and Hach Colorimeter Model DR	2 mg/1
		1 mg/1
Specific Conductance	154	1 µmho/cm
Sulfate	156C or Barium Sulfate Method and Hach Model DR Colorimeter	5 mg/1

TABLE 2-1 (Cont'd)

Parameter	"Standard Methods" Number	Detection Limit
Turbidity	163B or Hach Model DR Colorimeter	25 JTU 10 JTU
Nitrogen, Nitrite	134	0.005 mg/ml
Copper	Hall Laboratories Procedure 207-F	0.001 mg/ml

*Procedures based on "Standard Methods Tests" may be used, if it can b demonstrated (with calibration data and records) that the procedure used is at least as sensitive as the Standard Method Test listed.

Where two procedures having different detection limits are given the less sensitive method may be used; if it is estimated that the parameter being measured is within the sensitivity of that procedure. If the parameter is found to be of the same magnitude or below the limit of detection of the procedure used, then the parameter will be remeasured using the more sensitive procedure.

TABLE 2-2

MINIMUM SAMPLING FREQUENCY

Item	Check	Frequency	Sensitivity of Waste Analysis in Lab[3]
1. Filtered Waste Monitor Tank, Treated Waste Monitor Tank, and Laundry Drain Tank	a. Gross Beta and Gamma Gamma isotopic analysis	a. Prior to release of each batch	a. 10^{-7} µCi/ml Gamma Nuclides 5×10^{-7} µCi/ml[4]
	b. Radiochemical Analysis Sr 89, 90	b. Monthly	b. 10^{-8} µCi/ml
	c. Dissolved Noble Gases	c. Monthly	c. Dissolved Gases 10^{-5} µCi/ml
	d. Tritium	d. Monthly Proportional Composite[2]	d. 10^{-5} µCi/ml
	e. Gross Alpha Activity	e. Monthly Proportional composite	e. 10^{-7} µCi/ml
	f. Ba-La-140, I-131	f. Weekly Proportional Composite[2]	f. 10^{-6} µCi/ml
2. Waste Gas Decay Tank	a. Gamma Isotopic Analysis	a. Prior to release of each batch	a. 10^{-4} µCi/cc
	b. Gross Gamma Activity	b. Prior to release of each batch	b. 10^{-11} µCi/cc
	c. Tritium	c. Prior to release of each batch	c. 10^{-6} µCi/cc
3. Unit Vent Sampling	a. Iodine Spectrum[1]	a. Weekly	a. 10^{-11} µCi/cc

TABLE 2-2 (Cont'd)

MINIMUM SAMPLING FREQUENCY

Item	Check	Frequency	Sensitivity of Waste Analysis in Lab[3]
4. Unit Vent Sampling (Cont'd)	b. Particulates[3]		
	1) Gross Beta and Gamma Activity	1) Weekly	1) 10^{-11} µCi/cc
	2) Gross Alpha Activity	2) Quarterly on Weekly Sample	2) 10^{-11} µCi/cc
	3) Gamma Isotopic Analysis	3) Monthly Composite	3) 10^{-10} µCi/cc
	4) Radiochemical Analysis Sr 89, 90	4) Quarterly Composite	4) 10^{-11} µCi/cc
	5) Ba-La-140, I-131	5) Weekly	5) 10^{-10} µCi/cc
	c. Gases		
	1) Gross γ Activity	1) Monthly[5]	1) 10^{-6} µCi/cc
	2) Tritium	2) Quarterly	2) 10^{-6} µCi/cc
5. Reactor Building Purge	a. Gamma Isotopic Analysis	a. Each Purge	a. 10^{-4} µCi/cc
	b. Gross Gamma Activity	b. Each Purge	b. 10^{-11} µCi/cc
	c. Tritium	c. Each Purge	c. 10^{-6} µCi/cc

TABLE 2-2 (Cont'd)

MINIMUM SAMPLING FREQUENCY

(1) When activity level exceeds 10 percent of the limits of Specification 2.4.2.3, the sampling frequency shall be increased to a minimum of once each day. When the gross activity release rate exceeds one percent of maximum release rate and the average gross activity release rate increases by 50 percent over the previous day, an analysis shall be performed for iodines and particulates.

(2) A proportional sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged from the plant.

(3) The detectability limits for activity analysis are based on the technical feasibility and on the potential significance in the environment of the quantities released. For some nuclides, lower detection limits may be readily achievable and when nuclides are measured below the stated limits, they should also be reported.

(4) For certain mixtures of gamma emitters, it may not be possible to measure radionuclides in concentrations near their sensitivity limits when other nuclides are present in the sample in much greater concentrations. Under these circumstances, it will be more appropriate to calculate the concentration of such radionuclides using observed ratios with those radionuclides which are measurable.

(5) Analyses shall also be performed following each refueling, startup or similar operational occurrence which could alter the mixture of radionuclides.

TABLE 2-3

CONCENTRATIONS OF CHEMICAL PARAMETERS PERMITTED BY THE ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY - REGULATION NO. 2, SEPTEMBER 26, 1973

PARAMETER	CONCENTRATION PERMITTED
Turbidity	No distinctly visible increase
pH	6.0-9.0 Must not fluctuate in excess of 1.0 pH unit in 24 hours.
Dissolved oxygen	Not less than 5 mg/1 except when of natural origin and beyond control of user.
Toxic substances	Shall not be present in receiving waters in such quantities as to be toxic to human, animal, plant or aquatic life or to interfere with the normal propagation of aquatic life.
Mineral quality	Existing mineral quality shall not be altered by municipal, industrial, agricultural or other waste discharges so as to interfere with other beneficial uses. The following maximum limits shall apply for the minimal quality parameters designated:
	Chlorides 250 mg/1
	Sulfates 120 mg/1
	Total Dissolved Solids 750 mg/1

The following are not listed in Regulation No. 2, but are suggested maximum concentrations.

	Mg/1
Boron	0.1
Iron	0.3
Manganese	0.05
Ammonia	0.05
Chlorine	0.10
Copper	0.02

3.0 DESIGN FEATURES AND OPERATING PRACTICES

3.1 Intake System

A velocity of 1.5 fps will occur in the intake canal from Illinois Bayou. Velocities greater than 2.0 fps are expected to exist at the intake screens. Therefore loss of fish due to impingement against the intake screens is expected to occur. Monitoring specified in 4.1.2 shall permit a quantitative assessment of the impact and an early identification of the need, if any, for corrective action or modifications to the intake system.

3.2 Discharge System

There are no design features or operating practices pertaining to the discharge system not covered in Section 2 which would have a significant adverse effect on the environmental impact if changed.

3.3 Chemical Usage

Table 3-1 lists the estimated chemical usage and expected discharges. If actual usage exceeds estimated usage by more than a factor of 3.0 or if other chemicals must be used, environmental effects of such chemical usage shall be re-evaluated and shall be reported in accordance with Specifications 5.6.2.

3.4 Plant Shutdown

The rate of change of the condenser discharge water temperature is limited by Specification 2.1.4 to protect aquatic organisms from thermal shock as a result of plant shutdown.

3.5 Land Management

Transmission line rights-of-way have low growing species of cedar, sumac, oak and shrubs as a screen and to assist with erosion control. Planting of grass and clover shall be carried out to further prevent erosion. Further plantings of game food and cover shall be made in cooperation with landowners and the Arkansas Game and Fish Commission. No herbicides shall be used for land management on transmission line rights-of-way.

The grounds in the immediate vicinity of the plant building shall be landscaped. Remaining portions of the plant site shall be allowed to remain in their present wild state with the exception of the area on which the visitors center will be located. This area is located approximately 0.7 mile northeast of the Reactor Building on a hill overlooking the plant.

TABLE 3-1

CHEMICALS DISCHARGED IN CIRCULATING COOLING WATER TO LAKE DARDANELLE

Chemical	lb/day	Increment Added to 383,000 GPM* Discharge Flow (Mg/l)	Average Concentration of Chemical Present in Lake, Mg/l	Chemical Use
Na^+	148	0.04	70	Demineralizer Regenerant (NaOH)
K^+	0.01	0.001	4.5	Removed from Makeup Water
NH_4^+	165	0.04	NA**	Control of Condensate pH
Ca^{2+}	9	0.002	36	Removed from Makeup Water
Mg^{2+}	1	0.002	7	Removed from Makeup Water
Fe^{2+}	0.05	0.0001	0.38	Removed from Makeup and Condenser
Cu^{2+}	15.3	0.004	NA	Removed from Condensate
Mn	0.03	0.0001	0.05	Removed from Makeup Water
Cl^-	455	0.10	97	Removed from Makeup Water
HCO_3^{2-}	12	0.002	110	Removed from Makeup Water
SO_3^{2-}	34	0.008	NA	Demineralizer Regenerant (Na_2SO_3)
SO_4^{2-}	670	0.14	38	Demineralizer Regenerant (H_2SO_4)
SiO_2	4	0.0008	6.2	Removed from Makeup Water

TABLE 3-1 (Cont'd)

CHEMICALS DISCHARGED IN CIRCULATING COOLING WATER TO LAKE DARDANELLE

Chemical	lb/day	Increment Added to 383,000 GPM* Discharge Flow (Mg/l)	Average Concentration of Chemical Present in Lake, Mg/l	Chemical Use
B^-	560	0.1	0.08	Neutron Absorber Processed Through Liquid Radwaste
LiOH	29.4	0.006	NA	Primary System pH Control
N_2H_4	122	0.02	NA	Oxygen Scavanger in Condensate
Detergents	10	0.002	NA	Laundry and Plant Cleanup

* A minimum of two pumps will be run (Approximately 383,000 GPM) at all times during discharge.

* NA = Not Analyzed

4.0 ENVIRONMENTAL SURVEILLANCE

The surveillance program provides an examination of the aquatic ecosystem of Lake Dardanelle in the vicinity of the plant as well as providing information on air, precipitation, ground water, soil, vegetation and milk by radiological analysis of samples in the area of the plant.

Since the aquatic ecosystem is the most likely to be affected both chemically and radiologically by plant operation, more emphasis has been placed on its surveillance. The waters of Lake Dardanelle are subjected to frequent chemical and radiological analyses. Organisms that live in the lake are studied biologically and subjected to radiological testing. Studies are also made on the effects of impingement and entrainment of organisms in the cooling water system. Provision is also made for temperature monitoring and controlling the rate of change in water temperature (Specification 2.1.4).

Results of the program, including the reports submitted in accordance with Specification 5.6, will be reviewed as specified in 5.3.

4.1 Nonradiological Environmental Surveillance

4.1.1 Abiotic

a. Aquatic

Lake water shall be sampled and analyzed as discussed below. Table 4-6 summarizes the Lake water chemical sampling locations and schedule.

(1) Chlorine

Objective:

To determine the levels of chlorine concentration in station effluent water.

Specification:

(a) Samples shall be taken twice weekly at the outlet of the discharge canal during chlorination periods and analyzed for chlorine and chloramines according to Table 2-1. (See specification 2.3.1.a)

(b) If total chlorine concentration in the discharge canal exceeds 0.1 mg/l, chlorine feed shall be reduced to a rate that results in a concentration in the discharge

canal of less than 0.1 mg/l chlorine, and immediate sampling and chlorine analyses shall begin at Points 1, 18, 5, and 9 shown in Figure 4-3.

Reporting Requirements:

If total available chlorine residual is found to be 0.1 mg/l or above at any of the Points 1, 18, 5, or 9 (shown on Figure 4-3), a report shall be made according to Specification 5.6.2.

Bases:

Chlorination of circulating cooling water shall be intermittent. Only one-half the condenser will be chlorinated per chlorination period. This arrangement will provide both dilution and additional chlorine demand to prevent excessive chlorine concentrations.

(2) Corrosion Inhibitors

Objective:

To insure that the sodium nitrite based corrosion inhibitor used in the plant closed cooling water systems does not enter the Reservoir in such concentrations as to be harmful to aquatic biota.

Specifications:

(a) Samples shall be taken weekly from the intake and discharge canals and shall be analyzed for nitrite nitrogen according to Table 2-1. Weekly samples shall be taken near or upstream of Point 20 (shown on Figure 4-3) coincident with sampling of intake and closed cooling water samples and shall be analyzed for nitrite to determine if recirculation is occurring.

(b) Samples of the closed cooling water system shall be analyzed for inhibitor weekly according to the manufacturer's instructions to determine leakage from this system.

Reporting Requirements:

If discharge canal samples show a concentration of 0.005 mg/l of nitrite nitrogen or more after subtracting the concentration of nitrite nitrogen found in the intake canal or Point 20 samples (whichever is smaller), a report shall be made in accordance with Specification 5.6.2.

Bases:

Under normal conditions, no sodium nitrite based corrosion inhibitor will be discharged to the Reservoir. Any abnormal leakage should be detected either in the discharge canal or by inhibitor analysis in the cooling system. Any leakage of sodium nitrite from the closed cooling water system will most probably find its way to the discharge canal. By sampling the intake canal and Point 20, a determination can be made of any nitrite present in the lake water from sources other than plant operation. Specification 2.3.2 requires that no sodium nitrite be discharged. 0.005 mg/l is the detection limit for the nitrite nitrogen test.

(3) Dissolved Oxygen:

Objective:

To determine levels of dissolved oxygen concentration in the Reservoir water and the effects of station effluents thereon.

Specifications:

(a) Dissolved oxygen analysis shall be made at all sample points shown in Figure 4-3 on a monthly basis.

(b) Analyses shall be made at the one and two foot depths and at five foot intervals thereafter to the bottom.

(c) Analysis shall be made using a polarographic membrane electrode with Yellow Springs Instruments Model 54 or equivalent. The instrument shall be calibrated just prior to and immediately following analyses made, according to Table 2-1.

Reporting Requirements:

If dissolved oxygen is found to be less than 5 mg/l a report shall be made according to Specification 5.6. 2.

Bases:

Monthly analyses of dissolved oxygen will provide information on changes in concentration caused by naturally occurring seasonal changes as well as any changes brought about by station operation.

Sampling locations were chosen to provide information about the intake and discharge of station cooling water and its effect on dissolved oxygen in the Reservoir water. Arkansas Department of Pollution Control and Ecology Regulations require that dissolved oxygen not be less than 5 mg/l except when periodic lower values are of natural origin and therefore beyond the control of the water user.

(4) Suspended and Total Dissolved Solids

Objective:

To insure that suspended and total dissolved solids do not enter the Reservoir in such concentrations as to be harmful to aquatic biota.

Specification:

Samples of the intake and discharge canals shall be analyzed weekly for turbidity and specific conductance in accordance with the methods contained in Table 2-1. At least two circulating water pumps shall be operating when samples are taken.

Reporting Requirements:

If the specific conductivity of the effluent in the discharge canal is found to be 10% greater than that of the water in the intake canal, the water in the discharge canal shall be resampled and analyzed for total dissolved solids (TDS). If the TDS is increased more than that specified in Table 2-3 or if the turbidity of the effluent is found to be 10% greater than that of the intake water, then a report shall be made in accordance with Specification 5.6.2.

Bases:

The plant is not expected to contribute any significant amounts of suspended solids. Dissolved solids will be diluted sufficiently to prevent their harmful concentration.

Turbidity and conductivity are accepted methods for determining suspended and dissolved solids, respectively, and a 10% increase in samples from the discharge compared to intake samples will be considered significant and may be attributed to plant operation since plant discharges are directed to the discharge canal. Determinations can be made on the same samples taken weekly for other parameters.

(5) Demineralizer Regeneration Wastes

Objective:

To insure that demineralizer regeneration wastes are not discharged in such concentrations as to be harmful to aquatic biota.

Specification:

(a) All demineralizer waste discharges shall be diluted by plant cooling water during release. No release of demineralizer waste shall be made without at least two Unit 1 circulating water pumps operating.

(b) The pH of discharges into the circulating water systems shall be maintained between 6.0 and 9.0. Records shall be maintained on the pH of these discharges.

(c) Weekly analyses shall be made on samples taken during discharge from the intake canal and Point 20 shown on Figure 4-3 and the discharge canal for ammonia, hardness, iron, manganese, copper, chloride, sulfate, silica, boron and hydrazine by the methods given in Table 2-1.

Reporting Requirements:

If, after the concentrations of the parameters given in (c) above present in the intake canal or Point 20 are subtracted from their concentration in the discharge canal, the concentration of any of these parameters equal or exceed the concentrations listed below, a report shall be made in accordance with Specification 5.6.2.

Parameter	Concentration
Ammonia	*0.05 mg/l
Iron	*0.3 mg/l
Manganese	*0.05 mg/l
Chloride	*25 mg/l
Sulfate	*50 mg/l
Boron	*0.1 mg/l
Hydrazine	**0.05 mg/l

* Criteria recommended by Arkansas Department of Pollution Control and Ecology.

** Criteria not established.

Bases:

Dilution of wastes by plant cooling water and weekly analyses will insure that recommended concentrations are not exceeded. Sampling the intake canal and Point 20 will determine the concentrations of the listed parameters present in the lake water from sources other than plant operation. Differences in concentrations at Point 20 and the intake will determine if recirculation is occurring. By subtracting these concentrations from concentrations in the discharge, the concentrations of listed parameters attributable to plant operation may be determined.

The parameters selected will be present in the plant discharge.

(6) Water Quality

Objective:

To determine effects of plant operation on the physical and chemical parameters at selected points covered in the pre-operational background surveys.

Specification:

(a) Monthly samples will be taken at points shown on Figure 4-3 and subjected to chemical tests listed in Table 4-5.

(b) Physical measurements listed in Table 4-4 will be made monthly.

Reporting Requirements:

These measurements are made by personnel of the University of Arkansas at Little Rock and results will be reported in the Semiannual Report of the UALR Project and will be included in reports filed under Specification 5.6.1.

Bases:

This program is essentially a continuation of the Dardanelle Background Survey begun by the University of Arkansas at Little Rock in 1968.

(7) Thermal Measurements

Objective:

To determine the effects of plant operation on the temperature of the Reservoir in those areas most likely to be affected.

Specification:

(a) Monthly samples shall be taken at points shown in Table 4-3.

(b) Samples shall be taken at one, two, five, and seven feet below the surface, and at five-foot intervals from that point to the bottom elevations.

(c) Readings shall be made with an approved multi-thermister measuring probe and instrument.

Reporting Requirements:

Same as "Water Quality" above.

Bases:

Same as "Water Quality" above.

(8) Erosion

Not applicable.

b. Terrestrial

Not applicable.

4.1.2 Biotic

a. Aquatic

(1) General Ecological Survey

Objective:

The purpose of this survey is to provide information on the compatability of Arkansas Nuclear One (ANO) with the planktonic, nektonic, and benthic populations of the Dardanelle Reservoir.

Preoperational monitoring studies have been conducted since 1968, approximately five years prior to operation of Unit 1. These studies served as a basis for development of the

operational monitoring program described herein. The operational monitoring shall begin with the operation of Unit 1 and shall continue for five years after Unit 2 goes into operation. The effects of plant operation shall be determined by comparison of ecological parameters studied in the preoperational program.

Survey Plan

A map of the survey area showing sampling locations is presented in Figure 4-3. The type and frequency of field sampling shall be as presented in Table 4-3.

Specification

(a) Biological Surveys

1) Plankton

Plankton samples shall be obtained by use of the Wisconsin plankton net. These samples shall be analyzed for plankton (fauna, periphyton, filimentous algae) count and these counts will indicate numbers of organisms per liter of water sample as determined by the strip count method.

2) Benthic Organisms

The bottom organisms shall be obtained by the use of the Ekman dredge. The number of specimens of each group will be listed by sampling areas. Counts shall be made for the number of organisms per one-fourth square foot. Analysis of the plankton and benthic organisms will provide important information regarding the food chain.

3) Fish Survey

a) Gill Net Survey

A fish population and fish species count shall be taken with sizes noted, through the use of gill and trammel nets. A minimum of 16 net-nights' sampling will be accomplished within four consecutive days every quarter. Spines, scale samples, and length/weight frequencies shall be obtained for representatives of each species.

b) Trawling Survey

Samples will be taken every other week during March, April, May, and June. Emphasis will be on larval fishes. Relative abundance and species composition will be determined. Spines, scale samples and length/frequencies shall be obtained for representatives of each species. Population count and species shall be reported.

c) Trap Net Survey

Trapnets shall be placed out in the spring and fall each year with lifts made for five (5) consecutive days. Spines, scale samples and length/weight frequencies shall be obtained for representatives of each species. Population count and species shall be reported.

d) Cove Rotenone Survey

The cove rotenone survey using standard procedures approved by the Arkansas Game and Fish Commission shall take place in sample area 18 and "control area" 19 in September. Spine, scale samples and length/weight frequencies shall be obtained for representatives of each species, and growth rate shall be determined. Population counts shall be reported.

e) Shoreline Seine Surveys

Shoreline seining shall provide data on fish spawning and fingerling population. The positions for shore-line seining operations shall be chosen in areas characteristic of fish spawning. This, along with the trawling survey, will provide information relative to the peak spawning period and the relative abundance of these fishes. This operation shall take place during spawning season (March and April) and in May to survey fingerlings.

f) Fish Cage Survey

Cages containing mussels shall be placed at sample stations shown in Table 4-3 and marked for recovery. Mussel samples shall be recovered semi-annually and retained for radiological testing.

Reporting Requirement

This survey shall be carried out by:

(a) The University of Arkansas at Little Rock (UALR)
(b) Arkansas Polytechnic College, Russellville, Arkansas
(c) Arkansas Power & Light Company

Annual meetings shall be held to discuss the results of the survey and, if necessary for better data, make modifications in the survey.

Reports shall be provided to AP&L at least every six months and copies shall be distributed to the Arkansas Department of Pollution Control and Ecology, UALR, U. S. Corps of Engineers, U. S. Department of Interior (Bureau of Sports Fisheries and Wildlife), Arkansas Game and Fish Commission, U. S. Environmental Protection Agency, U. S. Atomic Energy Commission, the Arkansas State Department of Health, (Bureau of Environmental Health Services).

Bases:

The purpose of the proposed programs is to monitor possible influences by Arkansas Nuclear One on aquatic life in Lake Dardanelle. The programs are set up so as to sample various levels in the food chain to detect any abnormalities in number, distribution, size, or physical characteristics of the organisms.

Sample stations were selected at various points in the area around the site so that data could be collected and a range of plant influence could be determined. By selecting points at the intake and discharge coves, direct changes in the lake water can be observed. The points upstream and in the Illinois Bayou were selected to monitor upstream aquatic life and plant influence. Stations were selected at scattered locations throughout the river channel so that ANO effects could be surveyed.

Frequencies of sampling were chosen to obtain a trend of aquatic life in the area. Most fish surveys are set up to be conducted in the summer because the fish are more plentiful at this time of year. It is felt that more frequent sampling of the organisms would produce repetitive data. However, less frequent sampling might yield erratic data from which no trend could be detected.

The data will be evaluated in relation to preoperational data obtained by AP&L, UALR, Ark, Tech., and various governmental agencies. By comparing preoperational data with postoperational data, changes in the environment can be detected. It is felt that in this way effects on the aquatic life by ANO can be monitored and controlled.

(2) Impingement of Organisms

Objective:

The objective is to monitor those fish impinged on the intake screens to permit a quantitative assessment of impingement impacts. Potential impacts of concern are effects on the fishery resource and dissolved oxygen resource of Lake Dardenelle. If these impacts are significant, appropriate state and federal agencies responsible for fisheries shall be consulted, and the necessary modifications to the intake system shall be implemented to satisfactorily reduce these impacts.

Specification

Fish trapped on all of the intake screens will be sluiced to a collection basket where they will be identified, counted, and weighed following an eight (8) hour sampling period once every four days. Tabulations of this data will be made. If the number of fish impinged on any given sampling day exceeds 700 pounds, sub-sampling shall be used to determine certain parameters of interest regarding the impinged fish, such as length/weight measurements. If the projected fish kill on the screens exceeds 3000 lbs/day based upon eight hour sampling, then a report will be made in accordance with Specification 5.6.2.

After the data are taken, the fish will be dumped into the trash grinder and discharged back into the outfall. If this intended disposal method produces visible waste on the surface of the discharge embayment of Lake Dardenelle oxygen demand (BOD) with a commensurate decrease in dissolved oxygen (DO), then alternate disposal methods such as land fill disposal shall be used.

Each day that the fish-kill on the screens exceeds 2000 lbs/day, samples of water in the discharge embayment shall be taken during the grinding operation and analyzed for BOD and DO.

Reporting Requirements:

Weekly tabulations of data on species, quantity and weight of fish collected on intake screens will be reported on a semiannual basis.

(3) Entrainment of Plankton, Eggs and Larval Forms

Objective:

The purpose of the entrainment survey is to determine the thermal and mechanical effects of the cooling water system on the various kinds and quantities of larvae, eggs, and plankton taken into the plant water system.

Specification:

Biological samples (organisms) of bottom samples and water samples were taken at 6-month intervals prior to plant operation and shall be taken at one-month intervals after operation at the intake and discharge locations. Pelagic larval fishes shall be sampled by trawling with a fish larval net also in the intake and discharge areas.

Reporting Requirement:

If the samples taken indicate a significant detrimental effect on these organisms such as radically increased radioactivity or drastically reduced population and these factors can be traced to ANO, whether due to pressure changes, thermal shock, mechanical stress or biocide exposure, appropriate action shall be taken to assure that these effects will not ultimately affect survival of the organism or its population. For additional information on the monitoring of these organisms, see Specification 4.1.2, General Ecological Survey.

(b) Terrestrial

Not applicable.

(c) Aerial

Not applicable.

4.2 Radiological Environmental Monitoring

Objective:

To provide information on the radiological effects of station operation on the environment.

Specification:

An environmental radiological monitoring program shall be carried out as defined in Tables 4-1 and 4-2 at locations defined in Figure 4-1 and Table 4-2.

4.2.1 Air Sampling

Continuous air sampling shall be performed at four locations onsite, two off-site within a ten-mile radius of the Plant, and one reference location. Locations have been selected near site boundaries and in existing populated areas for evaluation of possible exposure to airborne particulate and halide radioactivity resulting from station operation. The collection devices for iodine shall contain potassium iodide impregnated charcoal or equivalent, and shall be constructed and operated so as to retain quantitatively the iodine in the air passing through the device. Appropriate analyses of particulate filters and halide collection devices shall be performed on all samples in accordance with accepted techniques and nuclides of interest.

4.2.2 Direct Radiation

Ambient levels of direct external radiation shall be measured at the same locations as air particulate. Measurements shall be made by exposing Harshaw TLD 100 (LiF) and TLD 200 (CaF) thermoluminescent dosimeters for periods of three months and six months, respectively.

4.2.3 Precipitation Sampling

Precipitation sampling shall be carried out at four locations; two onsite, one within a ten-mile radius, and one reference location approximately twenty miles southwest of the plant. Analyses shall be performed as given in Table 4-1.

4.2.4 Lake Dardanelle

Samples of lake water shall be taken monthly from the mouth of the discharge canal and at various points in the Reservoir as shown in Table 4-2 and Figure 4-1. Appropriate analyses shall be performed in accordance with accepted techniques and nuclides of interest as given in Table 4-1. The status of plant discharge operations shall be recorded and correlations between discharge operations and measured levels of radioactivity in the environment noted.

4.2.5 Ground Water Sampling

Samples shall be taken quarterly from one onsite well and two offsite wells within a five-mile radius of the plant. One of the offsite wells is a water supply well for the town of London. Locations of the wells shall be as shown in Figure 4-1, and the analysis shall be performed as shown in Table 4-1.

4.2.6 Russellville City Water

City water shall be sampled monthly at the system intake on the Illinois Bayou. Samples shall be analyzed for gross alpha and beta, gamma emitting isotopes as shown in Table 4-1. Tritium and radiostrontium* shall be performed quarterly on composite samples.

4.2.7 Reservoir Bottom Sediments

Samples shall be taken semi-annually with a 9-inch by 9-inch Ekman Dredge at the same points as lake water samples are taken. Analyses and samples size shall be as shown in Table 4-1.

4.2.8 Aquatic Biota

Samples of fish, plankton, benthic organisms, and underwater plants as available, shall be taken semi-annually at or near the same points where bottom sediment samples are taken. Appropriate analyses of all samples shall be performed in accordance with accepted techniques and nuclides of interest as given in Table 4-1.

4.2.9 Fish Bone

Samples of fish bone from the fall aquatic biota sampling period shall be retained and analyzed for Strontium 89-90 each year.

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* Radiostrontium analysis includes identification of Sr 89 and 90.

4.2.10 Milk Sampling

Samples of milk shall be collected monthly from the Kirkpatrick farm approximately eight miles west-northwest, from the Sims farm 4.8 miles northwest of the plant and from the Arkansas Tech. Herd 5 miles east. Samples shall be analyzed for Iodine-131, Strontium 89-90 and gamma emitting isotopes.

The area within five (5) miles of the plant shall be surveyed semi-annually for the locations of animals (cows, goats) producing milk for human consumption. The results of this survey shall be included in the Semiannual Operating Report required by Specification 5.6.1. These locations shall be included in the milk sampling program as soon as the necessary arrangements can be made. The sampling frequency for locations nearer than three (3) miles shall be every two weeks during the grazing season and locations nearer than 1.5 miles shall be sampled weekly during the grazing season. Each sample shall be analyzed for I-131 as in Table 4-1, and monthly composites shall be analyzed for radiostrontium and gamma emitters.

4.2.11 Vegetation Sampling

Grass and the leafy portions of other natural vegetation available at each of the air sampling stations shall be collected three times per year (spring, summer, and fall). Food crops and pasturage in the vicinity of the plant also shall be collected as available at harvest time. Appropriate analyses of all samples shall be performed in accordance with accepted techniques and nuclides of interest as given in Table 4-1.

4.2.12 Soil Sampling

Soil samples shall be collected semi-annually at the same locations as vegetation samples and analyzed for gross alpha and gross beta and gamma emitting isotopes as described in Table 4-1. The Fall sample also shall be analyzed for Strontium 89-90.

Bases:

One of the limiting conditions for operation of Arkansas Nuclear One is restricting environmental effects due to plant operation in unrestricted areas surrounding the plant site to within limits specified in AEC Regulations 10 CFR - Parts 20, 50, and 100. This Radiological Monitoring Program includes measurements made on the air, water, and land environments to insure that these limits are observed.

FIGURE 4-1
SAMPLING LOCATIONS

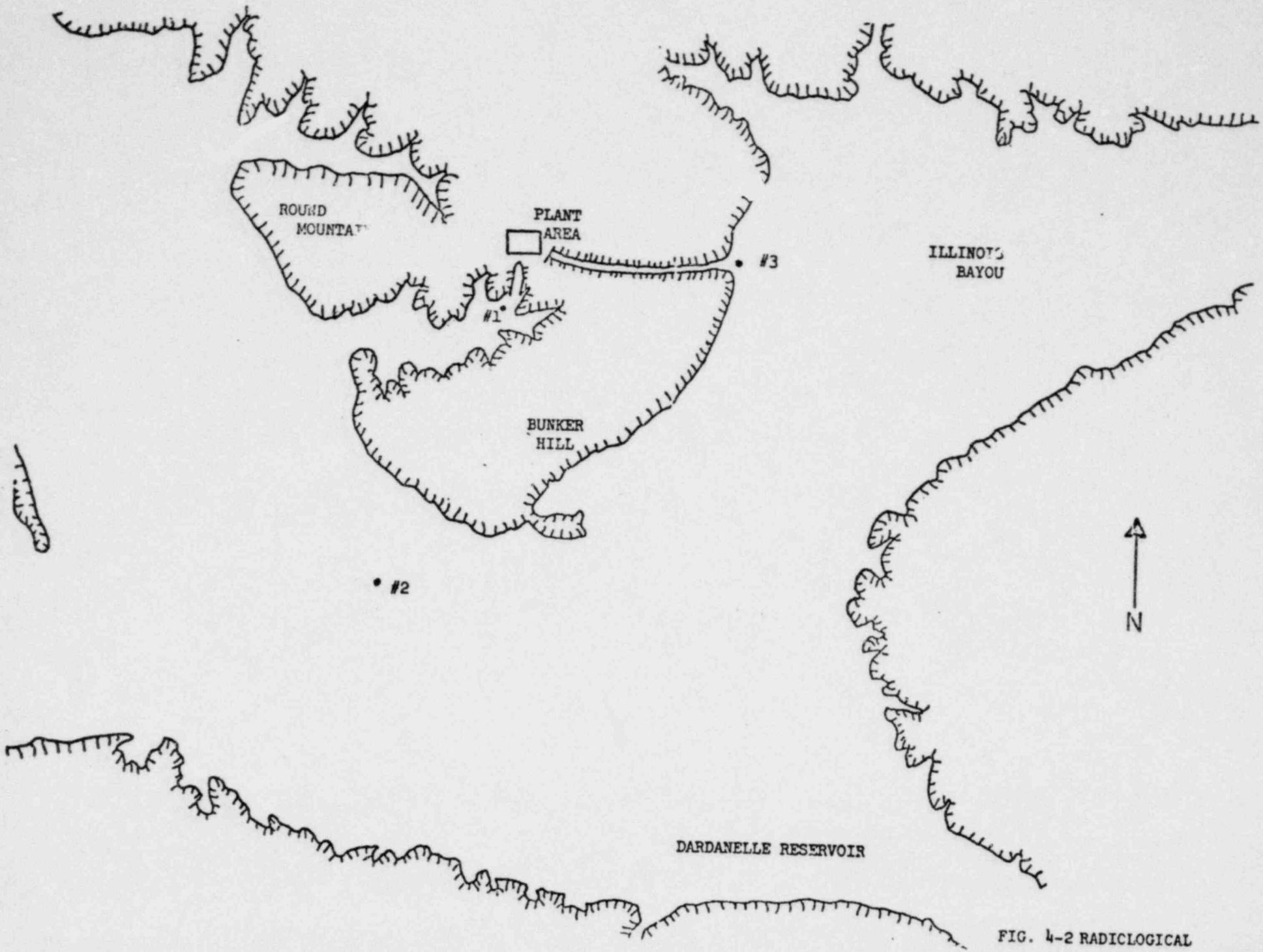

FIG. 4-2 RADICLOGICAL

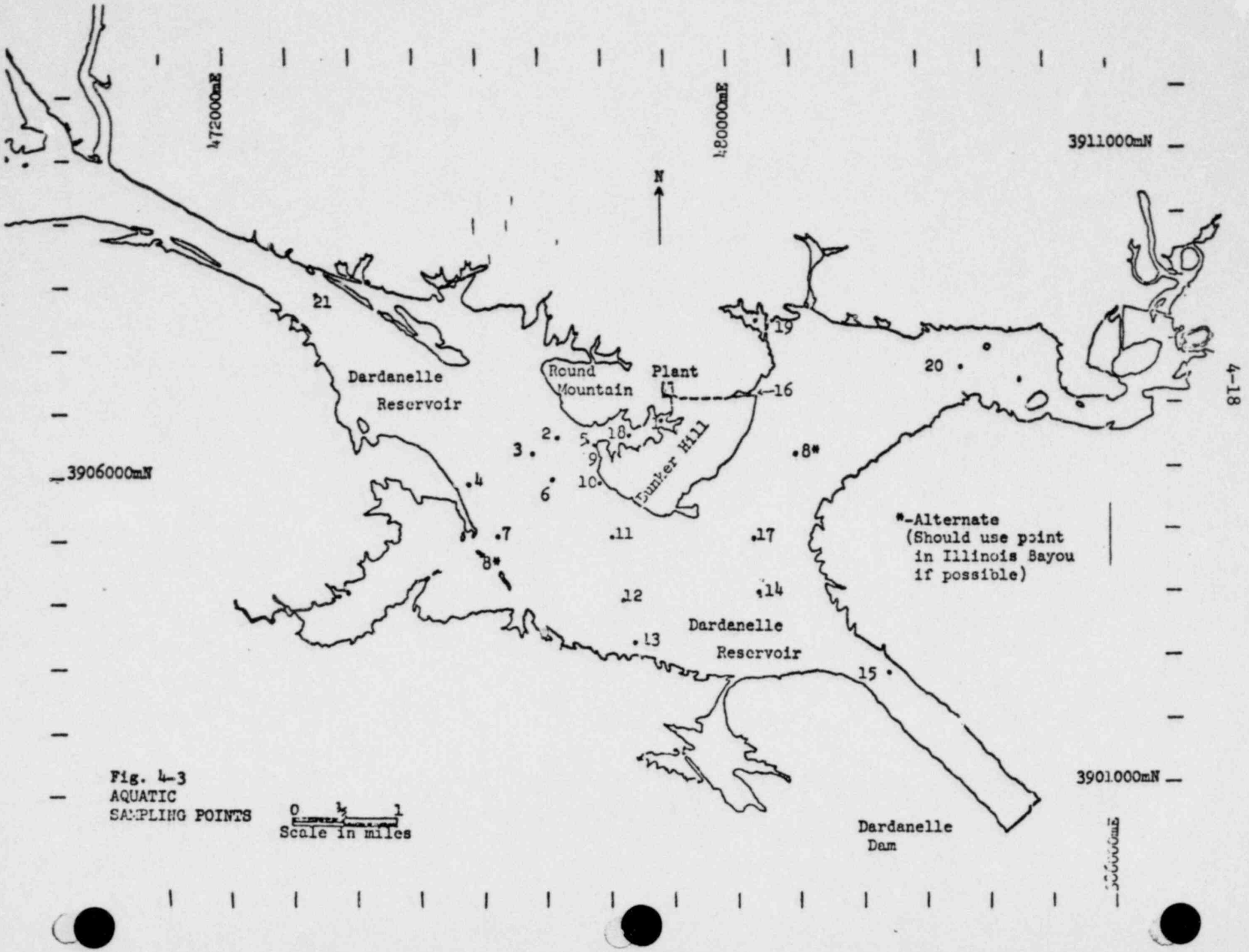

Fig. 4-3
AQUATIC
SAMPLING POINTS

TABLE 4-1

RADIOANALYSES - LISTED BY SAMPLE TYPE

I. AIR

A. Particulate

1. Continuous 7-day samples, filters changes weekly (Eberline Model RAP-1 sample pumps, Gelman 47 mm glass fiber filters, calibrated to one cubic foot per minute ($0.028M^3$/min) air sampling rate), seven (7) locations.

2. Analyses:

a. Gross alpha
b. Gross beta
c. Gamma isotope on a monthly composite (each station) and on high beta levels ($\geq$ 100 DPM/sample)
d. Radiostrontium on quarterly composite if gamma isotopic analysis shows presence of Cs-137.

B. Iodine-131

1. Continuous 7-day samples, activated charcoal filter trap on inlet of air sampler downstream of particulate filter, charged weekly, seven (7) locations.

2. Analyses:

a. Iodine-131

C. Direct Radiation

1. Four (4) thermoluminescent dosimeters (two LiF and two CaF_2), seven (7) locations.

2. Analyses:

a. Change and readout one set (1 LiF and 1 CaF_2) dosimeters quarterly and one set semi-annually.

D. Precipitation

1. Four (4) locations, samples collected weekly (as available).

2. Analyses:

a. Gross beta
b. Gamma isotopic

II. WATER

A. Lake Water

1. Samples (two gallons) monthly from five (5) locations (discharge canal, intake canal, and lake south of plant between discharge and intake). (Sample stations 8, 9, 10, 15, 16)

2. Analyses:

a. Gross beta (monthly)
b. Gamma isotopic (monthly if gross beta exceeds 30 pCi/L and on quarterly composites)
c. Tritium (quarterly composites)
d. Radiostrontium (quarterly composites)

B. Bottom Sediments

1. Samples (~Kg) semi-annually from near the same locations as lake water. Station 15 sample to be taken in pool above dam.

2. Analyses:

a. Gamma isotopic
b. Radiostrontium (annual composites)

C. Ground Water

1. Samples (two gallons) quarterly from one onsite and two offsite wells.

2. Analyses:

a. Gross alpha
b. Gross beta
c. Gamma isotopic
d. Tritium

D. Russellville City Water

1. Samples (two gallons) monthly from system intake.

2. Analyses:

   a. Gross alpha
   b. Gross beta
   c. Gamma isotopic
   d. Tritium (quarterly composite)
   e. Radiostronium (quarterly composite)

E. Aquatic Biota

1. Semi-annual samples are taken as available at or near the same sample points as lake water and bottom sediments. Samples will be as large as practicable not to exceed 2Kg.

2. Analyses:

   a. Gross beta (plankton)
   b. Gamma isotopic (fish flesh, plankton, benthic organisms, aquatic plants)
   c. Radiostrontium (benthic organisms, aquatic plants)

F. Fish Bone

1. Annual samples (≈500g bone) in the Fall. Sampled as in E.1 above.

2. Analyses:

   a. Strontium 89-90

III. TERRESTRIAL

A. Milk

1. One gallon samples will be taken monthly from farms or dairies within a ten-mile radius of the plant.

2. Analyses	Frequency (see 4.2.10)
a. Iodine-131	Monthly
b. Strontium 89, 90	Quarterly
c. Gamma isotopic	Monthly

B. Vegetation

1. Samples (≈1Kg) of grass and leafy portions of other vegetation in the the vicinity of the seven air sampling locations are taken in the Spring, Summer, and Fall seasons.

2. Similar samples of pasturage vegetation within a ten-mile radius of the plant will be taken at time coinciding with those of 1. above.

3. Analyses:

   a. Radioiodine (upon collection)
   b. Gamma isotopic

C. Soil

1. Samples (≈1.5 liters) are taken at each of the air sampler sites semi-annually.

2. Analyses:

   a. Gamma isotopic
   b. Strontium 89-90 are determined annually.

TABLE 4-1a

DETECTION LIMITS

	Air Particulate pci/m^3	Fish pci/kg	Aquatic Organisms pci/kg	Veg. Terrest. pci/kg	Soil Bot. Sed. pci/kg	Water pci/l	Milk pci/l
H^3	---	---	---	---	---	30	---
Be^7	7×10^{-2}	200	200	200	400	80	150
K^{40}	10^{-1}	300	300	300	500	100	200
Mn^{54}	10^{-2}	50	50	50	70	10	20
Fe^{55}		20	20	20	20	10	20
Co^{58}	10^{-2}	50	50	50	70	10	20
Fe^{59}	2×10^{-2}	100	100	100	130	20	40
Co^{60}	10^{-2}	50	50	50	70	10	20
Zn^{65}	2×10^{-2}	100	100	100	130	20	40
Sr^{89}		25	25	25	25	5	5
Sm^{90}		5	5	5	5	1	1
Zr^{95}-Nb^{95}	5×10^{-3}	30	30	30	50	5	10
Ru^{106}	2×10^{-2}	70	70	70	100	15	30
I^{131}(a)	10^{-2}	50	50	50	70	10	20
I^{131}(b)						0.3	0.3

TABLE 4-1a (Cont'd)

	Air Particulate pci/m^3	Fish pci/kg	Aquatic Organisms pci/kg	Veg. Terrest. pci/kg	Soil Bot. Sed. pci/kg	Water pci/l	Milk pci/l
Cs^{134}	10^{-2}	50	50	50	70	10	20
Cs^{137}	10^{-2}	50	50	50	70	10	20
Ba^{140} La^{140}	10^{-2}	50	50	50	70	10	20
Ce^{144}	5×10^{-2}	200	200	200	300	40	80
Ra^{226}+Dau	10^{-2}	50	50	50	70	10	20
Th^{228}+Dau.	10^{-2}	50	50	50	70	10	20

(a) Gamma Isotopic Analysis

(b) Radiochemical Separation

TABLE 4-2

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
1	92° - 0.5 miles	Near meteorology tower on site	1) Air Sample	1) Weekly	1) 7-day continuous-weekly
			2) TLD	2) Quarterly 2) Semi-annually	2) Readout and Record at stated frequency
			3) Soil Sample	3) Semi-annually	3) Spring and Fall
			4) Vegetation	4) 3 times/year	4) Spring, Summer, Fall
			5) Precipitation	5) Weekly, as available	
2	235° - 0.5 miles	Near AP&L lodge on site	1) Air Sample	1) Weekly	1) 7-day continuous-weekly
			2) TLD	2) Quarterly 2) Semi-annually	2) Readout and record at stated frequency
			3) Soil Sample	3) Semi-annually	3) Spring and Fall
			4) Vegetation	4) 3 times/year	4) Spring, Summer and Fall
3	4° - 0.4 miles	South of Hershel Bennet home	1) Air Sample	1) Weekly	1) 7-day continuous-weekly
			2) TLD	2) Quarterly 2) Semi-annually	2) Readout and record at stated frequency
			3) Soil Sample	3) Semi-annually	3) Spring and Fall
			4) Vegetation	4) 3 times/year	4) Spring, Summer, Fall
			5) Precipitation	5) Weekly, as available	
4	171° - 0.4 miles	Near the May Cemetery	1) Air Sample	1) Weekly	1) 7-day continuous-weekly
			2) TLD	2) Quarterly 2) Semi-annually	2) Readout and record at stated frequency
			3) Soil Sample	3) Semi-annually	3) Spring and Fall
			4) Vegetation	4) 3 times/year	4) Spring, Summer, Fall

TABLE 4-2 (Contd)

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
5	298° - 8.5 miles	At Ray Walter's residence, Knoxville, Johnson County	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation 5) Precipitation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year 5) Weekly, as available	1) 7-day continuous-weekly 2) Readout and record at stated frequency 3) Spring and Fall 4) Spring, Summer, Fall
6	109° - 6.8 miles	At AP&L's Russellville Local Office	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year	1) 7-day continuous-weekly 2) Readout and record at stated frequency 3) Spring and Fall 4) Spring, Summer, Fall
7	209° - 19.3 miles	At AP&L's Sub-station in Danville, Yell County	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation 5) Precipitation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year 5) Weekly, as available	1) 7-day continuous-weekly 2) Readout and record at stated frequency 3) Spring and Fall 4) Spring, Summer, Fall
8	180° - 0.1 miles	Mouth of Discharge Canal	1) Lake Water 2) Aquatic Biota 3) Bottom Sediments	1) Monthly 2) Semi-annually 3) Semi-annually	1) Record status of plant discharge operations 2) Summer and Winter 3) Summer and Winter

TABLE 4-2 (Contd)

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
9	160° - 1.8 miles	South of Bunker Hill near main river channel	1) Lake Water	1) Monthly	1) Record status of plant discharge operations
			2) Aquatic Biota	2) Semi-annually	2) Summer and Winter
			3) Bottom Sediments	3) Semi-annually	3) Summer and Winter
10	90° - 1.0 miles	Mouth of inlet canal	1) Lake Water	1) Monthly	1) Record status of plant discharge operations
			2) Aquatic Biota	2) Semi-annually	2) Summer and Winter
			3) Bottom Sediments	3) Semi-annually	3) Summer and Winter
11	240° - 0.5 miles	Near AP&L Lodge	1) Ground Water	1) Quarterly	
12	310° - 2.0 miles	London Water Co. off U.S. Highway 64, 0.5 mile west of London, Pope County	1) Ground Water	1) Quarterly	
13	95° - 2.0 miles	Quita Lake Recreation Area on Illinois Bayou off Dyke Road	1) Ground Water	1) Quarterly	
14	65° - 5.8 miles	Inlet to City Water System from Illinois Bayou	1) City of Russellville Water Supply	1) Monthly	
15	150° - 5.0 miles	Discharge of Dardanelle Dam Pool above Dardanelle Dam	1) Lake Water	1) Monthly	1) Record status of plant discharge operations
			2) Bottom Sediments	2) Semi-annually	
			3) Aquatic Biota	3) Semi-annually	

TABLE 4-2

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
16	295° - 6.0 miles	Piney Creek Area	1) Lake Water 2) Bottom Sediment 3) Aquatic Biota	1) Monthly 2) Semi-annually 3) Semi-annually	
17	310° - 4.8 miles	Sims Farm	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer, Fall
18	293° - 8.0 miles	Kirkpatrick Farm	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring. Summer, Fall
19	99° - 5.0 miles	Akansas-Tech. Herd	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer, Fall

TABLE 4-3

AQUATIC SAMPLING LOCATION AND FREQUENCIES

Sample Type	Sample Frequency	Sample Station #
Plankton	Quarterly - January, April July, October	1, 2, 3, 5, 10, 11, 14, 15, 16, 19, 21
Benthic Organisms	Quarterly - January, April July, October	1, 2, 3, 5, 10, 11, 14 15, 16, 19, 21
Gill Net Survey	4 Consecutive days Quarterly - January, April July, October	1, 3, 5, 9, 10, 11, 14, 15, 16, 19, 21
Trawling Survey	Every other week March, April, May, June	1, 3, 5, 9, 10, 11, 16, 19
Trap Net Survey	March, July, August, September, October	1, 3, 5, 9, 10, 11, 16, 19
Cove Rotenone Survey	September	18, 19
Shoreline Seine Survey	Every other week March, April, May, June	1, 3, 5, 9, 10, 11, 16, 19
Fish Cage Survey (Mussels)	Semi-Annually	5, 6, 16, 19
Chemical	Monthly	3, 5, 7, 8, 10, 11, 13, 14, 15, 16, 17, 19
Physical	Monthly	3, 5, 7, 8, 10, 11, 13, 14, 15, 16, 17, 19

TABLE 4-4

PHYSICAL MEASUREMENTS

1. Air Temperature
2. Sky Condition
3. Wind mph
4. Solar BTU Radiation
5. Water Condition
6. Water Level
7. Water Temperature
8. Local Fishing Conditions
   (Commercial Fishing Activity)

TABLE 4-5

CHEMICAL ANALYTICAL METHODS USED IN THE UALR BACKGROUND STUDY

1. Dissolved Oxygen - Yellow springs Model 54 dissolved oxygen meter (Polarographic)
2. PH - Taylor Color Comparator
3. Iron - Hach photoelectric colorimeter Model DR and 1,10 phenanthroline
4. Manganese - Hach Colorimeter Model DR - Cold periodate method
5. Turbidity - Hach Colorimeter, Model DR
6. Chemical Oxygen Demand - Method 220 of "Standard Methods"
7. Total Hardness - Orion Specific Electrode Method
8. Boron - Method 107A, "Standard Methods"
9. Filterable Iron - Method 124A, Procedure 4.(b) "Standard Methods"

TABLE 4-6

LAKE WATER CHEMICAL SAMPLING LOCATIONS AND SCHEDULE

Parameter Measured	Sample Point (Fig. 4-3)	Sample Frequency	Sample Location	Remarks
Chlorine	--	Twice Weekly	Discharge Canal	
	--	Monthly	Sewage Treatment Effluent	
	1	See Remarks	Mouth of Discharge Canal	
	18	See Remarks	Discharge Embayment	Sampled only if total available chlorine residual is found above 0.1 mg/l in Discharge Canal
	5	See Remarks	Mouth of Discharge Embayment	
	9	See Remarks	Immediately Downstream of mouth of Discharge Embayment	
Ammonia	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
Specific Conductance	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
Hardness	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
	1 thru 21	Monthly	See Fig. 4-3	Made as Part of UALR Study

TABLE 4-6 (CONTD)

LAKE WATER CHEMICAL SAMPLING LOCATIONS AND SCHEDULE

Parameter Measured	Sample Point (Fig. 4-3)	Sample Frequency	Sample Location	Remarks
Phosphate	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
Sulfate	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embaym	
Turbidity	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	1-21	Monthly	See Fig. 4-3	Made as Part of UALR Study
Iron	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
	1-21	Monthly	See Fig. 4-3	Made as part of UALR Study
Manganese	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
	1-21	Monthly	See Fig. 4-3	Made as Part of UALR Study

TABLE 4-6 (CONTD)

LAKE WATER CHEMICAL SAMPLING LOCATIONS AND SCHEDULE

Parameter Measured	Sample Point (Fig. 4-3)	Sample Frequency	Sample Location	Remarks
Copper	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
Silica	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
Boron	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
	1-21	Monthly	See Fig. 4-3	Made as Part of UALR Study
Hydrazine	--	Weekly	Intake Canal	
	--	Weekly	Discharge Canal	
	20	Weekly	Illinois Bayou Embayment	
Dissolved Oxygen	1-21	Monthly	See Fig. 4-3	Made as Part of UALR Study
Chemical Oxygen Demand	1-21	Monthly	See Fig. 4-3	Made as Part of UALR Study

TABLE 4-6 (CONTD)

LAKE WATER CHEMICAL SAMPLING LOCATIONS AND SCHEDULE

Parameter Measured	Sample Point (Fig. 4-3)	Sample Frequency	Sample Location	Remarks
pH	--	Weekly	Intake Canal	
	20	Weekly	Illinois Bayou Embayment	
	--	During Demineralizer Neutralizing Tank Discharge	Discharge Canal	
	1-21	Monthly	See Fig. 4-3	Made as Part of UALR Study

5.0 ADMINISTRATIVE CONTROLS

Objective:

To describe the administrative controls and procedures necessary to implement the environmental technical specifications.

5.1 Responsibility

5.1.1 Sampling

The Chemical and Radiation Protection Engineers under the direction of the Technical Support Engineer, Assistant Superintendent, and Superintendent of Arkansas Nuclear One shall be responsible for all environmental sampling except that covered by agreement with the University of Arkansas at Little Rock or others (aquatic biota, bottom sediments, and certain Reservoir water samples). The Chemical and Radiation Protection Engineers shall also be responsible for sampling required by the technical specifications of plant wastes prior to release to the environment.

5.1.2 Analyses

The Chemical and Radiation Protection Engineers under the direction of higher plant supervision, shall be responsible for the required analyses of plant wastes prior to their release to the environment.

They also shall be responsible for non-radiological analysis of environmental samples except those covered by agreement with the University of Arkansas at Little Rock or others.

Radiological analyses of environmental samples described in Table 4-1 shall be the responsibility of the Production Department Chief Chemist and shall be performed under his direction in the Production Department Central Laboratory.

In the event of analytical equipment malfunction or other circumstances likely to cause unreasonable delays in radiological sample analyses, samples will be sent for the required analyses to the Nuclear Science Division of the Eberline Instrument Corporation or another competent, reputable outside laboratory.

5.1.3 Reporting

The Arkansas Power & Light Senior Vice President, Production, Transmission and Engineering, shall be responsible for plant reporting described in Specification 5.6.

5.2 Organization

Figure 5-1 shows the organization chart at both plant and corporate levels relative to environmental matters. Responsibilities of those directly concerned with environmental monitoring are described in Specification 5.1.

5.3 Review and Audit

The Plant Safety Committee and the Safety Review Committee shall review and audit the following:

a. Preparation of proposed Environmental Technical Specifications.

b. Coordination of Environmental Technical Specification development with the Safety Technical Specification.

c. Proposed changes to the Environmental Technical Specifications and the evaluated impact of the changes.

d. Proposed written procedures, as described in Specification 5.5, and proposed changes thereto which affect the plant's environmental impact.

e. Proposed changes or modifications to plant systems or equipment which would affect the plant's environmental impact and the evaluation of the impact of these changes.

f. Results of the Environmental Monitoring Programs prior to their submittal in each semi-annual Environmental Monitoring Report.

g. Investigation of all reported instances of violations of Environmental Technical Specifications. Where investigation warrants, instances shall be evaluated and recommendations formulated to prevent recurrence.

5.4 Action to be Taken if a Limiting Condition for Operation is Exceeded

5.4.1 Remedial action as permitted by the technical specification will be taken until the condition can be met.

5.4.2 Exceeding a limiting condition for operation shall be investigated by the independent review and audit authority.

5.4.3 A report for each occurrence shall be prepared as specified in Section 5.6.2.

5.5 Procedures

5.5.1 Detailed written procedures shall be prepared and followed for all activities involved in carrying out the environmental technical specifications. Procedures shall include sampling, instrument calibration, analysis, and actions to be taken when limits are approached or exceeded. Testing frequency of any alarms shall be included. These frequencies shall be determined from experience with similar instruments in similar environments and from manufacturers' technical manuals.

5.5.2 In addition to the procedures specified in Section 5.5.1, the plant standard operating procedures shall include provisions to ensure the plant and all its systems and components are operated in compliance with the limiting conditions for operations established as part of the environmental technical specifications.

5.5.3 Temporary changes to procedures in 5.5.1 above, which do not change the intent of the original procedure may be made, provided such changes are approved by two members of the plant staff, at least one of whom shall be a Shift Supervisor. Such changes shall be documented.

5.6 Plant Reporting Requirements

5.6.1 Routine Reports

A report on environmental surveillance programs for the previous six months operations shall be submitted as part of the Semiannual Operating Report within 60 days after January 1 and July 1 of each year. The period of the first report shall begin with the date of initial criticality. The report shall be a summary of the results of the environmental activities for the 6 month period and an assessment of the observed impacts of the plant operation on the environment.

The report shall include a summary of the quantities of radioactive effluents released from the plant as outlined in USAEC Regulatory Guide 1.21, with data summarized on a monthly basis following the format of Appendix A thereof.

If statistically significant variations of offsite environmental radionuclide concentrations with time are observed, a comparison of these results with effluent releases shall be provided.

Individual samples which show higher than normal levels (25% above background for external dose, or twice background for radionuclide content) shall be noted in the reports.

Results from all radiological samples taken shall be summarized on a quarterly basis following the format of Table 5-1 for inclusion in the semiannual report. In the event that some results are not available within the 60 day period, the report should be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

5.6.2 Non-Routine Reports

a. Radioactive Discharge

The reporting requirements for radioactive discharges are specified in Section 2.4 of the Technical Specification.

b. Radiological Environmental Monitoring

(1) In the event that a report level specified below is reached, a report shall be made within the designated time period to the Director of Regulatory Operations, Region II, with a copy to the Deputy Director for Reactor Projects. If a measured level of radioactivity in "critical pathway environmental medium samples" indicates that the resultant annual dose to an individual from these levels could equal or exceed 4 times the design objective, a plan shall be submitted within one week advising the AEC of the proposed action to ensure the plant related annual doses will be within the design objective. For example, with an I-131 design objective of 15 mrem/yr to the thyroid of any individual, if individual charcoal filters show I-131 concentrations in air of 4×10^{-12} $\mu Ci/cm^3$ (4 pci/m^3) or greater (2×10^{-14} $\mu Ci/m^3$ if the milk pathway is involved), or if individual milk samples show I-131 concentrations of 10 pCi/l or greater, the results shall be reported along with a proposed plan of action, as discussed above. For purposes of calculating doses the models presented in WASH-1258 issued in July 1973 and Regulatory Guide 1.42 shall be used.

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*Critical pathway is defined by §14 of ICRP Publication 7.

(2) If samples of critical pathway environmental media collected over a calendar quarter show total levels of radioactivity that could result in accumulated plant related doses to an individual for that quarter of 1/2 the annual design objective, the results shall be reported and a plan submitted and implemented within 30 days to limit conditions so that the annual dose to an individual will not exceed the design objective.

c. Nonradiological

In the event a limiting condition for operation is exceeded, or a report level specified in Section 4, Environmental Surveillance is reached, or an unusual event involving a significant environmental impact occurs, a report shall be made within 24 hours by telephone and telegraph to the Director of the Regional Regulatory Operations Office, followed by a written report within one week to the Director of the Regional Regulatory Operations Office (cc to Director of Licensing).

The written report and to the extent possible, the preliminary telephone and telegraph report, shall: (a) describe, analyze and evaluate the occurrence, including extent and magnitude of the impact, (b) describe the cause of the occurrence and (c) indicate the corrective action (including any significant changes made in procedures) taken to preclude repetition of the occurrence and to prevent similar occurrences involving similar components or systems.

5.6.3 Changes

a. When a change to the plant design, to the plant operation, or to the procedures described in Section 5.5 is planned which would have a significant adverse effect on the environment or which involves an environmental matter or question not previously reviewed and evaluated by the AEC, a report on the change shall be made to the AEC prior to implementation. The report shall include a description and evaluation of the change including a supporting benefit-cost analysis.

b. Changes or additions to permits and certificates required by Federal, State, local and regional authorities for the protection of the environment shall be reported. When the required changes are submitted to the concerned agency for approval, they shall also be submitted to the Deputy Director for Reactor Projects, Directorate

of Licensing, USAEC, for information. The submittal shall include an evaluation of the environmental impact of the change.

c. Request for changes in environmental technical specifications shall be submitted to the Deputy Director of Reactor Projects, Directorate of Licensing, USAEC, for prior review and authorization. The request shall include an evaluation of the impact on the change, including a supporting benefit-cost analysis.

5.7 Records Retention

5.7.1 Records and logs relative to the following areas shall be retained for the life of the plant:

a. Records and drawing changes reflecting plant design modifications made to systems and equipment as described in Section 5.6.3.

b. Records of environmental surveillance data.

c. Records to demonstrate compliance with the limiting conditions for operation in Section 2.

5.7.2 All other records and logs relating to the environmental technical specifications shall be retained for five years.

TABLE 5-1

REPORTING OF RADIOACTIVITY IN THE ENVIRONS

Facility _____ Docket No. _____ Reporting Period _____

A. Sample Results

Sample	Location[3]	Average Quarterly Results[5] Frequency and[6] Type of Samples	Analysis Results[2] (specify radionuclide or entity)	Remarks[1]
(1) External Radiation				
(2) Filterable Airborne				
a. Particulate Filters				
1)				
2)				
etc.				
b. Charcoal Filters				
1)				
2)				
etc.				
(3) Water[4]				
a.				
b.				
etc.				
(4) Food (Human)				
a.				
b.				
etc.				
(5) Other Media				
a. Vegetation (include pasture and other animal foodstuffs)				
b. Soils				
c. Sediments				
d. Fish				
e. Molluscs				
f. Plankton				
g. Algae				
h. etc.				

[1] Explain any unusual measurements or deviation from sampling schedule.

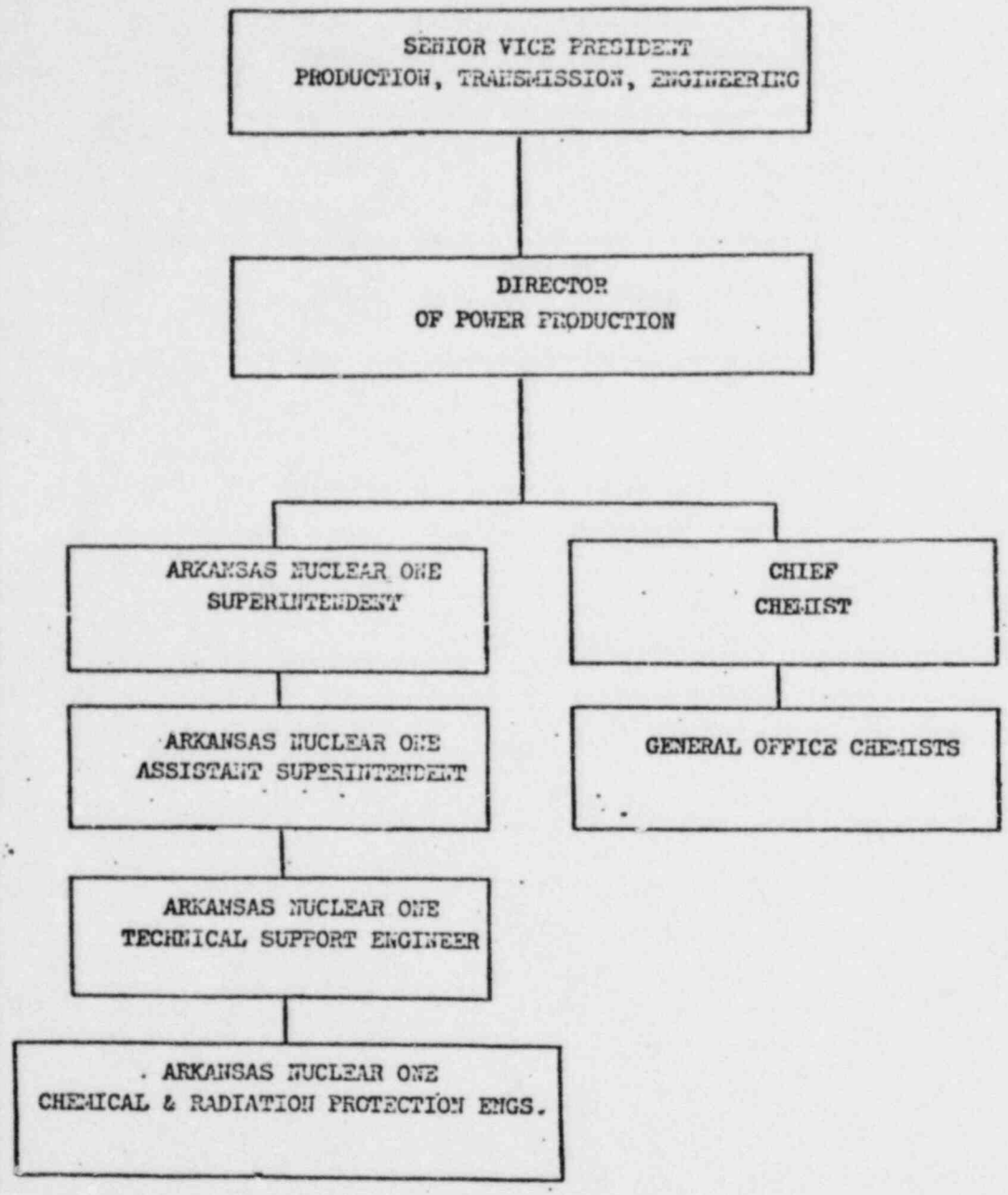
[2] Use the following units; external radiation, mrem/quarter; filterable airborne, water and milk, μCi/ml; soil, μCi/m^2 (specify depth) precipitation, μCi/m^2; stream sediments and terrestrial and aquatic vegetation, μCi/dry gm; other media, specify units.

3/ Specify location and its distance and direction from the facility, and indicate which is used for background.

4/ Indicate whether precipitation, surface, ground, lake, river, ocean, etc.; specify drinking water.

5/ Use separate table for each quarter.

6/ Type of sample means either grab, continuous, proportional, composite, etc.



ARKANSAS POWER & LIGHT CO. ARKANSAS NUCLEAR ONE-UNIT 1	ENVIRONMENTAL SURVEILLANCE ORGANIZATION CHART	FIG. NO 5-1

6.0 SPECIAL SURVEILLANCE, RESEARCH, OR STUDY ACTIVITIES

6.1 Thermal plume mapping

Objective:

To verify analytical and model studies of the thermal plume and to establish compliance with applicable water quality criteria under low-flow conditions in the Reservoir.

Program Specification:

A quasi-synoptic survey of the plant's thermal plume will be made by towing several fast response temperature sensors over a preplanned grid track. Temperatures at each depth will be sampled sequentially at frequent intervals and the data will be automatically recorded (digitally) for processing. Wire angle and boat position will be measured and recorded throughout the survey so that the absolute position in space of each recorded temperature can be of such density that computer contouring will be used for information display. (Provide more details)

This survey will be carried out once prior to plant operation to obtain background temperature data. When the plant has achieved full power operation, a series of 12 monthly surveys will be conducted to define the three dimensional aspects of the thermal discharge. Various flow conditions will occur during the year allowing verification of compliance with applicable water quality criteria at several different flow conditions. Each continuous underway field survey will result in several thousand discrete data points. These data will be processed by computer to provide contours of temperature for each measured depth. At the conclusion of the survey program, a final report will be prepared which will assess seasonal trends and correlate the measured temperatures and plume configurations with causative natural effects and plant operational data.

Reporting Requirements:

The results of this survey shall be reported to the AEC upon the completion of the survey.

Bases:

This survey is necessary to establish compliance with applicable water quality criteria. It will be conducted by a consultant firm competent in the measurement of thermal discharges from power plants. This will insure that the survey data will be accurate and reliable in determining compliance with applicable water quality standards.

6.2 Fish Spawning Characteristics of Dardanelle Reservoir

Objective:

A program has been undertaken to determine the characteristics of the Dardanelle Reservoir relative to fish spawning activities.

Program Specifications:

This program relates to the fish spawningg activities during the Spring of 1973 and shall determine the spawning fish populations and sizes in the intake canal, discharge embayment, and one reference area.

Samples shall be taken by fish nets selected to provide optimum spawning information. The positions for shore-line seining operations will be chosen in areas characteristic of fish spawning. In addition, the pelagic larval fishes will be sampled by trawling with a fish larval net. Major spawning areas will be determined by sampling several points in each area. Once the optimum sampling points have been located, consistent sampling will be done to provide as much practical information as possible.

Samples taken by net will be separated according to size, and reported by number under each size. Data will be prepared noting any significant changes or unusual conditions.

Reporting Requirements:

The results of this survey shall be reported to the AEC upon its completion.

Bases:

This survey will provide information relative to the peak spawning period and the relative abundance of these fishes. This in turn will allow a more detailed evaluation of the data obtained from the operational fish monitoring program.