

POINT BEACH NUCLEAR PLANT
UNIT 1 AND 2

RADIOLOGICAL EFFLUENT CONTROL MANUAL
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RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE OF CONTENTS

	<u>PAGE</u>
1.0 RADIOLOGICAL EFFLUENT CONTROL PROGRAM	1
1.1 Basis	1
1.2 Basis Statement	1
1.3 Responsibilities	3
1.4 Manual Revisions	3
1.5 RECP Parameters Reportable in the Annual Monitoring Report	4
1.6 Other RECP Reportable Events	6
2.0 RADIOACTIVE EFFLUENT CONTROL	7
2.1 Liquid Radioactive Effluent Treatment System	7
2.2 Gaseous Radioactive Effluent Treatment System	7
2.3 Effluent Control and Accountability	8
3.0 RADIOACTIVE EFFLUENT MONITORING INSTRUMENTATION OPERABILITY REQUIREMENTS	13
3.1 Objective	13
3.2 Operability Specifications	13
4.0 RADIOACTIVE EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS	18
4.1 Objective	18
4.2 Radioactive Monitoring Instrumentation Surveillance Requirements	18
4.3 Definitions	18



RADIOLOGICAL EFFLUENT CONTROL MANUAL

	<u>PAGE</u>
5.0 RADIOACTIVE EFFLUENT RELEASE LIMITS	23
5.1 Objective	23
5.2 Radioactive Effluent Concentrations	23
5.3 Radioactive Liquid Effluent Release Limits	23
5.4 Radioactive Gaseous Effluent Concentrations	24
5.5 Radioactive Gaseous Effluent Release Limits	24
5.6 Quarterly Summary	25
5.7 Radioactive Effluent Treatment	25
5.8 Total Dose	27
5.9 Explosive Gas Mixture	27
5.10 Solid Radioactive Waste	27
6.0 RADIOACTIVE EFFLUENT SAMPLING AND ANALYSIS REQUIREMENTS	28
6.1 Purpose	28
6.2 Radioactive Liquid Waste Sampling and Analysis	28
6.3 Radioactive Gaseous Waste Sampling and Analysis	28



RADIOLOGICAL EFFLUENT CONTROL MANUAL

LIST OF TABLES AND FIGURES

<u>SECTION 2.0</u>	<u>PAGE</u>
Table 2-1 Radioactive Liquid Waste Effluent Monitors	9
Figure 2-1 Radioactive Liquid Waste Effluent Monitors	10
Table 2-2 Radioactive Gaseous Waste Effluent Monitors	11
Figure 2-2 Radioactive Gaseous Waste Effluent Monitors	12
 <u>SECTION 3.0</u>	
Table 3-1 Radioactive Liquid Waste Effluent Monitoring Instrumentation	14
Table 3-2 Radioactive Gaseous Effluent Monitoring Instrumentation	15
 <u>SECTION 4.0</u>	
Table 4-1 Radioactive Liquid Effluent Monitoring Instrumentation Surveillance Requirements	19
Table 4-2 Radioactive Gaseous Effluent Monitoring Instrumentation Surveillance Requirements	20
 <u>SECTION 6.0</u>	
Table 6-1 Radioactive Liquid Waste Sampling and Analysis Program	29
Table 6-2 Radioactive Gaseous Waste Sampling and Analysis Program	31



RADIOLOGICAL EFFLUENT CONTROL MANUAL

1.0 RADIOLOGICAL EFFLUENT CONTROL PROGRAM

1.1 Basis

The Radiological Effluent Control Program (RECP) shall conform to 10 CFR 50.36a for the control of radioactive effluents and maintaining doses to members of the public from radioactive effluents as low as reasonably achievable (ALARA). The RECP also is established to control the amount and concentrations of radioactivity in PBNP effluent pursuant to the following documents:

- 1.1.1 10 CFR 50.34a-Design objectives for equipment to control releases of radioactive material in effluents-nuclear power reactors,
- 1.1.2 10 CFR 50, Appendix A, Criterion 60-Control of releases of radioactive material to the environment,
- 1.1.3 10 CFR 50, Appendix A, Criterion 63-Monitoring fuel and waste storage,
- 1.1.4 10 CFR 50, Appendix A, Criterion 64-Monitoring radioactivity releases,
- 1.1.5 10 CFR 20.1302-Compliance with dose limits for individual members of the public,
- 1.1.6 10 CFR 20.1501-General,
- 1.1.7 PBNP General Design Criterion 17-Monitoring Radioactivity Releases, and
- 1.1.8 PBNP General Design Criterion 70-Control of releases of radioactivity to the environment.

1.2 Basis Statement

Liquid effluent from the radioactive waste disposal system are diluted by the circulating water system prior to release to Lake Michigan. With two pumps operating per unit, the rated flow of the circulating water system is approximately 340,000 gpm per unit. Operation of a single circulating water pump per unit reduces the nominal flow rate by about 40%. Liquid waste from the waste disposal system may be discharged to the circulating water system of either unit via the service water return header. Because of the low radioactivity levels in the circulating water discharge, the concentrations of liquid radioactive effluents at this point are not measured directly. Instead, the concentrations in the circulating water discharge are calculated from the measured concentration of the liquid effluent, the discharge flow rate of the effluent and the nominal flow in the circulating water system.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

The release of radioactive materials in liquid effluents to unrestricted areas is monitored and controlled to conform to the dose objectives in Section II.A of Appendix I to 10 CFR 50 and will be as low as reasonably achievable (ALARA) in accordance with the requirements of 10 CFR Parts 50.34a and 50.36a. The monitoring and control also is undertaken to keep the concentrations of radionuclides in PBNP liquid effluent released to unrestricted areas conforming to the maximum effluent concentration (MEC) values specified in Table 2, Column 2 of Appendix B to 10 CFR 20. Furthermore, the appropriate portions of the liquid radwaste treatment systems will be used as required to keep the releases ALARA.

These actions provide reasonable assurance that the resulting average annual dose or dose commitment from liquid effluent from each unit of the Point Beach Nuclear Plant for any individual in an unrestricted area from all pathways of exposure will not exceed the 10 CFR 50, Appendix I dose objectives. Thus, discharge of liquid wastes not exceeding these release limits will not result in significant exposure to members of the public as a result of consumption of drinking water from the lake, even if the effect of potable water treatment systems on reducing radioactive concentrations of the water supply is conservatively neglected.

Prior to release to the atmosphere, gaseous wastes are mixed in the auxiliary building vent with the flow from at least one of two auxiliary building exhaust fans. Further dilution then occurs in the atmosphere. Release of radionuclides to the atmosphere is monitored and controlled so that effluents to unrestricted areas conform to the dose objectives of Sections II.B and C of Appendix I to 10 CFR 50. Monitoring and control also is undertaken to ensure that at the point of maximum ground concentration at the site boundary, the radionuclide concentrations in the atmosphere will conform to the limits specified in Table 2, Column 1 of Appendix B to 10 CFR 20. Furthermore, the appropriate portions of the gaseous radwaste treatment system are used as required to keep the radioactive releases to the atmosphere ALARA.

In order to achieve the dose objectives of Appendix I to 10 CFR 50 and the aforementioned concentration limits, the setpoints for releases to the atmosphere and to Lake Michigan utilize the methodology found in the Offsite Dose Calculation Manual. Setpoints for releases to the atmosphere are based on the dilution provided by building vents as well as the highest annual average χ/Q at the site boundary. Setpoints for releases to Lake Michigan are based only on dilution by circulation water. Together, control and monitoring provide reasonable assurance that the annual dose from each unit's effluents, to an individual in an unrestricted area will not exceed the dose objectives of Appendix I to 10 CFR 50.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

Implementation of the RECP will keep average annual releases of radioactive material in PBNP effluents and their resultant committed effective dose equivalents at small percentages of the dose limits specified in 10 CFR 20.1301. At the same time, the methodology of implementing the RECP permits the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided with a dependable source of power even under unusual operating conditions which may temporarily result in releases higher than such numerical guides for design objectives set forth in Appendix I but still within levels that assure that the average population exposure is equivalent to small fractions of doses from natural background radiation.

Compliance with the provisions of Appendix I to 10 CFR Part 50 constitutes adequate demonstration of conformance to the standards set forth in 40 CFR Part 190 regarding the dose commitment to individuals from the uranium fuel cycle.

1.3 Responsibilities

All required actions of the Radiological Effluent Control Program shall be conducted using approved procedures. The responsibility for the implementation of the approved procedures reside with the Manager-PBNP.

1.4 Manual Revisions

1.4.1 Revisions of the RECM shall be documented and reviews performed of the revisions shall be retained as required by TS 15.7.8.6. The review documentation shall contain:

- a. Sufficient information to support the change together with the appropriate analyses or evaluations justifying the revision, and
- b. A determination that the change will maintain the levels of radioactive effluent control required pursuant to 10 CFR 20.1302, 10 CFR 50.36a, Appendix I to 10 CFR 50, and 40 CFR 190.

1.4.2 Revisions shall become effective after review and approval pursuant to the appropriate PBNP administrative procedure and T.S. 15.7.8.7.

1.4.3 Revisions shall be submitted to the NRC in the form of a complete, legible copy of the entire manual either as part of, or concurrent with, the Annual Monitoring Report for the period of the report in which the revision was made. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed. Each copy shall indicate the date the revision was implemented.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

1.5 RECP Parameters Reportable in the Annual Monitoring Report

Information relative to the monthly quantities of liquid, gaseous, and solid radioactive effluents released from PBNP and effluent volumes used in maintaining the releases within 10 CFR 20 limits shall be reported in the Annual Monitoring Report as follows:

1.5.1 Liquid Releases

- a. Total radioactivity in curies released and average diluted discharge concentrations of the following release categories: gamma isotopic, gross alpha, tritium, and strontium (beta emitters other than tritium).
- b. Total volume (in gallons) of liquid waste released into circulating water discharge.
- c. Total volume (in gallons) of dilution water used.
- d. The maximum concentration of tritium and gross gamma radioactivity released (averaged over the period of a single release).
- e. Estimated monthly total radioactivity in curies of individual radionuclides released based on representative isotopic analyses.
- f. Semiannual and annual totals of monthly quantities of individual radionuclides, as determined by isotopic analyses.

1.5.2 Releases to the Atmosphere

- a. Total radioactivity (in Curies), by month, released of:
 1. Noble Gases.
 2. Halogens.
 3. Particulates, subdivided into beta emitters (strontium, etc.), gross alpha, and gamma emitters.
 4. Tritium.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

- b. Maximum release rate (for any one-hour period).
- c. Estimated monthly total radioactivity (in Curies) released, by nuclide, based on representative analyses performed by beta and by gamma isotopic analyses.
- d. Semi-annual and annual totals of monthly isotopic radionuclide quantities.

1.5.3 Solid Waste

- a. The total amount of solid waste shipped, buried, or stored (in cubic feet).
- b. Estimated total radioactivity and isotopic content (in Curies) determined by scaling factors, gamma isotopic and/or other suitable analyses.
- c. The dates of shipment and burial site if shipped for burial.
- d. The type of waste shall be indicated, i.e., dry activated waste, resins, evaporator concentrates, filters, scrap metal, asbestos, etc.

1.5.4 Doses

The air doses and the doses to the hypothetical maximum exposed individual calculated following the ODCM methodology shall be reported.

1.5.5 Explosive Gas Monitoring

In accordance with note 7 to Table 3-2, a Special Circumstance Report shall be included in the Annual Monitoring Report if the Waste Gas Holdup System Explosive Gas Monitor is out of service for greater than 14 days.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

1.6 Other RECP Reportable Events

1.6.1 Radioactive Effluent Non-Treatment

If the effluent treatment system for radioactive liquids or for releases to the atmosphere is inoperable and effluents are being discharged for 31 days without the treatment required to meet the release limits specified in Section 5, a special report shall be prepared and submitted to the Commission within thirty days which includes the following information:

- a. Identification of the inoperable equipment or subsystem and the reason for inoperability.
- b. Actions taken to restore the inoperable equipment to operable status.
- c. Summary description of actions taken to prevent a recurrence.

1.6.2 Radioactive Effluent Release Limit Exceedence

If the quantity of radioactive material actually released in liquid or gaseous effluents during any calendar quarter exceeds twice the quarterly limit as specified in Section 5, a special report shall be prepared and submitted to the Commission within thirty days of determination of the release quantity.

1.6.3 Major Change to Radioactive Liquid, Gaseous and Solid Waste Treatment Systems

Licensee initiated major changes to the radioactive waste treatment systems (liquid, gaseous, and solid) shall be reported to the U.S. Nuclear Regulatory Commission with the annual update to the FSAR for the period in which the major change was complete. The discussion of each change shall include:

- a. A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR Part 50.59;
- b. Information necessary to support the reason for the change;
- c. A description of the equipment, components and processes involved and the interfaces with other plant systems;



RADIOLOGICAL EFFLUENT CONTROL MANUAL

- d. An evaluation of the change, which shows how the predicted releases of radioactive materials in liquid effluents and gaseous effluents and/or quantity of solid waste will differ from those previously predicted in the license application and amendments thereto;
- e. An evaluation of the change, which shows the expected maximum exposures to an individual in the unrestricted area and to the general population that differ from those previously estimated in the license application and amendments thereto;
- f. An estimate of the exposure to plant operating personnel as a result of the change.

2.0 RADIOACTIVE EFFLUENT CONTROL

2.1 Liquid Radioactive Effluent Treatment System

The liquid radioactive effluent treatment system consists of those components or devices used to reduce radioactive material in liquid effluent. The system consists of the following:

- 2.1.1 blowdown evaporator or waste evaporator,
- 2.1.2 polishing demineralizers,
- 2.1.3 boric acid evaporator feed demineralizers,
- 2.1.4 boric acid evaporators,
- 2.1.5 boric acid evaporator condensate demineralizers.

2.2 Gaseous Radioactive Effluent Treatment System

The gaseous radioactive effluent treatment system consists of those components or devices utilized to reduce radioactive material in effluent released to the atmosphere. The system consists of the following:

- 2.2.1 gas decay tanks,
- 2.2.2 drumming area ventilation exhaust duct filter assembly,
- 2.2.3 Unit 1 and 2 containment purge exhaust filter assemblies,
- 2.2.4 air ejector decay duct filter assembly,



RADIOLOGICAL EFFLUENT CONTROL MANUAL

- 2.2.5 auxiliary building ventilation filter assembly (nominal 11,214 cfm exhaust pathway),
- 2.2.6 chemistry laboratory exhaust duct filter assembly,
- 2.2.7 service building ventilation exhaust duct filter assembly,
- 2.2.8 auxiliary building ventilation filter assemblies (nominal 34,150 cfm exhaust pathway)

2.3 Effluent Control and Accountability

2.3.1 Radiation Monitoring System

a. Description

The computerized Radiation Monitoring System (RMS) at Point Beach Nuclear Plant consists of area, process, and effluent monitors. The effluent components of the RMS are designed to detect and measure radioactivity in liquid and gaseous releases from PBNP. A description of the liquid and gaseous effluent monitors and associated isolation and control functions are presented in Tables 2-1 and 2-2.

b. Calibration

Calibration of the RMS detectors is accomplished according to the procedures of the PBNP Health Physics Calibration Manual

c. Setpoints

The methodology for determining effluent RMS detector setpoints is described in the ODCM.

d. Alarms

Response to alarms received from RMS effluent detectors is described in the PBNP RMS Alarm Setpoint and Response Book.

e. Effluent Detector Operability and Surveillance

Detector operability and surveillance requirements are addressed in Sections 3 and 4 of this manual.

2.3.2 Effluent Treatment Schematic

The liquid and gaseous waste processing flow paths, equipment, and radiation monitors are depicted in Figures 2-1 and 2-2.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 2-1

RADIOACTIVE LIQUID WASTE EFFLUENT MONITORS

CHANNEL NUMBER	NAME	CONTROL FUNCTION	DETECTOR TYPE
1 (2) RE-216	Containment Fan Coolers Liquid Monitors	None	Scintillation
RE-218	Waste Disposal System Liquid Monitor	Shuts waste liquid overboard	Scintillation
1 (2) RE-219	Steam Generator Blowdown Liquid Monitors	Shuts steam generator blowdown isolation valves, blowdown tank outlet valves and steam generator sample valves	Scintillation
RE-220	Spent Fuel Pool Liquid Monitor	None	Scintillation
RE-223	Waste Distillate Overboard Liquid Monitor	Shuts waste distillate overboard isolation valve	Scintillation
1 (2) RE-229	Service Water Discharge Monitors	None	Scintillation
RE-230	Retention Pond Discharge Liquid Monitor	None	Scintillation
1 (2) RE-222	Steam Generator Blowdown Tank Outlet Monitor	Shuts steam generator blowdown isolation valves and blowdown tank outlet valves	GM Tube

RADIOLOGICAL EFFLUENT CONTROL MANUAL

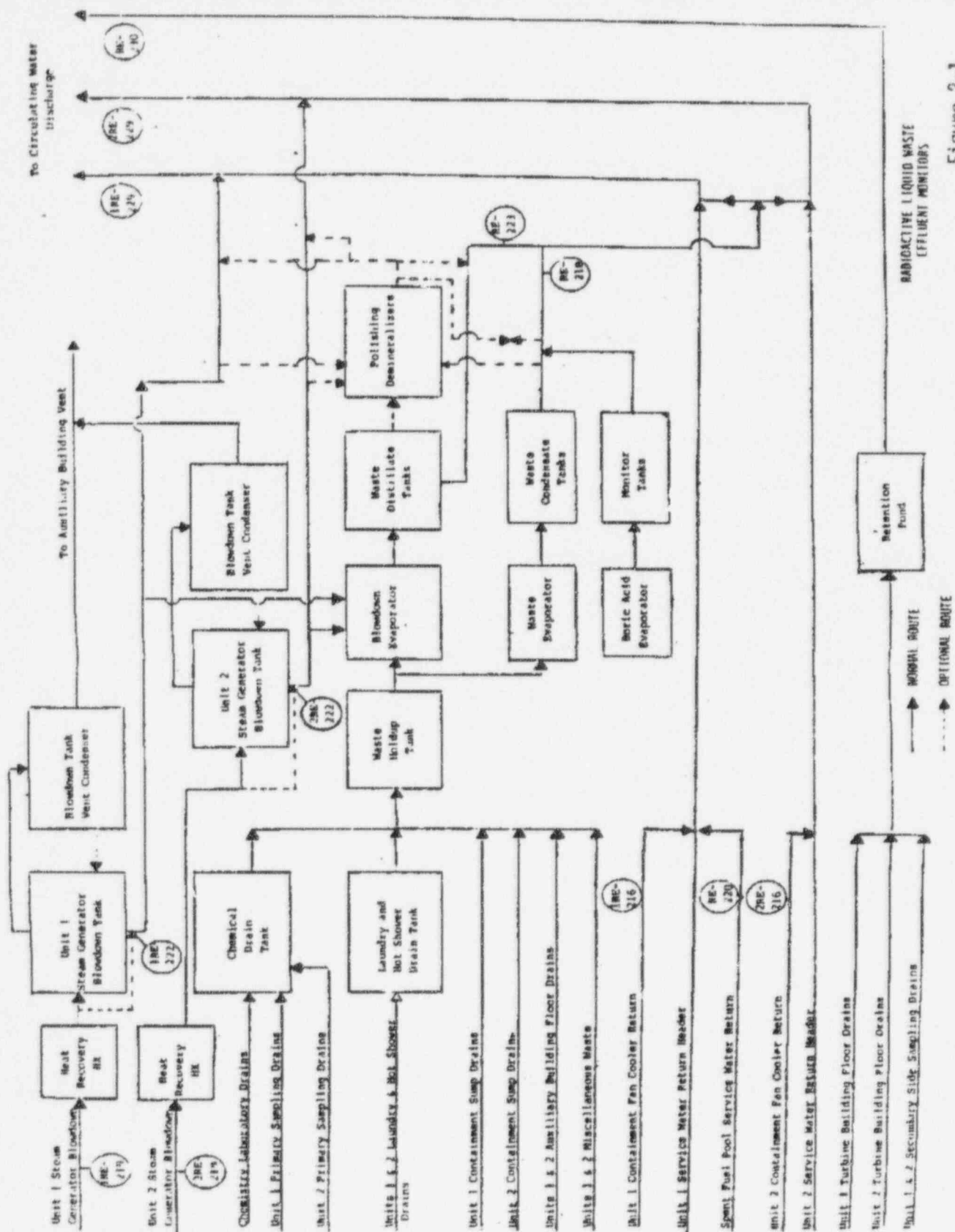


Figure 2-1



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 2-2

RADIOACTIVE GASEOUS WASTE EFFLUENT MONITORS

CHANNEL NUMBER	NAME	CONTROL FUNCTION	DETECTOR TYPE
1 (2) RE-212	Containment Noble Gas Monitor	Actuates containment ventilation isolation	Scintillation
RE-214	Auxiliary Building Exhaust Ventilation Noble Gas Monitor	Shuts gas release valve and shifts auxiliary building exhaust through carbon filters	Scintillation
1 (2) RE-215	Condenser Air Ejector Noble Gas Monitors	None	Scintillation
RE-225	Combined Air Ejector Low-Range Noble Gas Monitor	None	Scintillation
RE-221	Drumming Area Vent Noble Gas Monitor	None	Scintillation
RE-224	Gas Stripper Building Exhaust Noble Gas Monitor	None	Scintillation
1 (2) RE-305	Unit 1 and 2 Purge Exhaust Noble Gas Monitors (Channel 5 on SPING Units No. 21 and No. 22)	Containment ventilation isolation	Scintillation
RE-315	Auxiliary Building Exhaust Ventilation Noble Gas Monitor (Channel 5 on SPING Unit No. 23)	None	Scintillation
RE-325	Drumming Area Ventilation Noble Gas Monitor (Channel 5 on SPING Unit No. 24)	None	Scintillation



RADIOLOGICAL EFFLUENT CONTROL MANUAL

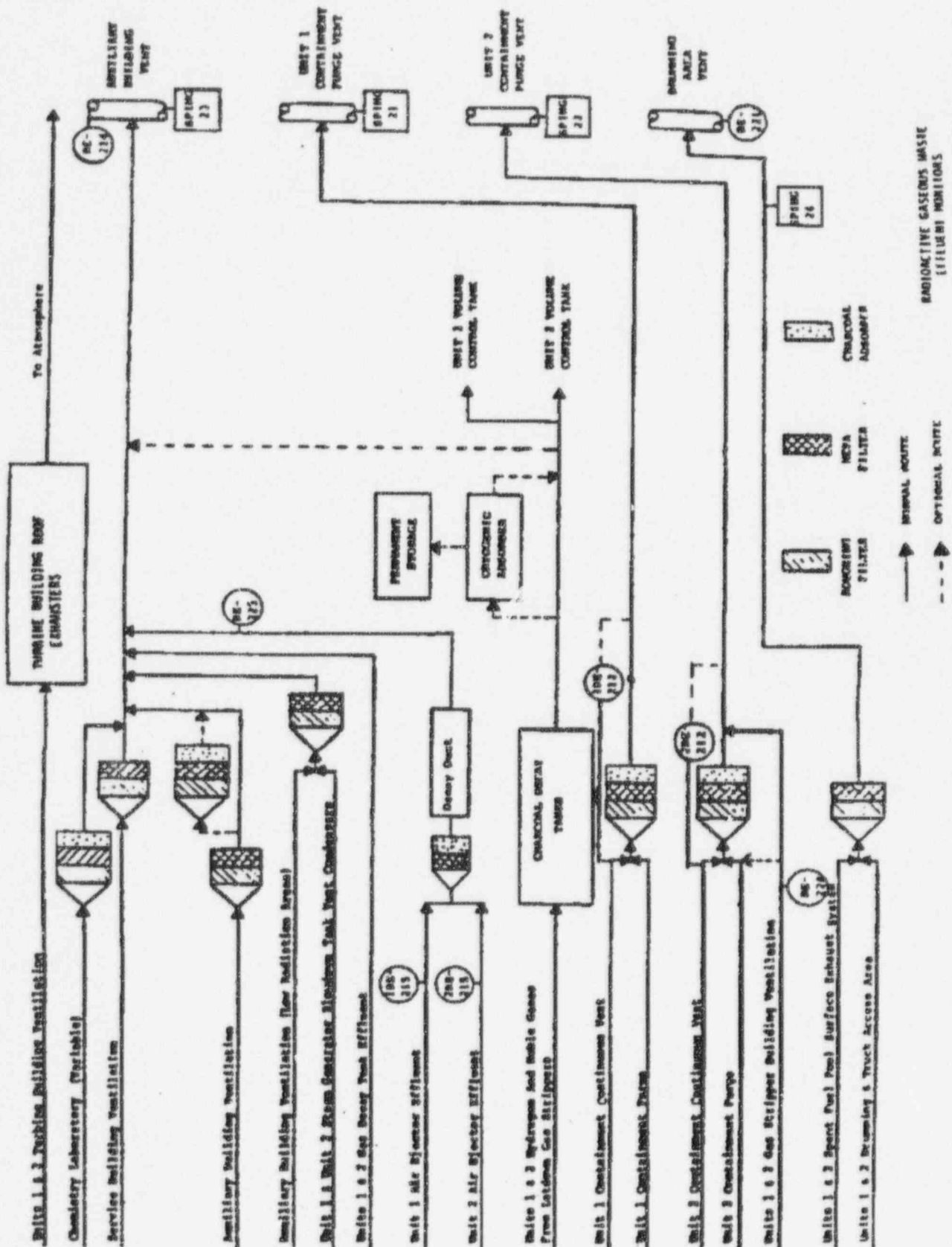


Figure 2-2



RADIOLOGICAL EFFLUENT CONTROL MANUAL

2.3.3 Release Accountability

Control and accountability of radioactivity in PBNP effluents is accomplished by the RMS in conjunction with the characterization of radionuclide distributions by laboratory analyses of grab samples from the various waste streams. Sampling frequencies and analysis requirements are set forth in Section 6.0 of this manual. Additional aspects of grab sampling and release accountability are described in the PBNP Release Accountability Manual.

3.0 RADIOACTIVE EFFLUENT MONITORING INSTRUMENTATION OPERABILITY REQUIREMENTS

3.1 Objective

The operability of detectors is specified in order to ensure that liquid and gaseous radioactive effluents are adequately monitored and to ensure that alarm or trip setpoints are established such that effluent releases do not exceed the values cited in Section 5.

3.2 Operability Specifications

- 3.2.1 The radioactive effluent monitoring instrumentation channels listed in Tables 3-1 and 3-2 shall be operable. The alarm or trip setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in the ODCM.
- 3.2.2 If fewer than the minimum number of radioactive effluent monitoring channels are operable, the action statement listed in either Table 3-1 or 3-2 opposite the channel shall be taken. Best effort shall be made to return an inoperable channel to operable status within 30 days. If the channel is not returned to an operable status within 30 days, the circumstances of the instrument failure and schedule for repair shall be reported to the NRC Resident Inspector.
- 3.2.3 If a radioactive effluent monitoring instrumentation channel alarm or trip setpoint is found less conservative than required by the ODCM, the channel shall be declared inoperable or the setpoint shall be changed to the ODCM value or a more conservative value.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 3-1
RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

<u>Instrument</u>	<u>Minimum Channels Operable</u>	<u>Action</u>
1. Liquid Radwaste System		
a. RE-223, Waste Distillate Tank Discharge, or RE-229, Service Water Discharge (for applicable unit)	1	Note 1
b. RE-218, Waste Condensate Tank Discharge, or RE-229, Service Water Discharge (for applicable unit)	1	Note 1
c. Waste Condensate Tank Discharge Flow Meter	1	Note 4
d. Waste Distillate Tank Flow Rate Recorder	1	Note 4
2. Steam Generator Blowdown System		
a. For Each Unit; RE-219, Steam Generator Blowdown Liquid Discharge, or RE-222, Blowdown Tank Monitor, or RE-229, Service Water Discharge	1	Note 2
b. Steam Generator Blowdown Flow Indicators (1 per steam generator)	1	Note 9
3. Service Water System		
a. RE-229, Service Water Discharge (1 per unit)	1	Note 3
b. For Each Unit; RE-216, Containment Cooling Fan Service Water Return, or RE-229, Service Water Discharge	1	Note 3
c. RE-220, Spent Fuel Pool Heat Exchanger Service Water Outlet or RE-229, Service Water Discharge (for applicable unit)	1	Note 3
4. Retention Pond Discharge System		
a. RE-230, Retention Pond Discharge	1	Note 3
b. Retention Pond Discharge Composite Sampler	1	Note 8
c. Retention Pond Discharge Flow Determination	NA	*

* Retention pond discharge flow may be determined from pump run time and pump performance curves.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 3-2
RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

<u>Instrument</u>	<u>Minimum Channels Operable</u>	<u>Action</u>
1. Gas Decay Tank System		
a. RE-214, Noble Gas (Auxiliary Building Vent Stack), or RE-315 Noble Gas (Auxiliary Building Vent SPING)	1	Note 1
b. Gas Decay Tank Flow Measuring Meter	1	Note 4
2. Auxiliary Building Ventilation System		
a. RE-214, Noble Gas (Auxiliary Building Vent Stack) or RE-315, Noble Gas (Auxiliary Building Vent SPING)	1	Note 6
b. Isokinetic Iodine and Particulate - Continuous Air Sampling System	1	Note 5
3. Condenser Air Ejector System		
a. RE-225, Noble Gas (Combined Air Ejector Discharge Monitor); or RE-215, Noble gas (Air Ejector Monitors - 1 per unit); or RE-214, Noble Gas (Auxiliary Building Vent Stack); or RE-315, Noble Gas (Auxiliary Building Vent SPING)	1	Note 6
b. Flow Rate Monitor - Air Ejectors	1	Note 9
4. Containment Purge and Vent System		
a. RE-212, Noble Gas Monitors (1 per unit); or RE-305, Noble Gas (Purge Exhaust SPING - 1 per unit)	1	Note 6
b. 30 cfm Forced Vent Path Flow Indicators	1	Note 9
c. Iodine and Particulate - Continuous Air Samplers	1	Note 5
d. Sampler Flow Rate Measuring Device	1	Note 9



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 3-2 (continued)

<u>Instrument</u>	<u>Minimum Channels Operable</u>	<u>Action</u>
5. Fuel Storage and Drumming Area Ventilation System		
a. RE-221, Noble Gas (Drumming Area Stack), or RE-325, Noble Gas (Drumming Area SPING)	1	Note 6
b. Isokinetic Iodine and Particulate - Continuous Air Sampling System	1	Note 5
6. Gas Stripper Building Ventilation		
a. RE-224, Noble Gas (Gas Stripper Building), or RE-305, (Unit 2 Purge Exhaust SPING)	1	Note 6
b. Iodine and Particulate - Continuous Air Sampler	1	Note 5
c. Sampler Flow Rate Measuring Device	1	Note 9
7. Waste Gas Holdup System Explosive Gas Monitoring System		
a. Oxygen Monitor	1	Note 7



RADIOLOGICAL EFFLUENT CONTROL MANUAL

NOTATIONS FOR TABLES 3-1 AND 3-2

- Note 1: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided that prior to initiating a release, two separate samples are analyzed by two technically qualified people in accordance with the applicable part of Tables 6-1 and 6-2 and the release rate is reviewed by two technically qualified people.
- Note 2: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided grab samples are analyzed for gamma radioactivity in accordance with Table 6-1 at least once every 24 hours when the secondary coolant specific activity is less than 0.01 $\mu\text{Ci/cc}$ dose equivalent I-131 or once every 12 hours when the activity is greater than 0.01 $\mu\text{Ci/cc}$ dose equivalent I-131.
- Note 3: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided that at least once every 12 hours grab samples are collected and analyzed in accordance with Table 6-1.
- Note 4: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided the flow rate is estimated at least once every four hours during actual gaseous or liquid batch releases.
- Note 5: If the number of channels operable is fewer than the minimum required, effluent releases via the affected pathway may continue provided samples are continuously collected with auxiliary sampling equipment.
- Note 6: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided grab samples are collected at least once per 12 hours and are analyzed in accordance with Table 6-2.
- Note 7: If the number of channels operable is fewer than the minimum required, addition of waste gas to the Waste Gas Holdup System may continue for up to 14 days, provided grab samples are taken from the on-service gas decay tank and analyzed either daily during normal operations or every four hours when the primary system is being degassed (other than normal gas stripping of the letdown flow). If the monitoring system is out of service for greater than 14 days, in addition to the above sampling, a report of the cause and corrective action for failure and repair of the gas monitor shall be included in the Annual Monitoring Report.
- Note 8: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided grab samples are collected twice per week and analyzed in accordance with Table 6-1.
- Note 9: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided the flow is estimated or determined with auxiliary indication at least once every 24 hours.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

4.0 RADIOACTIVE EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

4.1 Objective

To verify that radioactive liquid and gaseous effluent monitoring instrumentation is demonstrated to be operable by periodic inspection, testing, and calibration.

4.2 Radioactive Monitoring Instrumentation Surveillance Requirements

Each radioactive effluent monitoring instrumentation channel shall be demonstrated operable by performance of the channel check, calibration, functional test, and source check at the frequencies shown in Tables 4-1 and 4-2.

4.3 Definitions

4.3.1 Source Check

The assessment of channel response by exposing the channel detector to a source of increased radiation.

4.3.2 Channel Check

A qualitative determination of acceptable operability by observing channel behavior during operation. This shall include comparison of the channel with other independent channels measuring the same variable.

4.3.3 Functional Test

The injection of a simulated signal into the channel to verify that it is operable, including alarm and/or trip initiating action.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 4-1
RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

<u>Instrument Description</u>	<u>Channel Check</u>	<u>Calibrate</u>	<u>Functional Test</u>	<u>Source Check</u>
1. Liquid Radwaste System				
a. RE-223, Waste Distillate Tank Discharge	D	R	Q	P
b. RE-218, Waste Condensate Tank Discharge	D	R	Q	P
c. Waste Condensate Tank Discharge Flow Meter	P/D	R	NA	NA
d. Waste Distillate Tank Flow Rate Recorder	P/D	R	NA	NA
2. Steam Generator Blowdown System				
a. RE-219, Steam Generator Blowdown Liquid Discharge (1 per unit)	D	R	Q	M
b. RE-222, Blowdown Tank Monitor (1 per unit)	D	R	Q	M
c. Steam Generator Blowdown Flow Indicator (1 per steam generator)	D	R	NA	NA
3. Service Water System				
a. RE-229, Service Water Discharge (1 per unit)	D	R	Q	M
b. RE-216, Containment Cooling Fan Service Water Return (1 per unit)	D	R	Q	M
c. RE-220, Spent Fuel Pool Heat Exchanger Service Water Outlet	D	R	Q	M
4. Retention Pond Discharge System				
a. RE-230, Retention Pond Discharge	D	R	Q	M
b. Retention Pond Discharge Composite Sampler	W	NA	NA	NA
c. Retention Pond Discharge Effluent Sump Pumps	W	R	NA	NA



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 4-2
RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

<u>Channel Description</u>	<u>Channel Check</u>	<u>Calibrate</u>	<u>Functional Test</u>	<u>Source Check</u>
1. Gas Decay Tank System				
a. RE-214, Noble Gas (Auxiliary Building Vent Stack)	D	R	Q	M
b. Gas Decay Tank Flow Measuring Device	P	R	NA	NA
2. Auxiliary Building Ventilation System				
a. RE-214, Noble Gas (Auxiliary Building Vent Stack)	D	R	Q	M
b. RE-315, Noble Gas (Auxiliary Building SPING)	D	R	Q	M
c. Isokinetic Iodine and Particulate Continuous Air Sampling System	W	R	NA	NA
3. Condenser Air Ejector System				
a. RE-225, Noble Gas (Combined Air Ejector Discharge)	D	R	Q	M
b. RE-215, Noble Gas (Air Ejectors - 1 per unit)	D	R	Q	M
c. Flow Rate Monitor - Air Ejectors (1 per unit)	D	R	NA	NA



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 4-2 (continued)

<u>Channel Description</u>	<u>Channel Check</u>	<u>Calibrate</u>	<u>Functional Test</u>	<u>Source Check</u>
4. Containment Purge and Vent System				
a. RE-212, Noble Gas (1 per unit)	D	R	Q	M*
b. 30 cfm Vent Path Flow Indicator	P/D	R	NA	NA
c. RE-305, Noble Gas (Purge Exhaust SPING - 1 per unit)	D	R	Q	M*
d. Iodine and Particulate Continuous Air Sampler	P/W	NA	NA	NA
e. Sampler Flow Rate Measuring Device	P/D	R	NA	NA
5. Fuel Storage and Drumming Area Ventilation Stack				
a. RE-221, Noble Gas (Drumming Area Vent Stack)	D	R	Q	M
b. RE-325, Noble Gas (Drumming Area SPING)	D	R	Q	M
c. Isokinetic Iodine and Particulate Continuous Air Sampling System	W	NA	NA	NA
6. Gas Stripper Building Ventilation System				
a. RE-224 Noble Gas	D	R	Q	M
b. Iodine and Particulate Continuous Air Sampler	W	NA	NA	NA
c. Sampler Flow Rate Measuring Device	W	R	NA	NA
7. Waste Gas Holdup System Explosive Gas Monitoring System				
a. Oxygen Monitor	D	Q**	Q	NA



RADIOLOGICAL EFFLUENT CONTROL MANUAL

NOTATIONS FOR TABLES 4-1 AND 4-2

D = Daily

W = Weekly

M = Monthly

Q = Quarterly

R = Each Refueling Interval (but not to exceed 18 months)

P/D = Prior to or immediately upon initiation of a release or daily if a release continues for more than one day

P/W = Prior to or immediately upon initiation of a release or weekly if a release continues for more than one week

P = Prior to or immediately upon initiation of a release

* = Source check required prior to containment purge

** = The channel calibration shall include the use of standard gas samples appropriate to the recommendations of the manufacturer of the gas analyzer equipment in use and include calibration points in the range of interest.

NA = not applicable



RADIOLOGICAL EFFLUENT CONTROL MANUAL

5.0 RADIOACTIVE EFFLUENT RELEASE LIMITS

5.1 Objective

To ensure controlled releases of radioactive materials in liquid and gaseous effluents to unrestricted areas are within applicable 10 CFR 20 concentration limits and to ensure the quantities of radioactive material released during any calendar year are such that resulting radiation exposures do not exceed the dose objectives of 10 CFR 50, Appendix I.

5.2 Radioactive Liquid Effluent Concentrations

- 5.2.1 Alarm setpoints for liquid effluent monitors shall be determined and adjusted utilizing the methodologies and parameters given in the ODCM.
- 5.2.2 The liquid effluent monitor setpoints shall be established to ensure that radioactive materials released as effluents shall not result in concentrations to unrestricted areas in excess of the values specified in 10 CFR 20, Appendix B, Table II.
- 5.2.3 During release of radioactive liquid effluents, at least one condenser circulating water pump shall be in operation and the service water return header shall be lined up only to the unit whose circulating water pump is operating.

5.3 Radioactive Liquid Effluent Release Limits

- 5.3.1 The annual calculated total quantity of radioactive material above background released from PBNP in liquid effluents shall not result in an unrestricted area estimated annual dose or dose commitment from all exposure pathways to any individual in excess of 6 millirem to the total body or 20 millirem to any organ.
- 5.3.2 Quarterly limits are defined as one quarter (1/4) of the annual limits.
- 5.3.3 Compliance with these release limits will be demonstrated by periodic dose calculations utilizing the methodology of the ODCM.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

5.4 Radioactive Gaseous Effluent Concentrations

- 5.4.1 Alarm setpoints for the gaseous effluent monitors shall be determined and adjusted utilizing the methodologies and parameters given in the ODCM.
- 5.4.2 The gaseous effluent monitor setpoints are established to ensure that radioactive materials released shall not result in concentrations to unrestricted areas in excess of the values specified in 10 CFR 20, Appendix B, Table II.
- 5.4.3 During the release of radioactive gaseous effluents from the gas decay tanks through the auxiliary building vent, at least one auxiliary building exhaust fan shall be in operation.

5.5 Radioactive Gaseous Effluent Release Limits

- 5.5.1 The annual calculated total quantity of radioactive materials above background released from PBNP to the atmosphere shall not result in an unrestricted area estimated annual dose or dose commitment from all exposure pathways to any individual in excess of the following:
 - a. 10 millirem to the total body or 30 millirem to the skin from gaseous effluents near ground level;
 - b. 30 millirem to any organ from all radioiodines and radioactive material in particulate form; and
 - c. Furthermore, the annual air dose from gaseous effluents at any location near ground level which could be occupied by individuals in unrestricted areas shall not exceed 20 millirads for gamma radiation or 40 millirads for beta radiation.
- 5.5.2 Quarterly limits are defined as one quarter (1/4) of the annual limits.
- 5.5.3 Compliance with these release limits will be demonstrated by periodic dose calculations utilizing the methodology of the ODCM.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

5.6 Quarterly Summary

- 5.6.1 A summary of radioactive effluent releases shall be made on a quarterly basis as described in the ODCM.
- 5.6.2 If the calculations required by 5.3.3 or 5.5.3 of this section exceed the corresponding quarterly limit during any calendar quarter, a summary of radioactive effluent releases shall be made monthly until it is determined that release quantities are within the annual limits.
- 5.6.3 If the calculations required by 5.3.3 or 5.5.3 of this section exceed twice the corresponding quarterly limit during any calendar quarter, a special report will be prepared and submitted per Technical Specification 15.7.8.4.D.
- 5.6.4 If the calculations required by 5.3.3 or 5.5.3 of this section demonstrate that quarterly releases exceed the quarterly limit, corrective actions shall be taken to ensure that subsequent releases in that calendar year will be in compliance with quarterly and annual limits.

5.7 Radioactive Effluent Treatment

- 5.7.1 The gaseous radioactive effluent treatment system shall be operated. If the gaseous effluent treatment system becomes inoperable, the effluent reporting requirements of Section 5.6 shall apply. These provisions do not include the gas decay tanks, the auxiliary building ventilation exhaust charcoal filter, and the air ejector decay duct charcoal filter assembly.
 - a. A gas decay tank(s) shall be operated whenever required to maintain gaseous releases within the limits of Section 5.5.1.a and Section 5.5.1.c.
 - b. The auxiliary building ventilation exhaust charcoal filter shall be operated when required to maintain gaseous releases within the limit of Section 5.5.1.b for radioiodines.
 - c. The air ejector charcoal filter shall be operated when required to maintain releases within the limit of Section 5.5.1.b for radioiodines.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

- 5.7.2 The liquid radioactive effluent treatment system shall be operated. If the liquid radioactive effluent system becomes inoperable, the effluent reporting requirements of Section 5.6 shall apply. These provisions do not include the processing of steam generator blowdown, the processing of liquid wastes collected in the waste holdup tank, the processing of secondary side sampling and turbine building wastes through the retention pond, and the processing of preplanned tank batch releases.
- a. Steam generator blowdown shall be processed to reduce radioactive effluents when required to maintain releases within the dose objectives of Section 5.3.1.
 - b. Wastes collected in the waste holdup tank shall be processed to reduce radioactive effluents when required to maintain releases within the dose objectives of 5.3.1.
 - c. Preplanned tank batch releases may be made without processing under any of the following conditions, provided the dose objectives of 5.3.1 are not exceeded:
 1. Processing or disposal of tank contents would prevent plant operation or delay plant start-up or shutdown; or
 2. The tank release is necessary to conform to Technical Specification operating requirements; or
 3. The tank release is necessary to eliminate a chemical contaminant to satisfy chemistry specifications; or
 4. The tank release is desired for any other reason and a cost-benefit analysis has been performed.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

5.8 Total Dose

- 5.8.1 Compliance with the provisions of Appendix I to 10 CFR 50 is adequate demonstration of conformance to the standards set forth in 40 CFR 190.
- 5.8.2 If the calculations required by 5.3.3 or 5.5.3 of this section exceed twice the annual dose objectives of Sections 5.3.3 and 5.5.3, dose calculations shall be performed as described in the ODCM and shall include direct radiation contributions from reactor units and from any outside storage tanks in addition to effluent pathways.
- 5.8.3 A report will be submitted to the Commission within 30 days upon completion of the dose calculations required by Section 5.8.2, if the calculated dose to any member of the general public exceeds the 40 CFR 190 annual dose limits.

5.9 Explosive Gas Mixture

- 5.9.1 The concentration of oxygen in the on-service gas decay tank shall be limited to less than or equal to 4% by volume.
- 5.9.2 If the concentration of oxygen in the on-service gas decay tank is greater than 4% by volume, immediately suspend all additions of waste gases to the on-service gas decay tank.
- 5.9.3 Reduce the oxygen concentration to less than 4% oxygen by volume as soon as possible. If the on-service gas decay tank is at or near capacity and the tank must be isolated to permit the required decay time to conform with dose objectives of Appendix I to 10 CFR 50, it will not be possible to immediately reduce the oxygen concentration. In this case, the tank will be isolated and the oxygen concentration reduced as soon as the gas decay requirements are satisfied.

5.10 Solid Radioactive Waste

The solid radwaste system shall be used in accordance with the Process Control Program to process radioactive wastes to meet all shipping and burial ground requirements. If the provisions of the Process Control Program are not satisfied, shipments of defectively processed or defectively packaged radioactive waste from the site will be suspended. The Process Control Program shall be used to verify solidification of radwaste.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

6.0 RADIOACTIVE EFFLUENT SAMPLING AND ANALYSIS REQUIREMENTS

6.1 Purpose

The purpose of this section is to specify the sampling frequency, the analysis frequency, and analysis requirements for radioactive liquid and gaseous effluents in order to verify that the concentrations and quantities of radioactive material released from the site in liquid and gaseous effluents do not exceed the objectives specified in Section 5.

6.2 Radioactive Liquid Waste Sampling and Analysis

The concentration of radioactivity in liquid waste shall be determined by sampling and analysis in accordance with Table 6-1.

6.3 Radioactive Gaseous Waste Sampling and Analysis

The concentration of radioactivity in gaseous wastes shall be determined by sampling and analyses in accordance with Table 6-2.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 6-1
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

Type of	Sampling	Minimum	Liquid Release Type ($\mu\text{Ci/cc}$)	Lower Level
	Analysis Frequency	of Detection ¹ Activity Analysis ⁵		Frequency
1. Batch Releases ²				
a. Waste Condensate Tank	Prior to Release	Prior to Release	Gamma Emitters	5×10^{-7}
b. Waste Distillate Tank			I-131	1×10^{-6}
c. Monitor Tanks				
d. Other tanks containing radioactivity to be discharged.		Monthly on composites obtained from batches released during the current month	Gross Alpha Tritium	1×10^{-7} 1×10^{-5}
		Quarterly on composites obtained from batches released during the current quarter	Sr-89/90	5×10^{-8}
2. Continuous Releases ³				
a. Steam Generator Blowdown	Grab Samples Twice Weekly	Twice Weekly	Gamma Emitters	5×10^{-7}
			I-131	1×10^{-6}
b. Service Water		Monthly on Grab Composites	Gross Alpha Tritium	1×10^{-7} 1×10^{-5}
		Quarterly on Grab Composites	Sr-89/90	5×10^{-8}
c. Retention Pond	Continuous Composite ⁴	Weekly	Gamma Emitters	5×10^{-7}
			I-131	1×10^{-6}
		Monthly on Weekly Composite	Gross Alpha Tritium	1×10^{-7} 1×10^{-5}
		Quarterly on Monthly Composites	Sr-89/90	5×10^{-8}



RADIOLOGICAL EFFLUENT CONTROL MANUAL

NOTES FOR TABLE 6-1

1. The principal gamma emitter for which the gamma isotopic LLD applies is Cs-137. Because gamma isotopic analyses are performed, the LLDs for all other gamma emitters are inherently determined by the operating characteristics of the counting system. All identifiable gamma emitters will be reported in the Annual Monitoring Report.
2. A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses each batch shall be isolated and mixed to assure representative sampling.
3. A continuous release is the discharge of liquid wastes of a non-discrete volume; e.g., from a volume of a system that has an input flow during the release.
4. A continuous composite is one in which the method of sampling employed results in a specimen that is representative of the liquids released.
5. Identified entrained noble gases shall be reported as gaseous effluents.



RADIOLOGICAL EFFLUENT CONTROL MANUAL

TABLE 6-2
RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

<u>Type of Analysis Frequency</u>	<u>Sampling Activity Analysis⁵</u>	<u>Minimum of Detection¹ (μCi/cc)</u>	<u>Gaseous Release Type</u>	<u>Lower Level Frequency</u>
1. Gas Decay Tank	Prior to Release	Prior to Release	Gamma Emitters	1×10^{-4}
2. Containment Purge or Continuous Vent	Prior to Purge ² or Vent	Prior to Purge or Vent	Gamma Emitters Tritium	1×10^{-4} 1×10^{-6}
3. Continuous Releases:	Continuous ³	Weekly Analysis of Charcoal and Particulate Samples	Gamma Emitters I-131	1×10^{-11} 1×10^{-12}
a. Unit 1 Containment Purge and Vent		Monthly Composite of Particulate Sample	Gross Alpha	1×10^{-11}
b. Unit 2 Containment Purge and Vent		Quarterly Composite of Particulate Sample	Sr-89/90	1×10^{-11}
c. Drumming Area Vent		Noble Gas Monitor	Noble gases Gross Beta or gamma	1×10^{-6}
d. Gas Stripper Building Vent	Monthly ⁴ (Grab)	Monthly	Gamma Emitters	1×10^{-4}
e. Auxiliary Building Vent		Monthly	Tritium	1×10^{-6}



RADIOLOGICAL EFFLUENT CONTROL MANUAL

NOTES FOR TABLE 6-2

1. The principal gamma emitters for which the LLD specification applies are Cs-137 in particulates and Xe-133 in gases. Because gamma isotopic analyses are performed, the LLDs for all other gamma emitters are inherently determined by the operating characteristics of the counting system. All identifiable gamma emitters will be reported in the Annual Monitoring Report.
2. Tritium grab samples will be taken every 24 hours when the refueling cavity is flooded.
3. The ratio of the sample flow rate to the release flow rate shall be known or estimated for the time period covered by each sampling interval.
4. Tritium grab samples will be taken every seven days from the drumming area ventilation exhaust/spent fuel pool area whenever there is spent fuel in the spent fuel pool.