RECM

RADIOLOGICAL EFFLUENT CONTROL MANUAL

Wisconsin Electric Power Company

DOCUMENT TYPE: Controlled Reference

CLASSIFICATION: NNSR

REVISION: 2

EFFECTIVE DATE: May 26, 2000

REVIEWER: Manager's Supervisory Staff

APPROVAL AUTHORITY: Plant Manager

PROCEDURE OWNER (title): Group Head

OWNER GROUP: Nuclear Safety Analysis (NSA)

Verified Current Copy: _____ _____ _____
Signature Date Time

List pages used for Partial Performance

_____
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_____

Controlling Work Document Numbers

_____ _____
_____ _____
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TABLE OF CONTENTS

SECTION **TITLE** **PAGE**

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 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.

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 ten times the maximum effluent concentration (MEC) values specified in Table 2, Column 2 of Appendix B to 10 CFR 20.1001-20.2402. 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.

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 indication the area of the page that was changed. Each copy shall indicate the date the revision was implemented.

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 gross 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.

b. Maximum release rate (for any one-hour period).

c. Estimated monthly total radioactivity (in Curies) released, by nuclide, for I-131, I-133, H-3, and radioactive particulates with half-lives greater than eight days, based on representative analyses performed by beta and by gamma isotopic analyses.

d. Semiannual 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 consecutive days.

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 consecutive days without the treatment required to meet the release limits specified in Section 5.0, 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 5.0, a special report shall be prepared and submitted to the Commission within thirty days of determination of the release quantity.

The report must describe the extent of exposure of individuals to radiation and radioactive material, including as appropriate:

a. the corrective action(s) to be taken to reduce subsequent releases to prevent recurrence of exceeding the limits, including the schedule for achieving conformance with applicable limits, ALARA constraints, generally applicable environmental standards, and associated license conditions,

b. estimates of exposures to a member of the public, including the dose from any external storage units, such as the ISFSI and the SGSF, for compliance with 40 CFR 190 limits,

c. the levels of radiation and concentrations of radioactive materials involved, and

d. the cause of the elevated exposures, dose rates, or concentrations.

If the dose to any member of the public exceeds 75 mrem to the thyroid or 25 mrem to the whole body or any organ other than the thyroid, pursuant to 40 CFR 190, the report shall also contain a request for a variance from this standard pursuant to 40 CFR 190.11.

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;

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,

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 and process monitors. The effluent monitors are those process monitors that 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 3.0 and 4.0 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.

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

FIGURE 2-1

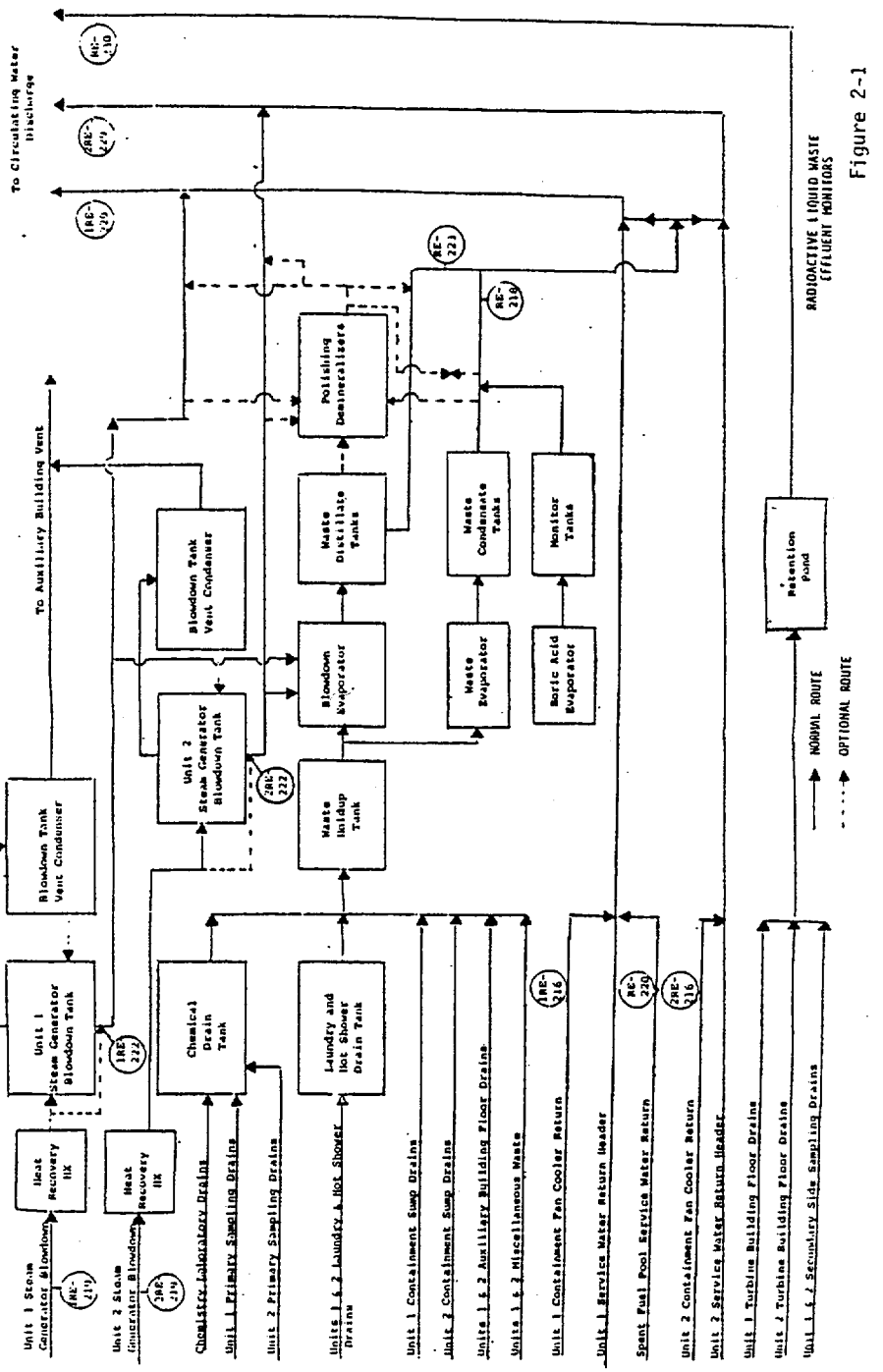

Figure 2-1

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

FIGURE 2-2

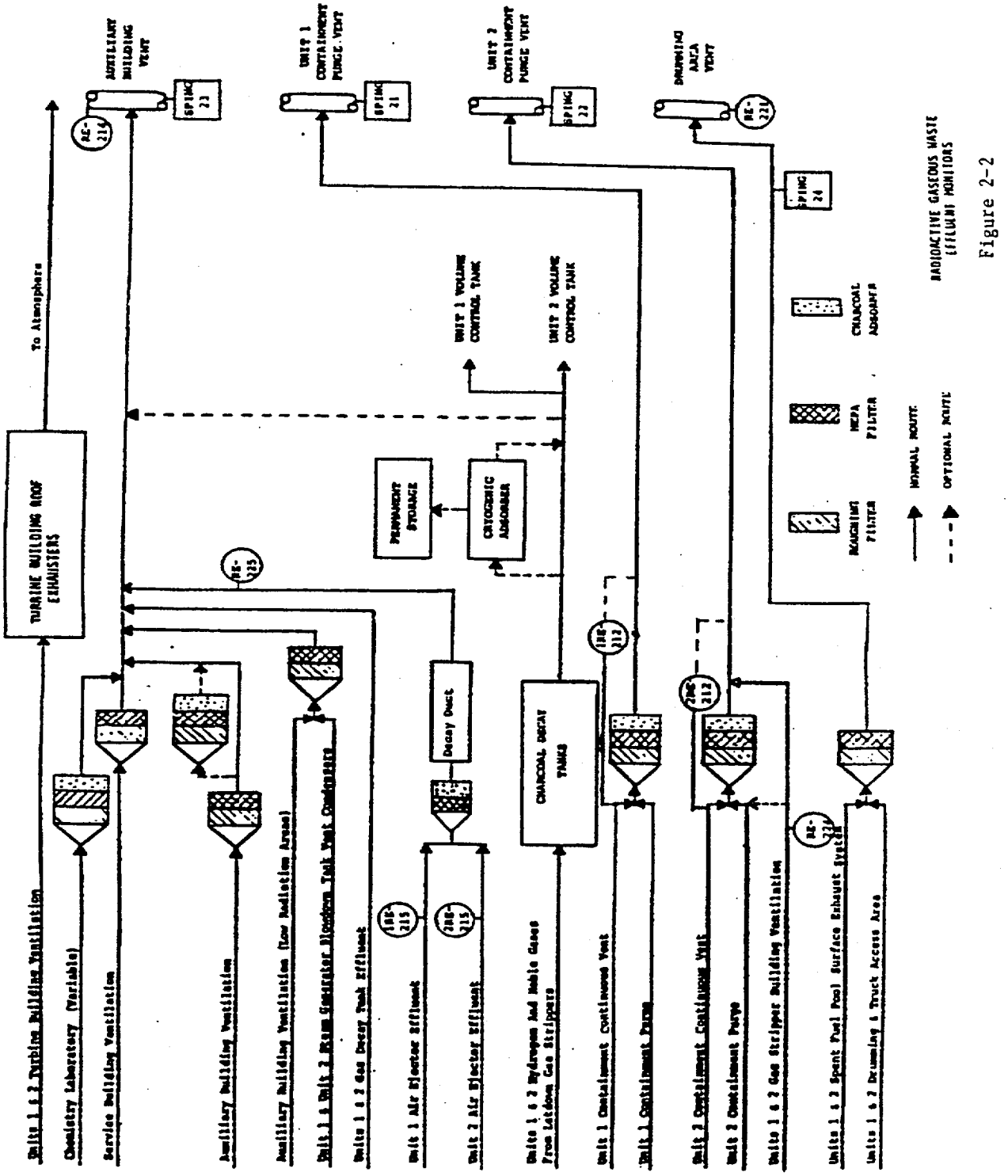

Figure 2-2

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 5.0.

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.

TABLE 3-1
RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

Instrument		Minimum Channels Operable	Action
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

Table 3-1

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.

TABLE 3-2
RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Instrument			Minimum Channels Operable	Action
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 or SPING 23	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

Table 3-2

Instrument			Minimum Channels Operable	Action
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 6
	c.	Iodine and Particulate - Continuous Air Samplers or SPING 21/22	1	Note 5
	d.	Sampler Flow Rate Measuring Device	1	Note 6
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 or SPING 24	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 or SPING 22	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

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 μCi/cc dose equivalent I-131 or once every 12 hours when the activity is greater than 0.01 μCi/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, (e.g., any low volume sampler which meets the requirements of Table 6-2).

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.

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.

TABLE 4-1
RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument Description	Channel Check	Calibrate	Functional Test	Source Check
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

Table 4-1

Instrument Description	Channel Check	Calibrate	Functional Test	Source Check
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

TABLE 4-2
RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Channel Description	Channel Check	Calibrate	Functional Test	Source Check
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

RADIOLOGICAL EFFLUENT CONTROL MANUAL

Table 4-2

Channel Description	Channel Check	Calibrate	Functional Test	Source Check
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
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

RADIOLOGICAL EFFLUENT CONTROL MANUAL

Table 4-2

Channel Description	Channel Check	Calibrate	Functional Test	Source Check
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

NOTATIONS FOR TABLES 4-1 AND 4-2

D	=	Daily
W	=	Weekly
M	=	Monthly
Q	=	Quarterly
R	=	Each Refueling Interval
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

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 ten times the concentration values specified in Appendix B, Table 2, Column 2, of 10 CFR 20.1001-20.2402.

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 For the purpose of initiating the use of the liquid effluent treatment system whenever the projected dose for a period of 31 days will exceed 2% of the dose guidelines of Appendix I to 10 CFR 50, the 2% of the Appendix I values, as given in Section 5.3.1, are 0.12 mrem for the whole body and 0.4 mrem for any organ.

5.3.3 Quarterly limits are defined as one-half of the annual limits.

5.3.4 Compliance with these release limits will be demonstrated by periodic dose calculations utilizing the methodology of the ODCM.

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 2.

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 I-131, I-133, H-3 and radioactive materials in particulate form whose half-life is > 8 days; 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 For the purpose of initiating the use of the atmospheric effluent treatment system whenever the projected dose for a period of 31 days will exceed 2% of the dose guidelines of Appendix I to 10 CFR 50, the 2% of the Appendix I values, as given in Section 5.5.1, are:

a. 0.2 mrem to the total body and 0.6 mrem to the skin, and

b. 0.6 mrem to any organ.

5.5.3 Quarterly limits are defined as one-half of the annual limits.

5.5.4 Compliance with these release limits will be demonstrated by periodic dose calculations utilizing the methodology of the ODCM.

5.6 Atmospheric Release Rate Limitations

The rate of release of radioactive effluents to the atmosphere from the site, which if continued for one year, shall not result in dose rates at or beyond the site boundary that exceed the following values.

5.6.1 For noble gases:

a. 500 mrem/yr to the total body

b. 3000 mrem/yr to the skin

5.6.2 For I-131, I-133, H-3, and all particulate form radionuclides with a half-life > 8 days:

1500 mrem/yr to any organ

5.6.3 The instantaneous, limiting release rates for the above annual rates, are calculated in Section 3.10 of the ODCM for various release types. Below are default values for various releases. Check the ODCM for the methodology to calculate release rates for more specific radionuclide mixtures or contact the cognizant Radiological Engineer.

a. For noble gases, the whole body dose is limiting yielding a rate of 1.22E-01 Ci/sec.

b. For particulates, radioiodines and H-3, as described above, the release rates are

1.14E-06 Ci/sec for radioiodines

1.30E-06 Ci/sec for cesiums

2.16E-05 Ci/sec for cobalts

3.62E-01 Ci/sec for H-3

As a conservative measure, the limiting release rate should be applied to the whole radionuclide mixture based upon the presence or absence of the above major dose contributors.

5.7 Cumulative and Projected Doses

5.7.1 Determination of cumulative and projected dose contributions from radioactive effluents for the current calendar quarter and current calendar year, in accordance with the methodology and parameters of the ODCM, shall be made at least every 31 days.

5.7.2 Because of the length of time required to complete all facets of the required calculations and to obtain the radioanalytical results for effluent samples sent to a contracted analytical laboratory, the determination of the current quarter dose may not be finished until the following quarter.

5.7.3 If the calculations required by Sections 5.3.4 or 5.5.4 exceed the corresponding quarterly limit during any calendar quarter, a special report will be prepared and submitted per Technical Specification 15.7.8.4.D.

5.7.4 If the calculations required by Sections 5.3.4 or 5.5.4 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.

5.8 Radioactive Effluent Treatment

5.8.1 The gaseous radioactive effluent treatment system shall be operated whenever the projected dose for a 31 day period, from I-131, I-133, H-3, and radioactive particulates with a half-life > 8 days, exceeds the values of Section 5.5.2 (2% of the Appendix I values). If the gaseous effluent treatment system becomes inoperable, the effluent reporting requirements of Section 1.6 shall apply.

a. A gas decay tank(s) shall be operated whenever required to maintain gaseous releases within the limits of Section 5.5.2.a.

b. The auxiliary building ventilation exhaust charcoal filter shall be operated when required to maintain gaseous releases within the limit of Section 5.5.2.b for radioiodines.

c. The air ejector charcoal filter shall be operated when required to maintain releases within the limit of Section 5.5.2.b for radioiodines.

5.8.2 The liquid radioactive effluent treatment system shall be operated whenever the projected dose for a 31 day period exceeds the values of Section 5.3.4 (2% of the Appendix I values). If the liquid effluent treatment system becomes inoperable, the effluent reporting requirements of Section 1.6 shall apply.

5.9 Total Dose

5.9.1 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.

5.9.2 If the calculations required by 5.3.4 or 5.5.4 exceed twice the annual dose objectives of Sections 5.3 and 5.5 , 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.

5.9.3 A report will be submitted to the Commission within 30 days upon completion of the dose calculations required by Section 5.9.2, if the calculated dose to any member of the general public exceeds the 40 CFR 190 annual dose limits.

5.10 Explosive Gas Mixture

5.10.1 The concentration of oxygen in the on-service gas decay tank shall be limited to less than or equal to 4% by volume.

5.10.2 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.

5.10.3 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.

5.11 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.

6.0 RADIOACTIVE EFFLUENT SAMPLING AND ANALYSIS REQUIREMENTS

6.1 Purpose

Pursuant to the requirements of 10 CFR 20.1302, 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 5.0.

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

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis[5]	Lower Level of Detection[1] (µCi/cc)
1. Batch Releases[2] a. Waste Condensate Tank b. Waste Distillate Tank c. Monitor Tanks d. Other tanks containing radioactivity to be discharged	Prior to Release	Prior to Release	Gamma Emitters I-131	5×10^{-7} 1×10^{-6}
		Monthly on composites obtained from batches released during the current month	Gross Alpha	1×10^{-7}
			Tritium	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 I-131	5×10^{-7} 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 I-131	5×10^{-7} 1×10^{-6}
			Monthly on Weekly Composite	Gross Alpha Tritium	1×10^{-7} 1×10^{-5}
			Quarterly on Monthly Composite	Sr-89/90	5×10^{-8}

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

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

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.