INDEX

6.0 TOTAL DOSE (40CFR190 CONFORMANCE)

6.1 INTRODUCTION

Compliance with 40CFR190 as prescribed by ODCM Specification 7.3.14 is to be demonstrated only when one or more of ODCM Specifications 7.3.4.a, 7.3.4.b, 7.3.8.a, 7.3.8.b, 7.3.9.a, 7.3.9.b is exceeded by a factor of 2. Once this occurs, the Company has 30 days to submit this report.

6.2 GENERAL

To perform the calculations to evaluate conformance with 40CFR190, an effort is made to develop doses that are realistic by removing assumptions that lead to overestimates of dose to a MEMBER OF THE PUBLIC (i.e., calculations for compliance with 10CR50, Appendix I). To accomplish this, the following calculational rules are used:

6.2.1 Doses to a MEMBER OF THE PUBLIC via the liquid release pathway are considered to be <1 mrem/yr. (Ref: NUREG 0543).

6.2.2 Doses to a MEMBER OF THE PUBLIC due to a milk pathway will be evaluated only as can be shown to exist. Otherwise, doses via this pathway will be estimated as <1 mrem/yr.

6.2.3 Environmental sampling data which demonstrates that no pathway exists may be used to delete a pathway to man from a calculation.

6.2.4 To sum numbers represented as "less than" (<), use the value of the largest number in the group.

(i.e., <5 + <1 + <1 + <3 = 5)

6.2.5 When doses via direct radiation are added to doses via inhalation pathway, they will be calculated for the same distance in the same sector.

6.2.6 The calculational locations for a MEMBER OF THE PUBLIC will only be at residences or places of employment.

NOTE: Additional assumptions may be used to provide situation-specific parameters, provided they are documented along with their concomitant bases.

6.3 CALCULATIONS OF TOTAL BODY DOSE

Estimates will be made for each of the following exposure pathways to the same location by age class. Only those age classes known to exist at a location are considered.

6.3.1 Direct Radiation

The component of dose to a MEMBER OF THE PUBLIC due to direct radiation will be determined by:

1. Determining the direct radiation dose at the plant boundary in each sector, D_B,θ.

2. Extrapolating that dose to the calculational location as follows:

$$D_L,\theta = \frac{D_B,\theta\ (1.49\ E + 6)}{(X_L^2,\theta)}$$

D_L,θ = dose at calculational location in sector θ

1.49E + 6 = square of mean distance to the site boundary (1220 m).

X_L,θ = distance to calculational locations in sector θ in meters.

6.3.2 Inhalation Dose

The inhalation dose will be determined at the calculational locations for each age class at risk according to the methods outlined in Section 3.3 of this manual.

6.3.3 Ingestion Pathway

The dose via the ingestion pathway will be calculated at the consumer locations for the consumers at risk. If no milk pathway exists in a sector, the dose via this pathway will be treated as <1 mrem/yr.

6.3.4 Other Uranium Fuel Cycle Sources

The dose from other fuel cycle sources will be treated as <1 mrem/yr.

6.4 THYROID DOSE

The dose to the thyroid will be calculated for each sector as the sum of inhalation dose and milk ingestion dose (if existing). The calculational methods will be those identified in Section 3.3 of this manual.

6.4.1 Dose projections can incorporate planned plant operations such as power reduction or outages for the projected period.

SECTION 7.0

RADIOACTIVE EFFLUENTS CONTROLS PROGRAM

CONTAINING

OFFSITE DOSE CALCULATION MANUAL
SPECIFICATIONS (ODCMS) AND BASES

FOR

BRUNSWICK STEAM ELECTRIC PLANT

UNITS 1 AND 2

(continued)

LIST OF TABLES

LIST OF FIGURES

7.1.0 USE AND APPLICATION

ODCMS 7.1.1 Definitions

NOTE
The defined terms of this section appear in capitalized type and are applicable throughout these Offsite Dose Calculation Manual Specifications and Bases.

Term	Definition
CHANNEL CALIBRATION	A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel, including the required sensor, alarm, display, and trip functions, and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by means of any series of sequential, overlapping, or total channel steps so that the entire channel is calibrated.
CHANNEL CHECK	A CHANNEL CHECK shall be the qualitative assessment, by observation, of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.
CHANNEL FUNCTIONAL TEST	A CHANNEL FUNCTIONAL TEST shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify OPERABILITY, including required alarm, interlock, display, and trip functions, and channel failure trips. The CHANNEL FUNCTIONAL TEST may be performed by means of any series of sequential, overlapping, or total channel steps so that the entire channel is tested.

(continued)

ODCMS 7.1.1 Definitions (continued)

GASEOUS RADWASTE TREATMENT SYSTEM	A GASEOUS RADWASTE TREATMENT SYSTEM is any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.
LIQUID RADWASTE TREATMENT SYSTEM	A LIQUID RADWASTE TREATMENT SYSTEM is any system designed and installed to collect, treat and process radioactive liquid waste streams for reuse or for controlled discharge from the restricted area in compliance with established regulatory requirements.
MEMBER(S) OF THE PUBLIC	MEMBER(S) OF THE PUBLIC shall include all persons who are not occupationally associated with the plant. This category does not include employees of the utility, its contractors or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational or other purposes not associated with the plant.
MODE	A MODE shall be as required by Technical Specifications.
OPERABLE—OPERABILITY	A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).
PURGE-PURGING	PURGE or PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is required to purify the containment.

(continued)

ODCMS 7.1.1 Definitions (continued)

RATED THERMAL POWER (RTP)	RTP shall be a total reactor core heat transfer rate to the reactor coolant of 2923 MWt for Unit 1 and 2558 MWt for Unit 2.
SITE BOUNDARY	The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased nor otherwise controlled by the licensee, as defined by Figure 7.1.1-1. For the purpose of effluent release calculations, the boundary for atmospheric releases is the SITE BOUNDARY and the boundary for liquid releases is the SITE BOUNDARY prior to dilution in the Atlantic Ocean.
SOURCE CHECK	A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to radiation.
THERMAL POWER	THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.
UNRESTRICTED AREA	An UNRESTRICTED AREA shall be any area at or beyond the SITE BOUNDARY access to which is not controlled by the licensee for purpose of protection of individuals from exposure to radiation and radioactive materials or any area within the SITE BOUNDARY used for residential quarters or industrial, commercial, institutional or recreational purposes.
VENTILATION EXHAUST TREATMENT SYSTEM	A VENTILATION EXHAUST TREATMENT SYSTEM is any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal adsorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any effect on noble gas effluents. Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

(continued)

ODCMS 7.1.1 Definitions (continued)

VENT-VENTING	VENT or VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required. Vent, used in system names, does not imply a VENTING process.

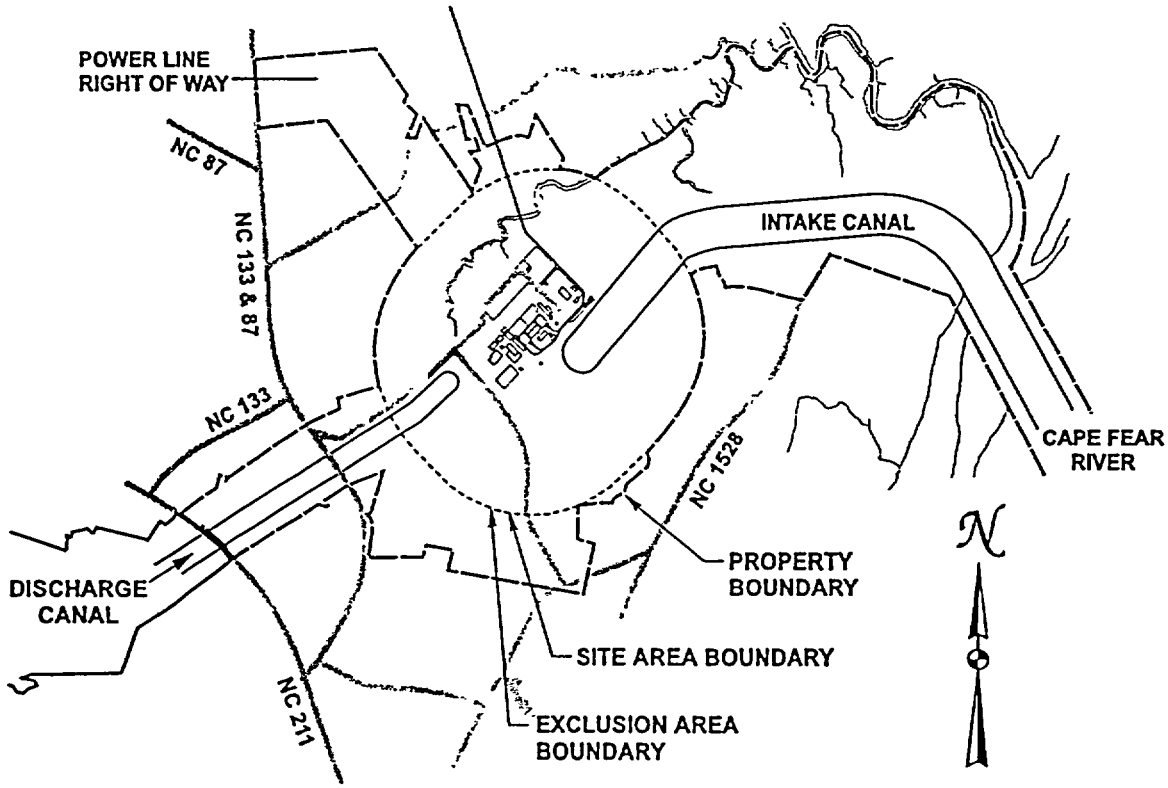


Figure 7.1.1-1 (page 1 of 1)
SITE BOUNDARY

7.1.0 USE AND APPLICATION

ODCMS 7.1.2 Logical Connectors

PURPOSE

The purpose of this section is to explain the meaning of logical connectors.

Logical connectors are used in Offsite Dose Calculation Manual Specifications (ODCMS) to discriminate between, and yet connect, discrete Conditions, Required Compensatory Measures, Completion Times, Tests, and Frequencies. The only logical connectors that appear in ODCMS are AND and OR. The physical arrangement of these connectors constitutes logical conventions with specific meanings.

BACKGROUND

Several levels of logic may be used to state Required Compensatory Measures. These levels are identified by the placement (or nesting) of the logical connectors and by the number assigned to each Required Compensatory Measure. The first level of logic is identified by the first digit of the number assigned to a Required Compensatory Measure and the placement of the logical connector in the first level of nesting (i.e., left justified with the number of the Required Compensatory Measure). The successive levels of logic are identified by additional digits of the Required Compensatory Measure number and by successive indentions of the logical connectors.

When logical connectors are used to state a Condition, Completion Time, Test, or Frequency, only the first level of logic is used, and the logical connector is left justified with the statement of the Condition, Completion Time, Test, or Frequency.

EXAMPLES

The following examples illustrate the use of logical connectors.

(continued)

ODCMS 7.1.2 Logical Connectors (continued)

EXAMPLES (continued)

EXAMPLE 7.1.2-1

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. ODCMS not met.	A.1 Verify . . . AND A.2 Restore . . .	

In this example the logical connector AND is used to indicate that when in Condition A, both Required Compensatory Measures A.1 and A.2 must be completed.

(continued)

ODCMS 7.1.2 Logical Connectors (continued)

EXAMPLES (continued)

EXAMPLE 7.1.2-2

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. ODCMS not met.	A.1 Trip . . . OR A.2.1 Verify . . . AND A.2.2.1 Reduce . . . OR A.2.2.2 Perform . . . OR A.3 Align . . .	

This example represents a more complicated use of logical connectors. Required Compensatory Measures A.1, A.2, and A.3 are alternative choices, only one of which must be performed as indicated by the use of the logical connector OR and the left justified placement. Any one of these three Compensatory Measures may be chosen. If A.2 is chosen, then both A.2.1 and A.2.2 must be performed as indicated by the logical connector AND. Required Compensatory Measure A.2.2 is met by performing A.2.2.1 or A.2.2.2. The indented position of the logical connector OR indicates that A.2.2.1 and A.2.2.2 are alternative choices, only one of which must be performed.

7.1.0 USE AND APPLICATION

ODCMS 7.1.3 Completion Times

PURPOSE	The purpose of this section is to establish the Completion Time convention and to provide guidance for its use.
BACKGROUND	Offsite Dose Calculation Manual Specifications (ODCMS) specify minimum requirements for unit systems or variables. The COMPENSATORY MEASURES associated with an ODCMS state Conditions that typically describe the ways in which the requirements of the ODCMS can fail to be met. Specified with each stated Condition are Required Compensatory Measure(s) and Completion Times(s).
DESCRIPTION	The Completion Time is the amount of time allowed for completing a Required Compensatory Measure. It is referenced to the time of discovery of a situation (e.g., inoperable equipment or variable not within limits) that requires entering a COMPENSATORY MEASURES Condition unless otherwise specified, providing the unit is in a MODE or specified condition stated in the Applicability of the ODCMS. Required Compensatory Measures must be completed prior to the expiration of the specified Completion Time. A COMPENSATORY MEASURES Condition remains in effect and the Required Compensatory Measures apply until the Condition no longer exists or the unit is not within the ODCMS Applicability. If situations are discovered that require entry into more than one Condition at a time within a single ODCMS (multiple Conditions), the Required Compensatory Measures for each Condition must be performed within the associated Completion Time. When in multiple Conditions, separate Completion Times are tracked for each Condition starting from the time of discovery of the situation that required entry into the Condition. Once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition unless specifically stated. The Required Compensatory Measures of the Condition continue to apply to each additional failure, with Completion Times based on initial entry into the Condition.

(continued)

ODCMS 7.1.3 Completion Times (continued)

DESCRIPTION (continued)

However, when a subsequent division, subsystem, component, or variable expressed in the Condition is discovered to be inoperable or not within limits, the Completion Time(s) may be extended. To apply this Completion Time extension, two criteria must first be met. The subsequent inoperability:

a. Must exist concurrent with the first inoperability; and

b. Must remain inoperable or not within limits after the first inoperability is resolved.

The total Completion Time allowed for completing a Required Compensatory Measure to address the subsequent inoperability shall be limited to the more restrictive of either:

a. The stated Completion Time, as measured from the initial entry into the Condition, plus an additional 24 hours; or

b. The stated Completion Time as measured from discovery of the subsequent inoperability.

The above Completion Time extension does not apply to those ODCMS that have exceptions that allow completely separate re-entry into the Condition (for each division, subsystem, component or variable expressed in the Condition) and separate tracking of Completion Times based on this re-entry. These exceptions are stated in individual ODCMS.

The above Completion Time extension does not apply to a Completion Time with a modified "time zero." This modified "time zero" may be expressed as a repetitive time (i.e., "once per 8 hours," where the Completion Time is referenced from a previous completion of the Required Compensatory Measures versus the time of Condition entry) or as a time modified by the phrase "from discovery . . ." Example 7.1.3-3 illustrates one use of this type of Completion Time. The 10 day Completion Time specified for Condition A and B in Example 7.1.3-3 may not be extended.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES The following examples illustrate the use of Completion Times with different types of Conditions and changing Conditions.

EXAMPLE 7.1.3-1

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

Condition B has two Required Compensatory Measures. Each Required Compensatory Measure has its own separate Completion Time. Each Completion Time is referenced to the time that Condition B is entered.

The Required Compensatory Measures of Condition B are to be in MODE 3 within 12 hours AND in MODE 4 within 36 hours. A total of 12 hours is allowed for reaching MODE 3 and a total of 36 hours (**not 48 hours**) is allowed for reaching MODE 4 from the time that Condition B was entered. If MODE 3 is reached within 6 hours, the time allowed for reaching MODE 4 is the next 30 hours because the total time allowed for reaching MODE 4 is 36 hours.

If Condition B is entered while in MODE 3, the time allowed for reaching MODE 4 is the next 36 hours.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-2

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One pump inoperable.	A.1 Restore pump to OPERABLE status.	7 days
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

When a pump is declared inoperable, Condition A is entered. If the pump is not restored to OPERABLE status within 7 days, Condition B is also entered and the Completion Time clocks for Required Compensatory Measures B.1 and B.2 start. If the inoperable pump is restored to OPERABLE status after Condition B is entered, Condition A and B are exited, and therefore, the Required Compensatory Measures of Condition B may be terminated.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-3

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One Function X subsystem inoperable.	A.1 Restore Function X subsystem to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the ODCMS
B. One Function Y subsystem inoperable.	B.1 Restore Function Y subsystem to OPERABLE status.	72 hours AND 10 days from discovery of failure to meet the ODCMS
C. One Function X subsystem inoperable. AND One Function Y subsystem inoperable.	C.1 Restore Function X subsystem to OPERABLE status. OR C.2 Restore Function Y subsystem to OPERABLE status.	72 hours 72 hours

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-3 (continued)

When one Function X subsystem and one Function Y subsystem are inoperable, Condition A and Condition B are concurrently applicable. The Completion Times for Condition A and Condition B are tracked separately for each subsystem, starting from the time each subsystem was declared inoperable and the Condition was entered. A separate Completion Time is established for Condition C and tracked from the time the second subsystem was declared inoperable (i.e., the time the situation described in Condition C was discovered).

If Required Compensatory Measure C.2 is completed within the specified Completion Time, Conditions B and C are exited. If the Completion Time for Required Compensatory Measure A.1 has not expired, operation may continue in accordance with Condition A. The remaining Completion Time in Condition A is measured from the time the affected subsystem was declared inoperable (i.e., initial entry into Condition A).

The Completion Times of Conditions A and B are modified by a logical connector, with a separate 10 day Completion Time measured from the time it was discovered the ODCMS was not met. In this example, without the separate Completion Time, it would be possible to alternate between Conditions A, B, and C in such a manner that operation could continue indefinitely without ever restoring systems to meet the ODCMS. The separate Completion Time modified by the phrase "from discovery of failure to meet the ODCMS" is designed to prevent indefinite continued operation while not meeting the ODCMS. This Completion Time allows for an exception to the normal "time zero" for beginning the Completion Time "clock". In this instance, the Completion Time "time zero" is specified as commencing at the time the ODCMS was initially not met, instead of at the time the associated Condition was entered.

(continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-4

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One or more valves inoperable.	A.1 Restore valve(s) to OPERABLE status.	4 hours
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

A single Completion Time is used for any number of valves inoperable at the same time. The Completion Time associated with Condition A is based on the initial entry into Condition A and is not tracked on a per valve basis. Declaring subsequent valves inoperable, while Condition A is still in effect, does not trigger the tracking of separate Completion Times.

Once one of the valves has been restored to OPERABLE status, the Condition A Completion Time is not reset, but continues from the time the first valve was declared inoperable. The Completion Time may be extended if the valve restored to OPERABLE status was the first inoperable valve. The Condition A Completion Time may be extended for up to 4 hours provided this does not result in any subsequent valve being inoperable for > 4 hours.

If the Completion Time of 4 hours (plus the extension) expires while one or more valves are still inoperable, Condition B is entered.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-5

COMPENSATORY MEASURES

NOTE
Separate Condition entry is allowed for each inoperable valve.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One or more valves inoperable.	A.1 Restore valve to OPERABLE status.	4 hours
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

The Note above the COMPENSATORY MEASURES Table is a method of modifying how the Completion Time is tracked. If this method of modifying how the Completion Time is tracked was applicable only to a specific Condition, the Note would appear in that Condition rather than at the top of the COMPENSATORY MEASURES Table.

The Note allows Condition A to be entered separately for each inoperable valve, and Completion Times tracked on a per valve basis. When a valve is declared inoperable, Condition A is entered and its Completion Time starts. If subsequent valves are declared inoperable, Condition A is entered for each valve and separate Completion Times start and are tracked for each valve.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-5 (continued)

If the Completion Time associated with a valve in Condition A expires, Condition B is entered for that valve. If the Completion Times associated with subsequent valves in Condition A expire, Condition B is entered separately for each valve and separate Completion Times start and are tracked for each valve. If a valve that caused entry into Condition B is restored to OPERABLE status, Condition B is exited for that valve.

Since the Note in this example allows multiple Condition entry and tracking of separate Completion Times, Completion Time extensions do not apply.

EXAMPLE 7.1.3-6

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One channel inoperable.	A.1 Perform TR 7.3.x.x. OR A.2 Reduce THERMAL POWER to ≤ 50% RTP.	Once per 8 hours 8 hours
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-6 (continued)

Entry into Condition A offers a choice between Required Compensatory Measure A.1 or A.2. Required Compensatory Measure A.1 has a "once per" Completion Time, which qualifies for the 25% extension, per TR 7.3.0.2, to each performance after the initial performance. The initial 8 hour interval of Required Compensatory Measure A.1 begins when Condition A is entered and the initial performance of Required Compensatory Measure A.1 must be completed within the first 8 hour interval. If Required Compensatory Measure A.1 is followed and the Required Compensatory Measure is not met within the Completion Time (plus the extension allowed by TR 7.3.0.2), Condition B is entered. If Required Compensatory Measure A.2 is followed and the Completion Time of 8 hours is not met, Condition B is entered.

If after entry into Condition B, Required Compensatory Measure A.1 or A.2 is met, Condition B is exited and operation may then continue in Condition A.

(continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-7

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One subsystem inoperable.	A.1 Verify affected subsystem isolated. AND A.2 Restore subsystem to OPERABLE status.	1 hour AND Once per 8 hours thereafter 72 hours
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

Required Compensatory Measure A.1 has two Completion Times. The 1 hour Completion Time begins at the time the Condition is entered and each "Once per 8 hours thereafter" interval begins upon performance of Required Compensatory Measure A.1.

If after Condition A is entered, Required Compensatory Measure A.1 is not met within either the initial 1 hour or any subsequent 8 hour interval from the previous performance (plus the extension allowed by TR 7.3.0.2), Condition B is entered. The Completion Time clock for Condition A does not stop after Condition B is entered, but continues

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)	EXAMPLE 7.1.3-7 (continued) from the time Condition A was initially entered. If Required Compensatory Measure A.1 is met after Condition B is entered, Condition B is exited and operation may continue in accordance with Condition A, provided the Completion Time for Required Compensatory Measure A.2 has not expired.
IMMEDIATE COMPLETION TIME	When "Immediately" is used as a Completion Time, the Required Compensatory Measure should be pursued without delay and in a controlled manner.

7.1.0 USE AND APPLICATION

ODCMS 7.1.4 Frequency

PURPOSE

The purpose of this section is to define the proper use and application of Frequency requirements.

DESCRIPTION

Each Test Requirement (TR) of the Offsite Dose Calculation Manual has a specified Frequency in which the Test must be met in order to meet the associated Offsite Dose Calculation Manual Specification (ODCMS). An understanding of the correct application of the specified Frequency is necessary for compliance with the TR.

The "specified Frequency" is referred to throughout this section and each of the Specifications of Section 7.3.0, Test Requirement (TR) Applicability. The "specified Frequency" consists of the requirements of the Frequency column of each TR, as well as certain Notes in the Test column that modify performance requirements.

Sometimes special situations dictate when the requirements of a Test are to be met. They are "otherwise stated" conditions allowed by TR 7.3.0.1. They may be stated as clarifying Notes in the Test, as part of the Test, or both. Example 7.1.4-4 discusses these special situations.

Situations where a Test could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after the associated ODCMS is within its Applicability, represent potential TR 7.3.0.4 conflicts. To avoid these conflicts, the TR (i.e., the Test or the Frequency) is stated such that it is only "required" when it can be and should be performed. With a TR satisfied, TR 7.3.0.4 imposes no restriction.

The use of "met or "performed" in these instances conveys specific meanings. A Test is "met" only when the acceptance criteria are satisfied. Known failure of the requirements of a Test, even without a Test specifically being "performed," constitutes a Test not "met." "Performance" refers only to the requirement to specifically determine the

(continued)

ODCMS 7.1.4 Frequency (continued)

DESCRIPTION (continued)

ability to meet the acceptance criteria. TR 7.3.0.4 restrictions would not apply if both the following conditions are satisfied:

a. The Test is not required to be performed; and

b. The Test is not required to be met or, even if required to be met, is not known to be failed.

EXAMPLES

The following examples illustrate the various ways that Frequencies are specified. In these examples, the Applicability of the ODCMS (ODCMS not shown) is MODES 1, 2, and 3.

EXAMPLE 7.1.4-1

TEST REQUIREMENTS

TEST	FREQUENCY
Perform CHANNEL CHECK.	12 hours

Example 7.1.4-1 contains the type of TR most often encountered in the ODCMS. The Frequency specifies an interval (12 hours) during which the associated Test must be performed at least one time. Performance of the Test initiates the subsequent interval. Although the Frequency is stated as 12 hours, an extension of the time interval to 1.25 times the interval specified in the Frequency is allowed by TR 7.3.0.2 for operational flexibility. The measurement of this interval continues at all times, even when the TR is not required to be met per TR 7.3.0.1 (such as when the equipment is inoperable, a variable is outside specified limits, or the unit is outside the Applicability of the ODCMS). If the interval specified by TR 7.3.0.2 is exceeded while the unit is in a MODE or other specified condition in the Applicability of the ODCMS, and the performance of the Test is not otherwise modified (refer to Examples 7.1.4-3 and 7.1.4-4), then TR 7.3.0.3 becomes applicable.

(continued)

ODCMS 7.1.4 Frequency (continued)

EXAMPLES (continued)

EXAMPLE 7.1.4-1 (continued)

If the interval as specified by TR 7.3.0.2 is exceeded while the unit is not in a MODE or other specified condition in the Applicability of the ODCMS for which performance of the TR is required, the Test must be performed within the Frequency requirements of TR 7.3.0.2 prior to entry into the MODE or other specified condition. Failure to do so would result in a violation of TR 7.3.0.4.

EXAMPLE 7.1.4-2

TEST REQUIREMENTS

TEST	FREQUENCY
Verify flow is within limits.	Once within 12 hours after ≥ 25% RTP AND 24 hours thereafter

Example 7.1.4-2 has two Frequencies. The first is a one time performance Frequency, and the second is of the type shown in Example 7.1.4-1. The logical connector "AND" indicates that both Frequency requirements must be met. Each time reactor power is increased from a power level < 25% RTP to≥ 25% RTP, the Test must be performed within 12 hours.

The use of "once" indicates a single performance will satisfy the specified Frequency (assuming no other Frequencies are connected by "AND"). This type of Frequency does not qualify for the extension allowed by TR 7.3.0.2.

(continued)

ODCMS 7.1.4 Frequency (continued)

EXAMPLES (continued)

EXAMPLE 7.1.4-2 (continued)

"Thereafter" indicates future performances must be established per TR 7.3.0.2, but only after a specified condition is first met (i.e., the "once" performance in this example). If reactor power decreases to < 25% RTP, the measurement of both intervals stops. New intervals start upon reactor power reaching 25% RTP.

EXAMPLE 7.1.4-3

TEST REQUIREMENTS

TEST	FREQUENCY
NOTE Not required to be performed until 12 hours after ≥ 25% RTP.	
Perform channel adjustment.	7 days

The interval continues whether or not the unit operation is < 25% RTP between performances.

As the Note modifies the required performance of the Test, it is construed to be part of the "specified Frequency." Should the 7 day interval be exceeded while operation is < 25% RTP, this Note allows 12 hours after power reaches ≥ 25% RTP to perform the Test. The Test is still considered to be within the "specified Frequency." Therefore, if the Test were not performed within the 7 day interval (plus the extension allowed by TR 7.3.0.2), but operation was < 25% RTP, it would not constitute a failure of the TR or failure to meet the ODCMS. Also, no violation of TR 7.3.0.4 occurs when changing MODES, even with the 7 day Frequency not met, provided operation does not exceed 12 hours with power ≥ 25% RTP.

(continued)

ODCMS 7.1.4 Frequency (continued)

EXAMPLES (continued)

EXAMPLE 7.1.4-3 (continued)

Once the unit reaches 25% RTP, 12 hours would be allowed for completing the Test. If the Test were not performed within this 12 hour interval, there would then be a failure to perform a Test within the specified Frequency, and the provisions of TR 7.3.0.3 would apply.

EXAMPLE 7.1.4-4

TEST REQUIREMENTS

TEST	FREQUENCY
NOTE Only required to be met in MODE 1.	
Verify leakage rates are within limits.	24 hours

Example 7.1.4-4 specifies that the requirements of this Test do not have to be met until the unit is in MODE 1. The interval measurement for the Frequency of this Test continues at all times, as described in Example 7.1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Test. Therefore, if the Test were not performed within the 24 hour (plus the extension allowed by TR 7.3.0.2) interval, but the unit was not in MODE 1, there would be no failure of the TR nor failure to meet the ODCMS. Therefore, no violation of TR 7.3.0.4 occurs when changing MODES, even with the 24 hour Frequency exceeded, provided the MODE change was not made into MODE 1. Prior to entering MODE 1 (assuming again that the 24 hour Frequency were not met), TR 7.3.0.4 would require satisfying the TR.

7.2.0 Not used.

7.3.0 OFFSITE DOSE CALCULATION MANUAL SPECIFICATION (ODCMS) APPLICABILITY

ODCMS 7.3.0.1	ODCMSs shall be met during the MODES or other specified conditions in the Applicability, except as provided in ODCMS 7.3.0.2.
ODCMS 7.3.0.2	Upon discovery of a failure to meet an ODCMS, the required Compensatory Measures of the associated Conditions shall be met, except as provided in ODCMS 7.3.0.5. If the ODCMS is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Compensatory measure(s) is not required, unless otherwise stated.
ODCMS 7.3.0.3	Not used.
ODCMS 7.3.0.4	When an ODCMS is not met, entry into a MODE or other specified condition in the Applicability shall not be made except when the associated COMPENSATORY MEASURES to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. This ODCMS shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with COMPENSATORY MEASURES, or that are part of a shutdown of the unit. Exceptions to this ODCMS are stated in the individual ODCMSs. These exceptions allow entry into MODES or other specified conditions in the Applicability when the associated COMPENSATORY MEASURES to be entered allow unit operation in the MODE or other specified condition in the Applicability only for a limited period of time.
ODCMS 7.3.0.5	Equipment removed from service or declared inoperable to comply with COMPENSATORY MEASURES may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to ODCMS 7.3.0.2 for the system returned to service under administrative control to perform the required testing.

(continued)

7.3.0 ODCMS APPLICABILITY (continued)

ODCMS 7.3.0.6 ODCMSs and associated COMPENSATORY MEASURES shall apply to both units except as follows:

a. Whenever the ODCMS refers to systems or components which are not shared by both units, the ODCMS and associated Applicability and COMPENSATORY MEASURES shall apply to each unit individually (e.g., in the event of an inoperability in a non-shared system, the appropriate COMPENSATORY MEASURES will apply only to the unit with the inoperable system);

b. Whenever the ODCMS only applies to one unit, this will be identified in the Applicability of the ODCMS; and

c. Whenever certain portions of the ODCMS, Applicability, or COMPENSATORY MEASURES contain operating parameters, setpoints, etc., which are different for each unit, this will be identified in parentheses, notes, or the body of the requirement.

7.3.0 TEST REQUIREMENT (TR) APPLICABILITY

TR 7.3.0.1 TRs shall be met during the MODES or other specified conditions in the Applicability for individual ODCMSs, unless otherwise stated in the TR. Failure to meet a Test whether such failure is experienced during the performance of the Test or between performances of the Test, shall be failure to meet the ODCMS. Failure to perform a Test within the specified Frequency shall be failure to meet the TRMS except as provided in TR 7.3.0.3. Tests do not have to be performed on inoperable equipment or variables outside specified limits.

TR 7.3.0.2 The specified Frequency for each TR is met if the Test is performed within 1.25 times the interval specified in the Frequency, as measured from the previous performance or as measured from the time a specified condition of the Frequency is met.

For Frequencies specified as "once," the above interval extension does not apply. If a Completion Time requires periodic performance on a "once per ..." basis, the above Frequency extension applies to each performance after the initial performance.

Exceptions to this ODCMS are stated in the individual ODCMSs.

TR 7.3.0.3 If it is discovered that a Test was not performed within its specified Frequency, then compliance with the requirement to declare the ODCMS not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified Frequency, whichever is less. This delay period is permitted to allow performance of the Test.

If the Test is not performed within the delay period, the ODCMS must immediately be declared not met, and the applicable Condition(s) must be entered.

When the Test is performed within the delay period and the Test is not met, the ODCMS must immediately be declared not met, and the applicable Condition(s) must be entered.

(continued)

7.3.0 TR APPLICABILITY (continued)

TR 7.3.0.4 Entry into a MODE or other specified condition in the Applicability of an ODCMS shall not be made unless the ODCMS's Tests have been met within their specified Frequency. This provision shall not prevent entry into MODES or other specified conditions in the Applicability that are required to comply with COMPENSATORY MEASURES or that are part of a shutdown of the unit.

TR 7.3.0.5 TRs shall apply to both units (e.g., a single Test performed at the specified Frequency will satisfy the TR for both units) except as follows:

a. Whenever the ODCMS refers to systems or components which are not shared by both units, the associated TR shall apply to each unit individually (e.g., individual tests must be performed on each of the two units' non-shared systems or components; a single Test on a non-shared system of one unit performed at the specified Frequency will not satisfy the TR for the non-shared system of the other unit);

b. Whenever a TR only applies to one unit, this will be identified by a note to the TR; and

c. Whenever certain portions of the TRs, contain test parameters, acceptance criteria, or frequencies which are different for each unit, this will be identified in parentheses, notes, or the body of the requirement.

7.3.1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

ODCMS 7.3.1 The radioactive liquid effluent monitoring instrumentation channels in Table 7.3.1-1 shall be OPERABLE.

APPLICABILITY: In accordance with Table 7.3.1-1.

COMPENSATORY MEASURES

NOTE
Separate Condition entry is allowed for each required channel.

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. One or more radioactive liquid effluent monitoring instrumentation channels inoperable.	A.1	Enter the Condition referenced in Table 7.3.1-1 for the channel.	Immediately
B. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	B.1	Perform TR 7.3.3.1 on two independent samples of the batch to be released.	Prior to release through the liquid radwaste effluent line
	AND		
	B.2	Verify the associated release rate calculations and the discharge valve lineup using two qualified members of the technical staff.	Prior to release through the liquid radwaste effluent line
	AND		
	B.3	Restore the channel to OPERABLE status.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
C. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	C.1	Estimate the flow rate through the associated pathway using pump performance curves or tank level indicators.	Once per 4 hours during releases through the associated line
	AND		
	C.2	Restore the channel to OPERABLE status.	30 days
D. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	D.1	Collect and analyze a grab sample for gross radioactivity (beta or gamma) of the associated effluent. The LLD shall be ≤ 1.0 E-7 μCi/gm.	Once per 12 hours
	AND		
	D.2	Restore the channel to OPERABLE status.	30 days
E. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	E.1	Collect and analyze a grab sample for principal gamma emitters per Table 7.3.3-1.	Once per 24 hours
	AND		
	E.2	Restore the channel to OPERABLE status.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
F. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	F.1	Estimate the flow rate through the associated pathway using the V-notch weir or another acceptable method.	Once per 24 hours
	AND		
	F.2	Restore the channel to OPERABLE status.	30 days
G. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	G.1	Estimate the tank liquid level.	Once per 8 hours during all liquid additions and deletions to and from the tank
	AND		
	G.2	Restore the channel to OPERABLE status.	30 days
H. Required Compensatory Measure B.1, B.2, C.1, D.1, E.1, F.1, or G.1 and associated Completion Time not met.	H.1	Suspend effluent releases via the associated pathway.	Immediately
	AND		
	H.2	NOTE Only applicable for Function 6.	
		Suspend liquid additions to the Condensate Storage Tank.	Immediately

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
I. Required Compensatory Measure B.3, C.2, D.2, E.2, F.2, or G.2 and associated Completion Time not met.	I.1 Prepare and submit, in the Radioactive Effluent Release Report, the reason the channel was not restored to OPERABLE status within 30 days.	Upon submittal of current calendar year Radioactive Effluent Release Report

TEST REQUIREMENTS

NOTE
Refer to Table 7.3.1-1 to determine which TRs apply for each Radioactive Liquid Effluent Monitoring Instrumentation Function.

	TEST	FREQUENCY
TR 7.3.1.1	NOTE For Function 6, only required to be met during liquid additions to the tank. Perform CHANNEL CHECK.	24 hours
TR 7.3.1.2	NOTE Only required to be met during continuous, periodic, or batch releases. Verify indication of flow.	24 hours

(continued)

TEST REQUIREMENTS (continued)

	TEST	FREQUENCY
TR 7.3.1.3	Perform SOURCE CHECK.	31 days
TR 7.3.1.4	Perform CHANNEL FUNCTIONAL TEST, including demonstration of automatic isolation of the pathway and control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Circuit failure. c. Downscale failure. d. Instrument controls not set in "operate" mode.	92 days
TR 7.3.1.5	Perform CHANNEL FUNCTIONAL TEST.	92 days
TR 7.3.1.6	Perform CHANNEL FUNCTIONAL TEST, including demonstration of control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Circuit failure. c. Downscale failure. d. Instrument controls not set in "operate" mode.	92 days

(continued)

TEST REQUIREMENTS (continued)

TEST		FREQUENCY
TR 7.3.1.7	NOTE For Functions 1 and 3, previously established calibration procedures or sources that have been related to the initial CHANNEL CALIBRATION shall be used.	
	Perform CHANNEL CALIBRATION.	24 months

Table 7.3.1-1 (page 1 of 1)
Radioactive Liquid Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/ TRIP SETPOINT VALUE
1.	Liquid Radwaste Radioactivity Effluent Monitor[b]	At all times	1	B	TR 7.3.1.1 TR 7.3.1.3 TR 7.3.1.4 TR 7.3.1.7	(c)
2.	Liquid Radwaste Effluent Flow Measurement Device	At all times	1	C	TR 7.3.1.2 TR 7.3.1.5 TR 7.3.1.7	NA
3.	Main Service Water System Effluent Radioactivity Monitor	At all times	1	D	TR 7.3.1.1 TR 7.3.1.3 TR 7.3.1.6 TR 7.3.1.7	(c)
4.	Stabilization Pond Effluent Composite Sampler	(d)	1	E	TR 7.3.1.1 TR 7.3.1.5 TR 7.3.1.7	NA[e]
5.	Stabilization Pond Effluent Flow Measurement Device	(d)	1	F	TR 7.3.1.1 TR 7.3.1.5 TR 7.3.1.7	NA
6.	Condensate Storage Tank Level Indicating Device	At all times	1	G	TR 7.3.1.1 TR 7.3.1.5 TR 7.3.1.7	NA[f]

(a) Specific instrumentation identification numbers are provided in Appendix E.

(b) Provides alarm and automatic termination of release.

(c) Alarm/trip setpoints shall be determined in accordance with ODCM methodology and set to ensure the limits of ODCMS 7.3.3, "Concentration—Liquid Effluents," are not exceeded.

(d) At all times other than when the line is valved out and locked.

(e) Flow Totalizer 2-DST-FQIS-5026 provides a trip signal to the composite sampler that will initiate sampling.

(f) 1(2) CO-LIT-1160 provides local level indication and also provides a signal to 1(2) CO-LI-1160A and 1(2) CO-LI-1160B.

7.3.2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

ODCMS 7.3.2 The radioactive gaseous effluent monitoring instrumentation channels in Table 7.3.2-1 shall be OPERABLE.

APPLICABILITY: In accordance with Table 7.3.2-1.

COMPENSATORY MEASURES

NOTE
Separate Condition entry is allowed for each required channel.

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. One or more radioactive gaseous effluent monitoring instrumentation channels inoperable.	A.1	Enter the Condition referenced in Table 7.3.2-1 for the channel.	Immediately
B. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	B.1	Take a grab sample at the associated sample location.	Once per 12 hours
	AND		
	B.2	Analyze the grab sample required by Required Compensatory Measure B.1 for gross noble gas activity.	24 hours after completion of Required Compensatory Measure B.1
	AND		
	B.3	Restore the channel to OPERABLE status.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
C. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	C.1.1	Initiate actions to establish auxiliary sampling equipment to continuously collect samples from the associated effluent release pathway as required by Table 7.3.7-1.	Immediately
	OR		
	C.1.2	NOTE Only applicable for ODCM test requirements, sample analysis, or system purging. Reference ODCMS 7.3.0.5 for post maintenance test requirements.	
		Initiate continuous sample collection from associated release pathway as required by Table 7.3.7-1 with auxiliary sampling equipment.	45 minutes
	AND		
	C.2	Restore the channel to OPERABLE status.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
D. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	D.1	Estimate the flow rate through the associated pathway.	Once per 8 hours
	AND		
	D.2	Restore the channel to OPERABLE status.	30 days
E. Required Compensatory Measure B.1, B.2, C.1.1, C.1.2, and D.1 and associated Completion Time not met.	E.1	Suspend effluent releases via the associated pathway.	Immediately

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
F. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	NOTE Required Compensatory Measures F.1 and F.2 are only applicable if two channels are inoperable in the operating recombiner train.		
	F.1	Take a grab sample from the operating recombiner train.	Once per 24 hours
	AND		
	F.2	Analyze the grab sample required by Required Compensatory Measure F.1.	4 hours after completion of Required Compensatory Measure F.1
	AND		
	F.3	Verify proper functioning of the operating recombiner train by monitoring recombiner temperature.	In accordance with approved procedures
	AND		
	F.4	Restore the channel(s) to OPERABLE status.	30 days
G. Required Compensatory Measure F.1, F.2, or F.3 and associated Completion Time not met.	G.1	Suspend operation of the associated recombiner train.	Immediately

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
H. Required Compensatory Measure B.3, C.2, D.2, or F.4 and associated Completion Time not met.	H.1	Prepare and submit in the Radioactive Effluent Release Report, the reason the channel was not restored to OPERABLE status within 30 days.	Upon submittal of current calendar year Radioactive Effluent Release Report
I. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	I.1	Verify GASEOUS RADWASTE TREATMENT SYSTEM is not bypassed.	Immediately
	AND		
	I.2	Verify the main stack effluent noble gas monitor is OPERABLE.	Immediately
	AND		
	I.3	Restore the channel to OPERABLE status.	72 hours
J. Required Compensatory Measure and associated Completion Time of Condition I not met.	J.1	Be in MODE 2.	12 hours
	AND		
	J.2	Prepare and submit in the Radioactive Effluent Release Report, the reason the channel was not restored to OPERABLE status within 72 hours.	Upon submittal of current calendar year Radioactive Effluent Release Report

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
K. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	K.1 Suspend effluent releases via the associated pathway.	Immediately

TEST REQUIREMENTS

NOTE
Refer to Table 7.3.2-1 to determine which TRs apply for each Radioactive Gaseous Effluent Monitoring Instrumentation Function.

TEST		FREQUENCY
TR 7.3.2.1	Perform CHANNEL CHECK.	24 hours
TR 7.3.2.2	Perform CHANNEL CHECK.	7 days
TR 7.3.2.3	Perform SOURCE CHECK.	31 days
TR 7.3.2.4	Perform CHANNEL FUNCTIONAL TEST.	31 days

(continued)

TEST REQUIREMENTS (continued)

	TEST	FREQUENCY
TR 7.3.2.5	Perform CHANNEL FUNCTIONAL TEST, including demonstration of control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Downscale failure. c. Instrument controls not set in "operate" mode.	92 days
TR 7.3.2.6	Perform CHANNEL FUNCTIONAL TEST.	92 days
TR 7.3.2.7	Perform CHANNEL FUNCTIONAL TEST; including demonstration of control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Downscale failure.	92 days
TR 7.3.2.8	Perform CHANNEL FUNCTIONAL TEST including control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Circuit failure. c. Downscale failure. d. Instrument controls not set in "operate" mode.	92 days

(continued)

TEST REQUIREMENTS (continued)

	TEST	FREQUENCY
TR 7.3.2.9	Perform CHANNEL CALIBRATION. The CHANNEL CALIBRATION shall include the use of standard gas samples containing a nominal: a. Two volume percent hydrogen, balance nitrogen; and b. Four volume percent hydrogen, balance nitrogen.	92 days
TR 7.3.2.10	NOTE For Functions 1.a, 2.a, 3.a, 4, and 6, previously established calibration procedures or sources that have been related to the initial CHANNEL CALIBRATION shall be used. Perform CHANNEL CALIBRATION.	24 months

Table 7.3.2-1 (page 1 of 4)
Radioactive Gaseous Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/TRIP SETPOINT VALUE
1.	Main Stack Monitoring System					
	a. Noble Gas Activity Monitor	At all times	1	B	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.5 TR 7.3.2.10	(b)
	b. Iodine Sampler Cartridge	At all times	1	C	TR 7.3.2.2	NA
	c. Particulate Sampler Filter	At all times	1	C	TR 7.3.2.2	NA
	d. System Effluent Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	NA
	e. Sampler Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	(c)
2.	Reactor Building Ventilation Monitoring System					
	a. Noble Gas Activity Monitor	At all times	1	B	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.7 TR 7.3.2.10	(b)
	b. Iodine Sampler Cartridge	At all times	1	C	TR 7.3.2.2	NA
	c. Particulate Sampler Filter	At all times	1	C	TR 7.3.2.2	NA
	d. System Effluent Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	NA

(continued)

(a) Specific instrumentation identification numbers are provided in Appendix E.

(b) Alarm/trip setpoints shall be determined in accordance with ODCM methodology and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded

(c) Alarm/trip setpoints shall be determined in accordance with associated design specification(s) and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded

Table 7.3 2-1 (page 2 of 4)
Radioactive Gaseous Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/TRIP SETPOINT VALUE
2.	Reactor Building Ventilation Monitoring System (continued)					
	e. Sampler Flow Rate Measurement Device	At all times	1	D	TR 7.3.2 1 TR 7.3.2.6 TR 7.3 2.10	(c)
3.	Turbine Building Ventilation Monitoring System					
	a. Noble Gas Activity Monitor	At all times	1	B	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.5 TR 7.3.2.10	(b)
	b. Iodine Sampler Cartridge	At all times	1	C	TR 7.3 2.2	NA
	c. Particulate Sampler Filter	At all times	1	C	TR 7.3.2.2	NA
	d. System Effluent Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	NA
	e. Sampler Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	(c)
4.	Main Condenser Off-Gas Treatment System Noble Gas Activity Monitor[d] (Downstream of AOG Treatment System)	At all times	1	B	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.6 TR 7.3 2.10	(b)

(continued)

(a) Specific instrumentation identification numbers are provided in Appendix E.

(b) Alarm/trip setpoints shall be determined in accordance with ODCM methodology and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded.

(c) Alarm/trip setpoints shall be determined in accordance with associated design specification(s) and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded.

(d) Provides alarm.

Table 7.3 2-1 (page 3 of 4)
Radioactive Gaseous Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A 1	TEST REQUIREMENTS	ALARM/ TRIP SETPOINT VALUE
5.	Main Condenser Off-Gas Treatment System Explosive Gas Monitoring System					
	a. Recombiner Train A	(e)	2	F	TR 7.3.2.1 TR 7.3 2.4 TR 7.3.2.9	(c)
	b. Recombiner Train B	(e)	2	F	TR 7.3.2.1 TR 7.3.2.4 TR 7.3 2.9	(c)
6.	Main Condenser Air Ejector Noble Gas Radioactivity Monitor[d] (Prior to input to Treatment System)	(f)	1	I	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.8 TR 7.3.2.10	(b)
7.	Hot Shop Ventilation Monitoring System					
	a. Iodine Sampler Cartridge	At all times	1	C	TR 7.3.2.2	NA
	b. Particulate Sampler Filter	At all times	1	C	TR 7.3.2.2	NA

(continued)

(a) Specific instrumentation identification numbers are provided in Appendix E.

(b) Alarm/trip setpoints shall be determined in accordance with ODCM methodology and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents." are not exceeded.

(c) Alarm/trip setpoints shall be determined in accordance with associated design specification(s) and set to ensure the limits of ODCMS 7.3 7, "Dose Rate—Gaseous Effluents " are not exceeded.

(d) Provides alarm.

(e) During associated recombiner train operation.

(f) During operation of the main condenser air ejector.

Table 7.3.2-1 (page 4 of 4)
Radioactive Gaseous Effluent Monitoring Instrumentation

FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/ TRIP SETPOINT VALUE
8. Radioactive Materials Container and Storage Building Decontamination Facility					
a. Iodine Sampler Cartridge	(g)	1	K	TR 7.3.2.1	NA
b. Particulate Sampler Filter	(g)	1	K	TR 7.3.2.1	NA[i]
9. Low Level Warehouse					
a. Particulate Sampler	(h)	1	K	TR 7.3.2.2	NA [i]

(a) Specific instrumentation identification numbers are provided in Appendix E.

(g) During operation of the Radioactive Materials Container and Storage Building Decontamination Facility.

(h) During operation of the Low Level Warehouse ventilation system.

(i) Local alarm.

7.3.3 CONCENTRATION—LIQUID EFFLUENTS

ODCMS 7.3.3 The concentration of radioactive material released to UNRESTRICTED AREAS after dilution in the discharge canal shall be limited to:

a. 10 times the concentrations specified in Appendix B, Table 2, Column 2 to 10 CFR 20.1001-20.2401 for radionuclides other than dissolved or entrained noble gases; and

b. 2×10^{-4} µCi/ml total activity concentration for all dissolved or entrained noble gases.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. Concentration of radioactive material released to UNRESTRICTED AREAS not within limits.	A.1 Initiate action to restore concentration to within limits.	Immediately

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.3.1	Verify the concentration of radioactive material released to UNRESTRICTED AREAS is within limits.	In accordance with Table 7.3.3-1

(continued)

TEST REQUIREMENTS (continued)

	TEST	FREQUENCY
TR 7.3.3.2	NOTE Only required to be performed if stabilization pond or service water samples analyzed in accordance with Table 7.3.3-1 indicate concentrations of any gamma-emitting radionuclides greater than the trigger level of 5×10^{-6} µCi/ml.	
	Verify concentration of radioactive material released to UNRESTRICTED AREAS is within limits.	In accordance with Table 7.3.3-2 for liquid wastes exceeding the trigger level

Table 7.3.3-1 (page 1 of 3)
Radioactive Liquid Waste Sampling and Analysis Program

	LIQUID RELEASE TYPE	SAMPLE FREQUENCY	SAMPLE ANALYSIS FREQUENCY	SAMPLE ANALYSIS TYPE	SAMPLE LOWER LIMIT OF DETECTION (LLD)[a][e]
1.	Sample Tanks, Detergent Drain Tank, and Salt Water Release Tanks (Batch Release),[h]	Prior to release of each batch	Prior to release of each batch	Principal Gamma Emitters[g]	5×10^{-7}[b] μCi/ml
				I-131	1×10^{-6} μCi/ml
	AND	Prior to release of one batch once per 31 days	31 days	Dissolved and entrained gases (Gamma Emitters)	1×10^{-5} μCi/ml
	Circulating Water Pit	Prior to release of each batch	31 days Composite[c]	Gross Alpha	1×10^{-7} μCi/ml
				H-3	1×10^{-5} μCi/ml
		Prior to release of each batch	92 days Composite[c]	Sr-89, Sr-90	5×10^{-8} μCi/ml
				Fe-55	1×10^{-6} μCi/ml
2.	Stabilization Pond (d)	Prior to each release AND 24 hours during periods of release[f]	Prior to each release AND 24 hours during periods of release[f]	Principal Gamma Emitters (g)	5×10^{-7}[b] μCi/ml
3.	Service Water[d] (Potential Continuous Release)	7 days during system operation	7 days during system operation	Principal Gamma Emitters (g)	5×10^{-7}[b]

Table 7.3.3-1 (page 2 of 3)
Radioactive Liquid Waste Sampling and Analysis Program

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

(b) When operational limitations preclude specific gamma radionuclide analysis of each batch, gross radioactivity measurements shall be made to estimate the quantity and concentrations of radioactive material released in the batch; and a weekly sample composited from proportional aliquots from each batch released during the week shall be analyzed for principal gamma-emitting radionuclides.

(c) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released.

(d) The stabilization pond and service water liquid release types represent potential release pathways and not actual release pathways. Test of these pathways is intended to alert the plant to a potential problem; analysis for principal gamma emitters should be sufficient to meet this intent. If analysis for principal gamma emitters indicates a problem (i.e., exceeds the trigger level of 5×10^{-6} μCi/ml), then complete sampling and analyses shall be performed as per Table 7.3.3-2.

(e) The lower limit of detectability (LLD) is the smallest concentration of a radioactive material in an unknown sample that will be detected with a 95% probability with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ \sigma_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot e^{-(\lambda_i t_e)}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume)

σ_b = $(N/t_b)^{1/2}$

= standard deviation of background (cpm)

Table 7.3.3-1 (page 3 of 3)
Radioactive Liquid Waste Sampling and Analysis Program

N = background count rate (cpm)

t_b = time background counted for (min)

E = counting efficiency, as counts per disintegration

V = volume or mass of sample

2.22×10^6 = conversion factor (dpm/microcurie)

Y = fractional radiochemical yield

λ_i = radioactive decay constant of ith nuclide (sec^{-1})

t_e = elapsed time between sample collection and counting (sec)

Typical values of E, V, Y, and t_e should be used in the calculation. It should be recognized that the LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular measurement.

(f) The stabilization pond is typically released over a several-day period. The pond is to be sampled and analyzed prior to commencing release. When composite sampling instrumentation becomes available and is OPERABLE, daily grab sampling of the stabilization pond effluent will not be required during release and the composite sample will be analyzed on a weekly basis.

(g) The principal gamma emitters for which the LLD specifications apply exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report.

(h) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated and then thoroughly mixed to assure representative sampling.

Table 7.3.3-2 (page 1 of 3)
Radioactive Liquid Waste Sampling and Analysis Program
for Potential Release Pathways Which Have Exceeded Trigger Levels

	LIQUID RELEASE TYPE	SAMPLE FREQUENCY	SAMPLE ANALYSIS FREQUENCY	SAMPLE ANALYSIS TYPE	SAMPLE LOWER LIMIT OF DETECTION (LLD)[a][e]
1.	Stabilization Pond	Prior to each release	Prior to each release	Principal Gamma Emitters[g]	5×10^{-7}[b] μCi/ml
		AND	AND	I-131	1×10^{-6} μCi/ml
		24 hours during periods of release[f]	24 hours during periods of release[f]		
		Prior to one release once per 31 days	31 days	Dissolved and entrained gases (Gamma Emitters)	1×10^{-5} μCi/ml
		Prior to each release	31 days Composite[c]	Gross Alpha	1×10^{-7} μCi/ml
				H-3	1×10^{-5} μCi/ml
		Prior to each release	92 days Composite[c]	Sr-89, Sr-90	5×10^{-8} μCi/ml
				Fe-55	1×10^{-6} μCi/ml
2.	Service Water (Continuous Release)[h]	24 hours[d]	7 days Composite[c]	Principal Gamma Emitters (g)	5×10^{-7}[b] μCi/ml
				I-131	1×10^{-6} μCi/ml
		31 days Grab Sample	31 days	Dissolved and entrained gases (Gamma Emitters)	1×10^{-5} μCi/ml
		24 hours[d]	31 days Composite[c]	Gross Alpha	1×10^{-7} μCi/ml
				H-3	1×10^{-5} μCi/ml
		24 hours[d]	92 days Composite[c]	Sr-89, Sr-90	5×10^{-8} μCi/ml
				Fe-55	1×10^{-6} μCi/ml

Table 7.3.3-2 (page 2 of 3)
Radioactive Liquid Waste Sampling and Analysis Program
for Potential Release Pathways Which Have Exceeded Trigger Levels

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

(b) When operational limitations preclude specific gamma radionuclide analysis of each batch, gross radioactivity measurements shall be made to estimate the quantity and concentrations of radioactive material released in the batch; and a weekly sample composited from proportional aliquots from each batch released during the week shall be analyzed for principal gamma-emitting radionuclides.

(c) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released.

(d) Until such time as continuous proportional composite samplers are installed on the service water discharge line, daily grab sampling of the service water effluent will be required for use in making up the composite.

(e) The lower limit of detectability (LLD) is the smallest concentration of a radioactive material in an unknown sample that will be detected with a 95% probability with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ \sigma_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot e^{-(\lambda_i t_e)}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume)

σ_b = $(N/t_b)^{1/2}$

= standard deviation of background (cpm)

N = background count rate (cpm)

Table 7.3.3-2 (page 3 of 3)
Radioactive Liquid Waste Sampling and Analysis Program
for Potential Release Pathways Which Have Exceeded Trigger Levels

t_b = time background counted for (min)

E = counting efficiency, as counts per disintegration

V = volume or mass of sample

2.22×10^6 = conversion factor (dpm/microcurie)

Y = fractional radiochemical yield

λ_i = radioactive decay constant of ith nuclide (sec^{-1})

t_e = elapsed time between sample collection and counting (sec)

Typical values of E, V, Y, and t_e should be used in the calculation. It should be recognized that the LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular measurement.

(f) The stabilization pond is typically released over a several-day period. The pond is to be sampled and analyzed prior to commencing release. When composite sampling instrumentation becomes available and is OPERABLE, daily grab sampling of the stabilization pond effluent will not be required during release and the composite sample will be analyzed on a weekly basis.

(g) The principal gamma emitters for which the LLD specifications apply exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report.

(h) A continuous release is the discharge of liquid waste of a nondiscrete volume, e.g., from a volume or a system that has an input flow during the continuous release.

7.3.4 DOSE—LIQUID EFFLUENTS

ODCMS 7.3.4 The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to UNRESTRICTED AREAS shall be limited to:

a. ≤ 3 mrem to the total body and ≤ 10 mrem to any organ during any calendar quarter; and

b. ≤ 6 mrem to the total body and ≤ 20 mrem to any organ during any calendar year.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

NOTE
Enter applicable Conditions and Required Compensatory Measures of ODCMS 7.3.14, "Total Dose (40 CFR 190)," when liquid effluent dose results in exceeding an annual total dose limit.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Calculated dose from the release of radioactive materials in liquid effluents to UNRESTRICTED AREAS not within limits.	A.1 Submit a Special Report to the NRC that identifies causes for exceeding limits, corrective actions taken to reduce releases, and corrective actions to assure that subsequent releases will be in compliance with the required limits.	30 days

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.4.1	Verify the cumulative dose contributions from liquid effluents for the current calendar quarter and current calendar year are within limits in accordance with the methodology and parameters in the ODCM.	31 days

7.3.5 LIQUID RADWASTE TREATMENT SYSTEM

ODCMS 7.3.5 The Liquid Radwaste Treatment System shall be used to reduce radioactive materials in liquid wastes prior to their discharge.

APPLICABILITY: During release of liquid radioactive water when the projected doses due to the liquid effluent, from the site to UNRESTRICTED AREAS, would exceed 0.12 mrem to the total body or 0.4 mrem to any organ in a 31 day period.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Liquid waste being discharged without treatment.	A.1 Submit a Special Report to the NRC that includes explanation of why liquid radwaste was being discharged without treatment, identification of any required inoperable equipment or subsystem and the reasons for the inoperability, the corrective actions taken to restore the required inoperable equipment to OPERABLE status, and a summary description of the corrective actions taken to prevent recurrence.	30 days

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.5.1	Verify required valve alignments to ensure Liquid Radwaste Treatment System is in use to reduce radioactive materials in liquid waste.	Prior to release of liquid effluents
TR 7.3.5.2	Determine the projected doses due to liquid releases from the site to UNRESTRICTED AREAS in accordance with the methodology and parameters in the ODCM.	31 days

7.3.6 LIQUID HOLDUP TANKS

ODCMS 7.3.6 The quantity of radioactive material, excluding tritium and dissolved or entrained gases, suspended in solution in the condensate storage tank, auxiliary surge tank and outdoor temporary tank shall be maintained within limits.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

NOTE
Separate Condition entry is allowed for each tank.

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. Quantity of radioactive material in one or more of the specified liquid holdup tanks not within limit.	A.1	Suspend addition of radioactive materials to the associated tank.	Immediately
	AND		
	A.2	Restore quantity of radioactive material in the tank to within limit.	48 hours
	AND		
	A.3	Prepare and submit in the Radioactive Effluent Release Report, a description of the events leading to the non-compliance.	Upon submittal of the current calendar year Radioactive Effluent Release Report

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.6.1	NOTE Only required to be performed when radioactive materials are being added to the tank. Verify the quantity of radioactive material, excluding tritium and dissolved or entrained gases, in the condensate storage tank is ≤ 10 Ci by analyzing a representative sample of the tank's contents.	7 days
TR 7.3.6.2	NOTE Only required to be performed when radioactive materials are being added to the tank. Verify the quantity of radioactive material, excluding tritium and dissolved or entrained gases, in the auxiliary surge tank is ≤ 10 Ci by calculation using dose measurement(s) of the tank area.	7 days
TR 7.3.6.3	NOTE Only required to be performed when radioactive materials are being added to the tank. Verify the quantity of radioactive material, excluding tritium and dissolved or entrained gases, in the outdoor temporary tank is ≤ 10 Ci by analyzing a representative sample of the tank's contents.	7 days

7.3.7 DOSE RATE—GASEOUS EFFLUENTS

ODCMS 7.3.7 The dose rate at and beyond the SITE BOUNDARY due to radioactive materials released in gaseous effluents from the site shall be limited to the following:

a. For nobles gases, ≤ 500 mrem per year to the total body and ≤ 3000 mrem per year to the skin; and

b. For iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives > 8 days, ≤ 1500 mrem per year to any organ.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. Dose rate from the release of radioactive materials in gaseous effluents from the site at or beyond the SITE BOUNDARY not within limits.	A.1 Initiate action to restore dose rate to within limits.	Immediately

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.7.1	Verify the dose rate due to noble gases in gaseous effluents is within limits in accordance with methodology and parameters in the ODCM.	In accordance with the ODCM
TR 7.3.7.2	Verify dose rate due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives > 8 days in gaseous effluents is within limits in accordance with the methodology and parameters in the ODCM.	In accordance with Table 7.3.7-1

Table 7.3.7-1 (page 1 of 4)
Radioactive Gaseous Waste Sampling and Analysis Program

	GASEOUS RELEASE TYPE	SAMPLE FREQUENCY	SAMPLE ANALYSIS FREQUENCY	SAMPLE ANALYSIS TYPE	SAMPLE LOWER LIMIT OF DETECTION (LLD)[a]
1.	Drywell Purge	Prior to each purge Grab Sample	Prior to each purge	Principal Gamma Emitters[b]	1×10^{-4} μChi/ml
2.	Environmental Release Points	31 days[c][d] Grab Sample	31 days	Principal Gamma Emitters[b]	1×10^{-4} μChi/ml
	a. Continuous Release: Main Stack Reactor Building Vents Turbine Building Vents Hot Shop[h] Building Vents			H-3	1×10^{-6} μChi/ml
		Continuous[e]	7 days[f][g] Charcoal Sample	I-131	1×10^{-12} μChi/ml
		Continuous[e]	7 days[f][g] Particulate Sample	Principal Gamma Emitters[b] (I-131, others)	1×10^{-11} μChi/ml
		Continuous[e]	31 days Composite Particulate Sample	Gross Alpha	1×10^{-11} μChi/ml
		Continuous[e]	92 days Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11} μChi/ml
		Continuous[e]	Noble Gas Monitor	Noble Gases, Gross Beta or Gamma	1×10^{-6} μChi/ml
	b. Batch Release: Radioactive Materials Container and Storage Building Decontamination Facility (RMCSB) Low Level Warehouse	During RMCSB[e] operation only	Each batch release: Charcoal Sample	I-131	1×10^{-12} μChi/ml
		During facility[e] operation	Each batch release: Particulate Sample	Principle Gamma Emitters[b] (I-131, others)	1×10^{-11} μChi/ml
		During facility[e] operation	31 days Composite Particulate Sample	Gross Alpha	1×10^{-11} μChi/ml
		During facility[e] operation	92 days Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11} μChi/ml
3.	Incinerated Oil[i]	Prior to each[j] batch release Grab Sample	Prior to each batch release[j]	Principal Gamma Emitters[b]	5×10^{-7} μChi/ml

Table 7.3.7-1 (page 2 of 4)
Radioactive Gaseous Waste Sampling and Analysis Program

(a) The lower limit of detectability (LLD) is the smallest concentration of a radioactive material in an unknown sample that will be detected with a 95% probability with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ \sigma_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot e^{-(\lambda_i t_e)}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume)

σ_b = $(N/t_b)^{1/2}$

= standard deviation of background (cpm)

N = background count rate (cpm)

t_b = time background counted for (min)

E = counting efficiency, as counts per disintegration

V = volume or mass of sample

2.22×10^6 = conversion factor (dpm/microcurie)

Y = fractional radiochemical yield

λ_i = radioactive decay constant of ith nuclide (sec^{-1})

t_e = elapsed time between sample collection and counting (sec)

Typical values of E, V, Y, and t_e should be used in the calculation. It should be recognized that the LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular measurement.

Table 7.3.7-1 (page 3 of 4)
Radioactive Gaseous Waste Sampling and Analysis Program

(b) The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report.

(c) With a THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER within one hour, or following shutdown or start-up, sampling and analyses shall also be performed unless (1) analysis shows that the Dose Equivalent I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the main condenser air ejector noble gas activity monitor shows that activity has not increased by more than a factor of 3.

(d) If during refueling, the tritium concentration in the spent fuel pool water exceeds 2×10^{-4} μCi/ml, tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel pool area whenever spent fuel is in the spent fuel pool. Spent fuel pool water will be sampled at least once per 7 days during refueling.

(e) The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with ODCMS 7.3.7, 7.3.8, and 7.3.9.

(f) Sample cartridges/filters shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing (or after removal from sampler).

(g) Sampling shall be performed at least once per 24 hours for at least 7 days following each shutdown, start-up, or THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER in 1 hour, and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement does not apply if (1) analysis shows that the Dose Equivalent I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the main condenser air ejector noble gas monitor shows that activity has not increased more than a factor of 3. This footnote does not apply to the Hot Shop environmental release point.

(h) Monthly grab samples to be analyzed for principal gamma emitters and tritium are not applicable for the Hot Shop environmental release point. In addition, the Hot Shop release point does not have a noble gas monitor and, therefore, the noble gas activity analysis requirements of Table 7.3.7-1 are not applicable.

Table 7.3.7-1 (page 4 of 4)
Radioactive Gaseous Waste Sampling and Analysis Program

(i) Releases from incinerated oil may be discharged via points other than the main vent (e.g., incinerator). Release shall be accounted for based on pre-release grab sample data.

(j) Samples of waste oil to be incinerated shall be collected from and be representative of oil in liquid form.

7.3.8 DOSE—NOBLE GASES

ODCMS 7.3.8 The air dose at and beyond the SITE BOUNDARY due to noble gases in gaseous effluents from the site shall be limited to the following:

a. ≤ 10 mrads gamma radiation and ≤ 20 mrads beta radiation during any calendar quarter; and

b. ≤ 20 mrads gamma radiation and ≤ 40 mrads beta radiation during any calendar year.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

NOTE
Enter applicable Conditions and Required Compensatory Measures of ODCMS 7.3.14, "Total Dose (40 CFR 190)," when gaseous effluent (noble gases) dose results in exceeding an annual total dose limit.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Calculated air dose from radioactive noble gases in gaseous effluents at or beyond the SITE BOUNDARY not within limits.	A.1 Submit a Special Report to the NRC that identifies causes for exceeding the limits, corrective actions taken to reduce releases, and corrective actions to assure that subsequent releases are within limits.	30 days

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.8.1	Verify the cumulative dose contributions from noble gases in gaseous effluents for the current calendar quarter and current calendar year are within limits in accordance with the methodology and parameters in the ODCM.	31 days

7.3.9 DOSE—I-131, I-133, TRITIUM, AND RADIONUCLIDES IN PARTICULATE FORM

ODCMS 7.3.9 The dose to a MEMBER OF THE PUBLIC at and beyond the SITE BOUNDARY from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives > 8 days, in gaseous effluents released from the site shall be limited to the following:

a. ≤ 15 mrems to any organ during any calendar quarter;

b. ≤ 30 mrems to any organ during any calendar year; and

c. < 0.1% of the limits of ODCMS 7.3.9.a and ODCMS 7.3.9.b as a result of burning contaminated oil.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

NOTE
Enter applicable Conditions and Required Compensatory Measures of ODCMS 7.3.14, "Total Dose (40 CFR 190)," when gaseous effluent (I-131, I-133, tritium, radionuclides in particulate form) dose results in exceeding an annual total dose limit.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Calculated dose from the release of iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives > 8 days, in gaseous effluents at or beyond the SITE BOUNDARY not within limits.	A.1 Submit a Special Report to the NRC that identifies causes for exceeding the limits, corrective actions taken to reduce releases, and corrective actions to assure subsequent releases are within limits.	30 days

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.9.1	Verify the cumulative dose contributions from iodine-131, iodine-133, tritium, and radionuclides in particulate form with half lives > 8 days, in gaseous effluents for the current calendar quarter and current calendar year are within limits in accordance with the methodology and parameters in the ODCM.	31 days

7.3.10 GASEOUS RADWASTE TREATMENT SYSTEM

ODCMS 7.3.10 The GASEOUS RADWASTE TREATMENT SYSTEM shall be in operation.

APPLICABILITY: Whenever the Main Condenser Air Ejector (evacuation) System is in operation.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. GASEOUS RADWASTE TREATMENT SYSTEM not in operation.	A.1 Place GASEOUS RADWASTE TREATMENT SYSTEM in operation.	7 days
B. NOTE: Required Compensatory Measure B.1 shall be completed if this Condition is entered. Required Compensatory measure and associated Completion Time not met.	B.1 Submit a Special Report to the NRC that identifies the required inoperable equipment and the reasons for the inoperability, corrective actions taken to restore the required inoperable equipment to OPERABLE status, and a summary description of the corrective actions taken to prevent recurrence.	30 days

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.10.1	Verify GASEOUS RADWASTE TREATMENT SYSTEM in operation by checking the readings of the relevant instruments.	12 hours

7.3.11 VENTILATION EXHAUST TREATMENT SYSTEM

ODCMS 7.3.11 The VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge.

APPLICABILITY: During release of gaseous radioactive wastes when the projected doses due to gaseous effluent, from the site to areas at or beyond the SITE BOUNDARY, when averaged over 31 days, would exceed 0.6 mrem to any organ in a 31 day period.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Gaseous waste being discharged without treatment.	A.1 Submit a Special Report to the NRC that identifies the inoperable equipment or subsystems and the reason for inoperability, the corrective actions taken to restore the inoperable equipment to OPERABLE status, and a summary description of the corrective actions taken to prevent recurrence.	30 days

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.11.1	Verify required valve alignment to ensure VENTILATION EXHAUST TREATMENT SYSTEM is in use to reduce radioactive materials in gaseous waste.	Prior to release of gaseous effluents

(continued)

TEST REQUIREMENTS (continued)

TEST		FREQUENCY
TR 7.3.11.2	NOTE Only required to be performed when the VENTILATION EXHAUST TREATMENT SYSTEM is not in use.	
	Determine the projected doses due to gaseous releases from the site to areas at or beyond the SITE BOUNDARY in accordance with the methodology and parameters in the ODCM.	31 days

7.3.12 EXPLOSIVE GAS MIXTURE

ODCMS 7.3.12 The concentration of hydrogen in the Main Condenser Offgas Treatment System shall be ≤ 4% by volume.

APPLICABILITY: When the Main Condenser Air Ejector System is in operation.

COMPENSATORY MEASURES

NOTE
ODCMS 3.0.4 is not applicable.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. Hydrogen concentration in the Main Condenser Offgas Treatment System > 4% by volume.	A.1 Restore hydrogen concentration to within limit.	48 hours

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.12.1	Verify the concentration of hydrogen in the Main Condenser Offgas Treatment System is ≤ 4% by volume by monitoring waste gases with the required hydrogen monitors of ODCMS 7.3.2, "Radioactive Gaseous Effluent Monitoring Instrumentation."	Continuously

7.3.13 DRYWELL VENTING OR PURGING

ODCMS 7.3.13 The drywell shall be purged to the environment at a rate in conformance with ODCMS 7.3.7, "Dose Rate—Gaseous Effluents."

APPLICABILITY: When the drywell is being vented or purged.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. Requirements of ODCMS not met.	A.1 Suspend VENTING and PURGING of the drywell.	Immediately

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.13.1	Perform a sample analysis in accordance with Table 7.3.7-1.	Prior to each drywell PURGE

7.3.14 TOTAL DOSE (40 CFR PART 190)

ODCMS 7.3.14 The dose or dose commitment to any MEMBER OF THE PUBLIC over the calendar year due to releases of radioactivity and radiation from uranium fuel cycle sources shall be limited to:

a. ≤ 25 mrems to the total body or any organ (except the thyroid); and

b. ≤ 75 mrem to the thyroid.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. Calculated dose for uranium fuel cycle sources to any MEMBER OF THE PUBLIC not within limits. NOTE Required Compensatory Measures A.1 and A.2 shall be completed if this Condition is entered.	A.1 Submit a Special Report to the NRC that includes corrective actions taken to prevent recurrence, the schedule for achieving conformance with required limits, an analysis that estimates the radiation exposure to a MEMBER OF THE PUBLIC from uranium fuel cycle sources for the calendar year, descriptions of the levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. NOTE Estimates of radiation exposure from uranium fuel cycle sources shall include the effects of all effluent pathways and direct radiation, including releases covered by this Special Report. AND	30 days (continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. (continued)	A.2 NOTES 1. Only applicable if the release condition resulting in violation of 40 CFR 190 has not been corrected. 2. Special Report submitted is considered a timely request and a variance is granted until NRC action on the request is complete. Submit a request for a variance in accordance with 40 CFR 190 in the Special Report to the NRC.	30 days

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.14.1	Determine cumulative dose contributions from liquid and gaseous effluents in accordance with TR 7.3.4.1, TR 7.3.8.1 and TR 7.3.9.1, and the methodology and parameters in the ODCM.	In accordance with ODCM

(continued)

TEST REQUIREMENTS (continued)

TEST	FREQUENCY
TR 7.3.14.2 NOTE Only required to be performed when calculated doses from the release of radioactive materials in liquid or gaseous effluents exceed twice the limits of ODCMSs 7.3.4.a, 7.3.4.b, 7.3.8.a, 7.3.8.b, 7.3.9.a., or 7.3.9.b.	
Determine cumulative dose contributions from direct radiation from the reactor units and from radwaste storage tanks in accordance with methodology and parameters in the ODCM.	In accordance with ODCM

7.3.15 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

ODCMS 7.3.15 · The Radiological Monitoring Program shall be as follows:

a. Radiological environmental monitoring samples shall be collected at locations and analyzed as specified in Table 7.3.15-1.

b. Each sample location specified in Table 7.3.15-1 shall contain required milk or leafy vegetable samples

c. The level of radioactivity as the result of plant effluents for each radionuclide in each environmental sampling medium at a required location shall be less than the limits specified in Table 7.3.15-2, when averaged over the calendar quarter;

d. The total level of radioactivity as the result of plant effluents in each environmental sampling medium at a required location shall be less than the limit specified in Table 7.3.15-2, when averaged over the calendar quarter; and

e. The potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides other than those in Table 7.3.15-2 in each environmental sampling medium at a required location shall be less than the calendar year limits of ODCMS 7.3.4, ODCMS 7.3.8, and ODCMS 7.3.9.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One or more samples not collected or analyzed as specified in Table 7.3.15-1. NOTE Required Compensatory Measure A.1 shall be completed if this Condition is entered.	A.1 Prepare and submit, in the Annual Radiological Environmental Operating Report, a description for not conducting the Radiological Environmental Monitoring sampling and analysis requirements as required and the corrective actions to prevent recurrence.	Upon submittal of current calendar year Annual Radiological Environmental Operating Report

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
B. One or more sample locations required by Table 7.3.15-1 with required milk or fresh leafy vegetable samples unavailable. NOTES 1. Separate Condition entry is allowed for each sample location. 2. Required Compensatory Measure B.2 shall be completed if this Condition is entered.	B.1 Identify locations for obtaining replacement samples and replace, in the Radiological Environmental Monitoring Program, the location(s) from which samples are unavailable with the new location(s). AND B.2 Prepare and submit, in the Radioactive Effluent Release Report, the cause of the unavailability of samples, the new locations for obtaining replacement samples, and the revised figure(s) and table for the ODCM reflecting the new locations.	30 days Upon submittal of current calendar year Radioactive Effluent Release Report

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
C. NOTES 1. Separate Condition entry is allowed for each sample location. 2. Required Compensatory Measure C.1 shall be completed if this Condition is entered. One or more sample locations with the level of radioactivity for one or more radionuclides as the result of plant effluents in an environmental sampling medium not within the limits of Table 7.3.15-2 when averaged over the calendar quarter. OR One or more sample locations with the total level of radioactivity as a result of plant effluents in an environmental sampling medium not within the limits of Table 7.3.15-2 when averaged over the calendar quarter.	C.1 Submit a Special Report to the NRC which includes the cause(s) for exceeding the limit(s) and the corrective actions to reduce radioactive effluents so that the potential annual dose to a MEMBER OF THE PUBLIC is less than the calendar year reporting limits of ODCMS 7.3.4, ODCMS 7.3.8, and ODCMS 7.3.9.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
D. One or more sample locations with the potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides other than those in Table 7.3.15-2 not within limits. NOTES 1. Separate Condition entry is allowed for each sample location. 2. Required Compensatory Measures D.1 and D.2 shall be completed if this Condition is entered.	D.1 Submit a Special Report to the NRC which includes the methodology and parameters used for estimating the potential annual dose, the cause(s) for exceeding the limit(s) and the corrective actions to reduce radioactive effluents so that the potential annual dose to a MEMBER OF THE PUBLIC is less than the calendar year limits of ODCMS 7.3.4, ODCMS 7.3.8, and ODCMS 7.3.9. NOTE Only required if the radionuclides are the result of plant effluents.	30 days
	AND	
	D.2 Describe the condition in the Annual Radiological Environmental Operating Report. NOTE Only required if the radionuclides are not the result of plant effluents.	Upon submittal of the current calendar year Annual Radiological Environmental Operating Report

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.15.1	Verify radiological environmental monitoring samples collected at the locations given in the table and figure(s) in the ODCM and analyzed as specified in Table 7.3.15-1 are within limits. Detection capabilities for the analyses are specified in Table 7.3.15-3.	In accordance with Table 7.3.15-1

Table 7.3.15-1 (page 1 of 5)
Radiological Environmental Monitoring Program

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS[a]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. Direct Radiation (b)	Forty locations, either with two or more dosimeters or with one or more instruments for measuring and recording dose rate continuously to be placed as follows: An inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY as is reasonably accessible and practical. An outer ring of stations, one in each of the meteorological sectors at distances of 8 km or greater from the site as is reasonably accessible and practical. The balance of the stations to be placed in special interest areas such as population centers, nearby residences, schools, and one or two areas to serve as control stations.	92 days	Gamma dose: 92 days
2. Airborne-Radioiodine and Particulate	Samples from the following five locations: Three samples from different sectors as close to the SITE BOUNDARY as is reasonably accessible, one of which being at the highest calculated annual average ground level D/Q. One sample from the vicinity of a nearby community. One sample from a control location, as for example greater than 15 km distant and in a less prevalent wind direction[c].	Continuous sampler operation Sample collection: 7 days or as required by dust loading, whichever is more frequent.	I-131 analysis of radioiodine canisters: 7 days AND Gross beta radioactivity analysis of particulate sampler: following filter change[d] AND Gamma isotopic analysis[e] of composite (by location): 92 days

(continued)

Table 7.3.15-1 (page 2 of 5)
Radiological Environmental Monitoring Program

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS[a]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. Waterborne			
a. Surface[f]	Two locations: One sample upstream. One sample downstream.	Composite[g] sample collection: 31 days	Gamma isotopic analysis[e]: 31 days AND Tritium analysis: 92 days
b. Sediment from Shoreline	One sample from downstream area with existing or potential recreational value.	184 days	Gamma isotopic analysis[e]: 184 days
4. Ingestion a. Milk	Samples from the following four locations: One sample from milking animals in each of three locations within 8 km of the site having the highest dose potential (when available).[h] One sample from milking animals at a control location greater than 15 km distance from the site and in a less prevalent wind direction.	With animals on pasture: 14 days At other times: 31 days	Gamma isotopic[e] and I-131 analyses: 14 days when animals are on pasture AND Gamma isotopic[e] and I-131 analyses: 31 days at other times

(continued)

Table 7.3.15-1 (page 3 of 5)
Radiological Environmental Monitoring Program

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS[a]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. (continued)			
b. Fish and Invertebrates	Samples from the following locations: One sample of each of three recreationally important species in vicinity of plant discharge area (one free swimming species, one bottom feeding species, and one shellfish species). One sample of each similarly edible species from an area not influenced by plant discharge to serve as control samples.	When in season: 184 days	Gamma isotopic analysis[e] on edible portion: 184 days
c. Broadleaf Vegetation	Samples from the following three locations: Samples of broadleaf vegetation grown in two sectors of historically high D/Q values at the SITE BOUNDARY if milk sampling is not performed. One sample of similar broadleaf vegetation grown at a distance of greater than 15 km from the site in a less prevalent wind direction if milk sampling is not performed.	When available: 31 days	Gamma isotopic[e] and I-131 analyses: 31 days when available

Table 7.3.15-1 (page 4 of 5)
Radiological Environmental Monitoring Program

(a) Specific parameters of distance and direction sector from the site, and additional description where pertinent, shall be provided for each and every sample location in Table 7.3.15-1 in a table and figure(s) in the ODCM. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment, and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the radiological environmental monitoring program. Identify the cause of the unavailability of samples for that pathway and identify the new location(s) for obtaining replacement samples in the next Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

(b) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.

(c) The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites that provide valid background data may be substituted.

(d) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

(e) Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

Table 7.3.15-1 (page 5 of 5)
Radiological Environmental Monitoring Program

(f) The "upstream" sample shall be taken at a distance beyond significant influence of the discharge. The "downstream" sample shall be taken in an area beyond but near the mixing zone. "Upstream" samples in an estuary must be taken far enough upstream to be beyond the plant influence. Salt water shall be sampled only when the receiving water is utilized for recreational activities.

(g) A composite sample is one in which the quantity (aliquot) of liquid sampled is proportional to the quantity of flowing liquid and in which the method of sampling employed results in a specimen that is representative of the liquid flow. Composite samples shall be collected with equipment that is capable of collecting an aliquot at time intervals that are short (e.g., once per 6 hours) relative to compositing period (e.g., monthly) in order to assure obtaining a representative sample.

(h) When less than three (3) milking animal locations are available for testing within an 8-km distance, sampling of broadleaf vegetation shall be performed as indicated in Table 7.3.15-1, 4.c, in lieu of milk sampling.

Table 7.3.15-2 (page 1 of 1)
Limits for the Level of Radioactivity in Environmental Samples(a)

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE AND GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/l)	BROADLEAF VEGETATION (pCi/kg)
H-3	30,000				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

(a) The Limits are for samples that have only one radionuclide detected. When a sample contains more than one radionuclide, the total level of radioactivity limit is

$$\frac{\text{concentration(1)}}{\text{limit(1)}} + \frac{\text{concentration(2)}}{\text{limit(2)}} + \ldots < 1.0.$$

Table 7.3 15-3 (page 1 of 3)
Detection Capabilities for Environmental Sample Analysis[a]

Lower Limit of detection (LLD)[b]

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/Kg, wet)	MILK (pCi/l)	BROADLEAF VEGETATION (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	3,000					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1[c]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

Table 7.3.15-3 (page 2 of 3)
Detection Capabilities for Environmental Sample Analysis

(a) This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall be analyzed and reported in the Annual Radiological Environmental Operating Report.

(b) The LLD is defined for purposes of the specifications, as the smallest concentration of radioactive material in an unknown sample that will be detected with 95% probability with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\,\sigma_b}{E \cdot V \cdot 2.22 \cdot Y \cdot e^{-(\lambda_i t_e)}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above, as picocuries per unit mass or volume.

σ_b = $(N/t_b)^{1/2}$

= standard deviation of background (cpm)

N = background count rate (cpm)

t_b = time background counted for (min)

E = counting efficiency, as counts per disintegration

V = volume or mass of sample

2.22 = conversion factor (dpm/pCi)

Y = fractional radiochemical yield

λ_i = radioactive decay constant of ith nuclide (sec^{-1})

t_e = elapsed time between sampling collection and counting (sec)

Table 7.3.15-3 (page 3 of 3)
Detection Capabilities for Environmental Sample Analysis

Typical values of E, V, Y, and t_e should be used in the calculation. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs shall be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

(c) LLD for drinking water samples. If no drinking water pathway exists, a value of 15 pCi/1 may be used.

7.3.16 LAND USE CENSUS

ODCMS 7.3.16 A land use census shall be conducted and:

a. Shall identify the location of the nearest milk animal, residence, and garden of greater than 50m^2 (500 ft^2) producing broadleaf vegetation in each of the 16 meteorological sectors within a distance of 8 km (5 miles);

b. Shall identify (for elevated releases as defined in Regulator Guide 1.111, Revision 1, July 1977) the location of all milk animals and all gardens of greater than 50m^2 producing broadleaf vegetation in each of the 16 meteorological sectors within a distance of 5 km (3 miles);

c. The calculated dose and dose commitment at each identified location shall be less than the most recent values calculated by TR 7.3.9.1; and

d. The calculated dose and dose commitment at each identified location, via the same exposure pathways, shall be ≤ 120% of the actual dose and dose commitment from the current sample location identified in Table 7.3.15-1, excluding the central station location.

NOTE

In lieu of the garden census of ODCMS 7.3.16.a, broadleaf vegetable sampling of at least 3 different kinds of vegetation may be performed at the SITE BOUNDARY in each of 2 different direction sectors with the highest D/Qs. Specifications for broadleaf vegetation sampling of Table 7.3.15-1 (item 4.c) shall be followed, including analysis of control samples.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. NOTE Required Compensatory Measure A.1 shall be completed if this Condition is entered. Land use census not conducted. OR All required locations not identified.	A.1	Prepare and submit, in the Annual Radiological Environmental Operating Report, a description for not conducting the land use census and the corrective actions to prevent recurrence.	Upon submittal of current calendar year Annual Radiological Environmental Operating Report
B. NOTE Required Compensatory Measure B.1 shall be completed if this Condition is entered. One or more identified locations with the calculated dose or dose commitment greater than the values calculated by TR 7.3.9.1.	B.1	Identify new location(s) in the Radioactive Effluent Release Report.	Upon submittal of the current calendar year Radioactive Effluent Release Report

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
C. NOTE Required Compensatory Measure C.1 shall be completed if this Condition is entered.	C.1	Add the new location to the Radiological Environmental Monitoring Program.	30 days
	AND		
One or more identified locations with the calculated dose or dose commitment, via the same exposure pathway, > 120% of the actual dose or dose commitment from the current location identified in Table 7.3.15-1.	C.2	Delete the sampling location having the lowest calculated dose or dose commitment, via the same exposure pathway, from the Radiological Monitoring program.	After October 31 of the year in which land use census was conducted
	AND		
	C.3	Identify the new location(s) in the Radioactive Effluent Release Report, and the revised figure(s) and table for the ODCM reflecting the new location.	Upon submittal of the current calendar year Radioactive Effluent Release Report

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.16.1	Conduct a land use census during the growing season using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities; identify all required locations, and verify the calculated dose and dose commitments at each identified location is within limits.	12 months

7.3.17 INTERLABORATORY COMPARISON PROGRAM

ODCMS 7.3.17 Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program approved by the NRC.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Requirements of ODCMS 7.3.17 not met.	A.1 Prepare and submit, in the Annual Radiological Environmental Operating Report, corrective actions to prevent recurrence.	Upon submittal of current calendar year Annual Radiological Environmental Operating Report

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.17.1	Perform the analyses required by the Interlaboratory Comparison Program.	In accordance with the ODCM

7.4.0 REPORTING REQUIREMENTS

ODCMS 7.4.1 Annual Radiological Environmental Operating Report

The Annual Radiological Environmental Operating Report shall be submitted in accordance with the requirements of Technical Specification 5.6.2. In addition to the requirements of Technical Specification 5.6.2, the Annual Radiological Environmental Operating Report shall include:

a. Summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with pre-operational studies, with operational controls (as appropriate), and with previous environmental surveillance reports, and an assessment of the observed impact of the plant operation on the environment;

b. Results of the land use census required by ODCMS 7.3.16;

c. A summary description of the radiological environmental monitoring program;

d. At least two legible maps of all sampling locations keyed to a table giving distances and directions from the centerline of one reactor (one map shall cover stations near the SITE BOUNDARY and the second map shall include more distant stations);

e. Results of the Interlaboratory Comparison Program required by ODCMS 7.3.17;

f. Discussion of all deviations from the sampling schedule of Table 7.3.15-1; and

g. Discussion of all analyses in which the LLD required by Table 7.3.15-3 was not achievable.

ODCMS 7.4.2 Radioactive Effluent Release Report

The Radioactive Effluent Release Report shall be submitted in accordance with the requirements of Technical Specification 5.6.3. In addition to the requirements of Technical Specification 5.6.3, the Radioactive Effluent Release Report shall include:

(continued)

7.4.0 REPORTING REQUIREMENTS (continued)

ODCMS 7.4.2 Radioactive Effluent Release Report (continued)

a. A summary of the quantities of radioactive liquid and gaseous effluents and solid waste released for the facility as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactivity Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974, with data summarized on a quarterly basis similar to the format of Appendix B thereof.

b. Information specified below for each class of solid waste (as defined by 10 CFR Part 61, when implemented) shipped offsite during the report period:

1. Container volume;

2. Total curie quantity (specify whether determined by measurement or estimate);

3. Principal radionuclides (specify whether determined by measurement or estimate);

4. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms);

5. Type of container (e.g., LSA, Type A, Type B, Large Quantity); and

6. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

c. A list and description of unplanned releases from the site to the UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

d. Any changes made during the reporting period to the Process Control Program (PCP) or the Offsite Dose Calculation Manual (ODCM), as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to ODCMS 7.3.16.

(continued)

7.4.0 REPORTING REQUIREMENTS (continued)

ODCMS 7.4.2 Radioactive Effluent Release Report (continued)

e. A summary of radioactivity released from the site by incineration of radioactive waste oil.

f. An annual summary of hourly meteorological data collected over the previous calendar year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability. In lieu of submission of this summary of required meteorological data with the Radioactive Effluent Release Report, the summary of required meteorological data may be retained in a file that shall be provided to the NRC upon request.

g. An assessment of radiation doses due to radioactive liquid and gaseous effluents released from the station during the previous calendar year.

7.5.0 MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

ODCMS 7.5.1 Licensee initiated major changes to the liquid, gaseous, and solid Radioactive Waste Treatment Systems shall be reported to the NRC as part of the Radioactive Effluent Release Report or as part of the annual UFSAR update. The discussion of each change shall contain:

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. Sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information;

c. A detailed description of the equipment, components, and processes involved and the interfaces with other plant systems;

d. An evaluation of the change that shows the predicted release of radioactive materials in the liquid and gaseous effluents and quantity of solid waste differ from those previously predicted in the license application and amendments thereto;

e. An evaluation of the change that shows the expected maximum exposure 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. A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents and in solid wastes, to the actual releases for the period prior to when the changes are to be made;

g. An estimate of the exposure to plant operating personnel as a result of the change; and

h. Documentation of the fact that the change was reviewed and found acceptable by the PNSC.

ODCMS 7.5.2 The change shall become effective upon review and acceptance by the PNSC.

B 7.3.0 OFFSITE DOSE CALCULATION MANUAL SPECIFICATION (ODCMS) APPLICABILITY

BASES

ODCMSs

ODCMS 7.3.0.1 through ODCMS 7.3.0.6 establish the general requirements applicable to all Specifications and apply at all times, unless otherwise stated.

ODCMS 7.3.0.1

ODCMS 7.3.0.1 establishes the Applicability statement within each individual ODCMS as the requirement for when the ODCMS is required to be met (i.e., when the unit is in the MODES or other specified conditions of the Applicability statement of each ODCMS).

ODCMS 7.3.0.2

ODCMS 7.3.0.2 establishes that upon discovery of a failure to meet an ODCMS, the associated COMPENSATORY MEASURES shall be met. The Completion Time of each Required Compensatory Measure for a COMPENSATORY MEASURES Condition is applicable from the point in time that a COMPENSATORY MEASURES Condition is entered. The Required Compensatory Measures establish those remedial measures that must be taken within specified Completion Times when the requirements of an ODCMS are not met. This ODCMS establishes that:

a. Completion of the Required Compensatory Measures within the specified Completion Times constitutes compliance with an ODCMS; and

b. Completion of the Required Compensatory Measures is not required when an ODCMS is met within the specified Completion Time, unless otherwise specified.

There are two basic types of Required Compensatory Measures. The first type of Required Compensatory Measure specifies a time limit in which the ODCMS must be met. This time limit is the Completion Time to restore an inoperable system or component to OPERABLE status or to restore variables to within specified limits. If this type of Required Compensatory Measure is not completed within the specified Completion Time, a shutdown may be required to place the unit in a MODE or condition in which the ODCMS is not applicable. (Whether stated as a Required Compensatory Measure or not, correction of the entered

(continued)

BASES

ODCMS 7.3.0.2 (continued)

Condition is a compensatory measure that may always be considered upon entering COMPENSATORY MEASURES.) The second type of Required Compensatory Measure specifies the remedial measures that permit continued operation of the unit that is not further restricted by the Completion Time. In this case, compliance with the Required Compensatory Measures provides an acceptable level of safety for continued operation.

Completing the Required Compensatory Measures is not required when an ODCMS is met or is no longer applicable, unless otherwise stated in the individual ODCMSs.

The nature of some Required Compensatory Measures of some Conditions necessitates that, once the Condition is entered, the Required Compensatory Measures must be completed even though the associated Condition no longer exists. The individual ODCMS's COMPENSATORY MEASURES specify the Required Compensatory Measures where this is the case.

The Completion Times of the Required Compensatory Measures are also applicable when a system or component is removed from service intentionally. The reasons for intentionally relying on the COMPENSATORY MEASURES include, but are not limited to, performance of Tests, preventive maintenance, corrective maintenance, or investigation of operational problems. Entering COMPENSATORY MEASURES for these reasons must be done in a manner that does not compromise safety. Intentional entry into COMPENSATORY MEASURES should not be made for operational convenience. Alternatives that would not result in redundant equipment being inoperable should be used instead. Doing so limits the time both subsystems/ divisions of a safety function are inoperable. Individual ODCMSs may specify a time limit for performing a TR when equipment is removed from service or bypassed for testing. In this case, the Completion Times of the Required Compensatory Measures are applicable when this time limit expires, if the equipment remains removed from service or bypassed.

When a change in MODE or other specified condition is required to comply with Required Compensatory Measures, the unit may enter a MODE or other specified condition in which another ODCMS becomes applicable. In this case, the Completion Times of the associated

(continued)

BASES

ODCMS 7.3.0.2 (continued)

Required Compensatory Measures would apply from the point in time that the new ODCMS becomes applicable and the COMPENSATORY MEASURES Condition(s) are entered.

ODCMS 7.3.0.3

Not used.

ODCMS 7.3.0.4

ODCMS 7.3.0.4 establishes limitations on changes in MODES or other specified conditions in the Applicability when an ODCMS is not met. It precludes placing the unit in a MODE or other specified condition stated in that Applicability (e.g., Applicability desired to be entered) when the following exist:

a. Unit conditions are such that the requirements of the ODCMS would not be met in the Applicability desired to be entered; and

b. Continued noncompliance with the ODCMS requirements, if the Applicability were entered, would result in the unit being required to exit the Applicability desired to be entered to comply with the Required Compensatory Measures.

Compliance with Required Compensatory Measures that permit continued operation of the unit for an unlimited period of time in a MODE or other specified condition provides an acceptable level of safety for continued operation. This is without regard to the status of the unit before or after the MODE change. Therefore, in such cases, entry into a MODE or other specified condition in the Applicability may be made in accordance with the provisions of the Required Compensatory Measures. The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components to OPERABLE status before unit startup.

The provisions of ODCMS 7.3.0.4 shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with COMPENSATORY MEASURES. In addition, the provisions of ODCMS 7.3.0.4 shall not prevent changes in MODES or other specified conditions in the Applicability that result from any unit shutdown.

(continued)

BASES

ODCMS 7.3.0.4 (continued)

Exceptions to ODCMS 7.3.0.4 are stated in the individual Tests. Exceptions may apply to all the COMPENSATORY MEASURES or to a specific Required Compensatory Measure of an ODCMS.

Tests do not have to be performed on the associated inoperable equipment (or on variables outside the specified limits), as permitted by TR 7.3.0.1. Therefore, changing MODES or other specified conditions while in a COMPENSATORY MEASURES Condition, either in compliance with ODCMS 7.3.0.4 or where an exception to ODCMS 7.3.0.4 is stated, is not a violation of TR 7.3.0.1 or TR 7.3.0.4 for those Tests that do not have to be performed due to the associated inoperable equipment. However, TRs must be met to ensure OPERABILITY prior to declaring the associated equipment OPERABLE (or variable within limits) and restoring compliance with the affected ODCMS.

ODCMS 7.3.0.5

ODCMS 7.3.0.5 establishes the allowance for restoring equipment to service under administrative controls when it has been removed from service or declared inoperable to comply with COMPENSATORY MEASURES. The sole purpose of this ODCMS is to provide an exception to ODCMS 7.3.0.2 (e.g., to not comply with the applicable Required Compensatory Measure(s)) to allow the performance of TRs to demonstrate:

a. The OPERABILITY of the equipment being returned to service; or

b. The OPERABILITY of other equipment.

The administrative controls ensure the time the equipment is returned to service in conflict with the requirements of the COMPENSATORY MEASURES is limited to the time absolutely necessary to perform the allowed TRs. This ODCMS does not provide time to perform any other preventive or corrective maintenance.

An example of demonstrating the OPERABILITY of the equipment being returned to service is taking an inoperable channel or trip system out of the tripped condition after it has been tripped to comply with Required Compensatory Measures since it must be untripped to perform the TRs.

(continued)

BASES

ODCMS 7.3.0.5 (continued)	An example of demonstrating the OPERABILITY of other equipment is taking an inoperable channel or trip system out of the tripped condition to prevent the trip function from occurring during the performance of a TR on another channel in the other trip system. A similar example of demonstrating the OPERABILITY of other equipment is taking an inoperable channel or trip system out of the tripped condition to permit the logic to function and indicate the appropriate response during the performance of a TR on another channel in the same trip system.
ODCMS 7.3.0.6	ODCM 7.3.0.6 delineates the applicability of each ODCMS and associated COMPENSATORY MEASURE to Brunswick Unit 1 and Brunswick Unit 2 operations.

B 7.3.0 TEST REQUIREMENT (TR) APPLICABILITY

BASES

TRs

TR 7.3.0.1 through TR 7.3.0.5 establish the general requirements applicable to all ODCMSs and apply at all times, unless otherwise stated.

TR 7.3.0.1

TR 7.3.0.1 establishes the requirement that TRs must be met during the MODES or other specified conditions in the Applicability for which the requirements of the ODCMS apply, unless otherwise specified in the individual TRs. This ODCMS is to ensure that Tests are performed to verify the OPERABILITY of systems and components, and that variables are within specified limits. Failure to meet a Test within the specified Frequency, in accordance with TR 7.3.0.2, constitutes a failure to meet an ODCMS.

Systems and components are assumed to be OPERABLE when the associated TRs have been met. Nothing in this ODCMS, however, is to be construed as implying that systems or components are OPERABLE when:

a. The systems or components are known to be inoperable, although still meeting the TRs; or

b. The requirements of the Test(s) are known to be not met between required Test performances.

Tests do not have to be performed when the unit is in a MODE or other specified condition for which the requirements of the associated ODCMS are not applicable, unless otherwise specified.

Tests, including Tests invoked by Required Compensatory Measures, do not have to be performed on inoperable equipment because the COMPENSATORY MEASURES define the remedial measures that apply. Tests have to be met and performed in accordance with TR 7.3.0.2, prior to returning equipment to OPERABLE status.

Upon completion of maintenance, appropriate post maintenance testing is required to declare equipment OPERABLE. This includes ensuring applicable Tests are not failed and their most recent performance is in accordance with TR 7.3.0.2. Post maintenance testing may not be possible in the current MODE or other specified conditions in the

(continued)

BASES

TR 7.3.0.1 (continued)

Applicability due to the necessary unit parameters not having been established. In these situations, the equipment may be considered OPERABLE provided testing has been satisfactorily completed to the extent possible and the equipment is not otherwise believed to be incapable of performing its function. This will allow operation to proceed to a MODE or other specified condition where other necessary post maintenance tests can be completed.

TR 7.3.0.2

TR 7.3.0.2 establishes the requirements for meeting the specified Frequency for Tests and any Required Compensatory Measure with a Completion Time that requires the periodic performance of the Required Compensatory Measure on a "once per..." interval.

TR 7.3.0.2 permits a 25% extension of the interval specified in the Frequency. This extension facilitates Test scheduling and considers plant operating conditions that may not be suitable for conducting the Test (e.g., transient conditions or other ongoing Test or maintenance activities).

The 25% extension does not significantly degrade the reliability that results from performing the Test at its specified Frequency. This is based on the recognition that the most probable result of any particular Test being performed is the verification of conformance with the TRs.

As stated in TR 7.3.0.2, the 25% extension also does not apply to the initial portion of a periodic Completion Time that requires performance on a "once per..." basis. The 25% extension applies to each performance after the initial performance. The initial performance of the Required Compensatory Measure, whether it is a particular Test or some other remedial action, is considered a single compensatory measure with a single Completion Time. One reason for not allowing the 25% extension to this Completion Time is that such a compensatory measure may verify that no loss of function has occurred by checking the status of redundant or diverse components or accomplishes the function of the inoperable equipment in an alternative manner.

(continued)

BASES

TR 7.3.0.2 (continued)

The provisions of TR 7.3.0.2 are not intended to be used repeatedly merely as an operational convenience to extend Test intervals (other than those consistent with refueling intervals) or periodic Completion Time intervals beyond those specified.

TR 7.3.0.3

TR 7.3.0.3 establishes the flexibility to defer declaring affected equipment inoperable or an affected variable outside the specified limits when a Test has not been completed within the specified Frequency. A delay period of up to 24 hours or up to the limit of the specified Frequency, whichever is less, applies from the point in time that it is discovered that the Test has not been performed in accordance with TR 7.3.0.2, and not at the time that the specified Frequency was not met.

This delay period provides adequate time to complete Tests that have been missed. This delay period permits the completion of a Test before complying with Required Compensatory Measures or other remedial measures that might preclude completion of the Test.

The basis for this delay period includes consideration of unit conditions, adequate planning, availability of personnel, the time required to perform the Test, the safety significance of the delay in completing the required Test, and the recognition that the most probable result of any particular Test being performed is the verification of conformance with the requirements.

When a Test with a Frequency based not on time intervals, but upon specified unit conditions or operational situations, is discovered not to have been performed when specified, TR 7.3.0.3 allows the full delay period of 24 hours to perform the Test.

TR 7.3.0.3 also provides a time limit for completion of Tests that become applicable as a consequence of MODE changes imposed by Required Compensatory Measures.

(continued)

BASES

TR 7.3.0.3 (continued)

Failure to comply with specified Frequencies for TRs is expected to be an infrequent occurrence. Use of the delay period established by TR 7.3.0.3 is a flexibility which is not intended to be used as an operational convenience to extend Test intervals.

If a Test is not completed within the allowed delay period, then the equipment is considered inoperable or the variable is considered outside the specified limits and the Completion Times of the Required Compensatory Measures for the applicable ODCMS Conditions begin immediately upon expiration of the delay period. If a Test is failed within the delay period, then the equipment is inoperable, or the variable is outside the specified limits and the Completion Times of the Required Compensatory Measures for the applicable ODCMS Conditions begin immediately upon the failure of the Test.

Completion of the Test within the delay period allowed by this ODCMS, or within the Completion Time of the COMPENSATORY MEASURES, restores compliance with TR 7.3.0.1.

TR 7.3.0.4

TR 7.3.0.4 establishes the requirement that all applicable TRs must be met before entry into a MODE or other specified condition in the Applicability. This ODCMS ensures that system and component OPERABILITY requirements and variable limits are met before entry into MODES or other specified conditions in the Applicability for which these systems and components ensure safe operation of the unit.

However, in certain circumstances failing to meet a TR will not result in TR 7.3.0.4 restricting a MODE change or other specified condition change. When a system, subsystem, division, component, device, or variable is inoperable or outside its specified limits, the associated TR(s) are not required to be performed, per TR 7.3.0.1, which states that Tests do not have to be performed on inoperable equipment. When equipment is inoperable, TR 7.3.0.4 does not apply to the associated TR(s) since the requirement for the TR(s) to be performed is removed. Therefore, failing to perform the Test(s) within the specified Frequency does not result in a

(continued)

BASES

TR 7.3.0.4 (continued)

TR 7.3.0.4 restriction to changing MODES or other specified conditions of the Applicability. However, since the ODCMS is not met in this instance, ODCMS 7.3.0.4 will govern any restrictions that may (or may not) apply to MODE or other specified condition changes.

The provisions of TR 7.3.0.4 shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with COMPENSATORY MEASURES. In addition, the provisions of TR 7.3.0.4 shall not prevent changes in MODES or other specified conditions in the Applicability that result from any unit shutdown.

The precise requirements for performance of TRs are specified such that exceptions to TR 7.3.0.4 are not necessary. The specific time frames and conditions necessary for meeting the TRs are specified in the Frequency, in the Test, or both. This allows performance of Tests when the prerequisite condition(s) specified in a Test procedure require entry into the MODE or other specified condition in the Applicability of the associated ODCMS prior to the performance or completion of a Test. A Test that could not be performed until after entering the ODCMS Applicability would have its Frequency specified such that it is not "due" until the specific conditions needed are met. Alternately, the Test may be stated in the form of a Note as not required (to be met or performed) until a particular event, condition, or time has been reached. Further discussion of the specific formats of TRs' annotation is found in ODCMS Section 7.1.4, Frequency.

TR 7.3.0.5

TR 7.3.0.5 delineates the applicability of the test activities to Brunswick Unit 1 and Brunswick Unit 2 operations.

B 7.3.1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

BASES

The radioactive liquid effluent monitoring instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50. The purpose of tank level indicating devices is to assure the detection and control of leaks that, if not controlled, could potentially result in the transport of radioactive materials to UNRESTRICTED AREAS.

The initial CHANNEL CALIBRATION for the Table 7.3.1-1, Functions 1 and 3, instruments was performed using National Bureau of Standards traceable sources which verified that each detector would operate properly over its intended energy range and measurement range. For instruments which were operational prior to this specification being implemented, previously established calibration procedures may be substituted for the initial requirement. Subsequent to CHANNEL CALIBRATIONS will be performed using sources that have been related to the initial calibration in order to ensure that each detector is still operational, but the sources need not span the full ranges used in the initial CHANNEL CALIBRATION.

B 7.3.2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

BASES

The radioactive gaseous effluent monitoring instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50.

The main condenser air ejector monitoring instrumentation, the main condenser offgas treatment system monitor, and the explosive gas monitoring instrumentation shown in Table 7.3.2-1 are not considered effluent monitoring instrumentation in the same sense as the other instrumentation listed in the table. Therefore, their alarm/trip setpoints are not necessarily set to ensure that the limits of ODCMS 7.3.7 are not exceeded.

The main condenser air ejector monitoring instrumentation channels are provided to monitor and control gross radioactivity removed from the main condenser. The alarm/trip setpoints for the main condenser air ejector monitor are set to ensure that the limits of Technical Specification 3.7.5 are not exceeded. The alarm/trip setpoint for this monitor shall be calculated in accordance with NRC approved methods to provide reasonable assurance that the potential total body accident dose will not exceed a fraction of the limits specified in 10 CFR Part 100.

This specification also includes provisions for monitoring the concentrations of potentially explosive gas mixtures in the offgas treatment system (hydrogen monitors).

The initial CHANNEL CALIBRATION for the Table 7.3.2-1, Functions 1.a, 2.a, 3.a, 4 and 6, instruments was performed using National Bureau of Standards traceable sources which verified that each detector would operate properly over its intended energy range and measurement range. For instruments which were operational prior to this specification being implemented, previously established calibration procedures may be substituted for the initial requirement. Subsequent CHANNEL CALIBRATIONS will be performed using sources that have been related to the initial calibration in order to ensure that each detector is still operational, but the sources need not span the full ranges used in the initial CHANNEL CALIBRATION.

(continued)

BASES

Regulatory Guide 1.21 requires continuous sampling of iodine and particulate in gaseous effluents and subsequent analysis at least weekly. However, a short downtime period of the sample devices is necessary to accomplish applicable ODCM test requirements, sample analysis, or system purging. This time will be accounted for in sample volume calculations. As such, 45 minutes is provided to initiate the auxiliary sampling system or restore the normal sampling devices to OPERABLE status.

Reference ODCMS 7.3.0.5 and B 7.3.0.5 for the performance of post maintenance testing.

Upon identification of a loss of radioactive gaseous effluent monitoring instrumentation, steps shall be taken immediately to install auxiliary sampling. If this cannot be accomplished, releases via the associated effluent pathway shall be secured. Any monitor downtime will be accounted for in sample volume calculations.

B 7.3.3 CONCENTRATION—LIQUID EFFLUENTS

BASES

This specification is provided to ensure that the concentration of radioactive materials released in liquid waste effluents to UNRESTRICTED AREAS after dilution in the discharge canal will be less than or equal to 10 times the concentration levels specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 to 10 CFR 20.1001-20.2401 for radionuclides other than dissolved and entrained noble gases. This limitation provides additional assurance that the levels of radioactive materials in bodies of water in UNRESTRICTED AREAS will not result in exposures within (1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to a MEMBER OF THE PUBLIC and (2) the limits of 10 CFR Part 20.1302(b)(2)(i) to the population. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP), Publication 2.

The required detection capabilities for radioactive materials in liquid waste samples are tabulated in terms of the Lower Limits of Detection (LLDs). Detailed discussion of the LLD and other detection limits can be found in HASL Procedures Manuals, HASL-300 (revised annually), Currie, L. A. "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry" Anal. Chem. 40, 586-93 (1968), and Hartwell, J. K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

Note that for batch releases, recirculation of at least two tank volumes shall be considered adequate for thorough mixing.

The stabilization pond and service water liquid release types represent potential release pathways and not actual release pathways. Tests of these pathways is intended to alert the plant to a potential problem; analysis for principal gamma emitters should be sufficient to meet this intent. If analysis for principal gamma emitters indicates a problem (i.e., exceeds the trigger level of 5×10^{-6} μCi/ml), then complete sampling and analyses shall be performed as per Table 7.3.3-2. The trigger level of 5×10^{-6} μCi/ml was chosen as being sufficient to provide reasonable assurance of accountability of all nuclides released based upon lower limits of detection and expected concentrations.

B 7.3.4 DOSE—LIQUID EFFLUENTS

BASES

This specification is provided to implement the requirements of Sections II.A, III.A, and IV.A of Appendix I, 10 CFR Part 50. ODCMS 7.3.4 implements the guides set forth in Section II.A of Appendix I. The COMPENSATORY MEASURES provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I of 10 CFR Part 50 to assure that releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents will be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

The dose or dose commitment to a MEMBER OF THE PUBLIC is based on the 10 CFR Part 50, Appendix I, guideline of:

a. 1.5 mrem to the total body and 5.0 mrem to any organ during any calendar quarter, and

b. 3 mrem to the total body and 10 mrem to any organ during any calendar year,

from radioactive material in liquid effluents from each reactor unit to UNRESTRICTED AREAS. This specification is written for a two unit site.

B 7.3.5 LIQUID RADWASTE TREATMENT SYSTEM

BASES

The requirement that appropriate portions of this system be used, when specified, provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as reasonably achievable." This specification implements the requirements of 10 CFR Part 50.36a, General Design Criteria 60 of Appendix A to 10 CFR Part 50 and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the Liquid Radwaste Treatment System were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

Mechanical filtration as per system design is considered to be an appropriate component of the Liquid Radwaste Treatment System.

The requirements of 0.12 mrem total body or 0.4 mrem to any organ in a 31-day period is based on two reactor units having a shared Liquid Radwaste Treatment System.

B 7.3.6 LIQUID HOLDUP TANKS

BASES

The tanks listed in this specification include all those outdoor tanks that are not surrounded by liners, dikes, or walls capable of holding the tank contents and do not have tank overflows and surrounding area drains connected to the Liquid Radwaste Treatment System.

Since the condensate storage tanks have continuous influent and effluent, stratification should not occur. Samples taken from the operating condensate transfer pump(s) vent or drain shall be deemed representative of this system.

Appropriate alternatives to the COMPENSATORY MEASURES and TEST REQUIREMENTS are acceptable if they provide reasonable assurance that in the event of an uncontrolled release of the tank's content, the resulting concentrations would be less than 10 times the concentration values in Appendix B, Table 2, Column 2 to 10 CFR 20.1001-20.2401 at the nearest potable water supply and the nearest surface water supply in an UNRESTRICTED AREA.

B 7.3.7 DOSE RATE—GASEOUS EFFLUENTS

BASES

This specification is provided to ensure that the dose rate at and beyond the SITE BOUNDARY from gaseous effluents from all units on the site will be within the annual dose rate limits of 10 CFR Part 20 for UNRESTRICTED AREAS. The annual dose limits are the doses associated with the concentrations of 10 CFR Part 20, Appendix B, Table 2, Column 1. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a MEMBER OF THE PUBLIC in an UNRESTRICTED AREA, either within or outside the SITE BOUNDARY, to annual average concentrations exceeding the limits specified in Appendix B, Table 2, of 10 CFR Part 20 (10 CFR Part 20.1302(b)(2)(i)). For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of that MEMBER OF THE PUBLIC will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrems/year to the total body or to less than or equal to 3000 mrems/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrems/year.

This specification applies to the release of gaseous effluents from all reactors at the site and from the incineration of waste oil.

With regard to footnotes (c) and (g) of Table 7.3.7-1, (1) to determine whether the Dose Equivalent I-131 concentration in the primary coolant has increased by more than a factor of 3, the iodine-131 analysis performed after the transient will be compared to the most recent routine analysis for Dose Equivalent I-131 concentration performed before the transient; and (2) to determine whether the main condenser air ejector noble gas monitor has increased by more than a factor of 3, the activity indicated on the monitor's chart recorder after the transient will be compared to the activity indicated on the recorder just before the transient occurred.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the Lower Limits of Detection (LLDs). Detailed discussion of the LLD and other detection limits can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry" Anal. Chem. 40, 586-93 (1968), and Hartwell, J. K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

B 7.3.8 DOSE RATE—NOBLE GASES

BASES

This specification is provided to implement the requirements of Sections II.B, III.A, and IV.A of Appendix I, 10 CFR Part 50. ODCMS 7.3.8 implements the guides set forth in Section II.B of Appendix I. The COMPENSATORY MEASURES provide the required operating flexibility and, at the same time, implement the guides set forth in Section IV.A of Appendix I, to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The TEST REQUIREMENTS implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through the appropriate pathways is unlikely to be substantially underestimated. The dose calculations established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents will be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Revision 1, July 1977. The ODCM equations provided for determining the air doses at and beyond the SITE BOUNDARY will be based upon the historical annual average atmospheric conditions. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111. The limits of this specification are twice the 10 CFR 50 Appendix I per reactor guidelines because they are written for a two unit site.

B 7.3.9 DOSE - IODINE-131, IODINE-133, TRITIUM, AND RADIONUCLIDES IN PARTICULATE FORM

BASES

This specification is provided to implement the requirements of Section II.C, III.A, and IV.A of Appendix I, 10 CFR Part 50. ODCMS 7.3.9 implements the guides set forth in Section II.C of Appendix I. The COMPENSATORY MEASURES provide the required operating flexibility and, at the same time, implements the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The ODCM calculational methods specified in the TEST REQUIREMENTS implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methods for calculating the doses due to the actual release rates of the subject materials are required to be consistent with the methodology provided in Regulatory Guide 1.109, "Calculating of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Revision 1, July 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate specification for iodine-131, iodine-133, tritium, and radioactive material in particulate form with half-lives greater than 8 days are dependent on the existing radionuclide pathways to man in the areas at and beyond the SITE BOUNDARY. The pathways which are examined in the development of these calculations are: (1) individual inhalation of airborne radionuclides, (2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, (3) deposition onto grassy areas where milk animals and meat producing animals graze, with consumption of the milk and meat by man, and (4) deposition on the ground with subsequent exposure of man. The limits of this specification are twice the 10 CFR 50 Appendix I per reactor guidelines because they are written for a two unit site.

Doses due to the incineration of waste oil will be determined in accordance with the ODCM.

B 7.3.10 GASEOUS RADWASTE TREATMENT SYSTEM

BASES

This requirement provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as reasonably achievable." This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The GASEOUS RADWASTE TREATMENT SYSTEM refers to the 30-minute offgas holdup line, stack filter house filtration, and the Augmented Off-Gas-Treatment System.

B 7.3.11 VENTILATION EXHAUST TREATMENT SYSTEM

BASES

This requirement provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as reasonably achievable." This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents. At the Brunswick Steam Electric Plant, the only VENTILATION EXHAUST TREATMENT SYSTEMS shall be those installed for the Turbine Buildings' ventilation.

B 7.3.12 EXPLOSIVE GAS MIXTURE

BASES

This specification is provided to ensure that the concentration of potentially explosive gas mixtures contained in the waste gas treatment system is maintained below the flammability limits of hydrogen. Maintaining the concentration of hydrogen below the flammability limits provides assurance that the releases of radioactive materials will be controlled in conformance with the requirements of General Design Criterion 60 of Appendix A to 10 CFR Part 50.

B 7.3.13 DRYWELL VENTING or PURGING

BASES

This specification provides reasonable assurance that releases from drywell VENTING or PURGING operations will not exceed the annual dose limits of 10 CFR Part 20 for UNRESTRICTED AREAS.

B 7.3.14 TOTAL DOSE (40 CFR PART 190)

BASES

This specification is provided to meet the dose limitations of 40 CFR Part 190 that have now been incorporated into 10 CFR Part 20 by 46 FR 18525. The specification requires the preparation and submittal of a Special Report whenever the calculated doses from plant generated radioactive effluents and direct radiation exceed 25 mrems to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems. For sites containing up to 4 reactors, it is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the individual reactors remain within the reporting requirement level. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 8 km must be considered. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected) in accordance with the provisions of 40 CFR Part 190.11 and 10 CFR Part 20.2203(a)(4) is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR Part 20, as addressed in ODCMSs 7.3.3 through 7.3.14. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

B 7.3.15 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

BASES

The radiological environmental monitoring program required by this specification provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10 CFR Part 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials are not higher than expected on the basis of effluent measurements and the modeling of the environmental exposure pathways.

The required detection capabilities for environmental sample analyses are tabulated in terms of the Lower Limits of Detection (LLDs). The LLDs required by Table 7.3.15-3 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD and other detection limits can be found in HASL Procedure Manual, HASL-300 (revised annually), Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination Application to Radiochemistry" Anal. Chem 40, 586-93 (1968), and Hartwell, L. K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

Groundwater is not monitored by this specification because plant liquid effluents are not tapped as a source for drinking or irrigation purposes.

In the absence of the availability of leafy vegetables intended for human consumption, sampling of indigenous broadleaf vegetation may be performed since the objective of sampling broadleaf vegetation (i.e., to approximate fallout from plant operation) is satisfied in either case.

B 7.3.16 LAND USE CENSUS

BASES

This specification is provided to ensure that changes in the use of the area at and beyond the SITE BOUNDARY are identified and that modifications to the radiological environmental monitoring program are made, if required, as a result of the census. The best information from door-to-door surveys, aerial surveys, or consulting with local agricultural authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 50 m^2 provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/yr) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine the minimum garden size, the following assumptions were made: (1) 20% of the garden was used for growing broadleaf vegetation (i.e., similar to lettuce and cabbage; and (2) a vegetation yield of 2 kg/m^2.

B 7.3.17 INTERLABORATORY COMPARISON PROGRAM

BASES

The requirement for participation in the Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are reasonably valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

LIST OF TABLES

APPENDIX A

METEOROLOGICAL DISPERSION FACTOR COMPUTATIONS

Carolina Power & Light Company (CP&L) engaged the services of Dames and Moore to assess the transport and dispersion of the effluent in the atmosphere as outlined in Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, NUREG 0133 (USNRC, 1978). The methodology for this assessment was based on guidelines presented in Regulatory Guide (RG) 1.111, Revision 1 (USNRC, 1977). The results of the assessment were to provide the relative depositions flux and relative concentrations (undepleted and depleted) based on numerical models acceptable for use in Appendix I evaluations.

Regulatory Guide 1.111 presented three acceptable diffusion models for use in estimating deposition flux and concentrations. These are (1) particle-in-cell model (a variable trajectory model based on the gradient-transport theory), (2) puff-advection model (a variable trajectory model based on the statistical approach to diffusion), and (3) the constant mean wind direction model referred to here as the straight-line trajectory Gaussian diffusion model (the most widely used model based on a statistical approach). It was resolved that for operational efficiency, the straight line described in XOQDOQ Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations (Draft), NUREG 0324 (USNRC, September 1977) would be used for generating the required analyses of Appendix I. To provide a more realistic accounting of the variability of wind around the plant site, terrain/ recirculation correction factors (TCF) were to be determined from a combined puff-advection/straight-line scheme for a one-year meteorological data base.

Dames and Moore was provided a one-year record of meteorological data from the on-site meteorological program at the Brunswick Steam Electric Plant. This data consisted of all collected parameters at both the 11.46-meter and 104.55-meter tower levels for the year 1977. The description of the model used and the results of the computations are presented in Reference 1. The following tables from Reference 1 provide the basis for the meteorological dilution factor development of the Technical Specifications for Appendix I and were the source of the χ/Q and D/Q values utilized to show compliance with 10CFR20 and 10CFR50 for noble gases and radioiodines and particulates.

Tables A-1 through A-6	Relative undepleted concentration, relative depleted concentration, and relative deposition flux estimates for ground-level release for both standard distances and special locations.
Tables A-7 through A-12	Relative undepleted concentration, relative depleted concentration, and relative deposition flux estimates for mixed-mode release for both standard distances and special locations.

Tables A-13 through A-18	Relative undepleted concentration, relative depleted concentration, and relative deposition flux estimates for elevated release for both standard distances and special locations.

Values for χ/Q, depleted χ/Q, and D/Q for releases to special locations are from the standard distance tables. The values used are from the distance nearest the special location in the appropriate sector.

Future Operation Computations

The NRC "XOQDOQ" Program (Revision 1) was obtained and installed on the CP&L computer system. For routine meteorological dispersion evaluations, the "XOQDOQ" Program will be run with the appropriate physical plant data, appropriate meteorological information for the standard distances, and special locations of interest without a terrain/recirculation factor. The input to "XOQDOQ" for ground-level releases are presented in Table A-19 and for elevated releases in Table A-20. The resulting computations will have applied the TCFs to produce a final atmospheric diffusion estimate for the site.

In general, it is concluded that the straight-line model is as reasonable a projection of concentrations as the puff-advection model. By inclusion of the terrain correction factors developed by a combination of the puff-advection/straight-line scheme with the results of the XOQDOQ Program, ready evaluation of on-site meteorological data may be made.

Reference

Chandler, Martin W. and George Hoopes, Revised Radiological Effluent Technical Specifications: Gaseous Effluent Dilution Factors, Prepared for Carolina Power & Light Company, Brunswick Facility, Dames and Moore, January 18, 1979.

TABLE A-1

χ/Q Values at the Special Locations for Releases From the Turbine Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Ground Level
Variable: Relative Concentration (Sec./Cubic Meter)
Calculation Points: Special
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	2.3E-06	0.	9.4E-07	9.4E-07	9.4E-07
NE	2.9E-06	1.4E-07	0.	0.	0.
ENE	3.2E-06	0.	0.	0.	0.
E	3.9E-06	0.	1.5E-06	1.5E-06	0.
ESE	5.2E-06	0.	5.2E-06	1.0E-06	1.0E-06
SE	3.4E-06	0.	3.4E-06	3.4E-06	0.
SSE	7.5E-06	0.	7.5E-06	7.5E-06	7.5E-06
S	3.8E-06	0.	0.	1.6E-06	9.8E-07
SSW	2.8E-06	0.	1.2E-06	1.2E-06	1.2E-06
SW	2.5E-06	0.	2.5E-06	2.5E-06	2.5E-06
WSW	1.8E-06	0.	3.8E-07	7.5E-07	7.5E-07
W	1.5E-06	0.	0.	1.5E-06	1.5E-06
WNW	1.2E-06	0.	0.	1.2E-06	1.2E-06
NW	9.7E-07	0.	0.	9.7E-07	9.7E-07
NNW	1.3E-06	0.	0.	1.3E-06	1.3E-06
N	1.4E-06	0.	0.	1.4E-06	1.4E-06

*A zero indicates that this point was not calculated.

TABLE A-2

Depleted χ/Q Values at the Special Locations for
Releases From the Turbine Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Ground Level
Variable: Relative Depleted Concentration (Sec./Cubic Meter)
Calculation Points: Special
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	2.0E-06	0.	8.1E-07	8.1E-07	8.1E-07
NE	2.6E-06	1.0E-07	0.	0.	0.
ENE	2.9E-06	0.	0.	0.	0.
E	3.4E-06	0.	1.3E-06	1.3E-06	0.
ESE	4.6E-06	0.	4.6E-06	8.7E-07	8.7E-07
SE	3.1E-06	0.	3.1E-06	3.1E-06	0.
SSE	6.8E-06	0.	6.8E-06	6.8E-06	6.8E-06
S	3.5E-06	0.	0.	1.3E-06	8.1E-07
SSW	2.5E-06	0.	1.0E-06	1.0E-06	1.0E-06
SW	2.4E-06	0.	2.4E-06	2.4E-06	2.4E-06
WSW	1.5E-06	0.	3.2E-07	6.4E-07	6.4E-07
W	1.3E-06	0.	0.	1.3E-06	1.3E-06
WNW	1.1E-06	0.	0.	1.1E-06	1.1E-06
NW	8.7E-07	0.	0.	8.7E-07	8.7E-07
NNW	1.1E-06	0.	0.	1.1E-06	1.1E-06
N	1.2E-06	0.	0.	1.2E-06	1.2E-06

*A zero indicates that this point was not calculated.

TABLE A-3

D/Q Values at the Special Locations for Releases From the Turbine Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Ground Level
Variable: Relative Deposition (Meter**-2)
Calculation Points: Special
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	1.3E-08	0.	4.8E-09	4.8E-09	4.8E-09
NE	1.9E-08	5.7E-10	0.	0.	0.
ENE	9.4E-09	0.	0.	0.	0.
E	8.6E-09	0.	3.1E-09	3.1E-09	0.
ESE	1.3E-08	0.	1.3E-08	2.2E-09	2.2E-09
SE	8.4E-09	0.	8.4E-09	8.4E-09	0.
SSE	1.5E-08	0.	1.5E-08	1.5E-08	1.5E-08
S	8.3E-09	0.	0.	3.2E-09	1.8E-09
SSW	7.7E-09	0.	3.0E-09	3.0E-09	3.0E-09
SW	1.1E-08	0.	1.1E-08	1.1E-08	1.1E-08
WSW	7.0E-09	0.	1.3E-09	2.7E-09	2.7E-09
W	5.1E-09	0.	0.	5.1E-09	5.1E-09
WNW	3.8E-09	0.	0.	3.8E-09	3.8E-09
NW	3.5E-09	0.	0.	3.5E-09	3.5E-09
NNW	5.0E-09	0.	0.	5.0E-09	5.0E-09
N	6.3E-09	0.	0.	6.3E-09	6.3E-09

*A zero indicates that this point was not calculated.

TABLE A-4

χ/Q Values at the Standard Distances for Releases from the Turbine Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Ground Level
Variable: Relative Concentration (Sec./Cubic Meter)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Base Distance in Miles/Kilometers

Aftd Sect	Design Dist Mi	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.5E-05	2.3E-06	9.4E-07	5.9E-07	3.5E-07	2.4E-07	1.9E-07	1.5E-07	1.2E-07	9.0E-08
NE	0.	2.0E-05	2.9E-06	1.3E-06	7.3E-07	4.5E-07	3.4E-07	2.7E-07	2.0E-07	1.7E-07	1.4E-07
ENE	0.	2.1E-05	3.2E-06	1.2E-06	6.5E-07	4.8E-07	3.6E-07	2.9E-07	2.1E-07	1.8E-07	1.4E-07
E	0.	2.9E-05	3.9E-06	1.5E-06	9.1E-07	6.6E-07	4.4E-07	3.5E-07	2.8E-07	2.2E-07	1.9E-07
ESE	0.	3.2E-05	5.2E-06	2.2E-06	1.0E-06	6.5E-07	4.4E-07	3.6E-07	2.9E-07	2.4E-07	1.9E-07
SE	0.	2.3E-05	3.4E-06	1.6E-06	7.9E-07	4.8E-07	3.3E-07	2.4E-07	2.2E-07	1.8E-07	1.6E-07
SSE	0.	4.4E-05	7.5E-06	3.1E-06	1.8E-06	1.2E-06	7.7E-07	5.1E-07	3.9E-07	3.2E-07	2.5E-07
S	0.	2.7E-05	3.8E-06	1.6E-06	9.8E-07	7.2E-07	4.9E-07	3.7E-07	2.9E-07	2.2E-07	1.8E-07
SSW	0.	1.9E-05	2.8E-06	1.2E-06	8.0E-07	4.9E-07	2.9E-07	2.3E-07	2.2E-07	1.3E-07	1.1E-07
SW	0.	1.8E-05	2.5E-06	1.1E-06	6.6E-07	4.9E-07	2.8E-07	2.2E-07	1.7E-07	1.4E-07	1.1E-07
WSW	0.	1.5E-05	1.8E-06	7.5E-07	3.8E-07	2.8E-07	1.8E-07	1.5E-07	1.2E-07	9.5E-08	7.9E-08
W	0.	1.3E-05	1.5E-06	6.9E-07	3.3E-07	2.2E-07	1.5E-07	1.1E-07	9.4E-08	8.1E-08	5.2E-08
WNW	0.	1.0E-05	1.2E-06	6.0E-07	2.8E-07	1.6E-07	1.3E-07	8.6E-08	7.2E-08	5.4E-08	4.4E-08
NW	0.	7.1E-06	9.7E-07	3.5E-07	2.1E-07	1.6E-07	1.2E-07	7.8E-08	6.6E-08	4.6E-08	3.9E-08
NNW	0.	8.9E-06	1.3E-06	5.4E-07	2.7E-07	1.7E-07	1.3E-07	1.1E-07	9.3E-08	6.6E-08	5.3E-08
N	0.	9.2E-06	1.4E-06	5.1E-07	3.3E-07	2.1E-07	1.6E-07	1.3E-07	1.1E-07	8.1E-08	7.0E-08

Number of Valid Observations 8678
Number of Invalid Observations 82
Number of Calms Lower Level 125
Number of Calms Upper Level 0

TABLE A-5

Depleted χ/Q Values at the Standard Distances for Releases from the Turbine Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Ground Level
Variable: Relative Concentration (Sec./Cubic Meter)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

		Base Distance in Miles/Kilometers									
Aftd Sect	Design Dist Mi	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.5E-05	2.0E-06	8.1E-07	4.8E-07	2.8E-07	1.9E-07	1.5E-07	1.1E-07	8.9E-08	6.8E-08
NE	0.	1.8E-05	2.6E-06	1.1E-06	6.1E-07	3.7E-07	2.6E-07	2.1E-07	1.5E-07	1.2E-07	1.0E-07
ENE	0.	2.0E-05	2.9E-06	1.0E-06	5.5E-07	3.9E-07	2.8E-07	2.2E-07	1.6E-07	1.3E-07	1.0E-07
E	0.	2.7E-05	3.4E-06	1.3E-06	7.6E-07	5.3E-07	3.5E-07	2.6E-07	2.2E-07	1.6E-07	1.4E-07
ESE	0.	3.0E-05	4.6E-06	1.9E-06	8.7E-07	5.3E-07	3.5E-07	2.8E-07	2.3E-07	1.7E-07	1.4E-07
SE	0.	2.2E-05	3.1E-06	1.3E-06	6.6E-07	3.9E-07	2.6E-07	1.9E-07	1.6E-07	1.3E-07	1.2E-07
SSE	0.	4.2E-05	6.8E-06	2.7E-06	1.5E-06	9.9E-07	6.1E-07	4.0E-07	3.0E-07	2.4E-07	1.9E-07
S	0.	2.5E-05	3.5E-06	1.3E-06	8.1E-07	5.9E-07	3.9E-07	2.9E-07	2.2E-07	1.6E-07	1.4E-07
SSW	0.	1.9E-05	2.5E-06	1.0E-06	6.6E-07	4.0E-07	2.3E-07	1.8E-07	1.6E-07	1.0E-07	8.3E-08
SW	0.	1.7E-05	2.4E-06	9.8E-07	5.5E-07	3.9E-07	2.3E-07	1.7E-07	1.3E-07	1.1E-07	9.0E-08
WSW	0.	1.4E-05	1.5E-06	6.4E-07	3.2E-07	2.2E-07	1.4E-07	1.1E-07	9.2E-08	7.0E-08	5.9E-08
W	0.	1.2E-05	1.3E-06	5.9E-07	2.7E-07	1.8E-07	1.1E-07	8.3E-08	7.2E-08	6.1E-08	3.8E-08
WNW	0.	9.9E-06	1.1E-06	5.2E-07	2.4E-07	1.3E-07	1.0E-07	6.6E-08	5.5E-08	4.1E-08	3.3E-08
NW	0.	6.7E-06	8.7E-07	3.0E-07	1.8E-07	1.3E-07	9.4E-08	6.1E-08	5.1E-08	3.5E-08	3.0E-08
NNW	0.	8.5E-06	1.1E-06	4.7E-07	2.2E-07	1.3E-07	1.1E-07	8.3E-08	7.2E-08	5.0E-08	3.9E-08
N	0.	8.6E-06	1.2E-06	4.4E-07	2.8E-07	1.7E-07	1.3E-07	1.0E-07	8.2E-08	6.1E-08	5.1E-08

Number of Valid Observations	8678
Number of Invalid Observations	82
Number of Calms Lower Level	125
Number of Calms Upper Level	0

TABLE A-6

D/Q Values at the Standard Distances for Releases from the Turbine Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Ground Level
Variable: Relative Deposition (Meter**-2)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Base Distance in Miles/Kilometers

Aftd Sect	Design Dist Mi	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	8.6E-08	1.3E-08	4.8E-09	2.8E-09	1.5E-09	9.9E-10	7.7E-10	5.7E-10	4.3E-10	3.3E-10
NE	0.	1.3E-07	1.9E-08	7.6E-09	4.0E-09	2.3E-09	1.6E-09	1.3E-09	8.8E-10	6.8E-10	5.7E-10
ENE	0.	5.8E-08	9.4E-09	3.2E-09	1.6E-09	1.1E-09	7.5E-10	5.5E-10	3.9E-10	3.0E-10	2.3E-10
E	0.	6.2E-08	8.6E-09	3.1E-09	1.7E-09	1.1E-09	6.9E-10	5.1E-10	3.9E-10	2.9E-10	2.3E-10
ESE	0.	7.2E-08	1.3E-08	5.0E-09	2.2E-09	1.2E-09	7.6E-10	6.0E-10	4.7E-10	3.5E-10	2.6E-10
SE	0.	5.1E-08	8.4E-09	3.3E-09	1.6E-09	8.6E-10	5.6E-10	3.8E-10	3.3E-10	2.6E-10	2.2E-10
SSE	0.	8.2E-08	1.5E-08	5.8E-09	3.0E-09	1.8E-09	1.1E-09	6.8E-10	4.9E-10	3.8E-10	2.9E-10
S	0.	5.6E-08	8.3E-09	3.2E-09	1.8E-09	1.2E-09	7.5E-10	5.4E-10	3.9E-10	2.9E-10	2.3E-10
SSW	0.	5.2E-08	7.7E-09	3.0E-09	1.9E-09	1.1E-09	5.8E-10	4.3E-10	3.8E-10	2.2E-10	1.8E-10
SW	0.	7.5E-08	1.1E-08	4.3E-09	2.4E-09	1.6E-09	8.8E-10	6.4E-10	4.6E-10	3.7E-10	3.1E-10
WSW	0.	6.0E-08	7.0E-09	2.7E-09	1.3E-09	8.8E-10	5.2E-10	4.0E-10	3.3E-10	2.4E-10	2.0E-10
W	0.	4.1E-08	5.1E-09	2.0E-09	9.2E-10	5.7E-10	3.6E-10	2.6E-10	2.1E-10	1.7E-10	1.0E-10
WNW	0.	3.4E-08	3.8E-09	1.7E-09	7.3E-10	3.9E-10	3.0E-10	1.9E-10	1.5E-10	1.1E-10	8.4E-11
NW	0.	2.7E-08	3.5E-09	1.1E-09	6.6E-10	4.7E-10	3.3E-10	2.1E-10	1.7E-10	1.1E-10	9.6E-11
NNW	0.	3.6E-08	5.0E-09	1.9E-09	8.5E-10	5.0E-10	3.8E-10	2.8E-10	2.4E-10	1.6E-10	1.3E-10
N	0.	4.4E-08	6.3E-09	2.1E-09	1.3E-09	8.0E-10	5.6E-10	4.5E-10	3.5E-10	2.5E-10	2.1E-10

Number of Valid Observations	8678
Number of Invalid Observations	82
Number of Calms Lower Level	125
Number of Calms Upper Level	0

TABLE A-7

χ/Q Values at the Special Locations for Releases From the Reactor Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Mixed Mode
Variable: Relative Concentration (Sec./Cubic Meter)
Calculation Points: Special
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	1.0E-07	0.	7.8E-08	7.8E-08	7.8E-08
NE	2.0E-07	4.1E-08	0.	0.	0.
ENE	6.5E-08	0.	0.	0.	0.
E	4.8E-08	0.	3.5E-08	3.5E-08	0.
ESE	6.9E-08	0.	6.9E-08	3.9E-08	3.9E-08
SE	4.1E-08	0.	4.1E-08	4.1E-08	0.
SSE	7.6E-08	0.	7.6E-08	7.6E-08	7.6E-08
S	4.5E-08	0.	0.	3.5E-08	2.8E-08
SSW	4.7E-08	0.	4.7E-08	4.7E-08	4.7E-08
SW	6.4E-08	0.	6.4E-08	6.4E-08	6.4E-08
WSW	4.1E-08	0.	3.9E-08	4.3E-08	4.3E-08
W	3.4E-08	0.	0.	3.4E-08	3.4E-08
WNW	1.8E-08	0.	0.	1.8E-08	1.8E-08
NW	1.9E-08	0.	0.	1.9E-08	1.9E-08
NNW	3.2E-08	0.	0.	3.2E-08	3.2E-08
N	4.0E-08	0.	0.	4.0E-08	4.0E-08

*A zero indicates that this point was not calculated.

TABLE A-8

Depleted χ/Q Values at the Special Locations for
Releases From the Reactor Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Mixed Mode
Variable: Relative Depleted Concentration (Sec./Cubic Meter)
Calculation Points: Special
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	9.1E-08	0.	7.8E-08	7.8E-08	7.8E-08
NE	1.9E-07	3.7E-08	0.	0.	0.
ENE	6.1E-08	0.	0.	0.	0.
E	4.4E-08	0.	3.2E-08	3.2E-08	0.
ESE	6.4E-08	0.	6.4E-08	3.7E-08	3.7E-08
SE	3.8E-08	0.	3.8E-08	3.8E-08	0.
SSE	7.1E-08	0.	7.1E-08	7.1E-08	7.1E-08
S	4.2E-08	0.	0.	3.3E-08	2.7E-08
SSW	4.3E-08	0.	4.4E-08	4.4E-08	4.4E-08
SW	6.0E-08	0.	6.0E-08	6.0E-08	6.0E-08
WSW	3.9E-08	0.	3.8E-08	4.2E-08	4.2E-08
W	3.3E-08	0.	0.	3.3E-08	3.3E-08
WNW	1.7E-08	0.	0.	1.7E-08	1.7E-08
NW	1.8E-08	0.	0.	1.8E-08	1.8E-08
NNW	3.0E-08	0.	0.	3.0E-08	3.0E-08
N	3.7E-08	0.	0.	3.7E-08	3.7E-08

*A zero indicates that this point was not calculated.

TABLE A-9

D/Q Values at the Special Locations for Releases From the Reactor Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Mixed Mode
Variable: Relative Deposition (Meter**-2)
Calculation Points: Special
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	2.0E-09	0.	1.1E-09	1.1E-09	1.1E-09
NE	4.3E-09	2.7E-10	0.	0.	0.
ENE	1.1E-09	0.	0.	0.	0.
E	4.6E-10	0.	2.5E-10	2.5E-10	0.
ESE	1.1E-09	0.	1.1E-09	3.3E-10	3.3E-10
SE	7.6E-10	0.	7.6E-10	7.6E-10	0.
SSE	1.2E-09	0.	1.2E-09	1.2E-09	1.2E-09
S	5.7E-10	0.	0.	3.4E-10	2.3E-10
SSW	7.7E-10	0.	5.2E-10	5.2E-10	5.2E-10
SW	1.2E-09	0.	1.2E-09	1.2E-09	1.2E-09
WSW	8.9E-10	0.	4.1E-10	5.9E-10	5.9E-10
W	6.6E-10	0.	0.	6.6E-10	6.6E-10
WNW	2.7E-10	0.	0.	2.7E-10	2.7E-10
NW	3.1E-10	0.	0.	3.1E-10	3.1E-10
NNW	4.0E-10	0.	0.	4.0E-10	4.0E-10
N	5.6E-10	0.	0.	5.6E-10	5.6E-10

*A zero indicates that this point was not calculated.

TABLE A-10

χ/Q Values at the Standard Distances for Releases from the Reactor Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Mixed Mode
Variable: Relative Concentration (Sec./Cubic Meter)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

		Base Distance in Miles/Kilometers									
Aftd Sect	Design Dist Mi	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	5.6E-07	1.0E-07	7.8E-08	6.3E-08	5.2E-08	4.1E-08	3.6E-08	3.1E-08	2.7E-08	2.4E-08
NE	0.	5.5E-07	2.0E-07	1.5E-07	1.2E-07	9.4E-08	7.6E-08	6.3E-08	5.3E-08	4.6E-08	4.1E-08
ENE	0.	1.6E-06	6.5E-08	5.8E-08	5.4E-08	4.9E-08	4.3E-08	3.9E-08	3.5E-08	3.1E-08	2.9E-08
E	0.	2.9E-07	4.8E-08	3.5E-08	2.9E-08	2.7E-08	2.3E-08	2.2E-08	1.8E-08	1.7E-08	1.5E-08
ESE	0.	1.2E-07	6.9E-08	5.0E-08	3.9E-08	3.5E-08	3.1E-08	2.6E-08	2.3E-08	2.0E-08	1.7E-08
SE	0.	7.8E-08	4.1E-08	3.6E-08	2.7E-08	2.0E-08	1.8E-08	1.7E-08	1.5E-08	1.3E-08	1.2E-08
SSE	0.	2.2E-07	7.6E-08	5.6E-08	4.2E-08	3.5E-08	2.9E-08	2.5E-08	2.2E-08	1.9E-08	1.6E-08
S	0.	4.2E-07	4.5E-08	3.5E-08	2.8E-08	2.5E-08	2.4E-08	2.1E-08	1.8E-08	1.6E-08	1.4E-08
SSW	0.	5.9E-07	4.7E-08	4.7E-08	4.1E-08	3.7E-08	2.9E-08	2.7E-08	2.3E-08	2.0E-08	1.8E-08
SW	0.	1.8E-07	6.4E-08	5.5E-08	4.4E-08	3.8E-08	3.1E-08	2.7E-08	2.4E-08	2.1E-08	1.9E-08
WSW	0.	8.9E-08	4.1E-08	4.3E-08	3.9E-08	3.4E-08	2.8E-08	2.5E-08	2.5E-08	2.2E-08	1.9E-08
W	0.	3.6E-08	3.4E-08	3.8E-08	3.7E-08	3.1E-08	2.8E-08	2.6E-08	2.2E-08	2.1E-08	1.8E-08
WNW	0.	4.1E-08	1.8E-08	2.2E-08	2.4E-08	2.3E-08	2.0E-08	1.8E-08	1.6E-08	1.4E-08	1.2E-08
NW	0.	3.0E-08	1.9E-08	2.3E-08	2.0E-08	1.9E-08	1.9E-08	1.6E-08	1.4E-08	1.3E-08	1.2E-08
NNW	0.	4.9E-07	3.2E-08	2.7E-08	2.4E-08	2.0E-08	1.8E-08	1.6E-08	1.5E-08	1.4E-08	1.3E-08
N	0.	6.3E-07	4.0E-08	3.0E-08	2.9E-08	2.7E-08	2.6E-08	2.6E-08	2.1E-08	1.8E-08	1.7E-08

Number of Valid Observations 8678
Number of Invalid Observations 82
Number of Calms Lower Level 125
Number of Calms Upper Level 0

TABLE A-11

Depleted x/Q Values at the Standard Distances for Releases from the Reactor Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Mixed Mode
Variable: Relative Depleted Concentration (Sec./Cubic Meter)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

		Base Distance in Miles/Kilometers									
Aftd Sect	Design Dist Mi	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	5.4E-07	9.1E-08	7.8E-08	5.9E-08	4.9E-08	3.8E-08	3.3E-08	2.8E-08	2.5E-08	2.2E-08
NE	0.	5.3E-07	1.9E-07	1.4E-07	1.1E-07	8.7E-08	7.1E-08	5.9E-08	5.0E-08	4.3E-08	3.7E-08
ENE	0.	1.5E-06	6.1E-08	5.6E-08	5.2E-08	4.7E-08	4.1E-08	3.7E-08	3.3E-08	3.0E-08	2.8E-08
E	0.	2.8E-07	4.4E-08	3.2E-08	2.7E-08	2.5E-08	2.2E-08	2.1E-08	1.8E-08	1.6E-08	1.4E-08
ESE	0.	1.1E-07	6.4E-08	4.6E-08	3.7E-08	3.3E-08	2.9E-08	2.4E-08	2.2E-08	1.8E-08	1.6E-08
SE	0.	7.4E-08	3.8E-08	3.3E-08	2.5E-08	1.9E-08	1.7E-08	1.5E-08	1.4E-08	1.2E-08	1.2E-08
SSE	0.	2.1E-07	7.1E-08	5.2E-08	3.9E-08	3.2E-08	2.6E-08	2.3E-08	2.0E-08	1.7E-08	1.5E-08
S	0.	4.0E-07	4.2E-08	3.3E-08	2.7E-08	2.3E-08	2.3E-08	1.9E-08	1.7E-08	1.5E-08	1.3E-08
SSW	0.	5.9E-07	4.3E-08	4.4E-08	3.9E-08	3.5E-08	2.7E-08	2.6E-08	2.2E-08	1.9E-08	1.7E-08
SW	0.	1.7E-07	6.0E-08	5.2E-08	4.2E-08	3.6E-08	2.9E-08	2.5E-08	2.2E-08	2.0E-08	1.7E-08
WSW	0.	8.2E-08	3.9E-08	4.2E-08	3.8E-08	3.2E-08	2.7E-08	2.4E-08	2.4E-08	2.1E-08	1.8E-08
W	0.	3.4E-08	3.3E-08	3.6E-08	3.6E-08	3.0E-08	2.7E-08	2.5E-08	2.1E-08	2.0E-08	1.7E-08
WNW	0.	3.9E-08	1.7E-08	2.1E-08	2.3E-08	2.2E-08	1.9E-08	1.7E-08	1.6E-08	1.3E-08	1.1E-08
NW	0.	2.9E-08	1.8E-08	2.3E-08	2.0E-08	1.8E-08	1.8E-08	1.6E-08	1.4E-08	1.3E-08	1.2E-08
NNW	0.	4.5E-07	3.0E-08	2.5E-08	2.3E-08	1.9E-08	1.7E-08	1.5E-08	1.4E-08	1.3E-08	1.2E-08
N	0.	5.8E-07	3.7E-08	2.9E-08	2.8E-08	2.6E-08	2.5E-08	2.4E-08	2.0E-08	1.7E-08	1.6E-08

Number of Valid Observations 8678
Number of Invalid Observations 82
Number of Calms Lower Level 12
Number of Calms Upper Level 0

TABLE A-12

D/Q Values at the Standard Distances for Releases from the Reactor Buildings

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Mixed Mode
Variable: Relative Deposition (Meter**-2)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Base Distance in Miles/Kilometers

Aftd Sect	Design Dist MI	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.1E-08	2.0E-09	1.1E-09	7.2E-10	5.0E-10	3.5E-10	2.8E-10	2.2E-10	1.7E-10	1.5E-10
NE	0.	1.1E-08	4.3E-09	2.3E-09	1.5E-09	9.8E-10	7.2E-10	5.3E-10	4.2E-10	3.3E-10	2.7E-10
ENE	0.	1.9E-08	1.1E-09	5.8E-10	3.9E-10	2.8E-10	2.2E-10	1.7E-10	1.4E-10	1.1E-10	9.7E-11
E	0.	2.1E-09	4.6E-10	2.5E-10	1.6E-10	1.2E-10	9.0E-11	7.5E-11	5.7E-11	4.8E-11	3.8E-11
ESE	0.	1.3E-09	1.1E-09	5.4E-10	3.3E-10	2.4E-10	1.9E-10	1.3E-10	1.1E-10	8.3E-11	6.9E-11
SE	0.	1.3E-09	7.6E-10	4.9E-10	2.8E-10	1.8E-10	1.3E-10	1.1E-10	8.9E-11	6.7E-11	6.1E-11
SSE	0.	2.4E-09	1.2E-09	6.7E-10	4.1E-10	2.8E-10	2.1E-10	1.6E-10	1.3E-10	1.0E-10	8.2E-11
S	0.	3.6E-09	5.7E-10	3.4E-10	2.3E-10	1.7E-10	1.4E-10	1.0E-10	8.2E-11	6.5E-11	5.5E-11
SSW	0.	8.0E-09	7.7E-10	5.2E-10	3.5E-10	2.6E-10	1.8E-10	1.5E-10	1.1E-10	9.3E-11	7.4E-11
SW	0.	3.4E-09	1.2E-09	7.3E-10	4.5E-10	3.3E-10	2.3E-10	1.7E-10	1.4E-10	1.2E-10	9.4E-11
WSW	0.	1.8E-09	8.9E-10	5.9E-10	4.1E-10	2.9E-10	2.1E-10	1.7E-10	1.5E-10	1.2E-10	1.0E-10
W	0.	7.9E-10	6.6E-10	4.3E-10	2.9E-10	1.9E-10	1.5E-10	1.2E-10	8.6E-11	7.7E-11	6.4E-11
WNW	0.	5.8E-10	2.7E-10	2.0E-10	1.7E-10	1.3E-10	8.8E-11	6.8E-11	5.5E-11	4.2E-11	3.3E-11
NW	0.	5.4E-10	3.1E-10	2.3E-10	1.5E-10	1.1E-10	8.9E-11	6.9E-11	5.4E-11	4.4E-11	3.9E-11
NNW	0.	5.3E-09	4.0E-10	2.2E-10	1.6E-10	1.0E-10	7.6E-11	6.1E-11	5.0E-11	4.2E-11	3.4E-11
N	0.	8.7E-09	5.6E-10	2.8E-10	2.1E-10	1.6E-10	1.4E-10	1.1E-10	8.1E-11	6.4E-11	5.7E-11

Number of Valid Observations 8678
Number of Invalid Observations 82
Number of Calms Lower Level 12
Number of Calms Upper Level 0

TABLE A-13

χ/Q Values at the Special Locations for Releases From the Stack

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Elevated
Variable: Relative Concentration
Calculation Points: Special
Model: Straight Line
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Accounting for Stack Center Offset

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	1.3E-08	0.	2.3E-08	2.3E-08	2.3E-08
NE	2.5E-08	2.4E-08	0.	0.	0.
ENE	7.2E-09	0.	0.	0.	0.
E	3.6E-09	0.	7.6E-09	7.6E-09	0.
ESE	7.7E-09	0.	7.7E-09	1.3E-08	1.3E-08
SE	8.7E-09	0.	8.7E-09	8.7E-09	0.
SSE	1.2E-08	0.	1.2E-08	1.2E-08	1.2E-08
S	4.7E-09	0.	0.	8.5E-09	9.6E-09
SSW	6.0E-09	0.	1.4E-08	1.4E-08	1.4E-08
SW	1.3E-08	0.	1.3E-08	1.3E-08	1.3E-08
WSW	9.0E-09	0.	1.8E-08	1.6E-08	1.6E-08
W	1.0E-08	0.	0.	1.0E-08	1.0E-08
WNW	5.3E-09	0.	0.	5.3E-09	5.3E-09
NW	6.5E-09	0.	0.	6.5E-09	6.5E-09
NNW	4.2E-09	0.	0.	4.2E-09	4.2E-09
N	4.5E-09	0.	0.	4.5E-09	4.5E-09

*A zero indicates that this point was not calculated.

TABLE A-14

Depleted χ/Q Values at the Special Locations for Releases From the Stack

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Elevated
Variable: Relative Depleted Concentrations
Calculation Points: Special
Model: Straight Line
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Accounting for Stack Center Offset

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	1.2E-08	0.	2.2E-08	2.2E-08	2.2E-08
NE	2.5E-08	2.3E-08	0.	0.	0.
ENE	7.1E-09	0.	0.	0.	0.
E	3.6E-09	0.	7.6E-09	7.6E-09	0.
ESE	7.5E-09	0.	7.5E-09	1.2E-08	1.2E-08
SE	8.7E-09	0.	8.7E-09	8.7E-09	0.
SSE	1.2E-08	0.	1.2E-08	1.2E-08	1.2E-08
S	4.6E-09	0.	0.	8.5E-09	9.6E-09
SSW	6.0E-09	0.	1.4E-08	1.4E-08	1.4E-08
SW	1.3E-08	0.	1.3E-08	1.3E-08	1.3E-08
WSW	9.0E-09	0.	9.2E-08	1.5E-08	1.5E-08
W	1.0E-08	0.	0.	1.0E-08	1.0E-08
WNW	5.1E-09	0.	0.	5.1E-09	5.1E-09
NW	6.5E-09	0.	0.	6.5E-09	6.5E-09
NNW	4.1E-09	0.	0.	4.1E-09	4.1E-09
N	4.5E-09	0.	0.	4.5E-09	4.5E-09

*A zero indicates that this point was not calculated.

TABLE A-15

D/Q Values at the Special Locations for Releases from the Stack

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Elevated
Variable: Relative Deposition (Meter**-2)
Calculation Points: Special
Model: Straight Line
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

Accounting for Stack Center Offset

Affected Sector	Site Boundary	Dairy*	Meat*	Resident*	Garden*
NNE	6.0E-10	0.	5.3E-10	5.3E-10	5.3E-10
NE	1.4E-09	2.2E-10	0.	0.	0.
ENE	3.2E-10	0.	0.	0.	0.
E	1.6E-10	0.	1.3E-10	1.3E-10	0.
ESE	4.1E-10	0.	4.1E-10	2.0E-10	2.0E-10
SE	4.2E-10	0.	4.2E-10	4.2E-10	0.
SSE	5.4E-10	0.	5.4E-10	5.4E-10	5.4E-10
S	2.0E-10	0.	0.	1.9E-10	1.4E-10
SSW	2.7E-10	0.	2.9E-10	2.9E-10	2.9E-10
SW	5.6E-10	0.	5.6E-10	5.6E-10	5.6E-10
WSW	3.8E-10	0.	3.0E-10	3.6E-10	3.6E-10
W	3.9E-10	0.	0.	3.9E-10	3.9E-10
WNW	1.7E-10	0.	0.	1.7E-10	1.7E-10
NW	2.0E-10	0.	0.	2.0E-10	2.0E-10
NNW	1.5E-10	0.	0.	1.5E-10	1.5E-10
N	1.9E-10	0.	0.	1.9E-10	1.9E-10

*A zero indicates that this point was not calculated.

TABLE A-16

χ/Q Values at the Standard Distances for Releases from the Stack

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Elevated
Variable: Relative Concentration (Sec./Cubic Meter)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

		Base Distance in Miles/Kilometers									
Aftd Sect	Design Dist Mi	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.5E-09	1.3E-08	2.3E-08	2.5E-08	2.4E-08	2.1E-08	1.9E-08	1.7E-08	1.5E-08	1.4E-08
NE	0.	2.5E-09	2.5E-08	4.0E-08	4.4E-08	4.2E-08	3.8E-08	3.3E-08	3.0E-08	2.6E-08	2.4E-08
ENE	0.	8.7E-10	7.2E-09	1.6E-08	2.1E-08	2.2E-08	2.1E-08	2.0E-08	1.9E-08	1.8E-08	1.7E-08
E	0.	7.5E-10	3.6E-09	7.6E-09	8.9E-09	1.0E-08	9.3E-09	9.4E-09	8.1E-09	7.6E-09	7.5E-09
ESE	0.	1.1E-09	7.7E-09	1.1E-08	1.3E-08	1.3E-08	1.3E-08	1.1E-08	1.0E-08	9.3E-09	8.5E-09
SE	0.	1.6E-09	8.7E-09	1.1E-08	1.0E-08	9.1E-09	8.9E-09	8.0E-09	7.3E-09	6.5E-09	6.5E-09
SSE	0.	1.5E-09	1.2E-08	1.6E-08	1.6E-08	1.5E-08	1.3E-08	1.3E-08	1.1E-08	1.0E-08	8.9E-09
S	0.	7.7E-10	4.7E-09	8.5E-09	9.6E-09	9.7E-09	1.1E-08	9.4E-09	8.3E-09	7.7E-09	7.2E-09
SSW	0.	4.9E-10	6.0E-09	1.4E-08	1.6E-08	1.7E-08	1.4E-08	1.4E-08	1.2E-08	1.1E-08	1.0E-08
SW	0.	1.5E-09	1.3E-08	1.8E-08	1.8E-08	1.8E-08	1.6E-08	1.4E-08	1.3E-08	1.1E-08	1.0E-08
WSW	0.	1.5E-09	9.0E-09	1.6E-08	1.8E-08	1.8E-08	1.6E-08	1.4E-08	1.4E-08	1.3E-08	1.2E-08
W	0.	1.4E-09	1.0E-08	1.5E-08	1.7E-08	1.6E-08	1.5E-08	1.4E-08	1.2E-08	1.2E-08	1.1E-08
WNW	0.	8.4E-10	5.3E-09	8.4E-09	1.1E-08	1.2E-08	1.0E-08	9.3E-09	8.6E-09	7.3E-09	6.7E-09
NW	0.	1.0E-09	6.5E-09	1.0E-08	1.0E-08	1.0E-08	1.0E-08	9.5E-09	8.6E-09	7.6E-09	7.5E-09
NNW	0.	1.1E-09	4.2E-09	7.6E-09	9.2E-09	8.5E-09	8.0E-09	7.4E-09	7.0E-09	6.9E-09	6.1E-09
N	0.	8.1E-10	4.5E-09	8.4E-09	1.1E-08	1.2E-08	1.3E-08	1.3E-08	1.1E-08	9.3E-09	9.2E-09

Number of Valid Observations 8678
Number of Invalid Observations 82
Number of Calms Lower Level 0
Number of Calms Upper Level 0

TABLE A-17

Depleted χ/Q Values at the Standard Distances for Releases from the Stack

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Elevated
Variable: Relative Depleted Concentration (Sec./Cubic Meter)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

		Base Distance in Miles/Kilometers									
Aftd Sect	Design Dist Mi ·	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.5E-09	1.2E-08	2.2E-08	2.4E-08	2.4E-08	2.1E-08	1.9E-08	1.7E-08	1.5E-08	1.4E-08
NE	0.	2.5E-09	2.5E-08	4.0E-08	4.3E-08	4.1E-08	3.7E-08	3.2E-08	2.9E-08	2.5E-08	2.3E-08
ENE	0.	8.7E-10	7.1E-09	1.6E-08	2.1E-08	2.2E-08	2.0E-08	1.9E-08	1.8E-08	1.7E-08	1.7E-08
E	0.	7.5E-10	3.6E-09	7.6E-09	8.9E-09	9.3E-09	9.3E-09	9.4E-09	8.1E-09	7.6E-09	6.8E-09
ESE	0.	1.1E-09	7.5E-09	1.1E-08	1.2E-08	1.3E-08	1.3E-08	1.1E-08	1.0E-08	9.3E-09	8.2E-09
SE	0.	1.6E-09	8.7E-09	1.1E-08	1.0E-08	8.5E-09	8.2E-09	8.0E-09	7.2E-09	6.3E-09	6.3E-09
SSE	0.	1.5E-09	1.2E-08	1.6E-08	1.5E-08	1.4E-08	1.3E-08	1.2E-08	1.0E-08	9.3E-09	8.1E-09
S	0.	7.7E-10	4.6E-09	8.5E-09	9.6E-09	9.7E-09	1.1E-08	9.4E-09	8.2E-09	7.4E-09	6.9E-09
SSW	0.	4.9E-10	6.0E-09	1.4E-08	1.6E-08	1.6E-08	1.4E-08	1.4E-08	1.1E-08	1.0E-08	9.3E-09
SW	0.	1.5E-09	1.3E-08	1.8E-08	1.0E-08	1.8E-08	1.5E-08	1.4E-08	1.2E-08	1.1E-08	1.0E-08
WSW	0.	1.5E-09	9.0E-09	1.5E-08	9.2E-08	1.7E-08	1.5E-08	1.3E-08	1.4E-08	1.2E-08	1.1E-08
W	0.	1.4E-09	1.0E-08	1.5E-08	1.1E-08	1.5E-08	1.5E-08	1.4E-08	1.2E-08	1.2E-08	1.1E-08
WNW	0.	8.4E-10	5.1E-09	8.4E-09	1.1E-08	1.2E-08	1.0E-08	9.3E-09	8.6E-09	7.3E-09	6.5E-09
NW	0.	1.0E-09	6.5E-09	1.0E-08	1.0E-08	9.6E-09	1.0E-08	8.7E-09	7.8E-09	7.3E-09	7.1E-09
NNW	0.	1.1E-09	4.1E-09	7.5E-09	9.2E-09	8.5E-09	8.0E-09	7.3E-09	6.8E-09	6.6E-09	6.0E-09
N	0.	8.1E-10	4.5E-09	8.4E-09	1.1E-08	1.1E-08	1.3E-08	1.3E-08	1.0E-08	9.3E-09	9.2E-09

Number of Valid Observations 8678
Number of Invalid Observations 82
Number of Calms Lower Level 0
Number of Calms Upper Level 0

TABLE A-18

D/Q Values at the Standard Distances for Releases from the Stack

Carolina Power & Light Company - Brunswick
Release Type: Annual
Release Mode: Elevated
Variable: Relative Deposition (Meter**-2)
Calculation Points: Standard
Model: Straight Line (ANNX009)
Application of Terrain Correction Factors: Yes
Number of Observations: 8678

		Base Distance in Miles/Kilometers									
Aftd Sect	Design Dist Mi	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.2E-09	6.0E-10	5.3E-10	4.3E-10	3.4E-10	2.5E-10	2.0E-10	1.6E-10	1.4E-10	1.2E-10
NE	0.	1.4E-09	1.4E-09	1.1E-09	8.8E-10	6.7E-10	5.2E-10	3.9E-10	3.1E-10	2.6E-10	2.2E-10
ENE	0.	1.8E-09	3.2E-10	3.0E-10	2.5E-10	2.0E-10	1.6E-10	1.3E-10	1.1E-10	9.3E-11	8.1E-11
E	0.	2.2E-10	1.6E-10	1.3E-10	1.0E-10	8.7E-11	6.6E-11	5.7E-11	4.4E-11	3.7E-11	3.1E-11
ESE	0.	1.9E-10	4.1E-10	2.7E-10	2.0E-10	1.7E-10	1.4E-10	1.1E-10	8.2E-11	6.6E-11	5.6E-11
SE	0.	3.2E-10	4.2E-10	3.1E-10	2.1E-10	1.4E-10	1.1E-10	8.7E-11	7.3E-11	5.8E-11	5.3E-11
SSE	0.	5.8E-10	5.4E-10	3.9E-10	2.8E-10	2.1E-10	1.7E-10	1.4E-10	1.1E-10	8.5E-11	7.1E-11
S	0.	5.4E-10	2.0E-10	1.9E-10	1.4E-10	1.1E-10	1.1E-10	8.3E-11	6.6E-11	5.5E-11	4.6E-11
SSW	0.	1.1E-09	2.7E-10	2.9E-10	2.4E-10	1.9E-10	1.4E-10	1.3E-10	9.5E-11	7.9E-11	6.5E-11
SW	0.	7.6E-10	5.6E-10	4.3E-10	3.1E-10	2.4E-10	1.8E-10	1.4E-10	1.1E-10	9.5E-11	8.0E-11
WSW	0.	4.1E-10	3.8E-10	3.6E-10	3.0E-10	2.3E-10	1.7E-10	1.4E-10	1.3E-10	1.0E-10	8.6E-11
W	0.	2.8E-10	3.9E-10	3.0E-10	2.1E-10	1.5E-10	1.3E-10	1.0E-10	7.8E-11	6.9E-11	5.9E-11
WNW	0.	2.4E-10	1.7E-10	1.5E-10	1.4E-10	1.0E-10	7.4E-11	5.8E-11	4.8E-11	3.7E-11	2.9E-11
NW	0.	2.6E-10	2.0E-10	1.7E-10	1.2E-10	8.8E-11	7.5E-11	6.0E-11	4.8E-11	4.0E-11	3.6E-11
NNW	0.	7.2E-10	1.5E-10	1.3E-10	1.0E-10	7.3E-11	5.4E-11	4.3E-11	3.6E-11	3.2E-11	2.6E-11
N	0.	8.1E-10	1.9E-10	1.5E-10	1.3E-10	1.1E-10	9.9E-11	7.9E-11	6.0E-11	4.9E-11	4.4E-11

Number of Valid Observations 8678
Number of Invalid Observations 82
Number of Calms Lower Level 0
Number of Calms Upper Level 0

TABLE A-19

Brunswick Plant Site Information To Be Used
for Ground Level Calculations with NRC "XOQDOQ" Program

Card Type	Columns	Description	Value to be Used in XOQDOQ
1	1	Print input data	1
	38	Calculate annual χ/Qs for points of interest	1
	39	Calculate annual χ/Q averages for site radial segments	1
	41	Print out set distance χ/Qs and D/Qs	1
	55	Calculate annual D/Q averages for the set radial segments	1
	56	Allow depleted χ/Qs (if Decays (1), (2), or (3) are negative)	1
	58	Calculate annual D/Qs for points of interest	1
2	1-80	Title card	N/A
3	1-5	Number of wind velocity categories	7
	6-10	Number of stability categories	7
	11-15	Number of distances within terrain data for each sector	1
	16-20	Total number of hours in joint wind frequency distribution	*
	21-25	Increment in % for which plotted results are to be printed	5
	26-30	Number of titles of receptor types	
	31-35	Number of release exit locations	1
4	1-5	Height of the measured wind	11
	6-20	Half-life (days) used in the χ/Q calculations	101.00 2.26 8.00

*Appropriate data to be supplied.

TABLE A-19 (Cont'd)

Card Type	Columns	Description	Value to be Used in XOQDOQ
5	N/A	N/A	
6	1-80	Joint wind frequency distribution	*
7	1-5	Wind velocity units correction	200.00
	6-75	Maximum wind speed in each wind class (m/sec)	0.75 3.50 7.50 12.50 18.50 25.00 26.00
8	1-80	Distance in meters at which terrain heights are given	All are 100
9	1-80	Terrain heights (in meters, above plant grade) correspond to distances in Card Type 8	All are 0
10	1-25	Number of receptor locations for a particular receptor type	
		Site Boundary	16
		Dairy	1
		Meat	5
		Residence	14
		Garden	11
11	1-16	Title of receptor type for receptor locations	Site Boundary
			Dairy
			Meat
			Residence

*Appropriate data to be supplied.

TABLE A-19 (Cont'd)

Card Type	Columns	Description	Value to be Used in XOQDOQ
	1-16 Cont'd	Title of receptor type for receptor locations (Cont'd)	Garden
12	1-80	Receptor direction and distance	(See Table 1)
13	1-80	Title for release point whose characteristics are described on Card Type 14	*
14	1-5	Vent average velocity (m/sec)	1.0
	6-10	Vent inside diameter (m)	1.0
	11-15	Height of vent release point (m)	0.000
	16-20	Height of the vent's building (m)	56.9
	21-25	Minimum cross-sectional area for the vent's building (m^2)	2120.0
	26-30	Wind height used for vent elevated release	11.0
	31-35	Vent heat emission rate (cal/sec)	0.0
15	1	Identification for release point	A
	2-5	Intermittent releases	0
	6-10	Number of intermittent releases per year for this release point	0
	11-15	Average number of hours per intermittent release	0

*Appropriate data to be supplied.

TABLE A-20

Brunswick Plant Site Information To Be Used
for Elevated Release Calculations with NRC "XOQDOQ" Program

Card Type	Columns	Description	Value to Be Used in XOQDOQ
1	1	Print input data	1
	4	Release to be elevated 100% of the time	1
	38	Calculate annual χ/Qs for points of interest	1
	39	Calculate annual χ/Q averages for site radial segments	1
	41	Print out set distance χ/Qs and D/Qs	1
	55	Calculate annual D/Q averages for the set radial segments	1
	56	Allow depleted χ/Qs (if Decays (1), (2), or (3) are negative)	1
	58	Calculate annual D/Qs for points of interest	1
2	1-80	Title card	N/A
3	1-5	Number of wind velocity categories	7
	6-10	Number of stability categories	7
	11-15	Number of distances within terrain data for each sector	1
	16-20	Total number of hours in joint wind frequency distribution	*
	21-25	Increment in % for which plotted results are to be printed	5
	26-30	Number of titles of receptor types	5
	31-35	Number of release exit locations	1
4	1-5	Height of the measured wind	104
	6-20	Half-life (days) used in the χ/Q calculations	101.00 2.26

*Appropriate data to be supplied.

TABLE A-20 (Cont'd)

Card Type	Columns	Description	Value to Be Used in XOQDOQ
	6-20 (Cont'd)	Half-life (days) used in the χ/Q calculations (Cont'd)	8.00
5	N/A	N/A	
6	1-80	Joint wind frequency distribution	*
7	1-5	Wind velocity units correction	200.00
	6-75	Maximum wind speed in each wind class (m/sec)	0.75
			3.50
			7.50
			12.50
			18.50
			25.00
			26.00
8	1-80	Distance in meters at which terrain heights are given	All are 100
9	1-80	Terrain heights (in meters, above plant grade) correspond to distances in Card Type 8	All are 0
10	1-25	Number of receptor locations for a particular receptor type	
		Site Boundary	16
		Dairy	1
		Meat	5
		Residence	14
		Garden	11

*Appropriate data to be supplied.

TABLE A-20 (Cont'd)

Card Type	Columns	Description	Value to Be Used in XOQDOQ
11	1-16	Title of receptor type for receptor locations	Site Boundary
			Dairy
			Meat
			Residence
			Garden
12	1-80	Receptor direction and distance (See Table 1)	
13	1-80	Title for release point whose characteristics are described on Card Type 14	*
14	1-5	Vent average velocity (m/sec)	4.66
	6-10	Vent inside diameter (m)	3.58
	11-15	Height of vent release point (m)	100.9
	16-20	Height of the vent's building (m)	0.0
	21-25	Minimum cross-sectional area for the vent's building (m^2)	0.00
	26-30	Wind height used for vent elevated release	104.0
	31-35	Vent heat emission rate (cal/sec)	0.0
15	1	Identification for release point	A
	2-5	Intermittent releases	0
	6-10	Number of intermittent releases per year for this release point	0
	11-15	Average number of hours per intermittent release	0

*Appropriate data to be supplied.

LIST OF TABLES

APPENDIX B

Calculation of V_i and B_i Values for the Elevated Plume

Values of V_i and B_i were calculated for the elevated plume release from the Brunswick stack using the NRC computer program RABFIN. This program was used to determine the controlling location based upon the releases of Table 3.2-1. In addition it was used to develop the V_i and B_i values for the various noble gas radionuclides at the site boundary at each of the 16 sectors. Table B-7 presents the V_i and B_i values for the NE sector which is the controlling location for noble gases for showing compliance with 10CFR20 and 10CFR50. Table B-8 presents the joint frequency distribution for the NE sector. Tables B-1 through B-6 and B-9 through B-32 present the V_i and B_i values and the joint frequency distribution for the remaining sectors. The inputs which were utilized in the RABFIN code are presented below.

1. Height of Stack - 100.9 (m)
2. Stack Diameter - 3.6 (m)
3. Exit Velocity - 5.0 m/sec
4. Wind Height - 104.6 (m)

TABLE B-1

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
ENE SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.64E-09	1.42E-07
Kr-85m	9.03E-05	1.34E-04
Kr-85	1.34E-06	2.02E-06
Kr-87	4.10E-04	6.17E-04
Kr-88	1.06E-03	1.60E-03
Kr-89	6.41E-04	9.63E-04
Xe-131m	2.13E-05	3.35E-05
Xe-133m	1.61E-05	2.62E-05
Xe-133	1.69E-05	2.63E-05
Xe-135m	2.13E-04	3.23E-04
Xe-135	1.45E-04	2.17E-04
Xe-137	5.51E-05	8.33E-05
Xe-138	6.51E-04	9.77E-04
Xe-139	1.96E-05	2.94E-05
Ar-41	7.74E-04	1.16E-03

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-2

JOINT FREQUENCY DISTRIBUTION FOR ENE SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.17	0.00	0.01	0.01	0.07	0.03	0.05
4	3.30	0.02	0.17	0.61	1.21	0.83	0.46
5	4.81	0.02	0.18	0.81	1.63	1.39	0.78
6	1.14	0.05	0.20	0.28	0.27	0.14	0.20
7	0.46	0.01	0.12	0.15	0.09	0.09	0.00
Total	9.88	0.10	0.68	1.86	3.27	2.48	1.49
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	6.75	6.75
Harmonic	0.00	5.27	5.27

TABLE B-3

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
N SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	8.97E-10	1.26E-07
Kr-85m	4.38E-05	6.50E-05
Kr-85	6.45E-07	9.78E-07
Kr-87	1.96E-04	2.94E-04
Kr-88	5.16E-04	7.75E-04
Kr-89	2.67E-04	4.01E-04
Xe-131m	1.05E-05	1.66E-05
Xe-133m	7.95E-06	1.31E-05
Xe-133	8.40E-06	1.32E-05
Xe-135m	9.77E-05	1.48E-04
Xe-135	7.00E-05	1.05E-04
Xe-137	2.20E-05	3.33E-05
Xe-138	3.10E-04	4.65E-04
Xe-139	6.00E-06	9.01E-06
Ar-41	3.70E-04	5.56E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-4

JOINT FREQUENCY DISTRIBUTION FOR N SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.01	0.00	0.00	0.00	0.01	0.00	0.00
3	0.11	0.00	0.00	0.01	0.07	0.03	0.00
4	1.79	0.01	0.16	0.70	0.65	0.18	0.09
5	2.00	0.00	0.15	0.46	0.65	0.29	0.45
6	0.68	0.02	0.06	0.29	0.12	0.07	0.12
7	0.15	0.02	0.10	0.01	0.00	0.01	0.01
Total	4.74	0.05	0.47	1.47	1.50	0.58	0.67
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	6.00	6.00
Harmonic	0.00	4.61	4.61

TABLE B-5

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
NNE SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.78E-09	3.05E-07
Kr-85m	8.12E-05	1.21E-04
Kr-85	1.18E-06	1.79E-06
Kr-87	3.63E-04	5.46E-04
Kr-88	9.34E-04	1.40E-03
Kr-89	5.84E-04	8.77E-04
Xe-131m	1.96E-05	3.11E-05
Xe-133m	1.48E-05	2.44E-05
Xe-133	1.57E-05	2.48E-05
Xe-135m	1.91E-04	2.89E-04
Xe-135	1.29E-04	1.94E-04
Xe-137	5.09E-05	7.69E-05
Xe-138	5.76E-04	8.65E-04
Xe-139	1.93E-05	2.90E-05
Ar-41	6.82E-04	1.02E-03

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-6

JOINT FREQUENCY DISTRIBUTION FOR NNE SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.07	0.00	0.00	0.01	0.05	0.01	0.00
3	0.45	0.00	0.00	0.03	0.25	0.15	0.02
4	4.51	0.01	0.16	0.56	1.79	1.38	0.61
5	2.90	0.00	0.17	0.21	0.88	0.78	0.86
6	0.65	0.02	0.12	0.22	0.09	0.07	0.13
7	0.45	0.05	0.14	0.08	0.07	0.10	0.01
Total	9.03	0.08	0.59	1.11	3.13	2.49	1.63
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	7.13	7.13
Harmonic	0.00	5.63	5.63

TABLE B-7

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
NE SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	2.93E-09	5.97E-07
Kr-85m	1.22E-04	1.81E-04
Kr-85	1.74E-06	2.64E-06
Kr-87	5.39E-04	8.11E-04
Kr-88	1.36E-03	2.05E-03
Kr-89	9.47E-04	1.42E-03
Xe-131m	2.96E-05	4.73E-05
Xe-133m	2.23E-05	3.72E-05
Xe-133	2.40E-05	3.80E-05
Xe-135m	2.94E-04	4.46E-04
Xe-135	1.92E-04	2.89E-04
Xe-137	8.47E-05	1.28E-04
Xe-138	8.60E-04	1.29E-03
Xe-139	3.57E-05	5.37E-05
Ar-41	1.01E-03	1.51E-03

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-8

JOINT FREQUENCY DISTRIBUTION FOR NE SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.02	0.00	0.00	0.00	0.01	0.00	0.01
2	0.21	0.00	0.00	0.00	0.05	0.10	0.06
3	1.13	0.00	0.00	0.03	0.28	0.50	0.32
4	7.30	0.01	0.15	0.63	2.50	2.51	1.50
5	5.15	0.03	0.09	0.30	1.21	1.99	1.53
6	1.04	0.01	0.06	0.32	0.33	0.24	0.08
7	0.41	0.01	0.12	0.10	0.13	0.03	0.02
Total	15.26	0.06	0.42	1.38	4.51	5.37	3.52
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	7.81	7.81
Harmonic	0.00	6.63	6.63

TABLE B-9

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
E SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	9.82E-10	6.10E-08
Kr-85m	6.43E-05	9.54E-05
Kr-85	9.71E-07	1.47E-06
Kr-87	2.99E-04	4.49E-04
Kr-88	7.78E-04	1.17E-03
Kr-89	4.59E-04	6.90E-04
Xe-131m	1.49E-05	2.33E-05
Xe-133m	1.13E-05	1.82E-05
Xe-133	1.16E-05	1.80E-05
Xe-135m	1.53E-04	2.32E-04
Xe-135	1.04E-04	1.56E-04
Xe-137	3.89E-05	5.89E-05
Xe-138	4.73E-04	7.10E-04
Xe-139	1.37E-05	2.05E-05
Ar-41	5.66E-04	8.49E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-10

JOINT FREQUENCY DISTRIBUTION FOR E SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.01	0.00	0.00	0.00	0.00	0.01	0.00
2	0.03	0.00	0.00	0.00	0.01	0.01	0.01
3	0.09	0.00	0.00	0.03	0.02	0.01	0.03
4	1.42	0.01	0.15	0.55	0.32	0.23	0.16
5	2.07	0.03	0.10	0.62	0.74	0.50	0.08
6	1.08	0.02	0.14	0.30	0.38	0.15	0.09
7	0.64	0.03	0.13	0.24	0.10	0.08	0.06
Total	5.34	0.09	0.52	1.74	1.57	0.99	0.43
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	5.80	5.80
Harmonic	0.00	4.41	4.41

TABLE B-11

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
ESE SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.10E-09	1.90E-07
Kr-85m	5.59E-05	8.31E-05
Kr-85	8.23E-07	1.25E-06
Kr-87	2.55E-04	3.83E-04
Kr-88	6.50E-04	9.76E-04
Kr-89	4.38E-04	6.58E-04
Xe-131m	1.33E-05	2.10E-05
Xe-133m	1.01E-05	1.64E-05
Xe-133	1.05E-05	1.65E-05
Xe-135m	1.36E-04	2.07E-04
Xe-135	8.94E-05	1.34E-04
Xe-137	3.86E-05	5.84E-05
Xe-138	4.05E-04	6.08E-04
Xe-139	1.75E-05	2.63E-05
Ar-41	4.79E-04	7.19E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-12

JOINT FREQUENCY DISTRIBUTION FOR ESE SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.06	0.00	0.00	0.01	0.00	0.05	0.00
2	0.15	0.00	0.00	0.01	0.03	0.06	0.05
3	0.31	0.00	0.00	0.02	0.13	0.03	0.13
4	1.71	0.00	0.07	0.31	0.58	0.46	0.29
5	2.02	0.01	0.08	0.31	0.52	0.80	0.30
6	0.85	0.03	0.06	0.17	0.18	0.36	0.05
7	0.46	0.01	0.07	0.12	0.07	0.07	0.12
Total	5.56	0.05	0.28	0.95	1.51	1.83	0.94
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	7.15	7.15
Harmonic	0.00	5.67	5.67

TABLE B-13

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
SE SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.34E-09	3.71E-07
Kr-85m	5.76E-05	8.56E-05
Kr-85	8.42E-07	1.28E-06
Kr-87	2.60E-04	3.91E-04
Kr-88	6.65E-04	9.98E-04
Kr-89	4.39E-04	6.59E-04
Xe-131m	1.40E-05	2.23E-05
Xe-133m	1.06E-05	1.76E-05
Xe-133	1.12E-05	1.77E-05
Xe-135m	1.39E-04	2.10E-04
Xe-135	9.18E-05	1.38E-04
Xe-137	3.86E-05	5.84E-05
Xe-138	4.13E-04	6.21E-04
Xe-139	1.65E-05	2.48E-05
Ar-41	4.89E-04	7.34E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-14

JOINT FREQUENCY DISTRIBUTION FOR SE SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.11	0.00	0.00	0.00	0.00	0.06	0.05
2	0.31	0.00	0.00	0.01	0.14	0.15	0.01
3	0.53	0.00	0.00	0.14	0.18	0.18	0.03
4	1.44	0.02	0.08	0.25	0.51	0.41	0.17
5	1.46	0.01	0.09	0.31	0.50	0.46	0.09
6	0.89	0.02	0.05	0.02	0.30	0.44	0.06
7	0.63	0.01	0.13	0.09	0.14	0.21	0.05
Total	5.37	0.06	0.35	0.82	1.77	1.91	0.46
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	6.78	6.78
Harmonic	0.00	5.37	5.37

TABLE B-15

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
SSE SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.29E-09	2.74E-07
Kr-85m	5.96E-05	8.85E-05
Kr-85	8.78E-07	1.33E-06
Kr-87	2.70E-04	4.07E-04
Kr-88	6.97E-04	1.05E-03
Kr-89	4.51E-04	6.78E-04
Xe-131m	1.43E-05	2.27E-05
Xe-133m	1.09E-05	1.79E-05
Xe-133	1.14E-05	1.80E-05
Xe-135m	1.43E-04	2.17E-04
Xe-135	9.53E-05	1.43E-04
Xe-137	3.96E-05	5.99E-05
Xe-138	4.30E-04	6.45E-04
Xe-139	1.71E-05	2.57E-05
Ar-41	5.10E-04	7.65E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-16

JOINT FREQUENCY DISTRIBUTION FOR SSE SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.02	0.00	0.00	0.00	0.01	0.01	0.00
2	0.13	0.00	0.00	0.02	0.02	0.09	0.00
3	0.49	0.00	0.00	0.14	0.24	0.09	0.02
4	2.35	0.05	0.16	0.32	0.80	0.70	0.32
5	1.40	0.00	0.08	0.23	0.46	0.58	0.05
6	0.84	0.02	0.05	0.13	0.18	0.31	0.15
7	0.32	0.03	0.02	0.05	0.07	0.13	0.02
Total	5.55	0.10	0.31	0.89	1.78	1.91	0.56
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	6.81	6.81
Harmonic	0.00	5.21	5.21

TABLE B-17

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
S SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	8.80E-10	9.50E-08
Kr-85m	5.11E-05	7.59E-05
Kr-85	7.66E-07	1.16E-06
Kr-87	2.34E-04	3.53E-04
Kr-88	6.13E-04	9.19E-04
Kr-89	3.71E-04	5.57E-04
Xe-131m	1.20E-05	1.88E-05
Xe-133m	9.10E-06	1.48E-05
Xe-133	9.44E-06	1.47E-05
Xe-135m	1.20E-04	1.82E-04
Xe-135	8.23E-05	1.24E-04
Xe-137	3.19E-05	4.83E-05
Xe-138	3.71E-04	5.56E-04
Xe-139	1.33E-05	2.00E-05
Ar-41	4.44E-04	6.66E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-18

JOINT FREQUENCY DISTRIBUTION FOR S SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.03	0.00	0.00	0.00	0.03	0.00	0.00
3	0.16	0.00	0.00	0.02	0.14	0.00	0.00
4	1.74	0.01	0.13	0.28	0.55	0.54	0.23
5	1.32	0.03	0.08	0.25	0.45	0.46	0.05
6	0.93	0.02	0.08	0.17	0.24	0.33	0.09
7	0.37	0.05	0.03	0.05	0.12	0.07	0.05
Total	4.55	0.11	0.32	0.77	1.53	1.40	0.42
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	6.57	6.57
Harmonic	0.00	4.84	4.84

TABLE B-19

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
SSW SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.10E-09	1.39E-07
Kr-85m	5.60E-05	8.31E-05
Kr-85	8.22E-07	1.25E-06
Kr-87	2.53E-04	3.81E-04
Kr-88	6.51E-04	9.76E-04
Kr-89	4.06E-04	6.10E-04
Xe-131m	1.33E-05	2.10E-05
Xe-133m	1.01E-05	1.65E-05
Xe-133	1.06E-05	1.66E-05
Xe-135m	1.34E-04	2.03E-04
Xe-135	8.94E-05	1.34E-04
Xe-137	3.52E-05	5.32E-05
Xe-138	4.02E-04	6.04E-04
Xe-139	1.21E-05	1.81E-05
Ar-41	4.77E-04	7.15E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-20

JOINT FREQUENCY DISTRIBUTION FOR SSW SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.19	0.00	0.00	0.07	0.05	0.06	0.01
4	2.47	0.01	0.03	0.53	0.99	0.62	0.29
5	1.88	0.01	0.15	0.37	0.56	0.74	0.05
6	1.12	0.01	0.12	0.14	0.28	0.55	0.02
7	0.51	0.01	0.03	0.10	0.22	0.13	0.02
Total	6.17	0.04	0.33	1.21	2.10	2.10	0.39
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	6.61	6.61
Harmonic	0.00	5.44	5.44

TABLE B-21

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
SW SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.40E-09	3.22E-07
Kr-85m	6.11E-05	9.08E-05
Kr-85	8.94E-07	1.35E-06
Kr-87	2.73E-04	4.11E-04
Kr-88	7.10E-04	1.07E-03
Kr-89	4.19E-04	6.29E-04
Xe-131m	1.48E-05	2.36E-05
Xe-133m	1.12E-05	1.86E-05
Xe-133	1.19E-05	1.88E-05
Xe-135m	1.41E-04	2.14E-04
Xe-135	9.75E-05	1.47E-04
Xe-137	3.60E-05	5.44E-05
Xe-138	4.33E-04	6.50E-04
Xe-139	1.16E-05	1.74E-05
Ar-41	5.15E-04	7.73E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-22

JOINT FREQUENCY DISTRIBUTION FOR SW SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.01	0.00	0.00	0.00	0.00	0.01	0.00
2	0.10	0.00	0.00	0.02	0.07	0.01	0.00
3	0.53	0.00	0.02	0.10	0.30	0.09	0.02
4	2.32	0.01	0.14	0.50	0.98	0.52	0.17
5	1.71	0.02	0.09	0.39	0.40	0.68	0.13
6	0.88	0.05	0.05	0.20	0.46	0.12	0.00
7	0.56	0.00	0.07	0.15	0.22	0.12	0.00
Total	6.11	0.08	0.37	1.36	2.43	1.55	0.32
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	6.22	6.22
Harmonic	0.00	4.98	4.98

TABLE B-23

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
WSW SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.42E-09	3.10E-07
Kr-85m	6.27E-05	9.31E-05
Kr-85	9.16E-07	1.39E-06
Kr-87	2.80E-04	4.21E-04
Kr-88	7.26E-04	1.09E-03
Kr-89	4.28E-04	6.42E-04
Xe-131m	1.52E-05	2.42E-05
Xe-133m	1.15E-05	1.90E-05
Xe-133	1.22E-05	1.93E-05
Xe-135m	1.45E-04	2.20E-04
Xe-135	9.99E-05	1.50E-04
Xe-137	3.67E-05	5.55E-05
Xe-138	4.44E-04	6.67E-04
Xe-139	1.12E-05	1.68E-05
Ar-41	5.27E-04	7.91E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-24

JOINT FREQUENCY DISTRIBUTION FOR WSW SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.02	0.00	0.00	0.00	0.02	0.00	0.00
2	0.18	0.00	0.01	0.00	0.14	0.00	0.03
3	0.36	0.00	0.01	0.15	0.15	0.05	0.00
4	2.64	0.00	0.15	0.54	1.12	0.75	0.08
5	1.73	0.02	0.09	0.37	0.84	0.39	0.02
6	0.87	0.02	0.08	0.25	0.37	0.14	0.01
7	0.36	0.03	0.03	0.13	0.17	0.00	0.00
Total	6.16	0.07	0.37	1.44	2.81	1.33	0.14
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	5.97	5.97
Harmonic	0.00	4.91	4.91

TABLE B-25

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
W SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.33E-09	3.17E-07
Kr-85m	5.83E-05	8.66E-05
Kr-85	8.61E-07	1.30E-06
Kr-87	2.57E-04	3.87E-04
Kr-88	6.92E-04	1.04E-03
Kr-89	3.34E-04	5.01E-04
Xe-131m	1.42E-05	2.27E-05
Xe-133m	1.08E-05	1.79E-05
Xe-133	1.14E-05	1.80E-05
Xe-135m	1.24E-04	1.89E-04
Xe-135	9.33E-05	1.40E-04
Xe-137	2.72E-05	4.11E-05
Xe-138	4.05E-04	6.08E-04
Xe-139	6.46E-06	9.70E-06
Ar-41	4.89E-04	7.34E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-26

JOINT FREQUENCY DISTRIBUTION FOR W SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.05	0.00	0.00	0.00	0.05	0.00	0.00
2	0.10	0.00	0.00	0.00	0.10	0.00	0.00
3	0.37	0.00	0.05	0.18	0.12	0.02	0.00
4	1.95	0.02	0.10	0.47	1.07	0.29	0.00
5	2.00	0.01	0.14	0.53	1.07	0.22	0.03
6	0.85	0.07	0.10	0.29	0.36	0.01	0.02
7	0.37	0.06	0.08	0.18	0.05	0.00	0.00
Total	5.69	0.16	0.47	1.65	2.82	0.54	0.05
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	5.30	5.30
Harmonic	0.00	4.13	4.13

TABLE B-27

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
WNW SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	9.41E-10	2.22E-07
Kr-85m	4.43E-05	6.58E-05
Kr-85	6.61E-07	1.00E-06
Kr-87	1.98E-04	2.98E-04
Kr-88	5.34E-04	8.01E-04
Kr-89	2.54E-04	3.81E-04
Xe-131m	1.07E-05	1.70E-05
Xe-133m	8.13E-06	1.34E-05
Xe-133	8.52E-06	1.34E-05
Xe-135m	9.52E-05	1.44E-04
Xe-135	7.12E-05	1.07E-04
Xe-137	2.05E-05	3.09E-05
Xe-138	3.12E-04	4.68E-04
Xe-139	4.91E-06	7.38E-06
Ar-41	3.77E-04	5.66E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-28

JOINT FREQUENCY DISTRIBUTION FOR WNW SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.01	0.00	0.00	0.01	0.00	0.00	0.00
2	0.09	0.00	0.00	0.08	0.01	0.00	0.00
3	0.24	0.00	0.05	0.17	0.02	0.00	0.00
4	1.03	0.01	0.10	0.45	0.45	0.02	0.00
5	1.19	0.03	0.14	0.37	0.50	0.13	0.02
6	0.63	0.05	0.12	0.28	0.17	0.01	0.00
7	0.19	0.03	0.03	0.07	0.06	0.00	0.00
Total	3.38	0.12	0.44	1.43	1.21	0.16	0.02
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	4.65	4.65
Harmonic	0.00	3.58	3.58

TABLE B-29

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
NW SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	1.02E-9	2.45E-07
Kr-85m	4.69E-05	6.97E-05
Kr-85	6.96E-07	1.05E-06
Kr-87	2.09E-04	3.14E-04
Kr-88	5.61E-04	8.41E-04
Kr-89	2.66E-04	4.00E-04
Xe-131m	1.14E-05	1.81E-05
Xe-133m	8.64E-06	1.43E-05
Xe-133	9.09E-06	1.43E-05
Xe-135m	1.01E-04	1.53E-04
Xe-135	7.53E-05	1.13E-04
Xe-137	2.15E-05	3.24E-05
Xe-138	3.29E-04	4.94E-04
Xe-139	5.39E-06	8.09E-06
Ar-41	3.96E-04	5.95E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-30

JOINT FREQUENCY DISTRIBUTION FOR NW SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.01	0.00	0.00	0.01	0.00	0.00	0.00
2	0.12	0.00	0.01	0.08	0.03	0.00	0.00
3	0.24	0.00	0.02	0.17	0.05	0.00	0.00
4	1.14	0.01	0.16	0.54	0.33	0.09	0.01
5	1.08	0.02	0.12	0.40	0.28	0.10	0.16
6	0.57	0.05	0.17	0.17	0.16	0.01	0.01
7	0.35	0.03	0.07	0.12	0.13	0.00	0.00
Total	3.51	0.11	0.55	1.49	0.98	0.20	0.18
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	4.81	4.81
Harmonic	0.00	3.59	3.59

TABLE B-31

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
NNW SITE BOUNDARY*

Noble Gas Radionuclides	V_i Total Body $\left(\frac{\text{mrem/yr}}{\mu\text{Ci/sec}}\right)$	B_i Gamma Air $\left(\frac{\text{mrad/yr}}{\mu\text{Ci/sec}}\right)$
Kr-83m	6.97E-10	9.17E-08
Kr-85m	3.96E-05	5.87E-05
Kr-85	5.96E-07	9.04E-07
Kr-87	1.80E-04	2.71E-04
Kr-88	4.83E-04	7.24E-04
Kr-89	2.39E-04	3.59E-04
Xe-131m	9.37E-06	1.47E-05
Xe-133m	7.10E-06	1.15E-05
Xe-133	7.36E-06	1.15E-05
Xe-135m	8.70E-05	1.32E-04
Xe-135	6.39E-05	9.60E-05
Xe-137	1.94E-05	2.94E-05
Xe-138	2.83E-04	4.25E-04
Xe-139	6.08E-06	9.13E-06
Ar-41	3.42E-04	5.14E-04

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

TABLE B-32

JOINT FREQUENCY DISTRIBUTION FOR NNW SECTOR (%)
PERIOD 1-1-77 THROUGH 12-31-77
BRUNSWICK STEAM ELECTRIC PLANT

MAXIMUM WIND SPEED (m/sec)							
Stability	Total	1.50	3.00	5.00	7.50	10.00	12.50
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.02	0.00	0.00	0.01	0.01	0.00	0.00
3	0.12	0.00	0.00	0.06	0.06	0.00	0.00
4	1.00	0.01	0.14	0.36	0.37	0.09	0.03
5	1.17	0.02	0.12	0.27	0.25	0.12	0.39
6	0.82	0.02	0.13	0.23	0.17	0.03	0.24
7	0.34	0.05	0.10	0.14	0.00	0.05	0.00
Total	3.47	0.10	0.49	1.07	0.86	0.29	0.66
Entrapment		0.00	0.00	0.00	0.00	0.00	0.00
Ground Velocity		0.23	0.70	1.24	1.93	2.71	3.48
Elevated Velocity		0.74	2.21	3.93	6.14	8.59	11.05

AVERAGE WIND SPEED (m/sec)			
Mean	Ground	Elevated	Combined
Arithmetic	0.00	5.89	5.89
Harmonic	0.00	4.02	4.02

LIST OF TABLES

APPENDIX C

DOSE PARAMETERS FOR RADIOIODINES, PARTICULATES AND TRITIUM

This appendix contains the methodology which was used to calculate the dose parameters for radioiodines, particulates, and tritium to show compliance with 10CFR 20 and Appendix I of 10CFR50 for gaseous effluents. These dose parameters P_i and R_i were calculated using the methodology outlined in NUREG 0133, Regulatory Guide 1.109 Revision 1, and letter to J. W. Davis, "Dose Factors for Hf-181 and SN-113", BSEP File: B10-10530, May 24, 1988. The following sections provide the specific methodology which was utilized in calculating the P_i and R_i values for the various exposure pathways.

C.1 CALCULATION OF P_i

The parameter P_i contained in the radioiodine and particulate portion of Section 3.2, includes pathway transport parameters of the ith radionuclide, the receptor's usage of the pathway media and the dosimetry of the exposure. Pathway usage rates and the internal dosimetry are functions of the receptor's age; however, the youngest age group, the infant, will always receive the maximum dose under the exposure conditions for ODCM, Section 1, 3.11.2.1(b). For the infant exposure, separate values of P_i may be calculated for the inhalation pathway which is combined with a W parameter based on (χ/Q), and the food (milk) and ground pathway which is combined with a W parameter normally based on (D/Q), except for tritium. The following sections provide in detail the methodology which was used in calculating the P_i values for inclusion into this ODCM.

C.1.1 Inhalation Pathway

$$P_i = K' (BR) DFA_i \qquad (C.1\text{-}1)$$

where:

P_i = dose parameter for radionuclide i for the inhalation pathway, mrem/yr per $\mu Ci/m^3$

K' = a constant of unit conversion

= 10^6 pCi/μCi

BR = the breathing rate of the infant age group, m^3/yr

DFA_i = the maximum organ inhalation dose factor for the infant age group for radionuclide i, mrem/pCi

The age group considered is the infant group. The infant's breathing rate is taken as 1400 m^3/yr from Table E-5 of Regulatory Guide 1.109 Revision 1. The inhalation dose factors for the infant, DFA_i, are presented in Table E-10 of Regulatory Guide 1.109, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113, "May 24, 1988, and NUREG CR4653 for Am-241, in units of mrem/pCi. The total body is considered as an organ in the selection of DFA_i.

The incorporation of breathing rate of an infant and the unit conversion factor results in the following:

$$P_i = 1.4 \times 10^9 \, DFA_i \qquad \text{(C.1-2)}$$

C.1.2 Ground Plane Pathway

$$P_{iG} = K'K''DFG_i(1-e^{-\lambda_i t})/\lambda_i \qquad \text{(C.1-3)}$$

where:

P_{iG} = Dose parameter for radionuclide i for the ground plane pathway, mrem/yr per μCi/sec per m^{-2}

K' = A constant of unit conversion

= 10^6pCi/μCi

K'' = A constant of unit conversion

= 8760 hr/yr

λ_i = The radiological decay constant for radionuclide i, sec^{-1}

t = The exposure period

= 3.15×10^7 sec (1 year)

DFG_i = The ground plane dose conversion factor for radionuclide i, mrem/hr per pCi/m^2

The deposition rate onto the ground plane results in a ground plane concentration that is assumed to persist over a year with radiological decay the only operating removal mechanism for each radionuclide. The ground plane dose conversion factors for radionuclide i, DFG_i, are presented in Table E-6 of Regulatory Guide 1.109, Revision 1. BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for Am-241.

Resolution of the units yields:

$$P_{iG} = 8.76 \times 10^{9}\ DFG_i(1-e^{-\lambda_i t_f})/\lambda_i \qquad \text{(C.1-4)}$$

C.1.3 Milk

$$P_{iM} = \frac{K'r\ Q_F\ (U_{ap})\ F_m}{Y_p\ (\lambda_i + \lambda_w)}\ DFL_i\ e^{-\lambda_i t_f} \qquad \text{(C.1-5)}$$

where:

P_{iM} = Dose parameter for radionuclide i for the cow milk or goat milk pathway, mrem/yr per μCi/sec per m^{-2}

K' = A constant of unit conversion

= 10^6 pCi/μCi

Q_F = The cow's or goat's consumption rate of feed, kg/day (wet weight)

U_{ap} = The infant's milk consumption rate, liters/yr

Y_p = The agricultural productivity by unit area, kg/m^2

F_m = The stable element transfer coefficient, pCi/liter per pCi/day

r = Fraction of deposited activity retained on cow's or goat's feed grass

DFL_i = The maximum organ ingestion dose factor for radionuclide i, mrem/pCi

λ_i = The radiological decay constant for radionuclide i sec^{-1}

λ_w = The decay constant for removal of activity on leaf and plant surfaces by weathering, sec^{-1}

= 5.73×10^{-7} sec^{-1} (corresponding to a 14 day half-time)

t_f = The transport time from pasture to cow or goat to milk to infant, sec

A fraction of the airborne deposition is captured by the ground plant vegetation cover. The captured material is removed from the vegetation (grass) by both radiological decay and weathering processes.

Various parameters which were utilized to determine the P_i values for the cow and goat milk pathways are provided in Table C-1. Table E-1 of Regulatory Guide 1.109, Revision 1, provides the stable element transfer coefficients, F_m, and Table E-14 of the same regulatory guide provides the ingestion dose factors, DFL_i, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241, for the infant's organs. The organ with the maximum value of DFL_i was used in the determination of P_i for this pathway. The incorporation of the various constants of Table C-1 into Equation C.1-5 results in the following:

For cow's milk for radioiodines and particulates:

$$P_{iM} = 2.14 \times 10^{10} \frac{rFm}{\lambda_i + \lambda_w} DFL_i \; e^{-\lambda_i t_f} \qquad \text{(C.1-6)}$$

For the goat milk pathway for radioiodines and particulates:

$$P_{iM} = 2.8 \times 10^{9} \frac{rFm}{\lambda_i + \lambda_w} DFL_i \; e^{-\lambda_i t_f} \qquad \text{(C.1-7)}$$

For tritium, the concentration of tritium in milk is based on its airborne concentration rather than the deposition rate.

$$P_{TM} = K'K'''F_m Q_F U_{ap} DFL_T \, [0.75 \, (0.5/H)] \qquad \text{(C.1-8)}$$

where:

P_{TM} = Dose parameter for tritium for the cow milk and goat milk pathways, mrem/yr per $\mu Ci/m^3$

K''' = A constant of unit conversion

= 10^3 gm/kg ·

H = Absolute humidity of the atmosphere, gm/m^3

0.75 = The fraction of total feed that is water

0.5 = The ratio of the specific activity of the feed grass water to the atmospheric water

DFL_T = Maximum organ ingestion dose factor for tritium, mrem/pCi

C.2 CALCULATION OF R_i

The Radioiodine and Particulate ODCM Specification 7.3.9 is applicable to the location in the unrestricted area where the combination of existing pathways and receptor age groups indicates the maximum potential exposure occurs. The inhalation and ground plane exposure pathways shall be considered to exist at all locations. The grass-goat-milk, the grass-cow-milk, grass-cow-meat, and vegetation pathways are considered based on their existence at the various locations. R_i values have been calculated for the adult, teen, child, and infant age groups for the ground plane, cow milk, goat milk, vegetable and beef ingestion pathways. The methodology which was utilized to calculate these values is presented below.

C.2.1 Inhalation Pathway

$$R_i = K' (BR)_a (DFA_i)_a \qquad \text{(C.2-1)}$$

where:

R_i = Dose factor for each identified radionuclide i of the organ of interest, mrem/yr per $\mu Ci/m^3$

K' = A constant of unit conversion

= 10^6 $pCi/\mu Ci$

$(BR)_a$ = Breathing rate of the receptor of age group a, m^3/yr

$(DFA_i)_a$ = Organ inhalation dose factor for radionuclide i for the receptor of age group a, mrem/pCi

The breathing rates $(BR)_a$ for the various age groups are tabulated below, as given in Table E-5 of the Regulatory Guide 1.109, Revision 1.

Age Group (a)	Breathing Rate (m^3/yr)
Infant	1400
Child	3700
Teen	8000
Adult	8000

Inhalation dose factors $(DFA_i)_a$ for the various age groups are given in Tables E-7 through E-10 of Regulatory Guide 1.109, Revision 1, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.

C.2.2 Ground Plane Pathway

$$R_{iG} = I_i K'K''(SF)DFG_i (1-e^{-\lambda_i t}) / \lambda_i \qquad (C.2\text{-}2)$$

where:

R_{iG} = Dose factor for the ground plane pathway for each identified radionuclide i for the organ of interest, mrem/yr per μCi/sec per m^{-2}

K' = A constant of unit conversion

= 10^6 pCi/μCi

K'' = A constant of unit conversion

= 8760 hr/year

λ_i = The radiological decay constant for radionuclide i, sec^{-1}

t = The exposure time, sec

= 4.73×10^8 sec (15 years)

DFG_i = The ground plane dose conversion factor for radionuclide i; mrem/hr per pCi/m^2

SF = The shielding factor (dimensionless)

I_i = Factor to account for fractional deposition of radionuclide i

For radionuclides other than iodine, the factor I_i is equal to one. For radioiodines, the value of I_i may vary. However, a value of 1.0 was used in calculating the R values in Table 3.3-2.

A shielding factor of 0.7 is suggested in Table E-15 of Regulatory Guide 1.109 Revision 1. A tabulation of DFG_i values is presented in Table E-6 of Regulatory Guide 1.109, Revision 1.

C.2.3 Grass-Cow or Goat Milk Pathway

$$R_{iM} = I_i K' Q_F U_{ap} F_m (DFL_i)_a e^{-\lambda_i t_f}$$

$$\left\{ f_p f_s \left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_p \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i} \right] + (1-f_p f_s) \left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_s \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i} \right] e^{-\lambda_i t_h} \right\} \quad \text{(C.2-3)}$$

where:

R_{iM} = Dose factor for the cow milk or goat milk pathway, for each identified radionuclide i for the organ of interest, mrem/yr per μCi/sec per m^{-2}

K′ = A constant of unit conversion

= 10^6 pCi/μCi

Q_F = The cow's or goat's feed consumption rate. kg/day (wet weight)

U_{ap} = The receptor's milk consumption rate for age group a, liters/yr

Y_p = The agricultural productivity by unit area of pasture feed grass, kg/m^2

Y_s = The agricultural productivity by unit area of stored feed, kg/m^2

F_m = The stable element transfer coefficients, pCi/liter per pCi/day

r = Fraction of deposited activity retained on cow's feed grass

$(DFL_i)_a$ = The organ ingestion dose factor for radionuclide i for the receptor in age group a, mrem/pCi

λ_{E_i} = $\lambda_i + \lambda_w$

λ_i = The radiological decay constant for radionuclide i, sec^{-1}

λ_w = The decay constant for removal of activity on leaf and plant surfaces by weathering sec^{-1}

= 5.73×10^{-7} sec^{-1} (corresponding to a 14 day half-life)

t_f = The transport time from feed to cow or goat to milk, to receptor, sec

t_h = The transport time from harvest to cow or goat consumption, sec

t_b = Period of time that soil is exposed to gaseous effluents, sec

B_{iv} = Concentration factor for uptake of radionuclide i from the soil by the edible parts of crops, pCi/Kg (wet weight) per pCi/Kg (dry soil)

P = Effective surface density for soil, Kg (dry soil)/m^2

f_p = Fraction of the year that the cow or goat is on pasture

f_s = Fraction of the cow feed that is pasture grass while the cow is on pasture

t_e = Period of pasture grass and crop exposure during the growing season, sec

I_i = Factor to account for fractional deposition of radionuclide i

For radionuclides other than iodine, the factor I_i is equal to one. For radioiodines, the value of I_i may vary. However, a value of 1.0 was used in calculating the R values Tables 3.3-9 through 3.3-16.

Milk cattle and goats are considered to be fed from two potential sources, pasture grass and stored feeds. Following the development in Regulatory Guide 1.109, Revision 1, the value of f_s was considered unity in lieu of site-specific information. The value of f_p was 0.667 based upon an 8-month grazing period.

Table C-1 contains the appropriate parameter values and their source in Regulatory Guide 1.109, Revision 1.

The concentration of tritium in milk is based on the airborne concentration rather than the deposition. Therefore, the R_i is based on X/Q:

$$R_{T_M} = K'K'''F_m Q_F U_{ap} (DFL_i)_a \left[0.75\left(\frac{0.5}{H}\right)\right] \quad \text{(C.2-4)}$$

where:

R_{T_M} = Dose factor for the cow or goat milk pathway for tritium for the organ of interest, mrem/yr per $\mu Ci/m^3$

K' = A constant unit of conversion, 10^6 pCi/μCi

K''' = A constant unit of conversion

= 10^3gm/kg

H = Absolute humidity of the atmosphere, gm/m^3

0.75 = The fraction of total feed that is water

0.5 = The ratio of the specific activity of the feed grass water to the atmospheric water

Other parameters and values as defined previously. A value for H of 8 grams/meter^3, was used in lieu of site-specific information.

C.2.4 Grass-Cow-Meat Pathway

The integrated concentration in meat follows in a similar manner to the development for the milk pathway, therefore:

$$R_{i_B} = I_i K' Q_F U_{ap} F_f (DFL_i)_a e^{-\lambda_i t_s}$$
$$\left\{f_p f_s \left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_p \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i}\right] + (1-f_p f_s)\left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_s \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i}\right] e^{-\lambda_i t_h}\right\} \quad \text{(C.2-5)}$$

where:

R_{i_B} = Dose factor for the meat ingestion pathway for radionuclide i for any organ of interest, mrem/yr per $\mu Ci/sec$ per m^{-2}

F_f = The stable element transfer coefficients, pCi/Kg per pCi/day

U_{ap} = The receptor's meat consumption rate for age group a, kg/yr

t_s = The transport time from slaughter to consumption, sec

t_h = The transport time from harvest to animal consumption, sec

t_e = Period of pasture grass and crop exposure during the growing season, sec

I_i = Factor to account for fractional deposition of radionuclide i

For radionuclides other than iodine, the factor I_i is equal to one. For radioiodines, the value of I_i may vary. However, a value of 1.0 was used in calculating the R values in Tables 3.3-6 through 3.3-8.

All other terms remain the same as defined in Equation C.2-3. Table C-2 contains the values which were used in calculating R_i for the meat pathway.

The concentration of tritium in meat is based on its airborne concentration rather than the deposition. Therefore, R_i is based on X/Q.

$$R_{T_B} = K'K'''F_f Q_F U_{ab} (DFL_i)_a \left[0.75\left(\frac{0.5}{H}\right)\right] \qquad \text{(C.2-6)}$$

where:

R_{T_B} = Dose factor for the meat ingestion pathway for tritium for any organ of interest, mrem/yr per $\mu Ci/m^3$

All other terms are as defined in Equation C.2-4 and C.2-5, above.

C.2.5 Vegetation Pathway

The integrated concentration in vegetation consumed by man follows the expression developed in the derivation of the milk factor. Man is considered to consume two types of vegetation (fresh and stored) that differ only in the time period between harvest and consumption, therefore:

$$R_{iv} = I_i K'(DFL_i)_a$$

$$\left\{ U_a^L f_L \, e^{-\lambda_i t_L} \left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_V \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i} \right] + U_a^S f_g \, e^{-\lambda_i t_h} \left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_V \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i} \right] \right\} \quad \text{(C.2-7)}$$

where:

R_{iv} = Dose factor for vegetable pathway for radio nuclide i for the organ of interest mrem/yr per μCi/sec per m^{-2}

K' = a constant of unit conversion

= 10^6 pCi/μCi

U_a^L = The consumption rate of fresh leafy vegetation by the receptor age group a, kg/yr

U_a^S = The consumption rate of stored vegetation by the receptor in age group a, kg/yr

f_g = The fraction of the annual intake of stored vegetation grown locally

f_L = The fraction of annual intake of fresh, leafy vegetables grown locally

t_L = The average time between harvest of leafy vegetation and its consumption, sec

t_h = The average time between harvest of stored vegetation and its consumption, sec

Y_V = The vegetation area density, kg/m^2

t_e = Period of leafy vegetable exposure during growing season, sec

I_i = Factor to account for fractional deposition of radionuclide i

For radionuclides other than iodine, the factor I_i is equal to one. For radioiodines, the value of I_i may vary. However, a value of 1.0 was used in Tables 3.3-3 through 3.3-5.

All other factors were defined above.

Table C-3 presents the appropriate parameter values and their source in Regulatory Guide 1.109, Revision 1.

In lieu of site-specific data default values for f_L and f_g, 1.0 and 0.76, respectively, were used in the calculation of R_i. These values were obtained from Table E-15 of Regulatory Guide 1.109, Revision 1.

The concentration of tritium in vegetation is based on the airborne concentration rather than the deposition. Therefore, the R_i is bases on χ/Q:

$$R_{T_V} = K'K''' \left[U_a^L f_L + U_a^S f_g\right] (DFL_i)_a \left[0.075\left(\frac{0.5}{H}\right)\right] \quad \text{(C.2-8)}$$

where:

R_{T_V} = Dose factor for the cow or goat milk pathway for tritium for the organ of interest, mrem/yr per $\mu Ci/m^3$

All other terms remain the same as those in Equations C.2-4 and C.2-7.

TABLE C-1

PARAMETERS FOR COW AND GOAT MILK PATHWAYS

Parameter	Value	Reference (Reg. Guide 1.109, Rev. 1)
Q_F (kg/day)	50 (cow)	Table E-3
	6 (goat)	Table E-3
Y_p (kg/m^2)	0.7	Table E-15
t_f (seconds)	1.73×10^5 (2 days)	Table E-15
r	1.0 (radioiodines)	Table E-15
	0.2 (particulates)	Table E-15
$(DFL_i)_a$ (mrem/pCi)	Each radionuclide	Tables E-11 to E-14*
F_m (pCi/1 per pCi/day)	Each stable element	Table E-1 (cow)* Table E-2 (goat)**
t_b (seconds)	4.73×10^8 (15 yr)	Table E-15
Y_s (kg/m^2)	2.0	Table E-15
Y_p (kg/m^2)	0.7	Table E-15
t_h (seconds)	7.78×10^6 (90 days)	Table E-15
U_{ap} (liters/yr)	330 infant	Table E-5
	330 child	Table E-5
	400 teen	Table E-5
	310 adult	Table E-5
t_e (seconds)	2.59×10^6 (pasture) 5.18×10^6 (stored feed)	Table E-15
B_{iv} pCi/Kg (wet weight) per pCi/Kg (dry soil)	Each stable element	Table E-1
P Kg (dry soil)/m^2	240	Table E-15

*Reference 1, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.

**Where goat data was not available, cow value F_m was assumed.

TABLE C-2

PARAMETERS FOR THE MEAT PATHWAY

Parameter	Value	Reference (Reg. Guide 1.109, Rev. 1)
r	1.0 (radioiodines) 0.2 (particulates)	Table E-15 Table E-15
F_f (pCi/Kg per pCi/day)	Each stable element	Table E-1*
U_{ap} (Kg/yr)	0 infant 41 child 65 teen 110 adult	Table E-5 Table E-5 Table E-5 Table E-5
$(DFL_i)_a$ (mrem/pCi)	Each radionuclide	Tables E-11 to E-14
Y_p (kg/m^2)	0.7	Table E-15
Y_s (kg/m^2)	2.0	Table E-15
t_b (seconds)	4.73×10^8 (15 yr)	Table E-15
t_s (seconds)	1.73×10^6 (20 days)	Table E-15
t_h (seconds)	7.78×10^6 (90 days)	Table E-15
t_e (seconds)	2.59×10^6 (pasture) 5.18×10^6 (stored feed)	Table E-15
Q_F (kg/day)	50	Table E-3
B_{iv} pCi/Kg (wet weight) per pCi/Kg (dry soil)	Each stable element	Table E-1*
P kg (dry soil)/m^2	240	Table E-15

*Reference 1, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.

TABLE C-3

PARAMETERS FOR THE VEGETABLE PATHWAY

Parameter		Value	Reference (Reg. Guide 1.109, Rev. 1)
r (dimensionless)		1.0 (radioiodines) 0.2 (particulates)	Table E-1 Table E-1
$(DFL_i)_a$ (mrem/Ci)		Each radionuclide	Tables E-11 to E-14*
U_a^L (kg/yr)	-Infant	0	Table E-5
	-Child	26	Table E-5
	-Teen	42	Table E-5
	-Adult	64	Table E-5
U_a^S (kg/yr)	-Infant	0	Table E-5
	-Child	520	Table E-5
	-Teen	630	Table E-5
	-Adult	520	Table E-5
t_L (seconds)		8.6×10^4 (1 day)	Table E-15
t_h (seconds)		5.18×10^6 (60 days)	Table E-15
Y_V (kg/m^2)		2.0	Table E-15
t_e (seconds)		5.18×10^6 (60 days)	Table E-15
t_b (seconds)		4.73×10^8 (15 yr)	Table E-15
P (Kg[dry soil]/m^2)		240	Table E-15
B_{iv}	(pCi/Kg[wet weight] per pCi/kg [dry soil])	Each stable element	Table E-1*

*Reference 1, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.

APPENDIX D

LOWER LIMIT OF DETECTION (LLD)

The following discussion of LLD is taken from NUREG-0473, Rev. 2, February 1, 1980. It represents the bases for LLD footnotes (e) in Table 7.3.3-1, (e) in Table 7.3.3-2, (a) in Table 7.3.7-1, and (b) in Table 7.3.15-3 of the BSEP ODCM Specifications. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95 percent probability with 5 percent probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\, s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

LLD is the "a priori" lower limit of detection as defined above (as microcurie per unit mass or volume),

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per transformation),

V is the sample size (in units of mass or volume),

2.22×10^6 is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and Δt is the elapsed time between midpoint of sample collection and time of counting (for plants effluents, not environmental samples).

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. Typical values of E, V, Y, and Δt shall be used in the calculation.

APPENDIX E

RADIOACTIVE LIQUID AND GASEOUS EFFLUENT MONITORING INSTRUMENTATION NUMBERS

I. Liquid Effluent Monitoring Instruments

A.	Liquid Radwaste Radioactivity Monitor	2-D12-RM-K604
B.	Liquid Radwaste Effluent Flow Measurement Device	2-G16-FIT-N057
C.	Main Service Water Effluent Radioactivity Monitor	1(2)-D12-RM-K605
D.	Stabilization Pond Effluent Composite Sampler	2-DST-XE-5027
E.	Stabilization Pond Effluent Flow Measurement Device	2-DST-FIT-5026
F.	Condensate Storage Tank Level Indicating Device	1(2)-CO-LIT-1160

II. Gaseous Effluent Monitoring Instruments

1. Main Stack Monitoring System

a.	Noble Gas Activity Monitor	2-D12-RM-23S (2-D12-RE-4982)
b.	Iodine Sampler Cartridge	IRSH35 Prefilters A or B
c.	Particulate Sampler Filter	IRSH35 Prefilters A or B
d.	System Effluent Flow Rate Measurement Device	2-VA-FIQ-5902-1 OR -2
e.	Sampler Flow Rate Measurement Device	2-D12-FE-4597

2. Reactor Building Ventilation Monitoring System

a.	Noble Gas Activity Monitor	1(2)-CAC-AQH-1264-3
b.	Iodine Sampler Cartridge	1(2)-CAC-AQH-1264-2 (collection cartridge only)
c.	Particulate Sampler Filter	1(2)-CAC-AQH-1264-1 (collection filter only)
d.	System Effluent Flow Rate Measurement Device	1(2)-VA-FIQ-3356
e.	Sampler Flow Rate Measurement Device	1(2)-CAC-FI-1264

RADIOACTIVE LIQUID AND GASEOUS EFFLUENT MONITORING INSTRUMENTATION NUMBERS (Cont'd)

3.	Turbine Building Ventilation Monitoring System		
	a.	Noble Gas Activity Monitor	1(2)-D12-RM-23 (1(2)-D12-RE-4563)
	b.	Iodine Sampler Cartridge	1(2)-IRTB32 Prefilters A or B
	c.	Particulate Sampler Filter	1(2)-IRTB32 Prefilters A or B
	d.	System Effluent Flow Rate Measurement Device	1(2)-VA-FIQ-3358
	e.	Sampler Flow Rate Measurement Device	1(2)-D12-FE-4542
4.	Main Condenser Off-Gas Treatment System (AOG) Monitor		
	a.	Noble Gas Activity Monitor	1(2)-AOG-RM-103
5.	Main Condenser Off-Gas Treatment System Explosive Gas Monitoring System		
	a.	Recombiner Train A	
		1. First Hydrogen Monitor	1(2)-OG-AIT-4284 - Stream 1
		2. Second Hydrogen Monitor	1(2)-OG-AIT-4324 - Stream 2
	b.	Recombiner Train B	
		1. First Hydrogen Monitor	1(2)-OG-AIT-4324 - Stream 1
		2. Second Hydrogen Monitor	1(2)-OG-AIT-4284 - Stream 2
6.	Main Condenser Air Ejector Radioactivity Monitor		
	a.	Noble Gas Activity Monitor	1(2)-D12-RM-K601 A and B
7.	Hot Shop Ventilation Monitoring System		
	a.	Iodine Sampler Cartridge	
	b.	Particulate Sampler Filter	

RADIOACTIVE LIQUID AND GASEOUS EFFLUENT MONITORING INSTRUMENTATION NUMBERS (Cont'd)

8. Radioactive Materials Container and Storage Building Decontamination Facility

   a. Iodine Sampler Cartridge

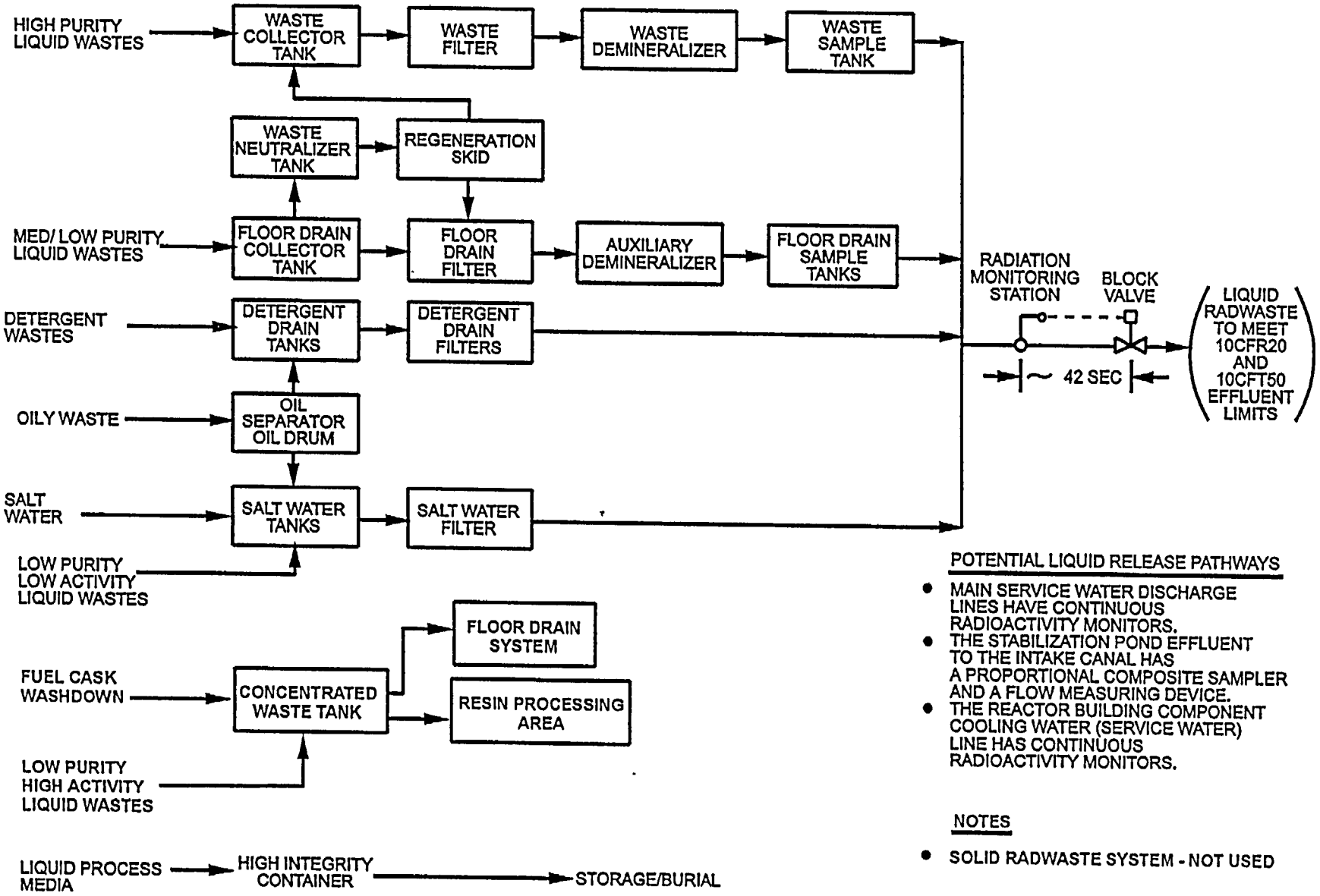
   b. Particulate Sampler Filter

APPENDIX F

LIQUID AND GASEOUS EFFLUENT SYSTEM DIAGRAMS

FIGURE F-1

Liquid Radwaste Effluent System



POTENTIAL LIQUID RELEASE PATHWAYS

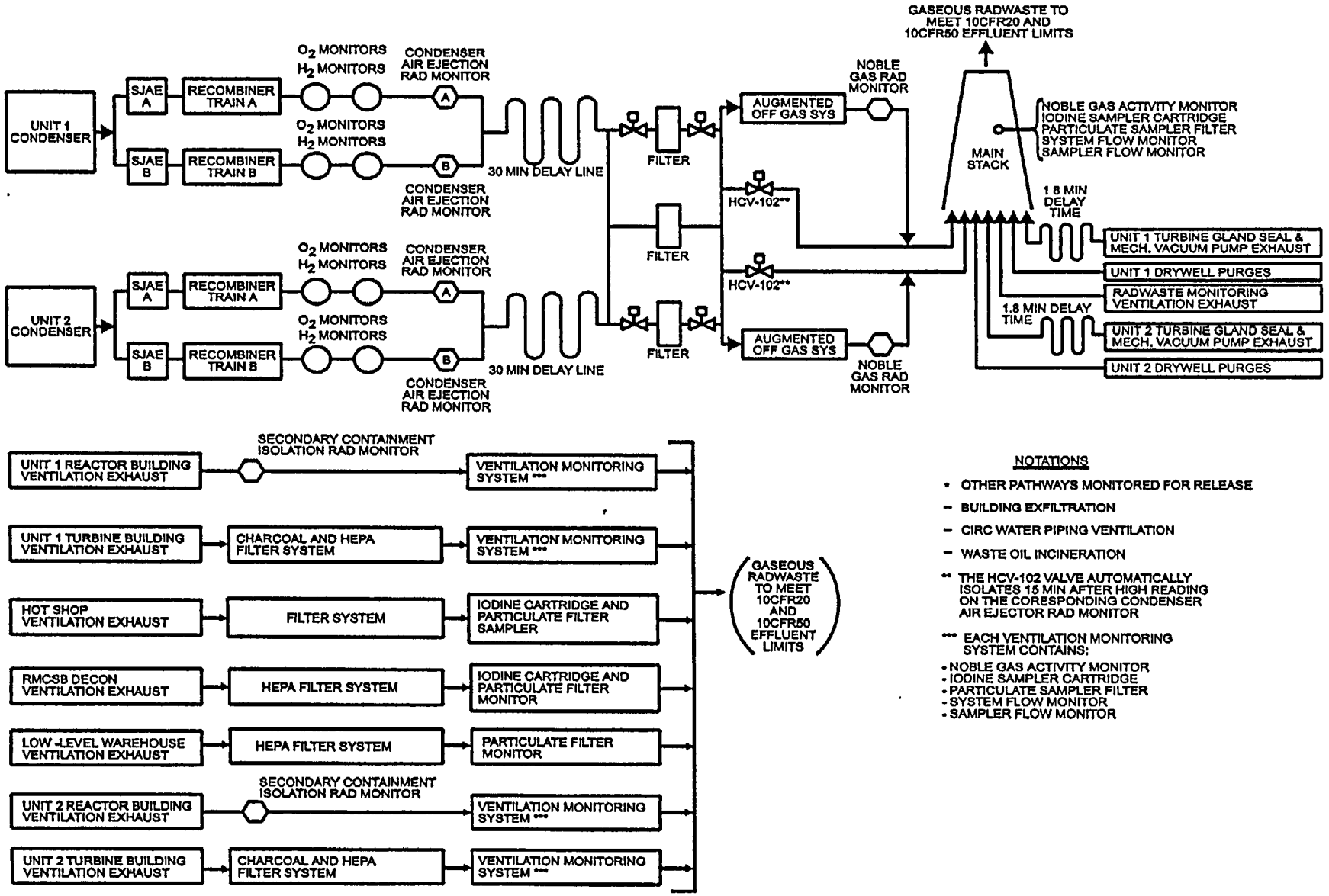
- MAIN SERVICE WATER DISCHARGE LINES HAVE CONTINUOUS RADIOACTIVITY MONITORS.
- THE STABILIZATION POND EFFLUENT TO THE INTAKE CANAL HAS A PROPORTIONAL COMPOSITE SAMPLER AND A FLOW MEASURING DEVICE.
- THE REACTOR BUILDING COMPONENT COOLING WATER (SERVICE WATER) LINE HAS CONTINUOUS RADIOACTIVITY MONITORS.

NOTES

- SOLID RADWASTE SYSTEM - NOT USED

FIGURE F-2

Gaseous Radwaste Effluent System



APPENDIX G

ODCM SOFTWARE PACKAGE

In order to minimize calculational errors and to facilitate the use of the ODCM, BSEP has developed an ODCM software package. All applicable calculations listed in the ODCM have been included in this software.

During periods when the ODCM software is not available, the following alternate method may be used to assess dose or dose rates to the public from liquid or gaseous effluents:

$$Dt = (Dh \times Ct)/Ch$$

where: Dt = the unknown dose/dose rate for the time period
Dh = the known dose/dose rate from historical data
Ct = the total curies released for the time period
Ch = the total curies used to calculate the known dose/dose rate

When the ODCM software becomes available again, all doses to the public will be reassessed using the software package.

APPENDIX H

METHODOLOGY AND CALCULATIONS FOR BURNING WASTE OIL

To permit burning of slightly contaminated waste oil in the clean trash incinerator, an insignificant fraction (0.1%) of the following regulations must be met: 10CFR20; 10CFR50, Appendix I; and 40CFR190. The following sections contain the methodology and the calculations to determine the concentration and the cumulative total activity to be used in procedures to demonstrate compliance with the above regulations.

I. Compliance with 10CFR20 for I-131, I-133, Particulates, and Tritium

The inhalation dose rate associated with burning waste oil is insignificant by definition. Regulatory Guide 1.109 states, "A pathway is considered significant if a conservative evaluation yields an additional dose increment equal to or more than 10 percent of the total from all pathways considered." Since the release rate by incineration of waste oil is ≤ 10% of the plant's total release rate, the dose rate via waste oil is insignificant.

10CFR20 Limit = 1500 mrem/yr (Inhalation to a child's most critical organ)

Insignificant = 150 mrem/yr (10% of limit)

0.1% of 10CRF20 = 1.5 mrem/yr, this more than meets the above criteria and is a consistent fraction as listed in ODCM Specification 7.3.9.c.

Since the limit is going to be limited to 0.1% of 10CFR20, the maximum release rate (μCi/sec) can be calculated by the following equation:

$$Q_i = \frac{1.5 \text{ mrem/yr}}{(R_i)\ (X/Q)}$$

where =

R_i = Dose factor for the most restrictive organ to a child (lung) for inhalation using Co-60 (7.06E6 mrem/yr/μCi/m^3)

$\overline{X/Q}$ = Annual average relative concentration for release from the Turbine Building, 7.5E-6 sec/m^3

Since the incinerator operates > 500 hrs/yr and the stack height is considered to be ground level, the meteorology used for dilution will be the same as the Turbine Buildings (ground level continuous). From Appendix A, Table A-1 the most restrictive sector is SSE (7.5E-6 sec/m^3).

For the source term mix, 100% of the activity is assumed to be Cobalt-60. Most of the activity in the slightly contaminated oil is corrosion and activation products with occasional detection of Cesium-134 and Cesium-137.

No iodines will be permitted in the waste oil for incineration. Cobalt-60 is the most restrictive radionuclide for the inhalation pathway to a child's lung (Table 3.3-18).

Therefore,

$$Q_i = \frac{1.5 \text{ mrem/yr}}{(7.06E6 \text{ mrem/yr}/\mu\text{Ci/m}^3)\ (7.5E\text{-}6 \text{ sec/m}^3)}$$

$$Q_i = 2.83E\text{-}2\ \mu\text{Ci/sec}$$

The maximum oil flow rate for burning oil in the incinerator is six gal/min. The maximum flow rate in cc/sec is calculated as follows:

(6 gal/min) (min/60 sec) (3785 cc/gal) = 378.5 cc/sec

The main fuel oil tank for the incinerator shall not contain more than 20% by volume of slightly contaminated oil. Therefore, the maximum waste oil flow rate would be 1.2 gal/min in lieu of 6 gal/min. For additional conservatism, the flow rate will equal 6 gallons/min for burning oil.

The maximum concentration (μCi/cc) of waste oil to be burned can be determined by the following equation:

$$\text{Max. Conc. } (\mu\text{Ci/cc}) = \frac{Q_i}{f}$$

Where:

f = waste oil flow rate 378.5 cc/sec

$$\text{Max. Conc. } (\mu\text{Ci/cc}) = \frac{2.83E\text{-}2\ \mu\text{Ci/sec}}{378.5 \text{ cc/sec}} = 7.48E\text{-}5\ \mu\text{Ci/cc}$$

The maximum concentration of waste oil to be incinerated is limited to 7.48E-5 μCi/cc which is 0.1% of 10CFR20 limits. This shall be controlled by procedures, sampling, and analyzing the waste oil prior to burning. Limiting the concentration to an insignificant release rate meets the intent of ODCM Specification 7.3.7.

II. Compliance with 10CFR50, Appendix I for I-131, I-133, Particulates and Tritium

ODCM Specification 7.3.9.c limits the burning of waste oil in the incinerator to 0.1% of two times 10CFR50, Appendix I (two-unit site). For conservatism, burning of waste oil shall be limited to 10CFR50, Appendix I.

Therefore:

0.001 x 7.5 mrems = 0.0075 mrem to any organ during any calendar quarter

0.001 x 15 mrems = 0.0150 mrem to any organ during any calendar year

The cumulative dose for the above yearly limit is determined by the following equation:

$$0.015 \text{ (mrem)} \leq 3.17E\text{-}8\ [(R_{i_G} + R_{i_M} + R_{i_V} + R_{i_B})\ (D / Q_{tb})\ (Q_{i_{oil}}) + (R_{i_I})\ (X / Q_{tb})\ (Q_{i_{oil}})]$$

The above equation can be further reduced as follows:

$$0.015 \text{ (mrem)} \leq 3.17E\text{-}8\ [(Q_{i_{oil}})[(R_{i_G} + R_{i_M} + R_{i_V} + R_{i_B})\ (D / Q_{tb}) + (R_{i_I})\ (X / Q_{tb})]]$$

The activity in the slightly contaminated waste oil is long lived fission, corrosion, and activation products. There is no Iodine-131 or Iodine-133 in the oil. Using the most conservative radionuclides (Cesium-134, Cesium-137, and Cobalt-60), a quarterly and yearly activity can be calculated for all organs and all age groups for the summation of all pathway doses. The maximum activity to be released for a calendar quarter and calendar year can be determined as follows:

$$Q_{i_{oil}} = \frac{0.015}{(3.17E\text{-}8)[R_{i_G} + R_{i_M} + R_{i_V} + R_{i_B})(D / Q_{tb}) + (R_{i_I})(X / Q_{tb})]}$$

where:

$3.17E\text{-}8$ = The inverse of the number of seconds in a year

R_{i_G} = Dose factor for an organ for radionuclide i for the ground plane exposure pathway, mrem/yr per μCi/sec per m^{-2}, Table 3.3-1

R_{i_M} = Dose factor for an organ for radionuclide i for the cow milk pathway, mrem/yr per μCi/sec per m^{-2}, Tables 3.3-8, 3.3-9, 3.3-10, and 3.3-11, there is no goat milk production within 5 miles of site

R_{i_V} = Dose factor for an organ for radionuclide i for the vegetable pathway, mrem/yr per μCi/sec per m^{-2}, Tables 3.3-2, 3.3-3 and 3.3-4

R_{i_B} = Dose factor for an organ for radionuclide i for the meat pathway, mrem/yr per μCi/sec per m^{-2}, Tables 3.3-5, 3.3-6, and 3.3-7

R_{i_I} = Dose factor for an organ for radionuclide i for the inhalation pathway, mrem/yr per μCi/m^3, Tables 3.3-16, 3.3-17, 3.3-18, and 3.3-19

D/Q_{tb} = Annual average deposition for release from the Turbine Buildings, NE Sector

= 1.9E-8 m^{-2}, most restrictive, from Appendix A, Table A-3

X/Q_{tb} = Annual average relative concentration for releases from the Turbine Buildings, SSE sector

= 7.5E-6 sec/m^3, most restrictive, from Appendix A, Table A-1

The most restrictive age group and organ is Child Bone. The maximum release in any calendar year is 436 μCi. The maximum release in any calendar quarter is 436 x 1/2 = 218 μCi.

All slightly contaminated waste oil that is to be burned in the incinerator shall be controlled by procedures demonstrating that the quarterly limit (218 μCi) and yearly limit (436 μCi) are not exceeded. Doubling these μCi limits shall be used for calculating percent of technical specification limit in the annual report. At the end of each calendar year a dose assessment will be made using the methodology in the ODCM.

Summary of Co-60, Cs-137, and Cs-134
μCi Release Yearly Limit by Age Group and Organ

	T Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Co-60								
Adult	1,132	965	1,158	1,147	1,158	1,158	1,044	988
Teen	1,120	977	1,158	1,142	1,158	1,158	999	988
Child	1,091	1,037	1,158	1,134	1,158	1,158	1,025	988
Infant	1,153	1,151	1,158	1,155	1,158	1,158	1,070	988
Cs-137								
Adult	1,179	2,349	1,112	928	1,564	2,418	2,053	2,075
Teen	1,278	2,333	826	678	1,292	2,418	1,812	2,075
Child	1,474	2,349	436*	453	1,001	2,418	1,603	2,075
Infant	1,910	2,390	575	509	1,205	2,418	1,714	2,075
Cs-134								
Adult	1,063	3,471	1,623	1,125	1,857	3,652	2,766	3,129
Teen	1,163	3,452	1,233	649	1,478	3,652	2,337	3,129
Child	1,441	3,517	672	442	1,120	3,652	2,017	3,129
Infant	2,258	3,594	851	513	1,417	3,652	2,217	3,129

*Most restrictive quantity in μCi resulting in 0.1% of 10CFR50 Appendix I limit.

III. Compliance with 40CRF190

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ except the thyroid, which shall be limited to less than or equal to 75 mrem. Incinerating waste oil is limited to 0.015 mrem to the most critical organ (including the whole body) using all pathways. 40CFR190 is automatically complied with since 0.015 mrem is ≤ 0.1% of 25 mrem.