ATTACHMENT "B"

PNPS
RADIOLOGICAL ENVIRONMENTAL
TECHNICAL SPECIFICATIONS
SUBMITTAL

1.0 DEFINITIONS (Continued)

U. Surveillance Frequency - Unless otherwise stated in these specifications, periodic surveillance tests, checks, calibrations, and examinations shall be performed, within the specified surveillance intervals. These intervals may be adjusted plus 25%. The total maximum combined interval time for any three consecutive tests shall not exceed 3.25 times the specified interval. The operating cycle interval is considered to be 18 months and the tolerances stated above are applicable.

V. Surveillance Interval - The surveillance interval is the calendar time between surveillance tests, checks, calibrations, and examinations to be performed upon an instrument or component when it is required to be operable. These tests may be waived when the instrument, component, or system is not required to be operable, but the instrument, component, or system shall be tested prior to being declared operable.

W. Fire Suppression Water System - A fire suppression water system shall consist of: a water source(s); gravity tank(s) or pump(s); and distribution piping with associated sectionalizing control or isolation valves. Such valves shall include hydrant post indicator valves and the first valve ahead of the water flow alarm device on each sprinkler, hose standpipe or spray system riser.

X. Staggered Test Basis - A staggered test basis shall consist of: (a) a test schedule for n systems, subsystems, trains, or other designated components obtained by dividing the specified test interval into n equal subintervals; (b) the testing of one system, subsystem, train or other designated components at the beginning of each subinterval.

Y. Source Check - A source check shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

Z. Offsite Dose Calculation Manual (ODCM) - An offsite dose calculation manual (ODCM) shall be a manual containing the current methodology and parameters to be used for the calculation of offsite doses due to radioactive gaseous and liquid effluents, the calculation of gaseous and liquid effluent monitoring instrumentation alarm/trip setpoints, and the conduct of the Radiological Environmental Monitoring Program.

1.0 DEFINITIONS (Continued)

AA. Action - Action shall be that part of a specification which prescribes remedial measures required under designated conditions.

BB. Member(s) of the Public[1] - 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 site.

CC. Site Boundary[1] - The site boundary is shown in Figure 1.6-1 in the FSAR.

DD. Radwaste Treatment System

1. Gaseous Radwaste Treatment System - The gaseous radwaste treatment system is that system identified in Figure 4.8-2.

2. Liquid Radwaste Treatment System - The liquid radwaste treatment system is that system identified in Figure 4.8-1.

[1] See FSAR Figure 1.6-1

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
C. Control Rod Block Actuation	C. Control Rod Block Actuation
1. The limiting conditions of operation for the instrumentation that initiates control rod block are given in Table 3.2.C.	1. Instrumentation shall be functionally tested, calibrated and checked as indicated in Table 4.2.C. System logic shall be functionally tested as indicated in Table 4.2.C.
2. The minimum number of operable instrument channels specified in Table 3.2.C for the Rod Block Monitor may be reduced by one in one of the trip systems for maintenance and/or testing, provided that this condition does not last longer than 24 hours in any thirty day period.	
D. Radiation Monitoring Systems - Isolation & Initiation Functions	D. Radiation Monitoring Systems - Isolation & Initiation Functions
1. Reactor Building Isolation and Control System and Standby Gas Treatment System The limiting conditions for operation are given in Table 3.2.D.	1. Reactor Building Isolation and Control System and Standby Gas Treatment System Instrumentation shall be functionally tested, calibrated and checked as indicated in Table 4.2.D. System logic shall be functionally tested as indicated in Table 4.2.D.

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
E. Drywell Leak Detection The limiting conditions of operation for the instrumentation that monitors drywell leak detection are given in Table 3.2.E.	E. Drywell Leak Detection Instrumentation shall be functionally tested, calibrated and checked as indicated in Table 4.2.E.
F. Surveillance Information Readouts The limiting conditions for the instrumentation that provides surveillance information readouts are given in Table 3.2.F.	F. Surveillance Information Readouts Instrumentation shall be calibrated and checked as indicated in Table 4.2.F.

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TABLE 3.2.D

RADIATION MONITORING SYSTEMS THAT INITIATE AND/OR ISOLATE

Minimum # of Operable Instrument Channels Per Trip System (1)	Trip Function	Trip Level Setting	Action (2)
2	Refuel Area Exhaust Monitors	Upscale, <100 mr/hr	A or B
2	Refuel Area Exhaust Monitors	Downscale	A or B

NOTES FOR TABLE 3.2.D

1. Whenever the systems are required to be operable, there shall be two operable or tripped trip systems. If this cannot be met, the indicated action shall be taken.

1. Action

   A. Cease operation of the refueling equipment.
   B. Isolate secondary containment and start the standby gas treatment system.

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TABLE 4.2.D
MINIMUM TEST AND CALIBRATION FREQUENCY FOR RADIATION MONITORING SYSTEMS

Instrument Channels	Instrument Functional Test	Calibration	Instrument Check (2)
1) Refuel Area Exhaust Monitors - Upscale	(1)	Once/3 months	Once/day
2) Refuel Area Exhaust Monitors - Downscale	(1)	Once/3 months	Once/day

Logic System Functional Test (4) (6)	Frequency
1) Reactor Building Isolation	Once/6 months
2) Standby Gas Treatment System Actuation	Once/6 months

3.2 BASES (Cont'd)

HPCI in the event the HPCI does not operate. The arrangement of the tripping contacts is such as to provide this function when necessary and minimize spurious operation. The trip settings given in the specification are adequate to assure the above criteria are met. The specification preserves the effectiveness of the system during periods of maintenance, testing or calibration, and also minimizes the risk of inadvertent operation; i.e., only one instrument channel out of service.

Four radiation monitors are provided which initiate the Reactor Building Isolation and Control System and operation of the standby gas treatment system. The instrument channels monitor the radiation from the refueling area ventilation exhaust ducts.

Four instrument channels are arranged in a 1 out of 2 twice trip logic.

Trip settings of < 100 mr/hr for the monitors in the refueling area ventilation exhaust ducts are based upon initiating normal ventilation isolation and standby gas treatment system operation so that none of the activity released during the refueling accident leaves the Reactor Building via the normal ventilation path but rather all the activity is processed by the standby gas treatment system.

Flow integrators are used to record the integrated flow of liquid from the drywell sumps. The alarm unit in each integrator is set to annunciate before the values specified in Specification 3.6.C are exceeded. A system whereby the time interval to fill a known volume will be utilized to provide a back-up to the flow integrators. An air sampling system is also provided to detect leakage inside the primary containment.

is shown by Curve No. 2. Note that the unavailability is lower as expected for a redundant system and the minimum occurs at the same test interval. Thus, if the two channels are tested independently, the equation above yields the test interval for minimum unavailability.

A more unusual case is that the testing is not done independently. If both channels are bypassed and tested at the same time, the result is shown in Curve No. 3. Note that the minimum occurs at about 40,000 hours, much longer than for cases 1 and 2. Also, the minimum is not nearly as low as Case 2 which indicates that this method of testing does not take full advantage of the redundant channel. Bypassing both channels for simultaneous testing should be avoided.

The most likely case would be to stipulate that one channel be bypassed, tested, and restored, and then immediately following, the second channel be bypassed, tested and restored. This is shown by Curve No. 4. Note that there is no true minimum. The curve does have a definite knee and very little reduction in system unavailability is achieved by testing at a shorter interval than computed by the equation for a single channel.

The best test procedure of all those examined is to perfectly stagger the tests. That is, if the test interval is four months, test one or the other channel every two months. This is shown in Curve No. 5. The difference between Cases 4 and 5 is negligible. There may be other arguments, however, that more strongly support the perfectly staggered tests, including reductions in human error.

The conclusions to be drawn are these:

1. A 1 out of n system may be treated the same as a single channel in terms of choosing a test interval; and

2. more than one channel should not be bypassed for testing at any one time.

The radiation monitors in the refueling area ventilation duct which initiate building isolation and standby gas treatment operation are arranged in two 1 out of 2 logic systems. The bases given above for the rod blocks apply here also and were used to arrive at the functional testing frequency. Based on experience with instruments of similar design, a testing interval of once every three months has been found adequate.

4.2 BASES (Cont'd)

The automatic pressure relief instrumentation can be considered to be a 1 out of 2 logic system and the discussion above applies also.

The instrumentation which is required for the recirculation pump trip and alternate rod insertion systems incorporate analog transmitters and are a new, improved line of BWR instrumentation. The calibration frequency is once per operating cycle which is consistent with both the equipment capabilities and the requirements for similar equipment used by other reactor vendors. The calibration frequency of the trip units is proposed to be quarterly, the same as other similar protective instrumentation. Likewise, the test frequency is specified at monthly like that of other protective instrumentation. A sensor check is proposed once per day; this is considered to be an appropriate frequency, commensurate with the design applications and the fact that the recirculation pump trip and alternate rod insertion systems are backups to existing protective instrumentation.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.8 RADIOACTIVE EFFLUENTS	4.8 RADIOACTIVE EFFLUENTS
A. Liquid Effluents Concentration	A. Liquid Effluents Concentration
Applicability:	Specification:
At all times.	1. The radioactivity content of each batch of radioactive liquid waste to be discharged shall be determined prior to release by sampling and analysis in accordance with Table 4.8-1.
Specification:	2. The results of pre-release analyses shall be used with calculational methods in the Offsite Dose Calculation Manual (ODCM) to assure that the concentration at the point of release is limited to the values in Specification 3.8.A.1.
1. The concentration of radioactive material released at any time from the site to areas at and beyond the site boundary shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration of individual isotopes shall be limited to 2 x 10^{-4} Ci/ml.	
Action	
With the concentration of radioactive material released from the site to areas at and beyond the site boundary exceeding the above limits, without delay restore concentration within the above limits.	
B. Radioactive Liquid Effluent Instrumentation	B. Radioactive Liquid Effluent Instrumentation
Applicability:	Specification:
As shown in Table 3.8-1.	1. The setpoints for monitoring instrumentation shall be determined in accordance with the ODCM.
Specification:	2. Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated operable at the frequencies shown in Table 4.8-2.
1. The radioactive liquid effluent monitoring instrumentation channels shown in Table 3.8-1 shall be operable with their alarm/trip setpoints set to ensure that the limits of Specification 3.8.A.1 are not exceeded	

3.8.B Radioactive Liquid Effluent Instrumentation (Continued)

during periods when liquid wastes are being discharged via the radwaste discharge header.

For releases other than the radwaste discharge header, the above specification does not apply, these releases shall be made in accordance with Action 1 of Table 3.8-1.

Action

a. With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure that the limits of Specification 3.8.A.1 are met, without delay suspend the release of radioactive liquid effluents monitored by the affected channel or change the setpoint so that it is acceptably conservative or declare the channel inoperable.

b. With one or more radioactive liquid effluent monitoring instrumentation channels inoperable, take the action shown in Table 3.8-1.

C. Liquid Radwaste Treatment

Applicability:

At all times.

Specification:

1. The liquid radwaste treatment system shall be maintained and used to reduce the radioactive materials in liquid wastes

C. Liquid Radwaste Treatment

Specification:

1. Doses due to liquid releases at and beyond the site boundary shall be calculated at least once per 31-day period in accordance with the ODCM, only if releases in that period have occurred.

3.8.C. Liquid Radwaste Treatment (Continued)

prior to their discharge when the dose due to liquid effluent releases to areas at and beyond the site boundary averaged over a 31-day period would exceed 0.06 mrem to the total body or 0.20 mrem to any organ.

Action

a. With radioactive liquid waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days a special report which includes the following information:

1. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability.

2. Action(s) taken to restore the inoperable equipment to operable status.

3. Summary description of action(s) taken to prevent a recurrence.

4.8.C. Liquid Radwaste Treatment (Continued)

2. The liquid radwaste treatment system schematic is shown in Figure 4.8-1.

D. Gaseous Effluents Dose Rate

Applicability:

At all times.

Specification:

1. The instantaneous dose rate due to radioactive materials released in gaseous effluents

D. Gaseous Effluents Dose Rate

Specification:

1. The instantaneous dose rate due to noble gases in gaseous effluents shall be determined to be within the limits of Specification 3.8.D.1.a on a continuous basis using the noble gas activity monitors

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.8.D. Gaseous Effluents Dose Rate (Continued) from the site to areas at and beyond the site boundary (see FSAR Figure 1.6-1) shall be limited to the following: a. For noble gases: Less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin, and b. For iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ. Action With the instantaneous dose rate(s) exceeding the above limits, without delay restore the release rate to within the above limit(s).	4.8.D. Gaseous Effluents Dose Rate (Continued) with appropriate setpoints and in accordance with the ODCM. 2. The instantaneous dose rate due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents shall be determined to be within the limits of Specification 3.8.D.1.b in accordance with the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 4.8-3.
E. Radioactive Gaseous Effluent Instrumentation Applicability: As shown in Table 3.8-2. Specification: 1. The radioactive gaseous effluent monitoring instrumentation channels shown in Table 3.8-2 shall be operable with their alarm/trip setpoints set to ensure that the limits of Specification 3.8.D.1 are not exceeded.	E. Radioactive Gaseous Effluent Instrumentation Specification: 1. The setpoints shall be determined in accordance with ODCM. 2. Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated operable at the frequencies shown in Table 4.8-4.

3.8.E. Radioactive Gaseous Effluent Instrumentation (Continued)

Action

a. With a radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure that the limits of Specification 3.8.D.1 are met, change the setpoint so that it is acceptably conservative or declare the channel inoperable.

b. With one or more radioactive gaseous effluent monitoring instrumentation channels inoperable, take the action shown in Table 3.8-2.

F. Gaseous Effluent Treatment

Applicability:

The augmented offgas system shall be put into service prior to reaching 50 percent reactor power during startup.

Action

a. With gaseous effluents being discharged for more than 14 days without treatment, prepare and submit to the Commission within 30 days, a special report which includes the following information:

1. Identification of any inoperable equipment or subsystems, and the reason for the inoperability.

2. Action(s) taken to restore the inoperable equipment to operable status.

F. Gaseous Effluent Treatment

Specification:

1. Augmented offgas annunciator operability shall be verified once per 12 hours.

2. The concentration of hydrogen in the augmented offgas treatment system shall be determined to be within the limits of Specification 3.8.F.1 by continuously monitoring the waste gases in the augmented offgas treatment system with the hydrogen monitor which is required to be operable by Table 3.8-2.

3.8.F. Gaseous Effluent Treatment (Continued)

3. Summary description of action(s) taken to prevent a recurrence.

Specification:

1. The concentration of hydrogen in the augmented offgas treatment system shall be limited to less than or equal to 2 percent by volume at the outlet of the augmented offgas recombiner. See also Action 5 for Item 4.a on Table 3.8-2.

Action

a. With the concentration of hydrogen in the augmented offgas treatment system greater than 2 percent by volume but less than or equal to 4 percent by volume, restore the concentration of hydrogen to within the limit within 48 hours or be in a cold shutdown condition within 24 hours.

G. Main Condenser

Applicability:

At all times when steam is available to the air ejectors.

Specification:

1. The gross radioactivity (beta and/or gamma) release rate of noble gases measured at the steam jet air ejector shall be limited to 500,000 μCi/sec (referenced to a 30-minute holdup).

Action

With the gross radioactivity (beta and/or gamma) release

G. Main Condenser

Specification:

1. The gross radioactivity (beta and/or gamma) release rate of noble gases from the steam jet air ejector shall be determined to be within the limit of Specification 3.8.G.1 at the following frequencies by performing an isotopic analysis of a representative sample of gases taken at the discharge of the steam jet air ejector (prior to dilution and/or discharge):

a. At least once per 31 days.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.8.G. Main Condenser (Continued) rate of noble gases at the steam jet air ejector exceeding 500,000 μCi/sec (referenced to a 30-minute holdup), restore the gross radioactivity release rate to within the limit within 72 hours or be in at least hot standby within the next 12 hours. See also Action 1 for Item 3.a on Table 3.8-2.	4.8.G. Main Condenser (Continued) b. When the average daily gross radioactivity release rate increases by 50 percent over the previous day, after factoring out increases due to changes in reactor thermal power level.
H. Mechanical Vacuum Pump Specification: 1. The mechanical vacuum pump shall be capable of being isolated and secured on a signal of high radioactivity in the steam lines whenever the main steam isolation valves are open. 2. If the limits of Specification 3.8.H.1 are not met, the vacuum pump shall be isolated.	H. Mechanical Vacuum Pump Specification: 1. At least once during each operating cycle verify automatic securing and isolation of the mechanical vacuum pump.

TABLE 3.8-1
RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

Instrument	Minimum Channels Operable	Applicability	Action[2]
1. Gross Radioactivity Monitors Providing Automatic Termination of Release			
a. Liquid Radwaste Effluent Line	1	During actual discharge of liquid wastes	1
2. Flow Rate Measurement Devices			
a. Liquid Radwaste Effluent Line	1	During actual discharge of liquid wastes	2
b. Discharge Canal[1]	NA	During actual discharge of liquid wastes	3

[1] Flow will be estimated based on the design flow rate of the operating circulating water pumps and/or the operating salt service water pumps.

[2] ACTION 1 With the number of operable channels less than required by the minimum channels operable requirement, effluent releases may be resumed provided that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with Specification 4.8.A.1, and

b. An independent verification of the release rate calculations is performed, and

c. An independent verification of the discharge valving is performed.

ACTION 2 With the number of operable channels less than required by the minimum channels operable requirement, effluent releases via this pathway may continue provided that the flow rate is verified at least once per 4 hours during actual releases.

ACTION 3 Suspend all radioactive liquid effluent discharges if no dilution water is available.

TABLE 3.8-2
RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Instrument	Minimum Channels Operable	Applicability	Parameter	Action[a]
1. Main Stack Effluent Monitoring System				
a. Noble Gas Activity Monitor - Providing Alarm	1	*	Radioactivity Rate Measurement	3
b. Iodine Sampler Cartridge	1	*	Collect Halogen Sample	4
c. Particulate Sampler Filter	1	*	Collect Particulate Sample	4
d. Effluent System Flow Rate Measuring Device	1	*	System Flow Rate Measurement	2
e. Sampler Flow Rate Measuring Device	1	*	Sampler Flow Rate Measurement	2
2. Reactor Building Ventilation Effluent Monitoring System				
a. Noble Gas Activity Monitor - Providing Alarm	1	*	Radioactivity Rate Measurement	3
b. Iodine Sampler Cartridge	1	*	Collect Halogen Sample	4
c. Particulate Sampler Filter	1	*	Collect Particulate Sample	4

TABLE 3.8-2 (Continued)
RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Instrument	Minimum Channels Operable	Applicability	Parameter	Action[4]
2. Reactor Building Ventilation Effluent Monitoring System (Continued)				
d. Effluent System Flow Rate Measurement Device	1	[1]	System Flow Rate Measurement	2
e. Sampler Flow Rate Measurement Device	1	[1]	Sampler Flow Rate Measurement	2
3. Steam Jet Air Ejector Radioactivity Monitor				
a. Noble Gas Activity Monitor (Providing alarm and auto-isolation of stack)	1	[3]	Noble Gas Radio-activity Rate Measurement	1
4. Augmented Offgas Treatment System Explosive Gas Monitoring				
a. Hydrogen Monitor	1	[2]	Hydrogen Concentra-tion Measurement	5

TABLE 3.8-2 (Continued)
TABLE NOTATION

[1] During releases via this pathway.

[2] During augmented offgas treatment system operation.

[3] During operation of the steam jet air ejector.

[4] ACTION 1 With the number of operable channels less than required by the minimum channels operable requirement, gases from the steam jet air ejector may be released to the offgas system for up to 72 hours provided:

a. The augmented offgas treatment system is not bypassed, and

b. The offgas holdup system noble gas activity effluent monitor (downstream) is operable.

Otherwise, be in at least hot standby within 12 hours.

ACTION 2* With the number of operable channels less than required by the minimum channels operable requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours.

ACTION 3* With the number of operable channels less than required by the minimum channels operable requirement, effluent releases via this pathway may continue provided grab samples are taken at least once per 12 hours and these samples are analyzed for activity within 24 hours.

ACTION 4* With the number of operable channels less than required by the minimum channels operable requirement, effluent releases via this pathway may continue provided samples are continuously collected with auxiliary sampling equipment as required in Table 4.8-3.

ACTION 5 With the number of operable channels less than required by the minimum channels operable requirement, operation of the augmented offgas holdup system may continue provided grab samples are collected at least once per 24 hours, analyzed within the following 4 hours, and the proper function of the recombiner is assured by monitoring recombiner temperature.

*Note: (For Actions 2, 3, and 4) If the instruments are not returned to operable status within 30 days, explain in the next Semiannual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

TABLE 4.8-1

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (Ci/ml)[a]
A. Batch Waste Release Tanks[c]	Each Batch	Prior to Release Each Batch	Principal Gamma Emitters[d]	5×10^{-7}
1. Non-treatable Releases (e.g., Neutralizer Sumps) and 2. Treatable Releases (e.g., Radwaste Tanks)			I-131	1×10^{-6}
			Dissolved and Entrained Gases	1×10^{-5}
	Composite from Each Batch	Monthly Composite[b]	H-3	1×10^{-5}
			Gross alpha	1×10^{-7}
	Composite from Each Batch	Quarterly Composite[b]	Sr-89, Sr-90	5×10^{-8}
			Fe-55	1×10^{-6}
B. Continuous Releases				
1. Salt Service Water	Weekly grab sample	Weekly	Principal Gamma Emitters	5×10^{-7}

TABLE 4.8-1 (Continued)
TABLE NOTATION

(a) Refer to ODCM for LLD definition.

(b) 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 which is representative of the liquids released.

(c) A batch release is the discharge of liquid wastes of a discrete volume.

(d) The principal gamma emitters for which the LLD specification applies 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 be analyzed and reported in the Semiannual Radioactive Effluent Release Report.

TABLE 4.8-2

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Instrument Check	Source Check	Channel Calibration	Channel Functional Test
1. Gross Beta or Gamma Radioactivity Monitors Providing Alarm and Automatic Isolation				
a. Liquid Radwaste Effluents Line	[1]	NA	Once per operating cycle [2]	Quarterly
2. Flow Rate Measurement Devices				
a. Liquid Radwaste Effluent Line	[1]	NA	Once per operating cycle	Quarterly

[1] During or prior to release via this pathway.

[2] Previously established calibration procedures will be used for these requirements.

TABLE 4.8-3

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	(LLD)[a] (Ci/ml)
Main Stack and Rx Bldg. Vent	Monthly Grab Sample	Monthly	Principal Gamma Emitters[b]	1×10^{-4}
			H-3	1×10^{-6}
	Continuous[d]	Weekly Charcoal[c] Sample	I-131	1×10^{-12}
	Continuous[d]	Weekly Particulate[c] Sample	Principal Gamma Emitters[b] (I-131, others)	1×10^{-11}
	Continuous[d]	Monthly Composite Particulate Sample	gross alpha	1×10^{-11}
	Continuous[d]	Quarterly Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11}
	Continuous[d]	Continuous Noble Gas Monitor	Noble Gases Gross Gamma	1×10^{-6}

TABLE 4.8-3 (Continued)
TABLE NOTATION

(a) Refer to ODCM for LLD definition.

(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 be analyzed and reported in the Semiannual Radioactive Effluent Release Report.

(c) When the average daily gross radioactivity release rate increases by 50 percent over the previous day (after factoring out power level changes), the iodine and particulate filters shall be analyzed to determine the release rate for iodines and particulates.

(d) 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 Specification 3.8.D.

TABLE 4.8-4

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Instrumer+ Check	Source Check	Instrument Calibration	Instrument Functional Test
1. Main Stack Effluent Monitoring System				
a. Noble Gas Activity Monitor (Two channels)	Daily[1]	Monthly	Once per operating cycle[4]	Quarterly
b. Iodine Sampler Cartridge	NA	NA	NA	NA
c. Particulate Sampler Filter	NA	NA	NA	NA
d. Effluent System Flow Rate Measuring Device	Daily[1]	NA	Once per operating cycle	Quarterly
e. Sampler Flow Rate Measuring Device	Daily[1]	NA	Once per operating cycle	Quarterly
2. Reactor Building Ventilation Effluent Monitoring System				
a. Noble Gas Activity Monitor	Daily[1]	Monthly	Once per operating cycle[4]	Quarterly
b. Iodine Sampler Cartridge	NA	NA	NA	NA
c. Particulate Sampler Filter	NA	NA	NA	NA
d. Effluent System Flow Rate Measuring Device	Daily[1]	NA	Once per operating cycle	Quarterly

TABLE 4.8-4 (Continued)
RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Instrument Check	Source Check	Instrument Calibration	Instrument Functional Test
e. Sampler Flow Rate Measuring Device	Daily[1]	NA	Once per operating cycle	Quarterly
3. Steam Jet Air Ejector Radioactivity Monitor				
a. Noble Gas Activity Monitor	Daily[3]	NA	Once per operating cycle[4]	Quarterly
4. Augmented Offgas Treatment System Explosive Gas Monitoring System				
a. Hydrogen Monitor	Daily[2]	NA	Quarterly[5]	Monthly

[1]During releases via this pathway.

[2]During augmented offgas treatment system operation.

[3]During operation of the steam jet air ejector.

[4]Previously established calibration procedures will be used for these requirements.

[5]Calibrate at 2 points with standard gas samples differing by at least 1% but not exceeding 4%.

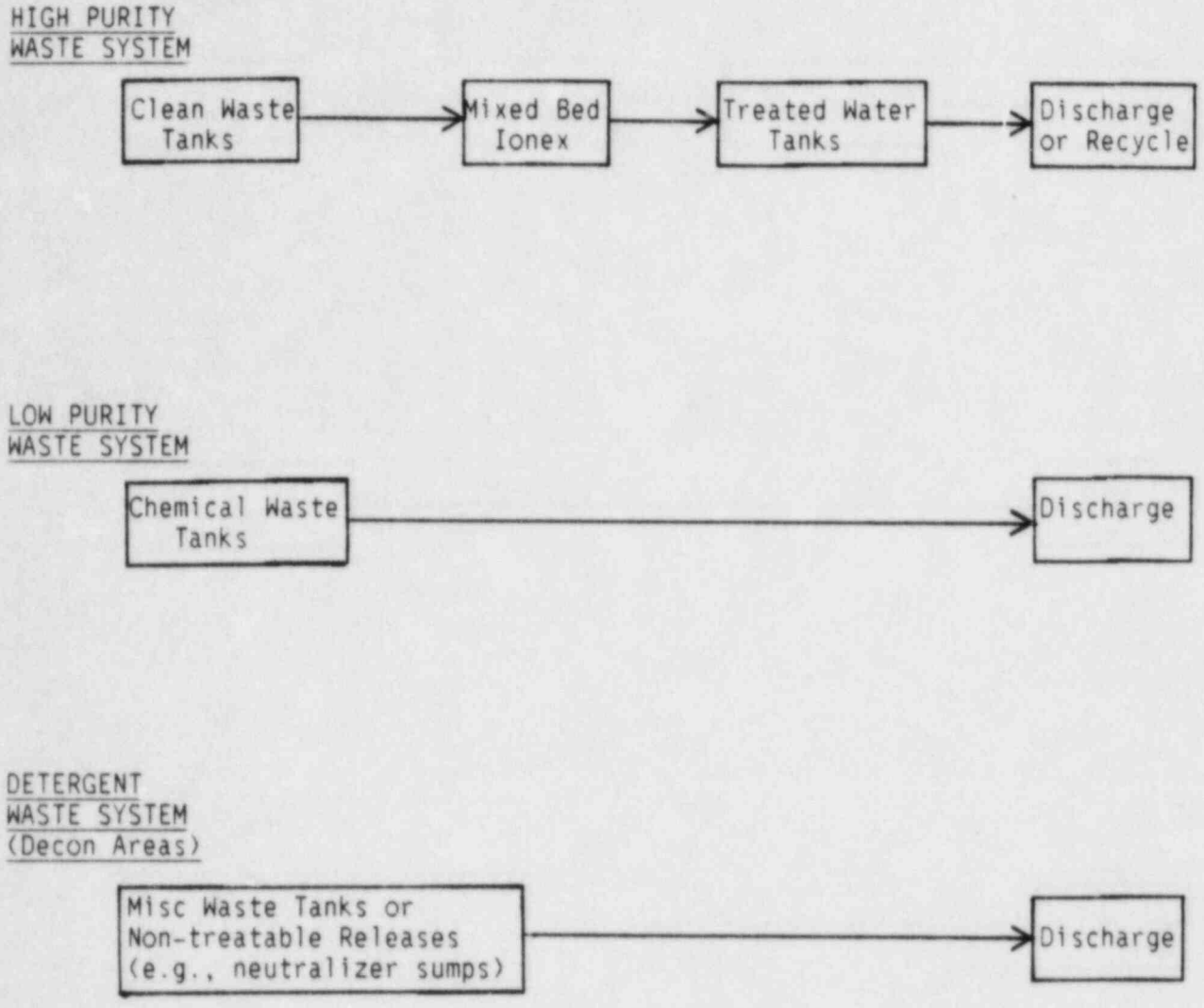
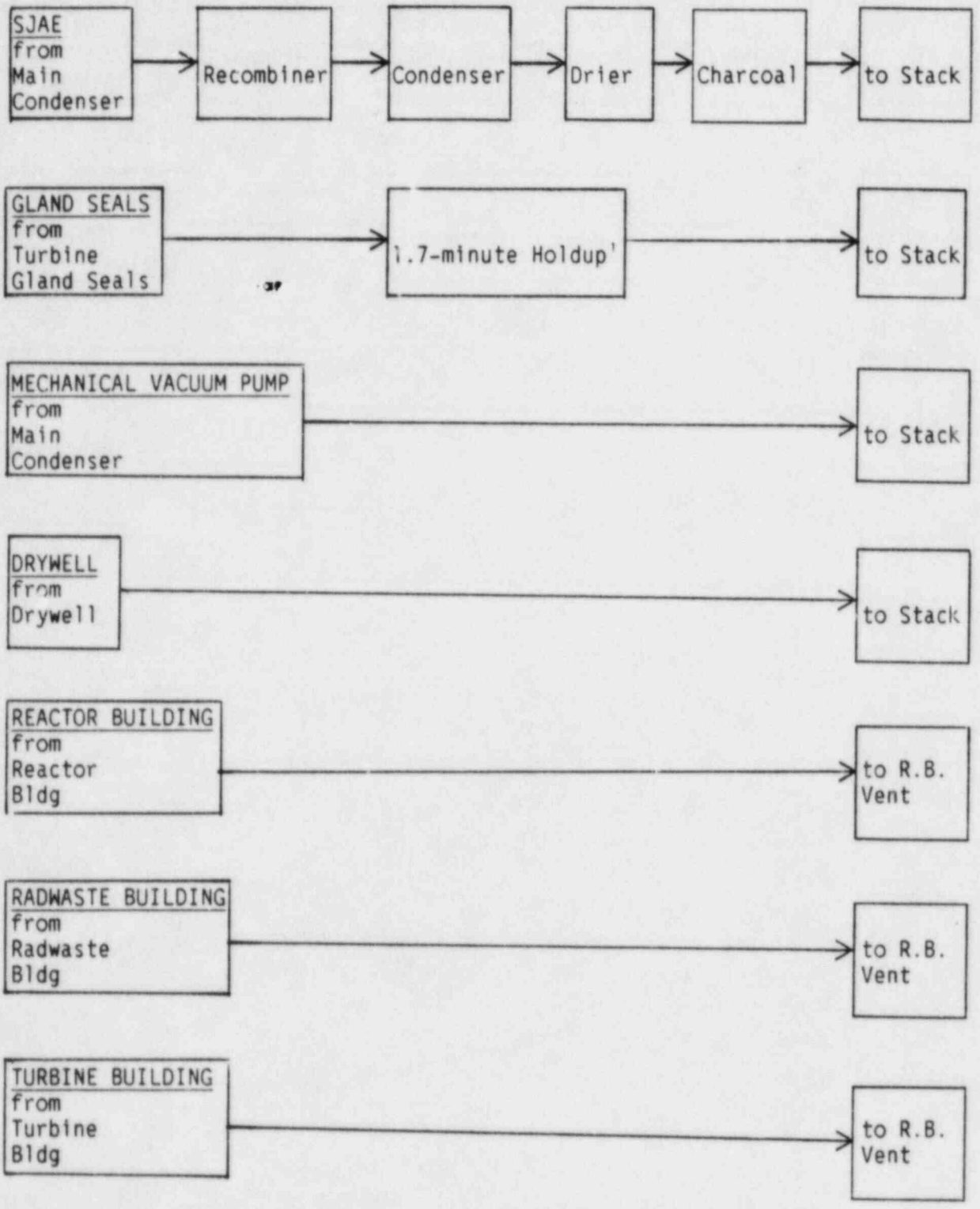


Figure 4.8-1 Liquid Radwaste Treatment System Schematic



[1] No significant effect in reducing offsite doses when compared to transit time required for releases to reach site boundary.

Figure 4.8-2 Gaseous Effluent Treatment Schematic

BASES

3/4.8 RADIOACTIVE EFFLUENTS

A. Liquid Effluents Concentration

This specification is provided to ensure that the concentration of radioactive materials released in liquid waste effluents at and beyond the site boundary will be less than the concentration levels specified in 10 CFR Part 20, Appendix B, Table II. This limitation provides additional assurance that the levels of radioactive materials in bodies of water at and beyond the site boundary 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 20.106(e) to the population.

B. Radioactive Liquid Effluent Instrumentation

The radioactive liquid effluent 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 NRC approved methods in the Offsite Dose Calculation Manual (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.

C. Liquid Effluent Treatment

The requirement that the 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 is 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 design objective 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 guide set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

D. Gaseous Effluents Dose Rate

This specification is provided to ensure that the dose rate at anytime at and beyond the site boundary from gaseous effluents from all units on the site will be within the annual dose limits of 10 CFR Part 20. The annual dose limits are the doses associated with the concentration of 10 CFR Part 20, Appendix B, Table II. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a member of the public either within or outside the site boundary to annual average concentrations exceeding the limits specified in Appendix B, Table II of 10 CFR Part 20.106(b). For members of the public who may at times be within the site boundary, the occupancy of the individual will usually 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

3/4.8.D Gaseous Effluents Dose Rate (Continued)

gamma and beta dose rates above background to a member of the public at or beyond the site boundary to ≤ 500 mrem/year to the total body or to ≤ 3000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to an infant via the cow-milk-infant pathway to ≤ 1500 mrem/year for the nearest cow to the plant.

E. Radioactive Gaseous Process and Effluent Monitoring Instrumentation

The radioactive gaseous effluent 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 NRC approved methods in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The process monitoring instrumentation includes provisions for monitoring (and controlling) the concentrations of potentially explosive gas mixtures in the main condenser offgas treatment system. 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.

F. Gaseous Effluent Treatment

The requirement that the appropriate portions of these systems be used when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is 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 design objective Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the guide set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

Maintaining the concentration of hydrogen below it's flammability limits provides assurance that releases of radioactive materials will be controlled in conformance with the requirements of General Design Criteria 60 of Appendix A to 10 CFR Part 50.

G. Main Condenser

Restricting the gross radioactivity rate of noble gases from the main condenser provides reasonable assurance that the total body exposure to a member of the public at and beyond the site boundary will not exceed a small fraction of the limits of 10 CFR Part 100 in the event this effluent is inadvertently discharged directly to the environment without treatment. This specification implements the requirements of General Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50.

3/4.8.G Main Condenser (Continued)

Two air ejector off-gas monitors are provided and when their trip point is reached, cause an isolation of the air ejector off-gas line. Isolation is initiated when both instruments reach their high trip point or one has an upscale trip and the other a downscale trip. There is a fifteen minute delay before the air ejector off-gas isolation valve is closed. This delay is accounted for by the 30-minute holdup time of the off-gas before it is released to the stack.

Both instruments are required for trip but the instruments are so designed that any instrument failure gives a downscale trip. The trip settings of the instruments are set so that the instantaneous stack release rate limit given in Specification 3.8 is not exceeded.

H. Mechanical Vacuum Pump

The purpose of isolating the mechanical vacuum pump line is to limit the release of activity from the main condenser. During an accident, fission products would be transported from the reactor through the main steam lines to the condenser. The fission product radioactivity would be sensed by the main steam line radioactivity monitors, which initiate isolation.

6.9.C. Unique Reporting Requirements

1. Radioactive Effluent Release Report

A report shall be submitted to the Commission within 60 days after January 1 and July 1 of each year specifying the quantity of each of the principal radionuclides released at and beyond the site boundary in liquid and gaseous effluents during the previous 6 months. The format and content of the report shall be in accordance with Appendix B of Regulatory Guide 1.21 (Revision 1) dated June, 1974.

2. Annual Radiological Environmental Monitoring Report

A report on the radiological environmental surveillance program for the previous calendar year of operation shall be submitted to the Director of the NRC Regional Office with a copy to the Director, Office of Nuclear Reactor Regulation as a separate document prior to May 1 of the year. The reports shall include summaries, interpretations, and statistical evaluation of the results of the radiological environmental surveillance activities for the report period, operational controls and previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of any land use surveys which affect the choice of sample locations. If harmful effects or evidence of irreversible damage are detected by the monitoring, the licensee shall provide an analysis of the problem and a proposed course of action to alleviate the problem.

The Annual Radiological Environmental Monitoring Report shall include a summary of the results of analysis of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in the table and figures in the Offsite Dose Calculation Manual (ODCM) as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979.

In the event that some results are not available prior to May 1 of the year, the report shall be submitted, noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The report shall also include the following: a summary description of the radiological environmental monitoring program; at least two legible maps[1] covering all sampling locations keyed to a table giving distances and directions from the centerline of the reactor;

[1] One map shall cover stations near the site boundary; a second shall include the more distant stations.

6.9.C.2 Annual Radiological Environmental Monitoring Report (Continued)

discussion of all deviations from the sampling schedule of Table 8.1-1; and discussion of all analyses in which the lower limits of detection (LLD) required by Table 8.1-4 were not achievable.

3. Offsite Dose Calculation Manual (ODCM)

Any changes to the ODCM shall be submitted to the Commission in the semiannual radioactive effluent release report.

OPERATIONAL OBJECTIVES

7.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

7.1 Monitoring Program

Applicability:

At all times.

Specification:

A. ENVIRONMENTAL MONITORING

An environmental monitoring program shall be conducted to evaluate the effects of station operation on the environs and to verify the effectiveness of the source controls on radioactive materials.

The radiological environmental monitoring program shall be conducted as specified in Table 8.1-1.

Action:

1. With the radiological environmental monitoring program not being conducted as specified in Table 8.1-1, prepare and submit to the Commission, in the Annual Radiological Environmental Monitoring Report required by Specification 6.9.C.2, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

2. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 7.1-1 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days, a special report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken

SURVEILLANCE REQUIREMENTS

8.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

8.1 Monitoring Program

Specification:

A. ENVIRONMENTAL MONITORING

The radiological environmental monitoring samples shall be collected pursuant to Table 8.1-1 from the specific locations given in the table and figure(s) in the Offsite Dose Calculation Manual (ODCM) and shall be analyzed pursuant to the requirements of Table 8.1-1 and the detection capabilities required by Table 8.1-4.

1. Cumulative dose contributions for the current calendar year from radionuclides detected in environmental samples shall be determined in accordance with the methodology and parameters in the ODCM. These results will be reported in the Annual Radiological Environmental Monitoring Report.

7.1.A ENVIRONMENTAL MONITORING (Continued)

to reduce radioactive effluents so that the potential annual dose to a member of the public is less than the calendar year limits of Specifications 7.2, 7.3, and 7.4. When more than one of the radionuclides in Table 7.1-1 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (1)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 7.1-1 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to a member of the public is equal to or greater than the calendar year limits of Specifications 7.2, 7.3, and 7.4. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Monitoring Report.

3. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 8.1-1, identify locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program within 30 days. The specific locations from which samples were unavailable may then be deleted from the monitoring program.

7.1.A ENVIRONMENTAL MONITORING (Continued)

Pursuant to Specification 6.9.C.2, identify the cause of the unavailability of samples and identify the new location(s) obtaining replacement samples in the next Annual Environmental Radiation Monitoring Report and also include in the report the table for the ODCM reflecting the new location(s).

B. LAND USE CENSUS

A land use census shall be conducted and shall identify, within a distance of 8 km (5 miles), the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation. (For elevated releases as defined in Regulatory Guide 1.111, Revision 1, July 1977, the land use census shall also identify, within a distance of 5 km (3 miles), the locations in each of the 16 meteorological sectors of all milk animals and all gardens of greater than 50 m^2 producing broad leaf vegetation.

Action

1. With a land use census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Specification 8.4.A, identify the new location(s) in the next Annual Environmental Radiological Monitoring Report.

B. LAND USE CENSUS

The land use census shall be conducted during the growing season, at least once per 12 months 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. The results of the land use census shall be included in the Annual Radiological Environmental Monitoring Report.

Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the site boundary in each of the two different direction sectors with the highest predicted D/Qs, in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 8.1-1 shall be followed, including analysis of control samples.

OPERATIONAL OBJECTIVES	SURVEILLANCE REQUIREMENTS
7.1.B LAND USE CENSUS (Continued) 2. With a land use census identifying a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20 percent greater than at a location from which samples are currently being obtained in accordance with Specification 7.1, add the new location(s) to the Radiological Environmental Monitoring Program within 30 days. The sampling location(s), excluding the control station location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted. Identify the new location(s) in the next Annual Environmental Radiological Monitoring Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).	
7.2 Dose - Liquids	8.2 Dose - Liquids
Applicability:	Specification:
At all times.	A. Dose Calculations - Cumulative dose contributions from liquid effluents shall be determined in accordance with the ODCM for each calendar month during which releases occurred.
Specification:	
A. The dose or dose commitment to a member of the public from radioactive materials in liquid effluents released at and beyond the site boundary shall be limited: 1. During any calendar quarter to $\leq$ 1.5 mrem to the total body and to $\leq$ 5 mrem to any organ, and 2. During any calendar year to $\leq$ 3 mrem to the total body and to $\leq$ 10 mrem to any organ.	

7.2 Dose - Liquids (Continued)

Action

With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, a special report that identifies the cause(s), corrective actions taken, and corrective actions to be taken.

7.3 Dose - Noble Gases

Applicability:

At all times.

Specification:

A. The air dose in areas at and beyond the site boundary due to noble gases released in gaseous effluents shall be limited to the following:

1. During any calendar quarter, to ≤ 5 mrad for gamma radiation and ≤ 10 mrad for beta radiation; and

2. During any calendar year, to ≤ 10 mrad for gamma radiation and ≤ 20 mrad for beta radiation.

Action

With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, a special report which identifies the cause(s), the corrective actions taken, and corrective actions to be taken.

8.3 Dose - Noble Gases

Specification:

A. Dose Calculations - Cumulative dose contributions for the total time period shall be determined in accordance with the ODCM for each calendar month during which releases occurred.

7.4 Dose - Iodine-131, Iodine-133, Radioactive Material in Particulate Form, and Tritium

Applicability:

At all times

Specification:

A. The dose to a member of the public from iodine-131, iodine-133, radioactive materials in particulate form with half-lives greater than 8 days, and tritium in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

1. During any calendar quarter to ≤ 7.5 mrem to any organ, and

2. During any calendar year to ≤ 15 mrem to any organ.

Action

With the calculated dose from the release of iodine-131, iodine-133, radioactive materials in particulate form, and tritium in gaseous effluents exceeding any of the above limits; prepare and submit to the Commission within 30 days, a special report which identifies the cause(s), corrective actions taken, and the corrective actions to be taken.

7.5 Total Dose

Applicability:

At all times.

Specification:

A. The dose or dose commitment to any member of the public from Pilgrim Station sources is limited to ≤ 25 mrem to the total body or any organ (except the thyroid, which

8.4 Dose - Iodine-131, Iodine-133, Radioactive Material in Particulate Form, and Tritium

Specification:

A. Dose Calculations - Cumulative dose contributions for the total time period shall be determined for iodine-131, iodine-133, radioactive material in particulate form with half-lives greater than 8 days, and tritium in accordance with the ODCM for each calendar month during which releases occurred.

8.5 Total Dose

Specification:

A. Dose Calculations - Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with Specifications 7.2.A, 7.3.A, and 7.4.A; and in accordance with the ODCM.

7.5 Total Dose (Continued)

is limited to ≤ 75 mrem) over a period of any calendar year.

Action

With the calculated dose from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Specifications 7.2.A, 7.3.A, or 7.4.A; prepare and submit a special report to the Commission and limit the subsequent releases such that the dose or dose commitment to any member of the public from all uranium fuel cycle sources is limited to ≤ 25 mrem to the total body or any organ (except thyroid, which is limited to ≤ 75 mrem) over any calendar year. This special report shall include an analysis which demonstrates that radiation exposures to all members of the public from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40 CFR, Part 190 standard. Otherwise, obtain a variance from the Commission to permit releases which exceed the 40 CFR, Part 190 standard.

TABLE 7.1-1

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Reporting Levels				
	Water (pCi/L)	Airborne Particulate or Gases (pCi/M^3)	Fish (pCi/kg, wet)	Milk (pCi/l)	Vegetables (pCi/kg, wet)
H-3	2×10^4				
Mn-54	1×10^3		3×10^4		
Fe-59	4×10^2		1×10^4		
Co-58	1×10^3		3×10^4		
Co-60	3×10^2		1×10^4		
Zn-65	3×10^2		2×10^4		
Zr-95	4×10^2				
I-131	2	0.9		3	1×10^2
Cs-134	30	10	1×10^3	60	1×10^3
Cs-137	50	20	2×10^3	70	2×10^3
Ba-140	2×10^2			3×10^2	

TABLE 8.1-1
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway or Sample Type	Locations (Direction-Distance) from Reactor	Sampling and Collection Frequency	Type and Frequency of Analysis
AIRBORNE			
Particulates	11 Locations (See Table 8.1-2)	Continuous sampling over one week	Gross beta radioactivity 24 hours or more after filter change[1]
Quarterly	11 Locations (See Table 8.1-2)		Composite (by location) for gamma isotopic[2]
Radioiodine	11 Locations (See Table 8.1-2)	Continuous sampling with canister collection weekly	Analyze weekly for I-131
DIRECT[5]	40 Locations (See Table 8.1-3)	Quarterly	Gamma exposure quarterly
	Plymouth Beach and Priscilla/White Horse Beach	Annually	Gamma exposure survey[5]
WATERBORNE (Surface Water)	Discharge Canal	Continuous composite sample	Gamma isotopic[2] monthly, and composite for H-3 analysis quarterly[3]
	Bartlett Pond (SE-1.7 mi)	Weekly grab sample	
	Powder Point (NNW-7.8 mi)[4]	Weekly grab sample	
AQUATIC			
Shellfish (clams, mussels or quahogs as available)	Discharge outfall Duxbury Bay Manomet Point Plymouth or Kingston Harbor Marshfield[4]	Quarterly (at approximate 3-month intervals)	Gamma isotopic[2,6]

TABLE 8.1-1 (Continued)
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway or Sample Type	Locations (Direction-Distance) from Reactor	Sampling and Collection Frequency	Type and Frequency of Analysis
Lobster	Vicinity of discharge point	Four times per season	Gamma isotopic[2] on edible portions
	Offshore[4]	Once per season	
Fish	Vicinity of discharge point	Quarterly (when particular species available) for Groups I and II[5], in season for Groups III and IV[5], annually for each group	Gamma isotopic[2] on edible portions[5]
	Offshore[4]		
Sediments	Rocky Point Plymouth Harbor Duxbury Bay Plymouth Beach Manomet Point Marshfield	Semiannually	Gamma isotopic[2,3,7]
INGESTION (Terrestrial)			
Milk	Plymouth County Farm, when available (W-3.5 mi)[8]	Semimonthly during periods when animals are on pasture, otherwise monthly	Gamma isotopic[2], radioiodine analysis all samples
	Whitman Farm (NW-21 mi)[4]		
Cranberries	Manomet Point Bog (SE-2.6 mi)	At time of harvest	Gamma isotopic[2] on edible portions
	Bartlett Rd. Bog (SSE/S-2.8 mi)		
	Pine St. Bog (WNW-17 mi)[4]		

TABLE 8.1-1 (Continued)
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway or Sample Type	Locations (Direction-Distance) from Reactor	Sampling and Collection Frequency	Type and Frequency of Analysis
Tuberous and green leafy vegetables	Plymouth County Farm (W-3.5 mi)[8] Bridgewater Farm (W-20 mi)[4]	At time of harvest	Gamma isotopic[2] on edible portions
Beef Forage	Plymouth County Farm (W-3.5 mi)[8] Whitman Farm (NW-21 mi)[4]	Annually	Gamma Isotopic[2]

TABLE 8.1-1 (Continued)
NOTES

[1] If gross beta radioactivity is greater than 10 times the control value, gamma isotopic will be performed on the sample.

[2] Gamma isotopic means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

[3] If integrated gamma activity (less K-40) is greater than 10 times the control value (less K-40), strontium-90 analysis will be performed on the sample.

[4] Indicates control location.

[5] Fish analyses will be performed on a minimum of 2 sub-samples, consisting of approximately 400 grams each from each of the following groups:

I. Bottom Oriented	II. Near Bottom Distribution	III. Anadromous	IV. Coastal Migratory
Winter flounder	Tautog	Alewife	Bluefish
Yellowtail founder	Cunner	Rainbow smelt	Atlantic herring
	Atlantic cod	Striped bass	Atlantic menhaden
	Pollock		Atlantic mackerel
	Hakes		

[6] Mussel samples from four locations (immediate vicinity of discharge outfall, Manomet Point, Plymouth or Kingston Harbor, and Green Harbor in Marshfield) will be analyzed quarterly as follows:

One kilogram wet weight of mussel bodies, including fluid within shells will be collected. Bodies will be reduced in volume by drying at about 100°C. Sample will be compacted and analyzed by Ge(Li) gamma spectrometry or alternate technique, if necessary, to achieve a sensitivity of 5 pCi/kg for Cs-134, Cs-137, Co-60, Zn-65, and Zr-95; and 15 pCi/kg for Ce-144. Sensitivity values are to be determined in accordance with a 95% confidence level on k_a and a 50% confidence level on k_b (See HASL-300 for definitions).

The mussel shell sample from one location will be analyzed each quarter. One additional mussel shell sample will be analyzed semiannually. Unscrubbed shells to be analyzed will be dried, processed, and analyzed similarly to the mussel bodies.

TABLE 8.1-1 (Continued)
NOTES

Because of the small volume reduction in pre-processing of shells, sensitivities attained will be less than that for mussel bodies. The equipment and counting times to be employed for analyses of shells will be the same or comparable to that employed for mussel bodies so that the reduction in sensitivities (relative to those for mussel bodies) will be strictly limited to the effects of poorer geometry related to lower sample volume reduction. Shell samples not scheduled for analysis will be reserved (unscrubbed) for possible later analysis.

If radiocesium (Cs-134 and Cs-137) activity exceeds 200 pCi/kg (wet) in mussel bodies, these samples will be analyzed by radiochemical separation, electrodeposition, and alpha spectrometry for radioisotopes of plutonium, with a sensitivity of 0.4 pCi/kg.

7 Sediment samples from four locations (Manomet Point, Rocky Point, Plymouth Harbor, and head of Duxbury Bay) will be analyzed once per year (preferably early summer) as follows:

Cores will be taken to depths of 30-cm, minimum depth, wherever sediment conditions permit, by a hand-coring sampling device. If sediment conditions do not permit 30-cm deep cores, the deepest cores achievable with a hand-coring device will be taken. In any case, core depths will not be less than 14-cm. Core samples will be sectioned into 2-cm increments; surface and alternate increments will be analyzed, all others will be reserved. Sediment sample volumes (determined by core diameter and/or number of individual cores taken from any single location) and the counting technique will be sufficient to achieve sensitivities of 50 pCi/kg dry sediment for Cs-134, Cs-137, Co-60, Zn-65, and Zr-95 and 150 pCi/kg for Ce-144. In any case, individual core diameters will not be less than 2 inches.

The top 2-cm section from each core will be analyzed for Pu isotopes (Pu-238, Pu-239, and Pu-240) using radiochemical separations, electrodeposition, and alpha spectrometry with target sensitivity of 25 pCi/kg dry sediment. Two additional core slices per year (mid-depth slice from two core samples) will be similarly analyzed.

8 These locations may be altered in accordance with results of surveys discussed in Specification 8.1.B.

9 Minimum sensitivities for gamma exposure measurements are as follows:

Gamma exposure - 1 R/hr average exposure rate.
Gamma exposure survey - 1 R/hr exposure rate.

TABLE 8.1-2

AIR PARTICULATES, GASEOUS RADIOIODINE, AND SOIL SURVEILLANCE STATIONS

Sampling Location (Sample Designation)	Distance and Direction from Reactor
Offsite Stations	
East Weymouth (EW) (Control Station)	21 miles NW
Plymouth Center (PC)	4.0 miles W-WNW
Manomet Substation (MS)	2.5 miles SE
Cleft Rock Area (CR)	0.9 miles S
Onsite Stations	
Rocky Hill Road (ER)	0.8 miles SE
Rocky Hill Road (WR)	0.3 miles W-WNW
Overlook Area (OA)	0.03 miles W
Property Line (PL)	0.34 miles NW
Pedestrian Bridge (PB)	0.14 miles N
East Breakwater (EB)	0.35 miles ESE
Warehouse (WS)	0.03 miles SSE

TABLE 8.1-3

EXTERNAL GAMMA EXPOSURE SURVEILLANCE STATIONS[1]

Dosimeter Location (Designation)	Distance and Direction from Station
ONSITE STATIONS	
Property Line (D)	0.17 miles NNW
Property Line (F)	0.12 miles NW
Property Line (I)	0.14 miles W
Property Line (G)	0.20 miles WSW
Rocky Hill Road (A)	0.12 miles SW
Property Line (H)	0.21 miles SSW
Public Parking Area (PA)	0.07 miles N-NNE
Pedestrian Bridge (PB)	0.1 miles NE
Overlook Area (OA)	0.03 miles W
East Breakwater (EB)	0.26 miles ESE
Property Line (C)	3.3 miles ESE-SE
Property Line (HB)	0.34 miles SE
Rocky Hill Road (B)	0.26 miles SSE
Microwave Tower (MT)	0.38 miles S
Emerson Road (EM)	0.68 miles SE-SSE
White Horse Road (WH)	0.89 miles SE-SSE
Property Line (E)	0.75 miles SSE-S
Rocky Hill Road (WR)	0.3 miles W-WNW
Property Line (J)	1.36 miles SSE-S
Property Line (K)	1.42 miles SSE-S
Rocky Hill Road (ER)	0.8 miles SE
Property Line (L)	0.40 miles E

TABLE 8.1-3 (Continued)
EXTERNAL GAMMA EXPOSURE SURVEILLANCE STATIONS[1]

Dosimeter Location (Designation)	Distance and Direction from Station
ONSITE STATIONS (Continued)	
Warehouse (WS)	0.1 miles SE
Property Line (PL)	0.3 miles W
OFFSITE STATIONS	
Duxbury (SS)	6.25 miles SSW-SW
Kingston (KS)	10 miles WNW
North Plymouth (NP)	5.5 miles WNW
Plymouth Center (PC)	4.0 miles W-WNW
South Plymouth (SP)	3 miles WSW
Bayshore Drive (BD)	0.7 miles W-WNW
Cleft Rock Area (CR)	0.9 miles S
Manomet (MP)	2.25 miles ESE-S
Manomet (ME)	2.5 miles SE
Manomet (MS)	2.5 miles SSE
Manomet (MB)	3.5 miles SE-SSE
College Pond (CP)	6.5 miles SSW-SW
Sagamore (CS)	10 miles SSE-S
Plymouth Airport (SA)	8 miles WSW
East Weymouth (EW)[2]	21 miles NW
Saquish Neck (SN)[3]	4.6 miles NNW

1 Thermal Luminescent Dosimeters (TLDs)
2 Control Station
3 TLDs for this location will be provided to a third party and will be analyzed for gamma exposure whenever returned to Boston Edison Company.

TABLE 8.1-4
MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD)[a]

Analysis	Water (pCi/kg)	Airborne Particulate or Gas (pCi/M^3)	Wet Solids (pCi/kg, wet)	Milk (pCi/g)	Food Products (pCi/kg, wet)	Dry Solids (pCi/kg, dry)
gross beta	4[b]	1×10^{-2}				
^{3}H	2000[d]					
^{54}Mn	15		130			
^{59}Fe	30		260			
$^{58,60}Co$	15		130			50
^{65}Zn	30		260			50
^{95}Zr	15					50
^{131}I	1	7×10^{-2}		1	60[c]	
$^{134,137}Cs$	15, 18	1×10^{-2}	130	15	60	50
^{140}Ba	15			15		
^{144}Ce						150

[a] Refer to ODCM for LLD definition.

[b] LLD for surface water.

[c] LLD for leafy vegetables.

[d] If no drinking water pathway exists, a value of 3000 pci/l may be used.

BASES

7/8.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

7/8.1 Monitoring Program

7/8.1.A ENVIRONMENTAL MONITORING

An environmental radiological monitoring program is conducted to verify the adequacy of in-plant controls on the release of radioactive materials. The program is designed to detect radioactivity concentrations to ensure that radiation doses to individuals do not exceed the levels set forth in 10 CFR 50, Appendix I.

A supplemental monitoring program for sediments and mussels has been incorporated into the basic program (see Notes 6 and 7 to Table 8.1-1) as a result of an agreement with the Massachusetts Wildlife Federation. This supplemental program is designed to provide information on radioactivity levels at substantially higher sensitivity levels in selected samples to verify the adequacy (or, alternatively, to provide a basis for later modifications) of the long-term marine sampling schedules. As part of the supplemental program, analysis of mussels for isotopes of plutonium will be performed if radiocesium activity should exceed 200 pCi/kg in the edible portions.

The 200 pCi/kg radiocesium "action level" is based on calculations which show that if radiocesium from plant releases reached this level, plutonium could possibly appear at levels of potential interest.[1] The calculations also show that the dose delivered from these levels of plutonium would not be a significant portion of the total dose attributable to liquid effluents.

The program was also designed to be consistent, wherever applicable, with NUREG 0473.

Groundwater flow at the plant site is into Cape Cod Bay; therefore, terrestrial monitoring of groundwater is not included in this program.

Detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLD). The LLD in Table 8.1.4 is considered optimum for routine environmental measurements in industrial laboratories. 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.

Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (revised annually), curie, 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).

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[1] In measurable quantities having a potential dose (human food chain) significance comparable to other nuclides if present at their detection limits.

BASES

7/8.1.B LAND USE CENSUS

This section is provided to ensure that changes in the use of areas at and beyond the site boundary are identified and that modifications to the radiological environmental monitoring program are made if required by the results of this census. The best information from the door-to-door survey, from aerial survey, or from consulting with local agricultural authorities shall be used. This census satisfies the requirements of 10CFR50, Appendix I, Section IV.B.3. 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/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made: 1) 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and 2) a vegetation yield of 2 kg/m^2.

7/8.2 DOSE - LIQUID

This section is provided to implement the requirements of Sections II.A, III.A, and IV.A of 10CFR50, Appendix I, to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable." Because Pilgrim is not a site where plant operations can conceivably affect drinking water, none of these requirements are intended to assure compliance with 40 CFR 141. The dose calculations in the ODCM implement the requirements of 10CFR50, Appendix I, Section III.A to ensure 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 10CFR 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. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.113.

BASES

7/8.3 DOSE - NOBLE GASES

This section is provided to implement the requirements of 10CFR50, Appendix I, Sections II.B, III.A, and IV.A to ensure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The surveillance requirements implement the requirements of 10CFR50, Appendix I, Section III.A to ensure 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 are consistent with the methodology provided in Regulatory Guide 1.109 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 average atmospheric conditions. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111.

7/8.4 DOSE - IODINE-131, IODINE-133, RADIOACTIVE MATERIAL IN PARTICULATE FORM, AND TRITIUM

This section is provided to implement the requirements of Sections II.C, III.A and IV.A of 10 CFR50, Appendix I, to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." The ODCM calculational methods specified in the surveillance requirements implement the requirements of 10CFR50, Appendix I, Section III.A to ensure that the actual exposure of a member of the public through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methods approved by the NRC 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 Guides 1.109 and 1.111. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate specifications for iodine-131, radioactive material in particulate form with half-lives greater than 8 days, and radionuclides other than noble gases are dependent on the existing radionuclide pathways to man, in 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.

BASES

7/8.5 TOTAL DOSE

This section is provided to meet the dose limitations of 40CFR190 that have now been incorporated into 10CFR20 by 46 FR 18525. The specification requires the preparation and submittal of a special report whenever the calculated doses from plant radioactive effluents exceed twice the design objective doses of 10CFR50, Appendix I. 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 40CFR190 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 40CFR190 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, except 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 limits of 40CFR190, a request for a variance in a special report in accordance with 40CFR190.11 and 10CFR20.405C is considered to be a timely request and fulfills the requirements of 40CFR190 until NRC staff action is completed. This is provided that the release conditions resulting in violation of 40CFR190 have not already been corrected. The variance only relates to the limits of 40CFR190, and does not apply in any way to the other requirements for dose limitation of 10CFR20. An individual is not considered a member of the public during any period in which he/she is engaged in any operation that is part of the nuclear fuel cycle.