January 23, 1980

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY	)	Docket No. 50-289
	)	(Restart)
(Three Mile Island Nuclear	)	
Station, Unit No. 1)	)	

LICENSEE'S FIRST SET OF INTERROGATORIES TO INTERVENOR MARVIN I. LEWIS

These interrogatories are filed pursuant to 10 C.F.R. § 2.740b, which requires that the interrogatories be answered separately and fully in writing and under oath or affirmation. Licensee recognizes that you may not now be able to completely answer all interrogatories propounded below, since some areas are the subject of discovery by you to Licensee. Licensee therefore requests that each of these interrogatories be answered within the time specified in § 2.740b to the extent that responsive information is presently available to you. With respect to those interrogatories for which complete and responsive information is not now available to you, Licensee requests that revised answers be provided prior to the close of the discovery period established in the Licensing Board's December 18, 1979 First Special Prehearing Conference Order.

The following definitions apply to each of the interrogatories below:

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A. "Document" means all writings and records of every type including, but not limited to memoranda, tapes, correspondence, reports, surveys, tabulations, charts, books, pamphlets, photographs, maps, bulletins, minutes, notes, diaries, logs, speeches, articles, transcripts and all other records, written, electrical, mechanical or otherwise.

B. "Identify" means:

(1) With respect to a natural person, name, present or last known home or business address, present or last known job title or position, and the dates of tenure in that position;

(2) With respect to a document, the type of document (e.g., letter, record, list, memorandum, memorandum of telephone or face-to-face conversation, etc.), date of the document, title of the document, subject of the document, name of person who prepared the document, and name of person for whom the document was prepared or to whom it was delivered.

Interrogatories on the Lewis Contention

1-1. Explain with particularity the basis for your claim that it is necessary to install preheaters on the filters in the TMI-1 auxiliary building.

1-2. Identify and describe the nature of each and every design error which you contend exists in the TMI-1 filter system.

1-3. With respect to each design error identified in response to Interrogatory 1-2 above, state with particularity what you contend must be done to correct the design error.

1-4. With respect to each proposed action identified in response to Interrogatory 1-3 above, explain how it would improve on the systems presently installed at TMI-1 for the control, hold-up and filtration of radioactive gases, as described in Section III-D-2-a of the Final Environmental Statement for TMI-1 and TMI-2 (copy attached).

1-5. Do you contend that the safety evaluation performed by the NRC Staff with respect to the adequacy of the TMI-1 gaseous radwaste systems, as described in the January 11, 1980 Status Report on the Evaluation of Licensee's Compliance with the NRC Order dated August 9, 1979, pages C5-1 through C5-14, is inadequate to resolve the concerns identified in your contention. If so:

(a) Describe in detail the inadequacies of the gaseous radwaste system safety evaluation performed by the NRC Staff, with special consideration given to the cost-benefit analysis made by the NRC Staff.

(b) For each inadequacy listed, set forth each and every fact and the source of each and every fact relating to or bearing upon the allegation.

(c) For each inadequacy listed, identify all documents, and the particular parts thereof, containing any evidence or information relating to or bearing upon the allegation.

1-6. Describe your understanding of the purpose(s) served by the filters in the TMI-1 auxiliary building.

1-7. Do you contend that the filters in the TMI-1 auxiliary building should be designed to handle gaseous releases more severe than conditions associated with the design basis accidents for TMI-1? If so, describe each accident scenario which you contend the filters should be designed to handle.

Interrogatory No. 2

2-1. With respect to each individual whom you intend to call as a witness in this proceeding:

(a) Identify by name, address and affiliation each such individual;

(b) State the educational and professional background of each such individual, including occupation and institutional affiliations, publications and papers;

(c) Describe the nature of the testimony which will be presented by each such individual, including an identification of all documents which the individual will rely upon in the testimony;

(d) Identify by court, agency or other body, proceeding, date and subject matter all prior testimon.y by each such individual.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

By: [signature]
George F. Trowbridge

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Washington, D.C. 20036
Tel: (202) 331-4100
Counsel for Licensee

Dated: January 23, 1980

under the natural draft cooling towers (capacity 8 x 10^6 gallons) is approximately 70 minutes and the temperature rise in the condenser cooling circuits is 28°F.

The maximum consumption of river water when the two units are operating at full power is 20,800 gal/minute. This is evaporated from the four natural draft cooling towers, and the two small forced draft towers.

2. Radioactive Waste

In the operation of nuclear power reactors, radioactive material is produced by fission and by neutron activation reactions of metals and material in the reactor coolant system. Small amounts of gaseous and liquid radioactive wastes enter the effluent streams, which are monitored and processed within the Station to minimize the radioactive nuclides that will ultimately be released to the atmosphere and into the Susquehanna River at low concentrations under controlled conditions. The Limitations of 10 CFR Part 20 and the "As Low As Practicable" requirements of 10 CFR Part 50 with respect to radioactive releases will be met during the operation of the Station at full power.

The waste treatment systems for the Station, described in the following paragraphs, are designed to collect and process the gaseous, liquid, and solid waste which may contain radioactive materials. These waste handling and treatment systems are discussed in detail in the Final Safety Analysis Report for Unit 1 (March 2, 1970), in the Preliminary Safety Analysis Report for Unit 2 (March 1969), and in the Applicant's Revised Environmental Report dated December 1971.

a. Gaseous Waste. During power operation of the facilities, radioactive materials released to the atmosphere in gaseous effluents include low concentrations of fission product noble gases (krypton and xenon), halogens (mostly iodines), tritium contained in water vapor and particulate material including both fission products and activated corrosion products. The systems for the processing of radioactive gaseous waste and ventilation paths are shown schematically in Figures 9-11.

Concentrations of various solutes, such as hydrogen and boron, in the primary coolant are maintained at specified values, and the buildup of fission and activation products is limited by withdrawing coolant at a normal rate of 45 gpm (the letdown stream). A side stream from this coolant is cooled, depressurized, and diverted to the makeup and purification system and, as necessary, to the boron management system or the liquid waste disposal system, Figure 12. Normally, the vent valves on the makeup and purification system equipment are closed and the system is operated at positive pressure. By this procedure the inventories of noble gases in the coolant increase to steady-state values except in the case of long-lived krypton-85. Only the coolant that is diverted to the boron control system is normally degassed.

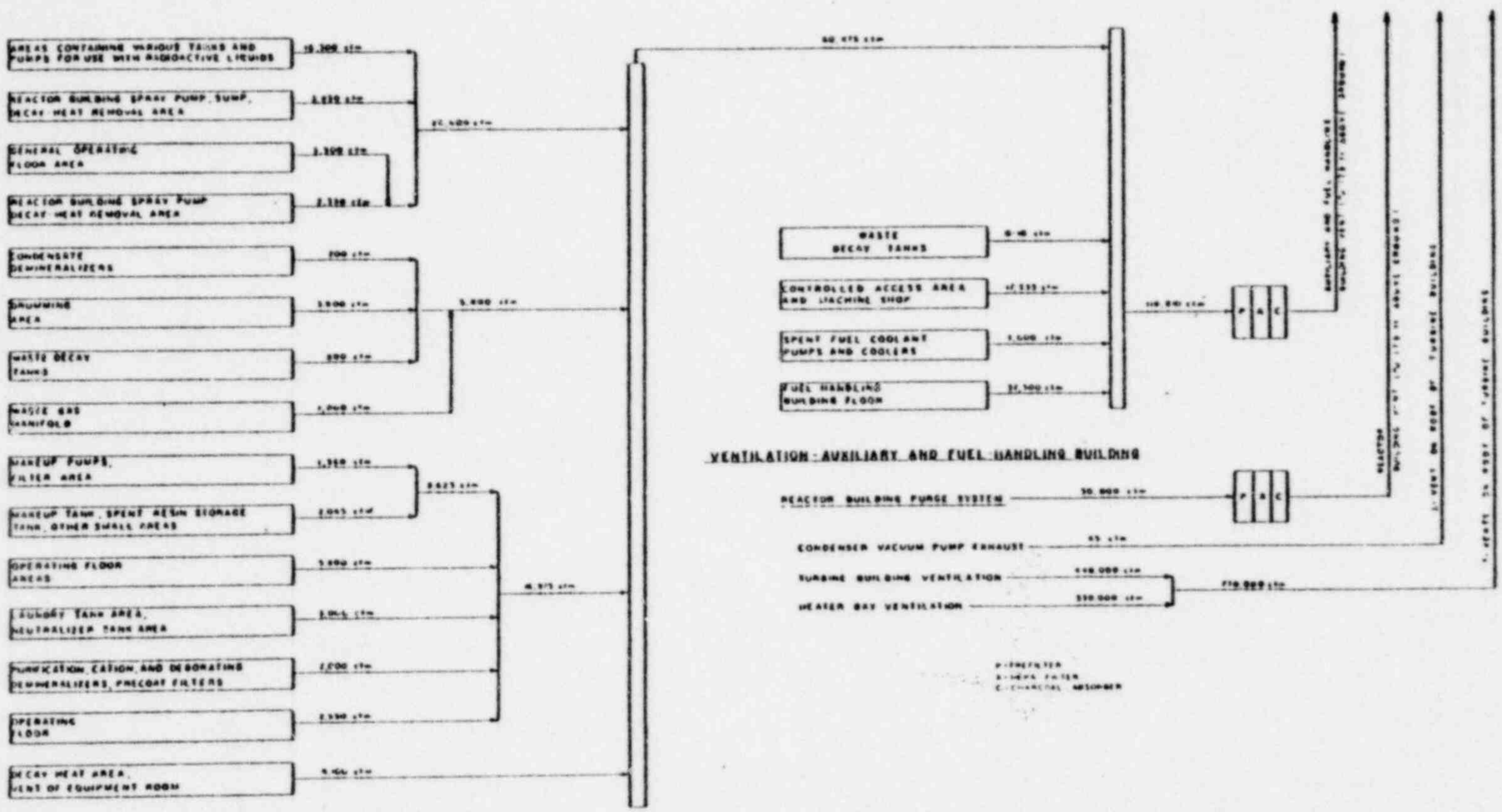

Figure 9 – VENTILATION SYSTEMS, THREE MILE ISLAND NUCLEAR STATION UNIT 1

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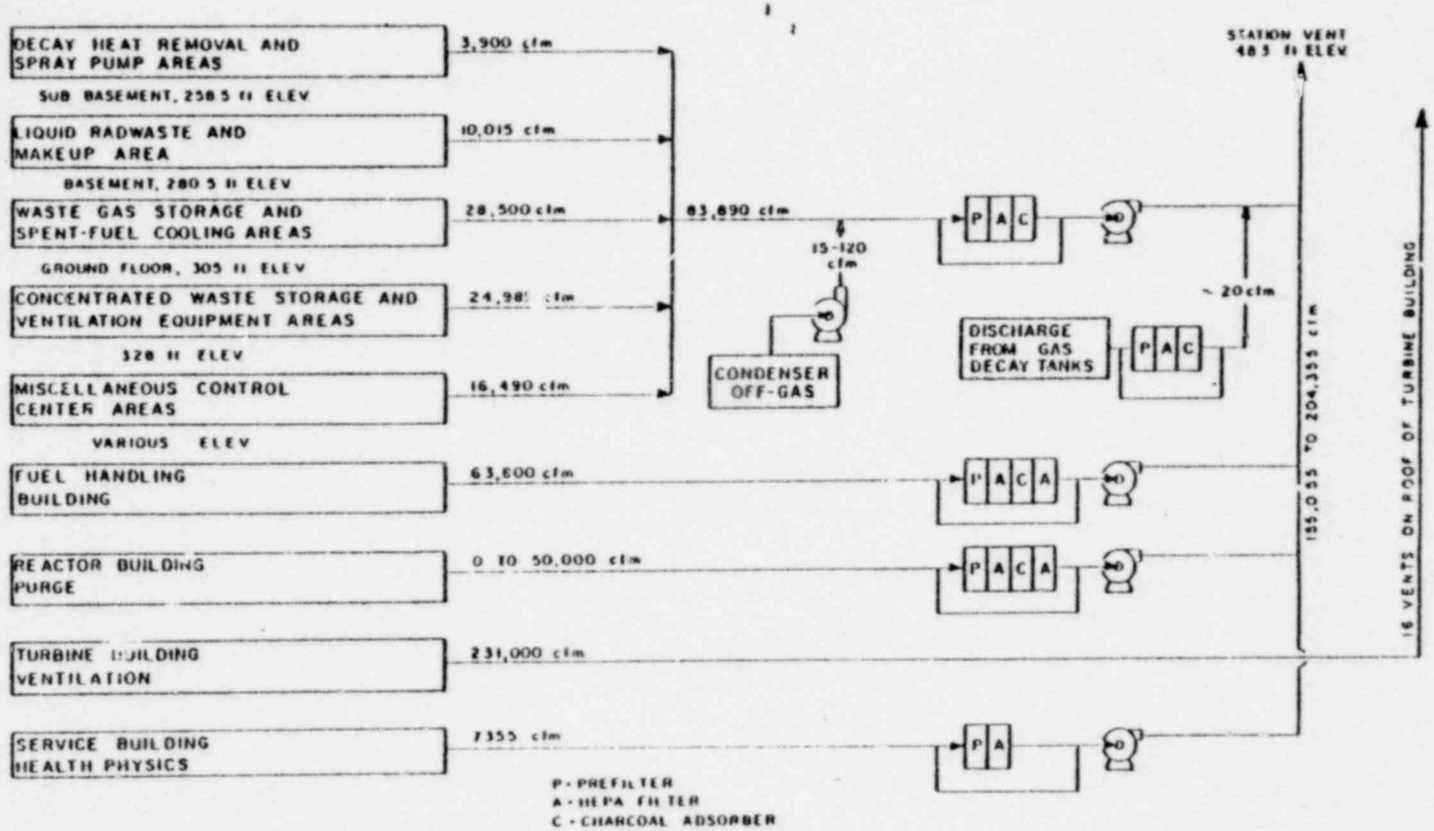

Figure 10 - VENTILATION SYSTEM, THREE MILE ISLAND NUCLEAR STATION - UNIT 2

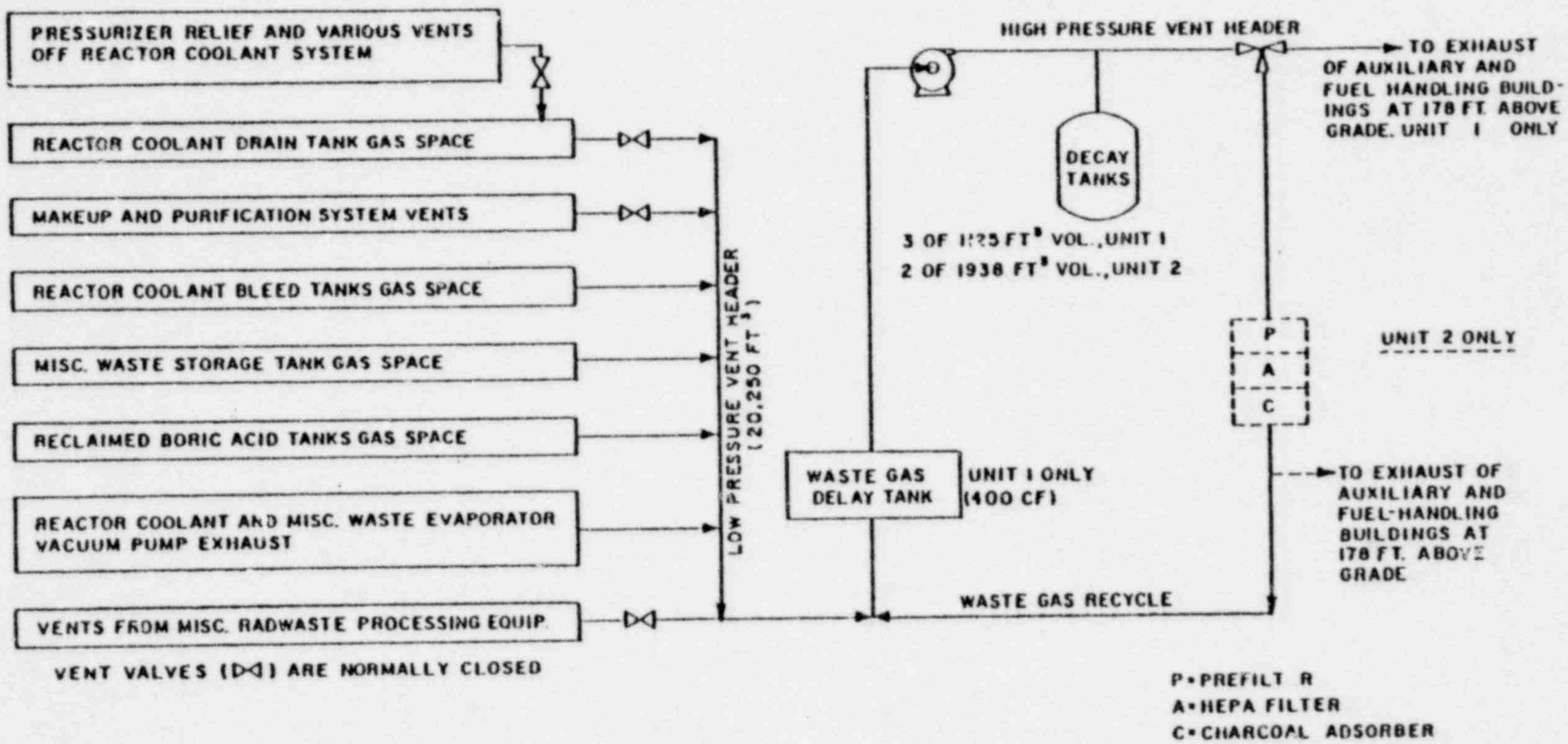

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Figure 11 – GASEOUS RADIOACTIVE WASTE COLLECTION SYSTEMS, THREE MILE ISLAND UNITS 1 AND 2

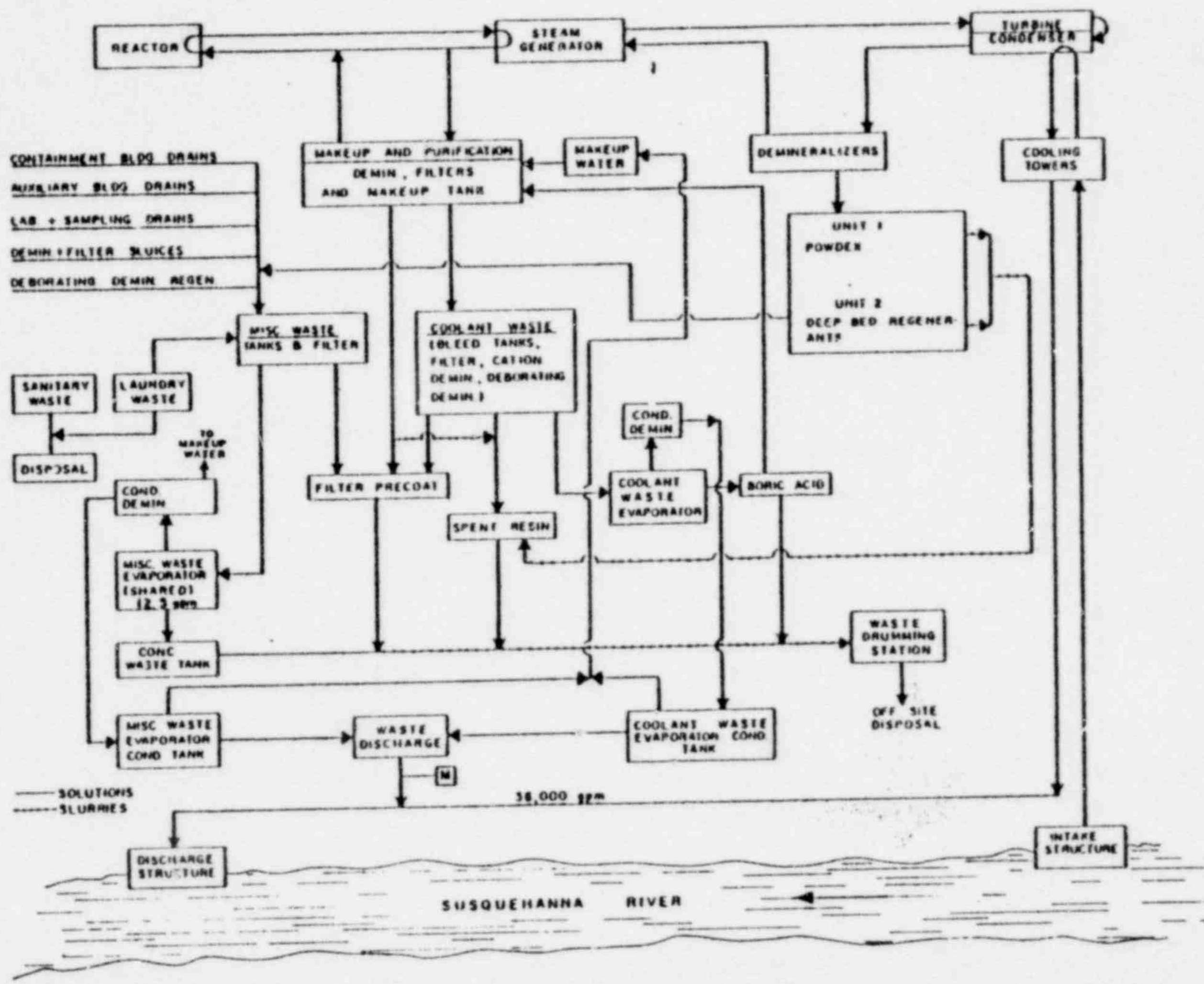

Figure 12 - LIQUID RADIOACTIVE WASTE TREATMENT SYSTEM, THREE MILE ISLAND, UNITS 1 AND 2

Gases stripped from the recycled reactor coolant together with cover gases are collected, compressed, and stored in pressurized tanks for radioactive decay. With the exception of long-lived krypton-85, the gases will decay to a small fraction of the original amount prior to being released. The gas is filtered through high efficiency particulate filters and charcoal adsorbers and released to the atmosphere through the auxiliary building vent stack. The holdup system was evaluated based on the Applicants' statement that a minimum holdup of 30 days will be used.

Additional sources of radioactive gases which are not concentrated enough to permit collection and storage include the auxiliary building exhaust, the turbine building exhaust, the reactor building containment air, and the main condenser air ejectors, which remove radioactive gases which have collected in the condenser as a result of primary to secondary system leakage. The air ejector exhaust from the main condenser of Unit 1 is discharged through the turbine building exhaust without treatment. The ejector exhaust from Unit 2 is routed through demisters to the auxiliary building filter train and released to the station vent.

The auxiliary building is maintained at a slightly negative pressure with respect to ambient pressure. All the exhaust air is filtered through high efficiency particulate filters (HEPA) prior to being discharged through the auxiliary building vent stack. Areas within the auxiliary building which have possible contamination have the capability to be exhausted through charcoal adsorbers in addition to HEPA filters.

The steam generators are once-through units with no blowdown and with full flow demineralizers on the condensate return. Turbine building ventilation is discharged to atmosphere without treatment through roof-mounted exhaust fans.

Calculations of expected normal discharges of noble gases and iodines are summarized in Tables 4 and 5. The bases for these calculations are presented in Table 8.

b. <u>Liquid Wastes</u>. All equipment relevant to the liquid waste processing system is duplicated in the two units except the miscellaneous waste evaporator which is located in Unit 1 and shared by Unit 2. A notable difference between the two units is the method of condensate demineralization. Unit 1 uses Powdex; whereas, Unit 2 uses deep-bed demineralizers. Due to the constraints on waste processing in the miscellaneous waste subsystem, we assumed in our evaluation that 10% of the deep-bed regenerant solution and 100% of the Powdex sluice water will be released to the environment without treatment.

In both units a make-up and purification system maintains the quality and boron concentration of the primary coolant. A stream is continuously "letdown," cooled, demineralized in a mixed bed ion exchanger,

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Table 4
ANTICIPATED ANNUAL RELEASE OF RADIOACTIVE NUCLIDES IN GASEOUS EFFLUENT FROM THREE MILE ISLAND UNIT 1

Discharge Rate (Ci/yr)

Isotope	Containment Purge	Gas Processing System	Steam Generator Leak	Auxiliary Building Leak	Total
Kr-83m	–	–	1	1	2
Kr-85m	–	–	5	5	10
Kr-85	20	665	10	10	705
Kr-87	–	–	2	3	5
Kr-88	–	–	9	9	18
Xe-131m	2	53	6	5	66
Xe-133m	–	–	10	10	20
Xe-133	140	890	860	850	2740
Xe-135	–	–	15	15	30
Xe-138	–	–	20	20	40
I-131	.04	–	.01	.08	.13
I-133	–	–	.01	.08	.09

Table 5
ANTICIPATED ANNUAL RELEASE OF RADIOACTIVE NUCLIDES IN GASEOUS EFFLUENT FROM THREE MILE ISLAND UNIT 2

Discharge Rate (Ci/yr)

Isotope	Containment Purge	Gas Processing System	Steam Generator Leak	Auxiliary Building Leak	Total
Kr-83m	-	-	1	1	2
Kr-85m	-	-	5	5	10
Kr-85	20	725	10	10	770
Kr-87	-	-	3	3	6
Kr-88	-	-	9	10	19
Xe-131m	2	60	6	6	74
Xe-133m	-	-	1	1	2
Xe-133	160	970	940	930	3000
Xe-135	-	-	16	16	32
Xe-138	-	-	2	2	4
I-131	.04	-	-	.08	.12
I-133	-	-	-	.09	.09

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filtered, and fed to the make-up tank from which it is returned to the reactor. When the boron concentration is being lowered, a "bleed" stream from the "letdown" stream is directed to the coolant waste system. This stream is processed through a demineralizer, filter and evaporator. The condensate from the evaporator passes through a mixed bed demineralizer to a storage tank from which it may be recycled or discharged. The concentrated boric acid (evaporator bottoms) is stored for re-use in a subsequent core cycle or sent to the radioactive waste drumming station for off-site disposal.

During the last portion of the core cycle, when the boron concentration is the lowest, the entire "letdown" stream is also passed through a deborating demineralizer to effect reduction of boron content, rather than by use of a "bleed" stream. This mode of operation does not produce a waste stream directly; however, this deborating bed is regenerated, and the neutralized regenerants and rinses are processed through the miscellaneous waste system. No other demineralizers processing radioactive streams are regenerated except the main condensate demineralizers in Unit 2, mentioned above. Other waste-water containing boric acid from reactor shutdowns, startups, and refueling operations is also processed through the coolant waste disposal system equipment.

Wastes collected in the containment and auxiliary building drains, lab and sampling drains, demineralizer resin and filter precoat sluice water, deborating bed regenerants, and decontamination and other miscellaneous wastes are processed in the miscellaneous waste system. These wastes are collected, filtered, and evaporated. The condensate from this evaporator is passed through a polishing demineralizer and then routed to recycle or to hold-up for discharge. Bottoms from this evaporator are stored in the concentrated waste tank until they can be processed through the waste drumming station.

Laundry wastes will be collected, filtered, monitored, and normally routed with the sanitary wastes. The turbine building drains are monitored and discharged to the cooling tower effluent stream. From an accumulative leak rate of 5 gpm from all systems in the turbine building that contain secondary coolant we expect less than .05 Ci/yr.

Controlled discharges will be made from the radwaste systems into the cooling tower effluent stream. This flow is 36,000 gpm on an annual average basis for the combined units. Unit 1 can discharge waste at up to 30 gpm while Unit 2 can achieve a maximum of 50 gpm. Activity monitors and flow controllers will maintain approximate activity levels. Discharges cannot be made from both units simultaneously. No discharge will be made unless the cooling tower effluent flow is at least 5000 gpm.

Based on the assumptions noted above and shown on Table 8, the releases from the primary sources for normal operation were calculated to be less than 5 Ci/year per unit. To compensate for treatment equipment

Table 6

ANTICIPATED ANNUAL RELEASE OF RADIOACTIVE MATERIAL IN THE LIQUID EFFLUENT FROM THREE MILE ISLAND UNIT 1

Nuclide	Curies/yr
Rb-86	0.00055
Sr-89	0.00044
Y-90	0.00005
Y-91	0.0099
Zr-95	0.00007
Nb-95	0.00007
Mo-99	0.037
Tc-99m	0.037
Ru-103	0.00005
Rh-103m	0.00005
Sb-124	0.00005
Te-125m	0.00003
Te-127m	0.00032
Te-127	0.00035
Te-129m	0.0016
Te-129	0.0010
Te-131m	0.00074
Te-131	0.00014
Te-132	0.019
I-130	0.0013
I-131	1.8
I-132	0.020
I-133	0.21
I-135	0.025
Cs-134	0.21
Cs-136	0.083
Cs-137	0.17
Ba-137m	0.16
Ba-140	0.00048
La-140	0.00042
Ce-141	0.00007
Ce-144	0.00005
Pr-143	0.00007
Pr-144	0.00005
Nd-147	0.00002
Na-24	0.00007
P-32	0.00007
Cr-51	0.0011
Fe-55	0.0010
Fe-59	0.0006
Co-58	0.0097
Co-60	0.0012
Ni-63	0.00009
W-185	0.00005
W-187	0.00058
Np-239	0.00035

TOTAL ~ 3.0

Tritium-1,000 Ci/yr

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Table 7

ANTICIPATED ANNUAL RELEASE OF RADIOACTIVE MATERIAL
IN LIQUID EFFLUENTS FROM THREE MILE ISLAND UNIT 2

Nuclide	Ci/yr
Rb-86	.0012
Sr-89	.0041
Sr-90	.00012
Sr-91	.000018
Y-90	.000072
Y-91	.0082
Zr-95	.00072
Nb-95	.00080
Mo-99	.032
Tc-99m	.030
Ru-103	.00048
Ru-106	.00014
Rh-103m	.00048
Rh-106	.00014
Sb-124	.00036
Sb-125	.000036
Te-125m	.00034
Te-127m	.0036
Te-127	.0034
Te-129m	.014
Te-129	.0088
Te-131m	.0012
Te-131	.00021
Te-132	.050
I-130	.0013
I-131	2.7
I-132	.052
I-133	.20
I-135	.021
Cs-134	.54
Cs-136	.15
Cs-137	.41
Ba-137m	.39
Ba-140	.0030
La-140	.0032
Ce-141	.00066
Ce-143	.00002
Ce-144	.00045
Pr-143	.00039
Pr-144	.00045
Nd-147	.00014

Nuclide	Ci/yr
Pm-147	.000054
Na-24	.000089
P-32	.00048
Cr-51	.0088
Mn-54	.000036
Fe-55	.011
Fe-59	.0054
Co-58	.095
Co-60	.013
Ni-63	.011
Zn-65	.000054
W-185	.00045
W-187	.00082
Np-239	.00075

TOTAL ~ 5.0

Tritium 1,000 Ci/yr

Table 8

ASSUMPTIONS USED IN DETERMINING RELEASES OF RADIOACTIVE EFFLUENTS AT THREE MILE ISLAND

	Unit 1	Unit 2
Reactor Power, MWt	2535	2772
Plant Capacity Factor	0.8	0.8
Fuel with Defective Cladding, %	0.25	0.2
Leak of Primary Coolant into Steam Generators, gpd	20	20
Leak of Primary Coolant to the Auxiliary Building, gpd	40	40
Frequency of Containment Purge, times/yr	4	4
Waste Gas Holdup for Decay, days	30	30
Cold Shutdowns, times/year	2	2
Coolant Volumes Degassed and Processed During Cold Shutdowns and Normal Operations	5	5
Miscellaneous Waste Processed, gallons/year	600,000	600,000

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downtime and expected operational occurrences, the values shown in Tables 6 and 7 for the waste systems have been normalized to 3 curies per year for Unit 1 and 5 curies per year for Unit 2.

e. Solid Wastes. The following types of solid wastes will be treated in Unit 1 (Unit 2 wastes that require solidification will be transferred to Unit 1):

(1) Compressible wastes - paper, rags, clothing, and charcoal filters.

(2) Incompressible wastes - metal parts from inside the reactor, wires, cables, and spent filter cartridges.

(3) Evaporator concentrates.

(4) Spent resins and used filter precoat.

All solid waste will be packaged and shipped to a licensed burial ground in accordance with AEC and DOT regulations. Based on plants presently in operation, it is expected that approximately 300 to 600 drums of solid waste will be transported off-site each year.

3. Chemical and Sanitary Wastes

The chemicals used in significant quantities at the Station are listed in Table 9.

a. Demineralizer Regeneration Solutions. Sulfuric acid and sodium hydroxide solutions are used for regenerating resins in the two-stage feed water demineralizers used for both Units 1 and 2. These materials are disposed of on a batch basis; each batch, for a given unit, consists of 2,000 pounds of sulfuric acid and 1,300 pounds of sodium hydroxide diluted in 70,000 gallons of water. The resulting solution of sodium sulfate, with a pH between 6 and 9, is released every three days at a controlled rate over a 4-hour period (about 300 gpm flow rate). The waste solution is diluted with the 36,000 gpm cooling water effluent of the forced-draft cooling towers prior to discharge to the river. The amounts listed in Table 8 are the total quantities of acid and base used annually for the two units at the Station. The concentrations in the second column of the Table, however, occur in the 36,000 gpm cooling water effluent only during the batch discharge from a single unit, since the two units discharge their batches at different times.

b. Condensate Polisher Regeneration Solutions. The condensate polishers for Unit 1 are the wound element filter type precoated with powdered resin. The spent resin is washed out and discharged to the sludge treatment house rather than being regenerated, hence no regeneration

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CERTIFICATE OF SERVICE

I hereby certify that copies of "Licensee's First Set of Interrogatories to Intervenor Marvin I. Lewis" were served upon those persons on the attached Service List by deposit in the United States mail, postage prepaid, this 23rd day of January, 1980.

Robert Zahler

Robert E. Zahler

Dated: January 23, 1980

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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