

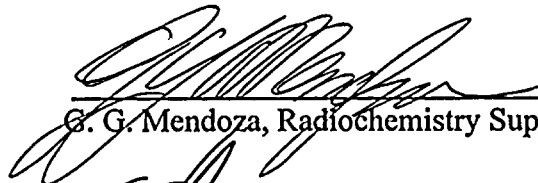
Turkey Point Plant  
Units 3 and 4


ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

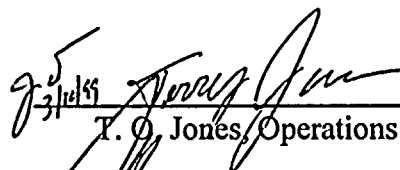
January 1998 through December 1998

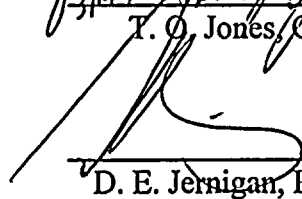
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TURKEY POINT UNITS 3 AND 4  
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## 1.0 REGULATORY LIMITS

### 1.1 Liquid Effluent

- (a) The concentration of radioactive material released in liquid effluent to unrestricted areas shall not exceed ten times the concentration specified in 10CFR20 Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained gases. For dissolved or entrained noble gases, the concentration shall not exceed 2.0 E-04 micro-curies per milliliter.
- (b) The dose or dose commitment per reactor to a member of the public from any radioactive materials in liquid effluents released to unrestricted areas shall be limited as follows:
  - During any calendar quarter, to less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ.
  - During any calendar year, to less than or equal to 3.0 mrem to the total body and less than or equal to 10 mrem to any organ.

### 1.2 Gaseous Effluent

- (a) The dose rate due to radioactive materials released in gaseous effluent from the site to areas at and beyond the site boundary shall be limited to the following:
  - Less than or equal to 500 mrem per year to the total body and less than or equal to 3000 mrem per year to the skin due to noble gases.
  - Less than or equal to 1500 mrem per year to any organ due to I-131, I-133, tritium, and for all radioactive materials in particulate form with half-lives greater than 8 days.
- (b) The air dose per reactor to areas at and beyond the site boundary due to noble gases released in gaseous effluents shall be limited to:
  - During any calendar quarter, to less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation.
  - During any calendar year, to less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.
- (c) The dose per reactor to a member of the public, due to I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluent released to areas at and beyond the site boundary shall not exceed 7.5 mrem to any organ during any calendar quarter and shall not exceed 15 mrem to any organ during any calendar year.



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## 2.0 MAXIMUM PERMISSIBLE CONCENTRATION

*Water* : In accordance with 10CFR20, Appendix B, Table 2, Column 2, and for entrained or dissolved noble gases as described in 1.1(a) of this report.

*Air* : Release concentrations are limited to dose rate limits described in 1.2(a) of this report.

## 3.0 AVERAGE ENERGY

The average energy of fission and activation gases in effluents is not applicable.

## 4.0 MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

All liquid and airborne discharges to the environment during this period were analyzed in accordance with Technical Specification requirements. The minimum frequency of analysis as required by Regulatory Guide 1.21 was met or exceeded.

When alpha, tritium and named nuclides are shown as "- " curies on the following tables, this should be interpreted as 'no activity' was detected on the samples using the Plant Technical Specification analysis techniques to achieve the required Lower Limit of Detection ("LLD") sensitivity for radioactive effluents.

### 4.1 Liquid Effluents

Aliquots of representative pre-release samples, from waste disposal system, were isotopically analyzed for gamma emitting isotopes on a multichannel analyzer.

Frequent periodic sampling and analysis were used to conservatively determine if any radioactivity was being released via the steam generator blowdown system and the storm drain system.

Monthly and quarterly composite samples for the waste disposal system were prepared to give proportional weight to each liquid release made during the designated period of accumulation. The monthly composite was analyzed for tritium and gross alpha radioactivity. Tritium was determined by use of liquid scintillation techniques, and gross alpha radioactivity was determined by use of a solid state scintillation system. The quarterly composite was analyzed for Sr-89, Sr-90, and Fe-55 by chemical separation.

All radioactivity concentrations determined from sample analysis of a pre-release composite were multiplied by the total represented volume of the liquid waste released to determine the total quantity of each isotope and of gross alpha activity released during the compositing period.





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Aliquots of representative samples from the waste disposal system were analyzed on a pre-release basis by gamma spectrum analysis. The resulting isotope concentrations were multiplied by the total volume released in order to estimate the total dissolved gases released.

The liquid waste treatment system is shared by both units at the site and generally all liquid releases are allocated on a 50/50 basis to each unit respectively.

There were no continuous liquid effluent releases above the lower limit of detection for either Unit 3 or Unit 4 during this reporting period and therefore these have been omitted from Table 2 of this report.



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#### 4.2 Gaseous Effluents

Airborne releases to the atmosphere occurred from the following sources:

- Gas Decay Tanks
- Containment Purges
- Releases incidental to operation of the plant.

The techniques employed in determining the radioactivity in airborne releases are:

- a) Gamma spectrum analysis for fission and activation gases,
- b) Removal of particulate material by filtration and subsequent gamma spectrum analysis, Sr-89, Sr-90 determination, and gross alpha determination,
- c) Absorption of halogen radionuclides on a charcoal filter and subsequent gamma spectral analysis, and
- d) Analysis of water vapor in a gas sample for tritium using liquid scintillation techniques.

All gas releases from the plant which were not accounted for by the above methods were conservatively estimated as curies of Xe-133 by use of the SPING-4 radiation monitors and the Plant Vent process monitor recorder chart and the current calibration curve for that process monitor.

Portions of the gas waste treatment system are shared by both units and generally all gas releases from the shared system are allocated on a 50/50 basis to each unit.

Meteorological data for the period January 1998 through December 1998, in the form of Joint Frequency Distribution Tables, are maintained on site.



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#### 4.3 Estimation of Errors

##### a) Sampling Error

The error associated with volume measurement devices, flow measuring devices, etc., based on calibration data and design tolerances has been conservatively estimated to be collectively less than  $\pm 10\%$ .

##### b) Analytical Error

Our quarterly Q.C. Cross-Check Program involves counting unknown samples provided by an independent external lab. The errors associated with our analysis of these unknown samples, reported to us by the independent lab, were used as the basis for deriving the following analytical error terms:

<u>NUCLIDE TYPE</u>	<u>AVERAGE ERROR</u>	<u>MAXIMUM ERROR</u>
Liquid	$\pm 5.9\%$	$\pm 11.0\%$
Gaseous	$\pm 2.7\%$	$\pm 11.0\%$

#### 5.0 BATCH RELEASES

##### 5.1 LIQUID

	<u>Unit 3</u>	<u>Unit 4</u>
a) Number of releases	1.52E+02	1.52E+02
b) Total time period of batch releases, minutes	1.23E+04	1.23E+04
c) Maximum time period for a batch release, minutes	1.99E+02	1.99E+02
d) Average time period for a batch release, minutes	7.81E+01	7.81E+01
e) Minimum time for a batch release, minutes	1.30E+01	1.30E+01
f) Average stream flow during period of release of effluent into a flowing stream, liters-per-minute	5.81E+06	5.81E+06

##### 5.2 GASEOUS

	<u>Unit 3</u>	<u>Unit 4</u>
a) Number of releases	2.00E+00	1.00E+00
b) Total time period of batch releases, minutes	3.05E+02	6.00E+01
c) Maximum time period for a batch release, minutes	2.40E+02	6.50E+01
d) Average time period for a batch release, minutes	1.52E+02	6.00E+01
e) Minimum time for a batch release, minutes	5.50E+01	5.50E+01



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**6.0 UNPLANNED RELEASES**

**6.1 Liquid**

There were no unplanned liquid releases this period for either Unit 3 or Unit 4.

**6.2 Gaseous**

There were no unplanned gas releases this period for either Unit 3 or Unit 4.

**7.0 REACTOR COOLANT ACTIVITY**

**7.1 Unit 3**

Reactor coolant activity limits of 100/E-Bar and 1.0 uCi/gram Dose Equivalent I-131 were not exceeded.

**7.2 Unit 4**

Reactor coolant activity limits of 100/E-Bar and 1.0 uCi/gram Dose Equivalent I-131 were not exceeded.

**8.0 SITE RADIATION DOSE**

The assessment of radiation dose from radioactive effluents to the general public due to their activities inside the site boundary assumes a visitor was at the child development center/fitness center for ten hours a day, five days each week for fifty weeks of the year, receiving exposure from both Unit 3 and Unit 4 at Turkey Point. The child development center/fitness center is located approximately 1.75 miles WNW of the plant. Specific activities used in these calculations are the sum of the activities listed in Unit 3 Table 3 and Unit 4 Table 3. The following dose calculations were made using historical, meteorological data :

	Adult Inhalation	Child Inhalation
Bone (mrem)	0.00E+00	0.00E+00
Liver (mrem)	3.40E-07	2.39E-07
Thyroid (mrem)	3.40E-07	2.39E-07
Kidney (mrem)	3.40E-07	1.58E-07
Lung (mrem)	3.40E-07	2.39E-07
GI-LLI (mrem)	3.40E-07	2.39E-07
Total Body (mrem)	3.40E-07	2.39E-07

Gamma Air Dose (mrad)	7.41E-06
Beta Air Dose (mrad)	2.67E-06





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**9.0    OFFSITE DOSE CALCULATION MANUAL (ODCM) REVISIONS**

The ODCM was revised once during this reporting period. The following changes are included in Appendix A.

- a. Deleted Sections/References relating to Channels 1 and 2 of the SJAE SPING which were abandoned in place, (page 3-21).
- b. Corrected typographical errors.
- c. Clarification of sampling technique for continuous releases, (page 3-2).

**10.0   SOLID WASTE AND IRRADIATED FUEL SHIPMENTS**

No irradiated fuel shipments were made from the site. Common solid waste from Turkey Point Units 3 and 4 was shipped jointly. A summation of these shipments is given in Table 6 of this report.

**11.0   PROCESS CONTROL PROGRAM REVISIONS**

No revisions were made to the process control program during this reporting period.

**12.0   INOPERABLE EFFLUENT MONITORING INSTRUMENTATION**

No inoperable effluent monitoring instrumentation requiring reportability during this period.



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**LIQUID EFFLUENTS SUMMARY**

UNIT 3  
TABLE 1

**A. FISSION AND ACTIVATION PRODUCTS**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release (not including tritium,gases, alpha)	CI	1.24E-02	9.23E-03	1.99E-02	5.02E-02	3.44
2. Average diluted concentration during the period	uCi/ml	1.25E-09	8.46E-10	1.03E-09	1.61E-09	
3. Percent of applicable limit	%	1.25E-02	8.46E-03	1.03E-02	1.61E-02	

**B. TRITIUM**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	5.55E+01	1.17E+02	2.07E+02	1.21E+02	2.50
2. Average diluted concentration during the period	uCi/ml	5.61E-06	1.07E-05	1.07E-05	3.86E-06	
3. Percent of applicable limit	%	5.61E-01	1.07E+00	1.07E+00	3.86E-01	

**C. DISSOLVED AND ENTRAINED GASES**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	0.00E+00	9.22E-05	2.56E-05	2.51E-05	3.44
2. Average diluted concentration during the period	uCi/ml	0.00E+00	8.45E-12	1.33E-12	8.01E-13	
3. Percent of applicable limit	%	0.00E+00	4.22E-06	6.65E-07	4.01E-07	

**D. GROSS ALPHA RADIOACTIVITY**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	--	--	--	--	

**E. LIQUID VOLUMES**

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Batch waste released, prior to dilution	LITERS	4.19E+05	4.34E+05	8.32E+05	1.49E+06	10.00
2. Continuous waste released, prior to dilution	LITERS	--	--	--	--	
3. Dilution water used during period	LITERS	9.90E+09	1.09E+10	1.93E+10	3.13E+10	



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**LIQUID EFFLUENTS SUMMARY**

UNIT 3  
TABLE 2

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fe-55	Cl	--	--	3.40E-03	2.43E-02
Sr-89	Cl	--	--	--	1.04E-05
Sr-90	Cl	--	--	3.24E-05	2.98E-06
Na-24	Cl	--	--	--	--
Cr-51	Cl	--	--	1.27E-04	8.05E-04
Mn-54	Cl	7.86E-04	2.35E-04	1.66E-03	9.37E-03
Co-57	Cl	2.64E-05	--	1.08E-05	1.03E-04
Co-58	Cl	3.47E-03	2.56E-04	1.61E-03	1.13E-03
Fe-59	Cl	--	--	9.27E-05	5.55E-05
Co-60	Cl	1.83E-03	6.78E-04	3.35E-03	1.27E-02
Zn-65	Cl	--	--	2.85E-06	--
Nb-95	Cl	3.14E-06	1.24E-06	--	1.50E-04
Zr-97	Cl	--	--	--	--
Mo-99	Cl	--	--	--	--
Ru-103	Cl	--	--	--	--
Ag-110	Cl	6.69E-05	--	1.23E-04	5.21E-05
Sn-113	Cl	--	--	--	--
Sn-117	Cl	--	--	--	--
Sb-124	Cl	--	--	--	8.54E-06
Sb-125	Cl	4.68E-05	--	2.19E-05	4.83E-05
I-131	Cl	--	--	--	--
I-133	Cl	--	--	--	--
I-134	Cl	--	--	--	--
Cs-134	Cl	1.30E-03	1.59E-03	1.80E-03	1.94E-04
I-135	Cl	--	--	--	--
Cs-137	Cl	4.84E-03	6.47E-03	7.69E-03	1.31E-03
La-140	Cl	--	--	--	--
Ce-141	Cl	--	--	--	--
Ce-144	Cl	--	--	--	--
W-187	Cl	--	--	--	--
Np-239	Cl	--	--	--	--
TOTAL FOR PERIOD	Cl	1.24E-02	9.23E-03	1.99E-02	5.02E-02

**LIQUID EFFLUENTS - DISSOLVED GAS SUMMARY**

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Cl	--	--	--	--
Kr-85m	Cl	--	--	--	--
Kr-85	Cl	--	--	--	--
Xe-133	Cl	--	9.22E-05	2.47E-05	2.46E-05
Xe-133m	Cl	--	--	--	--
Xe-135	Cl	--	--	9.12E-07	4.31E-07
Xe-138	Cl	--	--	--	--
TOTAL FOR PERIOD	Cl	0.00E+00	9.22E-05	2.56E-05	2.51E-05

**LIQUID EFFLUENTS - DOSE SUMMATION**

Age group : Teenager		
Location : Cooling Canal		
Shoreline Deposition	Dose (mrem)	% of Annual Limit
TOTAL BODY	1.29E-03	4.29E-02

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GASEOUS EFFLUENTS SUMMARY

UNIT 3  
TABLE 3

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	0.00E+00	0.00E+00	2.99E-01	2.13E-04	2.79
2. Average release rate for the period	uCi/sec	0.00E+00	0.00E+00	3.76E-02	2.74E-05	
3. Percent of Technical Specification Limit	%	0.00E+00	0.00E+00	3.38E-11	9.21E-16	

B. IODINES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	--	--	--	--	
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	

C. PARTICULATES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Particulates with half-life >8 days	CI	--	--	--	--	
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	
4. Gross Alpha Radioactivity	CI	--	--	--	--	

D. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	--	--	1.18E-01	--	2.50
2. Average release rate for the period	uCi/sec	--	--	1.48E-02	--	
3. Percent of Technical Specification Limit	%	--	--	1.18E-05	--	



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**GASEOUS EFFLUENTS SUMMARY**

UNIT 3  
TABLE 4

**A. FISSION GASES**

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	2.59E-01	--
Kr-85	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	--	--	4.00E-02	2.13E-04
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	--	--

TOTAL FOR PERIOD	Ci	--	--	2.99E-01	2.13E-04
------------------	----	----	----	----------	----------

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-87	Ci	--	--	--	--
Kr-88	Ci	--	--	--	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	--	--	--	--
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	--	--
Xe-135m	Ci	--	--	--	--
Xe-138	Ci	--	--	--	--

TOTAL FOR PERIOD	Ci	--	--	--	--
------------------	----	----	----	----	----

**B. IODINES**

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Br-82	Ci	--	--	--	--
I-131	Ci	--	--	--	--
I-133	Ci	--	--	--	--

TOTAL FOR PERIOD	Ci	--	--	--	--
------------------	----	----	----	----	----

**C. PARTICULATES**

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Co-58	Ci	--	--	--	--
Co-60	Ci	--	--	--	--
Mn-54	Ci	--	--	--	--
Cr-51	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--





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**DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES**

UNIT 3  
TABLE 5

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY
Cow milk - Infant (mrem)	0.00E+00	8.87E-07	8.87E-07	3.89E-07	8.87E-07	8.87E-07	0.00E+00	8.87E-07
Fruit & Veg Fresh (mrem)	0.00E+00	9.24E-08	9.24E-08	6.10E-08	9.24E-08	9.24E-08	0.00E+00	9.24E-08
Ground Plane (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inhalation - Adult (mrem)	0.00E+00	4.00E-07	4.00E-07	4.00E-07	4.00E-07	4.00E-07	0.00E+00	4.00E-07
<b>TOTAL (mrem)</b>	0.00E+00	1.38E-06	1.38E-06	8.50E-07	1.38E-06	1.38E-06	0.00E+00	1.38E-06
<b>% of Annual Limit</b>	0.00E+00	9.19E-06	9.19E-06	5.67E-06	9.19E-06	9.19E-06	0.00E+00	9.19E-06

**DOSE DUE TO NOBLE GASES**

	mrad	% of Annual Limit
Gamma Air Dose	4.38E-05	4.38E-04
Beta Air Dose	1.58E-05	7.90E-05



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**LIQUID EFFLUENTS SUMMARY**

**UNIT 4  
TABLE 1**

**A. FISSION AND ACTIVATION PRODUCTS**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release (not including tritium, gases, alpha)	CI	1.24E-02	9.23E-03	1.99E-02	5.02E-02	3.44
2. Average diluted concentration during the period	uCi/ml	1.25E-09	8.46E-10	1.03E-09	1.61E-09	
3. Percent of applicable limit	%	1.25E-02	8.46E-03	1.03E-02	1.61E-02	

**B. TRITIUM**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	5.55E+01	1.17E+02	2.07E+02	1.21E+02	2.50
2. Average diluted concentration during the period	uCi/ml	5.61E-06	1.07E-05	1.07E-05	3.86E-06	
3. Percent of applicable limit	%	5.61E-01	1.07E+00	1.07E+00	3.86E-01	

**C. DISSOLVED AND ENTRAINED GASES**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	--	9.22E-05	2.56E-05	2.51E-05	3.44
2. Average diluted concentration during the period	uCi/ml	--	8.45E-12	1.33E-12	8.01E-13	
3. Percent of applicable limit	%	--	4.22E-06	6.65E-07	4.01E-07	

**D. GROSS ALPHA RADIOACTIVITY**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	--	--	--	--	

**E. LIQUID VOLUMES**

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Batch waste released, prior to dilution	LITERS	4.19E+05	4.34E+05	8.32E+05	1.49E+06	10.00
2. Continuous waste released, prior to dilution	LITERS	--	--	--	--	
3. Dilution water used during period	LITERS	9.90E+09	1.09E+10	1.93E+10	3.13E+10	



**TURKEY POINT UNITS 3 AND 4  
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**LIQUID EFFLUENTS SUMMARY**

**UNIT 4  
TABLE 2**

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fe-55	Ci	--	--	3.40E-03	2.43E-02
Sr-89	Ci	--	--	--	1.04E-05
Sr-90	Ci	--	--	3.24E-05	2.98E-06
Na-24	Ci	--	--	--	--
Cr-51	Ci	--	--	1.27E-04	8.05E-04
Mn-54	Ci	7.86E-04	2.35E-04	1.66E-03	9.37E-03
Co-57	Ci	2.64E-05	--	1.08E-05	1.03E-04
Co-58	Ci	3.47E-03	2.56E-04	1.61E-03	1.13E-03
Fe-59	Ci	--	--	9.27E-05	5.55E-05
Co-60	Ci	1.83E-03	6.78E-04	3.35E-03	1.27E-02
Zn-65	Ci	--	--	2.85E-06	--
Nb-95	Ci	3.14E-06	1.24E-06	--	1.50E-04
Zr-97	Ci	--	--	--	--
Mo-99	Ci	--	--	--	--
Ru-103	Ci	--	--	--	--
Ag-110	Ci	6.69E-05	--	1.23E-04	5.21E-05
Sn-113	Ci	--	--	--	--
Sn-117	Ci	--	--	--	--
Sb-124	Ci	--	--	--	8.54E-06
Sb-125	Ci	4.68E-05	--	2.19E-05	4.83E-05
I-131	Ci	--	--	--	--
I-133	Ci	--	--	--	--
I-134	Ci	--	--	--	--
Cs-134	Ci	1.30E-03	1.59E-03	1.80E-03	1.94E-04
I-135	Ci	--	--	--	--
Cs-137	Ci	4.84E-03	6.47E-03	7.69E-03	1.31E-03
La-140	Ci	--	--	--	--
Ce-141	Ci	--	--	--	--
Ce-144	Ci	--	--	--	--
W-187	Ci	--	--	--	--
Np-239	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	1.24E-02	9.23E-03	1.99E-02	5.02E-02

**LIQUID EFFLUENTS - DISSOLVED GAS SUMMARY**

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-85	Ci	--	--	--	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	--	9.22E-05	2.47E-05	2.46E-05
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	9.12E-07	4.31E-07
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD		Ci	--	9.22E-05	2.56E-05
					2.51E-05

**LIQUID EFFLUENTS - DOSE SUMMATION**

Age group : Teenager		
Location : Cooling Canal		
Shoreline Deposition	Dose (mrem)	% of Annual Limit
TOTAL BODY	1.29E-03	4.29E-02



TURKEY POINT UNITS 3 AND 4  
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**GASEOUS EFFLUENTS SUMMARY**

**UNIT 4  
TABLE 3**

**A. FISSION AND ACTIVATION PRODUCTS**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	--	--	--	2.13E-04	2.79
2. Average release rate for the period	uCi/sec	--	--	--	2.74E-05	
3. Percent of Technical Specification Limit	%	0.00E+00	0.00E+00	0.00E+00	9.21E-16	

**B. IODINES**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	--	--	--	--	
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	

**C. PARTICULATES**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Particulates with half-life >8 days	CI	--	--	--	--	
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	
4. Gross Alpha Radioactivity	CI	--	--	--	--	

**D. TRITIUM**

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	CI	--	--	--	--	
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	





TURKEY POINT UNITS 3 AND 4  
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**GASEOUS EFFLUENTS SUMMARY**

UNIT 4  
TABLE 4

**A. FISSION GASES**

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	CI	--	--	--	--
Kr-85	CI	--	--	--	--
Kr-85m	CI	--	--	--	--
Xe-131m	CI	--	--	--	--
Xe-133	CI	--	--	--	2.13E-04
Xe-133m	CI	--	--	--	--
Xe-135	CI	--	--	--	--
Xe-135m	CI	--	--	--	--
TOTAL FOR PERIOD	CI	0.00E+00	0.00E+00	0.00E+00	2.13E-04

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	CI	--	--	--	--
Kr-85	CI	--	--	--	--
Kr-85m	CI	--	--	--	--
Kr-87	CI	--	--	--	--
Kr-88	CI	--	--	--	--
Xe-131m	CI	--	--	--	--
Xe-133	CI	--	--	--	--
Xe-133m	CI	--	--	--	--
Xe-135	CI	--	--	--	--
Xe-135m	CI	--	--	--	--
Xe-138	CI	--	--	--	--
TOTAL FOR PERIOD	CI	--	--	--	--

**B. IODINES**

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Br-82	CI	--	--	--	--
I-131	CI	--	--	--	--
I-133	CI	--	--	--	--
TOTAL FOR PERIOD	CI	--	--	--	--

**C. PARTICULATES**

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Co-58	CI	--	--	--	--
Co-60	CI	--	--	--	--
Mn-54	CI	--	--	--	--
Cr-51	CI	--	--	--	--
TOTAL FOR PERIOD	CI	--	--	--	--

TURKEY POINT UNITS 3 AND 4  
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**DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES**

UNIT 4  
TABLE 5

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GILLI	SKIN	TOTAL BODY
Cow milk - Infant (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fruit & Veg Fresh (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ground Plane (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inhalation - Adult (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Annual Limit	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**DOSES DUE TO NOBLE GASES**

	mrad	% of Annual Limit
Gamma Air Dose	1.36E-09	1.36E-08
Beta Air Dose	4.08E-09	2.04E-08

TURKEY POINT UNITS 3 AND 4  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT  
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**DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES**

Summation  
Table 5

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY
Cow milk - Infant	0.00E+00	8.87E-07	8.87E-07	3.89E-07	8.87E-07	8.87E-07	0.00E+00	8.87E-07
Fruit & Veg Fresh	0.00E+00	9.24E-08	9.24E-08	6.10E-08	9.24E-08	9.24E-08	0.00E+00	9.24E-08
Ground Plane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inhalation - Adult	0.00E+00	4.00E-07	4.00E-07	4.00E-07	4.00E-07	4.00E-07	0.00E+00	4.00E-07
<b>TOTAL (mrem)</b>	0.00E+00	1.38E-06	1.38E-06	8.50E-07	1.38E-06	1.38E-06	0.00E+00	1.38E-06
<b>% of Annual Limit</b>	0.00E+00	9.19E-06	9.19E-06	5.67E-06	9.19E-06	9.19E-06	0.00E+00	9.19E-06

**DOSES DUE TO NOBLE GASES**

	mrad	% of Annual Limit
Gamma Air Dose	4.38E-05	4.38E-04
Beta Air Dose	1.58E-05	7.90E-05

TURKEY POINT UNITS 3 AND 4  
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TABLE 6

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFF SITE FOR BURIAL OR DISPOSAL

1.	<u>TYPE OF WASTE</u>	<u>UNITS</u>	<u>12 MONTH PERIOD</u>	<u>% ERROR</u>
a.	Spent resin, filters sludge, evaporator bottoms	m <sup>3</sup> Ci	3.4 EO 1.00 E-3	20
b.	Dry Compressible waste (Note 1)	m <sup>3</sup> Ci	1.36 E1 5.39 E-1	20
c.	Irradiated components Control rods, etc.	m <sup>3</sup> Ci	0.00 EO 0.00 EO	
d.	Other non-compressible Waste	m <sup>3</sup> Ci	1.16 E1 3.00 E-3	20

2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION OF TYPE OF WASTE

	<u>UNITS</u>	<u>VALUE</u>
a. H-3	%	3
CR-51	%	4
MN-54	%	1
FE-55	%	32
Co-58	%	37
Co-60	%	5
NI-63	%	7
NB-95	%	6
2R-95	%	4
AG-110M	%	1

TURKEY POINT UNITS 3 AND 4  
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TABLE 6

b.	<u>UNITS</u>	<u>VALUE</u>
	CR-51	%
	MN-54	%
	Co-58	%
	FE-55	%
	Co-60	%
	Ni-63	%
	Nb-95	%
		2
		2
		3
		74
		13
		5
		1

c. N/A

d.	<u>UNITS</u>	<u>VALUE</u>
	CR-51	%
	MN-54	%
	Co-58	%
	FE-55	%
	Co-60	%
	Ni-63	%
	Nb-95	%
		2
		2
		3
		74
		13
		5
		1

3. SOLID WASTE DISPOSITION

<u>Number of shipments</u>	<u>Mode of transport</u>	<u>Destination</u>
10 (Note 2)	Sole use truck	Oak Ridge, TN
3 (Note 2)	Sole use truck	Barnwell, SC

B. IRRADIATED FUEL SHIPMENTS

None



TURKEY POINT UNITS 3 AND 4  
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TABLE 6  
SOLID WASTE SHIPMENT

Waste Classification	Total Volume Ft <sup>3</sup>	(NOTE 3) Total Curie Quantity	(NOTE 4) Principal Radionuclides	(NOTE 5) Type of Waste	R.G. 121 Category	(NOTE 6) Type of Container	Solidification or Absorbers Agent
Class A	483.2	0.539	None	Compactable Waste	1b.	Strong Tight	N/A
Class A	411.6	.003	None	Non-Compressible Waste	1d.	Cask	N/A
Class C	120.3	.001	None	Dewatered Filters	1a.	Cask	N/A



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TABLE 6

NOTE 1: Dry compressible waste volume indicates volume shipped to burial site following reduction by a waste processing facility was 13.6.

NOTE 2: Material transported to Oak Ridge, Tennessee, was consigned to licensed processing facilities for volume reduction and decontamination activities. The material remaining after processing was transported by the processor to Barnwell, South Carolina for burial. The material shipped directly to Barnwell was processed by CNSI and buried.

NOTE 3: The total curie quantity and radionuclide composition of solid waste shipped from the Turkey Point Plant Units 3 and 4 are determined using a combination of qualitative and quantitative techniques. The Turkey Point Plant follows the guidelines in the Low Level Waste Licensing Branch Technical Position on Radioactive Waste Classification (5/11/83) for these determinations.

The most frequently used techniques for determining the total activity in a package are the dose to curie method and inference from specific activity and mass or activity concentration and volume. Activation analysis may be applied when it is appropriate. The total activity determination by any of these methods is considered to be an estimate.

The composition of radionuclides in the waste is determined by periodic off-site analyses for difficult to measure isotopes. Off-site analyses are used to establish scaling factors or other estimates for difficult to measure isotopes and principle Gamma emitters.

NOTE 4: Principle radionuclide refers to those radionuclides contained in the waste in concentrations greater than 0.01 times the concentration of the nuclide listed in Table 1 or 0.01 times the smallest concentration of the nuclide listed in Table 2 of 10CFR 61.55.

NOTE 5: Type of waste is specified as described in NUREG 0782, Draft Environment Impact Statement on 10 CFR 61 "Licensing Requirements for Land Disposal of Radioactive Waste".

NOTE 6: Type of container refers to the transport package.



## **APPENDIX A**

### **ODCM CHANGES 1998**