COMANCHE PEAK STEAM ELECTRIC STATION

UNITS 1 and 2

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 1993 - June 30, 1993

V = volume of resins in the pond (gallons), and

264 = conversion unit (μCi/Ci per ml/gal)

2.1.5 Total Dose

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

2.2 Effluent Concentration Limits

2.2.1 Gaseous Effluents

For gaseous effluents, effluent concentration limit (ECL) values are not directly used in release rate calculations since the applicable limits are expressed in terms of dose rate at the site boundary.

2.2.2 Liquid Effluents

The values specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 are used as the ECL for liquid radioactive effluents released to unrestricted areas. A value of 2.0E-04 μCi/ml is used as the ECL for dissolved and entrained noble gases in liquid effluents.

2.3 Average Energy

This section is not applicable to the Radiological Effluent Controls contained in Part I of the ODCM for Comanche Peak, Units 1 and 2.

2.4 Measurements and Approximations of Total Radioactivity

Measurements of total radioactivity in liquid and gaseous radioactive effluents were accomplished in accordance with the sampling and analysis requirements of Tables 4.11-1 and 4.11-2, respectively, of the CPSES ODCM.

2.4.1 Liquid Radioactive Effluents

Each batch release was sampled and analyzed for gamma emitting radionuclides using gamma spectroscopy, prior to release. Composite samples were analyzed monthly and quarterly for the Primary Effluent Tanks (PET), Waste Monitor Tanks (WMT), Laundry Holdup and Monitor Tanks (LHMT) and Wastewater Holdup Tanks (WHUT). Composite samples were analyzed monthly for tritium and gross alpha radioactivity in the onsite laboratory using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90 and Fe-55 by a contract laboratory (Teledyne Isotopes). The results of the composite analyses from the previous month or quarter were used to estimate the quantities of these radionuclides in liquid effluents during the current month or quarter. The total radioactivity in liquid effluent releases was determined from the measured and estimated concentrations of each radionuclide present and the total volume of the effluent released during periods of discharge.

For batch releases of powdex resin to the LVW pond, samples were analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques, prior to release. Composite samples were analyzed quarterly, for Sr-89 and Sr-90, by an offsite laboratory (Teledyne Isotopes).

For continuous releases to the circulating water discharge from the LVW pond, daily grab samples were obtained over the period of pond discharge. These samples were composited and analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques. Composite samples were also analyzed for tritium and gross alpha radioactivity using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90 and Fe-55 by an offsite laboratory (Teledyne Isotopes).

2.4.2 Gaseous Radioactive Effluents

Each gaseous batch release was sampled and analyzed for radioactivity prior to release. For releases from Waste Gas Decay Tanks, noble gas grab samples were analyzed for gamma emitting radionuclides using gamma spectroscopy. For releases from the Containment Buildings, samples were taken using charcoal and particulate filters, in addition to noble gas and tritium grab samples, and analyzed for gamma emitting radionuclides prior to each release with the exception of Containment vents made as a precursor to a Containment purge. In these cases, samples collected and analyzed as a prerequisite to the vent were used to estimate total radioactivity released during the subsequent purge. The results of the analyses and the total volume of effluent released were used to determine the total amount of radioactivity released in the batch mode.

For continuous effluent release pathways, noble gas and tritium grab samples were collected and analyzed weekly for gamma emitting radionuclides by gamma spectroscopy and liquid scintillation counting techniques, respectively. Continuous release pathways were continuously sampled using radioiodine adsorbers and particulate filters. The filters were analyzed weekly for I-131 and gamma emitting radionuclides using gamma spectroscopy. Results of the noble gas and tritium grab samples, radioiodine adsorber and particulate filter analyses from the current week and the average effluent flow rate for the previous week were used to determine the total amount of radioactivity released in the continuous mode. Monthly composites of particulate filters were analyzed for gross alpha activity, in the onsite laboratory using the gas flow proportional counting technique. Quarterly composites of particulate filters were analyzed for Sr-89 and Sr-90 by an offsite laboratory (Teledyne Isotopes).

2.5 Batch Releases

A summary of information for gaseous and liquid batch releases is included in Table 7.1.

2.6 Abnormal Releases

Abnormal releases are defined as unplanned or uncontrolled releases of radioactive material from the site boundary.

One (1) abnormal gaseous effluent release occurred during the period covered by this report. This event is described in section 6.5.1 of this report.

A summary of information for gaseous and liquid abnormal releases is included in Table 7.2.

3.0 GASEOUS EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables 7.3 and 7.4. All releases of radioactive material in gaseous form are considered to be ground level releases.

4.0 LIQUID EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in Tables 7.5 and 7.6.

5.0 SOLID WASTES

The quantities of radioactive material released as solid effluents are summarized in Table 7.7.

6.0 RELATED INFORMATION

6.1 Operability of Liquid and Gaseous Monitoring Instrumentation

ODCM Radiological Effluent Controls 3.3.3.4 and 3.3.3.5 require an explanation of why designated inoperable liquid and gaseous monitoring instrumentation was not restored to operable status within thirty days. During the period covered by this report, there were no instances where this instrumentation was inoperable for more than thirty days.

6.2 Changes to the Offsite Dose Calculation Manual

Major changes to the Offsite Dose Calculation Manual (ODCM) became effective in Revision 8 issued on January 1, 1993. A brief outline of these changes is provided below. A complete copy of the latest revision to the ODCM is provided and appears as Attachment 8.1 to this report.

Changes to the ODCM involved the following:

- Implemented changes that supported the latest revisions to 10CFR20 Sections 20.1001 - 20.2401.

- Implemented changes that supported the initial startup of Unit 2 with its accompanying radioactive effluent release pathways and effluent monitoring instrumentation.

- Revisions were made that deleted methodologies for determining instantaneous setpoints for the stack PIG monitors particulate and iodine channels.

- Revisions were made that changed the methodology for performing 31 day dose projections and added methodology for a flow rate setpoint for liquid effluent releases.

- Previously unidentified radionuclides were added to the ODCM along with their site-related dose commitment factors.

- Revisions to the calculational methodology used to determine dose to individuals from liquid releases by eliminating drinking water pathways and adding the cow-meat pathway.

6.3 New Locations for Dose Calculations or Environmental Monitoring

ODCM Administrative Control 6.9.1.4 requires any new locations for dose calculations or environmental monitoring, identified by the Land Use Census, to be included in the Semiannual Radioactive Effluent Release Report. Based on the 1992 Land Use Census, the ODCM was revised to reflect the deletion of an environmental sampling location (Dairy SSE-2.2) due to closure of that dairy. No new receptor locations were identified which resulted in changes requiring a revision in current environmental sample locations. Values for the new nearest resident, milk animal, garden X/Q and D/Q values were added to Tables 2.5 and 3.1 of the ODCM.

6.4 Liquid Holdup and Gas Storage Tanks

ODCM Administrative Control 6.9.1.4 requires a description of the events leading to liquid holdup or gas storage tanks exceeding the Technical Specification limits. Technical Specification 3.11.1 limits the quantity of radioactive material contained in each unprotected outdoor tank to less than or equal to ten curies, excluding tritium and dissolved or entrained noble gases. Technical Specification 3.11.2.2 limits the quantity of radioactive material contained in each gas storage tank to less than or equal to 200,000 curies of noble gases (considered as Xe-133 equivalent). These limits were not exceeded during the period covered by this report.

6.5 Noncompliance with Radiological Effluent Control Requirements

This section provides a listing of events that did not comply with the applicable requirements of the Radiological Effluent Controls given in Part I of the CPSES ODCM. Detailed documentation concerning evaluations of these events and corrective actions is maintained onsite.

6.5.1 Abnormal Liquid and Gaseous Releases

- On June 4, 1993, at approximately 15:00 hours, a Radwaste Operator noticed a decrease in pressure on Gas Decay Tank (GDT)4 from the previous log entry. An immediate investigation was conducted which included airborne surveys of in-plant rooms and review of plant vent stack noble gas monitor readings and trends. These all showed no indication of abnormal conditions. Additionally an unplanned non-routine release permit was generated. Radwaste Operators trying to identify and isolate the leak performed verifications of the H_2 recombiner gas analyzer isolations and placed GDT1 in service. With pressure still decreasing, the Waste Gas System was shut down and secured with a full lineup verification.

A mass balance check was performed across the entire system and a 12.5 psig GDT pressure decrease could not be accounted for in the system. All possible leakage sources were checked and verified in a controlled manner. The source of the leak was determined to be a hydrogen recombiner rupture disc failure. The unplanned non-routine permit accounted for the released noble gas from GDT's 1, 4 and 10. The dose contribution for this release was calculated to be 2.14E-06 mrad gamma air dose and 4.21E-05 mrad beta air dose.

6.5.. Control of Effluent Monitor Setpoints

- On April 9, 1993, at the completion of a Unit 1 Containment vent evolution, a Radiation Protection technician was assigned to restore the radiation monitor setpoints to their normal values. During the restoration of the setpoints, the normal values for the plant vent noble gas release rate monitor (PVF-684) were entered for the noble gas concentration monitor (PVG-084). Monitor PVF-684 setpoints were never returned to their normal values. This personnel error caused a violation of the ODCM because the setpoints were not set in accordance with the calculational methodology of the ODCM.

  The monitor setpoints were adjusted inappropriately for approximately 20 hours. Upon discovery, the setpoints were returned to the correct values. All monitor trends for the time period indicated that there were no abnormal releases or any indicated problems during this 20 hour period. Due to this error, only specially trained Radiation Protection personnel will be allowed to set alarm setpoints to support effluent permits.

- On June 29, 1993, a liquid release permit (LRP-93-0229) was processed for the Primary Effluent Tank X-02. The alarm setpoints for monitor LWE-076 were left at the normal default setpoints instead of being changed to the calculated maximum alarm setpoint called for by the effluent permit. Personnel error occurred in that the procedure was not followed, however the calculated alarm setpoint was actually below the normal default setpoints and extremely conservative. New methodology in calculating the liquid effluent monitor setpoint is being developed and a change in the ODCM methodology is being prepared to handle releases of very low activity liquids. No abnormal readings or increases in monitor activity were detected during this liquid release. Enhanced refresher training for Radiation Protection Lead Technicians and their alternates has been scheduled for alarm setpoint methodology and requirements.

6.5.3 Required Sampling Not Performed

ODCM Tables 4.11-1 and 4.11-2 specify the sampling requirements for all liquid and gaseous releases. There was one instance where a sample was not taken as required.

- A daily sample of the LVW pond discharge was not performed on March 7, 1993, as required. The sampling requirement had been scheduled, but no individual was assigned the specific duty of collecting the sample. Samples taken on March 6 and March 8 indicated no radioactivity was present. Corrective actions were initiated to require that this item be specifically addressed at each Chemistry shift turnover.

6.5.4 Continuous Sampling Monitor Failure

- On February 12, 1993, I&C technicians discovered sample pump inlet line leakage on the North vent stack Wide Range Gas Monitor (WRGM) sample pump. Air from the Auxiliary Building was leaking into the sample chamber which diluted the vent stack sample intended to be monitored. Fortunately, the North vent stack also has a backup monitor, the vent stack Particulate, Iodine and Noble Gas Monitor (PIG) along with the South vent stack WRGM and PIG. Chemistry performed an evaluation on all samples taken since the last I&C maintenance was performed on October 24, 1992, until February 12, 1993. Based on North and South vent stack samples, composite samples, WRGM flow rate logs and stack iodine and particulate sample data it was determined that there was no significant difference in the reported samples and the compared samples. All backup data indicated no abnormalities or problems. Sample results were not altered based on this comparison. As a result of this pump failure a Preventative Maintenance (PM) schedule has been established for this particular problem and the pump was repaired and returned to service within four hours of failure discovery.

6.6 Resin Releases to the LVW Pond

A total of 12,461 ft^3 of resin was transferred to the LVW pond during the period covered by this report. The results of the sample analyses indicate no radioactive material was transferred to the pond.

6.7 Changes to the Liquid, Gaseous and Solid Waste Treatment Systems

In accordance with the CPSES Process Control Program, Section 2.2a, major changes to the Radwaste Treatment Systems (liquid, gaseous and solid) shall be reported to the Commission in the Semiannual Radioactive Effluent Release Report for the period in which changes were reviewed and approved by the SORC.

- Design Modification DM 91-099, was reviewed and approved by SORC on May 12, 1993. This Design Modification will provide a new radiation monitor (XRE-5251A) on a combined secondary liquid effluent pathway that discharges water to the LVW ponds. This secondary effluent stream will discharge water from Auxiliary Building Sumps 3 and 11, Diesel Generator Sumps 1, 2, 3 and 4, and Unit 1 and Unit 2 Component Cooling Water Drain Tanks. These sources of water are normally non-radioactive and are discharged to the LVW ponds for holdup and treatment of non-radioactive contaminants such as oils and grease prior to being discharged to Outfall 101. Currently, these waste streams are routed to the Waste Water Holdup Tanks where sampling and analysis is required prior to discharge to the LVW ponds. The new radiation monitor will continuously sample the combined effluents from the tanks and sumps and provide automatic functions necessary to divert the flow from the LVW ponds to the Cocurrent Waste System on a high radiation signal. This will allow for continuous discharge from these tanks and sumps and eliminate the batch release requirements now in effect.

SECTION 7.0

TABLES

Table 7.1

BATCH LIQUID AND GASEOUS RELEASE SUMMARY

	Quarter 1	Quarter 2
A. Liquid Releases All Sources		
Number of Batch Releases	1.12E+02	1.00E+02
Total Time Period for Batch Releases (min)	2.14E+04	1.95E+04
Maximum Time Period for a Batch Release (min)	4.73E+02	4.43E+02
Average Time Period for a Batch Release (min)	1.91E+02	1.95E+02
Minimum Time Period for a Batch Release (min)	3.00E+00	3.60E+01
Average Stream Flow During Periods of Release (ft^3/s)	N/A	N/A
B. Gaseous Releases All Sources		
Number of Batch Releases	1.90E+01	3.50E+01
Total Time Period for Batch Releases (min)	6.30E+03	1.31E+04
Maximum Time Period for a Batch Release (min)	4.34E+02	1.44E+03
Average Time Period for a Batch Release (min)	3.32E+02	3.74E+02
Minimum Time Period for a Batch Release (min)	2.20E+02	2.42E+02

TABLE 7.2

ABNORMAL BATCH LIQUID AND GASEOUS RELEASE SUMMARY

	Quarter 1	Quarter 2
A. Liquids		
Number of Releases	0.00E+00	0.00E+00
Total Activity Released, Ci	0.00E+00	0.00E+00
B. Gases		
Number of Releases	0.00E+00	1.00E+00
Total Activity Released, Ci	0.00E+00	2.74E-01

TABLE 7.3

GASEOUS EFFLUENTS--SUMMATION OF ALL RELEASES

	Units	Quarter 1	Quarter 2	Est.Total Error, %
A. Fission and Activation Gases				
1. Total release	Ci	5.33E-01	6.70E+01	2.35E+01
2. Average release rate for period	μCi/sec	6.85E-02	8.52E+00	
3. Percent of ODCM REC limit (Total Body)	%	4.74E-05	2.05E-03	
4. Percent of ODCM REC limit (Skin)	%	9.21E-06	9.88E-04	
B. Iodines				
1. Total Iodine-131	Ci	0.00E+00	0.00E+00	N/A
2. Average release rate for period	μCi/sec	0.00E+00	0.00E+00	
3. Percent of ODCM REC limit (Organ)	%	0.00E+00	0.00E+00	
C. Particulates				
1. Particulates with half lives > 8 days	Ci	0.00E+00	0.00E+00	N/A
2. Average release rate for period	μCi/sec	0.00E+00	0.00E+00	
3. Percent of ODCM REC limit (Organ)	%	0.00E+00	0.00E+00	
4. Gross alpha radioactivity	Ci	0.00E+00	0.00E+00	
D. Tritium				
1. Total release	Ci	6.46E-01	9.41E-01	2.38E+01
2. Average release rate for period	μCi/sec	8.30E-02	1.20E-01	
3. Percent of ODCM REC limit (Organ)	%	6.06E-04	8.74E-04	

TABLE 7.4

GASEOUS EFFLUENTS--GROUND LEVEL RELEASES

		Continuous Mode		Batch Mode	
Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission and Activation Gases					
Ar-41	Ci	0.00E+00	0.00E+00	4.15E-02	8.81E-02
Kr-85	Ci	0.00E+00	0.00E+00	0.00E+00	2.15E-01
Xe-131M	Ci	0.00E+00	0.00E+00	0.00E+00	2.05E-03
Xe-133M	Ci	0.00E+00	0.00E+00	0.00E+00	4.66E-05
Xe-133	Ci	0.00E+00	6.00E+01	4.91E-01	6.76E+00
Xe-135	Ci	0.00E+00	0.00E+00	2.27E-04	0.00E+00
Total for Period	Ci	0.00E+00	6.00E+01	5.33E-01	7.07E+00
2. Iodines					
I-131	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates					
H-3	Ci	6.41E-01	9.29E-01	4.72E-03	1.18E-02
Br-82 (Note 1)	Ci	0.00E+00	0.00E+00	1.01E-07	3.26E-07
Total for period	Ci	6.41E-01	9.29E-01	4.72E-03	1.18E-02

Note 1: Since the half life of this nuclide is less than eight days, the amount released in gaseous effluents is not reported in Table 7.3, item C. For the same reason, this nuclide is not considered in dose calculations.

TABLE 7.5

LIQUID EFFLUENTS--SUMMATION OF ALL RELEASES

	Units	Quarter 1	Quarter 2	Est.Total Error, %
A. Fission and Activation Products				
1. Total release (not including tritium, gases, alpha)	Ci	9.48E-02	4.58E-02	3.03E+01
2. Average diluted concentration during period	µCi/ml	1.65E-09	6.92E-10	
3. Percent of ODCM REC limit	%	5.24E-03	1.09E-03	
B. Tritium				
1. Total release	Ci	4.39E+01	1.26E+02	1.34E+01
2. Average diluted concentration during period	µCi/ml	7.66E-07	1.90E-06	
3. Percent of ODCM REC limit	%	6.96E-02	1.54E-01	
C. Dissolved and Entrained Gases				
1. Total release	Ci	1.31E-01	4.45E-02	1.16E+01
2. Average diluted concentration during period	µCi/ml	2.28E-09	6.72E-10	
3. Percent of ODCM REC limit	%	2.33E-03	3.54E-04	
D. Gross Alpha Radioactivity				
1. Total release	Ci	0.00E+00	0.00E+00	N/A
E. Volume of waste released (prior to dilution)	Liters	5.37E+06	4.36E+06	2.20E+00
F. Volume dilution of water used during period (Note 1)	Liters	5.73E+10	6.62E+10	1.00E+01

Note 1: The dilution volume reported is the total dilution volume during periods when effluent releases were occurring. The additional dilution volume available when there are no effluent releases occurring is not included.

TABLE 7.6

LIQUID EFFLUENTS

		Continuous Mode		Batch Mode	
Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 1	Quarter 2
H-3	Ci	0.00E+00	0.00E+00	4.39E+01	1.26E+02
Be-7	Ci	0.00E+00	0.00E+00	8.64E-05	0.00E+00
Na-24	Ci	0.00E+00	0.00E+00	0.00E+00	1.46E-06
Cr-51	Ci	0.00E+00	0.00E+00	3.30E-03	8.80E-06
Mn-54	Ci	0.00E+00	0.00E+00	4.46E-04	6.33E-06
Fe-55	Ci	0.00E+00	0.00E+00	1.57E-02	4.02E-02
Co-57	Ci	0.00E+00	0.00E+00	8.94E-05	0.00E+00
Co-58	Ci	0.00E+00	0.00E+00	5.20E-02	1.82E-03
Fe-59	Ci	0.00E+00	0.00E+00	1.73E-03	1.34E-04
Co-60	Ci	0.00E+00	0.00E+00	7.94E-03	3.45E-04
Se-75	Ci	0.00E+00	0.00E+00	7.09E-06	0.00E+00
Br-82	Ci	0.00E+00	0.00E+00	1.50E-05	2.43E-05
Zr-95	Ci	0.00E+00	0.00E+00	1.26E-04	0.00E+00
Nb-95	Ci	0.00E+00	0.00E+00	3.74E-04	0.00E+00
Mo-99	Ci	0.00E+00	0.00E+00	1.03E-04	2.01E-05
Tc-99M	Ci	0.00E+00	0.00E+00	3.27E-05	1.95E-05
Ag-110M	Ci	0.00E+00	0.00E+00	5.84E-06	0.00E+00
Sn-113	Ci	0.00E+00	0.00E+00	1.72E-05	0.00E+00
In-113M	Ci	0.00E+00	0.00E+00	1.99E-05	0.00E+00
Sb-124	Ci	0.00E+00	0.00E+00	8.87E-04	1.21E-06
Sb-125	Ci	0.00E+00	0.00E+00	5.58E-03	1.03E-03
I-131	Ci	0.00E+00	0.00E+00	3.[illegible]5E-04	2.09E-05
I-133	Ci	0.00E+00	0.00E+00	5.96E-06	0.00E+00
Cs-134	Ci	0.00E+00	0.00E+00	3.88E-03	9.30E-04
Cs-137	Ci	0.00E+00	0.00E+00	3.22E-03	1.14E-03
Ce-144	Ci	0.00E+00	0.00E+00	1.02E-05	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	4.40E+01	1.26E+02

TABLE 7.6 (Continued)

LIQUID EFFLUENTS

		Continuous Mode		Batch Mode	
Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 1	Quarter 2
Kr-85	Ci	0.00E+00	0.00E+00	7.97E-03	0.00E+00
Xe-131M	Ci	0.00E+00	0.00E+00	3.34E-04	1.90E-04
Xe-133M	Ci	0.00E+00	0.00E+00	3.50E-04	1.20E-04
Xe-133	Ci	0.00E+00	0.00E+00	1.23E-01	4.41E-02
Xe-135	Ci	0.00E+00	0.00E+00	2.59E-05	2.93E-05
Total for period	Ci	0.00E+00	0.00E+00	1.32E-01	4.45E-02

TABLE 7.7

SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite for Burial or Disposal (Not Irradiated Fuel

1. Type of Waste	Shipped m^3	Shipped Ci	Buried m^3	Buried Ci
a. Spent resins/filters	1.84E+01	5.92E+01	1.84E+01	5.92E+01
b. Dry active waste	5.898E+02*	9.54E+00*	5.58E+01	1.01E+01
c. Irradiated components	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Other	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	6.082E+02	6.87E+01	7.42E+01	6.93E+01

*Includes 263.9 m^3 of suspected clean trash sent to offsite processor for monitoring before final disposition.

Note: Shipped volumes and curies are not always equal to the buried volumes and curies due to some burials occurring outside the six month time period in which the shipments occurred.

2. Estimate of Major Nuclide Composition (by type of waste)	Nuclide	% Abund.	Activity (Ci)
a. Spent resins/filters	Co-58	28.2%	1.67E+01
	Co-60	18.6%	1.10E+01
	Cs-137	15.0%	8.89E+00
	Cs-134	15.0%	8.88E+00
	Ni-63	6.0%	3.53E+00
	I-131	5.9%	3.51E+00
	Mn-54	3.8%	2.23E+00
	Zr-95	2.2%	1.32E+00
	Fe-55	1.7%	9.96E-01
	H-3	0.5%	2.84E-01
	C-14	0.1%	3.07E-02
	Tc-99	0.0%	7.42E-04
	I-129	0.0%	LLD
	Other*	3.0%	1.80E+00
	Total	100.0%	5.92E+01

* Nuclides representing <1% of total shipped activity: Cr-51, Fe-59, Zn-65, Nb-95, Ce-144, Pu-241, Pu-242.

TABLE 7.7 (Continued)

SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS

2. Estimate of Major Nuclide Composition (by type of waste)	Nuclide	% Abund.	Activity (Ci)
b. Dry active waste	Fe-55	31.2%	2.97E+00
	Co-58	28.4%	2.71E+00
	Co-60	16.4%	1.56E+00
	Nb-95	5.5%	5.21E-01
	Cr-51	4.6%	4.42E-01
	Mn-54	4.5%	4.24E-01
	Zr-95	3.2%	3.07E-01
	Fe-59	2.4%	2.29E-01
	I-131	2.0%	1.94E-01
	Ni-63	1.1%	1.06E-01
	H-3	0.4%	3.96E-02
	C-14	0.0%	6.30E-05
	I-129	0.0%	LLD
	Tc-99	0.0%	LLD
	Other*	0.3%	3.07E-02
	Total	100.0%	9.54E+00

* Nuclides representing <1% of total shipped activity: Sb-125, Cs-137, Cs-134, Ce-144, Cs-136, Sr-89.

3. Solid Waste Disposition	(Mode of Transportation: Truck)			
Waste Type	Waste Class	Container Type	Number of Shipments	Destination
a. Resin/filters	As	HIC*	2	Chem Nuclear Barnwell, SC
	B	HIC*	3	Chem Nuclear Barnwell, SC
b. Dry active waste	As	HIC*	1	Chem Nuclear Barnwell, SC
	Au	Strong, tight	3	SEG Oak Ridge, TN
	Au	Strong, tight	3	Alaron Wampum, PA
	Au	Strong, tight	4	Quadrex Oak Ridge, TN

* High Integrity Container

B. **Irradiated Fuel Shipments (Disposition)**

Number of Shipments	Mode of Transportation	Destination
0	N/A	N/A

ATTACHMENT 8.1

OFFSITE DOSE CALCULATION MANUAL

FOR

TU ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

UNITS 1 AND 2