Portland General Electric Company

James E. Cross Vice P. ent Nuclear

August 29, 1991

Trojan Nuclear Plant
Docket 50-344
License NPF-1

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington DC 20555

Dear Sir:

TROJAN NUCLEAR PLANT
Semiannual Radioactive Effluent and Waste Disposal Report

In accordance with Trojan Nuclear Plant Technical Specifications, attached is the semiannual Radioactive Effluent and Waste Disposal Report for the period January 1, 1991 through June 30, 1991. This information will also be included in the 1991 Annual Operating Report.

Sincerely,

T. D. Walt
for J. E. Cross

Attachment

c: Mr. David Stewart-Smith
State of Oregon
Department of Energy

Mr. John B. Martin
Regional Administrator, Region V
U. S. Nuclear Regulatory Commission

Mr. R. C. Barr
NRC Resident Inspector
Trojan Nuclear Plant

110061

121 SW Salmon St, Portland, OR 97204
503/464-8897

1. RADIOACTIVE EFFLUENT RELEASE REPORT

Requirement

Trojan Facility Operating License NPF-1, Appendix A, Technical Specifications 6.9.1.5.3 and 6.9.1.5.4, "Semiannual Radioactive Effluent Release Report", require:

> "Routine Radioactive Effluent Release Reports covering the operation of the unit during the previous 6 months of operation shall be submitted within 60 days after January 1 and July 1 of each year.
>
> "The Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit as outlined in Regulatory Guide 1.21 (Rev. 1), 'Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants', with data summarized on a quarterly basis following the format of Appendix B thereof.
>
> "The Radioactive Effluent Release Reports may include a summary of the meteorological conditions concurrent with the release of gaseous effluents during each quarter as outlined in Regulatory Guide 1.21 (Rev. 1), with data summarized on a quarterly basis following the format of Appendix B thereof. If the summary of the meteorological data is not included in the radioactive effluent release reports, it will be available for review at PGE's Corporate Office.
>
> "The Radioactive Effluent Release Reports shall include an assessment of the radiation doses from radioactive effluents to individuals due to their activities inside the unrestricted area boundary (Figure 5.1-1) during the report period. All assumptions used in making these assessments (e.g., specific activity, exposure time and location) shall be included in these reports.
>
> "The Radioactive Effluent Release Reports shall include a copy of all licensee event reports required by Specification 3.11.1.1 and 3.11.2.1.
>
> "The Radioactive Effluent Release Reports shall include an assessment of radiation doses from the radioactive liquid and gaseous effluents released from the unit during each calendar quarter as outlined in Regulatory Guide 1.21. In addition, the unrestricted area boundary maximum noble gas gamma air and beta air doses shall be evaluated. The meteorological conditions concurrent with the releases of effluents shall be used for determining the gaseous pathway doses. The assessment of radiation doses shall be performed in accordance with the Offsite Dose Calculation Manual (ODCM).
>
> "The Radioactive Effluent Release Reports shall include any changes to the PROCESS CONTROL PROGRAM or to the Offsite Dose Calculation Manual (ODCM) made during the reporting period, . . . ".

Report

Complete data for the period January 1991 through June 1991 have been included.

No licensee event reports required by Specification 3.11.1.1 or 3.11.2.1 were submitted during the first six months of 1991.

A. EFFLUENT AND WASTE DISPOSAL REPORT

This section contains a summary of the liquid and gaseous release limits; a list of the maximum permissible concentrations of the isotopes released; a summary of batch and abnormal release data; a summary of total liquid and gaseous releases; listings of isotopes released classified by pathway, gaseous or liquid, and type, continuous or batch; and a summary of solid radioactive waste shipments. This section represents all releases during the period January 1, 1991 through June 30, 1991.

The "ND" notation used in the following data tables indicates that no detectable activity was found when samples were analyzed using counting techniques which ensure compliance with the "Lower Limit of Detection, (LLD), values of Technical Specification Tables 4.11-1, "Radioactive Liquid Waste Sampling and Analysis Program", and 4.11-2, "Radioactive Gaseous Waste Sampling and Analysis Program". The referenced "LLD" specifications are not used as limiting values for reporting activity; all measurable activity is reported. For gamma emitting isotopes, all isotopes with measurable activity, together with those isotopes specified in Technical Specification Tables 4.11-1 and 4.11-2 are reported.

Activity releases from the Auxiliary Building are based on observed activity concentrations multiplied by a correction factor of 2.2. Releases from the Auxiliary Building have been based on the use of correction factors since February of 1988, when deficiencies in the design of the Auxiliary Building exhaust sampling system were identified.

Two orifice plates associated with two liquid effluent release pathways were found to have been installed backwards. The release pathways were the Steam Generator Blowdown (flow indicator FI-6715) and the Liquid Radwaste (flow element FE-4044) Discharge Effluent lines. Corrective Action Requests (CARs) C-91-0113 and C-91-0122 were written and the situation was evaluated and corrected. It was determined that FI-6715 is bypassed for discharges to the dilution and discharge structure and is not used to restrict the maximum flow rate for a steam generator blowdown discharge. Although FI-6715 could have been installed backwards and had a plugged high pressure tap/line, it was never used to monitor steam generator blowdown discharges and was never used to calculate radioactivity or chemical concentrations discharged.

Flow orifice FE-4044 was used to monitor instantaneous values of boron, pH, and activity and not to record actual values discharged. The official record of discharges is determined from a physical sample and analysis of the contents in the tank and the change in tank volume. In addition, there is a safety margin of 30-percent-plus on instantaneous flow limits measured for discharges. A test measurement determined that the degree of error incurred with FE-4044 installed backwards was 8.75 percent.

In conclusion, although FE-4044 was installed backwards and was inaccurate, the inaccuracy was such that no radioactive effluent limits were exceeded and the flow orifice was operable.

There was one abnormal release when a leak occurred on "B" seal injection filter. The release lasted 47 minutes, released minimal activity, and was monitored by Process Effluent Radiological Monitor (PERM) 2.

The following terms are used:

$\bar{K}_v$ = Average total body dose factor due to gamma emissions,

$\bar{L}_v$ = Average skin dose factor due to beta emissions,

$\bar{M}_v$ = Average air dose factor due to beta emissions,

$\bar{N}_v$ = Average air dose factor due to gamma emissions,

$\bar{R}_i$ = Average dose factor for nuclides other than noble gases at the controlling exposure locations.

TABLE A-1

SUPPLEMENTAL INFORMATION

January 1, 1991 through June 30, 1991

REGULATORY LIMITS

Fission and Activation Gas Release Rate Limits	Unit	First Quarter	Second Quarter
1. Tech. Spec. 3.11.2.1(a), Instantaneous			
$QTv < \frac{1}{2.0\ \bar{K}_V}$	Ci/sec	1.65E-1	1.88E-1
$QTv < \frac{1}{0.33\ (\bar{L}_V + 1.1\ \bar{N}_V)}$	Ci/sec	4.22E-1	4.57E-1
2. Tech. Spec. 3.11.2.2, Quarterly Average			
$QTv < \frac{1}{50\ \bar{N}_V}$	Ci/sec	5.48E-3	6.15E-3
$QTv < \frac{1}{25\ \bar{M}_V}$	Ci/sec	3.92E-3	3.96E-3
3. Tech. Spec. 3.11.2.4(1), Quarterly Average Requiring Use of the Gaseous Radwaste Treatment System			
$QTv < \frac{1}{100\ \bar{N}_V}$	Ci/sec	2.74E-3	3.08E-3
$QTv < \frac{1}{50\ \bar{M}_V}$	Ci/sec	1.96E-3	1.98E-3

TABLE A-2

SUPPLEMENTAL INFORMATION

January 1, 1991 through June 30, 1991

REGULATORY LIMITS

Gaseous Iodine 131, Tritium, and Particulates With > 8 Day T1/2 Limits	Unit	First Quarter	Second Quarter
1. Tech. Spec. 3.11.2.1(b), Instantaneous			
$QTv < \frac{1}{.67 \bar{R}i}$	Ci/sec	3.61E-2	4.42E-2
2. Tech. Spec. 3.11.2.3, Quarterly Average			
$QTv < \frac{1}{100 \bar{R}i}$	Ci/sec	2.42E-4	2.96E-4
3. Tech. Spec. 3.11.2.4(2), Quarterly Average Requiring Use of the Ventilation Exhaust Treatment System			
$QTv < \frac{1}{200 \bar{R}i}$	Ci/sec	1.21E-4	1.48E-4

TABLE A-3

SUPPLEMENTAL INFORMATION

January 1, 1991 through June 30, 1991

REGULATORY LIMITS

Liquid Effluent Limits

1.	Tech. Spec. 3.11.1.1 Instantaneous	Instantaneous discharge concentrations less than the maximum permissible concentrations listed 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 is limited to 2 x 10-4 μCi/ml total activity.
2.	Tech. Spec. 3.11.1.2 Quarterly Average	Gross release limit of 2.5 Ci per quarter excluding tritium and dissolved noble gases. If this limit is exceeded, cumulative dose due to liquid effluents will be limited to 1.5 mrem to the whole body and to 2.5 mrem to any organ, using isotope specific methodology in the Plant Offsite Dose Calculation Manual (ODCM).
3.	Tech. Spec. 3.11.1.3 Quarterly Average Requiring Use of the Liquid Radwaste Treatment System	The liquid radwaste treatment system shall be maintained and used when activity discharged (excluding tritium and dissolved noble gas) would exceed 1.25 Ci/Qtr.
4.	Tech. Spec. 3.11.1.4 Temporary Storage Tank Activity Limit	The quantity of radioactive material contained in temporary radwaste storage tanks is limited to ≤ 10 Ci excluding tritium and dissolved noble gases.

TABLE A-4

SUPPLEMENTAL INFORMATION

January 1, 1991 through June 30, 1991

MAXIMUM PERMISSIBLE CONCENTRATIONS

Liquid
(10 CFR 20, Appendix B, Table II, Col. 2)

Isotope	MPC (μCi/cc)	Isotope	MPC (μCi/cc)
Fluorine 18	8 x 10-4	Iodine 131	3 x 10-7
Chromium 51	2 x 10-3	Iodine 132	8 x 10-6
Manganese 54	1 x 10-4	Tellurium 132	2 x 10-5
Iron 55	8 x 10-4	Iodine 133	1 x 10-6
Cobalt 57	4 x 10-4	Cesium 134	9 x 10-6
Cobalt 58	9 x 10-5	Cesium 137	2 x 10-5
Iron 59	5 x 10-5	Cesium 138	3 x 10-6
Cobalt 60	3 x 10-5	Barium 140	2 x 10-5
Strontium 89	3 x 10-6	Lanthanum 140	2 x 10-5
Strontium 90	3 x 10-7	Cerium 141	9 x 10-5
Zirconium 95	6 x 10-5	Cerium 144	1 x 10-5
Niobium 95	. 10-4	Tungsten 187	6 x 10-5
Molybdenum 99	x 10-5	Gross Alpha	3 x 10-8
Technetium 99m	3 x 10-3	Unidentified	3 x 10-8
Ruthenium 103	8 x 10-5	Tritium	3 x 10-3
Ruthenium 106	1 x 10-5	Krypton 85m	2 x 10-4
Silver 110m	3 x 10-5	Krypton 87	2 x 10-4
Tin 113	8 x 10-5	Krypton 88	2 x 10-4
Antimony 124	2 x 10-5	Xenon 131m	2 x 10-4
Antimony 125	1 x 10-4	Xenon 133	2 x 10-4
Antimony 127	3 x 10-6	Xenon 133m	2 x 10-4
		Xenon 135	2 x 10-4
		Xenon 135m	2 x 10-4

Gaseous

Gaseous MPCs are not used in calculating technical specifications at Trojan.

TABLE A-5

SUPPLEMENTAL INFORMATION

January 1, 1991 through June 30, 1991

AVERAGE ENERGY

Effluent release limits are not based upon $\bar{E}$, hence, reporting $\bar{E}$ is not required.

MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

Gaseous Releases

Fission and Activation Gases: Gamma spectrometric analysis of gaseous grab samples define radionuclide distribution at least monthly on monitored gaseous release points. Using the known nuclide distributions and process radiation monitor rerdings, the actual quantities of gaseous releases are calculated.

Iodines and Particulates: Weekly composite filter and iodine cartridge samples are analyzed by gamma spectroscopy to determine the concentration of particulate and iodine isotopes. Weekly composite samples are analyzed for alpha-emitting isotopes by counting with a gas flow proportional counter. Quarterly composite filters are analyzed for Sr-89/90 using gas proportional beta counting and chemical separation techniques when necessary.

Tritium: Tritium is collected on dry silica gel in monthly composite samples and counted using liquid scintillation spectroscopy.

Liquid Releases

Fission and Activation Products: Gamma spectrometric analysis of each batch is performed. Weekly composite samples are maintained for continuous releases, and the composites are analyzed for specific nuclides as required. Monthly and quarterly composites are prepared for both batch and continuous releases for specified activity determinations.

Tritium: Monthly composite samples are distilled and deionized as necessary to remove contamination and counted by liquid scintillation techniques.

Dissolved and Entrained Gases: Gaseous isotopes are determined by gamma spectrometric analysis of each batch and on a minimum frequency of once per month for continuous releases.

TABLE A-6

SUPPLEMENTAL INFORMATION

January 1, 1991 through June 30, 1991

BATCH RELEASES

	Unit	Liquid	Gaseous
Number of Batch Releases		42	74
Total time period for Batch Releases	Hours	287.7	1939.4
Maximum time period for Batch Releases	Hours	34.8	233.7
Average time period for Batch Releases	Hours	6.8	26.2
Minimum time period for Batch Releases	Hours	0.1	0.2
Average dilution flow during Batch Releases	GPM	29073	NA*

ABNORMAL RELEASES

Number of Abnormal Releases		0	1
Total Activity Released	Ci	NA	0.2

*NA = Not Applicable

TABLE A-7

GASEOUS EFFLUENTS
SUMMATION OF ALL RELEASES

January 1, 1991 through June 30, 1991

FISSION AND ACTIVATION GASES	Unit	First Quarter	Second Quarter	Estimated Error (%)
Total Activity Released	Ci	7.57E+1	2.39E+1	±3.5E+1
Average Release Rate for Quarter	µCi/sec	9.76E+0	3.02E+0	
Percent of Limit:				
Tech. Spec. 3.11.2.1 (a) - Instantaneous		1.09E-2	2.64E-3	
Tech. Spec. 3.11.2.2 - Quarterly Average		2.48E-1	7.66E-2	
Tech. Spec. 3.11.2.4.(1) - Quarterly Average Requiring Processing		4.97E-1	1.53E-1	
IODINE 131				
Total Iodine 131 Released	Ci	6.44E-5	3.71E-4	±3.5E+1
Average Release Rate for Quarter	µCi/sec	8.28E-6	4.72E-5	
PARTICULATES				
Total with Half-lives > 8 days	Ci	2.69E-5	4.98E-6	±3.5E+1
Average Release Rate for Quarter	µCi/sec	3.46E-6	6.33E-7	
Total Gross Alpha Released	Ci	5.58E-8	1.08E-7	
TRITIUM				
Total Released	Ci	2.45E+1	3.97E+1	±3.0E+1
Average Release Rate for Quarter	µCi/sec	3.15E+0	5.05E+0	

IODINE 131, PARTICULATES WITH > 8 DAY T1/2 AND TRITIUM	Unit	First Quarter	Second Quarter	Estimated Error (%)
Total Released	Ci	2.45E+1	3.97E+1	±3.5E+1
Average Release Rate for Quarter	µCi/sec	3.16E+0	5.06E+0	
Percent of Limit:				
Tech. Spec. 3.11.2.1 (b) Instantaneous		8.77E-3	2.28E-2	
Tech. Spec. 3.11.2.3 Quarterly Average		1.31E+0	1.71E+0	
Tech. Spec. 3.11.2 4(2) Quarterly Average Requiring Processing		2.62E+0	3.42E+0	

TABLE A-8

GASEOUS EFFLUENTS
GROUND LEVEL RELEASES

January 1, 1991 through June 30, 1991

NUCLIDES RELEASED

FISSION GASES

		Continuous Mode		Batch Mode	
	Unit	First Quarter	Second Quarter	First Quarter	Second Quarter
Krypton 85m	Ci	9.43E-4	ND	1.82E-2	ND
Krypton 85	Ci	ND	ND	8.40E-1	3.81E-1
Krypton 87	Ci	1.86E-3	ND	2.77E-3	ND
Krypton 88	Ci	3.31E-3	ND	3.18E-3	ND
Xenon 131m	Ci	ND	ND	3.93E-1	3.88E-2
Xenon 133m	Ci	5.75E-1	ND	6.75E-2	ND
Xenon 133	Ci	6.00E+1	1.65E+1	1.30E+1	6.99E+0
Xenon 135m	Ci	6.27E-1	ND	3.68E-3	ND
Xenon 135	Ci	7.79E-3	ND	8.98E-2	ND
Xenon 137	Ci	8.43E-3	ND	ND	ND
Xenon 138	Ci	7.75E-3	ND	ND	ND
Argon 41	Ci	1.79E-3	ND	9.81E-2	ND
TOTAL FOR QUARTER	Ci	6.12E+1	1.65E+1	1.45E+1	7.41E+0

IODINES

	Unit	Continuous Mode First Quarter	Continuous Mode Second Quarter	Batch Mode First Quarter	Batch Mode Second Quarter
Iodine 131	Ci	5.95E-5	1.42E-4	5.14E-6	2.29E-4
Iodine 132	Ci	ND	ND	9.42E-8	ND
Iodine 133	Ci	4.27E-8	ND	5.83E-7	ND
Iodine 134	Ci	ND	ND	ND	ND
Iodine 135	Ci	ND	ND	ND	ND
TOTAL FOR QUARTER	Ci	5.93E-5	1.42E-4	5.82E-6	2.29E-4

PARTICULATES > 8 DAY T-1/2 AND TECHNICAL SPECIFICATION REQUIRED ISOTOPES

Manganese 54	Ci	ND	ND	ND	ND
Cobalt 58	Ci	ND	ND	9.87E-9	4.98E-6
Iron 59	Ci	ND	ND	ND	ND
Cobalt 60	Ci	ND	ND	ND	ND
Zinc 65	Ci	ND	ND	ND	ND
Strontium 89	Ci	2.16E-8	ND	1.54E-5	ND
Strontium 90	Ci	1.19E-8	ND	1.15E-5	ND
Niobium 95	Ci	ND	ND	ND	ND
Molybdenum 99	Ci	ND	ND	ND	ND
Cesium 134	Ci	ND	ND	ND	ND
Cesium 137	Ci	ND	ND	2.33E-8	ND
Barium 140	Ci	ND	ND	ND	ND
Cerium 141	Ci	ND	ND	ND	ND
Cerium 144	Ci	ND	ND	ND	ND
Neodymium 147	Ci	ND	ND	ND	ND
TOTAL FOR QUARTER	Ci	3.35E-8	0.00E+0	2.69E-5	4.98E-6

TABLE A-9

GASEOUS EFFLUENTS
ELEVATED RELEASES

January 1, 1991 through June 30, 1991

No Elevated Release Points

TABLE A-10

LIQUID EFFLUENTS
SUMMATION OF ALL RELEASES

January 1, 1991 through June 30, 1991

	Unit	First Quarter	Second Quarter	Estimated Error %
FISSION AND ACTIVATION PRODUCTS				
Total Activity Released (excluding gases, tritium, and alpha)	Ci	1.18E-2	2.61E-2	±3.5E+1
Average Diluted Concentration	µCi/ml	7.76E-10	1.59E-9	
Percent of Limit				
Tech. Spec. 3.11.1.1 - Instantaneous	%	2.75E-1	2.37E-1	
Tech. Spec. 3.11.1.2 - Quarterly Limit	%	4.75E-1	1.04E+0	
Tech. Spec. 3.11.1.3 - Quarterly Limit Requiring Processing	%	9.49E-1	2.08E+0	
TRITIUM				
Total Released	Ci	6.44E+1	6.34E+1	±3.0E+1
Average Diluted Concentration	µCi/ml	4.24E-6	3.86E-6	
Fraction of MPC	%	1.41E-1	1.29E-1	
DISSOLVED AND ENTRAINED GASES				
Total Activity Released	Ci	1.05E-3	3.35E-5	±3.0E+1
Average Diluted Concentration	µCi/ml	6.91E-11	2.04E-12	
Fraction of MPC	%	3.46E-5	1.02E-6	
GROSS ALPHA RADIOACTIVITY				
Total Activity Released	Ci	1.02E-5	9.89E-6	±3.0E+1
UNDILUTED VOLUME OF WASTE RELEASED	Liters	1.58E+7	5.10E+6	±5.0E+0
VOLUME OF DILUTION WATER	Liters	1.52E+10	1.64E+10	±1.5E+1

TABLE A-11 Sheet 1 of 2

LIQUID EFFLUENTS

January 1, 1991 through June 30, 1991

NUCLIDES RELEASED	Unit	Continuous Mode		Batch Mode	
		First Quarter	Second Quarter	First Quarter	Second Quarter
Chromium 51	Ci	ND	ND	2.63E-5	1.56E-3
Manganese 54	Ci	ND	ND	1.95E-4	2.51E-4
Iron 55	Ci	2.04E-4	1.97E-4	3.46E-3	3.59E-3
Cobalt 57	Ci	ND	ND	5.54E-6	4.02E-5
Cobalt 58	Ci	ND	ND	8.97E-4	1.10E-2
Iron 59	Ci	ND	ND	ND	1.15E-4
Cobalt 60	Ci	ND	ND	2.54E-3	3.47E-3
Zinc 65	Ci	ND	ND	ND	ND
Strontium 89	Ci	1.71E-4	8.27E-5	1.43E-5	3.73E-5
Strontium 90	Ci	2.62E-4	9.17E-6	5.23E-6	8.94E-6
Zirconium 95	Ci	ND	ND	3.54E-5	2.62E-4
Niobium 95	Ci	ND	ND	1.72E-4	5.92E-4
Molybdenum 99	Ci	ND	ND	ND	ND
Technitium 99m	Ci	ND	ND	ND	ND
Ruthenium 103	Ci	ND	ND	5.47E-5	1.42E-4
Ruthenium 106	Ci	ND	ND	1.19E-3	1.76E-3
Silver 110m	Ci	ND	ND	7.94E-4	8.89E-4
Tin 113	Ci	ND	ND	ND	6.11E-5
Antimony 124	Ci	ND	ND	ND	1.84E-5
Antimony 125	Ci	ND	ND	1.00E-3	7.66E-4
Iodine 131	Ci	ND	ND	9.94E-5	ND
Iodine 132	Ci	ND	ND	ND	ND
Tellurium 132	Ci	ND	ND	ND	ND
Iodine 133	Ci	ND	ND	3.18E-6	ND
Cesium 134	Ci	ND	ND	3.20E-5	9.64E-5
Cesium 137	Ci	ND	ND	1.00E-4	3.26E-4
Barium 140	Ci	ND	ND	2.72E-5	ND
Lanthanum 140	Ci	ND	ND	3.23E-4	1.71E-5

NUCLIDES RELEASED

	Unit	Continuous Mode		Batch Mode	
		First Quarter	Second Quarter	First Quarter	Second Quarter
Cerium 141	Ci	ND	ND	ND	8.74E-6
Cerium 144	Ci	ND	ND	2.92E-4	6.63E-4
Tungsten 187	Ci	ND	ND	ND	ND
Unidentified	Ci	ND	ND	ND	3.71E-5
TOTAL FOR QUARTER	Ci	6.37E-4	2.89E-4	1.12E-2	2.57E-2

DISSOLVED AND ENTRAINED GASES

	Unit	Continuous Mode		Batch Mode	
		First Quarter	Second Quarter	First Quarter	Second Quarter
Krypton 85	Ci	ND	ND	ND	ND
Krypton 88	Ci	ND	ND	ND	ND
Xenon 131m	Ci	ND	ND	ND	ND
Xenon 133m	Ci	ND	ND	ND	ND
Xenon 133	Ci	ND	ND	1.04E-3	3.35E-5
Xenon 135	Ci	ND	ND	1.29E-5	ND
Xenon 138	Ci	ND	ND	ND	ND
TOTAL FOR QUARTER	Ci	ND	ND	1.05E-3	3.35E-5

TABLE A-12

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

January 1, 1991 through June 30, 1991

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel) - Type of Waste	Activity During Six Months	Volume During Six Months	Estimate Total Error %
1. Spent Resin, Filters, Sludges, Evaporator Bottoms, etc.	11.397 Ci	61.39 m^3	25%
2. Dry Compressible Waste, Contaminated Equipment, etc.	2.91 Ci	44.44 m^3 (9.35 m^3)*	25%
NOTE: Total Volume shipped for processing		373.80 m^3	
Volume remaining for processing		122.67 m^3	
3. Irradiated Components, Control Rods, etc.	0.000	0.00	
4. Other	0.000	0.00	

ESTIMATE OF MAJOR NUCLIDE DISTRIBUTION BY TYPE OF WASTE

Nuclide

1. See attached sheet.

2. See attached sheet.

3.

4.

SOLID WASTE DISPOSITION

Number of Shipments	Mode of Transportation	Destination
8	Exclusive Use Truck	U.S. Ecology, Inc. PO Box 638 Richland WA 99352

*Burial volume after processing by Scientific Ecology Group and subsequent disposal at U.S. Ecology, Inc. (estimate).

7	Exclusive Use Truck	Scientific Ecology Group 1560 Bear Creek Rd. Oak Ridge TN 37831
1	Exclusive Use Truck	Allied Nuclear, Inc. 2025 Battelle Blvd. Richland WA 99352

IRRADIATED FUEL SHIPMENTS DISPOSITION

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

ESTIMATE OF MAJOR NUCLIDE DISTRIBUTION BY TYPE OF WASTE

1.

Nuclide	Ci	Nuclide	Ci
H-3	1.572	Ru-106	0.271
C-14	0.135	Ag-110m	0.018
Cr-51	0	Sn-113	0
Mn-54	0.117	Sb-125	0.146
Fe-55	4.605	I-131	0
Co-57	0	Cs-134	0.105
Co-58	0.421	Cs-137	0.387
Fe-59	0	Ba-140	0
Co-60	1.685	Ce-141	0
Ni-63	1.415	Ce-144	0.124
Sr-89	0	U-235	0
Sr-90	0.007	Pu-238	0.004
Nb-95	0.001	Pu-239	0.007
Zr-95	0	Pu-241	0.377
Ru-103	0	Cm-242	0
		Total	11.397

* N/A = Not Applicable

2. Nuclide	Ci	Nuclide	Ci
H-3	0.539	Ru-106	0.102
C-14	0.298	Ag-110m	0.007
Cr-51	0.041	Sn-113	0
Mn-54	0.039	Sb-125	0.004
Fe-55	0.752	I-131	0
Co-57	0	Cs-134	0.007
Co-58	0.340	Cs-137	0.039
Fe-59	0	Ba-140	0
Co-60	0.308	Ce-141	0
Ni-63	0.201	Ce-144	0.034
Sr-89	0	U-235	0
Sr-90	0.001	Pu-238	0.002
Nb-95	0.028	Pu-239	0.003
Zr-95	0.015	Pu-241	0.145
Ru-103	0.005	Cm-242	0
		Total	2.910

B. OFFSITE RADIATION DOSES

Offsite radiation doses from gaseous and liquid effluents for the first six months of 1991 are presented in this section. Included are quarterly doses to individuals at locations of maximum actual exposure and quarterly doses to the 50-mile population. Doses are presented separately for batch and continuous releases and for noble gas, gaseous iodine, and particulate and liquid effluents.

Exposure locations are based on the land-use survey presented in the Final Safety Analysis Report and the 1990 annual survey of agricultural production.

Models and assumptions used in performing the dose analyses for 1991 are presented in Sections 11.2, "Liquid Waste Management Systems", and 11.3, "Gaseous Waste Management Systems", of the Trojan Final Safety Analysis Report.

TABLE B-1

PARAMETERS USED IN CALCULATING DOSES FROM GASEOUS EFFLUENTS
(First Half 1991)

Parameter	Value
Irradiation and Decay Times (days)	
Irradiation of leafy vegetables to consumption by man	1.0
Irradiation of pasture grass to consumption by animals	0.0
Irradiation of stored feed to consumption by animals	90.0
Harvest of produce to consumption by man	60.0
Animal butchering to consumption	20.0
Food ingestion by animal to milking	2.0
Accumulation time on ground	7,300.0
Human Consumption Rates (kg/yr)	
Leafy vegetables by adult	64.0
Produce by adult	456.0
Meat by adult	110.0
Milk by adult	310.0
Milk by infant	330.0
Breathing Rates (m^3/yr)	
Adult	8,000.0
Infant	1,400.0
Animal Consumption Rates (kg/day)	
Animal feed by meat animal	50.0
Animal feed by milk cow	50.0
Animal feed by milk goat	6.0
Exposure Periods During Growing Season (days)	
Leafy vegetables	60.0
Pasture vegetation	30.0
Produce	60.0
Residential Structure Shielding Factor	0.7
Fraction of Particulates Initially Deposited on Leafy Vegetation	0.2
Fraction of Particulates Initially Deposited on Produce	0.2
Fraction of Iodine Deposited on Leafy Vegetation	1.0
Fraction of Iodine Deposited on Produce	1.0
Surface Density of Soil for Root Zone (kg/m^2)	240.0
Field Decay Half Life (days)	14.0

Parameter	Value
Agricultural Productivity (kg/m^2)	
Leafy vegetables	2.0
Pasture grass	0.7
Produce	2.0
Period of Long-Term Buildup for Activity in Soil (days)	7,300.0
Fraction of Leafy Vegetables Grown in Garden of Interest	1.0
Fraction of Produce Grown in Garden of Interest	0.76
Fraction of Year Animal Grazes on Pasture	0.5
Fraction of Daily Feed that is Pasture Grass when Animal Grazes	1.0

PARAMETERS USED IN CALCULATING DOSES FROM LIQUID EFFLUENTS

Parameter	Value First Quarter 1991	Value Second Quarter 1991
Plant Dilution Flow Rate (gpm)	30,967.	33,077.
Columbia River Flow Rate (cfs)	144,947.	394,363.
Dilution Factors		
Drinking water	2,100.	5,351.
Swimming water	462.	1,177.
Aquatic biota	462.	1,177.
Shoreline sediment	462.	1,177.
Irrigation water	2,100.	5,351.
Milk and meat animal water	2,100.	5,351.
Decay Times (days)		
Discharge to drinking water	0.74	0.59
Discharge to swimming water	0.0	0.0
Discharge to aquatic biota consumption	1.0	1.0
Discharge to deposition on shoreline sediment	0.0	0.0
Discharge to irrigation water withdrawal	0.74	0.59
Discharge to milk and meat animal water withdrawal	0.74	0.59
Leafy vegetable harvest to consumption by man	1.	
Produce harvest to consumption by man	60.	
Stored feed harvest to consumption by animals	90.	
Pasture grass to consumption by animals	0.	
Animal butchering to consumption	20.	
Food and water ingestion by cow/goat to milking	2.	
Accumulation Times (days)		
Shoreline sediment	7,300.	
Irrigated soil	7,300.	
Irrigated vegetables	60.	
Pasture grass	30.	
Adult Consumption Rates (kg/yr)		
Drinking water	730.	
Fish	21.	
Invertebrates (crayfish)	5.	
Irrigated leafy vegetables	64.	
Irrigated produce	456.	
Cow's milk from irrigated pastureland	310.	
Goat's milk from irrigated pastureland	310.	
Meat from irrigated pastureland	110.	

Parameter	Value First Quarter 1991	Value Second Quarter 1991
Annual Exposure Times (hr/yr)		
Swimming and boating	12.	
Shoreline activities	12.	
Irrigated pasture	2,190.	
Infant Consumption Rates (kg/yr)		
Drinking water	330.	
Cow's milk from irrigated pastureland	330.	
Fraction of Year Animals Graze on Pasture	0.5	
Fraction of Year Crops are Irrigated	0.5	
Field (Weathering) Half-Life (days)	14.	
Irrigation Rate (liters/m^2-hr)	0.104	
Fractional Concentration of Water in Soil (g/g)	0.2	
Fraction of Leafy Vegetables Grown in Garden of Interest	1.	
Fraction of Produce Grown in Garden of Interest	0.76	
Irrigated Soil Self-Shielding Factor	2.5	
Fraction of Isotope in Irrigation Water That is Initially Retained by Leafy Vegetables	0.25	
Fraction of Isotope in Irrigation Water That is Initially Retained by Produce	0.25	
Pasture Grass Yield (kg/m2)	0.7	
Vegetable Yield (kg/m2)	2.	
Surface Density of Soil (kg/m2)	240.	
Animal Consumption Rates (kg/day)		
Water by milk cow	60.	
Water by milk goat	8.	
Water by beef	50.	
Pasture vegetation by milk cow	50.	
Pasture vegetation by milk goat	6.	
Pasture vegetation by beef	50.	

TABLE B-3

1 QUARTER 1991

DOSES FROM LIQUID EFFLUENTS
(MREM)

EXPOSURE PATHWAY	TOTAL BODY	SKIN	LUNG	BONE	ADULT THYROID	INFANT THYROID	OTHER INTERNAL ORGANS
AQUATIC AT MAXIMUM LOCATION							
DRINKING WATER	4.1E-05	4.1E-05	4.1E-05	5.0E-05	4.2E-05	5.7E-05	4.1E-05
FISH CONSUMPTION	3.2E-05	3.2E-05	1.9E-05	6.7E-05	3.4E-05	0.0E+00	9.2E-05
INVERTEBRATE CONSUMPTION	1.6E-05	1.6E-05	1.6E-05	4.8E-05	1.6E-05	0.0E+00	8.1E-05
EXPOSURE TO SHORELINE SEDIMENT	7.4E-07	8.7E-07	7.4E-07	7.4E-07	7.4E-07	0.0E+00	7.4E-07
SWIMMING AND BOATING	9.9E-09	1.7E-07	9.9E-09	9.9E-09	9.9E-09	0.0E+00	9.9E-09
AQUATIC TOTAL	9.0E-05	9.0E-05	7.6E-05	1.7E-04	9.3E-05	5.7E-05	2.2E-04
AQUATIC AT AGRICULTURAL LOCATION							
DRINKING WATER	4.1E-05	4.1E-05	4.1E-05	5.0E-05	4.2E-05	5.7E-05	4.1E-05
FISH CONSUMPTION	7.1E-06	7.1E-06	4.2E-06	1.5E-05	7.6E-06	0.0E+00	2.0E-05
INVERTEBRATE CONSUMPTION	3.5E-06	3.5E-06	3.4E-06	1.1E-05	3.5E-06	0.0E+00	1.8E-05
EXPOSURE TO SHORELINE SEDIMENT	1.6E-07	1.9E-07	1.6E-07	1.6E-07	1.6E-07	0.0E+00	1.6E-07
SWIMMING AND BOATING	2.2E-09	3.6E-08	2.2E-09	2.2E-09	2.2E-09	0.0E+00	2.2E-09
IRRIGATION AND LIVESTOCK WATERING							
EXPOSURE TO AGRICULTURAL SOIL	2.1E-06	2.5E-06	2.1E-06	2.1E-06	2.1E-06	0.0E+00	2.1E-06
LEAFY VEGETABLE CONSUMPTION	5.0E-06	5.0E-06	5.0E-06	1.0E-05	5.8E-06	0.0E+00	4.9E-06
PRODUCE CONSUMPTION	2.5E-05	2.5E-05	2.5E-05	4.9E-05	2.5E-05	0.0E+00	2.4E-05
MEAT CONSUMPTION	7.3E-06	7.3E-06	8.7E-06	8.8E-06	7.4E-06	0.0E+00	5.6E-05
MILK CONSUMPTION (COW)	1.9E-05	1.9E-05	1.9E-05	2.1E-05	2.0E-05	7.0E-05	2.2E-05
MILK CONSUMPTION (GOAT)	4.1E-05	4.1E-05	4.0E-05	4.6E-05	4.3E-05	1.4E-04	3.9E-05
AGRICULTURAL TOTAL							
EXCLUDING COW MILK CONSUMPTION	1.3E-04	1.3E-04	1.3E-04	1.9E-04	1.4E-04	2.0E-04	2.1E-04
EXCLUDING GOAT MILK CONSUMPTION	1.1E-04	1.1E-04	1.1E-04	1.7E-04	1.1E-04	1.3E-04	1.9E-04

TABLE B-4

FIRST QUARTER 1991

POPULATION DOSE (50-MILE) FROM
LIQUID EFFLUENTS
(MAN-REM)

EXPOSURE PATHWAY	TOTAL BODY	THYROID
AQUATIC		
DRINKING WATER	1.6E-04	1.7E-04
FISH CONSUMPTION	3.1E-03	3.3E-03
INVERTEBRATE CONSUMPTION	7.0E-06	7.0E-06
EXPOSURE TO CONTAMINATED SEDIMENT	3.6E-06	3.6E-06
SWIMMING AND BOATING	2.5E-08	2.5E-08
IRRIGATION AND LIVESTOCK WATERING		
LEAFY VEGETABLE CONSUMPTION	3.9E-07	4.4E-07
PRODUCE CONSUMPTION	1.9E-06	1.9E-06
MEAT CONSUMPTION	1.0E-05	1.0E-05
MILK CONSUMPTION	9.6E-05	1.1E-04
EXPOSURE TO CONTAMINATED SOIL	3.1E-07	3.1E-07
TOTAL	3.4E-03	3.6E-03
AVERAGE DOSE (MREM/PERSON)	1.6E-06	1.7E-06

TABLE B-5

FIRST QUARTER 1991
BATCH RELEASES

DOSES FROM NOBLE GASES AT
SITE BOUNDARY AND RESIDENCE OF
HIGHEST CONCENTRATION

	Site Boundary[a]	Residence[b]
Beta Air Dose (mrad)	9.9E-3	5.2E-3
Gamma Air Dose (mrad)	3.5E-3	1.3E-3
Beta + Gamma Skin Dose (mrem)	-	3.3E-3
Gamma Total Body Dose (mrem)	-	1.1E-3

[a] NNW sector at 674 meters.

[b] NNW sector at 1000 meters.

TABLE B-6

FIRST QUARTER 1991
CONTINUOUS RELEASES

DOSES FROM NOBLE GASES AT
SITE BOUNDARY AND RESIDENCE OF
HIGHEST CONCENTRATION

	Site Boundary[a]	Residence[b]
Beta Air Dose (mrad)	3.3E-2	1.8E-2
Gamma Air Dose (mrad)	1.2E-2	4.6E-3
Beta + Gamma Skin Dose (mrem)	-	1.1E-2
Gamma Total Body Dose (mrem)	-	3.9E-3

[a] NNW sector at 674 meters.

[b] NNW sector at 1000 meters.

TABLE B-7

FIRST QUARTER 1991
BATCH + CONTINUOUS RELEASES

DOSES FROM NOBLE GASES AT
SITE BOUNDARY AND RESIDENCE OF
HIGHEST CONCENTRATION

	Site Boundary[a]	Residence[b]
Beta Air Dose (mrad)	4.3E-2	2.3E-2
Gamma Air Dose (mrad)	1.6E-2	5.9E-3
Beta + Gamma Skin Dose (mrem)	-	1.4E-2
Gamma Total Body Dose (mrem)	-	5.0E-3

[a] Maximum site boundary location.

[b] Maximum residence location.

TABLE B-8

1 QUARTER 1991 BATCH RELEASES

DOSES FROM GASEOUS EFFLUENTS (EXCLUDING NOBLE GASES) AT MAXIMUM OFFSITE EXPOSURE LOCATIONS (MREM)

EXPOSURE LOCATION AND PATHWAY	TOTAL BODY	SKIN	LUNG	BONE	ADULT THYROID	INFANT THYROID	OTHER INTERNAL ORGANS
GARDEN (NNW SECTOR AT 1000. METERS)							
AIR INHALATION	7.09E-03	7.09E-03	7.11E-03	7.39E-03	7.11E-03	3.65E-03	7.09E-03
EXPOSURE TO SOIL	9.74E-08	1.18E-07	9.74E-08	9.74E-08	9.74E-08	9.74E-08	9.74E-08
LEAFY VEGETABLE CONSUMPTION	2.27E-03	2.27E-03	2.27E-03	3.21E-03	2.37E-03	0.00E+00	2.27E-03
PRODUCE CONSUMPTION	1.23E-02	1.23E-02	1.23E-02	1.72E-02	1.23E-02	0.00E+00	1.23E-02
TOTAL	2.16E-02	2.16E-02	2.17E-02	2.78E-02	2.18E-02	3.65E-03	2.16E-02
MEAT ANIMAL (NNW SECTOR AT 3200. METERS)							
AIR INHALATION	1.31E-03	1.31E-03	1.31E-03	1.36E-03	1.31E-03	6.73E-04	1.31E-03
EXPOSURE TO SOIL	1.32E-08	1.60E-08	1.32E-08	1.32E-08	1.32E-08	1.32E-08	1.32E-08
LEAFY VEGETABLE CONSUMPTION	35E-04	4.35E-04	4.35E-04	5.62E-04	4.48E-04	0.00E+00	4.35E-04
PRODUCE CONSUMPTION	.35E-03	2.35E-03	2.35E-03	3.02E-03	2.35E-03	0.00E+00	2.35E-03
MEAT CONSUMPTION	.10E-04	4.10E-04	4.10E-04	4.24E-04	4.11E-04	0.00E+00	4.10E-04
TOTAL	4.51E-03	4.51E-03	4.51E-03	5.37E-03	4.52E-03	6.73E-04	4.51E-03
MILK COW (NNW SECTOR AT 8000. METERS)							
AIR INHALATION	3.01E-04	3.01E-04	3.02E-04	3.18E-04	3.02E-04	1.55E-04	3.01E-04
EXPOSURE TO SOIL	2.35E-09	2.85E-09	2.35E-09	2.35E-09	2.35E-09	2.35E-09	2.35E-09
LEAFY VEGETABLE CONSUMPTION	1.08E-04	1.08E-04	1.08E-04	1.31E-04	1.10E-04	0.00E+00	1.08E-04
PRODUCE CONSUMPTION	5.84E-04	5.84E-04	5.84E-04	7.03E-04	5.84E-04	0.00E+00	5.84E-04
MEAT CONSUMPTION	1.04E-04	1.04E-04	1.04E-04	1.07E-04	1.05E-04	0.00E+00	1.04E-04
COW MILK CONSUMPTION	2.47E-04	2.47E-04	2.47E-04	2.56E-04	2.51E-04	8.04E-04	2.47E-04
TOTAL	1.34E-03	1.34E-03	1.34E-03	1.51E-03	1.35E-03	9.59E-04	1.34E-03
MILK GOAT (NNW SECTOR AT 8000. METERS)							
AIR INHALATION	3.01E-04	3.01E-04	3.02E-04	3.14E-04	3.02E-04	1.55E-04	3.01E-04
EXPOSURE TO SOIL	2.35E-09	2.85E-09	2.35E-09	2.35E-09	2.35E-09	2.35E-09	2.35E-09
LEAFY VEGETABLE CONSUMPTION	1.08E-04	1.08E-04	1.08E-04	1.31E-04	1.10E-04	0.00E+00	1.08E-04
PRODUCE CONSUMPTION	5.84E-04	5.84E-04	5.84E-04	7.03E-04	5.84E-04	0.00E+00	5.84E-04
MEAT CONSUMPTION	1.04E-04	1.04E-04	1.04E-04	1.07E-04	1.05E-04	0.00E+00	1.04E-04
GOAT MILK CONSUMPTION	5.04E-04	5.04E-04	5.04E-04	5.23E-04	5.09E-04	1.61E-03	5.04E-04
TOTAL	1.60E-03	1.60E-03	1.60E-03	1.78E-03	1.61E-03	1.77E-03	1.60E-03

TABLE B-9

1 QUARTER 1991 CONTINUOUS RELEASES

DOSES FROM GASEOUS EFFLUENTS (EXCLUDING NOBLE GASES) AT MAXIMUM OFFSITE EXPOSURE LOCATIONS (MREM)

EXPOSURE LOCATION AND PATHWAY	TOTAL BODY	SKIN	LUNG	BONE	ADULT THYROID	INFANT THYROID	OTHER INTERNAL ORGANS
GARDEN (NNW SECTOR AT 1000. METERS)							
AIR INHALATION	1.55E-03	1.55E-03	1.55E-03	1.55E-03	1.74E-03	1.03E-03	1.55E-03
EXPOSURE TO SOIL	1.13E-06	1.38E-06	1.13E-06	1.13E-06	1.13E-06	1.13E-06	1.13E-06
LEAFY VEGETABLE CONSUMPTION	4.35E-04	4.35E-04	4.35E-04	4.37E-04	1.61E-03	0.00E+00	4.37E-04
PRODUCE CONSUMPTION	2.35E-03	2.35E-03	2.35E-03	2.35E-03	2.39E-03	0.00E+00	2.35E-03
TOTAL	4.33E-03	4.33E-03	4.33E-03	4.34E-03	5.74E-03	1.03E-03	4.33E-03
MEAT ANIMAL (NNW SECTOR AT 3200. METERS)							
AIR INHALATION	2.76E-04	2.76E-04	2.76E-04	2.76E-04	3.11E-04	1.85E-04	2.76E-04
EXPOSURE TO SOIL	1.55E-07	1.89E-07	1.55E-07	1.55E-07	1.55E-07	1.55E-07	1.55E-07
LEAFY VEGETABLE CONSUMPTION	8.40E-05	8.40E-05	8.40E-05	8.42E-05	2.46E-04	0.00E+00	8.42E-05
PRODUCE CONSUMPTION	4.53E-04	4.53E-04	4.53E-04	4.54E-04	4.58E-04	0.00E+00	4.53E-04
MEAT CONSUMPTION	8.60E-05	8.60E-05	8.60E-05	8.60E-05	9.70E-05	0.00E+00	8.60E-05
TOTAL	8.99E-04	8.99E-04	8.99E-04	9.00E-04	1.11E-03	1.85E-04	8.99E-04
MILK COW (NNW SECTOR AT 8000. METERS)							
AIR INHALATION	6.31E-05	6.31E-05	6.31E-05	6.31E-05	7.15E-05	4.28E-05	6.31E-05
EXPOSURE TO SOIL	2.75E-08	3.34E-08	2.75E-08	2.75E-08	2.75E-08	2.75E-08	2.75E-08
LEAFY VEGETABLE CONSUMPTION	2.12E-05	2.12E-05	2.12E-05	2.12E-05	4.99E-05	0.00E+00	2.12E-05
PRODUCE CONSUMPTION	1.15E-04	1.15E-04	1.15E-04	1.15E-04	1.16E-04	0.00E+00	1.15E-04
MEAT CONSUMPTION	2.18E-05	2.18E-05	2.18E-05	2.18E-05	2.37E-05	0.00E+00	2.18E-05
COW MILK CONSUMPTION	5.13E-05	5.13E-05	5.13E-05	5.13E-05	1.05E-04	5.68E-04	5.14E-05
TOTAL	2.72E-04	2.72E-04	2.72E-04	2.72E-04	3.66E-04	6.11E-04	2.72E-04
MILK GOAT (NNW SECTOR AT 8000. METERS)							
AIR INHALATION	6.31E-05	6.31E-05	6.31E-05	6.31E-05	7.15E-05	4.28E-05	6.31E-05
EXPOSURE TO SOIL	2.75E-08	3.34E-08	2.75E-08	2.75E-08	2.75E-08	2.75E-08	2.75E-08
LEAFY VEGETABLE CONSUMPTION	2.12E-05	2.12E-05	2.12E-05	2.12E-05	4.99E-05	0.00E+00	2.12E-05
PRODUCE CONSUMPTION	1.15E-04	1.15E-04	1.15E-04	1.15E-04	1.16E-04	0.00E+00	1.15E-04
MEAT CONSUMPTION	2.18E-05	2.18E-05	2.18E-05	2.18E-05	2.37E-05	0.00E+00	2.18E-05
GOAT MILK CONSUMPTION	1.05E-04	1.05E-04	1.05E-04	1.05E-04	1.69E-04	8.16E-04	1.05E-04
TOTAL	3.25E-04	3.25E-04	3.25E-04	3.25E-04	4.30E-04	8.59E-04	3.25E-04

TABLE B-10

1 QUARTER 1991 BATCH + CONTINUOUS RELEASES

DOSES FROM GASEOUS EFFLUENTS (EXCLUDING NOBLE GASES) AT MAXIMUM OFFSITE EXPOSURE LOCATIONS (MREM)

EXPOSURE LOCATION AND PATHWAY	TOTAL BODY	SKIN	LUNG	BONE	ADULT THYROID	INFANT THYROID	OTHER INTERNAL ORGANS
GARDEN MAXIMUM LOCATION							
AIR INHALATION	8.64E-03	8.64E-03	8.66E-03	8.94E-03	8.85E-03	4.68E-03	8.64E-03
EXPOSURE TO SOIL	1.23E-06	1.50E-06	1.23E-06	1.23E-06	1.23E-06	1.23E-06	1.23E-06
LEAFY VEGETABLE CONSUMPTION	2.71E-03	2.71E-03	2.71E-03	3.65E-03	3.98E-03	0.00E+00	2.71E-03
PRODUCE CONSUMPTION	1.46E-02	1.46E-02	1.46E-02	1.95E-02	1.47E-02	0.00E+00	1.46E-02
TOTAL	2.59E-02	2.59E-02	2.60E-02	3.21E-02	2.75E-02	4.68E-03	2.59E-02
MEAT ANIMAL MAXIMUM LOCATION							
AIR INHALATION	1.59E-03	1.59E-03	1.59E-03	1.64E-03	1.62E-03	8.58E-04	1.59E-03
EXPOSURE TO SOIL	1.68E-07	2.05E-07	1.68E-07	1.68E-07	1.68E-07	1.68E-07	1.68E-07
LEAFY VEGETABLE CONSUMPTION	5.19E-04	5.19E-04	5.19E-04	6.46E-04	6.94E-04	0.00E+00	5.19E-04
PRODUCE CONSUMPTION	2.80E-03	2.80E-03	2.80E-03	3.47E-03	2.81E-03	0.00E+00	2.80E-03
MEAT CONSUMPTION	4.96E-04	4.96E-04	4.96E-04	5.10E-04	5.08E-04	0.00E+00	4.96E-04
TOTAL	5.41E-03	5.41E-03	5.41E-03	6.27E-03	5.63E-03	8.58E-04	5.41E-03
MILK COW MAXIMUM LOCATION							
AIR INHALATION	3.64E-04	3.64E-04	3.65E-04	3.77E-04	3.73E-04	1.98E-04	3.64E-04
EXPOSURE TO SOIL	2.98E-08	3.62E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08
LEAFY VEGETABLE CONSUMPTION	1.29E-04	1.29E-04	1.29E-04	1.52E-04	1.60E-04	0.00E+00	1.29E-04
PRODUCE CONSUMPTION	6.99E-04	6.99E-04	6.99E-04	8.18E-04	7.00E-04	0.00E+00	6.99E-04
MEAT CONSUMPTION	1.26E-04	1.26E-04	1.26E-04	1.29E-04	1.29E-04	0.00E+00	1.26E-04
COW MILK CONSUMPTION	2.98E-04	2.98E-04	2.98E-04	3.07E-04	3.56E-04	1.37E-03	2.98E-04
TOTAL	1.61E-03	1.61E-03	1.61E-03	1.78E-03	1.72E-03	1.57E-03	1.61E-03
MILK GOAT MAXIMUM LOCATION							
AIR INHALATION	3.64E-04	3.64E-04	3.65E-04	3.77E-04	3.73E-04	1.98E-04	3.64E-04
EXPOSURE TO SOIL	2.98E-08	3.62E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08
LEAFY VEGETABLE CONSUMPTION	1.29E-04	1.29E-04	1.29E-04	1.52E-04	1.60E-04	0.00E+00	1.29E-04
PRODUCE CONSUMPTION	6.99E-04	6.99E-04	6.99E-04	8.18E-04	7.00E-04	0.00E+00	6.99E-04
MEAT CONSUMPTION	1.26E-04	1.26E-04	1.26E-04	1.29E-04	1.29E-04	0.00E+00	1.26E-04
GOAT MILK CONSUMPTION	6.09E-04	6.09E-04	6.09E-04	6.28E-04	6.78E-04	2.43E-03	6.09E-04
TOTAL	1.92E-03	1.92E-03	1.92E-03	2.10E-03	2.04E-03	2.63E-03	1.92E-03

TABLE B-11

FIRST QUARTER 1991
BATCH + CONTINUOUS RELEASES

POPULATION DOSE (50-MILE) FROM
GASEOUS EFFLUENTS
(MAN-REM)

EXPOSURE PATHWAY	TOTAL BODY	THYROID
AIR SUBMERSION	1.8E-02	1.3E-02
AIR INHALATION	3.2E-02	3.2E-02
EXPOSURE TO SOIL	1.8E-06	1.8E-06
LEAFY VEGETABLE CONSUMPTION	2.4E-04	3.0E-04
PRODUCE CONSUMPTION	1.3E-03	1.3E-03
MEAT CONSUMPTION	1.8E-03	1.8E-03
MILK CONSUMPTION	1.8E-02	2.2E-02
TOTAL	7.2E-02	7.1E-02
AVERAGE DOSE (MREM/PERSON)	3.5E-05	3.5E-05

TABLE B-12

2 QUARTER 1991

DOSES FROM LIQUID EFFLUENTS
(MREM)

EXPOSURE PATHWAY	TOTAL BODY	SKIN	LUNG	BONE	ADULT THYROID	INFANT THYROID	OTHER INTERNAL ORGANS
AQUATIC AT MAXIMUM LOCATION							
DRINKING WATER	1.4E-05	1.4E-05	1.4E-05	1.4E-05	1.4E-05	1.9E-05	1.6E-05
FISH CONSUMPTION	2.1E-05	2.1E-05	5.6E-06	2.2E-05	2.1E-05	0.0E+00	1.1E-04
INVERTEBRATE CONSUMPTION	5.0E-06	5.0E-06	3.6E-06	7.7E-06	5.0E-06	0.0E+00	4.3E-05
EXPOSURE TO SHORELINE SEDIMENT	3.9E-07	4.6E-07	3.9E-07	3.9E-07	3.9E-07	0.0E+00	3.9E-07
SWIMMING AND BOATING	7.8E-09	6.0E-08	7.8E-09	7.8E-09	7.8E-09	0.0E+00	7.8E-09
AQUATIC TOTAL	4.1E-05	4.1E-05	2.4E-05	4.4E-05	4.1E-05	1.9E-05	1.7E-04
AQUATIC AT AGRICULTURAL LOCATION							
DRINKING WATER	1.4E-05	1.4E-05	1.4E-05	1.4E-05	1.4E-05	1.9E-05	1.6E-05
FISH CONSUMPTION	4.7E-06	4.7E-06	1.2E-06	4.7E-06	4.7E-06	0.0E+00	2.4E-05
INVERTEBRATE CONSUMPTION	1.1E-06	1.1E-06	7.9E-07	1.7E-06	1.1E-06	0.0E+00	9.4E-06
EXPOSURE TO SHORELINE SEDIMENT	8.6E-08	1.0E-07	8.6E-08	8.6E-08	8.6E-08	0.0E+00	8.6E-06
SWIMMING AND BOATING	1.7E-09	1.3E-08	1.7E-09	1.7E-09	1.7E-09	0.0E+00	1.7E-09
IRRIGATION AND LIVESTOCK WATERING							
EXPOSURE TO AGRICULTURAL SOIL	1.1E-06	1.3E-06	1.1E-06	1.1E-06	1.1E-06	0.0E+00	1.1E-06
LEAFY VEGETABLE CONSUMPTION	1.3E-06	1.3E-06	1.3E-06	1.5E-06	1.3E-06	0.0E+00	2.1E-06
PRODUCE CONSUMPTION	6.6E-06	6.6E-06	6.4E-06	7.3E-06	6.6E-06	0.0E+00	9.6E-06
MEAT CONSUMPTION	2.7E-06	2.7E-06	3.4E-06	3.1E-06	2.7E-06	0.0E+00	2.9E-05
MILK CONSUMPTION (COW)	6.8E-06	6.8E-06	6.5E-06	6.8E-06	6.8E-06	2.0E-05	8.2E-06
MILK CONSUMPTION (GOAT)	1.5E-05	1.5E-05	1.4E-05	1.5E-05	1.5E-05	4.4E-05	1.4E-05
AGRICULTURAL TOTAL	4.7E-05	4.7E-05	4.2E-05	4.9E-05	4.6E-05	6.3E-05	1.0E-04
EXCLUDING COW MILK CONSUMPTION	3.8E-05	3.9E-05	3.5E-05	4.1E-05	3.8E-05	3.9E-05	9.9E-05
EXCLUDING GOAT MILK CONSUMPTION							

TABLE B-13

SECOND QUARTER 1991

POPULATION DOSE (50-MILE) FROM
LIQUID EFFLUENTS
(MAN-REM)

EXPOSURE PATHWAY	TOTAL BODY	THYROID
AQUATIC		
DRINKING WATER	5.6E-05	5.6E-05
FISH CONSUMPTION	2.0E-03	2.0E-03
INVERTEBRATE CONSUMPTION	2.2E-06	2.2E-06
EXPOSURE TO CONTAMINATED SEDIMENT	1.9E-06	1.9E-06
SWIMMING AND BOATING	2.0E-08	2.0E-08
IRRIGATION AND LIVESTOCK WATERING		
LEAFY VEGETABLE CONSUMPTION	1.0E-07	1.0E-07
PRODUCE CONSUMPTION	5.1E-07	5.1E-07
MEAT CONSUMPTION	3.7E-06	3.7E-06
MILK CONSUMPTION	3.5E-05	3.6E-05
EXPOSURE TO CONTAMINATED SOIL	1.6E-07	1.6E-07
TOTAL	2.1E-03	2.1E-03
AVERAGE DOSE (MREM/PERSON)	1.0E-06	1.0E-06

TABLE B-14

SECOND QUARTER 1991
BATCH RELEASES

DOSES FROM NOBLE GASES AT
SITE BOUNDARY AND RESIDENCE OF
HIGHEST CONCENTRATION

	Site Boundary[a]	Residence[b]
Beta Air Dose (mrad)	1.9E-3	9.5E-4
Gamma Air Dose (mrad)	5.7E-4	2.0E-4
Beta + Gamma Skin Dose (mrem)	-	5.4E-4
Gamma Total Body Dose (mrem)	-	1.7E-4

[a] North sector at 663 meters.

[b] NNW sector at 1000 meters.

TABLE B-15

SECOND QUARTER 1991
CONTINUOUS RELEASES

DOSES FROM NOBLE GASES AT
SITE BOUNDARY AND RESIDENCE OF
HIGHEST CONCENTRATION

	Site Boundary[a]	Residence[b]
Beta Air Dose (mrad)	3.6E-3	1.8E-3
Gamma Air Dose (mrad)	1.2E-3	4.1E-4
Beta + Gamma Skin Dose (mrem)	-	9.7E-4
Gamma Total Body Dose (mrem)	-	3.4E-4

[a] North sector at 663 meters.

[b] NNW sector at 1000 meters.

TABLE B-16

SECOND QUARTER 1991
BATCH + CONTINUOUS RELEASES

DOSES FROM NOBLE GASES AT
SITE BOUNDARY AND RESIDENCE OF
HIGHEST CONCENTRATION

	Site Boundary[a]	Residence[b]
Beta Air Dose (mrad)	5.5E-3	2.8E-3
Gamma Air Dose (mrad)	1.8E-3	6.1E-4
Beta + Gamma Skin Dose (mrem)	-	1.5E-3
Gamma Total Body Dose (mrem)	-	5.1E-4

[a] Maximum site boundary location.

[b] Maximum residence location.

TABLE B-17

2 QUARTER 1991 BATCH RELEASES

DOSES FROM GASEOUS EFFLUENTS (EXCLUDING NOBLE GASES) AT MAXIMUM OFFSITE EXPOSURE LOCATIONS (MREM)

EXPOSURE LOCATION AND PATHWAY	TOTAL BODY	SKIN	LUNG	BONE	ADULT THYROID	INFANT THYROID	OTHER INTERNAL ORGANS
GARDEN (NNW SECTOR AT 1000. METERS)							
AIR INHALATION	1.79E-03	1.79E-03	1.79E-03	1.79E-03	2.09E-03	1.29E-03	1.79E-03
EXPOSURE TO SOIL	4.99E-06	5.99E-06	4.99E-06	4.99E-06	4.99E-06	4.99E-06	4.99E-06
LEAFY VEGETABLE CONSUMPTION	5.06E-04	5.06E-04	5.06E-04	5.07E-04	4.02E-03	0.00E+00	5.11E-04
PRODUCE CONSUMPTION	2.71E-03	2.71E-03	2.71E-03	2.71E-03	2.82E-03	0.00E+00	2.71E-03
TOTAL	5.01E-03	5.01E-03	5.01E-03	5.01E-03	8.94E-03	1.30E-03	5.01E-03
MEAT ANIMAL (SSW SECTOR AT 1600. METERS)							
AIR INHALATION	3.64E-04	3.64E-04	3.64E-04	3.64E-04	4.26E-04	2.64E-04	3.64E-04
EXPOSURE TO SOIL	8.87E-07	1.06E-06	8.87E-07	8.87E-07	8.87E-07	8.87E-07	8.87E-07
LEAFY VEGETABLE CONSUMPTION	1.05E-04	1.05E-04	1.05E-04	1.05E-04	7.30E-04	0.00E+00	1.06E-04
PRODUCE CONSUMPTION	5.63E-04	5.63E-04	5.63E-04	5.63E-04	5.84E-04	0.00E+00	5.63E-04
MEAT CONSUMPTION	1.07E-04	1.07E-04	1.07E-04	1.07E-04	1.50E-04	0.00E+00	1.07E-04
TOTAL	1.14E-03	1.14E-03	1.14E-03	1.14E-03	1.89E-03	2.65E-04	1.14E-03
MILK COW (SOUTH SECTOR AT 8000. METERS)							
AIR INHALATION	5.24E-05	5.24E-05	5.24E-05	5.24E-05	6.22E-05	3.90E-05	5.24E-05
EXPOSURE TO SOIL	1.44E-07	1.73E-07	1.44E-07	1.44E-07	1.44E-07	1.44E-07	1.44E-07
LEAFY VEGETABLE CONSUMPTION	1.77E-05	1.77E-05	1.77E-05	1.78E-05	1.19E-04	0.00E+00	1.79E-05
PRODUCE CONSUMPTION	9.51E-05	9.51E-05	9.51E-05	9.51E-05	9.85E-05	0.00E+00	9.51E-05
MEAT CONSUMPTION	1.81E-05	1.81E-05	1.81E-05	1.81E-05	2.50E-05	0.00E+00	1.81E-05
COW MILK CONSUMPTION	4.28E-05	4.28E-05	4.28E-05	4.29E-05	2.33E-04	1.58E-03	4.31E-05
TOTAL	2.26E-04	2.26E-04	2.26E-04	2.26E-04	5.38E-04	1.62E-03	2.27E-04
MILK GOAT (SSW SECTOR AT 4200. METERS)							
AIR INHALATION	7.83E-05	7.83E-05	7.83E-05	7.83E-05	9.24E-05	5.76E-05	7.83E-05
EXPOSURE TO SOIL	1.64E-07	1.97E-07	1.64E-07	1.64E-07	1.64E-07	1.64E-07	1.64E-07
LEAFY VEGETABLE CONSUMPTION	2.45E-05	2.45E-05	2.45E-05	2.46E-05	1.40E-04	0.00E+00	2.47E-05
PRODUCE CONSUMPTION	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.36E-04	0.00E+00	1.32E-04
MEAT CONSUMPTION	2.50E-05	2.50E-05	2.50E-05	2.50E-05	3.29E-05	0.00E+00	2.50E-05
GOAT MILK CONSUMPTION	1.21E-04	1.21E-04	1.21E-04	1.21E-04	3.81E-04	2.35E-03	1.21E-04
TOTAL	3.80E-04	3.80E-04	3.80E-04	3.80E-04	7.82E-04	2.41E-03	3.81E-04

TABLE B-18

2 QUARTER 1991 CONTINUOUS RELEASES

DOSES FROM GASEOUS EFFLUENTS (EXCLUDING NOBLE GASES) AT MAXIMUM OFFSITE EXPOSURE LOCATIONS (MREM)

EXPOSURE LOCATION AND PATHWAY	TOTAL BODY	SKIN	LUNG	BONE	ADULT THYROID	INFANT THYROID	OTHER INTERNAL ORGANS
GARDEN (NNW SECTOR AT 1000. METERS)							
AIR INHALATION	3.02E-03	3.02E-03	3.02E-03	3.02E-03	3.19E-03	1.75E-03	3.02E-03
EXPOSURE TO SOIL	1.78E-06	2.16E-06	1.78E-06	1.78E-06	1.78E-06	1.73E-06	1.78E-06
LEAFY VEGETABLE CONSUMPTION	8.48E-04	8.48E-04	8.48E-04	8.49E-04	2.70E-03	0.00E+00	8.51E-04
PRODUCE CONSUMPTION	4.58E-03	4.58E-03	4.58E-03	4.58E-03	4.64E-03	0.00E+00	4.58E-03
TOTAL	8.45E-03	8.45E-03	8.45E-03	8.45E-03	1.05E-02	1.75E-03	8.45E-03
MEAT ANIMAL (SSW SECTOR AT 1600. METERS)							
AIR INHALATION	8.22E-04	8.22E-04	8.22E-04	8.22E-04	8.67E-04	4.77E-04	8.22E-04
EXPOSURE TO SOIL	4.34E-07	5.27E-07	4.34E-07	4.34E-07	4.34E-07	4.34E-07	4.34E-07
LEAFY VEGETABLE CONSUMPTION	2.36E-04	2.36E-04	2.36E-04	2.36E-04	6.88E-04	0.00E+00	2.36E-04
PRODUCE CONSUMPTION	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.29E-03	0.00E+00	1.27E-03
MEAT CONSUMPTION	2.42E-04	2.42E-04	2.42E-04	2.42E-04	2.72E-04	0.00E+00	2.42E-04
TOTAL	2.57E-03	2.57E-03	2.57E-03	2.57E-03	3.12E-03	4.77E-04	2.57E-03
MILK COW (SOUTH SECTOR AT 8000. METERS)							
AIR INHALATION	1.02E-04	1.02E-04	1.02E-04	1.02E-04	1.08E-04	6.00E-05	1.02E-04
EXPOSURE TO SOIL	6.35E-08	7.71E-08	6.35E-08	6.35E-08	6.35E-08	6.35E-08	6.35E-08
LEAFY VEGETABLE CONSUMPTION	3.44E-05	3.44E-05	3.44E-05	3.45E-05	1.01E-04	0.00E+00	3.45E-05
PRODUCE CONSUMPTION	1.86E-04	1.86E-04	1.86E-04	1.86E-04	1.88E-04	0.00E+00	1.86E-04
MEAT CONSUMPTION	3.53E-05	3.53E-05	3.53E-05	3.53E-05	3.98E-05	0.00E+00	3.53E-05
COW MILK CONSUMPTION	8.33E-05	8.33E-05	8.33E-05	8.34E-05	2.07E-04	1.20E-03	8.35E-05
TOTAL	4.41E-04	4.41E-04	4.41E-04	4.42E-04	6.44E-04	1.26E-03	4.42E-04
MILK GOAT (SSW SECTOR AT 4200. METERS)							
AIR INHALATION	1.79E-04	1.79E-04	1.79E-04	1.79E-04	1.89E-04	1.04E-04	1.79E-04
EXPOSURE TO SOIL	8.52E-08	1.03E-07	8.52E-08	8.52E-08	8.52E-08	8.52E-08	8.52E-08
LEAFY VEGETABLE CONSUMPTION	5.56E-05	5.56E-05	5.56E-05	5.56E-05	1.44E-04	0.00E+00	5.57E-05
PRODUCE CONSUMPTION	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.03E-04	0.00E+00	3.00E-04
MEAT CONSUMPTION	5.70E-05	5.70E-05	5.70E-05	5.70E-05	6.31E-05	0.00E+00	5.70E-05
GOAT MILK CONSUMPTION	2.74E-04	2.74E-04	2.74E-04	2.74E-04	4.74E-04	2.37E-03	2.75E-04
TOTAL	8.66E-04	8.66E-04	8.66E-04	8.66E-04	1.17E-03	2.48E-03	8.66E-04

TABLE B-19

2 QUARTER 1991 BATCH + CONTINUOUS RELEASES

DOSES FROM GASEOUS EFFLUENTS (EXCLUDING NOBLE GASES) AT MAXIMUM OFFSITE EXPOSURE LOCATIONS (MREM)

EXPOSURE LOCATION AND PATHWAY	TOTAL BODY	SKIN	LUNG	BONE	ADULT THYROID	INFANT THYROID	OTHER INTERNAL ORGANS
GARDEN MAXIMUM LOCATION							
AIR INHALATION	4.81E-03	4.81E-03	4.81E-03	4.81E-03	5.28E-03	3.04E-03	4.81E-03
EXPOSURE TO SOIL	6.77E-06	8.15E-06	6.77E-06	6.77E-06	6.77E-06	6.77E-06	6.77E-06
LEAFY VEGETABLE CONSUMPTION	1.35E-03	1.35E-03	1.35E-03	1.36E-03	6.72E-03	0.00E+00	1.36E-03
PRODUCE CONSUMPTION	7.29E-03	7.29E-03	7.29E-03	7.29E-03	7.46E-03	0.00E+00	7.29E-03
TOTAL	1.35E-02	1.35E-02	1.35E-02	1.35E-02	1.94E-02	3.05E-03	1.35E-02
MEAT ANIMAL MAXIMUM LOCATION							
AIR INHALATION	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.29E-03	7.41E-04	1.19E-03
EXPOSURE TO SOIL	1.32E-06	1.59E-06	1.32E-06	1.32E-06	1.32E-06	1.32E-06	1.32E-06
LEAFY VEGETABLE CONSUMPTION	3.41E-04	3.41E-04	3.41E-04	3.41E-04	1.42E-03	0.00E+00	3.42E-04
PRODUCE CONSUMPTION	1.83E-03	1.83E-03	1.83E-03	1.83E-03	1.87E-03	0.00E+00	1.83E-03
MEAT CONSUMPTION	3.49E-04	3.49E-04	3.49E-04	3.49E-04	4.22E-04	0.00E+00	3.49E-04
TOTAL	3.71E-03	3.71E-03	3.71E-03	3.71E-03	5.01E-03	7.42E-04	3.71E-03
MILK COW MAXIMUM LOCATION							
AIR INHALATION	1.54E-04	1.54E-04	1.54E-04	1.54E-04	1.70E-04	9.90E-05	1.54E-04
EXPOSURE TO SOIL	2.08E-07	2.50E-07	2.08E-07	2.08E-07	2.08E-07	2.08E-07	2.08E-07
LEAFY VEGETABLE CONSUMPTION	5.21E-05	5.21E-05	5.21E-05	5.23E-05	2.20E-04	0.00E+00	5.24E-05
PRODUCE CONSUMPTION	2.81E-04	2.81E-04	2.81E-04	2.81E-04	2.86E-04	0.00E+00	2.81E-04
MEAT CONSUMPTION	5.34E-05	5.34E-05	5.34E-05	5.34E-05	6.48E-05	0.00E+00	5.34E-05
COW MILK CONSUMPTION	1.26E-04	1.26E-04	1.26E-04	1.26E-04	4.40E-04	2.78E-03	1.27E-04
TOTAL	6.67E-04	6.67E-04	6.67E-04	6.68E-04	1.18E-03	2.88E-03	6.69E-04
MILK GOAT MAXIMUM LOCATION							
AIR INHALATION	2.57E-04	2.57E-04	2.57E-04	2.57E-04	2.81E-04	1.62E-04	2.57E-04
EXPOSURE TO SOIL	2.49E-07	3.00E-07	2.49E-07	2.49E-07	2.49E-07	2.49E-07	2.49E-07
LEAFY VEGETABLE CONSUMPTION	8.01E-05	8.01E-05	8.01E-05	8.02E-05	2.84E-04	0.00E+00	8.04E-05
PRODUCE CONSUMPTION	4.32E-04	4.32E-04	4.32E-04	4.32E-04	4.39E-04	0.00E+00	4.32E-04
MEAT CONSUMPTION	8.20E-05	8.20E-05	8.20E-05	8.20E-05	9.60E-05	0.00E+00	8.20E-05
GOAT MILK CONSUMPTION	3.95E-04	3.95E-04	3.95E-04	3.95E-04	8.55E-04	4.72E-03	3.96E-04
TOTAL	1.25E-03	1.25E-03	1.25E-03	1.25E-03	1.95E-03	4.89E-03	1.25E-03

TABLE B-20

SECOND QUARTER 1991
BATCH + CONTINUOUS RELEASES

POPULATION DOSE (50-MILE) FROM
GASEOUS EFFLUENTS
(MAN-REM)

EXPOSURE PATHWAY	TOTAL BODY	THYROID
AIR SUBMERSION	2.5E-03	2.5E-03
AIR INHALATION	2.2E-02	2.4E-02
EXPOSURE TO SOIL	1.3E-05	1.3E-05
LEAFY VEGETABLE CONSUMPTION	1.9E-04	5.3E-04
PRODUCE CONSUMPTION	1.1E-03	1.1E-03
MEAT CONSUMPTION	1.6E-03	1.8E-03
MILK CONSUMPTION	1.5E-02	3.9E-02
TOTAL	4.3E-02	6.9E-02
AVERAGE DOSE (MREM/PERSON)	2.1E-05	3.4E-05

C. METEOROLOGICAL DATA

Meteorological data for the first six months of 1991 are available for review in the PGE Corporate Office as per Technical Specification 6.9.1.5.4, "Semiannual Radioactive Effluent Release Report". Meteorological models and assumptions used in performing the analyses are presented in PGE-1021, "Offsite Dose Calculation Manual".

D. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP) AND TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM)

Requirement

Trojan Facility Operating License NPF-1, Appendix A, Technical Specification 6.14.2 for changes to the PCP contained in the ODCM requires:

> "6.14.2 Licensee initiated changes to the portion of the PCP contained in the ODCM:
>
> "a. Shall be submitted to the Commission by inclusion in the Semiannual Radioactive Effluent Release Report for the period in which the change(s) was made and shall contain:
>
> "(1) information summarizing and supporting the rationale of the change without benefit of additional or supplemental information;
>
> "(2) a determination that the change did not reduce the overall conformance of the solidified waste product to existing criteria for burial ground requirements; and
>
> "(3) documentation of the fact that the change has been reviewed by the Plant Review Board."

Trojan Facility Operating License NPF-1, Appendix A, Technical Specification 6.15.2.A for changes to the ODCM requires:

> "6.15.2.A Licensee initiated changes:
>
> "1. Shall be submitted to the Commission by inclusion in the Semiannual Radioactive Effluent Release Report for the period in which the change(s) was made and shall contain:
>
> "a. sufficiently detailed information to totally support the rationale for the change without benefit of additional or supplemental information. Information submitted should consist of a package of those pages of the ODCM to be changed with each page numbered and provided with an approval and date box, together with appropriate analyses or evaluations justifying the change(s);
>
> "b. a determination that the change will not reduce the accuracy or reliability of dose calculations or setpoint determinations; and
>
> "c. documentation of the fact that the change has been reviewed and found acceptable by the PRB."

Report

Amendment 6 to the ODCM was issued in April 1991. This amendment was issued to update the sample locations of the Radiological Environmental Monitoring Program. The need for updating the locations was described in the semi-annual Effluent and Waste Disposal Report for July-December 1990. This change did not reduce the accuracy or reliability of dose calculations or setpoint determinations.

Pages D-4 through D-11 of this report contain the new pages of Amendment 6 to the ODCM with appropriate amendment lines. The rationale for these changes is included on Page D-3. Amendment 6 to PGE-1021, "Offsite Dose Calculation Manual", was initiated with Licensing Document Change Request (LDCR) 90-45. This LDCR was assigned Plant Review Board (PRB) Tracking Number 91-0558. This item was approved by the PRB on April 18, 1991. This LDCR is available for review onsite.

Amendment 7 to the ODCM was issued in May 1991. This amendment was made to remove a section on processing of Dry Active Waste which was not required as part of the Process Control Program. This change did not reduce the overall conformance of the solidified waste product to existing criteria for burial ground requirements. This change also did not reduce the accuracy or reliability of dose calculations or setpoint determinations.

Page D-12 of this report contains the new pages of Amendment 7 to the ODCM with appropriate amendment lines. The rationale for these changes is included on Page D-3. Amendment 7 to PGE-1021, "Offsite Dose Calculation Manual", was initiated with Licensing Document Change Request (LDCR) 91-14. This LDCR was assigned Plant Review Board (PRB) Tracking Number 91-0714. This item was approved by the PRB on May 1, 1991. This LDCR is available for review onsite.

Reasons for and Descriptions of Change to the ODCM:

LDCR 90-45:

During 1990, the Winans Dairy (Location 68) ceased operations (after 11/20/90). A review of possible replacement dairies resulted in the addition of the Smith Dairy (Location 16) and the Kimble Dairy (Location 15). Per the requirements of the Trojan Technical Specification (TTS) 3.12.1, "Radiological Environmental Monitoring Program", the cause of the unavailability of samples and the locations for obtaining replacement samples was reported in the Semiannual Radiological Effluent Release Report for the period July - December 1990. TTS 3.12.1 then states that the locations from which samples were unavailable may then be deleted from the ODCM provided the locations from which the replacement samples were obtained are added to the environmental monitoring program as replacement locations. This LDCR deleted location 68 and added locations 15 and 16 to the environmental monitoring program.

The change in name for the dairy at Location 17A from Kandle Dairy to McLean Dairy was a result of marriage rather than location or ownership changes.

Additional groundwater sampling locations were added for 1990 at the Trojan Nuclear Plant's new potable water supply (Location 1F) and a planned municipal water supply for Prescott, Oregon (Location 4A).

LDCR 91-14:

This change was initiated to remove a section which is not required from PGE-1021, "Offsite Dose Calculation Manual". Section 6.5 of PGE-1021 described process controls for Dry Active Waste (DAW). This section was added in Amendment 5 of PGE-1021 for completeness. It described controls specific to the vendor in use at the time to process Trojan's DAW. This vendor is no longer used. This section was removed from PGE-1021 to allow more innovation in processing DAW. The change was to delete section 6.5 of PGE-1021 and to renumber section 6.6 to 6.5.

TABLE 5-1

SAMPLING LOCATIONS AND FREQUENCY BY TYPE

Sample Location	Radial		Terrestrial						Aquatic		
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
ONSITE											
1A - U. S. 30 & E-W Road to Prescott	0.8	NW			Q						S/A
1B - U. S. 30 W of Containment	0.5	WSW			Q						
1C - Cemetery on hill W of Plant	0.7	SW			Q						
1D - Recreation Lake	0.7	S									S/A
1E - S site boundary, U. S. 30 at RR	0.8	S			Q						
1F - Meteorology tower	0.5	S	W	W	Q			Q			
1G - S of Containment	0.1	SSE						Q			
1H - Plant outfall	0.2	ESE			Q						
1I - N site boundary at Columbia River	0.5	NNW	W	W	Q	HT					
1J - RR & E-W road to Prescott	0.6	NNW			Q						
20 - S of Plant on Columbia River shore	0.4	SSE			Q						
21 - SE of Plant on Columbia River shore	0.3	SE			Q						

TABLE 5-1

Sample Location	Radial		Terrestrial						Aquatic		
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
ONSITE											
22 - Between Recreation Lake and U. S. 30	0.4	SSW			Q						
23 - U. S. 30 S of E-W road to Prescott	0.6	WNW			Q						
24 - Recreation Lake near E-W road to Plant	0.5	WSW			Q						
54 - NW corner of Reflection Lake	0.5	W			Q						
OREGON											
2 - Rainier	3.8	NW	W	W	Q				MC		
3 - Lindberg (Kelly Res.)	2.0	NNW			Q			Q			
4A - Prescott Water Supply	0.8	NNW						Q			
4C - Prescott (Jack Falls residential area)	1.6	NW			Q						
6B - Goble (Neer Res.)	1.2	S	W	W	Q			Q			
17A - Beaver Homes (McLean Dairy)	2.6	SSW					SM				
19 - Portland	37.5	S	W	W			SM				
25 - Prescott (Shoreline)	0.6	N			Q						

(3)

(6) - (3) (6) (3)

TABLE 5-1

Sample Location	Radial		Terrestrial					Aquatic			
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
OREGON											
26 - Deer Island (Tide Creek)	5.0	S			Q						
27 - Columbia City (Gensman Road)	9.6	S			Q						
28 - Shiloh Basin (Orr Road)	4.7	SSW			Q						
29 - Trenholm (Canaan Road)	10.7	SSW			Q						
30 - Shiloh Basin (Whitney Road)	5.0	SW			Q						
31 - Apiary (Schaffer Road)	10.1	SW			Q						
32 - Fern Hill (Lentz Road)	5.2	WSW			Q						
33 - Apiary (Van Natta Road)	8.6	WSW			Q						
34 - Fern Hill (Lentz Road)	5.0	W			Q						
35 - Swedetown (Swedetown Road)	10.0	W			Q						
36 - Rainier (Doan Road)	5.2	WNW			Q						
37 - Delena (Lost Creek Road)	10.0	WNW			Q						

(3)

TABLE 5-1

Sample Location	Radial		Terrestrial						Aquatic			
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim	
OREGON												
38 - Rainier (highway 30)	4.8	NW			Q							(3)
39 - Alston-Mayger Road	9.9	NW			Q							(6)
56 - Deer Island	3.2	SSE			Q							(3)
63 - Rinck Dairy	8.1	WNW					SM					(6)
66 - St. Helens (Municipal Water Supply)	10.5	SSE							MC			(3)
WASHINGTON												
11A - Kalama River (Columbia River)	0.8	SE			Q							
11B - Kalama River (PUD Substation)	1.4	ENE	W	W								
14 - Longview (Ocean Beach Substation)	8.2	NNW	W	W								
15 - Kimble Dairy (Castle Rock)	13.6	N					SM					
16 - Smith Dairy (Woodland)	11.1	SSE					SM					
40 - Longview (NR)	5.8	NNW			Q							
41 - Eufaula	10.7	NNW			Q							

TABLE 5-1

Sample Location	Radial		Terrestrial						Aquatic			
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
WASHINGTON												
42 - Kelso (near Hwy 4)	6.6	N			Q						
43 - Lexington	10.3	N			Q						
44 - Kelso (N Maple Hill Road)	5.2	NNE			Q						
45 - Mt. Brynion	9.1	NNE			Q						
46 - Rose Valley	5.3	NE			Q						
47 - Smith Mountain	9.2	NE			Q						
48 - Mt. Pleasant	5.6	ENE			Q						
49 - Goble Mountain	7.8	ENE			Q						
50 - Kalama River (Fallert Road)	5.0	E			Q						
51 - Kalama River (Kalama River Road)	10.0	E			Q						
52 - Kalama (China Garden Road)	5.2	ESE			Q						
53 - Ross Peak	10.?	ESE			Q						
54 - Cloverdale	5.2	SE			Q						
55 - Woodland (Green Mountain Road)	10.0	SE			Q						

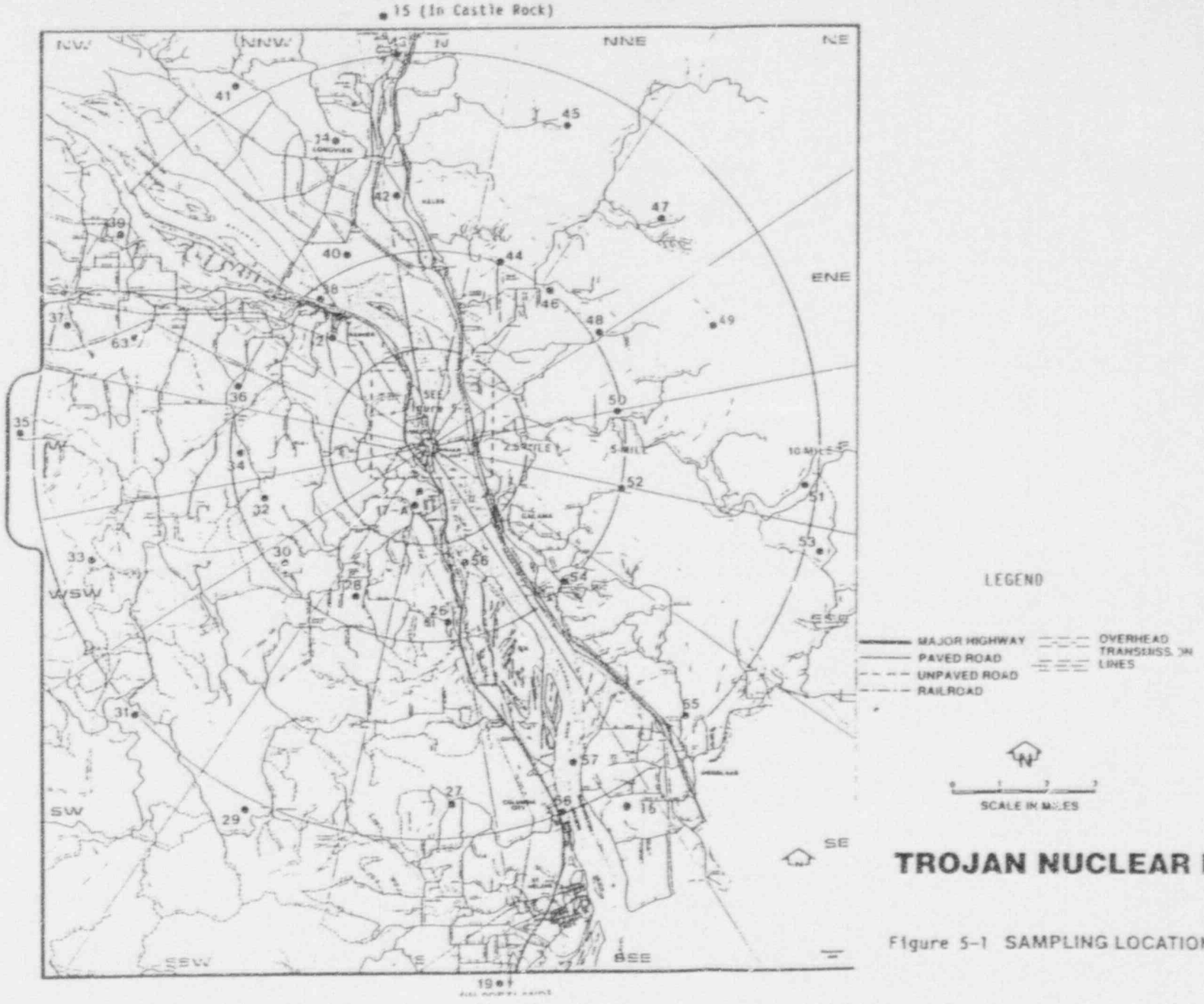
(3) (3) (3)

TABLE 5-1

Sample Location	Radial		Terrestrial						Aquatic		
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
WASHINGTON											
57 - Woodland (Dike Road)	9.5	SSE			Q						
58 - Kalama (N of Port of Kalama Marina)	1.6	SE			Q						
59 - Kalama (S of Sportsman Road)	1.5	ESE			Q						
60 - Kalama (N of Sportsman Road)	1.2	ENE			Q						
61 - Carrolls (W Kingsbury Road)	1.5	NE			Q						
62 - W of Carrolls Channel	1.0	NNE			Q						
COLUMBIA RIVER											
CR3 - Trojan	72.4*	E								S/A	S/A

LEGEND:

W - Weekly.
Q - Quarterly.
SM - Semimonthly except monthly during December, January, and February.
MC - Monthly composite, semimonthly composite if I-131 analysis required.
S/A - Semiannually.
HT - Harvest time.
* - Columbia River mileage refers to river miles (measured from mouth).



TROJAN NUCLEAR PLANT

Figure 5-1 SAMPLING LOCATIONS

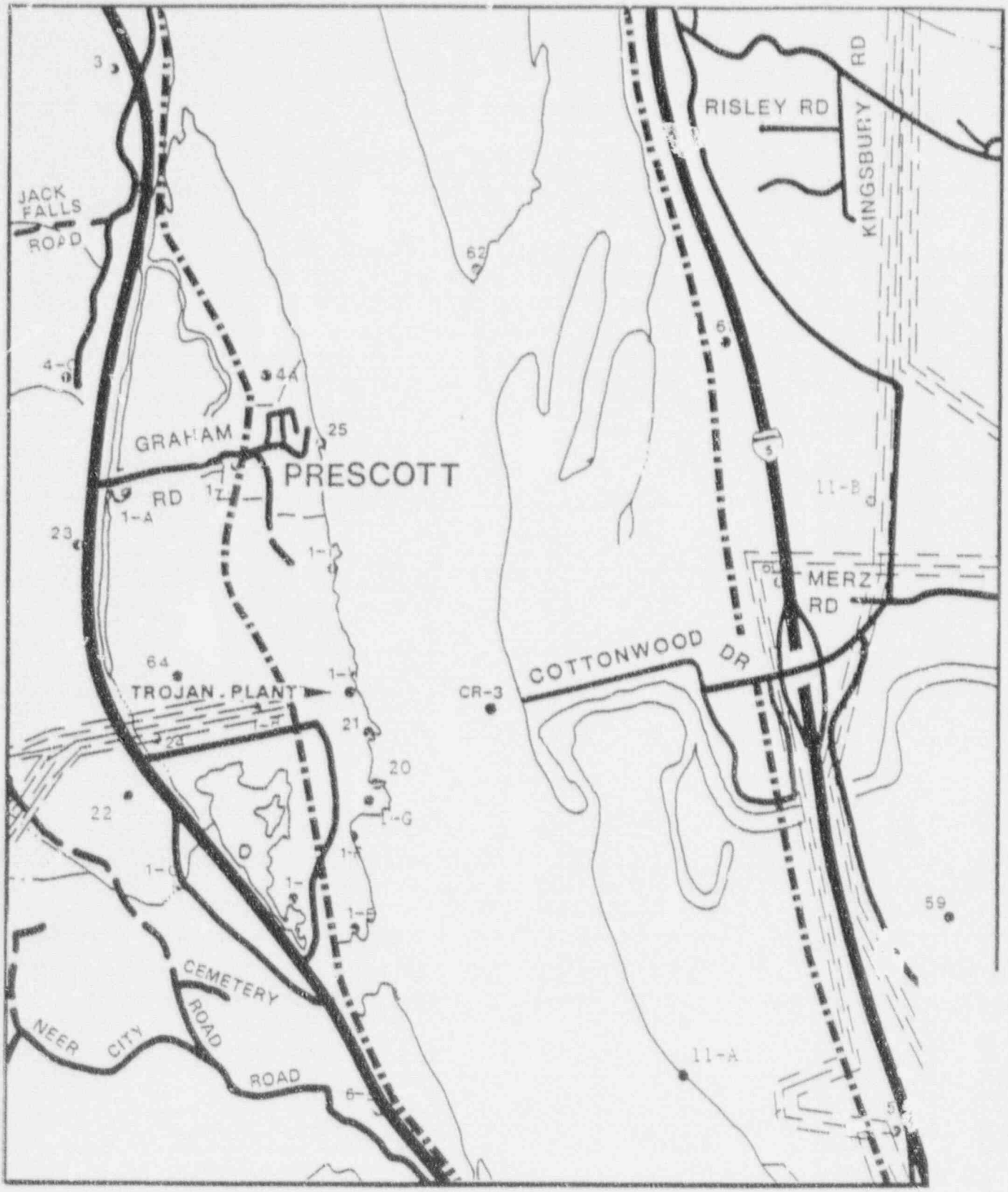


Figure 5-2 SAMPLING LOCATIONS

6.4 PROCESS CONTROL PROGRAM FOR LOW ACTIVITY DEWATERED RESINS AND OTHER WET WASTES

6.4.1 SCOPE

This section pertains to bead-type spent radioactive demineralizer resin and other wet wastes, such as condensate demineralizer resins (Powdex) and absorbed oils, which contain a total specific activity less than the burial ground criteria for solidification, and which does not exceed the concentration limits for Class A waste as defined in 10 CFR 61.

6.4.2 PROGRAM ELEMENTS

(1) The dewatered resin or wet wastes must meet the requirements of 10 CFR 61.56 or those of the burial ground (whichever is more restrictive) for freestanding, noncorrosive liquid. (1)

(2) For bead resins, the preceding criterion will be met by following approved Plant Operating Manual procedures for dewatering resin.

(3) Liquid waste other than oil must be solidified or packaged in sufficient absorbent material to absorb twice the volume of liquid. Oil must be solidified. (5)

(7)

6.5 SUPPORTING DOCUMENTS

Documentation used in support of this process control program should be retained and maintained by the Radioactive Waste Supervisor in acceptable locations. (5)