Trojan Nuclear Plant

OPERATIONAL ENVIRONMENTAL RADIOLOGICAL SURVEILLANCE PROGRAM 1987 ANNUAL REPORT

PORTLAND GENERAL ELECTRIC COMPANY

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TROJAN NUCLEAR PLANT
OPERATIONAL ENVIRONMENTAL RADIOLOGICAL
SURVEILLANCE PROGRAM

January through December 1987

May 1988

Prepared by

PORTLAND GENERAL ELECTRIC COMPANY

With Analyses by

TMA/EBERLINE

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TROJAN NUCLEAR PLANT
OPERATIONAL ENVIRONMENTAL RADIOLOGICAL
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ABSTRACT

This report presents the data obtained through the analyses of environmental samples collected through the Portland General Electric Trojan Nuclear Plant Environmental Radiological Surveillance Program for the period January 1, 1987 through December 31, 1987.

In several milk samples, levels of radioactivity observed during 1987 were higher than years prior to 1986. This higher level of radioactivity was due to biota uptake of fallout radioactivity dispersed over Oregon from the April 1986 accident at the Chernobyl Nuclear Power Station in the Ukraine, USSR. In no case did radioactivity attributed to the Trojan Nuclear Plant exceed the Reporting Levels of the Trojan Radiological Technical Specifications.

1.0 INTRODUCTION

The Trojan Nuclear Plant, a 1130 megawatt-electric pressurized water reactor, first achieved criticality on December 15, 1975. This report presents the analytical data from the Environmental Radiological Surveillance Program with appropriate interpretation for 1987.

The analytical contractor during this period has been TMA/Eberline, Albuquerque, New Mexico. In comparing data obtained during this period with those from previous periods, care should be taken to ensure that differences in procedures between the several contractors are considered. This is particularly true for "gross beta" measurements for which the use of different reference nuclides may produce appropriately significant differences in gross beta concentrations.

Information concerning the Environmental Radiological Surveillance Program prior to this period may be found in earli : reports.

2.0 SAMPLING AND PROGRAM PROCEDURES

2.1 SAMPLING LOCATIONS

Sixty-seven (67) sampling locations were used in the Environmental Radiological Surveillance Program in 1987, 66 on land, and 1 in the Columbia River. This is the same number of sampling locations in use at the end of 1986.

The sampling locations are shown in Figures 2-1 and 2-2. Table 2-1 includes a listing of the sites, their distance from Trojan, and the type and frequency of sample collection.

2.2 SAMPLING PROCEDURES

2.2.1 AIR PARTICULATE AND RADIOIODINE

Air particulate and radioiodine sampling was performed weekly. The samples were gathered with a low-volume air sampling device which is designed to draw a constant flow rate regardless of the pressure drop across the filter. The sampling devices were set to maintain 1 cfm. The sample pump, metering devices, and timer were in a weatherproof housing. The filter and cartridge were located in an inlet parallel to and about 1 meter above the ground. Glass fiber filters were used to collect particulate matter. Activated charcoal cartridges were used to collect radioiodine.

The glass fiber filter was removed from the air sampler and placed in a 2-inch plastic petri dish. The activated charcoal cartridge was removed at the same time. Air flow readings and other data required to compute the levels of radioactivity were recorded and submitted to the analysis laboratory along with the samples.

2.2.2 AMBIENT RADIATION MEASUREMENTS USING TLDs

Thermoluminescent dosimeters (TLDs) were placed for field exposure and collected on a quarterly frequency. The TLDs were placed about 1 meter above ground level in plastic bags. The time of collection, the exposure period, and any abnormal conditions such as moisture in the holders, damage done by animals, etc, were recorded when the TLDs were retrieved. Care was taken to minimize exposure to the TLDs between collection and delivery to the laboratory. The TLDs were transported to the field in lead boxes to ensure low background levels. Control TLDs were carried with the field TLDs during collection and delivery.

2.2.3 FOOD CROPS

Representative samples of tuberous and foliar fruits and vegetables were collected during local harvesting. Samples of leafy vegetables were collected during each of the three summer months of June, July, and August. Samples were sealed in plastic bags following collection, taking care not to include any soil or foreign material. The sample site identification number, the date collected, the sample type, and the amount obtained were recorded on the data collection forms.

2.2.4 MILK

Milk samples (cow or goat) were collected monthly during January, February, and December with twice monthly collections during the other months. Milk was collected in polyethylene bottles (2 gallons for cow dairy and 1 gallon for goat dairy). Prior to shipment of samples to the analysis laboratory, an ion exchange resin was used to concentrate any iodine present to improve detection sensitivity. The whole milk (after iodine removal) and resins were labeled and collection data forms prepared specifying sample site, date collected, sample type, and volume obtained.

2.2.5 WELL WATER

Well water was collected quarterly either from the tap that leads off the pump or directly from the well itself. At sites with faucets the line was purged for 1 minute prior to collection. Sixty milligrams were drawn from the 1-gallon sample for tritium analysis. The remainder of the sample was put in a 1-gallon polyethylene bottle and acidified with concentrated HCl. The bottles were securely sealed, labeled, and collection data forms prepared specifying site, date collected, volume, and sample type.

2.2.6 DRINKING WATER

Monthly composite samples of municipal drinking water were collected for Rainier (Sample Location 2) and St. Helens (Sample Location 66) at their respective intake structures on the Columbia River. Rainier is downstream of the Trojan Nuclear Plant while St. Helens is upstream. At each location, a compositing sampler took a sample every 2 hours and aliquots of this monthly composite were sent for analysis. From these aliquots, 60 milliliters are sent for tritium analysis and a 1-gallon polyethylene bottle is acidified with concentrated HCl and sent for the other analyses. The bottles were securely sealed, labeled, and collection data forms prepared specifying site, date collected, volume, and sample type.

2.2.7 SHORELINE SOIL

Shoreline soil samples of about 1 quart in volume were taken twice a year. The samples were taken from a 1 square foot area with the vegetation and large rocks removed before sample collection. The soil sampling depth varied between 1 to 4 inches and the soil was passed through a No. 6 sieve before placement in the plastic collection bottles. The sample site identification number, date collected, and volume obtained were recorded on the collection data forms.

2.2.8 AQUATIC ANIMAL

Aquatic animal sampling was performed semiannually. Both indigenous and anadromous species of fish and invertebrates such as crayfish were acquired by seining, netting, or trapping. The radioactivity analysis was performed on fish muscle or crayfish muscle samples. If needed for a particular sampling location, the fish muscle sample may be a mixture of several panfish species. The sample site identification number, the date collected, the fish species, and the amount obtained were recorded on collection data forms.

2.3 YEARLY LAND USE CENSUS WITHIN 5-MILE RADIUS OF TROJAN

The annual land use census within a 5-mile radius of Trojan Nuclear Plant was performed during August 1987. Identified by this census were the locations of the nearest milk animal (cow and goat), meat animal, residence, and vegetable garden in each of the 16 meteorological sectors within this area. This census was completed by driving the roads within a 5-mile radius of Trojan. Table 2-2 presents the results of the yearly land use census.

TABLE 2-1

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 Railroad (RR)	0.8	S			Q						
1F - Meteorology tower	0.5	S	W	W	Q						
1G - S of Containment	0.1	SSE						Q			
1H - Plant cooling tower	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						

NOTE: Legend at bottom of Page 6 of 6 of Table 2-1.

Sample Location	Radial		Terrestrial						Aquatic		
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
ONSITE											
21 - SE of Plant on Columbia River shore	0.3	SE			Q						
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						
64 - 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			
4C - Prescott (Jack Falls residential area)	1.6	NW			Q						
6B - Goble (Neer Res.)	1.2	S	W	W	Q			Q			
17A - Beaver Homes (Kandle Dairy)	2.6	SSW					SM				
19 - Portland	37.5	S	W	W			SM				

Sample Location	Radial		Terrestrial						Aquatic		
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
OREGON											
25 - Prescott (Shoreline)	0.6	N			Q						
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						

Sample Location	Radial		Terrestrial						Aquatic		
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
OREGON											
37 - Delena (Lost Creek Road)	10.0	WNW			Q						
38 - Rainier (Highway 30)	4.8	NW			Q						
39 - Alston-Mayger Road	9.9	NW			Q						
56 - Deer Island	3.2	SSE			Q						
63 - Rinck Dairy	8.1	WNW					SM				
66 - St. Helens (Municipal Water Supply)	10.5	SSE							MC		
68 - Winans Dairy	5.0	SW					SM				
WASHINGTON											
11A - Kalama River (Columbia River)	0.8	SE			Q						
11B - Kalama River (Public Utility District Substation)	1.4	ENE	W	W							
14 - Longview (Ocean Beach Substation)	8.2	NNW	W	W							
40 - Longview (RR)	5.8	NNW			Q						
41 - Eufaula	10.7	NNW			Q						
42 - Kelso (near Hwy 4)	6.6	N			Q						

Sample Location	Radial		Terrestrial						Aquatic		
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
WASHINGTON											
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	10.7	ESE			Q						
54 - Cloverdale	5.2	SE			Q						
55 - Woodland (Green Mountain Road)	10.0	SE			Q						
57 - Woodland (Dike Road)	9.5	SSE			Q						

Sample Location	Radial		Terrestrial						Aquatic		
	Mileage	Direction	Air Partic	Air I-131	TLD	Veg	Milk	Well Water	Surf Water	Shore Soil	Anim
WASHINGTON											
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).

TABLE 2-2

1987 LAND USE CENSUS
NEAREST LOCATION TO TROJAN WITHIN A FIVE-MILE RADIUS

Directional Sector	Radiation Mileage for Nearest Location				
	Residence	Garden	Milk Cow	Milk Goat	Meat Animal
N	0.6	0.6	None	None	None
NNE	2.4	2.4	None	3.0	2.7
NE	1.6	1.8	None	None	1.8
ENE	2.4	2.4	None	None	5.0
E	1.3	1.6	None	None	1.4
ESE	0.8	1.8	None	None	1.7
SE	2.5	2.5	None	None	2.5
SSE	1.4	1.4	None	None	3.0
S	1.2	1.4	None	None	2.0
SSW	0.9	0.9	None	2.6	1.0
SW	1.5	1.5	None	None	1.6
WSW	1.4	1.9	None	None	1.9
W	1.7	2.1	None	None	1.7
WNW	1.7	1.7	None	None	1.8
NW	1.2	1.2	None	None	1.2
NNW	0.6	0.6	None	None	2.0


37
35
33

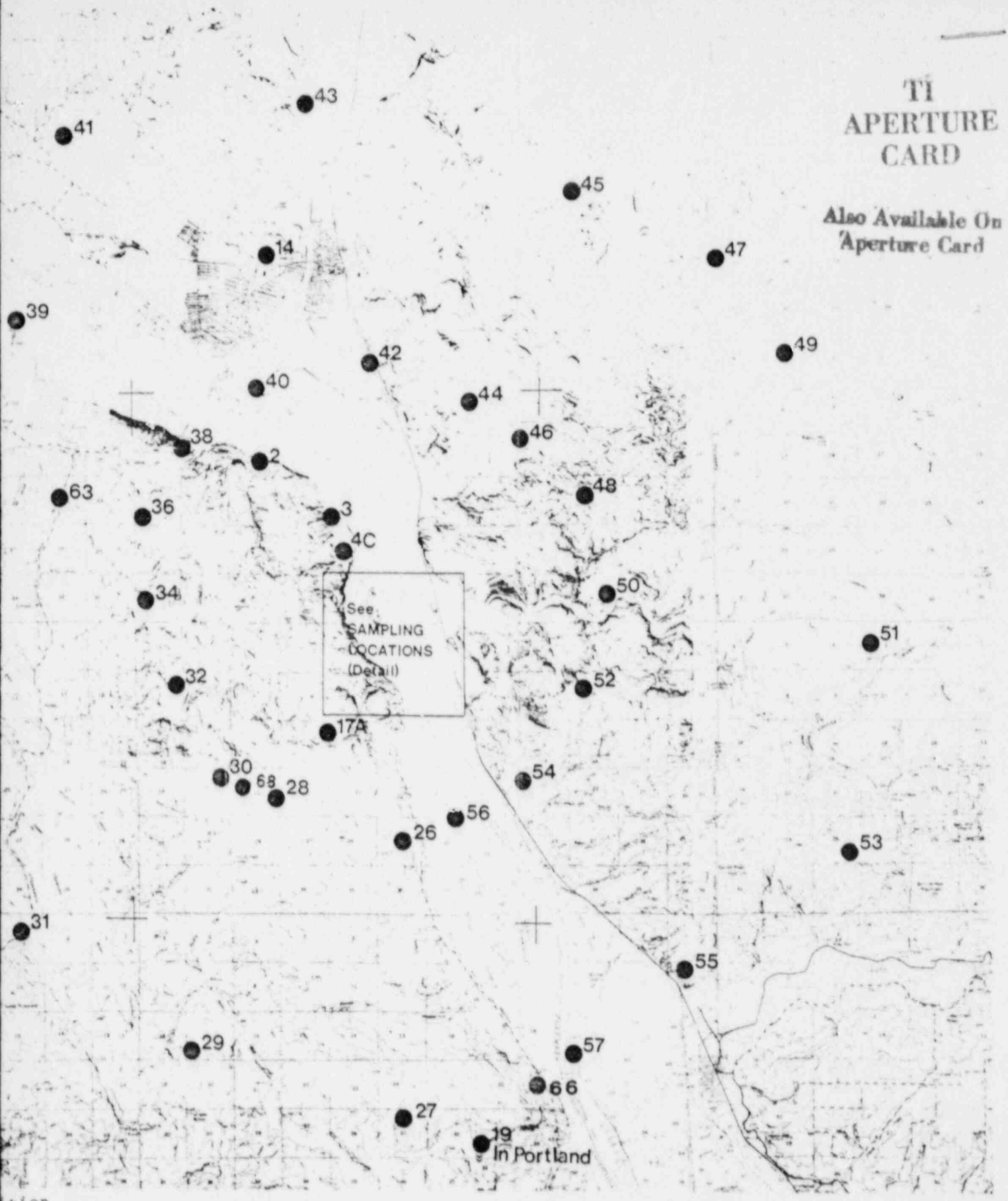

Figure 2-1. SAMPLING LOCATIONS

1 0 1 2 miles

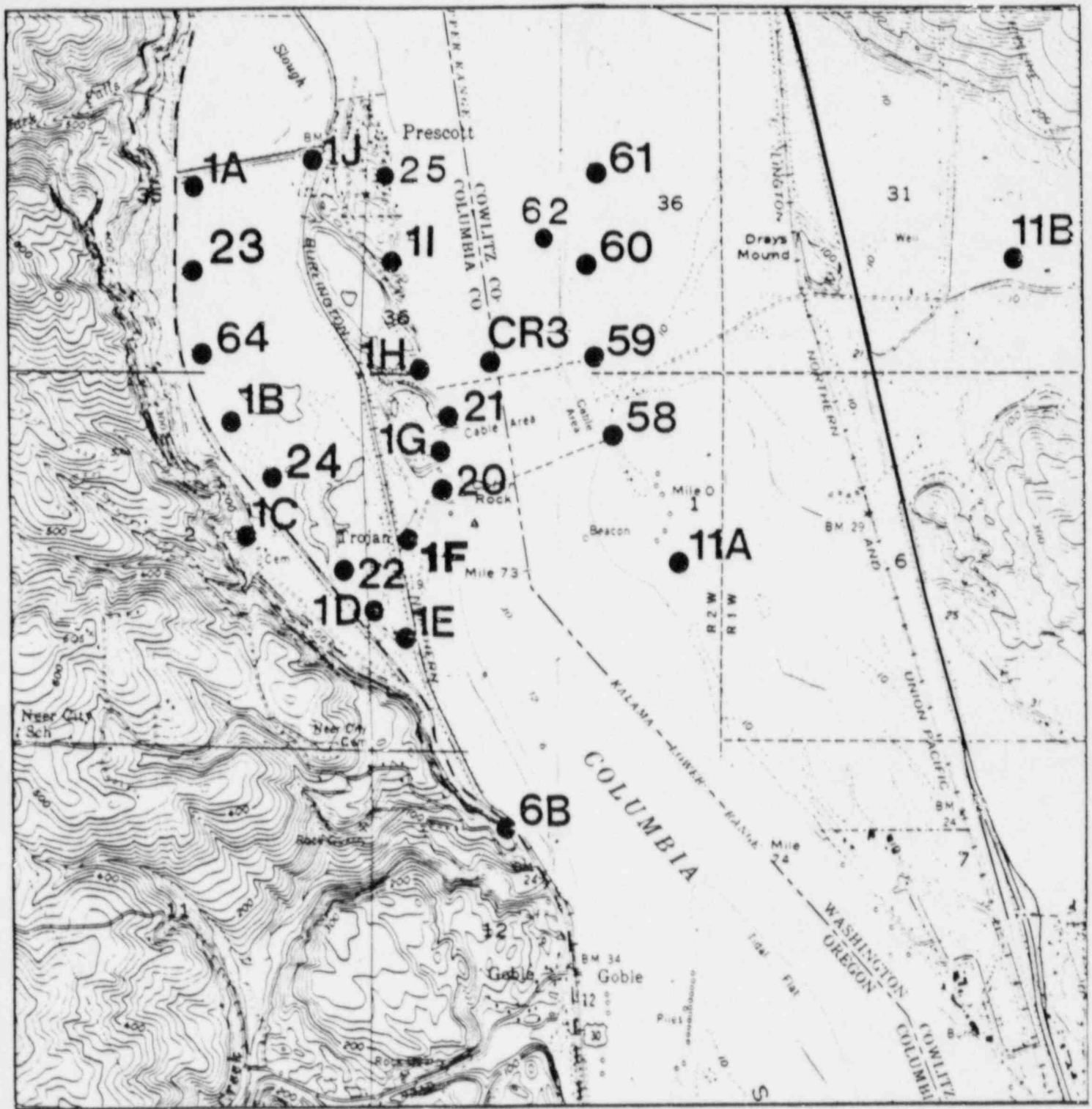

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Figure 2-2. SAMPLING LOCATIONS (Detail)

1 0 1/2 1mi.

3.0 ANALYTICAL PROCEDURES AND COUNTING METHODS

Samples are analyzed for the various radioactive components by standard radiochemical methods. These methods are equal to, and in most cases, identical with, those of the U. S. Department of Energy [Health and Safety Laboratory (HASL) Procedures Manual, HASL-300, see references, Section 3.10], or those of the U. S. Environmental Protection Agency (EPA).

Analyses of individual sample types, general methods, and routine analytical sensitivities are discussed below. The analytical program and sensitivity requirements are given in Table 3-1.

3.1 ANALYTICAL DETECTION LIMITS AND COUNT RATE ERRORS

In environmental radiological analyses the dominant known uncertainty is usually the sample count rate. Error terms given in this report are based on this factor since all other analytical uncertainties are relatively small. Uncertainties are calculated by standard methods (HASL-300), and are reported at the 95-percent confidence level (2σ). The lower limit of detection (LLD) is defined as the smallest concentration of radioactive material in a sample or the smallest amount of radiation to a dosimeter that will yield a net indication, above system background, that will be detected with 95-percent probability with only 5-percent probability of falsely concluding that a blank observation represents a real signal. Analytical data for samples for which concentrations are less than or equal to the LLD are preceded by the symbol "<".

3.2 AIR PARTICULATES

Gross beta concentrations are measured with low background, window-type (0.85 mg/cm^2 in thickness), proportional counting systems. The routine detection limit (LLD) is 0.002 pCi/m^3 for gross beta measurements assuming a collected air volume of 300 m^3/week.

Gamma isotopic analyses are performed with germanium detectors with a routine detection limit of 0.05 pCi/m^3 for the gamma emitters.

3.3 RADIOIODINE

The charcoal cartridges used are of the TEDA-impregnated type. The iodine is extracted from the charcoal, chemically separated, and counted as AgI using the low-background beta counters mentioned in Section 3.2 which yield an LLD of 0.05 pCi/m^3.

3.4 DRINKING AND WELL WATER

Gross beta analysis of water samples is performed by evaporation of a measured aliquot of the sample, digestion, planchetting of the processed sample and radiometric assay by the low-background beta counters mentioned in Section 3.2, with an LLD of 0.5 pCi/1. Tritium analysis is performed on all water samples to the required LLD of 1000 pCi/1 by liquid scintillation counting. Gamma isotopic analysis is performed using germanium detectors with a routine LLD of 10 pCi/1 per gamma emitting radionuclide.

3.5 SHORELINE SOIL

Samples are oven-dried and results reported based on dry weight. Gamma emitters are measured with germanium detectors with an LLD of 0.1 pCi/g per nuclide.

3.6 FISH, INVERTEBRATES, AND FOOD CROPS

Measured amounts of these types of samples are analyzed for gamma emitters by gamma spectrometry with counting times adjusted to provide LLDs at least as sensitive as those required in Table 3-1 for the appropriate sample type.

3.7 MILK

The determination of Iodine-131 in fresh milk is based on anion exchange removal of the Iodine-131 followed by radiochemical purification and low background beta counting using the systems described in Section 3.2. The LLD is 0.5 pCi/l or better. Gamma emitters in milk are measured with germanium detectors with an LLD of 10 pCi/l per nuclide. The analysis for Strontium-89 and Strontium-90 is performed on ashed samples using a strontium chemical yield and two-separation technique with an LLD of 1.0 pCi/l.

3.8 AMBIENT RADIATION MEASUREMENTS

The responsibility for ambient radiation dose measurements resides with Portland General Electric Company (PGE). A total of 57 field locations were monitored with the dosimeters analyzed quarterly. The field dosimeters used thermoluminescent radiation detection materials (CaF_2:Dy, TLD-200 chips) with each dosimeter having more than two separate chips or measurement devices. For each field dosimeter, the chips were packed in a plastic foam and sealed in shielded containers. To minimize radiation energy dependence for the TLD-200 chips, the field dosimeters were shielded with a two-element filter of 10 mil tantalum and 2 mil lead as described in the report by Denham, et al (see Section 3.10).

Calibration of the field dosimeters was performed with a Cesium-137 source traceable to the U. S. National Bureau of Standards. Calibration dosimeters were prepared for each readout of the field dosimeters.

3.9 QUALITY CONTROL

Approximately 15 percent of the analyses performed by the analysis laboratory are for quality control purposes. The analysis laboratory participates in EPA, Nuclear Regulatory Commission, and other intercalibration programs. Reports of all quality control analyses

are presented monthly to PGE. Results of EPA intercalibrations (for which "known" data are available) are given in Table 3-2. In those cases where discrepant values are obtained, the analysis laboratory performs an investigation to determine the cause and corrective action as required. Table 3-3 summarizes the intralaboratory quality control results for the year 1987.

During 1981, 1982, and 1984, PGE participated in the Fifth, Sixth, and Seventh International Intercomparison of Environmental Dosimeters. The results of these participations were presented in the 1982, 1983, and 1984 reports, respectively. By the successful PGE participation in these three intercomparison projects, the measurement method for the environmental ambient radiation levels has been shown to be appropriate and accurate.

3.10 REFERENCES FOR ANALYTICAL PROCEDURES

1. American Public Health Association, American Water Works Association and Water Pollution Control Federation (1971): Standard Methods for the Examination of Water and Wastewater. Thirteenth edition, pp 583-632; 12th edition, pp 325-352. APHA, 1740 Broadway, New York, NY 10019.

2. Department of Health, Education and Welfare, Public Health Service: Radioassay Procedures for Environmental Samples. National Center for Radiological Health (1967), Sec. 1, pp 36-115.

3. Atomic Energy Commission: Regulatory Guide 4.3 (September 1973).

4. Health and Safety Laboratory, Atomic Energy Commission: HASL Procedures Manual (now known as EML of the Department of Energy). HASL, 376 Hudson Street, New York, NY 10014.

5. National Environmental Research Center, Environmental Protection Agency; Handbook of Radiochemical Analytical Methods. Program Element 1HA 325. Office of Research and Development, Las Vegas, NV 89114.

6. D. H. Denham, R. L. Kathren, and J. P. Corley, "A Ca_2:D/ Thermoluminescent Dosimeter for Environmental Monitoring", USAEC Report BNWL-SA-4191 (1972).

TABLE 3-1

PROGRAM ANALYSES AND REPORTED DETECTION LEVELS

Program Analysis	Reported Detection Limits (LLD)[a]
Air Particulate-gross beta	0.002 pCi/m^3
Air Particulate-gamma scan	0.05 pCi/m^3/nuclide
Air Radioiodine	0.05 pCi/m^3
Food Crops-gamma scan	0.02 pCi/g/nuclide (wet)
Milk-Iodine-131	0.5 pCi/liter
Milk-Strontium 89/90	1.0 pCi/liter
Milk-gamma scan	10 pCi/liter/nuclide
Water-gross beta	0.5 pCi/liter
Water-tritium	1000 pCi/liter
Water-gamma scan	10 pCi/liter/nuclide
Shoreline Soil-gamma scan	0.1 pCi/g/nuclide (dry)
Fish/Invertebrates-gamma scan	0.1 pCi/g/nuclide (wet)
Direct Radiation	0.04 mR/day

[a] Reported detection level or LLD is defined in Section 3.1.

TABLE 3-2

1987 U. S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
ANALYSIS LABORATORY INTERCOMPARISON PROGRAM

Sample Type	Analysis	EPA Value	Eberline Value	Units
Water	Alpha	11.0±5.0	12.3±2.7	pCi/l
Water	Ra-226	6.80±1.02	5.27±2.21	pCi/l
Water	Ra-228	11.10±1.67	6.27±2.20	pCi/l
Water	Beta	10.0±5.0	13.0±2.9	pCi/l
Water	Pu-239	16.70±1.67	17.40±0.70	pCi/l
Water	H-3	4209±421	4633±570	pCi/l
Water	Sr-90	25.0±5.0	22.0±3.7	pCi/l
Water	Sr-90	25.0±1.5	26.3±2.7	pCi/l
Water	U(Nat.)	8.0±6.0	11.7±1.7	pCi/l
Water	Alpha	3.0±5.0	2.7±0.6	pCi/l
Water	Beta	13.0±5.0	9.3±1.2	pCi/l
Water	Ra-226	7.30±1.10	5.97±0.71	pCi/l
Water	Ra-228	7.50±1.13	9.10±2.35	pCi/l
Water	H-3	5620±562	6130±256	pCi/l
Water	H-3	2895±357	3417±310	pCi/l
Water	Alpha	30.0±8.0	35.7±2.0	pCi/l
Water	Beta	66.0±5.0	75.3±4.0	pCi/l
Water	Sr-89	19.0±5.0	15.7±4.0	pCi/l
Water	Sr-90	10.0±1.5	10.7±2.3	pCi/l
Water	Co-60	8.0±5.0	5.6±1.8	pCi/l
Water	Cs-134	20.0±5.0	11.9±1.3	pCi/l
Water	Cs-137	15±5.0	10.5±1.5	pCi/l
Water	Ra-226	3.90±0.60	3.90±0.17	pCi/l
Water	Ra-228	4.00±0.60	5.50±1.0	pCi/l
Water	U(Nat.)	5.00±6.00	5.67±0.80	pCi/l
Water	Alpha	5.0±5.0	4.0±0.8	pCi/l
Water	Beta	5.0±5.0	3.3±0.6	pCi/l
Water	Sr-89	41.0±5.0	42.0±5.9	pCi/l
Water	Sr-90	20.0±1.5	27.3±7.1	pCi/l
Water	Cr-51	41.0±5.0	30.7±12.0	pCi/l
Water	Co-60	64.0±5.0	57.7±3.2	pCi/l
Water	Zn-65	10.0±5.0	4.66±2.00	pCi/l
Water	Ru-106	75.0±5.0	62.7±13.0	pCi/l
Water	Cs-134	40.0±5.0	30.0±2.0	pCi/l
Water	Cs-137	80.0±5.0	68.3±2.1	pCi/l
Water	Ra-226	7.30±1.30	6.30±0.30	pCi/l
Water	Ra-228	15.20±2.28	12.6±2.00	pCi/l
Water	Alpha	4.0±5.0	5.0±1.9	pCi/l
Water	Beta	12.0±5.0	12.0±2.3	pCi/l
Water	I-131	48.0±6.0	52.0±2.6	pCi/l
Water	Pu-239	5.30±0.53	5.53±0.47	pCi/l
Water	U(Nat.)	13.0±6.0	14.7±0.7	pCi/l
Water	H-3	4492±449	3620±297	pCi/l
Water	Ra-226	9.70±1.46	9.60±0.26	pCi/l
Water	Ra-228	6.30±0.95	10.17±0.25	pCi/l

TABLE 3-2

Sample Type	Analysis	EPA Value	Eberline Value	Units
Air Filter	Alpha	14.0±5.0	14.7±2.5	pCi/sample
Air Filter	Beta	43.0±5.0	47.0±1.3	pCi/sample
Air Filter	Cs-137	8.0±5.0	13.0±1.8	pCi/sample
Air Filter	Alpha	10±5	9.67±0.58	pCi/sample
Air Filter	Beta	30±5	32±1.7	pCi/sample
Air Filter	Sr-90	10±1.5	8.33±0.58	pCi/sample
Air Filter	Cs-137	10±5	20.7±1.5	pCi/sample
Milk	I-131	9.00±0.90	7.67±1.0	pCi/l
Urine	H-3	5257±526	4987±180	pCi/l
Urine	H-3	7432±743	6027±133	pCi/l

TABLE 3-3

1987 QUALITY CONTROL ANALYSES SUMMARY

The table below summarizes results of samples run for process quality control purposes during the subject year. These listings are in addition to such measurements as detector backgrounds, check source values, radiometric-gravimetric comparisons, system calibrations, etc. Detailed listings of each measurement are maintained at the analysis laboratory and are available for inspection if required.

Blank Samples

Nuclide Analyzed	Number of Determinations	Number of Analyses Exceeding the LLD for that Analysis
Gross Alpha	69	0
Gross Beta	36	0
H-3	30	0
U-234	45	0
U-238	15	0
Th-230	124	0
Ra-226	90	0
Ra-228	7	0
Pb-210	4	0
Sr-89	20	0
Sr-90	48	0
Pu-239	25	0
Am-241	19	0
I-131	5	0
Fe-55	3	0

Spiked Samples

Nuclide Analyzed	Number of Determs.	Within 2 Sigma of Known	Within 3 Sigma of Known
Gross Alpha	69	69	-
Gross Beta	36	36	-
H-3	30	30	-
U-234	45	45	-
U-238	15	15	-
Th-230	124	124	-
Ra-226	90	90	-
Ra-228	7	7	-
Pb-210	4	4	-
Sr-89	20	20	-
Sr-90	45	45	-
Pu-239	25	25	-
Am-241	19	19	-
I-131	5	5	-
Fe-55	3	3	-

Split Samples

Nuclide Analyzed	Number of Determs.	Within 2 Sigma of Known	Within 3 Sigma of Known
Gross Alpha	57	57	-
Gross Beta	37	37	-
H-3	29	29	-
U-234	46	46	-
U-238	11	11	-
Th-230	119	116	3
Ra-226	81	81	-
Ra-228	7	7	-
Sr-89	16	16	-
Sr-90	36	36	-
Pu-239	18	18	-
Pb-210	1	1	-
AM-241	15	15	-
FE-55	5	5	-

4.0 RESULTS AND DISCUSSION

4.1 SAMPLES FROM THE TERRESTRIAL ENVIRONMENT

4.1.1 AIR PARTICULATES AND AIRBORNE I-131

The gross beta air particulate data obtained during 1987 were comparable to the data obtained during the years of 1982, 1983, 1984, 1985, 1986 (except May 1986), and the preoperational period. Gross beta concentrations for air particulates for all sampling periods in 1987 remained generally at low levels.

Average concentrations with their average standard deviations for the years 1987 and before are presented in Table 4-1 for both onsite and offsite locations. In October 1980, the Peoples' Republic of China tested a nuclear device in the atmosphere. For this reason, the increased average concentrations in 1981 were due to increased fallout levels from the October 1980 Chinese test and not from operation of the Trojan Nuclear Plant. The larger average standard deviation for the 1986 data was due to the increased gross beta activity for May 1986 resulting from the Chernobyl incident.

Airborne I-131 concentration values for 1987 were below the detection limit of 0.05 pCi/m^3 (at collection time) for all samples.

For 1987, the measurement of gamma emitting radionuclides in quarterly composites of air particulate filters for each monitoring location did not show detectable activity above the detection limit of 0.05 pCi/m^3.

Data for these air monitoring samples are listed in Chapter 5, Tables 5-1, 5-2, and 5-3.

4.1.2 FOOD CROPS

Samples of food crops (garden produce) were collected and analyzed for gamma emitters. The sample collections of these garden produce were made

during the harvest months of June, July, and August 1987. Gamma emitting radionuclides were not detected in the food crop samples. The data are presented in Chapter 5, Table 5-4.

4.1.3 WELL WATER

Well water samples were collected quarterly from three locations. Tritium and gamma emitting radionuclide levels were below the sensitivity requirements of the program. The data are presented in Chapter 5, Table 5-5.

4.1.4 MILK

Milk samples were collected from four locations and were analyzed for I-131, Sr-89, Sr-90, and and gamma emitters. No samples contained I-131 or Sr-89 at detectable levels. Most samples contained Sr-90, which is attributable to worldwide fallout due to atmospheric weapons tests.

During the months March through June and in December, 17 of 88 milk samples collected for the year showed detectable levels of radiocesiums. Five of these samples exceeded 20 pCi/l. The lack of I-131 and Sr-89 radioactivity in the milk samples shows that the measured cesium radioactivity is attributable to fallout radioactivity due to the April 1986 Chernobyl incident in Russia, rather than operational activity of the Trojan Nuclear Plant. Refer to the 1986 report for discussion of this incident.

The milk sample data are presented in Chapter 5, Table 5-6.

4.1.5 AMBIENT RADIATION LEVELS

Ambient dose rates in mR/day for dosimeters at measurement locations in the environs around the Trojan Nuclear Plant are shown in Chapter 5, Table 5-7. Several of these measurement locations were established before the Plant became operational. The mean and standard deviation

for the quarterly dosimeters data has been calculated for the three geographical groups of Oregon, Washington, and Trojan onsite locations. For 1987, the mean ambient dose rates were: 0.13±0.03 mR/day for the 14 Trojan onsite locations, 0.15±0.03 mR/day for the 20 Oregon locations, and 0.12±0.02 mR/day for the 23 Washington locations. These values do not differ significantly from the results of previous years.

Another manner for review of the ambient radiation measurements is to divide the results between three rings which are grouped as to radial distance from Trojan: the close ring (24 locations) at distances from 0.1 to 2.0 miles; the 5-mile ring (17 locations) at distances from 2.1 to 7.0 miles; the 10-mile ring (16 locations) at distances from 7.1 to 10.7 miles. The 10-mile ring serves as the control locations for the ambient radiation measurements. Each ring has at least one measurement location in each of the 16 directional sectors. The measurement mean and standard deviations were calculated to be 0.13±0.03 mR/day for all locations, with the close, 5-mile, and 10-mile rings being 0.12±0.03 mR/day, 0.14±0.03 mR/day, and 0.14±0.03 mR/day, respectively. These data indicate that the operational activities of the Trojan Nuclear Plant do not affect the ambient radiation levels around the Plant.

The ambient gamma radiation data in Table 5-7 were also analyzed for dose rate differences in the four major compass directions from the Trojan Nuclear Plant. No significant differences were found, in respect to both the compass directions or the similar data from 1986 and before. The values were: 0.13±0.03 mR/day for the 16 north locations, 0.11±0.02 mR/day for the 9 east locations, 0.15±0.04 mR/day for the 12 south locations, and 0.15±0.03 mR/day for the 6 west locations.

4.2 SAMPLES FROM THE AQUATIC ENVIRONMENT

4.2.1 DRINKING WATER SAMPLES

Composited drinking water samples were collected from municipal water supply locations on the Columbia River that are downstream (Sample

Location 2) and upstream (Sample Location 66) of the Trojan site. The samples were analyzed monthly for gross beta activity, tritium, and gamma emitters. The data are presented in Chapter 5, Table 5-8.

No radioactivity attributable to operation of the Trojan Nuclear Plant was detected in any of the water samples.

4.2.2 SHORELINE SOIL

Shoreline soil samples were collected from a location on the bank of the Columbia River near the Trojan site. Analyses were performed for gamma emitters. The data are presented in Chapter 5, Table 5-9. None of the shoreline soil samples showed detectable levels of gamma emitters.

4.2.3 FISH

Fish and crayfish were collected twice during the year and the fillets and/or tails were analyzed for gamma emitters. None of the fish or crayfish samples contained gamma emitting radionuclides larger than the detectability level of 0.1 pCi/g. The data are presented in Chapter 5, Table 5-10.

4.3 SUMMARY OF RESULTS

Table 4-2 presents a summary of the radioactivity analysis results for each medium or pathway sampled for the 1987 Radiological Environmental Monitoring Program around the Trojan Nuclear Plant. The format of Table 4-2 is that which is required by Trojan Technical Specification 6.9.1.5.2.

A review of Table 4-2 shows that, except for milk, none of the radioactivity measurements were larger than the Reporting Levels defined by

Technical Specification 3.12.1. The milk samples that exceeded the Reporting Levels were determined to be caused by fallout radioactivity and not Trojan Plant operations.

For the gross beta analyses of the air particulate samples, the value for the location with the highest annual mean was not significantly different from the the values for the control location or all locations.

For the milk samples, the only detectable radioactivity was due to the atmospheric weapons testing and the Chernobyl nuclear accident fallout radionuclides, Sr-90, Cs-134, and Cs-137. Also, the dairy with the highest measured values of Sr-90, Cs-134, and Cs-137 was a goat dairy. Goats tend to concentrate radioactivity in the milk to a greater degree than do cows.

For the ambient radiation measurements, the mean value for the control locations (10-mile ring) was not significantly different than the mean values for all locations or the close ring (see Section 4.1.5).

For the radioactivity measurements in drinking water, the annual mean for the gross beta determination was higher for the upstream (Columbia River) or control location (St. Helens) than it was for the downstream location (Rainier).

As is shown by Table 4-2, except for milk, most of the radioactivity measurements performed for the 1987 Trojan Nuclear Plant Radiological Environmental Monitoring Program were at or below the level of detectability. There is no indication that the operations of the Trojan Nuclear Plant had a radiological impact on the environs around the Plant.

TABLE 4-1

AVERAGE GROSS BETA CONCENTRATIONS
FOR AIR PARTICULATES

(Units: 10^{-2} pCi/m^3)

	Trojan (onsite)	Oregon (offsite)	Washington (offsite)
Preop	2±2	2±2	3±2
1976	2±6	3±8	2±4
1977	3±4	4±4	5±2
1978	2±2	2±1	2±1
1979	1±1	1±1	1±1
1980	3±4	3±4	2±4
1981	11±2	11±4	11±1
1982	2±5	2±7	2±6
1983	2±2	2±2	2±2
1984	2±2	2±2	2±2
1985	2±2	2±1	2±1
1986	3±7	3±6	3±7
1987	1±1	1±1	1±1

TABLE 4-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Trojan Nuclear Plant, Columbia County, Oregon, Docket 50-344, Reporting Period: January 1-December 31, 1987

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean(f)[a] Range	Location With Highest Annual Mean Name Distance and Direction	Mean(f)[a] Range	Control Locations Mean(f)[a] Range	Number of Reportable Events
Air Particulates (pCi/m^3)	Gross β 364	0.002	0.014(364/364) 0.004-0.042	5 of the 6 sample sites, see Table 5-2	0.014(260/260) 0.004-0.042	0.015(52/52) 0.003-0.034	N/A[b]
	I-131 364	0.05	<LLD	-	<LLD	<LLD	0
	γ-scan 28	0.05/nuclide	<LLD	-	<LLD	<LLD	0
Food Crops (pCi/g - wet)	γ-scan 8	0.02/nuclide	<LLD	-	<LLD	N/A	0
Well Water (pCi/liter)	Tritium 12	1000	<LLD	-	<LLD	N/A	0
	γ-scan 12	10/nuclide	<LLD	-	<LLD	N/A	0
Milk (pCi/liter)	I-131 88	0.5	<LLD	-	<LLD	<LLD	0
	Sr-89 88	1.0	<LLD	-	<LLD	<LLD	N/A[b]
	Sr-90 88	1.0	3.0(68/88) 0.6-13.0	63-Rink Dairy 8.1 mi - WNW	3.8(22/22) 1.0-13.0	1.6(10/22) 0.6-2.8	N/A[b]

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean(f)[a] Range	Location With Highest Annual Mean Name Distance and Direction	Mean(f)[a] Range	Control Locations Mean(f)[a] Range	Number of Reportable Events
	γ-scan, 88	10/nuclide	-		-	-	0
	Cs-134		14(3/88) 10-20	63-Rink Dairy 8.1 mi - WNW	14(3/22) 10-20	<LLD	0
	Cs-137		21(17/88) 8-40	63-Rinck Dairy 8.1 mi - WNW	28(9/22) 8-40	8.5(2/22) 8-9	0
Ambient Radiation (mR/day)	γ-exposure 223	0.04	0.13(223/223) 0.05-0.27	1H-Plant Cooling Tower 0.2 mi - ESE	0.20(4/4) 0.16-0.27	0.14(63/63) 0.09-0.20	N/A[b]
Drinking Water (pCi/liter)	Gross β 24	0.5	3.5(24/24) 1.7-6.9	66-St. Helens (control) 10.5 mi - SSE	3.8(12/12) 2.2-5.6	3.8(12/12) 2.2-5.6	N/A[b]
	Tritium 24	1000	<LLD	-	<LLD	<LLD	0
	γ-scan 24	10/nuclide	<LLD	-	<LLD	<LLD	0
Shoreline Soil (pCi/g - dry)	γ-scan 2	0.1/nuclide	<LLD	-	<LLD	N/A[b]	N/A[b]
Fish/Invertebrates (pCi/g - wet)	γ-scan 8	0.1/nuclide	<LLD	-	<LLD	<LLD	0

[a] Mean and range based upon detectable measurements only. The fraction of detectable measurements at specified locations is indicated in parentheses (f).

[b] N/A - Not applicable.

5.0 COMMENTS ON AND TERMS USED IN DATA TABLES

Wet Weight — A reporting unit used with organic tissue samples such as vegetation and aquatic animal samples in which the amount of sample is taken to be the weight as received from the field with no moisture removed.

Dry Weight — A reporting unit used for shoreline soil in which the amount of sample is taken to be the weight of the sample after removal of moisture by drying in an oven at about 110°C for about 15 hours.

pCi/m^3 — A reporting unit used with air particulate and radioiodine data which refers to the radioactivity content expressed in picocuries of the volume of air expressed in cubic meters passed through the filter and/or the charcoal trap. Note that the volumes are not corrected to standard conditions.

Gamma Emitters or Gamma Isotopic — Samples were analyzed by high resolution germanium gamma spectrometry. The resulting spectrum is analyzed by a computer program which scans about 50 to 2000 KeV and lists the energy peaks of any nuclides present in concentrations exceeding the sensitivity limits set for that particular experiment.

Error Terms — Figures following "$\pm$" are error terms based on counting uncertainties at the 2σ (95-percent confidence) level. Values preceded by the "<" symbol were below the stated concentration at the 3σ (99-percent confidence) level.

Sensitivity

All analyses meet the sensitivity requirements of the program as given in Table 3-1. For the few samples that do not (because of inadequate sample quantities, analytical interference, etc), the sensitivity actually obtained in the analysis is given.

Comment

When all analyses of a particular type during the period resulted in concentrations below the sensitivity limits, a statement is made on the appropriate table rather than presenting a whole page of "<" data. If all but one or two data points are below the sensitivity limits, the previously mentioned convention is followed and the finite data are given as footnotes.

TABLE 5-1

AIRBORNE IODINE-131* AND GROSS BETA IN AIR PARTICULATE FILTERS
(Weekly Collections)

Location 1F*			Location 1I*		
Collection Date	Volume (m^3)	Gross B (pCi/m^3)	Collection Date	Volume (m^3)	Gross B (pCi/m^3)
01/06/87	285	0.007±0.003	01/06/87	285	0.007±0.003
01/13/87	285	0.028±0.004	01/13/87	285	0.028±0.003
01/20/87	285	0.017±0.003	01/20/87	285	0.014±0.003
01/27/87	285	0.028±0.003	01/27/87	285	0.027±0.003
02/03/87	285	0.013±0.003	02/03/87	285	0.010±0.003
02/10/87	280	0.038±0.004	02/10/87	280	0.035±0.004
02/17/87	290	0.020±0.003	02/17/87	290	0.014±0.003
02/24/87	285	0.011±0.003	02/24/87	285	0.013±0.003
03/03/87	285	0.019±0.003	03/03/87	285	0.021±0.003
03/10/87	285	0.011±0.002	03/10/87	285	0.013±0.002
03/17/87	285	0.005±0.003	03/17/87	280	0.005±0.003
03/24/87	280	0.006±0.003	03/24/87	265	0.009±0.003
03/31/87	265	0.008±0.003	03/31/87	100	0.042±0.009
04/07/87	285	0.014±0.003	04/07/87	280	0.021±0.003
04/14/87	285	0.009±0.003	04/14/87	285	0.008±0.003
04/21/87	285	0.012±0.003	04/21/87	285	0.011±0.003
04/28/87	285	0.018±0.003	04/28/87	285	0.006±0.003
05/05/87	285	0.013±0.003	05/05/87	285	0.014±0.003
05/12/87	285	0.017±0.003	05/12/87	285	0.013±0.003
05/19/87	285	0.006±0.003	05/19/87	285	0.013±0.003
05/26/87	285	0.011±0.003	05/26/87	285	0.012±0.003
06/02/87	285	0.005±0.003	06/02/87	285	0.007±0.003
06/09/87	285	0.014±0.003	06/09/87	285	0.009±0.003
06/16/87	285	0.006±0.003	06/16/87	290	0.009±0.003
06/23/87	285	0.004±0.003	06/23/87	285	0.007±0.003
06/30/87	285	0.009±0.003	06/30/87	280	0.009±0.003
07/07/87	280	0.007±0.003	07/07/87	285	0.007±0.003
07/14/87	290	0.004±0.003	07/14/87	290	0.006±0.003
07/21/87	285	0.007±0.003	07/21/87	285	0.008±0.003
07/28/87	285	0.011±0.003	07/28/87	280	0.010±0.003
08/04/87	285	0.013±0.003	08/04/87	285	0.007±0.003
08/11/87	285	0.011±0.003	08/11/87	285	0.011±0.003
08/18/87	290	0.008±0.003	08/18/87	290	0.004±0.003
08/25/87	285	0.009±0.003	08/25/87	280	0.007±0.003
09/01/87	285	0.019±0.003	09/01/87	285	0.016±0.003
09/08/87	285	0.015±0.003	09/08/87	285	0.016±0.003
09/15/87	290	0.011±0.003	09/15/87	285	0.013±0.003
09/22/87	290	0.017±0.003	09/22/87	290	0.017±0.003

* Iodine cartridge concentrations are <0.05 unless otherwise noted.

TABLE 5-1

AIRBORNE IODINE-131* AND GROSS BETA IN AIR PARTICULATE FILTERS
(Weekly Collections)

Location 1F*			Location 1I*		
Collection Date	Volume (m^3)	Gross B (pCi/m^3)	Collection Date	Volume (m^3)	Gross B (pCi/m^3)
09/29/87	280	0.016±0.003	09/29/87	285	0.016±0.003
10/06/87	285	0.024±0.003	10/06/87	285	0.022±0.003
10/13/87	280	0.023±0.003	10/13/87	285	0.028±0.003
10/20/87	290	0.016±0.003	10/20/87	285	0.018±0.003
10/27/87	285	0.026±0.003	10/27/87	285	0.030±0.003
11/03/87	285	0.021±0.003	11/03/87	290	0.025±0.003
11/10/87	285	0.020±0.003	11/10/87	280	0.021±0.003
11/17/87	285	0.010±0.003	11/17/87	285	0.012±0.003
11/24/87	285	0.019±0.003	11/24/87	285	0.018±0.003
12/01/87	285	0.011±0.002	12/01/87	285	0.009±0.002
12/08/87	285	0.004±0.003	12/08/87	285	0.005±0.003
12/15/87	285	0.010±0.003	12/15/87	290	0.009±0.003
12/22/87	285	0.022±0.003	12/22/87	285	0.021±0.003
12/29/87	280	0.020±0.003	12/29/87	285	0.019±0.003

* Iodine cartridge concentrations are <0.05 unless otherwise noted.

TABLE 5-1

AIRBORNE IODINE-131* AND GROSS BETA IN AIR PARTICULATE FILTERS
(Weekly Collections)

Location 6B*			Location 11B*		
Collection Date	Volume (m^3)	Gross B (pCi/m^3)	Collection Date	Volume (m^3)	Gross B (pCi/m^3)
01/06/87	285	0.007±0.003	01/06/87	285	0.008±0.003
01/13/87	285	0.028±0.004	01/13/87	285	0.030±0.004
01/20/87	285	0.013±0.003	01/20/87	285	0.014±0.003
01/27/87	285	0.027±0.003	01/27/87	285	0.030±0.003
02/03/87	285	0.010±0.003	02/03/87	285	0.009±0.003
02/10/87	280	0.037±0.004	02/10/87	285	0.042±0.004
02/17/87	290	0.014±0.003	02/17/87	290	0.017±0.003
02/24/87	285	0.010±0.003	02/24/87	285	0.012±0.003
03/03/87	285	0.020±0.003	03/03/87	285	0.022±0.003
03/10/87	285	0.012±0.003	03/10/87	285	0.013±0.003
03/17/87	280	0.005±0.003	03/17/87	280	0.007±0.003
03/24/87	280	0.005±0.003	03/24/87	285	0.005±0.003
03/31/87	285	0.010±0.003	03/31/87	285	0.009±0.003
04/07/87	280	0.017±0.003	04/07/87	285	0.010±0.003
04/14/87	230	0.011±0.003	04/14/87	285	0.010±0.003
04/21/87	285	0.009±0.003	04/21/87	285	0.005±0.003
04/28/87	285	0.014±0.003	04/28/87	285	0.019±0.003
05/05/87	285	0.013±0.003	05/05/87	285	0.012±0.003
05/12/87	285	0.004±0.003	05/12/87	285	0.004±0.003
05/19/87	285	0.011±0.003	05/19/87	285	0.011±0.003
05/26/87	285	0.013±0.003	05/26/87	285	0.010±0.003
06/02/87	65(a)	0.008±0.003	06/02/87	285	0.004±0.003
06/09/87	285	0.013±0.003	06/09/87	285	0.010±0.003
06/16/87	290	0.011±0.003	06/16/87	285	0.008±0.003
06/23/87	285	0.005±0.003	06/23/87	285	0.006±0.003
06/30/87	275	0.011±0.003	06/30/87	280	0.011±0.003
07/07/87	285	0.008±0.003	07/07/87	285	0.009±0.003
07/14/87	295	0.008±0.003	07/14/87	290	0.007±0.003
07/21/87	285	0.006±0.003	07/21/87	285	0.009±0.003
07/28/87	280	0.010±0.003	07/28/87	285	0.009±0.003
08/04/87	285	0.010±0.003	08/04/87	285	0.012±0.003
08/11/87	285	0.012±0.003	08/11/87	285	0.011±0.003
08/18/87	290	0.007±0.003	08/18/87	290	0.008±0.003
08/25/87	280	0.010±0.003	08/25/87	285	0.010±0.003
09/01/87	285	0.018±0.003	09/01/87	285	0.021±0.003
09/08/87	285	0.016±0.003	09/08/87	285	0.013±0.003
09/15/87	280	0.013±0.003	09/15/87	285	0.013±0.003
09/22/87	285	0.012±0.003	09/22/87	290	0.015±0.003

* Iodine cartridge concentrations are <0.05 unless otherwise noted.

(a) Timer failure on monitoring unit.

TABLE 5-1

AIRBORNE IODINE-131* AND GROSS BETA IN AIR PARTICULATE FILTERS
(Weekly Collections)

Location 6B*			Location 11B*		
Collection Date	Volume (m^3)	Gross B (pCi/m^3)	Collection Date	Volume (m^3)	Gross B (pCi/m^3)
09/29/87	285	0.018±0.003	09/29/87	285	0.021±0.003
10/06/87	285	0.024±0.003	10/06/87	285	0.025±0.003
10/13/87	285	0.028±0.003	10/13/87	285	0.026±0.003
10/20/87	285	0.020±0.003	10/20/87	285	0.020±0.003
10/27/87	285	0.027±0.003	10/27/87	285	0.032±0.004
11/03/87	290	0.021±0.003	11/03/87	285	0.026±0.003
11/10/87	280	0.022±0.003	11/10/87	285	0.022±0.003
11/17/87	285	0.011±0.003	11/17/87	285	0.011±0.003
11/24/87	285	0.018±0.003	11/24/87	285	0.019±0.003
12/01/87	285	0.012±0.002	12/01/87	285	0.012±0.002
12/08/87	285	0.004±0.003	12/08/87	285	0.006±0.003
12/15/87	285	0.009±0.003	12/15/87	290	0.009±0.003
12/22/87	285	0.019±0.003	12/22/87	285	0.021±0.003
12/29/87	280	0.018±0.003	12/29/87	285	0.016±0.003

* Iodine cartridge concentrations are <0.05 unless otherwise noted.

AIRBORNE IODINE-131* AND GROSS BETA IN AIR PARTICULATE FILTERS
(Weekly Collections)

Location 14*			Location 2*		
Collection Date	Volume (m^3)	Gross B (pCi/m^3)	Collection Date	Volume (m^3)	Gross B (pCi/m^3)
01/06/87	285	0.007±0.003	01/06/87	285	0.005±0.003
01/13/87	285	0.031±0.004	01/13/87	285	0.024±0.003
01/20/87	285	0.013±0.003	01/20/87	285	0.011±0.003
01/27/87	285	0.027±0.003	01/27/87	285	0.024±0.003
02/03/87	285	0.010±0.003	02/03/87	285	0.010±0.003
02/10/87	280	0.034±0.004	02/10/87	280	0.036±0.004
02/17/87	290	0.014±0.003	02/17/87	290	0.013±0.003
02/24/87	285	0.009±0.003	02/24/87	285	0.011±0.003
03/03/87	285	0.023±0.003	03/03/87	285	0.018±0.003
03/10/87	285	0.014±0.003	03/10/87	285	0.012±0.003
03/17/87	280	0.004±0.003	03/17/87	280	0.007±0.003
03/24/87	285	0.006±0.003	03/24/87	285	0.006±0.003
03/31/87	285	0.013±0.003	03/31/87	285	0.017±0.003
04/07/87	285	0.014±0.003	04/07/87	285	0.023±0.003
04/14/87	285	0.010±0.003	04/14/87	285	0.012±0.003
04/21/87	285	0.009±0.003	04/21/87	285	0.009±0.003
04/28/87	285	0.019±0.003	04/28/87	285	0.013±0.003
05/05/87	285	0.014±0.003	05/05/87	285	0.006±0.003
05/12/87	285	0.017±0.003	05/12/87	285	0.007±0.003
05/19/87	285	0.011±0.003	05/19/87	285	0.012±0.003
05/26/87	285	0.011±0.003	05/26/87	285	0.014±0.003
06/02/87	285	0.005±0.003	06/02/87	285	0.008±0.003
06/09/87	285	0.011±0.003	06/09/87	285	0.017±0.003
06/16/87	290	0.006±0.003	06/16/87	290	0.010±0.003
06/23/87	285	0.005±0.003	06/23/87	285	0.009±0.003
06/30/87	100(a)	0.013±0.008	06/30/87	280	0.009±0.003
07/07/87	285	0.005±0.003	07/07/87	285	0.006±0.003
07/14/87	290	0.011±0.003	07/14/87	290	0.006±0.003
07/21/87	285	0.006±0.003	07/21/87	285	0.007±0.003
07/28/87	280	0.006±0.003	07/28/87	280	0.006±0.003
08/04/87	285	0.007±0.003	08/04/87	285	0.010±0.003
08/11/87	285	0.012±0.003	08/11/87	285	0.012±0.003
08/18/87	290	0.008±0.003	08/18/87	290	0.007±0.003
08/25/87	280	0.010±0.003	08/25/87	280	0.010±0.003
09/01/87	285	0.017±0.003	09/01/87	285	0.018±0.003
09/08/87	125(a)	0.019±0.003	09/08/87	285	0.015±0.003
09/15/87	30(a)	0.034±0.003	09/15/87	285	0.012±0.003
09/22/87	285	0.011±0.003	09/22/87	285	0.014±0.003

* Iodine cartridge concentrations are <0.05 unless otherwise noted.

(a) Loss of electrical power to monitoring unit.

TABLE 5-1

AIRBORNE IODINE-131* AND GROSS BETA IN AIR PARTICULATE FILTERS
(Weekly Collections)

Location 14*			Location 2*		
Collection Date	Volume (m^3)	Gross β (pCi/m^3)	Collection Date	Volume (m^3)	Gross β (pCi/m^3)
09/29/87	285	0.016±0.003	09/29/87	285	0.017±0.003
10/06/87	285	0.017±0.003	10/06/87	285	0.022±0.003
10/13/87	280	0.025±0.003	10/13/87	275	0.031±0.004
10/20/87	285	0.020±0.003	10/20/87	285	0.018±0.002
10/27/87	285	0.024±0.003	10/27/87	285	0.028±0.003
11/03/87	290	0.020±0.003	11/03/87	290	0.021±0.003
11/10/87	285	0.021±0.003	11/10/87	280	0.020±0.003
11/17/87	285	0.010±0.003	11/17/87	285	0.013±0.003
11/24/87	285	0.016±0.003	11/24/87	285	0.018±0.003
12/01/87	285	0.009±0.002	12/01/87	285	0.010±0.002
12/08/87	285	0.006±0.003	12/08/87	285	0.005±0.003
12/15/87	290	0.009±0.003	12/15/87	290	0.009±0.003
12/22/87	285	0.018±0.003	12/22/87	285	0.016±0.003
12/29/87	285	0.017±0.003	12/29/87	285	0.014±0.003

* Iodine cartridge concentrations are <0.05 unless otherwise noted.

TABLE 5-1

AIRBORNE IODINE-131* AND GROSS BETA IN AIR PARTICULATE FILTERS
(Weekly Collections)

Location 19*			Location 19*		
Collection Date	Volume (m^3)	Gross β (pCi/m^3)	Collection Date	Volume (m^3)	Gross β (pCi/m^3)
01/06/87	285	0.009±0.003	07/07/87	285	0.007±0.003
01/13/87	285	0.025±0.003	07/14/87	285	0.008±0.003
01/20/87	285	0.014±0.003	07/21/87	285	0.010±0.003
01/27/87	285	0.022±0.003	07/28/87	285	0.011±0.003
02/03/87	285	0.011±0.003	08/04/87	285	0.010±0.003
02/10/87	290	0.034±0.004	08/11/87	285	0.013±0.003
02/17/87	280	0.011±0.003	08/18/87	285	0.010±0.003
02/24/87	285	0.012±0.003	08/25/87	290	0.012±0.003
03/03/87	285	0.018±0.003	09/01/87	285	0.021±0.003
03/10/87	285	0.012±0.003	09/08/87	285	0.019±0.003
03/17/87	285	0.005±0.003	09/15/87	285	0.015±0.003
03/24/87	285	0.005±0.003	09/22/87	285	0.020±0.003
03/31/87	280	0.014±0.003	09/29/87	285	0.016±0.003
04/07/87	285	0.009±0.003	10/06/87	285	0.020±0.003
04/14/87	285	0.011±0.003	10/13/87	290	0.027±0.003
04/21/87	285	0.006±0.003	10/20/87	285	0.019±0.003
04/28/87	285	0.020±0.003	10/27/87	285	0.031±0.003
05/05/87	285	0.014±0.003	11/03/87	280	0.028±0.003
05/12/87	285	0.018±0.003	11/10/87	290	0.023±0.003
05/19/87	285	0.013±0.003	11/17/87	285	0.014±0.003
05/26/87	285	0.011±0.003	11/24/87	285	0.016±0.003
06/02/87	285	0.007±0.003	12/01/87	285	0.009±0.003
06/09/87	285	0.012±0.003	12/08/87	285	0.003±0.003
06/16/87	280	0.010±0.003	12/15/87	285	0.009±0.003
06/23/87	285	0.006±0.003	12/22/87	285	0.021±0.004
06/30/87	290	0.014±0.003	12/29/87	290	0.020±0.003

* Iodine cartridge concentrations are <0.05 unless otherwise noted.

TABLE 5-2

SUMMARY - GROSS BETA IN AIR SAMPLES

	pCi/m^3		
	Average	Maximum	Minimum
Trojan On:ite Stations			
1F	0.013±0.007	0.038	0.004
1I	0.014±0.008	0.042	0.004
Oregon Stations			
2	0.014±0.007	0.036	0.005
6B	0.014±0.007	0.037	0.004
19	0.015±0.007	0.034	0.003
Washington Stations			
11B	0.014±0.008	0.042	0.004
14	0.014±0.007	0.034	0.004

TABLE 5-3

GAMMA EMITTERS CONCENTRATIONS IN AIR PARTICULATE FILTERS
(Quarterly Composites)

Collection Date	(pCi/m^3/nuclide)			
	1F	1I	6B	11B
1st Quarter	<0.05	<0.05	<0.05	<0.05
2nd Quarter	<0.05	<0.05	<0.05	<0.05
3rd Quarter	<0.05	<0.05	<0.05	<0.05
4th Quarter	<0.05	<0.05	<0.05	<0.05

Collection Date	(pCi/m^3/nuclide)		
	14	2	19
1st Quarter	<0.05	<0.05	<0.05
2nd Quarter	<0.05	<0.05	<0.05
3rd Quarter	<0.05	<0.05	<0.05
4th Quarter	<0.05	<0.05	<0.05

TABLE 5-4

RADIOACTIVITY IN FOOD CROPS

[pCi/g/nuclide (wet)]

Location 1I		
Sample Type	Collection Date	Gamma Emitters
Lettuce[a]	06/10/87	<0.02
Beets	06/10/87	<0.02
Carrots	07/15/87	<0.02
Swiss Chard	07/15/87	<0.02
Swiss Chard	08/05/87	<0.02
Carrots	08/05/87	<0.02
Blackberries	08/05/87	<0.02
Apples	08/31/87	<0.02

[a] Split with State of Oregon.

TABLE 5-5

RADIOACTIVITY IN WELL WATER

Collection Date	pCi/l					
	Location 1G		Location 3		Location 6B	
	Tritium	Gamma Emitters	Tritium	Gamma Emitters	Tritium	Gamma Emitters
03/11/87	<1000	<10	<1000	<10	<1000	<10
06/10/87	<1000	<10	<1000	<10	<1000	<10
09/09/87	<1000	<10	<1000	<10	<1000	<10
12/09/87	<1000	<10	<1000	<10	<1000	<10

TABLE 5-6

RADIOACTIVITY IN MILK

Collection Date	pCi/l Location 17A I-131	Sr-89	Sr-90	Nuclides	γ Emitters
01/05/87	<0.5	<1	1.2±1.2		<10
02/09/87	<0.5	<1	3.8±1.3	Cs-137	19±4 (a)
03/09/87	<0.5	<1	3.2±1.1	Cs-137	26±3 (a)
03/23/87	<0.5	<1	1.6±0.9	Cs-137	14±3 (a)
04/06/87	<0.5	<1	4.1±1.0		<10
04/20/87	<0.5	<2 (b)	6.4±1.2		<10
05/04/87	<0.5	<2 (b)	5.0±1.2		<10
05/18/87	<0.5	<1	2.1±1.0		<10
06/08/87	<0.5	<2 (b)	7.2±1.3		<10
06/22/87	<0.5	<1	5.3±1.2		<10
07/06/87	<0.5	<1	<1		<10
07/20/87	<0.5	<1	1.7±1.0		<10
08/03/87	<0.5	<1	4.3±1.2		<10
08/17/87	<0.5	<1	2.5±1.0		<10
08/31/87	<0.5	<1	2.4±0.7		<10
09/14/87	<0.5	<2 (c)	8.6±1.6		<10
09/28/87	<0.5	<1	0.8±0.8		<10
10/12/87	<0.5	<1	1.4±0.9		<10
10/26/87	<0.5	<1	2.8±1.0		<10
11/09/87	<0.5	<1	3.1±1.3		<10
11/23/87	<0.5	<1	3.6±1.1		<10
12/07/87	<0.5	<1	6.6±1.7	Cs-137	9±4 (a)

(a) All other gamma emmiters <10.
(b) Due to low chemical recovery.
(c) Due to low sample volume.

Collection Date	pCi/l Location 19 I-131	Sr-89	Sr-90	Nuclides	γ Emitters
01/05/87	<0.5	<2[b]	<1		<10
02/09/87	<0.5	<2[b]	<1	Cs-137	8±2[a]
03/09/87	<0.5	<1	<1		<10
03/23/87	<0.5	<1	1.1±0.8	Cs-137	9±2[a]
04/06/87	<0.5	<1	<1		<10
04/20/87	<0.5	<1	1.4±0.8		<10
05/04/87	<0.5	<1	<1		<10
05/18/87	<0.5	<1	<1		<10
06/08/87	<0.5	<1	<1		<10
06/22/87	<0.5	<1	2.2±0.9		<10
07/06/87	<0.5	<1	<1		<10
07/20/87	<0.5	<1	2.8±0.8		<10
08/03/87	<0.5	<1	0.9±0.8		<10
08/17/87	<0.5	<1	<1		<10
08/31/87	<0.5	<2[b]	2.2±0.9		<10
09/14/87	<0.5	<1	1.6±0.8		<10
09/28/87	<0.5	<1	1.7±0.8		<10
10/12/87	<0.5	<1	0.6±0.5		<10
10/26/87	<0.5	<1	1.5±0.8		<10
11/09/87	<0.5	<1	<1		<10
11/23/87	<0.5	<1	<1		<10
12/07/87	<0.5	<1	<1		<10

(a) All other gamma emmiters <10.
(b) Due to low chemical recovery.

Collection Date	pCi/l Location 68 I-131	Sr-89	Sr-90	Nuclides	γ Emitters
01/05/87	<0.5	<1	1.2±0.9		<10
02/09/87	<0.5	<1	<1	Cs-137	12±3 (a)
03/09/87	<0.5	<1	1.1±0.9	Cs-137	13±3 (a)
03/23/87	<0.5	<2 (b)	1.7±1.1		<10
04/06/87	<0.5	<1	<1		<10
04/20/87	<0.5	<1	<1		<10
05/04/87	<0.5	<2 (b)	<1		<10
05/18/87	<0.5	<1	<1		<10
06/08/87	<0.5	<2 (b)	3.3±1.1		<10
06/22/87	<0.5	<2 (b)	6±1.4		<10
07/06/87	<0.5	<1	1.8±1.3		<10
07/20/87	<0.5	<2 (b)	1.5±0.9		<10
08/03/87	<0.5	<1	2.0±0.7		<10
08/17/87	<0.5	<1	0.9±0.5		<10
08/31/87	<0.5	<2 (b)	3.3±1.1		<10
09/14/87	<0.5	<1	2.2±0.7		<10
09/28/87	<0.5	<1	<1		<10
10/12/87	<0.5	<1	1.6±0.7		<10
10/26/87	<0.5	<1	1.0±0.8		<10
11/09/87	<0.5	<1	1.6±0.8		<10
11/23/87	<0.5	<1	1.4±0.9		<10
12/07/87	<0.5	<1	<1		<10

(a) All other gamma emmiters <10.
(b) Due to low chemical recovery.

Collection Date	pCi/l Location 63 I-131	Sr-89	Sr-90	Nuclides	γ Emitters
01/05/87	<0.5	<1	1.0±0.8		<10
02/09/87	<0.5	<1	2.5±1.1		<10
03/09/87	<0.5	<2(b)	3.1±0.9	Cs-137	32±4(a)
03/23/87	<0.5	<1	4.3±1.2	Cs-137	17±3
				Cs-134	12±3
04/06/87	<0.5	<1	1.0±0.9	Cs-137	27±3(a)
04/20/87	<0.5	<2(b)	6.7±1.2	Cs-137	36±3
				Cs-134	10±3
05/04/87	<0.5	<1	1.5±1.0	Cs-137	40±4
				Cs-134	20±4
05/18/87	<0.5	<1	2.4±1.1	Cs-137	40±4(a)
06/08/87	<0.5	<1	3.3±1.1	Cs-137	39±5(a)
06/22/87	<0.5	<2(b)	13.0±1.4		<10
07/06/87	<0.5	<1	1.2±1.0	Cs-137	11±3(a)
07/20/87	<0.5	<1	7.7±1.4	Cs-137	8±3(a)
08/03/87	<0.5	<1	2.6±0.9		<10
08/17/87	<0.5	<1	2.1±1.0		<10
08/31/87	<0.5	<2(b)	5.2±1.0		<10
09/14/87	<0.5	<1	1.8±0.5		<10
09/28/87	<0.5	<1	4.6±1.2		<10
10/12/87	<0.5	<1	2.6±0.6		<10
10/26/87	<0.5	<1	5.0±1.2		<10
11/09/87	<0.5	<1	5.2±1.2		<10
11/23/87	<0.5	<1	5.2±1.2		<10
12/07/87	<0.5	<2(b)	1.7±0.9		<10

(a) All other gamma emmiters <10.
(b) Due to low chemical recovery.

TABLE 5-7

AMBIENT GAMMA RADIATION LEVELS FOR 1987

mR/Day (Mean Daily Exposure ±2σ Error)

Site	First Quarter 02/11/87-05/13/87	Second Quarter 05/13/87-08/13/87	Third Quarter 08/13/87-11/11/87	Fourth Quarter 11/11/87-02/10/88
1A	0.10±0.01	0.09±0.02	0.11±0.02	*
1B	0.11±0.02	0.10±0.02	0.12±0.02	0.14±0.04
1C	0.12±0.02	0.12±0.02	0.14±0.02	0.15±0.05
1E	0.09±0.01	0.09±0.02	0.11±0.02	0.12±0.04
1F	0.13±0.02	0.12±0.02	0.15±0.03	0.14±0.05
1H	0.16±0.03	0.27±0.06	0.18±0.04	0.20±0.07
1I	0.12±0.02	0.10±0.02	0.12±0.02	0.14±0.05
1J	0.10±0.02	0.10±0.02	0.11±0.02	0.13±0.04
2	0.15±0.02	0.15±0.03	0.17±0.03	0.18±0.06
3	0.14±0.02	0.15±0.03	0.17±0.03	0.18±0.06
4C	0.12±0.02	0.13±0.03	0.15±0.03	0.15+0.05
6B	0.11±0.02	0.12±0.02	0.14±0.03	0.14±0.04
11A	0.11±0.02	0.12±0.03	0.12±0.02	0.11±0.02
20	0.10±0.02	0.10±0.02	*	0.12±0.04
21	0.09±0.01	0.08±0.02	0.10±0.02	0.11±0.04
22	0.10±0.01	0.09±0.02	0.12±0.02	0.12±0.04
23	0.11±0.02	0.11±0.02	0.12±0.02	0.13±0.04
24	0.16±0.02	0.15±0.03	0.17±0.03	0.18±0.07
25	0.13±0.02	0.12±0.02	0.14±0.03	0.14±0.06
26	0.16±0.02	0.16±0.02	0.17±0.03	0.18±0.06
27	0.16±0.03	0.18±0.04	0.20±0.04	0.19±0.07
28	0.16±0.03	0.17±0.04	0.19±0.04	0.19±0.07
29	0.17±0.03	0.17±0.04	0.19±0.04	0.19±0.07
30	0.17±0.03	0.16±0.02	0.18±0.04	0.18±0.06
31	0.15±0.02	0.15±0.03	0.16±0.03	0.18±0.06
32	0.14±0.02	0.12±0.03	0.14±0.03	0.16±0.05
33	0.16±0.03	0.15±0.03	0.17±0.03	0.17±0.06

* Dosimeter vandalized during monitoring period.

TABLE 5-7

Site	First Quarter 02/11/87-05/13/87	Second Quarter 05/13/87-08/13/87	Third Quarter 08/13/87-11/11/87	Fourth Quarter 11/11/87-02/10/88
34	0.16±0.02	0.14±0.03	0.15±0.03	*
35	0.13±0.02	0.13±0.03	0.14±0.03	0.17±0.06
36	0.17±0.03	0.14±0.03	0.15±0.03	0.16±0.06
37	0.16±0.03	0.15±0.03	0.17±0.03	0.17±0.06
38	0.13±0.02	0.11±0.02	0.12±0.02	0.14±0.05
39	0.17±0.03	0.16±0.04	0.18±0.04	0.18±0.07
40	0.11±0.02	0.11±0.02	0.13±0.02	0.11±0.03
41	0.12±0.03	0.12±0.03	0.13±0.02	0.12±0.03
42	0.11±0.02	0.11±0.02	0.13±0.02	0.11±0.03
43	0.12±0.03	0.13±0.03	0.14±0.03	0.12±0.03
44	0.13±0.03	0.13±0.03	0.15±0.03	0.13±0.04
45	0.13±0.03	0.13±0.03	0.15±0.03	0.12±0.03
46	0.11±0.02	0.12±0.02	0.12±0.02	0.10±0.03
47	0.12±0.03	0.12±0.02	0.12±0.02	0.12±0.03
48	0.12±0.03	0.11±0.02	0.13±0.02	0.12±0.03
49	0.09±0.02	0.10±0.02	0.11±0.02	0.11±0.03
50	0.11±0.02	0.10±0.02	0.11±0.02	0.11±0.03
51	0.12±0.03	0.12±0.02	0.13±0.02	*
52	0.[illegible]±0.02	*	0.11±0.02	0.12±0.03
53	0.11±0.02	0.11±0.02	0.12±0.02	0.11±0.03
54	0.16±0.04	0.17±0.04	0.19±0.04	0.17±0.05
55	0.11±0.02	0.11±0.02	0.12±0.02	0.12±0.03
56	0.07±0.01	0.06±0.01	0.08±0.01	0.08±0.03
57	0.13±0.03	0.13±0.02	0.15±0.03	0.13±0.04
58	0.14±0.03	0.13±0.02	0.15±0.03	0.13±0.04
59	0.10±0.02	0.10±0.02	0.11±0.02	0.10±0.03
60	0.11±0.02	0.11±0.02	0.12±0.02	0.11±0.03
61	0.14±0.03	*	0.16±0.02	0.11±0.03
62	0.07±0.01	0.05±0.01	0.08±0.01	0.08±0.02
64	0.12±0.02	0.11±0.02	0.13±0.02	0.14±0.05

* Dosimeter vandalized during monitoring period.

TABLE 5-8

RADIOACTIVITY IN DRINKING WATER

Location 2 - Rainier Municipal Water Supply	pCi/l			Location 66 - St. Helens' Municipal Water Supply	pCi/l		
Collection Dates	Gross Beta	Tritium	Gamma Emitters	Collection Dates	Gross Beta	Tritium	Gamma Emitters
01/05/87-02/02/87	2.0±1.0	<1000	<10	01/05/87-02/02/87	3.3±1.1	<1000	<10
02/02/87-03/02/87	1.7±1.0	<1000	<10	02/02/87-03/02/87	4.0±1.2	<1000	<10
03/02/87-04/06/87	3.6±1.0	<1000	<10	03/02/87-04/06/87	4.6±1.4	<1000	<10
04/06/87-05/04/87	1.8±1.0	<1000	<10	04/06/87-05/04/87	3.5±1.1	<1000	<10
05/04/87-06/01/87	3.0±1.1	<1000	<10	05/04/87-06/01/87	4.5±1.1	<1000	<10
06/01/87-07/06/87	2.0±1.0	<1000	<10	06/01/87-07/06/87	2.2±1.0	<1000	<10
07/06/87-08/03/87	1.7±1.0	<1000	<10	07/06/87-08/03/87	3.0±1.1	<1000	<10
08/03/87-08/31/87	3.1±1.0	<1000	<10	08/03/87-08/31/87	3.7±1.0	<1000	<10
08/31/87-10/05/87	3.7±1.0	<1000	<10	08/31/87-10/05/87	2.8±1.6	<1000	<10
10/05/87-11/02/87	2.6±1.0	<1000	<10	10/05/87-11/02/87	4.1±1.1	<1000	<10
11/02/87-12/07/87	6.9±1.3	<1000	<10	11/02/87-12/07/87	5.6±1.3	<1000	<10
12/07/87-01/05/88	5.9±1.2	<1000	<10	12/07/87-01/05/88	4.2±1.1	<1000	<10

TABLE 5-9

RADIOACTIVITY IN SHORELINE SOIL

pCi/g/nuclide (dry)

Collection Date	Location CR3 Gamma Emitters
03/11/87	<0.1
09/02/87	<0.1

TABLE 5-10

RADIOACTIVITY IN FISH/INVERTEBRATES

pCi/g/nuclide (wet)

Location	Collection Date	Species	Gamma Emitters
CR3	03/12/87	Rainbow Trout (Steelhead)[a]	<0.1
1A	03/12/87	Northern Squawfish (14), Yellow Perch (6)	<0.1
1D	03/19/87	Bluegill (1), Yellow Perch (2), Largemouth Bass (1), Carp (2)	<0.1
CR3	05/29/87	Crayfish	<0.1
CR3	09/03/87	Chinook Salmon[a]	<0.1
1A	09/04/87	Largemounth Bass (1), Carp (1), Bridgelip Sucker (1)	<0.1
1D	09/04/87	Yellow Perch (1), Smallmouth Bass (8), Largemouth Bass (1), Carp (1)	<0.1
CR3	10/09/87	Crayfish	<0.1

[a] Split sample with State of Oregon.

Portland General Electric Company

David W. Cockfield Vice President, Nuclear

April 29, 1988

Trojan Nuclear Plant
Docket 50-344
License NPF-1

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

Dear Sir:

Radiological Environmental Monitoring Report

Enclosed is one copy of the Portland General Electric Company's 1987 Operational Environmental Radiological Surveillance Program Annual Report, PGE-1006-87, for the Trojan Nuclear Plant.

Sincerely,

Enclosure

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

Mr. George Knighton
Director, PWR-A
Project Directorate No. V

Mr. William Dixon
State of Oregon
Department of Energy

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

Mr. Ray D. Paris, Manager (2 encl.)
Radiation Control Section
Oregon State Health Division

Mr. Jerry Leitch
Radiation Representative
U.S. Environmental Protection Agency

Mr. Robert R. Mooney, Supervisor
Radiation Control Section
Washington Social and Health Services

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