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August 16, 1984
G02-84-465

Docket No. 50-397

Mr. J. B. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Dear Mr. Martin:

Subject: NUCLEAR PLANT NO. 2
SEMI-ANNUAL EFFLUENT REPORT
JANUARY 1 to JUNE 30, 1984 (ATTACHED)

In accordance with Title 10 of the Code of Federal Regulations Part 50.36a (a) (2), the subject report is submitted.

Should you have any questions, please contact Mr. R. G. Graybeal, Manager WNP-2 Health Physics/Chemistry.

Very truly yours,

J. D. Martin
WNP-2 Plant Manager

PLP/tmh
Attachment

cc: R Auluck - NRC
RC DeYoung - NRC RV
NC Lewis - EFSEC
D Sherman - Amer. Nuclear Insurers
TR Strong - DSHS
AD Toth - NRC Site

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1/1

WNP-2 SEMI-ANNUAL EFFLUENT REPORT

JANUARY 1 TO JUNE 30, 1984

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

LICENSE NO. NPF-21

AUGUST, 1984

IE-25
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1.0 INTRODUCTION

On January 19, 1984 Washington Public Power Supply System's plant, WNP-2, initially went critical. In meeting the requirements of the license, this report is submitted in compliance with Technical Specification 6.9.1.11 and Regulatory Guide 1.21.

2.0 LIQUID EFFLUENTS

The radwaste liquid effluents from WNP-2 were released in a batch mode only, no continuous release of liquid effluent occurred during the six month period. A monthly LADTAP computer run was performed to verify compliance with Technical Specification limits using the assumptions in the ODCM. There were no abnormal releases during the reporting period.

The average diluted concentrations are based on the dilution in the blowdown line and are prior to being discharged to the river.

All liquid discharges from the radwaste building are recirculated in a vented holdup tank at atmospheric pressure prior to sampling and discharge. Thus, no dissolved or entrained noble gases were present in the liquid discharges.

The "Percent of Applicable Limit" is based on 10CFR20 Appendix B, Table 2, Column 2 concentrations.

The "Estimated Total Error" is calculated to be 22% at the 95% confidence level. The estimated errors in the radioactivity are based on counting statistics, measurement of flow rates, both from the tank and in the blowdown line and in obtaining a representative sample prior to discharge.

The "Estimated Total Error" is calculated by taking the square root of the sum of the squares of the errors of the individual contributers.

Gross alpha activity was based on the MDA of the counting equipment. No positive count of alpha activity has been detected.

WNP-2 also has three non-radioactive turbine building sumps that are continuously monitored for radioactivity. During normal operations, the sumps discharge water to the storm drain system not the river. The Storm Drain System is an open pond by the WNP-2 warehouse and discharges on an as needed basis. If the setpoint, which is below MPC concentrations, is exceeded the water is automatically routed to radwaste instead of the Storm Drain System. During the reporting period, all liquids from the turbine sumps were below the radiation monitor setpoints.

Table 2-1

WNP-2 LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES(1)

January - June 1984

	Unit	1st Quarter	2nd Quarter	Est. Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	3.0 E-3	3.6 E-3	2.2 E+1
2. Average diluted concentration during period	uCi/ml	2.7 E-7	6.2 E-7	
3. Percent of MPC limit	%	4.6 E-3	1.1 E-2	
B. Tritium				
1. Total release	Ci	5.4 E-3	5.7 E-3	2.2 E+1
2. Average diluted concentration during period	uCi/ml	4.9 E-7	9.9 E-7	
3. Percent of MPC limit	%	1.6 E-2	3.3 E-2	
C. Gross alpha radioactivity				
1. Total release	Ci	1.8 E-2	1.4 E-5	7.0 E+0
D. Volume of waste (prior to dilution)	liters	5.5 E+6	5.8 E+6	1.5 E+1
E. Volume of dilution water used during period	liters	1.1 E+7	(2)	1.5 E+1

(1) Only MDA values have been observed during the first and second quarters.
(2) No dilution of the liquid effluent occured during the second quarter.

Table 2-2

WNP-2 LIQUID EFFLUENTS - SOURCE TERMS(1)

January - June 1984

BATCH MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter
Strontium-89	Ci	1.1 E-4	5.8 E-5
Strontium-90	Ci	3.9 E-4	4.1 E-4
Cesium-134	Ci	9.5 E-5	1.2 E-4
Cesium-137	Ci	9.1 E-5	5.9 E-5
Iodine-131	Ci	8.2 E-5	5.4 E-5
Cobalt-58	Ci	9.9 E-5	5.5 E-5
Cobalt-60	Ci	9.3 E-5	5.3 E-5
Iron-59	Ci	1.5 E-4	1.9 E-4
Zinc-65	Ci	1.3 E-4	1.2 E-4
Manganese-54	Ci	9.5 E-5	1.0 E-4
Chromium-51	Ci	4.9 E-4	8.4 E-4
Niobium-95	Ci	6.1 E-5	5.6 E-5
Molybdenum-99	Ci	5.0 E-5	5.6 E-5
Technetium-99m	Ci	6.0 E-5	1.3 E-4
Barium-lanthanum-140	Ci	2.1 E-4	3.5 E-4
Cerium-141	Ci	1.3 E-4	9.4 E-5

TABLE 2-2 (Continued)

Other (specify)	Ci	E	E
Cerium-144	Ci	6.0 E-4	7.9 E-4
Tritium	Ci	5.4 E-3	5.7 E-3
Iron-55	Ci	3.2 E-5	3.3 E-5
Total for period (above)	Ci	8.4 E-3	9.3 E-3

(1) Only MDA values have been observed during the first and second quarters.

3.0 GASEOUS EFFLUENTS

The gaseous radwaste effluents from WNP-2 were released in a continuous mode. There are three (3) release points at WNP-2:

1. Main Plant Vent - mixed mode release
2. Turbine Building - ground level release
3. Radwaste Building - ground level release

There were no batch or abnormal releases of gaseous effluent during the first and second quarter of 1984. Monitoring and sampling of the gaseous effluents were performed according to plant procedures. The setpoints for the environmental radiation monitors were set as described in the ODCM.

The gaseous source terms from each release points are listed in Table 3-1 to 3-3. Table 3-4 is a summation of the total releases of gaseous effluents from WNP-2 plus the average release rate, gross alpha activities and the estimated total error associated with the measurements of radioactivity in the gaseous effluents.

The method of calculating the total estimated error associated with the gaseous effluent measurements is similar to the one described in Section 2.0 (Liquid Effluents). The error estimates were performed on the gas grab sample, volume determination, flow rates, gas analysis by gamma spectrometry, air monitoring flow, calibration error of the gas analyzer detectors, and beta scintillation readings. The final error was calculated to be 36% at the 95% confidence level.

In Table 3-4, the "Percent of Technical Specification Limit" calculations were based on the offsite exposure. For the noble gases, dose to the whole body was 3.2 E-3 mrem for the first quarter and 2.7 E-2 mrem for the second quarter.

The maximum organ dose from the noble gases was 1.1 E-2 mrem for the first quarter and 1.3 E-1 mrem for the second quarter.

The maximum whole body dose due to Iodines and particulates was 1.4 E-1 mrem for the first quarter and 7.5 E-3 mrem for the second quarter.

Gross alpha activity was based on the MDA of the counting equipment. No alpha activity above background has been detected.

To verify compliance with Technical Specification limits, calculations were performed each month using the GASPAR computer program to determine the offsite radiation exposure at two special locations.

1. The site boundary at 1.2 miles from the plant and for the sector with the maximum X/Q value.

2. Taylor Flats - at 4.2 miles SE.

The calculations on the radiation levels at the site boundary were used to verify compliance with Technical Specification limits in 10CFR20, and for air dose limits as listed in 10CFR50. The Taylor Flats location was used to verify compliance with Technical Specification limits from 10CFR50 Appendix I.

In addition to the reactor site, WNP-2 has a permanent laundry facility which is located approximately 0.75 miles from the site. The laundry uses a dry cleaning process so there are no liquid discharges of radioactive effluents. The ventilation system contains HEPA filters on the discharge and is continuously monitored for particulates and radio iodines. To date, no activity has been detected in the ventilation discharge.

Table 3-1

WNP-2 GASEOUS EFFLUENTS
SOURCE TERMS - MIXED MODE RELEASES
MAIN PLANT VENT

January - June 1984

CONTINUOUS MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter
1. Fission gases			
Krypton-85	Ci	0.0 E+0	6.4 E-2
Krypton-85m	Ci	0.0 E+0	0.0 E+0
Krypton-87	Ci	2.9 E-1	5.6 E-1
Krypton-88	Ci	1.9 E-1	4.2 E-1
Xenon-133	Ci	1.1 E-1	8.4 E-1
Xenon-135	Ci	2.4 E-2	1.1 E-1
Xenon-135m	Ci	0.0 E+0	8.9 E-2
Xenon-138	Ci	5.6 E-1	2.0 E+0
Xenon-131m	Ci	0.0 E+0	4.2 E-2
Xenon-133m	Ci	2.8 E-1	2.9 E-1
Argon-41	Ci	0.0 E+0	4.3 E-2
Total for period	Ci	1.5 E+0	4.5 E+0
2. Iodines			
Iodine-131	Ci	1.7 E-3	3.7 E-4
Iodine-133	Ci	1.2 E-2	2.0 E-3
Total for period	Ci	1.4 E-2	2.4 E-3

Table 3-1 (Continued)

3. Particulates

Strontium-89	Ci	1.6 E-5	1.4 E-5
Strontium-90	Ci	2.3 E-5	2.7 E-5
Cesium-134	Ci	5.5 E-4	6.3 E-5
Cesium-137	Ci	6.2 E-4	9.6 E-5
Barium-lanthanum-140	Ci	6.4 E-4	1.8 E-4
Molybdenum-99	Ci	6.3 E-4	4.5 E-4
Cerium-141	Ci	5.1 E-4	1.1 E-4
Cerium-144	Ci	2.2 E-3	4.4 E-4
Cobalt-58	Ci	2.1 E-2	9.2 E-5
Cobalt-60	Ci	2.9 E-2	5.6 E-5
Chromium-51	Ci	1.5 E-3	4.1 E-4
Zinc-65	Ci	1.2 E-3	1.0 E-2
Zirconium-95	Ci	3.5 E-4	1.2 E-4
Iron-59	Ci	1.3 E-3	1.9 E-4
Manganese-54	Ci	1.5 E-3	8.5 E-5
Total for period	Ci	6.1 E-2	1.2 E-02

4. Tritium	Ci	9.1 E-3	5.7 E-03

Total building release	Ci	1.6 E+0	4.5 E+0

Table 3-2

WNP-2 GASEOUS EFFLUENTS
SOURCE TERMS GROUND LEVEL RELEASES
TURBINE BUILDING

January - June 1984

CONTINUOUS MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter
1. Fission gases			
Krypton-85	Ci	0.0 E+0	0.0 E+0
Krypton-85m	Ci	0.0 E+0	1.4 E-3
Krypton-87	Ci	6.3 E-1	2.0 E-1
Krypton-88	Ci	2.1 E+0	2.4 E+0
Xenon-133	Ci	3.0 E-1	3.8 E-1
Xenon-135	Ci	5.6 E-1	5.3 E-1
Xenon-138	Ci	1.2 E+1	1.9 E+0
Xenon-133m	Ci	1.2 E+0	4.8 E-1
Total for period	Ci	1.7 E+1	5.9 E+0
2. Iodines			
Iodine-131	Ci	2.7 E-3	4.7 E-4
Iodine-133	Ci	7.3 E-3	4.3 E-3
Total for period	Ci	1.0 E-2	4.8 E-3

Table 3-2 (Continued)

3. Particulates

Strontium-89	Ci	3.0 E-5	1.0 E-4
Strontium-90	Ci	4.4 E-5	7.5 E-5
Cesium-134	Ci	9.3 E-4	9.1 E-5
Cesium-137	Ci	7.5 E-4	1.1 E-4
Barium-lanthanum-140	Ci	7.8 E-5	1.7 E-4
Cerium-141	Ci	9.0 E-4	1.4 E-4
Cerium-144	Ci	3.0 E-4	5.0 E-4
Cobalt-58	Ci	9.8 E-4	1.0 E-4
Molybdenum-99	Ci	1.4 E-2	5.1 E-4
Cobalt-60	Ci	1.2 E-3	1.2 E-4
Chromium-51	Ci	5.8 E-4	6.0 E-4
Zinc-65	Ci	2.1 E-3	1.0 E-2
Zirconium-95	Ci	1.8 E-4	4.3 E-4
Iron-59	Ci	2.5 E-3	2.3 E-4
Manganese-54	Ci	7.4 E-4	1.1 E-4
Total for period	Ci	2.5 E-02	1.3 E-02

4. Tritium	Ci	2.3 E-2	1.1 E-2

Total building release	Ci	1.7 E+1	5.9 E+0

Table 3-3

WNP-2 GASEOUS EFFLUENTS
SOURCE TERMS GROUND LEVEL RELEASES
RADWASTE BUILDING

January - June 1984

CONTINUOUS MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter
1. Fission gases			
Krypton-87	Ci	6.2 E-2	1.4 E-1
Krypton-88	Ci	7.9 E-2	1.6 E-1
Xenon-133	Ci	6.1 E-2	1.3 E+0
Xenon-135	Ci	7.8 E-3	4.4 E-2
Xenon-138	Ci	6.3 E-1	2.3 E+0
Xenon-133m	Ci	1.7 E-1	3.5 E-1
Total for period	Ci	1.0 E+1	4.3 E+0
2. Iodines			
Iodine-131	Ci	1.2 E-3	1.7 E-4
Iodine-133	Ci	1.2 E-2	1.1 E-3
Total for period	Ci	1.3 E-2	1.3 E-3

Table 3-3 (Continued)

3. Particulates

Strontium-89	Ci	1.5 E-5	2.0 E-5
Strontium-90	Ci	2.1 E-5	1.8 E-5
Cesium-134	Ci	2.9 E-4	3.2 E-5
Cesium-137	Ci	4.0 E-4	3.2 E-5
Barium-lanthanum-140	Ci	6.4 E-4	1.2 E-4
Molybdenum-99	Ci	4.6 E-04	4.9 E-5
Cerium-141	Ci	2.7 E-4	3.7 E-5
Cerium-144	Ci	1.2 E-3	1.5 E-4
Cobalt-58	Ci	2.1 E-2	3.1 E-5
Cobalt-60	Ci	2.9 E-2	3.8 E-5
Chronium-51	Ci	1.4 E-3	1.1 E-3
Zinc-65	Ci	6.4 E-4	6.4 E-5
Zirconium-95	Ci	3.4 E-4	5.2 E-5
Iron-59	Ci	6.1 E-4	7.4 E-5
Manganese-54	Ci	2.6 E-4	2.8 E-5
Total for period	Ci	5.7 E-2	1.9 E-3

4. Tritium	Ci	8.6 E-03	1.2 E-02

Total building release	Ci	1.1 E+00	4.3 E+00

Table 3-4

WNP-2 GASEOUS EFFLUENTS
SUMMATION OF ALL RELEASES

January - June 1984

	Unit	1st Quarter	2nd Quarter	Est. Total Error %*
A. Fission & activation gases				
1. Total release	Ci	2.0 E+1	1.5 E+1	3.6 E+1
2. Average release rate for period	uCi/sec	1.0 E+1	5.2 E+0	
3. Percent of Tech. Spec. limit	%	6.4 E-4	5.4 E-3	
B. Iodines				
1. Total iodine (131, 133)	Ci	3.7 E-2	8.5 E-3	3.6 E+1
2. Average release rate for period	uCi/sec	1.1 E-2	3.0 E-3	
3. Percent of Tech. Spec. limit	%	2.7 E-02	9.3 E-4	
C. Particulates				
1. Particulates with half-lives 8 days	Ci	1.4 E-1	4.4 E-2	3.6 E+1
2. Average release rate for period	uCi/sec	1.8 E-2	8.2 E-2	
3. Percent of Tech. Spec. limit	%	2.0 E-01	1.2 E-3	
4. Gross alpha radioactivity	Ci	2.8 E-10	2.7 E-10	
D. Tritium				
1. Total releases	Ci	4.1 E-2	2.9 E-2	3.6 E+1
2. Average release rate for period	uCi/sec	1.9 E-2	1.0 E-2	
3. Percent of Tech. Spec. limit	%	8.4 E-5	1.6 E-4	

* At 95% confidence level

4.0 SOLID WASTE

There were three shipments of dewatered spent resins for a total volume of 46 m^3. The shipping casks were 183 ft^3 CNS 14-195H containers from Chem Nuclear. The total activity of the three shipments was 2.8 E-02 Ci. The principle nuclides and their percentage contribution to the total activity is listed in Table 4-1. The solid wastes were shipped to the US Ecology burial site in Richland, Washington using flat bed trucks.

The counting error associated with the total activity of the four nuclides (about 95% of the total activity shipped) is 2.7% at one standard deviation. Since the remaining nuclides represents such a small portion of the total activity shipped, their error contribution was neglected.

Other parameters considered in estimating the total error of the activity shipped included the error in measuring the absolute volume, the weight of the waste in the liners, the representativeness of the sample taken, the homogeneity of the nuclide distribution within a batch or liner and the geometry error in the gamma spectroscopy analysis. The ND6600 NBS calibration error was approximately 5%. The best estimate of the total error in the activity shipped was assumed to be less than or equal to 20%.

4.1 Scaling Factor Methodology

H-3

In accordance with the procedure outlined in the AIF report, the amount of H-3 in solid radwaste shipments is determined by estimating or measuring the amount of water present and multiplying by the average H-3 concentration in the coolant for the time period associated with the waste generation. Dewatered resin samples were weighed and dryed in an oven. It was found that the dewatered resin contained 38% water by weight.

C-14

The standard default value recommended in the AIF report of 1.0 E-8 mCi/g was used for the LSA radwaste shipped.

I-129

The I-129 concentration is determined by scaling to Cs-137. The scaling factor is 5.0 E-5 as recommended in the AIF report. The Cs-137 MDA is used if no Cs-137 is detected.

Tc-99

The Tc-99 concentration is determined by scaling to Cs-137. The scaling factor is 2.0 E-6 as recommended in the AIF report. The Cs 137 MDA is used if no Cs-137 is detected.

TRU, Pu-241, Cm-242

These nuclides are scaled to Ce-144 (if detected) or to the Cs-137 concentration or Cs-137 MDA. As recommended in the AIF report, these nuclides are not considered to be present if the scaled values are less than 1 nCi/g for TRU 35 nCi/g for Pu-241 or 200 nCi/g for Cm-242. During the reporting period Cs-137 or the Cs-137 MDA was used to estimate the concentrations. The highest Cs-137 value was less than 1.0E-5 uCi/gm in the radwaste shipments. Based on the scaling factors the calculated concentrations of TRU's, Pu-241 and Cm-242 were below the threshold values to report and were assumed not to be present. The scaling factors are listed below:

Scaled Nuclide	Ce-144 Scaling Factor	Cs-137 Scaling Factor
TRU	8E-3	2E-5
Pu-241	1E-1	4.0E-3
Cm-242	4E-3	1.5E-4

NI-63

As recommended in the AIF report, Ni-63 is scaled to the Co-60 concentration or MDA (scaling factor = 2.0 E-2) and is not reported if the resulting value is less than 3.5E-2 uCi/g.

4.2 Process Control Program

No changes were initiated in Chem Nuclear's Process Control Program during the last semi-annual.

Table 4-1
WNP-2 SOLID WASTE SHIPMENTS

January - June 1984

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste	Unit	6-month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m3 Ci	4.6 E+1 2.8 E-2	2.0 E+1
b. Dry compressible waste, contaminated equip, etc.	m3 Ci	No Shipment	
c. Irradiated components, control rods, etc.	m3 Ci	No Shipment	
d. Other (describe)	m3 Ci	No Shipment	

2. Estimate of major nuclide composition (by type of waste)

a.	Cr-51	71.0%	2.0 E-2 Ci
	Fe-59	2.1%	6.0 E-4 Ci
	Co-60	2.1%	5.8 E-4 Ci
	Co-58	20.0%	5.5 E-3 Ci
b.		%	E
		%	E
c.		%	E
		%	E
		%	E
d.		%	E
		%	E
		%	E

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
3	Flat bed truck	US Ecology Richland, WA

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None		

5.0 METEOROLOGY

The meteorological data contained in Tables 5-1 through 5-4 were obtained from the WNP-2 meteorological tower located 2500 ft. west of WNP-2. Data was recovered from 33 ft. and 245 ft. levels. The meteorological data is a composite file from both manual and automated data recovery systems.

Problems with the automated data recovery system were compounded with a magnetic tape recorder head failure. The three week outage in February 1984 resulted in a data recovery of approximately 84 percent for the first quarter. By the second quarter, data recovery was above 95% and has remained near that level.

Tables 5-1 through 5-4 list the joint frequency distribution at the 33 ft. and 245 ft. levels for the first and second quarters. The tabulated stability classes, A-6, are denoted by numerals 1-7 respectively. Numerals 1-7 were used for the wind subfields as is noted at the top of each sensor level reported. The 16 compass sectors in Tables 5-1 through 5-4 pertain to the direction the wind is coming from.

Calibration performed in March 1984 produced no values exceeding WNP-2 FSAR tolerances. Therefore, no correction has been made to the raw data. A cross check of Sigma Theta versus Delta Temperature was made with the Delta Temperature Stability Class being the most conservative. The Delta Temperature Class was utilized in the production of all joint frequency tables.

TABLE 5-1

JOINT FREQUENCY DISTRIBUTION FOR THE 33 FT LEVEL
CALCULATED FROM HOURLY AVERAGES FROM TAPE

MAXIMUM WIND SPEEDS FOR EACH CATEGORY IN MPH ARE:
1 - 0.6 2 - 3.0 3 - 7.0 4 - 12.0 5 - 18.0 6 - 24.0

FIRST QUARTER 1984

NUMBERS GIVEN ARE HOURS

STAB CLASS	WIND CAT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	2	1.	0.	1.	0.	1.	0.	1.	2.	1.	2.	0.	2.	1.	2.	0.	1.
1	3	3.	2.	4.	0.	1.	2.	2.	4.	5.	2.	2.	2.	1.	4.	5.	4.
1	4	0.	2.	1.	0.	1.	0.	0.	6.	14.	5.	2.	6.	0.	5.	1.	3.
1	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.	4.	0.	0.	2.	0.	0.
1	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	2	0.	5.	0.	2.	0.	1.	1.	2.	0.	1.	3.	3.	1.	0.	3.	0.
2	3	3.	0.	0.	2.	0.	1.	2.	2.	2.	2.	0.	0.	1.	3.	8.	0.
2	4	1.	0.	0.	0.	0.	0.	0.	3.	7.	2.	3.	1.	1.	1.	0.	1.
2	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.	0.	0.	0.	0.
2	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	2	0.	2.	2.	0.	0.	1.	1.	0.	3.	0.	4.	2.	6.	5.	5.	3.
3	3	4.	1.	2.	0.	1.	1.	5.	5.	5.	3.	1.	3.	5.	6.	16.	8.
3	4	0.	0.	0.	0.	0.	0.	1.	3.	6.	1.	5.	2.	0.	2.	3.	0.
3	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.	0.	2.	1.	1.
3	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
3	7	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.
4	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	2	10.	6.	3.	4.	8.	5.	10.	10.	13.	10.	6.	13.	23.	26.	23.	8.
4	3	11.	0.	2.	2.	6.	15.	23.	27.	23.	13.	4.	8.	11.	45.	43.	20.
4	4	0.	0.	2.	0.	0.	1.	7.	16.	11.	12.	3.	0.	12.	8.	5.	1.
4	5	0.	0.	0.	0.	0.	0.	0.	7.	9.	3.	2.	0.	1.	0.	1.	0.
4	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.	1.	0.	0.	0.	0.	0.
4	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	2.	0.	0.	0.	0.	0.
5	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	2	4.	5.	4.	3.	3.	6.	10.	9.	11.	15.	5.	3.	8.	10.	13.	6.
5	3	1.	3.	7.	4.	3.	8.	20.	30.	25.	8.	20.	7.	13.	34.	20.	7.
5	4	1.	0.	0.	0.	0.	0.	3.	9.	9.	8.	7.	4.	4.	7.	1.	1.
5	5	0.	0.	0.	0.	0.	0.	0.	0.	4.	13.	0.	1.	0.	0.	0.	0.
5	6	0.	0.	0.	0.	0.	0.	0.	0.	2.	5.	1.	0.	0.	0.	0.	0.
5	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	2	8.	4.	5.	1.	2.	3.	8.	13.	7.	10.	5.	10.	16.	10.	9.	13.
6	3	1.	2.	3.	1.	3.	4.	18.	33.	20.	8.	8.	8.	12.	22.	18.	12.
6	4	0.	0.	0.	0.	0.	0.	4.	4.	11.	8.	3.	0.	0.	6.	0.	0.
6	5	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	2	11.	5.	1.	0.	0.	1.	4.	7.	4.	3.	7.	4.	8.	12.	20.	15.
7	3	4.	2.	0.	0.	0.	1.	14.	23.	7.	12.	10.	2.	5.	9.	15.	7.
7	4	0.	0.	0.	0.	0.	0.	0.	1.	2.	3.	0.	0.	0.	0.	0.	0.
7	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	6	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
7	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NUMBER OF HOURS
USED = 1826 MISSING = 298 CALM = 26 VARIABLE = 35

TABLE 5-2

JOINT FREQUENCY DISTRIBUTION FOR THE 245 FT LEVEL
CALCULATED FROM HOURLY AVERAGES FROM TAPE

MAXIMUM WIND SPEEDS FOR EACH CATEGORY IN MPH ARE:
1 - 0.6 2 - 3.0 3 - 7.0 4 - 12.0 5 - 18.0 6 - 24.0

FIRST QUARTER 1984

NUMBERS GIVEN ARE HOURS

STAB CLASS	WIND CAT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	2	2.	2.	0.	0.	0.	1.	1.	3.	1.	1.	2.	1.	1.	0.	0.	1.
1	3	3.	3.	2.	2.	0.	0.	0.	2.	3.	1.	2.	2.	1.	2.	3.	3.
1	4	0.	2.	2.	0.	0.	0.	1.	1.	5.	10.	5.	3.	7.	1.	6.	6.
1	5	0.	0.	0.	0.	0.	0.	0.	0.	2.	2.	7.	4.	1.	0.	2.	1.
1	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	5.	0.	0.	0.	0.	0.
1	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	2	0.	0.	0.	2.	1.	2.	2.	5.	0.	0.	1.	1.	1.	1.	1.	2.
2	3	3.	3.	0.	1.	1.	2.	1.	1.	4.	1.	1.	0.	1.	0.	5.	5.
2	4	1.	0.	0.	0.	0.	0.	0.	1.	2.	4.	2.	0.	2.	0.	1.	1.
2	5	0.	0.	0.	0.	0.	0.	0.	0.	2.	3.	1.	2.	0.	0.	1.	0.
2	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.
2	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	2	2.	3.	3.	0.	1.	2.	2.	1.	2.	0.	1.	2.	3.	3.	1.	1.
3	3	4.	0.	3.	1.	0.	1.	2.	4.	6.	4.	4.	0.	3.	5.	17.	9.
3	4	2.	0.	0.	1.	1.	0.	0.	3.	4.	4.	3.	1.	2.	2.	5.	2.
3	5	1.	0.	0.	0.	0.	0.	0.	0.	1.	1.	1.	2.	1.	0.	0.	1.
3	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	1.	1.	0.
3	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	2.	0.	0.	0.	1.
4	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	2	8.	8.	4.	5.	9.	7.	4.	10.	13.	4.	4.	6.	9.	8.	17.	21.
4	3	20.	3.	3.	7.	6.	6.	17.	26.	19.	16.	4.	8.	6.	20.	36.	35.
4	4	2.	1.	1.	0.	0.	4.	2.	15.	20.	14.	3.	2.	2.	12.	25.	6.
4	5	0.	0.	0.	1.	0.	0.	0.	5.	7.	8.	6.	7.	0.	8.	0.	1.
4	6	0.	0.	0.	0.	0.	0.	0.	0.	1.	8.	3.	0.	0.	0.	0.	0.
4	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.	5.	2.	1.	0.	0.	0.
5	1	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	2	2.	2.	3.	5.	2.	7.	5.	5.	7.	6.	0.	1.	3.	4.	6.	2.
5	3	9.	8.	11.	5.	1.	5.	14.	13.	15.	15.	6.	5.	6.	10.	13.	12.
5	4	4.	0.	1.	1.	3.	1.	1.	15.	24.	16.	7.	10.	4.	13.	22.	5.
5	5	0.	0.	2.	1.	0.	0.	0.	3.	2.	8.	4.	5.	5.	10.	8.	0.
5	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.	3.	1.	0.	0.	0.	0.
5	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.	12.	1.	0.	0.	0.	0.
6	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	2	6.	4.	6.	3.	4.	2.	5.	1.	3.	5.	1.	3.	5.	5.	2.	5.
6	3	5.	5.	8.	6.	10.	1.	7.	18.	13.	12.	7.	16.	5.	5.	15.	12.
6	4	1.	0.	2.	0.	0.	0.	3.	16.	16.	10.	7.	5.	5.	13.	15.	6.
6	5	0.	0.	0.	0.	0.	0.	0.	0.	3.	8.	5.	1.	0.	9.	5.	0.
6	6	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
6	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	1	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	2	3.	2.	0.	5.	1.	3.	3.	2.	4.	7.	4.	8.	3.	1.	2.	5.
7	3	7.	4.	3.	7.	2.	2.	7.	10.	12.	8.	9.	8.	2.	4.	6.	13.
7	4	0.	0.	0.	0.	0.	0.	0.	7.	13.	4.	8.	1.	0.	14.	5.	8.
7	5	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	1.	0.	0.	0.
7	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.

TOTAL NUMBER OF HOURS
USED = 1840 MISSING = 298 CALM = 27 VARIABLE = 20

TABLE 5-3

JOINT FREQUENCY DISTRIBUTION FOR THE 33 FT LEVEL
CALCULATED FROM HOURLY AVERAGES FROM TAPE

MAXIMUM WIND SPEEDS FOR EACH CATEGORY IN MPH ARE:
1 - 0.6 2 - 3.0 3 - 7.0 4 - 12.0 5 - 18.0 6 - 24.0

SECOND QUARTER 1984

NUMBERS GIVEN ARE HOURS

STAB CLASS	WIND CAT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	2	1.	0.	0.	0.	0.	0.	2.	1.	1.	2.	0.	2.	0.	0.	2.	1.
1	3	5.	5.	0.	0.	0.	10.	17.	16.	24.	11.	15.	10.	13.	9.	10.	7.
1	4	0.	0.	0.	0.	0.	0.	2.	7.	26.	25.	9.	12.	7.	19.	8.	3.
1	5	0.	0.	2.	0.	0.	0.	0.	0.	1.	4.	16.	10.	2.	7.	1.	0.
1	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	2.	0.	0.	0.	0.
1	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	2	0.	1.	0.	0.	0.	1.	1.	3.	1.	0.	0.	0.	2.	0.	0.	0.
2	3	3.	2.	0.	0.	0.	5.	9.	13.	8.	12.	6.	3.	2.	4.	3.	9.
2	4	0.	0.	0.	0.	0.	0.	0.	0.	8.	6.	1.	6.	4.	5.	0.	0.
2	5	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	1.	0.	0.	4.	1.	0.
2	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	2	3.	0.	0.	1.	1.	0.	2.	5.	2.	0.	3.	6.	3.	3.	2.	0.
3	3	2.	3.	1.	0.	1.	3.	7.	16.	20.	10.	14.	15.	8.	7.	9.	6.
3	4	0.	0.	0.	0.	0.	0.	2.	3.	14.	13.	9.	5.	4.	6.	4.	0.
3	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	2.	0.	1.	3.	0.	0.
3	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	1.	0.	0.
3	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	2	2.	1.	2.	1.	1.	5.	4.	7.	8.	5.	5.	3.	6.	2.	2.	2.
4	3	4.	2.	0.	1.	4.	12.	17.	28.	28.	18.	14.	10.	16.	15.	12.	8.
4	4	0.	0.	0.	0.	0.	0.	3.	6.	24.	14.	7.	15.	5.	16.	10.	2.
4	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	6.	2.	7.	0.	0.
4	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.
4	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.
5	2	5.	5.	2.	2.	7.	2.	2.	5.	17.	7.	11.	9.	9.	10.	7.	12.
5	3	9.	3.	2.	1.	1.	11.	34.	45.	27.	29.	18.	28.	20.	46.	21.	9.
5	4	5.	19.	1.	1.	0.	2.	6.	10.	12.	12.	11.	19.	32.	38.	3.	0.
5	5	0.	2.	0.	0.	0.	0.	0.	0.	1.	3.	2.	0.	1.	4.	1.	0.
5	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
5	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
6	2	7.	5.	3.	0.	3.	6.	5.	9.	8.	7.	8.	7.	6.	8.	13.	13.
6	3	8.	2.	0.	0.	1.	6.	15.	21.	21.	12.	11.	13.	14.	26.	18.	14.
6	4	0.	0.	0.	0.	0.	1.	0.	0.	2.	0.	0.	0.	6.	2.	0.	0.
6	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	2	8.	6.	1.	0.	2.	0.	5.	8.	9.	4.	1.	4.	0.	6.	9.	10.
7	3	6.	2.	1.	0.	0.	2.	10.	29.	18.	6.	3.	2.	3.	6.	6.	7.
7	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NUMBER OF HOURS
USED = 2118 MISSING = 1 CALM = 0 VARIABLE = 64

TABLE 5-4

JOINT FREQUENCY DISTRIBUTION FOR THE 245 FT LEVEL
CALCULATED FROM HOURLY AVERAGES FROM TAPE

MAXIMUM WIND SPEEDS FOR EACH CATEGORY IN MPH ARE:
1 - 0.6 2 - 3.0 3 - 7.0 4 - 12.0 5 - 18.0 6 - 24.0

SECOND QUARTER 1984

NUMBERS GIVEN ARE HOURS

STAB CLASS	WIND CAT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	2	0.	0.	0.	0.	0.	0.	1.	0.	3.	0.	1.	0.	1.	2.	1.	0.
1	3	4.	8.	3.	1.	0.	7.	15.	18.	15.	13.	10.	2.	7.	4.	4.	5.
1	4	0.	1.	0.	0.	0.	0.	2.	7.	14.	34.	12.	11.	10.	12.	17.	5.
1	5	0.	0.	2.	0.	0.	0.	0.	0.	1.	9.	18.	16.	4.	13.	2.	0.
1	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	4.	2.	0.	2.	0.
1	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.
2	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	2	0.	1.	0.	0.	0.	1.	0.	2.	1.	1.	0.	0.	1.	1.	0.	0.
2	3	3.	4.	1.	0.	0.	3.	3.	9.	7.	10.	3.	6.	4.	2.	3.	9.
2	4	1.	0.	0.	0.	0.	0.	1.	1.	9.	11.	2.	4.	4.	2.	1.	0.
2	5	0.	0.	0.	0.	0.	0.	0.	0.	1.	2.	1.	2.	0.	4.	3.	0.
2	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	1.	0.
2	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.
3	2	0.	1.	2.	0.	1.	1.	1.	5.	0.	0.	2.	3.	1.	1.	3.	1.
3	3	3.	5.	0.	1.	1.	1.	4.	15.	12.	16.	6.	6.	11.	12.	8.	8.
3	4	2.	1.	0.	0.	0.	1.	1.	4.	8.	11.	14.	13.	8.	2.	7.	0.
3	5	0.	0.	0.	0.	0.	0.	0.	0.	1.	5.	4.	0.	0.	2.	4.	0.
3	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	1.	4.	0.	0.
3	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	2	4.	0.	1.	1.	1.	0.	2.	7.	6.	3.	2.	2.	5.	0.	3.	2.
4	3	10.	9.	4.	1.	3.	6.	7.	17.	19.	20.	11.	16.	8.	8.	9.	5.
4	4	2.	2.	0.	0.	1.	0.	3.	11.	18.	22.	8.	12.	16.	11.	13.	2.
4	5	0.	0.	0.	0.	0.	0.	2.	0.	2.	10.	4.	3.	3.	15.	9.	0.
4	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	6.	1.	0.
4	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	2	3.	6.	2.	1.	6.	2.	1.	7.	3.	4.	9.	4.	5.	1.	4.	3.
5	3	7.	8.	4.	3.	4.	6.	7.	16.	18.	12.	11.	16.	18.	19.	17.	6.
5	4	4.	5.	4.	2.	0.	6.	16.	22.	17.	19.	14.	14.	27.	51.	25.	3.
5	5	0.	4.	14.	0.	0.	0.	2.	2.	4.	11.	10.	5.	12.	54.	16.	1.
5	6	0.	0.	3.	0.	0.	0.	0.	0.	0.	2.	2.	0.	0.	5.	1.	0.
5	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.
6	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	2	2.	0.	1.	4.	2.	0.	0.	2.	2.	7.	1.	5.	4.	1.	1.	0.
6	3	11.	6.	4.	0.	1.	9.	7.	14.	9.	10.	8.	14.	14.	15.	17.	15.
6	4	4.	3.	3.	0.	0.	2.	3.	8.	4.	3.	4.	4.	14.	23.	21.	6.
6	5	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.	0.	0.	2.	9.	4.	0.
6	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	2	2.	1.	1.	1.	1.	0.	1.	1.	5.	4.	8.	2.	1.	1.	0.	2.
7	3	10.	4.	5.	1.	1.	2.	5.	15.	19.	8.	8.	6.	1.	2.	1.	14.
7	4	0.	1.	2.	0.	0.	2.	1.	7.	3.	1.	1.	2.	3.	8.	7.	4.
7	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
7	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NUMBER OF HOURS
USED = 2146 MISSING = 1 CALM = 0 VARIABLE = 36

6.0 DOSE ASSESSMENT - IMPACT ON MAN

Liquid Effluents - The doses to the maximum individual from WNP-2 liquid effluents were calculated using the NRC LADTAP computer code and the site specific input parameters applicable to the reporting period (e.g., food production, agricultural productivity, etc.) The maximum exposed individual considered in the analysis was assumed to be an adult residing in Richland, who fishes at the WNP-2 slough area and eats food locally grown at the Riverview area district southwest of Pasco, Washington.

Table 6-1 lists the doses to the maximum individual during the first and the second quarters respectively. The liquid source terms used in the analyses are listed in Table 2-2 of this report.

The doses to the average exposed individual are listed in Table 6-2. The 50-mile population doses are listed in Table 6-3. All data was obtained from calculations using the LADTAP computer code.

Gaseous Effluents - The NRC GASPAR computer code was used to calculate the doses at 1.2 mile site boundary and Taylor Flats location at 4.2 miles southeast. The sector with the highest X/Q values at the 1.2 mile location was used to verify compliance with Technical Specifications. The quarterly GASPAR runs utilized the updated annual averaged X/Q and D/Q values, site specific input parameters pertaining to food productions (e.g., goat and cow grazing periods, etc.) Since no residential area and crops are present at the site boundary, the exposure pathways considered for the 1.2 mile site boundary were plume submersion, ground and inhalation, with the child age group being the maximum exposed individual.

The air doses at 1.2 miles were used to verify compliance with Technical Specifications. To verify compliance with 10CFR50, Appendix I limits the doses at Taylor Flats, were used with the infant age group being the maximum exposed individual. Taylor Flats is the nearest residential location with a significant home garden food production. (4.2 miles SE) Table 6-4 lists the doses at the two special locations.

6.1 EXPOSURE TO THE PUBLIC WITHIN 1.2 MILE EXCLUSION AREA

Within the WNP-2 exclusion area there are five special locations where the dose from gaseous effluents are routinely calculated. These areas are unique in that access is not completely controlled to them by WNP-2 personnel. These areas are:

1. Wye burial site - normally controlled by DOE
2. The DOE train has tracks through the area
3. The BPA Ashe Substation
4. The WNP-2 Visitor Center
5. WNP-1/4 parking lot and construction site

The WNP-2 Visitor Center was assumed to be the location with the highest potential for exposure to a member of the public due to it close proximity to the plant. Although the workers at the BPA Ashe Substation have

a higher assumed occupancy, 2000 hours/year versus 8 hours/year for the Visitor Center, they are not considered members of the public as defined in the Technical Specifications because they are "occupationally associated with the plant".

The ODCM assumes an eight (8) hour/year occupancy by a non-Supply System individual at the Visitor Center. In calculating the doses from the gaseous effluents the GASPAR computer program used X/Q and D/Q values at a distance of 0.5 miles from the plant in the analysis.

This resulted in a calculated whole body dose committment from the noble gases for the first and second quarters of 9.1 E-05 mrem and 1.1 E-04 mrem respectively at the WNP-2 Visitor Center. The maximum organ dose commitment from noble gases was: 2.7 E-04 mrem for the First quarter and 5.1 E-04 mrem for the second quarter.

The whole body dose commitment from iodines and particulates was 2.7 E-04 mrem and 5.1 E-04 mrem for the first and second quarters respectively. The maximum organ dose commitment from the iodines and particulates for the first and second quarter were 2.7 E-03 mrem and 1.0 E-04 mrem respectively.

Table 6-1

MAXIMUM INDIVIDUAL DOSES FROM WNP-2 LIQUID EFFLUENTS

First Quarter*		
Pathway	First Quarter Cumulative Whole Body (mrem/yr)	First Quarter Cumulative Max. Organ. (mrem/yr)
Drinking	3.2E-06	1.2E-05
Shoreline	3.0E-07	3.2E-07
Fishing	4.5E-03	6.6E-03
Total	4.5E-03	6.6E-03

Second Quarter				
Pathway	Whole Body (mrem/yr)	Cumulative Whole Body (mrem/yr)	Max. Organ. (mrem/yr)	Cumulative Max. Organ. (mrem/yr)
Drinking	3.4E-06	6-6E-06	1.2E-05	2.1E-05
Shoreline	2.1E-07	5.2E-07	2.5E-07	5.7E-07
Fishing	4.0E-03	8.5E-03	6.7E-03	1.3E-02
Boating	1.2E-09	1.2E-09	1.2E-09	9.9E-10
Leafy Veg.	2.8E-06	2.8E-06	1.0E-05	1.0E-05
Vegetables	1.3E-05	1.3E-05	4.6E-05	4.6E-05
Cow milk	4.5E-05	4.5E-05	1.1E-04	1.1E-04
Meat	2.1E-07	2.1E-07	5.7E-07	5.7E-04
Total	4.1E-03	8.6E-03	6.9E-03	1.3E-02

* No food was grown during the first quarter. Therefore, the food ingestion pathways were not considered.

Age Group - Adult: Maximum individual resides at Richland and fishes at the WNP-2 slough area.

Table 6-2

AVERAGE INDIVIDUAL DOSES FROM WNP-2 LIQUID EFFLUENTS

1ST AND 2ND QUARTERS

	Total per 1st Quarter		Total per 2nd Quarter	
Pathway	Max. Organ. (mrem)	Whole Body (mrem)	Max. Organ. (mrem)	Whole Body (mrem)
Fish	3.3E-03	2.2E-03	3.2E-03	2.3E-03
Drinking water	7.1E-06	2.0E-06	7.2E-06	2.0E-06
Shoreline	1.1E-08	9.5E-09	8.2E-09	7.2E-09
Swimming	0.0	0.0	1.8E-11	1.8E-11
Boating	0.0	0.0	3.1E-11	3.1E-11
Vegetables	0.0 (1)	0.0 (1)	4.6E-05	1.3E-05
Leafy vegetables	0.0 (1)	0.0 (1)	1.0E-05	2.8E-06
Milk	0.0 (1)	0.0 (1)	1.5E-04	6.2E-05
Meat	0.0 (1)	0.0 (1)	5.7E-07	2.1E-07
Total	3.3E-03	2.2E-03	3.4E-03	2.4E-03

(1) No food was locally grown during that quarter.

Table 6-3

50-MILE POPULATION DOSES FROM WNP-2 LIQUID EFFLUENTS

1ST QUARTER, 1984

Month	Total per 1st Quarter		Total per 2nd Quarter	
Pathway	Max. Organ. (man-rem)	Whole Body (man-rem)	Max. Organ. (man-rem)	Whole Body (man-rem)
Fish	1.5E-03	1.1E-03	1.6E-03	1.1E-03
Drinking water	2.8E-04	7.8E-05	3.0E-04	8.1E-05
Shoreline	3.7E-06	3.2E-06	2.7E-06	2.3E-06
Swimming	0.0	0.0	2.1E-08	2.1E-08
Boating	0.0	0.0	1.9E-08	1.9E-08
Vegetables	0.0	0.0 (1)	8.1E-04	2.2E-04
Leafy vegetables	0.0	0.0 (1)	4.7E-04	1.3E-04
Milk	0.0	0.0 (1)	2.5E-05	9.6E-06
Meat	0.0	0.0 (1)	6.8E-06	2.3E-06
Total	1.8E-03	1.2E-03	3.2E-03	1.5E-03

(1) No food was locally grown during that quarter.

Table 6-4

SEMI-ANNUAL SUMMARY OF DOSES FROM WNP-2 GASEOUS EFFLUENTS

Location: 1.2 miles site boundary

Reporting Period: First and Second Quarter, 1984

Age Group: Child

	First Quarter	Second Quarter	Cumulative	Balance to Year-End
Beta air dose (mrad)	4.4E-03	5.0E-02	5.4E-02	1.99E+01
Gamma air dose (mrad)	9.4E-03	1.1E-01	1.2E-01	9.88E+0
Whole body dose from Noble gases (mrem)*	3.2E-03	2.7E-02	3.0E-02	4.99E+02
Maximum organ dose from Noble gases (mrem)*	1.1E-02	1.3E-01	1.4E-01	2.99E+03
Whole body dose from Iodines and particulates (mrem)**	1.4E-01	7.5E-03	1.5E-01	1.49E+03
Maximum organ dose from Iodines and particulates (mrem)**	2.2E-01	2.2E-02	2.4E-01	1.49E+03

Location: Taylor Flats, 4.2 miles SE

Reporting Period: First and Second Quarters, 1984

Age Group: Infant

	First Quarter	Second Quarter	Cumulative	Balance to Year-End
Whole body dose (mrem)***	3.0E-02	6.9E-04	3.1E-02	1.49E+01
Maximum organ dose (mrem)***	9.8E-02	7.5E-03	1.1E-01	1.49E+01
50 mile population whole body dose (man-rem)	2.1E-01	9.4E-03		
50 mile maximum organ dose (man-rem)	5.6E-01	3.6E-02		

* Plume submersion exposure pathway.
** Inhalation and ground contamination exposure pathways.
*** Ground, goat milk, and inhalation exposure pathways.

7.0 REVISIONS TO THE ODCM

During the semi-annual reporting period, four revisions were made to the Offsite Dose Calculation Manual (ODCM). These changes were approved in POC meeting 84-19 on May 15, 1984. A description of each change is included below and the effected pages are attached.

SCN-84-85

This revision addressed two items. The first one concerns page 11 of the ODCM where the statement is made;

"If the dilution ratio is equal to or less than one:

$$DR \leq 1$$

then the tank may be discharged at any circulating water or radwaste blowdown rate".

Equations 10, 12a and 12b, which are used to calculate setpoints, did not allow this and required the setpoint to be zero if the blowdown flow was zero. To correct this, pages 3-7 and 10-12 were revised to remove this inconsistency.

The second item in SCN-84-85 added Section 2.9 titled "Liquid Process Monitors and Alarm Setpoint Calculations" to the ODCM. This section describes the methodology for calculating setpoints for the Standby Service Water Monitor (SW), Turbine Building Service Water Monitor (TSW), and the Non-Radioactive Turbine Building Floor Drain Sump Radiation Monitors.

SCN-84-92

This revision was initiated by the environmental program department to correct typing errors, reference several implementing procedures and clarify table headings and footnotes in Section 5.0 of the ODCM.

SCN-84-97 and 98

Both of these SCN's included changes to Tables 3-4 through 3-5d. SCN-84-97 corrected Table 3-4 to include a dose factor for Sr-90 via the ground pathway. This was inadvertently listed as zero in the original submittal due to Table E-6 of Regulatory Guide 1.109 not having a value listed for Sr-90. A value for Y-90 is now listed.

The appropriate sections of the minutes from POC meeting 84-19 (May 15, 1984) indicating approval of these revisions are attached. Upon P.O.C. approval, these revisions were incorporated into the ODCM Amendment 1 (also attached).

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

INTEROFFICE MEMORANDUM

DISTRIBUTION: MAIL DROP:

- ☐ WNP-1 FILE _____
- ☐ WNP-2 FILE _____
- ☐ WNP-3 FILE _____
- ☐ WNP-4 FILE _____
- ☐ WNP-5 FILE _____
- ☐ HGP FILE _____
- ☐ PKWD FILE _____
- ☐ LEGAL FILE _____
- ☐ ADMIN FILE _____

See Cover Sheet

DATE: May 15, 1984

TO: Distribution

FROM: J. F. Peters, Plant Administration, WNP-2 (927S)

SUBJECT: POC MEETING MINUTES/ACTIVITIES 84-19

REFERENCE: PPM *1.1.5

Members Present	Other Attendees
GK Afflerbach (POC Chairman)	PR Beers (Plant Maintenance)
RL Corcoran	DS Feldman (Plant QA)
KD Cowan	RJ Hintz (Plant HP/Chemistry)
RG Graybeal	JT Hwu (Technical Support - GE)
JA Landon	LD Kassakatis (Plant Technical)
JF Peters	JD Mills (Plant HP/Chemistry)
DH Walker	CR Noyes (On-Site Engineering)
	JO Parry (Radiological)
	PL Powell (Plant Licensing)
	CM Powers (Plant Technical)
	JK Prince (Emergency & Environmental Planning)
	ML Williams (Plant Maintenance)
	EK Worthen (Plant Operations)

A quorum was present and POC Meeting 84-19 convened at 2:10 p.m., Wednesday, May 9, 1984. POC has reviewed and recommends approval of the following scheduled procedures with comments incorporated:

Procedure	Rev.	Title
8.1.6	0	Boron Disposal Procedure
*7.4.8.4.2.1	0	6.9 KV Circuit Breaker E-CB-RRA Protective Relays - CC
*10.2.28	0	Installation, Modification and Inspection of Piping Systems
*10.2.30	0	Installation and Modification of E-Systems Clamps and Pipe Whip Restraints
*10.2.31	0	Concrete Drilling, Core Cutting and Sawing Grouting
10.2.33	0	Grouting
*10.20.6	0	Diesel Engine Jacket Cooling Water Fill and Flush
*10.20.7	0	HPCS Diesel Engine Jacket Cooling Water Fill and Flush

Item 2, Licensee Event Report (LER) and Notice of Violation Response (continued)

As part of the corrective action to preclude recurrence, a training plan has been developed to ensure all personnel operate the air lock properly. A written plant policy has been implemented stating that normally only Operators will operate the airlock. This event has been determined to pose no potential safety problems and is considered an unique event with no further corrective action. There will be no POC Action Item assigned as a result of this LER.

LER 84-033-00 This LER was written as a result of Plant Nonconformance Reports 284-0306, 284-0321, 248-0326 and is submitted pursuant to the reporting requirements of 10CFR50.72(b)(2)(ii) and 10CFR50.73(a)(2)(iv). During initial plant heatup there were 3 Nuclear Steam Supply Shut-off System isolations of the Reactor Water Cleanup System. These isolations were determined to be caused by the leak detection temperature monitors. It has been further evaluated that the present setpoints are set conservatively low and are then adjusted to higher values when the existing setpoints are approached or reached. As a result of these instances, it was determined that a supplement to this LER will be necessary when the final temperature switch setpoints have been determined. This supplement will include the isolation report in this LER and any subsequent isolations resulting from leak detection temperature monitors which have not been adjusted to their final setpoint.

LER 84-034-00 This LER was written as a result of Plant Nonconformance Report 284-0346 and 284-0315 and is submitted as a voluntary report. During initial plant heatup, 4 of the 43 containment temperature indicators exceeded 150°F with the highest reading being 165°F for a period greater than 8 hours. The average drywell temperature however did not exceed 135°F as defined in Plant Technical Specifications section 3.6.1.7. After a plant power reduction, a containment temperature survey was performed. The four temperature indicators were determined to be in a stagnant air flow area with no active safety components in the immediate area. Because a further investigation of this issue will be performed, a follow-up report will be submitted to the NRC by 12/1/84.

* Item 3, Review of the Offsite Dose Calculation Manual, ODCM

This ODCM proposed change was reviewed and approved by POC as required by PPM *1.1.5, Plant Operations Committee and Plant Technical Specifications. POC reviewed and approved the following SCN's (Attachment 3):

- 84-85
- 84-92
- 84-97
- 84-98

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15, 1984
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MEETING MINUTES/ACTIVITIES 84-19

Item 4, Proposed Change to Plant Technical Specifications:

This proposed change to Plant Technical Specifications (Attachment 4) was reviewed and approved by POC as required by PPM *1.1.5, Plant Operations Committee and Plant Technical Specifications.

The proposed Plant Technical Specification change would allow suspension of Primary Containment Inerting during the Power Ascension Test Program until either the required 100% of rated thermal power trip tests have been completed or the reactor was operated for 120 effective full power days. With WNP-2 achieving initial criticality Jan. 19, 1984, the present Technical Specifications would require inerting of the containment by July 19. Continuation of the Power Ascension Test Program beyond this date with inerted Containment and the high frequency of containment entries requiring deinerting would severely impact the present schedule and significantly delay Commercial Operation.

Item 5, POC Action Item 84-19-01

This POC Action Item will be assigned to the Plant Licensing Manager to report to POC on the submittal of FSAR change notice 84-34 reflecting the location of radiation monitors as part of Amendment 35. This Change Notice is defined in the action statement of the Response to Violation Notice submitted by WNP-2 Plant on May 10, 1984.

Item 6, POC Action Item 84-19-02

This POC Action Item will be assigned to the Plant Maintenance Manager to report back to POC upon the successful completion of the thermo lag fire protection coatings being added to the raceway routing identified as a corrective action necessary in LER 84-031-00.

All comments from other than POC Members on POC agenda subjects were discussed and resolved either prior to or during this meeting. Additionally, there were no unreviewed safety questions identified and the meeting closed at 7:10 p.m., May 9, 1984.

APPROVED: J. M. Martin
J. M. Martin
Plant Manager, WNP-2

JFP:mm

Attachments:
1) Procedure Deviation Forms (PDF)
2) Licensee Event Report (LER)
3) SCN's
4) Proposed Change to Plant Technical Specifications

AMENDMENT NO. 1
May 1984

OFFSITE DOSE CALCULATION MANUAL

TABLE OF CONTENTS

OFFSITE DOSE CALCULATION MANUAL

LIST OF TABLES

LIST OF FIGURES

All radwaste effluent passes through a four-inch line which has an off-line sodium iodide radiation monitor. The radwaste effluent flow, variable from 0 to 190 gpm, combines with the 36-inch cooling water blowdown line, variable from 0 to 7500 gpm, (average of 2690 gpm) and is discharged to the Columbia River with a total flow based on MPC_i total, and cooling water flushing needs.

The radiation monitor has a minimum sensitivity of 10^{-6} µCi/cc of Cs-137), and the radiation indicator has a range of seven decades. The radiation monitor is located on the 437' level of the Radwaste Building.

2.3 10 CFR 20 Release Rate Limits

The requirements pertaining to discharge of radwaste liquid effluents to the unrestricted area are specified in Technical Specification 3.11.1.1:

> "The concentration of radioactive material released from the site to unrestricted areas shall be limited to the concentrations specified in 10 CFR 20, Appendix B, Table II, Column 2 for radionuclides other than noble gases, and 2×10^{-4} µCi/ml total activity concentration for all dissolved or entrained noble gases."

In order to comply with the requirements stated above, limits will be set to assure that blowdown line concentrations do not exceed 10 CFR 20, Appendix B, Table II, Column 2 at any time.

2.3.1 Pre-Release Calculation

The activity of the radionuclide mixture will be determined in accordance with Supply System procedure PPM 12.5.3. Liquid effluent discharge is determined and calculated according to PPM New 12.11.1 Radiological Effluent Monitoring Report. The effluent concentration is determined by the following equation:

$$Con_{Ci} = \frac{Ci \times Fw}{Fd} \qquad (1)$$

where:

Con_{Ci} = Concentration of radionuclide i in the effluent at point of discharge - µCi/ml.

Ci = Concentration of radionuclide i in the batch to be released - µCi/ml.

Fw = Discharge flow rate from sample tank to the blowdown line - variable from 0 to 190 gpm.

Fb = Blowdown flow rate - variable from 0 to 7500 gpm.

Fd = Total discharge flow rate - (Fd = Fb + Fw)

The calculated concentration in the blowdown line must be less than the concentrations listed in 10 CFR 20, Appendix B. Before releasing the batch to the environment, the following equation must hold:

$$\sum_{i=1}^{m} (Con_{Ci}/MPC_i) \leq 1 \qquad (2)$$

where:

Con_{Ci} = The concentration of radionuclide i in the effluent at the point of discharge into the river.

MPC_i = Maximum permissible concentration of nuclide i as listed in 10 CFR 20, Appendix B, Table II.

m = Total number of radionuclides in the batch.

2.3.2 Post-Release Calculation

The concentration of each radionuclide in the restricted area, following the batch release, will be calculated as follows:

The average activity of radionuclide i during the time period of the release is divided by the Plant Discharge Flow/Tank Discharge Flow ratio yielding the concentration at the point of discharge:

$$Con_{Cik} = \frac{Cik \times Fw}{Fd} \qquad (3)$$

where:

Con_{Cik} = The concentration of radionuclide i in the effluent at the point of discharge during the release period k - (μCi/ml).

Cik = The concentration of radionuclide i in the batch during the release period k - (μCi/ml).

Fw = Discharge flow rate from sample tank to the blowdown line - variable from 0 to 190 gpm.

Fb = Blowdown flow rate - variable from 0 to 7500 gpm.

Fd = Total discharge (Fd = Fb + Fw) flow rate - variable from 0 to 7690 gpm.

To assure compliance with 10 CFR 20, the following relationships must hold:

$$\sum_{i=1}^{m} (Con_{Cik}/MPC_i) \leq 1 \qquad (4)$$

where the terms are as defined in Equation (2).

2.3.3 Continuous Release

Continuous release of liquid radwaste effluent is not planned for WNP-2. However, should it occur, the concentrations of various radionuclides in the

T_l = The length of the lth release period over which C_{il} and F_l are averaged for liquid releases - (in hours).

m = The number of releases for the time period under consideration.

C_{il} = Average concentration of nuclide i in the liquid effluent at point of discharge during the release period T_l from any liquid release - (μCi/ml).

A_{ij} = The site-related ingestion dose factor to the total body or critical organ j for each identified nuclide listed in Table 2-2 (in mrem/hr per μCi/ml).

F_ℓ = The near field average dilution factor for C_{il} during any liquid waste release. Defined as the ratio of the average radwaste discharge flow during the release to the product of the average flow from the site structure to unrestricted receiving waters times 100. This is a conservative value since the average river flow is 120,000 cfs and blowdown rate is only 6 cfs.

$$\left(F_\ell = \frac{\text{Liquid Radwaste Flow}}{\text{Discharge Structure Exit} \times 100} = \frac{Fw}{Fd \times 100}\right) \quad (6)$$

The trip/alarm setpoint for the liquid radwaste effluent monitor is calculated from the results of the radiochemical analysis of the waste solution. The setpoint will be set into the radwaste monitor just prior to the release of each batch of radioactive liquid.

2.5.2 Methodology for Determining the Dilution Ratio

Prior to discharge, the tank is isolated and recirculated for at least thirty minutes, and a representative sample is taken from the tank. An isotopic analysis of the batch will be made to determine the dilution ratio required to comply with 10 CFR 20 limits. Radwaste liquid effluents can only be discharged to the environment through the four-inch radwaste line. The maximum radwaste discharge flow rate is 190 gpm. Typical circulating water blowdown flow is approximately 2700 gpm, which would resulting in a dilution factor of 14 at the maximum radwaste flow.

From the sample analysis and the MPC_i values, a dilution ratio (D.R.) is calculated using the following equation:

$$D.R. = \sum_{i=1}^{m} \frac{Ci}{MPC_i} \qquad (8)$$

where:

D.R. = The dilution ratio required for compliance with 10 CFR 20, Appendix B, Table II, Column 2.

Ci = The undiluted concentration of radionuclide i in the batch to be released - μCi/ml.

MPC_i = 10 CFR 20, Appendix B, Table II, Column 2, maximum permissible concentration for nuclide i - μCi/ml.

m = The total number of radionuclides in the batch to be released.

If the dilution ratio is equal to or less than one:

$$D.R. < 1 \qquad (9)$$

Than the tank may be discharged at any circulating water or radwaste blow downrate.

If the dilution ratio (D.R.) exceeds unity (D.R.>1); discharge rates are set such that:

$$Fm \leq \frac{Fd}{D.R.} \qquad (10)$$

where:

Fm = The maximum allowed discharge flow rate from the liquid waste storage tank or the maximum pump rate of 190 gpm, whichever is less.

Fd = The total discharge flow rate to the river (Fw + Fb).

Fw = Discharge flow rate from sample tank to the blowdown line - variable from 0 to 190 gpm.

Fb = Blowdown flow rate - variable from 0 to 7500 gpm.

2.5.3 Setpoint Determinations

The calculation for the radiation monitor's alarm/trip point is as follows:

For D.R. $\geq$1:

$$\text{Setpoint (max.)} = \left[\left(\sum_{i=1}^{m} C_i \times E_{fi} + \text{Background}\right)\right] \times Fd/Fm \quad (11)$$

For D.R. <1:

$$\text{Setpoint} = \left[\left(\sum_{i=1}^{m} C_i \times E_{fi} + \text{Background}\right)\right] \times Fd/Fw \quad (12)$$

where:

C_i = undiluted concentration of radionuclide i in the batch to be released in μCi/ml.

E_{fi} is the radiation monitors response to nuclide i.

To assure never exceeding the MPC_i limit, if the D.R. $\geq$ 1, the setpoint will be set at 50 percent of the setpoint (max.).

2.6 Verification of Compliance with 10 CFR 50, Appendix I, and 10 CFR 20, Appendix B

Verification of compliance with 10 CFR 50, Appendix I, and 10 CFR 20, Appendix B, dose limits will be achieved by following WNP-2 Plant Operating Procedures for liquid discharge and a monthly run of LADTAP computer code.

2.7 Methods for Calculating Doses to Man From Liquid Effluent Pathways

Dose models presented in NRC Regulatory Guide 1.109, as incorporated in the LADTAP computer code, will be used for offsite dose calculation. The details of LADTAP, including the program listing and user instruction, are included in the Radiological Programs Procedure R.P.I. 2.3.

yields:

$$K_d = A_T \sum \frac{f_i}{MPC_i e^{-\lambda t}}$$

or

$$A_T = K_d \sum \frac{f_i}{MPC_i e^{-\lambda t}} \quad (24)$$

2.9 Liquid Process Monitors and Alarm Setpoints Calculations

As mentioned in Section 2.2 of this manual, all liquid radwaste effluent is discharged through a four-inch line that is monitored by an off-line sodium iodide radiation monitor. This monitor is located on the 437' level of the Radwaste Building. All WNP-2 radwaste liquid effluent is discharged to the Columbia River through the 36-inch Cooling Water Blowdown line. In addition to the liquid effluent discharge monitor there are three liquid streams that are normally non-radioactive but have a finite possibility of having radioactive material injected into them. These liquid streams are:

- Standby Service Water (SW)
- Turbine Building Service Water (TSW)
- Turbine Building Sump Water (FD)

To prevent any discharges of radioactive liquid from these streams, radiation monitoring systems have been installed to detect any increase in the normal concentration of radioactive material.

Alarm/setpoints are established to prevent any release of radioactive material in concentrations greater than 10CFR20 limits. The maximum radiation detector setpoint calculation for the three systems is based on the MPC_i concentration of Cs-137 which is 2.0E-05 microCi/ml. The following equation is used to calculate the maximum setpoint:

Setpoint max. = [(2.0E-05 μCi/ml) (CF)] (25)
(in cpm or cps)

where:

2.0E-05 μCi/ml = MPC limit for Cs-137

CF = Monitor calibration factor - in cpm/ μCi/ml or cps/ μCi/ml

2.9.1 Standby Service Water (SW) Monitor - The Standby Service Water Monitors (SW) are located on the 522' level of the Reactor Building.

The meter is located in the main control room on panel P-604.

The flow rate through the monitor is variable, from zero (0) to two (2) gpm with a normal flow of 1.0-1.5 gpm.

To ensure 10CFR20 limits are never exceeded, the alarm setpoint shall be established at 4.66 times background or 80% of the maximum setpoint plus background, whichever is less.

If the setpoint is exceeded, an alarm will activate in the main control room. The control room operator can then terminate the discharge and mitigate any uncontrolled release of radioactive material.

2.9.2 Turbine Building Service Water (TSW) Monitor - This monitor is located on the 441' level of the Turbine Building. The readout meter and recorder is located in the main control panel BD-RAD-24.

The flow rate through that monitor is variable, from zero (0) to six (6) gpm with a normal flow of 3-4 gpm.

To ensure 10CFR20 limits are never exceeded, the alarm setpoint shall be established at 4.66 times background or 80% of the maximum setpoint plus background, whichever is less.

If the setpoint is exceeded, an alarm will activate in the main control room. The control room operator can then terminate the discharge and mitigate any uncontrolled release of radioactive material.

2.9.3 Turbine Building Sumps Water (FD) Monitor - There are three detectors to measure the activity of each of the three non-radioactive sumps. The monitors are located on the 441' level of the Turbine Building. The readout meters and recorder are located in the Radwaste Control Room Panel BD-RAD-41.

The Turbine Building Sump Water Effluents are not released to the Columbia River. This effluent is discharged to the Storm Drain System which is an open pond by the WNP-2 Warehouse.

The hydrological analysis performed for the WNP-2 FSAR (Section 2.4) determined that the transmit time through the ground water from WNP-2 to the WNP-1 well is 67 years for strontium and 660 years for cesium.

In the event the setpoint is exceeded, the sump water will be automatically routed to the radioactive waste system.

To prevent the sum of the sump water discharged from the three pumps from exceeding 10CFR20 limits, the alarm/setpoint will be established at 4.66 times background or 80% of the maximum setpoint plus background, whichever is less.

Table 3-4

DOSE RATE PARAMETERS
IMPLEMENTATION OF 10 CFR 20, AIRBORNE RELEASES

Nuclide	λ sec^{-1}	Child Dose Factor* DFA_i mrem/pCi	DFG_i mrem/hr / pCi/m^2	P_i^I Inhalation mrem/yr / µCi/m^3
H-3	1.8E-09	3.0E-07	0.0	1.1E+03
I-131	1.0E-06	4.4E-03	3.4E-09	1.6E+07
I-133	9.2E-06	1.0E-03	4.5E-09	3.7E+06
Cr-51	2.9E-07	4.6E-06	2.6E-10	1.7E+04
Mn-54	2.6E-08	4.3E-04	6.8E-09	1.6E+06
Fe-55	8.5E-09	3.0E-05	0.0	1.1E+05
Fe-59	1.8E-07	3.4E-04	9.4E-09	1.3E+06
Co-58	1.1E-07	3.0E-04	8.2E-09	1.1E+06
Co-60	4.2E-09	1.9E-03	2.0E-08	7.0E+06
Zn-65	3.3E-08	2.7E-04	4.6E-09	1.0E+06
Sr-89	1.5E-07	5.8E-04	6.5E-13	2.2E+06
Sr-90	7.9E-10	2.7E-02	2.6E-12**	1.0E+08
Zr-95	1.2E-07	6.3E-04	5.8E-09	2.3E+06
Cs-134	1.1E-08	2.7E-04	1.4E-08	1.0E+06
Cs-137	7.3E-010	2.5E-04	4.9E-09	9.3E+05
Ba-140	6.3E-07	4.7E-04	2.4E-09	1.7E+06

* Maximum Organ
**No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for dose conversion factor Sr-90.

Table 3-5a

DOSE RATE PARAMETERS--IMPLEMENTATION OF 10 CFR 50, AIRBORNE RELEASES

Age Group: Infant

Nuclide	λ sec^{-1}	Dose Parameters (Maximum Organ) Inhalation R_i^I mrem/yr (per ($\mu Ci/m^3$))	Ground R_i^G m^2 x mrem/yr (per ($\mu Ci/sec$))	Milk (Cow) R_i^C m^2 x mrem/yr (per ($\mu Ci/sec$))	Milk (Goat) R_i^C m^2 x mrem/yr (per ($\mu Ci/sec$))
H-3	1.8E-9	6.5E+2	0.0	3.4E+3	7.0E+3
I-131	1.0E-6	1.5E+7	1.0E+2	2.4E+11	4.3E+11
I-133	9.2E-6	3.6E+6	5.6E+6	2.2E+9	4.0E+9
Cr-51	2.9E-7	1.3E+4	5.5E+6	2.0E+6	3.5E+5
Fe-55	8.5E-9	8.7E+4	0.0	7.0E+7	7.1E+6
Fe-59	1.8E-7	1.0E+6	3.2E+8	1.7E+8	3.2E+7
Mn-54	2.6E-8	9.9E+5	1.6E+9	2.0E+7	2.9E+6
Co-58	1.1E-7	7.8E+5	4.4E+8	2.8E+7	4.5E+6
Co-60	4.2E-9	4.5E+6	2.5E+10	1.1E+8	1.4E+7
Sr-89	1.5E-7	2.0E+6	2.5E+4	5.6E+9	1.6E+10
Sr-90	7.9E-10	4.1E+7	8.9E+6*	7.1E+10	1.7E+11
Cs-134	1.1E-8	7.0E+5	8.0E+9	3.6E+10	1.3E+11
Cs-136	5.9E-7	5.6E+4	1.7E+8	2.6E+9	1.2E+10
Cs-137	7.3E-10	6.1E+5	1.2E+10	3.4E+10	1.2E+11
Ba-140	6.3E-7	1.6E+6	2.3E+7	1.1E+8	1.9E+7

*No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for the dose conversion factor for Sr-90.

Table 3-5b

DOSE RATE PARAMETERS--IMPLEMENTATION OF 10 CFR 50, AIRBORNE RELEASES

Age Group: Child

Nuclide	λ sec^{-1}	Dose Parameters (Maximum Organ) Inhalation R_i^I mrem/yr (per $\mu Ci/m^3$)	Ground R_i^G m^2 x mrem/yr (per $\mu Ci/sec$)	Milk (Cow) R_i^C m^2 x mrem/yr (per $\mu Ci/sec$)	Milk (Goat) R_i^C m^2 x mrem/yr (per $\mu Ci/sec$)	Vegetables R_i^V m^2 x mrem/yr (per $\mu Ci/sec$)	Meat R_i^H m^2 x mrem/yr (per $\mu Ci/sec$)
H-3	1.8E-9	1.1E+3	0.0	2.3E+3	4.6E+3	5.6E+3	3.4E+2
I-131	1.0E-6	1.6E+7	1.0E+7	9.9E+10	1.8E+11	1.1E+10	1.3E+9
I-133	9.2E-6	3.8E+6	1.5E+6	9.2E+8	1.7E+9	1.7E+8	3.0E+1
Cr-51	2.9E-7	1.7E+4	5.5E+6	2.3E+6	4.1E+5	5.3E+6	2.0E+5
Fe-55	8.5E-9	1.1E+5	0.0	5.8E+7	9.1E+6	3.9E+8	2.4E+8
Fe-59	1.8E-7	1.3E+6	3.2E+8	9.0E+7	1.6E+7	6.0E+8	2.8E+8
Mn-54	2.6E-8	1.6E+6	1.6E+9	1.1E+7	1.6E+6	6.3E+8	4.1E+6
Co-58	1.1E-7	1.1E+6	4.4E+8	3.2E+7	5.2E+6	3.4E+8	4.4E+7
Co-60	4.2E-9	7.1E+6	2.5E+10	1.3E+8	1.8E+7	2.0E+9	2.1E+8
Sr-89	1.5E-7	2.2E+6	2.5E+4	3.0E+9	8.6E+9	3.3E+10	2.2E+8
Sr-90	7.9E-10	1.0E+8	8.9E+6*	6.5E+10	1.6E+11	1.3E+12	6.1E+9
Cs-134	1.1E-8	1.0E+6	8.0E+9	2.0E+10	7.0E+10	2.5E+10	7.9E+8
Cs-136	5.9E-7	1.7E+5	1.7E+8	1.2E+9	5.6E+9	1.5E+8	2.0E+7
Cs-137	7.3E-10	9.1E+5	1.2E+10	1.8E+10	6.4E+10	2.4E+10	7.5E+8
Ba-140	6.3E-7	1.7E+6	2.3E+7	5.2E+7	9.4E+6	1.8E+8	2.0E+7

*No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for the dose conversion factor for Sr-90.

Table 3-5c

DOSE RATE PARAMETERS--IMPLEMENTATION OF 10 CFR 50, AIRBORNE RELEASES

Age Group: Teen

Nuclide	λ sec^{-1}	Dose Parameters (Maximum Organ) Inhalation R_i^I mrem/yr (per $\mu Ci/m^3$)	Ground R_i^G m^2 x mrem/yr (per $\mu Ci/sec$)	Milk (Cow) R_i^C m^2 x mrem/yr (per $\mu Ci/sec$)	Milk (Goat) R_i^C m^2 x mrem/yr (per $\mu Ci/sec$)	Vegetables R_i^V m^2 x mrem/yr (per $\mu Ci/sec$)	Meat R_i^M m^2 x mrem/yr (per $\mu Ci/sec$)
H-3	1.8E-9	1.3E+3	0.0	1.4E+3	2.9E+3	3.5E+3	2.8E+2
I-131	1.0E-6	1.5E+7	1.0E+7	5.1E+10	9.1E+10	7.0E+9	8.4E+8
I-133	9.2E-6	2.9E+6	1.5E+4	3.9E+8	7.0E+8	9.4E+7	1.7E+1
Cr-51	2.9E-7	2.1E+4	5.5E+4	3.6E+6	6.4E+5	8.5E+6	4.1E+5
Fe-55	8.5E-9	1.2E+5	0.0	1.6E+7	3.6E+6	3.0E+8	8.8E+7
Fe-59	1.8E-7	1.5E+6	3.2E+8	1.3E+8	2.3E+7	8.7E+8	5.2E+8
Mn-54	2.6E-8	2.0E+6	1.6E+9	1.5E+7	2.2E+6	8.7E+8	7.4E+6
Co-58	1.1E-7	1.3E+6	4.4E+8	5.0E+7	8.1E+6	5.4E+8	8.9E+7
Co-60	4.2E-9	8.7E+6	2.5E+10	2.0E+8	2.8E+7	3.1E+9	4.1E+8
Sr-89	1.5E-7	2.4E+6	2.5E+4	1.2E+9	3.5E+9	1.3E+10	1.1E+8
Sr-90	7.9E-10	1.1E+8	8.9E+6*	3.8E+10	9.4E+10	7.9E+11	4.7E+9
Cs-134	1.1E-8	5.5E+5	8.0E+9	1.2E+10	4.4E+10	1.5E+10	6.5E+8
Cs-136	5.9E-7	1.9E+5	1.7E+8	7.9E+8	3.5E+9	1.0E+10	1.6E+7
Cs-137	7.3E-10	8.5E+5	1.2E+10	1.0E+10	3.5E+10	1.3E+10	5.4E+8
Ba-140	6.3E-7	2.0E+6	2.3E+7	3.3E+7	6.0E+6	1.2E+8	1.6E+7

*No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for the dose conversion factor for Sr-90.

Table 3-5d

DOSE RATE PARAMETERS--IMPLEMENTATION OF 10 CFR 50, AIRBORNE RELEASES

Age Group: Adult

Nuclide	λ sec^{-1}	Dose Parameters (Maximum Organ) Inhalation R_i^I mrem/yr (per (μCi/m^3)	Ground R_i^G m^2 x mrem/yr (per (μCi/sec)	Milk (Cow) R_i^C m^2 x mrem/yr (per (μCi/sec)	Milk (Goat) R_i^C m^2 x mrem/yr (per (μCi/sec)	Vegetables R_i^V m^2 x mrem/yr (per (μCi/sec)	Meat R_i^M m^2 x mrem/yr (per (μCi/sec)
H-3	1.8E-9	1.3E+3	0.0	1.1E+3	2.2E+3	3.0E+3	4.7E+2
I-131	1.0E-6	1.2E+7	1.0E+7	3.2E+10	5.7E+10	8.2E+9	1.2E+9
I-133	9.2E-6	2.2E+6	1.5E+6	2.3E+8	4.1E+8	1.1E+8	2.2E+1
Cr-51	2.9E-7	1.4E+4	5.5E+6	3.1E+6	5.5E+5	8.7E+6	7.7E+5
Fe-55	8.5E-9	7.2E+4	0.0	1.9E+7	2.0E+6	1.8E+8	1.5E+8
Fe-59	1.8E-7	1.0E+6	3.2E+8	1.0E+8	1.9E+7	8.0E+8	9.2E+8
Mn-54	2.6E-8	1.4E+6	1.6E+9	1.3E+7	1.9E+6	8.5E+8	1.4E+7
Co-58	1.1E-7	9.3E+5	4.4E+8	4.4E+7	7.1E+6	5.3E+8	1.7E+8
Co-60	4.2E-9	6.0E+6	2.5E+10	1.7E+8	2.4E+7	2.9E+9	7.6E+8
Sr-89	1.5E-7	1.4E+6	2.5E+4	6.5E+8	1.9E+9	8.2E+9	1.3E+8
Sr-90	7.9E-10	9.9E+7	8.9E+6*	2.7E+10	6.7E+10	6.2E+11	7.2E+9
Cs-134	1.1E-8	8.5E+5	8.0E+9	7.0E+9	2.5E+10	9.9E+9	8.2E+8
Cs-136	5.9E-7	1.5E+5	1.7E+8	4.6E+8	2.1E+9	9.0E+7	2.1E+7
Cs-137	7.3E-10	6.2E+5	1.2E+10	5.6E+9	1.5E+10	8.3E+9	6.7E+8
Ba-140	6.3E-7	1.3E+6	2.3E+7	2.5E+7	4.4E+6	1.4E+8	2.6E+7

*No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for the dose conversion factor for Sr-90.

8.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

No Radiological Effluent Monitoring Program locations were changed during the first six months.