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Title

UNC NUCLEAR INDUSTRIES
REACTOR AND FUELS PRODUCTION FACILITIES
1983 EFFLUENT RELEASE REPORT

Author

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UNC NUCLEAR INDUSTRIES

REACTOR AND FUELS PRODUCTION FACILITIES

1983 EFFLUENT RELEASE REPORT

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UNC NUCLEAR INDUSTRIES
REACTOR AND FUELS PRODUCTION FACILITIES
1983 EFFLUENT RELEASE REPORT

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1.0 SUMMARY

This document has been prepared to fulfill the annual reporting requirements of DOE 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements," and "Environmental Control Manual."

All significant discharges to the environs from UNC facilities cor CY 1983 are reported in this document.

An evaluation of radioactive effluent discharges from N Reactor during CY 1983 has been completed. Discharges were calculated from the results of radioanalyses performed on samples taken from liquid and airborne effluent streams using the Environmental Release Summary computer program.

Graphical representations of cumulative effluent discharges are compared to the 1982 cumlative discharges in Figures 1 through 7. The "indicator" radionuclides chosen for the graphs represent the following releases:

Ar-41 - Activation product in airborne release
Xe-135 - Fission product in airborne release
I-131 - Fission product to onsite ground disposal facility
Co-60 - Corrosion product discharge to ground disposal facility
I-131 - Anionic radionuclide discharge at river springs
Co-60 - Corrosion product discharge at river springs
Sr-90 - Fission product discharge at river springs

Results of the effluent sampling program for the period January 1 - December 31, 1983, indicated that:

- The Technical Specification concentration guide for the annual average concentration of Sr-90 released via the N Area riverbank springs was exceeded for CY 1983. The annual average concentration guide, based on the As Low As Reasonably Achievable concept, is 2.0E3 pCi/L. The average concentration for CY 1983 was 2.3E3 pCi/l. The concentration guide was exceeded during December of 1983.

  The Technical Specification concentration guides provide the limits to initiate corrective action to reduce or eliminate environmental releases. The concentration guides are well below the concentrations that would cause the Columbia River to exceed the Federal and State maximum annual dose equivalent for Drinking Water (4 mrem to the whole body or organ; 40 CFR 141, EPA Drinking Water Regulations). The doses resulting from CY 1983 releases of Sr-90 calculate to be <.0033 mrem to the whole body and <.012 mrem to the bone.

- The remaining "indicator" radionuclide releases were consistent with those seen in the past years.

- No other Technical Specification concentration guide was exceeded.

Nonradioactive effluent discharges from N Reactor during CY 1983 are also included in this report. Nonradioactive releases were consistent with the release levels observed during past years.

Figure 1.1

AR-41 RELEASE (116-N STACK)

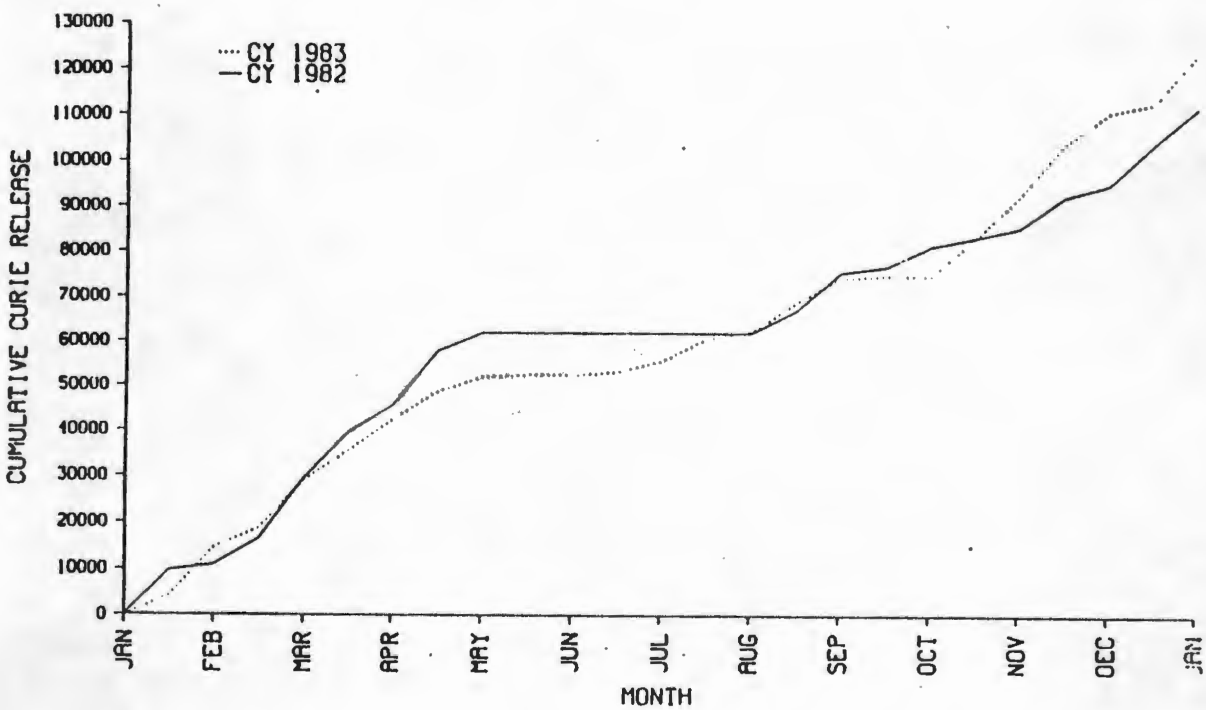


Figure 1.2

XE-135 RELEASE (116-N STACK)

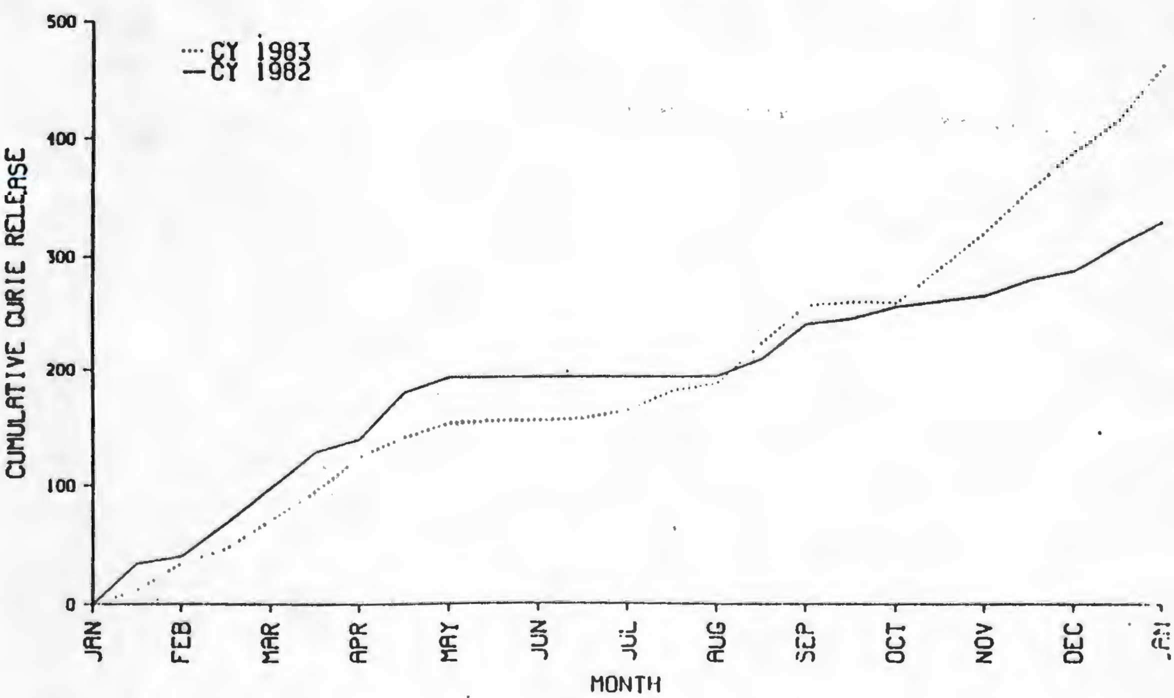


Figure 1.3

I-131 TO THE CRIB

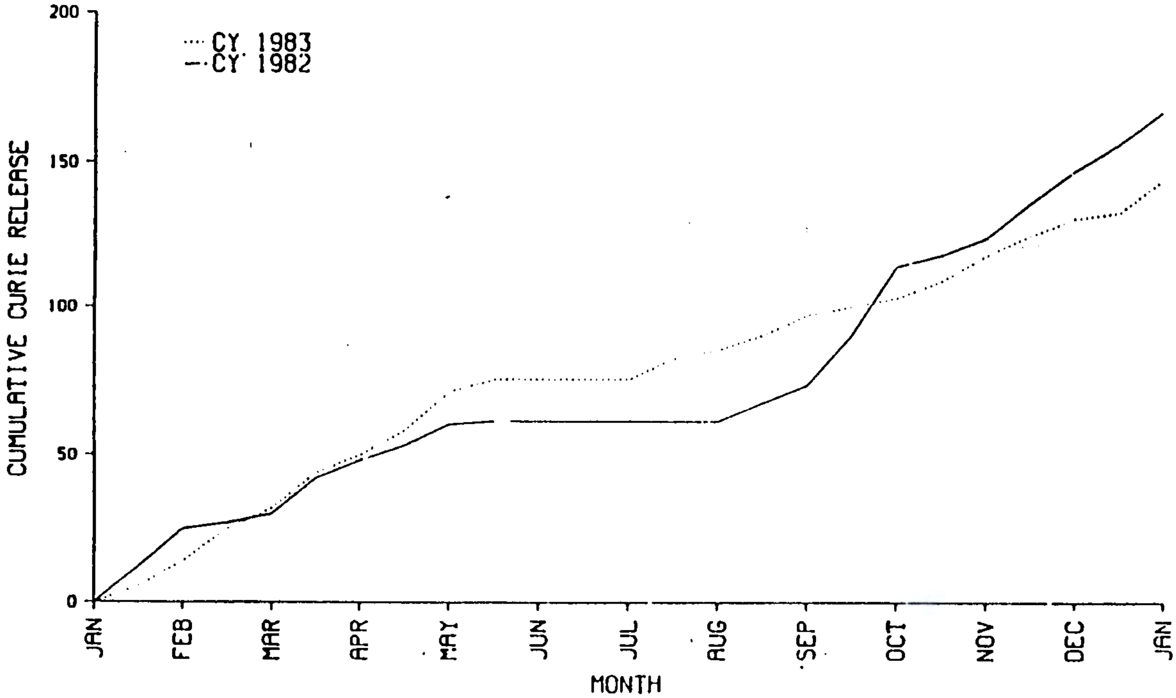


Figure 1.4

CO-60 TO THE CRIB

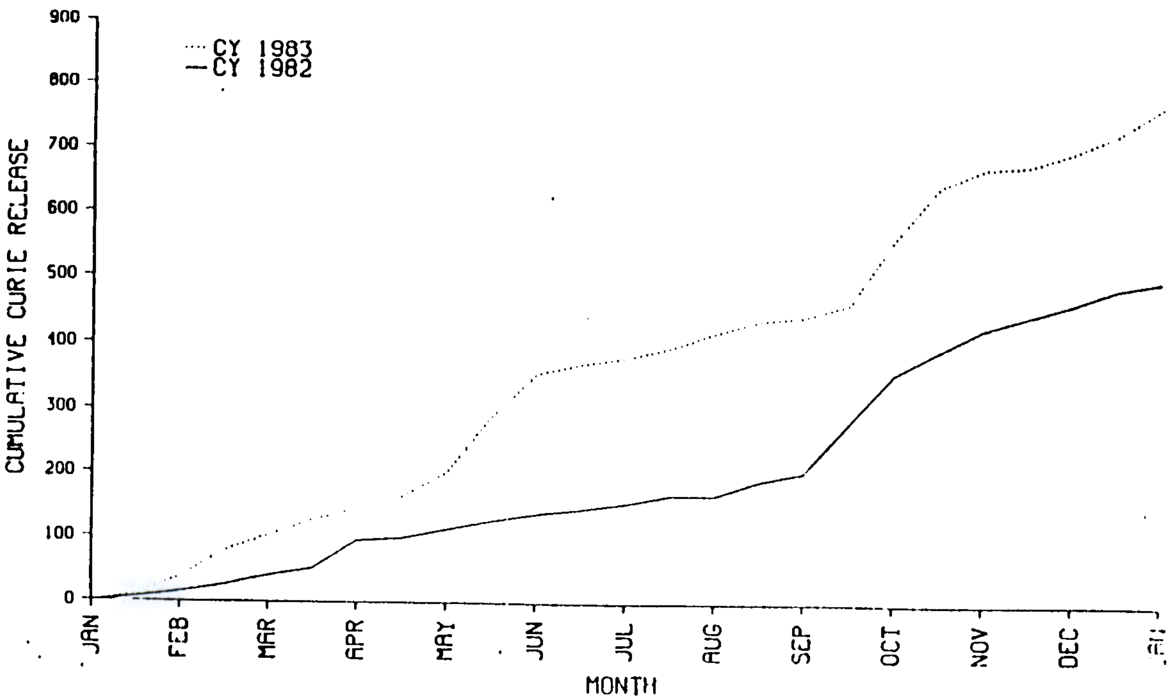


Figure 1.5

I-131 VIA THE N-SPRINGS

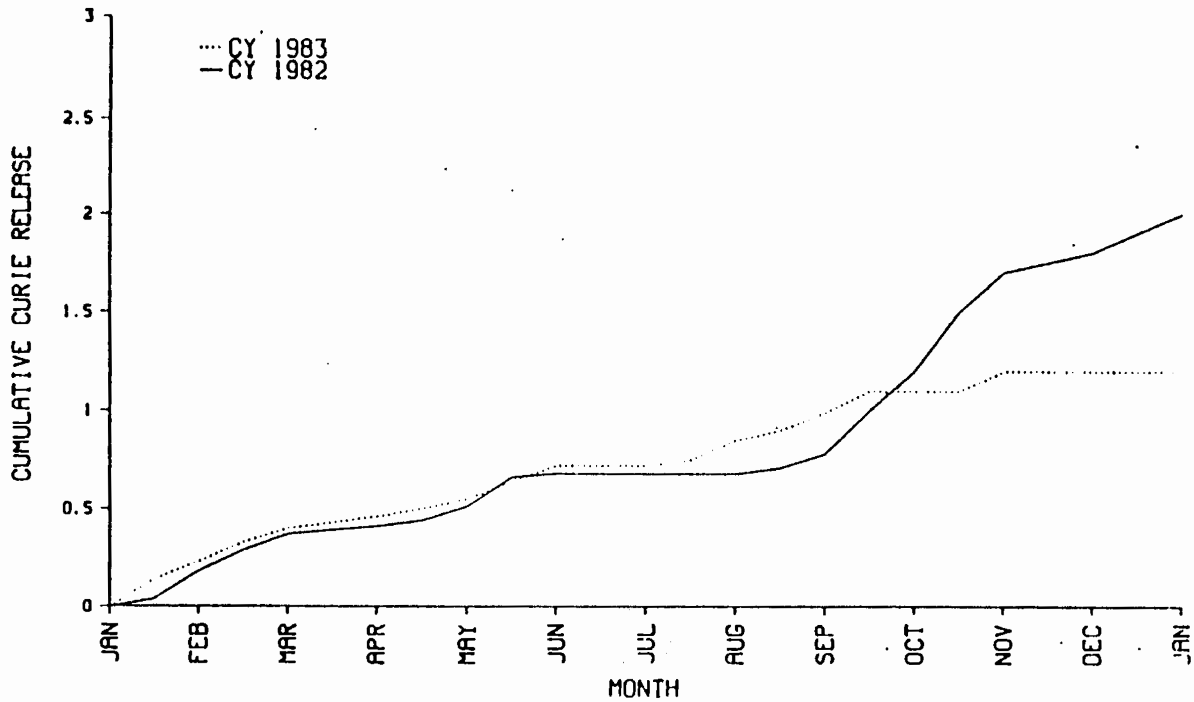


Figure 1.6

CO-60 VIA THE N-SPRINGS

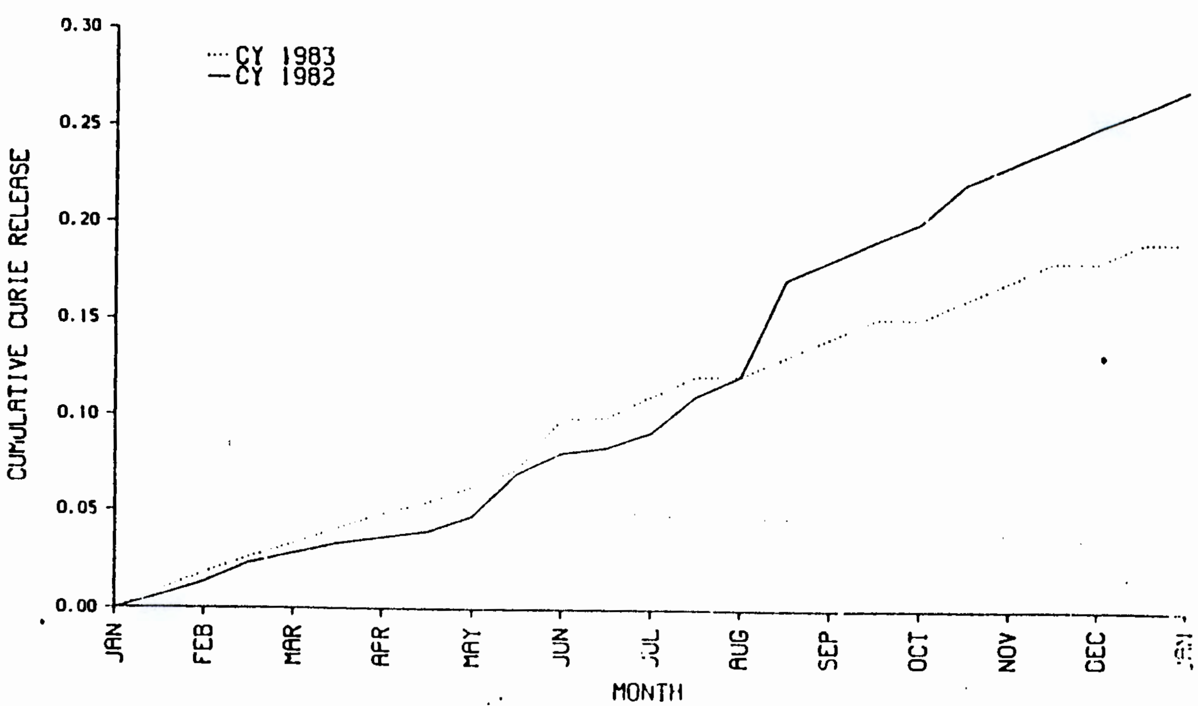
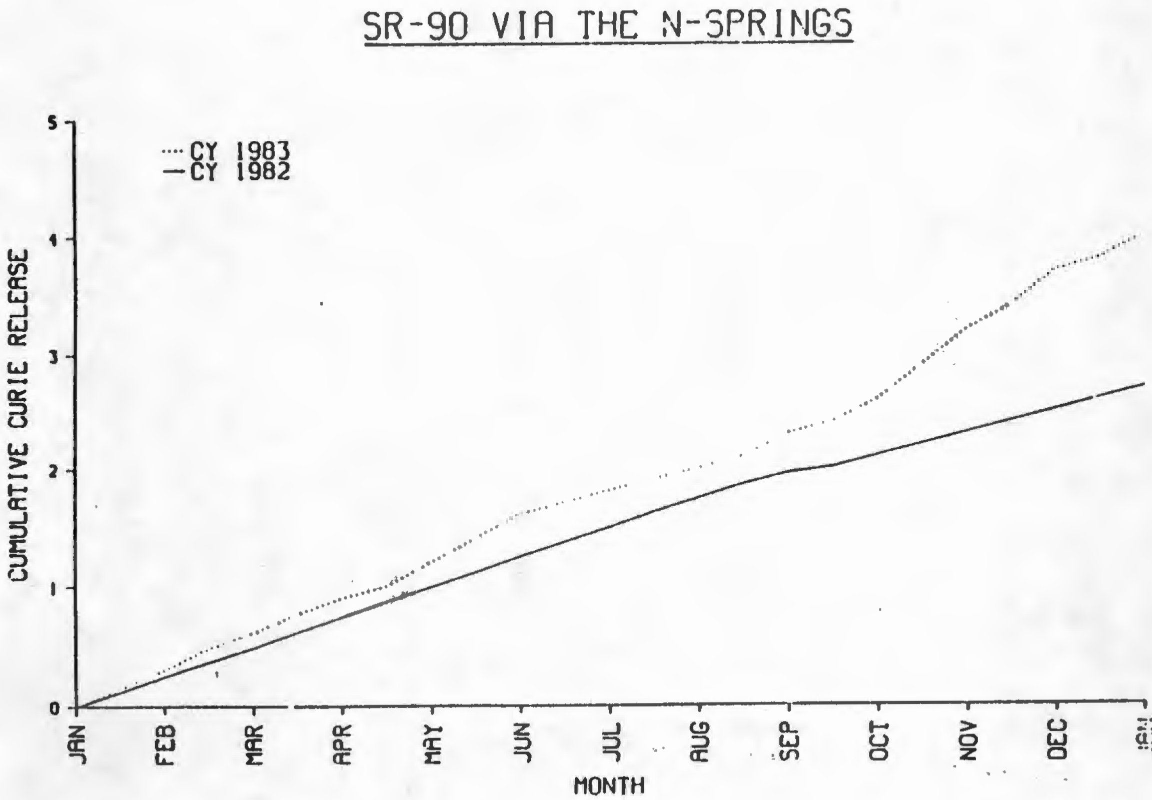


Figure 1.7


SR-90 VIA THE N-SPRINGS
CY 1983
CY 1982
CUMULATIVE CURIE RELEASE
0
1
2
3
4
5
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
MONTH

2.0 ATMOSPHERIC RELEASES TO THE ENVIRONMENT FROM THE 100 AREAS

2.1 Radioactive Airborne Emissions at 100-N Area

2.1.1 Activity Discharged From 116-N Stack, 109-N Zone I Vent, and 109-N Cell No. 6 Vent

	116-N STACK			109-N ZONE I VENT			109-N CELL #6 VENT		
Radionuclides, Gases	Release, Ci	Ave. Conc. pCi/L	Peak Conc. pCi/L	Release, Ci	Ave. Conc. pCi/L	Peak Conc. pCi/L	Release, Ci	Ave. Conc. pCi/L	Peak Conc. pCi/L
H-3	9.9E0	3.2E0	1.3E1	1.7E-2	9.7E-3	5.0E-2	ND	ND	ND
Ar-41	1.2E5	3.9E4	1.6E5	9.0E2	5.0E2	7.3E3	3.4E2	8.2E2	1.1E4
Kr-85m	9.2E1	2.9E1	1.6E2	6.9E1	3.9E1	1.7E2	1.1E1	2.6E1	1.9E2
Kr-87	2.8E2	8.8E1	6.0E2	1.2E2	6.7E1	2.9E2	2.7E1	6.4E1	5.5E2
KrRb-88	5.3E2	1.7E2	1.7E2	1.2E2	6.7E1	3.5E2	2.1E1	4.9E1	4.3E2
I-131	2.1E-1	6.6E-2	3.2E0	1.2E-1	6.8E-2	1.4E0	8.9E-3	2.1E-2	8.2E-2
I-132	6.6E-2	2.1E-2	2.1E-1	4.7E-1	2.6E-1	3.5E0	2.7E-2	6.5E-2	3.7E-1
I-133	9.9E-2	3.2E-2	1.7E-1	5.7E-1	3.2E-1	3.1E0	5.3E-2	1.3E-1	6.1E-1
I-135	1.1E-1	3.4E-2	2.4E-1	7.1E-1	4.0E-1	4.7E0	5.7E-2	1.4E-1	7.6E-1
Xe-133	ND	ND	ND	ND	ND	ND	1.1E1	2.6E1	2.6E1
Xe-135	4.6E2	1.5E2	5.5E2	3.2E2	1.8E2	6.2E2	3.7E1	8.8E1	5.9E2
Cs-138	3.3E2	1.0E2	1.1E3	1.7E2	9.3E1	7.2E2	3.6E1	8.5E1	8.9E2
Particulates									
Na-24	ND	ND	ND	1.5E-2	8.4E-3	7.4E-2	2.3E-3	5.4E-3	4.9E-2
Mn-54	4.3E-4	1.4E-4	3.4E-4	2.3E-3	1.3E-3	2.2E-2	2.9E-4	7.0E-4	3.9E-3
Mn-56	ND	ND	ND	1.4E-1	7.7E-2	3.0E-1	1.4E-2	3.4E-2	4.4E-1
Fe-59	6.6E-4	2.1E-4	4.5E-4	2.2E-3	1.2E-3	1.7E-2	3.9E-4	9.4E-4	8.4E-3
Co-58	3.3E-4	1.0E-4	2.5E-4	7.9E-4	4.4E-4	5.5E-3	1.6E-4	3.8E-4	3.5E-3
Co-60	9.7E-4	3.1E-4	1.1E-3	4.4E-3	2.5E-3	3.4E-2	8.2E-4	2.0E-3	1.0E-2
As-76	5.6E-1	1.8E-1	5.1E0	4.6E-1	2.6E-1	2.1E0	4.8E-2	1.2E-1	1.2E0
Sr-89	2.1E-5	6.7E-6	1.1E-5	8.5E-4	4.7E-4	6.9E-4	1.3E-4	3.1E-4	7.1E-4
Sr-90	1.5E-5	4.8E-6	5.6E-6	4.7E-5	2.6E-5	4.4E-5	4.5E-6	1.1E-5	1.8E-5
Sr-91	ND	ND	ND	2.4E-2	1.3E-2	4.4E-1	ND	ND	ND
Nb-95	ND	ND	ND	6.5E-4	3.7E-4	2.7E-3	1.5E-4	3.7E-4	3.5E-3
Zr-95	ND	ND	ND	ND	ND	ND	ND	ND	ND
MoTc-99m	1.2E-2	3.7E-4	9.8E-4	4.3E-2	2.4E-2	4.5E-1	4.0E-3	9.7E-3	8.4E-2
Ru-103	4.3E-4	1.4E-4	2.9E-4	1.1E-3	6.0E-4	4.0E-3	1.5E-4	3.5E-4	2.6E-3
Cs-137	ND	ND	ND	7.0E-4	3.9E-4	3.8E-3	ND	ND	ND
BaLa-140	ND	ND	ND	2.6E-2	1.4E-2	1.5E-1	2.0E-3	4.7E-3	4.2E-2
CePr-144	ND	ND	ND	4.1E-3	2.3E-3	2.0E-2	1.1E-3	2.6E-3	1.8E-2
Pu-238	1.0E-6	3.2E-7	8.7E-7	1.0E-7	5.7E-8	8.1E-8	1.9E-8	4.5E-8	6.7E-8
Pu 239/240	7.7E-6	2.5E-6	6.9E-6	7.0E-7	3.9E-7	5.3E-7	1.1E-7	2.6E-7	3.6E-7

ND = Not Detected

2.1.2 Miscellaneous Airborne Discharges

Release, Ci

Radionuclides, Gases	ZONE II EF 7 & 8	ZONE III EF 10	ZONE IV EF 14 & 15	Transfer Area	105-N Dummy Spacer Decon Fac	105-N 14' Decon Fac	Sum Total Ci
As-76	ND	6.5E-3	ND	ND	ND	ND	6.5E-3
I-131	ND	ND	3.0E-5	4.2E-4	7.0E-5	8.0E-5	6.0E-4
I-133	ND	ND	1.4E-4	ND	ND	ND	1.4E-2
Particulates							
Mn-54	ND	ND	ND	ND	ND	1.2E-5	1.2E-5
Co-60	4.3E-4	1.8E-4	8.7E-5	7.1E-5	3.3E-5	3.8E-5	8.4E-3
Cs-137	ND	ND	ND	ND	ND	2.3E-5	2.3E-5

ND = Not Detected
EF = Exhaust Fan

2.1.3 Flow Rates

116-N Stack - 2.10E5 cfm
109-N Zone I Vent - 1.20E5 cfm
109-N Cell #6 Vent - 2.80E4 cfm
Zone II, EF7+8 - 2.26E4 cfm
Zone III, EF 10 - 1.27E5 cfm
Zone IV, EF 14 + 15 - 1.60E4 cfm
105-N Transfer Area - 2.75E4 cfm
105-N Dummy Spacer Decon Facility - 4.80E3 cfm
105-N 14' Decon Facility - 6.35E3 cfm

2.2 Radioactive Airborne Emissions at 100-K Area

2.2.1 *Activity Discharged From 105-KE*

Radionuclides	Release, Ci	Ave. Conc. pCi/L
Mn-54	8.9E-5	2.2E-4
Co-60	1.6E-4	3.9E-4
Sr-90	6.1E-4	1.5E-3
Ru-106	3.0E-4	7.4E-4
Cs-134	1.4E-5	3.6E-5
Cs-137	2.3E-4	5.7E-4
CePr-144	2.6E-4	6.5E-4
Eu-155	4.2E-5	1.0E-4
Pu-238	1.8E-6	4.6E-6
Pu-239/240	1.3E-5	3.2E-5

2.2.2 Activity Discharged From 105-KW

Radionuclides	Release, Ci	Ave. Conc. pCi/L
Co-60	6.2E-5	1.5E-4
Sr-90	6.5E-7	1.6E-6
Cs-137	1.1E-5	2.7E-5
Pu-238	4.4E-8	1.1E-7
Pu-239/240	2.1E-7	5.3E-7

2.2.3 Activity Discharged From 1706-KEL

Radionuclides	Release, Ci
Sr-90	3.0E-6
Pu 239/240	6.4E-7

2.2.4 Flow Rates

105-KE Vents - 2.7E5 cfm
105-KW Vents - 2.7E5 cfm
1706-KEL Vents - 1.2E5 cfm

2.3 Nonradioactive Airborne Emissions at 100-N Area

2.3.1 Chemicals Discharged From the 184-N Boiler Stacks

The following table lists the airborne emissions at 100-N Area due to the combustion of No. 6 Fuel Oil and No. 2 Diesel Oil. The weights of listed materials discharged as a result of fuel burning were calculated using the factors published in 1973 by the Environmental Protection Agency in "Compilation of Air Pollutant Emission Factors."

Material	Emissions From				Total Emissions	
	No. 6 Oil		No. 2 Oil			
	lbs	Kg	lbs	Kg	lbs	Kg
Particulate	108,000	48,900	6,600	3,000	114,000	51,900
Sulfur Dioxide	1,290,000	584,000	28,900	13,100	1,320,000	597,000
Sulfur Trioxide	16,400	7,400	400	180	16,800	7,580
Carbon Monoxide	18,800	8,500	1,800	800	20,600	9,300
Hydrocarbons	14,100	6,400	1,300	600	15,400	7,000
Nitrogen Oxides	375,000	170,000	35,400	16,100	410,000	186,000
Aldehydes	4,700	2,100	900	410	5,600	2,510

2.3.2 Flow Rate

184-N Powerhouse - 10.0E10 ft^3/yr

Flow rate of the 184-N powerhouse stack was estimated using the factors published in August, 1975, by the Hanford Environmental Health Foundation in "Particulate and Sulfur-

Dioxide Emissions from the Foster Wheeler Boiler, 184-N Powerhouse." The flow rate should be considered as an estimate since steam loading on the boilers varies greatly throughout the year and there is no instrumentation on the boilers to measure flow rate.

3.0 LIQUID RELEASES TO THE ENVIRONMENT FROM THE 100 AREAS

3.1 Radioactive Liquid Releases From 100-N Area

3.1.1 Activity Discharged via the 1301-N Crib and Seepage to the River

	TO THE 1301-N CRIB			SEEPAGE TO RIVER VIA SPRINGS		
Radionuclides	Release, Ci	Ave. Conc. pCi/L	Peak Conc. pCi/L	Release, Ci	Ave. Conc. pCi/L	Peak Conc. pCi/L
H-3	1.8E2	5.4E4	6.5E5	1.8E2+	3.1E4	5.8E4
P-32	9.3E1	2.8E4	5.1E5	2.3E-2	1.3E1	2.8E2
Cr-51	1.1E2	3.3E4	1.3E5	ND	ND	ND
Mn-54	6.5E2	1.9E5	4.3E5	*		
Fe-59	5.8E2	1.7E5	7.4E5	*		
Co-58	4.8E1	1.4E4	6.4E4	*		
Co-60	7.7E2	2.3E5	1.0E6	1.9E-1	1.1E2	2.5E2
Zn-65	1.2E1	3.7E3	2.9E4	*		
Sr-89	2.3E2	6.9E4	1.7E5	1.0E0	5.7E2	2.8E3
Sr-90	1.1E2	3.4E4	8.0E4	4.0E0	2.3E3	3.7E3
ZrNb-95	4.1E2	1.2E5	3.5E5	*		
MoTc-99m	4.2E2	1.2E5	4.8E5	8.4E-2	4.8E1	3.4E2
Ru-103	6.0E1	1.8E4	4.1E4	1.8E-1	1.0E2	2.4E2
Ru-106	6.5E1	1.9E4	1.4E5	2.2E-1	1.3E2	2.3E2
Sb-124	7.9E0	2.4E3	8.2E3	4.3E-2	2.5E1	8.6E1
Sb-125	ND	ND	ND	1.7E-1	9.7E1	2.1E2
I-131	1.4E2	4.3E4	1.1E5	1.2E0	6.7E2	3.7E3
Xe-133	2.1E2	6.1E4	1.7E5	9.1E-1	5.2E2	2.4E3
Cs-134	1.4E1	4.3E3	4.8E4	*		
Cs-137	2.0E2	5.9E4	1.2E5	*		
BaLa-140	2.6E3	7.7E5	3.0E6	*		
Ce-141	9.7E1	2.9E4	1.2E5	*		
CePr-144	2.4E2	7.1E4	2.3E5	*		
Sm-153	2.5E1	7.5E3	3.4E4	ND	ND	ND
W-187	1.8E2	5.5E4	9.4E5	ND	ND	ND
Pu-238	3.0E-1	8.8E1	4.3E2	6.3E-5	3.6E-2	2.4E0
Pu 239/240	2.0E0	5.9E2	2.8E3	1.9E-5	1.1E-2	1.1E-1
SLR	1.2E4	3.7E6	1.6E7	**		

SLR = Short-lived radionuclides ($T_{1/2}$ < 48 hours)

* Indicates radionuclides with a high ionic exchange potential or particulate form which are trapped within the crib soil, therefore removed beyond detection limits.

** Indicates short half-life radionuclides which have decayed beyond the detection limits before appearing in the river spring water.

\+ Tritium released to the crib is also assumed to eventually reach the Columbia River via the N-Springs. Average and peak concentrations represent sampling and analysis of the actual N-Springs liquid discharge.

3.1.2 Activity Discharged to the River Via 102" RWR

	TO COLUMBIA RIVER VIA 102" LINE		
Radionuclide	Release, Ci	Ave. Conc. pCi/L	Peak Conc. pCi/L
Na-24	1.3E-1	2.2E-1	1.8E0
Cr-51	1.7E-1	2.9E-1	5.1E-1
Mn-54	5.8E-1	1.0E0	2.2E0
Co-58	1.1E-1	1.9E-1	3.2E-1
Fe-59	6.1E-1	1.1E0	2.1E0
Co-60	1.6E0	2.8E0	6.0E0
ZrNb-95	4.2E-1	7.4E-1	1.5E0
MoTc-99m	1.8E-1	3.2E-1	1.2E0
Ru-103	3.4E-2	5.8E-2	2.0E-1
Sb-124	2.2E-2	3.8E-2	6.5E-2
I-131	1.1E-1	1.8E-1	2.8E-1
I-133	1.4E-1	2.4E-1	1.9E0
Cs-137	1.1E-1	1.9E-1	3.5E-1
BaLa-140	1.1E0	1.9E0	5.2E0
Ce-141	2.0E-2	3.5E-2	7.1E-2
CePr-144	8.4E-2	1.5E-1	2.0E-1

3.1.3 Total Flow

Stream	Total Flow, Gallons
To crib	8.9E8
To river via N-Springs	4.5E8
To river via 102" RWR	1.5E11

3.2 Radioactive Liquid Releases From 100-K Area

3.2.1 Activity Discharged to the River Via 1908-K Outfall

	TO COLUMBIA RIVER VIA 1908-K OUTFALL		
Radionuclide	Release, Ci	Ave. Conc. pCi/L	Peak Conc. pCi/L
Co-60	3.8E-2	1.3E1	3.9E1
Cs-137	2.4E-2	8.1E0	2.3E1
Sr-90	1.5E-2	5.0E0	2.6E1
Pu-238	6.6E-5	2.3E-2	2.7E-2
Pu-239/240	1.6E-4	5.5E-2	2.1E-1

3.2.2 Total Flow

Stream	Total Flow, Gallons
To river via 1908-K outfall	7.7E8

3.3 Nonradioactive Liquid Releases from 100-N and 100-K Areas

This discharge of water to the Columbia River from UNC operated facilities is regulated by the Hanford NPDES Permit. The following table summarizes the analytical results from samples collected from the NPDES outfalls during CY 1983.

SUMMARY OF NPDES DATA FOR CY 1983

Sample Parameter		003	004	w/o low lift 005	with low lift 005	w/o FS 006	with FS 006	007	009
Flow (MGD)	Max.	5.0E-2	3.3E0	7.0E0	2.1E1	2.9E-1	6.1E0	2.6E0	4.5E2
	Avg.	3.0E-2	2.1E0	3.5E0	4.5E0	2.9E-1	3.7E0	5.3E-1	3.8E2
	Total/yr.	9.5E-1	7.7E2	1.3E3	7.1E5	1.1E2	3.3E1	1.9E2	1.4E5
Temp. (°F)	Max.	*	71	100	*	69	*	*	81
	Avg.	*	54	57	*	63	*	*	59
pH	Max.	*	8.3	8.6	*	8.4	*	*	8.3
	Min.	*	7.4	7.9	*	7.6	*	*	7.4
Total Suspended Solids (mg/L)	Max.	7.6	4.2	28.7	*	4.5	*	5.6	*
	Avg.	3.3	2.1	4.1	*	2.6	*	2.8	*
Oil & Grease (mg/L)	Max.	*	*	4.9	*	2.3	*	*	*
	Avg.	*	*	1.7	*	1.3	*	*	*

FS = Fog Spray
*Measurement not required.

UNC NPDES DISCHARGE POINTS

Discharge Number	
003	181-KE Inlet Screen Backwash
004	1908-K Outfall
005	182-N Tank Farm Overflow (36" RWR)
006	182-N Drain System (42" RWR)
007	181-N Inlet Screen Backwash
009	102" RWR Line

4.0 RELEASE TRENDS

The following graphs show the releases of selected radionuclides over the past several years. Due to differences in sampling and analytical techniques, release data from the mid-seventies may not be as accurate as current data.

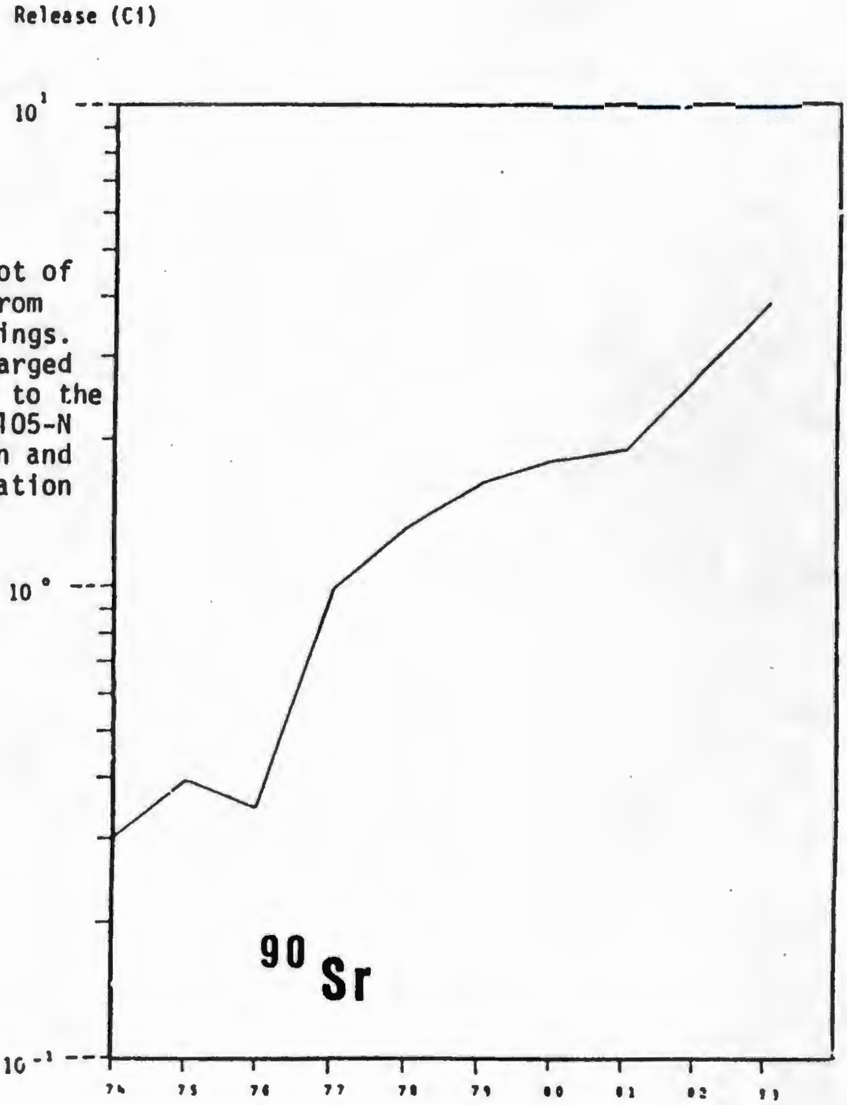


Figure 4.1: Semilog plot of Strontium-90 releases from the 100-N riverbank springs. Most of the Sr-90 discharged from the springs is due to the Sr-90 inventory in the 105-N spent fuel storage basin and is not affected by operation of N Reactor.

Figure 4.2: Semilog plot of Ruthenium-106 releases from the 100-N riverbank springs. Most of the Ru-106 discharged from the springs is due to the Ru-106 inventory in the 105-N spent fuel storage basin and is not affected by operation of N Reactor.

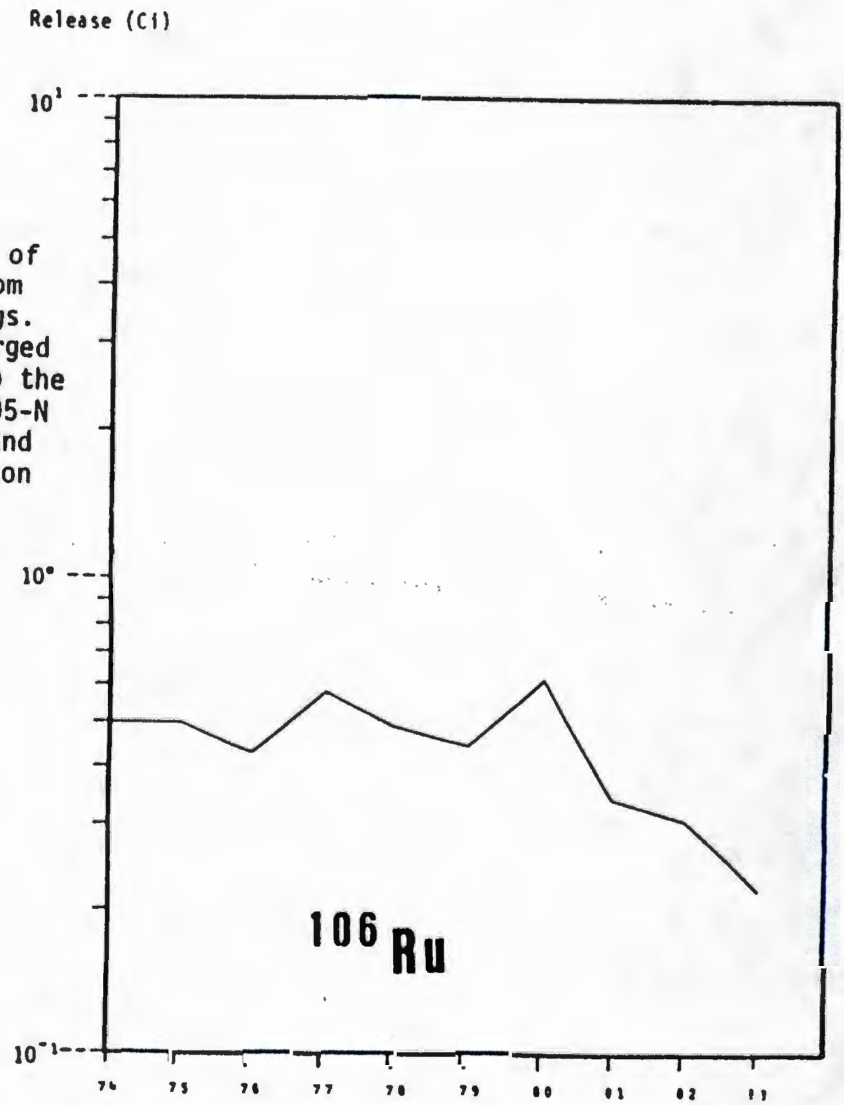


Figure 4.3: Semilog plot of Iodine-131 releases from the 100-N riverbank springs.

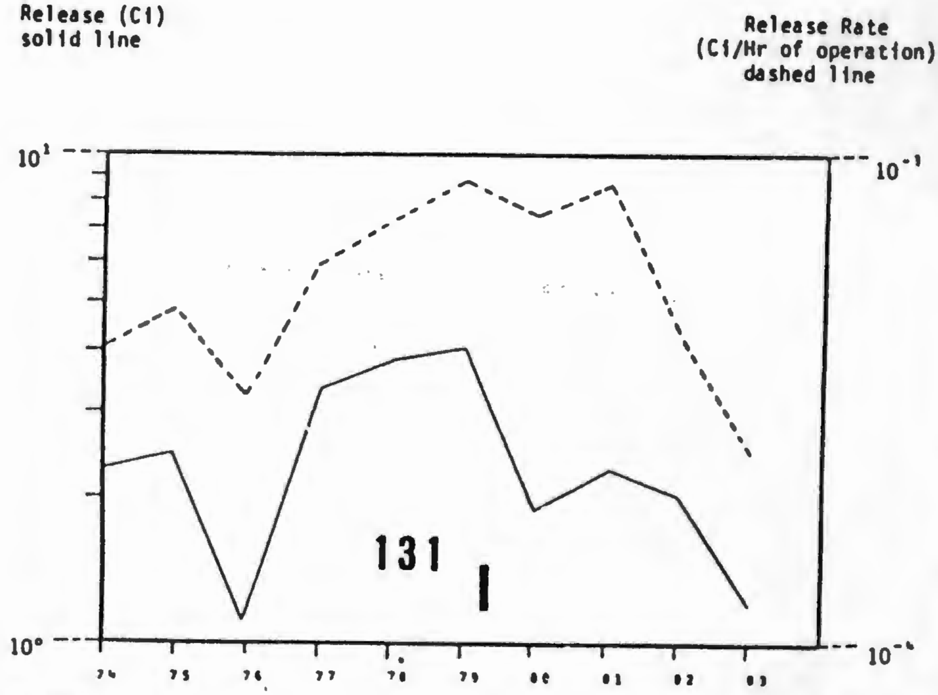


Figure 4.4: Semilog plot of Cobalt-60 releases from the 100-N riverbank springs.

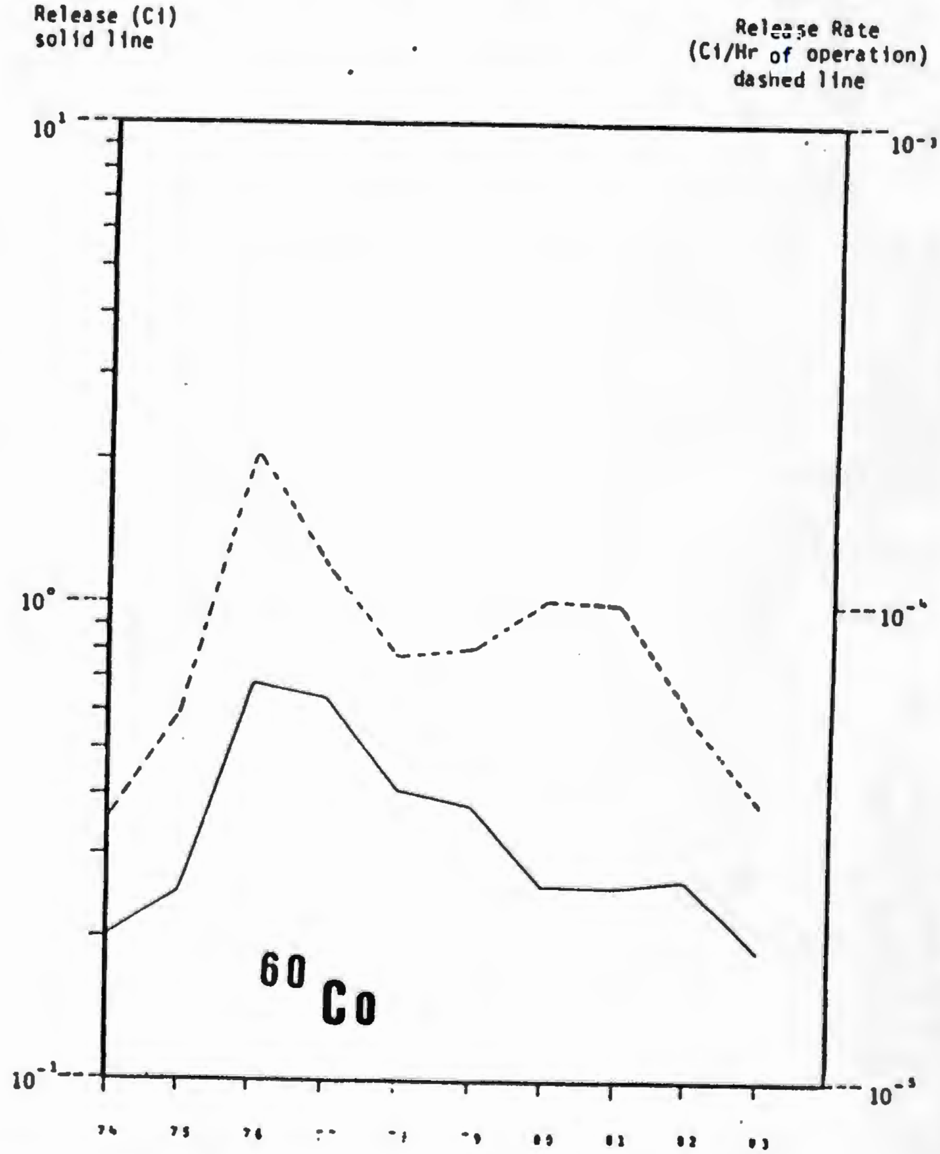
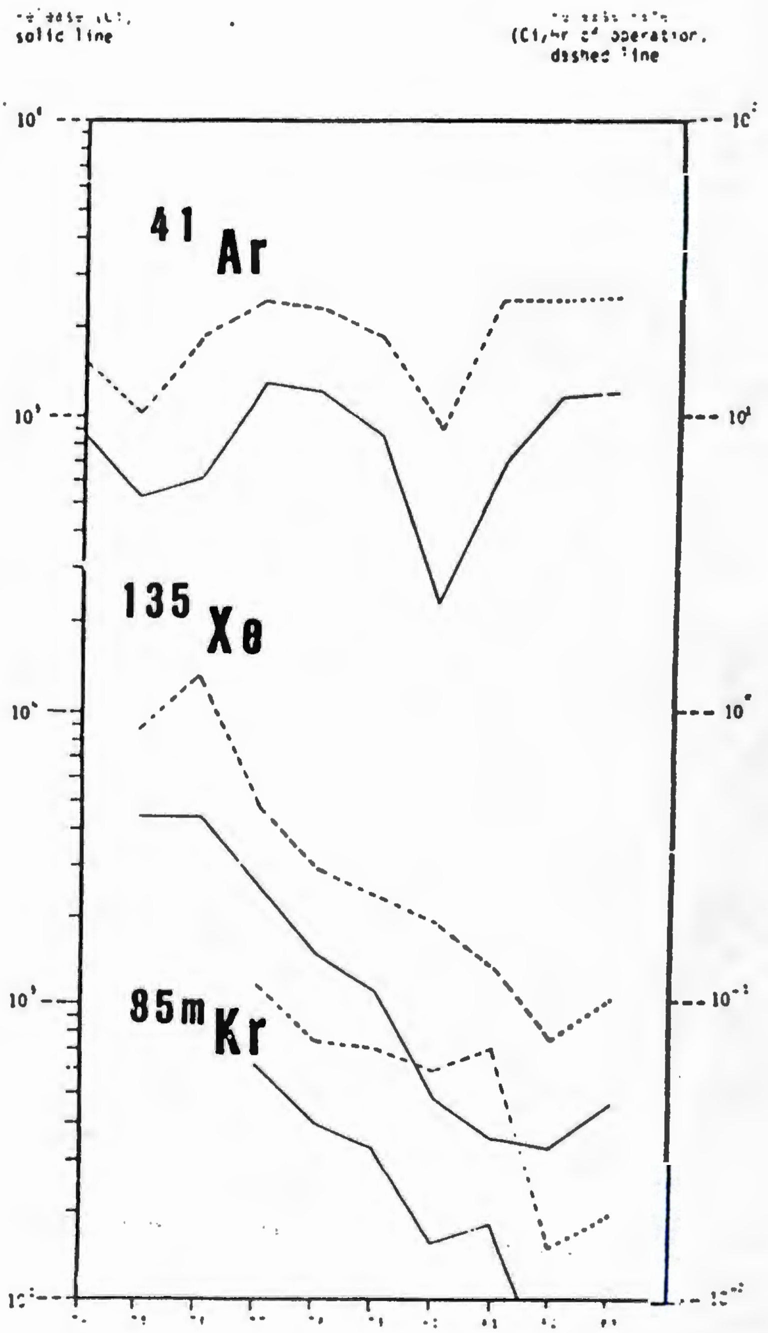


Figure 4.5: Semilog plot of Noble gas releases from the 116-N Stack.



5.0 ATMOSPHERIC RELEASES TO THE ENVIRONMENT FROM 300 AREA

5.1 Radioactive Airborne Emissions at 300 Area

The total airborne uranium release from the 333 Building cutoff saw stack during CY 1983 was 2.07E2 µCi. The average flow rate out the cutoff saw stack was 2.54E3 cfm.

5.2 Nonradioactive Airborne Emissions at 300 Area

5.2.1 Chemicals Discharged from Chemical Bay Stack

The amount of NO_x discharged was based on the totalizer reading on the NO_x monitor.

Material	Total Pounds	Total Kg	Avg. Concentration
NO_x	70,100	30,500	51.3 ppm

5.2.2 Flow Rate

The 333 Building chemical bay exhaust stack averaged 3.17E4 cfm (8.98E2 m^3/min) for the year, except when the exhaust fans were shut off or on reduced flow during the summer outage in August.

6.0 LIQUID RELEASES TO THE ENVIRONMENT FROM 300 AREA

The quantities of materials listed in the table below represent the total quantity discharged to the process trenches in CY 1983. The discharged quantities are based on the weekly water usage for the 303, 313, and 333 buildings and the weekly composite process sewer samples minus the average content in the inlet water. The total volume of liquid entering the process sewer from the 303, 313 and 333 buildings during CY 1983 was 2.14E8 gallons (8.10E8 litres).

Quantities of Materials Discharged to the Process Trenches

Material	Pounds	Kg	Average Concentration ppm
Nitrate ion	113,000	51,400	63.4
Fluoride ion	3,130	1,420	1.75
Copper	894	405	0.5
Uranium	584	265	0.33

7.0 MATERIALS DISCHARGED TO THE 183-H SOLAR EVAPORATION BASIN

The main purpose of the 183-H Solar Evaporation Basin is to dispose of the chemical wastes generated by the UNC Fuels Manufacturing Department. The basin is also used to dispose of chemical wastes generated by other company components and Hanford Project contractors.

The numbers in the following table represent the total quantities of chemical materials discharged to the 183-H basin for CY 1983. These totals are based on analyses of every load going to the basin for copper and uranium and analyses of monthly composite samples for other materials. The total volume shipped to the 183-H Solar Evaporation Basin during CY 1983 was 4.06E5 gallons (1.54E6 litres).

Quantities of Materials Discharged to the 183-H Evaporation Basin

Material	Pounds	Kg
Ammonium ion	762	346
Fluoride ion	22,700	10,300
Nitrate ion	451,000	205,000
Chromium	116	52
Copper	72,600	32,900
Manganese	383	174
Sulfate ion	122,000	55,500
Uranium	631	286

8.0 CONSUMPTION OF CHEMICALS

8.1 Chemicals Consumed in the 100 Areas

Material	Total Consumed From						Total Consumed From All Facilities	
	183-D*		100-KE		100-N			
	lbs	kg	lbs	Kg	lbs	Kg	lbs	Kg
Aluminum Sulfate	24,300	11,000	23,000	10,400	393,000	178,000	440,000	199,000
Chlorine			14,000	6,350	20,000	9,070	34,000	15,400
Polyacrylamide			300	136	1,100	499	1,400	635
Sulfuric Acid					1,090,000	494,000	1,090,000	494,000
Hydrazine					11,000	4,990	11,000	4,990
Morpholine					3,180	1,440	3,180	1,440
Sodium Hydroxide					428,000	194,000	428,000	194,000
					Gal	Liter	Gal	Liter
Ammonium Hydroxide					42,300	160,000	42,300	160,000

*Material supplied to RHO 183-D

8.2 Fate of Chemicals Consumed in the 100 Areas

The chemicals consumed in the 100 Areas are used in several different applications. The following qualitative descriptions indicate the environmental discharges, if any, of each chemical noted in the above table.

8.2.1 Aluminum Sulfate

Aluminum sulfate is used as a flocculant in filtered water production in the 100-N and 100-KE Areas. Most of the sulfate is retained by the filtered water and either discharged to the Columbia River or trapped in the anion resins in the demineralized water plant and discharged to the 163-N/183-N waste disposal ponds when the resins are regenerated. The aluminum is trapped in the filters and is discharged to the 163-N/183-N waste disposal ponds during filter backwash at 100-N Area or settles out in the filtered water plant backwash hold-up basin in the 100-K Area.

8.2.2 Chlorine

Chlorine is used as an algaecide and for producing potable water in the 100-N and 100-KE Areas. After reacting with water, most of the chlorine is transformed to chloride ion and is discharged mainly to the 1301-N crib or the sanitary tile field.

8.2.3 Polyacrylamide

Polyacrylamide (Separan) is used as a filter aid and coagulant in filtered water production at the 100-N and 100-KE Areas. Most of the polyacrylamide is backwashed to the 163-N/183-N waste disposal ponds in 100-N Area or settles out in the filtered water plant backwash hold-up basin in the 100-KE Area.

8.2.4 Sulfuric Acid

Surfuric acid is used to regenerate the cation resins in the demineralized water plant. This chemical is flushed to the 163-N/183-N ground disposal ponds after resin regeneration.

8.2.5 Sodium Hydroxide

Sodium hydroxide is used to regenerate the anion resins in the deminzeralized water plant. This chemical is flushed to the 163-N/183-N ground disposal ponds after resin regeneration.

8.2.6 Ammonium Hydroxide

Ammonium hydroxide is used to control the pH of the water in the primary cooling system (PCS) and the graphite and shield cooling system (GSCS). Small quantities of this chemical enter the 1301-N ground disposal crib due to a purity bleed maintained on the PCS and GSCS.

8.2.7 Hydrazine

Hydrazine is used to control the oxygen concentration in the secondary cooling system (SCS), rod cooling system (RCS), PCS, and GSCS. Small quantities of hydrazine reach the ground disposal crib in the same manner as ammonium hydroxide. Small quantities of hydrazine are discharged from the SCS to the Columbia River via the steam air ejectors and the steam generator blowdown.

8.2.8 Morpholine

Morpholine is used to control the pH of the SCS. Small quantities of morpholine are discharged to the Columbia River in the same way that hydrazine is discharged to the river.

8.2.9 Miscellaneous Chemicals

Small quantities of other chemicals used in the hot water quality lab at 100-N Area are discharged to the 1301-N ground disposal crib.

8.3 Chemicals Consumed at the 300 Area

Material	Total Consumed Pounds	Total Consumed Kg
Hydrofluoric Acid	43,300	19,600
Nitric Acid	624,000	283,000
Sodium Hydroxide	462,000	209,000
Sulfuric Acid	17,900	8,110
Perchlorethylene	44,200	20,100
1,1,1 Trichloroethane	3,100	1,400

8.4 Fate of Chemicals Consumed at the 300 Area

8.4.1 Hydrofluoric, Nitric, and Sulfuric Acids

The main uses for these acids in the fuel fabrication process include etching copper and zirconium components, chemical milling of fuel pieces, and cleaning of fuel pieces. In addition, sulfuric acid may be used to neutralize large caustic spills that leak into the process sewer. Waste acids that contain significant amounts of uranium are neutralized, filtered, packaged in drums, and returned to the uranium billet fabricators for final uranium recovery. Waste acids without appreciable quantities of uranium are neutralized and disposed of in the 183-H Solar Evaporation Basin.

8.4.2 Sodium Hydroxide

Sodium Hydroxide is used for neutralizing uranium-bearing acids bound for uranium recovery, waste acids bound for the 183-H basin, and acid spills that leak into the process sewer.

8.4.3 Perchloroethylene and 1,1,1 - Trichloroethane

These chemicals are used as degreasing solvents in the fuel fabrication process. The degreasing solvents are replaced as necessary. Waste solvent is placed in the waste solvent evaporation lugger to allow evaporation to reduce the volume of solvent. The lugger, and resultant sludge, is wrapped in plastic and buried in the 200 Areas.

9.0 SANITARY SEWAGE DISCHARGED TO THE GROUND

9.1 100 Area Facilities

The 100 Area sewage flows are calculated by assuming that 50 gallons of sewage are discharged per person per day. The number of people in each area is based on routine personnel assignment locations. Temporary personnel are not included in the tabulation.

Sanitary Sewage Discharged

	100-B	100-D	100-F	100-K	100-N	Total Released
(Lpd)	530	13,300	4,700	26,500	234,000	274,000
(gpd)	140	3,500	1,250	7,000	61,900	72,500

9.2 300 Area Facilities

The 300 Area sanitary sewage system is operated by the Westinghouse Hanford Company which also reports the discharges of that system.

10.0 SOLID WASTE DISCHARGED TO THE GROUND

10.1 Radioactive Solid Waste

Radioactive solid waste generated in the 300 Area and 100 Area facilities is buried by Rockwell Hanford Company in the 200 Area waste disposal facilities.

10.2 Nonradioactive Solid Waste

Nonradioactive solid waste generated in the 300 and 100 Areas is compacted (when applicable) and buried by Rockwell Hanford Company in the central landfill facility.