TELEDYNE
ISOTOPES

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

ANNUAL SUMMARY REPORT 1982

ENVIRONMENTAL RADIATION

MONITORING PROGRAM

PREPARED BY

TELEDYNE ISOTOPES
50 VAN BUREN AVENUE
WESTWOOD, NEW JERSEY 07675

REPORT APPROVED BY: J. David Martin

MANAGER
ENVIRONMENTAL ANALYSIS DEPARTMENT

TELEDYNE ISOTOPES

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TELEDYNE ISOTOPES

INTRODUCTION

This report contains a complete tabulation of data collected during the period January to December 1982, for the operational Radiological Environmental Monitoring Program performed for the Cooper Nuclear Station (CNS) of the Nebraska Public Power District (NPPD) by Teledyne Isotopes. Samples were collected in the environs of CNS by NPPD and analyzed by the Teledyne Isotopes Laboratories in compliance with the Environmental Technical Specifications, Appendix B of the Cooper Nuclear Station Operating License.

Cooper Nuclear Station is located in Nemaha County in the southeast corner of Nebraska on the Missouri River. A portion of the site extends into Missouri. The reactor is a 778 megawatt boiling water reactor. Initial criticality was attained on February 21, 1974. The reactor reached 50% power on June 25, 1974 and 100% power on November 20, 1974.

Radiological environmental monitoring began in 1971 before the plant became operational and has continued to the present. The program monitors radiation levels in air terrestrial and aquatic environments. Samples are collected by NPPD personnel. All are shipped for analysis to a contractor's laboratory where there exists special facilities required for measurements of extremely low levels of radioactivity. From 1971 through 1976 the contractor was Teledyne Isotopes, Westwood, New Jersey. NALCO Environmental Sciences assumed responsibility for the analyses January 1, 1977. On November 1, 1978 Hazelton Environmental Sciences Corporation assumed responsibility for the program. Prior to November 1, 1978 Hazelton Environmental Sciences operated as NALCO Environmental Sciences. Teledyne Isotopes again assumed responsibility for the analyses effective January 1, 1979 through the present period, December 31, 1982.

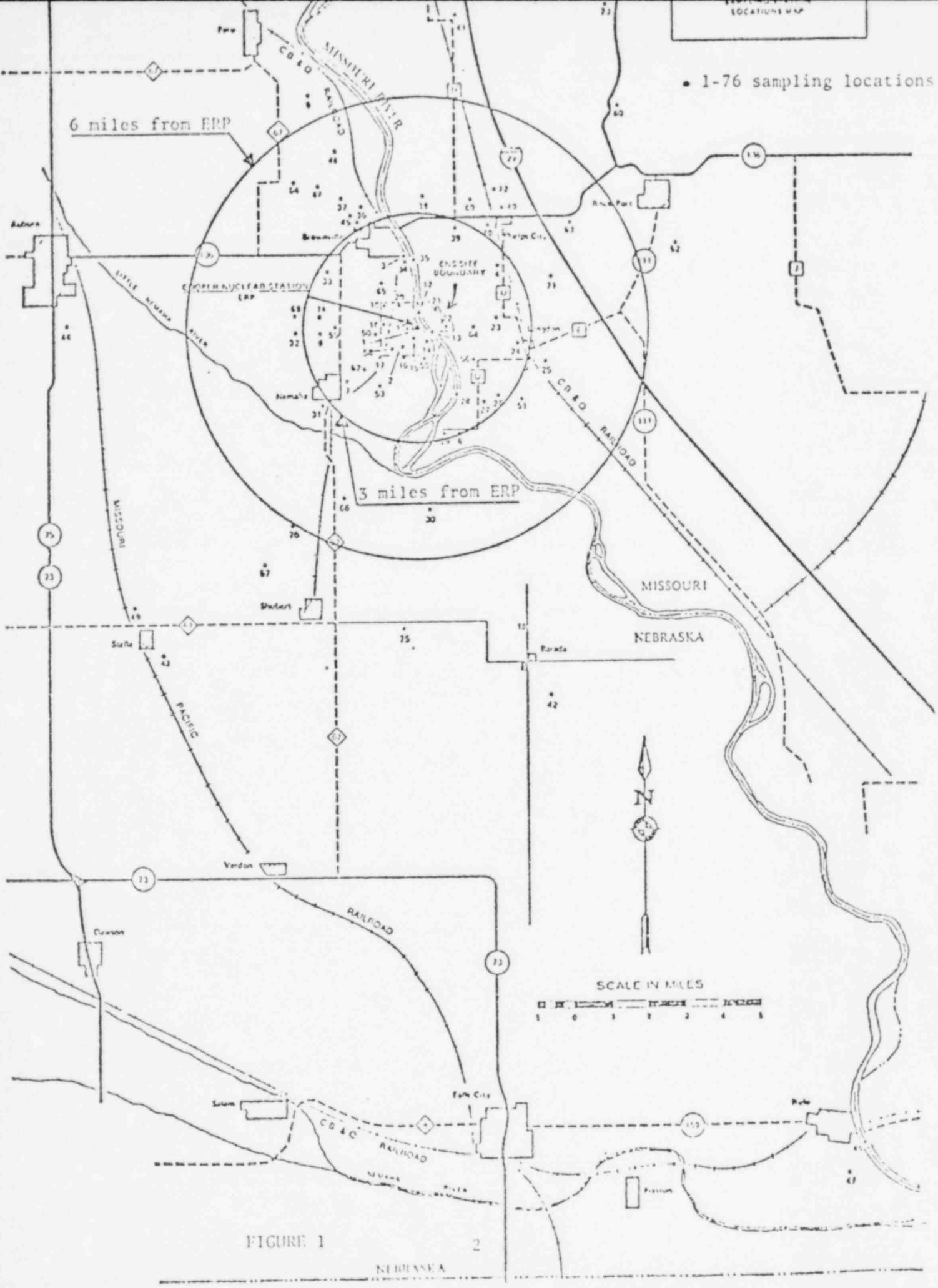
• 1-76 sampling locations
6 miles from ERP
3 miles from ERP
EXCLUSION BOUNDARY
COOPER NUCLEAR STATION ERP
MISSOURI RIVER
C B & Q RAILROAD
MISSOURI
NEBRASKA
PACIFIC RAILROAD
SCALE IN MILES
N

FIGURE 1

TELEDYNE ISOTOPES

TABLE 1

Sampling schedule and analyses, 1982, Cooper Nuclear Station

WEEKLY

Sample Type	Station Nos.	Analyses
Airborne - Particulates	1 - 10	Gross α, β Gamma spec. on quarterly composite of each station and on samples with β levels > 300 dpm
Airborne - Iodine	1 - 10	I-131
Feed and Forage - Beef Producers (peak pasture only)	64,65(a),67,68,71,76	Gamma spec. on monthly composite
Milk - Nearest Producers (peak pasture only)	61, 74	I-131 (low level) Sr-89, Sr-90 Elem. Ca Gamma spec. on monthly composite

MONTHLY

Sample Type	Station Nos.	Analyses
Feed and Forage - Beef Producers (except peak pasture season)	64,65(a),67,68,71,76	Gamma spec.
Feed and Forage - Nearest Milk Producers (peak pasture only)	61, 74	Sr-89, Sr-90 Elem. Ca Gamma spec.
River Water	12, 13, 28	Gross α - sus and dis Gross β - sus and dis Sr-89, Sr-90 Gamma spec. and tritium on quarterly composite
Milk - Nearest Producers	61, 74	I-131 (low level) Sr-89, Sr-90 Elem Ca Gamma spec.

(a) Cattle sold; station discontinued after 05/03/82.

(continued)

TABLE 1

QUARTERLY

Sample Type	Station Nos.	Analyses
Background Radiation	1 - 10, 15,18,22, 44,58,59	TLD readout
Feed and Forage - Nearest Milk Producers (except peak pasture season)	61, 74	Sr-89, Sr-90 Elem. Ca Gamma spec.
Feed and Forage Commercial Milk Producers	42, 73, 75	Sr-89, Sr-90 Elem. Ca Gamma spec.
Ground Water	11, 47	Gross α, β Gamma spec. Tritium
Milk - Commercial Producers	42, 73, 75	I-131 (low level) Sr-89, Sr-90 Elem. Ca Gamma spec.
Eggs	42, 51, 67, 76	Gross β Sr-89, Sr-90 Elem. Ca Gamma spec.

2 TIMES/YEAR

Sample Type	Station Nos.	Analyses
Fish (Summer and Fall)	28, 35	Gross β Sr-89, Sr-90 Gamma spec.
Aquatic Vegetation	12, 13, 28	Gross β Sr-89, Sr-90 Gamma spec.

ANNUALLY

Sample Type	Station Nos.	Analyses
Food and Feed Crops (at harvest)	15,18,20,27,29 38, 41	Gross β Sr-89, Sr-90 Elem. Ca Gamma spec.

(Continued)

TABLE 1

ANNUALLY

Sample Type	Station Nos.	Analyses
Garden Crops (at harvest)	34(b), 56, 62	Gross β Sr-89, Sr-90 Elem, Ca Gamma spec.
Apples (at harvest)	53, 54	Gross β Sr-89, Sr-90 Elem, Ca Gamma spec.
Rabbits (fall or early winter)	28, 35	Thyroid - I-131 Femur - Sr-89, Sr-90 Muscle - Gamma spec.

ONCE EVERY THREE YEARS

Sample Type	Station Nos.	Analyses
Soil (Sampled in 1981)	2 - 10	Sr-90 Gamma spec.

(b) No crop at station 34 for 1982.

TELEDYNE ISOTOPES

TABLE 2

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION
BROWNVILLE, NEBRASKA

DISTANCE AND DIRECTION FROM THE ELEVATED RELEASE POINT (ERP) TO THE SAMPLE STATION LOCATIONS

STATION NUMBER	DISTANCE (MILES)	DIRECTION (DEGREES)	CLASSIFICATION (a)
1	.1	225	IND
2	.75	225	IND
3	2.5	338	IND
4	3.0	43	IND
5	3.5	102	IND
6	3.0	165	IND
7	2.5	230	IND
8	2.5	260	IND
9	7.25	335	IND
10	10.0	160	IND
11	.15	225	IND
12	.1	360	CON
13	.25	120	IND
14	.5	140	PO
15	.51	180	IND
16	.75	202	NA
17	1.5	235	PO
18	.8	270	IND
19	1.0	300	PO
20	.96	315	IND
21	.6	46	PO
22	.7	95	IND
23	1.9	80	PO
24	3.0	97	PO
25	3.75	105	PO
26	3.0	130	PO
27	3.0	143	IND
28	1.8	150	IND
29	3.0	170	IND
30	5.0	178	PO
31	2.75	222	NA
32	3.4	268	PO
33	2.8	302	PO
34	2.5	333	IND
35	2.0	350	CON
36	3.6	335	PO
37	3.9	330	NA
38	4.0	360	IND
39	2.75	25	PO

TELEDYNE ISOTOPES

TABLE 2

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION
BROWNVILLE, NEBRASKA

DISTANCE AND DIRECTION FROM THE ELEVATED RELEASE POINT (ERP) TO THE SAMPLE STATION LOCATIONS

STATION NUMBER	DISTANCE (MILES)	DIRECTION (DEGREES)	CLASSIFICATION (a)
40	3.9	37	PO
41	8.4	11	IND
42	12.85	156	IND
43	11.75	217	NA
44	10.25	270	CON
45	4.0	325	NA
46	24.75	153	NA
47	25.75	154	IND
48	5.6	332	NA
49	11.4	222	NA
50	1.1	270	NA
51	4.2	125	IND
52	7.4	79	NA
53	2.0	216	IND
54	5.2	320	IND
55	1.75	270	NA
56	1.9	118	IND
57	6.6	208	NA
58	1.25	219	IND
59	1.0	189	IND
60	8.4	42	NA
61	3.5	326	IND
62	1.5	225	IND
63	5.0	56	NA
64	2.25	99	IND
65	1.1	305	NA
66	4.5	200	NA
67	4.75	325	IND
68	3.4	270	IND
69	3.5	3	NA
70	3.5	3	NA
71	4.25	71	IND
72	3.75	39	NA
73	10.0	35	IND
74	2.4	270	IND
75	9.0	180	IND
76	5.3	212	IND

(a) Classification codes: IND = indicator; CON = control; PO = pre-operational sampling site not used in 1980-1981 sampling program; NA = not active as of 1 January 1980.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - AIR PARTICULATE FILTERS
UNITS - PCI/CU. M

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-A	520	0.0020	0.0023 0.0021 - 0.0027 236/520	06 STATION 06 - 3.0 MI. 165 DEG. IND.	0.0027 020/052 0.0014 - 0.0078		0	12/28/81-12/28/82
GR-B	520	0.0030	0.027 0.018 - 0.031 519/520	05 STATION 05 - 3.5 MI. 102 DEG. IND.	0.031 052/052 0.011 - 0.11		0	12/28/81-12/28/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - CHARCOAL FILTERS
UNITS - PCI/CU. M

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
I-131	520	0.0300	LT 100. LT 60.0 -LT 100. 000/520			0	12/28/81-12/28/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - COMPOSITE AIR PARTICULATE FILTERS
UNITS - PCI/CU. M

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
BE-7	40	0.0500	0.117 0.0822 - 0.149 040/040	08 004/004 STATION 08 - 2.5 MI. 260 DEG. IND.	0.149 0.123 - 0.176		0	12/28/81-12/28/82
K-40	40	0.0600	0.0157 0.0137 - 0.0181 005/040	09 001/004 STATION 09 - 7.25 MI. 335 DEG. IND.	0.0181 0.0181 - 0.0181		0	12/28/81-12/28/82
CO-60	40	0.00500	0.00241 0.00241- 0.00241 001/040	01 001/004 STATION 01 - 0.1 MI. 225 DEG. IND.	0.00241 0.00241- 0.00241		0	12/28/81-12/28/82
I-131	40	0.00300 LT	LT 1.00 0.700 -LT 1.00 000/040				0	12/28/81-12/28/82
CS-137	40	0.00300 LT	LT 0.00100 0.00060-LT 0.00100 000/040				0	12/28/81-12/28/82
TH-228	40	0.0100	0.00319 0.00319- 0.00319 001/040	07 001/004 STATION 07 - 2.5 MI. 230 DEG. IND.	0.00319 0.00319- 0.00319		0	12/28/81-12/28/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - E G G S
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	16		0.12 0.082 - 0.20 016/016	76 004/004 STATION 76 - 5.3 MI. 212 DEG. IND.	0.20 0.051 - 0.31		0	01/18/82-10/18/82
GR-B	16	0.060	1.7 1.6 - 1.8 016/016	51 004/004 STATION 51 - 4.2 MI. 125 DEG. IND.	1.8 0.85 - 2.7		0	01/18/82-10/18/82
SR-89	16	0.0060 LT	LT 0.0060 0.0050 -LT 0.0060 000/016				0	01/18/82-10/18/82
SR-90	16	0.0060	0.0012 0.00094- 0.0016 002/016	42 001/004 STATION 42 - 12.85 MI. 156 DEG. IND.	0.0016 0.0016 - 0.0016		0	01/18/82-10/18/82
K-40	16	0.470	0.881 0.813 - 0.993 016/016	67 004/004 STATION 67 - 4.75 MI. 325 DEG. IND.	0.993 0.856 - 1.11		0	01/18/82-10/18/82
I-131	16	0.0310 LT	LT 0.0200 0.0100 -LT 0.0200 000/016				0	01/18/82-10/18/82
CS-137	16	0.0310 LT	LT 0.0100 0.00900-LT 0.0100 000/016				0	01/18/82-10/18/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FEED & FORAGE - BEEF PRODUCERS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
BE-7	76	0.310	4.91 1.14 - 8.05 037/076	67 004/014 STATION 67 - 4.75 MI. 325 DEG. IND.	8.05 2.38 - 10.6		0	01/04/82-12/07/82
K-40	76	0.470	13.2 8.32 - 16.9 076/076	64 014/014 STATION 64 - 2.25 MI. 99 DEG. IND.	16.9 4.07 - 29.6		0	01/04/82-12/07/82
I-131	76	0.0310	LT 0.600 LT 0.100 -LT 0.600 000/076				0	01/04/82-12/07/82
CS-137	76	0.0470	0.0691 0.0211 - 0.164 010/076	76 002/014 STATION 76 - 5.3 MI. 212 DEG. IND.	0.164 0.117 - 0.211		0	01/04/82-12/07/82
CE-144	76	0.160	0.550 0.426 - 0.670 003/076	64 001/014 STATION 64 - 2.25 MI. 99 DEG. IND.	0.670 0.670 - 0.670		0	01/04/82-12/07/82
RA-226	76	0.0930	1.02 1.02 - 1.02 001/076	68 001/014 STATION 68 - 3.4 MI. 270 DEG. IND.	1.02 1.02 - 1.02		0	01/04/82-12/07/82
TH-228	76	0.120	0.144 0.132 - 0.156 002/076	64 001/014 STATION 64 - 2.25 MI. 99 DEG. IND.	0.156 0.156 - 0.156		0	01/04/82-12/07/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD/GARDEN CROPS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	4		0.12 0.040 - 0.20 004/004	56 001/001 STATION 56 - 1.9 MI. 118 DEG. IND.	0.20 0.20 - 0.20		0	08/16/82-09/13/82
				62 001/001 STATION 62 - 1.5 MI. 225 DEG. IND.	0.20 0.20 - 0.20			
GR-B	4	0.030	3.6 1.8 - 5.6 004/004	56 001/001 STATION 56 - 1.9 MI. 118 DEG. IND.	5.6 5.6 - 5.6		0	08/16/82-09/13/82
SAMPLE	1 (a)	LT	LT 0.00000 0.00000-LT 0.00000 000/001				0	08/15/82-08/16/82
SR-89	4	0.0030	LT 0.0030 LT 0.0020 -LT 0.0030 000/004				0	08/15/82-09/13/82
SR-90	4	0.0030	0.0021 0.0021 - 0.0021 001/004	54 001/001 STATION 54 - 5.2 MI. 320 DEG. IND.	0.0021 0.0021 - 0.0021		0	08/15/82-09/13/82
K-40	4	0.470	1.39 1.05 - 1.75 004/004	62 001/001 STATION 62 - 1.5 MI. 225 DEG. IND.	1.75 1.75 - 1.75		0	08/16/82-09/13/82

(a) There was no sample from Station 34, there was no crop in 1982.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD/GARDEN CROPS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE FRACTION	CONTROL LOCATION MEAN X E-00 RANGE	NON-ROUTINE	REPORTING PERIOD
I-131	4	0.0310	LT 0.0200 LT [illegible]0100 -LT 0.0200 [illegible]/004				0	08/16/82-09/13/82
CS-137	4	0.0310	0.0100 LT [illegible] -LT 0.0100 [illegible]/004				0	08/16/82-09/13/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - FEED AND FORAGE - MILK PRODUCERS
UNITS - PCI/GM WET (NEAREST)

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 STATION FRACTION RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	16		3.4 1.3 - 5.4 016/016	5.4 74 005/005 1.80 11.0 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/82-10/04/82
SR-89	16	0.60	LT 0.08 LT 0.02 -LT 0.08 000/016			0	01/04/82-10/04/82
SR-90	16	0.60	0.060 0.034 - 0.086 008/016	0.086 74 005/008 0.014 0.15 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/82-10/04/82
BE-7	16	0.310	2.05 1.95 - 2.15 008/016	2.15 61 004/008 1.67 2.66 STATION 61 - 12.85 MI. 156 DEG. IND.		0	01/04/82-10/04/82
K-40	16	0.470	9.73 6.28 - 13.18 009/009	13.18 74 008/008 8.33. 27.90 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/82-10/04/82
I-131	16	0.0310	LT 0.200 LT 0.0400 -LT 0.200			0	01/04/82-10/04/82
CS-137	16	0.0470	0.0240 0.018 - 0.032 003/016	0.0240 74 003/008 0.018 0.032 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/82-10/04/82
RA-226	16	0.0930	0.512 0.364 0.660 002/016	0.512 74 002/008 0.364 0.660 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/82-10/04/82
TH-228	16	0.120	0.208 0.104 0.476 004/016	0.208 74 004/008 0.104 0.476 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/82-10/04/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - FEED AND FORAGE - MILK PRODUCERS (COMMERCIAL)
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	15		3.21 1.90 - 6.72 015/015	6.72 73 005/005 0.41 15.0 STATION 73 - 10.0 MI. 35 DEG. IND.		0	01/11/82-10/11/82
SR-89	15	0.60	LT 0.05 LT 0.009 -LT 0.05 000/015			0	01/11/82-10/11/82
SR-90	15	0.60	0.038 0.015 - 0.067 014/015	0.067 73 005/005 0.017 0.13 STATION 73 - 10.0 MI. 35 DEG. IND.		0	01/11/82-10/11/82
BE-7	15	0.310	1.3 0.72 - 1.8 010/015	1.80 42 003/005 1.94 3.09 STATION 42 - 12.85 MI. 145 DEG. IND.		0	01/11/82-10/11/82
K-40	15	0.470	8.93 5.53 - 13.61 015/015	13.61 73 005/005 3.77. 27.0 STATION 73 - 10.0 MI. 35 DEG. IND..		0	01/11/82-10/11/82
I-131	15	0.0300	LT 0.09 LT 0.0300 -LT 0.09 000/015			0	01/11/82-10/11/82
CS-137	15	0.0470	0.004 0.002 - 0.086 001/015	0.086 73 001/005 0.086 0.086 STATION 73 - 10.0 MI. 35 DEG. IND.		0	01/11/82-10/11/82
RA-226	15	0.0930	LT 0.9 LT 0.9 -LT 0.9 000/015			0	01/11/82-10/11/82
TH-228	15	0.120	LT 0.08 LT 0.030 -LT 0.080 000/015			0	01/11/82-10/11/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD AND FEED CROPS
UNITS - PCI/GM

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	8		0.53 0.014 - 1.7 008/008	38 001/001 STATION 38 - 4.0 MI. 360 DEG. IND.	1.7 1.7 - 1.7		0	09/20/82-09/20/82
GR-B	8	6.0	8.2 3.9 - 13. 008/008	38 001/001 STATION 38 - 4.0 MI. 360 DEG. IND.	13. 13. - 13.		0	09/20/82-09/20/82
SR-89	8	0.60 LT	LT 0.020 0.0030 -LT 0.020 000/008				0	09/20/82-09/20/82
SR-90	8	0.60	0.025 0.020 - 0.037 004/008	20 001/001 STATION 20 - 0.96 MI. 315 DEG. IND.	0.037 0.037 - 0.037		0	09/20/82-09/20/82
BE-7	8	1.20	0.393 0.332 - 0.449 004/008	20 001/001 STATION 20 - 0.96 MI. 315 DEG. IND.	0.449 0.449 - 0.449		0	09/20/82-09/20/82
K-40	8	0.930	3.83 1.77 - 5.88 008/008	15 001/001 STATION 15 - 0.51 MI. 180 DEG. IND.	5.88 5.88 - 5.88		0	09/20/82-09/20/82
I-131	8	0.120 LT	LT 0.0400 0.0200 -LT 0.0400 000/008				0	09/20/82-09/20/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD AND FEED CROPS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 STATION FRACTION RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	8	0.160	LT 0.0200 LT 0.00700-LT 0.0200 000/008			0	09/20/82-09/20/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - F I S H
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-B	10	0.25	5.0 4.5 - 5.5 010/010	35 005/005 STATION 35 - 2.0 MI. 350 DEG. CON.	5.5 4.9 - 7.3		0	08/02/82-11/15/82
SR-89	10	0.030	LT 0.030 LT 0.020 -LT 0.030 000/010				0	08/02/82-11/15/82
SR-90	10	0.030	0.014 0.0096 - 0.020 008/010	35 004/005 STATION 35 - 2.0 MI. 350 DEG. CON.	0.020 0.0052 - 0.034		0	08/02/82-11/15/82
K-40	10	0.470	2.28 1.89 - 2.68 010/010	35 005/005 STATION 35 - 2.0 MI. 350 DEG. CON.	2.68 2.09 - 2.98		0	08/02/82-11/15/82
I-131	10	0.0310	LT 0.0600 LT 0.0600 -LT 0.0600 000/010				0	08/02/82-11/15/82
CS-137	10	0.0310	LT 0.0100 LT 0.00900-LT 0.0100 000/010				0	08/02/82-11/15/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - MILK COMMERCIAL PRODUCERS
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	11		1.83 0.90 - 2.73 011/011	2.73 42 004/004 2.70 2.80 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/18/82-10/18/82
I-131	11	0.78	LT 0.40 LT 0.20 -LT 0.40 000/011	BY CHEMICAL SEPARATION		0	01/18/82-10/18/82
LOST (a)(b)	3		LT 0.00000 LT 0.000000-LT 0.00000 000/000			0	01/18/82-10/18/82
SR-89	11	2.0	LT 2.0 LT 2.0 -LT 2.0 000/011			0	01/18/82-10/18/82
SR-90	11	1.4	2.68 1.23 - 5.00 011/011	5.00 73 003/003 3.9 6.2 STATION 73 - 10.0 MI. 35 DEG. IND.		0	01/18/82-10/18/82
K-40	11	140.	1130. 994. - 1220. 011/011	1220. 75 004/004 1150. 1310. STATION 75 - 9.0 MI. 180 DEG. IND..			
I-131	11	0.780	LT 20.0 LT 8.0 -LT 20.0 000/011			0	01/18/82-10/18/82

(a) January 18, Station 73 - No sample available; cows dry.

(b) January 18, Station 75 - No sample available; collected 01/25.
April 19, Station 75 - Sample lost in transit; replaced 04/26.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - MILK COMMERCIAL PRODUCERS
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	11	9.00	10.0 10.0 - 10.0 001/011	10.0 42 10.0 10.0 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/18/82-10/18/82
TH-228	11	31.0	LT 10.0 LT 10.0 - LT 10.0 000/011			0	01/18/82-10/18/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - MILK NEAREST PRODUCERS
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	27		1.55 1.54 - 1.55 027/027	1.55 61 013/013 1.20 2.00 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/11/82-12/14/8
I-131	60	0.78	LT 0.50 LT 0.20 -LT 0.50 000/060			0	01/11/82-12/14/8
SR-89	27	2.0	LT 2.0 LT 2.0 -LT 2.0 000/027			0	01/11/82-12/14/8
SR-90	27	1.4	1.55 1.36 - 1.74 027/027	1.74 61 013/013 0.45 3.5 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/11/82-12/14/8
K-40	27	140.	1170. 1110. - 1230. 027/027	1230. 74 014/014 957. 1810. STATION 74 - 2.4 MI. 270 DEG. IND..		0	01/11/82-12/14/8
I-131	27	0.780	LT 50.0 LT 10.0 -LT 50.0 000/027			0	01/11/82-12/14/8
CS-137	27	9.00	LT 7.00 LT 7.00 -LT 7.00 000/027			0	01/11/82-12/14/8
TH-228	27	31.0	LT 20.0 LT 20.0 LT 20.0 000/027			0	01/11/82-12/14/8

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- WATERBORNE
SAMPLE - WATER - GROUND
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-A	8	0.80	1.8 1.8 - 1.8 001/008	1.8 11 001/004 1.8 - 1.8 STATION 11 - 0.15 MI. 225 DEG. IND.		0	01/25/82-10/25/82
GR-B	8	1.4	8.3 8.0 - 8.5 008/008	8.5 47 004/004 5.8 - 12. STATION 47 - 25.75 MI. 154 DEG. IND.		0	01/25/82-10/25/82
I-131	8	9.00	LT 20.0 LT 20.0 -LT 20.0 000/008			0	01/25/82-10/25/82
CS-137	8	9.00	LT 7.00 LT 6.00 -LT 7.00 000/008			0	01/25/82-10/25/82
H-3	8	140.	160. 130. - 200. 008/008	200. 47 004/004 150. - 320. STATION 47 - 25.75 MI. 154 DEG. IND.		0	01/25/82-10/25/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- WATERBORNE
SAMPLE - WATER - RIVER
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL - STATION 12 - 0.1 MI. 360 DEG. CO

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 STATION FRACTION RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-A DIS	36	0.80	4.5 4.4 - 4.6 006/036	4.6 13 002/012 4.4 - 4.9 STATION 13 - 0.25 MI. 120 DEG. IND.	4.4 2.6 - 8.1 003/012	0	01/12/82-12/07/82
GR-A SUS	36	0.80	7.2 5.4 - 8.1 017/036	8.1 28 008/012 1.9 - 40. STATION 28 - 1.8 MI. 150 DEG. IND.	8.0 1.2 - 19. 004/012	1	01/12/82-12/07/82
GR-B DIS	36	1.4	10. 9.7 - 10. 036/036	10. 12 012/012 4.8 - 21. STATION 12 - 0.1 MI. 360 DEG. CON.	10. 4.8 - 21. 012/012	0	01/12/82-12/07/82
GR-B SUS	36	1.4	16. 11. - 23. 033/036	23. 28 011/012 1.5 - 150. STATION 28 - 1.8 MI. 150 DEG. IND.	13. 0.91 - 65. 011/012	1	01/12/82-12/07/82
SR-89	36	1.1	LT 1.0 LT 1.0 -LT 1.0 000/036		LT 1.0 LT 0.80 -LT 1.0 000/012	0	01/12/82-12/07/82
SR-90	36	0.93	0.76 0.76 - 0.76 001/036	0.76 13 001/012 0.76 - 0.76 STATION 13 - 0.25 MI. 120 DEG. IND.	LT 0.90 LT 0.40 -LT 0.90 000/012	0	01/12/82-12/07/82
I-131	12	9.00	LT2000. LT2000. -LT2000. 000/012		LT2000. LT 80.0 -LT2000. 000/004	0	01/12/82-12/07/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- WATERBORNE
SAMPLE - WATER - RIVER
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL - STATION 12 - 0.1 MI. 360 DEG. CO

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	12	9.00	LT 7.00 LT 6.00 -LT 7.00 000/012		LT 7.00 LT 5.00 -LT 7.00 000/004	0	01/12/82-12/07/82
H-3	12	140.	180. 140. - 220. 012/012	220. 13 004/004 100. - 410. STATION 13 - 0.25 MI. 120 DEG. IND.	140. 120. - 170. 004/004	0	01/12/82-12/07/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - RABBITS ANIMALS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
I-131 THYROID	4		LT 2.0 LT 1.0 -LT 2.0 000/004	BY CHEMICAL SEPARATION			0	11/04/82-11/15/82
SR-89 FEMUR	4		LT 0.30 LT 0.30 -LT 0.30 000/004				0	11/04/82-11/15/82
SR-90 FEMUR	4		0.22 0.21 - 0.24 004/004	28 002/002 STATION 28 - 1.8 MI. 150 DEG. IND.	0.20 - 0.28	0.24	0	11/04/82-11/15/82
K-40 MUSCLE	4		2.95 2.78 - 3.12 004/004	35 002/002 STATION 35 - 2.0 MI. 350 DEG. CON.	2.26 - 3.98	3.12	0	11/04/82-11/15/82
I-131 MUSCLE	4		LT 0.400 LT 0.300 -LT 0.400 000/004				0	11/04/82-11/15/82
CS-137 MUSCLE	4		LT 0.0600 LT 0.0500 -LT 0.0600 000/004				0	11/04/82-11/15/82

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AQUATIC
SAMPLE - VEGETATION - AQUATIC
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL - STATION 12 - 0.1 MI. 360 DEG. SO

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
SAMPLE	3		LT 0.00000 LT 0.00000-LT 0.00000 000/003			LT 0.00000 LT9900. -LT 0.00000 000/001	0	10/15/82-10/15/82

NO SAMPLES OF AQUATIC VEGETATION WERE COLLECTED IN 1982; THERE WAS NO GROWTH.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - GAMMA EXPOSURE
SAMPLE - ENVIRONMENTAL TLD
UNITS - mR/YEAR

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
TLD	63 (a)	2mR	82 69 - 164 063/063	164 STATION 01 01 0.1 MI. 225 DEG. IND.		0	01/04/82-01/04/83
Exposure/year							

(a) TLD from station 18 for second quarter missing due to vandalism.

DISCUSSION, IMPACT ON THE ENVIRONMENT

AND

STATISTICAL TABLES

A and B. AIR PARTICULATE SAMPLES - GROSS BETA AND GROSS ALPHA

(See Tables A-1 - A-4, B-1 - B-4

STATIONS 01 to 10

Air particulates were collected continuously on membrane filters which were changed weekly at Stations 01 through 10. The filters were shipped to Teledyne Isotopes and analyzed for gross beta and gross alpha. They were composited for each station quarterly and monitored for gamma activity (See Tables D-1 and D-2).

The gross beta activity for each quarter of 1981 and 1982 is summarized below:

1981	First Quarter	0.130 pCi/Cu. M.
	Second Quarter	0.260 pCi/Cu. M.
	Third Quarter	0.053 pCi/Cu. M.
	Fourth Quarter	0.033 pCi/Cu. M.
1982	First Quarter	0.035 pCi/Cu. M.
	Second Quarter	0.021 pCi/Cu. M.
	Third Quarter	0.023 pCi/Cu. M.
	Fourth Quarter	0.031 pCi/Cu. M.

The level of gross beta activity has returned to normal environmental levels since the Chinese atmospheric nuclear weapons tests of October 16, 1980. The gross alpha activity (Tables B-1 through B-4) continues low and close to the limits of detection. This low gross alpha activity is probably due to alpha emitters found in soil and to cosmogenic radiation. The gross beta particulate levels in all of the stations are similar to other areas of the United States and indicate no influence from the plant.

TELEDYNE ISOTOPES

TABLE A-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FIRST QUARTER 1982
(JANUARY-MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 12/28/81-02/01/82	MONTHLY SUMMARY 02/01/82-03/01/82	MONTHLY SUMMARY 03/01/82-03/29/82	QUARTERLY SUMMARY 12/28/81-03/29/82
AIR PARTICULATE FILTERS GROSS BETA	01	2.0 ± 0.6 E-02	7.4 ± 0.3 E-03	1.7 ± 1.9 E-02	1.5 ± 1.2 E-02
	02	5.5 ± 0.9 E-02	4.1 ± 1.5 E-02	2.7 ± 1.2 E-02	4.2 ± 1.6 E-02
	03	4.1 ± 0.9 E-02	3.0 ± 1.1 E-02	1.4 ± 0.6 E-02	3.0 ± 1.4 E-02
	04	5.8 ± 0.3 E-02	3.9 ± 1.3 E-02	2.6 ± 1.0 E-02	4.2 ± 1.7 E-02
	05	6.0 ± 3.3 E-02	5.4 ± 3.4 E-02	2.4 ± 1.0 E-02	4.7 ± 3.1 E-02
	06	4.9 ± 1.1 E-02	3.4 ± 1.4 E-02	2.0 ± 0.8 E-02	3.5 ± 1.6 E-02
	07	4.8 ± 1.0 E-02	3.1 ± 1.3 E-02	1.6 ± 0.6 E-02	3.3 ± 1.7 E-02
	08	4.9 ± 1.1 E-02	3.8 ± 1.0 E-02	2.8 ± 1.1 E-02	3.9 ± 1.3 E-02
	09	3.9 ± 0.6 E-02	2.4 ± 1.0 E-02	1.2 ± 0.5 E-02	2.6 1.3 E-02
	10	4.6 ± 1.0 E-02	3.1 ± 1.5 E-02	2.0 ± 0.9 E-02	3.3 ± 1.5 E-02
AVERAGE ALL STATIONS	01-10	4.7 ± 1.7 E-02	3.3 ± 1.8 E-02	2.0 ± 1.1 E-02	3.5 ± 1.9 E-02
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE A-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
SECOND QUARTER 1932
(APRIL - JUNE)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 03/29/82-05/03/82	MONTHLY SUMMARY 05/03/82-06/01/82	MONTHLY SUMMARY 06/01/82-06/28/82	QUARTERLY SUMMAR 03/29/82-06/28/8
AIR PARTICULATE FILTERS GROSS BETA	01	3.4 ± 0.6 E-02	2.5 ± 0.9 E-02	2.6 ± 0.4 E-02	2.8 ± 0.7 E-02
	02	2.9 ± 0.6 E-02	2.1 ± 0.6 E-02	2.1 ± 0.3 E-02	2.4 ± 0.6 E-02
	03	1.2 ± 0.8 E-02	2.0 ± 0.7 E-02	1.4 ± 0.3 E-02	1.5 ± 0.7 E-02
	04	2.7 ± 0.4 E-02	2.1 ± 0.5 E-02	1.8 ± 0.5 E-02	2.3 ± 0.5 E-02
	05	2.3 ± 0.6 E-02	2.2 ± 0.7 E-02	2.2 ± 0.3 E-02	2.2 ± 0.5 E-02
	06	2.0 ± 0.7 E-02	2.0 ± 0.4 E-02	2.2 ± 0.2 E-02	2.1 ± 0.5 E-02
	07	1.7 ± 0.4 E-02	2.0 ± 0.6 E-02	2.0 ± 0.1 E-02	1.9 ± 0.4 E-02
	08	2.7 ± 0.5 E-02	2.3 ± 0.7 E-02	2.1 ± 0.3 E-02	2.4 ± 0.5 E-02
	09	1.2 ± 0.9 E-02	1.9 ± 0.8 E-02	1.4 ± 0.2 E-02	1.5 ± 0.7 E-02
	10	2.4 ± 0.6 E-02	2.3 ± 0.6 E-02	2.1 ± 0.3 E-02	2.3 ±0.5 E-02
AVERAGE ALL STATIONS	01-10	2.3 ± 0.9 E-02	2.1 ± 0.6 E-02	2.0 ± 0.4 E-02	2.1 ± 0.7 E-02
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE A-3

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
THIRD QUARTER 1982
(JULY -- SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/28/82-08/02/82	MONTHLY SUMMARY 08/02/82-08/30/82	MONTHLY SUMMARY 08/30/82-09/27/82	QUARTERLY SUMMARY 06/28/82-09/27/82
AIR PARTICULATE FILTERS GROSS BETA	01	3.2 ± 0.8 E-02	3.0 ± 1.8 E-02	2.9 ± 0.9 E-02	3.1 ± 1.1 E-02
	02	2.6 ± 0.7 E-02	2.3 ± 1.1 E-02	2.4 ± 0.5 E-02	2.4 ± 0.6 E-02
	03	2.1 ± 0.7 E-02	2.2 ± 1.0 E-02	2.7 ± 1.0 E-02	2.3 ± 0.8 E-02
	04	2.5 ± 0.6 E-02	2.6 ± 1.1 E-02	2.5 ± 1.0 E-02	2.5 ± 0.8 E-02
	05	2.3 ± 0.4 E-02	2.3 ± 1.1 E-02	2.5 ± 0.8 E-02	2.4 ± 0.7 E-02
	06	2.0 ± 0.3 E-02	1.6 ± 0.6 E-02	1.3 ± 0.6 E-02	1.6 ± 0.5 E-02
	07	2.1 ± 0.3 E-02	1.9 ± 0.9 E-02	2.0 ± 0.7 E-02	2.0 ± 0.6 E-02
	08	2.8 ± 1.1 E-02	2.2 ± 0.9 E-02	2.7 ± 1.1 E-02	2.6 ± 1.0 E-02
	09	1.2 ± 0.3 E-02	1.1 ± 0.7 E-02	1.1 ± 0.4 E-02	1.1 ± 0.4 E-02
	10	2.6 ± 0.5 E-02	2.4 ± 1.1 E-02	2.6 ± 0.9 E-02	2.5 ± 0.8 E-02
AVERAGE ALL STATIONS	01-10	2.3 ± 0.8 E-02	2.2 ± 1.1 E-02	2.2 ± 0.9 E-02	2.3 ± 0.9 E-02
	$\bar{x}$ and s				Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE A-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FOURTH QUARTER 1982
(OCTOBER-DECEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/27/82-11/01/82	MONTHLY SUMMARY 11/01/82-11/30/82	MONTHLY SUMMARY 11/30/82-12/28/82	QUARTERLY SUMMAR 09/27/82-12/28/8
AIR PARTICULATE FILTERS GROSS BETA	01	3.0 ± 0.6 E-02	3.9 ± 1.2 E-02	3.5 ± 0.5 E-02	3.4 ± 0.8 E-02
	02	2.8 ± 0.9 E-02	3.6 ± 0.7 E-02	3.1 ± 0.3 E-02	3.1 ± 0.7 E-02
	03	2.7 ± 1.0 E-02	3.8 ± 0.9 E-02	3.5 ± 0.3 E-02	3.2 ± 0.7 E-02
	04	2.9 ± 1.0 E-02	3.7 ± 0.4 E-02	3.1 ± 0.1 E-02	3.2 ± 0.7 E-02
	05	2.6 ± 0.8 E-02	3.6 ± 0.8 E-02	3.3 ± 0.3 E-02	3.1 ± 0.8 E-02
	06	3.1 ± 1.3 E-02	4.0 ± 0.8 E-02	3.5 ± 0.3 E-02	3.5 ± 1.0 E-02
	07	2.4 ± 0.8 E-02	3.1 ± 0.3 E-02	1.8 ± 0.1 E-02	2.4 ± 0.7 E-02
	08	2.8 ± 0.9 E-02	3.7 ± 0.6 E-02	3.3 ± 0.5 E-02	3.2 ± 0.7 E-02
	09	1.6 ± 0.9 E-02	3.2 ± 0.5 E-02	2.3 ± 0.1 E-02	2.3 ± 0.9 E-02
	10	2.9 ± 0.8 E-02	3.4 ± 0.5 E-02	3.0 ± 0.2 E-02	3.1 ± 0.6 E-02
AVERAGE ALL STATIONS	01-10	2.7 ± 1.0 E-02	3.6 ± 0.7 E-02	3.0 ± 0.3 E-02	3.1 ± 0.9 E-02
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE B-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FIRST QUARTER 1982
(JANUARY-MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 12/28/81-02/01/82	MONTHLY SUMMARY 02/01/82-03/01/82	MONTHLY SUMMARY 03/01/82-03/29/82	QUARTERLY SUMMARY 12/28/81-03/29/82
AIR PARTICULATE FILTERS GROSS ALPHA	01	1.7 ± 0.4 E-03	1.4 ± 0.9 E-03	1.5 ± 0.6 E-03	1.6 ± 0.7 E-03
	02	2.9 ± 1.1 E-03	1.6 ± 0.5 E-03	1.9 ± 0.4 E-03	2.2 ± 0.9 E-03
	03	2.6 ± 0.4 E-03	1.5 ± 0.6 E-03	1.5 ± 0.6 E-03	1.9 ± 0.7 E-03
	04	2.6 ± 1.3 E-03	2.5 ± 1.0 E-03	1.7 ± 0.3 E-03	2.1 ± 1.1 E-03
	05	2.9 ± 1.2 E-03	1.9 ± 1.2 E-03	2.1 ± 0.9 E-03	2.4 ± 1.1 E-03
	06	3.5 ± 1.3 E-03	1.4 ± 0.5 E-03	2.1 ± 0.7 E-03	2.4 ± 1.7 E-03
	07	2.3 ± 1.2 E-03	1.5 ± 0.5 E-03	1.6 ± 0.7 E-03	1.8 ± 0.9 E-03
	08	3.0 ± 1.5 E-03	1.6 ± 0.7 E-03	1.7 ± 0.4 E-03	2.1 ± 1.2 E-03
	09	2.2 ± 0.9 E-03	1.3 ± 0.5 E-03	1.8 ± 1.0 E-03	1.8 ± 0.9 E-03
	10	2.7 ± 1.3 E-03	1.4 ± 0.5 E-03	1.3 ± 0.3 E-03	2.1 ± 1.1 E-03
AVERAGE ALL STATIONS	01-10	2.7 ± 1.3 E-03	1.6 ± 0.7 E-03	1.8 ± 0.6 E-03	2.1 ± 1.1 E-03
	$\bar{x}$ and s				Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE B-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
SECOND QUARTER 1982
(APRIL - JUNE)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 03/29/82-05/03/82	MONTHLY SUMMARY 05/03/82-06/01/82	MONTHLY SUMMARY 06/01/82-06/28/82	QUARTERLY SUMMARY 03/29/82-06/28/82
AIR PARTICULATE FILTERS GROSS ALPHA	01	2.8 ± 0.7 E-03	2.1 ± 1.0 E-03	1.4 ± 0.5 E-03	2.1 ± 0.9 E-03
	02	2.5 ± 2.1 E-03	1.4 ± 0.5 E-03	1.5 ± 0.5 E-03	1.9 ± 1.3 E-03
	03	2.0 ± 1.0 E-03	1.4 ± 0.5 E-03	1.2 ± 0.5 E-03	1.6 ± 0.8 E-03
	04	2.6 ± 1.5 E-03	1.4 ± 0.5 E-03	1.6 ± 0.5 E-03	1.9 ± 1.1 E-03
	05	2.2 ± 1.6 E-03	1.3 ± 0.5 E-03	1.4 ± 0.5 E-03	1.6 ± 1.1 E-03
	06	2.1 ± 1.5 E-03	1.4 ± 0.5 E-03	1.2 ± 0.4 E-03	1.6 ± 1.0 E-03
	07	2.3 ± 1.2 E-03	1.5 ± 0.5 E-03	1.6 ± 0.7 E-03	1.8 ± 0.9 E-03
	08	2.0 ± 1.4 E-03	1.3 ± 0.5 E-03	1.6 ± 0.5 E-03	1.7 ± 0.9 E-03
	09	1.8 ± 0.8 E-03	1.3 ± 0.5 E-03	1.2 ± 0.5 E-03	1.4 ± 0.6 E-03
	10	3.4 ± 1.5 E-03	1.5 ± 0.6 E-03	1.3 ± 0.3 E-03	2.2 ± 1.4 E-03
AVERAGE ALL STATIONS	01-10	2.4 ± 1.3 E-03	1.4 ± 0.6 E-03	1.4 ± 0.5 E-03	1.8 ± 1.0 E-03
	$\bar{x}$ and s				Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE B-3

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
THIRD QUARTER 1982
(JULY - SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/28/82-08/22/82	MONTHLY SUMMARY 08/02/82-08/30/82	MONTHLY SUMMARY 08/30/82-09/27/82	QUARTERLY SUMMARY 06/28/82-09/27/82
AIR PARTICULATE FILTERS GROSS ALPHA	01	1.6 ± 1.0 E-03	1.8 ± 0.7 E-03	1.3 ± 0.5 E-03	1.6 ± 0.8 E-03
	02	2.1 ± 1.5 E-03	1.2 ± 0.3 E-03	1.4 ± 0.5 E-03	1.6 ± 1.0 E-03
	03	1.7 ± 0.6 E-03	1.5 ± 0.8 E-03	1.4 ± 0.5 E-03	1.6 ± 0.6 E-03
	04	2.4 ± 1.5 E-03	1.5 ± 0.8 E-03	1.4 ± 0.5 E-03	1.8 ± 1.1 E-03
	05	2.1 ± 1.2 E-03	1.2 ± 0.3 E-03	1.3 ± 0.5 E-03	1.6 ± 0.9 E-03
	06	1.5 ± 0.7 E-03	2.5 ± 2.4 E-03	1.3 ± 0.5 E-03	1.7 ± 1.4 E-03
	07	1.7 ± 0.9 E-03	1.3 ± 0.5 E-03	1.6 ± 0.7 E-03	1.6 ± 0.7 E-03
	08	1.8 ± 0.9 E-03	1.5 ± 0.6 E-03	1.5 ± 0.7 E-03	1.6 ± 0.6 E-03
	09	1.3 ± 0.6 E-03	1.2 ± 0.5 E-03	1.3 ± 0.5 E-03	1.3 ± 0.5 E-03
	10	2.0 ± 0.6 E-03	1.2 ± 0.3 E-03	2.3 ± 1.6 E-03	1.9 ± 1.0 E-03
AVERAGE ALL STATIONS	01-10	1.8 ± 1.0 E-03	1.5 ± 0.9 E-03	1.5 ± 0.7 E-03	1.6 ± 0.9 E-03
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE B-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FOURTH QUARTER 1982
(OCTOBER-SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/27/82-11/01/82	MONTHLY SUMMARY 11/01/82-11/30/82	MONTHLY SUMMARY 11/30/82-12/28/82	QUARTERLY SUMMARY 09/27/82-12/28/82
AIR PARTICULATE FILTERS GROSS ALPHA	01	1.7 ± 0.5 E-03	2.2 ± 1.3 E-03	1.5 ± 0.6 E-03	1.8 ± 0.8 E-03
	02	2.0 ± 0.6 E-03	1.6 ± 0.7 E-03	1.5 ± 0.4 E-03	1.7 ± 0.6 E-03
	03	2.0 ± 0.6 E-03	2.4 ± 0.7 E-03	1.8 ± 0.6 E-03	2.0 ± 0.6 E-03
	04	1.9 ± 0.2 E-03	2.5 ± 0.9 E-03	1.9 ± 0.3 E-03	2.1 ± 0.6 E-03
	05	1.9 ± 0.5 E-03	2.2 ± 0.9 E-03	1.6 ± 0.3 E-03	1.9 ± 0.6 E-03
	06	1.7 ± 0.5 E-03	2.3 ± 0.8 E-03	1.7 ± 0.5 E-03	1.9 ± 0.6 E-03
	07	1.7 ± 0.5 E-03	2.1 ± 0.9 E-03	1.3 ± 0.5 E-03	1.7 ± 0.7 E-03
	08	2.0 ± 0.4 E-03	1.8 ± 0.8 E-03	1.6 ± 0.7 E-03	1.8 ± 0.6 E-03
	09	1.9 ± 0.3 E-03	1.6 ± 0.5 E-03	1.7 ± 0.6 E-03	1.7 ± 0.5 E-03
	10	2.0 ± 0.3 E-03	2.0 ± 1.1 E-03	1.7 ± 0.6 E-03	1.9 ± 0.7 E-03
AVERAGE ALL STATIONS	01-10	1.9 ± 0.4 E-03	2.1 ± 0.8 E-03	1.6 ± 0.5 E-03	1.8 ± 0.6 E-03
	$\bar{x}$ and s				Grand $\bar{x}$ and s

C. AIR RADIOIODINE - CHARCOAL FILTERS (See Tables C-1 through C-4)

STATIONS 01 to 10

Charcoal filters used in series with air particulate filters were collected weekly during 1982 at station 01 through 10 and monitored for radioiodine.

Tables C-1 through C-4 show the average monthly and quarterly results for each station and for all 10 stations. No airborne I-131 was detected; all results were at or below the minimum level of detection.

Lack of any detections of I-131 supports the conclusion that no detectable radionuclides were emitted in air releases from CNS.

TELEDYNE ISOTOPES

TABLE C-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FIRST QUARTER 1982
(JANUARY MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 12/28/81-02/01/82	MONTHLY SUMMARY 02/01/82-03/01/82	MONTHLY SUMMARY 03/01/82-03/29/82	QUARTERLY SUMMARY 12/28/81-03/29/82	DET TOTAL	RANGE
CHARCOAL FILTERS I-131	01	L.T. 3. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	02	L.T. 3. E-02	L.T. 4. E-02	L.T. 3. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	03	L.T. 3. E-02	L.T. 4. E-02	L.T. 3. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	04	L.T. 3. E-02	L.T. 4. E-02	L.T. 3. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	05	L.T. 3. E-02	L.T. 3. E-02	L.T. 3. E-02	L.T. 3. E-02	0/13	--
	06	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	07	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	08	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	09	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	10	L.T. 4. E-02	L.T. 2. E-02	L.T. 2. E-02	L.T. 4. E-02	0/13	(L.T.2.-L.T.4.)E-02
	01-10	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	--	--
	DET./TOTAL	0/50	0/40	0/40	0/130	0/130	--
	RANGE	(L.T.3.-L.T.4.)E-02	(L.T.2.-L.T.4.)E-02	(L.T.2.-L.T.4.)E-02	(L.T.3.-L.T.4.)E-02	--	--

TELEDYNE ISOTOPES

TABLE C-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
SECOND QUARTER 1982
(APRIL-MAY)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 03/29/82-05/03/82	MONTHLY SUMMARY 05/03/82-06/01/82	MONTHLY SUMMARY 06/01/82-06/28/82	QUARTERLY SUMMARY 03/29/82-06/28/82	DET	TOTAL RANGE
CHARCOAL FILTERS I-131	01	L.T. 5. E-02	L.T. 3. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	02	L.T. 5. E-02	L.T. 3. E-02	L.T. 3. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	03	L.T. 5. E-02	L.T. 3. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	04	L.T. 5. E-02	L.T. 3. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	05	L.T. 3. E-02	L.T. 3. E-02	L.T. 3. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	06	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	07	L.T. 8. E-02(a)	L.T. 4. E-02	L.T. 4. E-02	L.T. 8. E-02(a)	0/13	(L.T.4.-L.T.8.)E-02
	08	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	09	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	10	L.T. 3. E-02	L.T. 2. E-02	L.T. 3. E-02	L.T. 3. E-02	0/13	(L.T.2.-L.T.3.)E-02
	01-10	L.T. 8. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 8. E-02	--	--
	DET./TOTAL	0/50	0/40	0/40	0/130	0/130	--
	RANGE	(L.T.3.-L.T.8.)E-02	(L.T.2.-L.T.4.)E-02	(L.T.3.-L.T.4.)E-02	(L.T.3.-L.T.8.)E-02	--	--

(a) High MDL at station 07 was due to low volume reading as electricity was off for 102 hours week of 04/12-04/19.

TELEDYNE ISOTOPES

TABLE C-3

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
THIRD QUARTER 1982
(JULY-SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/23/82-08/02/82	MONTHLY SUMMARY 08/02/82-08/30/82	MONTHLY SUMMARY 08/30/82-09/27/82	QUARTERLY SUMMARY 06/28/82-09/27/82	DET TOTAL	RANGE
CHARCOAL FILTERS I-131	01	L.T. 5. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	02	L.T. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	03	L.T. 5. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	04	L.T. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	05	L.T. 4. E-02	L.T. 4. E-02	L.T. 3. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	06	L.T. 5. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	07	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	08	L.T. 5. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	09	L.T. 5. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	10	L.T. 4. E-02	L.T. 4. E-02	L.T. 7. E-02(a)	L.T. 7. E-02(a)	0/13	(L.T.2.-L.T.7.)E-02
	01-02	L.T. 5. E-02	L.T. 5. E-02	L.T. 7. E-02	L.T. 7. E-02	--	--
	DET./TOTAL	0/50	0/40	0/40	0/130	0/130	--
	RANGE	(L.T.4.-L.T.5.)E-02	(L.T.4.-L.T.5.)E-02	(L.T.3.-L.T.7.)E-02	(L.T.4.-L.T.7.)E-02	--	--

(a) High MDL at station 10 was due to low volume reading as pump was off for 118.6 hours week of 09/20-09/27.

TELEDYNE ISOTOPES

TABLE C-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FOURTH QUARTER 1982
(JULY-SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/27/82-11/01/82	MONTHLY SUMMARY 11/01/82-11/30/82	MONTHLY SUMMARY 11/30/82-12/28/82	QUARTERLY SUMMARY 09/27/82-12/28/82	DET TOTAL	RANGE
CHARCOA FILTERS I-131	01	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	02	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	03	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	04	L.T. 4. E-02	L.T. 3. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	05	L.T. 3. E-02	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.2.-L.T.5.)E-02
	06	L.T. 5. E-02	L.T. 4. E-02	L.T. 6. E-02	L.T. 6. E-02	0/13	(L.T.3.-L.T.6.)E-02
	07	L.T. 4. E-02	L.T. 4. E-02	L.T. 6. E-02	L.T. 6. E-02	0/13	(L.T.3.-L.T.6.)E-02
	08	L.T. 4. E-02	L.T. 4. E-02	L.T. 6. E-02	L.T. 6. E-02	0/13	(L.T.3.-L.T.6.)E-02
	09	L.T. 4. E-02	L.T. 4. E-02	L.T. 6. E-02	L.T. 6. E-02	0/13	(L.T.3.-L.T.6.)E-02
	10	L.T. 3. E-02	L.T. 2. E-02	L.T. 3. E-02	L.T. 3. E-02	0/13	(L.T.2.-L.T.3.)E-02
	01-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 6. E-02	L.T. 6. E-02	0/130	--
	DET./TOTAL	0/50	0/40	0/40	0/130	--	--
	RANGE	(L.T.3.-L.T.5.)E-02	(L.T.2.-L.T.4.)E-02	(L.T.3.-L.T.6.)E-02	(L.T.3.-L.T.6.)E-02	--	--

D. COMPOSITE OF AIR PARTICULATE FILTERS - GAMMA

(See Tables D-1 and D-2)

STATIONS 01 to 10

Weekly Air Particulate filters were composited for each station for a quarterly gamma spectral analysis during the four quarters of 1982.

Beryllium-7, a naturally occurring cosmogenic nuclide, was detected in 40 of 40 samples at a level of 0.117 pCi per cubic meter which is the same level as in past years. There was one detection of Thorium-228 at station 07 in the first quarter of 1982. This is a natural terrestrial nuclide and the activity was below the limit of detection. Potassium-40, also a natural nuclide, was detected in 5 of 40 samples also below the limit of detection.

One detection of Co-60 occurred at station 01 during the third quarter. This sample was analyzed for a second time and the presence of Co-60 was confirmed. This is an activation product and was detected once in a trace amount so that no firm attribution to a plant release can be made.

There were no detections of I-131 in the charcoal filters in series with the air particulate filters. There was no correlation between the level of activity and the stations close to the plant. There was no indication of an effect from the operations of CNS.

TELEDYNE ISOTOPES

TABLE D-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE OF WEEKLY AIR PARTICULATE FILTERS

pCi/Cu. M.

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 12/28/81-03/29/82	2nd QUARTER 03/29/82-06/28/82	3rd QUARTER 06/28/82-09/27/82	4th QUARTER 09/27/82-12/28/82
Be-7	01-10	Mean±std.dev.	1.0 ± 0.4 E-01	1.6 ± 0.4 E-01	1.1 ± 0.3 E-01	1.1 ± 0.3 E-01
		det./total	10/10	10/10	10/10	10/10
		range	(0.4-1.7)E-01	(0.9-2.0)E-01	(0.7-1.5)E-01	(0.6-1.4)E-01
K-40	01-10	Mean±std.dev.	1.4 ± 0.6 E-02	L.T. 2. E-02	1.4 ± 0.6 E-02	2.0 ± 0.6 E-02
		det./total	1/10	0/10	3/10	1/10
		range	--	--	(0.8-1.8)E-02	--
Co-60	01-10	Mean±std.dev.	L.T. 8. E-04	L.T. 8. E-04	2.4 +-0.8 E-03(a)	L.T. 9. E-04
		det./total	0/10	0/10	1/10	0/10
		range	--	--	--	--
I-131	01-10	Mean±std.dev.	L.T. 4. E-01	L.T. 5. E-01	L.T. 1. E 00	L.T. 1. E 00
		det./total	0/10	0/10	0/10	0/10
		range	--	--	--	--
Cs-137	01-10	Mean±std.dev.	L.T. 9. E-04	L.T. 1. E-03	L.T. 9. E-04	L.T. 9. E-04
		det./total	0/10	0/10	0/10	0/10
		range	--	--	--	--
Ce-144	01-10	Mean±std.dev.	L.T. 6. E-03	L.T. 6. E-03	L.T. 2. E-03	L.T. 6. E-03
		det./total	0/10	0/10	0/10	0/10
		range	--	--	--	--
Th-228	01-10	Mean±std.dev.	3.2 +-1.1 E-03	L.T. 2. E-03	L.T. 2. E-03	L.T. 2. E-03
		det./total	1/10	0/10	0/10	0/10
		range	--	--	--	--

(a) The composite air particulate sample from station 01 was counted a second time; the positive detection of Co-60 was confirmed.

TELEDYNE ISOTOPES

TABLE D-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE OF WEEKLY AIR PARTICULATE FILTERS

pCi/Cu.M.

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 12/28/81-03/29/82	2nd QUARTER 03/29/82-06/28/82	3rd QUARTER 06/28/82-09/27/82	4th QUARTER 09/27/82-12/28/82
Be-7	01-10	1.0 ± 0.4 E-01 (10/10)	1.6 ± 0.4 E-01 (10/10)	1.1 ± 0.3 E-01 (10/10)	1.1 ± 0.3 E-01 (10/10)
K-40	01-10	1.4 ± 0.6 E-02 (1/10)	L.T. 2. E-02 (0/10)	1.4 ± 0.4 E-02 (3/10)	2.0 ± 0.6 E-02 (1/10)
Mn-54	01-10	L.T. 9. E-04 (0/10)	L.T. 9. E-04 (0/10)	L.T. 9. E-04 (0/10)	L.T. 9. E-04 (0/10)
Co-58	01-10	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)	L.T. 2. E-03 (0/10)
Fe-59	01-10	L.T. 4. E-03 (0/10)	L.T. 4. E-03 (0/10)	L.T. 5. E-03 (0/10)	L.T. 5. E-03 (0/10)
Co-60	01-10	L.T. 8. E-04 (0/10)	L.T. 8. E-04 (0/10)	2.4 ± 0.8 E-03 (1/10)(a)	L.T. 9. E-04 (0/10)
Zn-65	01-10	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)
Zr-95	01-10	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)
Ru-103	01-10	L.T. 3. E-03 (0/10)	L.T. 3. E-03 (0/10)	L.T. 3. E-03 (0/10)	L.T. 4. E-03 (0/10)
Ru-106	01-10	L.T. 9. E-03 (0/10	L.T. 9. E-03 (0/10)	L.T. 9. E-03 (0/10)	L.T. 9. E-03 (0/10)
I-131	01-10	L.T. 4. E-01 (0/10)	L.T. 5. E-01 (0/10)	L.T. 1. E 00 (0/10)	L.T. 1. E 00 (0/10)
Cs-134	01-10	L.T. 9. E-04 (0/10)	L.T. 9. E-04 (0/10)	L.T. 8. E-04 (0/10)	L.T. 9. E-04 (0/10)
Cs-137	01-10	L.T. 9. E-04 (0/10)	L.T. 1. E-03 (0/10)	L.T. 8. E-04 (0/10)	L.T. 9. E-04 (0/10)
Ba-140	01-10	L.T. 4. E-02 (0/10)	L.T. 4. E-02 (0/10)	L.T. 8. E-02 (0/10)	L.T. 6. E-02 (0/10)
Ce-141	01-10	L.T. 5. E-03 (0/10)	L.T. 6. E-03 (0/10)	L.T. 4. E-03 (0/10)	L.T. 7. E-03 (0/10)
Ce-144	01-10	L.T. 6. E-03 (0/10)	L.T. 6. E-03 (0/10)	L.T. 6. E-03 (0/10)	L.T. 6. E-03 (0/10)
RA-226	01-10	L.T. 2. E-02 (0/10)	L.T. 2. E-02 (0/10)	L.T. 2. E-02 (0/10)	L.T. 2. E-02 (0/10)
Th-228	01-10	3.2 ± 1.1 E-03 (1/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)

(a) The composite air particulate sample from Station 01 was counted a second time; the positive detection of Co-60 was confirmed.

E. EGGS (See Tables E1, E2)

STATIONS 42, 51, 67, 76

Egg samples were collected quarterly from four locations and analyzed for elemental calcium, gross beta, Sr-89, Sr-90 and gamma emitters. The gross beta measured 1.7 pCi per gram, wet, which was accounted for largely by the naturally occurring, terrestrial isotope K-40. No other gamma emitters were measured above the minimum level of detection. There were no detections of Sr-89. The level of elemental calcium in 16 samples was 0.12 mg per gram which is similar to the levels of previous years.

There were two detections of Sr-90 in 16 samples at a level of 0.0013 pCi per gram, wet, which is below the minimum level of detection and is a residue from past nuclear explosions.

There was no evidence of an effect from the operation of CNS on egg samples.

TELEDYNE ISOTOPES

TABLE E-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

EGGS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/18/82	2nd QUARTER 04/19/82	3rd QUARTER 07/19/82	4th QUARTER 10/18/82
Gross Beta	42,51,67,76	Mean±std.dev.	1.3 ± 0.4 E 00	1.3 ± 0.5 E 00	2.2 ± 0.6 E 00	2.1 ± 0.4 E 00
		det./total	4/4	4/4	4/4	4/4
		range	(0.9-1.7)E 00	(1.0-2.0)E 00	(1.3 ± 2.7)E 00	(1.8-2.7)E 00
Sr-89	42,51,67,76	Mean±std.dev.	L.T. 4. E-03	L.T. 6. E-03	L.T. 5. E-03	L.T. 6. E-03
		det./total	0/4	0/4	0/4	0/4
		range	--	--	--	--
Sr-90	42,51,67,76	Mean±std.dev.	L.T. 1. E-03	L.T. 3. E-03	1.3 ± 0.5 E-03	L.T. 4. E-03
		det./total	0/4	0/4	2/4	0/4
		range	--	--	(.9- 1.6)E-03	--
Ca (elem.) mg/gm	42,51,67,76	Mean±std.dev.	1.7 ± 1.0 E-01	1.0 ± 0.5 E-01	1.6 ± 1.2 E-01	7.7 ± 4.3 E-02
		det./total	4/4	4/4	4/4	4/4
		range	(0.8-3.1)E-01	(0.5-1.5)E-01	(0.2-3.1)E-01	(3.4-13.0)E-02
K-40	42,51,67,76	Mean±std.dev.	7.9 ± 1.6 E-01	9.4 ± 1.0 E-01	7.9 ± 1.8 E-01	1.0 ± 0.2 E 00
		det./total	4/4	4/4	4/4	4/4
		range	(6.9-10.0)E-01	(8.0-10.0)E-01	(5.3-9.4)E-01	(0.8-1.2)E 00
I-131	42,51,67,76	Mean±std.dev.	L.T. 9. E-03	L.T. 2. E-02	L.T. 1. E-02	L.T. 2. E-02
		det./total	0/4	0/4	0/4	0/4
		range	--	--	--	--
Cs-137	42,51,67,76	Mean±std.dev.	L.T. 6. E-03	L.T. 9. E-03	L.T. 1. E-02	L.T. 1. E-02
		det./total	0/4	0/4	0/4	0/4
		range	--	--	--	--

TELEDYNE ISOTOPES

TABLE E-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

EGGS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/18/82	2nd QUARTER 04/19/82	3rd QUARTER 07/19/82	4th QUARTER 10/18/82
Be-7	42,51,67,76	L.T. 5. E-02 (0/4)	L.T. 8. E-02 (0/4)	L.T. 1. E-01 (0/4)	L.T. 1. E-01 (0/4)
K-40	42,51,67,76	7.9 ± 1.0 E-01 (4/4)	9.4 ± 0.5 E-01 (4/4)	7.9 ± 1.8 E-01 (4/4)	1.0 ± 0.2 E 00 (4/4)
Mn-54	42,51,67,76	L.T. 5. E-03 (0/4)	L.T. 8. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Co-58	42,51,67,76	L.T. 5. E-03 (0/4)	L.T. 9. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Fe-59	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 2. E-02 (0/4)	L.T. 2. E-02 (0/4)	L.T. 2. E-02 (0/4)
Co-60	42,51,67,76	L.T. 6. E-03 (0/4)	L.T. 8. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Zn-65	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 2. E-02 (0/4)	L.T. 3. E-02 (0/4)	L.T. 3. E-02 (0/4)
Zr-95	42,51,67,76	L.T. 6. E-03 (0/4)	L.T. 9. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Ru-103	42,51,67,76	L.T. 6. E-03 (0/4)	L.T. 9. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Ru-106	42,51,67,76	L.T. 5. E-02 (0/4)	L.T. 8. E-02 (0/4)	L.T. 1. E-01 (0/4)	L.T. 1. E-01 (0/4)
I-131	42,51,67,76	L.T. 9. E-03 (0/4)	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/4)	L.T. 2. E-02 (0/4)
Cs-134	42,51,67,76	L.T. 7. E-03 (0/4)	L.T. 9. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Cs-137	42,51,67,76	L.T. 6. E-03 (0/4)	L.T. 9. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Ba-140	42,51,67,76	L.T. 8. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Ce-141	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 2. E-02 (0/4)	L.T. 2. E-02 (0/4)	L.T. 2. E-02 (0/4)
Ce-144	42,51,67,76	L.T. 5. E-02 (0/4)	L.T. 8. E-02 (0/4)	L.T. 1. E-01 (0/4)	L.T. 1. E-01 (0/4)
RA-226	42,51,67,76	L.T. 1. E-01 (0/4)	L.T. 2. E-01 (0/4)	L.T. 3. E-01 (0/4)	L.T. 3. E-01 (0/4)
Th-228	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 2. E-02 (0/4)	L.T. 2. E-02 (0/4)	L.T. 2. E-02 (0/4)

F. FEED AND FORAGE - BEEF PRODUCERS (See Tables F-1 and F-2)

STATIONS 64, 65, 67, 68, 71, 76

Feed and forage samples were collected monthly from beef producers at six stations and radioassayed for gamma emitters . During peak pasture season (June through September) a monthly composite was made of the weekly samples received and also measured for gamma activity. The cattle at station 65 were sold and the station discontinued. No sample was collected after May 1982. Beryllium-7, of cosmic origin, was detected in 37 of 76 samples and the terrestrial nuclide K-40 was detected in 76 of 76 samples at the levels encountered in the past.

There was one detection of radium-226 and two detections of thorium-228 in the 76 samples analyzed. These are naturally occurring terrestrial nuclides.

Ten detections of Cs-137 occurred at an average activity level of 0.0691 pCi/gm, wet. The highest number (five) occurred in the spring of the year. There were three detections of Ce-144 at a level of 0.550 pCi/gm, wet. These are fission products which occurred in other areas of the United States and are probably residual fallout from previous nuclear weapons testing. There was no indication of a plant effect on feed and forage from the operations of CNS.

TELEDYNE ISOTOPES

TABLE F-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - BEEF PRODUCERS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/04/82-03/01/82	2nd QUARTER 04/05/82-06/28/82	3rd QUARTER 07/06/82-09/27/82	4th QUARTER 10/04/82-12/07/82
Be-7	64,65,67,68, 71,76 Station 65 (a)	Mean±std.dev.	7.0 ± 5.0 E-01	3.3 ± 1.6 E 00	8.2 ± 2.7 E 00	2.0 ± 1.3 E 00
		det./total	4/21	9/19	18/18	6/18
		range	(0.2-1.2)E 00	(0.8-5.1)E 00	(2.9-13.8)E 00	(0.4-4.2)E 00
K-40	64,65,67,68, 71,76	Mean±std.dev.	1.4 ± 1.1 E 01	1.5 ± 00.9E 01	1.6 ± 0.5 E 01	5.6 ± 4.8 E 00
		det./total	21/21	19/19	18/18	18/18
		range	(0.3-4.1)E 01	(0.3-3.0)E 01	(0.9-2.8)E 01	(1.5-21.8)E 00
I-131 by chemical separation	64,65,67,68, 71,76	Mean±std.dev.	L.T. 2. E-01	L.T. 6. E-01	L.T. 6. E-01	L.T. 8. E-02
		det./total	0/21	0/19	0/18	0/18
		range	--	--	--	--
Cs-137	64,65,67,68, 71,76	Mean±std.dev.	5.0 ± 2.6 E-02	1.1 ± 0.7 E-01	7.0 ± 3.4 E-02	1.3 ± 0.7 E-02
		det./total	3/21	5/19	1/18	1/18
		range	(0.2-7.3)E-02	(0.4-2.1)E-01	--	--
Ce-144	64,65,67,68, 71,76	Mean±std.dev.	4.9 ± 0.9 E-01	6.7 ± 1.1 E-01	L.T. 5. E-01	L.T. 3. E-01
		det./total	2/21	1/19	0/18	0/18
		range	(4.3-5.6)E-01	--	--	--
Ra-226	64,65,67,68, 71,76	Mean±std.dev.	L.T. 1. E 00	1.0 ± 0.6 E 00	L.T. 1. E 00	L.T. 7. E-01
		det./ otal	0/21	1/19	0/18	0/18
		range	--	--	--	--
Th-228	64,65,67,68, 71,76	Mean±std.dev.	L.T. 1. E-01	1.3 ± 0.4 E-01	1.6 ± 0.3 E-01	L.T. 6. E-02
		det./total	0/21	1/19	1/18	0/18
		range	--	--	--	--

(a) Station 65 - Cattle sold; no samples of feed and forage received after 05/03/82.

TELEDYNE ISOTOPES

TABLE F-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - BEEF PRODUCERS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/04/82-03/01/82	2nd QUARTER 04/05/82-06/28/82	3rd QUARTER 07/06/82-09/27/82	4th QUARTER 10/04/82-12/07/82
Be-7	64,65,67,68,71,76 Station 65 (a)	7.0 ±5.0 E-01 (4/21)	3.3 ±1.6 E 00 (9/19)	8.2 ±2.7 E 00 (18/18)	2.0 ±1.3 E 00 (6/18)
K-40	64,65,67,68,71,76	1.4 ± 1.1 E 01 (21/21)	1.5 ±0.9 E 01 (19/19)	1.6 ±0.5 E 01 (18/18)	5.6 ±4.8 E 00 (18/18)
Mn-54	64,65,67,68,71,76	L.T. 7. E-02 (0/21)	L.T. 7. E-02 (0/19)	L.T. 7. E-02 (0/18)	L.T. 3. E-02 (0/18)
Co-58	64,65,67,68,71,76	L.T. 7. E-02 (0/21)	L.T. 7. E-02 (0/19)	L.T. 8. E-02 (0/18)	L.T. 3. E-02 (0/18)
Fe-59	64,65,67,68,71,76	L.T. 2. E-01 (0/21)	L.T. 2. E-01 (0/19)	L.T. 2. E-01 (0/18)	L.T. 8. E-02 (0/18)
Co-60	64,65,67,68,71,76	L.T. 7. E-02 (0/21)	L.T. 7. E-02 (0/19)	L.T. 7. E-02 (0/18)	L.T. 3. E-02 (0/18)
Zn-65	64,65,67,68,71,76	L.T. 2. E-01 (0/21)	L.T. 2. E-01 (0/19)	L.T. 1. E-01 (0/18)	L.T. 8. E-02 (0/18)
Zr-95	64,65,67,68,71,76	L.T. 8. E-02 (0/21)	L.T. 9. E-02 (0/19)	L.T. 8. E-02 (0/18)	L.T. 3. E-02 (0/18)
Ru-103	64,65,67,68,71,76	L.T. 7. E-02 (0/21)	L.T. 1. E-01 (0/21)	L.T. 9. E-02 (0/18)	L.T. 3. E-02 (0/18)
Ru-106	64,65,67,68,71,76	L.T. 6. E-01 (0/21)	L.T. 6. E-01 (0/19)	L.T. 6. E-01 (0/18)	L.T. 3. E-01 (0/18)
I-131	64,65,67,68,71,76	L.T. 2. E-01 (0/21)	L.T. 6. E-01 (0/19)	L.T. 6. E-01 (0/18)	L.T. 8. E-02 (0/18)
Cs-134	64,65,67,68,71,76	L.T. 7. E-02 (0/21)	L.T. 7. E-02 (0/19)	L.T. 7. E-02 (0/18)	L.T. 4. E-02 (0/18)
Cs-137	64,65,67,68,71,76	5.0 ± 2.6 E-02 (3/21)	1.1 ± 0.7 E-01 (5/19)	7.0 ± 3.4 E-02 (1/18)	1.3 ± 0.7 E-02 (1/18)
Ba-140	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	L.T. 3. E-01 (0/19)	L.T. 3. E-01 (0/18)	L.T. 4. E-02 (0/18)
Ce-141	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	L.T. 2. E-01 (0/19)	L.T. 2. E-01 (0/18)	L.T. 7. E-02 (0/18)
Ce-144	64,65,67,68,71,76	4.9 ± 0.9 E-01 (2/21)	6.7 ± 1.1 E-01 (1/19)	L.T. 5. E-01 (0/18)	L.T. 3. E-01 (0/18)
RA-226	64,65,67,68,71,76	L.T. 1. E 00 (0/21)	1.0 ± 0.6 E 00 (1/19)	L.T. 1. E 00 (0/18)	L.T. 7. E-01 (0/18)
Th-228	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	1.3 ± 0.4 E-01 (1/19)	1.6 ± 0.3 E-01 (1/18)	L.T. 6. E-02 (0/18)

(a) Station 65 -- cattle sold; no samples of feed and forage received after 05/03/82.

FOOD AND GARDEN CROPS (SEE TABLES G-1, G-2 and H-1, H-2)

G. STATIONS 53, 54 - APPLES

H. STATIONS 34, 56, 62 - TOMATOES AND GARDEN VEGETABLES

Garden crops and apples were radioassayed once during the year at harvest time for gross beta, Sr-89, Sr-90, elemental calcium and gamma emitters. There was no sample available from station 34; no crop was planted in 1982. Detectable concentrations of gross beta, elemental calcium and K-40 were monitored in each sample and are the naturally occurring terrestrial nuclides found in food and garden crops. The results monitored during 1982 duplicate measurements conducted during previous years.

No Sr-90 was detected in tomatoes and garden vegetables. There was one detection of Sr-90 in apples at a level of 0.0021 pCi/gm, wet at Station 54, 5.2 miles, 320 degrees. This is below the minimum level of detection and is probably due to residual fallout from past atmospheric nuclear weapons testing. There were no gamma emitters above the minimum levels of detection except K-40 as cited above. It may be concluded that there was no detectable effect on food and garden crops from the operations of CNS.

TELEDYNE ISOTOPES

TABLE G-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

APPLES

SAMPLE NUCLIDE	STATION NUMBER		3rd QUARTER 07/19/82
Gross Beta	53, 54	Mean±std.dev. det./total range	2.2 ± 0.5 E 00 2/2 (1.8-2.5) E 00
Sr-89	53, 54	Mean±std.dev. det./total range	L.T. 3. E-03 0/2 --
Sr-90	53, 54	Mean±std.dev. det./total range	2.1 ± 1.1 E-03 1/2 --
Ca (mg/gm,wet)	53, 54	Mean±std.dev. det./total range	4.5 ± 0.7 E-02 2/2 (4.0-5.0) E-02
K-40	53, 54	Mean±std.dev. det./total range	1.1 ± 0.0 E 00 2/2 --

K-40 is the only gamma emitter above the limits of detection. See Table G-2 for the list of gamma emitters monitored.

TELEDYNE ISOTOPES

TABLE G-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

APPLES

SAMPLE NUCLIDE	STATION NUMBER	3rd QUARTER 09/13/82
Be-7	53, 54	L.T. 1. E-01 (0/2)
K-40	53, 54	1.1 ± 0.0 E 00 (2/2)
Mn-54	53, 54	L.T. 1. E-02 (0/2)
Co-58	53, 54	L.T. 1. E-02 (0/2)
Fe-59	53, 54	L.T. 2. E-02 (0/2)
Co-60	53, 54	L.T. 1. E-02 (0/2)
Zn-65	53, 54	L.T. 2. E-02 (0/2)
Zr-95	53, 54	L.T. 1. E-02 (0/2)
Ru-103	53, 54	L.T. 1. E-02 (0/2)
Ru-106	53, 54	L.T. 1. E-01 (0/2)
I-131	53, 54	L.T. 2. E-02 (0/2)
Cs-134	53, 54	L.T. 1. E-02 (0/2)
Cs-137	53, 54	L.T. 1. E-02 (0/2)
Ba-140	53, 54	L.T. 2. E-02 (0/2)
Ce-141	53, 54	L.T. 2. E-02 (0/2)
Ce-144	53, 54	L.T. 1. E-01 (0/2)
RA-226	53, 54	L.T. 3. E-01 (0/2)
Th-228	53, 54	L.T. 2. E-02 (0/2)

TELEDYNE ISOTOPES

TABLE H-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

GARDEN VEGETABLES - TOMATOES

SAMPLE NUCLIDE	STATION NUMBER		3rd QUARTER 08/16/82
Gross Beta	56, 62 (a)	Mean±std.dev. det./total range	5.1 ± 0.7 E 00 2/2 (4.6-5.6) E 00
Sr-89	56, 62	Mean±std.dev. det./total range	L.T. 3. E-03 0/2 --
Sr-90	56, 62	Mean±std.dev. det./total range	L.T. 2. E-03 0/2 --
Ca (mg/gm,wet)	56, 62	Mean±std.dev. det./total range	2.0 ± 0.0 E-01 0/2 --
K-40	56, 62	Mean±std.dev. det./total range	1.8 ± 0.1 E 00 2/2 (1.7-1.8) E 00

(a) There was no sample from station 34; there was no crop in 1982.

TABLE H-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

GARDEN VEGETABLES - TOMATOES

SAMPLE NUCLIDE	STATION NUMBER	3rd QUARTER 08/16/82
Be-7	56, 62(a)	L.T. 8. E-02 (0/2)
K-40	56, 62	1.8 ± 0.1 E 00 (2/2)
Mn-54	56, 62	L.T. 9. E-03 (0/2)
Co-58	56, 62	L.T. 8. E-03 (0/2)
Fe-59	56, 62	L.T. 2. E-02 (0/2)
Co-60	56, 62	L.T. 9. E-03 (0/2)
Zn-65	56 , 62	L.T. 2. E-02 (0/2)
Zr-95	56, 62	L.T. 9. E-03 (0/2)
Ru-103	56, 62	L.T. 9. E-03 (0/2)
Ru-106	56, 62	L.T. 8. E-02 (0/2)
I-131	56, 62	L.T. 1. E-02 (0/2)
Cs-134	56, 62	L.T. 9. E-03 (0/2)
Cs-137	56, 62	L.T. 9. E-03 (0/2)
Ba-140	56, 62	L.T. 1. E-02 (0/2)
Ce-141	56, 62	L.T. 2. E-02 (0/2)
Ce-144	56, 62	L.T. 8. E-02 (0/2)
RA-226	56, 62	L.T. 2. E-01 (0/2)
Th-228	56, 62	L.T. 2. E-02 (0/2)

(a) There was no sample from station 34; there was no crop in 1982.

FEED AND FORAGE (See Tables I-1, I-2 and J-1, J-2)

I. STATIONS 61, 74 (Nearest Milk Producers)

J. STATIONS 42, 73, 75 (Commercial Milk Producers)

Feed and forage was collected from milk producers nearest the plant quarterly from two stations and monthly during peak pasture season. Feed and forage from commercial milk producers was collected quarterly from three stations. These samples were monitored for Sr-89, Sr-90, elemental calcium and gamma emitting nuclides.

There were no detections of Sr-89 and elemental calcium remained at levels seen in previous years. There were 22 detections of Sr-90 at a level of 0.046 pCi/gm, wet which is lower than that of the year 1981. Cesium-137 was detected in 4 of 31 samples at a level of 0.055 pCi/gm, wet. Both of these nuclides are fission products and are probably the result of fallout from previous nuclear atmospheric testing. Both nuclides are at a lower level than that of the year 1981.

The naturally occurring nuclide Be-7 was seen in 18 of 31 samples at a level of 1.58 pCi/gm, wet. Potassium-40 was detected in 31 of 31 samples at a level of 9.08 pCi/gm wet, the same as in previous years. Radium-226 was seen in two of 31 samples and Th-228 in four of 31 samples. These are terrestrial nuclides. There was no essential difference in the number or level of detection of the naturally occurring nuclides or of the fission fallout products between the feed and forage from the nearest producers or from the commercial producers. Thus it has been established that no nuclides which were related to CNS could be ingested by cows from feed and forage and there was no dose impact to the population.

TELEDYNE ISOTOPES

TABLE I-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - NEAREST MILK PRODUCERS

pCi/gm wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/04/82	2nd QUARTER 04/05/82-06/07/82	3rd QUARTER 07/06/82-09/07/82	4th QUARTER 10/04/82
Sr-89	61, 74	Mean±std.dev.	L.T. 3. E-02	L.T. 5. E-02	L.T. 7. E-02	L.T. 8. E-02
		det./total	0/3	0/4	0/7	0/2
		range	--	--	--	--
Sr-90	61, 74	Mean±std.dev.	1.4 ± 0.2 E-01	L.T. 2. E-02	4.3 ± 3.6 E-02	L.T. 5. E-02
		det./total	2/3	0/4	6/7	0/2
		range	(1.2-1.5)E-01	--	(0.1-11.0)E-02	--
Ca (elem.) mg/gm	61, 74	Mean±std.dev.	3.3 ± 2.4 E 00	3.7 ± 3.7 E 00	3.4 ± 3.4 E 00	2.7 ± 3.4 E 00
		det./total	3/3	4/4	7/7	2/2
		range	(0.6-5.4)E 00	(0.4-8.0)E 00	(1.6-11.9)E 00	(0.3-5.1)E 00
Be-7	61, 74	Mean±std.dev.	7.9 ± 2.3 E-01	L.T. 1. E-01	2.2 ± 0.4 E 00	L.T. 1. E-01
		det./total	1/3	0/4	7/7	0/2
		range	--	--	(1.7-2.7)E 00	--
K-40	61, 74	Mean±std.dev.	1.3 ± 0.8 E 01	6.8 ± 2.0 E 00	4.2 ± 3.0 E 00	6.7 ± 2.4 E 00
		det./total	3/3	4/4	7/7	2/2
		range	(0.6-2.2)E 01	(4.5-8.6)E 00	(0.7-8.7)E 00	(5.0-8.4)E 00

TELEDYNE ISOTOPES

TABLE I-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - NEAREST MILK PRODUCERS

pCi/gm wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/04/82	2nd QUARTER 04/05/82-06/07/82	3rd QUARTER 07/06/82-09/07/82	4th QUARTER 10/04/82
I-131	61, 74	Mean±std.dev. det./total range	L.T. 2. E-01 0/3 --	L.T. 4. E-02 0/4 --	L.T. 1. E-01 0/7 --	L.T. 2. E-02 0/2 --
Cs-137	61, 74	Mean±std.dev. det./total range	L.T. 8. E-02 0/3 --	2.5 ± 0.9 E-02 2/4 (1.8-3.2)E-02	L.T. 6. E-02 0/7 --	2.2 ± 0.5 E-02 1/2 --
Ce-144	61, 74	Mean±std.dev. det./total range	L.T. 5. E-01 0/3 --	L.T. 9. E-02 0/4 --	L.T. 3. E-01 0/7 --	L.T. 1. E-01 0/2 --
Ra-226	61, 74	Mean±std.dev. det./total range	L.T. 1. E 00 0/3 --	3.6 ± 1.6 E-01 1/4 --	L.T. 9. E-01 0/7 --	6.6 ± 0.1 E-01 1/2 --
Th-228	61, 74	Mean±std.dev. det./total range	L.T. 1. E-01 0/3 --	1.1 ± 0.0 E-01 2/4 (1.0-1.1)E-01	4.7 ± 0.8 E-01 1/7 --	1.5 ± 0.1 E-01 1/2 --

TELEDYNE ISOTOPES

TABLE I-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - NEAREST MILK PRODUCERS

pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/04/82	2nd QUARTER 04/05/82-06/07/82	3rd QUARTER 07/06/82-09/07/82	4th QUARTER 10/04/82
Be-7	61, 74	7.9 ± 2.3 E-01 (1/3)	L.T. 1. E-01 (0/4)	2.2 ± 0.4 E 00 (7/7)	L.T. 1. E-01 (0/2)
K-40	71, 74	1.3 ± 0.8 E-01 (3/3)	6.8 ± 2.0 E 00 (4/4)	4.2 ± 3.0 E 00 (7/7)	6.7 ± 2.4 E 00 (2/2)
Mn-54	61, 74	L.T. 7. E-02 (0/3)	L.T. 1. E-02 (0/4)	L.T. 5. E-02 (0/7)	L.T. 1. E-02 (0/2)
Co-58	61, 74	L.T. 7. E-02 (0/3)	L.T. 1. E-02 (0/4)	L.T. 5. E-02 (0/7)	L.T. 1. E-02 (0/2)
Fe-59	61, 74	L.T. 2. E-01 (0/3)	L.T. 3. E-02 (0/4)	L.T. 1. E-01 (0/7)	L.T. 3. E-02 (0/2)
Co-60	61, 74	L.T. 8. E-02 (0/3)	L.T. 1. E-02 (0/4)	L.T. 6. E-02 (0/7)	L.T. 1. E-02 (0/2)
Zn-65	61, 74	L.T. 2. E-01 (0/3)	L.T. 3. E-02 (0/4)	L.T. 1. E-01 (0/7)	L.T. 3. E-02 (0/2)
Zr-95	61, 74	L.T. 7. E-02 (0/3)	L.T. 1. E-02 (0/4)	L.T. 6. E-02 (0/7)	L.T. 1. E-02 (0/2)
Ru-103	61, 74	L.T. 8. E-02 (0/3)	L.T. 1. E-02 (0/4)	L.T. 5. E-02 (0/7)	L.T. 1. E-02 (0/2)
Ru-106	61, 74	L.T. 7. E-01 (0/3)	L.T. 1. E-01 (0/4)	L.T. 4. E-01 (0/7)	L.T. 1. E-01 (0/2)
I-131	61, 74	L.T. 2. E-01 (0/3)	L.T. 4. E-02 (0/4)	L.T. 1. E-01 (0/7)	L.T. 2. E-02 (0/2)
Cs-134	61, 74	L.T. 8. E-02 (0/3)	L.T. 1. E-02 (0/4)	L.T. 5. E-02 (0/7)	L.T. 1. E-02 (0/2)
Cs-137	61, 74	L.T. 8. E-02 (0/3)	2.5 ± 0.9 E-02 (2/4)	L.T. 6. E-02 (0/7)	2.2 ± 0.5 E-02 (1/2)
Ba-140	61, 74	L.T. 1. E-01 (0/3)	L.T. 3. E-02 (0/4)	L.T. 8. E-02 (0/7)	L.T. 1. E-02 (0/2)
Ce-141	61, 74	L.T. 1. E-01 (0/3)	L.T. 3. E-02 (0/4)	L.T. 8. E-02 (0/7)	L.T. 2. E-02 (0/2)
Ce-144	61, 74	L.T. 5. E-01 (0/3)	L.T. 9. E-02 (0/4)	L.T. 3. E-01 (0/7)	L.T. 1. E-01 (0/2)
RA-226	61, 74	L.T. 1. E 00 (0/3)	3.6 ± 1.6 E-01 (1/4)	L.T. 9. E-01 (0/7)	6.6 ± 0.1 E-01 (1/2)
Th-228	61, 74	L.T. 1. E-01 (0/3)	1.1 ± 0.0 E-01 (2/4)	4.7 ± 0.8 E-01 (1/7)	1.5 ± 0.1 E-01 (1/2)

TELEDYNE ISOTOPES

TABLE J-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - COMMERCIAL MILK PRODUCERS

pCi/gm wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/11/82	2nd QUARTER 04/12/82	3rd QUARTER 07/12/82	4th QUARTER 10/11/82
Sr-89	42, 73, 75	Mean±std.dev. det./total range	L.T. 3. E-02 0/4 --	L.T. 3. E-02 0/3 --	L.T. 5. E-02 0/4 --	L.T. 1. E-02 0/4 --
Sr-90	42, 73, 75	Mean±std.dev. det./total range	6.8 ± 6.0 E-02 4/4 (0.1-1.3)E-01	1.6 ± 0.3 E-02 3/3 (1.3-1.9)E-02	4.6 ± 1.6 E-02 4/4 (2.3-5.9)E-02	L.T. 0.8 E-02 3/4 (0.3-1.7)E-02
Ca (elem.) mg/gm	42, 73, 75	Mean±std.dev. det./total range	1.0 ± 0.5 E-01 4/4 (0.5-1.5)E 01	5.8 ± 7.9 E 00 3/3 (0.08-1.5) E 01	2.4 ± 0.9 E 00 4/4 (1.2-3.4)E 00	7.2 ± 3.9 E-01 4/4 (0.4-1.2)E 00
Be-7	42, 73, 75	Mean±std.dev. det./total range	1.9 ± 0.7 E-01 1/4 --	1.3 ± 0.6 E-01 1/3 --	2.4 ± 0.5 E 00 4/4 (1.9-3.1)E 00	8.7 ± 7.6 E-01 4/4 (0.1-1.9)E 00
K-40	42, 73, 75	Mean±std.dev. det./total range	1.5 ± 1.3 E 01 4/4 (.3-2.7)E 01	4.6 ± 0.8 E 00 3/3 (4.0-5.5)E 00	1.0 ± 0.2 E 01 4/4 (0.8-1.2)E 01	4.9 ± 1.8 E 00 4/4 (3.8-7.6)E 00
I-131	42, 73, 75	Mean±std.dev. det./total range	L.T. 9. E-02 0/4 --	L.T. 7. E-02 0/3 --	L.T. 7. E-02 0/4 --	L.T. 3. E-02 0/4 --
Cs-137	42, 73, 75	Mean±std.dev. det./total range	8.6 ± 4.4 E-02 1/4 --	L.T. 2. E-02 0/3 --	L.T. 4. E-02 0/4 --	L.T. 2. E-02 0/4 --
Ce-144	42, 73, 75	Mean±std.dev. det./total range	L.T. 4. E-01 0/4 --	L.T. 2. E-01 0/3 --	L.T. 3. E-01 0/4 --	L.T. 1. E-01 0/4 --

TELEDYNE ISOTOPES

TABLE J-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - COMMERCIAL MILK PRODUCERS

pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/11/82	2nd QUARTER 04/12/82	3rd QUARTER 07/12/82	4th QUARTER 10/11/82
Be-7	42, 73, 75	1.9 ± 0.7 E-01 (1/4)	1.3 +-0.6 E-01 (1/3)	2.4 ± 0.5 E 00 (4/4)	8.7 ± 7.6 E-01 (4/4)
K-40	42, 73, 75	1.5 ± 1.3 E 01 (4/4)	4.6 ± 0.8 E 00 (3/3)	1.0 ± 0.2 E 01 (4/4)	4.9 ± 1.8 E 00 (4/4)
Mn-54	42, 73, 75	L.T. 5. E-02 (0/4)	L.T. 2. E-02 (0/3)	L.T. 3. E-02 (0/4)	L.T. 2. E-02 (0/4)
Co-58	42, 73, 75	L.T. 5. E-02 (0/4)	L.T. 2. E-02 (0/3)	L.T. 4. E-02 (0/4)	L.T. 2. E-02 (0/4)
Fe-59	42, 73, 75	L.T. 2. E-02 (0/4)	L.T. 5. E-02 (0/3)	L.T. 8. E-02 (0/4)	L.T. 4. E-02 (0/4)
Co-60	42, 73, 75	L.T. 6. E-02 (0/4)	L.T. 2. E-02 (0/3)	L.T. 4. E-02 (0/4)	L.T. 2. E-02 (0/4)
Zn-65	42, 73, 75	L.T. 1. E-01 (0/4)	L.T. 5. E-02 (0/3)	L.T. 8. E-02 (0/4)	L.T. 4. E-02 (0/4)
Zr-95	42, 73, 75	L.T. 5. E-02 (0/4)	L.T. 3. E-02 (0/3)	L.T. 4. E-02 (0/4)	L.T. 2. E-02 (0/4)
Ru-103	42, 73, 75	L.T. 6. E-02 (0/4)	L.T. 3. E-02 (0/3)	L.T. 4. E-02 (0/4)	L.T. 2. E-02 (0/4)
Ru-106	42, 73, 75	L.T. 5. E-01 (0/4)	L.T. 2. E-01 (0/3)	L.T. 3. E-01 (0/4)	L.T. 2. E-01 (0/4)
I-131	42, 73, 75	L.T. 9. E-02 (0/4)	L.T. 7. E-02 (0/3)	L.T. 7. E-02 (0/4)	L.T. 3. E-02 (0/4)
Cs-134	42, 73, 75	L.T. 6. E-02 (0/4)	L.T. 2. E-02 (0/3)	L.T. 4. E-02 (0/4)	L.T. 2. E-02 (0/4)
Cs-137	42, 73, 75	8.6 ± 4.4 E-02 (1/4)	L.T. 2. E-02 (0/3)	L.T. 4. E-02 (0/4)	L.T. 2. E-02 (0/4)
Ba-140	42, 73, 75	L.T. 7. E-02 (0/4)	L.T. 4. E-02 (0/3)	L.T. 6. E-02 (0/4)	L.T. 2. E-02 (0/4)
Ce-141	42, 73, 75	L.T. 9. E-02 (0/4)	L.T. 4. E-02 (0/3)	L.T. 8. E-02 (0/4)	L.T. 3. E-02 (0/4)
Ce-144	42, 73, 75	L.T. 4. E-01 (0/4)	L.T. 2. E-01 (0/3)	L.T. 3. E-01 (0/4)	L.T. 1. E-01 (0/4)
RA-226	42, 73, 75	L.T. 9. E-01 (0/4)	L.T. 4. E-01 (0/3)	L.T. 8. E-01 (0/4)	L.T. 4. E-01 (0/4)
Th-223	42, 73, 75	L.T. 8. E-02 (0/4)	L.T. 4. E-02 (0/3)	L.T. 7. E-02 (0/4)	L.T. 3. E-02 (0/4)

K. FOOD AND FEED CROPS - CORN AND SOY BEANS

(See Tables K-1 and K-2)

STATIONS 15, 18, 20, 27, 29, 38, and 41

Food and feed crops were collected once during the year at harvest time and monitored for gross beta, Sr-89, Sr-90, elemental calcium and gamma emitters. Measurements on all of these analyses were similar in activity level and range to those measured in the previous years of 1973 - 1981.

Gross beta activity measured an average of 8.0 ± 3.4 pCi per gram, wet. This was largely due to K-40, the naturally occurring, terrestrial nuclide. Strontium-90 was detected in 4 of 8 samples at an average of 0.026 pCi/gm, wet, which is below the minimum level of detection. The elemental calcium level was similar to that of other years at 0.47 mg per gram.

From this monitoring data it may be concluded that there was no effect on food and feed crops from the operations of CNS.

TELEDYNE ISOTOPES

TABLE K-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND FEED CROPS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		3rd QUARTER 09/20/82
Gross Beta	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	8.0 ± 3.4 E 00 8/8 (3.9-13.0)E 00
Sr-89	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	L.T. 2. E-02 0/8 --
Sr-90	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	2.6 ± 0.8 E-02 4/8 (2.0-3.7) E-02
Ca (mg/gm,wet)	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	4.7 ± 6.5 E-01 8/8 (0.007-1.7E 00
K-40	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	3.6 ± 1.7 E 00 8/8 (1.8-5.9) E 00
Be-7	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	3.9 ± 0.5 E-01 4/8 (3.3-4.5) E-01

TELEDYNE ISOTOPES

TABLE K-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND FEED CROPS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	3rd QUARTER 09/20/82
Be-7	15,18,20,27,29,38,41	3.9 ± 0.5 E-01 (4/8)
K-40	15,18,20,27,29,38,41	3.6 ± 1.7 E 00 (3/8)
Mn-54	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Co-58	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Fe-59	15,18,20,27,29,38,41	L.T. 5. E-02 (0/8)
Co-60	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Zn-65	15,18,20,27,29,38,41	L.T. 5. E-02 (0/8)
Zr-95	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Ru-103	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Ru-106	15,18,20,27,29,38,41	L.T. 2. E-01 (0/8)
I-131	15,18,20,27,29,38,41	L.T. 4. E-02 (0/8)
Cs-134	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Cs-137	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Ba-140	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Ce-141	15,18,20,27,29,38,41	L.T. 4. E-02 (0/8)
Ce-144	15,18,20,27,29,38,41	L.T. 2. E-01 (0/8)
RA-226	15,18,20,27,29,38,41	L.T. 5. E-01 (0/8)
Th-228	15,18,20,27,29,38,41	L.T. 4. E-02 (0/8)

L. FISH (See Tables L-1, L-2)

STATIONS 28, 35

Fish samples were collected during the spring and fall and analyzed for gross beta, Sr-89, Sr-90 and gamma emitting isotopes. The gross beta and Sr-90 activities were similar to the levels of previous years. Strontium-90 was detected in eight of ten samples at a level of 0.014 pCi per gram wet, which is below the minimum level of detection. There were no detections of Sr-89. All of the gamma emitters were at or below the minimum level of detection except K-40, a naturally occurring isotope, which was at a level of 2.3 pCi per gram, wet, approximately the same level as in previous years.

There was no significant difference between the fish caught at station 28 downstream from the discharge point and that caught at station 35 upstream from the discharge point. Since no change has occurred in levels of activity in the isotopes monitored since 1975 it can be concluded that the operations of CNS have had no effect on fish samples.

TELEDYNE ISOTOPES

TABLE L-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FISH - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		2nd QUARTER 08/02/82	4th QUARTER 11/15/82
Gross Beta	28, 35	Mean±std.dev. det./total range	3.8 ± 1.2 E 00 5/5 (2.5-5.0)E 00	6.4 ± 1.1 E 00 5/5 (5.0-7.5)E 00
Sr-89	28, 35	Mean±std.dev. det./total range	L.T. 2. E-02 0/5 --	L.T. 3. E-02 0/5 --
Sr-90	28, 35	Mean±std.dev. det./total range	1.4 ± 1.3 E-02 5/5 (0.5-3.4)E-02	1.7 +-1.3 E-02 3/5 (0.9-3.2)E-02
K-40	28, 35	Mean±std.dev. det./total range	2.0 +-1.0 E 00 5/5 (0.4-2.9) E 00	2.6 +-0.3 E 00 5/5 (2.2-3.0)E 00

TELEDYNE ISOTOPES

TABLE L-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FISH - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	2nd QUARTER 08/02/82	4th QUARTER 11/15/82
Be-7	28, 35	L.T. 8. E-02 (0/5)	L.T. 9. E-02 (0/5)
K-40	28, 35	2.0 ± 1.0 E 00 (5/5)	2.6 ± 0.3 E 00 (5/5)
Mn-54	28, 35	L.T. 9. E-03 (0/5)	L.T. 9. E-03 (0/5)
Co-58	28, 35	L.T. 9. E-03 (0/5)	L.T. 1. E-02 (0/5)
Fe-59	28, 35	L.T. 2. E-02 (0/5)	L.T. 2. E-02 (0/5)
Co-60	28, 35	L.T. 1. E-02 (0/5)	L.T. 1. E-02 (0/5)
Zn-65	28, 35	L.T. 2. E-02 (0/5)	L.T. 2. E-02 (0/5)
Zr-95	28, 35	L.T. 1. E-02 (0/5)	L.T. 1. E-02 (0/5)
Ru-103	28, 35	L.T. 1. E-02 (0/5)	L.T. 1. E-02 (0/5)
Ru-106	28, 35	L.T. 8. E-02 (0/5)	L.T. 9. E-02 (0/5)
I-131	28, 35	L.T. 2. E-02 (0/5)	L.T. 6. E-02 (0/5)
Cs-134	28, 35	L.T. 9. E-03 (0/5)	L.T. 1. E-02 (0/5)
Cs-137	28, 35	L.T. 1. E-02 (0/5)	L.T. 1. E-02 (0/5)
Ba-140	28, 35	L.T. 1. E-02 (0/5)	L.T. 3. E-02 (0/5)
Ce-141	28, 35	L.T. 2. E-02 (0/5)	L.T. 3. E-02 (0/5)
Ce-144	28, 35	L.T. 7. E-02 (0/5)	L.T. 8. E-02 (0/5)
RA-226	28, 35	L.T. 2. E-01 (0/5)	L.T. 2. E-01 (0/5)
Th-228	28, 35	L.T. 1. E-02 (0/5)	L.T. 2. E-02 (0/5)

MILK (See Tables M-1, M-2 and N-1, N-2)

M. STATIONS 42, 73, 75 (COMMERCIAL PRODUCERS)

N. STATIONS 61, 74 (NEAREST PRODUCERS)

Milk samples from commercial producers were collected quarterly from 3 stations and monitored for I-131, Sr-89, Sr-90, elemental calcium and gamma emitters. Milk samples from nearest producers were collected from two stations monthly and monitored for I-131, Sr-89, Sr-90, elemental calcium and gamma emitters. During peak pasture season weekly samples were collected and monitored for I-131 for the nearest producers. The weekly samples were composited monthly and monitored for Sr-89, Sr-90 elemental calcium and gamma emitters. There was no milk sample collected from Station 73 during the first quarter because the cows were dry.

There were no detections of I-131 in milk from either the eleven samples from the commercial producers or the 60 samples from the nearest producers. No Sr-89 was detected in any of the milks. Strontium-90 was detected in 38 of 38 samples analyzed at an average level of 2.4 pCi per liter which is approximately the same as previous years. The elemental calcium levels remained stable as compared with other years. Naturally occurring K-40 remained at the same levels as previous years. There were no other detections of gamma emitting nuclides except for one detection of Cs-137 during the second quarter at station 42, a commercial producer. This was at a level of 10.0 pCi per liter, which is slightly above the minimum level of detection. This was probably the result of fallout from previous atmospheric nuclear tests and was observed in other areas of the United States.

Thus we conclude that the operations of CNS had no effect on the milk from commercial nor from nearest producers and thus no dose impact on the population.

TELEDYNE ISOTOPES

TABLE M-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK - pCi/liter

COMMERCIAL PRODUCERS

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/18/82-01/25/82	2nd QUARTER 04/19/82-04/26/82	3rd QUARTER 07/19/82	4th QUARTER 10/18/82
Sr-89	42,73,75	Mean±std.dev. det./total range	L.T. 2. E 00 0/2(a) --	L.T. 2. E 00 0/3(b) --	L.T. 2. E 00 0/3 --	L.T. 2. E 00 0/3 --
Sr-90	42,73,75	Mean±std.dev. det./total range	2.3 ± 0.2 E 00 2/2 (2.1-2.4)E 00	2.7 ± 1.1 E 00 3/3 (1.8-2.5)E 00	3.4 ± 1.3 E 00 3/3 (2.5-4.9)E 00	3.1.± 2.9 E 00 3/3 (0.5-6.9)E 00
I-131 (by chemical separation)	42,73,75	Mean±std.dev. det./total range	L.T. 4. E-01 0/2 --	L.T. 3. E-01 0/3 --	L.T. 3. E-01 0/3 --	L.T. 2. E-01 0/3 --
Ca(mg/liter)	42,73,75	Mean±std.dev. det./total range	1.9 ± 0.1 E 00 2/2 (1.8-1.9))E 00	1.5 ± 0.6 E 00 3/3 (0.9-1.9)E 00	1.2 ± 0.1 E 00 3/3 (1.2-1.3)E 00	2.7 ± 0.1 E 00 3/3 (2.7-2.8)E 00
K-40	42,73,75	Mean±std.dev. det./total range	1.1 ± 0.1 E 03 2/2 (1.1-1.2)E 03	1.1 ± 0.2 E 03 3/3 (0.8-1.3)E 03	1.1 ± 0.1 E 03 3/3 (1.1-1.2)E 03	1.2 ± 0.2 E 03 3/3 (1.0-1.4)E 03
Cs-137	42,73,75	Mean±std.dev. det./total range	L.T. 8. E 00 0/2 --	1.0 +-0.6 E 01 1/3 --	L.T. 7. E 00 0/3 --	L.T. 9. E 00 0/3 --

(a) Sample not available at Station 73; cows dry. (b) Sample from Station 75 of 4/19 lost in transit; replaced 4/26.

TELEDYNE ISOTOPES

TABLE M-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK - pCi/liter

COMMERCIAL PRODUCERS

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/18/82-01/25/82	2nd QUARTER 04/19/82-04/26/82	3rd QUARTER 07/19/82	4th QUARTER 10/18/82
Be-7	42,73,75	L.T. 6. E 01 (0/2)	L.T. 6. E 01 (0/3)	L.T. 5. E 01 (0/3)	L.T. 7. E 01 (0/3)
K-40	42,73,75	1.1 ± 0.1 E 03 (2/2)	1.1 ± 0.2 E 03 (3/3)	1.1 ± 0.1 E 03 (3/3)	1.2 ± 0.2 E 03 (3/3)
Mn-54	42,73,75	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 8. E 00 (0/3)
Co-58	42,73,75	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)
Fe-59	42,73,75	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 2. E 01 (0/3)
Co-60	42,73,75	L.T. 7. E 00 (0/2)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)
Zn-65	42,73,75	L.T. 1. E 01 (0/2)	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 2. E 01 (0/3)
Zr-95	42,73,75	L.T. 7. E 00 (0/2)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)
Ru-103	42,73,75	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)
Ru-106	42,73,75	L.T. 6. E 01 (0/2)	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)
I-131	42,73,75	L.T. 1. E 01 (0/2)	L.T. 2. E 01 (0/3)	L.T. 9. E 00 (0/3)	L.T. 8. E 00 (0/3)
Cs-134	42,73,75	L.T. 7. E 00 (0/2)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 8. E 00 (0/3)
Cs-137	42,73,75	L.T. 8. E 00 (0/2)	1.0 ± 0.6 E 01 (1/3)	L.T. 7. E 00 (0/3)	L.T. 9. E 00 (0/3)
Ba-140	42,73,75	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/3)	L.T. 7. E 00 (0/3)	L.T. 1. E 01 (0/3)
Ce-141	42,73,75	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)
Ce-144	42,73,75	L.T. 6. E 01 (0/2)	L.T. 5. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 7. E 01 (0/3)
RA-226	42,73,75	L.T. 1. E 02 (0/2)	L.T. 1. E 02 (0/3)	L.T. 1. E 02 (0/3)	L.T. 2. E 02 (0/3)
Th-228	42,73,75	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)

TELEDYNE ISOTOPES

TABLE N-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK - pCi/liter

NEAREST PRODUCERS

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/11/82-03/08/82	2nd QUARTER 04/12/82-06/28/82	3rd QUARTER 07/07/82-09/27/82	4th QUARTER 10/05/82-12/14/82
Sr-89	61, 74	Mean±std.dev.	L.T. 2. E 00	L.T. 2. E 00	L.T. 2. E 00	L.T. 2. E 00
		det./total	0/7	0/7	0/6	0/7
		range	--	--	--	--
Sr-90	61, 74	Mean±std.dev.	1.3 ± 0.6 E 00	1.6 ± 0.5 E 00	1.3 ± 0.9 E 00	1.9 ± 0.8 E 00
		det./total	7/7	7/7	6/6	7/7
		range	(0.6-2.3)E 00	(1.1-2.3)E 00	(0.5-2.5)E 00	(1.2-3.5)E 00
I-131 by chemical separation	61, 74	Mean±std.dev.	L.T. 2. E-01	L.T. 4. E-01	L.T. 5. E-01	L.T. 3. E-01
		det./total	0/7	0/15	0/31	0/7
		range	--	--	--	--
Ca(mg/liter)	61, 74	Mean±std.dev.	1.3 ± 0.2 E 00	1.8 ± 0.3 E 00	1.5 ± 0.2 E 00	1.5 ± 0.3 E 00
		det./total	7/7	7/7	6/6	7/7
		range	(1.1-1.7)E 00	(1.3-2.0)E 00	(1.4-1.8)E 00	(1.4-2.0)E 00
K-40	61, 74	Mean±std.dev.	1.2 ± 0.3 E 03	1.2 ± 0.1 E 03	1.1 ± 0.2 E 03	1.2 ± 0.1 E 03
		det./total	7/7	7/7	6/6	7/7
		range	(1.0-1.8)E 03	(1.1-1.3)E 03	(1.0-1.5)E 03	(1.0-1.3)E 03

TELEDYNE ISOTOPES

TABLE N-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK - pCi/liter

NEAREST PRODUCERS

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/11/82-03/08/82	2nd QUARTER 04/12/82-06/28/82	3rd QUARTER 07/07/82-09/27/82	4th QUARTER 10/05/82-12/14/82
Be-7	61, 74	L.T. 5. E 01 (0/7)	L.T. 5. E 01 (0/7)	L.T. 8. E 01 (0/6)	L.T. 6. E 01 (0/7)
K-40	61, 74	1.2 ± 0.3 E 03 (7/7)	1.2 ± 0.1 E 03 (7/7)	1.1 ± 0.2 E 03 (6/6)	1.2.± 0.1 E 03 (7/7)
Mn-54	61, 74	L.T. 6. E 00 (0/7)	L.T. 6. E 00 (0/7)	L.T. 7. E 00 (0/6)	L.T. 7. E 00 (0/7)
Co-58	61, 74	L.T. 6. E 00 (0/7)	L.T. 6. E 00 (0/7)	L.T. 8. E 00 (0/6)	L.T. 7. E 00 (0/7)
Fe-59	61, 74	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/7)	L.T. 2. E 01 (0/6)	L.T. 2. E 01 (0/7)
Co-60	61, 74	L.T. 6. E 00 (0/7)	L.T. 6. E 00 (0/7)	L.T. 7. E 00 (0/6)	L.T. 6. E 00 (0/7)
Zn-65	61, 74	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/7)	L.T. 2. E 01 (0/6)	L.T. 2. E 01 (0/7)
Zr-95	61, 74	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/7)	L.T. 8. E 00 (0/6)	L.T. 7. E 00 (0/7)
Ru-103	61, 74	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/7)	L.T. 1. E 01 (0/6)	L.T. 7. E 00 (0/7)
Ru-106	61, 74	L.T. 6. E 01 (0/7)	L.T. 6. E 01 (0/7)	L.T. 6. E 01 (0/6)	L.T. 6. E 01 (0/7)
I-131	61, 74	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/7)	L.T. 5. E 01 (0/6)	L.T. 1.5 E 01 (0/7)
Cs-134	61, 74	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/6)	L.T. 8. E 00 (0/7)
Cs-137	61, 74	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/6)	L.T. 7. E 00 (0/7)
Ba-140	61, 74	L.T. 1. E 01 (0/7)	L.T. 9. E 00 (0/7)	L.T. 2. E 01 (0/6)	L.T. 1. E 01 (0/7)
Ce-141	61, 74	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/7)	L.T. 2. E 01 (0/6)	L.T. 1.5 E 01 (0/7)
Ce-144	61, 74	L.T. 6. E 01 (0/7)	L.T. 6. E 01 (0/7)	L.T. 6. E 01 (0/6)	L.T. 6. E 01 (0/7)
RA-226	61, 74	L.T. 2. E 02 (0/7)	L.T. 2. E 02 (0/7)	L.T. 2. E 02 (0/6)	L.T. 2. E 02 (0/7)
Th-228	61, 74	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/6)	L.T. 1. E 01 (0/7)

O. GROUNDWATER (See Tables O-1 and O-2)

STATIONS 11, 47

Groundwater was collected from two stations quarterly and analyzed for gross beta and gross alpha activity, for tritium and for gamma emitting radionuclides. Station 11 is 0.15 miles from the plant and station 47 is 25.75 miles from, the plant. There was one gross alpha detection at station 11 of 1.8 pCi/liter in the second quarter of 1982. The gross beta activity averaged 8.3 pCi/liter which is statistically the same as in past years. There were no detections of gamma emitters above the minimum level of detection. The tritium level averaged 160 pCi/liter for the year which is the normal environmental level.

There was no difference in levels of beta activity or tritium for the station close to the plant as compared with the more distant station. It may be concluded that there is no impact from the operations of CNS on the environment as shown by measurements of radionuclides in groundwater.

TELEDYNE ISOTOPES

TABLE 0-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - WATERBORNE

GROUND WATER - pCi/ℓ

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/25/82	2nd QUARTER 04/26/82	3rd QUARTER 07/26/82	4th QUARTER 10/25/82
Gross Alpha	11, 47	Mean±std.dev. det./total range	L.T. 4. E 00 0/2 --	1.8 ± 1.3 E 00 1/2 --	L.T. 3. E 00 0/2 --	L.T. 4. E 00 0/2 --
Gross Beta	11, 47	Mean±std.dev. det./total range	9.5 ± 0.3 E 00 2/2 (9.3-9.7)E 00	6.8 ± 1.4 E 00 2/2 (5.8-7.8)E 00	7.2 ± 0.6 E 00 2/2 (6.7-7.6)E 00	9.8 ± 3.1 E 00 2/2 (7.2-12.0)E 00
H-3	11, 47	Mean±std.dev. det./total range	2.7 ± 0.7 E 02 2/2 (2.2-3.2)E 02	1.4 ± 0.6 E 02 2/2 (1.0-1.8)E 02	1.3 ± 0.4 E 02 2/2 (1.0-1.6)E 02	1.3 ± 0.4 E 02 2/2 (1.0-1.5)E 02

Eighteen gamma emitters were monitored on a Ge(Li) spectrometer. All were below the limits of detection and are listed on Table 0-2.

TELEDYNE ISOTOPES

TABLE O-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - WATERBORNE

GROUNDWATER - pCi/ℓ

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/25/82	2nd QUARTER 04/26/82	3rd QUARTER 07/26/82	4th QUARTER 10/25/82
Be-7	11, 47	L.T. 5. E 01 (0/2)	L.T. 5. E 01 (0/2)	L.T. 4. E 01 (0/2)	L.T. 6. E 01 (0/2)
K-40	11, 47	L.T. 2. E 02 (0/2)	L.T. 1. E 02 (0/2)	L.T. 1. E 02 (0/2)	L.T. 1.7 E 02 (0/2)
Mn-54	11, 47	L.T. 5. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 6. E 00 (0/2)
Co-58	11, 47	L.T. 5. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 4. E 00 (0/2)	L.T. 6. E 00 (0/2)
Fe-59	11, 47	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 9. E 00 (0/2)	L.T. 1. E 01 (0/2)
Co-60	11, 47	L.T. 5. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 6. E 00 (0/2)
Zn-65	11, 47	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)
Zr-95	11, 47	L.T. 6. E 00 (0/2)	L.T. 6. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 7. E 00 (0/2)
Ru-103	11, 47	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/4)	L.T. 5. E 00 (0/2)	L.T. 7. E 00 (0/2)
Ru-106	11, 47	L.T. 5. E 01 (0/2)	L.T. 5. E 01 (0/2)	L.T. 4. E 01 (0/2)	L.T. 5. E 01 (0/2)
I-131	11, 47	L.T. 9. E 00 (0/2)	L.T. 2. E 01 (0/2)	L.T. 8. E 00 (0/2)	L.T. 2. E 01 (0/2)
Cs-134	11, 47	L.T. 6. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 7. E 00 (0/2)
Cs-137	11, 47	L.T. 6. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 7. E 00 (0/2)
Ba-140	11, 47	L.T. 7. E 00 (0/2)	L.T. 1. E 01 (0/2)	L.T. 7. E 00 (0/2)	L.T. 1. E 01 (0/2)
Ce-141	11, 47	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 2. E 01 (0/2)
Ce-144	11, 47	L.T. 5. E 01 (0/2)	L.T. 4. E 01 (0/2)	L.T. 4. E 01 (0/2)	L.T. 6. E 01 (0/2)
RA-226	11, 47	L.T. 1. E 02 (0/2)	L.T. 1. E 02 (0/2)	L.T. 1. E 02 (0/2)	L.T. 1. E 02 (0/2)
Th-228	11, 47	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 9. E 00 (0/2)	L.T. 1. E 01 (0/2)

P. RIVER WATER (See Table P-1 and P-2)

STATIONS 12,13,28

River water was collected monthly and monitored for gross beta and gross alpha, suspended and dissolved, Sr-89 and Sr-90. A quarterly composite was measured for gamma emitters and tritium.

There were no detections of gamma emitters above the minimum level of detection. No Sr-89 was detected.

There was one detection of Sr-90 at station 13 in the second quarter at 0.76 pCi/liter which is below the minimum level of detection. This was probably caused by the flood conditions in the spring or it may have been an anomaly since no further detections occurred. The gross alpha and gross beta suspended and dissolved were higher than in the previous year. The yearly average was increased by the high readings in the spring due to flooding conditions. This is further supported by the increase in gross alpha and gross beta, suspended particules, due to the turbulence.

The yearly averages are as follows:

	1982 Average pCi/liter	1981 Average per/liter
Gross Alpha (dissolved)	4.5	2.9
Gross Alpha (suspended)	7.2	2.7
Gross Beta (dissolved)	10.0	9.5
Gross Beta (suspended)	16.0	3.9

This was due to naturally occurring nuclides and is not associated with the operations of CNS. By the last quarter of 1982 readings had returned to normal environmental levels.

These measurements indicate that the river water samples monitored during 1982 contained no detectable CNS plant radionuclides. Additional verification of no detectable releases is the low range of H-3 activity which was from 100 to 410 pCi/liter.

TELEDYNE ISOTOPES

TABLE P-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - Waterborne

River Water - pCi/ℓ

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/12/82-03/09/82	2nd QUARTER 04/18/82-06/23/82	3rd QUARTER 07/27/82-09/08/82	4th QUARTER 10/04/82-12/07/82
Gross Alpha (dissolved)	12, 13, 28	Mean±std.dev. det./total range	3.5 ± 1.3 E 00 2/9 (2.6-4.4)E 00	5.1 ± 2.3 E 00 4/9 (2.6-8.1)E 00	L.T. 4. E 00 0/9 --	L.T. 1. E 00 0/9 --
Gross Alpha (suspended)	12, 13, 28	Mean±std.dev. det./total range	L.T. 4. E 00 0/9 --	11.2 ± 12.9 E 00 8/9 (1.9-40.0)E-00	2.1 ± 0.6 E 00 5/9 (1.2-2.8)E 00	6.1 ± 2.4 E 00 4/9 (3.7-9.0)E 00
Gross Beta (dissolved)	12, 13, 28	Mean±std.dev. det./total range	10.0 ± 0.2 E 00 9/9 (0.7-1.2)E 01	13.0 ± 4.6 E 00 9/9 (8.0-21.0)E 00	9.0 ± 3.0 E 00 9/9 (0.5-14.0)E 00	8.2 ± 2.0 E 00 9/9 (4.8-11.0)E 00
Gross Beta (suspended)	12, 13, 28	Mean±std.dev. det./total range	4.3 ± 3.6 E 00 6/9 (0.8-8.9)E 00	39. ± 45. E 00 9/9 (9.7-150.0)E 00	6.1 ± 3.3 E 00 9/9 (2.1-11.0)E 00	11.2 ± 3.0 E 00 9/9 (7.4-15.0)E 00
Sr-89	12, 13, 28	Mean±std.dev. det./total range	L.T. 1. E 00 0/9 --	L.T. 1. E 00 0/9 --	L.T. 1. E 00 0/9 --	L.T. 1. E 00 0/9 --
Sr-90	12, 13, 28	Mean±std.dev. det./total range	L.T. 9. E-01 0/9 --	7.6 ± 4.8 E-01 1/9 --	L.T. 9. E-01 0/9 --	L.T. 9. E-01 0/9 --
H-3	12, 13, 28 (a)	Mean±std.dev. det./total range	2.6 ± 1.4 E 02 3/3 (1.3-3.1)E 02	1.2.± 0.3 E 02 3/3 (1.0-1.5)E 02	1.7 ± 0.1 E 02 3/3 (1.7-1.8)E 02	2.0 ± 0.3 E 02 3/3 (1.7-2.3)E 02

(a) Tritium analysis is performed on the quarterly composite of all stations only.

TELEDYNE ISOTOPES

TABLE P-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - WATERBORNE

RIVER WATER - pCi/liter

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/12/82-03/09/82	2nd QUARTER 04/18/82-06/23/82	3rd QUARTER 07/27/82-09/08/82	4th QUARTER 10/04/82-12/07/82
Be-7	12, 13, 28(a)	L.T. 8. E 01 (0/3)	L.T. 9. E 01 (0/3)	L.T. 8. E 01 (0/3)	L.T. 1. E 02 (0/3)
K-40	12, 13, 28	L.T. 1. E 02 (0/3)	L.T. 2. E 02 (0/3)	L.T. 2. E 02 (0/3)	L.T. 1. E 02 (0/3)
Mn-54	12, 13, 28	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 6. E 00 (0/3)
Co-58	12, 13, 28	L.T. 8. E 00 (0/3)	L.T. 9. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 1. E 01 (0/3)
Fe-59	12, 13, 28	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 3. E 01 (0/3)
Co-60	12, 13, 28	L.T. 6. E 00 (0/3)	L.T. 1. E 01 (0/3)	L.T. 6. E 00 (0/3)	L.T. 6. E 00 (0/3)
Zn-65	12, 13, 28	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)
Zr-95	12, 13, 28	L.T. 9. E 00 (0/3)	L.T. 1. E 01 (0/3)	L.T. 9. E 00 (0/3)	L.T. 1. E 01 (0/3)
Ru-103	12, 13, 28	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 2. E 01 (0/3)
Ru-106	12, 13, 28	L.T. 5. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)
I-131	12, 13, 28	L.T. 1. E 02 (0/3)	L.T. 2. E 02 (0/3)	L.T. 8. E 01 (0/3)	L.T. 2. E 03 (0/3)
Cs-134	12, 13, 28	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)
Cs-137	12, 13, 28	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)
Ba-140	12, 13, 28	L.T. 4. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 3. E 01 (0/3)	L.T. 2. E 02 (0/3)
Ce-141	12, 13, 28	L.T. 2. E 01 (0/3)	L.T. 3. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 4. E 01 (0/3)
Ce-144	12, 13, 28	L.T. 5. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)
RA-226	12, 13, 28	L.T. 1. E 02 (0/3)	L.T. 1. E 02 (0/3)	L.T. 2. E 02 (0/3)	L.T. 1. E 02 (0/3)
Th-228	12, 13, 28	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)

(a) The eighteen gamma emitters were monitored on the quarterly composite only.

Q. ANIMALS - RABBITS (See Tables Q-1 and Q-2)

STATION 28 and 35

Rabbit samples were collected from stations 28 and 35 in the fall of 1982. The femur was analyzed for Sr-89 and Sr-90, the thyroid gland for I-131 and the muscle for gamma emitters. Strontium 90 was detected in four of four samples analyzed at a level of 0.22 pCi/gm, wet, which is similar to the levels of previous years. Iodine-131 analyses of the thyroid gland conducted by the chemical separation method were below the minimum level of detection. There were no gamma emitters detected except for naturally occurring K-40 which was at the same level as in the previous years from 1977 through 1981. Cesium-137 was below the lower limit of detection.

The results of the monitoring of rabbit samples indicate that no nuclear plant effects resulting from the operations of CNS were detectable in animal life.

TELEDYNE ISOTOPES

TABLE Q-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

RABBIT - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		4th QUARTER 11/04/82-11/15/82
Sr-89 (femur)	28, 35	Mean±std.dev. det./total range	L.T. 3. E-01 0/4 --
Sr-90 (femur)	28, 35	Mean±std.dev. det./total range	2.3 ± 0.6 E-01 4/4 (1.6-2.8) E-01
I-131 (throid by chemical separation)	28, 35	Mean±std.dev. det./total range	L.T. 2. E 00 0/4 --
K-40 (flesh)	28, 35	Mean±std.dev. det./total range	3.0 ± 0.7 E 00 4/4 (2.3-4.0) E 00
Cs-137 (flesh)	28, 35	Mean±std.dev. det./total range	L.T. 6. E-02 0/4 --

TELEDYNE ISOTOPES

TABLE Q-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

RABBIT - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	4th QUARTER 11/04/82-11/15/82
Be-7	28, 35	L.T. 6. E-01 (0/4)
K-40	28, 35	3.0 ± 0.7 E 00 (4/4)
Mn-54	28, 35	L.T. 6. E-02 (0/4)
Co-58	28, 35	L.T. 6. E-02 (0/4)
Fe-59	28, 35	L.T. 2. E-01 (0/4)
Co-60	28, 35	L.T. 6. E-02 (0/4)
Zn-65	28, 35	L.T. 2. E-01 (0/4)
Zr-95	28, 35	L.T. 7. E-02 (0/4)
Ru-103	28, 35	L.T. 8. E-02 (0/4)
Ru-106	28, 35	L.T. 6. E-01 (0/4)
I-131	28, 35	L.T. 4. E-01 (0/4)
Cs-134	28, 35	L.T. 6. E-02 (0/4)
Cs-137	28, 35	L.T. 6. E-02 (0/4)
Ba-140	28, 35	L.T. 2. E-01 (0/4)
Ce-141	28, 35	L.T. 2. E-01 (0/4)
Ce-144	28, 35	L.T. 5. E-01 (0/4)
RA-226	28, 35	L.T. 1. E 00 (0/4)
Th-228	28, 35	L.T. 1. E-01 (0/4)

R. AQUATIC VEGETATION

STATION 12, 13, 28

No samples were collected during 1982. There was no growth at any of the stations because of spring flooding conditions and dry summer weather prohibiting growth. The absence of sufficient growth was observed on numerous visits to these stations.

TELEDYNE ISOTOPES

TABLE R-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION/AQUATIC pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER	2nd QUARTER	3rd QUARTER	4th QUARTER
	12, 13, 28	No aquatic vegetation was collected in 1982. Fluctuating water levels and excessive turbidity prevented its establishment. The absence of sufficient growth was observed on numerous visits to these stations. Scheduled to be collected two times per year.			

S. SOIL

STATIONS 2,3,4,5,6,7,8,9,10

Soil samples, which must be analyzed every three years for Strontium-90 and gamma emitters, were collected and analyzed in 1981.

Soil samples will be collected and analyzed in 1984.

T. AMBIENT RADIATION - THERMOLUMINESCENT DOSIMETERS (TLDs - SEE TABLE T-1)

STATIONS 01-10,15,18,22,44,58,59

Ambient radiation was monitored at 16 locations within a 10 mile radius of CNS and collected quarterly. The quarterly averages of ambient net gamma radiation ranged from 18.9 ± 6.1 milliRoentgen/quarter (91 days) to 22.5 ± 6.5 milliRoentgen/quarter. The highest exposure during each of the four quarters was at station 01 (0.1 mile, 225 degrees) and averaged 37.1 ± 2.1 mR/quarter. The lowest exposure was at station 03 (2.5 miles, 338 degrees) and averaged 17.2 ± 0.5 mR/quarter.

The radiation at station 44, which is the control station, was similar to that at the other stations.

These exposures were considerably below the 125 millirems per quarter specified in 10 CFR 20.105 for an unrestricted area. The relationship between milliRoentgen (mR) and millirems (mr) is approximately one for the exposure conditions encountered. No plant effect from CNS was indicated.

TELEDYNE ISOTOPES

TABLE T-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AMBIENT GAMMA RADIATION: TLD

milliRoentgen/Quarter

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/04/82-04/01/82	2nd QUARTER 04/01/82-06/29/82	3rd QUARTER 06/29/82-10/01/82	4th QUARTER 10/01/82-01/04/83
TLD Gamma	01	41.8 ± 1.0	33.6 ± 0.6	41.9 ± 0.6	46.3 ± 1.5
	02	16.7 ± 0.7	19.1 ± 1.1	19.4 ± 1.1	20.0 ± 0.4
	03	16.0 ± 0.5	17.0 ± 0.2	17.3 ± 0.7	18.6 ± 0.5
	04	16.5 ± 0.5	18.2 ± 0.7	18.5 ± 0.3	19.6 ± 0.4
	05	18.0 ± 0.4	17.7 ± 0.6	18.6 ± 1.6	20.0 ± 0.2
	06	17.4 ± 0.4 (a)	18.2 ± 0.6	18.7 ± 0.5	20.3 ± 0.3
	07	17.0 ± 0.4	17.9 ± 0.4	18.6 ± 0.6	19.7 ± 0.3
	08	17.8 ± 0.3	17.4 ± 1.2	18.7 ± 0.3	21.1 ± 0.3
	09	17.0 ± 0.5	17.9 ± 0.5	18.9 ± 0.3	20.0 ± 0.3
	10	17.8 ± 0.3	17.9 ± 0.9	19.4 ± 0.3	20.1 ± 0.6
	15	17.6 ± 0.6	19.3 ± 0.5	20.1 ± 0.5	22.4 ± 0.3
	18	17.6 ± 0.3	(b)	19.7 ± 0.6	21.3 ± 0.3
	22	18.2 ± 0.5	18.9 ± 0.4	20.2 ± 0.9	21.8 ± 0.2
	44	17.2 ± 0.7	21.1 ± 0.8	21.4 ± 0.7	23.7 ± 0.4
	58	18.5 ± 0.5	19.9 ± 0.7	20.8 ± 0.6	22.3 ± 0.4
	59	17.7 ± 0.3	19.4 ± 0.7	20.2 ± 0.3	23.1 ± 0.2
Average/Quarter		18.9 ± 6.1 mR/87 Days	19.6 ± 4.0 mR/89 days	20.8 ± 5.7 mR/94 days	22.5 ± 6.5 mR/95 days
Average/Day		0.22 ± 0.07 mR/day	0.22 ± 0.05 mR/day	0.22 ± 0.06 mR/day	0.24 ± 0.07 mR/day
Range		(16.0-41.8) mR/87 days	(17.0-33.6) mR/89 days	(17.3-41.9) mR/94 days	(18.6-46.3) mR/95 day
Det./Total		16/16	15/15 (b)	16/16	16/16

(a) Average of areas 1,3 and 4. Using the criterion that, if the value of one area is outside the range of 3 std. dev. from the average of the other 3 areas, then that area will be excluded from the final average determination.

(b) Dosimeter missing for the second quarter due to vandalism.

Nebraska Public Power District

Cooper Nuclear Station

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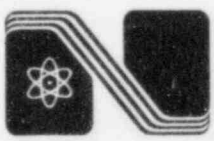

Prepared by

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