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Carolina Power & Light Company Raleigh, N. C. 27602 E. E. Utley	6-29-73	7-5-73	X			

TO:	ORIG	CC	OTHER	
Mr. Schemel	3 signed			SENT AEC PDR X SENT LOCAL PDR X

CLASS	UNCLASS	PROP INFO	INPUT	NO CYS REC'D	DOCKET NO:
	XX			40	50-261

DESCRIPTION:
Ltr re our 6-5-73 ltr & their 4-24- & 5-1-73 ltrs.....furnishing info re the uncontrolled releases of radioactive liquids....W/Attached Fig 1 & 2 ....& Tables 1 & 2.

ENCLOSURES:

ACKNOWLEDGED
Do Not Remove

PLANT NAME: H. B. Robinson Unit No. 2

FOR ACTION/INFORMATION 7-6-73 AB

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(1)(2)(9)-NATIONAL LAB'S
1-R.Schoonmaker,OC,GT,D-323
1-R. CATLIN, E-256-GT
1-CONSULTANT'S NEWMARK/BLUME/AGBABIAN
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1-PDR-SAN/LA/NY
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BROOKHAVEN NAT. LAB
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1-RD..MULLER..F-309 GT

Regulatory File Cope

CP&L

Carolina Power & Light Company

June 29, 1973

NG 5212

NG-73-142

Mr. Robert J. Schemel, Chief
Operating Reactors Branch #1
Directorate of Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

H. B. ROBINSON UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23

Dear Mr. Schemel:

Your letter of June 5, 1973 requested additional information to assist you in your evaluation of uncontrolled releases of radioactive liquids as reported by our letters of April 24, 1973, and May 1, 1973. The additional information requested was included as Attachment A to your letter and the following is submitted in direct response to that request.

Item 1. For the April 10 abnormal occurrence, provide a schematic diagram of the system in which the leak occurred and of related systems. Identify on the schematic diagram: design pressures, the valve which leaked, the safety injection pump which was running, the spectacle flange and any other flanges of interest. Describe the need for: interconnection of the systems involved, the spectacle flange and any similar or related flanges, and pressure relief valves and appropriate routing of their effluents.

Response: Figure 1 gives a schematic representation of the system in question. As shown, the design pressure of the safety injection system is 1500 psig up to the spectacle flange with the design pressure of the spent fuel clean-up system being 150 psig. Safety Injection Pump A was running at the time of the incident with leakage occurring at valve 802C and the 3/4 inch vent valve.

The interconnection of the systems is necessary for purification of the reactor cavity water during refueling to maintain clarity and purity. This purification is accomplished by circulating the water through the spent fuel pit demineralizer and back to the reactor cavity through the safety injection line. The connection of the systems also provides an alternate make-up charging path to the reactor cavity.

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The purpose of the spectacle flange is to act as a protective device to prevent overpressurization of the low pressure piping downstream of the flange. This would occur if the isolation valve (897G) leaked during operation of the safety injection pumps. No other flanges or relief valves are installed in the low pressure piping. This protection was not provided in the design of the plant as it was not anticipated that a test involving operation of the safety injection pumps would be required while the plant was in a refueling shutdown condition. A request for a change to the Technical Specifications to gain relief from such testing requirements has been requested.

The overpressurization causing the leakage was the result of the spectacle flange being in the open position, which is its normal orientation during refueling shutdown. The refueling period is the only time during which the flange would normally require such positioning.

Item 2. For spaces containing the systems above, describe in detail: their drainage, the location and volume of sumps, sump level sensors and alarms, and the divide between areas which drain to onsite and offsite sumps.

Response: Leakage from the 3/4 inch vent valve flowed to the floor drain in that area and subsequently to the auxiliary building sump tank (375 gal. capacity). Leakage from valve 802C flowed to the floor drain in that area and then to the fuel handling building sump tank (375 gal. capacity), however, some of the water in this area overflowed a concrete sill at the door. Each of these sumps are serviced by two 20 gpm sump pumps which transfer the water to the waste hold-up tank. Both sump tanks have the following controls and alarms which annunciate on the WDSBR panel and on the RTGB:

a.	High level alarm	72%
b.	Start 2nd pump	58%
c.	Start 1st pump	47%
d.	Stop 2nd pump	30%
e.	Stop 1st pump	20%
f.	Low level alarm	13%

The divide between areas which drain to onsite and offsite sumps is shown on Figure 1.

Item 3. For the abnormal occurrences of April 10 and 23, identify in detail the path of the effluent from the source of leakage to Black Creek. Indicate the points at which the effluent crossed restricted area boundaries, the fence line, and the site boundary. Identify the points at which dilution occurred and how the amount of dilution was estimated. Estimate the fraction of MPC (10 CFR Part 20, Appendix B, Table II, Column 2) at each point. Provide the results of soil samples taken from the effluent path.

Response: The April 10 incident occurred in the spent fuel pool heat exchanger area. Water spilled into this area, overflowed a concrete sill at the door on the north side of the area and flowed into drain CB202B (Figure 2). Overflow from the refueling water storage tank on April 23 flowed directly into drain CB230A. From there the water flowed through drain piping to drain CB202B, which is the point where the water from the April 10 incident entered the drainage system. In both incidents the leakage was directed underground to the drainage ditch south of the facility passing drains CB203, CB204, CB7, CB8, CB9, CB14, CB15 and CB226.

Figure 3 identifies the point at which the drain pipe enters the drainage ditch. From this point flow was down the drainage ditch approximately 300 feet in a southerly direction and then east for some 100 feet. At this point flow was again underground passing beneath the plant access road and picnic area. The flow then emerged east of the picnic area and continued along the drainage ditch almost due east for about 600 feet and into Black Creek (Figure 4).

Physically the drainage ditch west of the plant access road has the native appearance of a natural stream. After emerging east of the picnic area the drainage cascades down a concrete ramp and through a concrete trough to Black Creek.

As shown in Figure 3, the immediate area surrounding the plant is enclosed with a fence for access control purposes. The releases in question crossed this fenced area underground prior to flowing into the drainage ditch.

The plant restricted area is defined as that area delineated by a radius of 1400 feet from the containment building and is synonymous with the plant exclusion area boundary. In addition the release of radioactive liquids to an unrestricted area is defined as that point prior to dilution in a natural body of water. Under both definitions the concentration at which the effluent crossed the restricted area boundary is the concentration in the drainage ditch prior to dilution in Black Creek.

The site boundary follows State Road 23 on the west side of Black Creek and then in a northerly direction after crossing Black Creek as shown in Figure 4. Accordingly, the point at which the effluents crossed the site boundary was at the bridge where State Road 23 crosses Black Creek.

Dilution first occurred at drain CB202B which receives some natural surface drainage from north of the area. As the effluents flowed into successive drains more dilution was acquired from drain lines from Units 1 and 2 and from natural drainage. The first large dilution occurred upon entry of the effluents into the drainage ditch. At this point a significant amount of water flow normally exists. This flow results from drainage of a large area west and northwest of the plant and from another plant drainage system which drains the west and southern plant and yard areas.

Dilution flow in the drainage ditch was determined at a point immediately downstream of the effluent entry. An area of the ditch twelve feet in length was marked off and the water depth measured at several points. The average depth was determined to be 3.5 inches. Stream width in the marked area was measured at several locations with an average width being 44 inches, giving a cross-sectional area of 1.08 sq. ft. A small float was then released upstream of the first marker and was timed with a stop watch to determine the time required to traverse the marked section. The average time required to traverse this area was 8.5 seconds giving a linear flow rate of 1.4 feet/second. From this data the flow in the drainage ditch was calculated to be 1.51 ft^3/sec. or 680 gal/min. These measurements were made on April 11, 1973 at about 1245. It was repeated again on April 24, 1973 at about 0800. These measurements showed the width and depth to be the same as was measured on April 11, however, the time measurements were about 1 second faster indicating a somewhat higher flow in the ditch. The flow of 680 gal/min. obtained on April 11 was, however, used to calculate dilution for the April 23 release.

Black Creek flow is continuously monitored and recorded in the plant control room. The flow on April 10 at the time of the release was 655 ft^3/sec. or 296,000 gal/min. The large flow at this time was the result of lowering the impoundment level. This flow was erroneously reported as 262 ft^3/sec. in our report of this incident due to reading the flow rate from the charts for April 11 instead of for April 10 when the release occurred. Black Creek flow at the time of the incident on April 23 was 260 ft^3/sec.

From the above flow rates the 24-hour dilution volume was calculated to be 3.71×10^9 milliliters in the drainage ditch for both incidents. The 24-hour dilution flow in Black Creek for the April 10 and April 23 incidents was calculated to be 1.60×10^{12} and 6.36×10^{11} milliliters, respectively.

Concentrations at the point of release, the point where effluents crossed the restricted area boundary (in the drainage ditch), and the site boundary (in Black Creek) and the fraction of MPC at these points for the releases of April 10 and April 23 are shown in Tables 1 and 2, respectively.

A soil sample was collected from the drainage ditch downstream of where the releases entered. This sample was sent to a commercial laboratory for analysis. Tentative results from this sample are as follows:

gross beta	7.0	pCi/gm
gross alpha	3.8	pCi/gm
Ce-144	775	pCi/gm
Ru-106	201	pCi/gm
Cs-137	64	pCi/gm
Zr-Nb-95	64	pCi/gm

Soil samples are now routinely collected from this drainage ditch as a part of our radiological environmental monitoring program, however, no additional analyses are available at this time.

Item 4. Identify all other tanks and systems which would release radioactive liquid from the site in the event of overflow or leakage.

Response: Figure 2 shows the location of all tanks which are located outside the plant buildings that could potentially contain radioactive material. These tanks include the primary water storage tank (PWST), the chemical and volume control system monitor tanks "A" and "B" (MT), and the refueling water storage tank (RWST).

The PWST containes deaerated, demineralized water which is free of radioactivity. The MT's receive effluents from the distillate of the boric acid evaporator, however, the overflow lines from these tanks are routed to the auxiliary building sump tank. The only tank with the potential for overflowing and releasing radioactive liquid from the site is the RWST which contains water from the refueling cavity.

Item 5. For the tanks and systems above, describe possible modifications which would direct all radioactive liquid overflows to the radioactive liquid waste system and all radioactive liquid spills to sumps of appropriate capacity onsite.

Response: A plant modification has been initiated to route the overflow from the RWST to the radioactive waste system in the plant. This modification should be completed within 30 days.

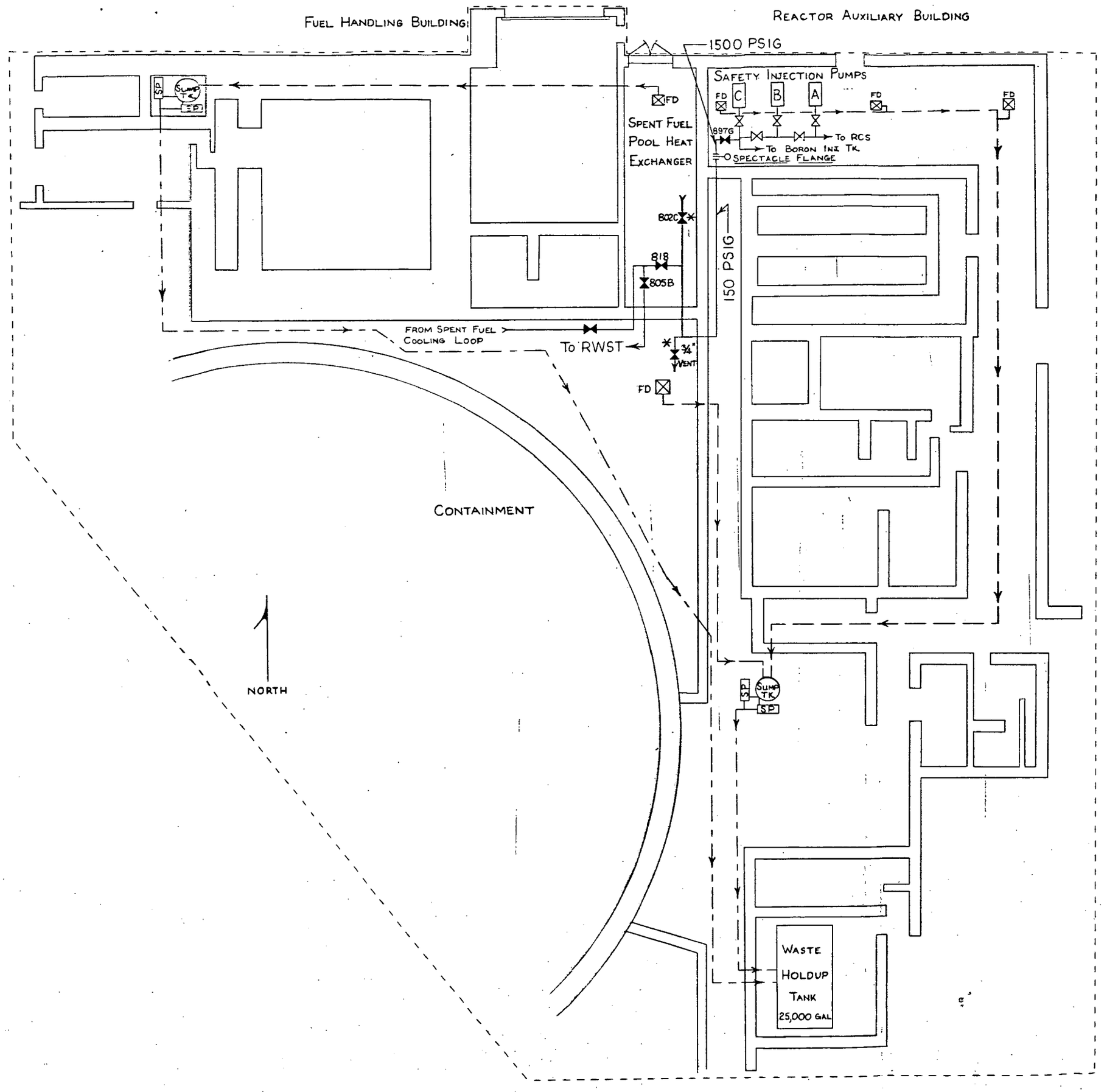
An investigation is in progress to determine the feasibility of modifying the doorways of the auxiliary building such that spills inside the building would be more positively contained. A survey of all other systems has been made and no potentially hazardous conditions have been found.

We trust that the above information is sufficient to enable you to complete your evaluation of our reports concerning these incidents.

Yours very truly,

E. E. Utley
Vice President
Bulk Power Supply

BHW:lw



LEGEND

- * VALVES WHICH LEAKED
- NORMALLY OPEN VALVE
- NORMALLY CLOSED VALVED
- FD FLOOR DRAIN
- FLOOR DRAIN LINE
- SP SUMP PUMP
- SUMP PUMP DISCH. LINE
- DIVIDE BETWEEN ONSITE AND OFFSITE DRAINAGE. AREAS OUTSIDE DIVIDE DRAIN OFFSITE.

FIGURE 1

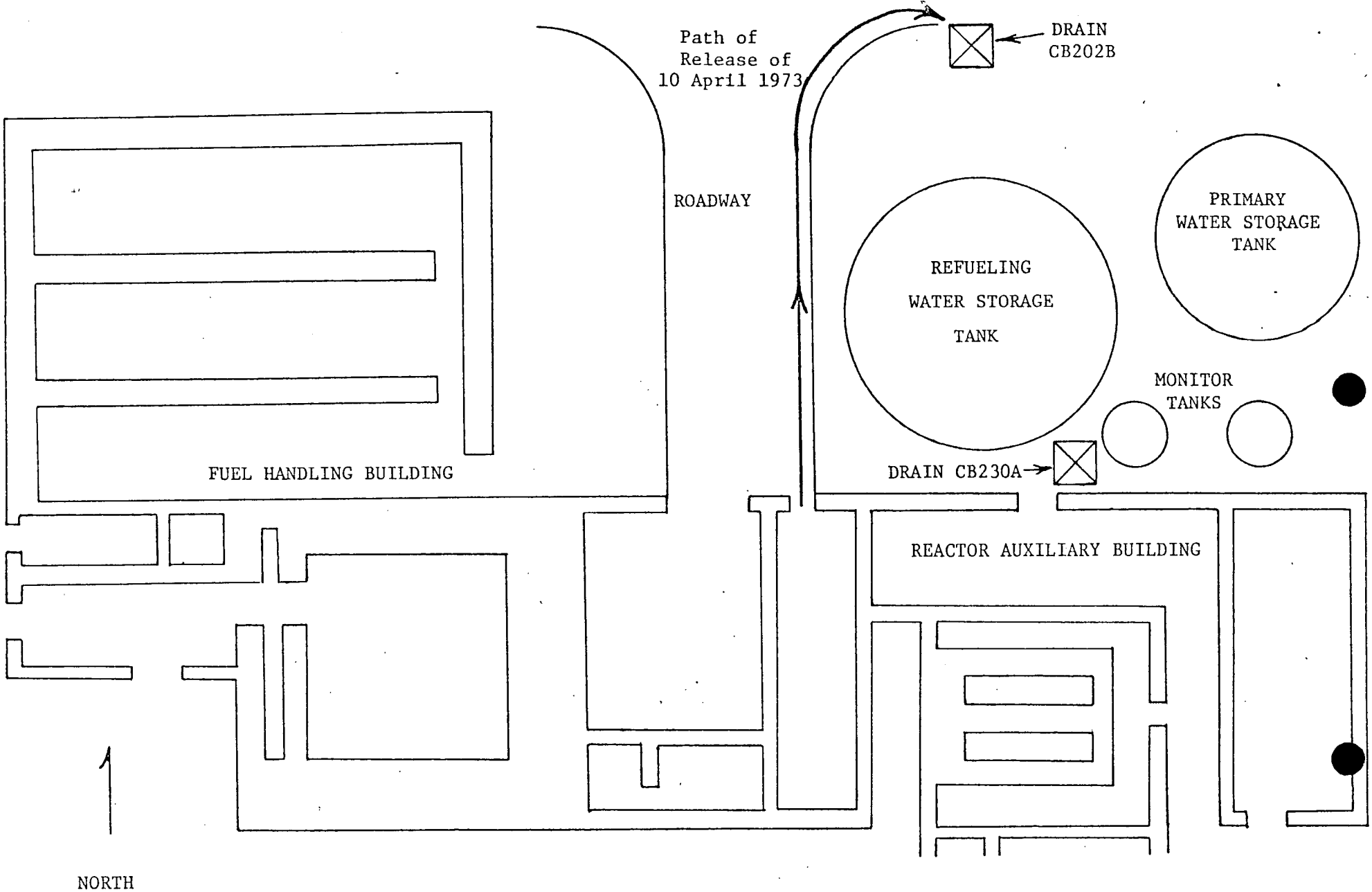

Path of
Release of
10 April 1973
DRAIN
CB202B
ROADWAY
PRIMARY
WATER STORAGE
TANK
REFUELING
WATER STORAGE
TANK
MONITOR
TANKS
DRAIN CB230A
FUEL HANDLING BUILDING
REACTOR AUXILIARY BUILDING
NORTH

FIGURE 2

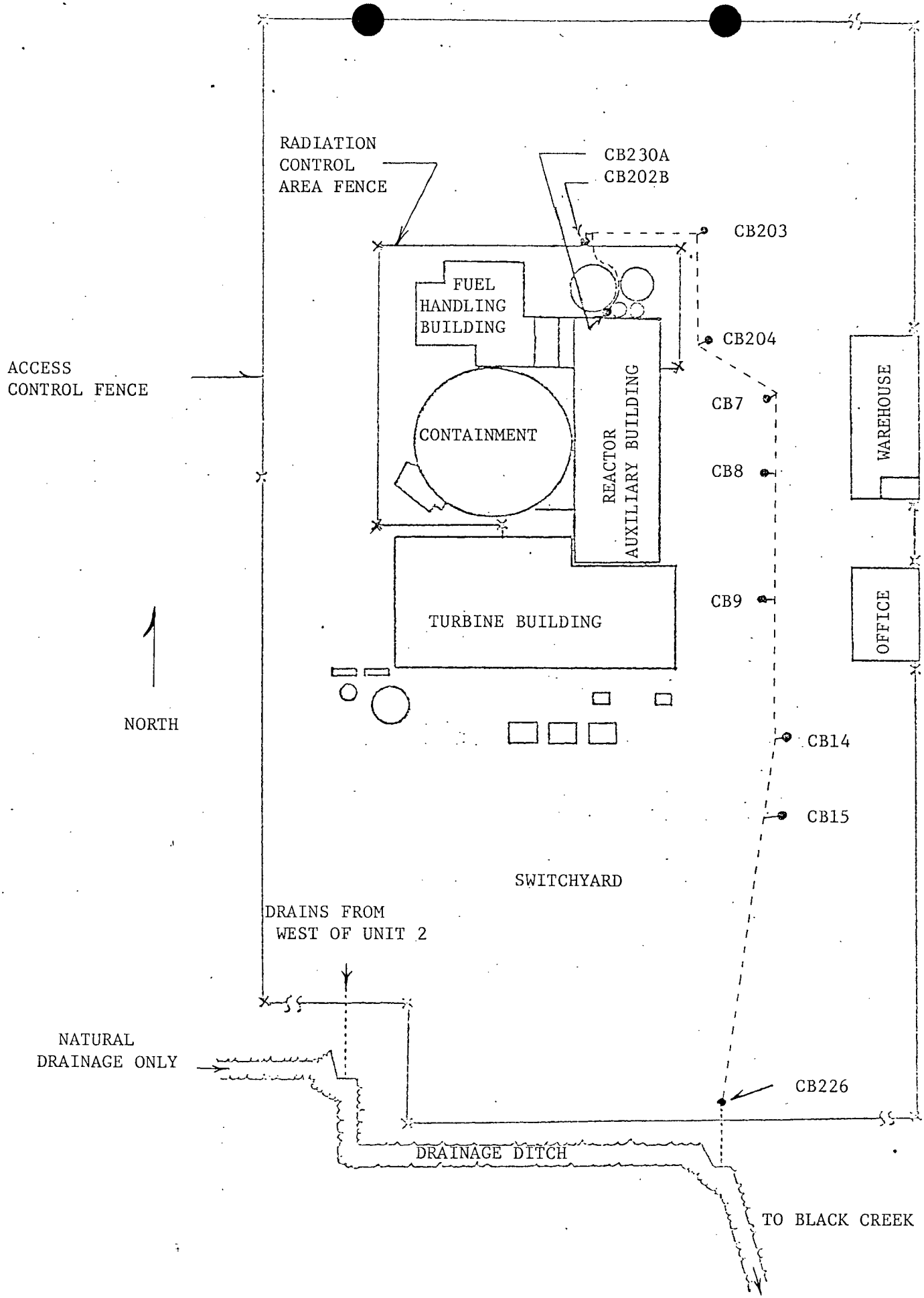

RADIATION
CONTROL
AREA FENCE
CB230A
CB202B
CB203
FUEL
HANDLING
BUILDING
CB204
ACCESS
CONTROL FENCE
CB7
CONTAINMENT
REACTOR
AUXILIARY BUILDING
WAREHOUSE
CB8
CB9
TURBINE BUILDING
OFFICE
NORTH
CB14
CB15
SWITCHYARD
DRAINS FROM
WEST OF UNIT 2
NATURAL
DRAINAGE ONLY
CB226
DRAINAGE DITCH
TO BLACK CREEK

FIGURE 3

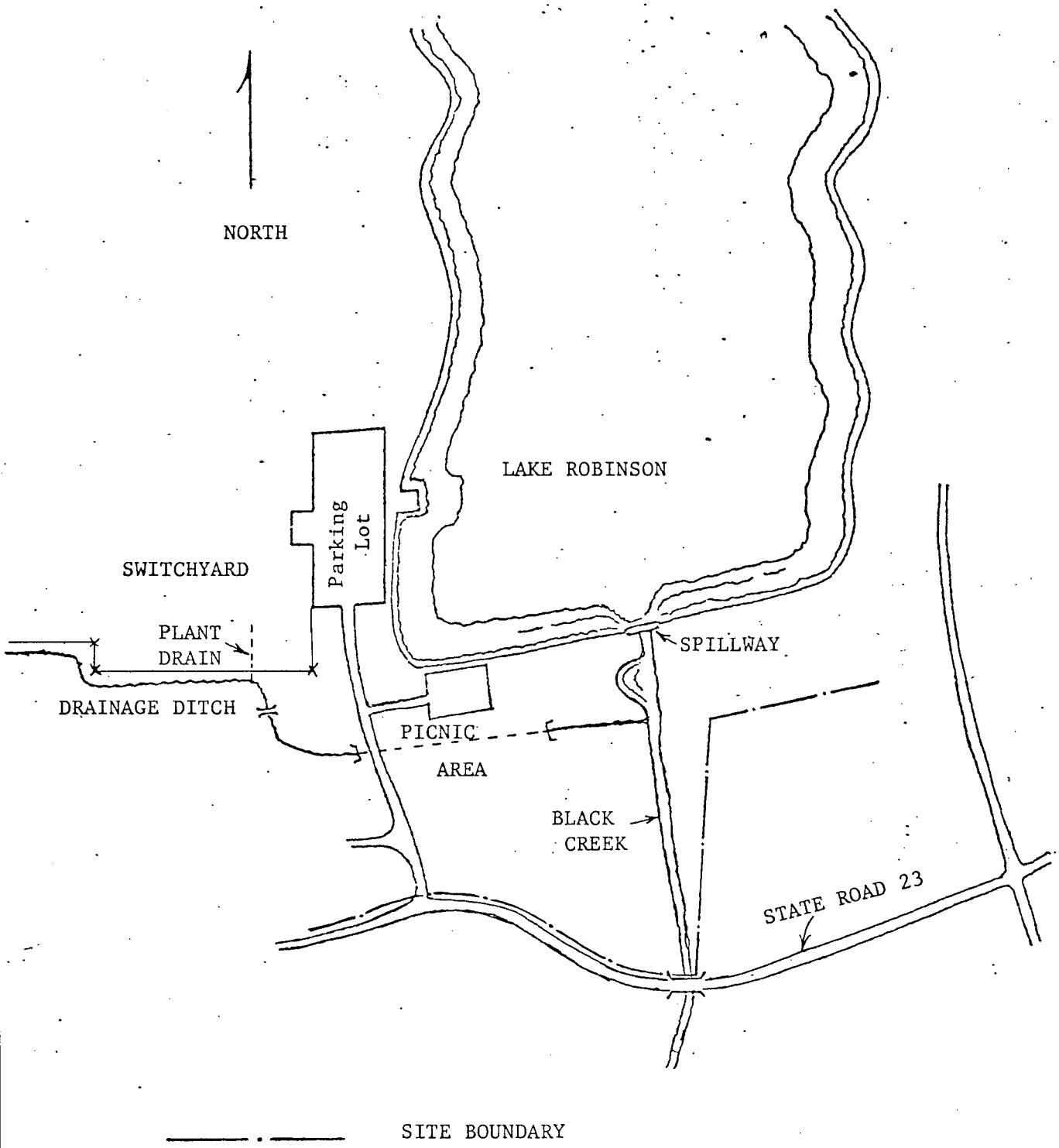

NORTH
LAKE ROBINSON
Parking Lot
SWITCHYARD
PLANT DRAIN
DRAINAGE DITCH
SPILLWAY
PICNIC AREA
BLACK CREEK
STATE ROAD 23
SITE BOUNDARY

FIGURE 4

TABLE 1

RELEASE OF APRIL 10, 1973

Isotope	Undiluted Concentration µCi/ml	Millicuries Released[1]	Drainage Ditch Concentration[2] µCi/ml	Fraction MPC[3]	Black Creek Concentration µCi/ml	Fraction MPC[3]
gross activity	1.24 E-02	23.5	6.33 E-06		1.47 E-08	
H-3	1.03 E-02	19.5	5.26 E-06	1.75 E-03	1.22 E-08	4.07 E-06
Cr-51	7.00 E-06	0.013	3.50 E-09	1.75 E-03	8.13 E-12	4.07 E-06
Co-58	9.37 E-03	17.7	4.77 E-06	5.30 E-02	1.11 E-08	1.23 E-04
Co-60	3.09 E-03	5.8	1.56 E-06	5.20 E-02	3.63 E-09	1.21 E-04
Cs-137	1.91 E-4	0.36	9.70 E-08	4.85 E-03	2.25 E-10	1.13 E-05
			Sum	0.112		2.59 E-04

(1) Based on the release of 500 gallons at the undiluted concentration.

(2) Based on the activities released divided by the 24-hour dilution volume in the drainage ditch.

(3) MPC's taken from Appendix B, Table II, Column 2 of 10CFR20.

(4) Based on the activities released by the 24-hour dilution volume in Black Creek.

TABLE 2

RELEASE OF APRIL 23, 1973

Isotope	Undiluted Concentration µCi/ml	Millicuries Released[1]	Drainage Ditch Concentration[3] µCi/ml	Fraction MPC[3]	Black Creek Concentration[4] µCi/ml	Fraction MPC[3]
gross activity	1.12 E-02	379.3	1.02 E-04		5.96 E-07	
H-3	1.01 E-02	334.0	9.00 E-05	3.00 E-02	5.25 E-07	1.75 E-04
Cr-51	1.37 E-03	46.3	1.25 E-05	6.25 E-03	7.28 E-08	3.64 E-05
Co-57	2.23 E-05	0.75	2.02 E-07	4.04 E-04	1.18 E-09	2.36 E-06
Co-58	6.69 E-03	226.0	6.09 E-05	6.77 E-01	3.55 E-07	3.94 E-03
Co-60	2.01 E-03	67.9	1.83 E-05	6.10 E-01	1.07 E-07	3.57 E-03
Cs-134	2.98 E-04	10.1	2.72 E-06	3.02 E-01	1.59 E-08	1.77 E-03
Cs-137	3.53 E-04	11.9	3.21 E-06	1.61 E-01	1.87 E-08	9.35 E-04
Mn-54	2.83 E-04	12.9	3.48 E-06	3.48 E-02	2.03 E-08	2.03 E-04
Nb-95	1.03 E-04	3.5	9.34 E-07	9.43 E-03	5.50 E-09	5.05 E-05
			Sum	1.83		1.07 E-02

(1) Based on the release of 8,925 gallons at the undiluted concentration.

(2) Based on the activities released divided by the 24-hour dilution volume in the drainage ditch.

(3) MPC's taken from Appendix B, Table II, Column 2 of 10CFR20

(4) Based on the activities released divided by the 24-hour dilution volume in Black Creek