LICENSEE EVENT REPORT

CONTROL BLOCK: [ ] (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

[0 1] [G A E I H 1] (2) [0 0 0 0 0 0 0 0 0 0 0] (3) [4 1 1 1 1] (4) [ ] (5)
LICENSEE CODE | LICENSE NUMBER | LICENSE TYPE | CAT

CON'T
[0 1] REPORT SOURCE [L] (6) [0 5 0 0 0 3 2 1] (7) [0 3 2 0 7 9] (8) [0 6 2 7 7 9] (9)
DOCKET NUMBER | EVENT DATE | REPORT DATE

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

[0 2] During steady state power operation at 2384 MWT, two Chemical Radiation Technicians
[0 3] were obtaining a water sample from Piezometer Well P17B near the Diesel Generator
[0 4] Building when they observed a small amount of water bubbling out of the ground nearby.
[0 5] An analysis of this water and the soil in the immediate area revealed small amounts of
[0 6] radioactivity as found in reactor steam samples. There are no significant impacts on
[0 7] the public health and safety because the event occurred in the Protected Area of the
[0 8] site, the activity released is small, and the activity (excluding tritium) was

[0 9] SYSTEM CODE [Z Z] (11) | CAUSE CODE [A] (12) | CAUSE SUBCODE [E] (13) | COMPONENT CODE [Z Z Z Z Z Z] (14) | COMP. SUBCODE [Z] (15) | VALVE SUBCODE [Z] (16)

(17) LER/RO REPORT NUMBER: EVENT YEAR [7 9] | SEQUENTIAL REPORT NO. [0 2 1] | OCCURRENCE CODE [0 3] | REPORT TYPE [L] | REVISION NO. [3]

ACTION TAKEN [X] (18) | FUTURE ACTION [X] (19) | EFFECT ON PLANT [Z] (20) | SHUTDOWN METHOD [Z] (21) | HOURS (22) [0 0 0 0] | ATTACHMENT SUBMITTED [Y] (23) | NPRD-4 FORM SUB. [N] (24) | PRIME COMP. SUPPLIER [Z] (25) | COMPONENT MANUFACTURER [Z 9 9 9] (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

[1 0] An investigation revealed that, during construction a ½" temporary line was installed
[1 1] to carry nitrogen for inerting to the feedwater heaters from a tank in the yard which
[1 2] was located adjacent to Piezometer P17B. Afterwards the tank in the yard was removed
[1 3] leaving a buried open line about eight inches below yard grade. The heater end of
[1 4] this temporary line was not removed after start up of the unit. The presence of the

[1 5] FACILITY STATUS [E] (28) | % POWER [9 8] (29) | OTHER STATUS (30) [NA] | METHOD OF DISCOVERY [C] (31) | DISCOVERY DESCRIPTION (32) [Laboratory Technician Observation]

[1 6] ACTIVITY RELEASED [L] (33) | OF RELEASE [M] (34) | AMOUNT OF ACTIVITY (35) [62 uc (exc. H3 & diss.] | LOCATION OF RELEASE (36) [Feedwater heater to ground]

[1 7] PERSONNEL EXPOSURES: NUMBER [0 0 0] | TYPE (38) [Z] (37) | DESCRIPTION (39) [NA]

[1 8] PERSONNEL INJURIES: NUMBER [0 0 0] (40) | DESCRIPTION (41) [NA]

[1 9] LOSS OF OR DAMAGE TO FACILITY: TYPE [Z] (42) | DESCRIPTION (43) [NA]

[2 0] PUBLICITY: ISSUED [N] (44) | DESCRIPTION (45) [NA] | NRC USE ONLY

301 158

NAME OF PREPARER W. H. ROGERS HEALTH PHYSICIST RADIOCHEMIST PHONE (912) 367-7781

Georgia Power Company
Plant E. I. Hatch
Baxley, Georgia 31513

Reportable Occurrence Report No. 50-321/1979-021

Event Description (cont.)

confined to the immediate point of discharge.

Cause Description (cont.)

line went undetected until the events of March 20 lead to its discovery. A valve on the temporary line near the feedwater heaters was found to be partially open. It was immediately closed. To prevent any possible re-occurence, the line was broken inside the turbine building by removing a pipe coupling and the line capped. The line was also capped at its end near Piezometer P17B. When the unit is shut down the line will be removed from the feedwater heater connection. Contaminated earth at the discharge point in the yard was drummed to be shipped off to a licensed burial site.

Further investigations are contemplated and are discussed in the attached Anomalous Measurement Report. Also discussed in this Report is information regarding elevated tritium levels in the Piezometer Wells in the Protected Area which was reported in the Annual Environmental Report for 1977.

NARRATIVE SUMMARY
NRC DOCKET 50-321
OPERATION LICENSE DPR-57
EDWIN I. HATCH NUCLEAR PLANT - UNIT 1
NONROUTINE RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT
ANOMALOUS MEASUREMENT REPORT

Pursuant to Section 3.2 and 5.7.2 of the Environmental Technical Specifications (ETS), Appendix B of the Operating License, this nonroutine report describes the elevated tritium concentrations in ground water samples collected from two locations within the protected area. These concentrations exceed the reporting level of 3 X 10^4 pCi/l specified in Table 3.2-2 of the ETS.

A sample taken from Piezometer No. P17B on December 1, 1978, showed a level of 2.6 X 10^5 pCi/l. After receiving the laboratory report from this sample, a new sample was collected on January 24, 1979, to confirm this elevated level. Confirmation was established on March 12 by receipt of the lab report for the January sample; the concentration was 1.7 X 10^5 pCi/l.

Piezometer No. P17B is a well about 13 feet deep which is located adjacent to the SE corner of the Diesel Generator Building. The laboratory results of the previous samples at this location (all in 1978) were 8.5 X 10^2, 7.9 X 10^3 and 1.1 X 10^4 pCi/l for collections on 6/18, 8/8 and 8/31, respectively. The laboratory results for samples collected on 2/16/79 and 3/13/79 have not yet been received.

The second location from which ground water was collected with elevated concentrations of tritium was Piezometer No. P16. This well is also about 13 feet deep; it is adjacent to the south side of the condensate storage tank (CST). The laboratory results received on March 12, for a sample collected on January 26, 1979, showed a concentration of 1.4 X 10^5 pCi/l. Previous samples (all in 1978) were 1.4 X 10^5, 1.6 X 10^5, and 1.5 X 10^5 pCi/l for collections on 6/18, 8/8, and 8/31, respectively. The laboratory results for samples collected on 2/14/79 and 3/9/79 have not yet been received.

These previous elevated levels were not reported since there were no reporting levels for radiological environmental samples prior to an amendment to the ETS on November 16, 1978. This amendment also eliminated the requirement of sampling for ground water. Prior to this amendment quarterly sampling was required only in the event of an accident or unusual circumstance; the ETS specified sampling from a background station, a well at Deen's Landing 2 miles upstream, and from an on-site control station, the subsurface drainage ditch. This subsurface drainage network encircles the plant yard and has two outfalls from which samples are collected; its purpose is to control the water level in the unconfined ground water table.

The U. S. Department of the Interior in their comments dated June 28,

1977 on the Draft Environmental Statement (DES) for the Hatch Nuclear Plant Unit 2 suggested ground water sampling of the minor confined aquifer which underlies the plant. Consequently in the 4th quarter of 1977, samples were collected from three piezometer wells which have depths on the order of 20 feet. Samples from one of these wells, N7A which is adjacent to the south side of the CST, showed a level of 1.6 X 10^3 pCi/l; samples from the other two wells showed the tritium levels to be less than the lower limit of detection (about 10^2 pCi/l). Also in the 4th quarter of 1977 the sample from the north outfall of the subsurface drainage ditch showed a level of 9.5 X 10^2 pCi/l. As explained in the Annual Environmental Surveillance Report for Calendar Year 1977, these two readings were a matter of concern since the previous maximum reading was 2.4 X 10^2 pCi/l. When additional samples collected at N7A in February and May of 1978 showed the level to be consistent, it was decided to sample the unconfined water table.

It is questionable that the ground water samples gathered at P17B and P16 should be considered as environmental samples due to their remoteness from unrestricted areas; thus there is considerable doubt that the nonroutine reporting requirements of Sections 3.2 and 5.7.2 of the ETS are applicable in this case.

The maximum environmental impact of these elevated tritium levels in ground water may be assessed as the dose to a hypothetical individual who regularly drinks this water where it enters the unrestricted area, that is, from the outfalls of the subsurface drainage ditch. The highest quarterly average concentration from the outfalls during 1978 was 1.8 X 10^3 pCi/l and the annual average concentration was 7.4 X 10^2 pCi/l. Using the assumptions and constants from Regulatory Guide 1.109 Revision 1, these constants translate to whole body and organ doses of 0.046 mrem for the maximum quarter and 0.077 mrem for the year. The dose limits from Appendix I to 10 CFR 50 for liquid effluents are 1.5 mrem whole body and 5 mrem organ for any quarter, and 3 mrem whole body and 10 mrem organ for the year. The MPC for tritium in unrestricted areas as given in 10 CFR 20 is 3 X 10^6 pCi/l.

The cause of the elevated tritium levels in samples collected from Piezometer No. P17B is believed to have been found. During construction a temporary line carried nitrogen to the feedwater heaters from a tank in the yard which was located adjacent to Piezometer No. P17B. Afterwards the tank in the yard was removed leaving a buried open line about 8 inches below yard grade. The heater end of this temporary line was not removed after the tests were completed. The presence of the line went undetected until the events of March 20 led to its discovery.

On March 20, 1979, water was observed to be flowing out of the ground near Piezometer P17B from this spot to a height of from one to two inches. Water would flow for around 10

seconds, then stop for perhaps 5 minutes or so. This cyclic phenomenon occurred several times over a few hours. Water samples from the flow and mud samples on the ground at this spot were collected. Gamma scans of these samples show Xe 133 - 2.45 E-4 uc/ml, Xe 133m - 7.23 E-6 uc/ml, Xe 135 - 5.90 E-5 uc/ml and Kr-85m - 1.68 E-6 uc/ml in the water and Cs 134-1.34 E-5 uc/gm, Cs 137 - 1.51 E-5 uc/gm. Co 58 - 1.11 E-6 uc/gm, Zn 65 - 9.65 E-7 uc/gm. Co 60 - 1.88 X 10-6 uc/gm, Ba La 140 - 4.51 E-7 uc/gm, Xe 133 - 4.98 E-6 uc/gm, Xe 135 - 6.87 E-7 uc/gm isotopes in the soil. The laboratory results of a tritium analysis is not yet available. A check of the valve on this temporary nitrogen line at the feed water heater on March 21, 1979, showed the valve to have been partially open. This valve was promptly closed. The open end of this temporary nitrogen line was unearthed on March 22, 1979. The line lies horizontal pointing north. There was no measurable activity in the soil beyond 2 feet from the pipe's end. The contaminated soil was placed in drums for shipment to a licensed burial ground. The open end of this temporary line was capped off. The line was also broken by removing a pipe coupling in the line inside the turbine building and capping the line.

The frequency of sampling has been increased at P17B to monitor the tritium level closely now that the probable tritium source to this area has been eliminated. During the forthcoming shutdown of Unit I scheduled to begin in late April or early May of 1979, it is planned to disconnect this temporary nitrogen line from the feedwater heater and cap-off the connection.

An investigation of the elevated tritium levels in the piezometer wells has been in progress for some months. The underground piping systems which carry high tritium levels have been identified. Some of these piping systems have been hydroed to some extent; but the results of the hydro do not positively confirm or exclude leakage to the ground from these systems. Dr. James R. Wallace, a Professional Engineer and Chief Hydrologist for Law Engineering Testing Company of Atlanta, Georgia has been engaged as a consultant in planning and implementing this investigation. A study of the piping diagrams, ground water levels and tritium levels is in progress to determine seepage paths to the source where tritium is entering the ground. Additional surface borings are being considered: the location and the priority for these borings are being determined. The gamma levels in the soil and ground water from these new borings may be indications of the proximity of any tritium source other than the one found at Piezometer P17B.

xc: U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
ATTN: Director of Regulation
Washington, D. C. 20555

March 26, 1979

APRIL 30, 1979

SUPPLEMENTAL NARRATIVE SUMMARY

NRC DOCKET 50-321

OPERATION LICENSE DPR-57

EDWIN I. HATCH NUCLEAR PLANT - UNIT 1

NONROUTINE RADIOLOGICAL ENVIRONMENTAL OPERATING

ANOMALOUS MEASUREMENT REPORT

This report supplements the previous report submitted with LER 50-321/1979-021 Rev. 1 by providing updated and additional information on the elevated tritium concentrations in ground water samples collected from piezometers within the protected (restricted to the public) area of the plant site. There has been no significant impact on the public health and safety since the previous submittal date of this LER; any release to unrestricted areas through the pathways described in this summary would be minuscule and results in insignificant doses to the public.

Additional surface borings are now underway. As of April 30, 1979, nine additional piezometers to the unconfined water table have been made in the vicinity of the affected piezometers. It is planned to install up to a total of 20 piezometers. These new borings will serve as aids in establishing flow pathways in the ground water in the vicinity of the affected piezometers, in order to be assured that there are no sources of tritium, other than previously reported. These piezometers will also inform us of where tritium is being confined in the plant yard.

The analyses being done with samples from the new surface borings will consist of measuring temperature, and tritium levels in the ground water. Also, gamma levels are being measured in ground soil and water to determine if any activity measured is above normal background and can be attributed to plant operation.

The history of tritium levels at each of three piezometers is provided in Table 1; this history began in June 1978. Both Piezometer P16 and Piezometer P17B are about 13 feet deep; they are respectively located adjacent to the south side of the condensate storage tank (CST) and adjacent to the S. E. corner of the diesel generator building. Piezometer N9B, a 17 foot deep hole, is located adjacent to the N. E. corner of the turbine building and is approximately 120 feet from P17B, which is adjacent to where the temporary nitrogen line was found buried.

The tritium levels at P17B after having built up rather dramatically over a six month period, then becoming more or less stable for several months, now seem to be decreasing after having eliminated the tritium source from the temporary nitrogen line.

The levels at N9B were steady in 1978, began a rise early in 1979, and now seem to be approaching a plateau. The activity level in this

piezometer exceeded the reporting level for offsite environmental samples of 3 X 10^4 pCi/l specified in Table 3.2-3 of the Environmental Technical Specifications on March 20, 1979. The highest level found in the piezometer to date (April 10) is 2.3 percent of the maximum permissible concentration (MPC) allowed for unrestricted areas. It is speculated that the recent increases at this location are due to migration of ground water from the vicinity of P17B since the two piezometers are close to one another.

The levels of P16 seem to be slowly but steadily decreasing; this could be construed to mean that the input of tritium to this location has stopped or has been significantly reduced.

To check the extent of tritium migration in the plant yard, on March 13 and 16, 1979, ground water samples were collected from 10 other piezometers which tap the unconfined water table. These piezometers encircle the complex of the main plant buildings - Service, Turbine (2), Reactor (2), Radwaste (2), and Control Buildings. None of these samples had detectible levels of tritium.

It is questionable that the ground water gathered from any of the on site piezometers should be considered as environmental samples due to their remoteness from unrestricted areas; thus, there is considerable doubt that the nonroutine reporting requirements of Sections 3.2 and 5.7.2 of the ETS are applicable in this case.

The maximum environmental impact of the elevated tritium levels is assessed as the dose to a hypothetical individual who regularly drinks the water from the outfalls of the subsurface drainage network. The highest quarterly average concentration of tritium from the outfalls was 1.8 X 10^3 pCi/l and occurred in the 3rd quarter of 1978; this concentration is equivalent to a whole body or organ dose of 0.046 mrem. The quarterly dose limits from Appendix I to 10 CFR 50 due to liquid releases are 1.5 mrem for the whole body and 5 mrem for any organ. The MPC for tritium in unrestricted areas as given in 10 CFR 20 is 3 X 10^6 pCi/l. Note that this dose estimate is very conservative as drinking water is not obtained from this source.

TABLE 1

HISTORY OF TRITIUM LEVELS IN pCi/l AT AFFECTED PIEZOMETERS

DATE	P16	P17B
JUNE 18	1.4 (5)[a]	8.5 (2)
AUG. 8	1.6 (5)	7.9 (3)
AUG. 31	1.5 (5)	1.1 (4)
SEPT. 29		
DEC. 1		2.6 (5)
JAN. 24	1.4 (5)	1.7 (5)
JAN. 26		
FEB. 14	1.3 (5)	
FEB. 16		3.0 (5)
MAR. 9	1.2 (5)	
MAR. 13		2.3 (5)
MAR. 20	1.1 (5)	2.5 (5)
MAR. 27		
APR. 4	1.1 (5)	2.3 (5)
APR. 10	1.1 (5)	2.4 (5)
APR. 17	1.1 (5)	8.5 (4)
APR. 24	9.52 (4)	1.66 (5)

FOOTNOTE:

(a) 1.4 (5) Indicates 1.4×10^5

June 27, 1979

SUPPLEMENTAL NARRATIVE SUMMARY

NRC DOCKET 50-321

OPERATION LICENSE DPR-57

EDWIN I. HATCH NUCLEAR PLANT - UNIT I

ON ROUTINE RADIOLOGICAL ENVIRONMENTAL OPERATING

ANOMALOUS MEASUREMENT REPORT

The report which follows supplements the previous submittals of LER 50-321/1979-021. The report is written in the format of the Annual Environmental Surveillance Report and will be submitted in the near future as a supplement to the Annual Environmental Surveillance Report for 1978.

SUPPLEMENT
June 27, 1979

2.4 DISCHARGES TO THE GROUND

Pursuant to Sections 3.2 and 5.7.2 of the new ETS, a nonroutine report (Reportable Occurrence No. 50-321/1979-021) with subsequent revisions was filed with the NRC in March and April 1979 to inform them of high tritium concentrations in ground water samples collected in the plant yard. There has been no significant impact on the public's health and safety due to these high tritium levels as the releases to unrestricted areas have been miniscule and have thus resulted in insignificant doses. In order that the reader may appraise this problem, a wealth of background and historical information is provided. As a result of the interest aroused by this nonroutine report, data and activities related to this problem are reported subsequent to 1978 up until the time of this writing. Some extraneous sources of tritium have been identified. Actions have been or are being taken to eliminate them. Other possible sources of extraneous tritium are being checked or will be checked as necessary. An investigation of the seepage pathways is in progress. An assessment of the current status of this problem and a prognosis of its eventual solution are also provided.

2.4.1 BACKGROUND AND HISTORY

There are three distinct water zones underlying the site: a water table, a local aquifer and a regional aquifer. Aquicludes separate and hydraulically isolate these zones from each other. The vast regional aquifer whose top is a few hundred feet below plant grade is not hydraulically connected to surface waters in the vicinity of the site. The shallow local aquifer is separated from the regional aquifer by an aquiclude which is about 100 feet thick; the top of the local aquifer is roughly 65 feet below the grade of the plant yard; it is hydraulically connected to surface waters in the HNP environs. The foundations for some of the buildings at the plant enter but do not rupture the aquiclude between the local aquifer and the water table; this aquiclude is 40 to 50 feet thick. The water table which is charged by the percolation of precipitation through the soil is unconfined. In the plant yard the water table more or less extends from 10 to 20 feet below grade. Two separate subsurface drainage ditches, whose outfalls are at about 25 feet below grade, provide a system for controlling the level of the water table. Roughly 70% of the yard area is drained by Ditch No. 1, the subsurface ditch whose outfall is north of the plant; Ditch No. 2, the subsurface ditch whose outfall is east of the plant, drains the remainder of the plant yard. This network of subsurface ditches encircles the plant buildings.

During preoperation between January 1972 and September 1974, ground water samples were taken from three indicator and one control station. The indicator stations were all on-site. They consisted of two deep wells and Ditch No. 2. The deep wells tap the regional aquifer. The subsurface drainage ditch taps the water table. The control station is a well located near the bank of the Altamaha River approximately 2 miles west (and upstream) of the plant at Deen's Landing. According to the owner, this well is 535 feet deep; thus water is apparently drawn from the regional aquifer.

During preoperation, gross alpha, gross beta, gamma spectral and tritium analyses were performed on the ground water samples. Traces of radon daughter products were detected occasionally by the gamma scans. The samples were analyzed for tritium by a gas enrichment process which provides a LLD on the order of 100 pCi/l. Detectable levels of tritium were found in only two of the seven samples collected. These were 240 and 130 pCi/l from Deep Well No. 1 and No. 2, respectively.

The old Unit 1 E.. required tritium and gamma spectral analyses at one indicator station and one control station. Since initial criticality of Unit 1 in September 1974, the gamma spectral analyses of ground water samples have never shown detectable levels of activity for any radionuclide. The indicator and control stations were established as an on-site subsurface drainage ditch and the well at Deen's Landing, respectively. The deep wells are not considered as good environmental

monitoring stations because of the isolation and remoteness of the regional aquifer from the plant. However, due to the importance of the regional aquifer, samples are occasionally drawn from the deep wells. The general location of all of these ordinary stations are shown in Figure 2.4-1. These are referred to as ordinary stations because they were either used during preoperation or were referred to in the old Unit 1 ETS; they were the only stations utilized until November 1977.

Furthermore, the old ETS required activation of this phase of the radiological environmental monitoring program only in the event of accidental or unusual circumstances. Consequently, regular collections were stopped when operations began in September, 1974. Collections were made, however, in the 1st quarter of 1975. Ditch No. 1 had not yet been utilized as a sampling station in early 1975. Then sometime later Ditch No. 2 was blocked off for a period of time due to construction work on Unit 2; it was subsequently reopened. Collections from Ditch No. 1 were initiated on a temporary basis in the 3rd quarter of 1976 to provide a comparison with previous data obtained from the samples gathered at Ditch No. 2; concurrently, samples were taken from the control station.

At least one sample each quarter has continued to be collected to this date from the control station and from at least one of the outfalls of the subsurface ditch; samples were also occasionally drawn from one or both of the deep wells. A complete listing of the laboratory results of the tritium analyses for all samples collected at the ordinary stations is given in Table 2.4-1.

It is seen from this table that, since operations began through the end of 1977, the tritium levels in all samples collected from these ordinary stations, except one, were no higher than those found during preoperation of HNP-1. The exception was for the November 16, 1977 sample from Ditch No. 1 which had a measured level of 950 pCi/l. This established a new maximum tritium level detected in ground water samples; but, an even higher level was found in a sample collected 5 weeks later from a new sampling location.

Sampling at some new locations came about as follows: The U. S. Department of Interior in their comments dated June 23, 1977 on the Draft Environmental Statement for HNP Unit 2 suggested ground water sampling of the local aquifer as its top is about 5 feet below the foundation of the HNP-2 radwaste building. It should be noted that the local aquifer had not been monitored previous to this time. Consequently, in the 4th quarter of 1977 samples were collected from three piezometer holes (identified as N7A, N8A, and P17A). Each of these test holes (or wells) has a depth on the order of 80 feet. The tritium level in the sample taken from N7A which is located about 15 feet south of the Unit 1 Condensate Storage Tank (CST-1) dyke was 1550 pCi/l. The tritium concentration in the samples from the other two holes was below the level of detection. All three holes lie within several hundred feet of each other. The locations of these holes (as well as the other piezometer holes discussed in subsequent paragraphs) are shown in Figure 2.4-2.

TABLE 2.4-1

TRITIUM LEVELS FROM ORDINARY STATIONS
pCi/l

Date	Deen's Landing	Deep Wells No. 1	Deep Wells No. 2	Subsurface Ditch North (#1)	Subsurface Ditch East (#2)
Preoperation 1/72 - 3/74	<8.00 (1)[a]	<7.00 (1)	1.30 (2)		<7.00 (1)
	<7.00 (1)	2.40 (2)			<7.00 (1)
	<7.00 (1)	<1.00 (2)	<1.00 (2)		<1.00 (2)
2/17/75	<1.00 (2)			2.30 (2)	
9/02/76	<1.00 (2)			2.40 (2)	
11/19/76	<9.00 (1)				<9.00 (1)
2/23/77	<1.00 (2)			1.40 (2)	
5/16/77	<1.00 (2)			2.20 (2)	
8/24/77	<1.10 (2)	1.30 (2)	1.20 (2)	9.50 (2)[b]	
11/16/77					1.00 (2)
12/20/77	1.00 (2)	<1.00 (2)		2.50 (2)	1.80 (2)
2/17/78	<1.10 (2)	1.90 (2)		3.90 (2)	1.90 (2)
5/28/78	<1.00 (2)			3.10 (2)	
7/20/78				<9.68 (2)	
8/03/78				1.82 (3)	<6.64 (2)
8/31/78	<1.10 (2)			2.41 (3)	2.70 (2)
9/06/78	1.70 (2)	2.70 (2)		1.06 (3)	2.90 (2)
9/29/78[c]		<7.01 (2)		<7.01 (2)	<7.01 (2)
9/29/78[d]	<1.10 (2)	<1.30 (2)		7.50 (2)	3.30 (2)
11/13/78	2.60 (2)			1.26 (3)	2.80 (2)
12/01/78				2.12 (3)	1.40 (2)
1/24/79	1.00 (2)				
1/25/79		1.20 (2)			
1/26/79				1.10 (2)	
2/13/79					

a) indicates < 8 x 10^1
b) recount 1.08 (3)
c) Teledyne
d) APT

TABLE 2.4-1 (Cont'd)

TRITIUM LEVELS FROM ORDINARY STATIONS
pCi/l

Date	Deen's Landing	Deep Wells No. 1	Deep Wells No. 2	Subsurface Ditch North (#1)	Subsurface Ditch East (#2)
2/20/79	<1.10 (2)				1.00 (3)[a]
3/09/79				<1.45 (3)	<1.45 (3)
3/20/79				<1.50 (3)	<1.50 (3)
3/27/79				2.72 (3)	<1.64 (3)
4/04/79				2.10 (3)	<1.45 (3)
4/10/79				<1.58 (3)	<1.58 (3)
4/17/79				<1.48 (3)	<1.48 (3)
4/24/79				<1.40 (3)	<1.40 (3)
5/02/79				<1.50 (3)	<1.50 (3)[b]
5/08/79		<1.70 (3)		<1.80 (3)	<1.70 (3)
5/09/79[c]	<1.70 (3)			<1.70 (3)	<1.70 (3)
5/17/79				<1.70 (3)	
5/23/79					<1.70 (3)
5/24/79					

a) indicates 1.00×10^3
b) split < 1.50 (3)
c) <1.70 (3) at MH18

TABLE 2.4-2

TRITIUM LEVELS IN LOCAL AQUIFER
pCi/l

Date	N7A	N8A	P17A
11/16/77			<1.10 (2)[a]
12/20/77	1.55 (3)[b]	<1.10 (2)	
2/17/78	1.66 (3)	2.50 (2)	<1.00 (2)
5/28/78	1.57 (3)	<1.10 (2)	2.90 (2)
7/20/78	1.46 (3)		
8/03/78	1.02 (3)		
8/31/78	1.55 (3)		
9/06/78	1.70 (3)	<1.10 (2)	
9/29/78	1.33 (3)[c]		
11/15/78	1.27 (3)	1.80 (2)	3.60 (2)
12/01/78	1.20 (3)		
1/24/79	2.82 (3)	<1.10 (2)	7.90 (2)
2/14/79	1.84 (3)		
3/28/79	<1.64 (3)		<1.64 (3)
4/10/79	2.12 (3)		
5/09/79[d]			

a) indicates $< 1.1 \times 10^2$
b) recount 1.71 (3)
c) splits 9.85 (2) and 1.49 (3)
d) <1.70 (3) at P102B and P108B

Recounts of the 4th quarter samples taken from Ditch No. 1 and piezometer well N7A confirmed their levels to be high. The 4th quarter sample from Ditch No. 1 was about four times the reading typically found there, and the 4th quarter sample from Piezometer N7A was more than six times higher than the level found in any sample from previous quarters. These much higher readings became a matter of concern but not of alarm since the levels were still quite innocuous.

2.4.2 MONITORING FOR 1978 AND EARLY 1979

Analyses of samples taken from Ditch No. 1 returned to normal in the 1st quarter of 1978, but the level at piezometer well N7A persisted at around 1600 pCi/l. It was then decided to take ground water samples from the water table in the plant yard from several piezometers; this was carried out in mid June of 1978. The tritium levels at N8B and N16B were 180 and 200 pCi/l, respectively; these levels are considered as only slightly above minimum detection levels. The level in P17B, a 13 foot deep test hole which is located adjacent to the southeast corner of the Diesel Generator Building, was 850 pCi/l. Piezometer P16, another 13 foot deep test hole, was of special interest since, as can be seen from Figure 2.4-2, its surface location is only about 8 feet from the errant N7A which is 75 feet deep. The level at P16, however, was 1.44×10^5 pCi/l which is about two orders of magnitude above the previous maximum reading at N7A.

All of the readings up to mid-June 1978 were associated with Unit 1 not only because an Operating License for Unit 2 was not issued until June 13, 1978, and initial criticality was not achieved until July 4, 1978, but also because all the piezometers which had been sampled were on the north side of the plant yard which is physically in the proximity of Unit 1 and relatively remote from Unit 2. The ordinary sampling stations, however, would serve to monitor each of the units more or less equally. It should be pointed out, however, that ground water sampling is not required by the Unit 2 ETS.

A nonroutine report on the discovery of the high tritium levels at P16 was not required by the old Unit 1 ETS since this did not involve a significant environmental impact. The environmental impact was not considered significant as this location was well within the protected area, the water was not being used, there were no planned usages of this water, and its movement through the ground is rather slow. The old Unit 1 ETS did not specify reporting levels for radiological environmental samples. The high reading at P16, however, did spark efforts to obtain laboratory results sooner, and the initiation of actions that might lead to the discovery of the cause of the high readings; it also brought about an increase in the intensity of sampling.

All of the ground water samples collected through July of 1978 had been analyzed by Teledyne Isotopes, Inc. of Westwood, New Jersey. A gas enrichment process was used to determine the tritium level of each sample. Although the LLD was very low, nominally about 100 pCi/l, the results were generally not forthcoming for 6 weeks or so; sometimes the wait was in excess of 2 months. To obtain quicker results, the services of a closer laboratory were procured through Applied Physical Technology (APT) of Smyrna, Georgia; it was also decided to use a liquid scintillation detector in the laboratory analysis for tritium. Although results were obtained quicker (from several days to several weeks), the LLD was much higher (ranging from about 700 to 1700 pCi/l). The old Unit 1 ETS did not specify detection capabilities for radiological environmental samples. The Unit 2 ETS specify an LLD of 330 pCi/l for tritium analyses of water samples. The services of Teledyne continued to be employed also.

The investigation of the high tritium readings began slowly and informally in August of 1978. The underground piping systems which carry high levels of tritium were identified from a study of the piping diagrams. Many of these piping systems were hydrostatically tested to some extent; results were generally inconclusive, neither positively confirming nor excluding leakage to the ground from these systems.

The sampling was intensified by an increase not only in the frequency of collections but also in the number of sampling locations. The results of the tritium analyses for the ordinary stations are listed in Table 2.4-1. The tritium levels for samples taken from the local aquifer are given in Table 2.4-2. The tritium levels in the test holes which have been the most affected, at least until very recently, are provided in Table 2.4-3; these three piezometers N98, P16 and P17A, tap the water table. The levels of tritium found at other piezometers tapping the water table were not found to be high; these are tabulated in Table 2.4-4. Samples were also taken from selected catch basins and the outfalls of the surface drainage ditches; these are presented in Table 2.4-5.

From Table 2.4-1, it is seen that the readings from Deen's Landing, the control station, are usually below the LLD, and when positive only slightly above detection. There appeared to be an exception to this for the collection on September 28, 1978, when samples taken from this station and from other stations were split and sent to Teledyne and APT for laboratory analyses. Teledyne found a level of 170 pCi/l which is consistent with the levels found previously while APT found a level of 2820 pCi/l from the "same" sample. It is believed that APT's results are erroneous; this could result from mislabeling, contamination, instrument error, etc. Since this is the only control station and all other stations may be considered as indicator stations, it is to be noted that nearly all positive readings of the indicator stations are more than twice the control station readings.

Also from Table 2.4-1, it is seen that the readings from the deep wells have continued to be low. The positive readings for Ditch No. 2 have slowly increased from 100 pCi/l on December 20, 1977 to 1000 pCi/l on February 20, 1979. There was, however, a reading of 8340 pCi/l (not in table) by APT for the collections on August 8, 1978; this reading is believed to be erroneous as the readings from this location around that time were less than 300 pCi/l.

The levels from Ditch No. 1 are generally a few times higher than those from Ditch No. 2. The readings at Ditch No. 1 have been somewhat erratic. The positive results in pCi/l for each station are summarized below by quarter:

TABLE 2.4-3

TRITIUM LEVELS IN EFFECTED TEST HOLES
pCi/l

Date	K9B	P16	P17B
6/13/78		1.44 (5)[a]	8.50 (2)
8/03/78	3.55 (3)	1.64 (5)[b]	7.88 (3)
8/31/78	3.48 (3)	1.51 (5)	1.05 (4)
9/29/78	3.67 (3)[c]		
12/01/78	4.49 (3)		2.64 (5)
1/24/79			1.66 (5)
1/26/79		1.37 (5)	
2/14/79		1.32 (5)	
2/16/79	9.63 (3)		2.97 (5)
3/09/79		1.21 (5)	
3/13/79	2.80 (4)[d]		2.32 (5)
3/20/79	4.56 (4)	1.12 (5)	2.49 (5)
3/27/79	5.40 (4)[e]	dry	dry
4/04/79	5.97 (4)[f]	1.09 (5)[g]	2.29 (5)
4/10/79	6.79 (4)	1.07 (5)	2.36 (5)[h]
4/17/79	6.67 (4)[i]	1.14 (5)	8.47 (4)
4/24/79	6.60 (4)[j]	9.52 (4)	1.66 (5)
5/02/79	6.89 (4)	9.55 (4)	7.88 (4)
5/09/79	8.64 (4)	1.11 (5)	5.69 (4)
5/17/79	7.68 (4)	7.78 (4)	2.88 (4)
5/23/79	8.99 (4)	8.20 (4)	4.71 (4)
6/05/79		7.66 (4)	3.06 (4)

a) indicates 1.44×10^5
b) recount 1.51 (5)
c) split 2.95 (3)
d) recount 2.95 (4)
e) split 5.13 (4)
f) split 5.73 (4)
g) split 1.01 (5)
h) split 2.21 (5)
i) split 6.90 (4)
j) split 6.93 (4)

TABLE 2.4-4

TRITIUM LEVELS IN OTHER TEST HOLES TAPPING WATER TABLE
pCi/l

Date	N8B	N10B	N12B	P15B
6/14/78	1.80 (2)[a]	2.00 (2)		
8/08/78	<9.68 (2)	<9.68 (2)		
9/29/78[b]	1.10 (2)			
9/29/78[c]	<7.01 (2)			
12/01/78	3.00 (2)			
1/24/79	1.70 (2)			
2/13/79	<1.00 (2)			2.10 (2)
2/16/79				
3/13/79[d]				<1.45 (3)
3/16/79[e]		<1.45 (3)	dry	
3/28/79			dry	
4/19/79	<1.58 (3)	<1.58 (3)		
5/02/79[f]		<1.70 (3)		

a) indicates 1.80×10^2
b) Teledyne
c) APT
d) <1.45 (3) at A1, A3, N11B
e) <1.45 (3) at A2, N2B, N3B, N5B, P13B
f) <1.70 (3) at N13B, N14B, N15B, P102A, and P108A

TABLE 2.4-5

TRITIUM LEVELS IN SURFACE DRAINAGE
pCi/l

Date	Outfalls		Catch Basins		
	North (#1)	East (#2)	PY24	PY12	PY16
8/08/78[a]			2.75 (3)[b]	2.40 (3)	1.22 (3)
8/31/78	dry	dry	dry	1.54 (3)	dry
9/29/78[c]	2.40 (2)		1.52 (3)	1.63 (3)	
9/29/78[d]	<7.01 (2)		<7.01 (2)	1.34 (3)	
12/01/78			6.80 (3)	5.00 (2)	
2/22/79			6.32 (3)	2.50 (2)	
3/09/79			8.73 (3)	<1.45 (3)	
3/13/79					<1.45 (2)
3/16/79[e]	dry	dry			
3/20/79	dry	dry			
3/28/79	dry	dry	2.82 (3)		
4/10/79			<1.58 (3)	<1.58 (3)	
5/02/79	dry	dry			
5/17/79	dry	dry			
5/23/79	dry	dry			
6/04/79	dry	dry			
6/14/79	dry	dry			

a) <7.89 (2) at PY17, MHPY4 and CBR63; <9.68 (2) at CBR61
b) indicates 2.75×10^3
c) Teledyne
d) ATT
e) 1.91 (3) adjacent to MH11

Supplement 1

2.4-12

INF
ANNUAL REPORT

Quarter	n	Max	Min	Avg	s
Ditch No. 1					
1st 78	1	250	250	250	-
2nd 78	1	380	380	380	-
3rd 78	4	2410	310	1400	913
4th 78	2	1260	750	1005	361
1st 79	3	3120	110	1953	1635
2nd 79	1	2100	2100	2100	-
Ditch No. 2					
1st 78	1	180	180	180	-
2nd 78	1	180	180	180	-
3rd 78	2	290	270	280	14
4th 78	2	330	280	305	35
1st 79	2	1000	140	570	608

This summary indicates a general upward trend of the tritium levels in the subsurface drainage network.

From the data presented in Table 2.4-2 it appears that the levels in the local aquifer on the whole have not varied greatly. An exception is seen for P17A where the readings have increased from < 180 pCi/l in February 1978 to 750 pCi/l in January 1979. The bulk of the data in this table is for N7A; its positive results in pCi/l are summarized below by quarter.

Quarter	n	Max	Min	Avg	s
4th 77	1	1630	1630	1630	-
1st 78	1	1660	1660	1660	-
2nd 78	1	1570	1570	1570	-
3rd 78	5	1700	1020	1412	257
4th 78	2	1270	1200	1235	50
1st 79	2	2820	1840	2330	693
2nd 79	1	2120	2120	2120	-

It might be postulated that P16 is tapping tritiated water that has accumulated in a pocket. If the input of tritium to such a "pool" were to stop, the tritium level would diminish due to radiological decay (the half life of tritium is 12.3 years) and due to the dilution afforded by precipitation. As may be seen from Table 2.4-3, the levels at P16 have slowly but steadily decreased from a maximum reading of 1.64×10^5 pCi/l in August 1978 to 7.66×10^4 pCi/l in early June 1979. Thus this can be construed to mean that the input of tritium to this location has stopped or has been significantly reduced.

The levels at [illegible] shown in Table 2.4-3 after having built up rather dramatically over a six-month period from 450 pCi/l on June 18, 1978 to 2.64×10^5 pCi/l on December 1, 1978, then became more or less stable for several months with a maximum reading of 2.97×10^5 pCi/l on February 16, 1979, but have since decreased to 2.65×10^4 pCi/l on May 17. The decrease resulted from the stopping of the discharge of radioactive water to the ground at a point adjacent to this location on March 21, 1979. The details of the discovery of this source and its punctual termination are provided in subsequent paragraphs.

It can be seen from Table 2.4-3 that the levels at X93, a 17 foot deep test hole located adjacent to the NE corner of the Turbine Building were not low when [illegible] on August 8, 1978. The level seemed to hover at around 3600 pCi/l for a few months then began to rise. The rise was vigorous early in 1979. The readings during April indicated that a plateau of around 6.7×10^4 pCi/l had been reached, but subsequent readings show further increases.

The tritium levels in other test holes tapping the water table are provided in Table 2.4-4. The activity of each of the samples was less than the LLD afforded by a liquid scintillation detector. When the gas enrichment process was employed, positive results ranging from 110 to 300 pCi/l were found. These very low levels give assurance that contamination in the water table is pretty much confined to the proximity of the three effected test holes listed in Table 2.4-3.

The results of samples taken in the surface drainage system are listed in Table 2.4-5. The outfalls were nearly always dry; the only positive result gave a very low level of 240 pCi/l. Rather high levels, however, were found in a few catch basins, especially PY24 which is near P16. It was postulated in a previous paragraph that water contaminated with tritium may have accumulated in a pocket in this proximity. After periods of considerable precipitation, the water table will rise and thereby cause an overflow from such pockets. Should the water table rise to the level of the surface drainage system, an easy path for horizontal movement would be provided. It appears then, there may be a relatively easy passage from this postulated pocket in which tritiated water is lodged to this catch basin. After precipitation stops and horizontal movement stops, some tritiated water becomes trapped in the catch basin. Any water which is transported from this catch basin would be greatly diluted as this stream of water is combined with a number of other streams on its way to the outfall.

In the second week of May 1979, a group of samples were taken and split with the NRC as per their suggestion. Included in this group were samples taken from outlying test holes which were a few hundred to about 13 hundred yards away. These were taken to provide assurance that ground water tritium had not migrated offsite. The outlying test holes tapping the water table were N13B, N14B, N15B, P102A and P108A; those tapping the

local aquifer were P102S and P103S; the locations of these test holes are shown in Figure 2.4-3. The tritium level in each of these outlying test holes was less than the LLD. Previously, on March 16, 1979, in order to determine the extent of tritium migration in the plant yard, samples were collected from 10 test holes which tap the water table. These test holes encircle the complex of main buildings - Service, two Turbine, two Reactor, two Radwaste, and Control Buildings. None of these samples had detectable levels of tritium.

2.4.3 NONROUTINE REPORTS

On November 16, 1978, Amendment to Appendix B of the Unit 1 Operating License was issued whereby the old ETS were replaced with the new ETS, that is, those issued with the Unit 2 Operating License in June 1978. Although these new ETS do not require ground water sampling, they do specify that if a confirmed measured radionuclide concentration in an environmental sampling medium averaged over any quarterly sampling period should exceed the reporting level given in Table 3.2-3 of the ETS, then a written report shall be submitted to the NRC within 30 days from the end of the quarter or after confirmation, whichever is later. The reporting level for tritium in water is 3.0×10^4 pCi/l. The ETS defined "confirmed" as a confirmatory reanalysis of the original, a duplicate, or a new sample as appropriate.

There was some doubt then, that this reporting level should apply to any of the ground water samples, even those from the ordinary stations. It was indeed questionable that a nonroutine report should be made for any subsequent high tritium levels such as those found at N9B, P16 and P17B. Due to the inaccessability of these locations to the general public, samples gathered here probably should not be considered as radiological environmental samples.

On December 1, 1978, samples were collected at a number of locations including P17B; these were shipped to Teledyne on December 4, 1978. The results were received on January 24; the tritium level for P17B was 2.64×10^5 pCi/l. The previous maximum reading at this station had been 1.05×10^4 pCi/l. A new sample was collected from P17B on January 24 to confirm this new maximum reading; it was shipped to Teledyne on January 27; the laboratory report was received on March 12; the tritium level was 1.66×10^5 pCi/l. On January 26, 1979, a sample was collected at P16 amongst other locations; these were shipped to Teledyne on January 27; the results were received on March 12; the tritium level for P16 was 1.37×10^5 pCi/l.

A wet spot on the ground near P17B had been noticed. There were also wet spots on the ground adjacent to the condensate transfer pumps which are near P16. On February 16, 1979, wet soil samples were collected from these two locations; on February 22 these samples were shipped to Teledyne for tritium and gamma spectral analyses; in early April 1979 the results were received; the results are presented in Table 2.4-6. The levels for the soil samples from the wet spot near P17B are on the order of that found in reactor water except for Ra-226 and Th-228 which occur in the soil naturally. Although the levels found in the soil collected near P16 are generally a few orders of magnitude lower, they too indicate some local contamination.

After receiving the laboratory analysis reports for the tritium levels at P16 and P17B on March 12, 1979, it was decided that despite the doubts regarding the reporting requirements, a nonroutine report would be submitted. However, before the writeup of the report was completed, the cause of the high tritium levels at P17B revealed itself. The report was filed on March 26 which was before the laboratory reports on the two soil samples were received.

During construction of Unit 1 a half inch temporary pipe carried nitrogen from a tank in the yard adjacent to F17B to the feedwater heaters in order to keep them from corroding before the plant was put in service. After Unit 1 was put into service, the tank in the yard was removed leaving an open line buried about eight inches below the yard grade; the end of this line was roughly 10 feet SW of F17B. The heater end of this temporary line was not removed after startup of the unit.

On March 20, 1979 water was discovered bubbling out of the ground to a height of several inches from the very spot where a soil sample had been gathered on February 16. Water would flow out for around 10 seconds, then stop for perhaps 5 minutes or so. This cyclic phenomenon occurred several times over a few hours; it may have been caused by changes of pressure in the feedwater heater at that time.

Water samples from the flow and mud samples from the ground at this spot were collected for tritium and gamma spectral analyses. The results are given in Table 2.4-7. Where comparable, these levels are seen to be generally higher than those found in Table 2.4-6.

On March 21, 1979, a check of the valve on this temporary nitrogen line at the feedwater heater showed the valve to have been partially open. The valve was promptly closed. To prevent any possible reoccurrence, the line was severed inside the turbine building by removing a pipe coupling. Caps were then placed on both the line and the heater connection.

It may be advanced that the valve was cracked open by vibration or by someone inadvertently bumping into it. In any regard, the tritium levels in F17B indicate leakage to the ground probably did not begin very long before first sampling this well on June 18, 1978.

On March 22, 1979, the open end of this temporary nitrogen line was unearthed. The line lay horizontal pointing north. A portable radiation detector showed activity in the soil near the end of the pipe. There was no measurable activity in the soil beyond 2 feet from the end of the pipe. Hence it may be concluded that all activity except tritium was confined to the immediate point of discharge. The contaminated soil was placed in drums for shipment to a licensed low level burial ground. The open end of this temporary line was capped off.

On March 26, 1979, the events of March 20, were reported to the NRC as a Licensee Event Report (LER). Attached to this LER was an Anomalous Measurement Report which revealed the high tritium levels at P16 and F17B. On March 28 a revision was issued to correct three errors in the report.

As has been mentioned in Section 2.4.2 above and as shown in Table 2.4-3, the level at K9B was undergoing a vigorous rise during the winter of 1978-1979. The first sample to exceed the reporting level was collected on March 20; its level was 4.56×10^4 pCi/l. By mid April the level seemed to have more or less reached a plateau of around 6.7×10^4 pCi/l. All of the tritium levels measured from samples taken from K9B, P16 and F17B through April 1979 were reported to the NRC on April 30, 1979 as a second revision to the previous

TABLE 2.4-6

TRITIUM AND GAMMA SPECTRAL ANALYSES OF WET SOIL SAMPLES
COLLECTED ON FEBRUARY 16, 1979

Radionuclide	Near P16	Near P17B
H-3	1.91 (3)[a] pCi/l	1.03 (6) pCi/l
Mn-54	<4.00 (1) pCi/kg dry	7.70 (1) pCi/kg dry
Co-58	<5.00 (1) pCi/kg dry	7.44 (2) pCi/kg dry
Co-60	1.36 (2) pCi/kg dry	9.37 (2) pCi/kg dry
Zn-65	<9.00 (1) pCi/kg dry	3.49 (2) pCi/kg dry
I-131	<7.00 (2) pCi/kg dry	3.93 (3) pCi/kg dry
Cs-134	8.52 (1) pCi/kg dry	1.78 (3) pCi/kg dry
Cs-137	1.61 (2) pCi/kg dry	1.75 (3) pCi/kg dry
Ra-226	2.65 (3) pCi/kg dry	1.52 (3) pCi/kg dry
Th-228	1.08 (3) pCi/kg dry	6.02 (2) pCi/kg dry

a) indicates 1.91×10^3

TABLE 2.4-7

TRITIUM AND GAMMA SPECTRAL ANALYSIS OF WATER FLOWING FROM GROUND ON MARCH 20, 1979, NEAR PITS; GAMMA SPECTRAL ANALYSIS OF MUD FROM THIS LOCATION ON SAME DATE

Radionuclid.	Level	
	Sample No. 1	Sample No. 2
	WATER (pCi/l)	
H-3	1.05 (6)	1.08 (6)
Kr-85m	1.79 (3)	1.68 (3)
Xe-133	2.46 (5)	2.45 (5)
Xe-133m	7.30 (3)	7.23 (3)
Xe-135	6.10 (4)	5.90 (4)
	MUD (pCi/kg dry)	
Co-58	3.40 (3)	1.11 (3)
Co-60	4.07 (3)	1.88 (3)
Zn-65	2.10 (3)	9.65 (2)
Xe-133	1.50 (4)	4.93 (3)
Xe-135	1.60 (3)	6.87 (2)
Cs-134	2.90 (4)	1.34 (4)
Cs-137	3.27 (4)	1.51 (4)
Ba-La-140	9.88 (2)	4.51 (2)

2.4.4 INVESTIGATION OF HIGH LEVELS

As mentioned in Section 2.4.2, a tentative investigation of the high tritium levels began in August of 1978, and although many of the piping systems which carry water with high concentrations of tritium were hydrostatically tested to some extent, there were no conclusive results. Six months later Dr. James R. Wallace, a Professional Engineer and Chief Hydrologist for Law Engineering Testing Company of Marietta, Georgia, was engaged as a consultant in planning and implementing this investigation; his work was initiated on February 16, 1979.

In order to determine the seepage pathways to the source points where extraneous tritium is entering or has entered the ground, a study was made of the piping diagrams, ground water levels (in conjunction with precipitation records), and the tritium levels. It was decided that about twenty test holes should be drilled (to depths of around 20 feet) in the vicinity of the three test holes (which tap the water table) with the high tritium levels. The following information was to be sought from each of these new test holes in hopes of determining if an extraneous source exists:

a) the gamma spectral analysis of soil samples at various depths,

b) the gamma spectral and tritium analyses of the ground water samples,

c) the conductivity of the ground water samples, and

d) the temperature of the ground water samples.

The designation of the test holes actually drilled, the date of installation, the hole depth, and the depths at which the aquiclude was reached are listed in Table 2.4-8. The locations of these test holes are shown in Figure 2.4-2. The contour of the aquiclude in the proximity of CST-1 seems to form part of a trough running under CST-1 and aligned in a more-or-less NNE-SSW direction with the southern end of the trough being slightly deeper. Piezometer P16 appears to lie in this trough. The aquiclude contours in the area a little east of the Unit 2 Recombiner Building (as judged by T5, T4 and T3) show a downward slope in a south to southeasterly direction. This suggests that the discharges of process water that took place through the open half-inch line near P17B would tend to flow to the vicinity of P9B.

While constructing each of the new wells, soil samples were generally collected at five foot intervals and at intermediate depths in some cases. A gamma scan employing a GeLi detector was run on each sample. Gamma spectral analyses were also run on ground water samples from each of the new test holes which was not dry. In a few instances naturally occurring radionuclides were detected; there were no other positive results. The soil acts as both a filter and a demineralizer whose efficacy was demonstrated by the virtual elimination within a few feet of all of the gamma activity being discharged from an open line as was noted in Section 2.4.3. Thus, the detection of great activity in a soil sample would have likely meant that an extraneous source existed within a few feet.

TABLE 2.4-8

NEW TEST HOLES IN WATER TABLE

Designation	Installation 1978	Depth (ft)	Aequiclude* (ft)
T2	5/04	21.5	21
T3	5/03	17.5	>17.5
T4	4/24	20.0	17
T5	4/24	20.0	12
T6	4/27	20.0	12.5
T7	4/26	20.0	13.5
T8	5/02	23.0	>23
T10	4/20	16.5	18
T11	4/19	20.0	18
T12	4/19	23.5	20
T13	4/20	18.0	15
T14	5/01	15.0	13
T15	5/01	22.5	20
T16	4/27	20.0	18
T18	5/02	18.0	13
T19	5/03	19.0	16
T20	5/04	23.0	21

*Approximate depth to aquiclude

The results of the tritium analyses for the new test holes are presented in Table 2.4-9. It is seen that most of the wells were dry from a few days to a few weeks following installation; a few are still dry. Seven test holes show tritium levels in excess of 1.0×10^4 pCi/l; all others show levels which are less than detectable or are only marginally detectable. Due to their locations it seems plausible to associate three of these seven test holes (T3, T4, and T8) with the same extraneous source causing the high readings at M9B and to associate the other four test holes (T12, T18, T19 and T20) with the same extraneous source causing the high readings at P16.

Piezometer T3 was dry for 3 weeks before a water sample could be collected; the two readings taken in late May 1979 from this location were nearly an order of magnitude lower than those taken from M9B which is in close proximity. After a few weeks of dryness and a few samples with tritium levels less than the MDL, a collection at T8 on June 1, 1979, showed a positive level of 1.06×10^4 pCi/l, which is nearly the same as that found at T3. None of the readings at T4 have been low, it took little more than a week for the levels to become about the same as those at M9B. The readings at T4 are now a bit higher than those at M9B and they are increasing.

It took about a week and a half for the levels at T12 to reach what appears to have been an equilibrium level which is a fourth to a third of the levels at P16; in the latter half of May, however, the readings suddenly dropped below the MDL and have remained there. The initial collection at P18 was made in mid-May 1979, 2 weeks after its installation; the readings are fairly consistent and are nearly as high as those at P16. The readings at P19 increased steadily to what seem to be its equilibrium which is less than those at P16 by a factor of 4 to 5. The readings at T20 have been steady from the start, they are about a quarter of those found at P16.

Since conductivity of the de-ionized process water is nominally less than 1 μmho/cm whereas the conductivity of water obtainable from normal ground water sources nearby is generally about two orders of magnitude higher, a very low conductivity found in a ground water sample would indicate that such a sample was likely to have been collected close to some leak of the process water. Typical conductivity values in μmhos/cm from nearby water sources are about 230 from the deep wells, 50 to 150 from the Altamaha River and around 50 for rain. Since generally the temperature of the water in the piping systems of interest does not run many degrees above ambient, not much could be expected to be learned from the temperature of samples.

Listed in Table 2.4-10 are the conductivity and temperature measurements for samples collected from the new test holes on May 10, 1979. None of the conductivity measurements are low, some are rather high; the variation in values probably reflects the variation in the mineral content of the soil at each location. The test holes with the higher temperatures are located where there are more piping systems which may provide slightly higher temperature to the ground water in that area. The highest temperature was found at T12 which also had a relatively low conductivity. Although

TABLE 2.4-9

TRITIUM LEVELS IN NEW TEST HOLES
pCi/l

Date	T2	T3	T4	T5	T6	T7	T8	T10	T11
4/19/79									a
4/20/79								a	dry
4/23/79									
4/24/79			a	a				dry	
4/26/79						a			<1.59 (3)[b]
4/27/79			6.27 (3)[c]	dry	a	dry		dry	
4/29/79			2.41 (4)		<1.38 (3)				<1.38 (3)
4/30/79								dry	<1.48 (3)
5/01/79			4.77 (4)	dry	<1.48 (3)	dry		<1.48 (3)	
5/02/79				dry		dry	a		
5/03/79		dry[a]	7.33 (4)	dry	<1.50 (3)	dry	dry	<1.50 (3)	<1.50 (3)
5/04/79	c	dry		dry		dry	dry		
5/07/79		dry		dry		dry	dry	<1.50 (3)	<1.50 (3)
5/08/79					<1.70 (3)				
5/10/79			7.74 (4)			dry	dry	<1.60 (3)	<1.60 (3)
5/13/79									
5/14/79	<1.70 (3)		7.17 (4)		1.75 (3)			<1.70 (3)	1.82 (3)
5/16/79	<1.60 (3)	dry		dry		dry	dry		
5/17/79		dry	4.66 (4)	dry		dry	dry		
5/21/79	<1.70 (3)		8.76 (4)				<1.70 (3)		
5/24/79	<1.70 (3)	1.08 (4)	1.15 (5)				<1.70 (3)		
5/28/79	<1.70 (3)	1.03 (4)	1.34 (5)		<1.70 (3)			<1.70 (3)	<1.70 (3)
5/31/79									
6/01/79			1.34 (5)				1.06 (4)		
6/03/79			1.41 (5)						

a) installed
b) indicates <1.59 x 10^3
c) split 6.72 (3)

TABLE 2.4-9 (Cont'd)

TRITIUM LEVELS IN NEW TEST HOLES
pCi/l

Date	T12	T13	T14	T15	T16	T18	T19	T20
4/19/79	a							
4/20/79	<1.20 (3)	a						
4/23/79	2.50 (3)							
4/24/79	4.76 (3)	dry						
4/26/79	1.46 (4)							
4/27/79		<1.59 (3)			a			
4/29/79					<1.38 (3)			
4/30/79	2.21 (4)	<1.48 (3)[c]			<1.48 (3)			
5/01/79			a	a				
5/02/79				<1.33 (3)		a		
5/03/79	2.42 (4)	<1.33 (3)		<1.33 (3)	<1.62 (3)	dry	dry[a]	
5/04/79						dry	dry	a
5/07/79	2.26 (4)						<1.62 (3)[d]	2.62 (4)
5/09/79				2.12 (3)				
5/10/79	3.13 (4)	<1.60 (3)	<1.60 (3)	<1.60 (3)	<1.60 (3)		<1.60 (3)	2.20 (4)
5/13/79								2.27 (4)
5/14/79	2.14 (4)	<1.70 (3)	<1.57 (3)	<1.57 (3)	<1.57 (3)		3.57 (3)	
5/16/79			<1.60 (3)			6.07 (4)		
5/17/79	<1.60 (3)						1.24 (4)	2.00 (4)
5/21/79	<1.70 (3)		<1.70 (3)			7.88 (4)	1.86 (4)	2.23 (4)
5/24/79	<1.70 (3)		<1.70 (3)				1.91 (4)	1.92 (4)
5/28/79		<1.70 (3)	<1.70 (3)	<1.70 (3)	<1.70 (3)	6.82 (4)	1.83 (4)	1.76 (4)
5/31/79	<1.70 (3)					6.91 (4)	1.98 (4)	1.84 (4)
6/01/79								
6/03/79	<1.70 (3)					6.49 (4)	1.88 (4)	1.87 (4)

a) installed
b) indicates $<1.20 \times 10^3$
c) split <1.48 (3)
d) approximate date

TABLE 2.4-10

CONDUCTIVITY AND TEMPERATURE MEASUREMENTS FOR GROUND WATER SAMPLES COLLECTED FROM NEW TEST HOLES ON MAY 10, 1979

Well No.	Conductivity (μmhos/cm)	Temperature (°F)
T2	*	*
T3	*	*
T4	126	71.6
T5	*	*
T6		
T7	*	*
T8	*	*
T10	204	79.2
T11	236	80.6
T12	99	82.4
T13	296	72.5
T14	181	71.6
T15	81	70.7
T16	92	75.2
T18	*	*
T19	+	79.7
T20	114	73.4

*dry
+sample was too small for measuring apparatus

the tritium levels have been high at TH2, no particular significance is seen in this happenstance. There seems to be no particular significance to any of the conductivity and temperature values as no correlation was established between these values and the tritium levels.

2.4.5 CRITIQUE

An explanation and prognosis of the tritium levels at each of the key locations is advanced in this section. Where it seemed needed, an attempt was made to bring these levels into perspective by showing their environmental impact and their relation to the regulatory limits. Appropriate actions either taken or being considered which are associated with these locations are also reported. The following locations are discussed herein: the areas in the water table associated with Piezometers M9B, P16, and P17B; the outfalls of the subsurface drainage network; and Piezometers M8A and P17A in the local aquifer.

2.4.5.1 Area About Threshold For P16

It has been suggested at several places above, that a "pool" of water contaminated with tritium is trapped in the water table in a pocket on the south side of CST-1. Furthermore it appears that Piezometer P16 provides a tap to this "pool" near its center. As explained in subsequent paragraphs this contaminated water is believed to have accumulated from leaks associated with the condensate transfer pumps.

On the south side of the SE corner of the dyke surrounding CST-1 is a small concrete slab (roughly 6 to 8 feet on a side) on which the condensate transfer pumps are mounted. The soil on the west side of this slab has occasionally been wet, sometimes soaked. These pumps have occasionally had leaking seals and valves. Pump repairs are made in a routine manner. In addition to the ordinary repairs, shields were mounted on the pumps to direct any spraying from such leaks to the slab where a drain to radwaste is installed. As mentioned in the 1977 Environmental Surveillance Report these leaks were considered in trying to determine the primary cause of the elevated tritium levels at E7A. After some deliberation that notion was discarded since at that time these leaks were thought to be much less than they presently appear to have been.

Leakages from these pumps and associated fittings if they should occur in spurts might go unnoticed for some time since normally no one is in this areas. On May 2, 1979, however, the engineer supervising the installation of the new test holes noticed that just as operation was switched from one of the condensate transfer pumps to the other, there was a momentary small release of water to the ground at the point where a pipe covered with insulation enters the ground. Subsequently, the insulation was removed and was found to have been completely soaked. The check valve for the pump, when not operating, was found to have been the principal source of the concealed leakage. The check valve was repaired punctually.

After the observation of the leaks on May 2, 1979, the area was surveyed with a portable radiation monitor to determine the extent of contamination. Gamma spectral analyses were performed on soil samples which were collected at various points in order to confirm the radiation measurements taken with the portable monitor. Near the middle of May 1979, the contaminated soil was placed in drums for shipment to a licensed low level burial ground. Over the past two years gamma spectral analyses have from time to time been performed on soil samples which were collected from near these condensate transfer pumps. Typical results were presented in Table 2.4-6 (for "Near P16").

The insulation on the pipes adjacent to the condensate transfer pumps has provided a mask which could have allowed persistent leakage to the ground to go unnoticed. The downward trend of the tritium levels at P16 since September (1978) indicates that there had occurred a stoppage of or significant reduction to the input of extraneous tritium to this "pool" about P16. It seems likely then that this leakage which was observed on May 2, 1979, and believed to have occurred in the past, had been much greater than previously thought.

Since repairing of the [illegible] and the installation of shields may have not been sufficient actions to entirely preclude releases of contaminated water to the ground, it has been proposed to move the condensate transfer pumps inside the dyke of the CST. A Design Change Request (DCR) has been submitted and is now being studied.

With the cessation of contaminated water to this "pool", the levels will slowly diminish. In addition to radiological decay, lower tritium concentrations will result not only from the direct dilution afforded by precipitation but also as a result of the horizontal transfer it will promote. Some of the tritium from this "pool" may reach the river via the east outfalls of the subsurface ditch (Ditch No. 2) and of Yard Drain No. 2. Levels at Ditch No. 2 and Catch Basins PY12 and PY24 indicate that this is indeed happening. However the two orders of magnitude difference between the levels in the "pool" and at the outfalls indicates that such migration is slow and such levels present no hazard.

The highest levels for the "pool" are found at P16; the highest measured value at P16 was 1.64×10^5 pCi/l on August 8, 1978; currently the levels are about half this maximum. The MPC for water to unrestricted areas from 10CFR20 is 3.0×10^6 pCi/l. Typical tritium levels found in the CST, the reactor water, the reactor steam, and in the hotwells of the condenser are each about 9×10^5 pCi/l. There are no current or planned usages of water from the water table here or at any other place on site. The highest positive level found in Ditch No. 2 was 1.00×10^3 pCi/l on February 20, 1979; it seems probable that this high came about as a result of migration from the "pool;" levels with this order of magnitude can be expected to continue in Ditch No. 2.

It is believed that quarterly sampling at P16 and monthly sampling at T12, T18, T19, and T20 should be adequate to monitor this "pool." Since the levels are generally high, a liquid scintillation detector should provide sufficient accuracy for the tritium analyses. Adjustments to the sampling frequency will be made as warranted.

2.4.5.2 Area About Piezometer P17B

The cause of the high tritium levels at P17B (the discharge of process water through an open half inch line to a point about 10 feet from this well), how it revealed itself, the actions taken to permanently remove this extraneous source, etc. have been expounded upon in Section 2.4.3 No further explanations are warranted here.

The tritium level at P17B has fallen nearly an order of magnitude since the termination of the leakage of process water to this proximity on March 21, 1979. The rate of reduction here is probably a stronger function of the amount of rainfall than anything else. A rather large amount of rain has fallen since March 21, 1979. It seems safe to predict that the level will drop another order of magnitude by this year's end.

Some of the tritium may reach the river via the north outfall of the subsurface ditch (Ditch No. 1). The levels in Ditch No. 1 attest that this is indeed slowly happening. Considering the high and rising levels at N9B and at T3, T4, and T8 coupled with the rather modest levels in Ditch No. 1, it may be adduced that only a very small fraction of the tritiated water from the P17B area is finding its way to the river and that the vast majority of this water is migrating to the N9B area.

The highest tritium level measured at P17B was nearly 3.0×10^5 pCi/l on February 16, 1979; this level is exactly an order of magnitude below the MPC for unrestricted areas. As indicated above the current level is about an order of magnitude below the high level found on February 16. The highest positive level found in Ditch No. 1 was 3.12×10^3 pCi/l on January 24, 1979; levels of this magnitude are apt to continue to occur in Ditch No. 1.

Quarterly sampling at P17B seems adequate at present. Within a year, annual sampling will probably be more than sufficient. When the tritium level drops below several thousand pCi/l, the analysis method should switch from the use of a liquid scintillation detector to the gas enrichment technique.

2.4.5.3 Area About Piezometer N9B

It wasn't until the latter part of March 1979 that the levels in this area reached the reporting level. While the levels in the other two effected areas of the water table (about P16 and P17B) are now diminishing, the levels here (about N9B) are on the rise. A set of readings taken in the 4th week of May show that of these three areas the highest tritium levels are now found in the area about N9B. In addition to N9B, Piezometers T3, T4, and T8 are associated with the N9B area.

It is postulated that the high and rising levels here are caused by the influx of much of the process water which was discharged through the open-ended half inch line near N17B. In Section 2.4.4 it was pointed out that in the area just east of the Offgas Recombiner Building, there appears to be a definite southeasterly slope to the upper surface of the aquiclude separating the water table from the minor aquifer. This suggests that the above-mentioned process water would indeed generally tend to migrate from its point of discharge which was roughly 10 feet SE of N17B to the vicinity of N9B.

Piezometer N9B is roughly 120 feet SSE of this point of discharge. It is estimated that the ground water in the water table will migrate between 0.1 to 0.5 feet per day depending upon the soil media and the driving force (difference in water levels between points along the path). Thus 8 to 40 months would be required for ground water to traverse this distance. In Section 2.4.3 it was adduced that effective leakage to the ground near P17B probably began in June 1978.

The natural flow paths in the water table at the site have been complicated by the construction of the plant, particularly by the layout of numerous underground piping systems crisscrossing the yard. Typically the pipes are buried 10 to 15 feet below the yard grade. Sand was used as a backfill for the piping systems. It can therefore be expected that groundwater migration will follow the piping beds which provide paths with relatively very low resistance to flow. Thus migration times may be relatively short to points accessible via the pipe beds.

It was pointed out in Section 2.4.4 that the tritium level at T4 was now greater than that at N9B. Piezometer T4 lies between two piping systems running in a north-south direction. The higher level at T4 conforms with the postulate that the high levels in the N9B area are due to migration from the P17B area in that this point would be reached first. The levels at T4 may thus be foreshadowing the levels that might be expected at N9B in a few months.

Detectable levels of tritium have very recently been obtained in samples from T3 and T8 for the first time. The level at each of these locations was about 1.1×10^4 pCi/l which is well above detection. Piezometers T3 and T8 are respectively due west and due east of N9B. The rather abrupt appearance of these levels seems to indicate the arrival of the "wave" of migrating ground water to these points.

If this postulate to account for the high levels in this area is correct, the levels at N9B, T3, T4, and T8 will probably continue to rise for a year or so. Levels perhaps in excess of 3×10^5 pCi/l are envisioned should the migrating tritiated water become trapped in this area in a manner similar to that supposed for the P16 area. If the tritiated water is merely being held up in a less permanent manner as it migrates elsewhere, the peak levels here are apt to be lower and to be reached sooner. In 6 months or so the levels should begin to show slower rates of increase, then after peaking with migration having been essentially completed, a gradual decrease in the levels is expected largely as a result of dilution afforded by precipitation. Any migration of the tritiated water from this area is apt to be at lower levels as it spreads itself over a wider area.

Another possible contribution to the levels about N9B could be from the break which occurred in the offgas line at the point where it entered the ground as it exited from the Turbine Building (which is perhaps 80 feet or so west of N9B). This break which became known in May 1978 (and which was punctually fixed after having been properly reported) resulted from the settlement of the Turbine Building. The gases in this line are laden with tritium; it is not highly unlikely that a significant quantity of the gaseous tritum would have escaped and would have been subsequently condensed and deposited in the ground; such leakage may have been happening for some indefinite period of time before the discovery of this break. The contribution (if any) of this leakage to the present and future levels about N9B is uncertain.

It seems plausible to conclude that the high tritium levels in the N9B area are caused by the migration of tritiated ground water from the vicinity of P17B where it had been deposited. Also the leakage from the offgas line may possibly have also contributed significantly to the tritium levels in this area. The input to the ground water from both of these sources has been terminated.

The highest tritium level yet to be found in the area was 1.41×10^5 pCi/l at T4 on June 5, 1979. This is less than one twentieth of the MPC for unrestricted areas as given in 10CFR20. The general public does not have access to this ground water.

There are piping systems in this area transporting relatively high levels of tritium which might also be considered as potential sources. Consideration is being given to hydrostatically testing each of these. These are:

(a) the condensate return line from the recombiner condenser to the hotwells of the main condenser;

(b) the drain lines to radwaste from the floor drain and the equipment sumps in the Offgas Recombiner Building; and

(c) the discharge line from the Radwaste Building to the dilution line prior to discharge to the river.

Such hydrostatic tests would be very difficult to perform on these lines due to the absence of valves at strategic points. In view of the plausibility of the migration postulate, the difficulty in performing such tests and the improbability of leaks in such lines, the more pragmatic course of action is to postpone these tests while their need is being evaluated. Such need will depend upon the future behavior of the tritium levels in this area which should confirm or reject the migration postulate.

Semimonthly sampling at T3, T4, T8 and 299B seems to be sufficient at this time. Since the levels at each of these locations is high, a liquid scintillation detector may be used for the tritium analyses. Adjustments to the sampling frequency and the method of laboratory analysis will be made as warranted.

2.4.5.4 Outfalls of Subsurface Drainage Network

In the above subsections it was alleged that tritium appears to be slowly migrating from the areas in the water table where the levels are high to the subsurface drainage network. The adjacency of these areas to this network coupled with many higher than usual levels and some elevated levels in the subsurface ditches attest to such an allegation. The higher and more erratic levels in Ditch No. 1 indicate that a greater amount of tritium is finding its way to this ditch; the erratic behavior of the levels are believed to reflect the "off and on" nature of the migration which has an "off and on" motivator, namely precipitation. It was also stated above that some elevated levels can be expected for some time.

At present, semimonthly sampling seems to be adequate. The tritium analyses of these samples ought to employ the gas enrichment process so that a positive level might likely be ascertained. The sampling frequency might be changed to monthly or quarterly if the readings become consistent or approach the LLD.

The vast majority of the tritium which might reach the river will pass through the outfalls of the subsurface drainage network enroute. The maximum environmental impact due to all of the tritium in the ground water in the plant yard is assessed as the dose to the hypothetical individual who drinks water only from the outfalls of the subsurface drainage network. (The average concentrations from the outfalls of the yard drains are much lower than those from the subsurface drainage network.) The highest measured quarterly average concentration of tritium from an outfall was 1.69×10^3 pCi/l for Ditch No. 1 in the 1st quarter of 1979; this concentration is equivalent to a whole body or organ dose of 0.044 mrem. These dose estimates are very conservative as drinking water is not obtained from the outfalls. The quarterly dose limits resulting from liquid releases as established by Appendix I to 10CFR50 are 1.5 mrem for the whole body and 5 mrem for any organ. The average annual concentration of tritium for drinking water in community water systems is required to be less than 2×10^4 pCi/l according to EPA's National Interim Primary Drinking Water Regulations, 40 CFR 141.16. The highest measured concentration in an individual sample was 3.12×10^3 pCi/l for Ditch No. 1 on January 24, 1979 which is three orders of magnitude below the MPC for tritium in unrestricted areas as given in 10CFR20.

2.4.5.5 Local Aquifer

The tritium levels at N7A have persistently been about an order of magnitude higher than what might reasonably be expected. This test hole passes through the postulated pocket of trittiated ground water near P16 which was referred to above. It may be advanced that a hydraulic connection exists between the water table and the local aquifer. Such would provide a plausible explanation for the elevated levels at N7A.

To preclude leakage to the local aquifer by way of the test holes tapping same, a good seal around the screen must be provided from the ground surface down some distance into the aquiclude separating the water table and the local aquifer. If the seal was not properly installed or if the seal were to be damaged subsequent to its installation, leakage could develop. During construction with a lot of movement of heavy equipment about the plant yard, damage was not highly unlikely.

It is therefore suggested that some seepage to the local aquifer from the water table is taking place at N7A. Since the tritium levels in the water table in this area are one to two order of magnitude greater than the levels at N7A, it can be expected that the levels at N7A will increase so long as the high levels in the water table are maintained. As the input of extraneous tritium to the water table is stopped or greatly diminished, the levels in the water table are expected to slowly decrease. This decrease would principally be due to dilution and dispersion afforded by precipitation. The levels at N7A can be expected to show a very slow response to reduced levels in the water table since the rate of hydraulic movement in the local aquifer is much slower; radiological decay may be the chief mechanism by which the tritium level will be reduced in the local aquifer.

A similar but milder situation might exist at P17A which also taps the local aquifer. The tritium levels here are quite a bit lower than those at N7A but still a bit high to occur in nature. Piezometer P17A is adjacent to the open half inch line which discharged process water into the water table. Some seepage from the water table to the local aquifer is likely to be taking place at P17A also. The prognosis here at P17A is like that for N7A, namely: the future level in the local aquifer at P17A is a function of the level in the water table at P17B, but the reduction rate at P17A is expected to be much less than that at P17B.

Migration in the local aquifer is very slow, about 5.65 feet/yr (see Section 2.4 of the FSAR for HNP-2). The direction of flow is toward the river and at this rate it would take about 200 years to reach the river. By that time the tritium would effectively be non-existent due to radiological decay. The tritium concentration would also be greatly reduced as it spreads through a larger volume.

It is presently planned to perform tritium analyses using the gas enrichment process on samples from N7A semiannually and from P17A annually. The sampling frequency is likely to change as warranted by the results of these analyses.

2.4.6 FINALE

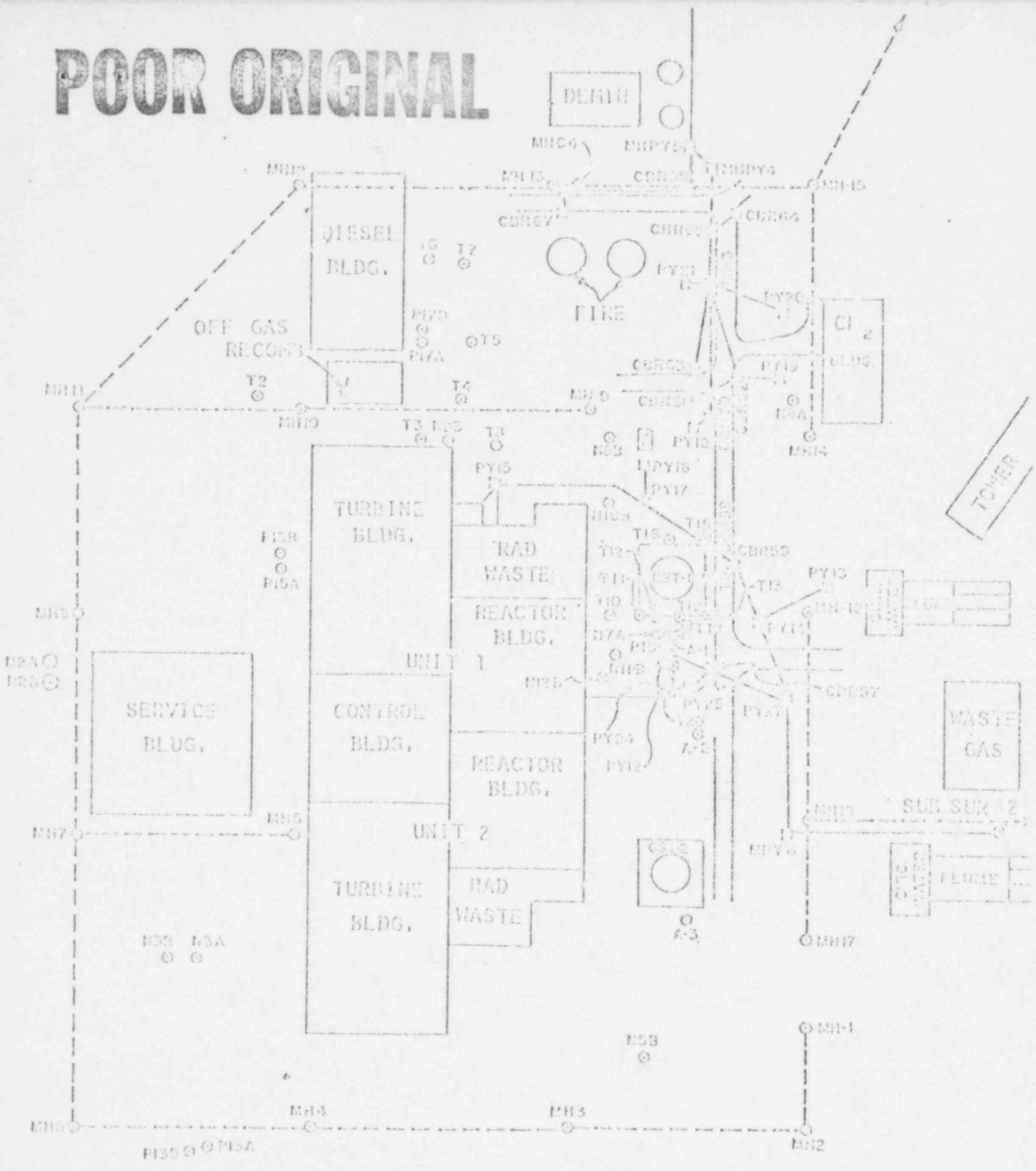
A complete account of the tritium problem in ground water in the plant yard has been described - its history was narrated; all data were presented; key areas were identified; explanations were offered; the actions taken, planned or considered were related; the monitoring program to be followed has been stated; prognoses were provided; the levels were shown to be well within the various regulatory limits; and the environmental impact was shown to be miniscule.

A grip has been obtained on this problem; its resolution is progressing satisfactorily. Reports to the NRC will be made as warranted.

GEORGIA POWER COMPANY
EDWIN I. HATCH NUCLEAR PLANT
ANNUAL REPORT 1978.

LOCATION OF THE ORDINARY GROUND WATER SAMPLING STATIONS.

FIGURE 2.4-1



SUBSURFACE DRAIN SYSTEM

⊙ -- PIEZOMETERS

11 -- CATCH BASIN

100'
Scale

GEORGIA POWER COMPANY
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TEST HOLES AND THE DRAINAGE SYSTEM

FIGURE 2.4-2