

SUMMARY REPORT: A GROUNDWATER INVESTIGATION  
TO DEFINE THE SOURCE(S) OF TETRACHLOROETHYLENE THAT HAVE CONTAMINATED THREE  
COMMUNITY WATER SUPPLY WELLS AT TARAWA TERRACE I  
CAMP LEJEUNE MARINE CORPS MARINE BASE (MCB)  
ONslow COUNTY

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INTRODUCTION

From April to September 1985, the North Carolina Department of Natural Resources and Community Development (DNRCD) conducted a groundwater pollution study to define the source of tetrachloroethylene (TCE) contamination in three of eight wells that are part of the Tarawa Terrace (TT) well-field. This report present the findings of this study.

This report was written in December 1985 by Rick Shiver, Hydrogeological Regional Supervisor, Wilmington Regional Office, 7225 Wrightsville Avenue, Wilmington, NC 28403, telephone number (919) 256-4161.

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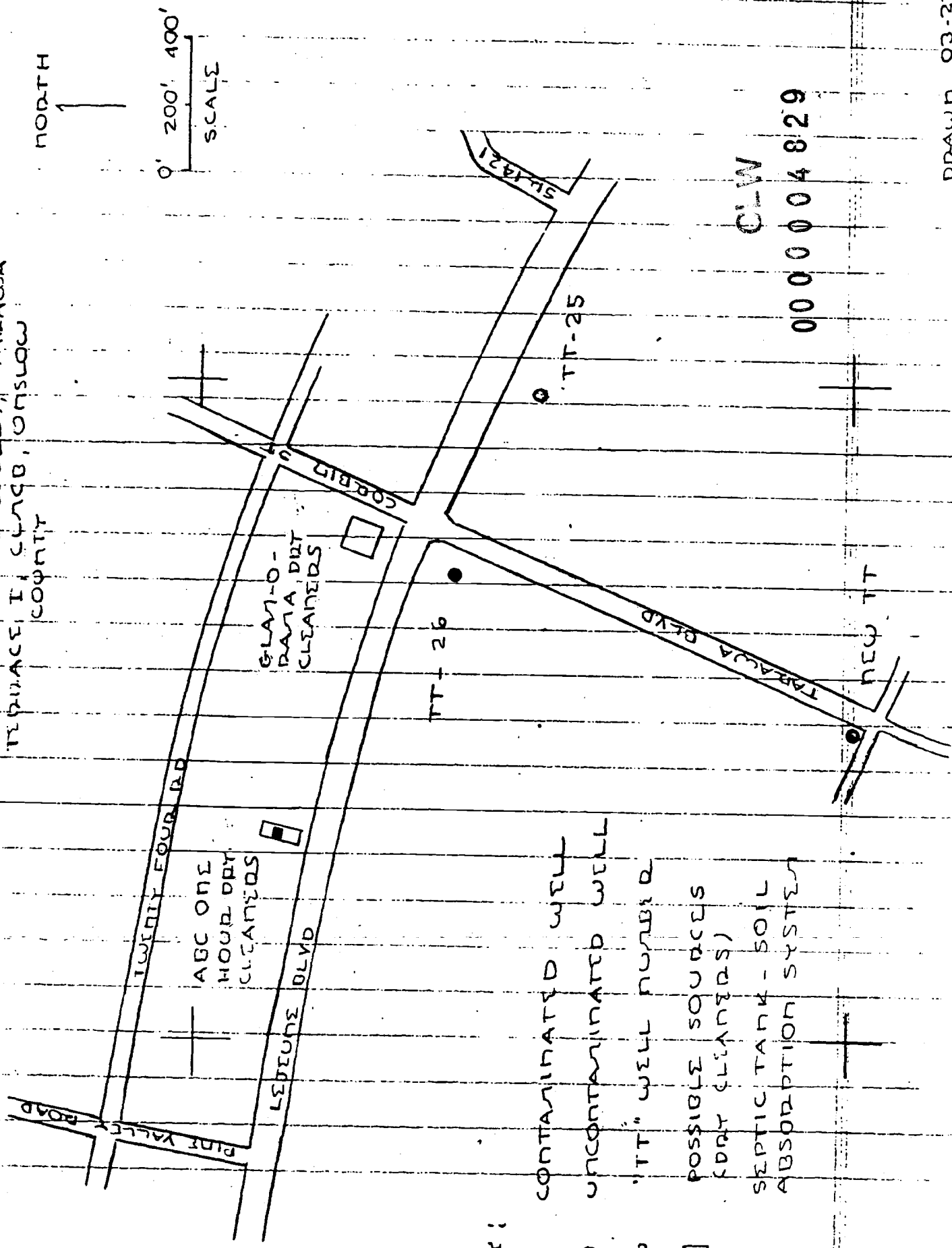
BACKGROUND

Having discovered organic contaminants present in water from well HP-602 during July 1984, the Marine Corps deemed it prudent to collect samples from 40 of its total 100 community water supply wells. Completed in March 1985, the analytical results showed the presence of volatile organic compounds (VOCs) in 10 of the 40 wells. The organic contaminants, moreover, consisted mostly of organic solvents that included tetrachloroethylene (PCE), trichloroethylene (TCE), and dichloroethylene (DCE).

Eight of the 10 contaminated wells obviously had been impacted by sources located on the Marine Corps Base (MCB). However, the other two contaminated wells, wells TT-26 and new TT were located near two off-base, commercial dry cleaning facilities (see Figure 1).

Since both dry cleaners were potential sources of the PCE contaminants, since GA standards obviously had been violated, and since the Marine Corps requested DNRCD's assistance in identifying the source of the pollution problem, the Groundwater Section began its investigation during April 1985.

FIGURE 1: MAP THAT SHOWS LOCATION OF POSSIBLE SOURCES TO CONTAMINATED WELLS, TABAWA TRIPRACE I, CUNGO, ONSLOW COUNTY



KEY:

- CONTAMINATED WELL
- UNCONTAMINATED WELL
- POSSIBLE SOURCES (DRY CLEANERS)
- SEPTIC TANK - SOIL ABSORPTION SYSTEM

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HYDROGEOLOGY

Figure 2 shows the hydrogeology underneath Tarawa Terrace. Here the Tertiary Sand System appears unconfined. The semi-confined Tertiary Limestone System is composed primarily of calcareous sand.

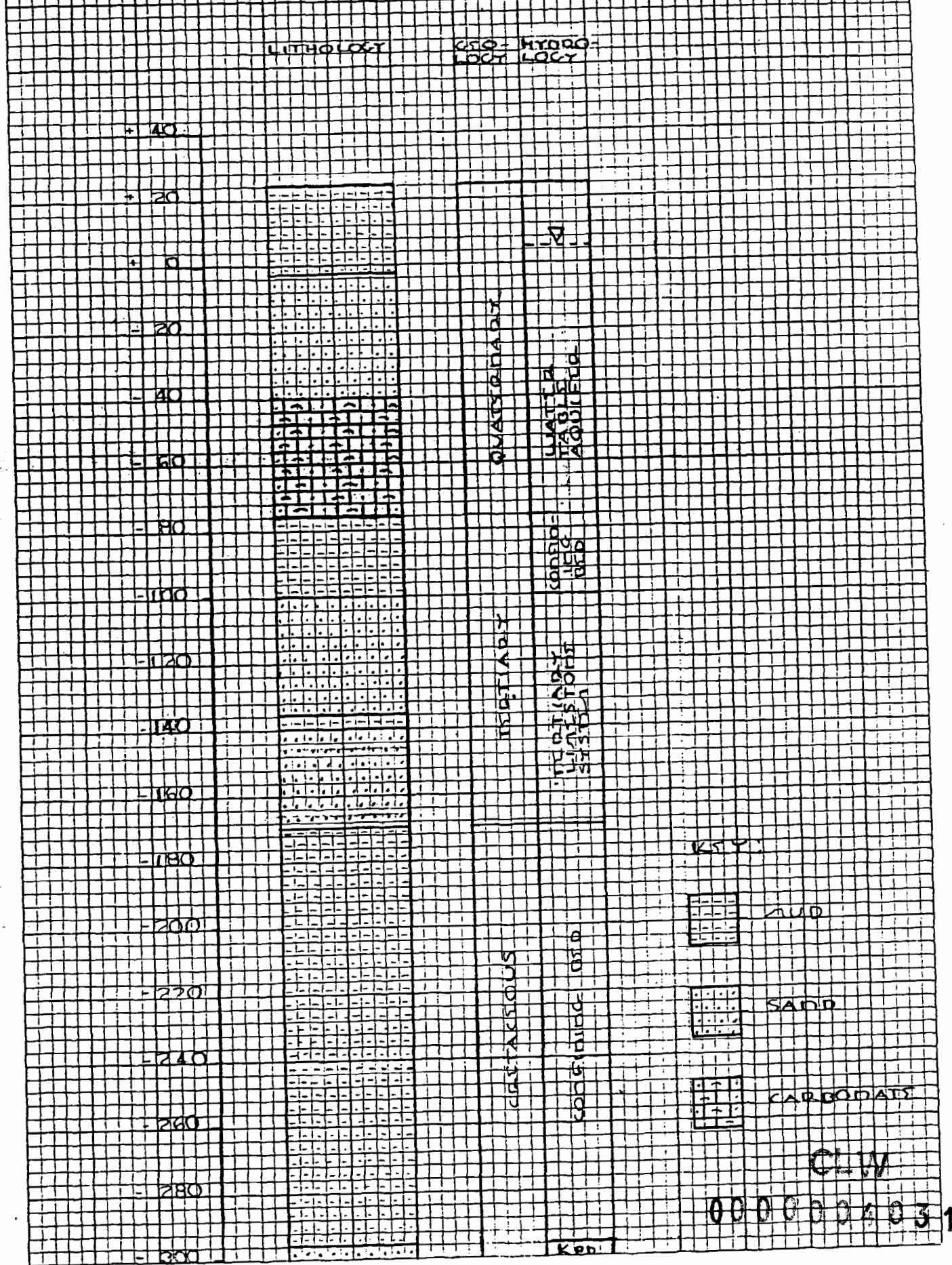
Large diameter wells screened opposite both aquifers typically yield 150 to 200 gallons per minute (GPM) of water. Specific capacity is about five (5) gallons per minute per foot of drawdown. Transmissivity averages about 1000 ft<sup>2</sup>/day.

Presuming an aquifer storativity that ranges from 0.1-0.25, and assuming a pumping time equal to 182.5 days, the cone of depression from a well in the TT well field attains a radius that is 900-1500 feet.

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FIGURE 2. A CROSS-SECTION OF THE HYDROGEOLOGY  
 UNDERSTANDING OF THE CLW BY TADAWIA  
 TERRACE IN CLAW, ON SLOW COURSE



WATER USE SITUATION

Wells TT-26 and new TT were two of a total eight base community water supply wells that comprised the Tarawa Terrace (TT) Water System. These wells are exposed to the Water Table Aquifer and/or Teritary Limestone System. Water use averages 1.00 million gallons per day (MGD) and ranges from a minimum of 0.72 MGD to a maximum of 1.50 MGD.

Use of contaminated wells TT-26 and new TT was discontinued during February 1985. Without these wells, demand exceeded supply, so it was necessary to impose water conservation measures on the users. These restrictions were lifted during June 1985, when an emergency water line from the Holcomb Boulevard System became operational.

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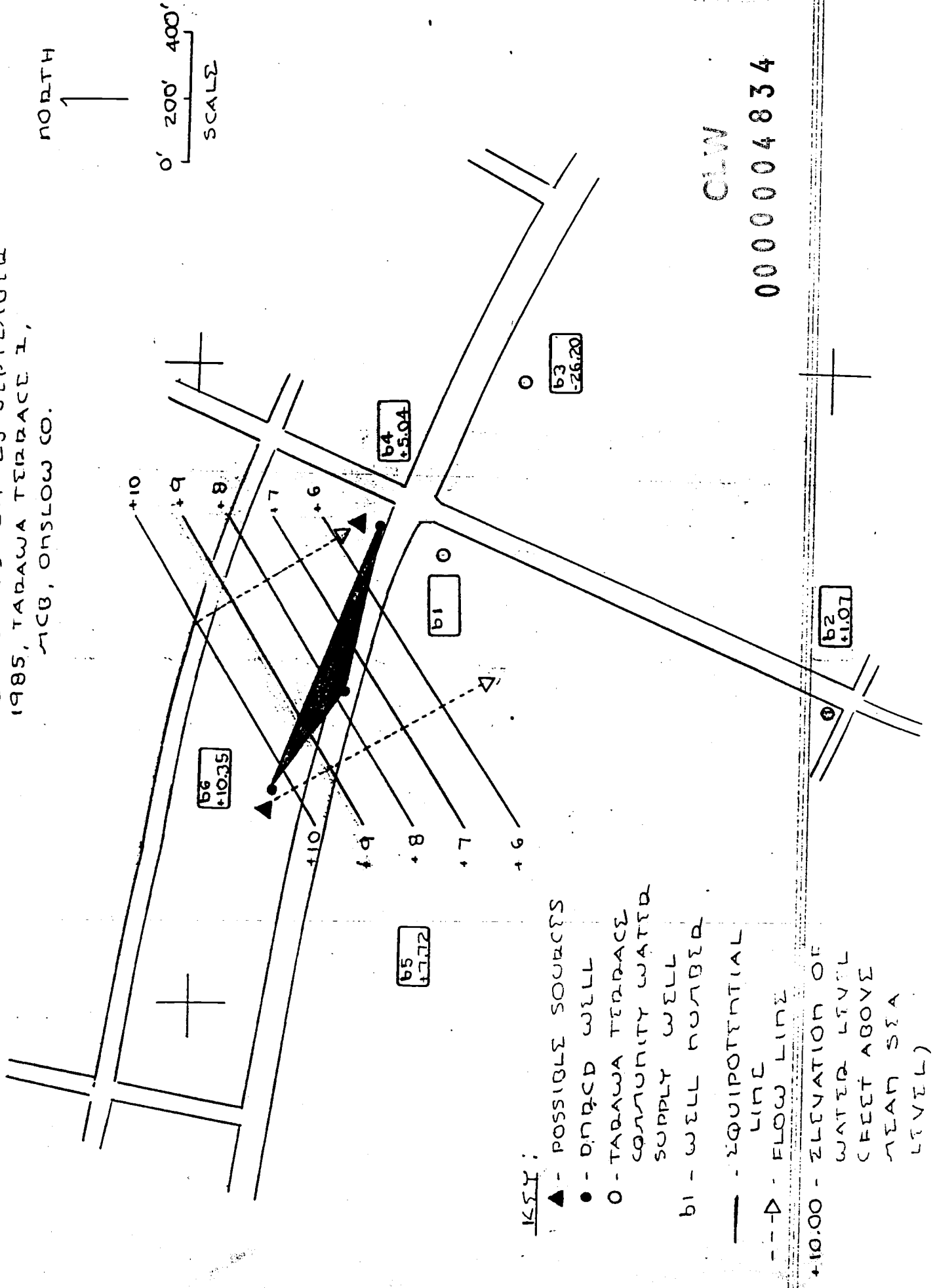
WATER LEVEL DATA

Table 2 summarizes the attributes of the wells from which water level data was collected on 25 September 1985 (Table 3). The static water level in the Water Table Aquifer was encountered at about 23 feet below land surface datum. Figure 3 shows that the generalized direction of flow within the Water Table Aquifer is to the southeast.

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FIGURE 3: FLOWNET MAP CONSTRUCTED FOR WATER LEVEL DATA COLLECTED ON 25 SEPTEMBER 1985, TABAWA TERRACE I, MCB, ONSLOW CO.



- KEY:
- ▲ - POSSIBLE SOURCES
  - - DRILLED WELL
  - - TABAWA TERRACE COMMUNITY WATER SUPPLY WELL
  - b1 - WELL NUMBER
  - - EQUIPOTENTIAL LINE
  - - - Δ - FLOW LINE
  - +10.00 - ELEVATION OF WATER LEVEL (FEET ABOVE MEAN SEA LEVEL)

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TABLE 2: A SUMMARY OF THE WELL ATTRIBUTES, TADAWA TERRACE I, CLACK, ONSLOW COUNTY

WELL NO.	WELL OWN- SR	TOTAL DEPTH (FT)	DIAM- ETER (IN)	SCREEN INTER- VAL (FT-FT)	GRAV- EL IN- TERVAL (FT-FT)	CEMENT GROUT (FT-FT)	MOD GROUT (FT-FT)	IQ (GPM)	Q/S (GPM/ FT-DD)	RS TAG
X-24,b1	USMC	100	-	-	60-100	11-	1-	128		TT-
X-24,b2	USMC	147	10	70-95	0-155	0-50	-	252	4.77	NSW
-	-	-	-	132-142	-	-	-	-		-
X-24,b3	USMC	180	8	70-75	0-185	0-40	-	130	5.04	TT-
-	-	-	-	85-95	-	-	-	-		-
-	-	-	-	150-175	-	-	-	-		-
X-24,b4	DDBCD	59	2	42-52	32-59	-	0-32	1	-	NO.
X-24,b5	DDBCD	59	2	42-52	32-59	-	0-32	5	-	NO.
X-24,b6	DDBCD	59	2	42-52	32-59	-	0-32	5	-	NO.

TABLE 3: A SUMMARY OF THE WATER LEVEL INFORMATION COLLECTED ON 25 SEPT 1985, TADAWA TERRACE I, ONSLOW COUNTY

WELL NO.	AP- LSD (FT)	WL- AP) (FT)	WL- LSD (FT)	ELSV LSD (FEET ANSL)	ELSV AP (FEET ANSL)	ELSV- WL (FEET ANSL)	AQUIFER
b1	-	-	-	-	35.48	-	-
b2	1.64	25.55	23.91	24.98	26.62	11.07	
b3	0.39	58.56	58.17	31.97	32.36	-26.20	
b4	-0.07	28.31	28.38	33.28	33.35	5.04	
b5	0.10	23.29	23.19	31.36	31.01	7.72	
b6	0.18	22.84	22.61	33.37	33.19	10.35	

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WATER QUALITY DATA

Table 4 lists the VOCs that have been encountered in the six wells. Appendix I contains the results of the standard complete and standard pollution analyses performed on wells b1, b2, and b3.

This data shows that the principal contaminants are tetrachloroethylene, trichloroethylene, and dichloroethylene. Figure 4 shows the 25 September 1985 extent of the tetrachloroethylene plume over the study area.

Significantly, the 25 September 1985 data show that water from a third well in the TT well field system, well TT-25, contains a measurable concentration of tetrachloroethylene. Before the September 1985 study, only two of the wells in the TT system contained organic solvents.

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TABLE 4: ORGANIC ANALYSES RESULTS  
 ON WATER SAMPLES COLLECTED  
 FROM WELLS X-24, b1-b6, TARAWA  
 TERRACE I, CLACK, ONSLOW COUNTY

PARAMETER	UNIT	RESULTS FOR WELL b1				
		1-16-85	2-19-85	4-9-85	9-25-85	
TETRACHLORODIETHYLENE	MG/L	1580	64	630	1100	
TRICHLORODIETHYLENE	MG/L	57	-	18	27	
1,2-TRANS-DICHLORODIETHYLENE	MG/L	92	-	1.4	1.6	
VINYL CHLORIDE	MG/L	27	-	-	-	
METHYL CYCLOPENTANE	MG/L	-	-	-	0.42	
	MG/L	-	-	-	-	
	MG/L	-	-	-	-	
PARAMETER	UNIT	RESULTS FOR WELL b2				
		1-16-85	2-19-85	3-11-85	4-9-85	9-25-85
TETRACHLORODIETHYLENE	MG/L	132	26	41	NOPE	4
TRICHLORODIETHYLENE	MG/L	-	53	-	NOPE	0
1,2-TRANS-DICHLORODIETHYLENE	MG/L	-	-	-	NOPE	-
VINYL CHLORIDE	MG/L	-	-	-	NOPE	-
(-)	MG/L	-	-	-	-	-
	MG/L	-	-	-	-	-
	MG/L	-	-	-	-	-
PARAMETER	UNIT	RESULTS FOR WELL b3				
		4-9-85	9-25-85			
TETRACHLORODIETHYLENE	MG/L	NOPE	0.43			
TRICHLORODIETHYLENE	MG/L	NOPE	-			
1,2-TRANS-DICHLORODIETHYLENE	MG/L	NOPE	-			
VINYL CHLORIDE	MG/L	NOPE	-			
	MG/L	-	-			
	MG/L	-	-			
	MG/L	-	-			
PARAMETER	UNIT	RESULTS FOR WELL b4				
		9-25-85				
TETRACHLORODIETHYLENE	MG/L	2.2				
DICHLORODIETHYLENE	MG/L	-				
p-TRANS-DICHLORODIETHYLENE	MG/L	-				
VINYL CHLORIDE	MG/L	-				
METHYL BENZENE	MG/L	2.3				
	MG/L	-				
	MG/L	-				

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TABLE 4: ORGANIC ANALYSIS RESULTS  
 ON WATER SAMPLES COLLECTED  
 FROM WELLS X-24, b1-b6, TARAWA  
 TERRACE I, CLACK, ONSLOW COUNTY

PARAMETER	UNIT	RESULTS FOR WELL	b5
		9-25-85	
TETRACHLOROETHYLENE	MG/L	4.9	
TRICHLOROETHYLENE	MG/L	0.98	
1,2-TRANS-DICHLOROETHYLENE	MG/L	-	
VINYL CHLORIDE	MG/L	-	
BENZENE	MG/L	2.3	
	MG/L	-	
	MG/L	-	
PARAMETER	UNIT	RESULTS FOR WELL	b6
		9-25-85	
TETRACHLOROETHYLENE	MG/L	12,000	
TRICHLOROETHYLENE	MG/L	2.7	
1,2-TRANS-DICHLOROETHYLENE	MG/L	-	
VINYL CHLORIDE	MG/L	-	
(	MG/L	-	
	MG/L	-	
	MG/L	-	

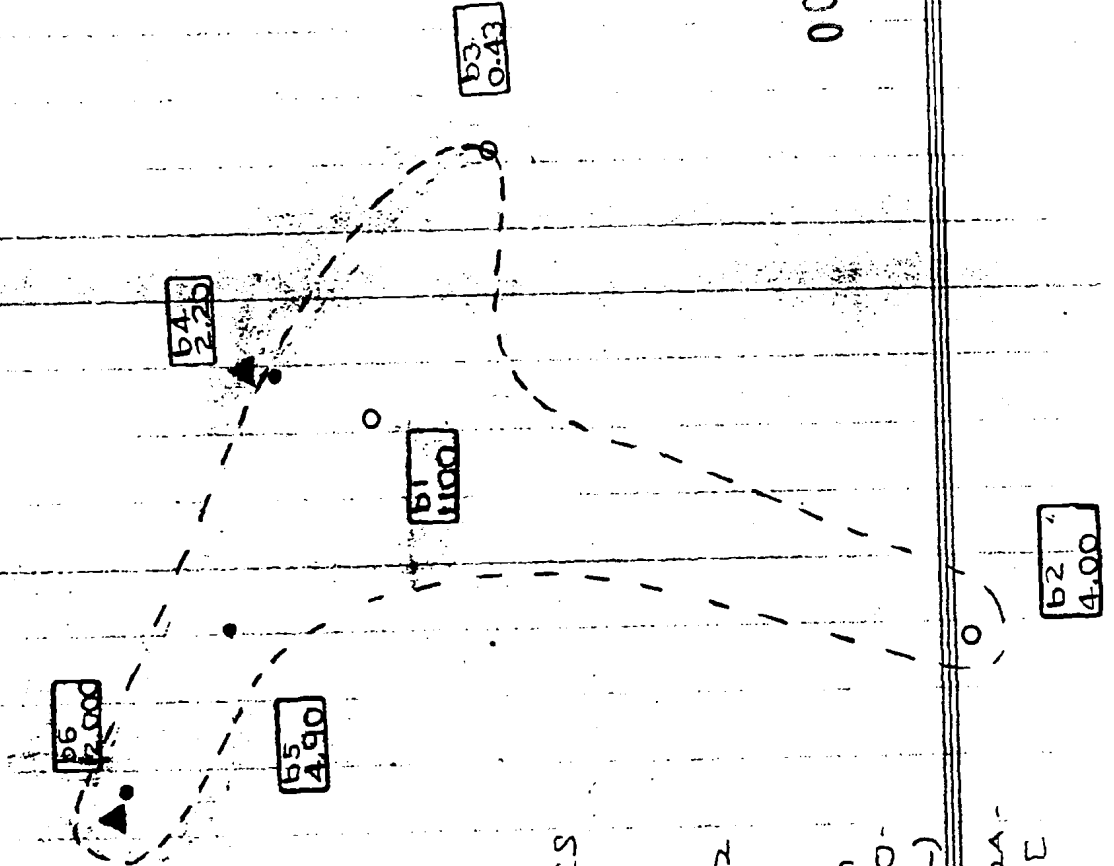
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FIGURE 4: MAP THAT SHOWS THE CONCENTRATION OF TETRACHLOROETHYLENE ON 25 SEPTEMBER, 1985, TARAWA TERRACE I, CLACB, ONSLOW

NORTH  
↑

0' 200' 400'



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- KEY:
- ▲ - POSSIBLE SOURCES
  - - DRICD WELLS
  - - TARAWA TERRACE COMMUNITY WATER SUPPLY WELLS
  - B1 - WELL NUMBER
  - 1100 - CONCENTRATION OF TETRACHLOROETHYLENE (MG/L)
  - EXTENT OF TETRACHLOROETHYLENE PLUME

## CONCLUSIONS

Interpretation of the data suggests that the PCE plume originates from the septic tank-soil absorption system (ST-SAS) at the ABC One Hour Cleaners (see Figure 1). ABC One Hour Cleaners (hereafter ABC) began business in 1954.

The reasons for identifying the ST-SAS at ABC as the principal source are as follows:

1. ABC uses, and has always used, PCE to dry clean clothes;
2. ABC uses, and has always used, a ST-SAS for the disposal of its wastewater;
3. Inspection of the area where PCE is stored, used and recycled shows that PCE releases can and do enter the septic tank (ST);
4. The formation from 0-15 feet at b6 possessed an obvious PCE odor: this finding infers a PCE release to the subsurface;
5. Figure 3 shows that the direction of flow within the Water Table Aquifer is from ABC to the three impacted wells;
6. Compensating for the disparity in depths between wells b1-b3 and b4-b6, and considering that PCE is a "sinker" (i.e., PCE is about 50% denser than the native groundwater), Figure 4 indeed shows a concentration gradient from the source (ST-SAS at ABC) to the impacted wells.

Not incidentally, Glam-O-Rama also stores-uses-and-recycles PCE, but the study results do not implicate Glam-O-Rama as a (significant) source of PCE contamination.

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CLOSING STATEMENT

Through telephone conversations, the following persons have been made aware of the extent and magnitude of this problem:

Colonel R. A. Tiebout  
Assistant Chief of Staff, Facilities  
Marine Corps Base  
Camp Lejeune, NC 28542-5001  
(919) 451-3034

Mr. Victor Melts, Manager  
ABC One Hour Cleaners  
2127 Lejeune Boulevard  
Jacksonville, NC 28540  
(919) 353-1800

Ms. Cherylle Deal  
Secretary to Dr. Lynn Muchmore  
NC-DNRCD  
Post Office Box 27687  
Raleigh, NC 27611  
(919) 733-4984

Mr. Mike Bell  
DHR-DHS  
Water Supply Branch  
404 St. Andrews Street  
Greenville, NC 27834  
(919) 756-1343

Mr. Grover Nicholson  
DHR-DHS  
Solid and Hazardous Waste Management Branch  
Post Office Box 2091  
Raleigh, NC 27602  
(919) 733-2178

All but Mr. Mike Bell have requested a copy of this report when it is approved for general circulation.

Furthermore, Mr. Grover Nicholson has begun the process to involve the EPA in this case. Since a military installation is the victim of a serious pollution problem, and since the EPA can assist in a resolution of this

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problem under CERCLA, it is not known how and to what extent the EPA may wish to become involved in this matter. Therefore, the recommendations in this report are independent of any other agencies' input, and simply reflect what DEM feels must be done to bring the ABC facility into compliance with 2L regulations.

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APPENDIX I

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**RECEIVED**

DEPARTMENT OF NATURAL RESOURCES  
& COMMUNITY DEVELOPMENT

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COUNTY ONSTON  
QUAD NO. X-24 SERIAL NO. 4 JUN 6 1985

REPORT TO: (circle one)  
XRD, VSD, MGD, TMD, VADO,  
ATSD, RND, Absorbable PO,  
OTHER

WILMINGTON REGIONAL OFFSHORE/UNDERWATER FIELD/LAB FORM  
DEM

JUN 4 1985

LAB NUMBER 6-182  
DATE REC'D 4-10-85  
REC'D BY SP  
DATA ENTRY BY SP  
DATA REPORTED SP

PURPOSE: (circle one) baseline, petition monitor, other  
DATE COLLECTED 04 09 85 Time 10:25 BY DICK  
Location of PALEGA RD

GROUND WATER SECTION I

Description of sampling point WELL CURB OFF EAST SIDE OF DISPOSED INTERNAL STREET ADJACENT TO  
PALEGA RD (pumping line, air temp, etc.) 1540

Field Analyte By: D SELYIN Lat. 344422N Long. 772152W  
pH 7.10 Spec. Cond. 310 Temp. 19 °C Other OCCASIONAL APPEARANCE OF CLEAR TASTE

Lab Analysis

<input checked="" type="checkbox"/> Alkalinity to pH 4.5	P00410	180	mg/l
<input checked="" type="checkbox"/> Alkalinity, Hydroxide	P1130	41	mg/l
<input checked="" type="checkbox"/> Carbonate	P00435	41	mg/l
<input checked="" type="checkbox"/> Bicarbonate	P00440	220	mg/l
<input checked="" type="checkbox"/> pH value (open analyzed)	P00400	8.2	units
<input checked="" type="checkbox"/> Arsenic (D)	P01000	<10	ug/l
<input checked="" type="checkbox"/> Carbon dioxide	P00405		mg/l
<input checked="" type="checkbox"/> Chloride (D)	P00940	9	mg/l
<input checked="" type="checkbox"/> Color (True)	P00080	24	units
<input checked="" type="checkbox"/> Cyanide	P00720		mg/l
<input checked="" type="checkbox"/> Dissolved solids (D)	P70301	230	mg/l
<input checked="" type="checkbox"/> Fluoride (D)	P00931	0.2	mg/l
<input checked="" type="checkbox"/> Hardness (as CaCO <sub>3</sub> ) (D)	P00900	190	mg/l
<input checked="" type="checkbox"/> Hardness (non-carbonate) (D)	P00902	10	mg/l
<input checked="" type="checkbox"/> HAs (D)	P38260		mg/l
<input checked="" type="checkbox"/> Phenol (D)	P34466	<5	ug/l
<input checked="" type="checkbox"/> Silica (D)	P00935	6	mg/l
<input checked="" type="checkbox"/> Sulfate (D)	P00946	5	mg/l
<input checked="" type="checkbox"/> Specific Cond.	P00094	420	umhos/cm

<input checked="" type="checkbox"/> Ar-Silver (D)	P01075	<50	ug/l
<input checked="" type="checkbox"/> Ar-Aluminum (D)	P01106	100	ug/l
<input checked="" type="checkbox"/> Ar-Barium (D)	P00609	200	ug/l
<input checked="" type="checkbox"/> Ar-Cadmium (D)	P00915	80	ug/l
<input checked="" type="checkbox"/> Ar-Calcium (D)	P01035	<20	ug/l
<input checked="" type="checkbox"/> Ar-Chromium (D)	P01030	<50	ug/l
<input checked="" type="checkbox"/> Ar-Copper (D)	P01040	<20	ug/l
<input checked="" type="checkbox"/> Ar-Iron (D)	P01046	1200	ug/l
<input checked="" type="checkbox"/> Ar-Mercury	P11900	<0.2	ug/l
<input checked="" type="checkbox"/> Ar-Manganese (D)	P01130	<50	ug/l
<input checked="" type="checkbox"/> Ar-Magnesium (D)	P00925	20	mg/l
<input checked="" type="checkbox"/> Ar-Manganese (D)	P01056	<50	ug/l
<input checked="" type="checkbox"/> Ar-Sodium (D)	P00929	5	ug/l
<input checked="" type="checkbox"/> Ar-Lead (D)	P01049	<100	ug/l
<input checked="" type="checkbox"/> Ar-Zinc (D)	P01090	<30	ug/l
<input checked="" type="checkbox"/> Ar-Potassium (D)	P00935	1.6	mg/l
<input checked="" type="checkbox"/> Ar-Selenium		<50	ug/l

<input checked="" type="checkbox"/> BOD	P00310		mg/l
<input checked="" type="checkbox"/> COD	P00341		mg/l
<input checked="" type="checkbox"/> Coliform (Fecal MP)	P31316		1/100ml
<input checked="" type="checkbox"/> Coliform (total MP)	P31305		1/100ml
<input checked="" type="checkbox"/> TOC	P00680	<5	mg/l
<input checked="" type="checkbox"/> Turbidity	P82079		NTU
<input checked="" type="checkbox"/> Ammonia (as Nitrogen) (D)	P00612	0.2	mg/l
<input checked="" type="checkbox"/> Kjeldahl (as Nitrogen) (D)	P00623	<0.1	mg/l
<input checked="" type="checkbox"/> Nitrate + Nitrite (as Nitrogen) (D)	P00631	<0.0	mg/l
<input checked="" type="checkbox"/> Phosphate, total as P (D)	P00666	0.7	mg/l
<input checked="" type="checkbox"/> Dissolved Solids - cond. meter	P70304		mg/l
<input checked="" type="checkbox"/> Other Analytes:			
<input checked="" type="checkbox"/> FLUORIDES		<0.1	mg/l

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COUNTY ORANGE  
QUAD NO. X-1, b2 SERIAL NO. 0A-1450

REPORT TO: (circle one)  
ARO, WRO, MRO, FRO, WARO,  
WTRD, NRO, Ahooskie FO,  
OTHER

PURPOSE: (circle one) baseline, pollution monitor, other

DATE COLLECTED 4-09-85 Time 11:00 by SWICK Location or site DEW IT

Description of sampling point WESS WALKER ROAD Sampled interval 10-05; 12-10

Remarks WESS WALKER ROAD (pumping time, air temp, etc.)

Field Analysis By: SWICK Lat. 344412 N Long. 772156 W

pH 7.2 Spec. Cond. 50 Temp. 17 °C Color ORGANIC Appearance CLAR Yeasts

Lab Analysis

✓ Alkalinity to pH 4.5	P00410	180 mg/l
Alkalinity, Hydroxide	P71830	4 mg/l
✓ Carbonate	P00445	<1 mg/l
✓ Bicarbonate	P00440	220 mg/l
✓ pH value (when analyzed)	P00400	7.4 units
✓ Arsenic (D)	P01000	<10 ug/l
Carbon dioxide	P00405	mg/l
✓ Chloride (D)	P00940	15 mg/l
✓ Color (True)	P00080	31 units
✓ Cyanide	P00720	mg/l
✓ Dissolved solids (D)	P70301	250 mg/l
✓ Fluoride (D)	P00951	0.3 mg/l
✓ Hardness (as CaCO <sub>3</sub> ) (D)	P00900	190 mg/l
✓ Hardness (non-carbonate) (D)	P00902	10 mg/l
MBAS (D)	P38260	mg/l
✓ Phenol (D)	P34466	<5 ug/l
✓ Silica (D)	P00955	7 mg/l
✓ Sulfate (D)	P00946	11 mg/l
✓ Specific Cond.	P00094	450 µMOS/cm

N. **RECEIVED** ENVIRONMENTAL RESOURCES DEPARTMENT  
**RECEIVED**  
DEM  
GROUNDWATER FIELD/LAB FORM  
JUN 8 1985  
MAY 31 1985

WILMINGTON REGIONAL OFFICE  
DEM

GROUND WATER SECTION  
RALEIGH, N. C.

LAB NUMBER G-174  
DATE REC'D 4-10-85  
REC'D BY SD  
DATA ENTRY BY BRUCE  
DATA REPORTED 5-29-85

✓ Ag-Silver (D)	P01075	<50 µg/l
✓ Al-Aluminum (D)	P01106	<100 µg/l
✓ Ba-Barium (D)	P01005	<1000 µg/l
✓ Ca-Calcium (D)	P00915	77 mg/l
✓ Cd-Cadmium (D)	P01025	<20 µg/l
✓ Cr-Chromium (D)	P01030	<50 µg/l
✓ Cu-Copper (D)	P01040	<20 µg/l
✓ Fe-Iron (D)	P01046	1000 µg/l
✓ Hg-Mercury	P71900	<0.2 µg/l
✓ Li-Lithium (D)	P01130	<50 µg/l
✓ Mg-Magnesium (D)	P00925	2.6 mg/l
✓ Mn-Manganese (D)	P01056	<50 µg/l
✓ Na-Sodium (D)	P00929	12 mg/l
✓ Pb-Lead (D)	P01049	<100 µg/l
✓ Zn-Zinc (D)	P01090	350 µg/l
✓ K-Potassium (D)	P00935	4.3 mg/l
✓ Se-Selenium		<50 µg/l

BOD	P00310	mg/l
COD	P00341	mg/l
Coliform (Fecal MP)	P31616	/100ml
Coliform (total MP)	P31505	/100ml
✓ TOC	P00680	<5 mg/l
Turbidity	P82079	NTU
✓ Ammonia (as Nitrogen) (D)	P00612	.04 mg/l
✓ Kjeldahl (as Nitrogen) (D)	P00623	0.1 mg/l
✓ Nitrate + Nitrite (as Nitrogen) (D)	P00631	.01 mg/l
✓ Phosphorus, total as P (D)	P00666	.22 mg/l
Dissolved Solids - cond. meter	P70304	mg/l

Other Analyses:  
✓ NITRATES <0.1 mg/l

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**RECEIVED**

N. C. DEPARTMENT OF NATURAL RESOURCES  
JUN. COUNTY DEVELOPMENT

WILMINGTON REGIONAL FORENSIC LAB FORM  
MAY 31 1985

DEM

GROUND WATER SECTION  
DALEIGH, N. C.

LAB NUMBER E-181  
DATE REC'D 4-10-85

REC'D BY SPD  
DATA ENTERED BY [Signature]  
DATA REPORTED 5-29-85

COURT ORDER  
QUAD NO. X-24 B332814 ON-1430  
REPORT TO: (circle one)  
AND, PNO, MO, PRO, VADO,  
(AND) PNO, AROCKLE TO,  
OFFICE

PURPOSE: (circle one) baseline, collection monitor other \_\_\_\_\_

DATE COLLECTED 04.09.85 Time 1200 By PICK Location or site TT-25

Description of sampling point WELL NEAR JAIL IN COURT HOUSE Sample Interval TO 75.85.95.10.11.12.13.14.15.16.17.18.19.20.21.22.23.24.25.26.27.28.29.30.31.32.33.34.35.36.37.38.39.40.41.42.43.44.45.46.47.48.49.50.51.52.53.54.55.56.57.58.59.60.61.62.63.64.65.66.67.68.69.70.71.72.73.74.75.76.77.78.79.80.81.82.83.84.85.86.87.88.89.90.91.92.93.94.95.96.97.98.99.100.

Remarks WELL WAS STOPPED SINCE 02-08-85 DUE TO COLLAPSE  
PICK (pumping time, air temp, etc.)

Field Analysis By: SWANSON Lat. 34419N Long. 772143W SECTION

PH 7.52 Spec. Cond. 795 Temp. 17 °C 60 °F 15 Appearance CLAR Taste CL

Lab Analysis

Alkalinity to pH 4.5	P00410	170	mg/l
Alkalinity, Hydroxide	P12088	41	mg/l
Carbonate	P00445	41	mg/l
Bicarbonate	P00440	200	mg/l
pH value (open analyzed)	P00400	7.5	unite
Arsenic (D)	P01000	<10	ug/l
Carbon dioxide	P00405		mg/l
Chloride (D)	P00940	9	mg/l
Color (True)	P00080	23	unite
Cyanide	P00720		mg/l
Dissolved solids (D)	P10301	220	mg/l
Fluoride (D)	P00951	0.2	mg/l
Hardness (as CaCO <sub>3</sub> ) (D)	P00900	180	mg/l
Hardness (non-carbonate) (D)	P00902	10	mg/l
HAS (D)	P38260		mg/l
Phenol (D)	P34466	<5	ug/l
Silica (D)	P00955	7	mg/l
Sulfate (D)	P00946	7	mg/l
Specific Cond.	P00094	390	UMHOS/cm
Ag-Silver (D)	P01052	<50	ug/l
Al-Aluminum (D)	P01006	180	ug/l
Ba-Barium (D)	P01005	<100	ug/l
Ca-Calcium (D)	P00915	73	mg/l
Cd-Cadmium (D)	P01025	<20	ug/l
Cr-Chromium (D)	P01030	<50	ug/l
Cu-Copper (D)	P01040	<20	ug/l
Fe-Iron (D)	P01046	700	ug/l
Hg-Mercury	P11900	<0.2	ug/l
Li-Lithium (D)	P01130	<50	ug/l
Mg-Magnesium (D)	P00925	14	mg/l
Mn-Manganese (D)	P01056	<50	ug/l
Na-Sodium (D)	P00929	6.1	mg/l
Pb-Lead (D)	P01049	<100	ug/l
Zn-Zinc (D)	P01090	<20	ug/l
K-Potassium (D)	P00935	7.8	mg/l
SE-STEADY STATE		<50	ug/l
NO <sub>3</sub> -Nitrate		<.01	ug/l
NO <sub>2</sub> -Nitrite			
PO <sub>4</sub> -Phosphate			
SO <sub>4</sub> -Sulfate			
CO <sub>3</sub> -Carbonate			
HCO <sub>3</sub> -Bicarbonate			
Cl <sup>-</sup> -Chloride			
SO <sub>4</sub> <sup>2-</sup> -Sulfate			
NO <sub>3</sub> <sup>-</sup> -Nitrate			
NO <sub>2</sub> <sup>-</sup> -Nitrite			
PO <sub>4</sub> <sup>3-</sup> -Phosphate			
CO <sub>3</sub> <sup>2-</sup> -Carbonate			
HCO <sub>3</sub> <sup>-</sup> -Bicarbonate			
Ca <sup>2+</sup> -Calcium			
Mg <sup>2+</sup> -Magnesium			
Fe <sup>2+</sup> -Iron			
Cu <sup>2+</sup> -Copper			
Zn <sup>2+</sup> -Zinc			
Pb <sup>2+</sup> -Lead			
Ag <sup>+</sup> -Silver			
As <sup>3+</sup> -Arsenic			
Cd <sup>2+</sup> -Cadmium			
Cr <sup>6+</sup> -Chromium			
Hg <sup>2+</sup> -Mercury			
Mn <sup>2+</sup> -Manganese			
Ni <sup>2+</sup> -Nickel			
Se <sup>6+</sup> -Selenium			
V <sup>5+</sup> -Vanadium			
W <sup>6+</sup> -Tungsten			
Y <sup>3+</sup> -Yttrium			
Zr <sup>4+</sup> -Zirconium			
Mo <sup>6+</sup> -Molybdenum			
Sb <sup>3+</sup> -Antimony			
Bi <sup>3+</sup> -Bismuth			
Br <sup>-</sup> -Bromine			
I <sup>-</sup> -Iodine			
Li <sup>+</sup> -Lithium			
Rb <sup>+</sup> -Rubidium			
Cs <sup>+</sup> -Cesium			
B <sup>3+</sup> -Boron			
Be <sup>2+</sup> -Beryllium			
Ge <sup>4+</sup> -Germanium			
Sn <sup>4+</sup> -Tin			
Pb <sup>2+</sup> -Lead			
Bi <sup>3+</sup> -Bismuth			
Po <sup>2+</sup> -Polonium			
At <sup>3+</sup> -Astatine			
Rn <sup>2+</sup> -Radon			
Fr <sup>+</sup> -Francium			
Ra <sup>2+</sup> -Radium			
Ac <sup>3+</sup> -Actinium			
Th <sup>4+</sup> -Thorium			
Pa <sup>5+</sup> -Protactinium			
U <sup>6+</sup> -Uranium			
Np <sup>3+</sup> -Neptunium			
Pu <sup>4+</sup> -Plutonium			
Am <sup>3+</sup> -Americium			
Cm <sup>3+</sup> -Curium			
Bk <sup>3+</sup> -Berkelium			
Cf <sup>3+</sup> -Californium			
Es <sup>3+</sup> -Einsteinium			
Fm <sup>3+</sup> -Fermium			
Mendelevium			
Nobelium			
Lanthanum			
Cerium			
Praseodymium			
Niobium			
Rhenium			
Rhodium			
Ruthenium			
Selenium			
Tellurium			
Vanadium			
Zinc			
Barium			
Strontium			
Yttrium			
Scandium			
Indium			
Thallium			
Antimony			
Vanadium			
Chromium			
Manganese			
Cadmium			
Mercury			
Copper			
Nickel			
Cobalt			
Iron			
Zinc			
Aluminum			
Silicon			
Boron			
Carbon			
Oxygen			
Nitrogen			
Hydrogen			

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## RECOMMENDATIONS

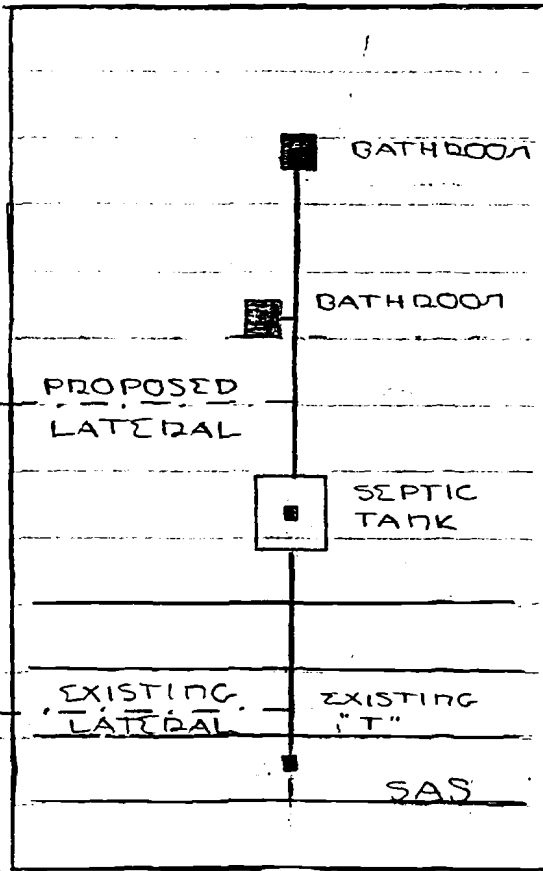
As it is highly probable that ABC One Hour Cleaners is the principal source of the PCE contamination problem, and because this problem has resulted in the violation of standards assigned to GA classified aquifer (s), it is recommended that DEM pursue the following course of action:

1. Require ABC to quit using the source (ST-SAS);
2. Require ABC to analyze the waste in the septic tank for PCE, TCE and DCE concentrations;
3. Require ABC to analyze soil samples around the facility for PCE, TCE and DCE concentrations;
4. If deemed necessary, require ABC to remove PCE contaminated waste and PCE contaminated soils to an authorized disposal site;
5. Require ABC to delineate the horizontal and vertical geometry of the contaminant plume;
6. Require ABC to adequately define the quality attributes of the contaminant plume;
7. Require ABC to predict the future impacts of the contamination problem;
8. Require remediation of the contaminated groundwater to the extent that GA standards can be restored.

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ABC ONE HOUR CLEANERS

LEJEUNE BLVD



LEGEND:  
■ - DRAINS

CW

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