United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R04-88/042
September 1988

EPA

Superfund Record of Decision:

Perdido Ground Water, AL

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R04-88/042	2.	3. Recipient's Accession No.
4. Title and Subtitle SUPERFUND RECORD OF DECISION Perdido Groundwater Contamination, AL First Remedial Action - Final			5. Report Date 09/30/88
			6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address			10. Project/Task/Work Unit No.
			11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460			13. Type of Report & Period Covered 800/000
			14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Perdido Groundwater Contamination site is located in the Town of Perdido, Baldwin County, Alabama. Site contamination occurred as a result of a 1965 train derailment on the Louisville and Nashville Railroad (now CSX Transportation, Inc.). Chemicals (particulary benzene) from derailed tank cars spilled into drainage ditches, infiltrating the underlying aquifer. The area of ground water contamination covers approximately 15 acres and is centered downgradient about 300 yards from the derailment site. The Alabama Department of Public Health, Division of Public Water Supply (ADPWS) first documented reports of taste and odor problems in resident's water wells in 1981. Further studies showed benzene contamination in 6 of 27 wells, which led to supplying bottled water to 250 affected residents. In February 1983 EPA provided immediate removal funding to construct a water supply line to connect to a nearby town. CSXT voluntarily provided funds for and installed the water system in July 1983. The primary contaminant of concern affecting the ground water is benzene.

(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision
Perdido Groundwater Contamination, AL
First Remedial Action - Final
Contaminated Media: gw
Key Contaminants: benzene

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 56
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

EPA/ROD/R04-88/042
Perdido Groundwater Contamination, AL
First Remedial Action - Final

16. ABSTRACT (continued)

The selected remedial action for this site includes: ground water pump and treatment using air stripping or activated carbon adsorption with reinjection of treated water back into the aquifer, and air monitoring during operations; and ground water monitoring to measure success of the cleanup. The estimated capital cost for this remedial action is $169,000 with estimated annual O&M cost of $103,000.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

SITE

Perdido Groundwater Contamination Site
Perdido, Alabama

STATEMENT OF PURPOSE

This decision document represents the selected remedial action for this site developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (40 CFR Part 300).

STATEMENT OF BASIS

This decision is based on the Administrative Record which encompasses those documents describing the site-specific conditions and the analysis of the cost effectiveness of the remedial alternatives for the Perdido site. The attached index (Appendix A) identifies the items which comprise the administrative record upon which the selection of the remedial action is based.

The State of Alabama has been consulted and concurs on the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

The groundwater at the Perdido site is contaminated with Benzene. Consultations with the Alabama Department of Environmental Management have been conducted to determine the cleanup levels and the preferred remedial alternative.

The selected remedy for the groundwater contamination consists of:

- recovery of the contaminated groundwater by means of a recovery well field;
- treatment of the recovered contaminated groundwater based on the cleanup levels established for Benzene and;
- reinjection of the treated groundwater back into the aquifer.

Operation and maintenance activities required to ensure the continued effectiveness of the remedy include:

- periodic monitoring of the pump and treat system to ensure continued effectiveness in attaining cleanup standards;
- periodic groundwater monitoring to ensure that long term performance goals have been achieved.

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principle element. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Patrick M Tobin   9-30-88

for GREER C. TIDWELL, REGIONAL ADMINISTRATOR   DATE

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
PERDIDO GROUNDWATER CONTAMINATION SITE
PERDIDO, BALDWIN COUNTY, ALABAMA

Prepared By:

U. S. ENVIRONMENTAL PROTECTION AGENCY

Region IV

Atlanta, Georgia

TABLE OF CONTENTS

List of Figures

List of Tables

Enforcement
Record of Decision
Summary of Remedial Alternative Selection

Perdido Groundwater Contamination Site
Perdido
Baldwin County, Alabama

1.0 Introduction

The Perdido site was proposed for inclusion on the National Priorities List (NPL) on December 1, 1982 and ranks 655. Placement of the Perdido site on the NPL became final on September 1, 1983. The Perdido site has been the subject of a Remedial Investigation (RI) and Feasibility Study (FS) performed by the responsible party, CSX Transportation, Inc., under an Administrative Order by Consent, dated October 11, 1985. The RI report, which examines air, soil, surface water and groundwater contamination at the site, was completed on May 1988. The FS, which develops and examines alternatives for remediation of the site, was issued in draft form to the public in May 1988.

This Record of Decision has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternative.

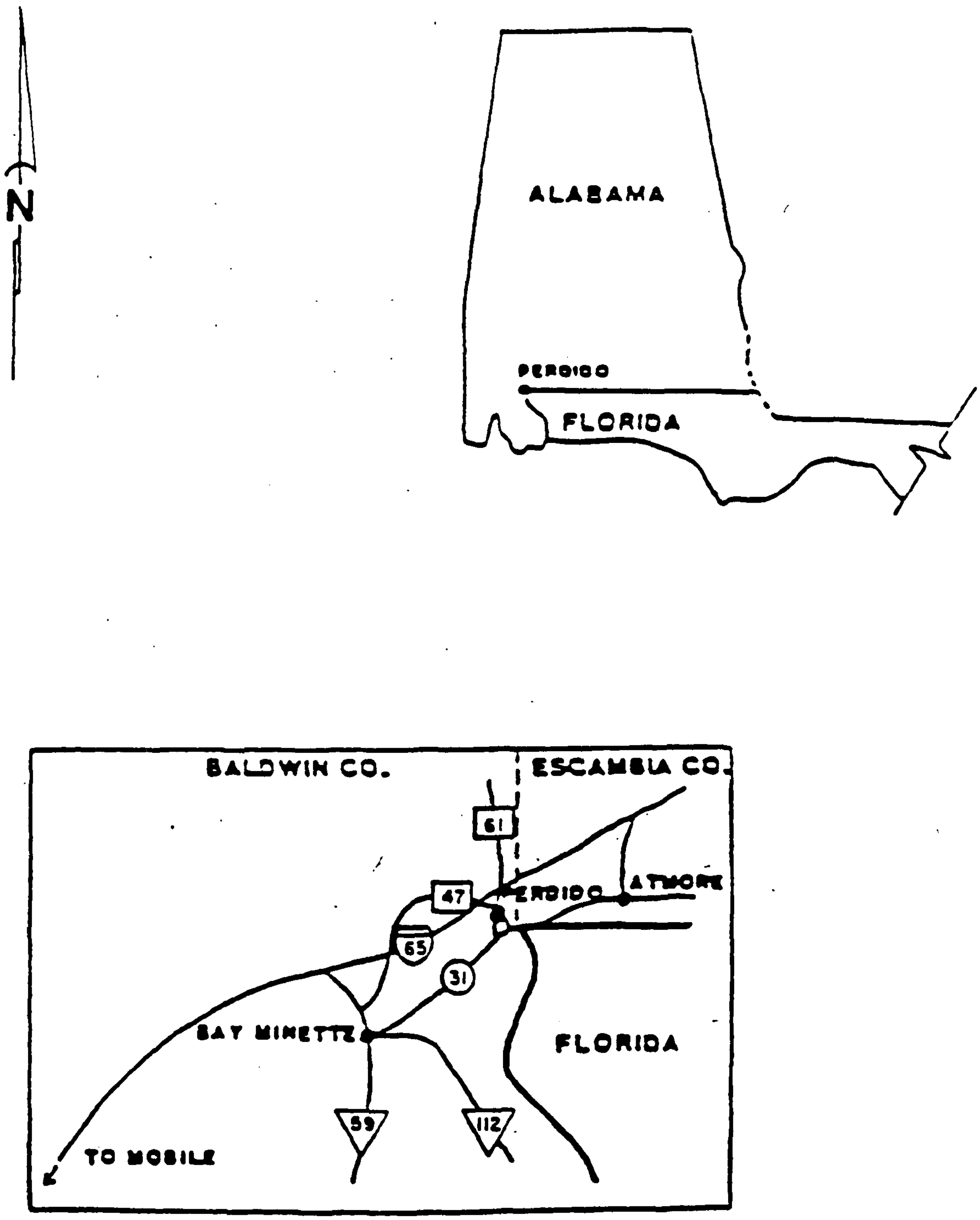
1.1 Site Location and Description

The Perdido Groundwater Contamination Site is located in the town of Perdido, Baldwin County, Alabama near the intersection of State Roads 47 and 61 (figure 1-1). The site consists of groundwater contamination originating from a 1965 train derailment by the Louisville and Nashville Railroad (now CSX Transportation, Inc.) which occurred approximately 200 yards east of the intersection of State Roads 47 and 61. Chemicals from the derailed tanks were spilled into the drainage ditches along State Road 61. As a result of the spill, the chemical Benzene penetrated through the soil and entered the groundwater aquifer used by area residents for their domestic well water.

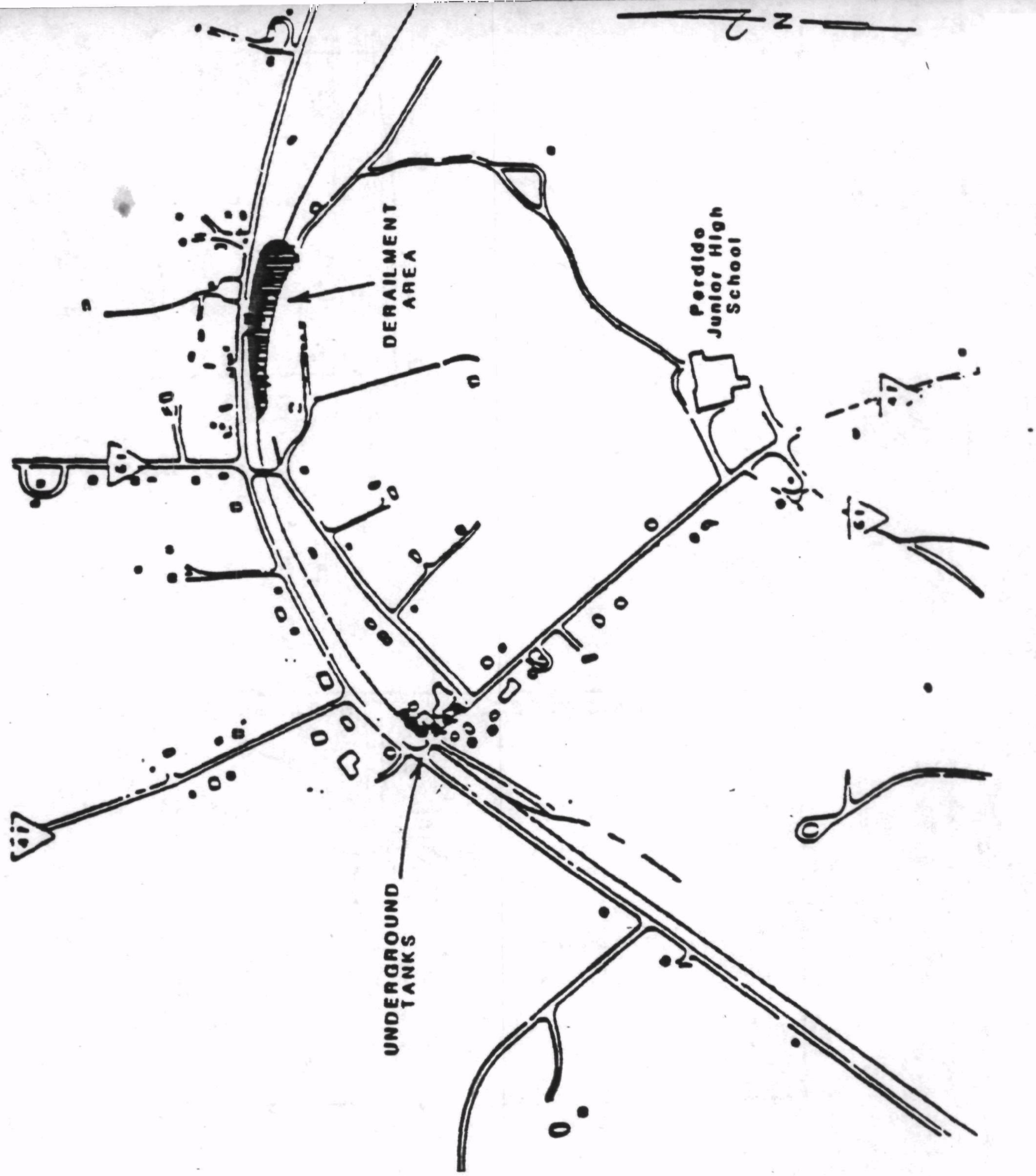
The total area investigated during the remedial investigation covers an area of approximately 125 acres. The area of groundwater contamination covers approximately 15 acres and is centered downgradient about 300 yards from the derailment site.

1.2 Site History

A train derailment occurred on May 17, 1965 in which 21 cars of the 122 cars in the train derailed. The rail cars left the track near the intersection of county Highway 61 and Railroad Street, along the eastern portion of a curve in the track (figure 1-2). Approximately 75% of the Benzene contents of the ruptured car was spilled. On the morning of May 19, 1965 the derailed cars were accidentally ignited by a cutting torch. The fire consumed the remaining Benzene.



SITE LOCATION
FIGURE 1-1



DERAILMENT LOCATION
FIGURE 1-2

[illegible] the Alabama Department of Public Health, Division of Public Water Supply (ADPWS) first documented reports of taste and odor problems in Perdido residents' domestic water supply wells. Two wells were sampled in February 1982 that showed Benzene contamination. In August and September 1982, the Alabama Department of Solid and Hazardous Waste (ADSHW) sampled 27 additional wells and found 6 of these contaminated with Benzene. As a result of the Benzene contaminated wells, the Baldwin County Health Officer recommended that residents within a one mile radius of the derailment stop drinking or bathing with their well water. This affected approximately 250 residents in the area and over 300 students attending the junior high school. The National Guard provided two water tanks at the post office and the affected residents carried water home in plastic jugs.

In September 1982, the Center for Disease Control (CDC) tested the urinary phenol levels of 30 residents whose wells were being tested for Benzene. None of the residents tested showed an elevated level of urinary phenol, so none could be shown to have had Benzene exposure at the time of the testing. Most of the people tested for urinary phenols had stopped drinking their well water long before the urine sampling.

Following the determination of the contaminated wells, the ADSHW requested support from the U.S. Environmental Protection Agency (U.S. EPA) to determine the extent of the groundwater contamination. During October 1982, ADSHW and the U.S. EPA conducted groundwater sampling of 49 domestic water wells. A total of nine wells were determined to be contaminated in the Perdido area. As a result of the findings of contaminated groundwater in Perdido, the U.S. EPA proposed on December 1, 1982 that the site be placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) otherwise known as Superfund. Placement of the Perdido site on the NPL became final on September 1, 1983.

In early 1983, state and county officials requested that EPA provide Perdido with funding assistance under Superfund so that an alternate supply of drinking water could be provided to the community. Immediate removal funding was provided by EPA in February 1983 in order to construct a water line that would extend six miles from the nearby town of Atmore, Alabama and connect to the approximately 150 Perdido homes within a one mile radius of the derailment site. At the suggestion of EPA Region IV, Seaboard System Railroad (now CSXT) voluntarily provided funds for and installed the Perdido water system. The water line and hookup was completed July 1983.

As a result of the determination of Benzene contamination in the Perdido groundwater, several studies were initiated to define the extent of contamination.

Geophysical surveys were performed by the U.S. EPA's Field Investigation Team (FIT) contractors in 1982 and 1983. FIT also developed the Remedial Action Master Plan (RAMP) in September 1983. CSX Transportation, Inc. contractor, P.E. LA Moreaux (PELA), conducted a field investigation in late 1983.

On October 11, 1985, CSXT executed an Administrative Order on Consent (Docket No. 86-02-C) with the EPA to conduct a Remedial Investigation and Feasibility Study (RI/FS) on the site. The RI was begun in 1986 and completed in November 1987. In March of 1987 EPA's Groundwater Technology Unit and the Environmental Response Group conducted a solute transport model and a soil vapor survey respectively. Based on review of the data EPA requested additional monitoring wells to be installed further downgradient. The supplemental report was completed in May 1988. The RI confirmed the presence of Benzene in the groundwater. The FS was submitted to EPA in May 1988 and recommends groundwater extraction and treatment as the preferred remedial alternative for the site.

The objectives of the site investigation were to determine:

* The human health and environmental receptors at risk;
* The routes of exposure;
* The concentrations and areal extent of contaminants, and the environmental fate and transport;
* Hydrogeological factors; and
* The extent to which the substances have migrated or are expected to migrate from the area of their original location and whether future migration may pose a threat to public health, or the environment.

2.0 Enforcement Analysis

2.1 Enforcement History

In late 1982 after domestic water well sampling by EPA and ADSHW showed the presence of Benzene contamination in 9 wells, Alabama state and county officials requested that EPA provide Perdido with funding assistance under Superfund so that an alternate drinking water supply could be provided to the community. Immediate removal funding was provided by EPA in February 1983 in order to construct a water line that would connect to the nearby town of Atmore, Alabama. At the suggestion of EPA Region IV, Seaboard System Railroad (now CSXT) voluntarily provided funds for and installed the Perdido water system. The water line and hookup was completed in July 1983.

On October 11, 1985, CSXT executed an Administrative Order on Consent (Docket No.86-02-C) with the EPA to conduct The RI/FS for the site. The RI was completed in November 1987 and the FS in May 1988.

CSXT has participated in the community relations program by presenting the results of the RI/FS and the preferred alternative during the public meeting held in Bay Minette, Alabama on July 14, 1988. An exemption to Special Notice Letter for Remedial Action was issued to CSXT on July 1, 1988.

3.1 Hydrogeologic Characteristics

The town of Perdido, Alabama lies within the Southern Pine Hill subsection of the Coastal Plain Physiographic Province. The Southern Pine Hills define an elevated, southward-sloping, dissected plain developed on Miocene age estuarine-deltaic deposits. These deposits have resulted in relatively subdued topography characterized by low, rounded hills and low relief. Surface elevations in the Perdido area range from about 190 to 280 feet above mean sea level.

Figure 3-1 shows a topographic map of the Perdido area. The most important surface water drainage divide occurs immediately east of Highways 47 and 61 and trends generally north-south. East of this divide, surface water drainage is predominantly east and intercepts the Perdido River approximately 1 mile to the east. West of this divide, surface water drainage has a predominant westward component of movement and intercepts Bushy Creek which flows into Dyas Creek which is a tributary of the Perdido River.

Two units characterize the geology underlying the Perdido site. The undifferentiated Miocene outcrops at lower elevations and provides water to most of the wells in the area. The Citronelle Formation outcrops at higher elevations south of Perdido. Both units consist of clay, silt, sand, and gravel in a wide range of combinations and exhibit complex interfingering, lenses, and lateral facies changes which make correlation on a small scale difficult. The cross-sections are shown on figures 3-2 and 3-3.

In the Perdido area, the Miocene aquifer acts as an unconfined, semi-confined, and confined aquifer depending on the presence or absence of the overlying Citronelle Formation. Water level readings from domestic and monitoring wells during the PELA and ERT studies were used to construct groundwater flow maps which indicate a southwesterly direction of flow (figure 3-4). The average groundwater flow rate is approximately 0.23 ft. per day.

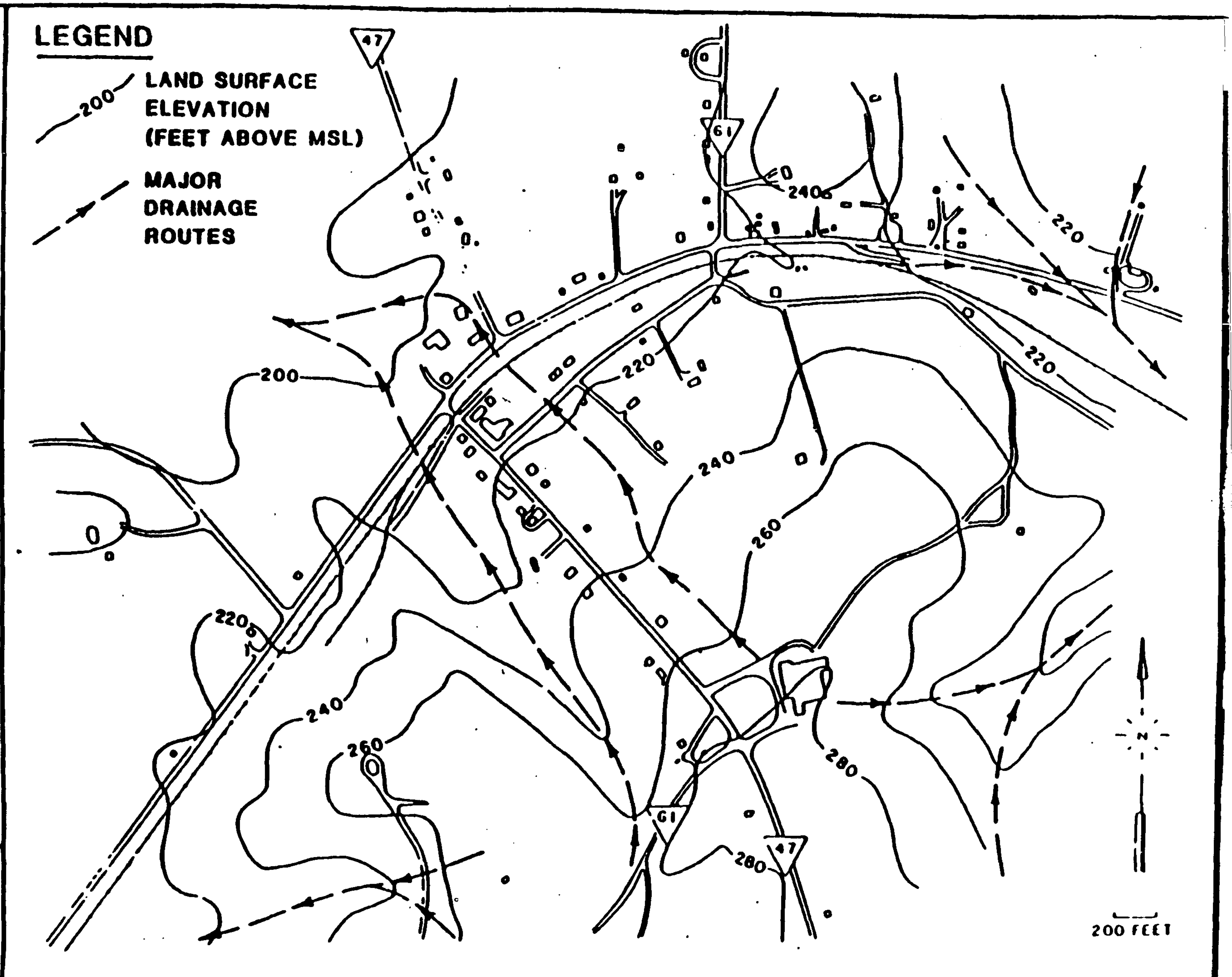
The groundwater from the Miocene aquifer is the only source of portable water for approximately 12.5 miles southwest to the town of Bay Minette.

3.2 Site Contamination

Benzene in chemical-grade form, spilled as a result of a 1965 train derailment, is the only contaminant of concern at the Perdido site. Another chemical which spilled as a result of the derailment, Hexamethylene Diamine, was never detected in any groundwater sample. The result of the RI lead to the following conclusions:

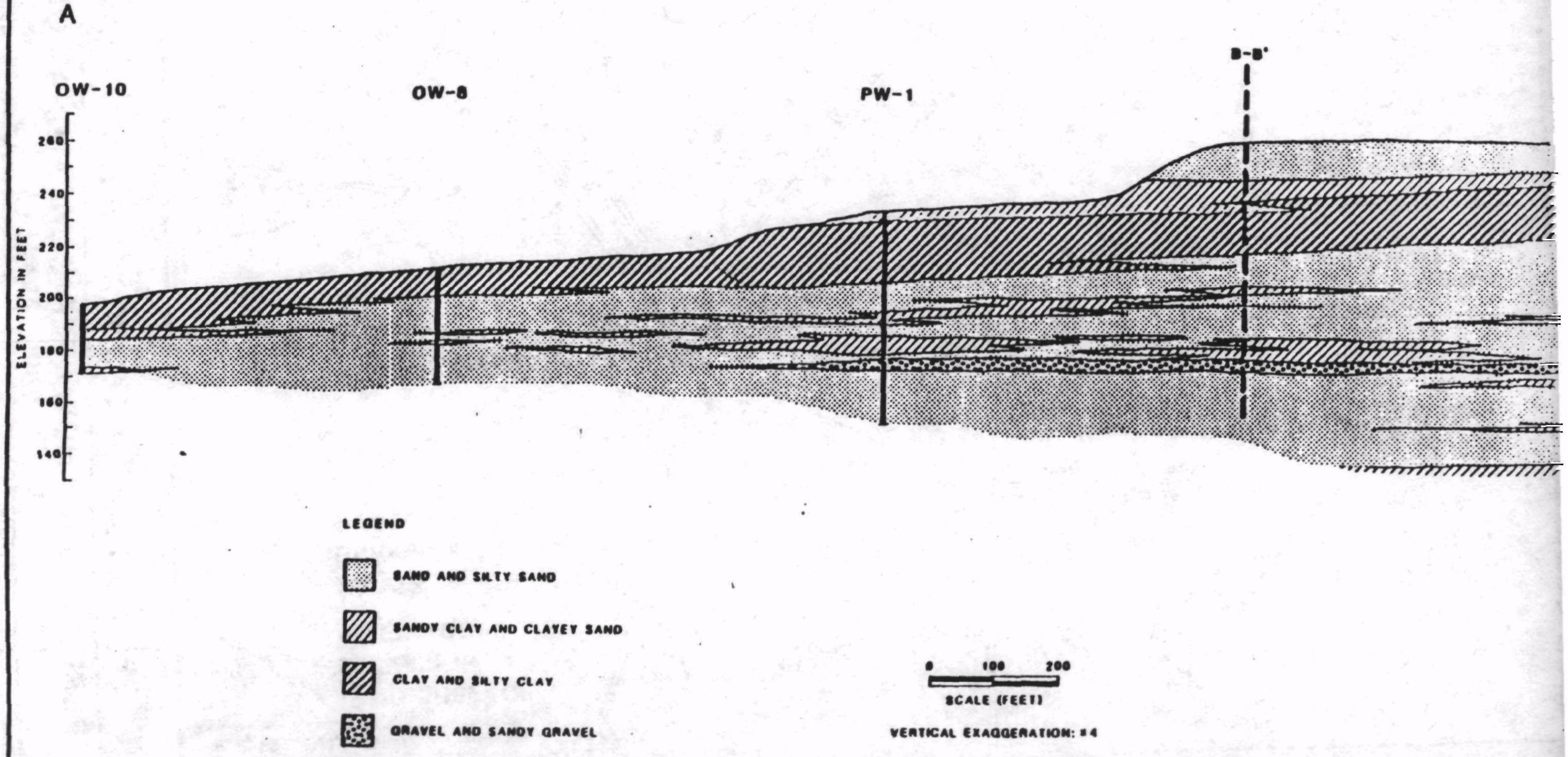
* Leaching of contaminants from surface and subsurface soils to the groundwater is no longer occurring or is insignificant;

* Volatilization of Benzene from contaminated surface soil is no longer occuring;



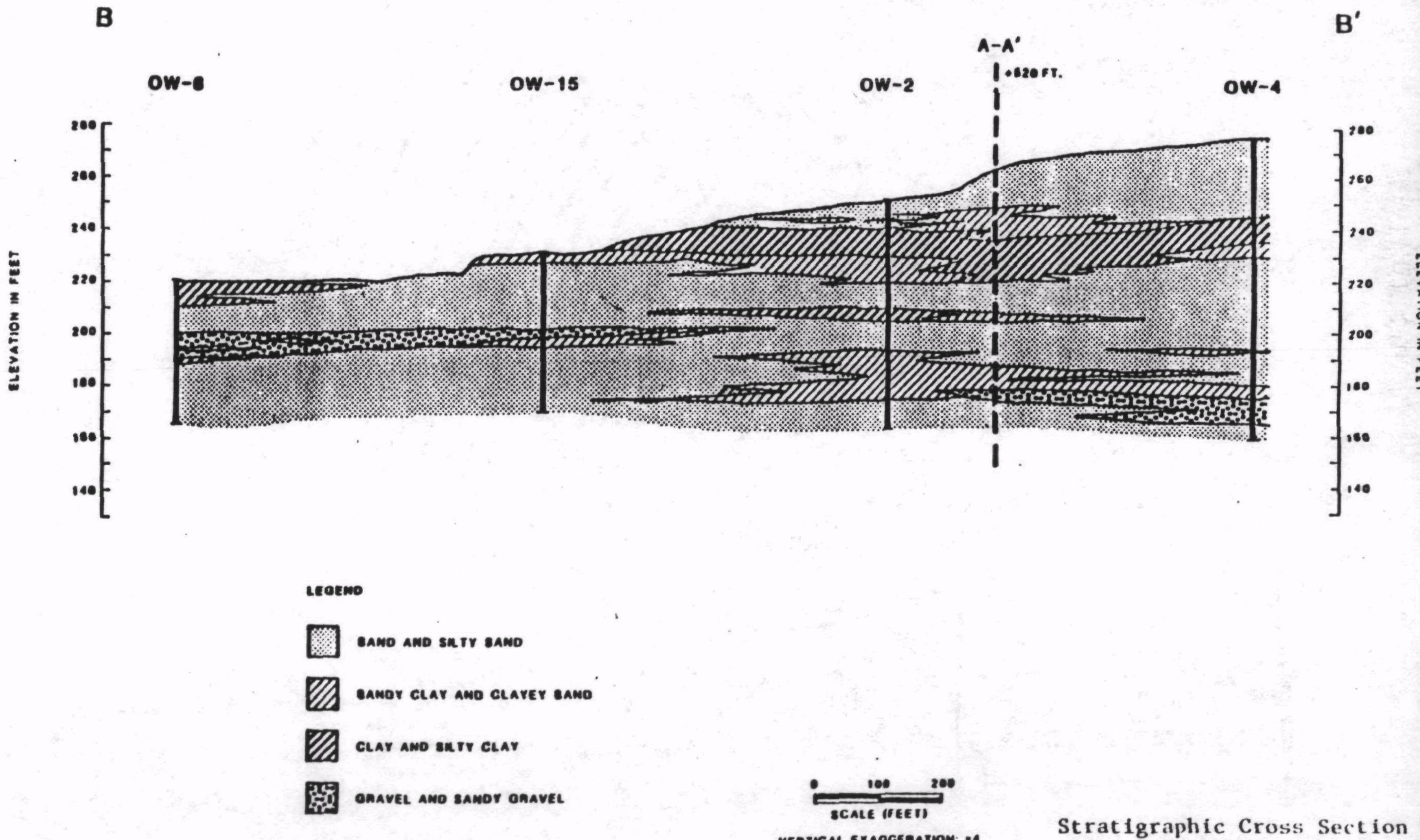
GENERALIZED TOPOGRAPHY AND DRAINAGE
PERDIDO GROUNDWATER CONTAMINATION SITE
PERDIDO, ALABAMA

FIGURE NO. 3-1



SEE FIGURE 3-7 FOR CROSS SECTION PLAN VIEW

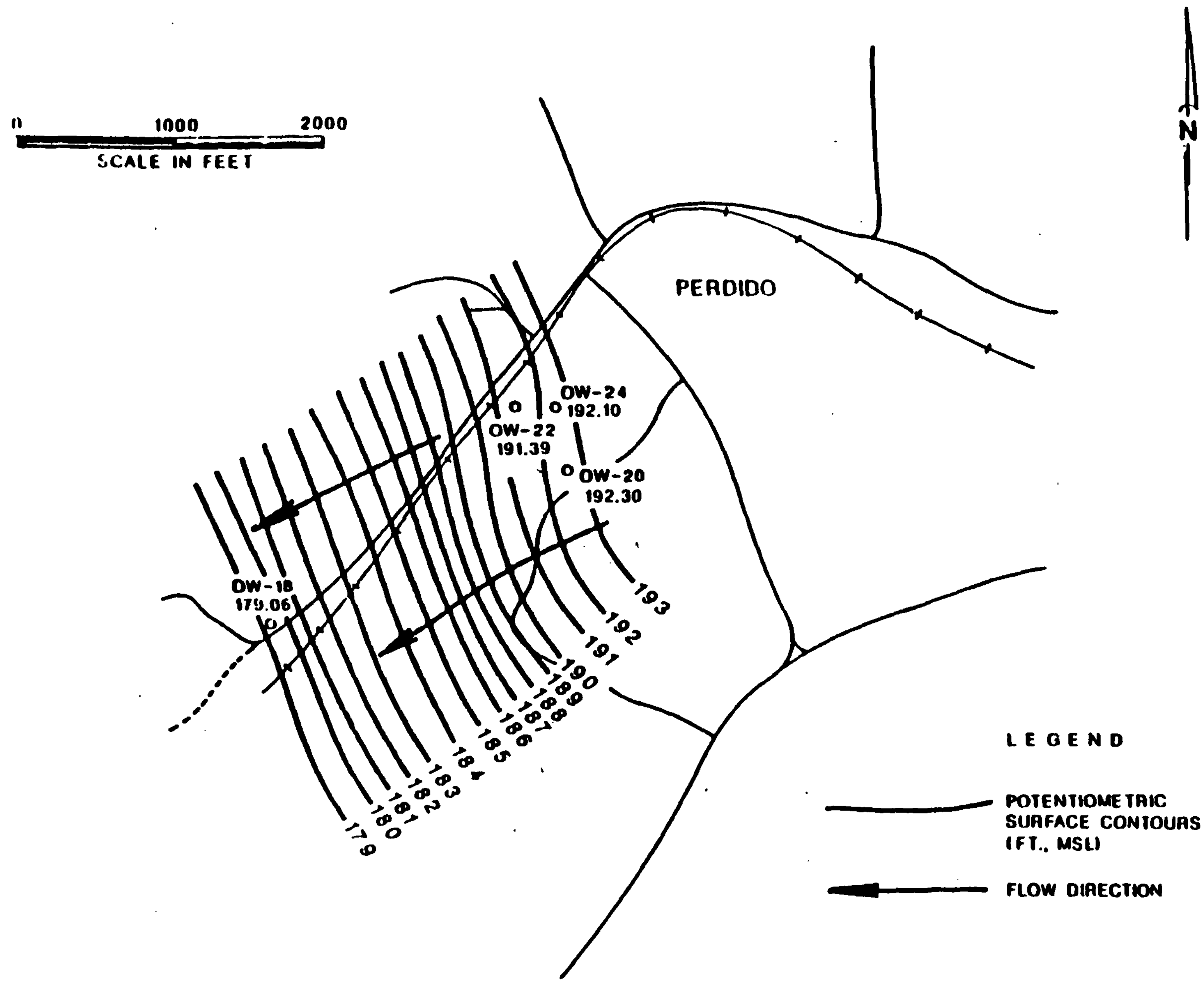
Stratigraphic Cross Section A-A
Figure 3-2



SEE FIGURE 3-7 FOR CROSS SECTION PLAN VIEW

Stratigraphic Cross Section B-

Figure 3-3



GROUNDWATER FLOW
Figure 3-4

The current impact to surface water is not a concern, but future contaminated groundwater discharge to surface water is a concern;

* Subsurface migration of the contaminated groundwater plume to domestic water well users is the principal human health concern.

3.2.1 Groundwater Assessment

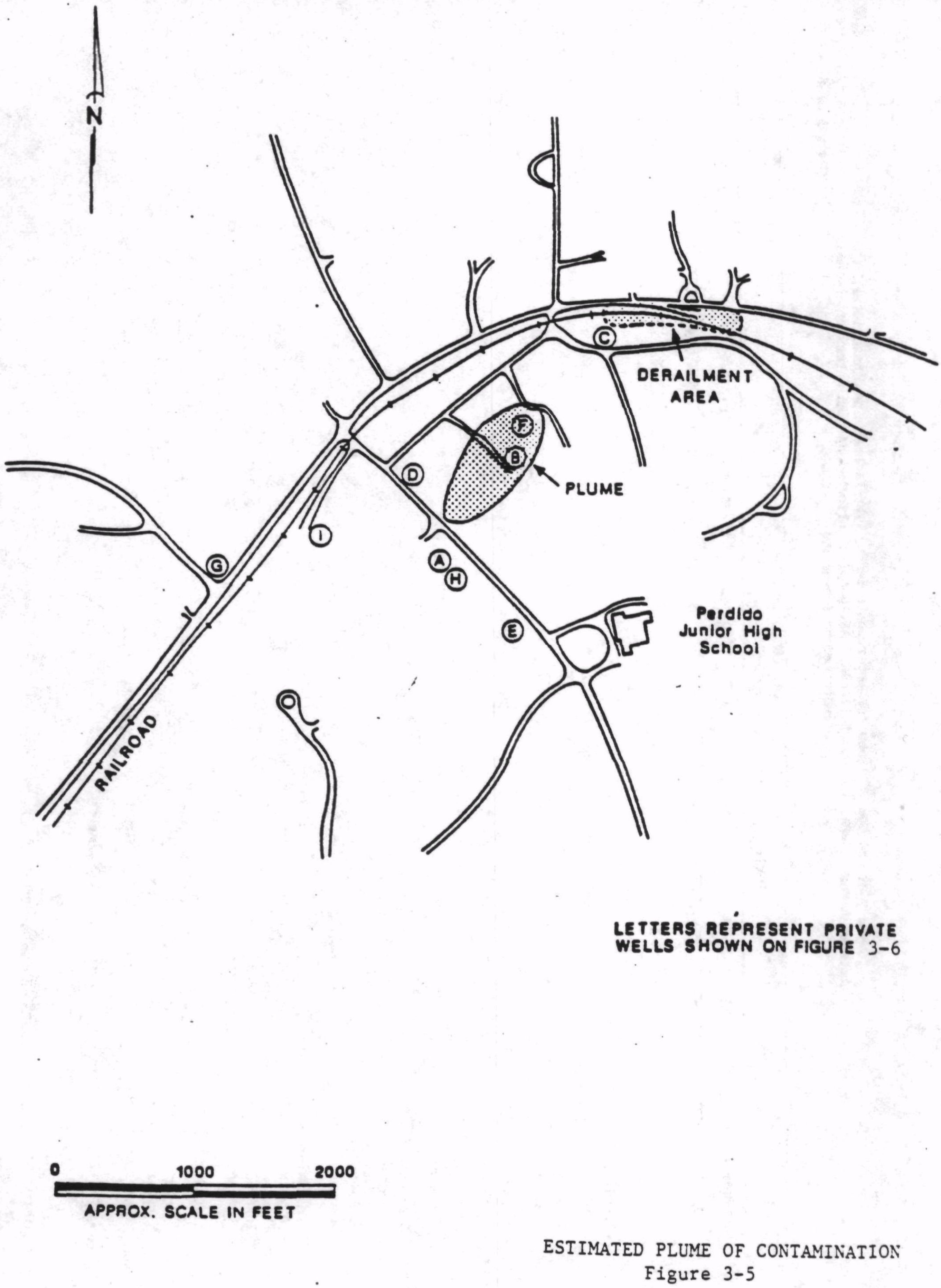
The Miocene aquifer at the Perdido site is a surficial aquifer in the area of the train derailment where the spill occurred. This allowed the Benzene to easily penetrate through the zone of aeration to the water table thereby contaminating the groundwater. Once within the groundwater aquifer the Benzene plume migrated downgradient in a southwesterly direction (figure 3-5). At this location the Miocene aquifer is in a semi-confined condition due to the presence of overlying younger sediments of the Citronelle Formation.

In a attempt to define the extent of the Benzene contaminated groundwater plume, the EPA's FIT performed geophysical surveys in 1982 and 1983. The results of these geophysical resistivity surveys were inconclusive probably as a result of the complexly interlayered sand and clay stratigraphy which did not allow for consistent background readings needed to distinguish between areas contaminated with Benzene and uncontaminated areas.

The 1982-1983 PELA study also investigated the Benzene contaminated groundwater at the site. PELA summarized all the Benzene analyses performed on domestic well water samples taken in 1982-1983. These results are present in table 3-1. Nine wells showed contamination from Benzene. Of the nine wells originally contaminated only four wells remained contaminated in later tests. The locations and Benzene concentrations of the nine wells are shown in figure 3-6.

PELA installed eight wells during their investigation, TW-1 through TW-5, LO-1 and LO-2, and PW-1. The location of most of these wells are shown on figure 3-7. TW-2 and TW-3 are just off the map to the southwest. PW-1 was installed for a pump test to determine aquifer characteristics. The other wells were installed to determine the lithology and geometry of the aquifer. Readings from these wells and the domestic wells were used to map the water level surface. It was then determined that the direction of groundwater movement was to the southwest. Chemical analyses of the groundwater from the monitoring wells failed to detect any Benzene contamination. Chemical analyses of groundwater taken from the pump test well, PW-1, showed Benzene concentrations of 111 ppm decreasing to 38.25 ppm after 270 minutes of pumping.

In the 1986 RI performed by ERT for CSXT sixteen additional wells were installed, monitoring wells, OW-1 through OW-10 and OW-15, and observation wells, OW-11 through OW-14 and OW-17. The observation wells were installed for another pump test on the PW-1 wells. The location of the wells are on figure 3-7. Well OW-16, which was used as an observation well, was a previously existing well.



ESTIMATED PLUME OF CONTAMINATION
Figure 3-5

TABLE 3-1

(Summary of benzene analyses for water collected by P.E. LaMoreaux and Associates, State of Alabama, EPA, and L&N Railroad. All samples collected by PELA unless otherwise indicated by footnote.)

WELL NUMBER/OWNER	DATE OF COLLECTION: 1982				1983										
	08/04	08/18	09/13	09/29–30	01/03	01/04	01/05	01/06	01/18	01/19	01/20	04/11	04/12	04/13	04/14
	BENZENE CONCENTRATION (ppm)				BENZENE CONCENTRATION (ppm)										
1/Louis Centanne	-	-	-	-	ND	-	-	-	-	-	-	-	-	ND	-
2/Louis Centanne	-	-	-	-	ND	-	-	-	-	-	-	-	-	ND	-
3/Juanita Daniels	-	-	-	-	-	ND	-	-	-	-	ND	-	-	-	-
4/Jessie Wilson	-	-	-	ND**	-	ND	-	-	-	-	-	-	ND	-	-
5/Essolene Morse	-	-	-	-	-	ND	-	-	-	-	-	-	ND	-	-
6/Velader Jackson	-	ND*	-	-	-	ND	-	-	-	-	ND	-	-	-	-
7/Leatha Brown	-	-	-	-	-	ND	-	-	-	-	ND	-	-	-	-
9/Margaret Bryars	-	-	-	ND**	-	ND	-	-	-	ND	-	-	-	-	-
10/Fred Centanne	-	-	-	-	-	ND	-	-	-	-	-	-	ND	-	-
11/Church of God	-	-	-	ND***	-	ND	-	-	ND	-	-	-	-	-	-
12/Emily Packer	-	-	-	ND***	-	ND	-	-	-	-	-	-	-	-	-
13/Emily Packer	-	-	-	-	-	ND	-	-	-	-	-	-	-	-	-
14/Martha Dunn	-	-	-	-	-	-	ND	-	-	-	-	-	ND	-	-
16/Clifford Hall	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	

TABLE 3-1 (CONTINUED)

WELL NUMBER/OWNER	1982 08/04	1982 08/18	1982 09/13	1982 09/29-30	1983 01/03	1983 01/04	1983 01/05	1983 01/06	1983 01/18	1983 01/19	1983 01/20	1983 04/11	1983 04/12	1983 04/13	1983 04/14
	BENZENE CONCENTRATION (ppm)				BENZENE CONCENTRATION (ppm)										
17/Clifford Hall	-	-	ND* ND**	ND***	-	-	ND	-	-	ND	-	-	-	-	-
18/Peter Schultz	-	-	-	-	-	-	65	70	-	51	-	-	-	-	-
19/F. Weekley (Post Ofc.)	0.1*	-	ND* ND**	-	-	-	ND	-	-	-	ND	-	-	-	-
20/F. Weekley (Methodist Church)	-	-	ND* ND**	-	-	-	ND	-	-	-	ND	-	-	-	-
21/Effie McCoy	-	ND*	-	-	-	-	ND	-	-	-	-	ND	-	-	-
22/Roil Hadely	-	-	-	ND***	-	-	ND	-	-	-	-	ND	-	-	-
23/H. L. Bryars	-	-	0.022* ND**	-	-	-	ND	-	-	ND	-	-	-	-	-
24/H. L. Bryars	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-
26/Daisy Henderson	-	ND*	-	-	-	-	-	-	-	-	-	-	-	-	-
27/Jerry Wiggins	-	-	0.209* 0.347* ND**	-	-	-	-	ND	-	-	ND	-	-	-	-
28/David Mosley	5.005*	4.8* -	5.22**	-	-	-	-	5	-	-	5	-	-	-	-
29/Johnnie German	-	-	-	ND***	-	-	-	nd	-	-	-	ND	-	-	-
30/Willie Ramer	-	-	-	ND***	-	-	-	ND	-	ND	-	-	-	-	-

TABLE 3-1 (CONTINUED)

WELL NUMBER/OWNER	DATE OF COLLECTION: 1982				1983										
	08/04	08/18	09/13	09/29-30	01/03	01/04	01/05	01/06	01/18	01/19	01/20	04/11	04/12	04/13	04/14
	BENZENE CONCENTRATION (ppm)				BENZENE CONCENTRATION (ppm)										
32/Board of Education	-	ND*	-	ND**	-	-	-	-	-	-	-	-	-	-	-
33/William Whitten	-	ND*	-	ND***	-	-	-	-	ND	-	-	-	-	-	-
34/Mrs. Ernest Weekley	-	ND*	-	-	-	-	-	-	ND	-	-	-	-	-	-
35/Mason Lowe	-	-	-	ND***	-	-	-	-	ND	-	-	-	-	-	-
36/Betty Minchew	-	-	ND* ND**	-	-	-	-	-	ND	-	-	-	-	-	-
37/Leona Ramer	-	-	-	ND***	-	-	-	-	ND	-	-	-	-	-	-
38/Webb Bush	-	-	-	ND***	-	-	-	-	-	ND	-	-	-	-	-
39/Tuney Hadley	-	-	-	ND***	-	-	-	-	-	ND	-	-	-	-	-
40/Mrs. Ernest Weekley	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-
41/Clara Wolfe	-	-	108/5* 41.020**	60***	-	-	-	-	-	111	-	-	-	-	-
42/Earl Johnson	-	-	8.49* 9.947**	5***	-	-	-	-	-	-	ND	-	-	-	-
43/Marie Slay	-	-	-	0.034***	-	-	-	-	-	-	ND	-	-	-	-
44/Vickie Cox	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-
45/Board of Education	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-

TABLE 3-1 (CONTINUED)

WELL NUMBER/OWNER	1982 08/04	1982 08/18	1982 09/13	1982 09/29-30	1983 01/03	1983 01/04	1983 01/05	1983 01/06	1983 01/18	1983 01/19	1983 01/20	1983 04/11	1983 04/12	1983 04/13	1983 04/14
	BENZENE CONCENTRATION (ppm)				BENZENE CONCENTRATION (ppm)										
46/Aubrey White	-	-	-	ND***	-	-	-	-	-	-	-	-	-	-	ND
47/Ed Johnson	-	-	-	ND***	-	-	-	-	-	-	-	-	-	-	-
48/Hugo Rogers	-	-	-	ND***	-	-	-	-	-	-	-	-	-	-	-
49/Etta B. Thompson	-	-	-	ND***	-	-	-	-	-	-	-	-	-	-	ND
50/Connie Barbarow	-	-	-	ND***	-	-	-	-	-	-	-	-	ND	-	-
51/Vance Turner (old house)	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-
52/Eugene Weaver	-	-	-	ND***	-	-	-	-	-	-	-	-	-	-	-
53/International Paper	-	4.601*	4.570* <1**	-	-	-	-	-	-	-	-	-	-	-	-
55/Allie Parker	-	-	-	ND***	-	-	-	-	-	-	-	-	-	-	-
56/George White	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-
57/Buford Hadley	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-
58/James Bryars	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-
59/Leon Coleman	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-
60/George Hayes	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-

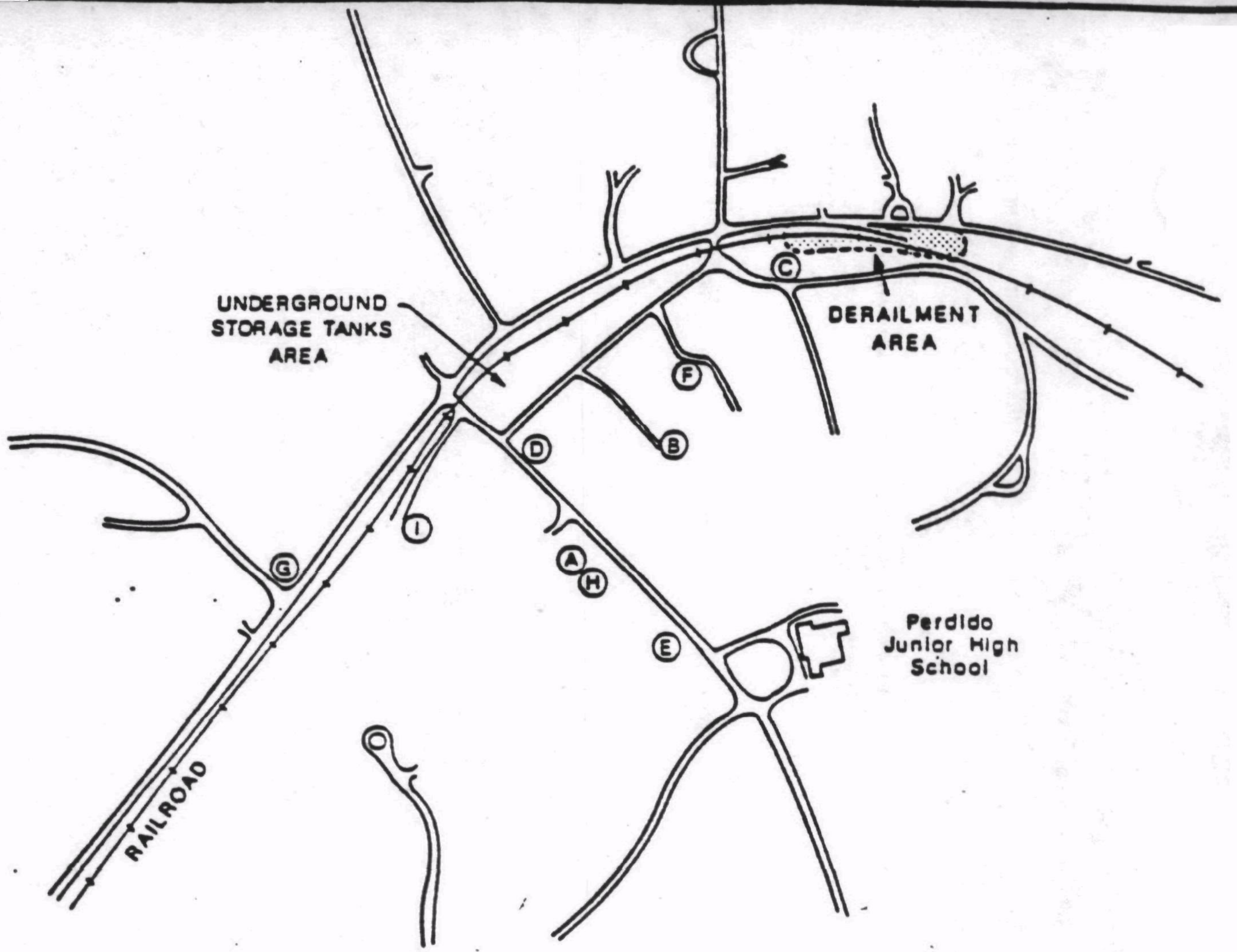
TABLE 3-1 (CONTINUED)

WELL NUMBER/OWNER	1982 08/04	1982 08/18	1982 09/13	1982 09/29-30	1983 01/03	1983 01/04	1983 01/05	1983 01/06	1983 01/18	1983 01/19	1983 01/20	1983 04/11	1983 04/12	1983 04/13	1983 04/14
	BENZENE CONCENTRATION (ppm)				BENZENE CONCENTRATION (ppm)										
61/Ted Presley	-	-	-	ND***	-	-	-	-	-	-	-	-	ND	-	-
62/Charles Stacey	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-
63/Vance Turner	-	-	-	ND***	-	-	-	-	-	-	-	-	ND	-	-
64/Vance Turner	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-
65/Charles Fickling	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-
66/Josephine Peacock	-	-	-	ND***	-	-	-	-	-	-	-	-	ND	-	-
67/Georgia Albaugh	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-
68/Bess Stewart	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-
69/Bertha Emmons	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
70/Joel Downey	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
71/Vance Turner	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
72/Forrest Weekley	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
73/G. T. Weekley	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
74/Gerald Zalfas	-	-	-	-	-		-	-	-	-	-	-	-	ND	-

TABLE 3-1 (CONTINUED)

WELL NUMBER/OWNER	DATE OF COLLECTION: 1982				1983										
	08/04	08/18	09/13	09/29-30	01/03	01/04	01/05	01/06	01/18	01/19	01/20	04/11	04/12	04/13	04/14
	BENZENE CONCENTRATION (ppm)				BENZENE CONCENTRATION (ppm)										
75/J. E. Ammons	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
76/Bradley Hadley	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
77/Ezra Turner	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
78/John T. Foster	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-
79/T. F. Rainer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
80/Lillian Curry	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
81/P. W. Ellison	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
82/Webb Rush (store)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND

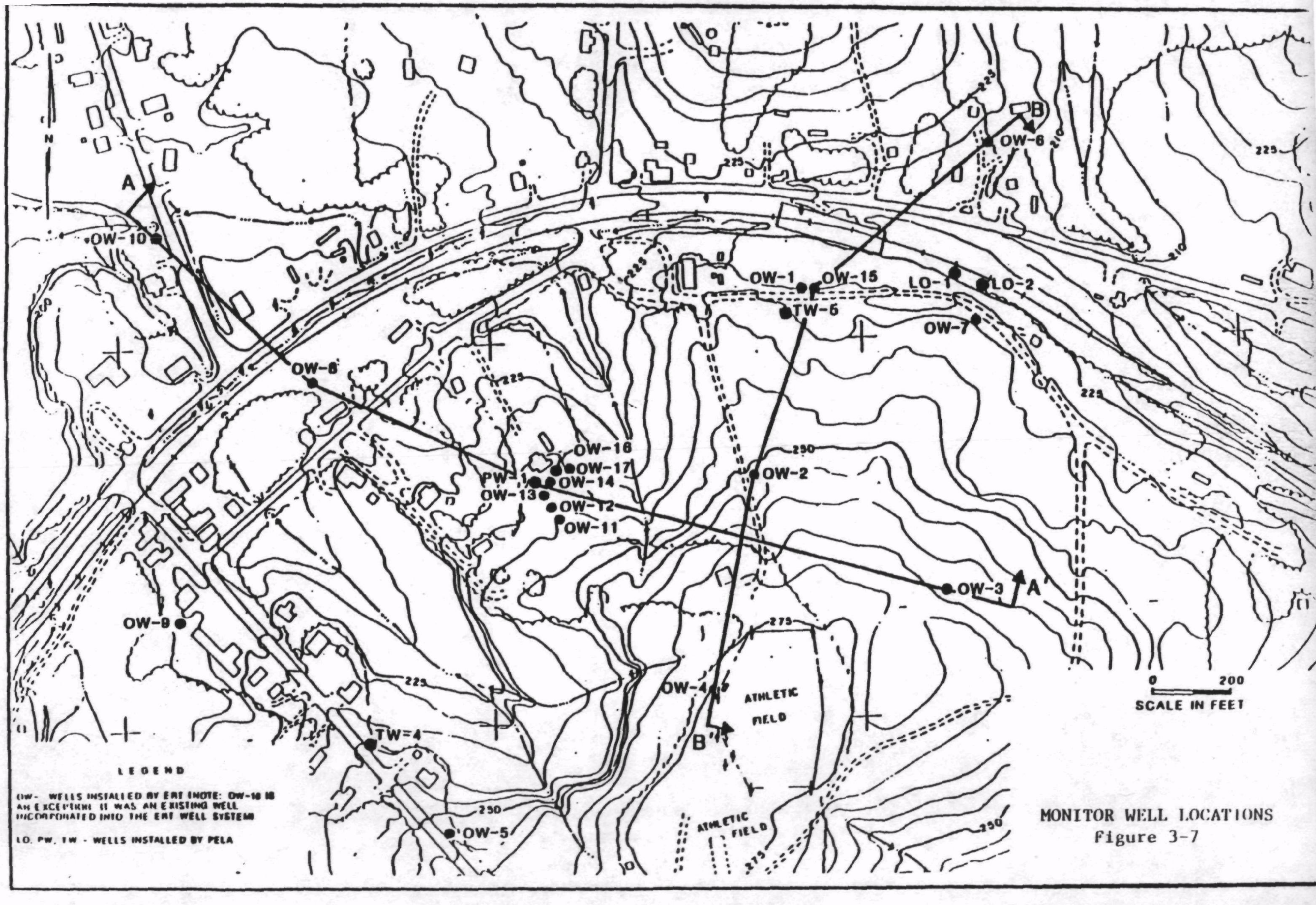
ND - None Detected
* Sampled by ADEM
** Sampled by L&N Railroad
*** Sampled by EPA



Well Code	Owner	Benzene Conc. (PPM)	Date
A	F. Weekly	0.1	08/04/82
		ND	09/13/82
		ND	01/05/83
		ND	01/20/83
B	P. Schultz	65	01/05/83
		70	01/06/83
		51	01/19/83
C	B.L. Bryars	0.022	09/13/82
		ND	01/05/83
		ND	01/19/83
D	J. Wiggins	0.209	09/13/82
		0.347	09/13/82
		ND	09/13/82
		ND	01/05/83
		ND	01/19/88
E	D. Mosley	5.005	08/04/82
		4.8	08/18/82
		5.22	09/13/82
		5.0	01/06/83
		5.0	01/20/83
F	C. Wolfe	108.5	09/13/82
		41.020	09/13/82
		60.0	09/30/82
		111.0	11/19/83
		6.493	01/86
G	E. Johnson	8.49	09/13/82
		9.947	09/13/82
		5.0	09/30/82
		ND	01/20/83
H	R. Slay	0.034	09/30/82
		ND	01/20/82
I	International Paper	4.601	08/18/82
		4.570	09/13/82
		<1.0	09/13/82
		0.009	01/86

Note: ND = None Detected

DOMESTIC WATER WELL LOCATION
AND BENZENE ANALYSIS HIS[illegible]
Figure 3-6



MONITOR WELL LOCATIONS
Figure 3-7

[illegible] sampled [illegible] domestic water wells during the RI. The location of these wells are shown in figure 3-8. Results from the domestic well water samples are given in table 3-2. Of the 13 wells tested only two showed Benzene contamination, the Clara Wolfe property well had 6493 ppb Benzene and the International Paper Company well had 9 ppb and 10 ppb from a split sample. Both of these wells tested positive for Benzene in previous testing, although at higher levels. The other domestic water wells that showed Benzene contamination in 1982-1983 were not able to be sampled because of various obstructions in the wells. The wells have been out of use since the availability of the public water supply.

From March 1, 1986 through April 15, 1986 ERT sampled 10 of the monitoring wells that they installed plus the 8 wells that PELA had previously installed (figure 3-7). Results of the groundwater sample analyses are given in table 3-3. Of the 18 wells tested, only the PW-1 well had Benzene contamination with 28.03 ppm. This well sampled positive for Benzene in the previous PELA study. Two of the wells, OW-15 and TW-5, are directly downgradient of the spill site and did not detect Benzene contamination. This indicates a lack of any continued source contamination from the soils in the spill area.

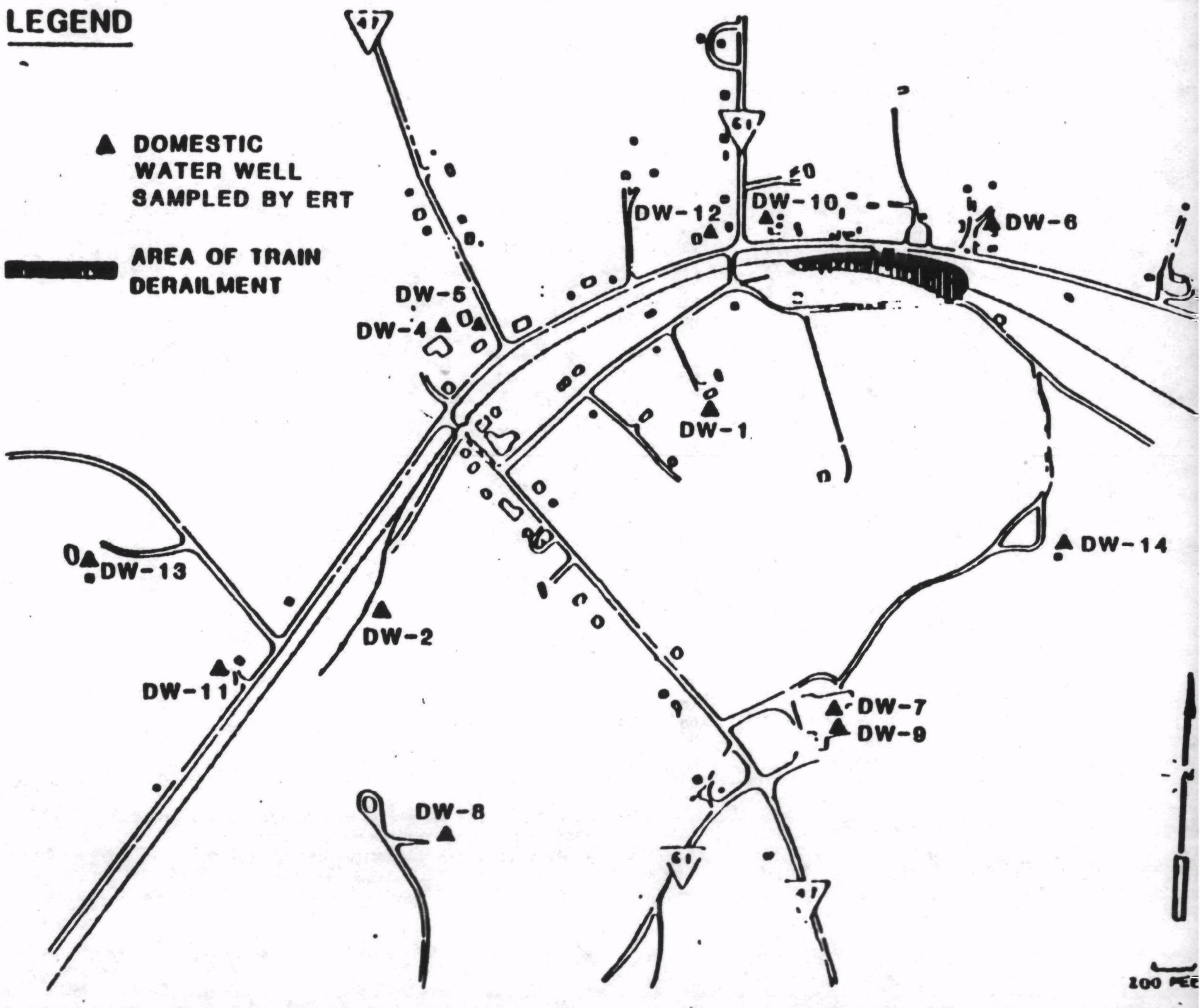
The EPA Groundwater Technology Unit constructed a solute transport groundwater model from the available data and predicted the extent of the groundwater plume in the Perdido area. This model also predicts that the Benzene plume will migrate past the Perdido public water supply in 75 years at concentrations dangerous to human health.

Based on this model and the soil vapor survey performed by the EPA's Environmental Response Team, eight more wells were installed further downgradient and sampled in December 1987/January 1988 (figure 3-9). Results from the sample analysis indicated below detection limit for the 33 selected parameters.

In March, 1988 EPA requested that the Environmental Services Division (ESD) sample specific wells in the Perdido groundwater contamination area for volatile organic contaminants (specifically Benzene) to confirm analytical data obtained from past studies.

Ten groundwater samples were collected. Several of the domestic wells were requested to be sampled during this investigation. When ESD arrived on site they found the pumps had been removed from the domestic wells and many were not capped. Various obstructions in the wells prevented the entry of pumps and bailers in all but one of the abandoned domestic wells (Ramer well). One well had been completely removed (PELA 53 International Paper). The domestic wells that could not be sampled are listed below and all well locations are depicted on figure 3.10.

PELA #18 (PETER SCHULTZ)
PELA #27 (JERRY WIGGINS)
PELA #19 (POST OFFICE)
PELA #43 (MARIE SLAY)
PELA #28 (DAVID MOSELY)
PELA #53 (INTNL. PAPER)
PELA #42 (EARL JOHNSON)



DOMESTIC WATER WELLS SAMPLED BY
E R T
Figure 3-8

TABLE 3-2

DOMESTIC WELL WATER ANALYSIS RESULTS SUMMARY
PERDIDO GROUNDWATER CONTAMINATION SITE
(SAMPLES COLLECTED IN DECEMBEDR 1985 AND JANUARY 1986)

	Boring Number ---:	DW-1		DW-2		DW-2		DW-4		DW-4	
	Sample Number ---:	DWW-001-01	Detection Limit	DWW-002-1A	Detection Limit	DWW-002-1B	Detection Limit	DWW-004-01	Detection Limit	DWW-004-02	Detection Limit
	Reported In ---:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	6493	1	9	10	10	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	9	5	BDL	5	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	96	5	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	1	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5

* EPA Method 624 - Reference: Method for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600/4-82-057, July 1982.

Notes: BDL - Below Detection Limits

TABLE 3-2 (Continued)

	Boring Number ---:	DW-5		DW-6		DW-6		DW-7		DW-8	
	Sample Number ---:	DWW-005-01	Detection Limit	DWW-6	Detection Limit	DWW-006-02	Detection Limit	DWW-7	Detection Limit	DWW-008-01	Detection Limit
	Reported In ---:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	24	5	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5

TABLE 3-2 (Continued)

	Boring Number ---:	DW-8		DW-9		DW-9		DW-10		DW-10	
	Sample Number ---:	DWW-008-02	Detection Limit	DWW-9	Detection Limit	Lab No 85-3697-1&2	Detection Limit	DWW-010-01	Detection Limit	DWW-010-02	Detection Limit
	Reported In ---:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5

TABLE 3-2 (Continued)

	Boring Number —:	DW-11		DW-11		DW-11		DW-11		DW-11	
	Sample Number —:	DWW-011-01A	Detection Limit	DWW-011-01B	Detection Limit	DWW-011-02	Detection Limit	DWW-011-03	Detection Limit	DWW-011-04	Detection Limit
	Reported In —:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5

TABLE 3-2 (Continued)

									Trip Blank		Trip Bla
Boring Number ——:	DW-12		DW-12		DW-13		DW-14		DW-214		DW-214
Sample Number ——:	DWW-012-01	Detection Limit	DWW-012-02	Detection Limit	DWW-013-01	Detection Limit	DWW-014-01	Detection Limit	Lab No. 86-208-2	Detection Limit	Lab No. 86-195-7
Reported In ——:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)		(ppb)
1V Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100	BDL
2V Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100	BDL
3V Benzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1	BDL
4V Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
5V Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
6V Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3	BDL
7V Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1	BDL
8V Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
9V Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
10V 2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
11V Chloroform	BDL	5	9	5	BDL	5	BDL	5	BDL	5	BDL
12V Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
13V Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
14V 1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
15V 1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3	BDL
16V 1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
17V 1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
18V 1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
19V Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1	BDL
20V Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
21V Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
22V Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
23V 1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
24V Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3	BDL
25V Toluene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1	BDL
26V 1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
27V 1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
28V 1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
29V Trichloroethylene	2	1	2	1	BDL	1	BDL	1	BDL	1	BDL
30V Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
31V Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1	BDL
32V Xylenes	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL
33V Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5	BDL

TABLE 3-3
MONITOR WELL WATER ANALYSIS RESULTS SUMMARY
PERDIDO GROUNDWATER CONTAMINATION SITE
(SAMPLES COLLECTED DURING MARCH AND APRIL 1986)

	Boring Number ---:	OW-2		OW-2		OW-3		OW-4		OW-5	
	Sample Number ---:	PA-OWW-002-01	Detection Limit	PA-OWW-002-02	Detection Limit	PA-OWW-003-01	Detection Limit	PA-OWW-004-01	Detection Limit	PA-OWW-005-01	Detection Limit
	Reported In ---:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5

TABLE 3-3 (Continued)

	Boring Number ---:	OW-6		OW-6		OW-6		OW-7		OW-7	
	Sample Number ---:	PA-OWW-006-01	Detection Limit	PA-OWW-006-02	Detection Limit	PA-OWW-006-03	Detection Limit	PA-OWW-007-01	Detection Limit	PA-OWW-007-02	Detection Limit
	Reported In -----:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5

TABLE 3-3 (Continued)

	Boring Number ---:	OW-8		OW-9		OW-10		OW-15		TW-1	
	Sample Number ---:	PA-OWW-008-01	Detection Limit	PA-OWW-009-01	Detection Limit	PA-OWW-010-01	Detection Limit	PA-OWW-015-01	Detection Limit	PA-TWW-001-01	Detection Limit
	Reported In ---:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	8	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5

TABLE 3-3 (Continued)

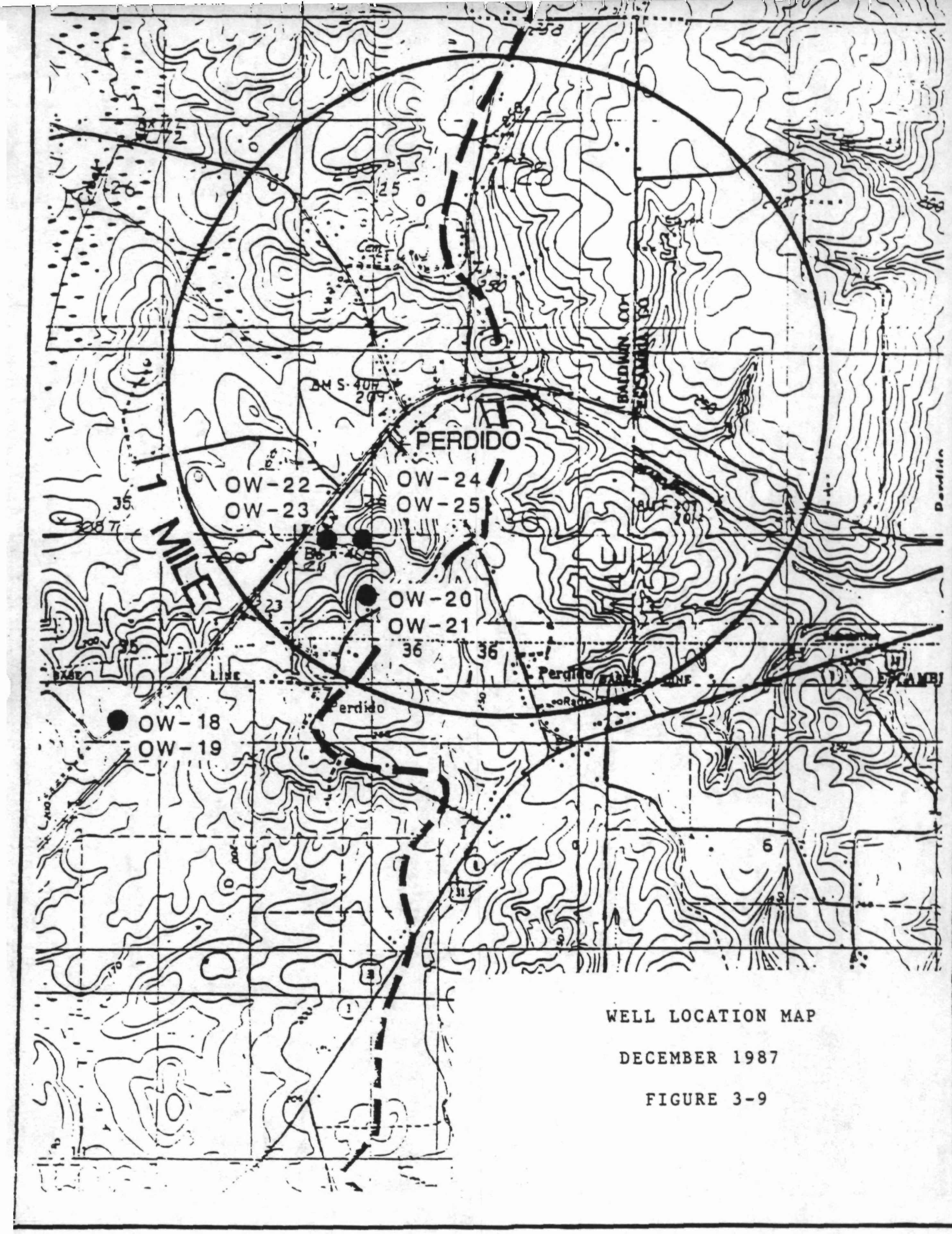
	Boring Number ---:	TW-1		TW-2		TW-2		TW-3	
	Sample Number ---:	PA-TWW-001-02	Detection Limit	PA-TWW-002-01	Detection Limit	PA-TWW-002-02	Detection Limit	PA-TWW-003-01	Detection Limit
	Reported In -----:	(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	BDL	1	BDL	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	6	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5	15	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	BDL	1	25	1	BDL	1	2	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5

TABLE 3-3 (Continued)

	Boring Number ---:	TW-4		TW-5		LO-1		LO-2		LOW-2	
	Sample Number ---:	PA-TWW-004-01	Detection Limit	PA-TWW-005-01	Detection Limit	PA-LOW-001-01	Detection Limit	PA-LOW-002-01	Detection Limit	PA-LOW-002-02	Detection Limit
	Reported In ---:	(ppb)		(ppb)		(ppb)		(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100	BDL	100	BDL	100	BDL	100
3V	Benzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3	BDL	3	BDL	3	BDL	3
25V	Toluene	12	1	BDL	1	BDL	1	2	1	BDL	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1	BDL	1	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5	BDL	5	BDL	5	BDL	5

TABLE 3-3(Continued)

		PA-PWW-001-01	Detection Limit	PA-PWW-001-02	Detection Limit
	Boring Number ---:	PW-1		PW-1	
	Sample Number ---:	PA-PWW-001-01	Detection Limit	PA-PWW-001-02	Detection Limit
	Reported In ---:	(ppb)		(ppb)	
1V	Acrolein	BDL	100	BDL	100
2V	Acrylonitrile	BDL	100	BDL	100
3V	Benzene	28030	1	BDL	1
4V	Bis(chloromethyl)ether	BDL	5	BDL	5
5V	Bromoform	BDL	5	BDL	5
6V	Carbon Tetrachloride	BDL	3	BDL	3
7V	Chlorobenzene	BDL	1	BDL	1
8V	Chlorodibromomethane	BDL	5	BDL	5
9V	Chloroethane	BDL	5	BDL	5
10V	2-Chloroethylvinyl Ether	BDL	5	BDL	5
11V	Chloroform	BDL	5	BDL	5
12V	Dichlorobromomethane	BDL	5	BDL	5
13V	Dichlorodifluoromethane	BDL	5	BDL	5
14V	1,1-Dichloroethane	BDL	5	BDL	5
15V	1,2-Dichloroethane	BDL	3	BDL	3
16V	1,1-Dichloroethylene	BDL	5	BDL	5
17V	1,2-Dichloropropane	BDL	5	BDL	5
18V	1,2-Dichloropropylene	BDL	5	BDL	5
19V	Ethylbenzene	BDL	1	BDL	1
20V	Methyl Bromide	BDL	5	BDL	5
21V	Methyl Chloride	BDL	5	BDL	5
22V	Methylene Chloride	BDL	5	BDL	5
23V	1,1,2,2-Tetrachloroethane	BDL	5	BDL	5
24V	Tetrachloroethylene	BDL	3	BDL	3
25V	Toluene	BDL	1	3	1
26V	1,2-trans-Dichloroethylene	BDL	5	BDL	5
27V	1,1,1-Trichloroethane	BDL	5	BDL	5
28V	1,1,2-Trichloroethane	BDL	5	BDL	5
29V	Trichloroethylene	BDL	1	BDL	1
30V	Trichlorofluoromethane	BDL	5	BDL	5
31V	Vinyl Chloride	BDL	1	BDL	1
32V	Xylenes	BDL	5	BDL	5
33V	Iso-Octane	BDL	5	BDL	5



WELL LOCATION MAP

DECEMBER 1987

FIGURE 3-9

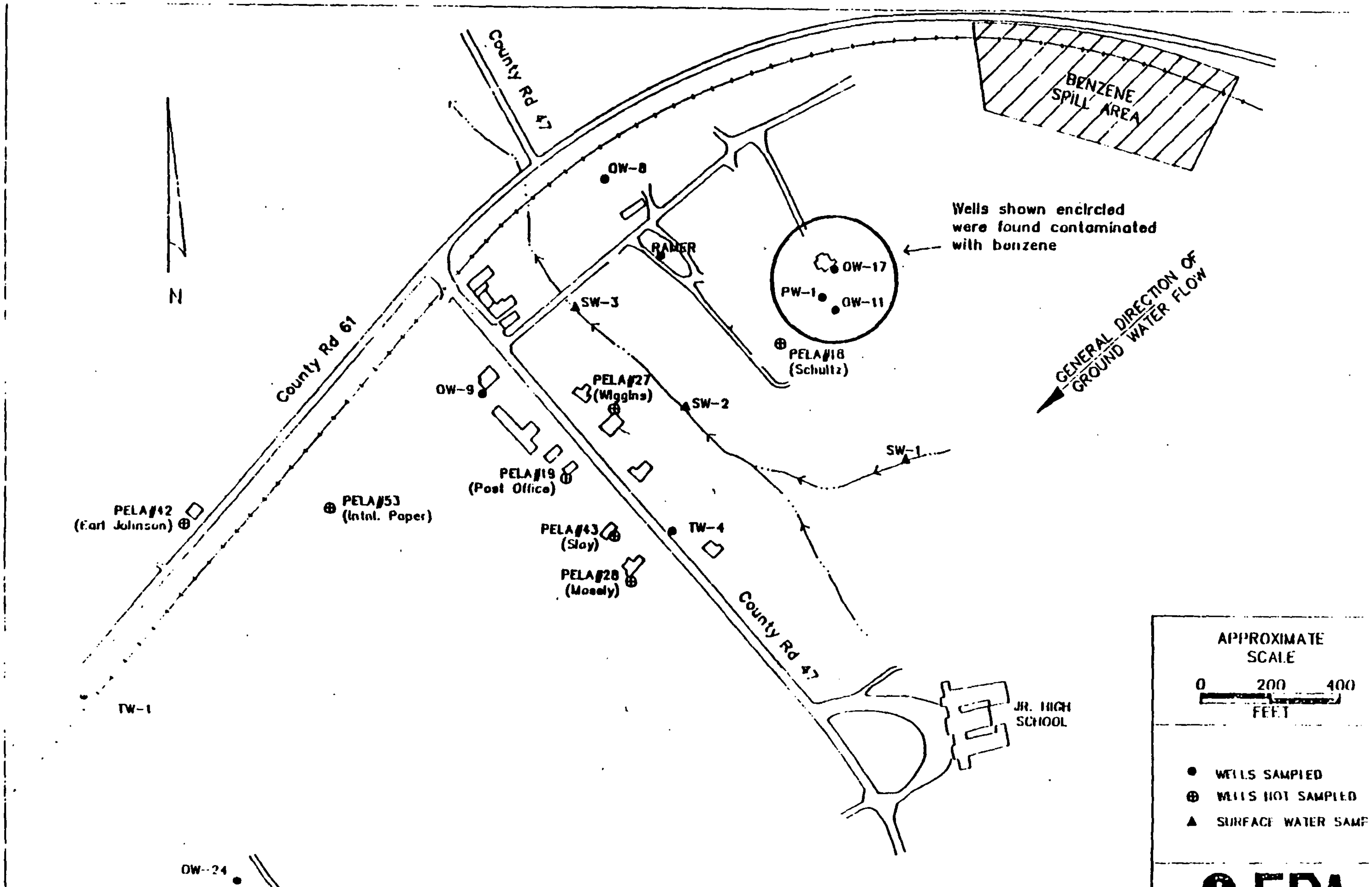


FIGURE 3-10

PERDIDO GROUNDWATER CONTAMINATION AREA

PERDIDO, DWIN COUNTY, ALABAMA

[illegible] wells were found to be contaminated with Benzene, OW-17(24000 ug/l), OW-11(7900 ug/l) and PW-1(450 J ug/l). These wells are located in the area of the suspected Benzene plume. There were no other contaminants attributable to the 1965 train derailment detected in any of the other wells sampled.

3.2.2 Surface Water Assessment

Currently the surface water bodies in the Perdido area are not affected by the Benzene contaminated groundwater plume. A surface water discharge area 1.5 to 2.2 miles to the southwest would eventually be affected if the plume is allowed to migrate undisturbed.

3.2.3 Soil Assessment

The area of the train derailment and the drainage ditches along Highway 61 were investigated for soil contamination from the Benzene spill. In late 1982 and 1983 PELA conducted a contamination investigation for CSXT. The source characterization phase of the study was performed to identify the area and vertical extent of Benzene contaminated soil. Of 20 soil test holes analyzed, 12 had measurable amounts of Benzene and 4 had trace amounts detected. The highest concentration found in the test holes was 20 ppm.

The 1986 RI conducted by ERT, also performed a source characterization study to identify the extent of Benzene contamination. A total of 45 shallow soil borings were taken by hand auger to a depth of 5 feet or refusal (figure 3-11). Only one boring (DB42) showed Benzene contamination with 1.2 ppm. This boring also contained 4.2 ppm 1,2-Dichloroethane which is not related to the spill. The source of the Benzene from this one isolated sample, that also contained an unrelated contaminant, cannot be definitely attributed to the train spill.

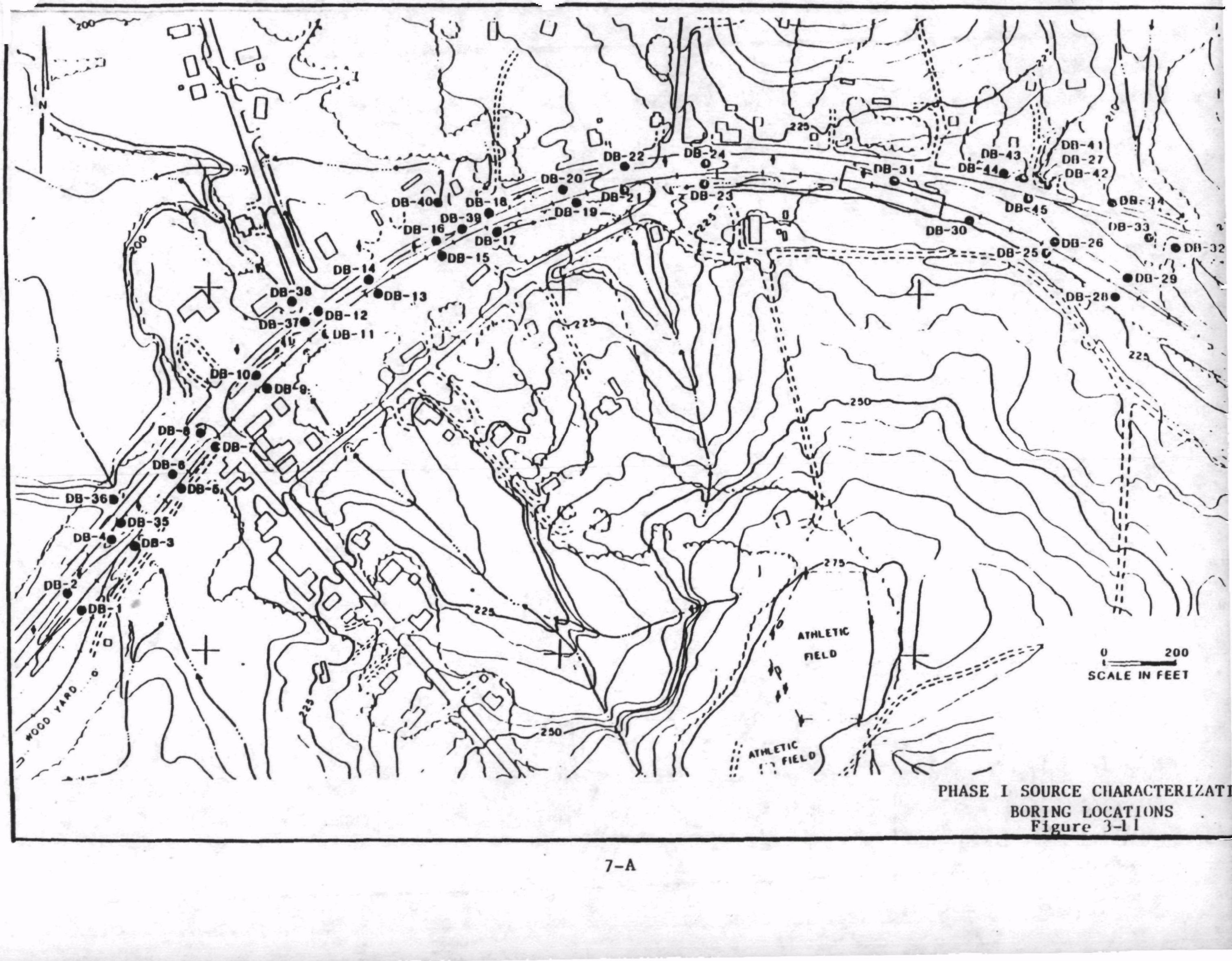
In addition to the 45 shallow soil borings, 19 deep soil borings were taken to investigate for Benzene contaminated soils down to the water table (figure 3-12). These borings ranged in depth from 17 to 122 feet. Analyses for volatile organic compounds (VOC) from these deep borings failed to detect the presence of Benzene or other VOCs. As a result of the source characterization studies for Benzene contaminated soils, it has been concluded that Benzene is no longer present in the soils or is at very low concentration and is not considered to be a significant source contributor.

3.2.4 Atmosphere Assessment

Benzene remaining from the 1965 spill has entered the groundwater and/or tightly bounded to the soil at low concentrations. Benzene does not currently impact ambient air quality at the Perdido site.

3.3 Summary of Site Risks

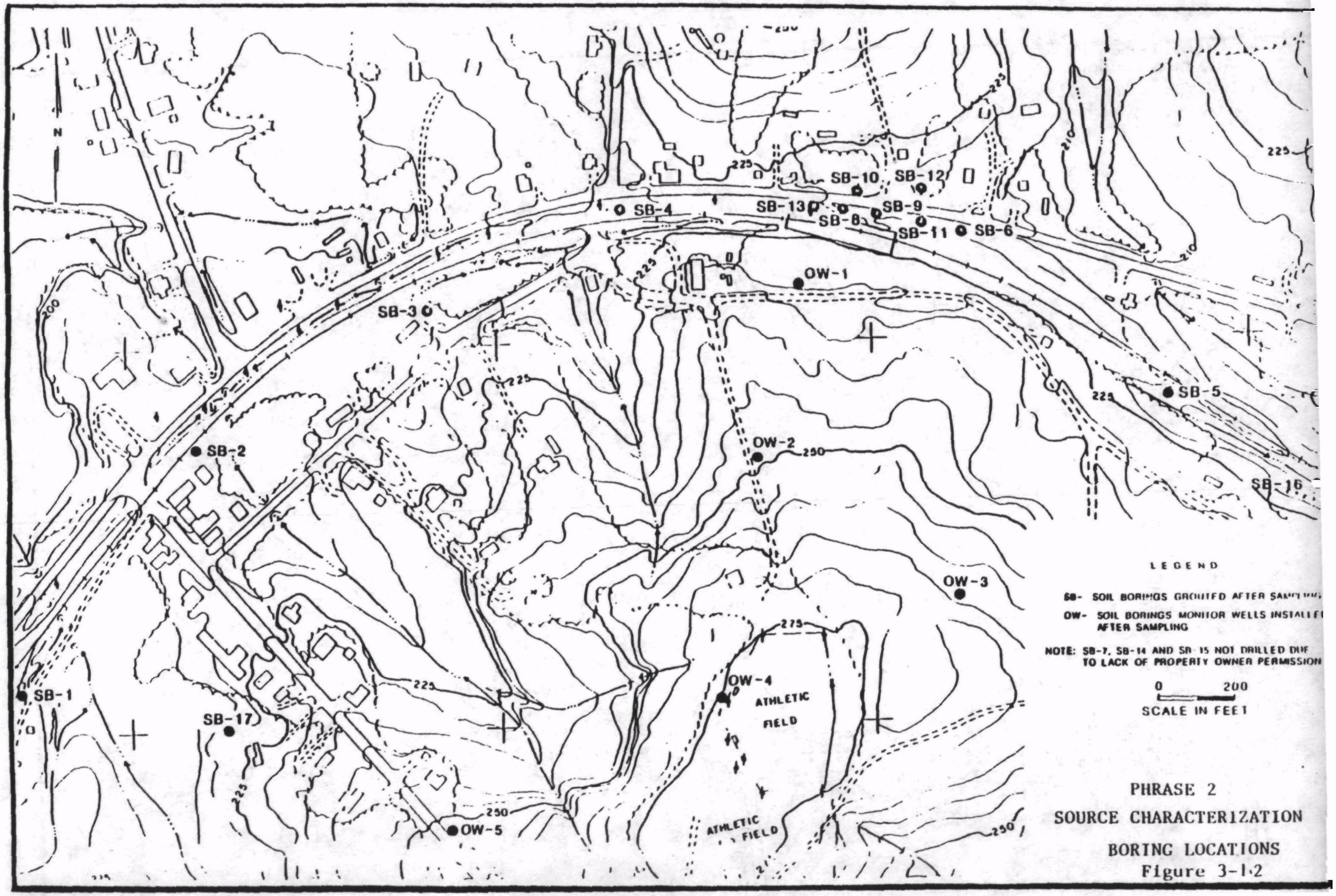
The chemical of concern identified for this site is benzene. The risks to human health and the environment from exposure to benzene at this site is summarized below.



PHASE I SOURCE CHARACTERIZATI

BORING LOCATIONS

Figure 3-11



PHRASE 2
SOURCE CHARACTERIZATION
BORING LOCATIONS
Figure 3-1-2

An assessment of current and potential routes of exposure at the Perdido site has identified several exposure pathways. The potential exposure pathways for humans is ingestion of contaminated groundwater. Additional pathways that were investigated were ingestion and dermal contact with surface waters for humans, and ingestion of surface water by cattle. These additional pathways were deleted from further consideration due to the facts that the benzene spill occurred over 20 years ago, that benzene is a highly volatile substance and will volatilize quickly, and that benzene has only been detected in the groundwater.

CERCLA directs the Agency to consider current and potential exposure scenarios in determining the risks from exposure to the sites. In addition, a goal of the Superfund program is to restore groundwater to its beneficial use whenever possible. Given the statutory and programmatic goals, the Agency is considering the risks from potential future use of the groundwater.

3.3.2 Toxicity Assessment

Benzene is a known human carcinogen. The EPA Cancer Assessment Group has estimated that the excess lifetime cancer risk from exposure to benzene at 6.6 ppb is 10(-5). The Superfund protective risk range is 10(-4) to 10(-7), with a point of departure of 10(-6). The protective Maximum Contaminant Level (MCL) for benzene is set at 5 ppb.

3.3.3 Environmental Assessment

The United States Department of the Interior, Fish and Wildlife Service has identified a threatened species, the eastern indigo snake, in Baldwin County. The contaminated groundwater at this site will not pose a threat the survival of this species.

4.0 Cleanup Criteria

The cleanup goal for benzene in groundwater has been established at 5 ppb, the MCL for this substance. Based on the risk assessment conducted for this site (described in section 3.3 above), this cleanup level has been determined to be protective of human health and the environment at this site.

5.0 Alternative Evaluation

The purpose of the remedial action at the Perdido site is to mitigate and minimize contamination in the groundwater, and to reduce potential risks to human health and the environment. The following cleanup objectives were determined based on regulatory requirements and level of contamination found at the site:

* To protect the human health and the environment from exposure to contaminated groundwater through direct contact and;

* To restore contaminated groundwater to levels protective of human health and the environment.

Cleanup goals were developed for the contaminated groundwater at the Perdido site based on applicable or relevant and appropriate requirements (ARARs) of federal and state statutes or other guidelines (table 5-1).

An initial screening of possible technologies was performed to identify those which best meet the criteria of Section 300.68 of the National Contingency Plan (NCP).

Each of the remaining alternatives for groundwater were evaluated based upon cost, technical feasibility, institutional requirements and degree of protection of public health and the environment.

5.1 Alternatives

Alternative 1: No Action

This alternative would allow for natural attenuation and biodegradation of the Benzene contamination plume. Long term groundwater monitoring would be provided for twenty years to monitor unsafe levels of Benzene approaching domestic water wells. Cost for utilizing monitoring wells was estimated at $4,000 per year. The natural attenuation of the Benzene plume is not protective of public health and the environment based on the following:

* the Benzene plume will reach the public water supply in 75 years;
* domestic well water within the one mile radius is being used for agricultural and recreational purposes;
* discharge into a surface water body would exceed the ambient water quality criteria.

Alternative 2: Groundwater extraction on-site treatment

This alternative involves the installation of approximately three groundwater extraction wells screened in the Benzene contamination plume. The contaminated water would be pumped to the surface and piped to a treatment facility utilizing either air stripping in packed tower(s) or liquid phase extraction using granular activated carbon adsorption. If air stripping technology is utilized, benzene air emissions (anticipated to be insignificant), would be eliminated by carbon absorption. Regardless of which treatment technology is utilized, treated groundwater would be reinjected back into the aquifer. Groundwater would be treated until cleanup levels were attained. Groundwater monitoring would occur for an additional five years to insure cleanup levels were maintained.

Alternative 3: Groundwater withdrawal off-site treatment

This alternative would be performed by using submerged pumps in withdrawal wells to move contaminated groundwater to surface storage. The contaminated water would then be transported to an approved off-site treatment system.

TABLE 5-1
ARAR REQUIREMENT PROVISIONS

RCRA PART 264

o Subpart F - Groundwater Protection

Requires that levels of hazardous constituents in the upper aquifer at site boundary meet limits set by EPA as:

1) Background,
2) Maximum Contaminant Levels (MCL), or
3) An Alternate Concentration Limit (ACL) posing no present or future hazard to human health or the environment.

Note: This feasibility study is based on achieving EPA MCL criteria for benzene in groundwater (5.0 ppb).

OCCUPATIONAL SAFETY AND HEALTH STANDARDS: 29 CFR 1910

Applicable for worker safety during construction and operation of Alternatives 1 and 2.

6.0 Recommended Alternative

6.1 Description of Recommended Remedy

The recommended alternative for remediation of groundwater at the Perdido site is groundwater extraction with onsite treatment (Alternative 2).

Approximately three groundwater extraction wells screened in the contamination plume will be installed. The contaminated water will be pumped to the surface and piped to a treatment facility utilizing either air stripping in packed tower(s) or liquid phase using granular activated carbon adsorption. This process is reported to be the best available technology (BAT) for Benzene removal from water under Section 1412 of the Safe Drinking Water Act (SDWA).

Air stripping is a mass transfer separation technique for removal of volatile organic compounds from water. In using the packed tower concept, water enters at the top of the tower and flows downward through the packing, while the airstream flow upward picks up the volatile compounds and exits at the top of the tower, passing through granular activated carbon before release to the atmosphere. The water is collected at the bottom, tested for compliance with the MCL and pumped back into the aquifer.

It is estimated that cleanup of the aquifer will take 5 to 7 years, with three wells pumping at a combined rate of 10 gallons/minute.

6.2 Operation and Maintenance

Groundwater monitoring would occur for an additional five years to ensure cleanup levels were maintained.

Air monitoring during treatment would be necessary to ensure that no threat to the human health or the environment is created by air emissions.

6.3 Cost of Recommended Alternative

The estimated capitol costs are $169,000. Yearly operations and maintenance costs are $99,000 and yearly groundwater monitoring costs are $4,000.

6.4 Preliminary Schedule of Activities

Issue Record of Decision to Public Repository	9/88
Completion of Enforcement Negotiations	10/88
Start Remedial Design	11/88
Complete Remedial Design	3/89
Start Remedial Action	4/89
Construction Phase	4/89-9/89

6.5 FUTURE ACTION

Additional groundwater and aquifer studies will be performed during the engineering design to define the contamination plume and aquifer characteristics for the purpose of groundwater recovery, treatment, and disposal.

6.6 CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

In selecting remedial alternatives, primary consideration must be granted under the Superfund Amendments and Reauthorization Act of 1986 to remedies that achieve applicable or relevant and appropriate requirements (ARARs) for protection of public health and the environment. For the Perdido site, such Federal laws include:

- National Environmental Protection Act
- Toxic Substances and Control Act
- Department of Transportation Hazardous Material Transportation Act
- Resource Conservation and Recovery Act
- Clean Air Act
- Safe Drinking Water Act
- Clean Water Act

The requirements of the National Environmental Protection Act (NEPA) have been met by conducting the functionally equivalent remedial investigation and feasibility study. Additionally, the results of these studies have been presented to the public at a public meeting, and the public was given the opportunity to comment on the results of the studies and the proposed plan for remedial action.

The Toxic Substances and Control Act (TSCA) requirements do not apply to any of the remedial alternatives under consideration for the Perdido site. The contaminant found at the Perdido site is not regulated under TSCA, and therefore, there are no ARARs to be considered under this regulation.

For Alternative 2 that includes transportation of spent activated carbon, the Department of Transportation (DOT) Hazardous Material Transportation Act requires that the proper labeling and safety requirements be followed.

Spent activated carbon will also have to be disposed according to the Resource Conservation and Recovery Act (RCRA) regulations.

Since there will be no air emissions, the Clean Air Act (CAA) does not apply to the site.

National Primary Drinking Water Regulations (NPDWRs) established under the Safe Drinking Water Act (SDWA) set the Maximum Contaminant Level (MCL) for Benzene at 5 ppb.

Ambient Water Quality Criteria under the Clean Water Act (CWA) for Benzene is 5.3 ppm. This would apply if a no action alternative was implemented and contaminated groundwater discharged to surface waters.

... requirements is planned for the remediation of the groundwater at the Perdido site.

7.0 COMMUNITY RELATIONS

Citizens concerns were originally high early in the project until the public water supply system was installed in July, 1983. Since then, there has been little citizen interest with the site.

A community relations plan was prepared by EPA in 1985. This plan includes a community relations history, a summary of issues and concerns, community relations objectives,community relations techniques, and a listing of interested parties.

An information repository was established in 1985 in the town of Bay Minette, Alabama, the county seat of Baldwin County. All required site information and documents were deposited in the repository.

In November 1985 a public meeting was held to discuss the implementation of the RI/FS.

In June 1988, a fact sheet concerning the Perdido site was prepared and distributed to interested citizens, area residents, local press, public officials and the PRP. The fact sheet summarized the site history, current site status, and future plans of the site, as well as announced a public meeting to present the results of the FS. EPA, state, and county contacts were identified. The fact sheet was mailed two weeks prior to the meeting. Also at this time, public notices and press releases were issued to the appropriate media as announcements for the meeting.

The public meeting to discuss the results of the RI/FS and the preferred alternative was held at the Bay Minette City Hall on July 14, 1988. Approximately 30 people attended the meeting mostly interested citizens, but also a representative of the media and an insurance company representative. Only one question was raised and that, by the insurance company representative. The public meeting marked the beginning of a formal 3 week public comment period (7/14/88-8/4/88), during which time the public was encouraged to submit written comments to EPA concerning the RI/FS and the preferred alternative.

Responsiveness Summary

Perdido Ground Water Contamination Site

Perdido, Baldwin County, Alabama

TABLE OF CONTENTS

Responsiveness Summary
Perdido Ground Water Contamination Site

July 14, 1988

Introduction

In accordance with the U.S. Environmental Protection Agency's (EPA) Community Relations policy and guidance, the EPA Region IV office held a public meeting July 18, followed by a 21-day public comment period. The purpose of the meeting was to obtain comments on the Feasibility Study (FS) for the Perdido Ground Water Contamination Superfund site and on the preferred alternative for the remediation of the contamination problem at the site. The meeting took place from 7:00 p.m. to 9:00 p.m. at the Bay Minette City Hall in Baldwin County, Alabama. Approximately 30 people attended. A public notice announcing the meeting and the public comment period was published in The Baldwin Times July 10, 1988. The report of the FS will be placed in the site information repository located in Bay Minette Public Library, for public review.

1.0 BACKGROUND

A. Site Status

The Perdido Ground Water Contamination site is located in the Town of Perdido, Baldwin County, Alabama. The site consists of approximately two square miles surrounding the location where a 1965 train derailment occurred that spilled chemicals into drainage ditches along State Road 61. As a result of the spill, pure chemical Benzene penetrated the soil and ground water used by area residents for their water supply.

In the early 1980s, the State initiated a sampling program in response to local complaints about petroleum odor in the water. The Alabama Department of Solid Waste and Hazardous Waste enlisted EPA's assistance, following a preliminary assessment and site inspection. Based on the findings of the preliminary assessment and site inspection, The EPA recommended the site for inclusion on the National Priorities List (NPL), the list of hazardous waste sites eligible for cleanup under the Superfund Program. The site was added in 1983.

In October 1985, CSX Transportation Company (previously the Louisville and Nashville Railroad, which operated the train that derailed) signed an Administrative Order on Consent with the EPA to conduct a remedial investigation/feasibility study (RI/FS) at the site. An RI/FS is a two-phase study wherein a site is characterized by investigating toxicity, volume, and form of hazardous substances at and surrounding the site and appropriate technologies are evaluated for cleanup. The Perdido RI, completed in November 1987, detected the presence of benzene in two wells; however, no soil contamination was detected. Based on findings in the RI, contractors began an FS to identify possible alternatives. The FS for the Perdido site evaluated remedial alternatives ranging from no action to pumping and treating the ground water, and narrowed the alternatives down to two in the final FS report. One alternative is no action, which EPA always considers and uses for a baseline to which it compares other alternatives. No action is not preferred for the Perdido site because the plume of benzene contamination traveling underground that emanated from the location of the train derailment will eventually migrate to areas where residents still depend on their domestic wells for drinking water. The second alternative, EPA's preferred alternative, is a ground water withdrawal and treatment method.

EPA described the alternatives in a site information fact sheet it distributed to the public and presented the information at the public meeting. Throughout the 21-day comment period, from July 14, 1988 through August 4, 1988 the Agency received, considered, and responded to public comments on the RI/FS and the preferred alternative. Once the comments have been evaluated and addressed, EPA will make its final decision on the remedy and will sign the Record of Decision (ROD). The ROD presents the choice of remedy and the process and rationale for reaching that choice. Once the ROD is signed, the remedial action (RA), which is the implementation of the chosen cleanup technology, will be initiated.

B. Community Relations

In accordance with its public outreach responsibilities under the Superfund Program, EPA initiated several community relations activities at the Perdido site. These activities included:

- Establishment of a site information repository at the Bay Minette Public Library. The repository contains site documents and provides a place where interested persons can review reports and other site information.

- Distribution of a site fact sheet to the site community. The fact sheet explains the most current activities at the site, site status, and future activities.

- Presentation of a public meeting that provided the public with an opportunity to hear a report on FS findings and EPA's preferred remedial alternative, and to ask questions regarding EPA's actions. The meeting was held at the Bay Minette City Hall auditorium on July 14, 1988.

- Provision of a 21-day public comment period on the RI/FS and proposed plan. This comment period ran from July 14, 1988 through August 4, 1988.

Additional public involvement activities will be implemented as cleanup activity at the site gets under way.

2.0 SUMMARY OF PRESENTATIONS

Mr. Larry Meyer, EPA's Remedial Project Manager, (recently succeeded by Gena Townsend) opened the meeting with a brief summary of the site history and a brief account of Superfund program and process, including the results of the recently completed RI/FS.

Mr. Michael Henderson, EPA's Community Relations Coordinator, gave a brief overview of the community relations program. Mr. Henderson explained that the 21-day comment period on the RI/FS and EPA's preferred alternative is designed to provide community members with an opportunity to ask questions and register concerns pertaining to the site.

Mr. Hoyt Clark, the project manager whose firm was hired by CSX to conduct the RI/FS, explained the findings of the RI/FS and the preferred alternative. Mr. Clark stated that the pump and treat method has been chosen as the preferred cleanup method because it is a permanent remedy for the site, it is protective to human health and the environment, and it is cost effective. He explained the technology, saying that the contractor will install three wells to pump ground water up from underground. The water will then be treated using a method called air stripping (a treatment process in which a current of air passes through contaminated water in a tower system to decontaminate water). This treatment removes benzene from the water and recaptures the benzene vapor in canisters.

Dr. Michael Allred, an Environmental Toxicologist with the Agency for Toxic Substances and Disease Registry (ATSDR), presented information on the health aspects associated with the Perdido Ground Water Contamination site. Dr. Allred discussed the results of the past health study conducted in Perdido, which tested individuals who live in the vicinity of the site. He explained that, to date, there is no evidence of adverse health effects on residents in the vicinity of the site.

3.0 SUMMARY OF COMMENTS

Only one question was asked by a meeting attendee. This participant referred to a draft copy of the FS report which recommended the no action alternative. The questioner wanted to know how EPA moved from the no action alternative to the expenditure of an estimated $169,000 for implementing the pump and treat technology. EPA's Project Manager, Mr. Larry Meyer, responded by stating that EPA had not released, therefore, had not accepted the draft report to which the speaker referred. He explained, that the RI/FS contractor initially recommended the no action alternative; however, negotiations between EPA, CSXT, and the contractor resulted in the recommendation of the pump and treat alternative.

No other questions were raised and the project manager indicated that should questions or concerns arise, residents could contact EPA by letter or telephone. He stated that a message could be left on the Superfund hotline (800-241-1754) and the appropriate person would return the call as soon as possible.

ADEM
ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Guy Hunt
Governor

Leigh Pegues, Director

1751 Federal Drive
Montgomery, AL
36130
205/271-7700

Field Offices:

Unit 806, Building 8
225 Oxmoor Circle
Birmingham, AL
35209
205/942-6168

P.O. Box 953
Decatur, AL
35602
205/353-1713

2204 Perimeter Road
Mobile, AL
36615
205/479-2336

September 21, 1988

Gena D. Townsend
Site Project Manager
U.S. EPA, Region IV
345 Courtland Street
Atlanta, Georgia 30365

Dear Gena:

We have reviewed the draft copy of the Perdido Groundwater Contamination site record of decision. We concur in the proposed remedial action at the Perdido site.

As I pointed out to you during a phone conversation, the last sample from PW-1 showed a concentration of .45 ppm of Benzene. Enclosed you will find a graph showing the change in Benzene concentration with Time for PW-1.

Sincerely,

Joseph E. Downey
Special Projects

JED/daf

Enclosure

CC: Steve Buser