Report on Hydrogeologic Assessment
Polvorosa Business Park Site
San Leandro, California

November 1, 1988
1204

Prepared for:

Mr. Robert Malin
Rouse and Associates
1555 Doolittle Drive
San Leandro, California 94577

LEVINE·FRICKE

LEVINE·FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

November 1, 1988

LF·1204

Mr. Robert Malin
Rouse and Associates
1555 Doolittle Drive
San Leandro, California 94577

Subject: Enclosed Report on Hydrogeologic Assessment
Polvorosa Business Park, San Leandro, California

Dear Bob:

Enclosed please find the subject report, which presents the results of our work to date in assessing the amount and extent of petroleum products in the ground water and soils at the Polvorosa Business Park site in San Leandro, California. The results of the most recent water sampling indicated that floating diesel product is present in the well near the former diesel tank locations. Smaller amounts of floating product were also seen in the wells in the center of the parking lot, south of the former tank locations.

Two product recovery alternatives have been evaluated, and this report recommends the single well alternative located within the building. Because of the proposed location of this well and the occupancy status, the recovery well has already been installed under Levine·Fricke supervision.

It is a pleasure to be of service to you. If you have any questions please contact me or Tom Graf.

Sincerely,

Ted Splitter
Senior Geotechnical Engineer

enclosure

1900 Powell Street, 12th Floor
Emeryville, California 94608
(415) 652-4500

Other offices in NEWPORT BEACH and OAKLAND, CA

C O N T E N T S

LIST OF TABLES AND FIGURES

November 1, 1988 L·F 1204

REPORT ON HYDROGEOLOGIC ASSESSMENT
POLVOROSA BUSINESS PARK SITE
SAN LEANDRO, CALIFORNIA

1.0 INTRODUCTION

The Polvorosa Business Park site consists of approximately 11.6 acres on the northwest corner of Doolittle Drive and Polvorosa Avenue in San Leandro, California. The eastern half of the site is occupied by an office park development, while the western half is the Viking truck terminal. The site was reportedly used as a truck terminal by several different owners from 1959 to 1986. In 1986 the terminal buildings were demolished, and the underground tanks were removed. Four 10,000-gallon diesel tanks, two 10,000-gallon gasoline tanks, and one motor oil tank of unknown size were removed from the central area of the present Building C (see Figure 1). In addition, two 3000-gallon waste oil and one 5000-gallon motor oil tanks were removed in the area of the north end of the Viking terminal building.

4-diesel 2-gas 2-mtr oil 2-waste oil

Samples of ground water found in the bottom of the depressions left by the removal of the tanks were found to contain concentrations of motor oil, diesel and gasoline constituents. Blymyer and Sons were retained by Rouse and Associates to assess the extent of the product migration. Blymyer and Sons retained Groundwater Technology, Inc. to perform this work. Seven exploratory borings were drilled and nine wells were installed. Samples of the soil and ground water were collected for chemical testing. Seven of the wells were destroyed during subsequent construction of the business park buildings.

7-borings 9-wells

In June 1987, Hazardous Materials Mitigation Professionals (HMMP) was retained to further examine the concentrations and extent of hydrocarbons in the soil and ground water. HMMP constructed two new wells and drilled seven exploratory soil borings. Water samples were collected on several occasions from the new and remaining wells for chemical testing. Pumping and recovery tests were performed by HMMP in June 1988 to evaluate the transmissivity and storativity of the shallow water-bearing zone.

7-borings 2-wells pump tests

Levine·Fricke was retained by Rouse and Associates in August 1988 to review the work carried out at the site by the previous consultants, to develop and carry out a program to better define the extent and amount of hydrocarbons in the ground water and soil, and to develop recommendations for remediation, if considered appropriate.

4-wells

2.0 FIELD ACTIVITIES

Based on our review of the previous consultants' studies, Levine·Fricke recommended additional field work at the site. The following field tasks were performed:

- four new monitoring wells were installed to depths of 17 feet below the existing ground surface or top-of-slab;
- the wells were developed and samples of the water were obtained for laboratory chemical analyses; and
- ground-water levels were measured on two occasions in the new and previously existing wells and the tops of the wells were surveyed to obtain ground-water elevations.

LF-12, -13, -14, -15

A more complete and detailed description of the field activities is contained in Appendix A.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The eastern half of the site is occupied by three one-story reinforced concrete tilt-up Research and Development-type buildings. Small landscaped areas are located adjacent to these buildings. The remaining areas are paved asphalt parking lots.

The Viking terminal building is a relatively long, narrow one-story building with a dock-high level. A small maintenance building is located in the northwest corner of the Viking portion of the site. A landscaped area fronts along Polvorosa Avenue. The rest of the property is paved with asphalt concrete.

The site is relatively level, with minor variations to facilitate drainage of surface water to catch basins. Two Southern Pacific spur lines are located to the north of the site at a slightly lower elevation than the site itself.

3.2 Subsurface Conditions

<u>Lithology</u>

The asphalt concrete pavement section or concrete slab-on-grade is generally underlain at the well locations by 6 to 8 feet of stiff silty or gravelly clay. Approximately 2 to 5 feet of more granular soils, consisting of sand, silty sand, clayey sand or silt were encountered in the Levine·Fricke wells below the silty

clay. Logs from three of the previously installed wells indicated that these granular layers extended to the bottom of the wells at depths of up to 25 feet. Below the granular layers at the other exploratory locations, medium stiff and stiff silty clays extend from the bottom of the granular layer to the bottom of the wells. The detailed logs showing the geologic conditions encountered are presented in Figures 2 through 5. A geologic cross-section showing subsurface soil conditions in a northwest-southeast direction through Building C is presented in Figure 6.

Site Hydrogeology

Ground water was encountered in all of the wells installed during this study and in all previous wells and soil borings. The shallow hydrostratigraphy under the site appears to be generally composed of the following three layers:

- an upper low permeability clay layer;
- a confined granular layer of moderate permeability; and
- a lower clay zone of low permeability.

The upper clay layer is above the present ground-water level, however, it is possible that during the winter months, or summer months in a normal rainfall year, the ground water could be in the upper clay. This clay, if saturated, would yield little water because of its fine-grained nature.

The ground-water level at the time of our measurements lies within the granular layers at depths of 10 to 12 feet below the present ground surface. The hydraulic gradient in this layer has a direction of about N10°W and a maximum magnitude of 0.003ft/ft (see Figure 7).

The lower clay zone appears to be a relatively low permeability clay. This dense, moderately plastic clay, where present, retards the vertical downward migration of dissolved fuel components. In several locations, this lower clay does not appear to occur within the depth of the wells.

4.0 HYDRAULIC TESTING

Hydraulic testing was performed by HMMP to evaluate the transmissivity and storativity of the shallow water-bearing zone. A pumping test and recovery measurements were used to evaluate the aquifer. The test results were analyzed by Levine·Fricke, and the resulting transmissivity and storativity appeared consistent with our understanding of the subsurface conditions. The

results of the analyses were incorporated into our evaluation of remediation alternatives, presented later in this report.

5.0 SOIL AND WATER QUALITY

Soil samples had been collected for chemical analyses and tested by the previous consultants. Tests were performed for soil borings SB-1 through SB-5 and monitoring wells MW-1 through MW-9. Ground-water samples were collected in the new Levine·Fricke wells LF-12 through LF-15 on August 31, 1988. Ground-water sampling protocol is detailed in Appendix B. Levine·Fricke samples were submitted to Brown and Caldwell Laboratories in Emeryville, California for analysis.

One ground-water sample from each of the Levine·Fricke wells was tested for total petroleum hydrocarbons (TPH) by EPA Method 8015. Tests for benzene, toluene, xylene and ethylbenzene (BTXE) were conducted using EPA Modified Method 602. The analytical results for ground-water samples collected on August 31, 1988 are summarized in Table 1. Laboratory certificates for these samples are included in Appendix B.

5.1 Monitoring Well Sampling and Results

Monitoring wells installed by Levine·Fricke during this assessment were sampled and analyzed. Product thickness on the ground water was measured in the Levine·Fricke wells and in the previously installed wells where free product was evident.

Product Thickness

Free diesel product was noted during the drilling and sampling process at well LF-12. No other Levine·Fricke well encountered free product. Well LF-12 was drilled on August 19, 1988 and developed and sampled on August 31, 1988. At that time, no floating product was observed, however droplets of product were noted in the Teflon bailer. On September 29, 1988, free product was observed in the well. The product thickness was 21-3/8 inches. (~2 ft)

Free product has been measured in the existing wells MW-3 and MW-8. The maximum thickness of product was recorded on August 11, 1986 by Blain Technical Services. The thickness in well MW-3 was 7-1/2 inches, and in well MW-8, 1/4-inch. On September 29, 1988, when the product thickness was checked by Levine·Fricke, MW-3 showed 1/3-inches of diesel product. Free product has not been observed by Levine·Fricke in well MW-8 or any of the remaining Levine·Fricke or previously drilled wells.

What about MW-2 ?

Using the available data, the estimated extent of floating diesel product on the ground water, where it is greater than 1/4-inch in thickness, is presented in Figure 8. This figure presents a reasonable boundary for the extent of floating product in the former tank area.

Ground-Water Quality

Water samples collected from wells LF-13 and LF-15, which bound the site to the east and west, indicate that ground water has not been affected by petroleum hydrocarbons. Wells LF-12 and LF-14 indicate that the ground water has been affected under Building C and slightly north of the building. Analytical test results showed that 60 ppm of total petroleums as diesel is dissolved in the ground water at well LF-12 and 3.9 ppm at well LF-14. Previous tests on ground-water samples taken by the previous consultants indicate that dissolved total petroleum products have been found in concentrations ranging from 750,000 ppm (free product) under Building C to "not detected" in some locations of the site. The general pattern of higher concentrations follows that of the location of the floating product. A plot of the highest recorded concentrations of petroleum hydrocarbons as diesel is presented in Figure 9.

Two analytical tests were performed by the previous consultants to measure total petroleum hydrocarbon concentrations as gasoline in wells MW-3 and MW-8. These tests yielded concentrations values of 7.4 and 0.37 ppm TPH as gasoline, results which are illustrated in Figure 10.

Ground-water samples taken from the Levine·Fricke wells were tested for the gasoline derivatives benzene, toluene, xylene, and ethylbenzene (BTXE). The analytical results show that no gasoline derivatives were detected at locations LF-13 through 15. Under Building C, in LF-12, a concentration of 0.037 ppm benzene in ground water was measured. No toluene, xylene or ethylbenzene was detected in any of the Levine·Fricke monitoring well water samples. Results from the previous consultants' work yield a maximum concentration of 2.2 ppm benzene, 1.8 ppm toluene, and 1.5 ppm xylene in well MW-3. The highest concentration of gasoline constituents appears to be in the general area of estimated floating product. Figure 11 shows the concentrations of BTXE in ground water.

Soil Analysis Results

Analyses of soil samples by the previous consultants indicate the presence of petroleum hydrocarbons in the soil beneath Building C and the central parking lot between Buildings A, B, and C. Soil samples were taken at 5-1/2 and 10-1/2 feet below the previous ground surface. Results of the analytical tests range from a low

of "not detected" in soils from wells MW-5, MW-7, and MW-9 to 2800 mg/kg diesel under Building C. Three concentrations exceed 1000 mg/kg. Two of the locations are under Building C and one is in the central parking lot. Figure 12 presents the test results and the corresponding sample depths and locations.

Soil samples taken from soil borings SB-1 through SB-5 and MW-1 were tested for benzene, toluene, and xylene (BTX) at depths of 5-1/2 and 10-1/2 feet. Generally the chemical test results were relatively low for BTX. The only slightly elevated concentration was 0.77 mg/kg of benzene taken at 10-1/2 feet in soil boring SB-1, which is in the former tank location (see Figure 13).

6.0 REMEDIAL ACTION EVALUATION

Under current California Regional Water Quality Control Board (RWQCB) guidelines, the presence of floating product on ground water requires remedial action to extract the free product. We recommend that a product and ground-water extraction system be installed at the site. The proposed system is described later in this report. Because of the presence of the Building C and the landscaped and paved parking areas at the site, two extraction configurations which would cause the least amount of disruption were considered. The alternatives selected were a french drain, to be located at the southern end of the Building C depressed loading dock, and a well, to be located within the footprint of Building C.

6.1 Objective and Approach

Design of a product/ground-water extraction and treatment system requires the prediction of water elevations over time, given a particular pumping scheme and the existing hydrogeologic constraints. Numerical analysis methods were utilized to predict the response of the hydrogeologic system to extraction conditions and to evaluate the effectiveness of the two selected remedial action alternatives.

Floating diesel product has been found on the ground water over a portion of the site. In order to recover this floating product, ground-water extraction is recommended. Ground-water extraction is intended to lower the ground-water level, creating an area-of-capture to induce free product flow towards the pumps where the diesel can be removed.

6.2 Ground-Water Model

The USGS Modular Three-Dimensional Finite-Difference Ground-Water Flow Model (MODFLOW) was used to simulate ground-water flow beneath the site. Ground-water computer modeling consisted of the following steps:

- o conceptualization of the hydrogeologic flow system;
- o definition of the initial conditions and boundary conditions for the hydrogeologic system;
- o the assigning of hydrogeologic properties to the region simulated;
- o design of a finite-difference grid system;
- o calibration of the computer model against field date; and
- o the performing of two model simulations under different extraction system design scenarios to evaluate the area-of-capture and effectiveness of the extraction system considered.

Conceptualization of the Hydrogeologic Flow System

The first step in constructing a computer model is to conceptualize the hydrogeologic system, based on site-specific and regional geologic and hydrogeologic data. Local geology indicates the ground-water level is located in a granular material. The thickness of the water-bearing strata was estimated to be between 2 and 12 feet. The ground-water elevation contour map indicates that the ground-water flow direction is from the southeast to the northwest (see Figure 7). A more detailed description of the hydrogeologic flow regime may be found in a previous section of this report.

Initial Boundary Conditions

Ground-water elevations on September 29, 1988 were used as initial water-level conditions. The boundary condition used in the simulations was the General Head Boundary Condition, which assumes a constant head outside the modeled area.

Using this boundary condition, ground water enters the model domain at a rate that is a function of the permeability of the sediments at the boundary, the area of the flow, and the hydraulic gradient across the boundary.

Hydrogeologic Properties

The hydrogeologic properties used in the model consisted of the following data:

- o transmissivity values; and
- o hydraulic head measurements;

Transmissivity values for the shallow sediments were obtained from the hydraulic testing results. These data indicate the value is approximately 272 square feet/day.

Ground-water elevations measured on September 29, 1988 were used as input data for hydraulic head values.

Finite-Difference Grid

The model domain was subdivided into fixed grid sizes of 40 by 40 feet. The grid system consists of 8 rows and 14 columns. By definition, the model nodes are located at the centers of the cells.

Model Calibration

Calibration of the model against the measured ground-water level was performed by adjusting hydraulic conductivity of the sediments and boundary fluxes. Calibration runs indicate that a transmissivity of 250 square feet/day everywhere in the model domain yields a better match between the simulated and measured ground-water elevations.

In model calibration, surface-water recharge was assumed to be negligible, since much of the site is paved or covered by buildings.

Extraction Well Modeling

The effectiveness of an extraction system consisting of a pumping well was evaluated for ground-water clean-up purposes. Given the moderate transmissivity of the shallow saturated sediments underlying and downgradient of the former buried tanks, it was determined that pumping 2.0 gpm from LF-12 could result in a sizeable capture zone for contaminant removal and aquifer remediation.

The predicted ground-water level elevation contour map resulting from extraction from well LF-12 at the specified rate is provided in Figure 14.

7.0 RECOMMENDATIONS

Considering the location of the former tanks, the thickness of product under Building C, the hydraulic characteristics of the soils, the site conditions, and the results of the extraction modelling, we recommend the alternative of the single well located within Building C. We consider this to be the most appropriate product and ground-water extraction method for the site.

The well should be installed as close to LF-12 as practicable. The well should be 6 inches in diameter, installed in a 12-inch-diameter drilled hole. The well should extend to a depth of 17 feet below the top-of-slab and standard well installation procedures should be followed. A schematic of the product/ground-water extraction system will be provided in a separate letter report for the next phase of work.

The proposed system will consist of two separate pumps. The upper pump will be a product-only pump, and the lower pump will pump ground water. The lower pump should lower the areal ground-water level and keep the product at the level of the upper pump. We recommend that the ground water be treated, if necessary, and then discharged to the sewer. The proper analytical testing will be performed and a permit to discharge will have to be approved by the City of San Leandro before any extraction water can be discharged to the sewer.

Diesel collected from the water surface will be stored in 55-gallon drums for disposal. The total volume of product and ground water extracted will be recorded and evaluated along with other pertinent data, including product thickness and water-level measurements.

Ground-water levels will be measured in the existing wells at the site during operation of the extraction system. These measurements will be used to assess the impact of the well on the water level and product thickness. Water levels will be measured daily and the pump locations and controls adjusted as necessary during the first week of operation, and then weekly until steady-state conditions are achieved. After steady-state has been achieved, monthly monitoring is recommended.

Once the floating product is extracted, the extraction system can be shut down and the conditions re-evaluated to assess whether further remediation will be required.

Table 1
Ground-Water Levels

Well	Top of Casing Elevation (ft.)	Depth to Water (ft.)	Water Level Elevation (ft., MSL Datum)	
Water-Level Measurements on August 31, 1988				
LF-12	14.89	11.79	3.10	(1/2-1nches free product)
LF-13	14.58	11.45	3.13	
LF-14	10.76	7.74	3.02	
LF-15	11.20	8.19	3.01	
MW-3	12.18	9.49	2.69	(1/4-inches free product)
MW-8	12.83	9.58	3.25	
MW-10	14.22	11.00	3.22	
Water-Level Measurements on September 29, 1988				
LF-12	14.89	11.95	2.94	(21-3/8-inches free product)
LF-13	14.58	11.48	3.10	
LF-14	10.76	7.76	3.00	
LF-15	11.20	8.28	2.92	
MW-3	12.18	9.11	3.07	(1/3-inches free product)
MW-8	12.83	9.60	3.23	
MW-10	14.22	11.02	3.20	
MW-11	11.20	8.18	3.02	

Table 2
Water-Quality Analysis Results (ppm)
Sampled August 31, 1988

Well	Benzene[2]	Toluene	Ethyl-Benzene	Xylenes	TPH[1] (as diesel)
LF-12	0.037	ND	ND	ND	60
LF-13	ND	ND	ND	ND	ND
LF-14	ND	ND	ND	ND	3.9
LF-15	ND	ND	ND	ND	ND

Notes: 1. Detection limits for TPH as diesel= 1.0 ppm

2. Detection limits for benzene, toluene, ethylbenzene, and xylenes 0.0005 ppm

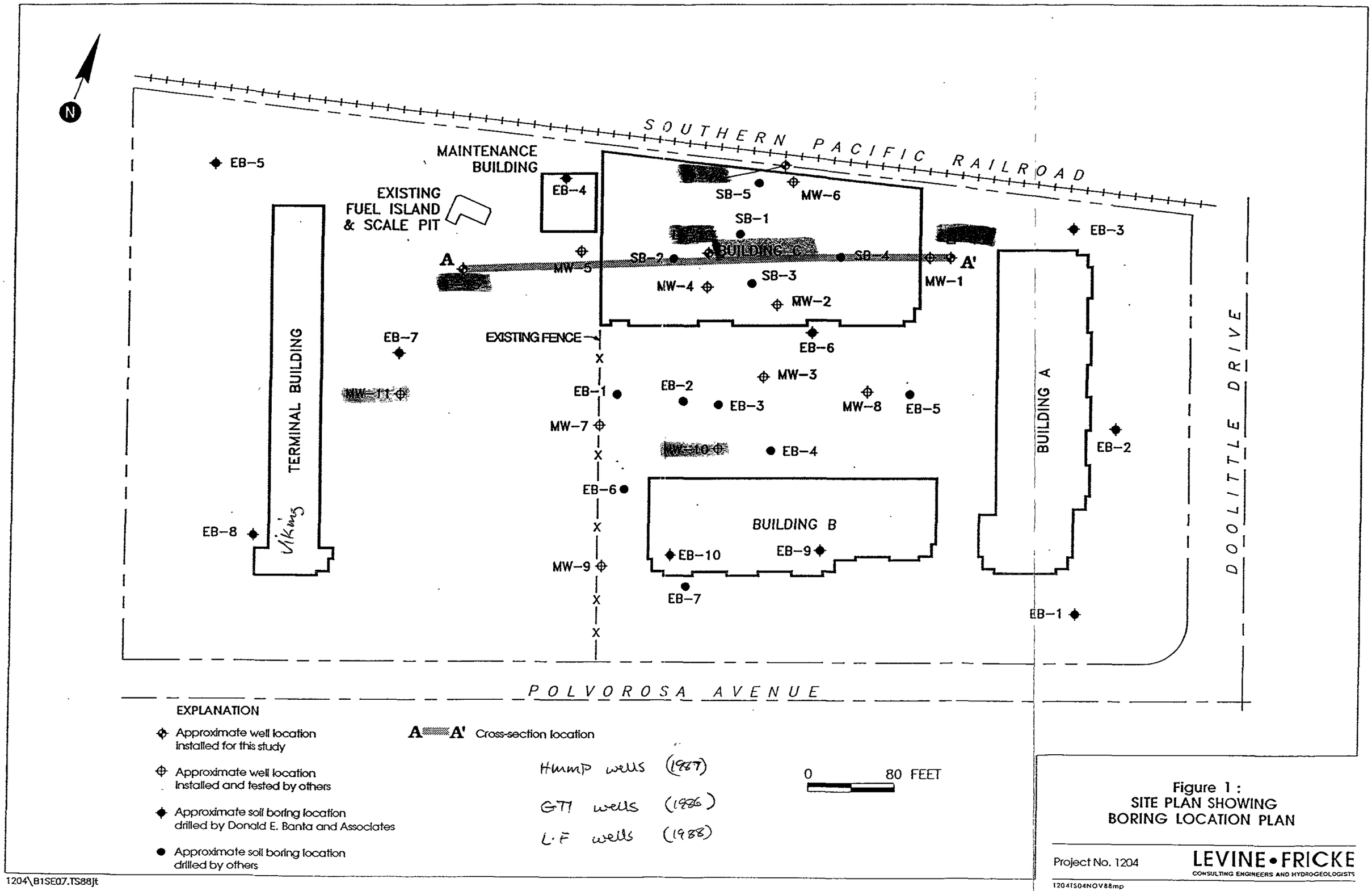


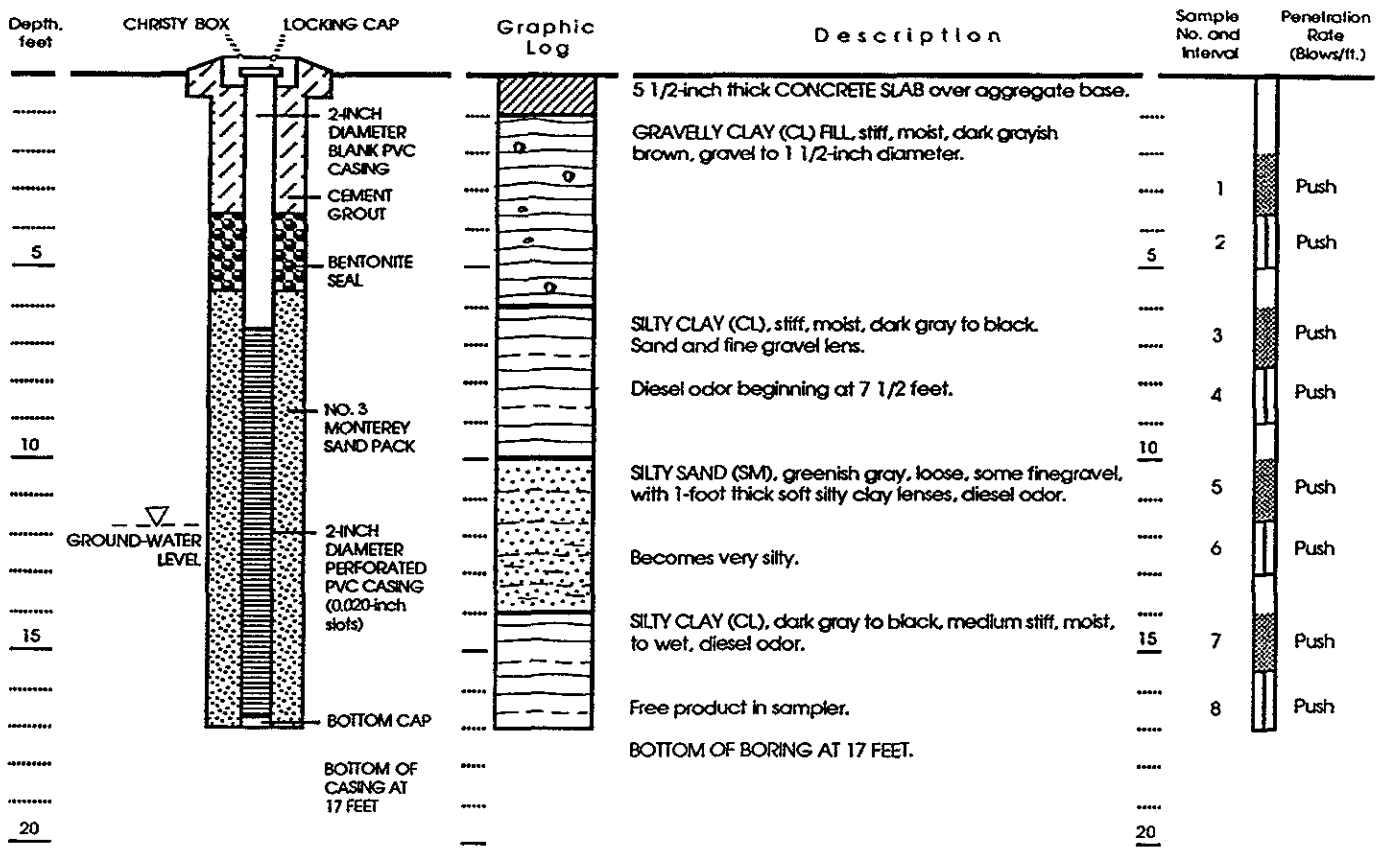
Figure 1 :
SITE PLAN SHOWING
BORING LOCATION PLAN

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204\B1SE07.TS88jt

1204TS04NOV88mp



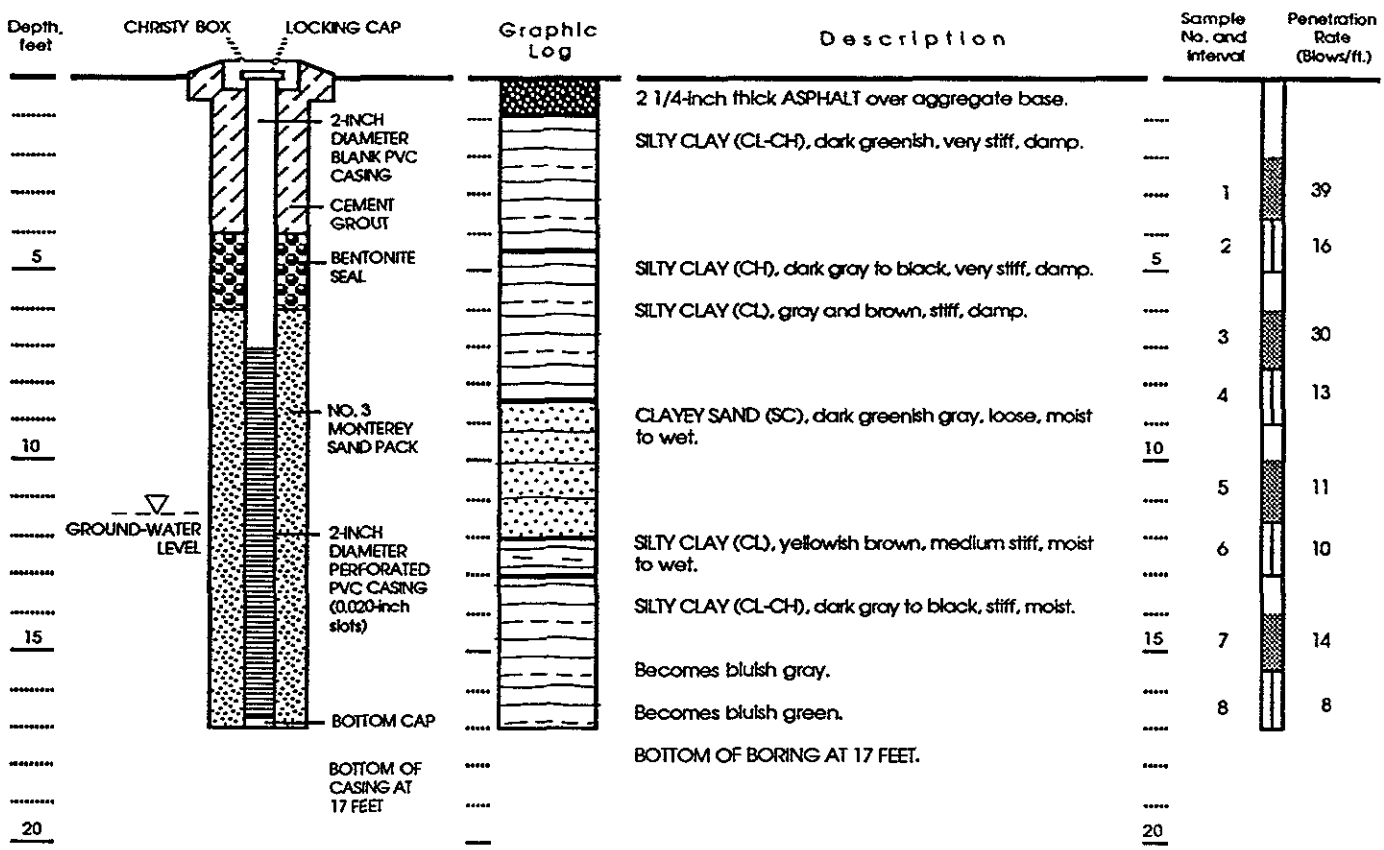
Well Permit No.	88400
Date well drilled:	19 August 1988
Date water level measured:	31 August 1988
Well elevation:	15.6 feet
LF Engineer:	Ted Splitter

EXPLANATION

- Clay
- Silt
- Sand or Sandstone
- Gravel
- 2" Modified California Sampler
- Split Spoon Sampler

Approved by:

Figure 2 : WELL CONSTRUCTION AND LITHOLOGY FOR WELL LF-12



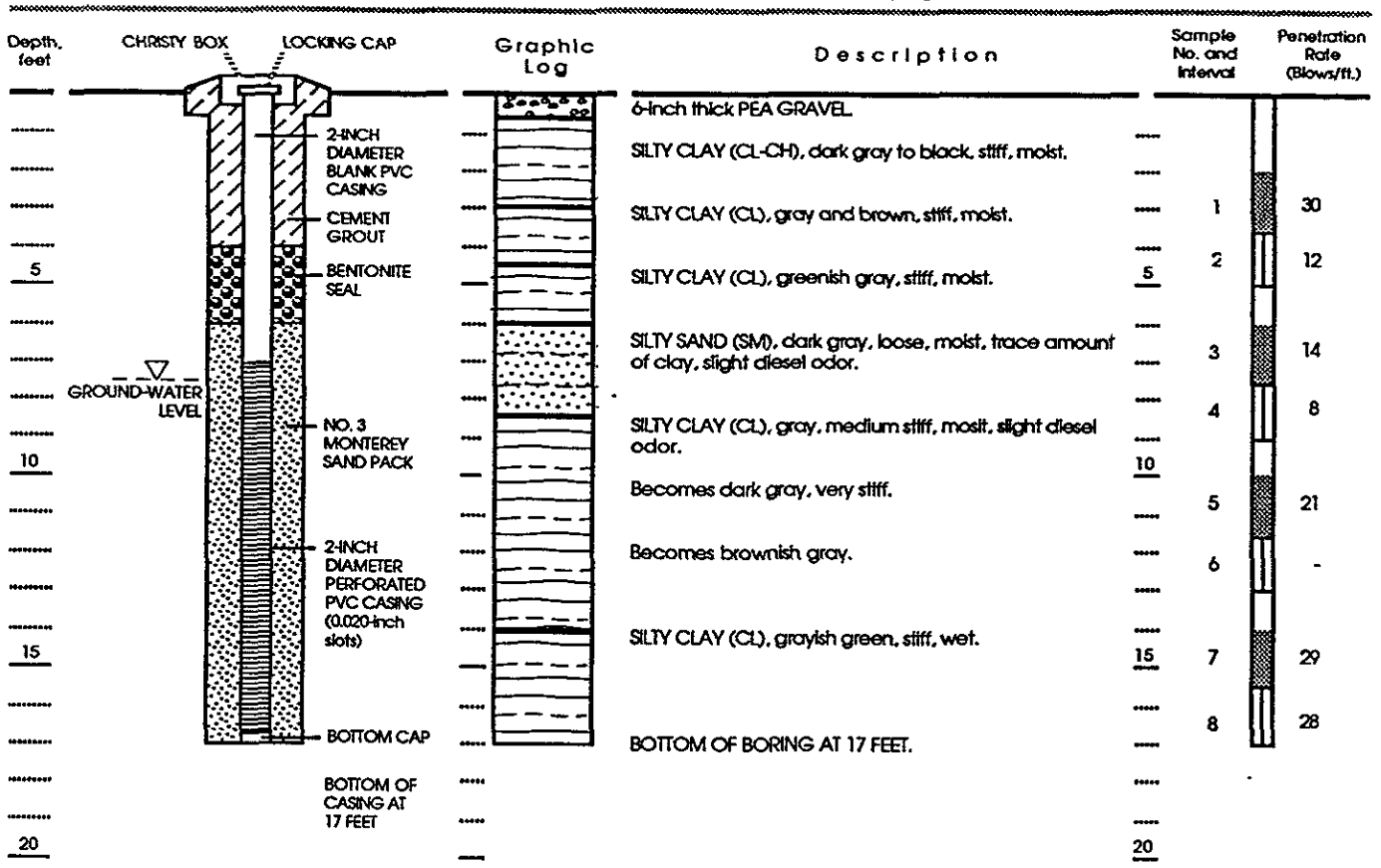
Well Permit No.	88400
Date well drilled:	22 August 1988
Date water level measured:	31 August 1988
Well elevation:	14.9 feet
LF Engineer:	Ted Splitter

EXPLANATION

- Clay
- Silt
- Sand or Sandstone
- 2" Modified California Sampler
- Split Spoon Sampler

Approved by:

Figure 3 : WELL CONSTRUCTION AND LITHOLOGY FOR WELL LF-13



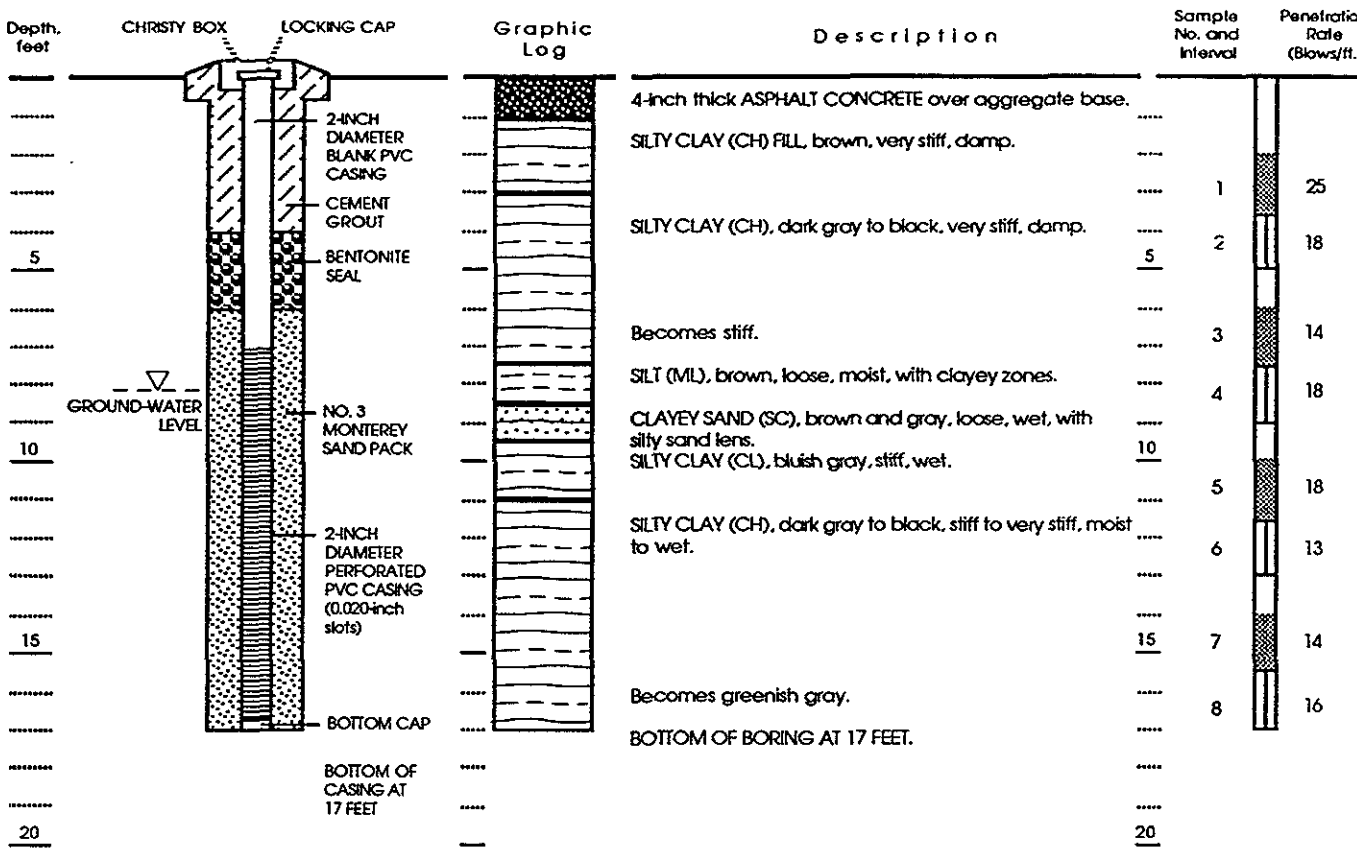
Well Permit No.	88400
Date well drilled:	22 August 1988
Date water level measured:	31 August 1988
Well elevation:	11.5 feet
LF Engineer:	Ted Splitter

EXPLANATION

- Clay
- Silt
- Sand or Sandstone
- Gravel
- 2" Modified California Sampler
- Split Spoon Sampler

Approved by:

Figure 4 : WELL CONSTRUCTION AND LITHOLOGY FOR WELL LF-14



Well Permit No.	88400
Date well drilled:	22 August 1988
Date water level measured:	31 August 1988
Well elevation:	11.7 feet
LF Engineer:	Ted Splitter

EXPLANATION

- Clay
- Silt
- Sand or Sandstone
- 2" Modified California Sampler
- Split Spoon Sampler

Approved by:

Figure 5 : WELL CONSTRUCTION AND LITHOLOGY FOR WELL LF-15

116438

ELEVATION
(feet, msl)

40
30
20
10
0
-10

A
(Southwest)

A'
(Northeast)

Existing Building C

Ground Surface

LF-15
Silty Clay
Silt
Clayey Sand
Silty Clay

MW-5
Sand and Gravel Fill
Organic Clay
Gravelly Sand
Silty Sand
Silty Clay

LF-12
Gravelly Clay Fill
Silty Clay
Silty Sand
Silty Clay
?

MW-2
Silty Clay
Silty Sand
?

LF-13
Silty Clay
Clayey Sand
Silty Clay

10
0
Scale in Feet
0
40

EXPLANATION

Clay
Silt
Sand
Gravel
Perforated Interval
Ground-water level

LF-12 Well logged and constructed by Levine•Fricke, 21& 22 August 1988

MW-2 Well logged and constructed by Groundwater Technology, Inc., 13-27 October 1986.

Figure 6 :

SOUTHWEST - NORTHEAST
GEOLOGIC CROSS SECTION A-A'

Project No. 1204

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204152NOV88am

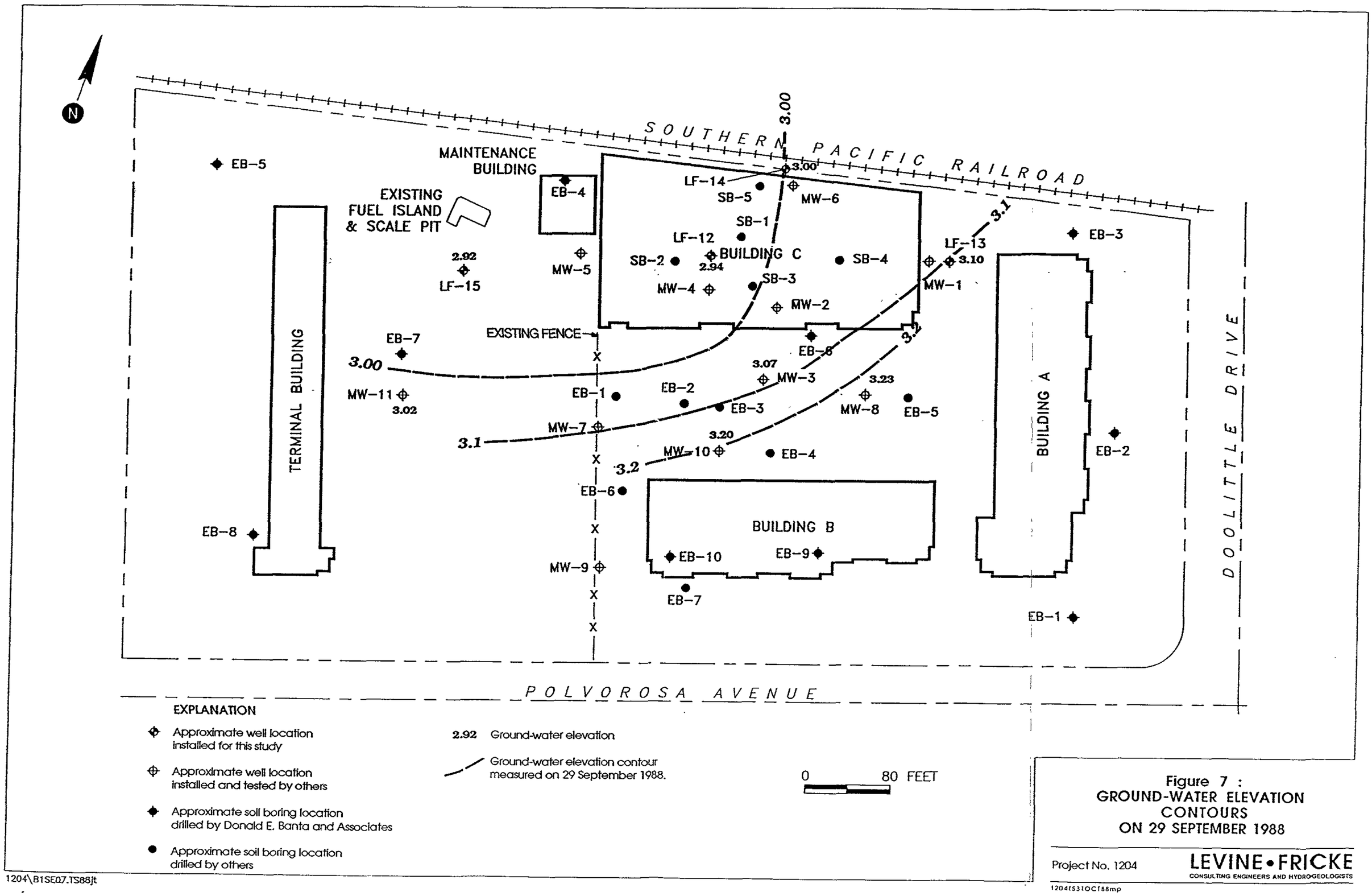


Figure 7 :
GROUND-WATER ELEVATION CONTOURS
ON 29 SEPTEMBER 1988

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204\B1SE07.TS88jt

1204fS31OCT88mp

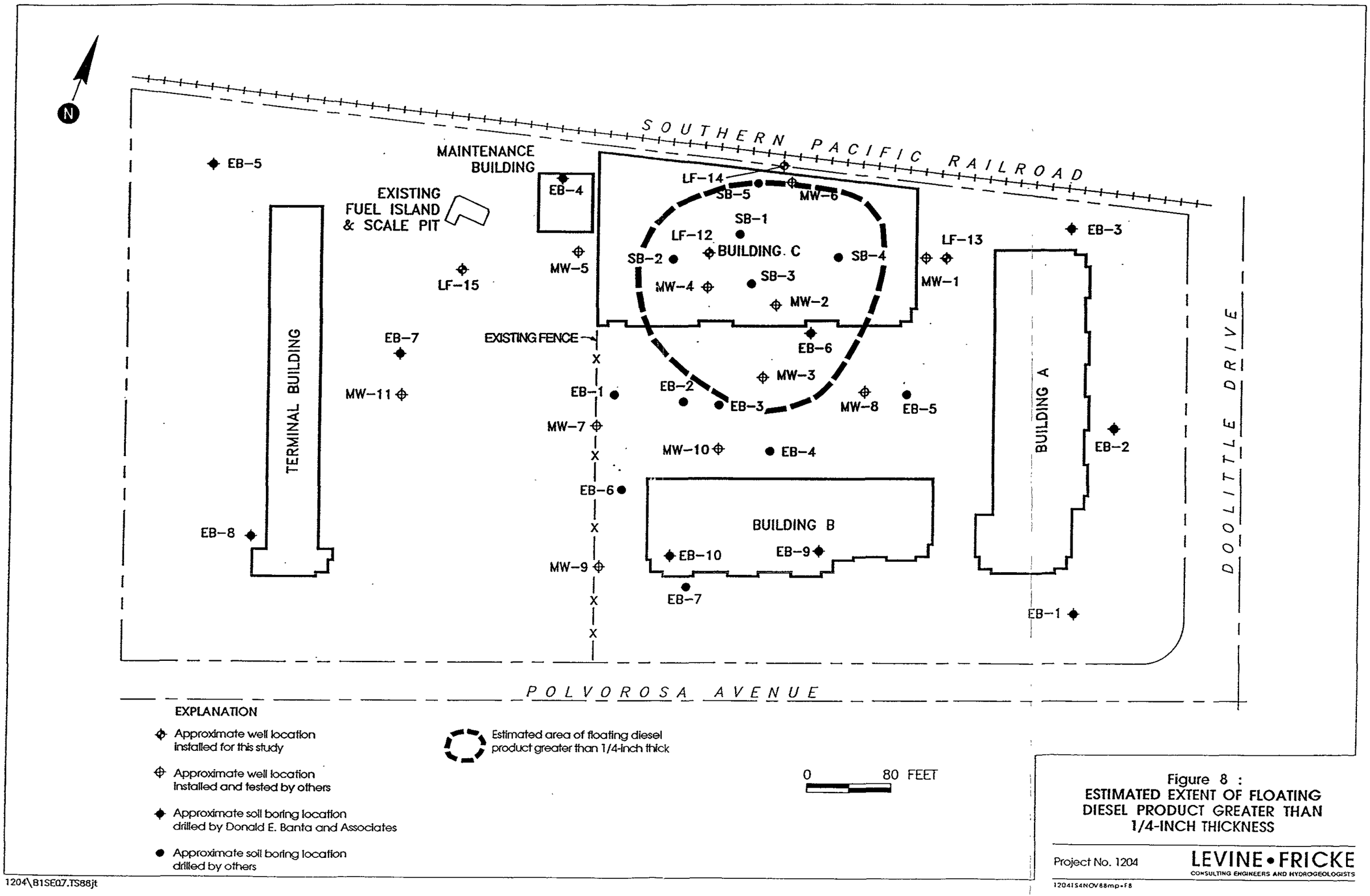


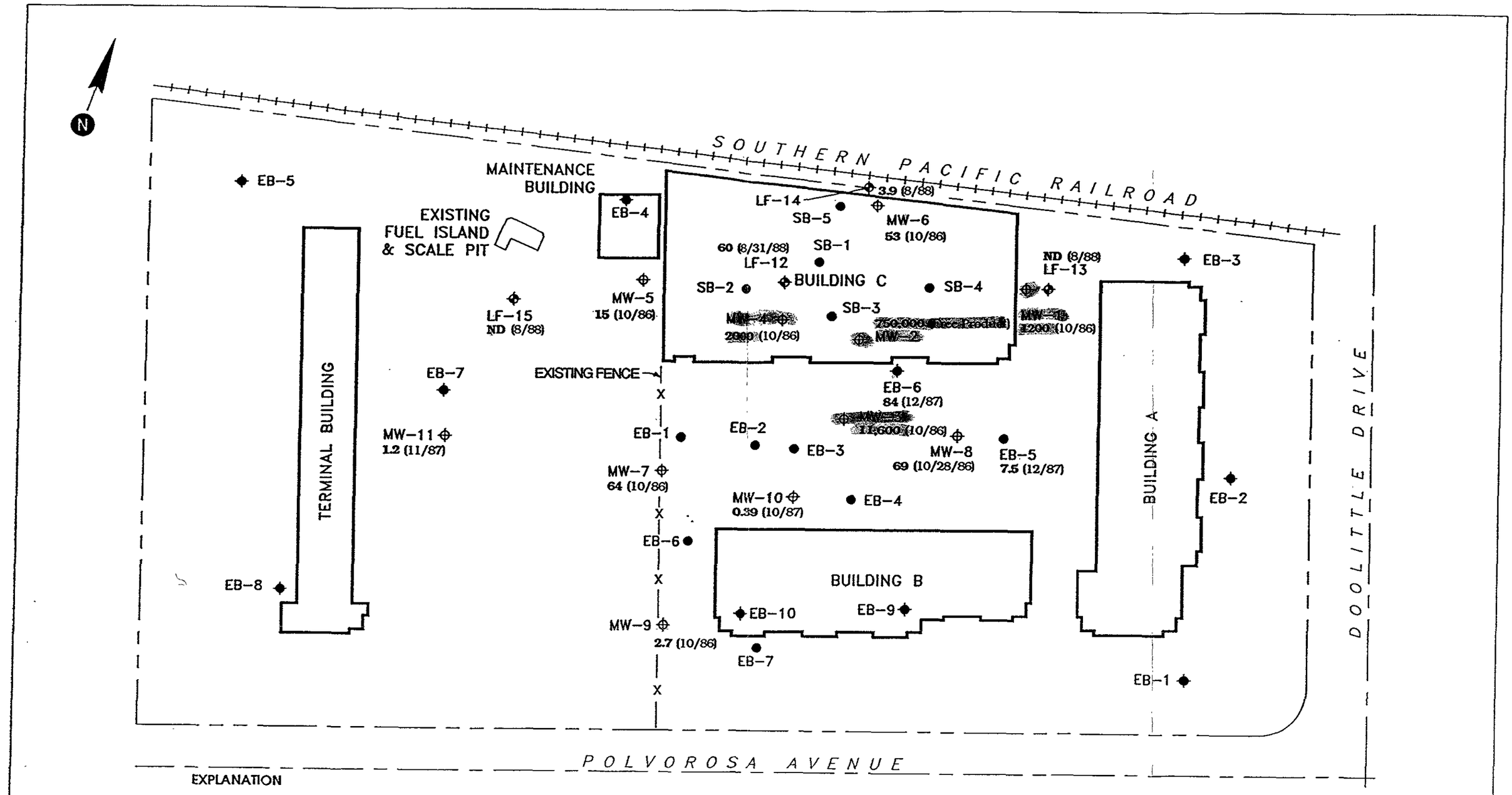
Figure 8 :
ESTIMATED EXTENT OF FLOATING DIESEL PRODUCT GREATER THAN 1/4-INCH THICKNESS

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204\B1SE07.TS88jt

1204IS4NOV88mp-F8



EXPLANATION

- Approximate well location installed for this study
- Approximate well location installed and tested by others
- Approximate soil boring location drilled by Donald E. Banta and Associates
- Approximate soil boring location drilled by others

15 (10/86) TPH concentration, [redacted] in ground water; date shown in parentheses

ND Not detected

0 80 FEET

Figure 9 :
HIGHEST RECORDED CONCENTRATIONS OF TOTAL PETROLEUM HYDROCARBON AS DIESEL IN GROUND WATER

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204\B1SE07.TS88jt

1204fs31OCT88mp

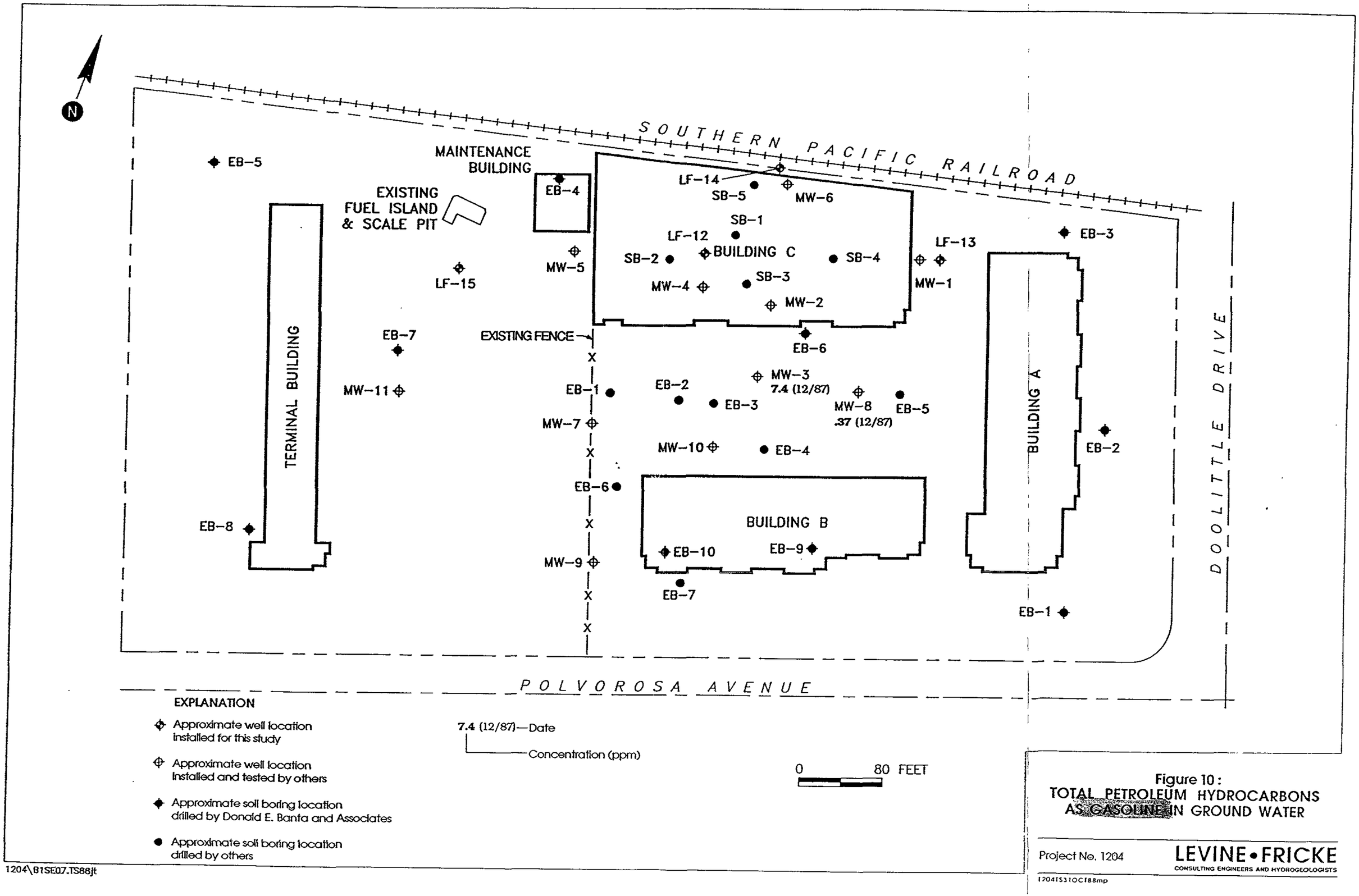


Figure 10:
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE IN GROUND WATER

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204TS31OCT88mp

1204\B1SE07.TS88jt

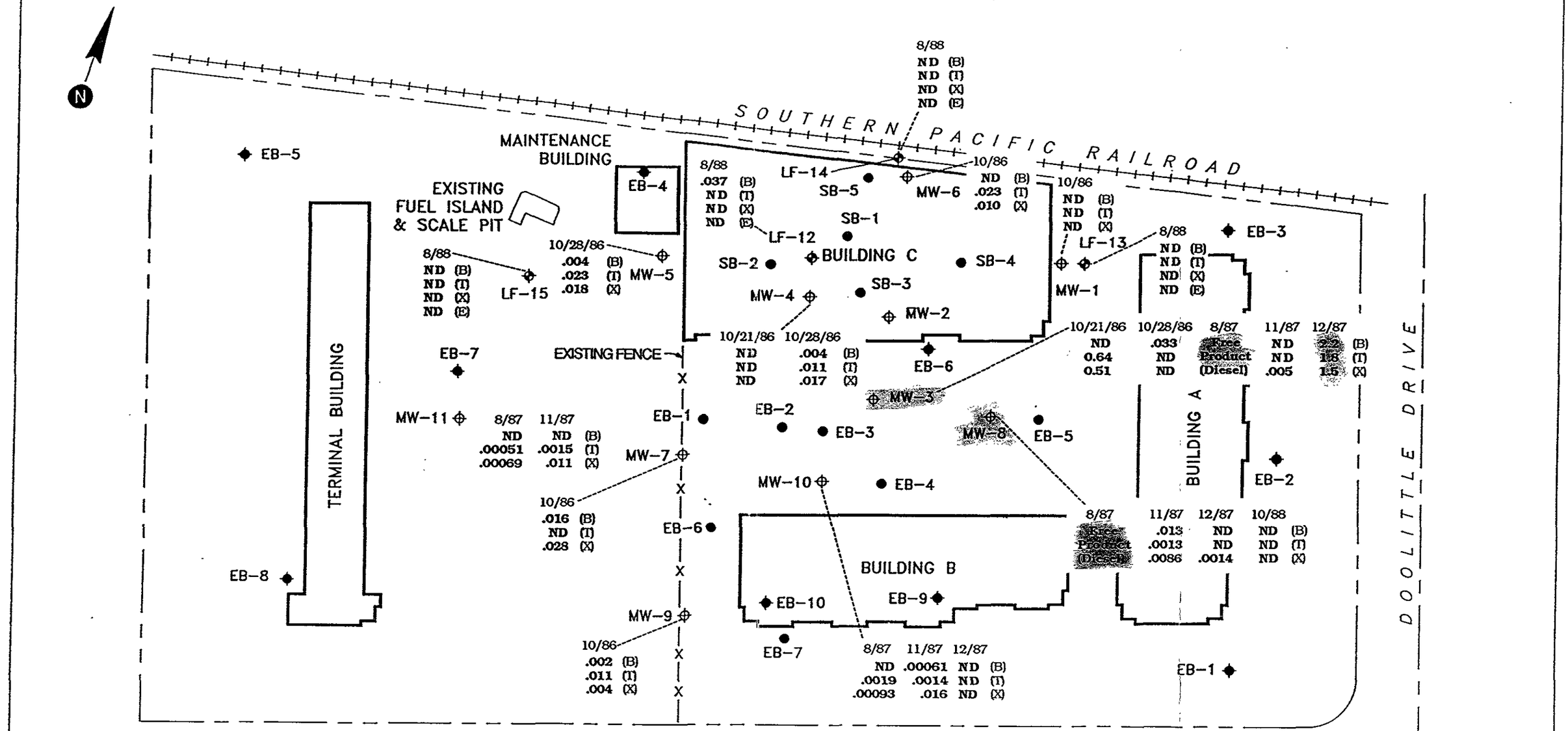


Figure 11 :
CONCENTRATIONS OF BTX AND E
IN GROUND WATER

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204\B1SE07.TS88jt

1204TS31OCT88mp

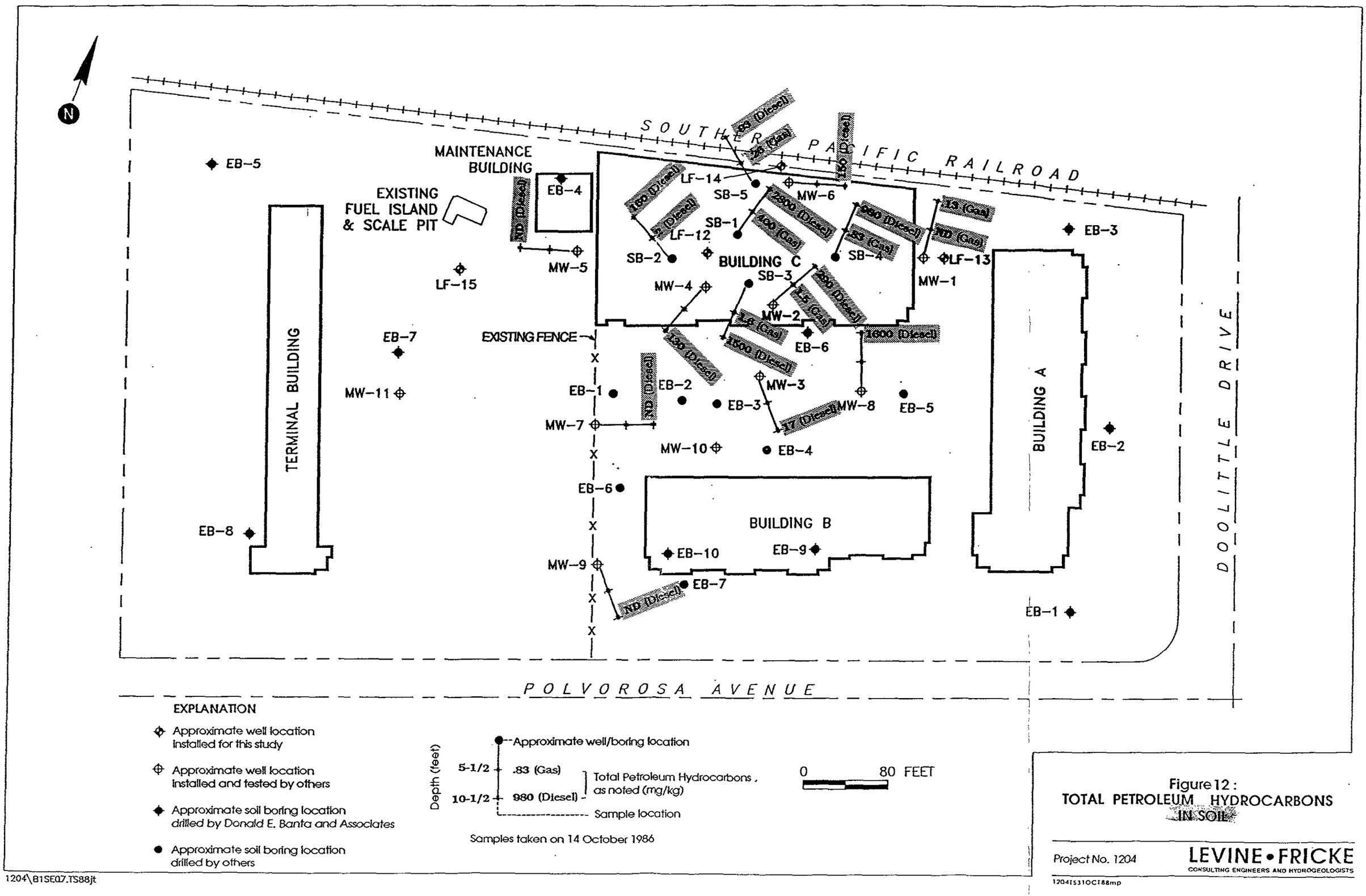


Figure 12 :
TOTAL PETROLEUM HYDROCARBONS IN SOIL

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204\B1SE07.TS88jt

1204TS31OCT88mp

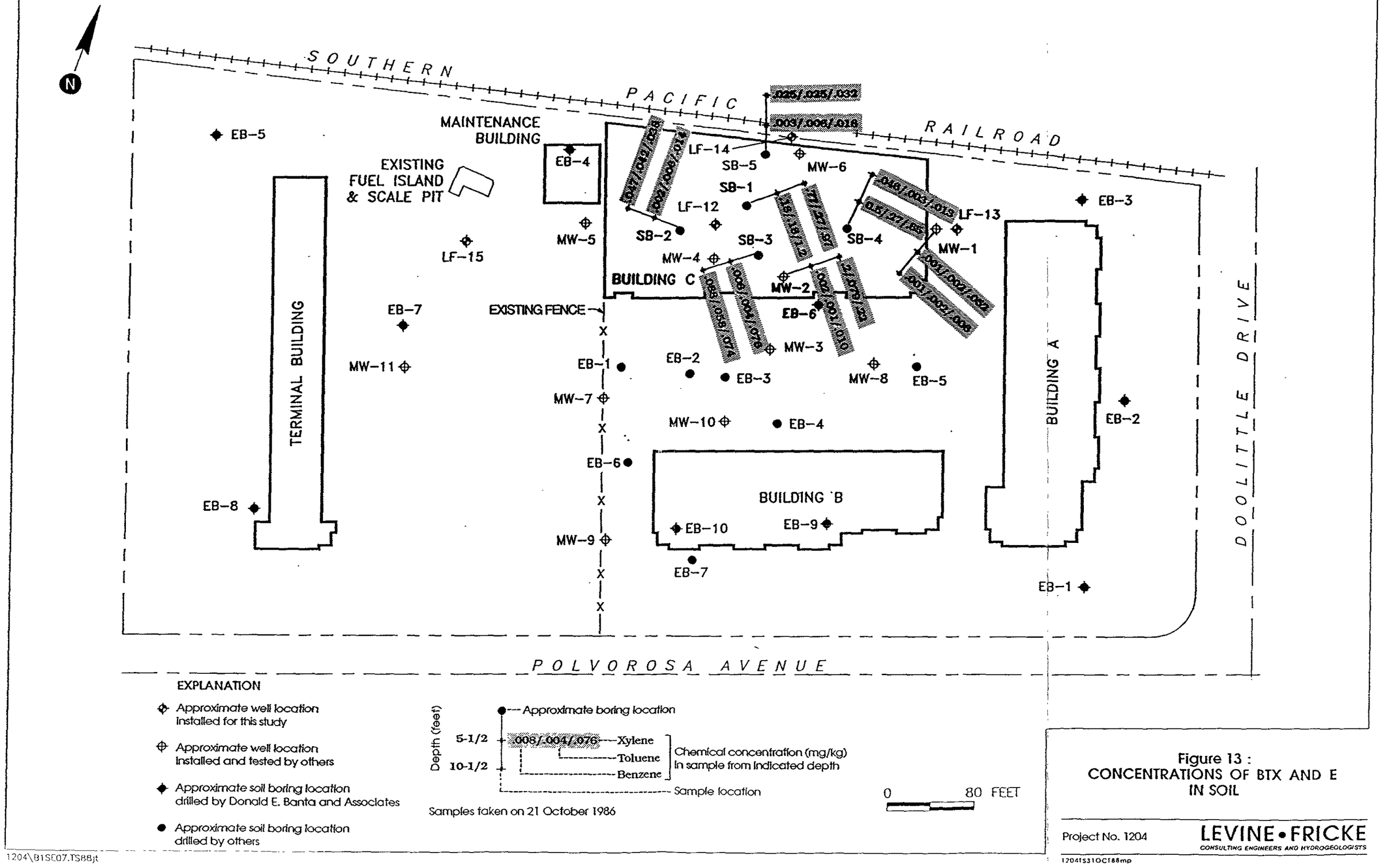


Figure 13 :
CONCENTRATIONS OF BTX AND E IN SOIL

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204\B1SE07.TS88jt

1204S31OCT88mp

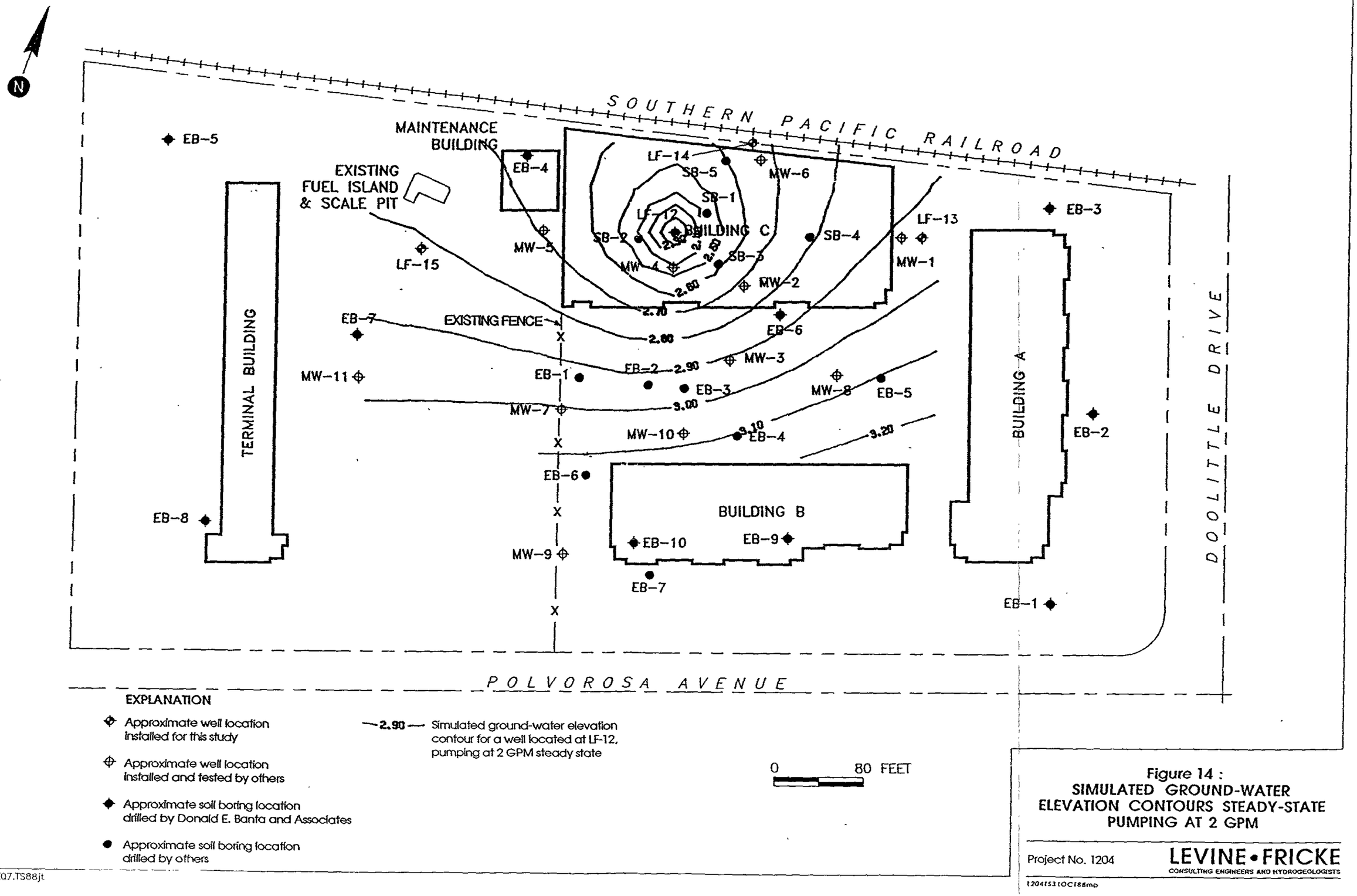


Figure 14 :
SIMULATED GROUND-WATER ELEVATION CONTOURS STEADY-STATE PUMPING AT 2 GPM

Project No. 1204

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1204\B1SE07.TS88jt

1204153 10C188mp

APPENDIX A:

DESCRIPTION OF FIELD ACTIVITIES

APPENDIX A

DESCRIPTION OF FIELD ACTIVITIES

WELL DRILLING AND CONSTRUCTION

Four wells were installed at the Polvorosa Business Park site in San Leandro, California on August 19 and 22, 1988. The wells were installed using hollow stem augers by Datum Exploration Company of Pittsburg, California. Field activities were performed under the supervision of Mr. Ted Splitter, a Senior Geotechnical Engineer with Levine·Fricke.

The hollow stem auger method uses 8-inch outside diameter (O.D.) and 4-inch inside diameter (I.D.) augers. Cuttings are returned to the ground surface as the augers are turned into the ground. Soil samples are recovered by lowering the sampler to the bottom of the borehole through the hollow portion of the auger and pushing or driving the sampler into the soil. Samples were obtained in well LF-12 by pushing the sampler, since the low ceiling height would not allow the drill rig's mast to be raised and therefore the hammer could not be used. Samples taken from wells LF-13 through LF-15 were obtained by driving the sampler into the soil with a 140-pound hammer falling 30-inches. The hole was advanced by driving a 2-inch I.D. Modified California Sampler 18 inches. The sampler was withdrawn; then a Standard Split Spoon Sampler was lowered to the tip of the previous sample and driven 18 inches. The augers were then advanced 4 feet and the process repeated.

The wells were constructed by installing 2-inch-diameter, Schedule-40, PVC casing. The casing is perforated with 0.02-inch machine-slots. After the casing was lowered to the bottom of the hole, the annulus between the casing and the sides of the hole was filled with #3 Monterey sand. The sand was brought up to approximately 1 foot above the slots. Approximately 1 to 1-1/2 feet of bentonite pellets was placed over the sand to seal the well from surface-water infiltration. The remaining hole was filled with cement and bentonite grout to the bottom of the Christy box.

All drilling equipment was steam-cleaned before use in each boring. The well casings and caps were also steam-cleaned prior to installation. Each well was fitted with a locking cap and has protected from damage by a concrete Christy box with a steel cover. Locks were placed on the wells to prevent vandalism.

WATER-QUALITY SAMPLING

One round of water samples was collected from the newly installed Levine·Fricke wells on August 31, 1988. Prior to sampling, the wells were developed by purging approximately 6 to 18 well volumes by hand using with a Teflon bailer, or by pumping with a centrifugal pump. All purging equipment was steam-cleaned prior to each use. Specific conductance, PH, temperature and water clarity were measured periodically during the purging process to help assess when a sufficient quantity of water had been removed to obtain a representative sample of the formation water.

Water samples collected from each well were placed using a clean Teflon bailer in laboratory-supplied 40-ml VOA vials containing Teflon septa. The VOA vials were filled to overflowing and gently capped and checked for trapped gas by inverting and tapping the vial. If a gas bubble was found, the bottle was topped off again with the water from the bailer. This process would continue until no gas bubbles were found. The completed samples were labeled and placed in a chilled cooler for transport to Brown and Caldwell's laboratory in Emeryville by Levine·Fricke personnel.

Prior to each use, the Teflon bailer was washed with Alconox (a laboratory-grade detergent) and steam-cleaned.

LABORATORY ANALYTICAL METHODS

All ground-water samples collected from the Levine·Fricke installed wells were analyzed for total petroleum hydrocarbons (TPH) using EPA Method 8015. The samples were also analyzed for benzene, toluene, ethylbenzene, and xylene using Modified EPA Method 602.

WATER-LEVEL MEASUREMENTS

Water-level measurements were taken on August 31, 1988 prior to developing the Levine·Fricke wells. Water-level measurements were taken again on September 29, 1988. Measurements during the first sampling event were taken using an electric water-level probe graduated in 5-foot increments. An engineer's tape graduated in 0.01-foot increments was used to determine the measurements between the 5-foot increments. The second round of measurements was made using an electric measuring device capable of detecting the thickness of floating product and the surface of the ground water. Where floating product was detected, the thickness was checked using a clear Teflon bailer.

Well elevations were surveyed by Ted Splitter and Craig Benson, Staff Geologist, of Levine·Fricke. Wells were surveyed to the nearest 0.01 foot and were tied into the rim of the manhole in Polvorosa Avenue opposite the site.

Water-level measurements and survey elevations were taken for the Levine·Fricke wells and the previously existing wells installed by other contractors.

APPENDIX B:

LABORATORY CERTIFICATES

TS

BROWN AND CALDWELL LABORATORIES
1256 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-08-728

Received: 01 SEP 88
Reported: 16 SEP 88

Dr. Akali Igbene
Levine - Fricke
1900 Powell Street 12th Floor
Emeryville, California 94608
CC: Ted Splitter

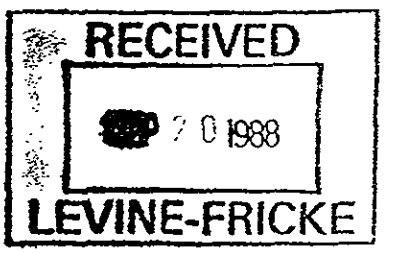
Project: 1204

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
08-728-1	LF12	31 AUG 88
08-728-2	LF13	31 AUG 88
08-728-3	LF14	31 AUG 88
08-728-4	LF15	31 AUG 88

PARAMETER	08-728-1	08-728-2	08-728-3	08-728-4
	LF12	13	14	15
Total Fuel Hydrocarbons				
Date Analyzed	09.08.88	09.08.88	09.08.88	09.08.88
Fuel Characterization, mg/L	DIESEL	---	DIESEL	---
Total Fuel Hydrocarbons, mg/L	60	<1.0	3.9	<1.0
EPA Method 602				
Date Extracted	09.10.88	09.09.88	09.12.88	09.09.88
1,2-Dichlorobenzene, ug/L	<1.0	<0.5	<0.5	<0.5
1,3-Dichlorobenzene, ug/L	<1.0	<0.5	<0.5	<0.5
1,4-Dichlorobenzene, ug/L	<1.0	<0.5	<0.5	<0.5
Benzene, ug/L	37	<0.5	<0.5	<0.5
Chlorobenzene, ug/L	<1.0	<0.5	<0.5	<0.5
Ethylbenzene, ug/L	<1.0	<0.5	<0.5	<0.5
Toluene, ug/L	<1.0	<0.5	<0.5	<0.5
Total Xylene Isomers, ug/L	<1.0	<0.5	<0.5	<0.5

S. D. Lessley
Sim D. Lessley, Ph.D., Laboratory Director



CHAIN OF CUSTODY / ANALYSES REQUEST FORM

8-278

Project No.: LF1204	Field Logbook No.:	Date: 8/31/88	Serial No.: Nº 3516
Project Name: Polvorosa	Project Location: San Leandro		
Sampler (Signature):			Samplers:

SAMPLE NO.	DATE	TIME	LAB SAMPLE NO.	NO. OF CONTAINERS	SAMPLE TYPE	EPA 601	EPA 624	EPA 8015 Diesel	BTXE		HOLD	RUSH	REMARKS
LF12	8/31			1	water								
LF12	8/31			1	D&L								
LF13	8/31			1									
LF13	8/31			1									Waiting for
LF14	8/31			1									Call in for
LF14	8/31			1									analysis.
LF15	8/31			1									BTX
LF15	8/31			1									60.2

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
	8/31/88	740			
RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
METHOD OF SHIPMENT:	DATE	TIME	LAB COMMENTS:		

SAMPLE COLLECTOR: (check one)

☐ LEVINE·FRICKE
629 Oakland Avenue
Oakland, CA 94611-4567
(415) 652-4500

☐ LEVINE·FRICKE
4019 Westerly Place, Suite 103
Newport Beach, CA 92660
(714) 955-1390

Analytical Laboratory:
Log # 8808728

Shipping Copy (White) Lab Copy (Green) File Copy (Yellow) Field Copy (Pink)

FORM NO. 86/COC/ARF