PRELIMINARY SITE CHARACTERIZATION FOR CARNATION OAKLAND DAIRY FACILITY LOCATED AT 1310 14TH STREET OAKLAND, CALIFORNIA ALAMEDA COUNTY

APRIL 3, 1989

AGE PROJECT No. 004-88-059

4-17-89

AGE 11330 SUNRISE PARK DR., SUITE C • RANCHO CORDOVA, CA 95742
P.O. BOX 161148 • SACRAMENTO, CA 95816 • PHONE (916) 631-0154 FAX (916) 631-0528

ANANIA GEOLOGIC ENGINEERING

PRELIMINARY SITE CHARACTERIZATION
FOR
THE CARNATION DAIRY FACILITY
LOCATED AT 1310 14TH STREET
OAKLAND, ALAMEDA COUNTY, CALIFORNIA

APRIL 3, 1989

ERRATA SHEET

On Plate 1, Plate 2 and Figure 5.3, 14th Street and 16th Streets are reversed. 16th Street should be the northern site boundary and 14th Street the southern site boundary.

AGE 11330 SUNRISE PARK DR., SUITE C • RANCHO CORDOVA, CA 95742
P.O. BOX 161148 • SACRAMENTO, CA 95816 • PHONE (916) 631-0154 FAX (916) 631-0528

PRELIMINARY SITE CHARACTERIZATION
FOR
THE CARNATION DAIRY FACILITY
LOCATED AT 1310 14TH STREET
OAKLAND, ALAMEDA COUNTY, CALIFORNIA
APRIL 3, 1989

TABLE OF CONTENTS

FIGURES

TABLES

PLATES (Located in pocket behind the text)

APPENDICES

PRELIMINARY SITE CHARACTERIZATION FOR THE CARNATION DAIRY FACILITY LOCATED AT 1310 14TH STREET OAKLAND, ALAMEDA COUNTY, CALIFORNIA

APRIL 3, 1989

AGE Project No. 004-88-059

1.0 EXECUTIVE SUMMARY

Carnation's Corporate Counsel, Mr. Howard R. Shmuckler, authorized Mr. Karl J. Anania, a California Registered Geologist, of Anania Geologic Engineering, to perform the site characterization to evaluate the lateral and vertical extent of subsurface fuel contamination on the Oakland Dairy Facility. Gasoline and diesel are present as free product in the soil and on the groundwater. The San Francisco Bay Regional Water Quality Control Board designated the Alameda County Health Hazardous Materials Department as the lead regulatory agency.

This report addresses the preliminary site characterization of the Carnation Dairy Facility located at 1310 14th Street in Oakland, California. Free product was discovered in the tank excavations of the four underground fuel tanks and one waste oil tank which were removed in January 1989. A work plan to conduct the site characterization was approved by Alameda County in mid-March 1989. The work plan was implemented in March and the preliminary site characterization field work was completed at the end of the month.

A total of 16 monitoring wells were installed. The wells and recovery probes that did not have evidence of free product on them were developed. Soil and groundwater samples were collected and analyzed for fuel constituents including lead. Selected samples were analyzed for semi-volatile and volatile organic compounds. The analytical results are summarized in Tables 7.1, 7.2 and 7.3.

Water elevation measurements were conducted in wells free of floating product and a preliminary groundwater gradient was calculated. Groundwater elevations and the direction of groundwater flow are shown on Figure 5.3. These results are based on one set of measurements and the potential for fluctuating water levels and tidal influences has not been evaluated.

The results of the preliminary site characterization indicate that a significant fuel contamination problem exists on-site at the Facility. Approximately 18,000 gallons of diesel type product and approximately 300,000 gallons of gasoline type product were estimated to occur beneath the property in the soil and on the groundwater. These estimates are based upon apparent product thicknesses and actual values may be considerably lower. A conservative estimate of 6,000 gallons of diesel type fuel and 100,000 gallons of gasoline is proposed. The product plumes are shown on Plate 2. The gasoline plume appears to be moving in the direction of groundwater flow, north to the property boundary. The property boundary was not investigated due to access limitations. The potenial for off-site migration was not part of the scope of work for this preliminary site characterization. *

The potential impact on groundwater was investigated with one round of groundwater sampling. Those preliminary results indicate that, for the most part, impact on groundwater appears to be limited to the immediate vicinity of the free product plume.

Remedial action is underway at the Facility and additional remediation is planned to address the free floating product beneath the site. Remedial action is discussed in greater detail in Carnation's Oakland Dairy Facility, Remedial Action Plan.

2.0 INTRODUCTION

Mr. Howard R. Shmuckler, Carnation Corporate Counsel, authorized Mr. Karl J. Anania, California Registered Geologist No. 4306, of Anania Geologic Engineering (AGE) to perform a site characterization to evaluate the lateral and vertical extent of on-site contamination from the former fuel and waste oil tanks at the Carnation Dairy Facility (Facility) in Oakland. This report addresses the preliminary site characterization. The San Francisco Bay Regional Water Quality Control Board (Board) has designated the Alameda County Hazardous Materials Department (County), represented by Ms. Katherine Chesick, as the lead regulatory agency.

2.1 PURPOSE

The first phase of work performed in support of site characterization of the excavated fuel tanks area at the Carnation Dairy facility was completed as an initial investigation to meet the following objectives:

1) Investigate the lateral and vertical extent of on-site contamination from the former fuel and waste oil tanks in the soil and groundwater in the western portion of the Facility;

2) Measure the floating product thicknesess and attempt to define the lateral extent of the free product plume floating on the groundwater;

3) Gather data to characterize the lithology and stratigraphy in the uppermost aquifer in the western portion of the Facility;

4) Interpret the geohydrologic setting;

5) Determine the depth to groundwater and groundwater gradient at the site;

6) Evaluate the site and subsurface conditions with respect to the extent of contamination, soils, underground utilities, groundwater gradient and physical restrictions on-site; and

7) Recommend the next phase of work, including tasks required to determine the aquifer characteristics.

2.2 SCOPE OF WORK

The authorized and approved scope of services completed in this preliminary site characterization included the following tasks:

1) Locating underground utilities as completely as feasible;

2) Continuously sampling soil borings for subsurface stratigraphic information to a maximum depth of 50 feet with a hollow stem auger drill rig;

3) Collecting soil samples for chemical analyses in each boring at five foot intervals and changes in lithology using correct sampling protocol and Chain of Custody procedures;

4) Analyzing soil samples for total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylenes (BTEX), and total lead using EPA methods 8015 Modified, 8020, and 6010. Analyzing selected samples for oil and grease by method 503 D;

5) Constructing four-inch diameter monitoring wells in the stratigraphic borings with schedule 40 PVC screen and casing. Well screen size is 0.030 inch slot with #3 clean Monterey sand for the filter pack based on sieve analysis results from the formation material;

6) Advancing eight more borings outside the building to a maximum depth of 25 feet and converting them to four-inch diameter monitoring wells to evaluate lateral and vertical extent of contamination. Advancing six borings inside the building to a maximum depth of 25 feet and converting them to two-inch monitoring wells. Monitoring well locations are shown on Plate 1;

7) Developing wells that do not have floating product by blowing them out with nitrogen and/or bailing to remove the fines and set the filter pack after allowing the well seal to set for at least 24 to 48 hours;

8) Allowing monitoring wells to equilibrate for at least 48 hours prior to sampling;

9) Measuring groundwater levels in monitoring wells that do not have floating product;

10) Measuring the thickness of the floating product present in the wells with an electronic interface tape. In wells with very thin product thicknesses, the measurement was also made using a clear acrylic bailer;

11) Collecting the initial round of groundwater samples from each of the wells that did not have floating product using a teflon bailer. At least three well volumes of water were removed with a bailer prior to sampling. Temperature, pH and conductivity were monitored during purging. The samples were collected in appropriate containers provided by the analyzing laboratory following proper protocol and transported to the laboratory under Chain of Custody;

12) Analyzing the water samples for TPH, BTEX, and lead using EPA methods 8015 Modified, 8020, and 6010. Selected samples were analyzed for oil and grease by method 503 A;

13) Surveying the location and elevation of each of the monitoring wells to the nearest tenth of a foot for location and nearest hundredth of foot for elevation.

Elevations were measured with respect to mean sea level using an established City of Oakland benchmark;

14) Determining groundwater gradient based on the initial groundwater elevation measurements; and

15) Preparing a written report detailing the preliminary findings with respect to the site characterization including field procedures, monitoring well installation and construction, analytical results from soil and initial groundwater samples, and conclusions and recommendations for the next phase of work.

3.0 BACKGROUND

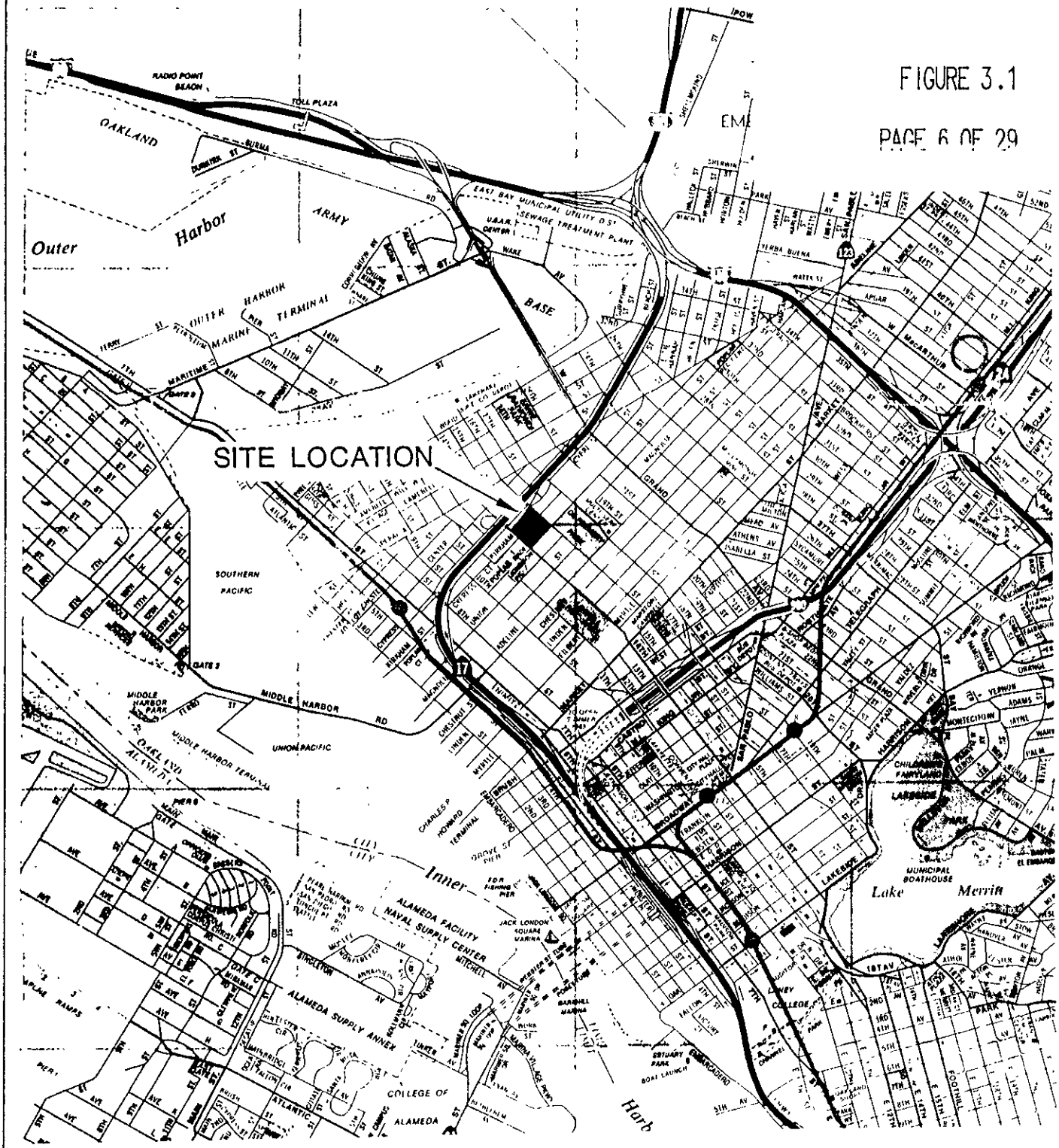
The Carnation Dairy Facility is located at 1310 14th Street in the City of Oakland. The facility covers two square city blocks and is shown on Figure 3.1.

3.1 FACILITY DESCRIPTION

The facility is an active ice cream and milk production plant with associated packaging, storage and distribution operations. Access within the Facility is often restricted due to the large volume of truck traffic. A large warehouse with several service bays occupies the northwest corner of the facility. The five underground storage tanks associated with this work plan were located south of the east wing of this building. Plate 1 shows the western half of the facility. The facility had seven underground fuel storage tanks. The scope of this report addresses the preliminary site characterization including assessment of the extent of on-site contamination from the four fuel tanks and one waste oil tank. The two boiler fuel tanks in the eastern part of the facility were not addressed in this phase of work. A separate work plan has been submitted to the County for that area.

3.2 FACILITY HISTORY

The Dairy Facility was originally owned by American Creamery and was constructed in 1915. Carnation purchased the facility in 1929. Several additions and improvements to the buildings were made between 1946 and 1973 to meet changing operational requirements. Carnation is currently negotiating the sale of the property and existing facilities with Foster Farms.



AGE
ANANIA GEOLOGIC ENGINEERING

TITLE: SITE LOCATION MAP					
PROJECT NAME: CARNATION/OAKLAND				PROJECT NO: 004-88-059	
SITE LOCATION: 1310 14th ST. AT POPLAR ST. OAKLAND					
FIG. NO.	DATE	DRAWING BY	CHECKED BY	APPROVED BY	SCALE
3.1	4-4-89	CHRIS DIDIO			NONE

3.3 PROJECT HISTORY

The four fuel tanks and one waste oil tank in the northwestern portion of the Facility were removed in early January 1989. Free product was observed in the excavation pit of the fuel tanks. Two 10,000 gallon tanks stored gasoline, two 12,000 gallon tanks stored diesel fuel, and one 1,000 gallon tank stored waste oil. With the exception of the waste oil tank, the steel tanks appeared competent and did not have visible holes at the time of their removal. The soil under the product lines was heavily stained and the evidence suggested leaking pipelines as a source of contamination.

AGE received authorization from Carnation to prepare a work plan for the site characterization of the excavated fuel tanks area in mid-January 1989. AGE prepared a work plan to drill fifteen borings in the western portion of the Facility, sample the soil, install monitoring wells in the borings, measure groundwater levels, collect groundwater samples, measure free product thicknesses, if present, and analyze soil and groundwater samples. The document was submitted to the County on February 13, 1989. The County approved the work plan with minor revisions on March 6, 1989. AGE modified the work plan in a letter to the County dated March 14, 1989. The changes addressed comments from the County as well as revisions based on results obtained in the field during emergency remediation measures. Copies of the work plan and the letter with modifications to the work plan are contained in Appendix A.

4.0 FIELD INVESTIGATION

The site characterization work plan stated fifteen monitoring wells would be installed in the western portion of the Facility. Ten of the wells were originally located outside the warehouse building and five wells were located inside the building at the property line. A total of sixteen borings were drilled and all were converted to monitoring wells. Several tentative well locations shown in the site characterization work plan were moved due to the presence of both abandoned and operative underground utilities, immovable obstacles, and inadequate access or unsafe clearance for the drill rig. Ten borings were drilled outside the building using a Mobile B-57 continuous flight hollow stem auger drill rig. These borings were converted to four-inch diameter wells. The remaining six borings were drilled inside the building. Restricted access to several areas in the building and limited clearance for the mast required the use of a skid mounted Diedrich D-25 drill rig for these borings. The borings inside the building were converted to two-inch diameter wells because the largest hole the smaller rig

could drill was six inches in diameter using an auger with an inside diameter of 3-3/4 inches.

4.1 STRATIGRAPHIC HOLES

Two stratigraphic borings, MW-1 and MW-4, were continuously sampled to total depths of 47 and 44 feet respectively for lithologic purposes. A third boring, MW-2, was continuously sampled to a depth of 25 feet. The boring was stopped at 25 feet because the soil appeared to be contaminated. As stated in the modifications to the work plan, borings with contaminated soil or floating product would not be extended below 25 feet in order to reduce the possibility of creating a conduit for vertical migration of the contaminants.

4.2 SOIL SAMPLING

Soil samples were collected for chemical analyses and to complete a lithologic log of borings. At least two samples were collected from each boring above the groundwater surface for chemical analysis. The deeper sample was collected as close to the groundwater surface as possible. In a few cases, samples were collected below the groundwater surface from borings inside the building.

Samples were collected by advancing the boring to a point immediately above sampling depth and then driving a Modified Porter Sampler lined with three brass tubes into the undisturbed soil. In some cases, a sand catch was used inside the sampler to retain a sample from within the saturated sand areas for logging purposes. After the sample was collected, the sampler was removed from the bottom of the boring. The ends of the bottom (third) tube were sealed using aluminum foil, tight-fitting plastic caps and tape over the caps. The sealed tubes were then immediately placed in an on-site refrigerator. At the end of the field day, selected soil samples were delivered under Chain of Custody procedures to a California State certified analytical laboratory. Additional samples were collected, both above and below groundwater, for geotechnical analyses from selected wells. Sample depths and well locations are given in Table 4.1. The boring logs are located in Appendix B. Analytical results for these samples and Chain of Custody forms are given in Appendix C.

TABLE 4.1: Monitoring Well Construction Details

Well Number	Construction Date	Well Diameter (Inches)	Boring Diameter (Inches)	Total Well Depth (Feet)	Total Boring Depth (Feet)	Screened Interval (Feet)	Screen Size (Inches)	Filter Pack Size	Surface Seal (Feet)	Rim Elevation MSL (Feet)	Top of Well Casing MSL (Feet)
MW-1	03/15/89	4	10	47	47	7.5 to 47	0.03	#3 Sand	0 to 3.5	16.82	16.49
MW-2	03/22/89	4	10	25	25	7 to 25	0.03	#3 Sand	0 to 4	15.52	15.11
MW-3	03/21/89	4	10	25	25	7 to 25	0.03	#3 Sand	0 to 4.5	14.66	14.30
MW-4	03/20/89	4	10	44	44	7 to 44	0.03	#3 Sand	0 to 4.0	14.84	14.42
MW-5	03/21/89	4	10	25	25	7 to 22	0.03	#3 Sand	0 to 3.5	14.82	14.41
MW-6	03/17/89	2	6	17	17	7 to 17	0.03	#3 Sand	0 to 4	14.79	14.12
MW-7	03/16/89	2	6	17	22	7 to 17	0.03	#3 Sand	0 to 4	14.74	14.29
MW-8	03/17/89	2	6	17	17	7 to 17	0.03	#3 Sand	0 to 4	14.77	14.20
MW-9	03/17/89	4	10	25	25	7 to 25	0.03	#3 Sand	0 to 3.5	15.77	14.96
MW-10	03/16/89	4	10	25	25	7 to 25	0.03	#3 Sand	0 to 3.5	16.04	15.73
MW-11	03/21/89	4	10	25	25	7 to 25	0.03	#3 Sand	0 to 4	15.06	14.55
MW-12	03/21/89	4	10	25	25	7 to 25	0.03	#3 Sand	0 to 4	15.70	15.28
MW-13	03/21/89	4	10	25	25	7 to 25	0.03	#3 Sand	0 to 4	15.48	14.85
MW-14	03/17/89	2	6	22	22	7 to 22	0.03	#3 Sand	0 to 4	14.80	14.10
MW-15	03/17/89	2	6	22	22	7 to 22	0.03	#3 Sand	0 to 4	14.82	14.17
MW-16	03/22/89	2	6	25	25	6.5 to 22	0.03	#3 Sand	0 to 4	14.78	14.11

4.3 WELL INSTALLATION

Sixteen monitoring wells were installed on the Carnation Facility between March 15 and March 22, 1989. The locations of the wells are shown on Plate 1. MW-1, MW-2 and MW-4 were continuously sampled and installed to depths of 47, 44 and 25 feet respectively. The remaining seven monitoring wells outside the building were completed to a total depth of 25 feet.

Due to limitations of the small drill rig and the presence of contamination in some of the borings inside the building, depths ranged from 17 to 25 feet. In one boring a clayey sand layer was encountered and the boring was backfilled with bentonite to 17 feet and was completed as a well to a depth of 17 feet. The only well drilled and completed to a total depth of 25 feet inside the building was MW-16 which was located in the northwest corner of the building. The remaining wells were completed to either 17 or 22 feet. Construction information for the monitoring wells are given in Table 4.1, Monitoring Well Construction Details. MW-7

During the construction of the wells, drilling, well casings, sampling and construction equipment were steam cleaned prior to drilling to eliminate the possibility of cross-contamination.

After the soil samples were collected, borings for MW-1 through MW-5 and MW-9 through MW-13 were redrilled with a ten-inch outer diameter (O.D.) auger. Because the wells were being installed in saturated sands, heaving sands backfilled the auger. To eliminate this, a wooden plug was placed inside the lead bit prior to redrilling. Once the boring was completed, the plug was pounded out using the sampling hammer. Immediately after the plug was removed, the well screen (0.030 inch) and blank casing were placed inside the auger and kept vertically in place using the sampling hammer on the drill rig. Number 3 sand was then poured outside the well casing and inside the auger to form a filter pack to a depth of two feet above the well screen. One to two feet of 3/8-inch bentonite pellets were then placed above the sand and charged with distilled water to form a seal against surface water infiltration. The remaining annular space was filled to the surface with a bentonite/cement mix composed of approximately 4% bentonite. MW-1 through MW-5 and MW-9 through MW-13 were then completed by placing a locking steel stovepipe over the well casing and setting it flush to the ground with a steel covered security box. Each security box has two security screws and a rubber gasket to prevent surface water infiltration.

4.4 MONITORING WELL DEVELOPMENT AND SAMPLING

The monitoring wells were first sampled with a clear acrylic bailer to visually inspect the well for a product layer or sheen. MW-2, MW-3, MW-6, MW-7 and MW-8 contain a product layer or sheen and were not developed. The remaining wells contained no visible product and were developed by first surging with a tool along the screened interval of each well to draw the sediment from the formation into the well and to set the sand pack. The sediment-laden water was then removed from MW-5 and MW-9 through MW-16 using a bailer. A minimum of ten well volumes of water was removed from each developed well. Because of their depths, MW-1 and MW-4 were developed by air lifting using nitrogen. An extension cap was placed on the well and a nitrogen hose was placed down the well. The gas was then used to blow out the development water. The recharge rate was monitored such that, during development, the groundwater was never lowered more than 1.5 feet. The development water was containerized and stored on-site.

After development, each well that did not contain a product layer or visible sheen was sampled. First, the depth or static water level was measured and recorded. If a well was developed 24 to 48 hours prior to sampling, no additional well water was removed prior to sampling. If the well was sampled more than 48 hours after development, three to five well volumes were removed prior to sampling. Temperature, pH and conductivity measurements were recorded for each sample. After collecting a sample, the sample bottles were immediately sealed and placed in an on-site refrigerator. At the end of the day, the water samples were delivered under Chain of Custody procedures to Precision Analytical Laboratory, a State certified analytical laboratory. A copy of the analytical results and Chain of Custody forms are given in Appendix D.

To minimize the potential for cross-contamination, developing and sampling equipment was first steam cleaned and then rinsed with distilled water prior to use.

4.5 GEOPHYSICS

Underground utilities and obstructions were identified by using geophysical apparatus to screen the area beneath prospective drilling locations. The geophysics was conducted by Spectrum Environmental Inc.

4.6 SURVEYING

After the wells were installed, the western portion of the Carnation Facility was surveyed by Mr. Earl Gray, a licensed land surveyor (California license no. 3874). The location and elevation of each well (surface and top of the PVC casing) were surveyed. The survey was tied into the City of Oakland benchmark number 3806 located 15 feet south of the southern property line on 14th Street. The survey point on each PVC casing was notched to eliminate potential discrepancies during subsequent groundwater elevation measurement events. The groundwater depths were then measured using a conductivity based water level probe from the notched location on the top of the PVC. This data was used to determine the depth to groundwater and provide information to determine the local groundwater gradient.

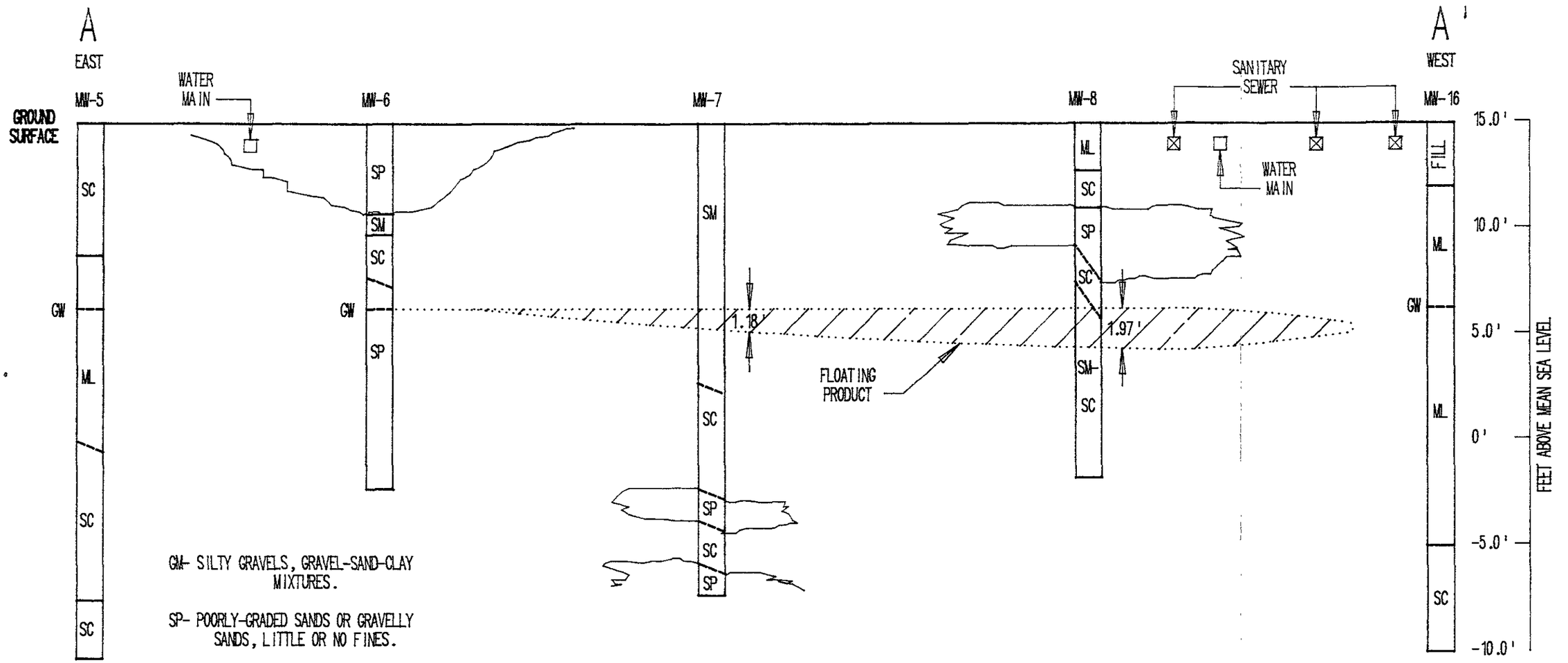
5.0 HYDROGEOLOGY

5.1 REGIONAL SETTING

Carnation Company's Oakland Dairy Facility is located within the Berkeley Alluvial Plain, a subplain of the Bay Plain. The Bay Plain consists of unconsolidated alluvial and near shore deposits to the west of the Hayward Fault Zone. The major groundwater producing area in the East Bay region of Alameda County is the Bay Plain. Most of the groundwater production in the East Bay has been from the San Leandro, San Lorenzo and Niles Cone subareas of the Bay Plain. They are located south of the Berkeley Alluvial Plain.

5.2 SITE CONDITIONS

The Carnation Company's Oakland Dairy Facility is underlain by silty to clayey fine sands with lenses of well sorted fine to medium sand and sandy silt. Sand grains are generally subangular to subrounded. Beneath the facility these sands occur to a depth of at least 50 feet. The shallow site stratigraphy is illustrated in Figures 5.1 and 5.2. Locations of cross-sections are shown on Plate 2. The probable origin of the sands is deposition in a near shore environment during late Pleistocene time when the San Francisco Bay was formed by post glacial flooding.



GM- SILTY GRAVELS, GRAVEL-SAND-CLAY MIXTURES.

SP- POORLY-GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.

SM- SILTY SANDS, SAND-SILT MIXTURES.

SC- CLAYEY SANDS, SAND-CLAY MIXTURES.

ML- INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY.

GW- GROUNDWATER LEVEL.

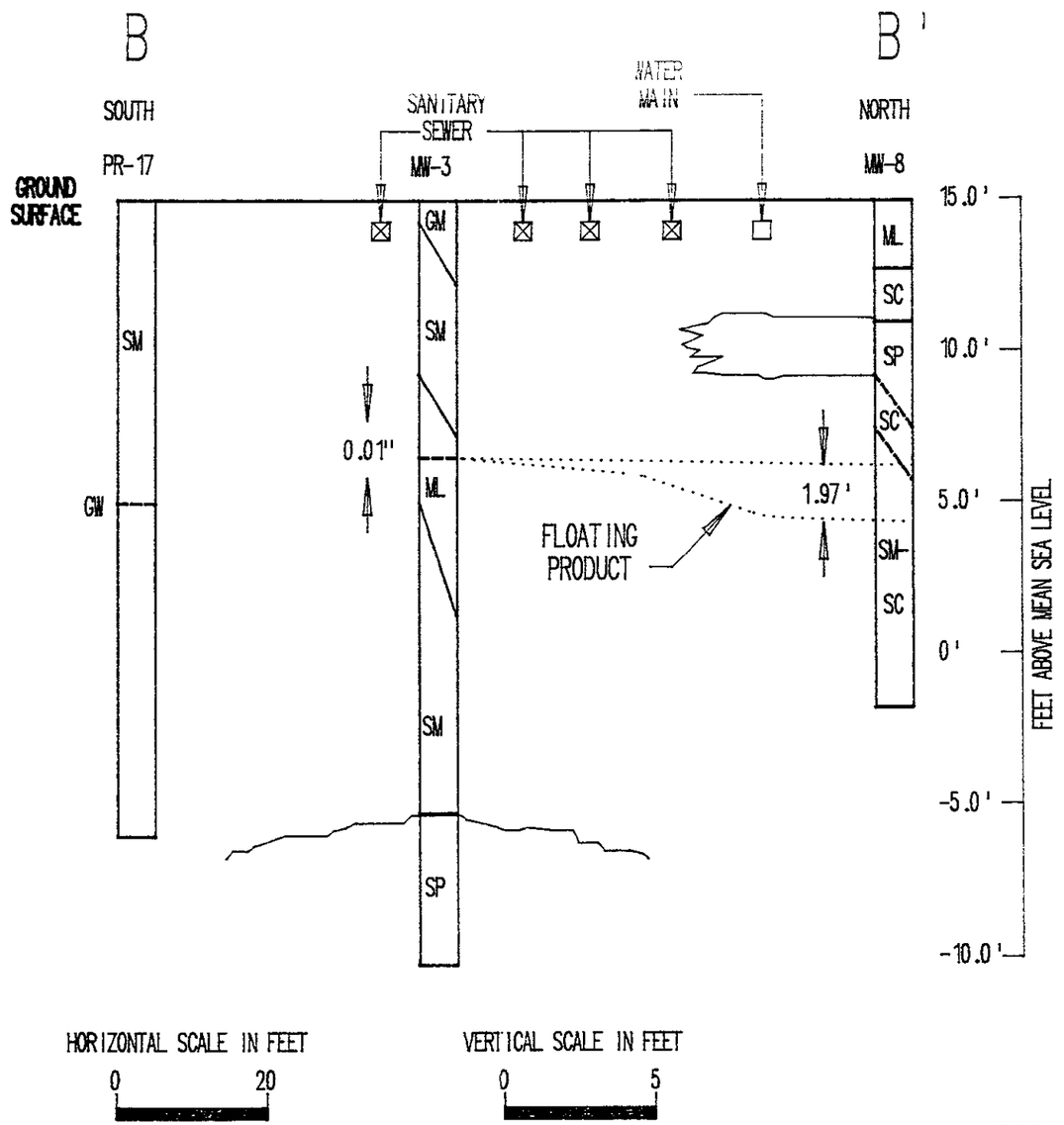
HORIZONTAL SCALE IN FEET
0 20

VERTICAL SCALE IN FEET
0 5

NOTE: DEPTHS OF WATER MAINS AND SANITARY SEWERS ARE INFERRED.

AGE
ANANIA GEOLOGIC ENGINEERING

TITLE: CROSS-SECTION OF PRODUCT PLUME (FROM MW-5 TO MW-16)					
PROJECT NAME: CARNATION/OAKLAND				PROJECT NO:	004-88-059
SITE LOCATION: 1310 14TH. OAKLAND, CA.					
REV.	DATE	DRAWING BY	CHECKED BY	APPROVED BY	SCALE
	3-29-89	CHRIS DIDIO			1" = 20'



GW- SILTY GRAVELS, GRAVEL-SAND-CLAY MIXTURES.

SP- POORLY-GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.

SM- SILTY SANDS, SAND-SILT MIXTURES.

SC- CLAYEY SANDS, SAND-CLAY MIXTURES.

ML- INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY.

GW- GROUNDWATER LEVEL.

NOTE: DEPTHS OF WATER MAINS AND SANITARY SEWERS ARE INFERRED.

AGE
ANANIA GEOLOGIC ENGINEERING

TITLE: CROSS-SECTION OF PRODUCT PLUME (FROM PR-17 TO MW-8)					
PROJECT NAME: CARNATION/OAKLAND				PROJECT NO:	004-88-059
SITE LOCATION: 1310 14TH. OAKLAND, CA.					
REV.	DATE	DRAWING BY	CHECKED BY	APPROVED BY	SCALE
	3-29-89	CHRIS DIDIO			1" = 20'

5.3 GROUNDWATER OCCURRENCE

The first encountered groundwater is found at depths of 8 to 10 feet below ground surface at the site. It is anticipated that permeability within the sand will be on the order of 10^{-2} cm/sec or higher. However, clayey sand layers and sandy silts may form lower permeability barriers to flow within the sand.

5.4 GROUNDWATER FLOW

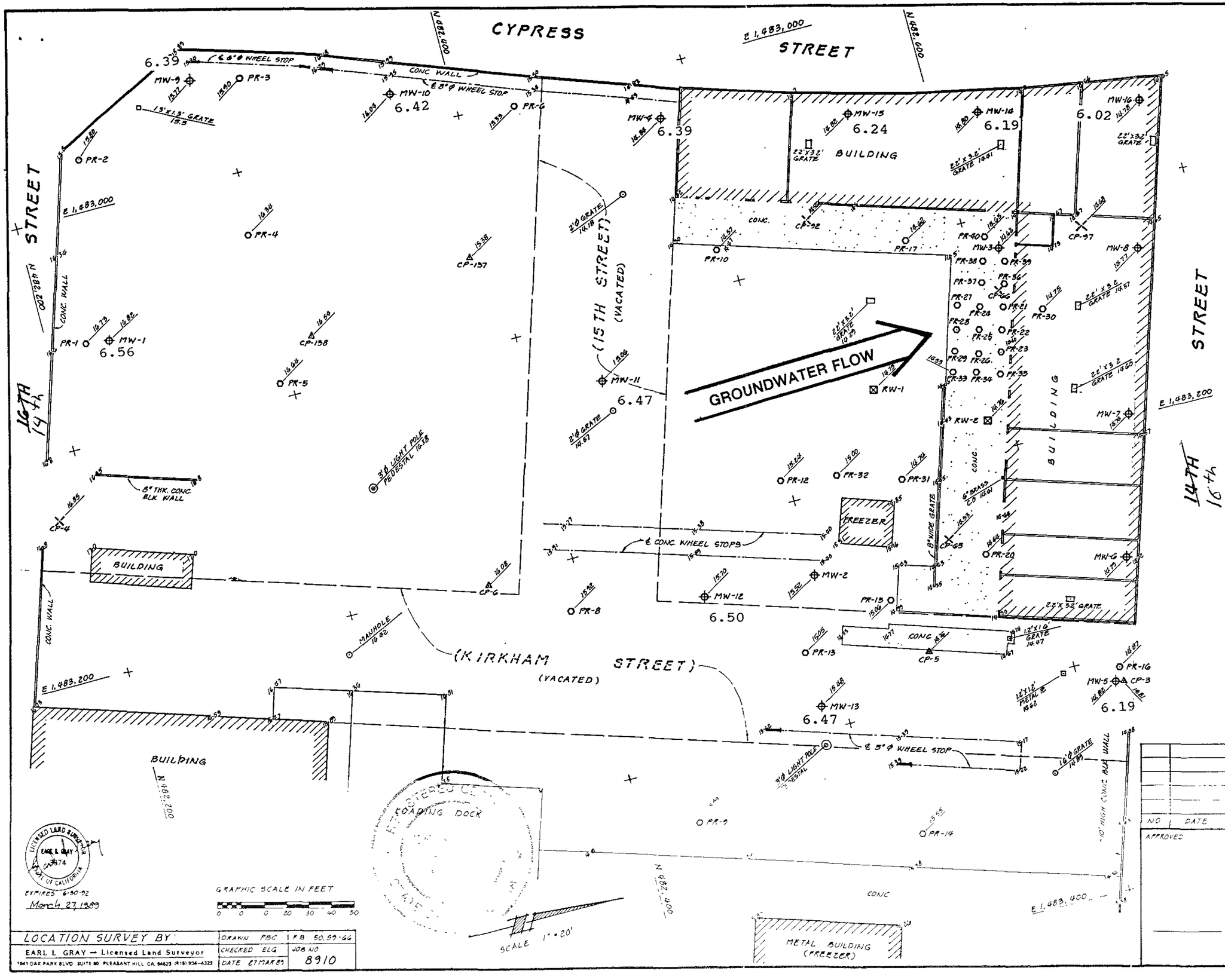
The regional direction of groundwater flow is assumed to be northwesterly based upon the geographical relationship of the area to San Francisco Bay. At the site, the direction of groundwater flow as shown on Figure 5.3 is to the north to north-northwest. Groundwater elevations used to calculate the gradient were measured on March 28, 1989 and are listed in Table 5.1. The hydraulic gradient ranges from 0.0007 in the southern part to 0.0019 in the northern part of the site. This is a relatively flat gradient and it can be inferred that movement of fluids across the site has been rather slow. The relative steepening of the gradient on the northern half of the property may be due to the presence of engineered structures in the subsurface in this area such as sewers and drain lines.

5.5 LIMITATIONS

The results of the groundwater flow calculations reported above are based upon a single set of water level measurements. In addition, no work has yet been done to ascertain the effect, if any, of tidal influences on the shallow aquifer.

6.0 FREE PRODUCT OCCURRENCE

The discussion below addresses the occurrence of free hydrocarbon product beneath the site found floating on the shallow groundwater. The known occurrence of hydrocarbon product is based upon measurements obtained from on-site wells and recovery probes. The measured thickness of hydrocarbon product in wells is generally greater than the true thickness of hydrocarbon product in the soils above the water table. Figure 6.1 illustrates the discrepancy. The difference results from the well's destruction of the capillary fringe of water in the soil above the water table which is found between the product and the water table. The well acts as a sump to accumulate product from the water table to the top of the original floating product surface. In the undisturbed soil, the



LEGEND:

- ⊕ MW-1 MONITORING WELL
- ○ PR-6 PRODUCT RECOVERY POINT
- ⊠ RW-2 RECOVERY WELL
- △ CP-3 CONTROL POINT, SET NAIL & SHINER
- ✕ CP-97 CONTROL POINT, SET CROSS "+" CUT IN CONCRETE
- 16.44 SPOT / RIM ELEVATIONS
- 6.82 GROUNDWATER ELEVATION

BENCHMARK (BASED ON NGVD 1929)

CITY OF OAKLAND BM NO. 3806 EL 13.76 CITY DATUM + 3.00' = 16.76 NGVD 1929, CONC. CURB WEST SIDE KIRKHAM ST 15 FT. SOUTHERLY OF SOUTHERLY PROP. LINE, 14TH ST.

BASIS OF BEARINGS (CITY OF OAKLAND DATA)

MONUMENT LINE ON POPLAR ST. BETWEEN MONUMENTS 8SW50 (@ 16TH ST.) & 8SW16-R (@ 14TH ST.) TAKEN AS N 17°06'38" E, 560.06' AND BASED ON THE CALIFORNIA COORDINATE SYSTEM ZONE III, 1927 N A D

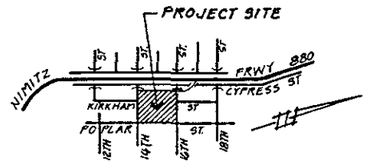
BASIS OF COORDINATES (CITY OF OAKLAND DATA)

CITY MONUMENT ON POPLAR ST. @ 16TH ST. (8SW-50) N 482,590 10 & E 1,483,597.39 AND BASED ON CALIFORNIA COORDINATE SYSTEM, ZONE III, 1927 N.A.D. GROUND TO GRID FACTOR = 0.9999296

SCHEDULE OF CONTROL POINTS

NO.	COORDINATES *		ELEV.
	NORTH	EAST	
CP-3	2,619.52	3,311.56	14 81
CP-4	2,186.39	3,128.32	16.85
CP-5	2,540 38	3,278.08	14.76
CP-6	2,361.26	3,202.30	16.08
CP-65	2,560.45	3,233.18	14.53
CP-66	2,608.78	3,132.52	14.55
CP-92	2,536 07	3,082.32	14.56
CP-97	2,650.52	3,114.22	14.68
CP-137	2,388 89	3,060.93	15.38
CP-138	2,313.60	3,076 68	16.54

* TO GET GRID COORDINATES, ADD 480,000 TO NORTH COORDINATES AND ADD 1,480,000 TO EAST COORDINATES



VICINITY MAP
N. T. S.

NO	DATE	REVISION	BY	APP'D

APPROVED

CARNATION DAIRIES
1310 14TH ST & POPLAR ST OAKLAND, CALIFORNIA

SCALE 1"=20'		DATE
DRAWN		PROJECT NO 004-88-059
CHECKED		

AGE ANANIA GEOLOGIC ENGINEERING
21330 SUNRISE PARK DR., SUITE C, RANCHO CORDOVA, CA 95742

GROUNDWATER ELEVATION/ DIRECTION MAP — DRAWING NO 5.3

LICENSED LAND SURVEYOR EARL L GRAY 3574 STATE OF CALIFORNIA
EXPIRES 6-30-92
March 27 1989

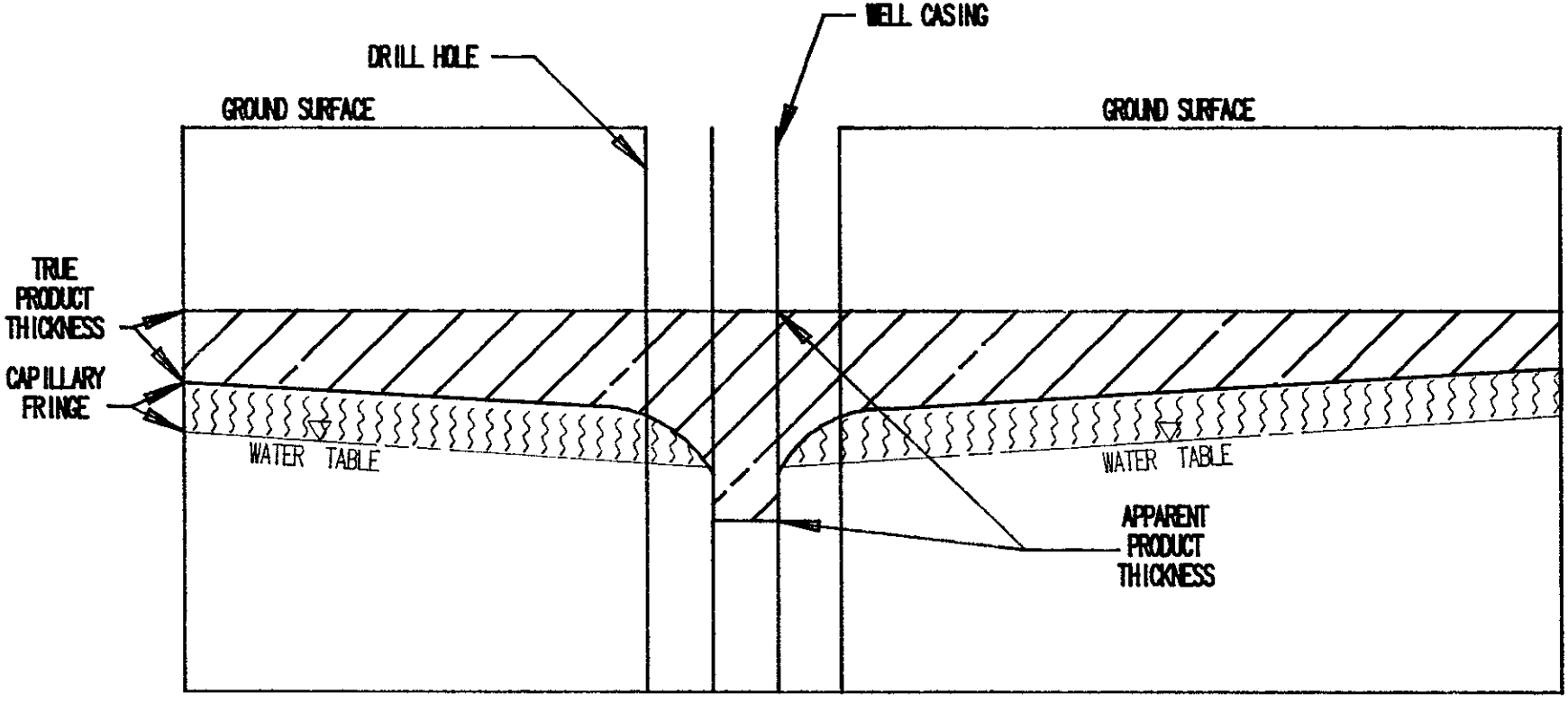
LOCATION SURVEY BY	DRAWN PBC	FB 50,59-66
EARL L GRAY — Licensed Land Surveyor	CHECKED ELG	JOB NO 8910
1941 OAK PARK BLVD SUITE 80 PLEASANT HILL CA 94523 (415) 934-4322	DATE 27MAR89	

Table 5.1: Groundwater Elevations in Monitoring Wells

Well Number	PVC Elevation (MSL)	RIM Elevation (MSL)	Ground Water Elevation (MSL)	Date
MW-1	16.49	16.82	6.56	03/28/89
MW-2	15.11	15.52	*	--
MW-3	14.30	14.66	*	--
MW-4	14.42	14.84	6.39	03/28/89
MW-5	14.41	14.82	6.19	03/28/89
MW-6	14.12	14.79	*	--
MW-7	14.29	14.74	*	--
MW-8	14.20	14.77	*	--
MW-9	14.96	15.77	6.39	03/24/89
MW-10	15.73	16.04	6.42	03/24/89
MW-11	14.55	15.06	6.47	03/24/89
MW-12	15.28	15.70	6.50	03/24/89
MW-13	14.85	15.48	6.47	03/24/89
MW-14	14.10	14.80	6.19	03/27/89
MW-15	14.17	14.82	6.24	03/27/89
MW-16	14.11	14.78	6.02	03/27/89

NOTE

*Groundwater-product interface elevations are not accurate measurements for true groundwater elevation due to the apparent product thickness influence on the potentiometric surface.



AGE
ANANIA GEOLOGIC ENGINEERING

TITLE:	SCHEMATIC DIAGRAM OF WELL INSTALLED THROUGH FLOATING PRODUCT		
PROJECT NAME:	CARNATION/OAKLAND	PROJECT NO:	004-88-059
SITE LOCATION:	1310 14TH ST. OAKLAND, CA.		
DATE: 4-3-89	DRAWING BY: CHRIS DIDIO		

capillary fringe may have accounted for more than half the thickness of hydrocarbons measured in the well. In addition, the accumulated thickness of hydrocarbon in the well causes an apparent lowering of the water table, as measured in the well, from bouyancy effects.

Another factor affecting measurements is that some compression of the capillary fringe in the soils may be expected from the product lying on it. The height of the capillary fringe is a function of physical properties of the soil. Compression of the capillary fringe by floating product cannot be estimated. Rules of thumb have been used to estimate true product thickness from measured apparent thicknesses. But no rule of thumb can be valid for all or even most conditions. The capillary fringe can be measured using in situ tensiometers, but this kind of study is costly, time consuming, and can be frustrated by fluctuating water level conditions. However, techniques have been developed for calculating true product thickness from drawdown tests. Estimation of true product thickness was not part of the scope of work addressed in the report, hence in the discussion that follows all references will be made to apparent hydrocarbon thicknesses.

6.1 METHODS OF INVESTIGATION

A total of sixteen monitoring wells, two recovery wells and forty recovery probes have been installed at the site. Plate 1 shows the location and surface elevation of these wells and probes. On March 8, 1989, apparent product thicknesses were measured in the recovery probes using an interface tape which measures depth to first encountered fluid and depth to interface between immiscible fluids. On March 28, 1989 apparent product thicknesses were measured in MW-1 through MW-16 using the interface probe and/or a clear acrylic bailer. Table 6.1 shows product thicknesses measured in both the monitoring wells and recovery probes. These results are interpreted in Plate 2, Apparent Product Thickness Contour Map.

6.2 APPARENT PRODUCT VOLUMES

Plate 2 shows two separate product plumes. The larger plume on the northern side of the site is mostly gasoline product. A smaller plume centered around recovery probe PR-12, to the south of the freezer box, is mostly diesel product. The currently known areal extent of the gasoline plume covers an approximate on-site area of 25,000 square feet. The average apparent product thickness is about 1.5 feet. The derived apparent on-site gasoline volume is approximately 39,000 cubic feet or about 310,000 gallons. As stated above, the true product thickness has not been calculated.

Table 6.1: Product Thicknesses

Location	PVC Elevation (Feet Above MSL)	RIM Elevation (Feet Above MSL)	Product Thickness (Feet)	Date Measured
MW-2	15.11	15.52	.01	03/28/89
MW-3	14.30	14.66	.01	03/28/89
MW-6	14.12	14.79	.01	03/28/89
MW-7	14.29	14.74	1.18	03/28/89
MW-8	14.20	14.77	1.97	03/28/89
PR-12	15.04	15.24	1.73	03/07/89
PR-20	14.36	14.64	3.27	03/07/89
PR-21	14.37	14.60	2.49	03/07/89
PR-22	14.43	14.61	2.39	03/07/89
PR-23	14.47	14.61	1.90	03/07/89
PR-24	14.32	14.57	2.29	03/07/89
PR-25	14.39	14.56	2.33	03/27/89
PR-26	14.38	14.58	2.24	03/07/89
PR-29	14.33	14.52	0.65	03/07/89
PR-31	14.08	14.74	0.10	03/07/89
PR-32	14.45	15.00	0.03	03/07/89
PR-33	14.36	14.53	1.97	03/07/89
PR-34	14.49	14.60	2.27	03/07/89
PR-35	14.55	14.64	2.43	03/07/89
PR-36	14.40	14.59	2.51	03/07/89
PR-37	14.29	14.55	2.38	03/07/89
PR-38	14.47	14.57	0.39	03/07/89
PR-39	14.49	14.61	0.72	03/07/89

NOTE
Prior to recording product thickness in any PR point, pumping was halted 48 hours before measuring.

→ PR-30?

→ MW-5 → no product, see Table 5.1

As a conservative estimate, the assumption that true product thickness is equal to one-third of the apparent product thickness yields an on-site volume of about 100,000 gallons. The diesel plume has been estimated to contain approximately 18,000 gallons based on apparent product thicknesses. The conservative estimate would be about 6,000 gallons.

Conservative est. would be about 1/2
150,000 gal gas
12,000 gal diesel

7.0 ANALYTICAL RESULTS

7.1 SOILS

The soil samples collected during drilling were analyzed for total petroleum hydrocarbons (TPH) with both gasoline and diesel standards by EPA method 8015 modified. Benzene, toluene, ethylbenzene, and xylene (BTEX) concentrations were analyzed by EPA method 8020. The total lead concentration in the soil samples were measured by EPA method 6010. Selected soil samples were submitted for analysis of total oil and grease by EPA method 503 D and analyses of volatile and semi-volatile organic compounds by EPA methods 8240 and 8270. The soil samples were transported to Precision Analytical Laboratory in Richmond. Analyses for TPH, BTEX, lead, and oil and grease were performed by Precision. The samples to be analyzed by methods 8240 and 8270 were sent by Precision to Clayton Environmental Consultants in Pleasanton. Both laboratories are certified by the California Department of Health Services (DHS) for the particular analyses performed.

Table 7.1 summarizes the analytical results for the soil samples analyzed for TPH, BTEX, lead, and oil and grease. Analytical results from samples indicated MW-7 and MW-8 had TPH-gasoline concentrations of 15,660 and 5,960 mg/kg respectively at a depth of 9.5 to 10.0 feet below ground surface. Results from MW-7 also indicated a TPH-diesel concentration of 390 mg/kg. The rest of the samples analyzed showed reported TPH levels less than 10 mg/kg or not detected for both gasoline and diesel standards. Some soil samples were not analyzed for both gasoline and diesel standards for TPH. BTEX concentrations reported for MW-7 were 310, 1100, 300, and 1550 mg/kg at 9.5 to 10.0 feet respectively. Reported concentrations in samples from MW-8 at a depth of 9.5 to 10.0 feet were an order of magnitude less than values from MW-7. BTEX was not detected in the soil samples from MW-9, MW-10, MW-14, and MW-15. The remaining samples had reported BTEX concentrations ranging from 0.03 to 0.2 mg/kg.

Soil samples from twelve borings were analyzed for oil and grease. Laboratory reports indicated that MW-8 and MW-5 had the highest concentrations of 1220 and 115 mg/kg at depths of 9.5 to 10.0 and

Table 7.1: Soil Analytical Results

Sample Number	Location	Depth Below Ground Surface (Feet)	THP-Gasoline 10mg/kg	THP-Diesel 10mg/kg	Oil and Grease 50mg/kg	Benzene 0.3µg/kg	Toluene 0.3µg/kg	Ethyl-benzene 0.3µg/kg	Xylenes 0.3µg/kg	Lead 0.044mg/kg
Limit of Detection										
3649	MW-1	4.5 to 5.0	NA	ND<10	NA	<0.03	<0.03	<0.03	<0.03	5.2
3650	MW-1	9.5 to 10.0	NA	ND<10	NA	<0.03	<0.03	<0.03	<0.03	7.1
3838	MW-2	4.5 to 5.0	ND<10	ND<10	NA	<0.03	0.04	<0.03	0.05	5.8
3839	MW-2	9.5 to 10.0	ND<10	ND<10	<50	<0.03	0.035	<0.03	0.04	4.7
3829	MW-3	4.0 to 4.5	ND<10	ND<10	NA	<0.03	0.04	<0.03	0.07	2.3
3833	MW-3	9.0 to 9.5	ND<10	ND<10	<50	0.03	0.05	<0.03	0.05	3.9
3681	MW-4	4.0 to 4.5	ND<10	NA	NA	<0.03	0.07	0.05	0.3	ND<1.1*
3682	MW-4	9.5 to 10.0	ND<10	NA	<50	ND<0.03	<0.03	<0.03	0.09	ND<1.1*
3965	MW-5	6.0 to 6.5	ND<10	ND<10	65	<0.03	0.04	<0.03	0.04	7.4
3966	MW-5	10.0 to 10.5	<10	<10	115	<0.03	0.045	<0.03	0.045	7.9
3164	MW-6	4.5 to 5.0	ND<10	NA	<50	0.1	0.08	<0.03	0.11	19
3165	MW-6	10.5 to 11.0	ND<10	NA	<50	0.04	0.04	<0.03	<0.03	10.1
3166	MW-6	15.5 to 16.0	ND<10	NA	<50	<0.03	0.03	<0.03	<0.03	9.7
3153	MW-7	4.5 to 5.0	30	ND<10	NA	0.32	0.1	0.03	0.16	21
3154	MW-7	9.5 to 10.0	15,660	390	NA	310	1100	300	1550	10.8
3155	MW-7	15.5 to 16.0	12	ND<10	<50	3	8	13	13	5.5
3156	MW-7	21.0 to 21.5	ND<10	ND<10	NA	0.20	0.30	0.04	0.20	8.2
3161	MW-8	4.5 to 5.0	ND<10	NA	NA	0.04	0.03	<0.03	0.12	ND<1.1*
3162	MW-8	9.5 to 10.0	5,960	NA	1220	37	210	60	320	1.5*
3163	MW-8	16.5 to 17.0	ND<10	NA	NA	0.05	0.16	0.04	0.21	ND<1.1*
3661	MW-9	4.0 to 4.5	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	7.3
3662	MW-9	8.0 to 8.5	NA	ND<10	<50	ND<0.03	ND<0.03	ND<0.03	ND<.03	8.2
3657	MW-10	4.5 to 5.0	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	5.0
3658	MW-10	9.5 to 10.0	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	10.1
3671	MW-11	5.0 to 5.5	ND<10	ND<10	NA	0.03	0.03	<0.03	0.05	4.4
3672	MW-11	9.0 to 9.5	ND<10	ND<10	<50	<0.03	0.04	<0.03	0.04	4.5
3679	MW-12	4.0 to 4.5	ND<10	ND<10	NA	<0.03	0.04	<0.03	0.05	9.5
3680	MW-12	9.0 to 9.5	ND<10	ND<10	<50	<0.03	0.04	<0.03	0.05	5.6
3969	MW-13	6.0 to 6.5	ND<10	ND<10	<50	<0.03	0.035	<0.03	0.035	10.1
3970	MW-13	9.0 to 9.5	ND<10	ND<10	<50	<0.03	0.036	<0.03	0.036	10.5
3149	MW-14	4.5 to 5.5	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	6.4
3150	MW-14	9.5 to 10.0	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	4.6
3151	MW-14	13.0 to 13.5	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	12.1
3152	MW-14	21.0 to 21.5	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	7.3
3157	MW-15	4.5 to 5.0	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	4.0
3159	MW-15	12.0 to 12.5	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	8.1
3160	MW-15	20.0 to 20.5	NA	ND<10	NA	ND<0.03	ND<0.03	ND<0.03	ND<.03	8.6
3973	MW-16	6.0 to 6.5	ND<10	ND<10	<50	<0.03	0.033	<0.03	0.04	8.4
3974	MW-16	11.0 to 11.5	ND<10	ND<10	<50	<0.03	0.033	<0.03	0.04	5.9

*Detection Limit is 1.1 mg/kg NA - Not Analyzed ND - Not Detected

10.0 to 10.5 feet respectively. The remaining samples analyzed showed less than 50 mg/kg, the detection limit. Reported total lead concentrations ranged from less than 1.1 to a high of 21 mg/kg. The highest lead concentrations reported in analyses of the soil were detected in samples from MW-6, MW-7, MW-10, MW-13, and MW-14. The remaining analytical reports did not indicate greater than 9.5 mg/kg of lead.

Five soil samples were submitted for analyses by EPA methods 8240 and 8270. A summary of detected constituents is compiled in Table 7.2. In addition to BTEX, 1,2-dichloroethane, phenol, and di-n-butylphthalate were detected in a few of the samples. Phenol was detected in concentrations of 60 and 100 µg/kg in MW-6 and MW-3 respectively.

Copies of the certified laboratory results and Chain of Custody forms for the soil samples are contained in Appendix C.

7.2 GROUNDWATER

Thirteen groundwater samples total from eleven wells were submitted for analyses for TPH, BTEX, and total lead by methods 8015 modified, 8020, and 6010. Selected samples were submitted for analyses for oil and grease, volatile organic compounds and semi-volatile organic compounds by methods 503 A, 8240 and 8270. All of the analyses were performed by a laboratory certified by the DHS to perform the analyses. Precision Analytical Laboratory conducted all of the analyses except for the 8240 and 8270 analyses which were submitted to Clayton Environmental Consultants. Two duplicate samples, one from MW-4 and one from MW-14, were also analyzed. In addition, a distilled water travel blank was analyzed for TPH, BTEX and total lead.

A summary of the analytical results for the water samples for TPH, BTEX, oil and grease, and total lead are shown on Table 7.3. The laboratory results indicated that in the wells that were sampled, the constituents tested for were below the detection limits. Three constituents were reported in samples from two of the five water samples submitted for analyses by methods 8240 and 8270. Toluene was reported in the MW-15 sample at a concentration of 8 µg/l. The sample from MW-16 was reported to contain 510 µg/l of bis-(2-ethylhexyl)phthalate and 10 µg/l of di-n-octylphthalate. The samples from MW-5, MW-10, and MW-13 were non-detect for all constituents.

The two duplicate water samples show consistent results. One travel blank (Sample 3700) was filled with distilled water which had been stored on-site and sent to Precision Analytical for

Table 7.2: Summary of Detected Constituents in Soil
from EPA Methods 8240 & 8270
(Concentrations in ppb)

Sample No.	Location	Depth (Feet)	Benzene	Toluene	Ethyl-benzene	Xylenes	1,2-dichloro-ethane	Phenol	Di-n-butyl phthalate
Limit of Detection			2µg/kg	2µg/kg	3µg/kg	3µg/kg	3µg/kg	30µg/kg	30µg/kg
3164	MW-6	4.5 to 5.0	130	47	8	30	6	60	ND
3165	MW-6	10.5 to 11.0	6	8	ND	ND	ND	ND	ND
3155	MW-7	15.5 to 16	310	850	150	750	ND*	ND	69
3833	MW-3	9 to 9.5	76	16	4	10	10	100	ND
3839	MW-2	9.5 to 10.0	ND	ND	ND	ND	ND	ND	ND

*Limit of Detection is 15 µg/kg

Table 7.3: *Groundwater Analytical Results*

Sample No.	Location	TPH-Gasoline	TPH-Diesel	Oil and Grease	Benzene	Toluene	Ethyl-benzene	Xylenes	Lead
Limit of Detection		0.5mg/l	0.5mg/l	50mg/l	0.3µg/l	0.3µg/l	0.3µg/l	0.3µg/l	0.044mg/l
3884	MW-1	ND<0.5	ND<0.5	NA	ND<0.3	<0.3	ND<0.3	<0.3	ND<0.044
3685	MW-4	ND<0.5	ND<0.5	NA	ND<0.3	<0.3	ND<0.3	<0.3	ND<0.044
3697 (dup)	MW-4	ND<0.5	ND<0.5	NA	ND<0.3	<0.3	<0.3	<0.3	ND<0.044
3688	MW-5	ND<0.5	ND<0.5	<50	ND<0.3	<0.3	ND<0.3	<0.3	ND<0.044
3841	MW-9	ND<0.5	ND<0.5	<50	<0.3	<0.3	<0.3	<0.3	ND<0.044
3845	MW-10	ND<0.5	ND<0.5	<50	<0.3	<0.3	<0.3	<0.3	ND<0.044
3853	MW-11	ND<0.5	ND<0.5	<50	<0.3	<0.3	<0.3	<0.3	ND<0.044
3850	MW-12	ND<0.5	ND<0.5	<50	<0.3	<0.3	<0.3	<0.3	ND<0.044
3857	MW-13	ND<0.5	ND<0.5	<50	<0.3	<0.3	<0.3	<0.3	ND<0.044
3865	MW-14	ND<0.5	ND<0.5	NA	<0.3	<0.3	<0.3	<0.3	ND<0.044
3881 (dup)	MW-14	ND<0.5	ND<0.5	NA	<0.3	<0.3	<0.3	<0.3	ND<0.044
3869	MW-15	ND<0.5	ND<0.5	NA	<0.3	<0.3	<0.3	<0.3	ND<0.044
3873	MW-16	ND<0.5	ND<0.5	NA	<0.3	<0.3	<0.3	<0.3	ND<0.044
3700	Travel Blank	ND<0.5	ND<0.5	NA	<0.3	<0.4	<0.3	0.47	ND<0.044

NA - Not Analyzed **ND** - Not Detected

analyses. The results were non-detect for TPH, benzene, and ethylbenzene. However, toluene and xylenes were detected at concentrations of 0.4 and 0.47 µg/l respectively. The occurrence of these compounds may be due to the fact that the travel blank was filled on-site in the vicinity of the recovered product. Contamination may have occurred from vapors present during the filling of the travel blank. Future travel blanks will be obtained from the analyzing laboratory prior to sampling.

Two water samples were submitted from the development water from MW-1 and MW-10 for analysis of total lead to determine how to handle the water removed from the wells during development and sampling. Both samples had a concentration of 0.1 mg/l lead.

Copies of the analytical results and Chain of Custody forms for the water analyses are in Appendix D.

7.3 CONCLUSIONS

The analytical results indicate that the soil is heavily contaminated with hydrocarbons under the building in the area of MW-7 and MW-8. The results also indicate that oil and grease may be present at MW-5 with the higher concentration occurring nearer the groundwater surface. The groundwater samples are below reporting limits for most every constituent. The duplicate samples and travel blank indicate that the results are valid and there was not cross-contamination during the sampling. It should be noted that although these results indicate that the groundwater does not appear to be adversely affected in the wells that do not have floating product, this conclusion is based on only one sampling event.

8.0 CONCLUSIONS

The results of the investigation conducted thus far indicate that significant hydrocarbon contamination has affected soils and groundwater on a portion of the site. An approximately 100,000 to 300,000 gallon free floating product plume has been identified on the northwest portion of the property. Evidence of hydrocarbons was found in monitoring wells near the northern property line. Plate 2 shows the apparent hydrocarbon thicknesses measured in wells during the month of March 1989. The potential for off-site migration of the product has not been investigated.

8.1 PRODUCT PLUMES

Based on visual evaluation of the product sampled from wells, two possible product plumes are indicated. One appears to be a diesel fuel type product and is found in the vicinity of a former diesel fuel underground storage tank. The lateral extent of this plume is, at present, unknown but is believed to be limited. The estimated volume of the diesel plume is presently about 6,000 gallons.

A larger product plume of a gasoline type material has been identified and is illustrated on Plate 2. This gasoline plume appears to be moving toward the northern property line from the area formerly occupied by underground gasoline storage tanks. This plume has been delineated except for the potential gasoline presence under the northwestern property line. The estimated gasoline product volume based on currently available data is 100,000 gallons.

The diesel plume may have originated from occasional overfill of the diesel storage tanks during the tank filling operations. The gasoline plume appears to have originated from a combination of overfill and line leaks.

8.2 GROUNDWATER

Based upon the analytical results presented and discussed in Section 7 of this report and Appendix D, the on-site impact on groundwater appears to be confined for the most part, to the area in the immediate vicinity of the free product plumes. The results are based upon one sampling event. No evaluation of groundwater beyond the confines of the Facility has been conducted.

9.0 RECOMMENDATIONS

A significant hydrocarbon contamination problem has been evaluated and discussed in this report. Remedial action is already underway and additional remedial measures are planned. Remedial actions, both current and planned, are discussed in a separate document entitled Remedial Action Plan for Carnation's Oakland Dairy Facility.

The gasoline product plume has been nearly delineated. The diesel product plume has been partially delineated. One round of groundwater sampling has been conducted and the results have been evaluated. Aquifer characteristics and product recoverability have

not been evaluated.

Based upon the work conducted to date and the results obtained thus far, the following additional activities are recommended:

1) Remediation -- discussed separately in the Remedial Action Plan.

2) Aquifer Tests -- pumping tests are proposed in clean monitoring wells to determine aquifer parameters. In addition, evaluation of potential tidal influences by fluctuating head tests is recommended.

3) Bail Down Tests -- bail down tests to evaluate true product thickness and product recoverability are recommended.

4) Evaluation of North West Boundary -- additional subsurface investigation of the gasoline product plume along the northern property line on the west side of the property is recommended. The potential for off-site movement of product can be evaluated by geophysical means that could avoid offsite drilling or excavation.

5) Groundwater Sampling -- one round of groundwater samples has been obtained and evaluated. At present, very little can be concluded from this preliminary data. The approved site characterization work plan recommended monthly groundwater sampling for the first three months and then quarterly sampling. This schedule is also proposed in the Remedial Action Plan. The additional data will be used to monitor the cleanup as well as provide insight into possible impacts on the groundwater beyond the area where free product occurs.

10.0 REMARKS AND SIGNATURE

This Preliminary Site Characterization was prepared in accordance with current industry standards and practice. The work described herein has been and will be performed under the supervision of a California Registered Geologist.

Co-Authored by:

Mary L. Scruggs — Date: 4/3/89
Senior Project Manager

Eric J. Holm — Date: 4-3-89
Project Manager

Prepared Under Supervision of
and Reviewed by:

REGISTERED GEOLOGIST
NICHOLAS W. COFFEY
NO. 4297
STATE OF CALIFORNIA

Nicholas W. Coffey — Date: 4-4-89
General Partner
California Registered Geologist No. 4297

Approved by:

Karl J. Anania — Date: 4-3-89
Managing Partner
California Registered Geologist No. 4306