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environmental
services, inc.

SOIL AND GROUND WATER INVESTIGATION

FOR

SHELL OIL COMPANY
7194 AMADOR VALLEY BLVD.
DUBLIN, CALIFORNIA

MAY 1988

Shell P. O. No. MOH 237138
Ensco Project Number 1826G
May, 1988

Corporate Offices 41674 Christy Street, Fremont, CA 94538-3114 (415) 659-0404 Fax: (415) 651-4677 Contr. Lic. No. 464324

ensco environmental services, inc.

May 25, 1988

Shell Oil Company
1390 Willow Pass Road
Suite 900
Concord, CA 94520

Attn.: Mr. Stan Roller

Re: Soil And Ground Water Investigation At Former Shell Service Station Site, 7194 Amador Valley Boulevard, Dublin, California, Shell P.O. Number MOH 237138 EES Project Number 1826G

Dear Mr. Roller:

Ensco Environmental Services, Inc. (EES) has completed a soil and ground water investigation at the above referenced site. The results of the investigation are presented in the attached report. The investigation generally consisted of the installation of four ground water monitoring wells and associated soil and ground water sampling, and chemical analyses of selected samples.

We trust that the attached report suits your needs. If you have any questions concerning the report or if we may be of further service to Shell Oil Company, please call.

Sincerely,
Ensco Environmental Services, Inc.

James K. Rike
Project Engineer

Lawrence D. Pavlak, C.E.G. 1187
Senior Program Geologist

Attachment

SOIL AND GROUND WATER INVESTIGATION AT FORMER SHELL SERVICE STATION 7194 AMADOR VALLEY BLVD. DUBLIN, CALIFORNIA

EXECUTIVE SUMMARY

Exceltech Inc., now Ensco Environmental Services Inc. (EES), has recently completed a soil and ground water investigation for Shell Oil Company at the former Shell Service Station located at 7194 Amador Valley Boulevard in Dublin, California. The investigation included, but was not limited to, a review of previous work at the site by another consultant, the installation of four ground water monitoring wells, and the collection of soil and ground water samples for chemical analysis. The findings of the investigation may be summarized as follows:

1) Underground fuel storage tanks which were previously located at the site have been excavated and removed from the site.

2) Silty clay underlies the site to a depth of 25 feet below grade.

3) Unconfined ground water occurs at the site at a depth between 9 and 11 feet below grade and flows to the south-east at a gradient of 0.0023.

4) Results of sample analyses indicate that total low to medium boiling point hydrocarbons (TPH), benzene, toluene, and xylene compounds are present in the soil and ground water at the site. TPH concentrations in the analyzed soil samples ranged from 18 parts-per-million (ppm) to 290 ppm. TPH concentrations in the analyzed ground water samples ranged from none detected to 0.44 ppm. Benzene concentrations exceeded the California Department of Health Services applied action level of 0.7 parts-per-billion in three of the four ground water samples analyzed. No floating product or sheen was evident in the monitoring wells at the time of sampling.

INTRODUCTION

At the request of Shell Oil Company (Shell), EES has completed a field investigation to assess potential site contamination at the former Shell Service Station located at 7194 Amador Valley Boulevard in Dublin, California. The location of the site is shown in Figure 1. The field investigation was conducted in accordance with a scope of work which was approved by Shell and was specified in the Shell Purchase Order #MOH 237138.

This report will present the background of the project, the scope of work, a description of the field investigation and sample analyses, a summary of findings, and conclusions.

BACKGROUND

Four underground storage tanks were excavated and removed from the site by Kaprealian Engineering, Inc. (Kaprealian), on August 3, 1987. Three 10,000 gallon fiberglass gasoline tanks were removed from one excavation and one 280 gallon steel waste oil tank was removed from another excavation. Upon excavation and removal of the tanks, strong product odors were observed which indicated that a possible petoleum hydrocarbon release had occured.

Four soil samples and one ground-water sample were collected from the gasoline tank excavation and one soil sample was collected from the waste oil tank excavation by Kaprealian. All of the samples were analyzed by Sequoia Analytical Laboratory (Sequoia) for total petroleum hydrocarbon (TPH) content. The soil samples from the gasoline tank excavation contained TPH (as gasoline) concentrations ranging from 270 parts-per-million (ppm) to 1,900 ppm and the water sample contained a TPH concentration of 85 ppm. The soil sample collected from the waste oil tank excavation contained a TPH (as diesel) concentration of 45 ppm and a gravimetric waste oil concentration of 75 ppm.

Subsequent to the initial tank excavation and sampling, approximately 4,600 cubic yards of soil were excavated and aerated at the site from August 28, 1987 to February 2, 1988. Shell then contracted EES to perform a site assessment to determine the lateral and vertical extent of any remaining soil and ground water contamination.

SCOPE OF WORK

The scope of work for the project included the installation of four ground-water monitoring wells, collection of soil samples during drilling, development and sampling of each of the four monitoring wells, sample analyses, and the preparation of this report. The locations of the monitoring wells were discussed and agreed upon by EES and Shell prior to commencement of drilling at the site.

FIELD INVESTIGATION

The field investigation was conducted between May 4, 1988 and May 9, 1988. Four ground-water monitoring wells, designated MW-1, MW-2, MW-3, and MW-4, were installed adjacent to the property boundaries along the north-east, south-east, north-west, and south-west sides of the site, respectively. Soil and ground-water samples were collected from each of the monitoring well locations, and the elevations of the tops of the well casings were surveyed. Figure 2 shows the location of each monitoring well along with the corresponding elevation of the top of the casing.

Exploratory Borings

A Mobile B-61 drilling rig, equipped with 6 5/8-inch inside diameter hollow stem auger, was used to drill the four soil borings required for soil sampling and monitoring well installation. The borings were logged by an EES geologist with soil descriptions classified according to the Unified Soil Classification System and Munsell Soil Color Charts. Prior to and during drilling at the site, all drilling and sampling equipment was cleaned to reduce the potential for cross-contamination between borings and between sampling intervals.

Soil samples were collected through the hollow stem auger at five foot intervals beginning at a depth of 4 feet. When the desired sample depth was reached, a modified California split-spoon sampler, equipped with three brass liner tubes, each six inches long and two inches in diameter, was used to collect and retain the soil sample. The sampler was advanced 18-inches into the undisturbed soils ahead of the auger by driving it with a 140-pound rig-operated hammer. After recovery from the borehole and the sampler, the soil was visually characterized and was also tested with a portable photo-ionization detector for the presence of volatile hydrocarbons. Upon completion of field characterization, the bottom sample liner was retained for chemical analysis. Both ends of the liner were covered with aluminum foil and a plastic cap, labeled with a unique sample number and pertinent sample information, placed in a plastic "zip-lock" bag, entered onto a Chain-Of-Custody form, and packed in a suitable container chilled with ice.

Each of the borings were drilled to an approximate depth of 25 feet. Ground water was first encountered in the borings at depths ranging from 10 to 15 feet. Strong product odor was observed at an approximate depth of 10 feet in the borings for MW-2, MW-3, and MW-4. Only a faint product odor or no product odor was detected in the other sampled intervals. The boring logs are attached as Appendix A.

Ground Water Monitoring Well Construction

Upon completion of each exploratory borehole, a ground-water monitoring well was constructed in the borehole. The monitoring wells were constructed using 4-inch diameter schedule 40 polyvinyl chloride (PVC) blank and factory-slotted casing with 0.020 inch slot size. Only flush-threaded couplings were used; no solvents or cements were used during well construction. The screened interval of the monitoring well was determined in the field, by the EES geologist, based on the characteristics of the uppermost saturated zone which was the one being monitored.

After the casing was installed, clean No. 2/12 sand was poured through the auger, as the auger was being removed, to fill the annulus between the casing and the borehole wall to 2 feet above the top of the screened interval. One foot of 1/2-inch bentonite pellets was then placed on top of the sand and hydrated. A cement grout seal was then placed in the remaining annulus to the surface. A steel protective cover, with a locking cap, was placed over the well head and into the cement grout to protect the well. The top of the protective cover was placed at a height of 1 to 2 feet above grade. Construction details of each monitoring well are contained in Appendix A along with the boring logs.

Well Development And Ground-Water Sampling

After completion of well construction, each well was developed to remove fine-grained material and turbid water, and to improve the hydraulic communication with the surrounding formation. A submersible purge pump was used to develop the wells. A minimum of 55 gallons, or approximately five well volumes of ground water were removed from each well.

Prior to ground-water sampling, the monitoring wells were checked for the presence of free floating petroleum product with a clear acrylic bailer. Product was not observed in any of the monitoring wells. The wells were then purged of approximately four more well volumes prior to sampling. Ground water samples were then collected using a clean teflon bailer. The water sample from each well was placed into two 40 milliliter (ml) vials with teflon septa caps, labeled with a unique sample number, entered onto a Chain-Of-Custody form, and placed in a suitable container chilled with ice.

Site Survey

The elevations of the tops of the PVC well casings and the tops of the protective covers were surveyed by Associated Consultants Group, Inc., from Dublin, California. The elevations were recorded to the nearest 0.01 foot and are corrected to the U.S.G.S. mean sea level datum. The reference benchmark (stamped "VL-PK-AM-VY 1977, Elevation 337.402 M.S.L.) is

located in the western median of Amador Valley Boulevard at Village Parkway adjacent to the site. The property boundary and the location of the monitoring wells on the property were also surveyed. The original survey map is included in Appendix C.

A well survey was also performed to identify existing wells of different types within a 1/2 mile radius of the site. The results of this survey are presented on Figure 1. The well survey information was obtained from the Alameda County Flood Control And Water Conservation District office in Pleasanton, California.

SITE GEOLOGY AND HYDROGEOLOGY

The exploratory borings for the ground water monitoring well installation were extended to a depth of approximately 25 feet. The soils observed during the drilling operation were primarily silty clays with occassional minor sand and gravel. Generally, the upper-most 16 to 18 feet was an organic, stiff to medium stiff, silty clay with a trace of very fine grained sand. This clay graded to a less organic silty clay, with decreased silt and no sand to the termination depth of the boring.

Ground water was encountered in the borings at depths ranging from between 10 to 15 feet. The static water level was measured in each of the monitoring wells on May 9, 1988, and was observed to be between 8.72 and 10.88 feet below the tops of the well casings. A ground-water elevation countour map is presented in Figure 4 which shows the ground-water gradient across the site. The apparent direction of ground-water flow is to the south-east at a gradient of .0023 (ground water drops approximately 0.2 feet across the site).

SAMPLE ANALYSES

Soil and ground-water samples collected at the site were analyzed at Sequoia Analytical Laboratory in Redwood City, California. A ground-water sample and the soil sample, collected from a depth of approximately 10 feet,

were analyzed from each monitoring well location. All of the samples were analyzed for total petroleum hydrocarbons (low to medium boiling points), with benzene, toluene, and xylenes (TPH and BTX) distinction, which quantifies hydrocarbons including gasoline. EPA Method 8015/8020 was used for the soil samples and EPA Method 8015/602 was used for the water samples. These methods use gas chromatography with a flame ionization detector. The method of analysis used for these parameters follows the methods described in Attachment 2 of the San Francisco Bay Area Regional Water Quality Control Board (RWQCB) Guidelines For Addressing Fuel Leaks.

SUMMARY OF RESULTS OF ANALYSES

TPH as gasoline (low to medium boiling point hydrocarbons), benzene, toluene, and xylenes were detected in all of the soil samples analyzed from the former gas station site. The samples were collected from a depth of approximately 10 feet at each monitoring well location. The TPH concentrations ranged from 18 parts-per-million (ppm) in monitoring well MW-1 to 290 ppm in monitoring well MW-4. Benzene concentrations ranged from .16 ppm to 5.7 ppm, toluene concentrations ranged from .19 to 10 ppm, and the concentration of xylenes ranged from 1.3 to 30 ppm.

Hydrocarbons were detected in water samples collected from monitoring wells MW-1, MW-3, and MW-4. TPH and BTX were not detected at levels above the method detection limit in the water sample collected from MW-2. TPH as gasoline was detected at concentrations of 440, 76, and 290 ppb in MW-1, MW-3, and MW-4 respectively. Benzene concentrations ranged from 10 to 120 ppb, toluene concentrations ranged from 4.4 to 50 ppb, and the concentrations of xylenes ranged from 15 to 120 ppb. A benzene concentration contour map is presented in Figure 3. The analytical results are summarized in Table 1. The Chain-Of-Custody forms and the laboratory analytical report is included in Appendix B.

CONCLUSIONS

The soils observed during the drilling operation consisted primarily of silty clay to a depth of 25 feet below grade. The static water level was approximately 9 to 10 feet below grade on May 9, 1988. The apparent ground-water gradient is approximately .0023 in the south-eastern direction.

Concentrations of TPH and BTX were detected in the soil samples collected from the four monitoring well locations at the site. The ground-water samples from three of the four monitoring wells (MW-1, MW-3, MW-4) were found to contain detectable concentrations of TPH and BTX. Based on our interpretation of RWQCB and the California Department of Health Services (DOHS) guidelines, the concentration of hydrocarbons in the soil may not warrant further excavation and remediation of the soil above the water table at the site; however, results of analyses indicate that the concentration of benzene in the ground water exceeds the applied action level of 0.7 ppb established by the DOHS.

LIMITATIONS

Ensco Environmental Services, Inc. (EES), formerly Exceltech, Inc., makes no warranty, expresed or implied, except that our services have been performed in accordance with generally accepted, existing engineering, geological, hydrogeological, health and safety principles and applicable regulations at the time and location of the study.

The chemical analytical data included in this report have been obtained from a state-certified laboratory. The analytical methods employed by the laboratory were in accordance with procedures suggested by the U.S. EPA and State of California. EES is not responsible for laboratory errors in procedure or result reporting.

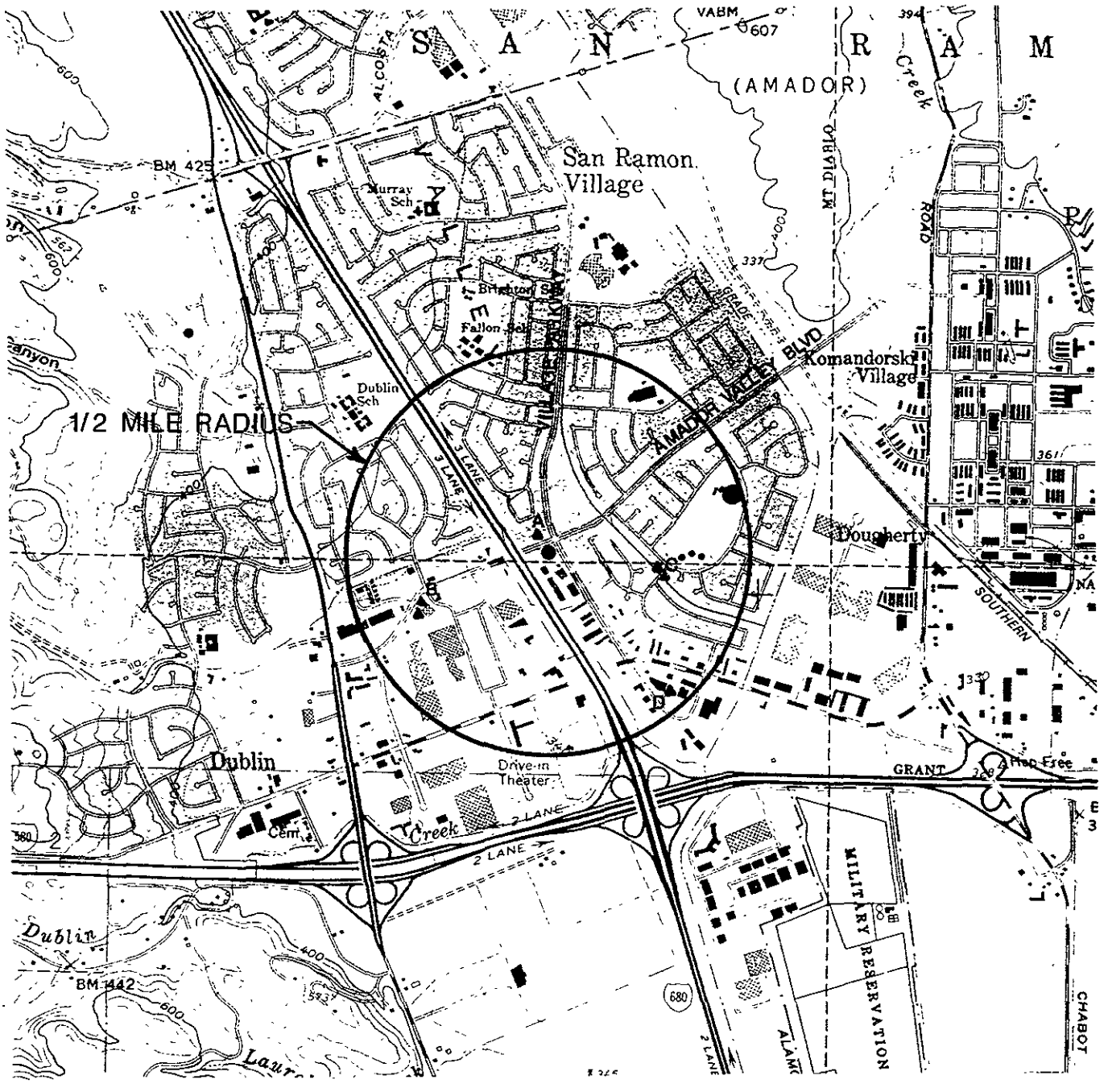
TABLE 1
RESULTS OF ANALYSES FOR SOIL AND GROUND WATER

FORMER SHELL SERVICE STATION
7194 AMADOR VALLEY BLVD
DUBLIN, CALIFORNIA

SAMPLE LOCATION	SAMPLE NUMBER	DEPTH OF SAMPLE	SAMPLE MATRIX	ANALYTICAL RESULTS (ppb) TVH	BENZENE	TOLUENE	XYLENES
MW-1	SDC-1002	9-10.5 FT.	SOIL	18,000	160	190	1,300
	SDC-1027	--	WATER	440	120	50	120
MW-2	SDC-1007	9-10.5 FT.	SOIL	95,000	1,500	410	11,000
	SDC-1028	--	WATER	ND<50	ND<0.5	ND<0.5	ND<0.5
MW-3	SDC-10012	10-11.5 FT.	SOIL	270,000	5,700	1,200	30,000
	SDC-1029	--	WATER	76	10	4.40	15
MW-4	SDC-1017	10-11.5 FT.	SOIL	290,000	3,800	10,000	23,000
	SDC-1030	--	WATER	290	76	33	150

TVH = Total Volatile Hydrocarbons
ppb = parts per billion
ND<0 5 = None Detected Above Indicated Detection Limit

Current California Department Of Health Services Action Levels For Water:
Benzene 0.7 ppb
Toluene 100 ppb
Xylenes 620 ppb
Note: Subject to change at DOHS discretion.



NOTE: SEE ATTACHED PAGE FOR WELL DESCRIPTIONS

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FIGURE 1 - SITE LOCATION & WELL SURVEY MAP

FORMER SHELL STATION	REVIEWED BY: LKR	APPROVED BY: LKR
7194 AMADOR VALLEY	K.S. #: 1826G	DRAWN BY: J.C.
DUBLIN, CALIFORNIA	DATE: 5-25-88	DRAWING #: FIG. 1

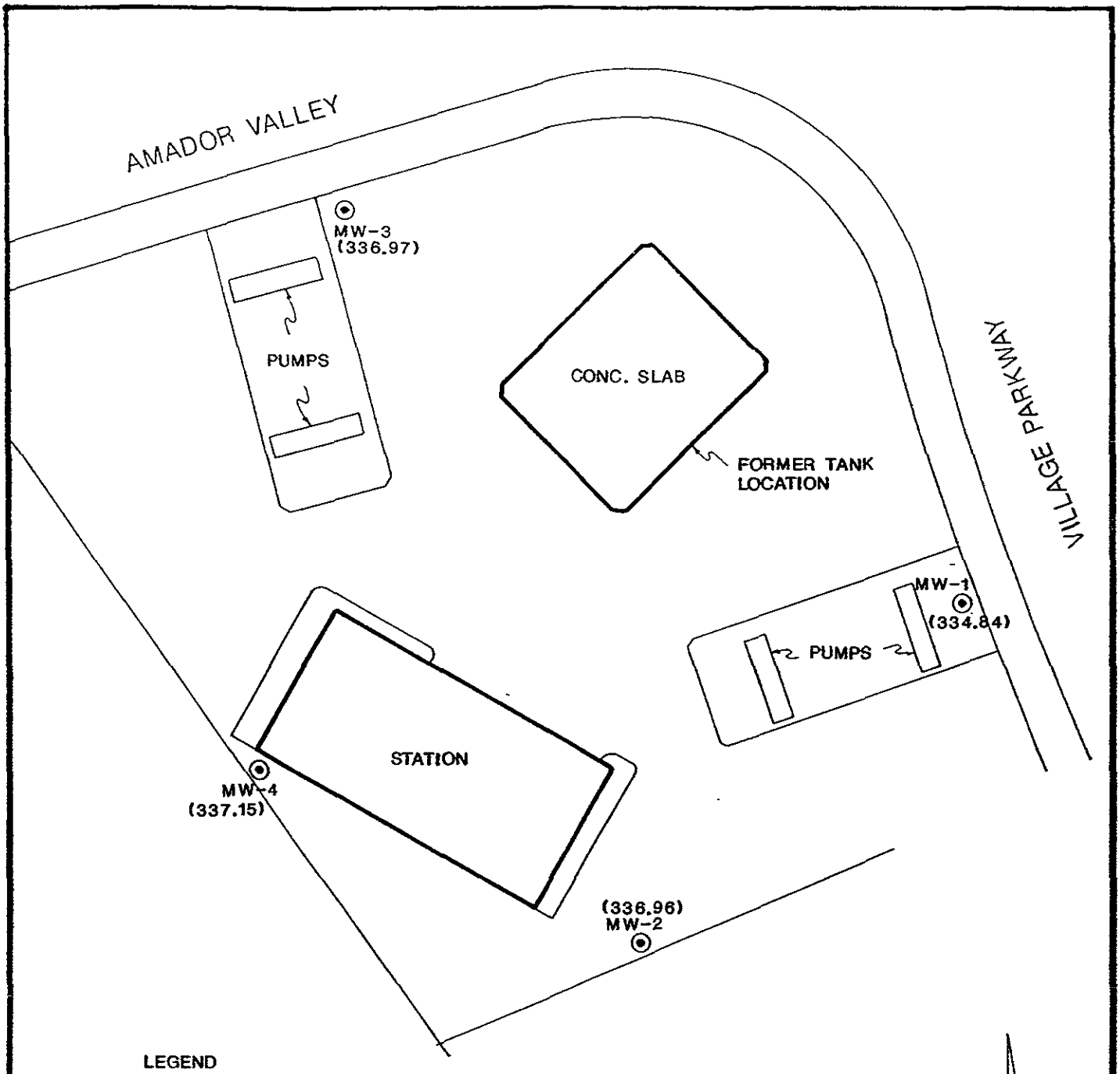
TABLE 2
SUMMARY OF WELL SURVEY WITHIN
1/2 MILE RADIUS OF FORMER SHELL SITE

SHELL OIL COMPANY
7194 AMADOR VALLEY BLVD.
DUBLIN, CALIFORNIA

FIGURE 1 DESIGNATION	WELL DESCRIPTION			
	OWNER OF WELLS AND LOCATION	NUMBER OF WELLS	TYPE OF WELLS	APPROXIMATE DEPTH OF WELLS
A	UNOCAL STATION #5366 7375 Amador Valley Blvd. Dublin, CA	4	Ground Water Monitoring Well	20 Feet
B	City Of Dublin Dublin Library	2	Test Water Wells	24 & 50 Feet
C	ACFC&WCD Flood Control Channel Mable Av. Dublin, CA	2	Test Water Wells	25 & 108 Feet
D	LUCKY STORES 600 Clark Av. Dublin, CA	1	Ground Water Monitoring Well	20 Feet

ACFC&WCD = Alameda County Flood Control & Water Conservation District

Note: The Location Of The Wells And Their Designation Are Shown On Figure 1.



Note: Site plan shows former layout
– demolition has removed station equipment.

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FIGURE 2 – WELL LOCATION MAP

FORMER SHELL STATION

7194 AMADOR VALLEY

DUBLIN, CALIFORNIA

REVIEWED BY	APPROVED BY
LKR	LKR
JOB # 1826G	DRAWN BY J.C.
DATE 5-24-88	DRAWING # FIG. 2

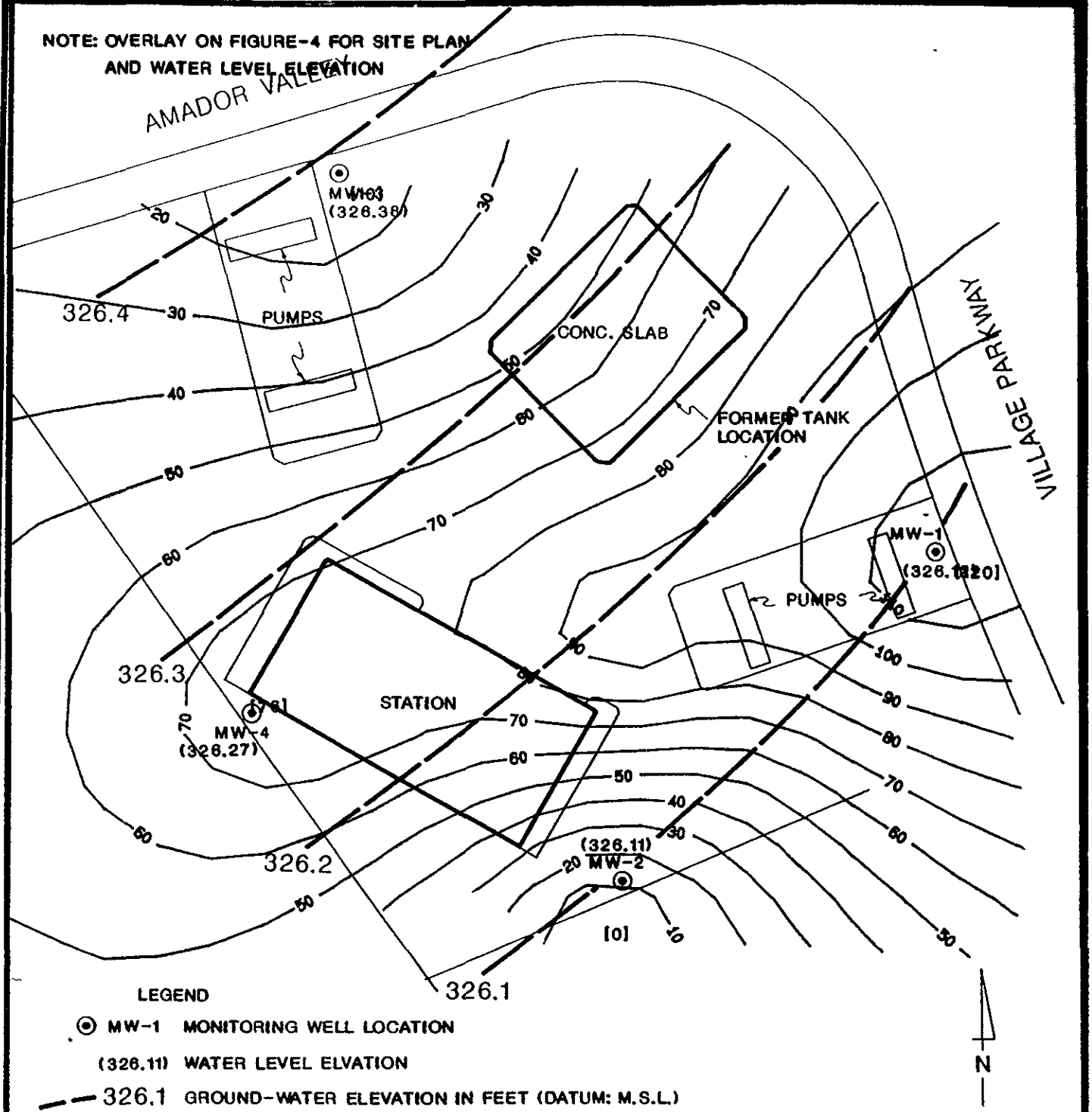

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FIGURE 4 – WATER LEVEL ELEVATION CONTOUR MAP

FORMER SHELL STATION

7194 AMADOR VALLEY

DUBLIN, CALIFORNIA

FIGURE 3 – BENZENE CONCENTRATION CONTOUR MAP

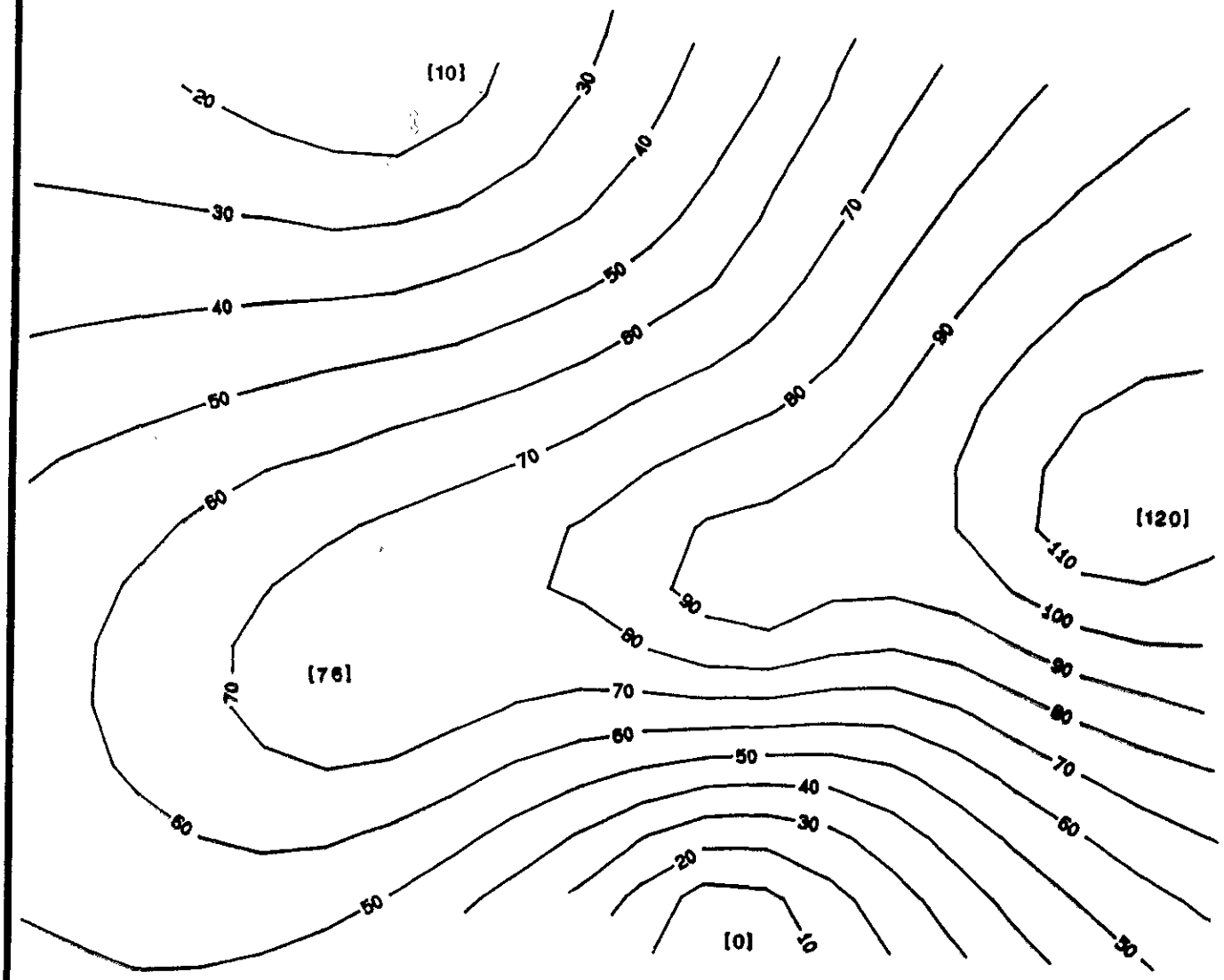
FORMER SHELL STATION

7194 AMADOR VALLEY

DUBLIN, CALIFORNIA

REVIEWED BY:	APPROVED BY:
JKR	JKR
JOB #: 1826G	DRAWN BY: LC
DATE: 5-24-88	DRAWING #: FIG. 4
5-31-88	FIG. 3

NOTE: OVERLAY ON FIGURE-4 FOR SITE PLAN
AND WATER LEVEL ELEVATION



——60—— BENZENE CONCENTRATION CONTOUR
[10] BENZENE CONCENTRATION IN PARTS-PER-BILLION

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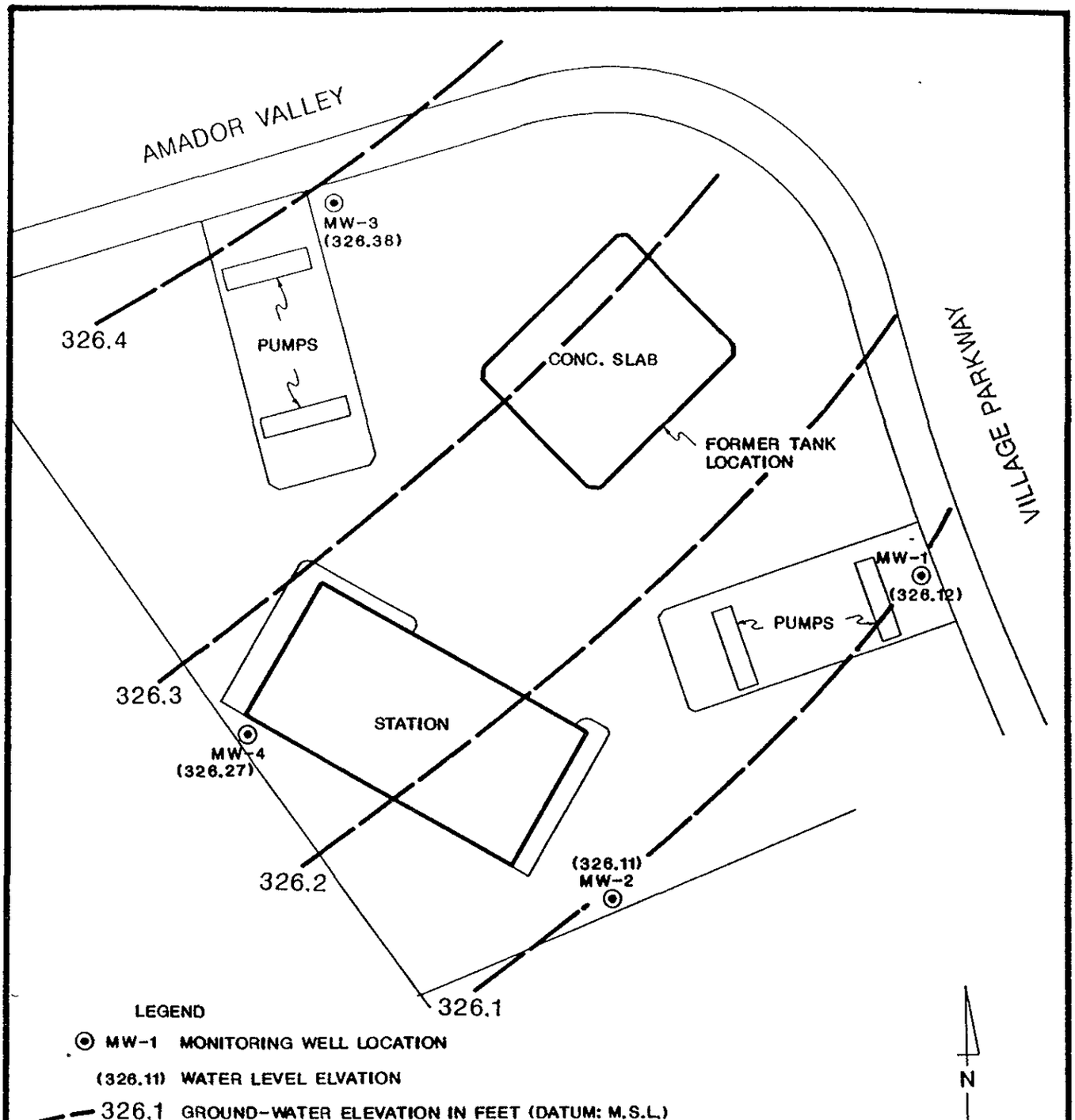
FIGURE 3 – BENZENE CONCENTRATION CONTOUR MAP

FORMER SHELL STATION
7194 AMADOR VALLEY
DUBLIN, CALIFORNIA

REVIEWED BY:	APPROVED BY:
K&P	DJB
JOB #: 1826G	DRAWN BY: JKR
DATE: 5-31-88	DRAWING #: FIG. 3



Note: Site plan shows former layout
- demolition has removed station equipment.

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FIGURE 4 – WATER LEVEL ELEVATION CONTOUR MAP

FORMER SHELL STATION

7194 AMADOR VALLEY

DUBLIN, CALIFORNIA

REVIEWED BY:	APPROVED BY:
JKR	JKR
JOB #: 1826G	DRAWN BY: J.C.
DATE: 5-24-88	DRAWING #: FIG. 4

APPENDIX A
BORING LOGS AND WELL CONSTRUCTION DETAILS

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EXPLORATORY BORING LOG

PROJECT NAME: Shell Oil Company
Dublin, CA
PROJECT NUMBER: 1826G

BORING NO. MW-1
DATE DRILLED: 28-Apr-88
LOGGED BY: J. Rike

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
1–4			CH	SILTY CLAY - very dark grey (2.5 YR N3), 5 to 10% medium gravel, medium stiff, plastic, moist, organic odor and slight product odor.		
5	SDC-1001	14				12
8				Static Water Level Measured 9-May-88 At 8.72 Feet.	▼	
10	SDC-1002	11				20
13				- grades to dark grayish brown (10YR, 4/2), mottled with oxidation staining, no product odor.		
15	SDC-1003	8				14
18			CL	SILTY CLAY - dark grey (7.5 YR N5), stiff, low plasticity, wet, no product odor.		
20	SDC-1004	19				8
				Continued Next Page		

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EXPLORATORY BORING LOG

PROJECT NAME: Shell Oil Company Dublin, CA
PROJECT NUMBER: 1826G

BORING NO. MW-1
DATE DRILLED: 28-Apr-88
LOGGED BY: J. Rike

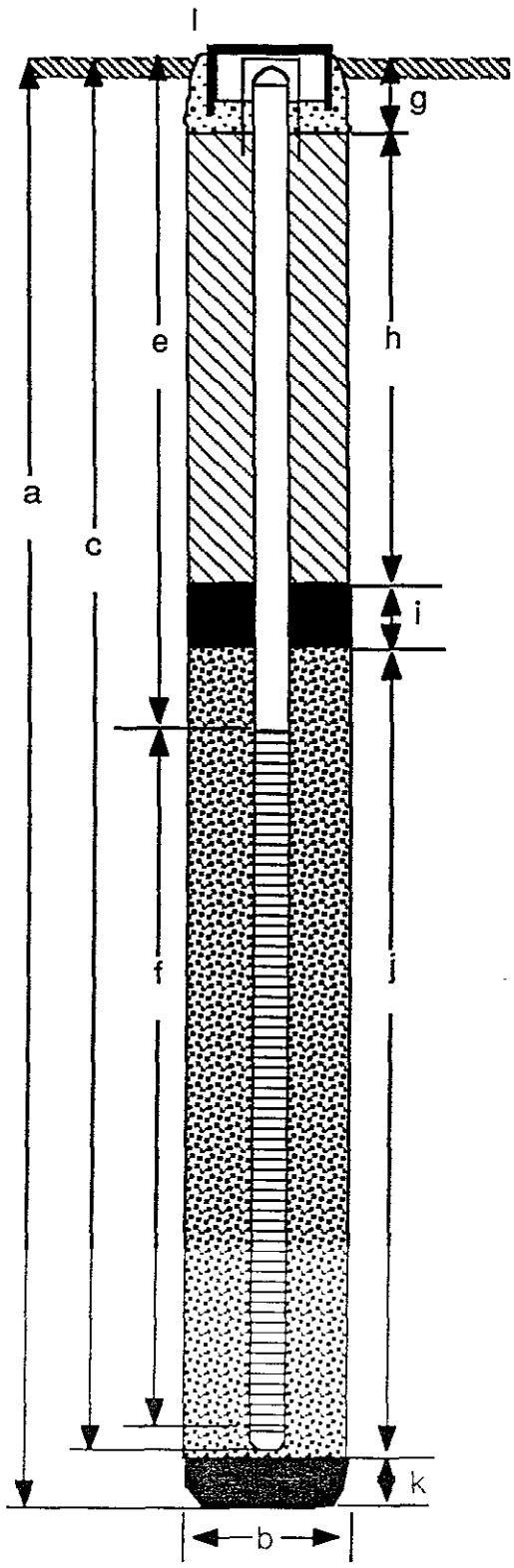
DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm	
21			CL	SILTY CLAY - dark grey (7.5 YR N5), stiff, low plasticity, wet, no product odor.			
22							
23							
24				- grades to dark greenish grey (5GY 5/1),			
25	SDC-1005	25				1	
26				Bottom Of Boring 25.5 Feet			

SUPERVISED AND APPROVED BY: L. D. Powers C.E.G. No. 1137

Monitoring Well Detail

PROJECT NUMBER 1826G
PROJECT NAME Shell Oil Company-Dublin
COUNTY Alameda
WELL PERMIT NO. 88082

BORING / WELL NO. MW-1
TOP OF CASING ELEV. 334.84
GROUND SURFACE ELEV. ---
DATUM Mean Sea Level



EXPLORATORY BORING

a. Total Depth 25.5 ft.
b. Diameter 10 in.
Drilling method Hollow Stem Auger

WELL CONSTRUCTION

c. Casing length 25.28 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 5 ft.
f. Perforated length 20 ft.
Perforated interval from 5 to 25 ft.
Perforation type machine slot
Perforation size 0.02 in.
g. Surface seal .5 ft.
Seal Material Concrete
h. Backfill 3 ft.
Backfill material Neat Cement Grout
i. Seal 1 ft.
Seal Material 1/2 In. Bentonite Pellets
j. Gravel pack 21 ft.
Pack material 2/20 Monterey Type Sand
k. Bottom seal --- ft.
Seal material n/a
l. Steel Protective Casing With Locking Cover

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EXPLORATORY BORING LOG

PROJECT NAME: Shell Oil Company
Dublin, CA
PROJECT NUMBER: 1826G

BORING NO. MW-2
DATE DRILLED: 28-Apr-88
LOGGED BY: J. Rike

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
1-4			CH	SILTY CLAY - very dark grey (2.5 YR N3), trace very fine sand, trace gravel (<5%), medium stiff, plastic, damp, organic odor and slight product odor, minor small wood fragments and oxidation staining.		
4-5	SDC-1006	9				5
9-10	SDC-1007	17		- stiff and strong product odor at 10 feet, moist Static Water Level Measured 9-May-88 At 10.85 Feet.	▼	60
14-15	SDC-1008	14		- grades to dark greyish brown (10YR 4/2), mottling with grey, stiff, moist, plastic, no product odor.		7
17-18			CL	SILTY CLAY - dark gray (5YR, 4/1), very stiff to stiff, plastic, moist, no product odor		
19-20	SDC-1009	24				0
				Continued Next Page		

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EXPLORATORY BORING LOG

PROJECT NAME: Shell Oil Company Dublin, CA
PROJECT NUMBER: 1826G

BORING NO. MW-2
DATE DRILLED: 28-Apr-88
LOGGED BY: J. Rike

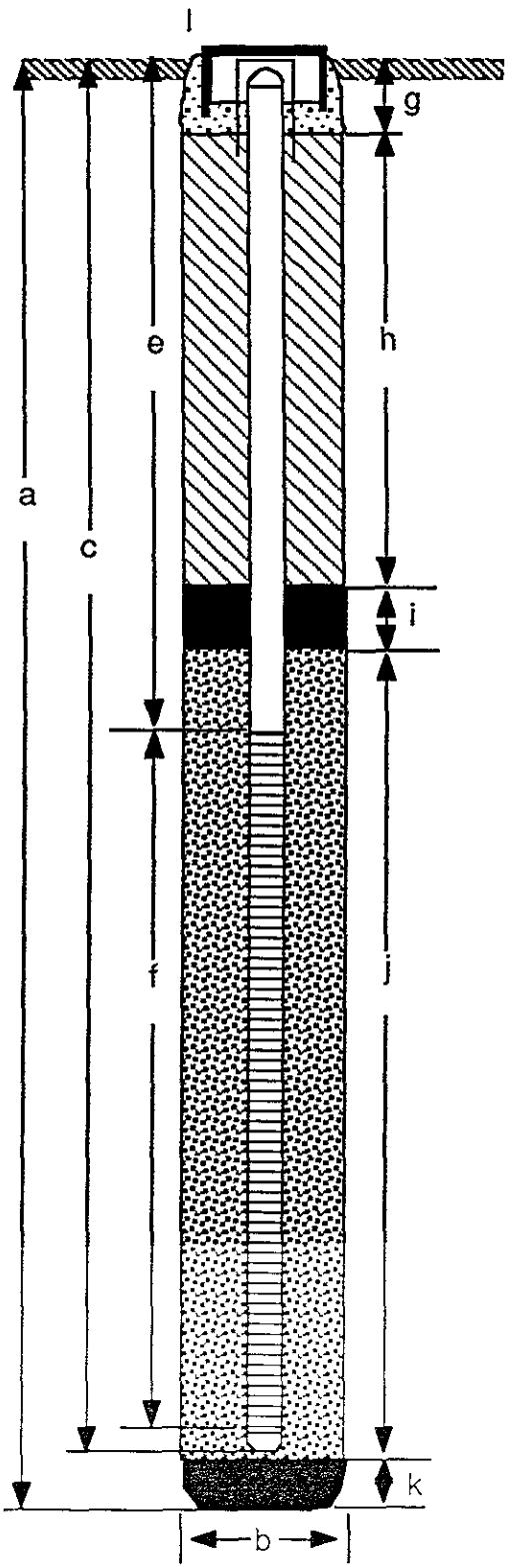
DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm	
21			CL	SILTY CLAY - dark grey (5 YR 4/1), stiff to very stiff, less plastic, moist, no product odor.			
22							
23				- grades to dark greenish grey (5GY 5/1),			
24							
25	SDC-1010	24				1	
26				Bottom Of Boring 25.5 Feet			

SUPERVISED AND APPROVED BY: L. C. Powell C.E.G. No. 1187

Monitoring Well Detail

PROJECT NUMBER 1826G
PROJECT NAME Shell Oil Company-Dublin
COUNTY Alameda
WELL PERMIT NO. 88082

BORING / WELL NO. MW-2
TOP OF CASING ELEV. 336.96
GROUND SURFACE ELEV. ---
DATUM Mean Sea Level



EXPLORATORY BORING

a. Total Depth 25.5 ft.
b. Diameter 10 in.
Drilling method Hollow Stem Auger

WELL CONSTRUCTION

c. Casing length 24.66 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 6 ft.
f. Perforated length 18 ft.
Perforated interval from 6 to 24 ft.
Perforation type machine slot
Perforation size 0.02 in.
g. Surface seal .5 ft.
Seal Material Concrete
h. Backfill 3 ft.
Backfill material Neat Cement Grout
i. Seal 1 ft.
Seal Material 1/2 In. Bentonite Pellets
j. Gravel pack 20 ft.
Pack material 2/20 Monterey Type Sand
k. Bottom seal --- ft.
Seal material n/a
l. Steel Protective Casing With Locking Cover

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EXPLORATORY BORING LOG

PROJECT NAME: Shell Oil Company Dublin, CA
PROJECT NUMBER: 1826G

BORING NO. MW-3
DATE DRILLED: 29-Apr-88
LOGGED BY: B. Von Thaden

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft./lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
1-3			OL	SILTY CLAY - very dark grey (2.5 YR N3), trace fine sand, trace gravel (<5%), stiff, low to moderate plasticity, damp, organic odor, no product odor.		
4-5	SDC-1011	19				1
6-8				- increasing moisture at 8 feet		
9-10	SDC-1012	14		- at 10 feet, strong product odor Static Water Level Measured 9-May-88 At 10.59 Feet.	▼	64
11-13				- grades to dark grayish brown (2.5YR, 4/2), mottled with oxidation staining, medium plasticity, firm, wet, no product odor.		
14-15	SDC-1013	8				3
16-17						
18			CL	SILTY CLAY - dark greenish grey (7.5 YR N5) mottled with dark grayish brown (2.5YR 4/2), low to medium plasticity, stiff, wet, no product odor		
19	SDC-1014	9				7
20						
				Continued Next Page		

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EXPLORATORY BORING LOG

PROJECT NAME: Shell Oil Company
Dublin, CA
PROJECT NUMBER: 1826G

BORING NO. MW-3
DATE DRILLED: 29-Apr-88
LOGGED BY: B. Von Thaden

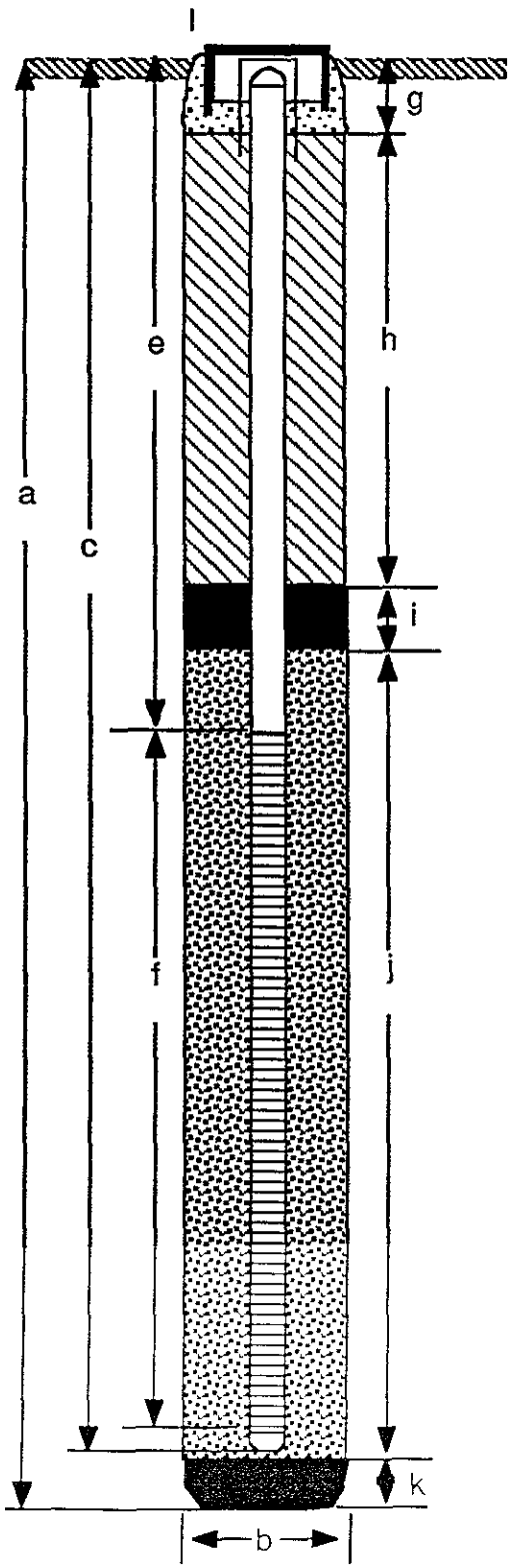
DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm	
21			CL	SILTY CLAY - dark greenish grey (7.5 YR N5) mottled with dark grayish brown (2.5YR 4/2), low to medium plasticity, stiff, wet, no product odor.			
22							
23							
24							
25	SDC-1015	21				0	
26				Bottom Of Boring 25.5 Feet			

SUPERVISED AND APPROVED BY L. D. Powell C.E.G. No. 1152

Monitoring Well Detail

PROJECT NUMBER 1826G
PROJECT NAME Shell Oil Company-Dublin
COUNTY Alameda
WELL PERMIT NO. 88082

BORING / WELL NO. MW-3
TOP OF CASING ELEV. 336.97
GROUND SURFACE ELEV. ---
DATUM Mean Sea Level



EXPLORATORY BORING

a. Total Depth 25.5 ft.
b. Diameter 10 in.
Drilling method Hollow Stem Auger

WELL CONSTRUCTION

c. Casing length 24.44 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 6 ft.
f. Perforated length 18 ft.
Perforated interval from 6 to 24 ft.
Perforation type machine slot
Perforation size 0.02 in.
g. Surface seal .5 ft.
Seal Material Concrete
h. Backfill 3 ft.
Backfill material Neat Cement Grout
i. Seal 1 ft.
Seal Material 1/2 In. Bentonite Pellets
j. Gravel pack 20 ft.
Pack material 2/20 Monterey Type Sand
k. Bottom seal --- ft.
Seal material n/a
l. Steel Protective Casing With Locking Cover

ensco environmental services, inc.

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EXPLORATORY BORING LOG

PROJECT NAME: Shell Oil Company
Dublin, CA
PROJECT NUMBER: 1826G

BORING NO. MW-4
DATE DRILLED: 29-Apr-88
LOGGED BY: B. Von Thaden

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
1-6	SDC-1016	15	CL	SILTY CLAY - grey brown, ~ 40% silt, trace fine sand, stiff, low plasticity, damp, slight product odor.		22
8-11	SDC-1017	15	OL	SILTY CLAY - very dark gray, low to medium plasticity, stiff, minor roots, damp to moist, strong product odor. Static Water Level Measured 9-May-88 At 10.88 Feet.	▼	62
13-15	SDC-1018	11		- grades to dark grayish brown (2.5YR, 4/2), slight mottling, medium plasticity, stiff, moist to wet, no product odor.		3
17-19	SDC-1019	5	CL	SILTY CLAY - dark greenish grey (7.5 YR N5) mottled with dark grayish brown (2 5YR 4/2), low to medium plasticity, medium stiff, wet, no product		0
20				Continued Next Page		

ensco environmental services, inc.

EXPLORATORY BORING LOG

PROJECT NAME: Shell Oil Company Dublin, CA
PROJECT NUMBER: 1826G

BORING NO. MW-4
DATE DRILLED: 29-Apr-88
LOGGED BY: B. Von Thaden

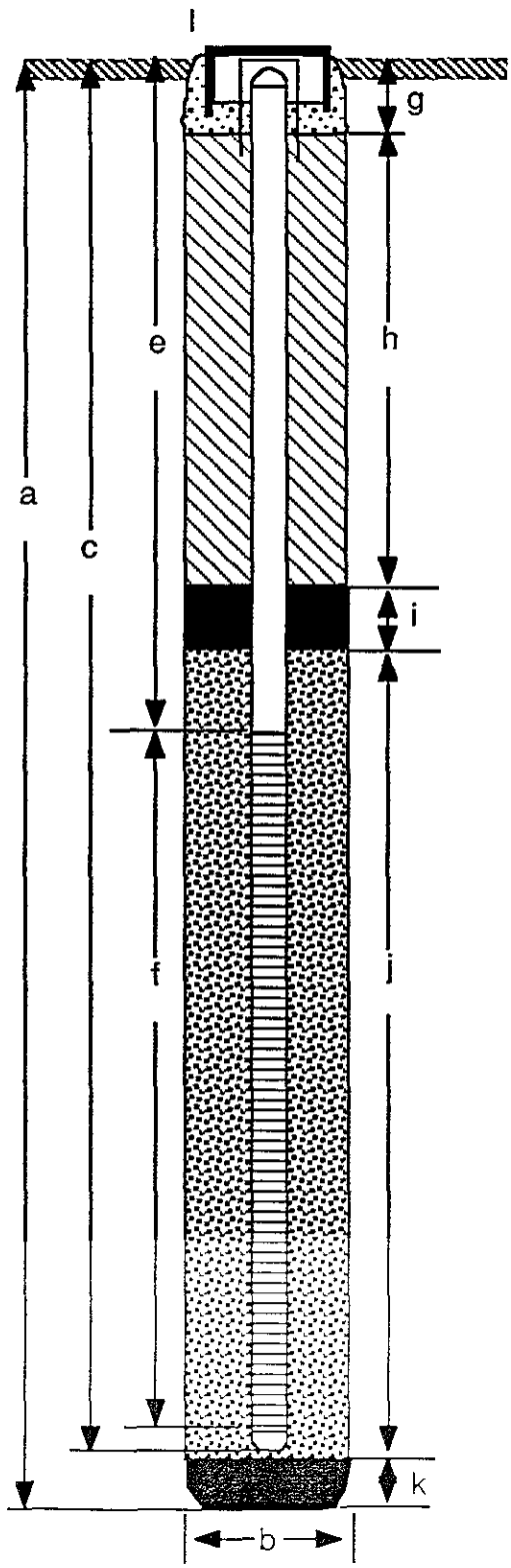
DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm	
21			CL	SILTY CLAY - dark greenish grey (7.5 YR N5) mottled with dark grayish brown (2.5YR 4/2), low to medium plasticity, medium stiff, wet, no product odor.			
22							
23							
24							
25	SDC-1020	18				0	
26				Bottom Of Boring 25.5 Feet			

SUPERVISED AND APPROVED BY: L. D. Forbes C.E G. No. 1197

Monitoring Well Detail

PROJECT NUMBER 1826G
PROJECT NAME Shell Oil Company-Dublin
COUNTY Alameda
WELL PERMIT NO. 88082

BORING / WELL NO. MW-4
TOP OF CASING ELEV. 337.15
GROUND SURFACE ELEV. ---
DATUM Mean Sea Level



EXPLORATORY BORING

a. Total Depth 25.5 ft.
b. Diameter 10 in.
Drilling method Hollow Stem Auger

WELL CONSTRUCTION

c. Casing length 24.90 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 6 ft.
f. Perforated length 18 ft.
Perforated interval from 6 to 24 ft.
Perforation type machine slot
Perforation size 0.02 in.
g. Surface seal .5 ft.
Seal Material Concrete
h. Backfill 3 ft.
Backfill material Neat Cement Grout
i. Seal 1 ft.
Seal Material 1/2 In. Bentonite Pellets
j. Gravel pack 20 ft.
Pack material 2/20 Monterey Type Sand
k. Bottom seal --- ft.
Seal material n/a
l. Steel Protective Casing With Locking Cover

ensco environmental services, inc.

APPENDIX B
LABORATORY ANALYTICAL REPORT

Sequoia

CHAIN OF CUSTODY RECORD

PO # 8480

PROJECT NO	PROJECT NAME	
1826G	Shell - Dublin	7194 Amador Valley Dublin, CA

SAMPLERS (Signature) Leonard Niles

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TEST REQUESTED: TVH w/BTX
MW-1	5/9	12:00P			2 ea. preserved VOA vials	X
MW-2	"	1:32P			"	X
MW-3	"	3:30P			"	X
MW-4	"	4:49P			"	X
	1988					

48 hr. TAT

REMARKS

SDC-1027
SDC-1028
SDC-1029
SDC-1030

RELINQUISHED BY	DATE	TIME	RECEIVED BY
Leonard Niles	5/9/88	6:30PM	[signature]

RELINQUISHED BY:	DATE	TIME	RECEIVED BY
RELINQUISHED BY:	DATE	TIME	RECEIVED BY LABORATORY

REMARKS

Report to Ken Rike

DISTRIBUTION

FORM DATED 1-28-87

ensco environmental services, inc.
41674 Christy Street
Fremont, CA 94538-3114
(415) 659-0404
Fax: (415) 651-4677
Contr. Lic. No. 464324

CHAIN OF CUSTODY RECORD

PO #8480

PROJECT NO: 1826 G

PROJECT NAME: SHELL OIL COMPANY - Dublin

SAMPLERS (Signature): James K Rike

7194 Amador Valley
Dublin, CA

48 hr. TAT

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TEST REQUESTED: TPH-418.1	REMARKS
SOC-1002	5/4/88	9 20	✓		mw-1 9-10.5'	✓	
SOC-1003	↓	1 35	✓		mw-1 14-15.5'	✓	
SOC-1007	5/4/88	12 50	✓		mw-2 9-10.5	✓	
SOC-1008	↓	13 15	✓		mw-2 14-15.5	✓	
SOC-1012	5/5/88	8 34	✓		mw-3 10-11.5	✓	
SOC-1013	↓	8 54	✓		mw-3 15-16.5	✓	
SOC-1017	5/5/88	12 34	✓		mw-4 10-11.5	✓	
SOC-1018	↓	12 43	✓		mw-4 15-16.5	✓	

RELINQUISHED BY	DATE	TIME	RECEIVED BY
James K Rike	5/9/88	0845	Leonard Niles

RELINQUISHED BY	DATE	TIME	RECEIVED BY
Leonard Niles	5/9/88	6:30	

RECEIVED BY LABORATORY

REMARKS: Report to Ken Rike

DISTRIBUTION

EXCELTECH
41638 CHRISTY STREET
FREMONT, CA 94538
(415) 659-0404
CONT LIC ######

FORM DATED 1-28-87

SEQUOIA Analytical Laboratory
2549 Middlefield Road
Redwood City, CA 94063 • (415) 364-9222 • FAX (415) 364-9233

ENSCO
41638 Christy Street
Fremont, CA 94538
Attn: Ken Rike

Date Sampled: 05/04/88
Date Received: 05/10/88
Date Reported: 05/11/88

Project: #1826G, Shell Oil Company, Dublin

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTX DISTINCTION

Sample Number	Sample Description
8050582	Soil, MW-1 SDC-1002 9-10.5'

	Detection Limit ppm	Sample Results ppm
Low to Medium Boiling Point Hydrocarbons	1	18
Benzene	0.1	0.16
Toluene	0.1	0.19
Xylenes	0.1	1.3

Method of Analysis: EPA 5020/8015/8020

SEQUOIA ANALYTICAL LABORATORY

Arthur G. Burton
Laboratory Director

SEQUOIA Analytical Laboratory
2549 Middlefield Road
Redwood City, CA 94063 • (415) 364-9222 • FAX (415) 364-9233

ENSCO
41638 Christy Street
Fremont, CA 94538
Attn: Ken Rike

Date Sampled: 05/04/88
Date Received: 05/10/88
Date Reported: 05/11/88

Project: #1826G, Shell Oil Company, Dublin

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTX DISTINCTION

Sample Number: 8050584

Sample Description: Soil, MW-2
SDC-1007
9-10.5'

	Detection Limit ppm	Sample Results ppm
Low to Medium Boiling Point Hydrocarbons	1	95
Benzene	0.1	1.5
Toluene	0.1	0.41
Xylenes	0.1	11

Method of Analysis: EPA 5020/8015/8020

SEQUOIA ANALYTICAL LABORATORY

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Laboratory Director

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2549 Middlefield Road
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ENSCO
41638 Christy Street
Fremont, CA 94538
Attn: Ken Rike

Date Sampled: 05/05/88
Date Received: 05/10/88
Date Reported: 05/11/88

Project: #1826G, Shell Oil Company, Dublin

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTX DISTINCTION

Sample Number	Sample Description
8050586	Soil, MW-3 SDC-1012 10-11.5'

	Detection Limit ppm	Sample Results ppm
Low to Medium Boiling Point Hydrocarbons	1	270
Benzene	0.1	5.7
Toluene	0.1	1.2
Xylenes	0.1	30

Method of Analysis: EPA 5020/8015/8020

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Laboratory Director

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ENSCO
41638 Christy Street
Fremont, CA 94538
Attn: Ken Rike

Date Sampled: 05/05/88
Date Received: 05/10/88
Date Reported: 05/11/88

Project: #1826G, Shell Oil Company, Dublin

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTX DISTINCTION

Sample Number	Sample Description
8050588	Soil, MW-4 SDC-1017 10-11.5'

	Detection Limit ppm	Sample Results ppm
Low to Medium Boiling Point Hydrocarbons	1	290
Benzene	0.1	3.8
Toluene	0.1	10
Xylenes	0.1	23

Method of Analysis: EPA 5020/8015/8020

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Arthur G. Burton
Laboratory Director

SEQUOIA Analytical Laboratory
2549 Middlefield Road
Redwood City, CA 94063 • (415) 364-9222 • FAX (415) 364-9233

ENSCO
41638 Christy Street
Fremont, CA 94538
Attn: Ken Rike

Date Sampled: 05/09/88
Date Received: 05/09/88
Date Reported: 05/12/88

Project: 1826G

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTX DISTINCTION

Sample Number	Sample Description
8050566	Water, MW-1, SDC-1027, Shell, Dublin

	Detection Limit ppb	Sample Results ppb
Low to Medium Boiling Point Hydrocarbons	50	440
Benzene	0.5	120
Toluene	0.5	50
Xylenes	0.5	120

Method of Analysis: EPA 5030/602/8015

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Laboratory Director

SEQUOIA Analytical Laboratory
2549 Middlefield Road
Redwood City, CA 94063 • (415) 364-9222 • FAX (415) 364-9233

ENSCO
41638 Christy Street
Fremont, CA 94538
Attn: Ken Rike

Date Sampled: 05/09/88
Date Received: 05/09/88
Date Reported: 05/12/88
Project: 1826G

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTX DISTINCTION

Sample Number	Sample Description
80050567	Water, MW-2, SDC-1028, Shell, Dublin

	Detection Limit ppb	Sample Results ppb
Low to Medium Boiling Point Hydrocarbons	50	< 50
Benzene	0.5	< 0.5
Toluene	0.5	< 0.5
Xylenes	0.5	< 0.5

Method of Analysis: EPA 5030/602/8015

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Laboratory Director

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2549 Middlefield Road
Redwood City, CA 94063 • (415) 364-9222 • FAX (415) 364-9233

ENSCO
41638 Christy Street
Fremont, CA 94538
Attn: Ken Rike

Date Sampled: 05/09/88
Date Received: 05/09/88
Date Reported: 05/12/88

Project: 1826G

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTX DISTINCTION

Sample Number	Sample Description
8050568	Water, MW-3, SDC-1029, Shell, Dublin

	Detection Limit ppb	Sample Results ppb
Low to Medium Boiling Point Hydrocarbons	50	76
Benzene	0.5	10
Toluene	0.5	4.4
Xylenes	0.5	15

Method of Analysis: EPA 5030/602/8015

SEQUOIA ANALYTICAL LABORATORY

Arthur G. Burton
Laboratory Director

SEQUOIA Analytical Laboratory
2549 Middlefield Road
Redwood City, CA 94063 • (415) 364-9222 • FAX (415) 364-9233

ENSCO
41638 Christy Street
Fremont, CA 94538
Attn: Ken Rike

Date Sampled: 05/09/88
Date Received: 05/09/88
Date Reported: 05/12/88

Project: 1826G

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTX DISTINCTION

Sample Number	Sample Description
8050569	Water, MW-4, SDC-1030, Shell, Dublin

	Detection Limit ppb	Sample Results ppb
Low to Medium Boiling Point Hydrocarbons	50	290
Benzene	0.5	76
Toluene	0.5	33
Xylenes	0.5	150

Method of Analysis: EPA 5030/602/8015

SEQUOIA ANALYTICAL LABORATORY

Arthur G. Burton
Laboratory Director

APPENDIX C
SURVEYORS MAP

BENCH MARK

A STANDARD BRASS DISC IN W
CENTER ISLAND OF AMADOR VALLE
BLVD. @ VILLAGE PARKWAY, 15' FRO
NOSE AND 0.8'± FROM N'LY CURB.
STAMPED "VL-PK-AM-VY 1977"
ELEVATION = 337.402 M.S.L.

VILLAGE

EXP. 6/30/92

STATE OF CALIFORNIA

PREPARED UNDER THE DIRECTION OF:

David W. Enke

DAVID W. ENKE L.S. 4071 EXP. 6/30/92

ASSOCIATED CONSULTANTS GROUP
11850 DUBLIN BOULEVARD
DUBLIN, CA 94568
(415) 829-0230

OIL CHANGERS MONITORING
WELL LOCATION

SW CORNER VILLAGE PARKWAY
AT AMADOR VALLEY BLVD.

DUBLIN, CALIFORNIA
SCALE: 1" = 20'

ENSCO ENVIRONMENTAL SERVICE
41674 CHRISTY STREET
FREMONT, CA 94538-3114