WORK PLAN TO INSTALL GROUNDWATER MONITORING WELLS
EXXON RETAIL SITE 7-0210
7840 AMADOR VALLEY BOULEVARD
DUBLIN, CALIFORNIA

Prepared for

Exxon Company, U.S.A.

Prepared by

EA Engineering, Science, and Technology

February 1992
81002.23

1. requested a Time table for annual monitoring plan.
2. Send this along with the monitoring results.

Ravi

EXXON COMPANY, U.S.A.
POST OFFICE BOX 4032 . CONCORD, CA 94524-2032

ENVIRONMENTAL ENGINEERING

MARLA D. GUENSLER
ENVIRONMENTAL ENGINEER
(510) 246-8776

March 5, 1992

Exxon RAS #7-0210
7840 Amador Valley Blvd.
Dublin, California

Approved
3/13/92
Ravi

Mr. Ravi Arulanantham
Alameda County Health Agency
Division of Hazardous Materials
80 Swan Way, Room 200
Oakland, California 94621

Dear Mr. Arulanantham:

Attached for your review and comment is the **Work Plan to Install Groundwater Monitoring Wells** for the above referenced site in Dublin. The work plan, prepared by EA Engineering, Science, and Technology of Lafayette, California, details tasks to be completed in the near future at the site.

If you have any questions or comments, or need further information regarding this, please do not hesitate to contact me at the above listed phone number.

Sincerely,

Marla D. Guensler

Attachment

c - w/attachment:
Mr. Tom Hathcox - Dougherty Regional Fire Authority
9399 Fircrest Lane
San Ramon, California 94583
Ms. Penny Silzer - San Francisco Bay Region
Regional Water Quality Control Board
2101 Webster Street #500
Oakland, California 94612

w/o attachment:
Mr. P. J. Brininstool
Mr. L. W. Lindeen
Mr. J. DeCarl - EA Engineering, Science, & Technology
41 Lafayette Circle
Lafayette, California

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EXXON RETAIL SITE 7-0210
7840 AMADOR VALLEY BOULEVARD
DUBLIN, CALIFORNIA

Prepared for

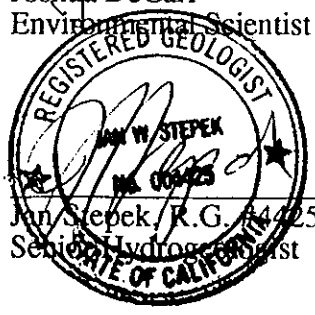
Exxon Company, U.S.A.
2300 Clayton Road
Concord, California 94520

Prepared by

EA Engineering, Science, and Technology
41 Lafayette Circle
Lafayette, California
(510) 283-7077

Joshua DeCarl
Environmental Scientist

28 Feb 92
Date



Jan Stepek, R.G. #4425
Senior Hydrogeologist

28 Feb 92
Date

January 1992

CONTENTS

SITE CONTACTS

Station Number:	Exxon Retail Site 7-0210
Station Address:	7840 Amador Valley Boulevard Dublin, California
Exxon Environmental Engineer:	William Y. Wang Senior Environmental Engineer Environmental Engineering Exxon Company, U.S.A. 2300 Clayton Road Concord, California 94520 (510) 246-8768
Consultant to Exxon:	EA Engineering, Science, and Technology 41 Lafayette Circle Lafayette, California 94549 (510) 283-7077
EA Project Supervisor:	Joshua DeCarl
Regulatory Oversight:	Penny Silzer San Francisco Bay Region Regional Water Quality Control Board 2101 Webster Street #500 Oakland, California 94612 (510) 464-1255 Ravi Arulanantham Division of Hazardous Materials Alameda County Health Agency 80 Swan Way, Room 200 Oakland, California 94621 (510) 271-4320 Tom Hathcox Dougherty Regional Fire Authority 9399 Fircrest Lane San Ramon, California 94583 (510) 829-2333

1. INTRODUCTION

At the request of Exxon Company, U.S.A., EA Engineering, Science, and Technology (EA) has prepared this work plan to install groundwater monitoring wells at Exxon Retail Site (RS) 7-0210, Dublin, California. Boreholes for the wells will be drilled and sampled to define the extent of petroleum hydrocarbons in the soil indicated by earlier preassessment drilling and closure sampling. The boreholes will be completed as monitoring wells to determine whether the groundwater beneath the site has been affected.

1.1 SITE DESCRIPTION

Exxon RS 7-0210 is an active service station located at 7840 Amador Valley Boulevard, on the east corner of the intersection of Amador Valley Boulevard and Regional Street (Figures 1 and 2), approximately one-quarter mile west of Interstate 680 and one-quarter mile north of Interstate 580. Three grades of gasoline fuel are stored in double-walled fiberglass-reinforced plastic (FRP) USTs and dispensed from pumps at two pump islands.

The immediate vicinity of the site is commercial in character, consisting of shopping malls and parking lots immediately surrounding the site. A Unocal service station with USTs is located on the west corner of the intersection (Figure 2).

The nearest surface water is Dublin Creek, which is located approximately 2,500 feet south of the site and flows in a generally easterly direction. The site is approximately 360 feet above sea level.

1.2 SITE HISTORY

Exxon RS 7-0210 was owned and operated by Texaco until 1988, when it was purchased by Exxon. In October 1991, three single-walled steel USTs and their associated piping were replaced with 12,000-gallon double-walled FRP tanks and piping. The tanks currently store Exxon Extra Unleaded, Exxon Regular Unleaded, and Exxon Plus gasolines (Figure 3).

2. PREVIOUS INVESTIGATIONS

2.1 PRODUCT DISPENSER AND PIPING REPLACEMENT

In February 1990, Exxon replaced the old product piping and dispensers with new dispensers and product piping outfitted with a vapor recovery system. At that time EA collected 12 samples (SP1-SP12) from the pea gravel and soil stockpiles excavated from the product piping trenches. The 12 samples were composited by the laboratory. Three composited samples were analyzed for Total Petroleum Hydrocarbons as gasoline (TPH-g) by EPA Method 8015, for benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020, and for total lead. No concentrations of petroleum hydrocarbons greater than 4.3 mg/kg were measured in any of the composite samples (Table 1). Lead was detected at concentrations from 5.1 to 11 mg/kg, which is within the low range of natural levels in soil (2-200 mg/kg, Dragun, J. 1988).

2.2 INVESTIGATIVE BORING

On 16 October 1991, Alton Geoscience conducted a preliminary soil assessment by drilling and sampling one soil boring (SB1, Figure 3) southeast of the UST field. Three soil samples collected from the boring at depths of 5.5-6 feet, 10-10.5 feet, and 15.5-16 feet below ground surface (bgs) were analyzed for Total Petroleum Hydrocarbons as gasoline (TPH-g) by EPA Method 8015 and for benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020. TPH-g was found in the sample collected at 15.5-16 feet bgs from greenish-brown, silty clay soil at a concentration of 69 mg/kg (Table 2). The drilling log of the exploratory boring is included as Appendix A.

2.3 REPLACEMENT OF UNDERGROUND STORAGE TANKS

From 28 to 30 October 1991, Redwood Builders and John's Excavation, overseen by EA, removed the three single-walled steel underground storage tanks (USTs) and installed three 12,000-gallon double-walled FRP tanks (see Figure 3). No signs of leaks or damage were observed in the steel USTs as they were removed. EA collected 21 soil samples from the bottom of the old (former) and new tank pit excavations and from the piping trenches (Figures 4 through 6) (EA 1991). EA also collected 14 samples from stockpiled soil that had been excavated from the new UST pit; this soil was used to backfill the former UST pit after the samples were analyzed, and no petroleum hydrocarbons were found at concentrations greater than method detection limits. To profile other soil excavated from the former UST pit and fuel piping trenches for disposal, 56 samples were collected and composited by the laboratory. Fourteen samples were analyzed for TPH-g and for BTEX. The analytical results of soil samples collected during the tank replacement are summarized in Tables 3 through 7.

2.4 SUBSURFACE CONDITIONS

2.4.1 Shallow Soils

Petroleum hydrocarbons were found in samples collected from silty-sandy soils at the southeastern end of the former UST field (TG2, TG4, and TG9; Table 3, Figure 4). TPH-g was found at concentrations up to 1,000 mg/kg (TG4, collected at 14 feet below ground surface (bgs) beneath the regular fuel tank). The excavation was deepened to 16 feet bgs, and soil samples were collected and analyzed. In sample TG9, collected at 16 feet bgs, 300 mg/kg TPH-g was found. Concentrations of petroleum hydrocarbons were measured in the soil sample collected 15.5-16 feet bgs from silty clay in the boring SB1 (Table 2, Figure 3), which was drilled approximately 10 feet southeast of the former tank field. Figure 7 shows the location of geologic cross-section A-A', and Figure 8 is a geologic cross-section of the area between the former product storage tank and boring SB1.

2.4.2 Hydrogeology

Exxon RS 7-0210 is located within the Dublin subbasin, which is the west part of the Livermore Valley Basin at the foot of the Dublin Hills. The sediments underlying the Livermore Valley Basin consist of Recent alluvium of Pleistocene to Pliocene age, consisting of thick gravel deposits, interbedded with sand and clay. The site itself is underlain by alluvial sediments, consisting of sandy-to-silty clays, with lenses of gravelly sand a few feet thick, to the explored depth of 16 feet.

Groundwater is found mostly under unconfined conditions in the Dublin area (ACFCWCD 1984). Judging from the Alameda County Flood Control and Water Conservation District groundwater level contours (ACFCWCD 1990), the indicated direction of groundwater flow is southeast. Groundwater under unconfined conditions was encountered at the site approximately 15 feet bgs in the soil boring and during the tank replacement.

3. WORK PLAN

EA proposes to install four groundwater monitoring wells to provide more information on the distribution of petroleum hydrocarbons in the soil and to determine whether the groundwater beneath Exxon RS 7-0210 has been affected. One well (MW1) will be installed approximately 10 feet southeast of the former UST field (Figure 9); groundwater is expected to flow to the southeast, and therefore MW1 will be downgradient of the former tank field (Figure 4). Two wells (MW2 and MW3, Figure 9) are proposed farther downgradient so that the groundwater/hydraulic gradient can be triangulated and to assess the potential extent of dispersion. EA also proposes the installation of a fourth well (MW4) located upgradient at the north end of the site adjacent to the Amador Valley Boulevard entrance (Figure 9). Well locations were chosen on the assumption that groundwater flows toward the southeast.

The boreholes for the wells will be drilled by a contractor with a C-57 license using a rotary drill and 10.25-inch hollow-stem augers. The borings will be drilled 11 feet below the static groundwater level, which is anticipated to be 15 feet below ground surface.

Soil samples collected from unsaturated soils and at the water table during drilling will be shipped to Pace Incorporated, a laboratory certified by the State of California Department of Health Services, and the samples will be analyzed for Total Petroleum Hydrocarbons as gasoline (TPH-g) and for benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Methods 8015 (DHS modified) and 8020. Selected samples will also be analyzed for organic lead.

Each well will be completed with 15 feet of 4-inch-diameter Schedule 40 PVC screen; 10 feet of screen will extend below static water, and 5 feet will extend above. Blank PVC casing will complete the well from the top of the screen to the surface. The annular space around the screen will be filled with clean sand from 1 foot below the screen to 1-2 feet above it; the filter pack will be sealed with 1 foot of hydrated bentonite pellets. The wells will then be sealed to the surface with neat cement grout (Figures 10 and B-1). The well top will be secured with a locking cap and a traffic-rated, water-tight well box, and equipped with a well tag containing pertinent information on well construction details. The well screen, sand pack, and seal will be selected and installed according to standard EA protocols (Appendix B), which are consistent with guidelines of ACFCWCD Zone 7.

No sooner than 72 hours after installation, the wells will be developed by surging with a valved surge block and by purging water and suspended sediment with a hand bailer or a submersible pump. The surging and purging will be repeated until the water is free of turbidity and suspended sediment. On the following day, 3-5 casing volumes of groundwater will be purged from each monitoring well prior to the collection of groundwater samples. Groundwater samples will be collected from each well with clean Teflon bailers, and the samples will be analyzed, in accordance with the "Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites" (RWQCB 1990), for TPH-g and BTEX. The horizontal and vertical positions of all wells on the site will be surveyed after the grout has been allowed time to set.

The wells will be installed, and soil and groundwater will be sampled in strict accordance with standard EA protocols for well drilling, completion, development, and sampling (Appendix B), which are consistent with the Tri-Regional Board Staff recommendations (RWQCB 1990) and guidelines of ACFCWCD Zone 7.

A final report of the investigation including the following information will be prepared:

- introduction which includes a scope of work, site history, and land uses of immediate vicinity
- summary of previous investigations
- procedures/methods of borehole drilling, well completion, soil sampling, well development, and groundwater sampling
- analytical methods applied to soil and groundwater samples
- tables that summarize the analytical results of soil and groundwater samples and depths to water and calculated groundwater elevations
- figures, including a site location map, vicinity/land use map, site map indicating locations of wells installed, site map indicating groundwater elevations and direction of groundwater flow, geologic cross-sections indicating the stratigraphy encountered, and site maps indicating the distribution of liquid-phase and dissolved hydrocarbons, as appropriate

Copies of the report will be distributed to the following agencies:

Penny Silzer
San Francisco Bay Region
Regional Water Quality Control Board
2101 Webster Street #500
Oakland, California 94612
(415) 464-1255

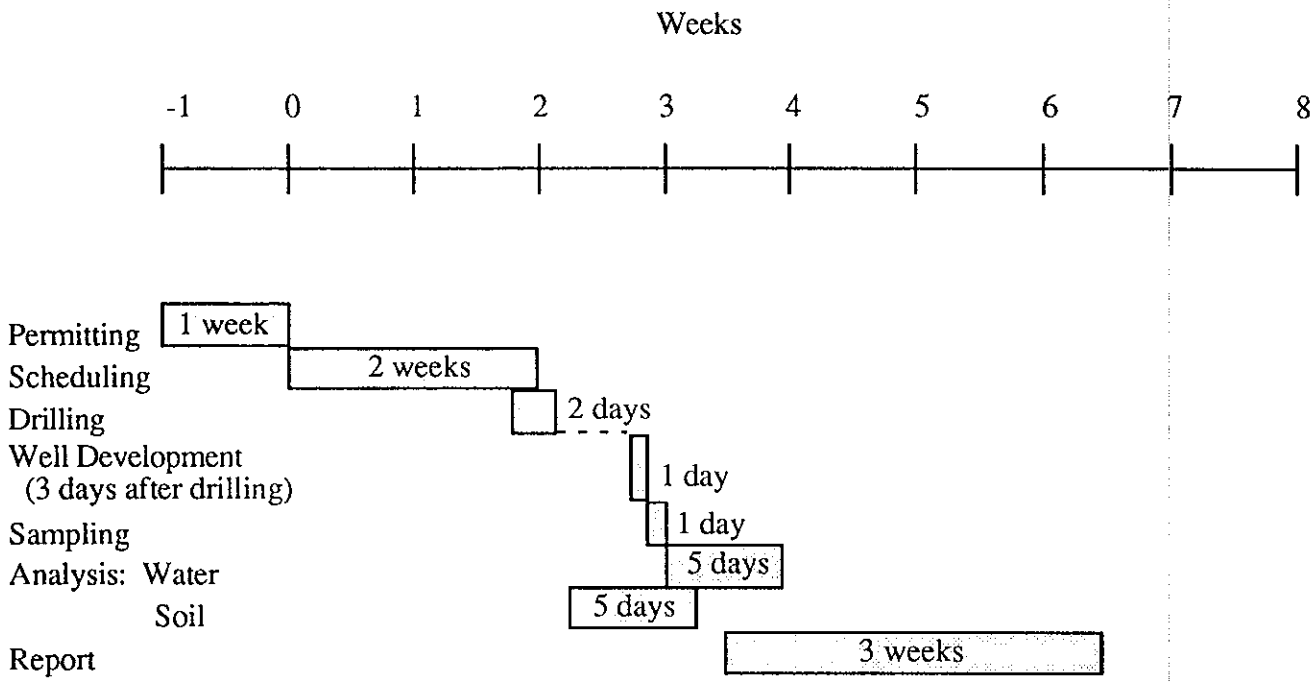
Ravi Arulanantham
Division of Hazardous Materials
Alameda County Health Agency
80 Swan Way, Rm 200
Oakland, California 94621
(510) 271-4320

Copies of the well logs and site map that indicates locations of monitoring wells as they have been installed will be sent to:

Alameda County Flood Control and Water Conservation District
5997 Parkside Drive
Pleasanton, California 94566

4. SCHEDULE

EA can begin field work within two weeks after the work plan is approved by the Alameda County Health Agency and the well permits are issued, depending on the availability of the licensed driller.



Projected Schedule of Phase I Investigation

REFERENCES

ACFCWCD (Alameda County Flood Control and Water Conservation District). 1984. Groundwater in the San Leandro and San Lorenzo Alluvial Cones of the East Bay Plain of Alameda County. Western Alameda County Water Resources.

ACFCWCD (Alameda County Flood Control and Water Conservation District). 1990. Groundwater level contours.

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Dragun, J. 1988. The Soil Chemistry of Hazardous Materials. Hazardous Materials Control Research Institute, Silver Spring, Maryland.

EA (EA Engineering, Science, and Technology). 1991. Report of Closure Sampling, Exxon Retail Site 7-0210. Prepared for Exxon Company, U.S.A., Construction and Maintenance. EA, Lafayette, California.

Geological Society of America. 1963. Guide Book to Field Trips in Alameda and Contra Costa Counties, California.

RWQCB (California Regional Water Quality Control Board). 1990. Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites. RWQCB, Oakland, California.

FIGURES

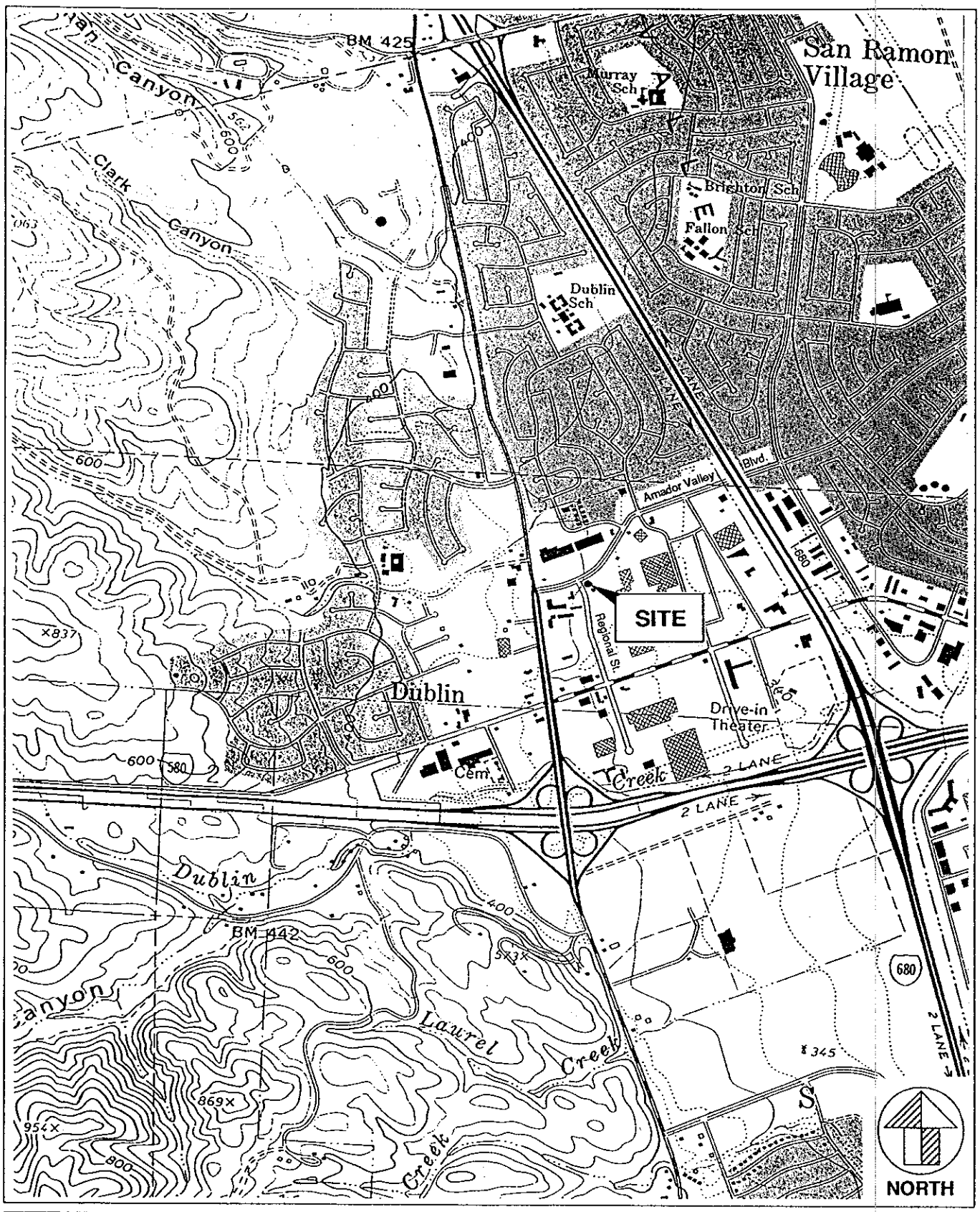

Figure 1. Location and topography, Exxon RS 7-0210, 7840 Amador Valley Boulevard, Dublin, California. (USGS 1980, Dublin Quadrangle 1:24,000)

0 1,500 3,000
Feet

ENVIRONMENTAL SERVICES
Western Division

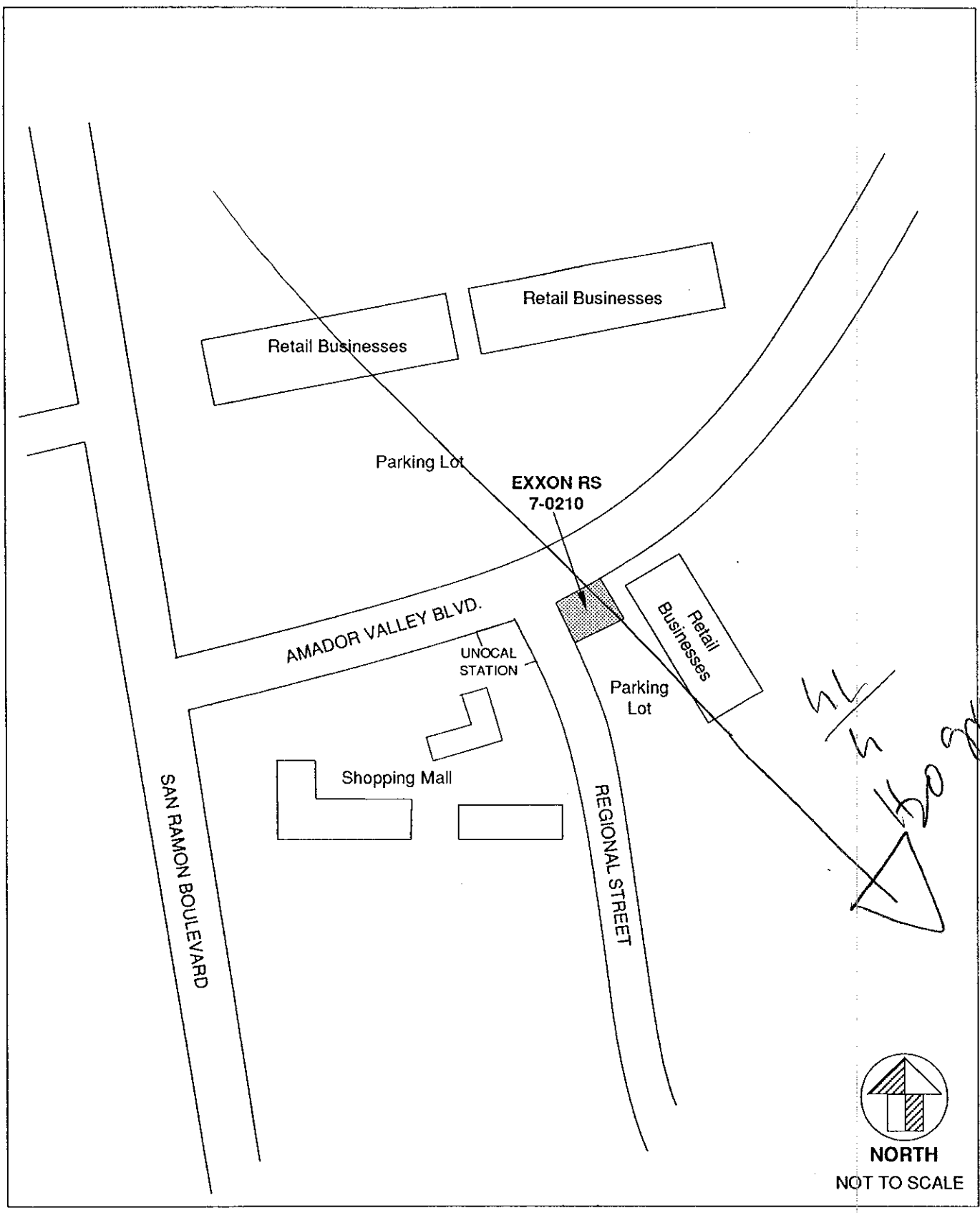

Figure 2. Land use and site vicinity, Exxon RS 7-0210, 7840 Amador Valley Blvd., Dublin, California.

Drawn	RK	Date	1/17/92
Reviewed	JPC	Date	26 Feb 92
Rev. 1		Date	
Final	TRW	Date	28 Feb 92

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Western Division

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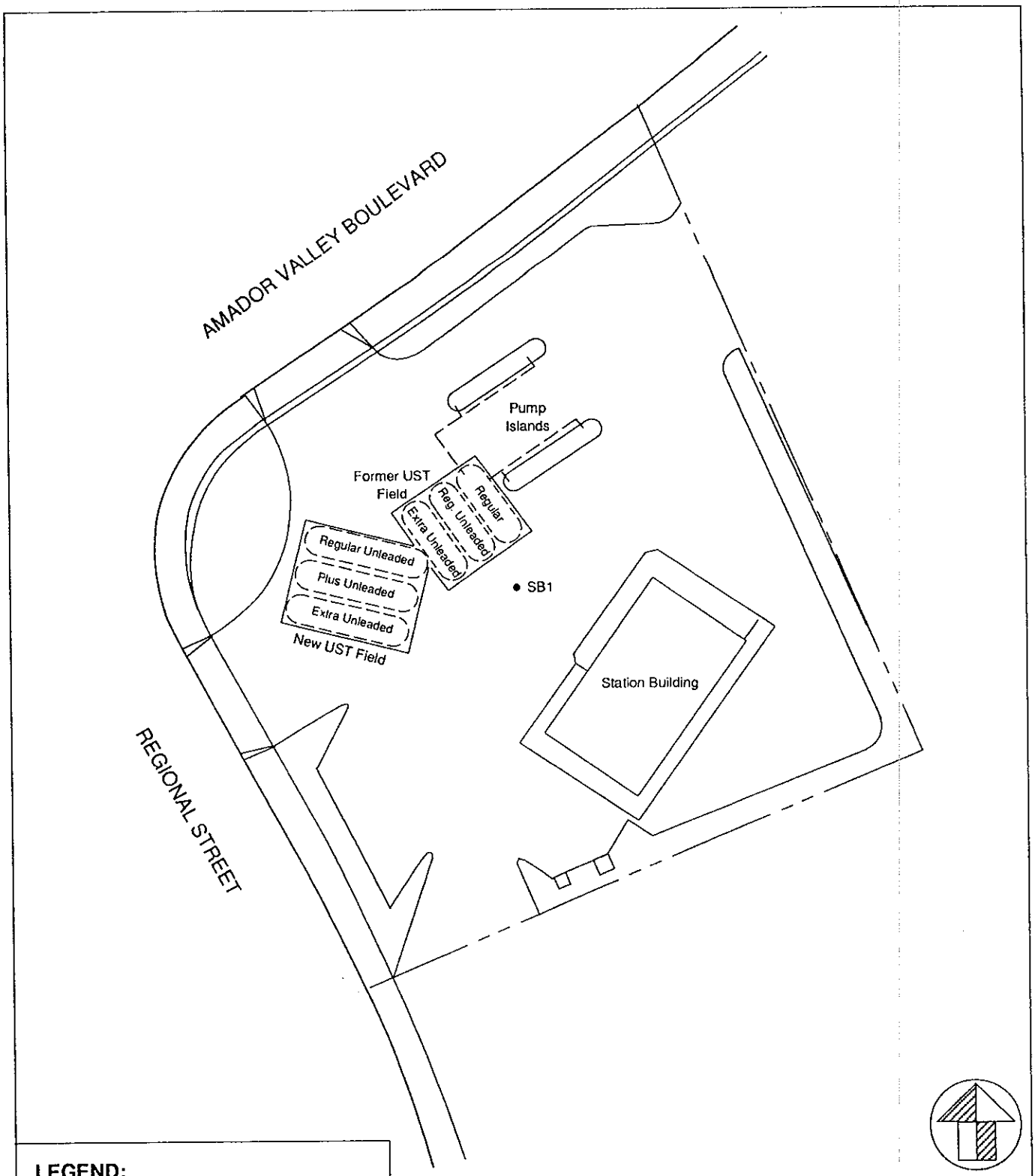

Figure 3. Location of station facilities and soil boring, Exxon RS 7-0210, 7840 Amador Valley Road, Dublin, California.

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Rev. 1		Date	
Final	TRW	Date	28 FEB 92

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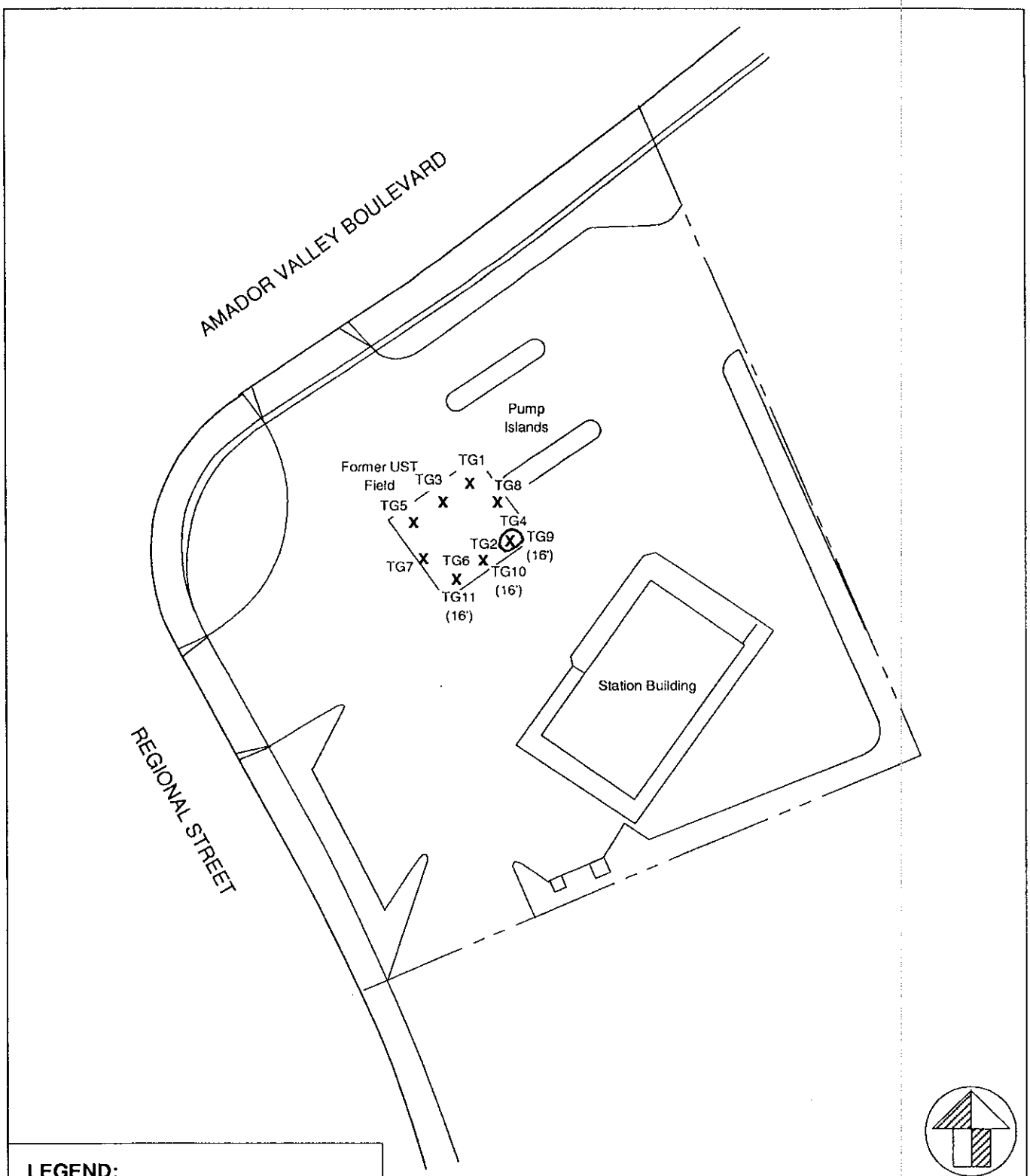

Figure 4. Location of soil closure samples collected from the former product storage tank field at Exxon RS 7-0210, 7840 Amador Valley Road, Dublin, California, 30 October 1991.

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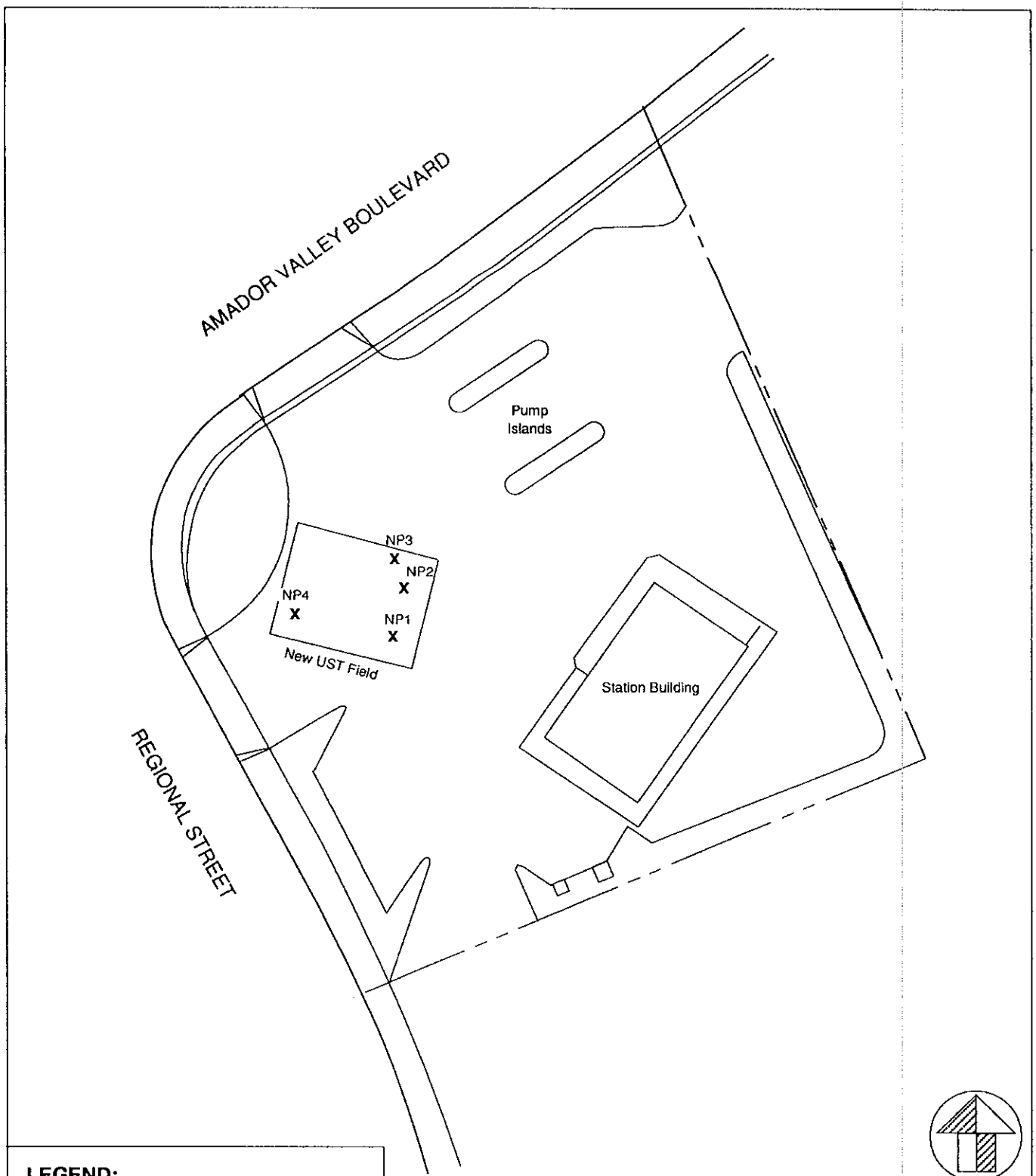

Figure 5. Location of soil closure samples collected from the new product storage tank field at Exxon RS 7-0210, 7840 Amador Valley Road, Dublin, California, 31 October 1991.

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Western Division

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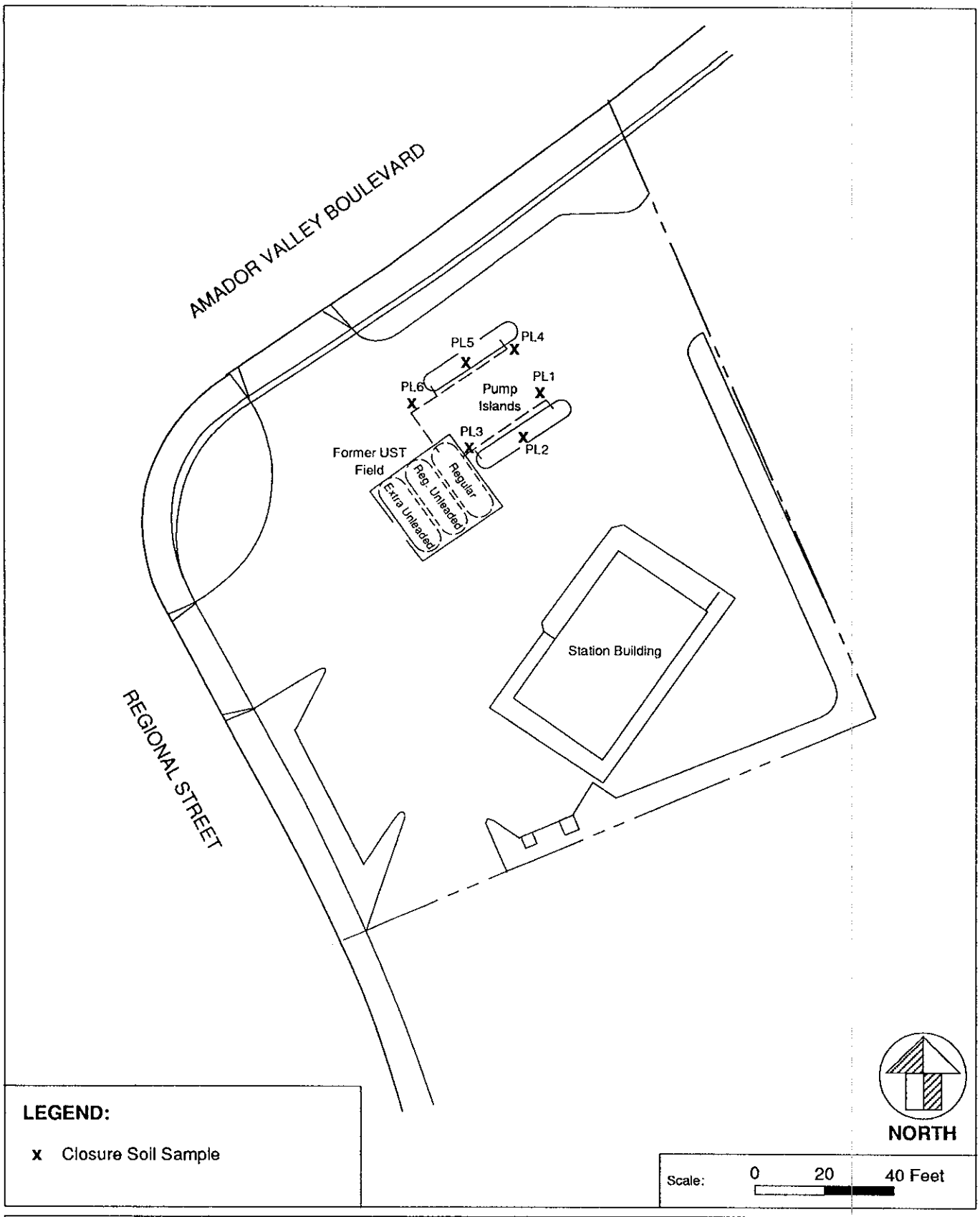

Figure 6. Location of soil closure samples collected from the product line trenches at Exxon RS 7-0210, 7840 Amador Valley Road, Dublin, California, 31 October 1991.

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Final	TRW	Date	28 Feb 92

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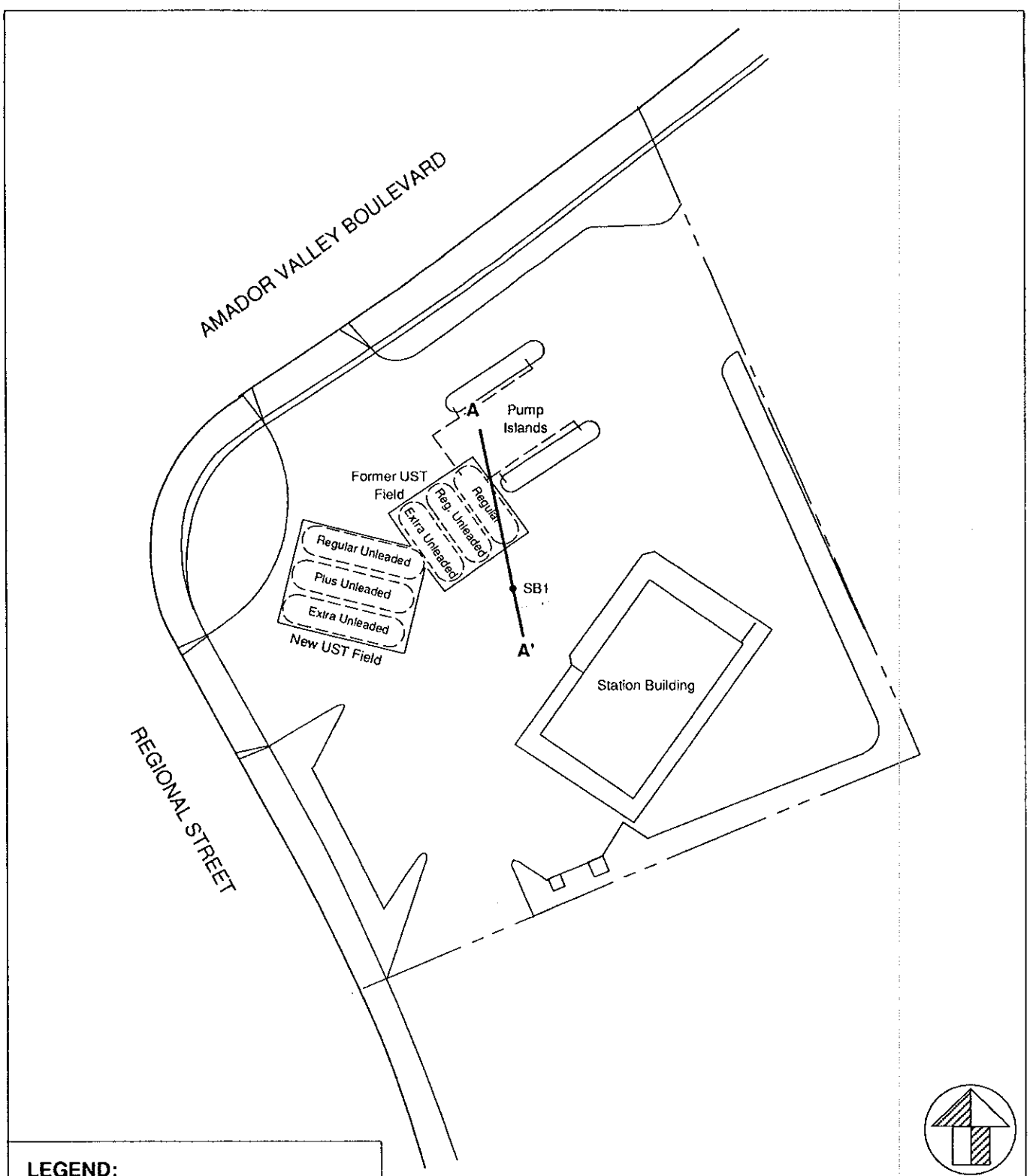

Figure 7. Location of geologic cross-section A-A', Exxon RS 7-0210, 7840 Amador Valley Road, Dublin, California.

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Western Division

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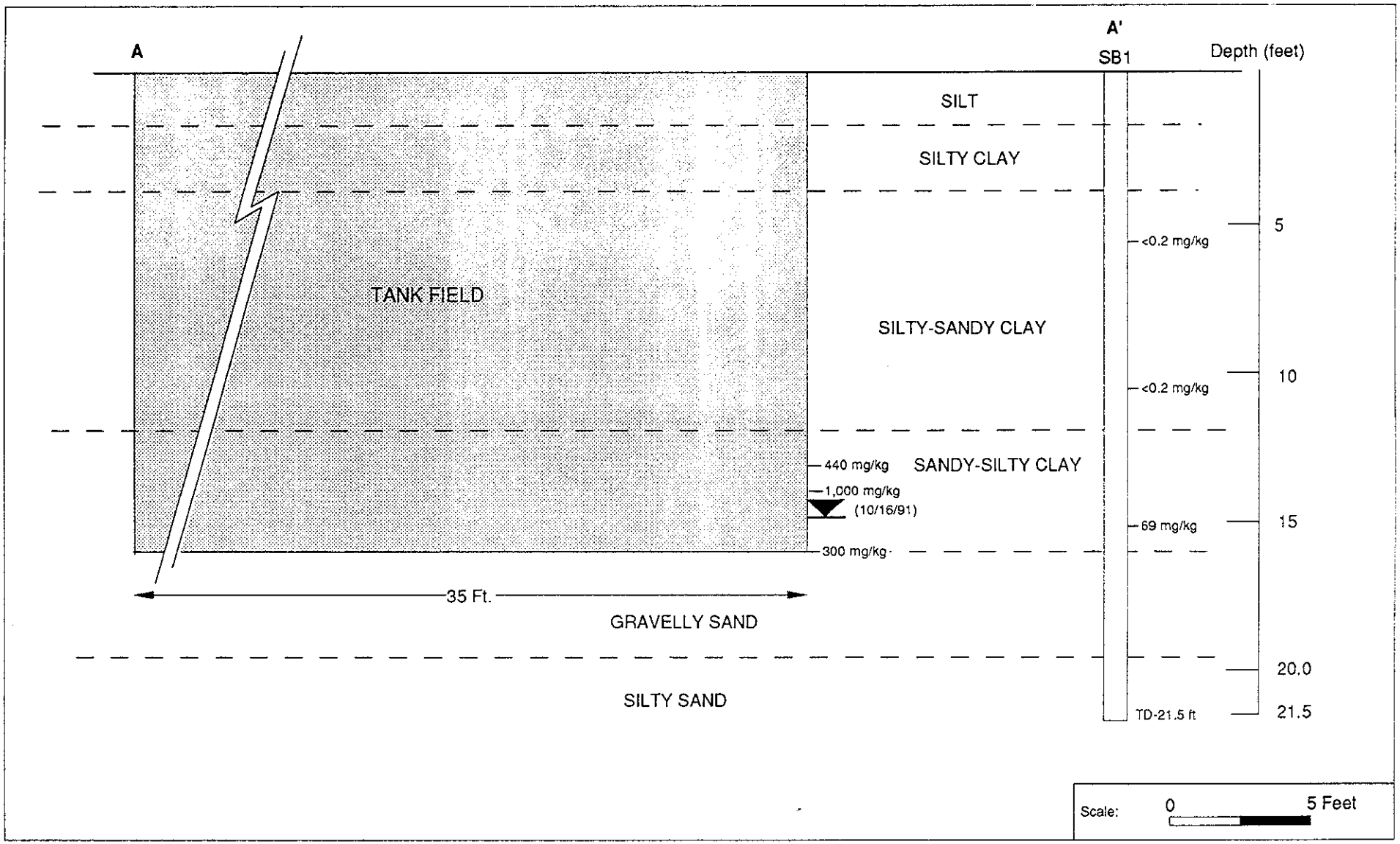

Figure 8. Geologic cross-section A-A', Exxon RS 7-0210, 7840 Amador Valley Road, Dublin, CA.

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Rev. 1		Date	
Final		Date	28 Feb 92

ENVIRONMENTAL SERVICES
Western Division

MDRW/0210/W/JAN92

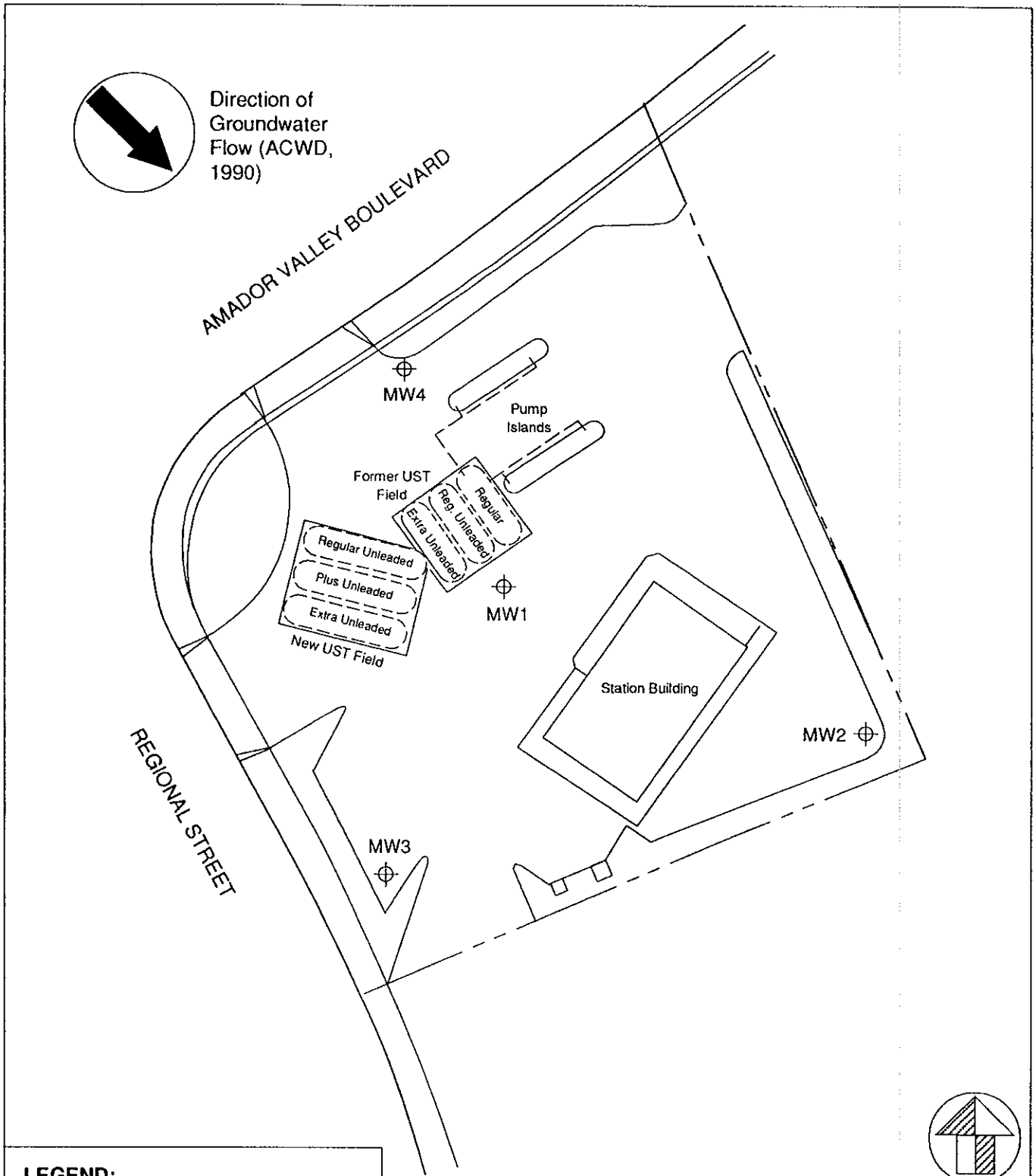

Figure 9. Location of proposed groundwater monitoring wells, Exxon RS 7-0210, 7840 Amador Valley Road, Dublin, California.

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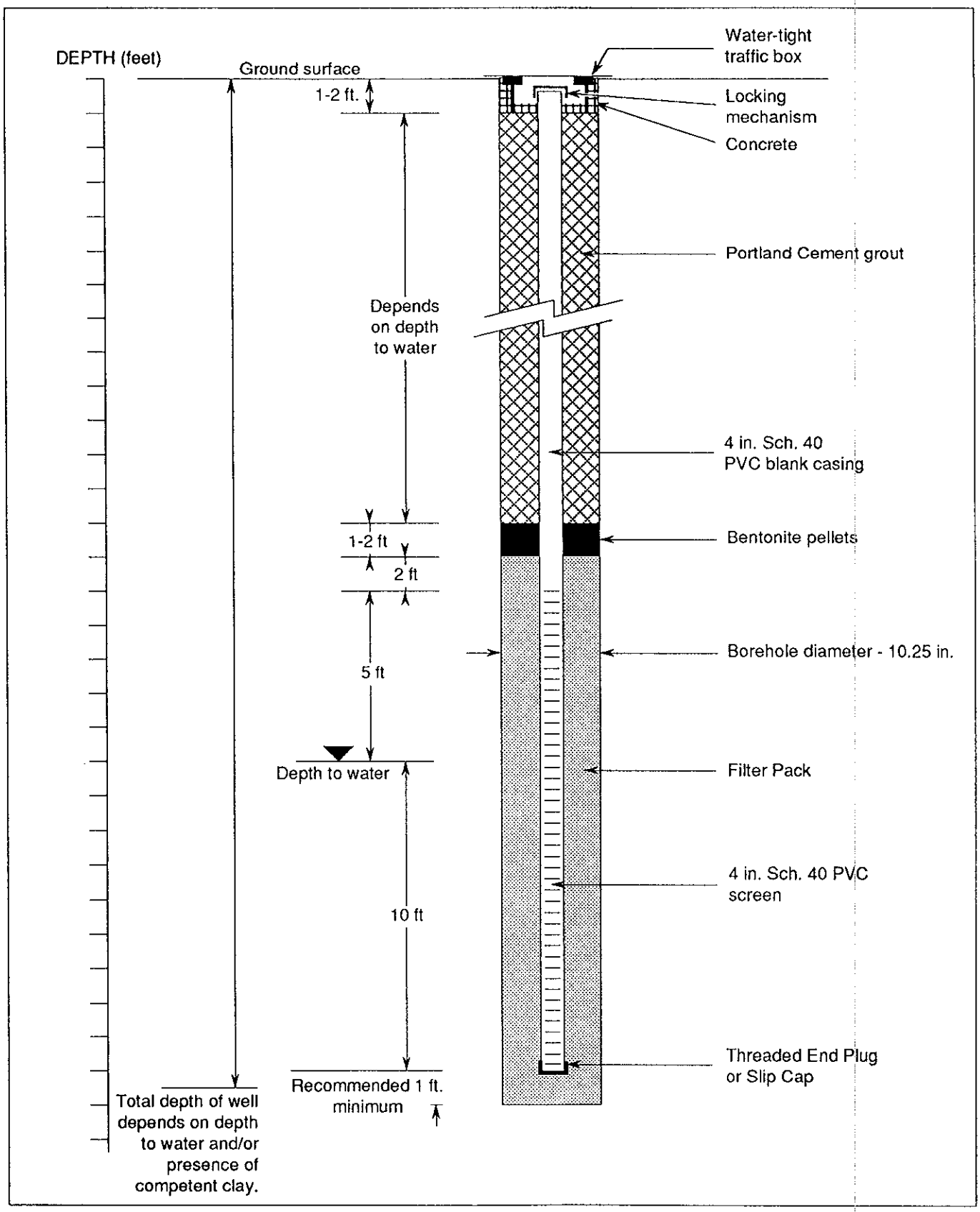

Figure 10. Representative details of proposed monitoring wells, Exxon RS 7-0210, Dublin, California.

TABLES

TABLE 1 CONCENTRATIONS (mg/kg) OF PETROLEUM HYDROCARBONS AND LEAD IN STOCKPILED SOIL SAMPLES COLLECTED FROM TOP OF THE PRODUCT TANK FIELD AND PRODUCT LINE TRENCHES, EXXON RS 7-0210, DUBLIN, CALIFORNIA, 28 FEBRUARY AND 12 MARCH 1990

Sample No.	Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH-g	Total Lead
SP1-4	--	<0.005	0.006	<0.005	0.015	1.6	11
SP5-8	--	LT0.013	0.023	0.015	0.091	4.3	<10
SP9-12	--	<0.1	<0.1	<0.1	<0.1	<1.0	5.1

LT Less than.

TABLE 2 CONCENTRATIONS (mg/kg) OF PETROLEUM HYDROCARBONS IN SOIL SAMPLES COLLECTED FROM A SOIL BORING, EXXON RS 7-0210, DUBLIN, CALIFORNIA, 16 OCTOBER 1991

Sample No.	Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH-g
SB-1	5.5-6	<0.001	<0.001	<0.001	<0.001	<0.2
SB-1	10-10.5	<0.001	<0.001	<0.001	<0.001	<0.2
SB-1	15.5-16	0.045	0.150	0.670	2.0	69.0

TABLE 3 CONCENTRATIONS (mg/kg) OF PETROLEUM HYDROCARBONS IN SOIL CLOSURE SAMPLES COLLECTED FROM FORMER TANK PIT, EXXON RS 7-0210, DUBLIN, CALIFORNIA, 30 OCTOBER 1991

Sample No.	Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH-g	TPH-d
TG1	12	<0.005	<0.005	0.009	0.007	<1.0	--
TG2	13	0.25	0.75	3.2	14	440	<5.0
TG3	15	0.023	0.074	0.064	0.21	7.5	--
TG4	14	1.2	8.8	17	98	1,000	<5.0
TG5	15	0.025	<0.005	0.037	0.044	13	--
TG6	14	0.046	<0.005	0.13	0.075	21	<5.0
TG7	13	<0.005	<0.005	<0.005	0.038	<1.0	--
TG8	15	<0.005	<0.005	<0.005	<0.005	<1.0	--
TG9	16	0.68	0.60	5.7	21	300	--
TG10	16	0.010	<0.005	0.052	0.13	2.8	--
TG11	16	<0.005	<0.005	<0.005	<0.005	<1.0	<5.0

TABLE 4 CONCENTRATIONS (mg/kg) OF PETROLEUM HYDROCARBONS IN SOIL CLOSURE SAMPLES COLLECTED FROM NEW TANK PIT, EXXON RS 7-0210, DUBLIN, CALIFORNIA, 31 OCTOBER 1991

Sample No.	Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH-g
NP1	14	<0.005	<0.005	<0.005	<0.005	<1.0
NP2	14	<0.005	<0.005	<0.005	<0.005	<1.0
NP3	14	<0.005	<0.005	<0.005	<0.005	<1.0
NP4	14	<0.005	<0.005	<0.005	<0.005	<1.0

TABLE 5 CONCENTRATIONS (mg/kg) OF PETROLEUM HYDROCARBONS IN SOIL CLOSURE SAMPLES COLLECTED FROM PRODUCT LINE TRENCHES, EXXON RS 7-0210, DUBLIN, CALIFORNIA, 31 OCTOBER 1991

Sample No.	Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH-g
PL1	2.5	<0.005	<0.005	<0.005	<0.005	<1.0
PL2	2.5	<0.005	<0.005	<0.005	<0.005	<1.0
PL3	2.5	<0.005	<0.005	<0.005	<0.005	<1.0
PL4	2.5	<0.005	<0.005	<0.005	<0.005	<1.0
PL5	2.5	<0.005	<0.005	<0.005	<0.005	<1.0
PL6	2.5	<0.005	<0.005	<0.005	<0.005	<1.0

TABLE 6 CONCENTRATIONS (mg/kg) OF PETROLEUM HYDROCARBONS IN SOIL SAMPLES COLLECTED FROM SOIL BACKFILLED INTO OLD TANK PIT, EXXON RS 7-0210, DUBLIN, CALIFORNIA, 30 AND 31 OCTOBER 1991

Sample No.	Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH-g
NF1	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF2	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF3	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF4	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF5	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF6	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF7	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF8	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF9	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF10	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF11	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF12	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF13	--	<0.005	<0.005	<0.005	<0.005	<1.0
NF14	--	<0.005	<0.005	<0.005	<0.005	<1.0

TABLE 7 CONCENTRATIONS (mg/kg) OF PETROLEUM HYDROCARBONS IN SOIL CLOSURE SAMPLES COLLECTED FROM STOCKPILED SOIL, EXXON RS 7-0210, DUBLIN, CALIFORNIA, 30 AND 31 OCTOBER AND 1 NOVEMBER 1991

Composite Sample No.	Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH-g
SS(1,2, 3,11)	--	<0.005	<0.005	<0.005	<0.005	<1.0
SS(3,4, 10,12)	--	<0.005	<0.005	<0.005	<0.005	<1.0
SS5-8	--	<0.005	<0.005	<0.005	<0.005	<1.0
SS13-16	--	<0.005	<0.005	<0.005	<0.005	<1.0
SS17-20	--	<0.005	<0.005	<0.005	<0.005	<1.0
SS21-24	--	0.028	0.079	<0.005	0.092	2.0
SS25-28	--	0.035	0.090	0.055	0.12	6.3
SS29-32	--	0.033	0.092	0.071	0.15	9.6
SS33-36	--	0.039	0.050	0.066	0.13	9.0
SS37-40	--	0.068	0.092	0.11	0.24	14.0
SS41-44	--	0.042	0.086	0.097	0.14	14
SS45-48	--	0.046	0.10	0.18	1.5	39
SS(49, 50, 55,56)	--	<0.005	<0.005	<0.005	<0.005	<1.0
SS51-54	--	<0.005	<0.005	<0.005	<0.005	<1.0

APPENDIX A

Drill Log of Exploratory Boring

ALTON GEOSCIENCE
LOG OF EXPLORATORY BORING

PROJECT NO. 30-0602 DATE DRILLED 10-16-91
CLIENT EXXON COMPANY, U.S.A.
LOCATION AMADOR VALLEY RD., DUBLIN
LOGGED BY M. TAYLOR APPROVED BY

BORING NO. SB-1

Page 1 of 1

FIELD SKETCH OF BORING LOCATION:

(SEE SITE DIAGRAM)

DRILLING METHOD HOLLOW STEM AUGER HOLE DIAM. 4"
SAMPLER TYPE SPLIT-SPOON
DRILLER WEST HAZMAT DRILLING

WATER LEVEL	15'		
DATE	10-16-91		
TIME	11:30 AM		

BLOWS PER 1/2 FOOT	CGI (PPM)	SAMPLE	DEPTH	PENETROMETER TONS/SQ. FT	BORING CLOSURE	USCS	PROFILE	DESCRIPTION
			0					ASPHALT
	0		2			CH		SILTY CLAY, with gravel, dk. brown, moist
	0		4			ML		SANDY SILT; with gravel, brown, moist
						SM		SILTY SAND, with gravel, brown, moist
8, 8, 9	0		6	0		SW		GRAVELLY SAND, brown, m. dense, moist
9, 10, 11	0		8	2.25		CL		SILTY CLAY, brown, very stiff, moist
4, 5, 7			10	2.0				SILTY CLAY, with some sand, greenish brown, stiff, moist
			12					
			14			CL		SILTY CLAY, greenish brown, stiff, wet
4, 6, 8	25		16	2.0				
			18			SW		GRAVELLY SAND, brown, m. dense, wet
				NEAT CEMENT				
10, 6, 2			20	0		SM		SILTY SAND, brown, loose, wet
			22					BORING TERMINATED @ 21.5'
			24					
			26					
			28					
			30					
			32					
			34					
			36					

APPENDIX B

Protocols for Well Drilling, Completion, Development, and Sampling

APPENDIX B

PROTOCOLS FOR WELL DRILLING, COMPLETION, DEVELOPMENT, AND SAMPLING

B.1 DRILLING

The boreholes are drilled with a truck-mounted rotary drill, using hollow-stem continuous-flight augers. The diameter of the augers is selected to provide an annular space between the boring wall and the well casing of no less than two inches. The borehole is drilled 10-20 feet below the static water level but will not be allowed to penetrate a competent clay layer that might act as an effective aquitard: drilling is terminated after two consecutive samples indicate comparable, apparently impermeable clays below static water.

All augers, sampling rods, samplers, and other pieces of downhole equipment are steam cleaned before drilling begins and before each new borehole is drilled. All drill cuttings and fluids from the steam cleaning are contained on the site in sealed 55-gallon drums. The drums are labeled with the borehole number, site description (including owner's name), depth interval of soil contents, date, and monitoring equipment readings. The drill cuttings are disposed of at proper facilities on the basis of soil sample analysis.

A log of drilling and the borehole are recorded by an EA geologist overseeing the drilling operations and well installation. The boring logs, which are signed and dated by the geologist, contain detailed geological information, including descriptions of the soils classified according to the Unified Soil Classification System, blow counts, OVA readings, moisture content of the soils, and initial and static water levels.

B.2 SOIL SAMPLING

Soil samples are collected at 5-foot intervals and at any substantial change of soil type, beginning at 5 feet below ground surface, with a 2-inch-diameter, 18-inch modified California split-spoon sampler containing three 6-inch brass liners. The sampler and liners are steam cleaned before use in each hole; they are scrubbed in deionized water and Alconox detergent and rinsed with deionized water after use at each sampling interval. Soil samples are collected to the total depth of the borehole unless heaving sand is encountered. Every attempt is made to collect a soil sample just above or at the water table.

At each sample depth, the sampler is driven 18 inches ahead of the augers into undisturbed soil. When the sampler is retrieved, either the lowermost or the middle sample liner is removed and the ends of the tube are covered with aluminum foil and sealed with plastic caps, which are secured to the liner with tape. The soil-filled liner is labeled with the location, sample number,

date, time, depth, sampler, and borehole number. The samples are placed in zip-lock bags and stored in a cooler containing dry ice.

Soil is removed from the other two liners and examined. The soil is scanned with a Foxboro Century 128 organic vapor analyzer with a flame ionization detector (FID), and the OVA readings are noted on the logs. The soil is examined and classified according to the Unified Soil Classification System.

Soil samples are delivered, under chain of custody, to a laboratory certified by the California Department of Health Services (DHS) for hazardous materials analyses. The samples are analyzed for petroleum hydrocarbons in accordance with Table 2 of the "Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites" (RWQCB 1990).

B.3 WELL INSTALLATION

The boreholes are completed as groundwater monitoring wells. The wells are constructed by installing Schedule 40 PVC flush-threaded casing through the inner opening of the auger. The screened interval consists of slotted casing of the appropriate slot size, placed from 10 to 20 feet below the water table to 5 feet above it. The slot size is selected to retain 90 percent of filter pack materials, typically either 0.010- or 0.020-inch slots, factory cut. A threaded end plug or a slip cap secured with a stainless steel screw is placed on the bottom of the well screen.

A filter pack of clean sand of appropriate size is placed in the annular space around the well screen to approximately two feet above the top of the screen. The sand size is selected according to DHS guidelines and is based on sieve analyses of aquifer materials. The sand is placed through the inner opening of the augers as they are slowly removed. The sand is sealed by adding 1 foot of bentonite pellets and hydrating them with deionized water. A surface seal is then created by placing a cement grout from the bentonite spacer to the surface with a tremie pipe or grout pump.

The well is finished at the surface with a slightly raised, 12-inch-diameter traffic-rated, watertight steel traffic box set in concrete. The traffic box is secured against unauthorized entry with a cap that requires a special wrench to open; the casing is further secured with a locking well cap.

A proposed well completion is shown in Figure B-1.

B.4 WELL DEVELOPMENT

The wells are developed 3 days after completion. Development consists of surging the screened interval of the well with a 4-inch flapper valve surge block for approximately 15 minutes. The

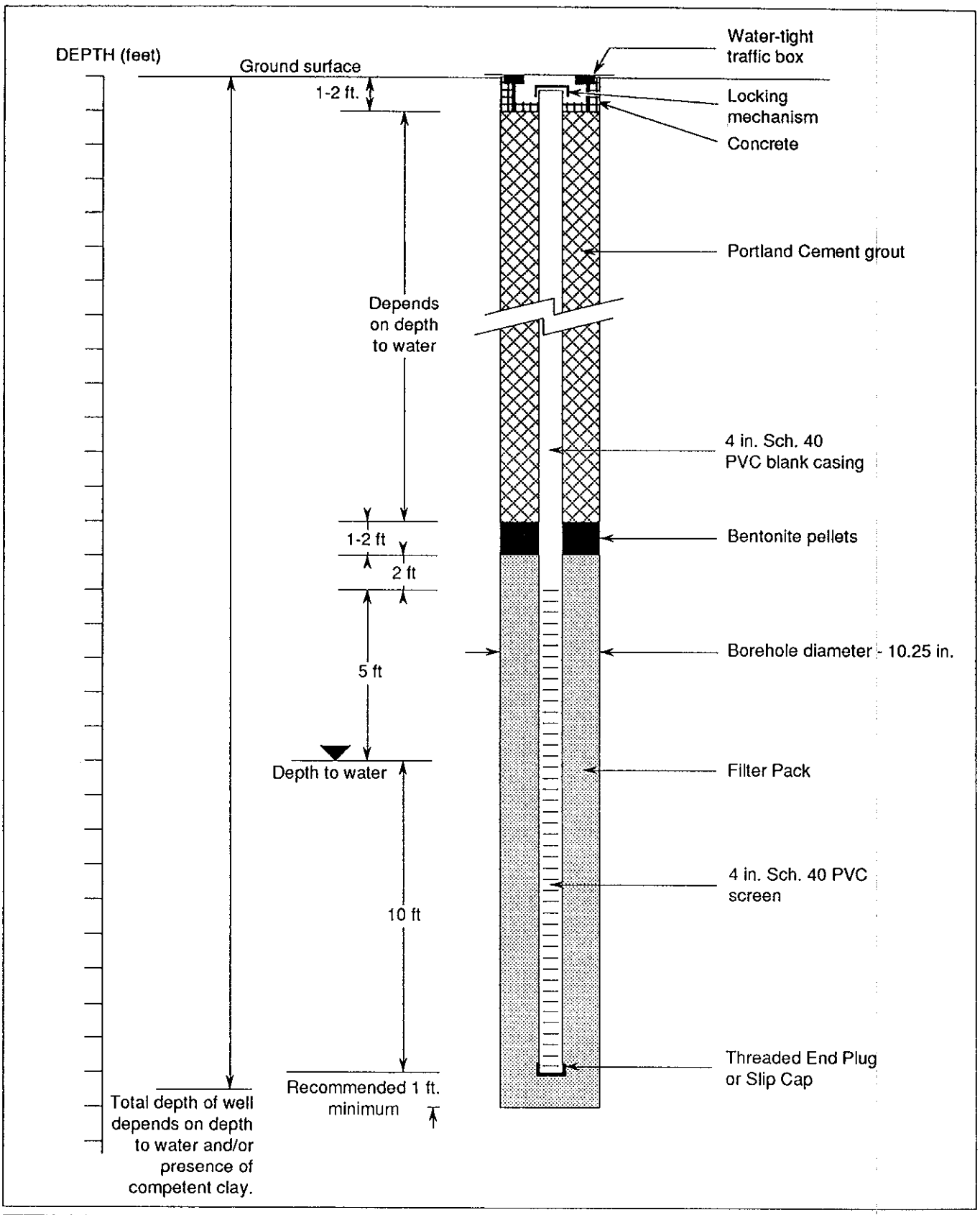

Figure B-1. Representative details of proposed monitoring wells, Exxon RS 7-0210, Dublin, California.

well is then purged, with a submersible electric pump, centrifugal pump, air-lift pump, or PVC bailer, of 2-6 casing volumes of water. The surging and pumping are repeated until the water is free of silt and apparent turbidity, for a maximum of 4 hours.

A record of the purging methods and volumes of water purged is maintained. All purge water is contained on the site in properly labeled 55-gallon drums. Purged water is disposed of at an appropriate facility on the basis of the laboratory analytical results.

B.5 WELL SURVEY

The elevation of the top of the well casing is surveyed relative to an established datum with a Lietz C-3 automatic level and a stadia rod. A small notch is cut in the top of the well casing to mark the survey point, to ensure that this point is used for all future water level measurements. A loop originating and ending at the datum is closed to ±0.01 feet according to standard methods (Brinker and Wolfe 1977).

B.6 GROUNDWATER SAMPLING

The new wells are sampled no less than 72 hours after development.

B.6.1 Sampling Equipment Preparation

To the extent possible, well measurement and sampling equipment is constructed of inert material. Sampling bailers are made of Teflon. Stainless steel submersible or airlift pumps, surface centrifugal pumps with dedicated polyethylene tubing, or PVC bailers are used to purge the well prior to sampling, depending on the depth to water. All sampling equipment is decontaminated in the following manner prior to introduction into each well:

1. Bailers, pumps, suspension rope and lines, and well sounding tapes are rinsed thoroughly with clean, fresh water to remove dust and dirt.

2. All equipment is cleaned with Alconox detergent and deionized (DI) water inside and out. The equipment may be cleaned offsite and stored and transported in steam-cleaned and protected inert containers. Fluids that have been used to decontaminate equipment on the site are stored with other purge water. Nitrile gloves are worn at all times during sample equipment cleaning, handling, and sample collection.

3. All equipment is thoroughly rinsed with deionized (DI) water immediately after cleaning.

4. All equipment is thoroughly rinsed with DI water twice before insertion into a well.

5. Bailers and pumps are suspended on clean, DI-water-rinsed lengths of polypropylene rope. The rope is discarded after each well.

B.6.2 Presampling Measurements

Prior to purging and sampling, the depth to standing water and the total depth of the well are measured with a decontaminated optical or sonic interface probe. A decontaminated clear acrylic bailer is then inserted into the well to just below the static water level and removed to confirm the presence or absence of any floating liquid-phase hydrocarbons. These presample measurement data are recorded on a Record of Well Gauging and Purging and used to calculate the volume of standing water in the well (one well casing volume). Measurements are made to the nearest 0.01 foot and referenced to the survey reference point on the well casing.

B.6.3 Well Purging

To ensure that the sample collected is as representative as possible of groundwater in the aquifer, standing water in the well and the surrounding sand pack is purged. Between four and six casing volumes of well water are purged to ensure that all stagnant water has been removed. The well is purged with a submersible, airlift, or surface pump or with a bailer, decontaminated as described above in Section B.6.1.

Should the well pump dry after the casing is initially dewatered, purging is discontinued and the well allowed to recover. Purging is continued to obtain the desired purge volume.

Field parameters of pH, temperature, and electrical conductance are measured as the well is purged. Measurements are taken and recorded approximately every five gallons. If any of the three field parameters has not stabilized by the time the 4-6 casing volumes have been purged, additional well water is pumped until the parameters have stabilized (but no more than 10 casing volumes). "Stabilized" is defined as a change in the reading amounting to less than 10 percent of the previous reading.

All purge water is contained in 55-gallon drums labeled with well number, date, contents, and facility identification. After the well has been purged of the required volume of water, the purging equipment is removed. A Teflon sampling bailer is used to collect four separate samples for presample field parameter measurements, to confirm field parameter stability and, therefore, representative aquifer samples.

B.6.4 Well Sampling

All samples are collected with a Teflon bailer cleaned as discussed in Section B.6.1. The bailer is operated by hand on a new, 1/4-inch polypropylene rope or on Teflon-coated stainless steel wire. The sampling personnel wear clean Nitrile gloves during sampling operations and while handling sample bottles.

The collected groundwater samples are emptied from the bailer with a bottom-emptying device directly into the sample bottles. The samples are collected in either 40-ml glass VOA vials or 1-liter amber bottles with Teflon-lined septum caps. The sample bottles contain appropriate preservatives, typically hydrochloric acid. The samples are contained in the containers free of headspace (i.e., with no air bubbles).

The filled sample containers are labeled with well number, date, location, sampler's initials, and preservative in indelible ink, and the sample labels are covered with clear waterproof tape.

The sample vials are placed in an iced cooler for delivery to a DHS-certified laboratory for analysis. Standard chain-of-custody procedures are followed.

B.6.5 Blanks

In addition to the groundwater samples, a trip blank and a decontamination blank are analyzed during each sampling round. A 40-ml glass VOA bottle with a Teflon septum lid, filled with DI water at the laboratory, functions as a trip blank. This trip blank travels with the sample kit from the laboratory to the facility and back to the laboratory again in the sample cooler. The blank is analyzed for the same parameters as the samples to indicate if the samples have been contaminated, from whatever source, during the trip from the site to the laboratory.

A decontamination blank is prepared in the field during well sampling. After the first well is sampled, DI water is poured into the clean, rinsed sampling bailer that is to be used for sampling the next well. This DI water is then emptied, as a sample, into a preserved 40-ml VOA bottle for analysis with the samples and trip blank. The decontamination blank indicates if any of the samples are contaminated from the sampling equipment or decontamination process.

B.6.6 Sample Analysis

All groundwater well samples, the trip blank, and the decontamination blank are analyzed by the laboratory according to Table 2 of the "Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites," typically for Total Petroleum Hydrocarbons as gasoline (TPH-g) by DHS-modified EPA Method 8015 and for the aromatic hydrocarbons benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020.