Feasibility Study
and
Site Closure Plan

for

PG&E

ENCON-GAS Transmission and Distribution Construction Yard

Former Tank Cluster Area

4930 Coliseum Way, Oakland, California

Submitted to:

Alameda County Health Care Services Agency

Department of Environmental Health

Division of Hazardous Materials

September 4, 1991

Aqua Resources Inc.

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EXECUTIVE SUMMARY

Aqua Resources Incorporated (ARI) performed a Feasibility Study (FS) and prepared a Site Closure Plan for the Pacific Gas and Electric Company (PG&E) ENCON-GAS Transmission and Distribution Construction Yard located at 4930 Coliseum Way in Oakland, California.

A Remedial Investigation (RI) for the PG&E site was performed by ARI between November 1990 and May 1991. The purpose of this investigation was to determine the extent of petroleum hydrocarbon impacted soils in the vicinity of a former underground tank cluster and to determine if any upgradient sources of contamination might exist. The results are presented in the RI report.

This Feasibility Study and Site Closure Plan evaluates a number of available remedial technologies and recommends a remedial action program consisting of soil remediation and groundwater monitoring. Figure ES-1 presents the area covered under this Site Closure Plan.

Soils in the southeast portion of the yard, near the former natural gas holder will not be remediated under this proposed closure plan. Although samples from three locations in that area did exceed the proposed soil cleanup levels, the nature and extent of petroleum hydrocarbons detected in those areas suggest that they are not related to spills or leaks from the former tank cluster. In fact, two of these three locations appear to be impacted by an off-site fuel leak.

Conclusions

ARI estimates that approximately 2,250 cubic yards of soil in the vicinity of the former tank cluster contain petroleum hydrocarbons, predominantly diesel fuel and oil and grease, at concentrations above the proposed cleanup levels. The actual amount of soil requiring remediation will not be known until excavation takes place and could be higher or lower than the estimated 2,250 cubic yards.

Recommendations

ARI recommends that an estimated 2,250 cubic yards of soil impacted by petroleum hydrocarbons in the former underground tank cluster area be excavated and remediated. The location of this soil is shown on Figure ES-2. The actual depth of excavation should be limited to above the saturated zone and varies with a specific location.

ARI's recommended remediation program consists of the following actions:

Proposed Cleanup Levels for Soils - In November 1990, ARI discussed soil cleanup levels with the Alameda County Health Agency. The proposed cleanup levels were derived using the State of California Leaking Underground Fuel Tank (LUFT) manual and the Tri-Regional Board Staff Recommendation for Preliminary Evaluation and Investigation of Underground Tank Sites. Proposed cleanup levels are as follows:

TPH as gasoline:	10 mg/kg
TPH as diesel:	100 mg/kg
TPH as kerosene:	100 mg/kg
Oil and grease:	1000 mg/kg
BTEX:	5 µg/kg

Soluble metals? What about solvents & semivolatiles?

Excavation - The soils with elevated levels of petroleum hydrocarbons can be excavated using conventional excavation equipment. Excavation of soils located beneath the welding shop will be most cost effective if the building is removed prior to excavation.

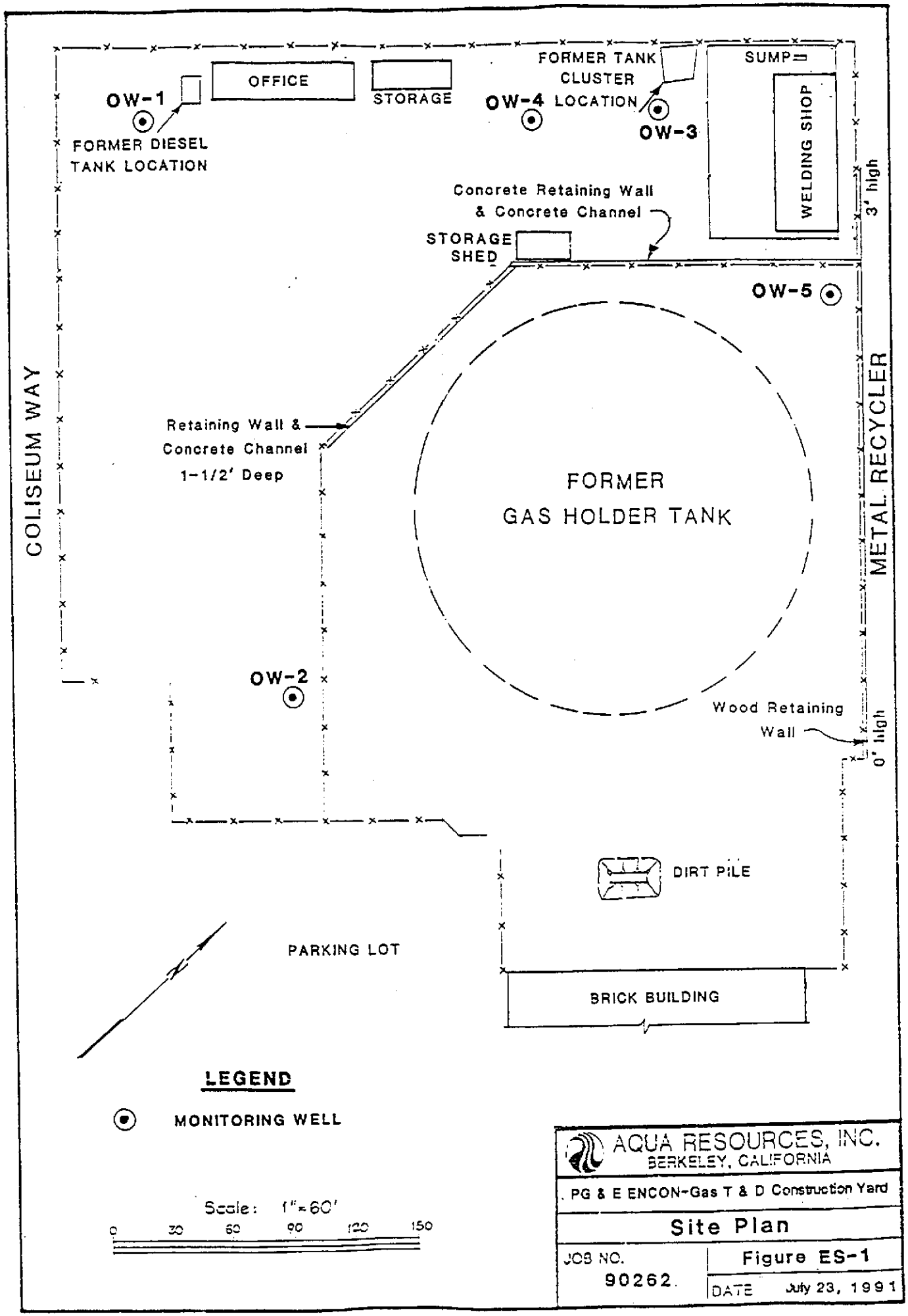
Confirmation sampling - Soil sampling will be conducted after excavation to confirm that soils with elevated levels of petroleum hydrocarbons have been removed. Sampling will conform to the LUFT manual requirements and will include samples at the base of the excavation, on all sidewalls, and of any visible contamination.

Stockpiled soil will also be sampled for final characterization prior to treatment/disposal. A statistically based sampling scheme will be implemented such that compliance with regulatory limits can be established with an 80% confidence interval as required by the California Department of Toxic Substances Control.

Results of the laboratory analysis of soil stockpile samples will be used to determine if the soil is classified as hazardous waste due to the concentration of soluble lead or other compounds. If soluble lead concentrations are found to exceed state hazardous waste limits, an application for variance from hazardous waste classification should be made to the California Department of Toxic Substances Control. If such a waiver is granted, the soil may be handled as non-hazardous waste. If not, management of the contaminated soil as a hazardous waste will be necessary.

Remediate soils by off-site thermal treatment and subsequent recycling - ARI recommends that non-hazardous soils containing petroleum hydrocarbons be transported to a thermal treatment and recycling facility. Direct disposal or off-site recycling without thermal treatment are also feasible options but are both more costly, primarily because of a long hauling distance.

Continue groundwater monitoring for at least one year and perform a trend analysis to determine if groundwater quality is improving - Because groundwater has been impacted by prior releases of petroleum hydrocarbons in the tank cluster area, groundwater monitoring is recommended for a period of two years after site closure. If after the first year, it can be demonstrated to the regulatory agencies that groundwater quality is improving and concentrations of petroleum hydrocarbons are considered insignificant, the monitoring program might be reduced or even ceased.


OFFICE
STORAGE
OW-1
FORMER DIESEL TANK LOCATION
FORMER TANK CLUSTER LOCATION
OW-4
OW-3
SUMP
WELDING SHOP
3' high
Concrete Retaining Wall & Concrete Channel
STORAGE SHED
OW-5
COLISEUM WAY
METAL RECYCLER
Retaining Wall & Concrete Channel 1-1/2' Deep
FORMER GAS HOLDER TANK
OW-2
Wood Retaining Wall
6' high
DIRT PILE
PARKING LOT
BRICK BUILDING
LEGEND
MONITORING WELL
Scale: 1"=60'
0 30 60 90 120 150
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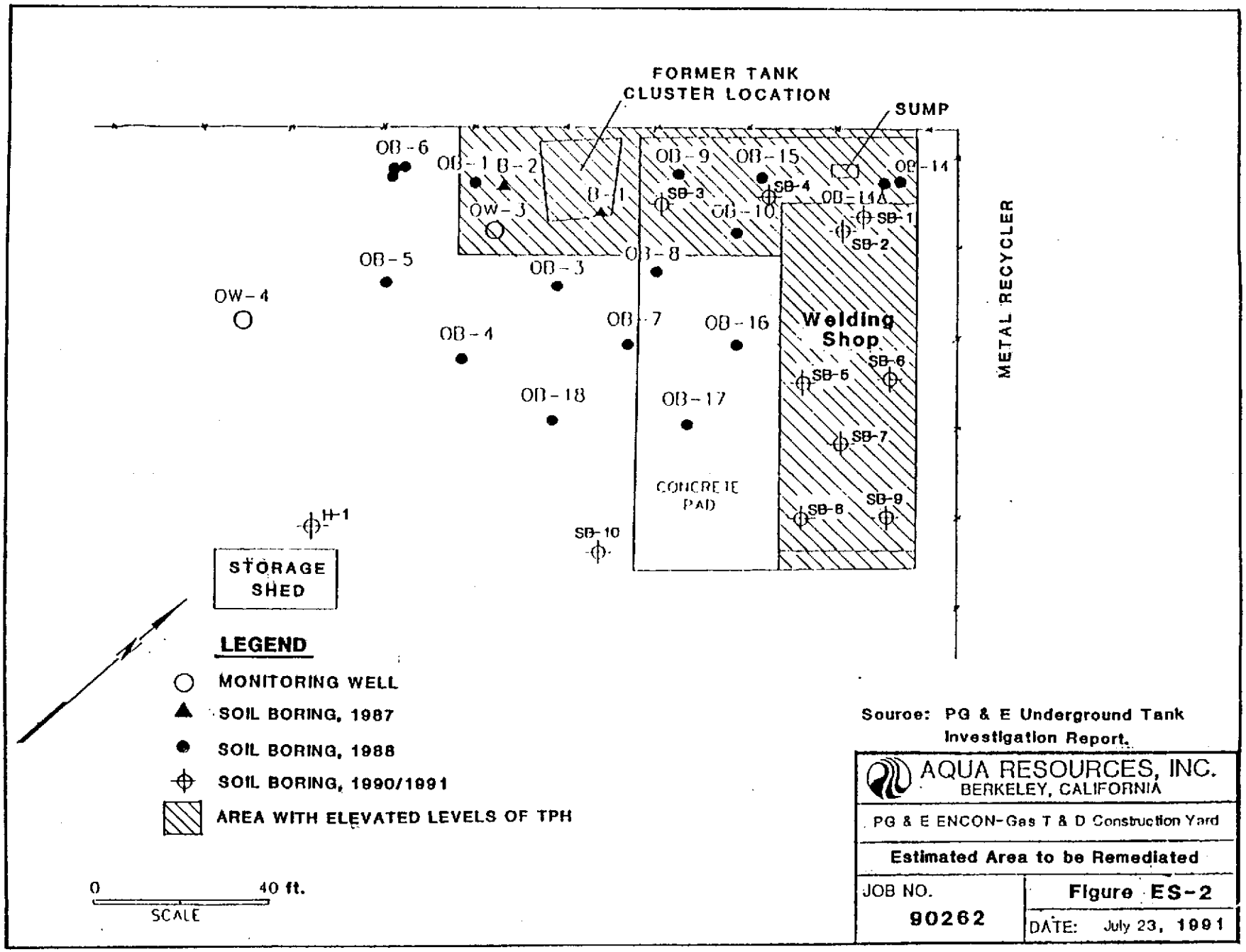
BERKELEY, CALIFORNIA
PG & E ENCON-Gas T & D Construction Yard
Site Plan
JOB NO. 90262
Figure ES-1
DATE July 23, 1991



Source: PG & E Underground Tank Investigation Report.

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Estimated Area to be Remediated

JOB NO.	Figure ES-2
90262	DATE: July 23, 1991

1.0 INTRODUCTION

1.1 Statement of Purpose

This report presents a Feasibility Study and a proposed Site Closure Plan for the PG&E ENCON-GAS Transmission and Distribution (T&D) Construction Yard. The site is located at 4930 Coliseum Way in the City of Oakland, California. The Vicinity Map (Figure 1.1) shows the site.

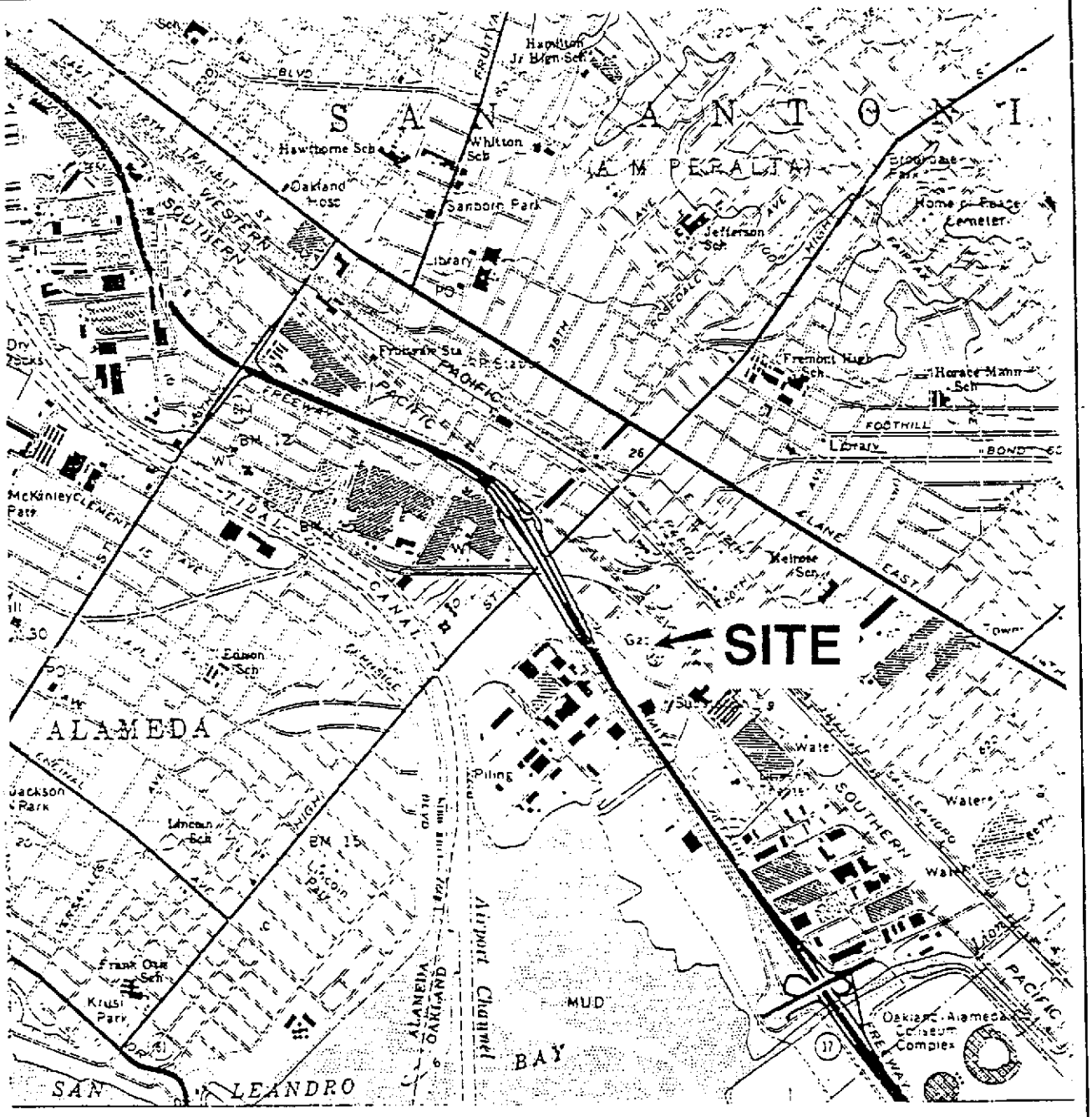
Prior to the preparation of this site closure plan, a remedial investigation was performed by ARI. The purpose of the RI was to identify the horizontal and vertical extent of elevated levels of petroleum hydrocarbons in soil so that various alternatives for remediation could be analyzed. Results of these investigations are presented in the RI report dated July 23, 1991.

The FS and Site Closure Plan presents an analysis of remedial alternatives. Recommendations regarding remediation of the area with elevated levels of petroleum hydrocarbons in soil for tank closure purposes are also presented.

1.2 Report Organization

The FS and Site Closure Plan report consists of the following elements:

- Site Background
- Results of the Remedial Investigation
- Proposed Cleanup Levels for Soil
- Volume of Soil to be Remediated
- Remediation Alternatives
- Recommendations



Scale

0 1/2 1

MILE

N

Source: United States Geological Survey, 1959, photorevised 1980, Oakland East 7.5 minute topographic quadrangle.

AQUA RESOURCES, INC. BERKELEY, CALIFORNIA	
PG & E ENCON-Gas T & D Construction Yard	
Site Location Map	
JOB NO. **90262**	**Figure 1.1**
	DATE: July 23, 1991

2.0 SITE BACKGROUND

The T&D Construction Gas Yard is located at 4930 Coliseum Way in the city of Oakland, California (Figure 1.1). The site is wholly owned by PG&E and is used as a vehicle, materials, and equipment storage and distribution facility. Historically, the site was also used as a vehicle service center and aboveground natural gas storage facility.

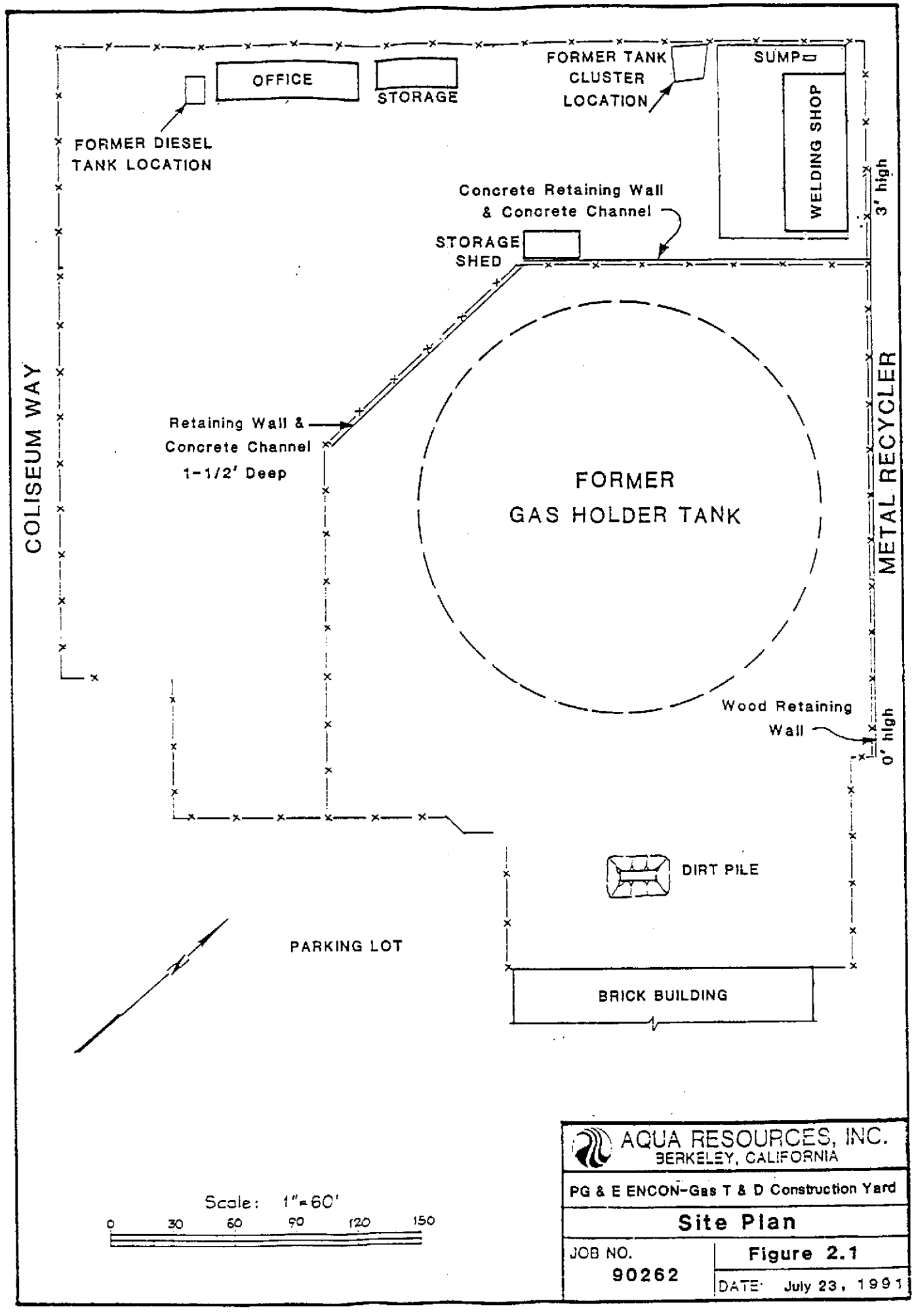
The site is surrounded by industrial properties. Immediately to the northeast of the site is a metal recycling operation; to the northwest is a plaster casting company, a pattern company and a metal foundry; to the west and southwest (across Coliseum Way) are two motels and a recreational vehicle sales facility; to the southeast (across 50th Street) is a trucking facility.

Figure 2.1 shows the site layout including the former locations of underground storage tanks. An office building, material storage warehouse, welding shop, and a petroleum, oil and lubricant (POL) storage shed are located on-site. The welding shop was previously used as a vehicle repair garage. Except for an asphalt parking lot and concrete pads located in front of the welding shop and under the former aboveground gas tank, the site is graveled.

Five underground tanks were formerly located on-site. Four of the tanks (three 500-gallon tanks and one 350-gallon tank) were located in a cluster near the north corner of the site by the welding shop ("tank cluster"). These tanks were thought to be used to store waste oils. A 1000-gallon tank was located near the west corner of the site near the office building ("diesel tank"). It was used to store diesel fuel. The bottom of each tank was approximately 7 feet below the ground surface.

On the north side of the welding shop, about 50 feet northeast of the former tank cluster location, is a concrete sump. The underground layout of the sump and its associated piping is unknown.

In December 1987, the contents of the five tanks were analyzed by PG&E's Department of Engineering Research chemical laboratory. Two of the tanks in the cluster were found to contain mineral spirits (paint thinner and water) and three tanks contained heavy oil (diesel and/or hydraulic oil). PCBs were not detected in any of the tanks. The five tanks were removed and disposed of on January 13, 1988 by Universal Engineering, Inc.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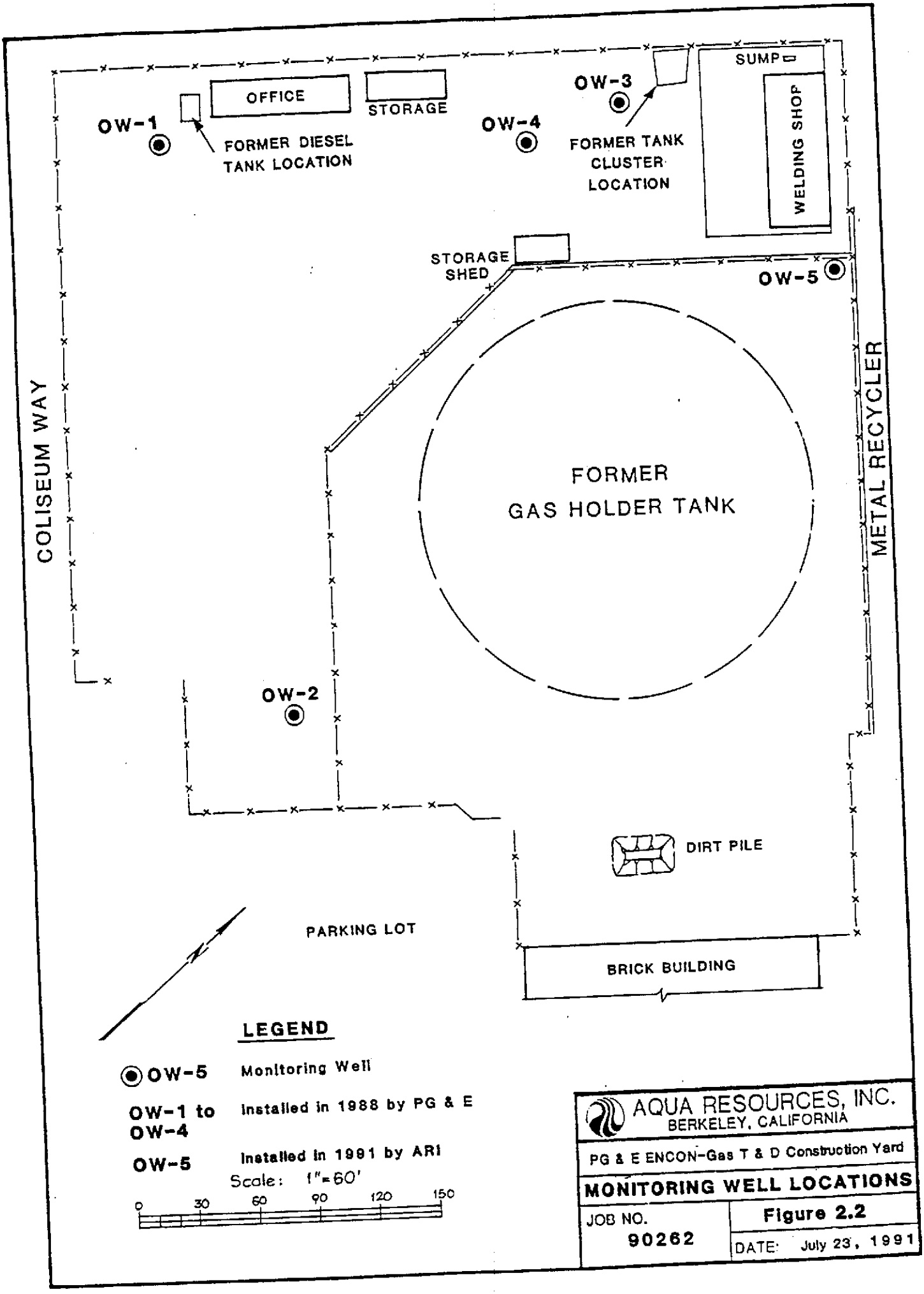
DIRT PILE
PARKING LOT
BRICK BUILDING
Scale: 1"=60'
0 30 60 90 120 150
AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA
PG & E ENCON-Gas T & D Construction Yard
Site Plan
JOB NO. 90262
Figure 2.1
DATE: July 23, 1991

In March and May 1988 four shallow monitoring wells (OW-1 through OW-4) were installed by PG&E to investigate the groundwater quality and to determine the groundwater flow direction and gradient. The locations of the monitoring wells are shown in Figure 2.2. Well OW-3 is located approximately hydraulically downgradient of the former tank cluster location, and Well OW-1 is located downgradient of the former diesel tank. Since October 1989, quarterly groundwater samples were collected by PG&E's Technical and Ecological Services Department to monitor the distribution of waste oil, solvents, and fuel compounds in the uppermost aquifer beneath the northern part of the yard, near the former site of the five underground storage tanks.

Details on the regional and site geology and hydrogeology are presented in the RI report.



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MONITORING WELL LOCATIONS

JOB NO. 90262

Figure 2.2

DATE: July 23, 1991

3.0 RESULTS OF THE REMEDIAL INVESTIGATION

3.1 Soil Investigations

ARI estimates that approximately 2,250 cubic yards of soil in the vicinity of the former tank cluster contain petroleum hydrocarbons with concentrations exceeding minimum cleanup levels.

In nearly all locations inside or in front of the welding shop, oil and grease was detected at concentrations above 2,000 mg/kg. The highest concentration in soil samples collected by ARI was 13,000 mg/kg oil and grease. However, soil samples collected from the tank cluster excavation during the tank removal process in January 1988 showed concentrations of up to 55,400 mg/kg oil and grease.

Extractable petroleum hydrocarbons quantified as diesel were detected at a maximum concentration of 8,900 mg/kg. Elevated levels of petroleum hydrocarbons in soil samples analyzed were limited to a maximum depth of 9 feet.

The following Volatile Organic Compounds (VOCs) were detected at or above the reporting limit: 1,1-Dichloroethane, 1,1,1-Trichloroethane, 1,3- and 1,4-Dichlorobenzene, Benzene, Toluene, Ethylbenzene and Xylenes.

PCBs were not detected in any soil sample, except for a trace in one sample. The results of metal analyses were all below the Total Threshold Limit Concentration (TTLC) as listed in Title 26 of the California Code of Regulations (CCR). In one sample the Soluble Threshold Limit Concentration (STLC) for lead was slightly exceeded.

3.2 Groundwater Investigations

Groundwater samples obtained from monitoring wells located downgradient from the former tank cluster have been found to slightly exceed Maximum Contaminant Levels (MCLs) for 1,1-Dichloroethane, 1,2-Dichloroethane, and 1,4-Dichlorobenzene. Semi-volatile petroleum hydrocarbons have also been found in nearly all groundwater samples.

An off-site source of fuel contamination is believed to exist upgradient from well OW-5, near the northeast property boundary of the site. This conclusion was reached because groundwater samples obtained nearest that property line were found to contain higher levels of benzene and other fuel compounds than samples obtained immediately downgradient from the former tank cluster.

4.0 PROPOSED CLEANUP LEVELS FOR SOIL

Soil cleanup levels were discussed by ARI with the Alameda County Health Agency in November, 1990. The County indicated that cleanup levels should generally be derived using the following three references:

- State of California Leaking Underground Fuel Tank (LUFT) Manual;
- Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites;
- California Code of Regulations Title 26;

In order to prevent further degradation of groundwater and to assist in the remediation of groundwater underlying the site, it is proposed that contaminated soils be remediated in the immediate vicinity of areas impacted by previous releases. The following cleanup levels for petroleum hydrocarbons, oil and grease, and aromatic hydrocarbons were derived:

TPH as gasoline:	10 mg/kg
TPH as diesel:	100 mg/kg
TPH as kerosene:	100 mg/kg
Oil and grease:	1000 mg/kg
BTEX:	5 µg/kg

These criteria were derived following the procedures described in the LUFT Manual and the Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites, using the climatological and hydrogeologic parameters of the PG&E site.

5.0 VOLUME OF SOIL TO BE REMEDIATED

The volume of soil estimated to exceed the proposed cleanup levels for petroleum hydrocarbons are discussed below.

In order to estimate the volume of soil to be remediated, the concentrations of petroleum hydrocarbons in soils were compared to the proposed cleanup levels. The cleanup levels for petroleum hydrocarbons (quantified as oil and grease, diesel, and gasoline) and aromatic hydrocarbons (BTEX), are listed in Section 4.0. Table 5.1 presents the results of the analyses of the soil samples compared to the proposed cleanup levels. These samples were collected during:

- PG&E investigations performed in February 1987
- PG&E investigations performed in March and May 1988
- ARI investigations performed in April and May 1991

The following assumptions were made to estimate the horizontal and vertical extent of the contamination:

- The horizontal extent of contamination was estimated by assuming that the contamination spread horizontally half the distance between contaminated and uncontaminated sample points.

- The contamination spread vertically down to 8.5 feet (approximate depth to groundwater) below ground surface over the whole area.

The affected soil appears to be restricted to the vicinity of the former tank cluster location and beneath the welding shop. Soils in the southeast portion of the yard, near the former gas holder (see Figure 2.1) were not considered under this closure plan. The nature and extent of contamination in those areas suggests that they are not related to spills or leaks from the former tank cluster. In fact, two of these three areas (SB-16 and OW-5) are quite clearly impacted by an off-site fuel leak.

Soil boring locations are presented in Figure 5.1. Figure 5.2 shows the area which is proposed to be remediated.

The estimated area to be remediated near the former tank cluster is about 6,000 square feet. The volume of soil is approximately 1,900 cubic yards. With an additional 20% for contingency, the total volume of soil estimated to require remediation is 2,250 cubic yards. The actual volume will not be known until excavation takes place, and could be significantly higher or lower than 2,250 cubic yards.

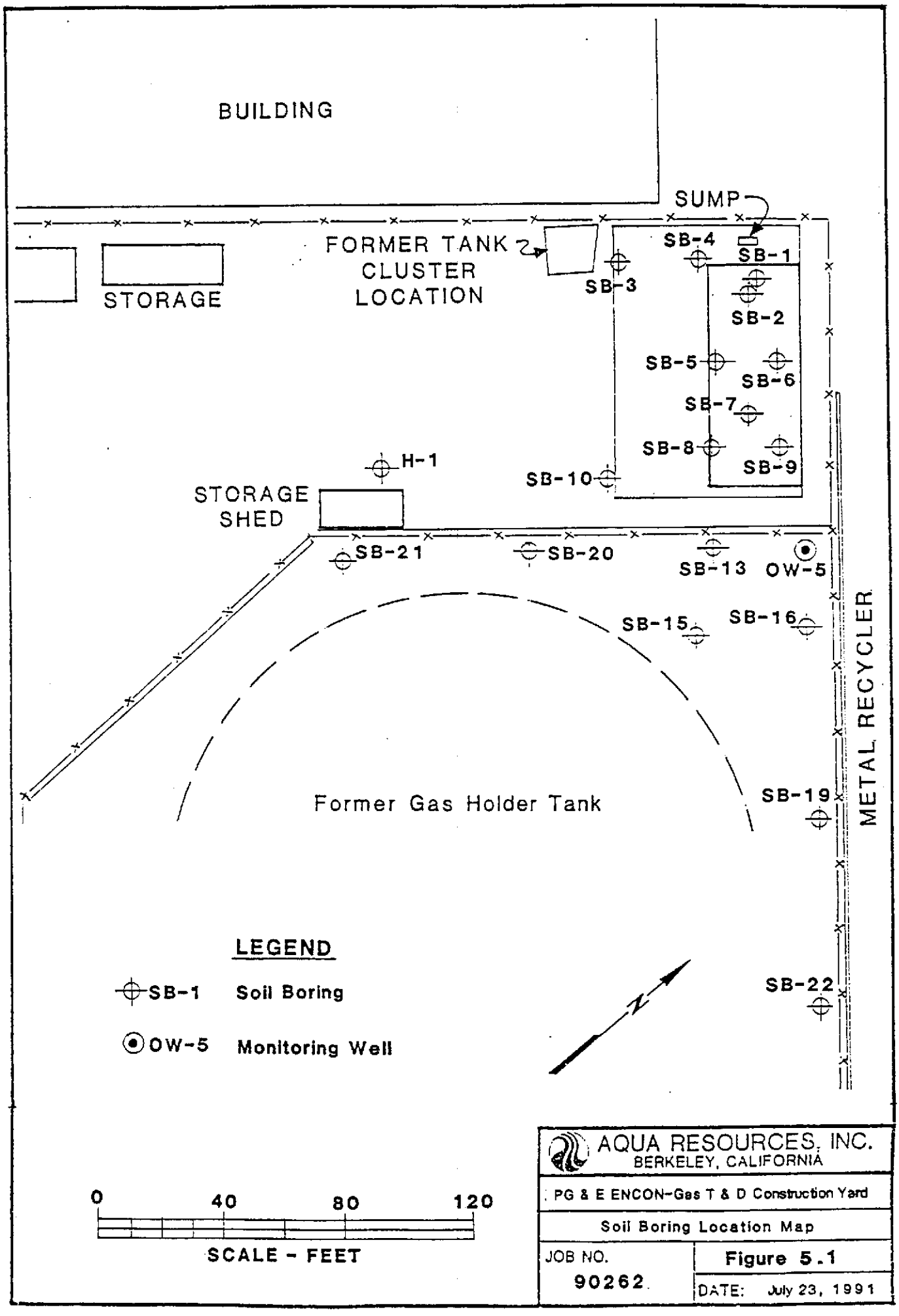
During ARI's field investigation saturated soil was encountered at about 8 feet below ground surface. The maximum depth of excavation will be limited to above the saturated zone. ARI recommends that the excavation be performed in late summer, when groundwater levels are usually lowest. That would allow excavation to 8.5 feet depth.

Table 5.1 Results of the Analyses of Soil Samples Compared to Proposed Cleanup Levels

Sample ID (7)	Depth [feet]	Oil and Grease [mg/kg]	TPH (d) [mg/kg]	TEH-Diesel [mg/kg]	TEH-Kerosene [mg/kg]	TVH-Gasoline [mg/kg]	Benzene [ug/kg]	Toluene [ug/kg]	Ethyl-benzene [ug/kg]	Xylenes [ug/kg]
B1-1-1	3.0	2,000								
B1-2-1	5.5	180							56	150
B2-1-1	5.0	3,500							1,200	1,900
B2-2-1	8.5	1,200							120	90
OB-9	5.5	52,000		3,900						
OB-9	7.5	1,000		400						
OB-14A	8.0	1,200			260					
OB-15	7.0	4,800			340					1,000
OW-3	5.0	220		210						
OW-3	7.0	1,100								
Tank Cluster	0.0-7.0	max 55,400		max 1,100						
SB-1-1b	4.0		32,000	8,900					45	25
SB-1-2	5.0-5.5		11,000	2,100 (a)						
SB-1-3	10.0-10.5		11	< 2.5						
SB-2-1	4.0-4.5		47,000	1,600 (b)					30	
SB-4-1	5.75-6.25		14,000							
SB-4-2	7.25-7.75		5,800							
SB-4-3	8.0-8.5		6,900							
SB-5-1	2.75-3.25	9,200								
SB-5-2	5.0-5.5	3,500								
SB-6-1	3.0-3.5	13,000		1,700			16	120	220	730
SB-6-2	4.5-5.0	3,600								
SB-6-3	7.5-8.0	2,400								
SB-7-1a	1.0-1.5 (e)	3,900								
SB-8-2	3.0-3.5	2,700		47					45	
SB-9-1	1.0-1.5	2,100		210						
SB-9-2	5.0-5.5	2,400								
SB-15-1	2.0-2.5	2,300								
SB-16-3	7.0-7.5	110		510			110	79		140
OW-5-5	2.5-3.0		450							
OW-5-9	4.5-5.0		600	< 50 (c)		2				
OW-5-12	6-6.5		75							
Proposed Cleanup Level (f)		1,000	100	100	100	10	5	5	5	5

Notes:

1) (a) = Sample contains a hydrocarbon fuel of approximately 3700 mg/kg, including 2149 mg/kg of diesel fuel
2) (b) = Sample contains a hydrocarbon fuel of approximately 2000 mg/kg, including 1571 mg/kg of diesel fuel
3) (c) = Sample contains a hydrocarbon fuel of approximately 3750 mg/kg, which does not match diesel fuel
4) Blank = Not Analyzed
5) < = Not Detected at or above Reporting Limit
6) (d) = TPH was analyzed by EPA method 418.1 allowing quantitation of the sum of all three hydrocarbon fractions. This is not a specific hydrocarbon determination method and is why proposed cleanup levels for individual hydrocarbons have not been assigned. All samples with concentration of TPH above 10 mg/kg are shown in the table.
7) Samples B1-1-1 through Tank Cluster were collected and analyzed by PG&E in 1987. Samples SB-1-1b through OW-5-9 were collected and analyzed by ARI in 1991 and 1991. SB-1 = Soil Boring 1; 1b = sample number; OW-5 = Observation well 5; 5 = sample number.
8) (e) = Sample could not be collected undisturbed.
9) (f) The basis for the proposed cleanup levels is discussed in Chapter 4.0.



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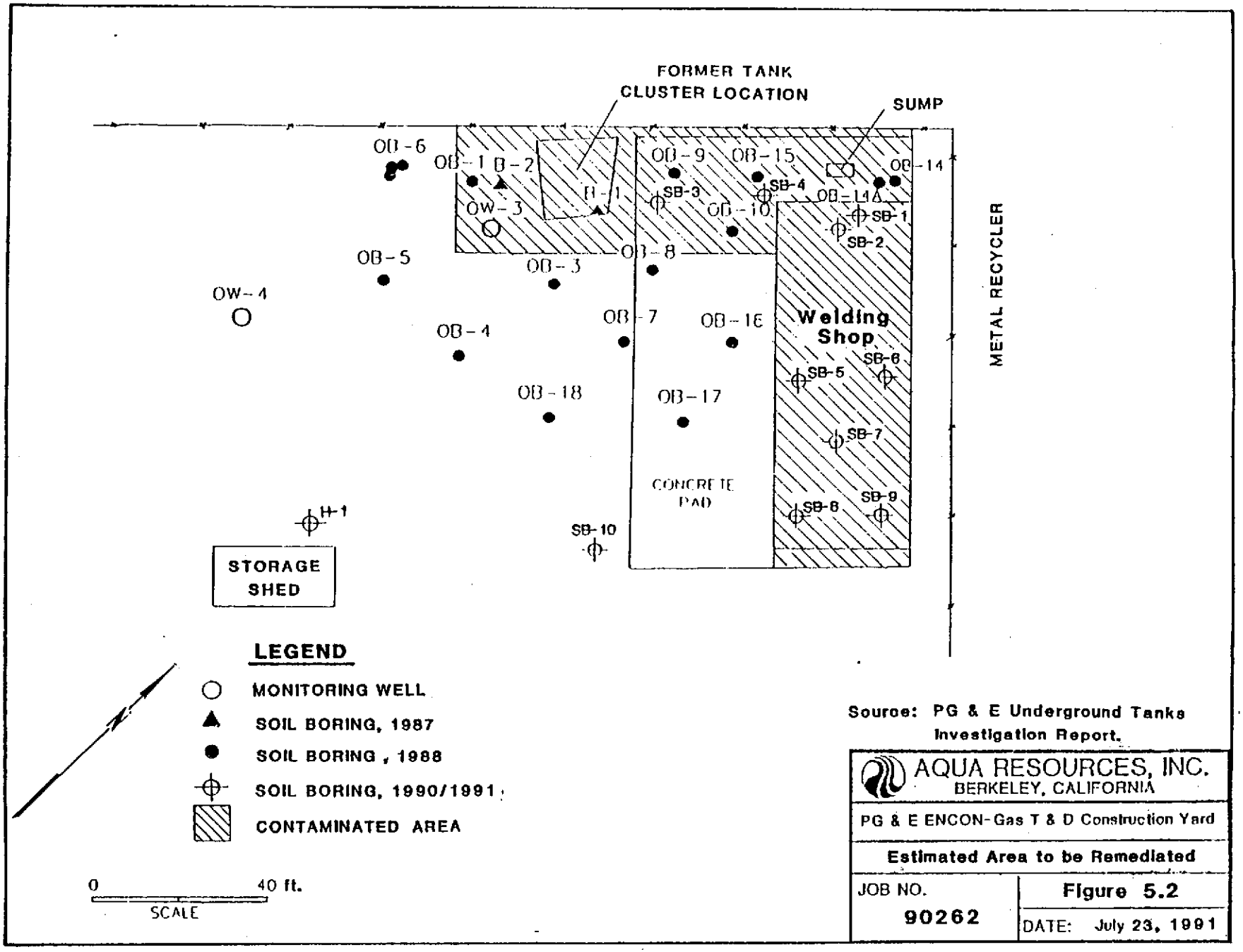
PG & E ENCON-Gas T & D Construction Yard

Soil Boring Location Map

JOB NO. 90262

Figure 5.1

DATE: July 23, 1991



Source: PG & E Underground Tanks Investigation Report.

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PG & E ENCON-Gas T & D Construction Yard

Estimated Area to be Remediated

JOB NO. 90262

Figure 5.2

DATE: July 23, 1991

6.0 REMEDIATION ALTERNATIVES

6.1 Alternative Screening

The following alternatives were considered for remediation of soils impacted with petroleum hydrocarbons:

1. Off-site thermal treatment and subsequent recycling;
2. Off-site recycling alone;
3. Off-site disposal;
4. Bioremediation;
5. Asphalt incorporation;
6. On-site low temperature rotary kiln thermal treatment.

Of these alternatives, only the first three were retained as potentially feasible. Alternatives 4 - 6 were screened out for the following reasons:

Bioremediation was screened out because a biotreatability analysis performed for ARI by Forward, Inc. determined that the high concentrations of high boiling point hydrocarbons (oil and grease) could not be remediated to 100 mg/kg, (i.e., the level acceptable for disposal at a Class II or III landfill) in a reasonable time.

Asphalt Incorporation is not feasible due to the high clay content (between 55 and 75 percent) of soils at the site. Soils with high clay content can cause "balling" of soil in the equipment, which prevents adequate treatment.

On-site low temperature rotary kiln thermal treatment was also eliminated due to similar problems with the high clay content. In addition, it is doubtful that this process would be effective in clay soils with a high concentration of high-boiling point hydrocarbons.

Alternatives retained for further analysis are described below.

6.2 Potentially Feasible Alternatives

6.2.1 Off-site thermal treatment and subsequent recycling - Unlike low temperature rotary kiln thermal treatment, high temperature thermal treatment is capable of destroying high boiling point hydrocarbons, such as those present at the PG&E site. Soil can be treated by thermal treatment and can be subsequently reused in the manufacture of light weight aggregate. This option is recommended because recycling facilities are relatively close to the site, it is cost-effective and produces a recycled product which can be used in concrete or road base, or can be placed back in the excavation hole.

At least one such facility has been approved by the Bay Area Air Quality Management District (BAAQMD). This facility can take non-hazardous soils containing up to 30,000 ppm diesel fuel and oil and grease. Diesel concentrations observed at the PG&E site have been well below this limit. Oil and grease concentrations observed have been below this level in all but two samples, while the average concentration observed has been well below 30,000 ppm. In order to assure that soils sent for treatment are within oil and grease limits, it is recommended that excavated soils be stockpiled onsite and characterized. Sufficient test samples must then be taken to characterize the waste prior to transportation off-site.

Recycling facilities also have limits on the concentration of metals that can be accepted. These limits are set at Title 26, CCR limits for non-hazardous waste. Samples collected at the site have been below these limits for all metals except lead. Of the soils to be remediated under this closure plan, one out of seven samples has exceeded the Title 26, CCR limit for soluble lead, although the average concentration of soluble lead in samples taken has been below this limit. ARI therefore recommends that soils be stockpiled and sampled using a statistical technique described in Chapter 9 of the "Test Methods for Evaluating Solid Waste (SW-846)" by EPA, prior to disposal, in order to determine if the lead limit is met.

If the soluble lead limit is not met, an application for a variance per Section 22-66260.200(f), Title 26, CCR should be made to California Department of Toxic Substances Control. If such a waiver is obtained, the soil may be managed as non-hazardous waste. If not, treatment as a hazardous waste will be necessary. Recycling facilities might accept material that exceeds Title 26 limits if a California Department of Toxic Substances Control variance is obtained. However, it may require permission from the BAAQMD under the terms of applicable air emission limits.

6.2.2 Off-site recycling alone - Soils containing hydrocarbons can also be directly recycled into a road sub-base. The closest site known to ARI accepting soils for this purpose is in Kern County. The long hauling distance makes this process more costly and therefore less desirable than the first option.

6.2.3 Off-site disposal - While direct land disposal is feasible for soils at this site, it is the least preferred option. At least two facilities in Kern County are currently accepting soils containing hydrocarbons for land disposal. As with option 2, costs of transportation to Kern County add significantly to the overall cost of this option.

The cost of land disposal of soils is also highly dependent on whether the soils are classified as hazardous per California Department of Toxic Substances Control guidelines. If some soils are found to exceed Title 26, CCR limits and a California Department of Toxic Substances Control variance cannot be obtained, they must be treated and disposed of at a Class I landfill. The EPA Land Ban effectively bans direct disposal of such soil without some pretreatment. The pretreatment is required to reduce soil toxicity and pollutant mobility before the soils are landfilled. In addition, such soils will have to be transported under a hazardous waste manifest. Continuing liability for the fate of these wastes may be assigned to the generator of the hazardous waste if this method is utilized. The cost of transportation, treatment, and disposal of hazardous waste are much higher than for non-hazardous soils, and are on the order of $250 per ton of soil. In our opinion, this option should be avoided if at all possible.

7.0 RECOMMENDED REMEDIATION PROGRAM

ARI's recommended remediation program consists of soil remediation and groundwater monitoring. Both components are described below.

7.1 Remediate Soils Impacted by Prior Petroleum Hydrocarbon Releases in the Former Underground Tank Cluster Area

ARI recommends that an estimated 2,250 cubic yards of soil impacted by prior petroleum hydrocarbon releases in the former underground tank cluster area be excavated and remediated. The actual amount of soil to be remediated will not be known until the excavation takes place and could be significantly higher or lower than 2,250 cubic yards.

Soils in the southeast portion of the yard, near the former natural gas holder (see Figure 5.2) will not be remediated under this proposed closure plan. Although samples from three boring locations in that area did exceed the proposed soil cleanup levels, the nature and extent of petroleum hydrocarbons detected in those areas suggest that they are not related to spills or leaks from the former tank cluster. In fact, two of these three locations are most likely impacted by an off-site fuel leak.

Steps needed to remediate soils in the tank cluster area are as follows.

7.1.1 Excavation - The contaminated soils can be excavated using conventional excavation equipment. Because the anticipated depths of excavation are less than ten feet, conventional rubber-tire backhoe excavators (i.e. Case model 580) could be used. Larger mechanical excavators could also be used; however, mobilization costs for such equipment will be higher. Despite the higher mobilization costs, the operating time will likely be lower because of increased excavation rates due to their larger bucket volumes and operating flexibility (ability to swing 360 degrees, longer boom lengths etc.). Other earth moving equipment could be used (i.e. loaders or scrapers); however, additional earthwork for constructing access ramps within the excavations would be required.

Excavation of soils located beneath the welding shop will be most cost effective if the building is removed prior to excavation.

7.1.2 Confirmation Sampling - Soil sampling will be conducted after excavation to confirm that contaminated soils have been removed. Sampling will conform to LUFT manual requirements and will include a required number of samples at the base of the excavation, on all sidewalls, and of any visible contamination.

Stockpiled soil will also be sampled for final characterization prior to treatment/disposal. This sampling is necessary because the soluble lead concentration of these soils must be established prior to disposal. A statistically based sampling scheme will be implemented such that compliance with regulatory limits for lead can be established with a 80% confidence interval as required by California Department of Toxic Substances Control.

Results of the laboratory analysis of soil stockpile samples will be used to determine if the soil is classified as hazardous waste due to the concentration of soluble lead. If soil lead concentrations are found to exceed hazardous waste limits, an application for variance from hazardous waste classification should be made to the California Department of Toxic Substances Control. If such a waiver is obtained, the soil may be managed as non-hazardous waste. If not, handling as a hazardous waste will be necessary, and ARI will analyze appropriate options at that time.

7.1.3 Remediate soils by off-site thermal treatment and subsequent recycling - ARI recommends that non-hazardous soils containing petroleum hydrocarbons be transported to a thermal treatment and recycling facility. Direct disposal or off-site recycling without thermal treatment are also feasible options but are both more costly, primarily because of a long hauling distance.

7.2 Continue Groundwater Monitoring for at Least One Year and Perform a Trend Analysis to Determine if Groundwater Quality is Improving

Because groundwater has been impacted by prior releases of petroleum hydrocarbons in the tank cluster area, groundwater monitoring is recommended for a period of at least one year after site closure. If after the first year, it can be demonstrated to the regulatory agencies that groundwater quality is improving and concentrations of petroleum hydrocarbons are considered insignificant, the monitoring program might be reduced or even ceased.

REFERENCES

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State of California Leaking Underground Fuel Tank Task Force, Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure, October 1989.

LIST OF ACRONYMS AND ABBREVIATIONS

ARI	Aqua Resources Incorporated
BAAQMD	Bay Area Air Quality Management District
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CCR	California Code of Regulations
EPA	Environmental Protection Agency
FS	Feasibility Study
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level
PCB	Polychlorinated Biphenyl
PG&E	Pacific Gas and Electric Company
RI	Remedial Investigation
RWQCB	Regional Water Quality Control Board
STLC	Soluble Threshold Limit Concentration
TDS	Total Dissolved Solids
TEH	Total Extractable Petroleum Hydrocarbons
TETC	The Earth Technology Corporation
TPH	Total Petroleum Hydrocarbons
TTLC	Total Threshold Limit Concentration
TVH	Total Volatile Hydrocarbons
VOC	Volatile Organic Compounds