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**GROUNDWATER INVESTIGATION WORK PLAN**

**Clark's Home and Garden  
23040 Clawiter Road  
Hayward, California**

**Prepared for**

**Mr. Chester Clark  
521 Triller Lane  
Grant's Pass, Oregon**

**15 April 1994  
Project No. 2611**

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**Geomatrix Consultants**

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15 April 1994  
Project 2611

Ms. Juliet Shin  
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Subject: Groundwater Investigation Work Plan  
Clark's Home and Garden  
23040 Clawiter Road  
Hayward, California

On behalf of Mr. Chester Clark, Geomatrix Consultants, Inc., is enclosing a copy of the Groundwater Investigation Work Plan for the subject site. Please call either of the undersigned if you have any questions regarding the enclosed report.

Sincerely,

GEOMATRIX CONSULTANTS, INC.

Handwritten signature of Gregory R. Kamman in black ink.

Gregory R. Kamman, R.G.  
Project Geologist

GRK/DAZ/lam  
CONTR2611GIWP.LTR

cc: Mr. Chester Clark  
Mr. Bob Price

Enclosure

Handwritten signature of Dawn A. Zeme in black ink, with a horizontal line extending to the right.

Dawn A. Zeme, C.E.G.  
Senior Hydrogeologist

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## TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 BACKGROUND	1
3.0 SCOPE OF WORK	4
3.1 Groundwater Sampling	5
3.2 Confirmation of Groundwater Flow Direction	5
3.3 Scenario A: No Groundwater Field Investigation	6
3.4 Scenario B: Groundwater Screening Investigation	6
3.4.1 Groundwater Screening Methodology	6
3.4.2 Analytical Methods	8
4.0 SCHEDULE AND REPORTING	8
5.0 REFERENCES	9

### LIST OF TABLES

Table 1 Summary of Groundwater Analytical Results from Monitoring Well MW-1

### LIST OF FIGURES

Figure 1 Site Location Map  
Figure 2 Site Plan

## GROUNDWATER INVESTIGATION WORK PLAN

Clarks Home and Garden  
23040 Clawiter Road Site  
Hayward, California

### 1.0 INTRODUCTION

This Groundwater Investigation Work Plan (Work Plan) describes the activities proposed for characterization and estimation of extent of petroleum hydrocarbon compounds in groundwater at the 23040 Clawiter Road facility, Hayward, California (the site) (Figure 1). This work is being performed by Geomatrix Consultants, Inc. (Geomatrix) on behalf of Mr. Chester Clark and in compliance with the Alameda County Health Care Services Agency's (ACHCSA) 1 November 1993 request for an additional groundwater investigation at the site. This work plan describes the approach, rationale, methods, and schedule for implementing a groundwater investigation at the site.

### 2.0 BACKGROUND

On 4 October 1988, two underground storage tanks (USTs), which were located adjacent to each other and to the north of the main office building at the site, were removed from the site (Figure 2). One UST was a 3000-gallon unleaded gasoline tank and the second was a 1000-gallon diesel tank. Kaprealian Engineering, Inc., (KEI) of Benicia, California, removed the tanks and observed no holes or leaks in the gasoline tank but did observe several small pin-size holes in the diesel tank. After excavation and removal of the tanks, 4 soil samples were collected (A1 and A2 from beneath the gasoline tank and B1 and B2 from beneath the diesel tank) at approximately 13 feet below ground surface (bgs) and analyzed for total petroleum hydrocarbons as diesel (TPHd), total petroleum hydrocarbons as gasoline (TPHg), and benzene, toluene, ethylbenzene, and total xylenes (BTEX). Analytical results indicated that 5.1 parts per million (ppm) TPHg was the only compound detected in the samples collected from beneath the gasoline UST while TPHd and TPHg were detected at concentrations ranging from 23,000 to 24,000 and 2700 and 3500 ppm,

respectively, in the two samples collected beneath the diesel UST. In addition, BTEX compounds were detected from 0.43 (benzene) to 350 ppm (total xylenes) in the two soil samples collected beneath the diesel UST.

On December 19, 1988 KEI expanded the excavation beneath the former diesel UST to the water table (approximately 18 feet bgs at the time). It is unclear if the lateral extent of the excavation was expanded. KEI then collected a single sidewall soil sample (SW-1) from the east side of the excavation at 17.2 feet bgs and analyzed it for TPHd, TPHg, and BTEX compounds. Analytical results indicated that TPHd and TPHg were detected at 1100 and 670 ppm, respectively, and individual BTEX compounds were detected at 1.1, 23, 15, and 67 ppm, respectively.

OEI  
former  
tank  
pit

Because the compounds detected in soil samples collected from within the UST excavation exceeded local and state regulatory action levels, Terratech, Inc. (Terratech) of San Jose, California, was retained to perform a groundwater investigation at the site. Terratech installed a monitoring well (MW-1) approximately 8 feet west of the former gasoline UST (Figure 2) on 1 August 1991. The well, constructed of 2-inch Schedule 40 PVC, is screened from 8 to 25 feet bgs with the sand pack extending to 6 feet bgs. During completion of the boring, soil samples were collected at 5.5, 10.5, and 15.0 feet bgs for TPHd, TPHg, and BTEX analyses. The sample collected from a depth of 15 feet likely represented soil quality near the historical capillary fringe or water table. In addition, Terratech collected a soil sample (DH-1) for the same analyses from beneath the former fuel dispenser, located several feet to the east of the USTs (Figure 2).

Results of the 1 August 1991 soil sampling indicated that TPHd and TPHg were detected at 350 and 6700 ppm, respectively, in the 15-foot soil sample from MW-1 and at 29 and 9.9 ppm, respectively, in the soil sample DH-1, collected from beneath the fuel dispenser. In addition, ethylbenzene and total xylenes were detected at 6.6 and 27 ppm, respectively, in the 15-foot soil sample from MW-1 and all BTEX compounds were detected in sample DH-1 at concentrations ranging between 0.0027 and 0.3 ppm.

Terratech sampled the groundwater from MW-1 on 7 August 1991 for TPHd, TPHg, and BTEX analyses. Results of these analyses indicated that 7100 parts per billion (ppb) TPHd, 5900 ppb TPHg, 45 ppb benzene, 130 ppb ethylbenzene, and 520 ppb total xylenes were detected. Terratech conducted monthly groundwater sampling from MW-1 on 5 September and 15 October 1991 and began a quarterly monitoring program on 7 January 1992. Analytical results of those sampling periods and all other groundwater sampling events through 31 January 1994 are presented on Table 1. Depth to water measurements in MW-1 have ranged between 15.57 to 17.92 feet below the top of casing during this period. It should be noted that the elevated concentration of benzene in groundwater is not consistent with the relatively low concentration of benzene detected in site soil to date.

In addition to the former USTs discussed above, numerous properties in close proximity to the site operate or formerly operated USTs containing petroleum hydrocarbons including: leaded gasoline; unleaded gasoline; diesel; motor oil; waste oil; and jet fuel. During a 1993 investigation for an adjacent property owner, Treadwell and Rollo, Inc. (TRI) of San Francisco, California, identified 33 USTs or former USTs within 1500 feet of the 23040 Clawiter site. In addition, numerous spills, releases and areas of groundwater contamination are documented in the surrounding area (TRI, 1993; Terratech, 1991; Juliet Shin, personal communication, 1994).

The regional groundwater flow in this part of the east San Francisco Bay area is reportedly to the west, or towards the bay (TRI, 1993). Local groundwater flow directions reported at surrounding properties include: west-southwest at the McKesson facility, located immediately to the north of the site (TRI, 1993); west-southwest at the Berkeley Farms facility, located approximately 600 feet to the southeast of the site (Juliet Shin, personal communication, 1994); southwest at the Hayward Air National Guard, located 1500 feet to the north of the site (TRI, 1993); and northwest at the Oliver de Silva facility, located approximately 40 feet to the northwest of the site (TRI, 1993). In addition, there are a total of nine production wells within approximately 600 feet of the site (TRI, 1993). Although no information was acquired regarding their pumping history, the wells may

currently affect, or have affected in the past, local groundwater gradients and flow directions in the area.

### 3.0 SCOPE OF WORK

The purpose of the proposed work is four-fold: verify that analytical results from MW-1 represent groundwater impact by the former USTs at the site; identify the presence of other petroleum hydrocarbon compounds (PHCs) existing in site groundwater, if any, and acknowledge their contribution to concentrations of TPHg and TPHd previously measured at MW-1; confirm local hydraulic gradient direction; and assess the lateral extent of groundwater impact by the former USTs relative to background PHC concentrations.

The groundwater investigation will be conducted in two stages. The first stage will consist of sampling monitoring well MW-1 to perform a fingerprint characterization of groundwater at this location. As described above, there are numerous sources and varieties of PHCs at and around the site. The purpose of the fingerprint characterization is to accurately identify the type of PHCs present in the groundwater and to verify that the PHCs result from impact by the former USTs. In addition, the first stage of work will consist of confirming the groundwater flow direction at the site. The sampling of MW-1 will also satisfy quarterly groundwater monitoring obligations for the site.

The second stage of work will be based on results of the groundwater fingerprint characterization and confirmation of groundwater flow direction. If MW-1 is found to be downgradient from the former UST locations and fingerprinting indicates that there is no diesel or gasoline in the groundwater sample from MW-1, we propose not to perform any further field investigations at the site. On the other hand, if fingerprint characterization indicates that a significant portion of the PHCs in the groundwater sample are gasoline and/or diesel, we propose to perform an on-site groundwater investigation to further delineate the extent and relative contribution of PHCs to groundwater from the former on-

*But diesel & gas has already been identified. Plus well*



site USTs. These options to the second stage of work are described in more detail in Sections 3.3 and 3.4.

### 3.1 GROUNDWATER SAMPLING

Blaine Tech Services, Inc. (Blaine Tech) of San Jose, California, is currently performing quarterly groundwater sampling services at the site. We propose that Blaine Tech continue to provide such services. Blaine will collect samples from MW-1 for TPHg, TPHd, and BTEX analyses. Groundwater samples for chemical analysis will be delivered to Curtis and Tompkins, Ltd., (Curtis and Tompkins) a California certified laboratory, under chain-of-custody procedures. Curtis and Tompkins will analyze samples for TPHd and TPHg using EPA Method 8015 and for BTEX using EPA Method 8020. In addition, Geomatrix will direct Blaine Tech to collect an extra sample from MW-1 for characterization purposes. The characterization sample will be delivered under chain-of-custody procedure to Friedman and Bruya, Inc., (Friedman and Bruya) of Seattle, Washington, a California state certified laboratory.

*We're missing this data!*

Fingerprint characterization will be performed by capillary gas chromatography and possibly other analytical methods (Zemo et al., 1993). This work will be performed by Dr. James Bruya with Friedman and Bruya who has numerous years of experience in developing and performing PHC fingerprint characterization.

### 3.2 CONFIRMATION OF GROUNDWATER FLOW DIRECTION

Simultaneous to the sampling of MW-1 and the fingerprint characterization analyses, Geomatrix will determine the groundwater flow direction at the site. Geomatrix is pursuing depth to water (DTW) information from McKesson Water Products Company, who have 4 wells on the property immediately north of the site. Combining this off-site and on-site DTW information will require surveying the elevation of MW-1 and collecting a round of DTW measurements from McKesson wells and MW-1 on the same day.

### 3.3 SCENARIO A: NO GROUNDWATER FIELD INVESTIGATION

1-10  
If results of fingerprint characterization indicate that diesel and/or gasoline <sup>or B10t</sup> are not detected in the sample collected from MW-1, this would suggest that the former diesel and/or gasoline USTs have not impacted site groundwater. Accordingly, we would conclude that previous groundwater samples collected from MW-1 have been incorrectly quantified. PHCs in samples that elute in the TPHg or TPHd range (such as jet fuel, kerosene, stoddard solvent, etc.) are commonly misidentified and incorrectly quantified as gasoline and/or diesel (Zemo, et. al., 1993). If this is the case at the 23040 Clawiter Road site, we will propose no additional groundwater field investigation; we will prepare a report of our findings for ACHCSA and continue to monitor existing well MW-1 on a limited basis.

Just a reference to 11/10/14

### 3.4 SCENARIO B: GROUNDWATER SCREENING INVESTIGATION

Yes!  
If the fingerprint characterization detects gasoline and/or diesel in groundwater at MW-1, we propose a groundwater screening investigation at the site. This investigation will consist of collecting 3 to 4 groundwater samples from beneath the site to further delineate the extent of the gasoline and/or diesel. <sup>New J.C.</sup> If the fingerprint characterization at MW-1 indicates PHCs in addition to gasoline and diesel in the groundwater, we will conduct further characterization analyses on the groundwater screening samples to differentiate these "background" PHCs from the gasoline and/or diesel. The purpose of this is to assess the extent of diesel and/or gasoline migration from the former UST area within the context of a larger area of TPH-affected groundwater.

#### 3.4.1 Groundwater Screening Methodology

Before work begins, Geomatrix will obtain the appropriate soil boring permit(s) from the Alameda County Flood Control and Water Conservation District (ACFCWCD), and will notify Underground Service Alert (USA) and arrange for a utility locator to clear the proposed boring locations of underground utilities. In addition, Geomatrix will prepare a site health and safety plan for Geomatrix field personnel. The health and safety plan will include safety procedures associated with fieldwork, emergency procedures, and a hospital location map.

Three to four borings and groundwater screening samples are proposed for the site investigation (Figure 2). Borings will be completed by Precision Sampling Inc. (PSI), of San Rafael, California under the direction of Geomatrix. Each boring will be advanced to a depth of approximately 20 feet bgs using PSI's EnviroCore hydraulic-powered drive casing system, which permits continuous soil coring and enables collection of groundwater samples after reaching the water table. A 2-inch-diameter outer drive casing will be advanced to seal off and keep the borehole open and one-inch-diameter inner sampling rods will be simultaneously advanced to collect continuous soil cores. The soil cores will be logged by a Geomatrix geologist and a lithologic log will be prepared for each boring. Once groundwater is reached, the inner sampling rods will be removed and a clean one-inch-diameter schedule 40 PVC casing with a 2-foot-long screen will be placed temporarily in the borehole. The outer drive casing will then be removed from the borehole, exposing the PVC screen to groundwater which can then enter the borehole. A clean PVC bailer will be used to collect a grab groundwater sample by lowering the bailer into the PVC casing.

A groundwater sample will be collected from one boring (B-1) near the downgradient property boundary (approximately 20 feet west of MW-1) to evaluate the potential presence of PHCs in groundwater leaving the site. Two groundwater samples will be collected from borings (B-2 and B-3) upgradient of the former UST location, to assess the presence of PHCs in groundwater in that area of the site. If time permits (only a one day field program is scheduled), a fourth boring (B-4) will be completed and groundwater screening sample collected from a location down and transgradient from the former USTs location.

Groundwater samples will be decanted from the bailer into one-liter amber bottles and 40-milliliter vials preserved with hydrochloric acid. The samples will be labeled, placed in an ice-cooled chest, and delivered to the analytical laboratory under Geomatrix chain-of-custody procedures.

At each sampling location, the temporary PVC well casing will be removed and the borehole will be grouted from the bottom of the boring to ground surface using neat

Portland Type I/II cement grout delivered through tremie pipe. Downhole tools will be cleaned before each use by steam-cleaning. The excess soil cores and cleaning rinse water will be contained in either 5-gallon buckets and/or steel 55-gallon drums. These containers will be stored temporarily at the site pending receipt of analytical results from the investigation.

### **3.4.2 Analytical Methods**

Groundwater samples will be submitted to Friedman and Bruya for TPHd and TPHg analyses using EPA Method 8015 and for BTEX analyses using EPA Method 8020. In addition, we expect that two of the groundwater screening samples will be selected for fingerprint characterization analyses.

## **4.0 SCHEDULE AND REPORTING**

Blaine Tech will sample monitoring well MW-1 and measure water levels during late April 1994 as part of the quarterly monitoring requirements for the site and will also collect and submit a fingerprint characterization sample to Friedman and Bruya pending approval of this Work Plan from ACHCSA. We expect to notify ACHCSA of the groundwater fingerprint characterization results in mid-May 1994. We will discuss the findings with ACHCSA and determine whether to proceed with the groundwater screening investigation. The groundwater screening investigation can be initiated within three weeks of receiving approval from ACHCSA, depending on subcontractor availability. We anticipate a one-day level of effort for the groundwater screening program and the standard laboratory turnaround time of two weeks for chemical analyses. Geomatrix expects to report the results of the groundwater fingerprint characterization and the groundwater screening investigation four weeks after receipt of all final analytical results.

## 5.0 REFERENCES

- Treadwell and Rollo, Inc., 1993, Subsurface Investigation, 22990 Clawiter Road, Hayward, California, 30 June.
- Terratech, Inc., 1991, Initial Investigation of Ground Water Contamination, Clark's Home and Garden, 23040 Clawiter Road, Hayward, California, 5 September.
- Zemo, D.A., Graf, T.E., and Bruya, J.E., 1993, "The Importance and Benefit of Fingerprint Characterization in Site Investigation and Remediation Focusing on Petroleum Hydrocarbons," in: Proceedings of the 1993 Petroleum Hydrocarbons and Organic Chemicals in Groundwater (Conference). NGWA/API, Dublin, OH, pp. 39-54.

**TABLE 1**

**SUMMARY OF GROUNDWATER ANALYTICAL RESULTS<sup>1</sup>  
FROM MONITORING WELL MW-1**

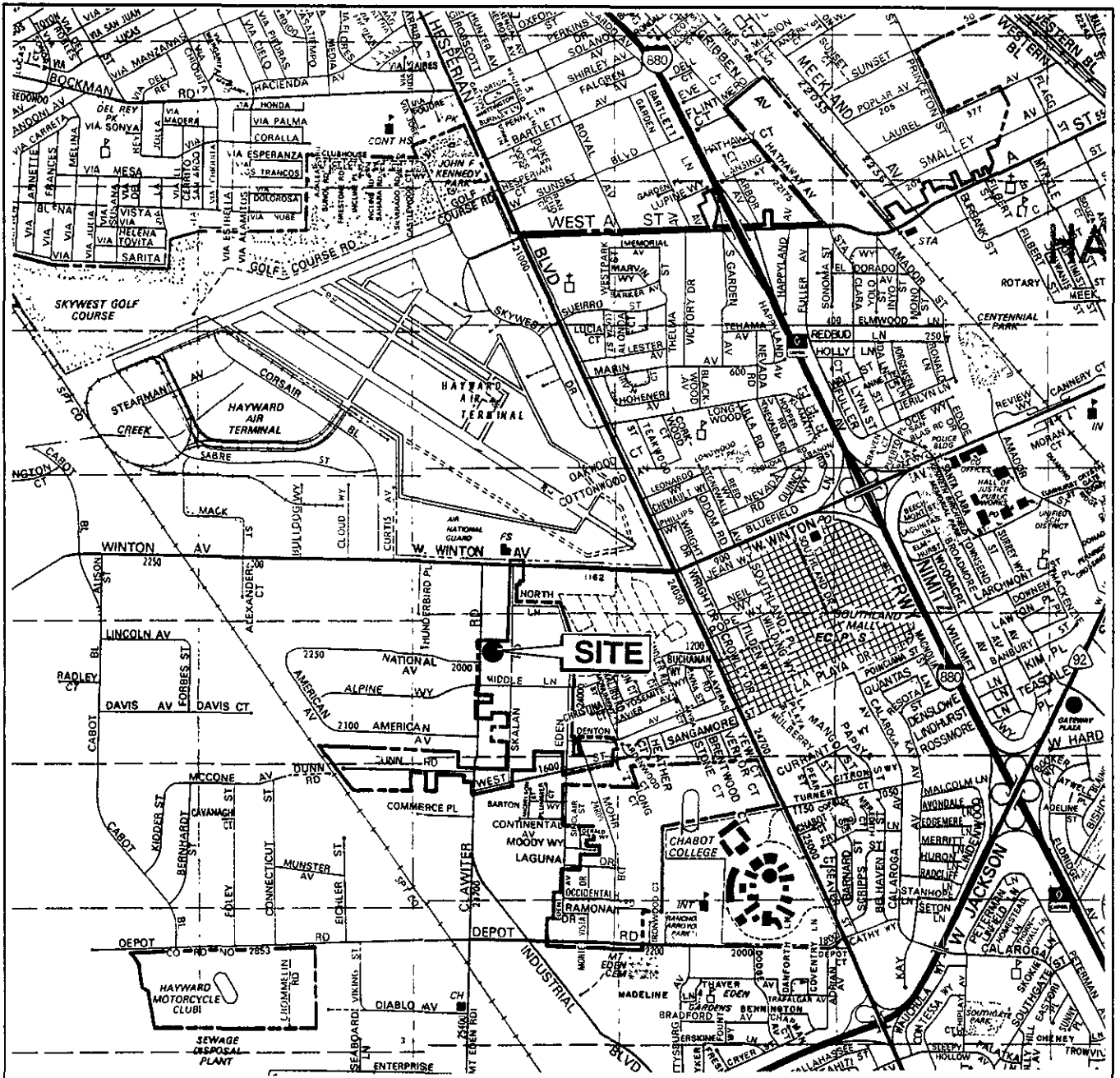
23040 Clawiter Road Site  
Hayward, California

Concentrations in micrograms per liter ( $\mu\text{g/l}$ )

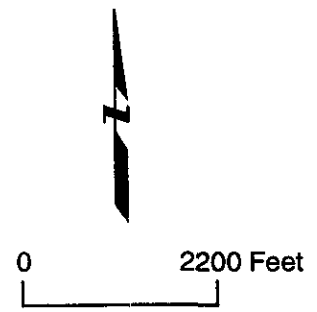
Date	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-Benzene	Total Xylenes
8/7/91	7100	5900	45	<25	130	520
9/5/91	2800 <sup>2</sup>	47,000	<50	<50	230	660
10/15/91	13,000	24,000	<50	<50	<50	390
1/7/92	9000 <sup>2</sup>	23,000 <sup>3</sup>	<50	<50	270	800
4/8/92	3500 <sup>2</sup>	8100	19	<5	350	210
7/7/92	6300	7000	<5	<5	190	170
11/23/93	1600	2400	1.5	3.7	41	24
1/31/94	1900	3900	1.9	4.2	56	49


Notes:

- <sup>1</sup> Soil samples analyzed for total petroleum hydrocarbons (TPH) as diesel and gasoline using Environmental Protection Agency (EPA) Method 8015, and for benzene, toluene, ethylbenzene, and xylenes by EPA Method 8020.
- <sup>2</sup> Laboratory notes that TPH detected as diesel due to both diesel and a petroleum hydrocarbon lighter than diesel.
- <sup>3</sup> Laboratory notes that TPH as gasoline does not appear to have a typical gasoline pattern.

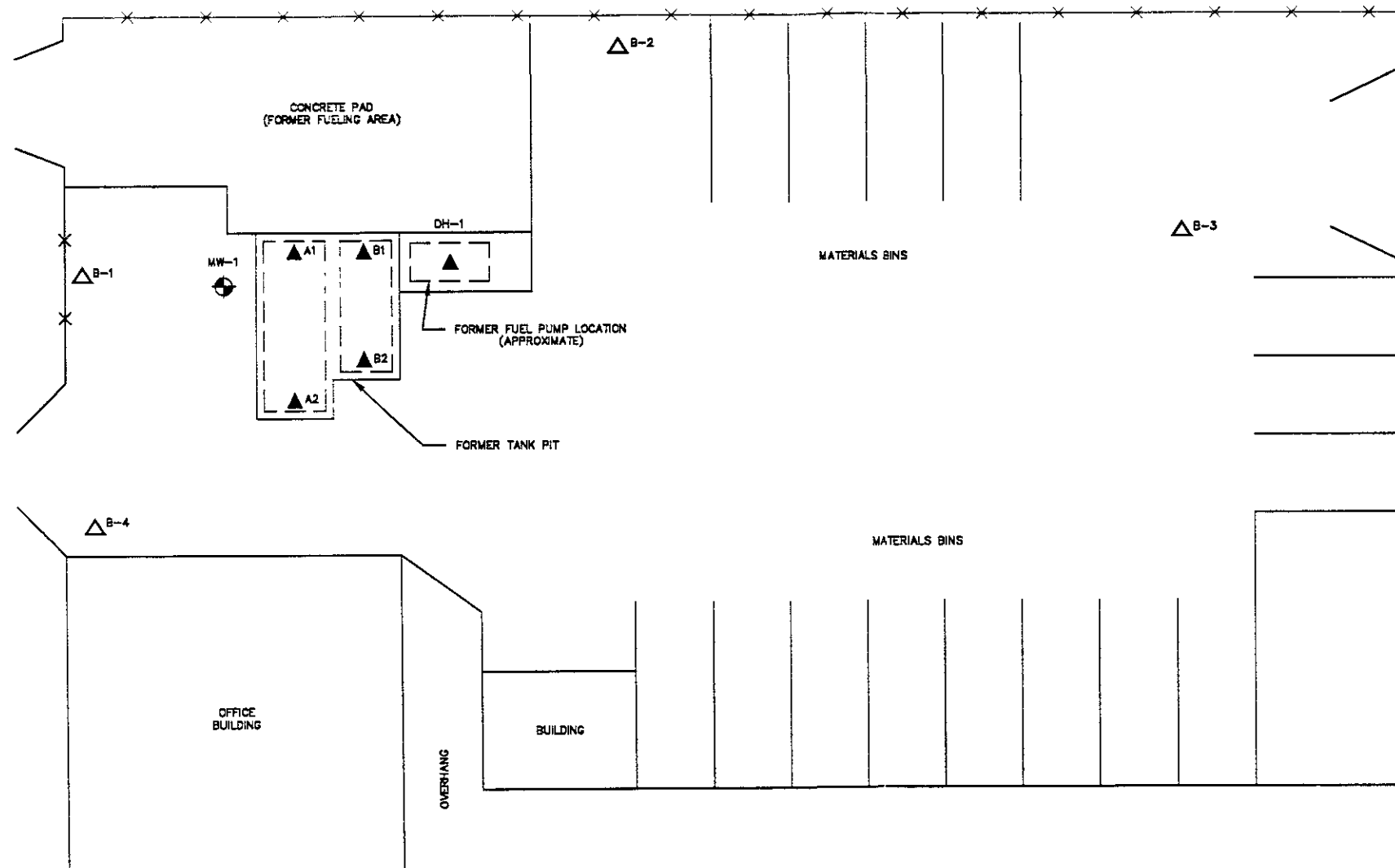


Base Map: Thomas Brothers Maps; Alameda County  
1990 edition; p. 58.



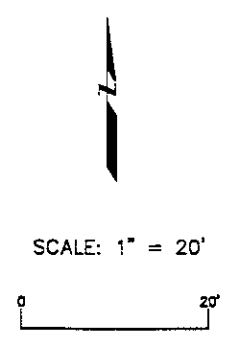
	<p><b>SITE LOCATION MAP</b>          Clark's Home and Garden          23040 Clawiter Road          Hayward, California</p>	<p>Figure          1          Project No.          2611</p>
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CLAWITER ROAD



EXPLANATION

- ▲ A1 PREVIOUS SOIL SAMPLING LOCATION
- △ B-1 PROPOSED GROUNDWATER SCREENING SAMPLE LOCATION
- ⊕ MW-1 MONITORING WELL LOCATION
- FORMER UNDERGROUND STORAGE TANK OR FUEL DISPENSER



NO.	DATE	REVISION	BY	NO.	DATE	REVISION	BY

Approval: \_\_\_\_\_  
Date: \_\_\_\_\_

  
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**SITE PLAN**  
**CLARK'S HOME AND GARDEN**  
**23040 CLAWITER ROAD**  
**HAYWARD, CALIFORNIA**

2611
Project No.
FIG. 2
Sheet