

JK3/8



21-E SITE ASSESSMENT

GRAVES TEXACO

**Uncas Avenue
Oak Bluffs, Massachusetts**

February 1989

Prepared For:

Robert Graves
Graves Machine Company
Uncas Avenue
Oak Bluffs, Massachusetts

Prepared By:

Saunders Associates
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(508) 693-1578

EXECUTIVE SUMMARY

A Chapter 21E Site Assessment for the Graves Texaco property in Oak Bluffs, Massachusetts, has been conducted by Saunders Associates, based on review of state and local records, historical review, subsurface exploration and water quality analyses. The findings of the site assessment are summarized below:

1. A significant release of gasoline, most likely leaking from the underground storage tanks located on the site, has occurred. Evidence of the leak includes:
 - a) high levels of volatile gases surrounding the tanks;
 - b) 3 inches of floating gasoline product found on top of the water table in a monitoring well located near the underground tanks; and
 - c) high levels of volatile compounds dissolved in a water sample collected from this same well.
2. An area south of the main building has been used for dumping waste oil in the past. Although very little volatile compounds are present in these soils, a composite sample showed moderately high levels of hydrocarbons.
3. Several isolated spills were detected on the site including in a drum storage area and adjacent to an old hydraulic lift within the building.
4. Further evaluation is necessary to determine the extent of contamination on the site.

Craig E. Saunders
Principal/Hydrogeologist

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**INVESTIGATION REPORT
FOR
SITE CERTIFICATION RELATIVE TO HAZARDOUS MATERIALS**

1.0 SITE OWNERSHIP AND LOCATION

1.1 Site Owner: Robert Graves
Graves Machine Company
Uncas Avenue
Oak Bluffs, MA 02557
(508) 693-5070

Date of Ownership: September 1984-Present

1.2 Site Location: Uncas Avenue
Oak Bluffs, MA 02557

County: Dukes County

Assessor's Plat: Map 11, Lot 153 (Figure 1)

USGS Quadrangle: Edgartown (Figure 2)

2.0 SITE DESCRIPTION AND ENVIRONMENTAL CHARACTERISTICS

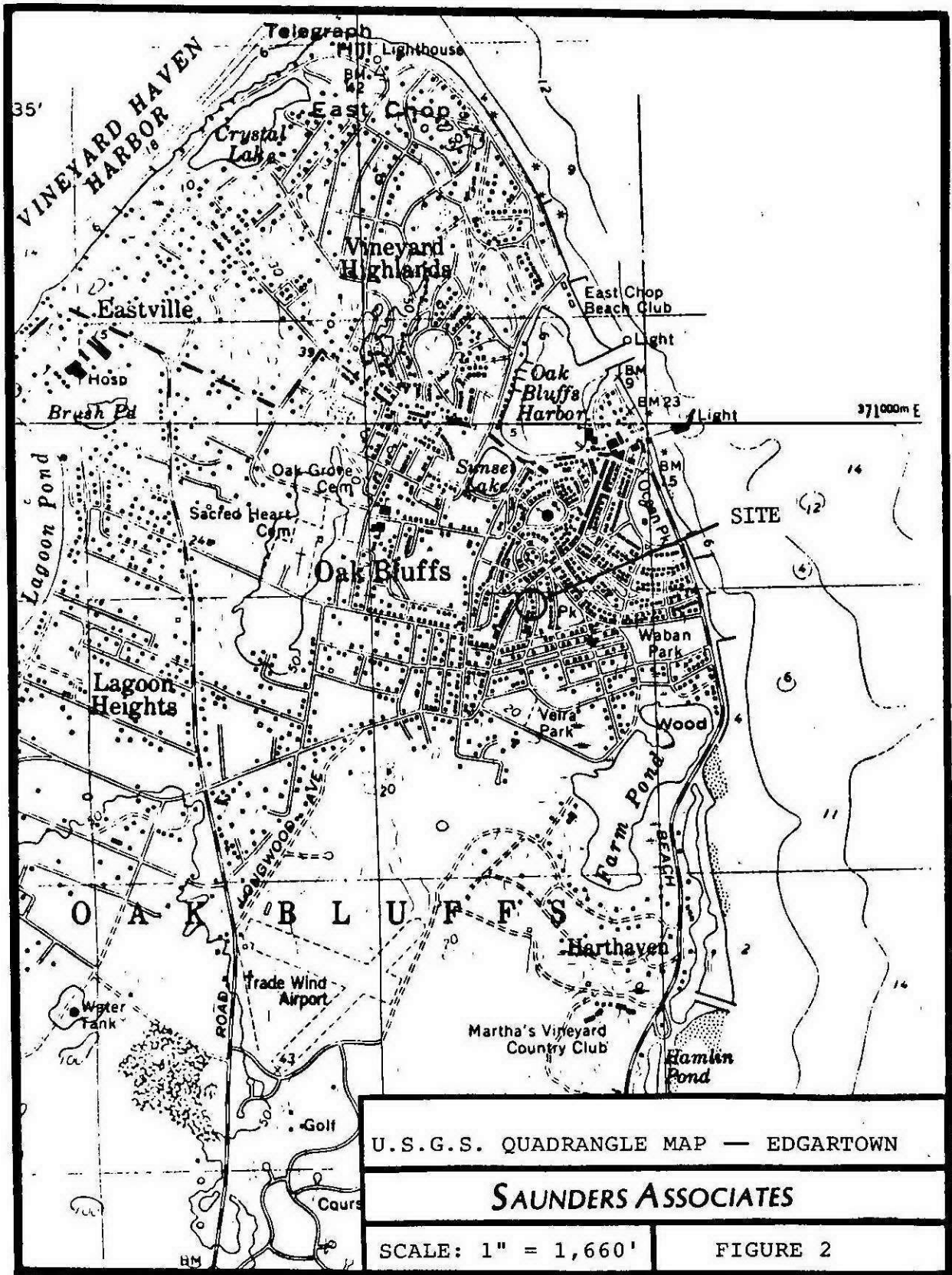
2.1 Site Description:

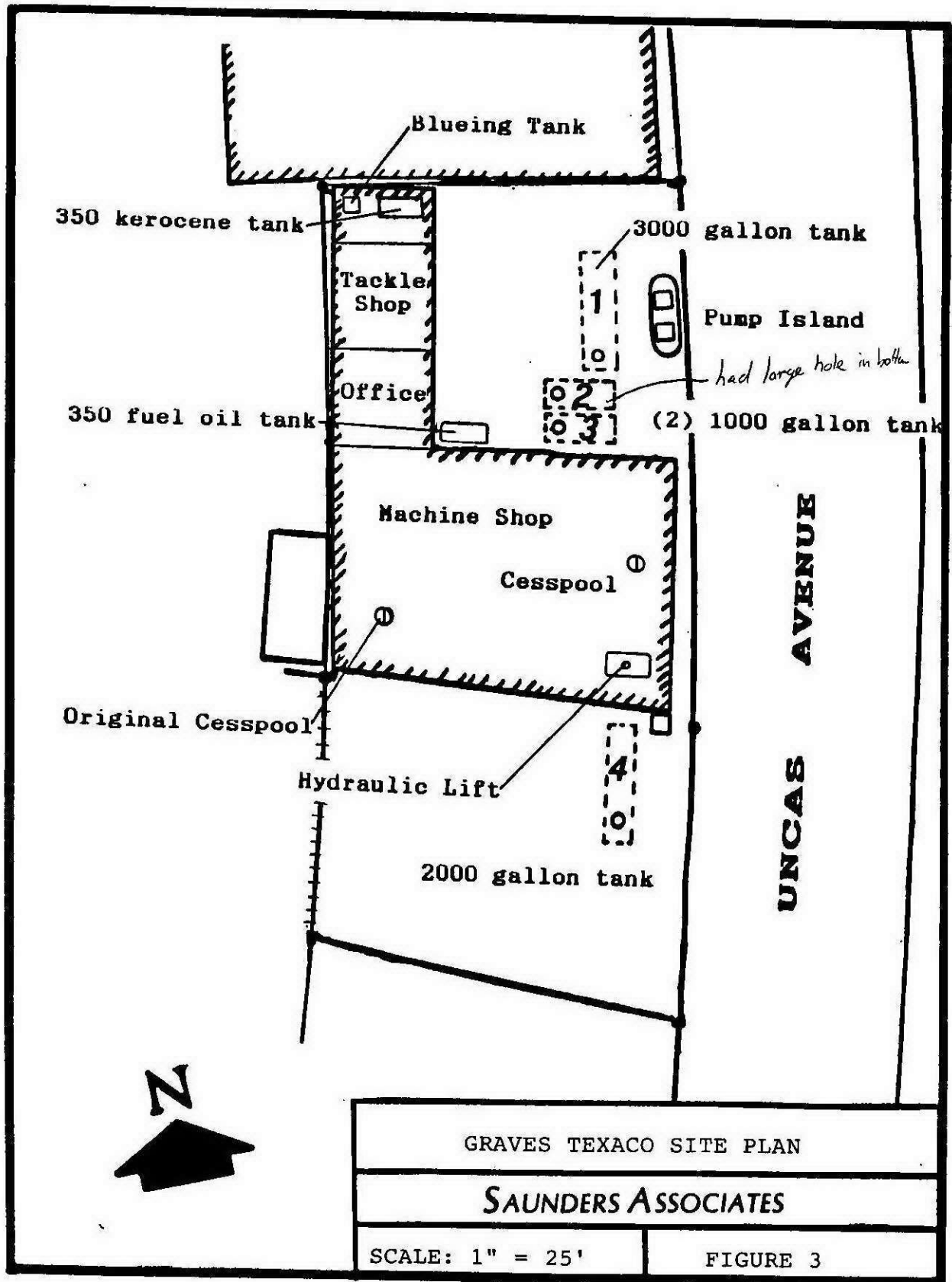
The .25-acre site is situated in a commercial area of Oak Bluffs, which abuts residentially developed land to the south and west. The 3,250 ft.² concrete block wall structure occupies much of the site area.

The surrounding area is predominantly flat-lying and gently slopes to the east toward Vineyard Sound which is found 1,800 feet east of the site. Farm Pond, a brackish water pond, is located 1,000 feet southeast of the property. Oak Bluffs Harbor is situated 1,600 feet directly north of the property.

2.2 Site Layout (Figure 3):

Site Boundaries: North: Cottage City Supply (now being renovated for Grand Central Rental)
East : Uncas Avenue Power Substation
South: Apartment Building
West : Houses; Rental Property





Roads:

The property fronts on Uncas Avenue.

Building and Parking
Area:

The location of the one-story building (3,250 ft.²) is shown on Figure 3. Limited parking is available adjacent to the office and tackle shop. Street parking is available on the opposite side of Uncas Avenue.

Fences:

One wood fence divides the vacant lot south of the building from the residence to the west.

Site Utilities:

Electricity and telephone are serviced above ground. The connection is found on the southeastern corner of the building. Water is serviced underground midway through the eastern wall of the machine shop.

On-site Drinking Water:

Drinking water is made available from the Town of Oak Bluffs municipal wells.

Ponds, Streams and
Wetlands:

Vineyard Sound: 1,800 feet to the east.

Farm Pond: 1,600 feet to the southeast.

Oak Bluffs Harbor: 1,800 feet to the north.

Sunset Lake: 1,600 feet to the north-northeast.

No wetlands are found on site or in the immediate vicinity.

Flood Plains:

The site lies in Zone C outside of the predicted 100-year flood zone.

2.3 Site Waste-water Information:

Waste water produced on site comes from a small bathroom located within the machine shop. Waste water is handled through a cesspool located under the slab adjacent to the bathroom. The cesspool is pumped twice annually indicating some problem with leaching. The original cesspool located under the slab near the western wall of the machine shop (Figure 3) is dry. No floor drains presently exist in the building.

2.4 On-site Storage of Hazardous Materials:

Above/Underground Tanks:

Above Ground:

350-Gallon Fuel Oil -- located outside of the office area

350-Gallon Kerosene -- located within the building

Underground:

Tank 1 -- 3,000 Gallon:

- 1) contains unleaded regular gasoline
- 2) installed in the 40's
- 3) Fiberglassed (armor-coated) in 1985
- 4) no record of testing

Tanks 2 & 3 -- each 1,000 Gallon:

- 1) contains unleaded super gasoline
- 2) installed in the 40's
- 3) no cathodic protection or armor coating
- 4) no record of testing

Tank 4 -- 200 Gallon:

- 1) contains diesel (4 inches -- approximately 25 gallons)
- 2) abandoned prior to present ownership
- 3) no reported cathodic protection or armor coating
- 4) installation date unknown, it is believed to be a newer tank
- 5) no record of testing

2.4 On-site Storage of Hazardous Materials:

Other:

Other hazardous waste used and stored on site include the following:

- 1) Light machine oils are used in the machine shop. Because these oils are consumed by heat in machinery, no waste is produced.
- 2) A blueing bath is used for blackening machined metal parts. The principal material used in the baths is nickel penetrate.
- 3) A hydraulic lift, located in the machine shop, has been out of use for over 20 years. It was reported to have not functioned (possible leakage) for several years.

3.0 SITE HISTORY

3.1 Zoning:

Present Classification: B-1 -- Commercially Zoned.

3.2 Current and Former Uses of the Site:

The site is presently used as a 1) machine shop and office, 2) Texaco station, supplying gasoline and kerosene, and 3) a tackle shop. The machine shop does precision machine work as well as some welding. No degreasers or chemicals, associated with electronic fabrication, are utilized on site. The vacant lot south of the machine shop is used for storing scrap metal, boats, etc. Several drums containing kerosene are stored in this area.

The gas station was established in the early 40's and consisted of existing tanks (1, 2 and 3) and a small building of approximately 600 square feet. The station has been run under several different owners since being established by William DeBettencourt. In the 50's the concrete block structure was built and used for automobile maintenance. The area presently housing the office, tackle shop and blueing room was used for automobile storage. During this period it was reported that considerable waste oil was discarded in the area south of the building.

During the 60's a new owner added the present southeast corner of the building, which contains a hydraulic lift. The station was leased to separate operators, who continued to sell gasoline and repair automobiles. Some Fiberglas boat building was carried out during part of this time.

The building was bought and converted to its present use by Robert Graves in 1984.

3.3 Current and Former Uses of Surrounding Properties:

Properties north of the site are owned by Cottage City Supply Company, which sells building materials. The building just north of the Graves Texaco site is presenting being renovated for an equipment rental business. Formerly these buildings were owned by the Town of Oak Bluffs and operated by the Highway Department. No fuel was stored on site.

Lots west and south of the site are presently occupied by single-family residences and apartments.

The lot directly across Uncas Avenue is used as a substation for Commonwealth Electric. Over 40 years ago this area was used for supplying natural gas to the Town of Oak Bluffs. A large pit and gas storage tank were present on the site at that time.

3.4 Environmental Permits:

Tanks are registered under Federal underground tank regulations with the Massachusetts Department of Public Safety.

No record of tank testing was known.

3.5 Summary of Prior Citations or Fines for Violations of Environmental Regulations:

None.

3.6 Persons Interviewed Relative to Site History and Use:

| <u>Person Interviewed</u> | <u>Relationship to Site</u> | <u>Address</u> |
|---------------------------|-----------------------------|------------------------------------------------------------------------------------------------|
| Robert Graves | Owner | Graves Machine & Tool Company Uncas Avenue Oak Bluffs, MA 02557 (508) 693-5070 |
| Donald Muckerheide | Former leasee | Dukes County Avenue Oak Bluffs, MA 02557 (508) 693-4219 |
| Nelson DeBettencourt | Nephew of original owner | DeBettencourt & Sons Inc. New York Avenue Oak Bluffs, MA 02557 (508) 693-0751 |
| Doug Seward | Oil supplier | R. M. Packer Co., Inc. Beach Road Vineyard Haven, MA 02568 (508) 693-0900 |
| Roger Wey | Owner of abutting property | Cottage City Supply Uncas Avenue Oak Bluffs, MA 02557 (508) 693-4655 |
| Herbert Combra | Supervisor | Oak Bluffs Highway Department County Road Oak Bluffs, MA 02557 (508) 693-0072 |

4.0 SUMMARY OF SITE INSPECTION AND SUBSURFACE INVESTIGATION

4.1 Surface Soil and Sediment Sampling Locations:

Composite samples of surface soils were collected from the upper foot of soil in two areas on site. The first composite sample (GR-S-1) was taken from the vacant lot south of the buildings from soil probe stations 1 through 12 (see Figure 4).

The second composite sample (GR-S-2) was taken from the tank area at stations 18 through 24. The soil samples were shipped to Groundwater Analytical Laboratory and analyzed for Total Petroleum Hydrocarbon Analysis (EPA Method 418.1-1R). Moderately high levels of contamination, 14,000 mg/kg and 7,400 mg/kg, were detected in samples GR-S-1 and GR-S-2, respectively. Soils in the southern open area (GR-S-1) were typically blackened, but no noticeable odor was detected, except at stations #10 and #11.

Much of the more volatile organics have apparently been removed over time by volatilization and biodegradation.

4.2 Surface Water Sampling Locations:

None.

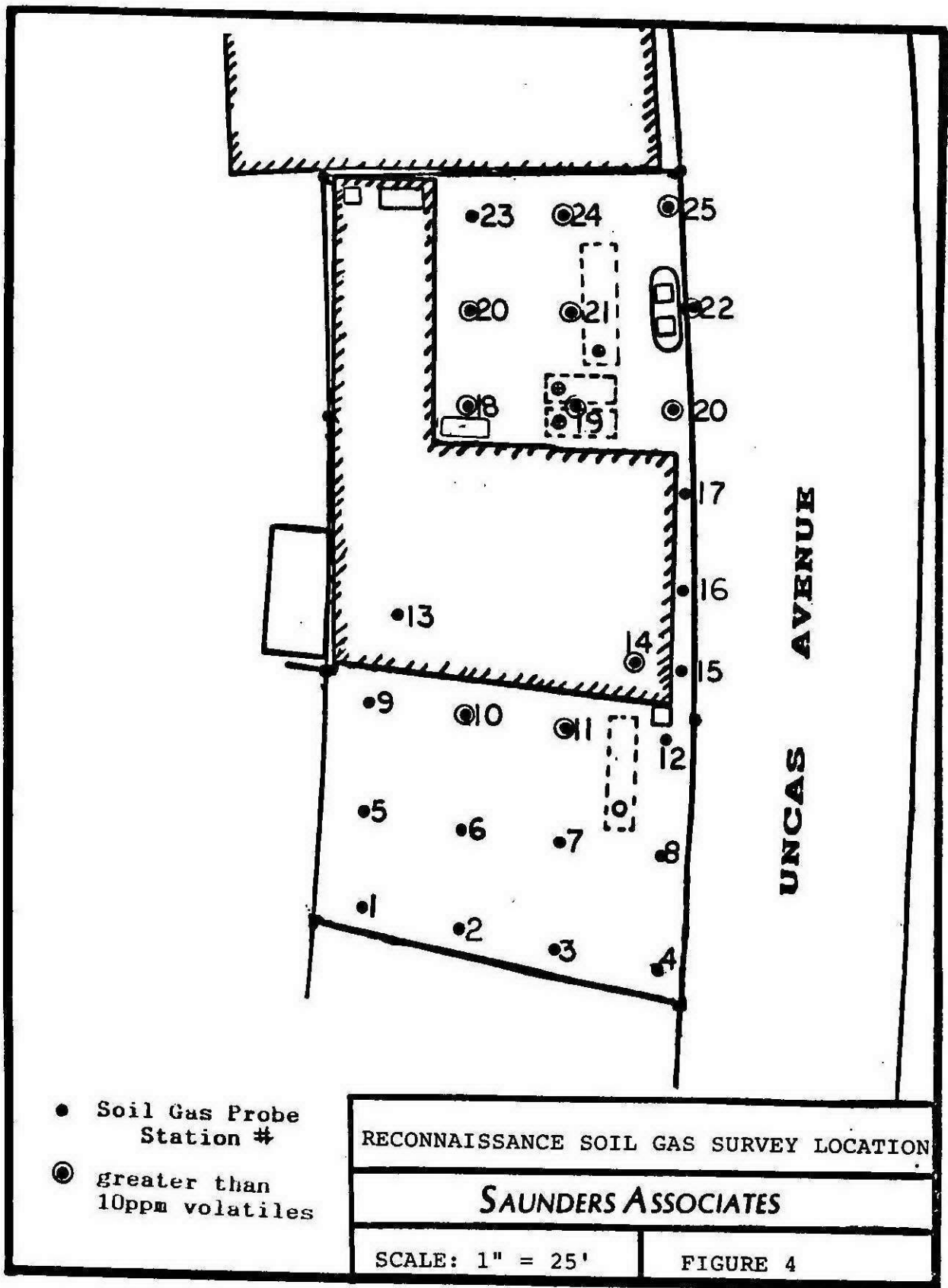
4.3 Soil Gas Testing:

Two soil gas surveys, one reconnaissance survey and one around-tank profiling survey, were conducted. After drilling through surface asphalt a slotted-probe was driven into the soil to appropriate depths. Gas was then pumped out of the probe and analyzed with a photoionization device (Photovac Tip 1). The instrument was calibrated to Benzene standard. The instrument measures total ionizationables present. See Appendix B for results.

1) Reconnaissance Survey (Figure 4):

At twenty-five stations probes were driven one foot below ground surface. At several stations deeper measurements were made. Elevated levels of volatile gas were detected at the following locations.

- a. Station #10 -- elevated levels probably associated with solvent spill. An acetone-like smell was noted to a depth of 3 feet below ground surface.



- b. Station #11 -- elevated levels probably associated with kerosene spillage from drums in this area;
- c. Station #14 -- moderately high levels were noted next to hydraulic lift;
- d. Stations #18-25 -- elevated levels probably related to gasoline release(s) in area.

2) Tank Survey-Profiling with Depth:

In order to help delineate possible product releases around each tank, soil gas measurements were made at 2.5-foot intervals around the perimeter of each tank. High levels of volatile gases were detected at many of the stations around Tanks #1, #2, and #3. Volatile readings were especially high on the western end of Tanks #2 and #3 indicating possible leakage from these underground tanks.

4.4 Subsurface Soil and Groundwater Exploration:

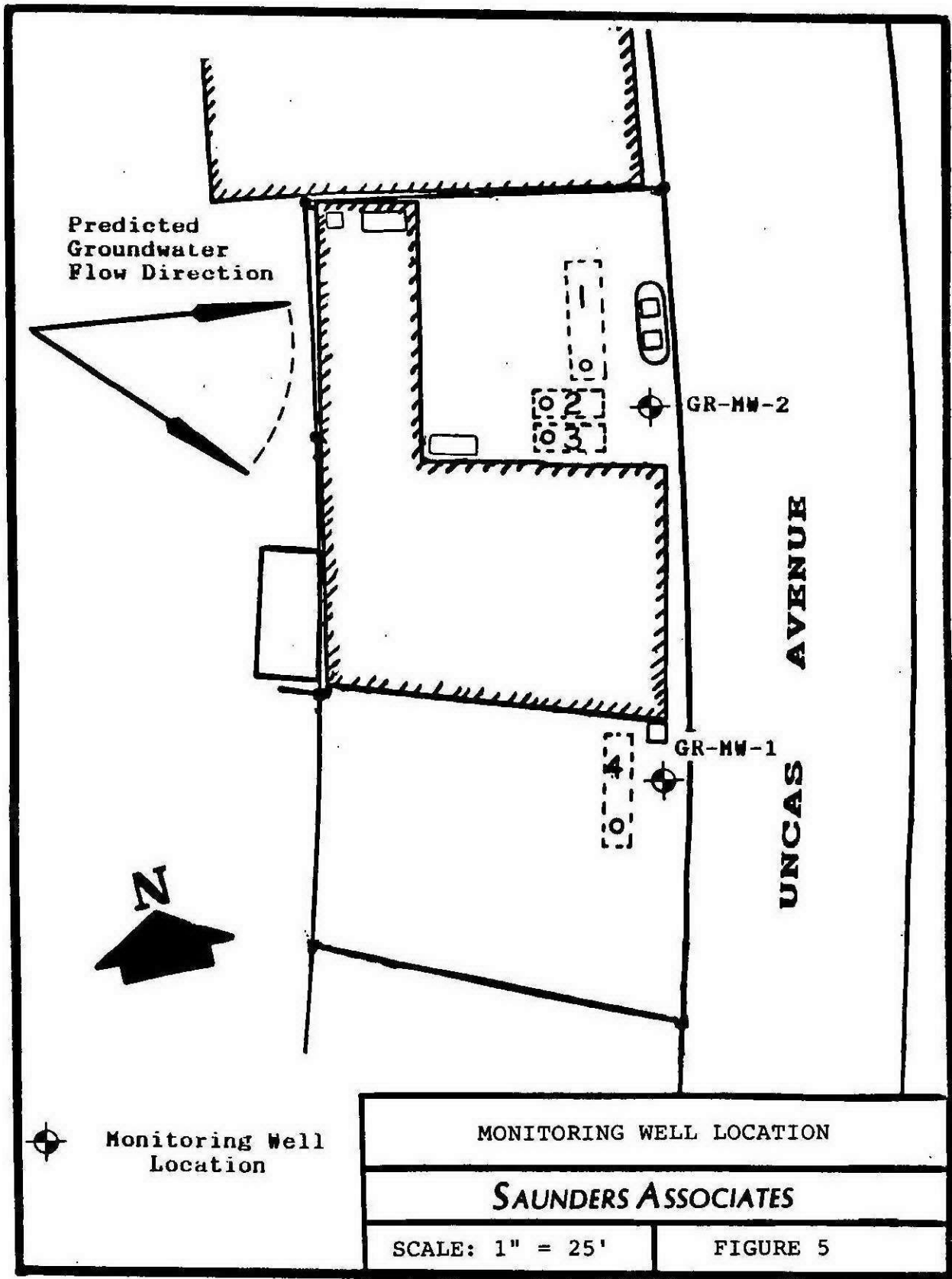
Boring locations and logs:

Figure 5 shows locations of both soil borings on site, GR-MW-1 and GR-MW-2. Borings were advanced with a mobile B-26 auger rig. Samples were collected at 5-foot intervals and analyzed for total volatiles with the Photoionization Detector. Logs of the borings are seen in Appendix A.

Monitoring well locations:

Two-inch PVC monitoring wells were installed in each of the above-mentioned bore holes. Each well contains a 10-foot slotted (.010 inch) PVC screen, placed so as to straddle the water table. Each well was backfilled with clean medium sand and sealed with bentonite. Wells were purged and samples were collected, refrigerated and shipped to Groundwater Analytical Laboratory in Buzzards Bay for volatile organic analysis (EPA Method 601-602).

Well GR-MW-2 contained 3 inches of floating product after stabilization.



4.5 Hydrogeological Interpretation:

Geology:

Bedrock of crystalline Paleozoic rocks is found approximately 1,000 feet below ground surface. Surface deposits consist of Martha's Vineyard Outwash (sand and gravel) overlying poorly stratified till deposited by Pleistocene glaciation. These deposits are permeable and do not support streams (Delaney, 1980). Tests at the Farm Neck well indicated transmissivity (measure of permeability) of 200,000 gallons per day per foot of drawdown.

Drilling on site penetrated predominantly fine-coarse grain sandy deposits. Some gravel intervals were encountered in bore hole GR-MW-2. Groundwater is found 15 to 16 feet below ground surface.

Groundwater Flow:

Regional groundwater flow is moving easterly toward Nantucket Sound. Local topography and surface water flow (Oak Bluffs Harbor, Farm Pond) may alter the flow direction locally.

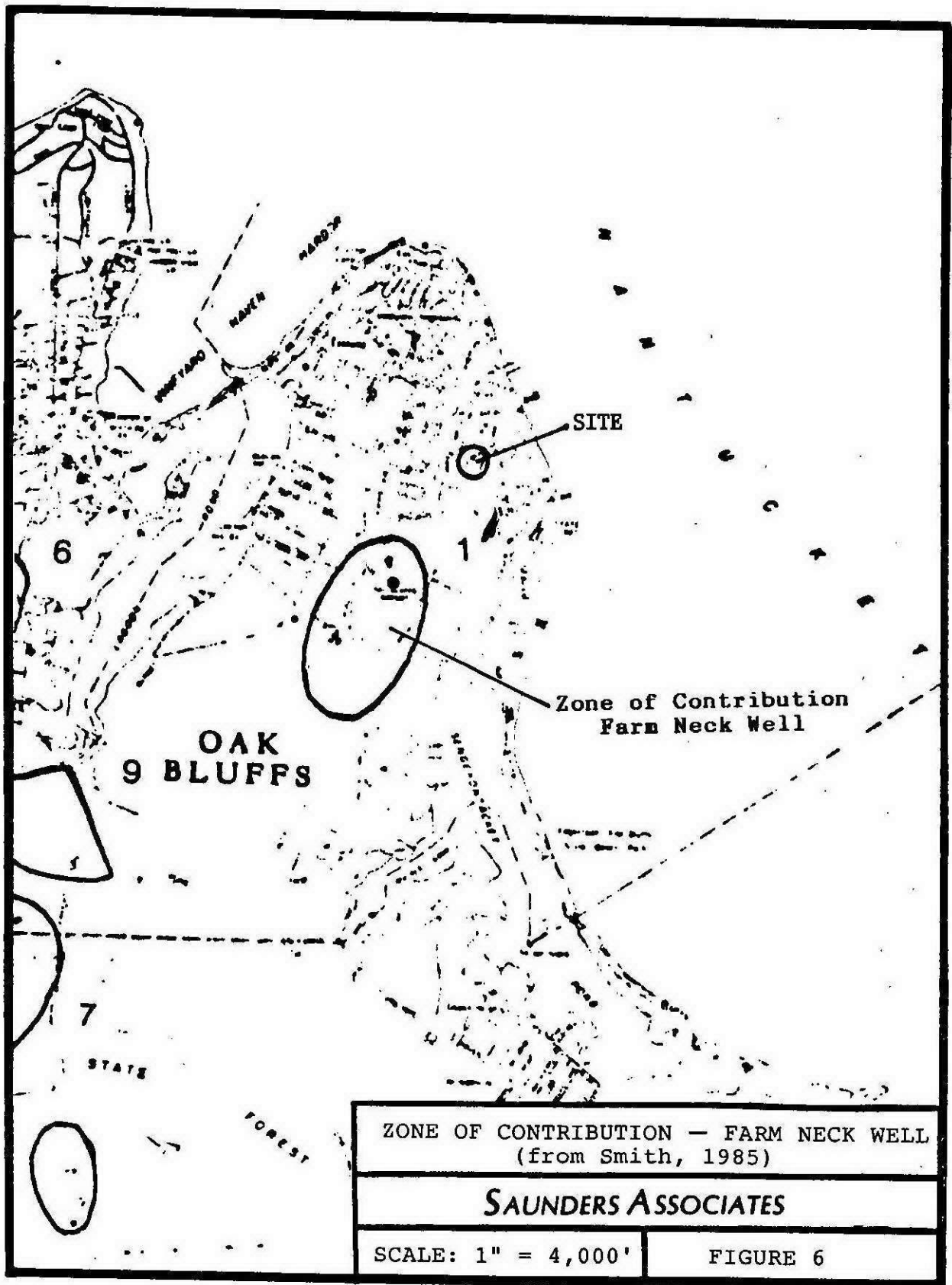
On-site and Other Drinking Water Supplies:

The site is supplied by Town water, and lies down-gradient of the Farm Neck municipal well. Figure 6 shows the site's location outside of the predicted zone of contribution of that well.

4.6 Water Quality Laboratory Analyses:

Volatile organic analyses (EPA Method 601-602) of water samples from the two monitoring wells on site indicated contamination resulting from releases of gasoline. High levels of BTXE compounds (volatile compounds commonly found in gasoline), totalling 60,000 parts per billion (ppb), were found in monitoring well GR-MW-2.

Methyl Tertiary Butyl Ether (MTBE) was found in both monitoring wells. MTBE is an octane additive found in volumes of up to 11% in super unleaded gasoline. Since 1980 this compound has become increasingly used as an octane booster, since the government has phased out tertiary ethyl lead. MTBE was the only volatile organic compound detected in well GR-MW-1, and probably represents the edge of the gasoline plume emanating from the gasoline tank area. This compound is very soluble and moves readily in groundwater.



5.0 CONCLUSIONS

5.1 Persons Conducting the Site Inspection and Analyses:

| | |
|--------------------------------------|----------------------------------------------|
| Craig Saunders | Hydrogeologist Saunders Associates |
| Groundwater Analytical Laboratory | 285 Main Street A3 Buzzards Bay, MA 02532 |

5.2 Conclusions of the Inspections and Investigations including any Limitation Thereto:

The investigation has identified significant releases of oil, gasoline and possibly solvents into the soil and underlying groundwater at the Graves Texaco site. These releases have been documented by composite soil tests, soil gas analyses and water sampling.

Areas of soil contamination include:

- 1) The open area south of the main building has been used for dumping waste oil in the past. Although very little volatile components (odor) is present in these soils, a composite sample of the upper foot of soil contains 14,000 ppm (1.4%) total petroleum hydrocarbons.
- 2) Soil gas stations #10 and #11 next to the building showed evidence of more recent kerosene and solvent spillage.
- 3) Leakage around the hydraulic lift (#14) was indicated by moderately high levels of volatile gas in this area. However, this spill may be very localized.
- 4) High levels of volatiles are present in the soil around the gasoline tanks.

Water quality analyses indicate substantial releases of gasoline on site. Three inches of gasoline were observed on top of the water table in Well GR-MW-2. The age of tanks (greater than 40 years), the amount of product present on the water table and the high levels of volatile gases present outside of the tanks indicate probable leakage from one or more of the underground tanks.

Further investigation is needed to pinpoint the source of leakage and the extent of groundwater contamination.

REFERENCES

- Delaney, David F. (1980). Groundwater Hydrology of Martha's Vineyard, Massachusetts, U.S.G.S. Atlas HA-618.
- Oldale, R. N. (1969). Seismic Investigations on Cape Cod, Martha's Vineyard and Nantucket, Massachusetts, U.S.G.S. Professional Paper 650-B.
- Smith, Russell A. (1985). Public Drinking Water Resource Protection on Martha's Vineyard, Martha's Vineyard Commission, p. 62.

SERVICE CONSTRAINTS

1. Much of the information provided in this report is based upon personal interviews and research of all available documents, records and maps held by the appropriate government and private agencies. This is subject to the limitations of historical documentation, availability and accuracy of pertinent records, and the personal recollection of those persons contacted.
2. An initial site investigation took into account the natural and man-made features of the site including any unusual or suspect phenomenon. These factors combined with the site's geology, hydrology, topography and past and present land uses served as a basis for choosing a methodology and location for subsurface exploration, as well as groundwater and subsurface soil sampling. The subsurface data generated is meant as a representative overview of the site.
3. The location and analyses of soil, groundwater and surface water samples were based upon the same considerations listed in the above. The samples were analyzed for those parameters unique to the site as determined from the preceding site evaluation.

A P P E N D I X A

Soil Logs

SOIL BORING LOG & MONITORING WELL SPECIFICATIONS

PROJECT: GRAVES TEXACO
BORING IDENTIFICATION: GR-MW-1

Page 1
Of 1

| Depth (ft) | SOIL GAS PPM | Log | Description | Well Completion |
|------------|--------------|-----|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| | | | sp sand; dark brown; fine-med.grain | 2-inch PVC casing Schedule 40 |
| | | | sp sand; as above, black-stained; no odor | |
| 5 | 0.1 | | sp sand; light-medium brown; fine-medium grain, minor silt, moderate sorting, moist | |
| 10 | 0.1 | | | |
| | | | |) bentonite seal) |
| 15 | 0.1 | | sp sand; as above, becomes medium brown, well sorted | PVC slotted screen 10-foot .010-inch slots clean medium sand pack |
| 20 | | | | |
| 25 | | | sp sand; light brown; medium-coarse grain, saturated | |
| | | | | 24.0 feet |

Remarks:

- 1) surface well housing
- 2) no odor throughout
- 3) samples off auger flights — PID calibrated ppm benzene

Date: 2/6/89 **Driller:** J. Kurth
Drilling Method: Solid Auger
Surface El. 26 ft. Depth GW 15'

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SOIL BORING LOG & MONITORING WELL SPECIFICATIONS

PROJECT: GRAVES TEXACO

Page 1

BORING IDENTIFICATION: GR-MW-2

Of 1

| Depth (ft) | SOIL GAS PPM | Log | Description | Well Completion |
|------------|--------------|-----|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| | | | .2 feet asphalt | |
| | | | sp sand; medium brown, fine-coarse grain, most, some gasoline odor | 2-inch PVC casing Schedule 40 |
| 5 | >1000 ppm | | sp light brown, fine-med. grain |) bentonite seal |
| | | | sp sand; tan; fine-medium grain, well-sorted, strong gasoline odor |) |
| 10 | 110 ppm | | sp sand; as above; becomes light brown | 11.5 feet |
| 15 | 75 ppm | | | 10-foot screen PVC .010-inch slots; backfill clean, medium sand pack |
| 20 | | | gp gravelly sand; light brown, fine-very coarse grain, moderate sorting, gravel less than 1/2 inch; strong odor | 21.5 feet |
| 25 | | | TOTAL DEPTH = 25.0' | |

Remarks:

- 1) flush surface well housing
- 2) strong gasoline odor over most of boring
- 3) samples off flights — PID to ppm benzene

Date: 2/6/89 **Driller:** J. Kurth

Drilling Method: Solid Auger

Surface El. 25 ft. **Depth GW** 16.0'

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A P P E N D I X B

Soil Gas Data

SOIL VAPOR ANALYSES - DATA SHEET

Site Identification: GRAVES TEXACO

| STATION | DEPTH IN FEET | | | | | | | |
|---------|---------------|------|------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| #1 | 0.1 | | | | | | | |
| #2 | 0.0 | | | | | | | |
| #3 | 1.0 | 0.5 | | | | | | |
| #4 | 0.0 | | | | | | | |
| #5 | 0.0 | | | | | | | |
| #6 | 0.1 | | | | | | | |
| #7 | 0.1 | | | | | | | |
| #8 | 0.2 | | | | | | | |
| #9 | 1.0 | | | | | | | |
| #10 | 185 | 22.5 | 15.5 | | | | | |
| #11 | 34.1 | 6.7 | 9.3 | | | | | |
| #12 | 0.8 | | | | | | | |
| #13 | 2.1 | | | | | | | |
| #14 | 150 | | | | | | | |

1) measurements made with Photovac Tip I photoionizer

2) readings in ppm as calibrated to iso-butylene standard

SAUNDERS ASSOCIATES

SOIL VAPOR ANALYSES - DATA SHEET

Site Identification: GRAVES TEXACO

| STATION | DEPTH IN FEET | | | | | | | |
|---------|---------------|-----|------|---|------|---|------|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| #15 | 0.5 | | | | | | | |
| #16 | 1.6 | | | | | | | |
| #17 | 0.5 | | | | | | | |
| #18 | 126 | | 97.6 | | | | | |
| #19 | 156 | | | | | | | |
| #20 | 49 | | | | | | | |
| #21 | 45.9 | | | | | | | |
| #22 | 110 | | 43.5 | | 29.7 | | | |
| #23 | 8.5 | | | | | | | |
| #24 | 65.9 | | | | | | | |
| #25 | 21.1 | 102 | 93.0 | | 72.7 | | 61.1 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

- 1) measurements made with Photovac Tip I photoionizer
- 2) readings in ppm as calibrated to iso-butylene standard

SAUNDERS ASSOCIATES

SOIL VAPOR ANALYSES - DATA SHEET

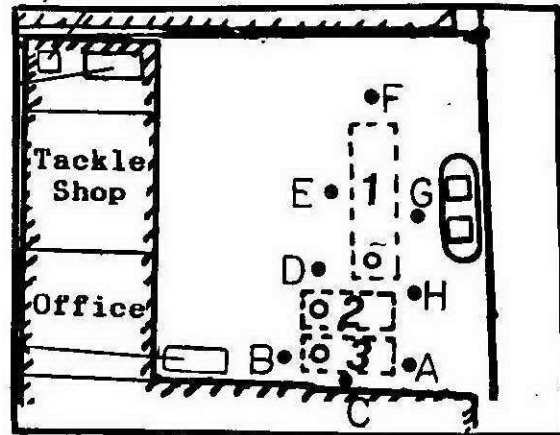
Site Identification:

Graves Texaco

Location of survey:

surrounding tanks #1, #2
and #3

SOIL VAPOR
STATION LOCATIONS



| STATION | DEPTH IN FEET | | | | PPM |
|---------|---------------|------|------|------|-----|
| | 2.5 | 5 | 7.5 | 10 | |
| A | 11.5 | 9.4 | 6.5 | 4.6 | PPM |
| B | 112 | 94.5 | 28.8 | 32.5 | |
| C | 92.5 | 72.1 | 3.8 | 5.4 | |
| D | 31.3 | 18.6 | 13.6 | 16 | |
| E | 36.0 | 29.5 | 22.3 | 16.4 | |
| F | 63.0 | 35.5 | 24.3 | 24.5 | |
| G | 129 | 19.3 | 13.8 | 12.6 | |
| H | 19.5 | 12.7 | 8.5 | 6.6 | |
| | | | | | |
| | | | | | |

1) measurements made with Photovac Tip I photoionizer

2) readings in ppm as calibrated to iso-butylene standard to ppm benzene

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SOIL VAPOR ANALYSES - DATA SHEET

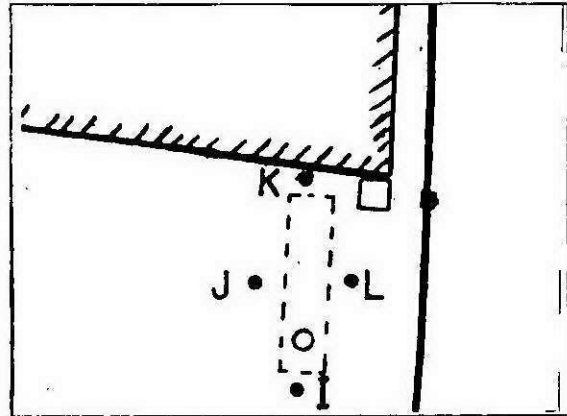
Site Identification:

Graves Texaco

Location of survey:

surrounding tank #4

SOIL VAPOR
STATION LOCATIONS



| STATION | DEPTH IN FEET | | | | PPM |
|---------|---------------|------|-----|-----|-----|
| | 2.5 | 5 | 7.5 | 10 | |
| I | 5.1 | 4.3 | 3.9 | 2.1 | PPM |
| J | 4.6 | 5.4 | 3.8 | 3.1 | |
| k | 13.6 | 8.71 | 3.8 | 2.4 | |
| L | 1.7 | 1.9 | 1.2 | 0.8 | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

- 1) measurements made with Photovac Tip I photoionizer
- 2) readings in ppm as calibrated to iso-butylene standard to ppm benzene

A P P E N D I X C

Water Quality and Soil Analyses

**GROUNDWATER
ANALYTICAL**

**EPA METHOD 418.1
Total Petroleum Hydrocarbons (IR)**

Sample Designation: **GR-S-1**
Project Name/Number: **Graves Texaco/0489**
Laboratory Number: **903506**
Date Analyzed: **02-08-89**
Sample Matrix: **Solid**

| PARAMETER | CONCENTRATION (mg/Kg) | DETECTION LIMIT (mg/Kg) |
|------------------------------|--------------------------|----------------------------|
| Total Petroleum Hydrocarbons | 14,000 | 15 |

BDL = Below Detection Limit. "Trace" indicates probable presence below listed detection limit. Method Reference: Method 418.1 (Spectrophotometric, Infrared) - Petroleum Hydrocarbons, Total Recoverable, Methods for Chemical Analysis of Water and Wastes, US EPA EPA-600/4-79-020, Revised March 1983. Modified for solids.

**GROUNDWATER
ANALYTICAL**

**EPA METHOD 418.1
Total Petroleum Hydrocarbons (IR)**

Sample Designation: **GR-S-2**
Project Name/Number: **Graves Texaco/0489**
Laboratory Number: **903507**
Date Analyzed: **02-08-89**
Sample Matrix: **Solid**

| PARAMETER | CONCENTRATION (mg/Kg) | DETECTION LIMIT (mg/Kg) |
|------------------------------|--------------------------|----------------------------|
| Total Petroleum Hydrocarbons | 7,400 | 15 |

BDL = Below Detection Limit. "Trace" indicates probable presence below listed detection limit. Method Reference: Method 418.1 (Spectrophotometric, Infrared) - Petroleum Hydrocarbons, Total Recoverable, Methods for Chemical Analysis of Water and Wastes, US EPA EPA-600/4-79-020, Revised March 1983. Modified for solids.

GROUNDWATER ANALYTICAL

EPA METHODS 601 and 602 Volatile Organics (GC/PID/ELCD)

Sample Designation: GR-MW-1
 Project Name/Number: Graves Texaco/0489
 Laboratory Number: 903901
 Date Analyzed: 02-09-89
 Sample Matrix: Water

| PARAMETER | CONCENTRATION (ug/L) | DETECTION LIMIT (ug/L) |
|-------------------------------|-------------------------|---------------------------|
| Dichlorodifluoromethane | BDL | 5 |
| Vinyl Chloride | BDL | 1 |
| Chloromethane | BDL | 1 |
| Chloroethane | BDL | 1 |
| Bromomethane | BDL | 5 |
| Trichlorofluoromethane | BDL | 1 |
| 1,1-Dichloroethene | BDL | 1 |
| Methylene Chloride | BDL | 1 |
| trans-1,2-Dichloroethene | BDL | 1 |
| Methyl tertiary Butyl Ether * | 1,200 | 10 |
| 1,1-Dichloroethane | BDL | 1 |
| cis-1,2-Dichloroethene * | BDL | 1 |
| Chloroform | BDL | 1 |
| 1,1,1-Trichloroethane | BDL | 1 |
| Carbon Tetrachloride | BDL | 1 |
| Benzene | BDL | 1 |
| 1,2-Dichloroethane | BDL | 1 |
| Trichloroethene | BDL | 1 |
| 1,2-Dichloropropane | BDL | 1 |
| Bromodichloromethane | BDL | 1 |
| 2-Chloroethylvinyl Ether | BDL | 1 |
| trans-1,3-Dichloropropene | BDL | 1 |
| Toluene | BDL | 1 |
| cis-1,3-Dichloropropene | BDL | 1 |
| 1,1,2-Trichloroethane | BDL | 1 |
| Tetrachloroethene | BDL | 1 |
| Dibromochloromethane | BDL | 1 |
| Chlorobenzene | BDL | 1 |
| Ethylbenzene | BDL | 1 |
| m+p Xylene * | BDL | 1 |
| o-Xylene * | BDL | 1 |
| Bromoform | BDL | 1 |
| 1,1,2,2-Tetrachloroethane | BDL | 1 |
| 1,3-Dichlorobenzene | BDL | 1 |
| 1,4-Dichlorobenzene | BDL | 1 |
| 1,2-Dichlorobenzene | BDL | 1 |

BDL = Below Detection Limit. "Trace" indicates probable presence below listed detection limit.
 * Non-target compound. Method References: Method 601 - Purgeable Halocarbons and Method 602 - Purgeable Aromatics, 40 C.F.R. 136, Appendix A (1986).

GROUNDWATER ANALYTICAL

EPA METHODS 601 and 602 Volatile Organics (GC/PID/ELCD)

Sample Designation: GR-MW-2
 Project Name/Number: Graves Texaco/0489
 Laboratory Number: 903902
 Date Analyzed: 02-09-89
 Sample Matrix: Water

| PARAMETER | CONCENTRATION (ug/L) | DETECTION LIMIT (ug/L) |
|-------------------------------|-------------------------|---------------------------|
| Dichlorodifluoromethane | BDL | 500 |
| Vinyl Chloride | BDL | 100 |
| Chloromethane | BDL | 100 |
| Chloroethane | BDL | 100 |
| Bromomethane | BDL | 500 |
| Trichlorofluoromethane | BDL | 100 |
| 1,1-Dichloroethene | BDL | 100 |
| Methylene Chloride | BDL | 100 |
| trans-1,2-Dichloroethene | BDL | 100 |
| Methyl tertiary Butyl Ether * | 20,000 | 1000 |
| 1,1-Dichloroethane | BDL | 100 |
| cis-1,2-Dichloroethene * | BDL | 100 |
| Chloroform | BDL | 100 |
| 1,1,1-Trichloroethane | BDL | 100 |
| Carbon Tetrachloride | BDL | 100 |
| Benzene | 16,000 | 100 |
| 1,2-Dichloroethane | trace | 100 |
| Trichloroethene | BDL | 100 |
| 1,2-Dichloropropane | BDL | 100 |
| Bromodichloromethane | BDL | 100 |
| 2-Chloroethylvinyl Ether | BDL | 100 |
| trans-1,3-Dichloropropene | BDL | 100 |
| Toluene | 24,000 | 100 |
| cis-1,3-Dichloropropene | BDL | 100 |
| 1,1,2-Trichloroethane | BDL | 100 |
| Tetrachloroethene | BDL | 100 |
| Dibromochloromethane | BDL | 100 |
| Chlorobenzene | BDL | 100 |
| Ethylbenzene | 2,900 | 100 |
| m+p Xylene * | 12,000 | 100 |
| o-Xylene * | 5,100 | 100 |
| Bromoform | BDL | 100 |
| 1,1,2,2-Tetrachloroethane | BDL | 100 |
| 1,3-Dichlorobenzene | BDL | 100 |
| 1,4-Dichlorobenzene | BDL | 100 |
| 1,2-Dichlorobenzene | BDL | 100 |

Sample dilution required to keep parameters within calibration. BDL = Below Detection Limit. "Trace" indicates probable presence below listed detection limit. * Non-target compound. Method References: Method 601 - Purgeable Halocarbons and Method 602 - Purgeable Aromatics, 40 C.F.R. 136, Appendix A (1986).