GSI
GeoStrategies Inc.
2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545
(510) 352-4800

September 30, 1992

Ms. Pamela Evans
Alameda County Environmental Health
470 27th Street, Suite 324
Oakland, California 94612

STID 3769

Reference: Shell Service Station
4255 MacArthur Boulevard
Oakland, California
WIC 204-5510-0600 619

Ms. Evans:

As requested by Mr. Dan Kirk of Shell Oil Company, we are forwarding a copy of the September 30, 1992 Work Plan for the above referenced location. The report describes the proposed scope of work to be performed by GSI at the referenced Shell site in the fourth quarter of 1992.

Please call if you have any comments or questions.

Sincerely,

Michael C. Carey
Engineering Geologist

enclosure

cc: Mr. Dan Kirk, Shell Oil Company
Mr. Lester Feldman, Regional Water Quality Control Board

GeoStrategies Inc.

WORK PLAN

Shell Service Station
4255 MacArthur Boulevard
Oakland, California
WIC# 204-5510-0600

768802-1

September 30, 1992

GeoStrategies Inc.
2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545
(510) 352-4800

September 30, 1992

Shell Oil Company
P.O. Box 5278
Concord, California

Attn: Mr. Dan Kirk

Re: WORK PLAN
Shell Service Station
4255 MacArthur Boulevard
Oakland, California
WIC# 204-5510-0600

Mr. Kirk:

This work plan has been prepared by GeoStrategies Inc. (GSI) for the Shell Service Station located at the above referenced location. GSI proposes that three ground-water monitoring wells be installed on-site to evaluate ground-water conditions. The proposed monitoring well locations are shown on Plate 1.

HYDROGEOLOGIC SETTING

A previous investigation at the site (EMCON, 1985) indicated that the uppermost water bearing zone is composed of primarily of clay to approximately 30.0 feet. Static water levels is believed to be at approximately 10 feet. The suspected regional flow direction suggests that groundwater flow direction will be in a westerly direction towards San Francisco Bay.

TECHNICAL APPROACH

Scope of Work

The field work will be performed according to procedures which are in compliance with current State of California LUFT Manual, RWQCB Tri-Regional Guidelines, Alameda County permit and guidance documents, and the GSI Methods and Procedures presented in Appendix A.

TASK 1: Obtain the necessary ground-water monitoring well installation permits.

TASK 2: Three 8-inch-diameter exploratory borings will be drilled to an anticipated depth of approximately 25 feet below ground surface. Conventional hollow-stem auger techniques will be used to advance the borings.

TASK 3: The monitoring wells will be constructed using 4-inch-diameter, precleaned Schedule 40 PVC well casing with 0.02-inch machine slotted well screen. The monitoring wells will be constructed according to the appended procedures (Appendix A). The well screens will extend a minimum of 3 feet above the first encountered water-level. The annular sandpack will extend from total depth to a minimum of 1-foot above the well screen. A minimum of 1-foot bentonite seal, followed by a cement grout seal to ground surface, will be placed above the sandpack. Nevertheless, the well screens will be placed so that well designs are compatible with subsurface geologic conditions. No well screens will be installed that potentially may permit cross-contamination of adjacent aquifers.

TASK 4: Soil samples will be collected from the three proposed exploratory boreholes for analysis of specific chemical parameters discussed in Task 6 (described below). Collected soil samples will be field screened for visual evidence of contamination (i.e. product saturation, discoloration, etc.) and for organic vapors using an Organic Vapor Monitor (OVM) photoionization detector. The selection of soil samples for chemical analysis will be based upon site-specific geologic conditions as they relate to potential contamination migration pathways and confining layers (aquitards).

TASK 5: The monitoring wells will be properly developed prior to collecting ground-water samples. Following well development, the wells will be sampled by the approved Shell groundwater sampling subcontractor for parameters listed in Task 6.

TASK 6: Soil and ground-water samples will be analyzed for TPH-Gasoline using EPA Method 8015 (Modified); and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) using EPA Methods 8020/602.

TASK 7: A report of the well installation will be prepared documenting field procedures, description of the subsurface geology (boring logs), well construction details, chemical analytical results, and a brief discussion of results.

If you have any questions, please call.

GeoStrategies Inc. by,

Michael Carey

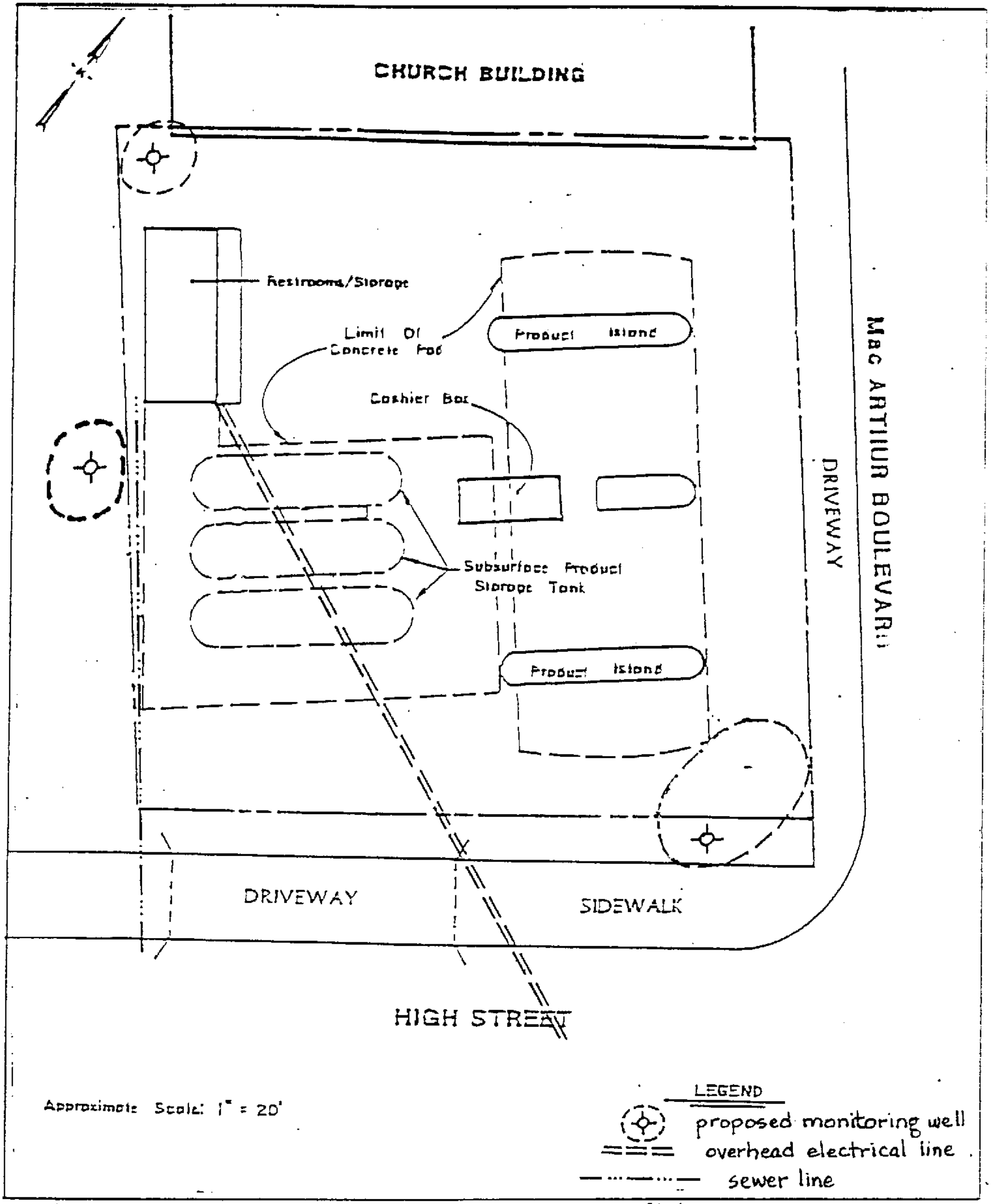
Michael C. Carey
Engineering Geologist
C.E.G. 1351

CERTIFIED ENGINEERING GEOLOGIST
MICHAEL C. CAREY
C.E.G. 1351
EXP: 6-30-94
STATE OF CALIFORNIA

MCC/kjj

Plate 1: Site Plan

Appendix A: Field Methods and Procedures



GeoStrategies Inc.

Shell Service Station
4255 MacArthur Blvd.
Oakland, California

PLATE 1

JOB NUMBER 768802

REVIEWED BY

DATE 9/92

APPENDIX A

FIELD METHODS AND PROCEDURES

FIELD METHODS AND PROCEDURES

EXPLORATION DRILLING

Mobilization

Prior to any drilling activities, GeoStrategies Inc. (GSI) will verify that necessary drilling permits have been secured.

Utility locations will be located and drilling will be conducted so as not to disrupt activities at a project site. GSI will obtain and review available public data on subsurface geology and if warranted, the location of wells within a half-mile of the project site will be identified. Drillers will be notified in advance so that drilling equipment can be inspected prior to performing work.

Drilling

The subsurface investigations are typically performed to assess the lateral and vertical extent of petroleum hydrocarbons present in soils and groundwater. Drilling methods will be selected to optimize field data requirements as well as be compatible with known or suspected subsurface geologic conditions.

Monitoring wells are installed using a truck-mounted hollow-stem auger drill rig or mud-rotary drill rig. Typically, the hollow-stem rig is used for wells up to 100 feet, if subsurface conditions are favorable. Wells greater than 100-feet deep are typically drilled using mud-rotary techniques. When mud rotary drilling is used, an electric log will be performed for additional lithological information. Also during mud rotary drilling, precautions will be taken to prevent mud from circulating contaminants by using a conductor casing to seal off contaminated zones. Samples will be collected for lithologic logging by continuous chip, and where needed by drive sample or core as specified by the supervising geologist.

Soil Sampling

Shallow soil borings will be drilled using a truck-mounted hollow-stem auger drilling rig, unless site conditions favor a different drilling method. Drilling and sampling methods will be consistent with ASTM Method D-1452-80. The auger size will be a minimum 6-inch nominal outside-diameter (O.D). No drilling fluids will be used during this drilling method. The augers and other tools used in the bore hole will be steam cleaned before use and between borings to minimize the possibilities of cross-contamination between borings.

Soil samples are typically collected at 5-foot intervals as a minimum from ground surface to total depth of boring. Additional soil samples will be collected based on significant lithologic changes and/or potential chemical content. Soil samples from each sampling interval will be lithologically described by a GSI geologist (Figure 1). Soil colors will be described using the Munsell Color Chart. Rock units will be logged using appropriate lithologic terms, and colors described by the G.S.A. Rock Color Chart.

Head-space analyses will be performed to check for the evidence of volatile organic compounds. Head-space analyses will be performed using an organic vapor analyzer; either an OVA, HNU, or OVM. Organic vapor concentrations will be recorded on the GSI field log of boring (Figure 1). The selection of soil samples for chemical analysis are typically based on the following criteria:

1) Soil discoloration
2) Soil odors
3) Visual confirmation of chemical in soil
4) Depth with respect to underground tanks (or existing grade)
5) Depth with respect to ground water
6) OVA reading

Soil samples (full brass liners) selected for chemical analysis are immediately covered with aluminum foil and the liner ends are capped to prevent volatilization. The samples are labeled and entered onto a Chain-of-Custody form, and placed in a cooler on blue ice for transport to a State-certified analytical laboratory.

Soil cuttings are stockpiled on-site. Soils are sampled and analyzed for site-specific chemical parameters. Disposition of soils is dependent of chemical analytical results of the samples.

Soil Sampling - cont.

Soil borings not converted to monitoring wells will be backfilled (sealed) to ground surface using either a neat cement or cement-bentonite grout mixture. Backfilling will be tremied by continuously pumping grout from the bottom to the top of the boring where depth exceeds 20' or as required by local permit requirements.

All field and office work, including exploratory boring logs, are prepared under the direction of a registered geologist.

Monitoring Well Installation

Monitoring well casing and screen will be constructed of Schedule 40, flush-joint threaded polyvinylchloride (PVC). The well screen will be factory mill-slotted unless additional open area is required (eg. conversion to an extraction well in a low-yield aquifer). The screen length will be placed adjacent to the aquifer material to a minimum of 2-feet above encountered water. No screen shall be placed in a borehole that potentially creates hydraulic interconnection of two or more aquifer units. Screen slot size and well sand pack will be compatible with encountered aquifer materials, as confirmed by sieve analysis.

Monitoring wells will be completed below grade (Figure 2) unless special conditions exist that require above-grade completion design. In the event a monitoring well is required in an aquifer unit beneath an existing aquifer, the upper aquifer will be sealed off by installing a steel conductor casing with an annular neat cement or cement-bentonite grout seal. This seal will be continuously tremie pumped from the bottom of the annulus to ground surface.

The monitoring well sand pack will be placed adjacent to the entire screened interval and will extend a recommended minimum distance of 2-feet above the top of the screen. No sand pack will be placed that interconnects two or more aquifer units. A minimum 2-foot bentonite pellet or bentonite slurry seal will be placed above the sand pack. Sand pack, bentonite, and cement seal levels will be confirmed by sounding the annulus with a calibrated weighted tape. The remaining annular space above the bentonite seal will be grouted with a bentonite-cement mixture and will be tremie-pumped from the bottom of the annular space to the ground surface. The bentonite content of the grout will not exceed 5 percent by weight. A field log of boring and a field well completion form will be prepared by GSI for each well installed.

Decontamination of drilling equipment before drilling and between wells will consist of steam cleaning, and/or Alconox wash.

Well Development

All newly installed wells will be properly developed within 48 hours of completion. No well will be developed until the well seal has set a minimum of 12 hours. Development procedures will include one or more of the methods described below:

Bailing

Bailing will be used to remove suspended sediments and drilling fluids from the well, where applicable. The bailer will be raised and lowered through the column of water in the well so as to create a gentle surging action in the screened interval. This technique may be used in conjunction with other techniques, such as pumping, and may be used alone if the well is of low yield.

Pumping

Pumping will be used in conjunction with bailing or surging. The pump will be operated in such a manner as to gently surge the entire screened interval of the well. This may involve operating the pump with a packer type mechanism attached and slowly raising and lowering the pump, or by cycling the pump off and on to allow water to move in and out of the screened interval. Care will be used not to overpump a well.

Surging

Surging will be performed on wells that are screened in known or suspected high yield formations and/or on larger diameter (recovery) wells. A surge block will be raised and lowered through the entire screened interval, forcing water in and out of the well screen and sand pack. Pumping or air lifting will be used in conjunction with this method of development to remove any sediment brought into the well during surging.

Air Lifting

Air lifting will be used to remove sediment from wells as an alternative to pumping under certain conditions. When appropriate, a surge block designed for use with air lifting will be used to agitate the entire screened interval and water will be lifted out of the well using forced air. When air lifting is performed, the air source will be either nitrogen or filtered air and the procedure will be performed gently to prevent any damage to the well screen or casing and to insure that discharged water is contained.

Well Development - cont.

All well developing equipment will be thoroughly decontaminated prior to development using a steam cleaner and/or Alconox detergent wash and clean water rinse. During development procedures, field parameters (temperature, specific conductance and pH) will be monitored and recorded on well development forms (Figure 3). Equilibration requirements consist of a minimum of three readings with the following accuracy standards:

pH	± 0.1 pH units
Specific Conductance	± 10% of full scale reading
Temperature	± 0.5 degrees Celsius

The wells will be developed until water is visibly clear and free of sediment, and well purging parameters stabilized. A minimum of 8 to 10 well volumes will be purged from each well, if feasible. If well purging parameters have not stabilized before 10 casing volumes have been removed, well development will continue until purging parameters have stabilized and formation water is being drawn into the well. The adequacy of well development will be judged by the field technician performing the well development and based on known formation conditions.

Well Surveying

Monitoring wells will be surveyed to obtain top of box elevations to the nearest ±0.01 foot. Water level measurements will be recorded to the nearest ±0.01 foot and referenced to Mean Sea Level (MSL). If additional wells are required, then existing and newly installed wells are surveyed relative to MSL.

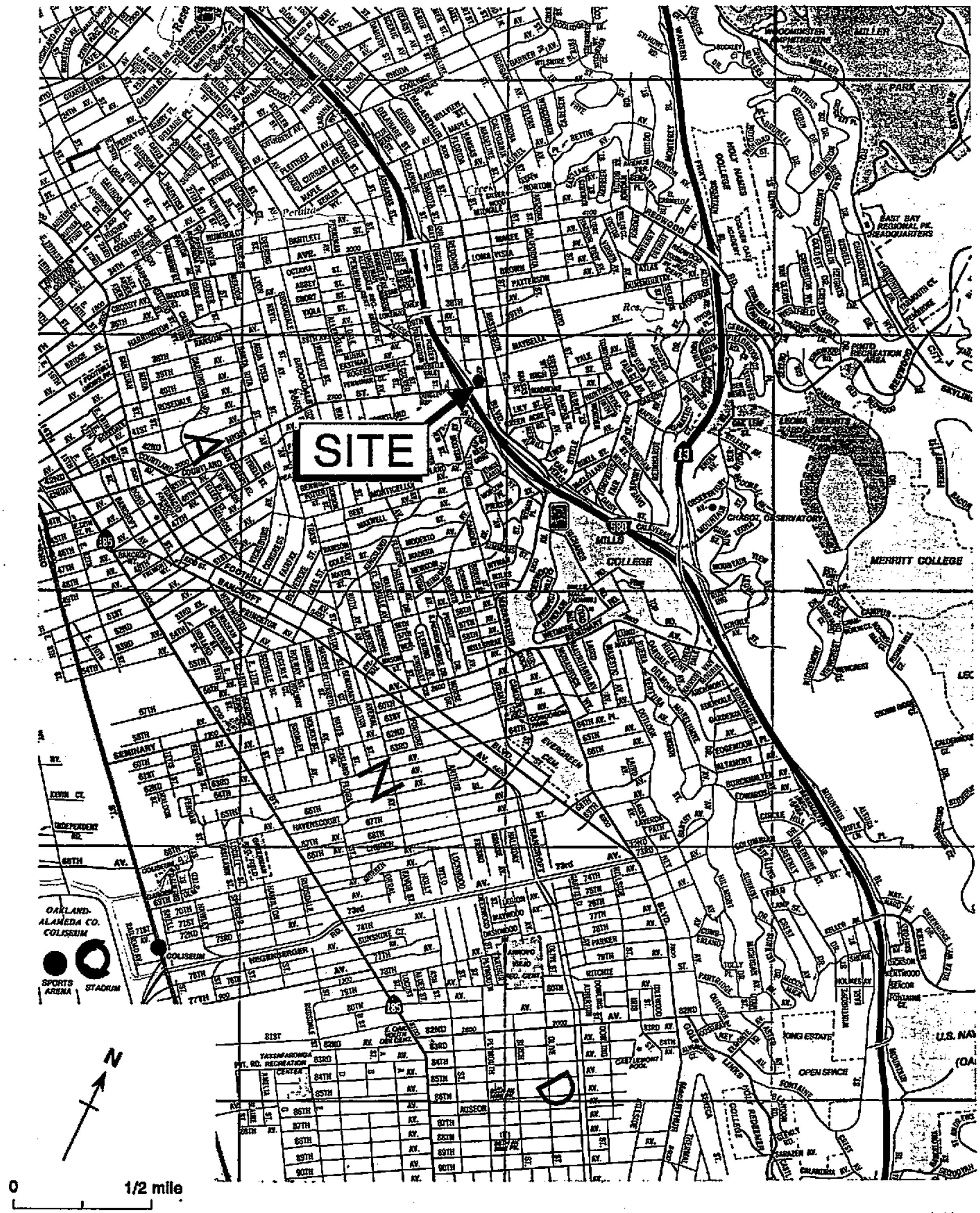


Figure 1. Site Location Map - Shell Service Station WIC# 204-5510-0600, 4255 MacArthur Boulevard, Oakland, California

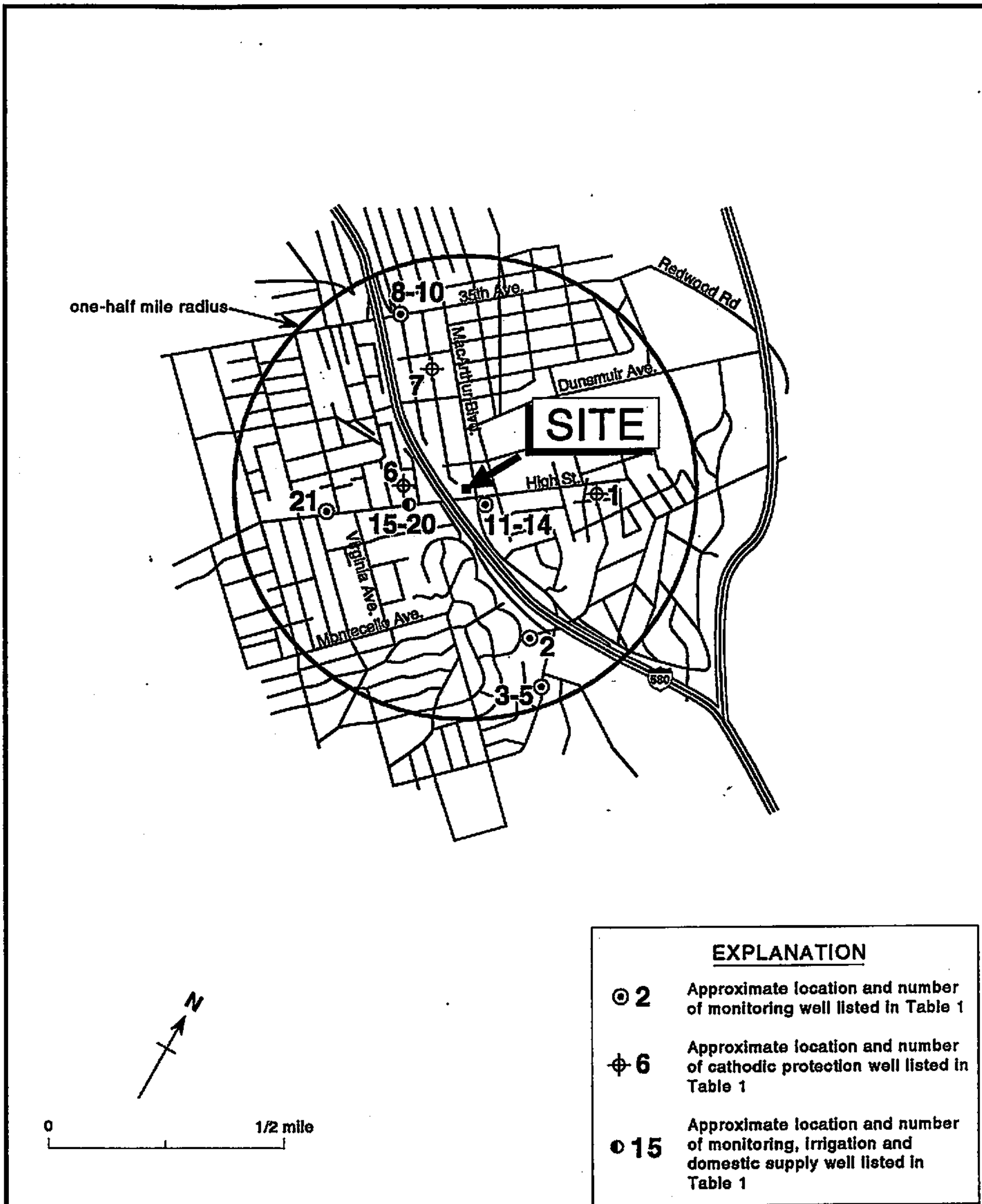


Figure 2. Wells Within One-Half Mile of Shell Service Station WIC #5510-0600, 4255 MacArthur Boulevard, Oakland

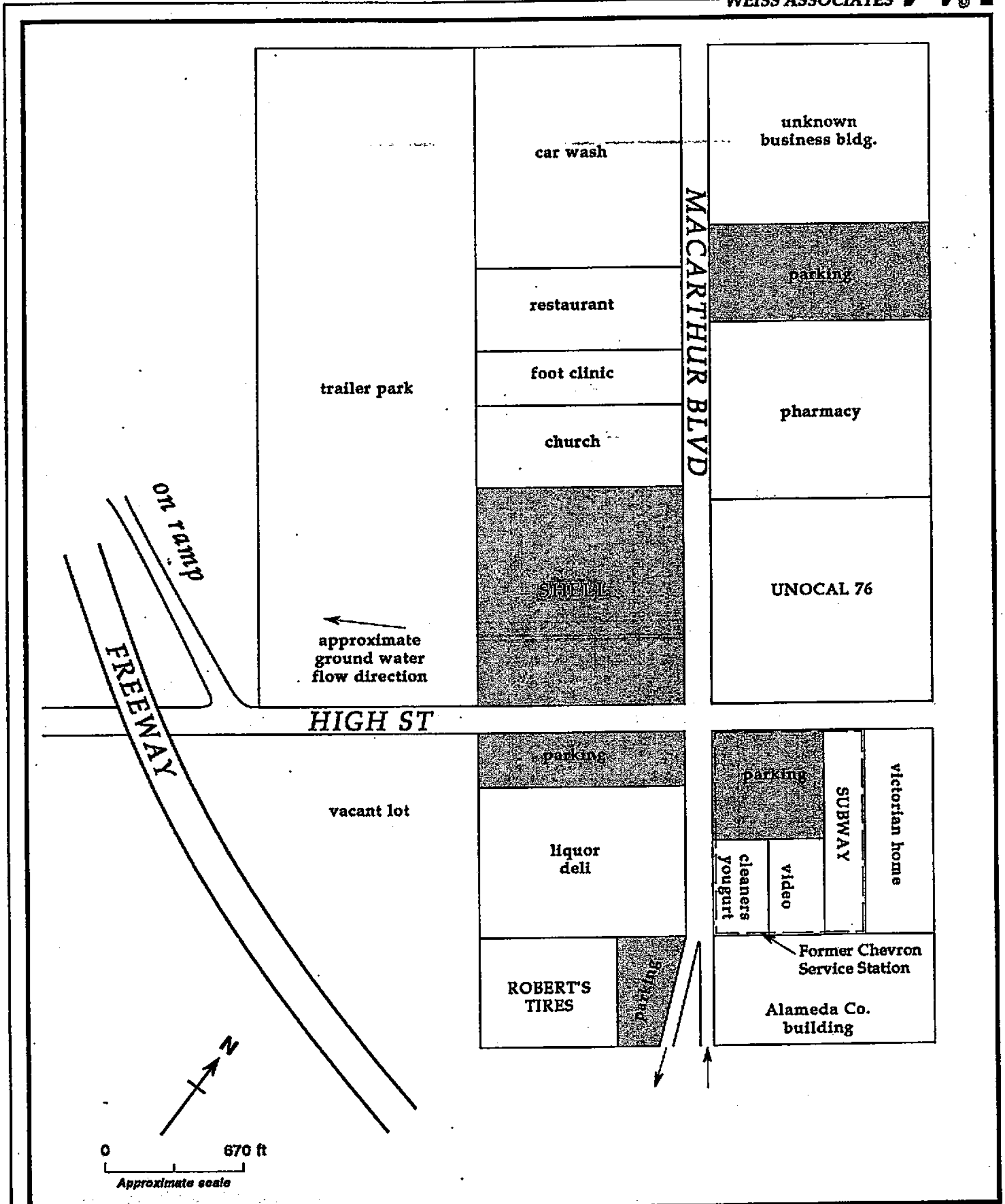


Figure 3. Businesses and Properties in the Site Vicinity - Shell Service Station WIC #204-5510-0600, 4255 MacArthur Boulevard, Oakland, California