Converse Environmental Consultants California

55 Hawthorne Street, Suite 500
San Francisco, California 94105

Telephone 415 543-4200

6/22/89

ALAMEDA COUNTY
DEPT. OF ENVIRONMENTAL HEALTH
HAZARDOUS MATERIALS

June 12, 1989
88-44-359-01-104

Ms. Leslie Ferguson
Water Resource Control Engineer
San Francisco Bay Regional Water Quality Control Board
1111 Jackson Street, Sixth Floor
Oakland, California 94607

Subject: Site Characterization and Remediation - Revised Work Plan
Shell Oil Company
285 Hegenberger Road
Oakland, California 94621

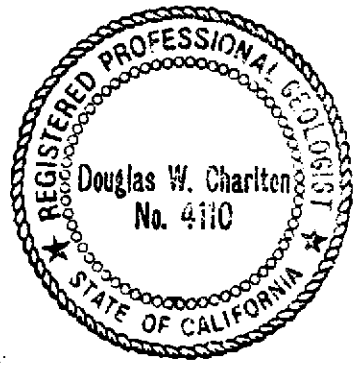
Dear Ms. Ferguson:

Enclosed herewith is a copy of the Revised Work Plan that Shell Oil Company and Converse Environmental Consultants California (CECC) will use as a guidance document for environmental investigation and remediation of the subject site. This Work Plan is submitted to your office to replace the prior CECC Work Plan dated February 2, 1989. The plan is revised to a detailed program of site investigation, which is appropriate in light of information obtained in site studies in 1989. Please note that CECC will remain on the work and quarterly reporting schedules set forth in the initial Work Plan February 10, 1989 as investigations proceed under this revised guidance document.

Please call Ms. Robin Breuer or me at (415) 543-4200, if you have questions about the scope or schedule of proposed activities.

Very truly yours,

Converse Environmental Consultants California



Douglas W. Charlton
Vice President
California Registered Geologist # 4110

Enclosure

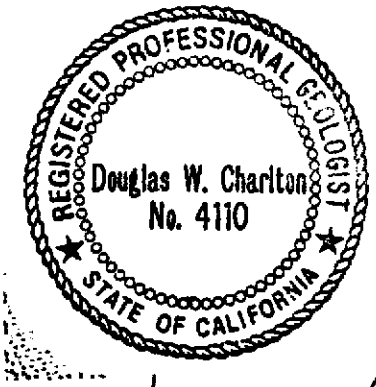
cc: Mr. Jack Brastad - Shell Oil Company (w/encl.)
Mr. Rafat Shahid - Alameda County Health Care Services (w/encl.)
Ms. Robin Breuer - CECC (w/encl.)

REVISED WORK PLAN

SHELL OIL COMPANY FACILITY
285 Hegenberger Road
Oakland, California

June 12, 1989

CECC Project No. 88-44-359-01



DOUGLAS W. CHARLTON
Principal Geologist

This report has been prepared by the staff of **Converse Environmental Consultants California** under the professional supervision of the Engineer and/or Geologist whose seal(s) and signature(s) appear hereon.

The findings, recommendations, specifications or professional opinions are presented, within the limits prescribed by the Client, after being prepared in accordance with generally accepted professional engineering and geologic practice. We make no other warranty, either express or implied.

Converse Environmental Consultants California

55 Hawthorne Street, Suite 500
San Francisco, California 94105

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REVISED WORK PLAN

SHELL OIL COMPANY FACILITY
285 Hegenberger Road
Oakland, California

June 12, 1989

A Wholly Owned Subsidiary of
The Converse Professional Group

PROJECT BACKGROUND

The following description is the summary of files supplied to Converse Environmental Consultants California (CECC) by Shell Oil Company (Shell) and files on record at the San Francisco Bay Regional Water Quality Control Board (RWQCB) and at the Alameda County Health Care Services Agency (ACHCSA).

The subject property is located at 285 Hegenberger Road, Oakland, California. The property is approximately 200 feet long and 170 feet wide, with prior tank and operating areas located in the southeast part of the site. The property is constructed on fill on Bay Mud. An estuary of the San Francisco Bay is approximately 500 feet from the site that leads to San Leandro Bay approximately one mile to the northeast.

The property was owned by Shell Oil Company and operated as a retail motor vehicle fuel (MVF) sales facility until early 1987. The site was decommissioned and the rebuilt by Shell in 1987. The underground fuel and waste oil tanks were replaced at that time. The number of tanks removed and the conditions of the tanks at the time of removal are unknown as of this writing.

TABLE 1 - Chronological Summary

The following chronological summary is based on information available to CECC for preparation of this Work Plan.

Date	Description of Activity
1984	Underground storage tanks replaced with single-wall fiberglass tanks
1987	Shell remodeled gas station.
01/89	Shell transferred this case to CECC.
02/02/89	CECC submits Draft Work Plan.
02/10/89	CECC submits Work Plan.
02/15/89	CECC drilled and sampled three wells (MW-1 through MW-3) and SB-1 and SB-2.
04/01/89	CECC reported results of Quarter 1, 1989 activities to agencies of jurisdiction.
04/28/89	**CECC installed MW-4 through MW-8.**
05/26/89	**CECC drilled and sampled SB-3, SB-4 and SB-5.**
06/08/89	**Date of Revised Work Plan**

Assessment of the site began in 1989 with the boring program, in which two borings were drilled outside the main tank complex, one well was drilled near the waste oil tank, and two wells were installed east and southeast of the gasoline tank complex (Drawing 2). Soil and groundwater contamination, and local floating (?) product in backfill, was discovered in this exploration.

No record exists of the extent of the tank excavation, but the removed soil was profiled as non-hazardous, and reportedly disposed in a local landfill.

PROPOSED INVESTIGATION

This Work Plan describes tasks Shell will undertake to achieve environmental closure for the subject facility. The Work Plan presumes that groundwater and soil conditions at the site have been impacted by the presence of and/or handling practices of petroleum products at this site or nearby. Investigations to date indicate that groundwater is contaminated and this contamination extends offsite. The extent of soil contamination is under current investigation. Information is lacking on: (1) the history of tank replacements, and (2) the history of MVF handling practices. Therefore, further soil sampling and groundwater testing are needed to assess the extent of environmental contamination at the site.

SCOPE

Shell has initiated a field program which, if conducted completely, could consist of as many as 18 tasks and groundwater monitoring to lead to site closure. Part of this program is complete. This Work Plan lists tasks which will be conducted during and after Quarter 3, 1989. The program will initially assess lateral and vertical extent of soil and groundwater contamination onsite and offsite. If needed, additional work may be undertaken later, including (1) offsite investigations, (2) hydrologic studies, (3) remediation planning, and (4) cleanup. The Shell investigations and remediation could comprise as many as four programs:

- Program I - Soil Investigations and Remediation, (Tasks 1-6)

- Program II - Onsite Groundwater Investigations (Tasks 7-9)
- Program III - Offsite Groundwater Investigations (Tasks 10-14)
- Program IV - Groundwater Remediation (Tasks 15-18)

Completion of these programs ultimately will lead to confirmation of clean soil, clean groundwater, and environmental closure of the facility. Drawing 3 shows the critical path for tasks to be undertaken under these programs.

PROGRAM I: SOIL INVESTIGATIONS

Prefield Activities

Prefield activities will include preparation of: (1) site-specific/task-specific Health Safety Plan(s), (2) this Work Plan, (3) task-specific plans, and (4) budgets. In addition, necessary installation and construction permits will be obtained.

Task 1 - Drill and Sample Soil Borings

Thirteen soil borings, SB-1 through SB-5, and MW-1 through MW-8, have been drilled at the locations shown on Drawing 4 to complete the definition of onsite soil and groundwater contamination. Five soil borings, SB-1 through SB-5, were drilled within 40 feet of the tank complex, to assess the lateral extent of the soil conditions in the unsaturated zone and distribution of Pb in soil, if any.

SB-1 through SB-5 were drilled only to the base of the unsaturated zone, with samples at 5 feet bgs. The other borings (MW-1 through MW-8) were drilled

to at least 15 feet below the water table because no 5 foot or thicker confining clay was encountered (see Appendix A). The borings were drive-sampled using a California split-spoon sampler on 5-foot centers downhole starting at 5 feet bgs using protocols described in Appendix A. Soil were thoroughly described using the Unified Soil Classification System (USCS) (see Appendix B).

Soil samples from the unsaturated zone were collected, transported to a State-certified analytical laboratory and analyzed for lead, TPH as gasoline, BTEX, and oil and grease (see Appendices A and E). Results of soil analysis were reported to regulatory agencies in the Quarter 1 and 2, 1989 Reports of Activities.

At the conclusion of sampling, soil borings (SB-1 through SB-5) were abandoned using proper permits and protocols (see Appendix B) and MW-1 through MW-8 were converted to groundwater monitoring wells by over-drilling and well construction according to the practices described in Appendices A and C.

Task 2 - Drill and Sample Step-Out Borings

Because Task 1 borings have not quantified the extent of soil contamination, additional borings will be installed in an iterative, step-out pattern until such contamination is blocked out. Several soil borings will be installed around the underground storage tank area and near groundwater monitoring well MW-1.

Such additional onsite borings will be drilled, sampled and abandoned according to the protocols in Task 1, and soil samples will be analyzed using methods listed in Table 2.

Task 3 - Prepare Soil Remedial Action Plan

The options for cost-effective soil remediation will be identified and relatively evaluated based on the volume of contaminated soil, the hydrologic conditions of contamination, and the concentrations of contaminants involved. Using this information, a Soil Remedial Action Plan will be prepared identifying the options and preferred alternative for soil cleanup at the Shell property.

Task 4 - Remediate Soil

Soil will be remediated according to the protocols, schedule and cleanup objectives specified in the Soil Remedial Action Plan, as approved by regulatory agencies of jurisdiction (Task 3).

Task 5 - Establish Cleanup Levels - Soil

Information supplied in Tasks 1 and 7-9 will be used to establish the cleanup levels for soil at this site. This information may include: (a) the depth to first groundwater, (b) the depth to highest high water as indicated by chemical reduction of soil, (c) the stratigraphy of soil types, with special emphasis on potential permeability, porosity and secondary natural and manmade permeability, and (d) the vertical distribution of contaminants in soil, (e) local topography, (f) local and regional groundwater gradient, (g) runoff patterns,

TABLE 2
REVISED 6 OCTOBER 1988

RECOMMENDED MINIMUM VERIFICATION ANALYSES FOR UNDERGROUND TANK LEAKS

HYDROCARBON LEAK	SOIL ANALYSIS			WATER ANALYSIS		
		Prep	Analysis		Prep	Analysis
Unknown Fuel	TPH G	5030	8015	TPH G	5030	8015
	TPH D	3550	8015	TPH D	3510	8015
	BTX&E	5030	8020/8240	BTX&E	5030	602/624
	LEAD	3050	7421	LEAD	3050	7421
Leaded Gas	TPH G	5030	8015	TPH G	5030	8015
	BTX&E	5030	8020/8240	BTX&E	5030	602/624
	LEAD	3050	7421	LEAD	3050	7421
Unleaded Gas	TPH G	5030	8015	TPH G	5030	8015
	BTX&E	5030	8020/8240	BTX&E	5030	602/624
Diesel	TPH D	3550	8015	TPH D	3510	8015
	BTX&E	5030	8020/8240	BTX&E	5030	602/624
Waste Oil or Unknown	TPH G	5030	8015	TPH G	5030	8015
	TPH D	3550	8015	TPH D	3510	8015
	O & G	503D	503E	O & G	503A	503E
	BTX&E	5030	8020/8240	BTX&E	5030	8020/8240
	CL HC	5030	8010/8240	CL HC	5030	601/624
	ICAP or AA to detect metals: Cd, Cr, Pb, Zn					

(h) identified areas of potential surface water infiltration, (i) potential beneficial uses of groundwater and waters of its discharge, and (j) the results of field testing for hydraulic parameters.

The site-specific cleanup objectives for soil will consider the cost and practicability of meeting cleanup objectives as well as elements of natural and manmade site conditions.

Task 6 - Confirm Remediated Soil

At the completion of Task 4, soil will be established as clean to levels acceptable to regulatory agencies. When combined with clean groundwater from Program IV, environmental closure of the property will be complete. Soil samples will be collected and analyzed to confirm the effectiveness of soil remediation measures. Sample analyses that fail to pass the agency-established concentrations will be cause for further remediation and resampling. Confirmation sample results will be presented in a Quarterly Report and submitted to the agencies.

PROGRAM II: ONSITE GROUNDWATER INVESTIGATIONS

Investigation of groundwater conditions onsite (Tasks 7-11) and investigation of soil conditions (Tasks 1-6) will be conducted simultaneously. Program II investigations will a complete definition of the lateral extent of MVF contamination in groundwater within the bounds of the property, and provide a basis for starting remediation.

Task 7 - Install and Develop Groundwater Monitoring Wells

Eight new groundwater monitoring wells were installed in Task 1 borings to investigate water quality in the upper water-bearing zone. One monitoring well (MW-6) was installed within 15 feet of the underground storage tank area where TPH-g contamination has been indicated in groundwater. The other three wells (MW-4, MW-7 and MW-8) were installed 40 to 120 feet upgradient of the tank complex (see Drawing 4) per the protocols of Work Plan dated February 10, 1989. These wells characterize the extent of groundwater contamination onsite, and no further onsite wells are planned.

The wells were constructed as 4-inch diameter, filter-packed PVC wells to at least 15 feet bgs into the upper saturated zone, per CECC standard procedures, Appendices A through C for protocols.

Task 8 - Collect And Analyze Groundwater Samples

The wells were fully developed by surge-purge, with at least four casing volumes of water removed and contained in 55-gallon drums onsite. This water will be profiled by sampling and analysis for TPH and Pb prior to disposal or authorized treatment under proper permit and manifest.

Groundwater samples were collected from each well for analysis for TPH as gasoline, BTEX, lead, and oil and grease (see Table 2 and Appendices E and G).

The field data, as-built well construction diagrams, boring logs, analytical results, and the of initial sampling were compiled and presented in the Quarters 1 and 2, 1989 Reports of Activities for the site.

Task 9 - Conduct Hydrology Tests and Research

Slug tests will be conducted on each well after development. In addition, local hydrologic conditions will be researched in public records, including libraries, water districts, and other well record depositories. Groundwater well completions will be surveyed and a detailed site plan showing wellhead elevations will be prepared. The depth to groundwater will be measured in each well to establish groundwater gradient onsite.

The results of this work and water quality data from Task 8 will be compiled onto maps presented in Quarter 3, 1989 Report of Activities to regulatory agencies. If needed, additional wells will be installed onsite to characterize groundwater conditions to the extent that receiving and discharging groundwater quality and groundwater MVF contamination plume geometry are known.

At the conclusion of Program II, the possibility of groundwater MVF contamination onsite will be assessed beneath the areas of strongest soil contamination.

PROGRAM III: OFFSITE GROUNDWATER INVESTIGATION

If groundwater plume conditions extend offsite, investigations will continue upgradient and/or downgradient under Program III. If site conditions indicate groundwater MVF contamination is confined to the site, Shell may proceed directly with groundwater remediation under Program IV.

Task 10 - Perform a Neighborhood Environmental Assessment

If groundwater contamination is discovered, an environmental assessment of neighborhood businesses, ownerships, and prior operational practices may be conducted to assess discharge history and hydrology of nearby locations.

Agency records will be reviewed to identify nearby owners of underground storage tanks and hazardous materials handlers and generators. In addition, regional hydrologic conditions, including present and historical gradients, and groundwater withdrawal and subsurface injection patterns and gradients, will be researched.

Task 11 - Refer to Legal Counsel

If other Principal Responsible Parties (PRPs) are possible or confirmed, Shell may elect to work through its legal counsel to establish fiscal and legal responsibility for environmental cleanup by negotiation with PRPs involved.

Task 12 - Inform The Regional Water Quality Control Board

If PRPs are confirmed, Shell may inform the Regional Water Quality Control Board (RWQCB) of its findings so that environmental investigations and cleanup conducted by PRPs in proportion to their responsibility.

Task 13 - Prepare Offsite Groundwater Investigation Plan

This Work Plan will be amended to address the investigation and possible remediation of offsite groundwater contamination. Step-out wells will be proposed for key projected upgradient and downgradient extensions of groundwater contamination. Subsequent activities may include obtaining rights-of-entry and well installation permits, specifying well design criteria, and specifying monitoring arrangements.

Task 14 - Install Offsite Groundwater Wells

Offsite groundwater monitoring wells will be installed in an iterative process until offsite groundwater MVF contamination is characterized, and downgradient PRPs are identified, if any.

PROGRAM IV: GROUNDWATER REMEDIATION

Program IV will comprise the permitting, planning, design, installation, operation, and monitoring of a groundwater remediation system which will cost-effectively clean up MVF contamination in groundwater at the site.

Task 15 - Groundwater Remedial Action Plan

Once groundwater conditions are characterized and offsite groundwater conditions are known, a Groundwater Remedial Action Plan will be prepared. This plan will address the means, duration, and cost to remediate groundwater MVF contamination at and around the Shell facility. The technical approach recommended will also consider the distribution and composition of contaminants, the beneficial uses of the groundwater, regulatory limits for extraction, treatment and discharge, best available technologies, and other relevant issues. Based on the outcome of neighborhood and offsite investigations, Shell will prepare this plan alone, or in conjunction with other PRPs.

The Plan will be presented to regulatory agencies of jurisdiction, and implemented upon agency approval to proceed.

If appropriate, an NPDES permit will be prepared for treatment system discharge. This permit will be submitted to the RWQCB for review and forwarding to EPA for further review at the earliest reasonable moment, so that groundwater remediation will not be delayed by the permitting process.

Task 16 - Implement Groundwater Remediation

Upon approval of final design by regulatory agencies and acquisition of necessary permits, remediation will be undertaken in accordance with the parameters specified in the Groundwater Remedial Action Plan.

A formal report of start-up activities and progress reports of remediation (including monitoring data) will be prepared and submitted to regulatory agencies at proper intervals.

Task 17 - Establish Groundwater Cleanup Standards

Shell will work with the RWQCB to establish the parameters defining site-specific water quality objectives. The ultimate cleanup standards will consider the cost and the practicability of meeting water quality objectives as well as elements of environmental risk and water quality conditions.

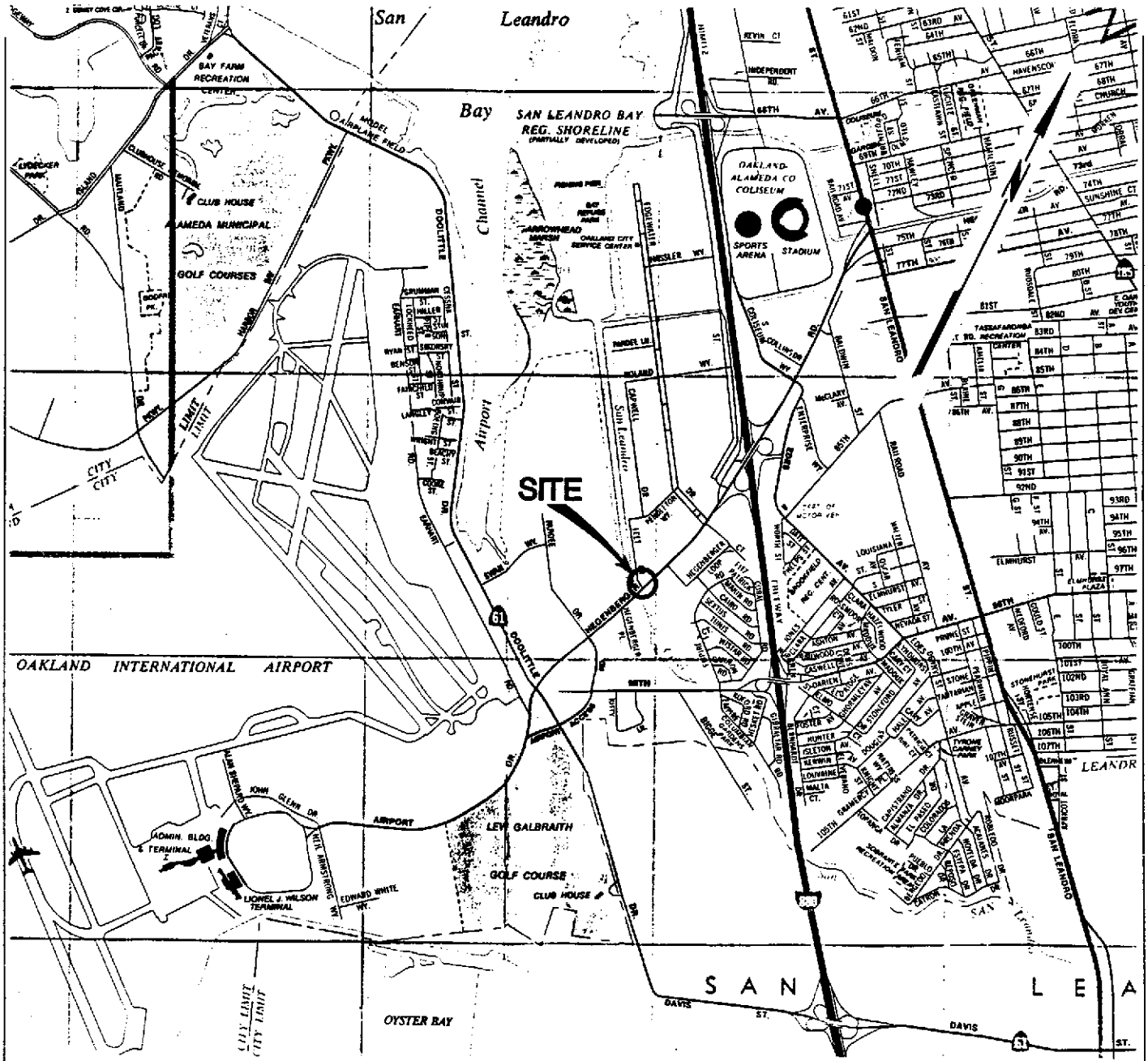
Information used in this effort may include site-specific soil conditions (Task 5); hydrologic conditions (Task 8); the chemistry of contaminants and their environment; and potential exposure routes.

Task 18 - Confirm Remediated Groundwater

At the conclusion of groundwater mitigation, monitoring samples will be collected over a brief period of time to confirm completion of groundwater remediation. Reports with certifications by registered professionals will be supplied to regulatory agencies as required.

LIST OF APPENDICES

APPENDIX A: Hollow-Stem Auger Drilling and Soil Sampling
APPENDIX B: Standards for Backfilling Borings and Sealing Wells
APPENDIX C: Groundwater Monitoring Well Construction
APPENDIX D: Well Development
APPENDIX E: Groundwater Sampling
APPENDIX F: Chain-of-Custody
APPENDIX G: Drum Handling Protocols



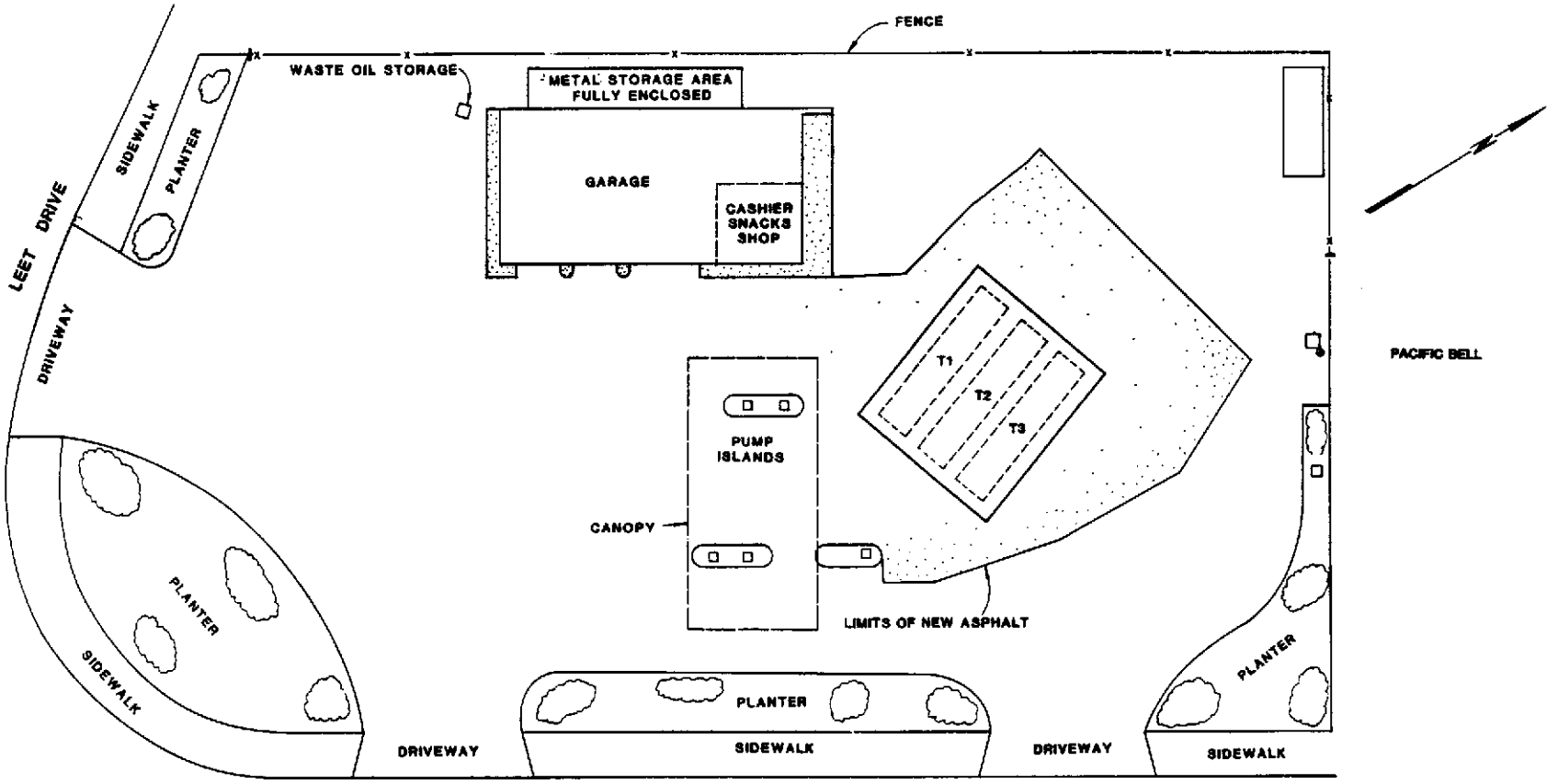
SOURCE: California State Automobile Association

SITE LOCATION

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale: AS SHOWN	Project No.: 88-44-359-01
Prepared by: KGC	Date: 3/21/89
Checked by: RMB	Drawing No.: 1
Approved by: DWC	



T1 = REGULAR UNLEADED, 10,000 GALLONS

T2 = REGULAR LEADED, 10,000 GALLONS

T3 = SUPER UNLEADED, 100,000 GALLONS

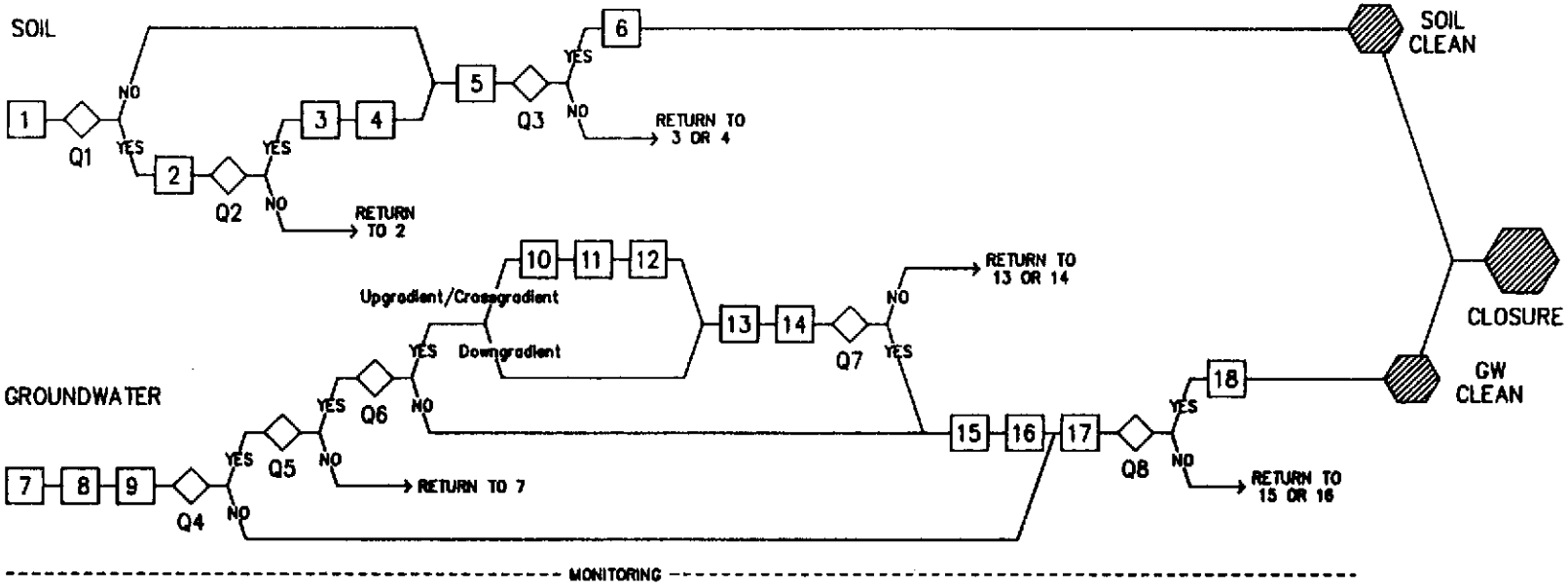
PLOT PLAN

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	6/13/89
Prepared By	LGL
Checked By	RMB
Approved By	DWC
Project No.	98-44-359-02
Drawing No.	2

Base Map: Surveyed with EDM, Converse 1989.



TASKS

Program 1: Onsite Soil Investigation/Remediation

Task 1 Drill and Sample Soil Borings
Task 2 Drill Step-Out Borings
Task 3 Prepare Soil Remedial Action Plan (if needed)
Task 4 Remediate Soil (if needed)
Task 5 Establish Clean Standards - Soil
Task 6 Confirm Remediated Soil

Program 2: Onsite Groundwater Investigation

Task 7 Install/Develop Groundwater Monitoring Wells
Task 8 Sample/Analyze Groundwater
Task 9 Conduct Hydrology Tests and Research

Program 3: Offsite Groundwater Investigation (if needed)

Task 10 Perform Neighborhood Assessment
Task 11 Refer to Legal Counsel
Task 12 Inform RWQCB
Task 13 Prepare Offsite Groundwater Investigation Plan
Task 14 Install Offsite Wells, Sample/Analyze

Program 4: Groundwater Remediation (if needed)

Task 15 Prepare Groundwater Remedial Action Plan
Task 16 Implement Remedial Action Plan
Task 17 Establish Cleanup Standards - Groundwater
Task 18 Confirm Groundwater Remediation

QUESTIONS

Q1: Are there concentrations of TPH greater than 100 ppm in any soil?

Q2: Is soil characterized?

Q3: Is the leaching potential acceptably low for contaminants proposed to be left in place?

Q4: Is groundwater actionable?

Q5: Is groundwater characterized onsite?

Q6: Does groundwater pollution extend offsite?

Q7: Is groundwater characterized offsite?

Q8: Is the environmental risk acceptably low for contaminants proposed to be left in groundwater?

SUMMARY OF PROGRESS - QUARTER 2, 1989

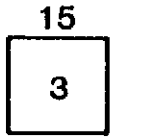
SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

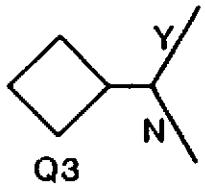
Scale	N/A
Date	5-24-89
Prepared By	LQL
Checked By	RMB
Approved By	DWC
Project No	88-44-359-01
Drawing No	3

KEY TO CRITICAL PATH DIAGRAMS

Time proceeds from left to right, with Tasks shown in relative order of succession.

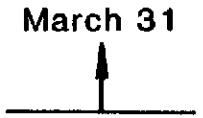


Task, showing Task number (inside) and anticipated number of days to completion (above), including preparatory activities, report preparation and review, and other related actions.



Question to be answered based on information from prior tasks.

Solid symbols indicate Letter Reports or formal Completion Reports coincident with question response.



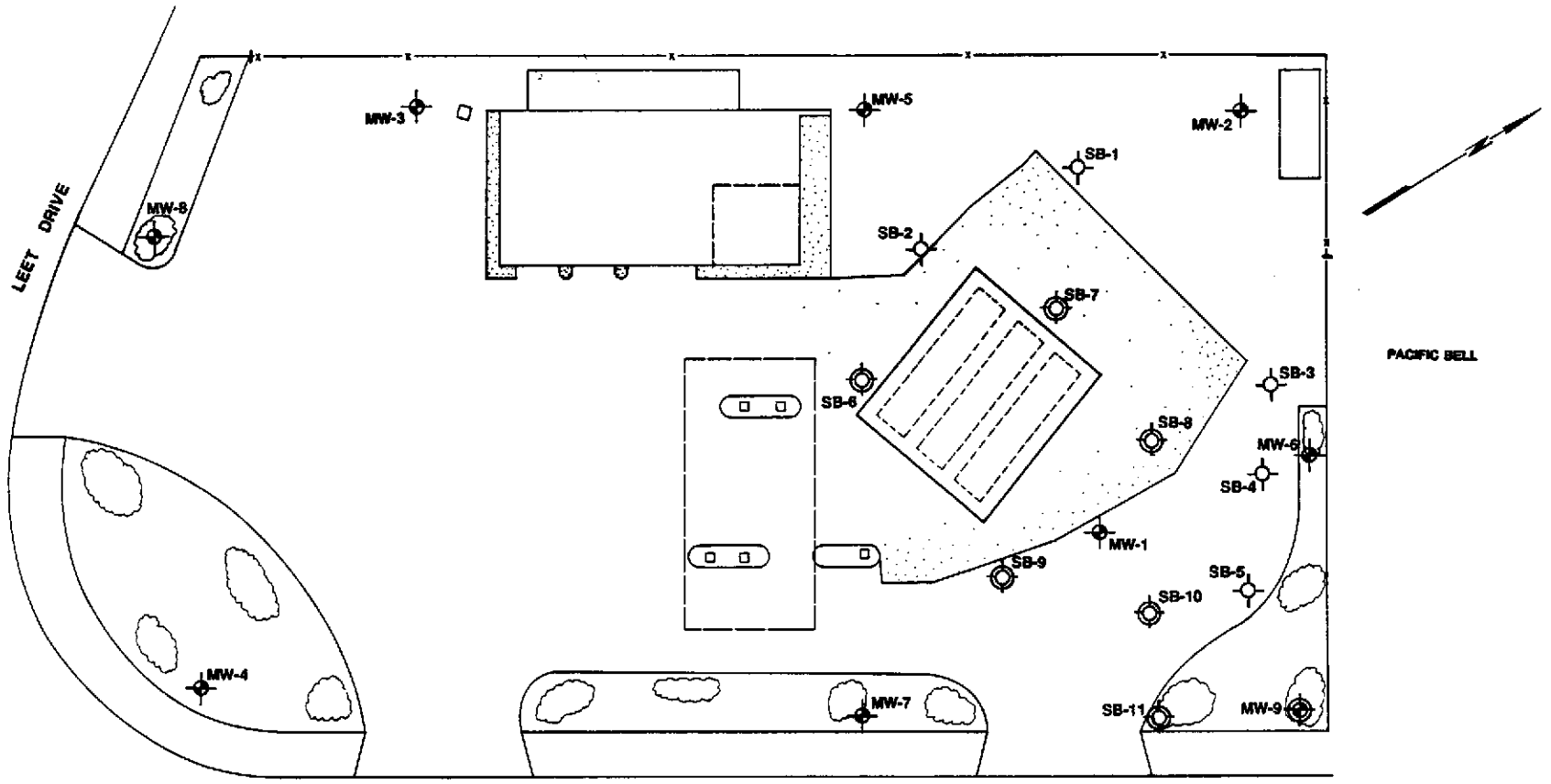
Relative calendar dates and dates of quarterly program reports to regulatory agencies.

KEY TO CRITICAL PATH DIAGRAM

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	N/A
Date	2/9/89
Prepared By	LQL
Checked By	RMB
Approved By	DWC
Project No	88-44-359-01
Drawing No	3a



LEGEND

- SB-6 — PROPOSED SOIL BORING
- MW-8 — PROPOSED GROUNDWATER MONITORING WELL
- SB-1 — SOIL BORING (AS OF 6/89)
- MW-1 — GROUNDWATER MONITORING WELL (AS OF 6/89)

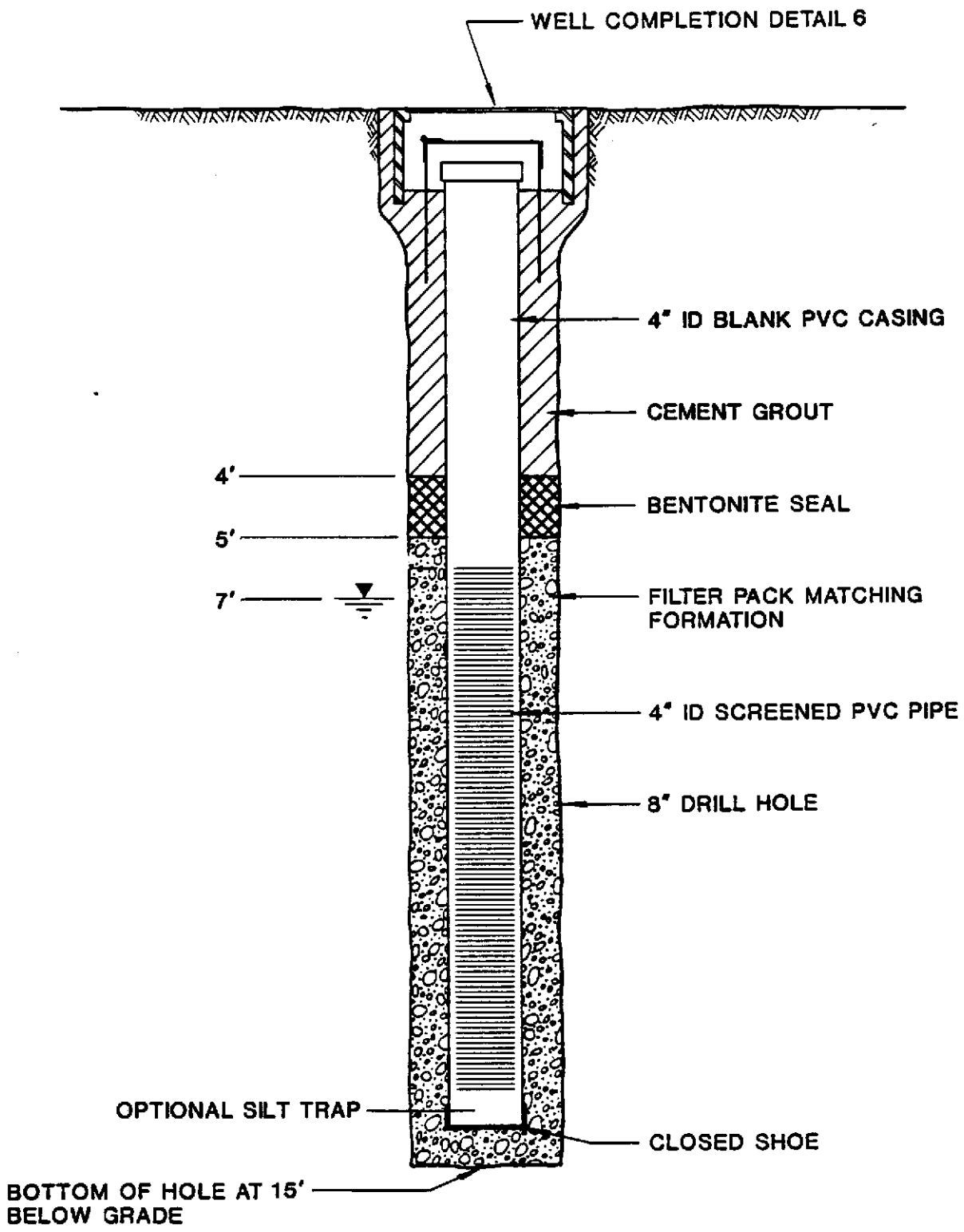
Base Map: Surveyed with EDM, Converse 1989.

PROPOSED GROUNDWATER MONITORING WELLS AND SOIL BORINGS

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	6/16/89
Prepared By	KGC
Checked By	RMB
Approved By	
Project No.	68-44-359-01
Drawing No.	4

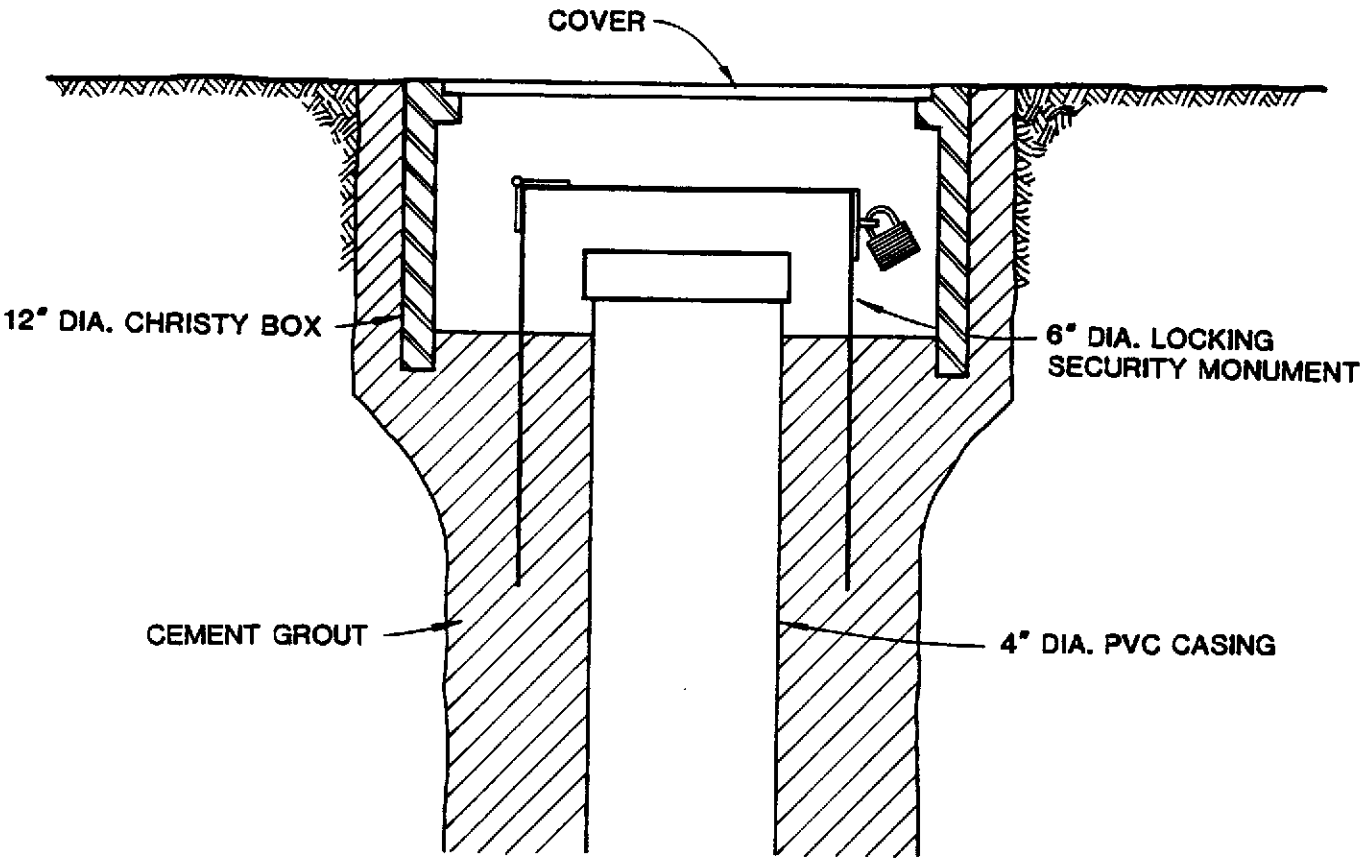


MONITORING WELL DIAGRAM

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale: NOT TO SCALE	Project No.: 88-44-359-01
Prepared by: LQL	Date: 2-3-89
Checked by: RMB	Drawing No.: 5
Approved by: DWC	



WELL COMPLETION DETAIL

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental
Consultants California

Scale: NOT TO SCALE	Project No.: 88-44-359-01
Prepared by: LQL	Date: 2-3-89
Checked by: RMB	Drawing No.: 6
Approved by: DWC	

APPENDIX A

Hollow-Stem Auger Drilling and Soil Sampling

HOLLOW-STEM AUGER DRILLING AND SOIL SAMPLING

Borings shall be drilled with a hollow-stem auger and sampled with a modified California-type split-spoon sampler. Soil samples shall be of sufficient volume to perform the analyses which may be required, including replicate analyses. Aside from deionized water or distilled water, no fluids will be used in drilling.

Undisturbed (intact) soil samples shall be recovered from soil borings without introducing liquids into the borings. Soil samples as core or cuttings shall be taken continuously from ground surface to termination depth (TD), or through the aquifer zone of interest for lithologic logging.

Soils from all borings shall be described in detail using the Unified Soil Classification System and shall be logged by a professional geologist, civil engineer, or engineering geologist who is registered or certified by the State of California and who is experienced in the use of the Unified Soil Classification System. A technician trained and experienced in the use of the Unified Soil Classification System who is working under the direct supervision of one of the aforementioned professionals shall be qualified to log borings, provided the aforementioned professional reviews the logs and assumes responsibility for the accuracy and completeness of the logs.

All wet zones above the free water zone shall be noted and accurately logged.

If evidence of contamination is detected by sight, smell, or other field analytical methods, drilling shall be halted until the responsible professional determines if drilling deeper is advisable.

All drilling tools shall be thoroughly decontaminated with trisodium phosphate (TSP) or steam cleaner immediately before starting each boring.

Soil samples shall be taken in decontaminated brass sampling tubes in the split-spoon. The brass sleeves will be cut apart using a clean knife. The ends of the tubes will be covered tightly with teflon wrap, capped with tight-fitting plastic caps, wrapped with plastic electricians' tape, and properly labeled.

APPENDIX B

Standards for Backfilling Borings and Sealing Wells

STANDARDS FOR BACKFILLING BORINGS AND SEALING WELLS

INTRODUCTION

As standard practice, all borings and observation and monitoring wells shall be backfilled or sealed with "relatively impervious" grout to prevent surface contamination or cross-contamination between aquifers. Borings will be sealed from termination depth to the surface and observation and monitoring wells shall be backfilled and sealed above the water table. This practice will reduce liability if it is determined and proven that groundwater contamination occurred along a "vertical pathway" in an improperly sealed or filled boring or well.

In hazardous and potentially hazardous waste sites where deep borings or wells are installed, appropriate geologic information will be reviewed to determine if multiple aquifer system(s) exist(s). If such system(s) exist(s), drilling and sealing techniques will be used to prevent contamination of a lower aquifer by upper, potentially contaminated aquifer(s). Grout seals will be installed according to the following techniques through all thicknesses of impermeable zones which separate aquifer.

Borehole grouting shall consist of backfilling with bentonite pellets, cement/bentonite grout, or a thick bentonite slurry, depending upon the depth of the boring, depth to ground water, and type of drilling equipment used. Details of currently acceptable sealing methods are outlined below.

GENERAL SPECIFICATIONS

- All grouting and well construction and sealing and abandonment of borings shall be consistent with local ordinances.

- Cement/bentonite grout used to seal wells will be of a hard consistency that can resist traffic loads, but not installed to create a "concrete pile" that will obstruct further earthwork. Bentonite slurry, which does not support surface loads, will not be used for sealing wells.

GROUTING/SEALING TECHNIQUES

Dry Holes and Borings Containing Less Than 5 Feet of Water

Option 1: Backfill boring with bentonite pellets or granules in about 2-foot lifts. Add a gallon of water to hole after each lift.

Option 2: Pour in a mixture of cement/bentonite group (9 parts cement, 1 part bentonite powder plus water as needed to make mixture consistency of pancake batter).

Option 3: Pour in a thick mixture of bentonite and water. Soil cuttings can be used to bulk this mixture is soil is not contaminated and chunks are small and well-mixed in slurry.

Borings Containing More Than 5 Feet of Water

Option 1: Pump out water and use criteria for "dry hole."

Option 2: Pump cement/bentonite grout to bottom of hole or use tremie. Do not pour grout through water.

Option 3: Pump or tremie bentonite slurry. This alternative is particularly efficient if you are using rotary wash equipment since all you have to do is thicken the drilling mud and pump it through the drill rod.

Monitoring/Observation Well Sealing (Single Aquifer)

A. Place sand pack around well casing to about 2 feet above slotted interval. Anticipate fluctuation of water level so screened interval covers maximum water elevation.

B. Place 2-foot thick bentonite pellet seal above sand pack. Add a bucket of clean water to swell pellets.

C. Pour cement/bentonite grout or bentonite slurry above pellet seal to ground surface.

APPENDIX C

Groundwater Monitoring Well Construction

GROUNDWATER MONITORING WELL CONSTRUCTION

Groundwater monitoring wells shall be constructed according to the general specifications described in the EPA Technical Enforcement Guidance Document (TEGD, 1986) and shown on the attached well construction diagram.

Groundwater monitoring wells shall be installed through hollow stem augers in borings drilled and sampled per Appendix A. Groundwater monitoring wells shall extend to the base of the upper aquifer, as defined by the first consistent (>5-foot thick) clay layer below the upper aquifer, or at least 15 feet below the top of the upper aquifer, whichever is shallower. The wells shall not extend through the laterally extensive clay layer below the upper aquifer. The wells shall be terminated 1 to 2 feet into such a clay layer.

The groundwater monitoring wells shall be single-cased wells which extend to the bottom of the boring or into a bentonite plug, if one is used at the bottom of the boring as a hydraulic seal. The screens shall be factory-perforated from the bottom of the upper blank casing at least 5 feet above the top of the upper aquifer as defined by boring lithology and/or geophysics. The base of the screen shall be the bottom of the well, or above a 2-5 foot long silt trap in the bottom of the well.

Groundwater monitoring wells shall be constructed as filter-packed wells that will prevent the migration of the surrounding formation into the well. Wells shall have 4-inch diameter factory-perforated casing with slots which match formation grain size as determined by field grain-size distribution analysis. Well casings shall have a threaded bottom cap or plug, and may have a silt trap below the screened zone.

All casing and screen shall be flush threaded, and no adhesive shall be used. PVC casing screen shall be steam-cleaned prior to installation. Filter pack shall be washed, graded sand.

Filter packs shall extend at least 2 feet above the top of the perforated interval. A layer of bentonite pellets 1 to 2 feet thick shall be placed on top of the filter pack. Approximately 2 gallons of water shall be added to hydrate the bentonite pellets. The wells shall then be sealed from the top of the bentonite seal to the surface with neat cement. All sand, bentonite and cement shall be placed using a tremie pipe.

Wellheads shall be installed in flush-mounted watertight structures and provided with a watertight caps. Wellheads shall be provided with locked security devices that protect the wells from the entry of surface water, accidental damage, unauthorized access, and vandalism.

Soil and water sampling equipment and materials used to construct the wells shall not donate, capture, mask, nor alter the chemical composition of the soils and ground water.

All well casings, casing fittings, screens, and all other components that are installed in the well shall be thoroughly decontaminated immediately before starting each well installation.

APPENDIX D

Well Development

WELL DEVELOPMENT

For all newly installed groundwater monitoring wells, the well casing, filter pack and adjacent formation shall be cleared of disturbed sediment and water before representative water samples are collected. A field geologist shall supervise such development work.

Before well development begins, the grout and bentonite seals shall set at least 24 hours and one pre-development water sample will be taken for each well. These water samples will be collected and analyzed for possible contaminants present according to CECC groundwater sampling protocol and QA/QC. These samples will be stored in the laboratory pending a decision to analyze, if required. If analyzed, standard laboratory procedures will be used. Samples not analyzed will be discarded.

All well development tools shall be thoroughly cleaned immediately before each well development. Well development shall begin with bailing using either a stainless steel or teflon bailer. This procedure will remove heavy sediments from within each well casing, reducing the possibility of the well screen abrasion and pump damage during subsequent pumping. Wells shall be bailed until water samples contain only trace amounts of fine to coarse sand, as measured in sampling jars after 15 minutes of settling.

The wells will be mechanically surged with a surge or flapper block for 15 strokes or 30 minutes, whichever is less. The block will be lowered to the well plug and then carefully drawn up to the top of the well screen or until it emerges from the water. For wells in moderate soils, the rate of surging will be progressively increased with each stroke. When working in areas of loose sediments, surging will be at a constant, slow stroke rate. Areas of dense or over-compacted sediments may require more vigorous surging. Between surging episodes, the wells will be bailed and/or pumped to remove the sediment-rich water generated.

After surging, wells under development will be pumped using stainless steel 3-inch positive displacement development pumps, 2-inch bladder pumps or other appropriate equipment. In this procedure, the pumps will operate at maximum rate which is less than the recharge rate of the pumped well. For complete development, the wells will be pumped until: (1) the discharge is clear or nearly clear; and (2) the turbidity has not noticeably changed with one-half hour.

All water and sediment generated by well development shall be collected in clean, 55-gallon steel drums unless only a small volume (less than 100 gallons) is produced. Drums of this development water will be temporarily contained onsite, pending sampling and laboratory analysis. Non-hazardous development waters shall be disposed of by surface dumping (small volumes) or sewerage. Potentially hazardous development water shall be properly disposed of at a suitable hazardous waste disposal site or properly treated for non-hazardous discharge. Small volumes of development water may be disposed of by surface dumping if, in the opinion of the onsite geologist, potential contamination to the environment is minimal.

APPENDIX E

Groundwater Sampling

GROUNDWATER SAMPLING

Groundwater samples shall be collected for laboratory analysis by the following procedures:

1. Before sampling or purging begins, all bailers, pumps, cables and lines will be steam-cleaned. An established and designated cleaning area will be kept clean by lining with visqueen or using a cleaning rack.

2. A pre-purge sample shall first be obtained with a bailer from as deep in the well as possible. Standard "Water Sampling Field Survey Forms" will be filled out for this and all future samples, to include the following information:

   - Depth to water and total depth of water column, measured and recorded before purging begins;

   - Conductivity, checked and recorded for every 5 gallons of purged water (for small volumes); and

   - Purged volume (as appropriate), with stabilized readings for pH, conductivity and temperature.

The well shall then be bailed or pumped to remove four to ten well volumes prior to sampling. The well will be purged until conductivity has been stabilized. "Stabilized" is defined as three consecutive readings within 15% of one another. A casing volume will be based on actual measurements made on the day of sampling, i.e., the total depth minus depth to water on day of sampling, time the cross-sectioned area of the casing.

If the well is emptied before four to ten well volumes are removed, the sample shall be taken when the water level in the well recovers to 80% of its initial water level or better.

Whenever possible, samples will be collected within 24 hours after purging; ideally, samples will be collected immediately after purging.

Following the required volume of evacuation from the well, the sample shall be obtained with a teflon or stainless steel bailer on a 60-pound monofilament or polypropylene (washed) line. Care will be taken to properly clean cables with braided stainless steel cable or plastic coverings, if used. Air lift sampling and bladder pumps shall not be used.

Unless specifically waived or changed by the local, prevailing regulatory agency, water samples shall be handled and preserved according to the latest EPA methods as described in the Federal Register (Volume 44, No. 233, Monday, December 3, 1979, Page 69544, Table II) for the type of analysis to be performed.

Purge water will be properly disposed of or temporarily contained in steel barrels pending chemical analysis to designate proper disposal procedure.

APPENDIX F

Chain-of-Custody

CHAIN-OF-CUSTODY

SAMPLE COLLECTION, HANDLING AND IDENTIFICATION

Sample collection, handling, and identification will follow the guidelines set by the California Department of Health Services. Field records will be completed when the sample is collected and will be signed or initialed, including the date and time, by the sample collector(s). Field records will contain the following information:

1. Unique sample or log number;
2. Date and time;
3. Source of sample (including name, location and sample type);
4. Preservative used;
5. Analyses required;
6. Name of collector(s);
7. Pertinent field data (pH, DO, C1, residual, etc.); and
8. Serial number on seals and transportation cases.

Each sample will be identified by affixing a pressure sensitive, gummed label, or standardized tag on the container(s). This label will contain the sample identification number, date and time of sample collection, source of sample preservative used, and the collector(s) initial(s). Analysis required will be identified. Where a label is not available, the same information will be affixed to the sample contained with an indelible, waterproof, marking pen.

The sample container will be placed in a transportation case along with the chain-of-custody record form, pertinent field records, and analyses request form. The transportation case will then be sealed and labeled. Records will be filled out legibly in pen.

TRANSFER OF CUSTODY AND SHIPMENT

When transferring the possession of the samples, the transferee will sign and record the date and time on the chain-of-custody record. Custody transfer, if made to a sample custodian in the field, will account for each individual sample, although samples may be transferred as a group.

The field custodian or field inspector will be responsible for properly packaging and dispatching samples to the appropriate laboratory for analysis. This responsibility includes filling out, dating, and signing the appropriate portion of the chain-of-custody record.

All packages sent to the laboratory will be accompanied by the chain-of-custody record and other pertinent forms. A copy of these forms will be retained by the originating office.

Mailed packages can be registered with return receipt requested. If packages are sent by common carrier, receipts should be retained as part of the permanent chain-of-custody documentation.

Samples to be shipped will be sealed locked so evidence of tampering may be readily detected.

LABORATORY CUSTODY PROCEDURES

Chain-of-custody procedures will be followed in the laboratory from the time of sample receipt to the time the sample is discarded.

The sample control officer (SCO) will be the designated custodian, and an alternate is designated to act as custodian in the custodian's absence. All incoming samples are received by the SCO, who shall indicate receipt by signing the accompanying custody forms and who shall retain the signed forms as permanent records.

The SCO will maintain a permanent log book to record, for each sample, the person delivering the sample, the person receiving the sample, date and time received, source of sample, sample identification or log number, how transmitted to the laboratory, and condition received (sealed, unsealed, broken container, or other pertinent remarks). A standardized format will be established for log book entries.

A clean, dry, isolated room, building, and/or refrigerated space that can be securely locked from the outside, will be designated as a "sample storage security area."

The SCO will ensure that heat-sensitive, light-sensitive samples, radioactive, or other sample materials having unusual physical characteristics, or requiring special handling, are properly stored and maintained prior to analysis.

Only the custodian will distribute samples to the section leaders who are responsible for the laboratory performing the analysis.

The laboratory area will be maintained as a secured area, restricted to authorized personnel only.

Laboratory personnel will be responsible for the care and custody of the sample once it is received by them. These personnel shall be prepared to testify that the sample was in their possession and view, or secured in the laboratory at all times, from the moment it was received from the SCO, until the time that the analyses are completed.

Once the sample analyses are completed, the unused portion of the sample, together with all identifying labels, will be returned to the SCO. The returned tagged sample will be retained in the custody room until permission to destroy the sample is received by the SCO.

Samples will be destroyed only upon the order of the Laboratory Director, in consultation with previously-designated Project Manager, and/or client, or when it is certain that the information is no longer required or the samples have deteriorated. The same procedure will apply to tags and laboratory records.

APPENDIX G

Drum Handling Procedures

OUTLINE OF DRUM HANDLING PROCEDURES

1. Complete drummed worksheets onsite, forward a copy to Shell.

2. Test material per Shell's site-specific test requirements (Appendix J).

3. Classify Material as: Clean/Non-Hazardous/Hazardous

4. Labeling of Drums

   - Pending Label: Used to describe material pending final analytical testing. Labels must be immediately affixed to drum during field work.

   - Non-Hazardous Label: Required within 48 hours after analytical results are received.

   - Hazardous Label: Required within 48 hours after analytical results are received.

   - For Pick-Up Label: Must be affixed to drum prior to Shell Hazardous Waste Coordinator arranged pick-up date.

5. Remove within 14 days of date of generation. Empty drums, where material was disposed in bulk, must be removed the same day they are emptied.

6. Dispose of Material:

   - Clean: Any local landfill
   - Non-Hazardous: Class III landfill. If a Class III landfill will not accept, contact Shell Hazardous Waste Coordinator for assistance
   - Hazardous: Class I landfill arranged by Shell Hazardous Waste Coordinator.

   Mail or FAX completed Hazardous Waste Pick-Up Forms to the Shell Hazardous Waste Coordinator with a copy of the analytical results and worksheets.

7. If required, contact the Shell Hazardous Waste Coordinator:

   Shell Oil Company
   Hazardous Waste Coordinator
   Anna Sampson
   P.O. Box 6249
   Carson, California 90749
   Phone: (213) 816-2037
   FAX: (213) 816-2114

8. Manifests may be signed by the onsite contractor or consultant, station dealer, or other authorized Shell Oil representatives. The transporter CAN NOT sign the manifest.

   IT IS THE RESPONSIBILITY OF THE CONTRACTOR/CONSULTANT TO ARRANGE FOR A PERSON TO SIGN THE MANIFEST ON THE DAY OF PICK-UP.

9. Reporting

   All reports must be received by the Shell Hazardous Waste Coordinator within 7 working days of disposal. Reports shall include the following:

   - Completed drummed soil and water worksheets.
   - Attach a copy of the analytical results.
   - State how and where material was disposed.
   - If drums are emptied and material was disposed in bulk, state how empty drums were handled.
   - The signed blue and yellow copies of the hazardous waste manifest.

SOIL:

1. Test Requirements and Methods: Per Shell's site-specific test requirements

   - TPH: EPA Method 8015

   - BTEX: EPA Method 8020

   - Lead:

     -One composite sample from each boring
     -See attached decision tree
     -Total Lead - EPA Method 7421
     -Inorganic (soluble) Lead - DOS Title 22, Waste Extraction Test, §22-66700

   - Ignitable:

     -One composite sample from each boring
     -Bunsen Burner Test Flame Test

2. Classification:

   - Clean: TPH, BTEX, and Lead non-detectable

   - Non-Hazardous if any are true:

     -TPH less than 1000 ppm

-Lead -Inorganic (soluble) Lead less than 5 ppm (STLC)
or less than 100 ppm (TTLC)
-Organic Lead less than 13 ppm (TTLC)

-Ignitable - If TPH < 1000 ppm do not conduct test

- Hazardous if any are true:

-TPH greater than 1000 ppm

-Lead -Inorganic (soluble) Lead greater than 5 ppm (STLC)
or greater than 1000 ppm (TTLC)
-Organic Lead greater than 13 PPM (TTLC)

-Ignitable -If TPH >1000 ppm, then conduct Bunsen Burner Test
-If soil burns vigorously and persistently, soils are RCRA D001

3. Responsibility for Disposal:
   - Clean: Consultant/Contractor
   - Non-Hazardous: Consultant/Contractor or Shell Hazardous Waste Coordinator
   - Hazardous: Shell Hazardous Waste Coordinator
4. Types of Drums: DOT-17H for a solid, solidified, or sludge material.
5. Disposal Facility:
   - Clean: Any local landfill
   - Non-Hazardous: Class III landfill. If a Class III landfill will not accept, contact Shell Hazardous Waste Coordinator for assistance
   - Hazardous: Class I landfill arranged by Shell Hazardous Waste Coordinator

WATER:

1. Test Requirements and Methods: Per Shell's site-specific test requirements.
   - TPH: EPA Method 8015
   - BTEX: EPA Method 602
2. Classification:
   - Clean Water: TPH and BTEX non-detectable

- Non-Hazardous:

  -Water with dissolved product and detectable TPH and BTEX
  -Water with free product
  -Free product only

3. Responsibility for Disposal:

   - Clean: Consultant/Contractor

   - Non-Hazardous: Consultant/Contractor or Shell Hazardous Waste Coordinator

4. Types of Drums: DOT-17C or DOT-17E for liquid or slurry

5. Disposal Facility:

   - Clean Water: Into dealer's sanitary sewer or with proper approval from Water Board to storm sewer

   - Non-Hazardous:

     Water with TPH and BTEX only -

     -Into dealer's sanitary sewer with approval from the POTW
     -Contact Shell Hazardous Waste Coordinator to arrange disposal

     Water with free product -

     -Contact Shell Hazardous Waste Coordinator to arrange disposal

   - Hazardous:

     Free product only -

     -Contact Shell Hazardous Waste Coordinator to arrange disposal