Converse Environmental Consultants California

55 Hawthorne Street, Suite 500
San Francisco, California 94105

Telephone 415 543-4200

June 9, 1989
88-44-361-01-091

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

Subject: Work Plan Certification
500 40th Street
Oakland, California

Dear Ms. Ferguson:

This letter is to attest to the fact that the Site Investigation and Remediation Work Plan for this site prepared by Converse Environmental Consultants California (CECC) (04/14/89) was submitted by the plan author, Douglas W. Charlton, California Registered Geologist # 4110. The signature block on the transmittal letter with the plan read "Douglas W. Charlton, V.P."

Future documents will be signed by Dr. Charlton, or other California Registered Geologist, showing registration number in the signature block, and properly stamped.

As a further point of clarification, please be advised that all analysis under the referenced Work Plan and its modifications will follow the RWQCB requirements 10/06/88 as shown in the attached list.

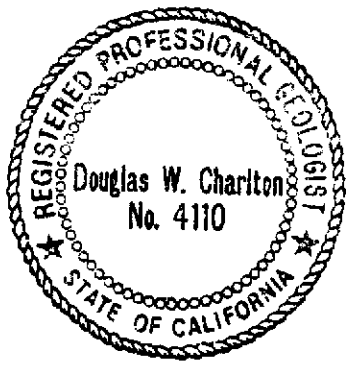
W[_CERT

Please incorporate this letter as an addendum to the Shell Work Plan for 500 40th Street (4/14/89), to confirm compliance with registration and analytical requirements.

Very truly yours,

Converse Environmental Consultants California

Douglas W. Charlton
California Registered Geologist # 4110



DWC:fs

Enclosure

cc: Mr. Diane Lundquist - Shell Oil Company (w/encl.)
Mr. Rafat Shahid - Alameda County (w/encl.)
Ms. Robin Breuer - CECC - (w/encl.)

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TABLE 3
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					

Converse Environmental Consultants California

55 Hawthorne Street, Suite 500
San Francisco, California 94105

Telephone 415 543-4200

April 14, 1989
88-44-361-01-048

Mr. Ariu Levi
Hazardous Materials Specialist
Alameda County Health Care Services Agency
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

Subject: Work Plan
Site Characterization and Remediation
Shell Oil Company
500 40th Street
Oakland, California

Dear Mr. Levi:

Enclosed herewith is a copy of the Work Plan that Shell Oil Company (Shell) 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 meet quarterly reporting requirements for this site. The next quarter report will be submitted on or before July 1, 1989.

Please note that scheduled activities are subject to Right of Entry approval from current owners. Therefore, the initiation of project activities can not be predicted at this time.

Project #

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CECC and Shell intend to proceed with the implementation of this Work Plan upon your approval of Right of Entry permission. 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

DWC:aes

Enclosure

cc:Ms. Diane Lundquist - Shell Oil Company - w/o att.
Ms. Robin Breuer - CECC - w/o att.

REVISED WORK PLAN

April 5, 1989

SHELL OIL COMPANY FACILITY
500 40th Street
Oakland, California

PROJECT BACKGROUND

Shell Oil Company (Shell) operated a retail gasoline station at 500 40th Street in Oakland, California until 1986, when underground storage tanks were removed from the ground (Drawing 1). The tanks were located at the southwest corner of the site, where investigations between 1982 and 1986 indicated motor vehicle fuel (MVF) product floating on the groundwater (Drawing 2).

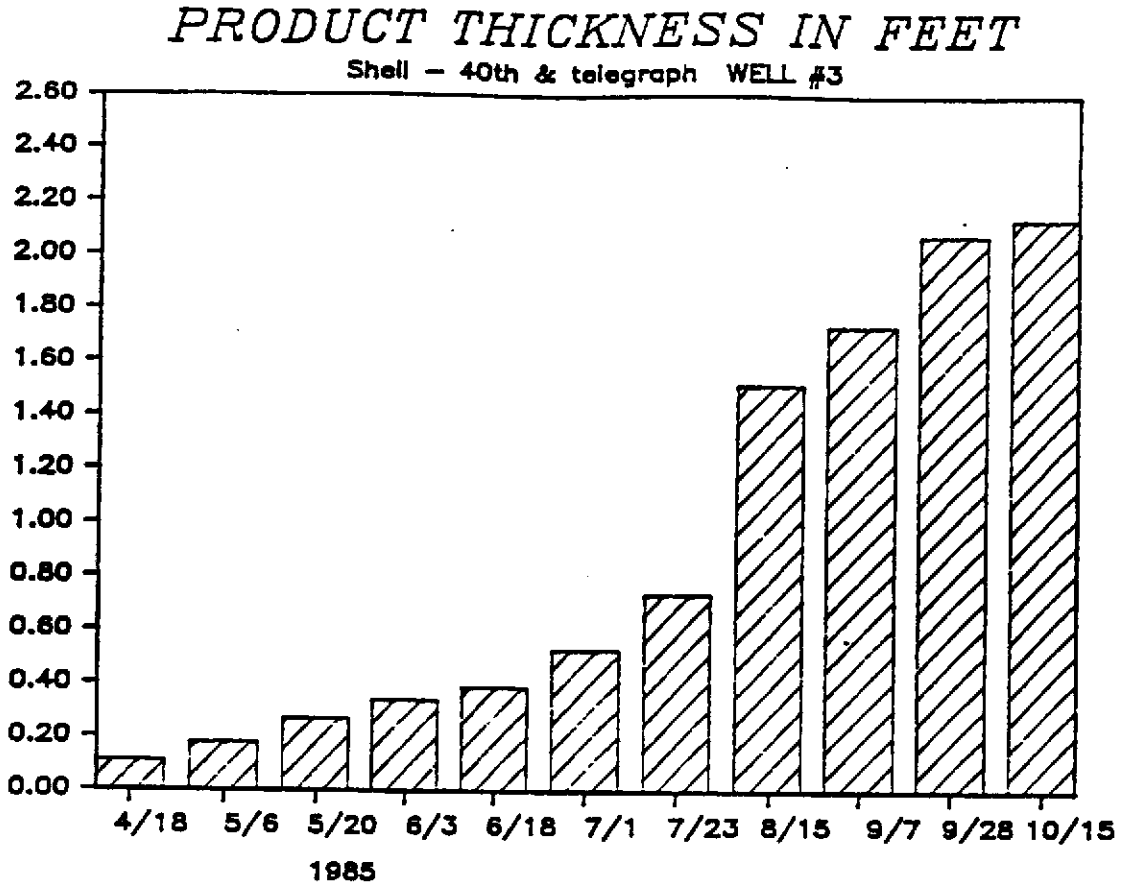
In July 1982 and July 1985, IT Corporation installed a total of ten groundwater monitoring wells on the property. The depth to water, product thickness and groundwater gradient were monitored regularly between July, 1982 and August 1986. This showed measurable product in wells B-3 and B-4, and occasional measurable product in wells B-2 and B-8 (See Table 1). The source of this product was never established.

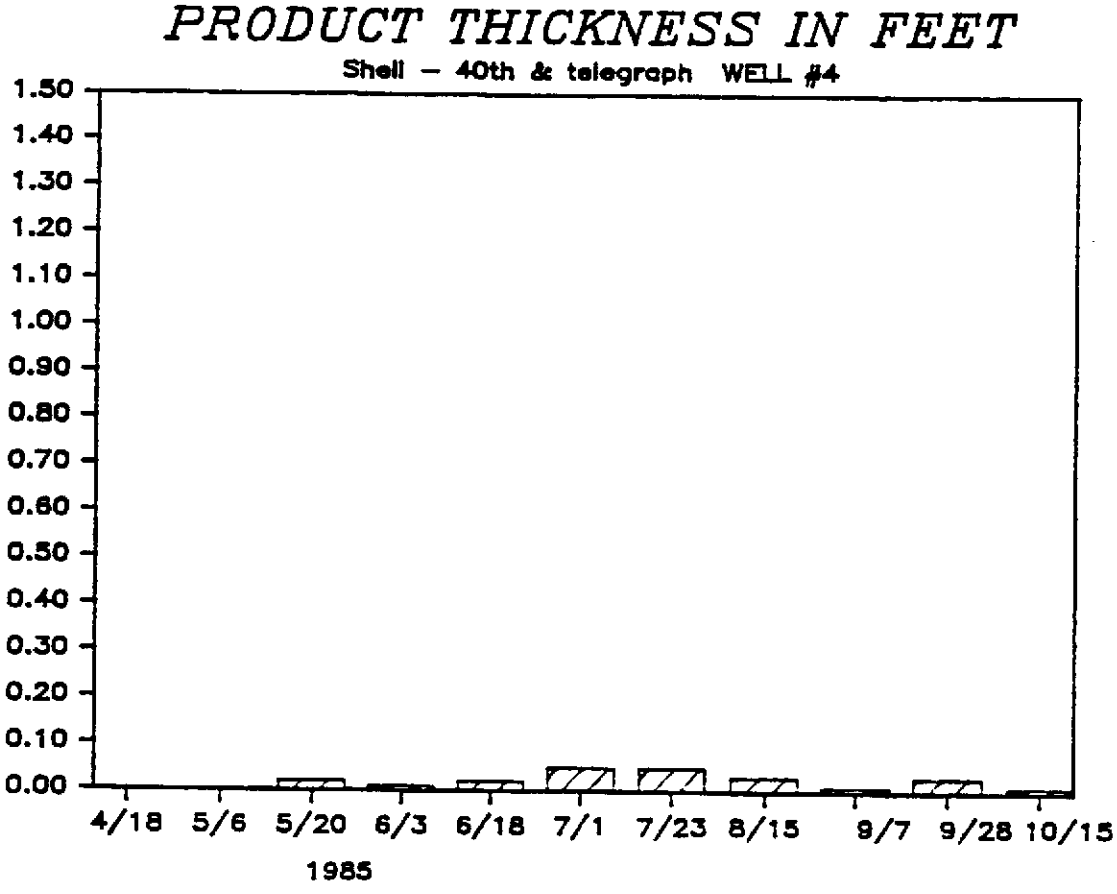
Well installations by IT Corporation in 1982 and 1985 provided detailed stratigraphic information for the site to 30 feet below ground surface (bgs). The following is an excerpt from the IT Corporation well installation report dated July, 1982:

> Approximately six inches of asphaltic concrete overlies one to two feet of artificial fill (subbase). From approximately two to four feet (bgs) a moist, black, gravelly clay was encountered. Below this black gravelly clay (to termination depth of 30' bgs), the soil is material of the Temescal Formation. The Temescal Formation generally consists of interfingering lenses of dense, grayish brown, clayey gravels; sandy, silty clays; and clay-silt-sand-gravel mixtures. The Temescal Formation is a typical alluvial fan deposit, derived from the erosion and re-deposition of material from the Berkeley Hills during periods of flooding. At the site, borings in the northern area (B-3, B-4, B-5 and B-6) tended to consist of coarser material (gravelly clays and clayey gravels) whereas borings B-7 and B-8 tended to consist of finer grain material (silty clays). The Temescal Formation at the site can be expected to have relatively low to moderate permeabilities, with the coarser material having the higher values.

In 1982, the product thickness was several feet thicker in B-4 than B-3. This was unusual because the corrected piezometric surface for B-4 was approximately 2 feet higher than the surface in B-3. However, in 1984 the relationship switched, and thicker product was consistently found in B-3 from 1984-1986.

The monitoring by IT Corporation clearly showed a relationship between water table elevation and thickness of product in wells B-3 and B-4. Although the ratio of product thickness in B-3 and B-4 varied irregularly during the 1982-1986 monitoring, a seasonal pattern was established: from November to January product thickness decreased in response to rising water tables from





Drawing 3: Typical product thickness
500 40th Street, Oakland Property, (from IT Corp., 1985)

winter recharge. As water tables fell in May, June and July, product thickness increased significantly. Lastly, product thickness decreased or increased irregularly from August through to October.

IT Corporation's concluded that seasonal changes in water tables were largely responsible for the amount of product observed in wells.

Apparently, as the water table drops, product is released from natural formations or backfill reservoirs to certain well locations (especially B-3 and B-4), with product flowing within permeable sand and gravel lenses that are confined by interfingered impermeable clays. The sudden appearance of product within these lenses indicates that product migrates to wells as if released or recharged by instantaneous events.

TABLE 1

CHRONOLOGICAL SUMMARY

Date	Description of Activity
7/82	IT installed 8 six inch diameter groundwater monitoring wells to 30 feet bgs. onsite. The wells were screened from 5 to 30 feet bgs. Combustible vapors were detected in the storm sewer system in the BART Station across the street.
7/82	IT Progress Report 1: Well installations and constructions were reported, and free product was noted in wells B-7 and B-8. Groundwater gradient was shown to be westward, towards the BART Station. (See Attachment 1 for well construction diagrams.)
11/82	IT Progress Report 6: Groundwater gradient still towards well B-3. From September 1 to November 19, 1982, IT removed 35 pints of product from B-4. Well TOCs were re-surveyed and groundwater gradient was confirmed toward B-3. Maximum product thickness was in B-4, at several inches.
12/82	IT Progress Report 7: Product thickness increased in B-3 in apparent response to rising water table. Product in B-4 remained at several inches.
1/83	IT Progress Report 8: Product in B-4 had diminished to film thickness.
2/83	IT Progress Report 9: Rainfall records were researched, and the relationship between rainfall, water table and product removed was charted by graph. Amount of product in B-4 appeared to vary inversely with water table; as water table rose with winter rains, the amount product in B-4 dropped. IT proposed that product was displaced downgradient as water table rose.
3/83	IT Progress Report 10: Vapor concentrations of TPH (expressed as percent lower explosive limit) were rising in wells B-1, B-2, B-3 and B-7. No product was measurable in B-4.
6/83	Rapid reappearance of product in well B-4, from negligible in May to 4+ feet by June 30 and 6.34 feet on July 15. Increase was also measured B-3, to a thickness of 0.66 feet in July. IT concluded that a reservoir of product existed in the tank backfill, and that as water table dropped in summer time this reservoir was allowed to escape by way of gravel lenses which were saturated at high water table seasons.
7/83	IT installed 8 inch diameter monitoring wells B-9 and B-10 to 20 feet bgs in native soils next to the tank backfill.
8/83	IT Progress Report 11: IT repeated the concept that product was released in surges through gravel lenses exposed to the water table during summer.
8/83	IT installed groundwater monitoring well B-11 and sand backfill in the southwest corner of the tank bed. No free-flowing product was encountered in this well.
9/83	IT drilled two 18 inch diameter borings to 30 feet bgs and completed same as 12 inch diameter recovery wells with screen intervals from 5 to 30 feet bgs. These wells, R-1 and R-2, were located near wells B-3 and B-4, directly west of the tank backfill.
10/83	IT purged and developed wells R-1 and R-2, holding a strong depression on the water table for 2 hours.
11/83	According to IT reference, the tanks were removed and, as part of this excavation wells R-1 and R-2 were also removed. No information was provided on tank excavation or associated soils/groundwater testing and reporting to regulatory agencies.
1/84	IT Progress Report 13: Wells B-3 and B-4 continued to contain measurable product, to thicknesses of 2 feet. In general, product thicknesses decreased during December and January. Product thicknesses also decreased after tank removal. Groundwater piezometric map showed a west-trending, low area encompassing wells R-1, R-2, B-3 and B-4. This extended offsite, suggesting a paleodrainage which controlled product collection and migration offsite.

1-5/84

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SIMAS REMOVED EXISTING (4) USTS & INSTALLED (3) FIBERGLAS TANKS.

TABLE 1

CHRONOLOGICAL SUMMARY

Continued

Date	Description of Activity
5/84	IT Report: The thicknesses of product in B-3 and B-4 measured from several inches to one foot during the period January to May 1984.
7/84	IT Report: Product thicknesses increased starting in mid-May in response to lowering water tables. This pattern was similar to the pattern observed in 1983.
8/84	IT Report: The thickness of product in B-3 remained one foot, while the amount of product in B-4 decreased. IT recommended looking for possible upgradient offsite sources.
9/84	IT Report: The thickness of product in B-4 started to increase (still at less than one inch) while the thickness of product in B-3 decreased (still on the order of one foot).
10/84	IT Report: New construction was noted. - BY SHELL - INSTALLED FIBER GLASS TANKS
1/85	IT Report: The thickness of product of B-3 had decreased to several inches and B-4 contained negligible measurable product. This pattern of decreasing product in the winter (high water table) months was consistent with that observed in the winters of 1982-83, and 1983-84.
2/85	IT Report: Significant measurable gasoline (1.64 feet) was discovered in B-8. The gasoline appeared degraded and "old". IT concluded that this gasoline could be from the same source as that contributing to observed in wells B-3 and B-4.
6/85	IT Report: Product thicknesses in B-3, B-4 and B-8 decreased from January to mid-May, with a dramatic decrease in B-8. IT repeated its interpretation that product thickness creased as water tables rose and increased water tables fell. IT further proposed that the product was trapped in permeable lenses, and migrated to different geographic areas as the water tables rose and fell.
12/85	IT Report: The thickness of product in B-3 increased to approximately 2 feet during the summer, showing the seasonal increase of prior years period. Simultaneously, no product was measured in B-8 after June 3, and product reappeared in B-2 in September and October. Product thickness in B-4 fluctuated at less than one foot thick during this period. IT recommended installing a recovery extraction trench along the west boundary of the property. - NOT DONE.
5/86	IT Quarterly Report: Product thickness decreased in wells B-3 and B-4 in response to seasonal rise in the water table.
6/86	IT requested permission to abandon B-6.
7/86	IT stated that Shell planned to remove the underground storage tanks in the near future. - TANKS REMOVED 3 UNITS
8/86	IT Quarterly Report: IT noted seasonal decline in water table and negligible measurable product in wells B-2 and B-4, with approximately 2 feet of floating product in B-3.
9/86	A groundwater sample from B-3 contained volatile organics: 0.90 ppm; benzene: 0.32 ppm; toluene: 0.23 ppm; xylene: 0.16 ppm.
1/4/87(?)	A commercial shopping center building was erected on the property, covering wells B-2, B-6, B-7, B-9 and B-10. Wells B-1, B-3, B-4, B-5 and B-8 were covered by site parking and a rear driveway.

PROPOSED INVESTIGATION

This Work Plan describes tasks Shell proposes to undertake in conducting a subsurface soil and groundwater investigation at the subject site.

SCOPE

Shell will conduct a field program of 25 tasks to: (1) resolve the status of previously installed groundwater monitoring wells on the property, (2) investigate the extent of groundwater and possible soil contamination, (3) undertake product remediation, and (4) undertake groundwater remediation. The Shell investigations will consist of five programs:

- Program I: Onsite Soil Investigation (Tasks 1-4);
- Program II: Interim Product Remediation (Tasks 5-11);
- Program III: Onsite Groundwater Investigations (Tasks 12-17);
- Program IV: Offsite Groundwater Investigations (Tasks 18-22);
- Program V: Groundwater Remediation (Tasks 23-25)

Drawing 3 shows the critical path for tasks in these programs.

PROGRAM I: ONSITE SOIL INVESTIGATIONS

Groundwater results by IT Corporation indicated localized floating product and inferred soil contamination near the former tank bed property. Soil investigations will be conducted near the existing retail building, to assess the potential residual soil contamination from tank operations.

Prefield Activities

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

Task 1 - Drill Borings/Analyze Soil

First, soil borings (SB-1 through SB-5) will be drilled at the locations shown on Drawing 4 to assess the potential for contamination beyond that inferred prior work. The borings will be drilled to 13 feet below ground surface (bgs) and drive-sampled using a California split-spoon sampler at depths of approximately 3-4 feet bgs and 8-9 feet bgs. Soil samples will be analyzed for TPH (as gasoline and diesel) using EPA Method 8015 (modified) and Pb by EPA Method 7421. Results of soil borings and analysis will be reported to regulatory agencies in the Quarter 2, 1989 Report of Activities.

At the end of Task 1, the extent of soil contamination onsite will be known for the areas investigated. If the initial borings near the pump islands do not quantify the extent of soil contamination, additional borings will be installed in an iterative, step-out pattern onsite until such contamination is blocked out to approximately the 100 ppm TPH isopleth. At the conclusion of sampling, the soil borings will either be abandoned using proper protocols (see Appendix F).

Task 2 - 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 3 - Remediate Soil (If needed)

Soil will be remediated according to the protocols, schedule and cleanup objectives specified in the Soil Remedial Plan, as approved by regulatory agencies of jurisdiction (Task 2).

At the completion of Task 3, soil will be established as clean to levels acceptable to regulatory agencies. When combined with clean groundwater from Program V and removal of product from Program II, environmental closure of the property will be complete.

Task 4 - Confirm Remediated Soil

Upon completion of Task 3, 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. Confirming sample results will be presented in a Quarterly Report and submitted to the agencies.

PROGRAM II: Interim Product Remediation

Product remediation will begin as soon as possible and will be conducted simultaneously with onsite soil investigations (Program I) and onsite groundwater investigations (Program III). Interim product remediation will consist of designing and obtaining regulatory agency approval for extraction trench installation, and consequent removal of product by skimmers placed in one or more extraction wells in the trench system. If needed, groundwater withdrawal maybe used to induce the flow of product to the trench system. If groundwater drawdown is induced, removed groundwater will be treated (if needed) and discharged under permit and approval of regulatory agencies.

Task 5: Prepare Product Remediation Plan

A Product Remediation Plan will be prepared and presented to the regulatory agencies. This plan will be a letter discussion of the product extraction system to be installed onsite, the methods for removing product (only) and the procedure for disposing, treating and/or recycling product removed in this remediation. The Product Remediation Plan will be submitted to the Regional Water Quality Control Board in the Alameda County Health Care Services Agency. No provision will be made for moving or removing groundwater in the initial Product Remediation Plan.

Task 6 - Apply For NPDES Permit (See Task 11)

In all likelihood, groundwater remediation through pumping will be necessary on this project. Therefore, the NPDES permit application process will begin at

the earliest possible moment. At this time, sufficient information is available to initiate the NPDES permit, provided that assumptions are made concerning discharge rates. The NPDES application will be submitted to the RWQCB for review, and then forwarded to the EPA for final approval. Even if obtained, the NPDES may not be used in groundwater remediation for the facility.

Task 7 - Design and Install Extraction Trench System

Historic monitoring has shown that the thicknesses of product is several inches to four feet in the area of former wells B-3 and B-4 (See Drawing 2). Product thicknesses in excess of one foot have occurred in these wells each summer-fall from 1982 to 1986. The product was observed even after the underground storage tanks were removed in November 1985. Therefore, it appears that a plume of product exists in the surface near the western boundary of the site, downgradient of the former tank area.

At this time it appears that product in this part of the site is confined to channelized lenses of permeable sediment. Therefore, the concept for interim product remediation is to excavate an extraction trench across the inferred channel in the area of former wells B-3 and B-4, along the property boundary.

A trench will be excavated to approximately 25 feet below grade at its center, and 15 to 20 feet below grade near former wells B-3 and B-4. The trench will be filled with properly compacted coarse gravel pack as it is excavated, so no more than a very short length of trench is open at one time.

A 12 inch diameter extraction well will be placed from 25 feet below grade to the surface in the center of the trench. This well will consist of factory-slotted screen below eight feet bgs. Two 4-inch diameter monitoring wells will be installed in the gravel pack near the locations of B-3 and B4. If encountered in the excavation, covered wells B-3 and B-4 will be removed.

The extraction well and trench monitoring wells will be completed with a flush, traffic-rated Christy boxes. Also, an underground product recovery holding tank will be connected to the extraction well.

Task 8 - Collect and Recycle/Dispose of Product; Monitor Product Remediation Progress

Product will be removed by automatic operation of a skimmer pump in the recovery well. The monitoring wells within the trench will be monitored to check the thickness of product and level of water table on a regular basis. Product will be collected in the recovery tank. Product will be removed from this tank on an as-needed basis by a licensed recycling company. - WHO? - PROVIDE RECEIPTS

Task 9 - Install Interim Groundwater Treatment System

If product collection described in Task 7 and 8 fails to remove product in an expeditious manner, groundwater may be removed from the trench to enhance product migration to the trench. This task will entail: (1) designing a total fluids treatment system, (2) obtaining approval the NPDES permit, or allow for

alternate disposal of treated or untreated groundwater, (3) obtaining permission from the RWQCB for removing groundwater and treating same, (4) upon approval of design plans, installing the interim groundwater treatment system, including discharge piping, as needed.

Task 10 - Conduct Groundwater-Product Remediation Pilot Test

Upon installation of the groundwater treatment system, pilot tests will be conducted to allow for system modification and adjustment to optimal operating efficiency and acceptable water quality discharge. Monitoring and laboratory testing and reporting to the agencies will be included.

Task 11 - Conduct Groundwater-Product Remediation

If undertaken, total fluids will be remediated on a interim basis using the treatment system installed and tested in Tasks 9 and 10. Influent water quality will be monitored on a regular basis and results will be reported to the regulatory agencies.

PROGRAM III: ONSITE GROUNDWATER INVESTIGATION

If the groundwater or product plumes extend offsite, investigations may 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 V.

Task 12 - Locate and Expose 1982 Wells

The 1982 wellheads which were not covered by buildings (B-1, B-3, B-4, B-5 and B-8) will be located and exposed. It may less expensive to re-establish these wells than to abandon and replace them. Depending on which wells are salvageable, other wells may be installed under Task 15. Activities will include: (1) locating and uncovering wellheads, so long as these activities can be conducted without endangering existing structures; (2) negotiating with regulatory agencies for waiver of abandonment requirements for wells beneath buildings.

Task 13 - Assess Conditions of Accessible Wells

The physical condition of accessible wells, i.e. wells which are not covered by buildings or pavement, or wells which are too close to buildings will be assessed to determine whether certain wells are worth salvaging. The comparative cost will be estimated for: (1) restoring the wells (retrofit construction, redevelopment, etc.), (2) abandoning the wells within regulatory requirements. Specific wells will be scheduled for restoration or replacement based on cost and hydrologic conditions.

Task 14 - Restore/Redevelop Wells

All wells which are salvageable will be restored by installing proper flush-mounted traffic boxes with internal locking security monuments (see Drawing 5). The wells will be redeveloped per CECC standard protocols to produce representative groundwater flow for sampling.

Task 15 - Install New Groundwater Monitoring Wells

Four new groundwater monitoring wells will be installed onsite to initiate investigation of water quality in the upper water-bearing zone. These wells will be installed, developed and sampled according to CECC standard protocols (see Appendices A through D).

MW-~~3~~ 5 will be installed near the former underground storage tank area, where contamination has been indicated in groundwater. MW-~~1~~ 1 will be installed crossgradient of the trench, approximately midway between former wells B-5 and B-4. MW-3 will be installed along the ~~east~~ WEST property boundary, approximately 15 feet north of former well B-8. Lastly, MW-4 will be installed at the upgradient property boundary, near former pump islands. MW 2 will be installed along WEST boundary

Well installation will consist of constructing 4-inch diameter, filter-packed PVC wells to at least 27 feet bgs into the upper saturated zone, per CECC standard procedures (see Drawings 5 and 6 for construction details, and Appendices A through C for protocols). Soil will be sampled at 5 feet intervals downhole, and thoroughly described using the Unified Soil Classification System (USCS) (see Appendix A). Soil samples from the unsaturated zone will be collected, transported to a State-certified analytical laboratory and analyzed for lead (EPA Method 7421), and TPH as gasoline and diesel (EPA Method modified 8015) (see Appendices A and E).

Task 16 - Sample/Analyze Groundwater

The wells will be 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 or manifest.

Groundwater samples will be collected from each well for analysis for TPH (as gasoline and diesel) and BTEX (see Appendices D and H).

The field data, as-built well construction diagrams, boring logs, analytical results, and the results of initial sampling will be compiled and presented in the Quarter 2, 1989 Report of Activities for the site.

Task 17 - Conduct Hydrology Tests and Research

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 current groundwater gradient onsite.

The results of this work and water quality data from Task 16 will be compiled onto maps presented in Quarter 2, 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 ground-

water quality and groundwater MVF contamination plume geometry are known.

At the conclusion of Program III, the potential for offsite extensions of groundwater MVF contamination will be known.

PROGRAM IV: OFFSITE GROUNDWATER INVESTIGATION

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

Task 18 - Perform a Neighborhood Environmental Assessment

An environmental assessment of neighborhood businesses, ownerships, and prior operational practices may identify nearby dischargers of MVF to the environment upgradient of the subject property. These parties could be, in part, responsible for site conditions observed at Shell.

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. The results of these studies will be reported directly to Shell.

Task 19 - 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 20 - Inform The Regional Water Quality control Board

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

Task 21 - Prepare Offsite Groundwater Investigation Plan

An amended to this Work Plan will be prepared to address the potential for offsite groundwater MVF contamination. Step-out wells will be proposed for key projected upgradient and downgradient extensions of groundwater MVF contamination. Subsequent activities may include prefield organization, obtaining rights-of-entry and well installation permits, specifying well design criteria, and specifying monitoring arrangements.

Task 22 - Install Offsite Groundwater Wells

Offsite groundwater monitoring wells will be installed in an iterative process until one of the following conditions is met: (1) offsite groundwater MVF contamination is characterized and is established to be the result of Shell activities or

(2) the investigation has proceeded to a point that other cross-gradient or downgradient PRPs are identified, if any.

PROGRAM V: GROUNDWATER REMEDIATION

Program V 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 23 - Prepare 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 24 - Implement Groundwater Remediation

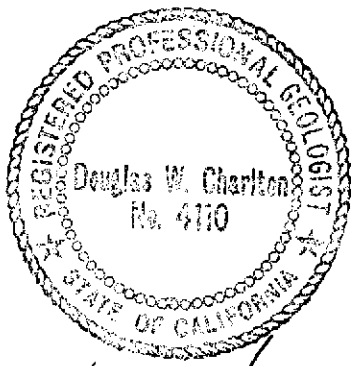
Upon approval of final design by regulatory agencies and acquisition of all necessary permits, remediation will be undertaken in accordance with the parameters specified in the groundwater Remedial Action Plan.

Lastly, a formal report of startup activities and progress reports of remediation (including monitoring data) will be prepared and submitted to regulatory agencies at proper intervals.

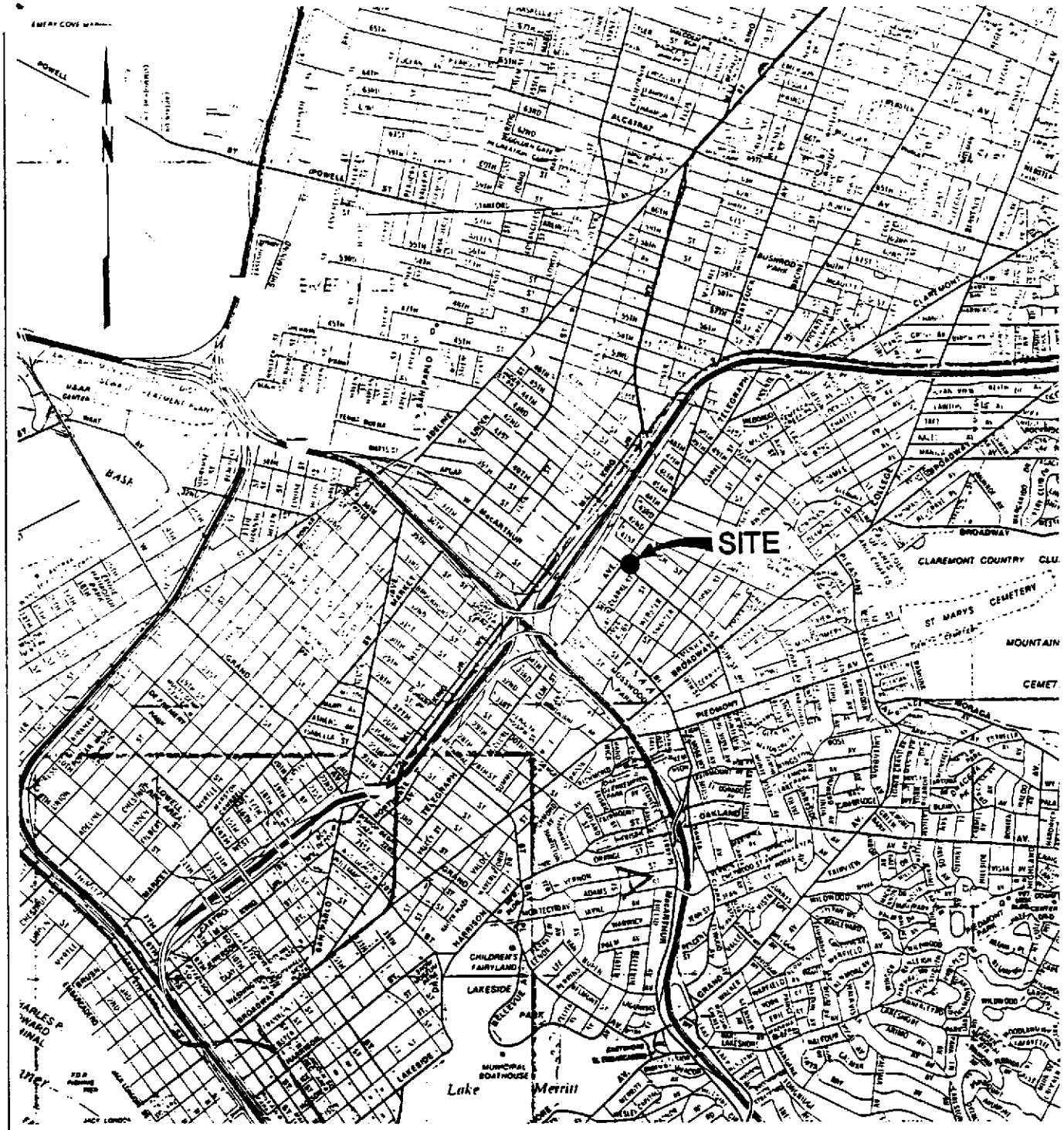
Task 25 - Confirm Remediated Groundwater

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.

Attachments: Site Drawing
Critical Path, with Schedule
Well Diagram



4/13/89



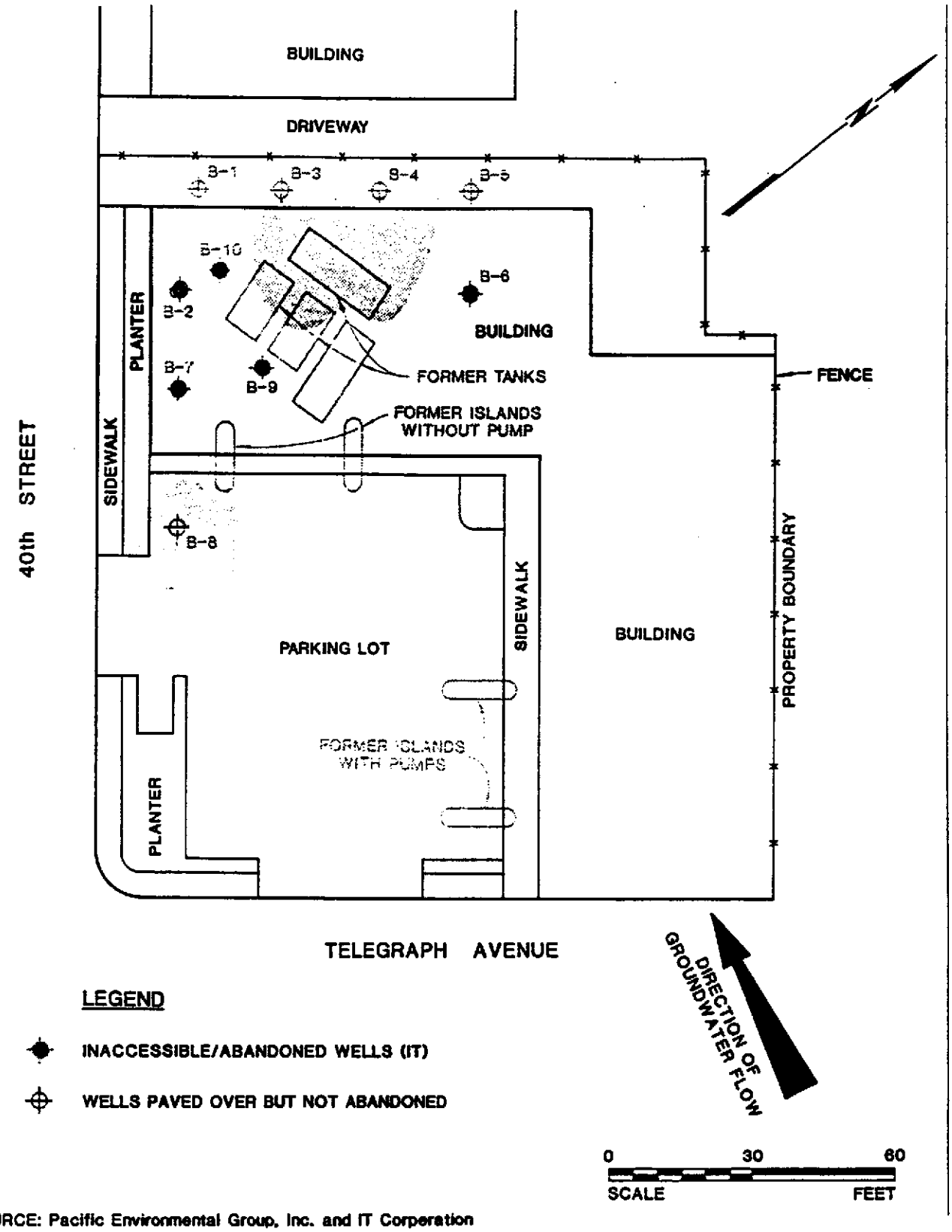
SOURCE: California State Automobile Association.

SITE LOCATION MAP

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental
Consultants California

Scale: 1"=2000'	Project No.: 88-44-361-01
Prepared by: KGC	Date: 4/4/89
Checked by: RMB/MIY	Drawing No.: 1
Approved by:	



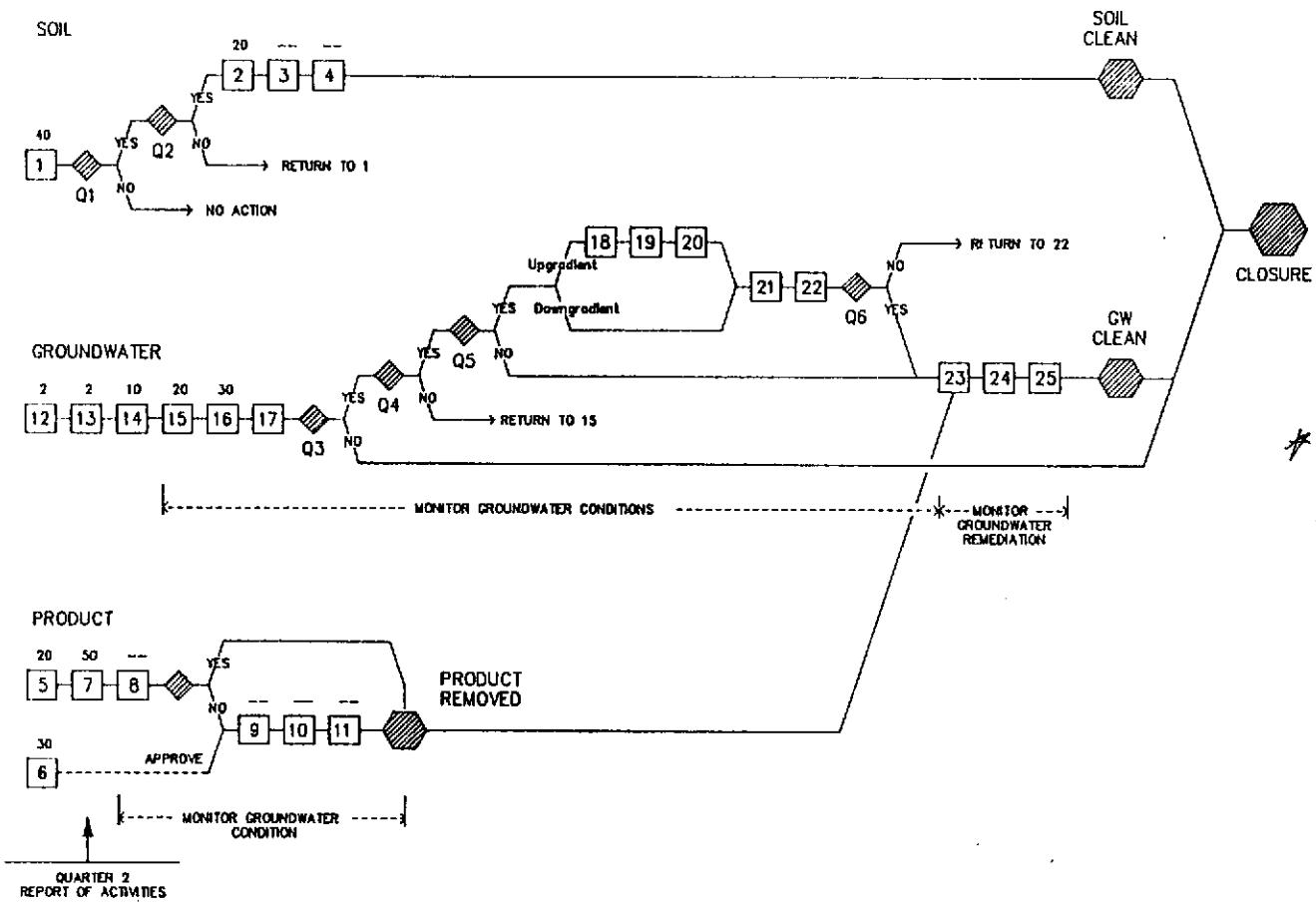
SOURCE: Pacific Environmental Group, Inc. and IT Corperation

SITE PLAN

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental Consultants California

Scale	1"=30'
Project No.	88-44-361-01
Prepared by	LQL
Date	2-24-89
Checked by	RBM/MIY
Drawing No.	2
Approved by	DWC



TASKS

Program I: Onsite Groundwater Investigations

- Task 1 Drill Soil Borings/Analyze Soil
- Task 2 Prepare Soil Remedial Action Plan
- Task 3 Remediate soil (if needed)
- Task 4 Confirm Remediated Soil

Program II: Interim Product Remediation

- Task 5 Prepare Product Remediation Plan
- Task 6 Apply for NPDES (See Task 11)
- Task 7 Install Extraction Trench
- Task 8 Operate Product Extraction Trench
- Task 9 Install Interim Groundwater Treatment System
- Task 10 Operate Groundwater Interim Pilot
- Task 11 Conduct Groundwater Product Remediation

Program III: Onsite Groundwater Investigations

- Task 12 Locate and Expose 1982 Wells
- Task 13 Assess Well Conditions
- Task 14 Restore/Redevelop Wells
- Task 15 Install New Wells
- Task 16 Sample/Analyze Groundwater
- Task 17 Conduct Hydro Tests/Research

Program IV: Offsite Soil Investigations and Remediation

- Task 18 Neighborhood Assessment
- Task 19 Refer to Legal Counsel
- Task 20 Inform RWQCB
- Task 21 Offsite Groundwater Investigation Plan
- Task 22 Install Offsite Wells; Sample/Analyze

Program V: Groundwater Remediation

- Task 23 Prepare Groundwater Remediation Action Plan
- Task 24 Implement Remedial Action Plan
- Task 25 Confirm Remediated Groundwater

QUESTIONS

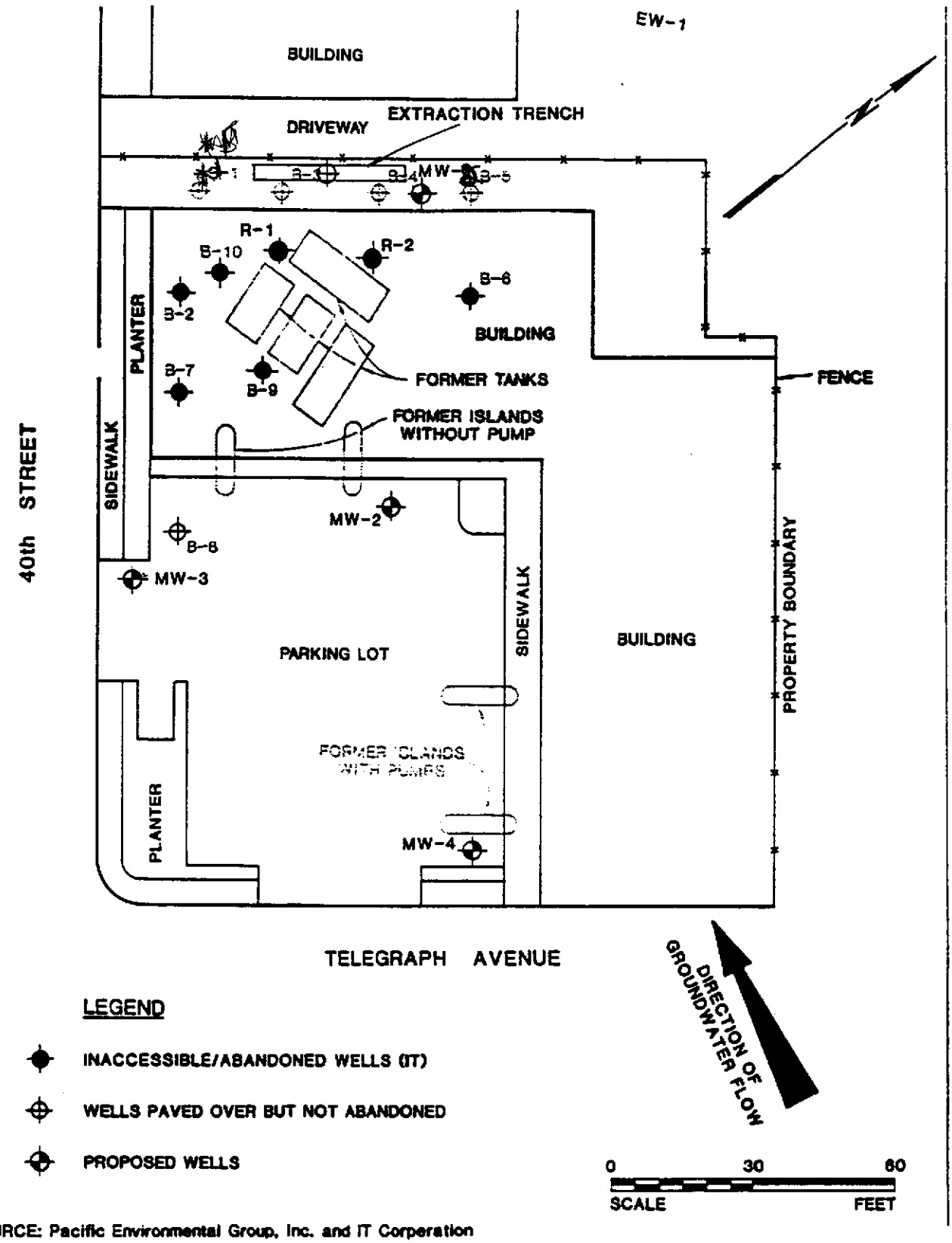
- Q1: Is soil actionable?
- Q2: Is soil fully characterized?
- Q3: Is groundwater actionable?
- Q4: Is groundwater characterized onsite?
- Q5: Does groundwater pollution extend offsite?
- Q6: Is groundwater characterized offsite?
- Q7: Is the product fully recovered to the extent possible?

CRITICAL PATH DIAGRAM

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental Consultants California

Scale	N/A
Date	4-5-89
Prepared By	LQL
Checked By	RMB
Approved By	DWC
Project No	88-44-361-01
Drawing No	3



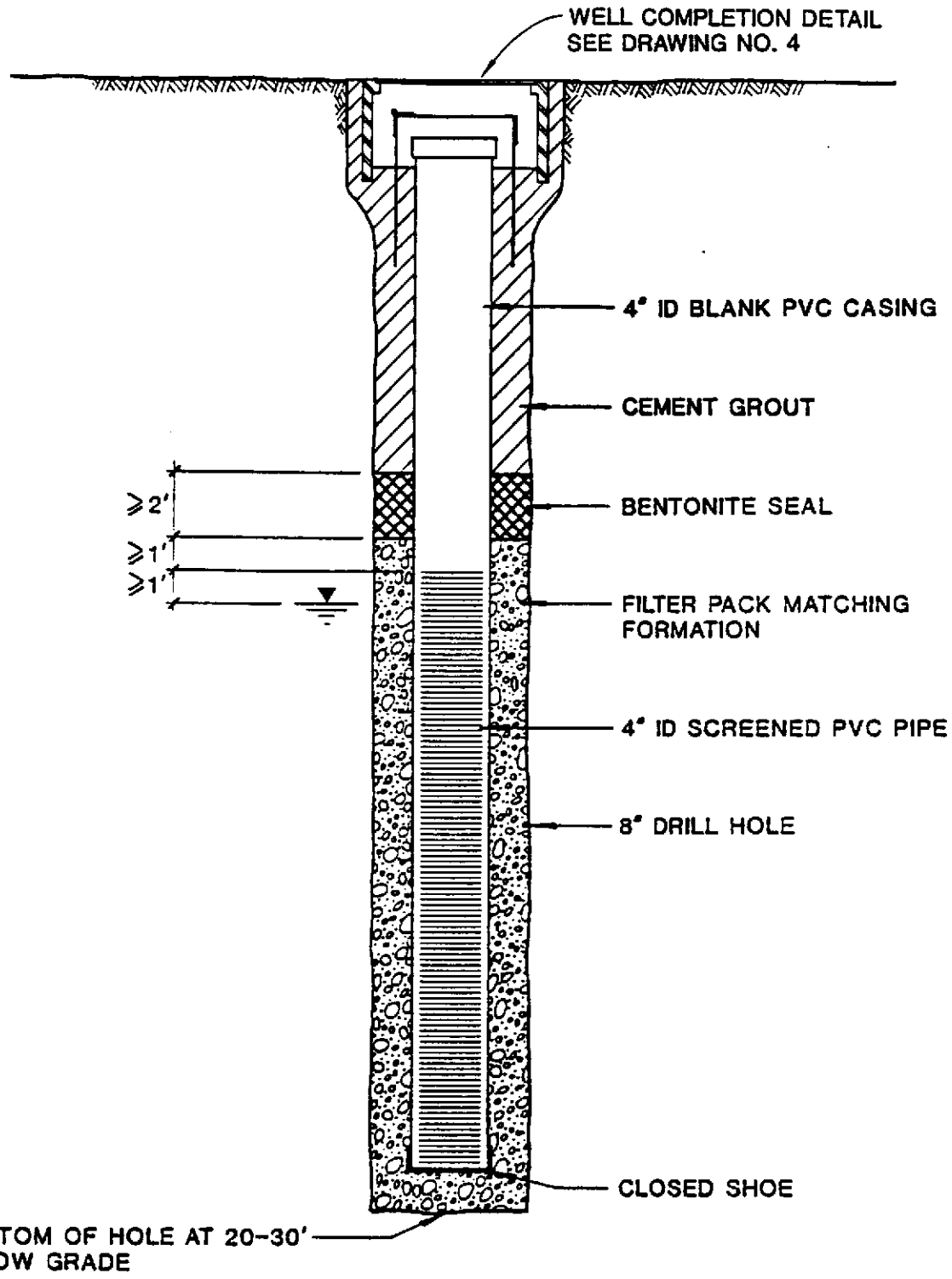
SOURCE: Pacific Environmental Group, Inc. and IT Corperation

SITE PLAN

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental Consultants California

Scale: 1"=30'	Project No.: 88-44-361-01
Prepared by: LQL	Date:
Checked by: RBM/MIY	Drawing No.: 4
Approved by: DWC	

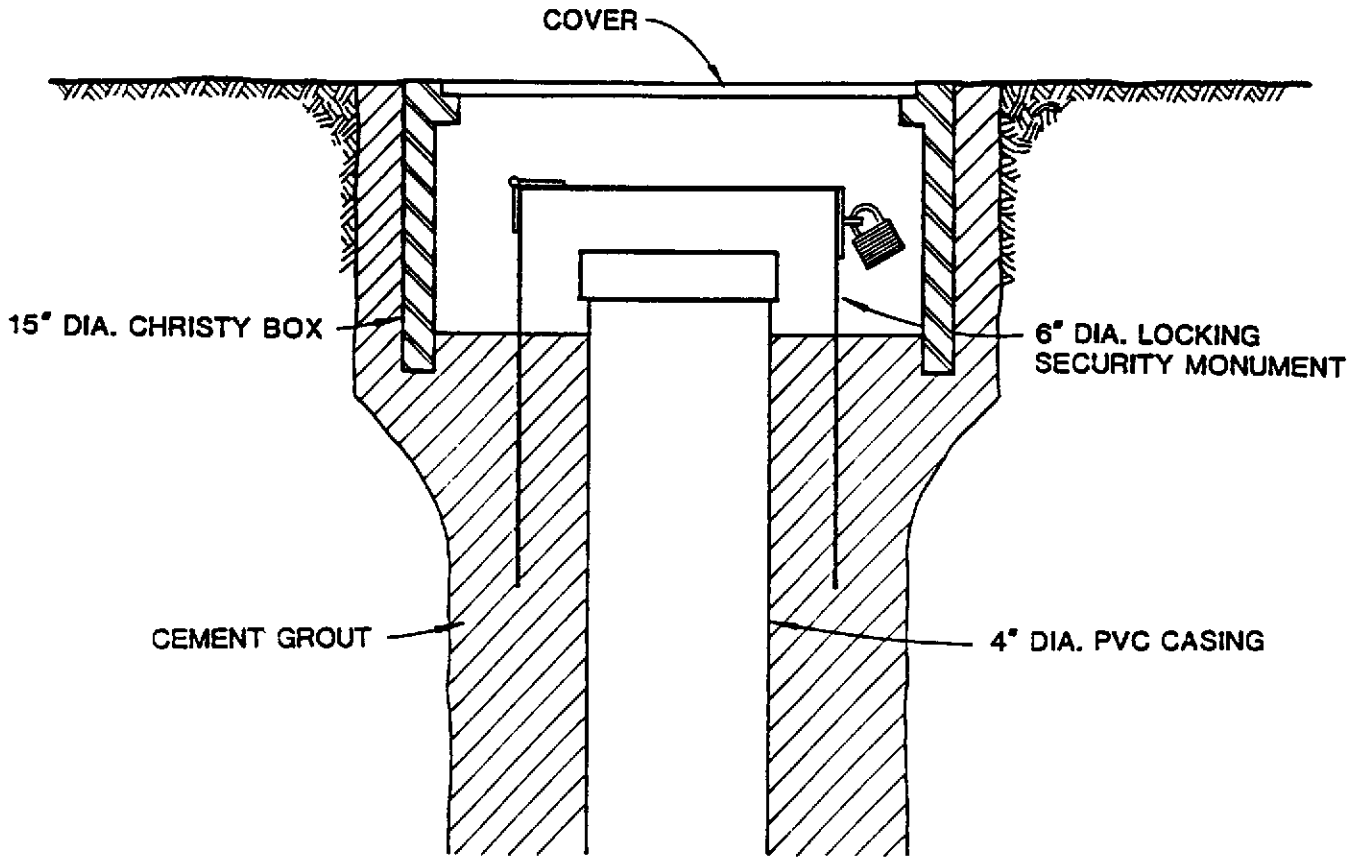


MONITORING WELL DIAGRAM

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental
Consultants California

Scale: NOT TO SCALE	Project No.: 88-44-361-01
Prepared by: LQL	Date: 2-23-89
Checked by: MIY	Drawing No.: 5
Approved by: DWC	



WELL COMPLETION DETAIL

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental
Consultants California

Scale	NOT TO SCALE
Project No.	88-44-361-01
Prepared by	LQL
Date	2-21-89
Checked by	MIY
Drawing No.	6
Aporoved by	DWC

APPENDIX A

HOLLOW-STEM AUGER DRILLING AND SOIL SAMPLING

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.

Borings shall be drilled hand-driven 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.

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

GROUNDWATER MONITORING WELL CONSTRUCTION

Groundwater monitoring wells shall be constructed according to the general specifications shown on the attached well construction diagram.

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.

For single-cased wells, groundwater monitoring well casing shall 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. These casings shall be factory-perforated from a point 1 foot above the bottom of the casing to at least 5 feet above the top of the upper aquifer, as defined by boring lithology and/or geophysics.

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 of 0.010 inch for shallow zone wells and 0.0168 inch (nominal) for Schedule 80 intermediate zone wells. Well casings shall have a threaded bottom cap or plug.

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 below groundwater shall be placed using a tremie pipe.

Any monitoring well to be screened below the upper aquifer shall be installed as double-cased wells, with a steel conductor casing through the upper water-bearing zones to preclude aquifer cross-contamination.

The conductor casing shall be installed in the following manner: a large diameter borehole (typically 18 inches) shall be drilled until it is determined that the first aquifer has been completely penetrated. At this time, a steel conductor casing shall be placed in the hole with centralizers to the depth drilled, and the annulus between the conductor casing and the surrounding formation shall be cement-grouted to the surface using a tremie pipe. The grout shall be allowed to set for a minimum of 72 hours. Drilling shall then continue inside the conductor casing, with a drill bit smaller than the inside diameter of the conductor casing, to the desired completion depth. If additional known aquifers are to be fully penetrated, the procedure can be repeated with successively small diameter conductor casings. If multiple casings are necessary, the width of each casing interval shall be sufficiently large to allow use of a tremie pipe for installing the filter pack without bridging.

Wellheads shall be installed in a watertight structure and provided with a watertight cap. Wellheads shall be enclosed in a locked well covering device that protects the well 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 C

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 D

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.

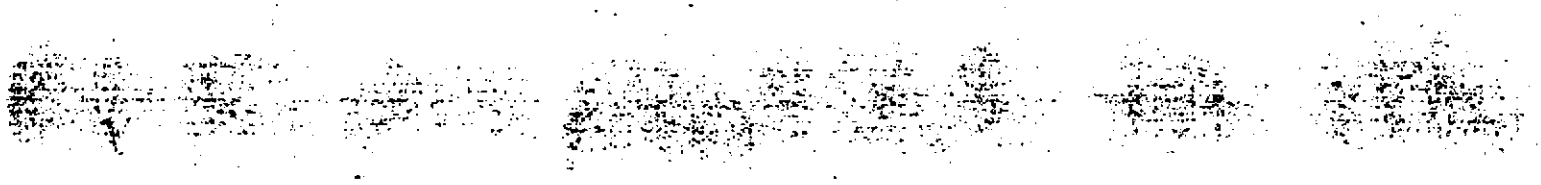
If the well is emptied before four to ten well volumes are removed, the sample shall be taken when the water level in the well recovers to 80% of its initial water level or better.

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 E

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 F

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 G

MUD ROTARY DRILLING PROCEDURES

Mud rotary will be drilled according to the following procedures:

All drilling equipment (rig, drill bits, drill pipe, mud tub) shall be thoroughly cleaned before drilling begins.

A mud tub shall be set in place and a drilling fluid of bentonite mud or some similar material shall be circulated.

Drilling shall proceed with constant monitoring of drilling speeds (how hard the engine must work in order to turn the bit) and rate of drilling (how quickly the bit cuts through the material) in order to determine subsurface lithology. "Rig chatter" shall be used to determine size or quantity of gravel. Loss of drilling fluid shall be used to determine permeability, e.g., in a gravel layer, large loss of drilling fluid implies clean gravels.

Drilling mud shall be kept thick to minimize "trip time" of cuttings to the surface and allow coarser, representative material to be carried to the surface quickly.

In the event large losses of drilling fluid are encountered, the mud shall be thickened to facilitate building of mud cake on the borehole walls and reduce loss of drilling fluid into the formation.

Sampling may be accomplished by pulling up all drill pipe, removing the drill bit from the borehole and running a sampler (exactly like hollow-steam auger) down the hole.

Mud rotary drilling shall be used in environmental investigations with minimal cross-contamination of aquifers for at least two reasons: (1) the bend produced by the column of mud in the borehole shall cause flow of fluids in the borehole into the formation and not contaminants in the surrounding formation into the borehole; and (2) the mud cake on the borehole walls will reduce communication between the borehole and the surrounding formation.

Mud rotary has the advantage over hollow-steam auger drilling of: (1) being able to drill deeper; and (2) being able to drill larger diameter holes to allow setting of conductor casing.

APPENDIX H

SAMPLING FOR VOLATILE ORGANICS

In this sampling, it is especially important that the sample represent conditions existing in the aquifer, not in the well. Differences in water quality characteristics often exist between the water in the well and the surrounding aquifer, particularly in wells used intermittently or infrequently such as monitoring wells. To obtain a representative sample of the aquifer, the well is purged until selected water quality parameters stabilize. The parameters should include pH, electrical conductivity and temperature. Once consistent readings are obtained for the three parameters, the discharge should represent formation waters rather than potentially stagnant water in the well. The purge volume should amount to between three and five well volumes.

After the well is purged, the discharge shall be decreased to the slowest rate obtainable. The sampler shall be careful to not contaminate the sample. The following practices shall be followed:

1. Do not touch the lip of the bottles or insides of the septum.

2. Avoid touching the mouth of the discharge tap.

3. Do not splash or agitate the water while the bottle is being filled.

4. Do not smoke, eat or handle any objects not necessary for sampling.

5. Do not sample downwind of any potential volatile organic sources such as car exhausts, open fuel tanks, etc. Note any potential sources in the area if the are unavoidable.

6. Avoid handling the septum. If handling is necessary, use specially prepared and protected forceps or tweezers.

When taking the sample, first rinse the bottle two to three volumes with the well water. The bottle is then filled slowly to prevent entrapment of any air bubbles. The bottle is filled completely such that a meniscus form, essentially "piling up" the water into the bottle. Immediately place the cap on, turn the bottle upside down, tap it a few times and note whether there are any bubbles in the sample. If a bubble exists, discard the sample and repeat sampling including the triple rinse. If a bubble is found on the second attempt, do not repeat the procedure again, but note the bubbles existence on the sample label and also notify the laboratory when it is submitted.

Place the sample in a sealable plastic bag and then into a cooler/ refrigerator. The sample should be protected from any light sources as much as possible.

Deliver the sample to the laboratory as soon as possible. If it cannot be delivered to the lab the same day, store the sample in a refrigerator which maintains a constant

temperature of 4°C. It is important that the sample be delivered as soon as possible since the samples must be analyzed within two weeks for the results to be valid. Therefore, the sooner the sample is given to the lab, the more time the lab has to analyze it.

APPENDIX I

OUTLINE OF DRUM HANDLING PROCEDURES

1. Complete drummed worksheets on site, 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.

APPENDIX J

DRUM HANDLING PROCEDURES

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

HAZARDOUS WASTE PICK-UP FORM

TO: Hazardous Waste Coordinator
Anna Sampson
Shell Oil Company

P. O. Box 6249
Carson, CA 90749
Phone: (213) 816-2037 FAX: (213) 816-2114

Date: _____ Pick-up Date and Time: _____

CONSULTANT/CONTRACTOR INFORMATION

Company Name: _____
Address: _____
City: _____ State: _____ Zip: _____
Contact: _____ Phone: _____

SHELL INFORMATION

District/Environmental Engineer: _____
District: _____ Phone: _____

SHELL FACILITY INFORMATION

Facility Address: _____
City: _____
County: _____ State: _____ Zip: _____
Location WIC Number: _____ AFE: _____ CT/DL: _____

DRUMMED MATERIAL DESCRIPTION

Soil: Description of Soil: _____

Date(s) accumulated: _____
Type of Drum: DOT17C___ Other: _____
Number of Drums containing Clean Soil ..... _____
Number of Drums containing Non-Hazardous Soil ..... _____
Number of Drums containing Hazardous Soil ..... _____
* Total Number of Soil Drums for pick-up ..... _____

Water: Description of Water: _____

Date(s) accumulated: _____
Type of Drum: DOT17E___ DOT17H___ Other: _____
Number of Drums containing clean water only ..... _____
Number of Drums containing dissolved product & water _____
Number of Drums containing free product & water ... _____
Number of Drums containing free product ..... _____
* Total Number of Water Drums for pick-up ..... _____

BULK MATERIAL DESCRIPTION

Bulk Material: Date(s) accumulated: _____
Type of Material: _____
Estimated Quantity: _____
Type of service required to move material: _____

NOTE: Attach a copy of all Analytical Results. All information must be completed, any questions call Shell Engineer.

DRUMMED SOIL WORKSHEET

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Facility address: Date:

Location WIC Number: City:

Pick Up yes/ no	Drum No.	Date Acumul	Description of Soil	TPH-ppm			Lead-ppm		
				<100	100 to 1000	>1000	Total	Organ	Inor

Consultant:

Geologist:

DRUMMED WATER WORKSHEET

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Facility address: Date:

Location WIC Number: City:

Pick Up yes/ no	Drum No.	Date Acumul	Description of Water	Clean Water Only		Disolvd Product & Water		Free Product & Water	Product Only
				TPH	B	TPH	B		

Consultant:
Geologist:

DECISION TREE FOR LEAD TESTING CONTAMINATED SOILS