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August 12, 1987

Project: 8710018A/B

The Martin Company
4265 Hacienda Drive, Suite 101
Pleasanton, California 94566

Attention: Mr. Walter Kaczmarek

Gentlemen:

ENVIRONMENTAL ASSESSMENT
FORMER NIELSEN FREIGHT LINE SITE AND ADJACENT PARCEL
Emeryville, California

The enclosed report presents the results of our consulting environmental services for The Martin Company at the former Nielsen Freight Lines site and the adjacent parcel to the south. The report presents the results of a site history review and field and laboratory evaluations; outlines the geologic and hydrogeologic conditions of the site; and assesses the environmental conditions of the parcels. Recommendations are presented for corrective measures at the former Nielsen site to address several identified environmental conditions.

WCC was also retained by The Martin Company to observe the removal of underground fuel storage tanks and fueling manifolds at the Nielsen site and to prepare the required removal and closure documents. This tank closure work is being presented in a forthcoming, separate report.

It has been a pleasure to be of assistance to The Martin Company. We look forward to being of further service during the implementation of corrective measures at the site.

Sincerely,

WOODWARD-CLYDE CONSULTANTS

John C. McMillan, Ph.D., P.E.
Project Engineer

Lawrence R. Houps, P.E.
Project Manager

Enclosure

S1043-L2

ENVIRONMENTAL ASSESSMENT
FORMER NIELSEN FREIGHT LINE SITE AND ADJACENT PARCEL
EMERYVILLE, CALIFORNIA

Prepared for

The Martin Company
4265 Hacienda Drive, Suite 101
Pleasanton, California 94566

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S1043

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EXECUTIVE SUMMARY

INTRODUCTION

The Martin Company proposes to develop a retail structure and attendant parking in Emeryville, California. Woodward-Clyde Consultants (WCC) has been retained by The Martin Company to perform an environmental assessment of the proposed project site consisting of the following elements: review of site history; performance of field investigations including drilling and sampling, and well installation and sampling; chemical testing of selected soil and groundwater samples; and assessment and presentation of the study results in a report. WCC was also retained to observe the removal of underground tanks and fueling manifolds and to submit the required tank removal and closure documentation to the appropriate regulatory agencies. This tank closure work is reported under separate cover (WCC, 1987). A summary of the major findings and remedial recommendations of that report are presented in the attached document in the section entitled "Summary of Fuel Tank and Manifold Closure Report" and are not presented in this Executive Summary.

SITE DESCRIPTION

The proposed development site consists of two adjacent parcels of land near the intersection of Christie and 64th Streets in Emeryville, California. The first is a 5.2-acre parcel currently occupied by a cross-dock trucking terminal and formerly operated by the Nielsen Freight Lines Company (see Figure 2). The second parcel is 1.7 acres and is the northern portion of the Marketplace development which borders the Nielsen site on the south. The two parcels are referred to in this report as the Nielsen and the North Marketplace parcels. The North Marketplace parcel is currently a parking lot.

SITE HISTORY

Both the Marketplace and Nielsen parcels are former tidal flats which have been filled. By 1930 most of the current Marketplace site had been filled and populated with buildings. Between 1935 and 1937, the portion of the Nielsen site north of 63rd Street was filled. Industrial activities pursued on the northern portion of the Marketplace site consisted principally of the manufacture of bituminous roofing products (tar paper), and the blending and packaging of oil-based paints and enamels. Included was a small distillation plant for referring crude asphalt into tar and other light hydrocarbon fractions. Early industrial development of the Nielsen site included four large above-ground storage tanks, an industrial building, and organized outdoor storage areas. In the 1960's, the site was redeveloped as a trucking facility. The exact nature of the industrial activities pursued in the building and tankage of what is now the Nielsen parcel is not known. However, aerial photos indicate that this facility was part of the same industrial complex which occupies the Marketplace parcel.

Existing features of environmental concern on Nielsen parcel include: a 10,000-gallon gasoline and a 10,000-gallon diesel tank, a 500-gallon waste oil and 500-gallon lube oil tank, an antifreeze and motor oil drum storage area, a tar seep in the area of the former tankage, solvent use in the Nielsen repair garage, and an oil/water separator sump also adjacent to the repair garage.

There are no toxic waste sites north of Powell Street and within the City of Emeryville currently under examination by California Department of Health Services. A Westinghouse plant known to have PCB soil and groundwater contamination lies to the southeast and across the railroad tracks from the Nielsen parcel. Fuel pumps and thus underground fuel tanks exist at industrial facilities east and northeast of the Nielsen parcel.

PREVIOUS MARKETPLACE STUDY

In 1982 an environmental assessment of the Marketplace property was done. The soil borings done on the North Marketplace parcel show the site to be covered with mixed fine- and coarse-grained fill about 5 feet thick. The fill contained assorted construction debris. A boring was drilled through a tar seep on the North Marketplace parcel, and a 2-foot-thick layer of tar was encountered. Shallow soil samples in the 1982 study were tested for the following: purgeable priority pollutant aromatics and halocarbons; total identified chlorinated hydrocarbons including PCB's; and, generally, eight metals. Water from the well on the North Marketplace parcel was tested for the same eight metals.

Of the samples tested from the North Marketplace parcel, only one PCB detection of 0.12 ppm was observed. No metal detections above the TTLC were found in the soil samples and tar seep grab sample taken from this parcel. On a site-wide basis, no priority pollutant aromatics or halocarbons were found at levels above 0.5 ppm and 0.09 ppm, respectively. The groundwater sample tested from the well on the North Marketplace parcel contained no detectable metals concentrations, the detection limits being at or below drinking water standards.

SUMMARY OF ENVIRONMENTAL CONCERN

Based on the previous discussion, the following environmental concerns for the subject parcels have been identified:

- Early Industrial Operations - presence of tar paper materials, paint components, crude asphalt, and asphalt distillation products in shallow fill and groundwater.

- Trucking Facility Operations - presence of oil and fuel residues in the shallow soil and groundwater due to surface dripping or spillage; presence of antifreeze in shallow soil and groundwater beneath the drum storage area; and the presence of gasoline or

diesel in subsurface soil and shallow groundwater due to underground tank, piping, or manifold leakage.

- o Regional Concerns - presence of trace levels of PCB's or heavy metals in shallow fill due to landfilling.

FIELD PROGRAMS

A program of soil boring and sampling, along with the installation of groundwater monitoring wells, was pursued. Ten soil borings were drilled to a depth of 11.5 to 16 feet. The borings were sampled using a 2-inch-inside-diameter modified California sampler. Eight of the ten soil borings were converted to groundwater monitoring wells using 2-inch-diameter PVC well casing. Five shallow borings (4 to 6.5 feet deep) were also installed. Vadose zone monitoring wells, i.e., monitoring wells to sample soil pore air between the groundwater table and the ground surface, were installed in three of these shallow borings. The site groundwater monitoring wells were developed by surging and bailing.

Site Soil and Groundwater Conditions

The shallow fill placed on the Nielsen site consisted predominately of silt and silty and gravelly clays. Some coarse-grained materials are also present in the fill including fine-grained, poorly graded sand as well as silty and gravelly sand. The depth of the fill appears to be about 9 to 15 feet at the east end of the Nielsen parcel and 14 to 17 feet at the west end. Immediately below the site pavement and base coarse layer is a 1.5-foot- to 2-foot-thick layer of sandy gravel containing a varying amount of silt and clay. It is postulated that this gravel material was imported to allow for the finish grading of the trucking facility. Some debris, including wood and brick chips, pieces of fibrous paper, and bits of tar were found in the shallow fill of the Nielsen site. Tar paper and tar paper materials were found in a number of site borings and wells, more predominately in the central and western portions of the site. A number of shallow obstacles were encountered during drilling. Most notable was a large wooden slab or block encountered in the shallow boring B-1 just north of the Nielsen repair garage and within the tank farm of the earlier development (see Figures 2a and 3). It appears that the native soil underlying the fill is generally a stiff to very stiff sandy or silty clay or silt. Based on WCC's local experience, a thick laterally, continuous layer of "old Bay Mud" is anticipated to exist beneath the Nielsen and North Marketplace parcels.

Groundwater level data taken in the area in 1982 and 1985 showed the regional shallow groundwater gradient to be towards the west-southwest. Groundwater level measurements taken from the new Nielsen wells showed a groundwater flow direction at the north end of the Nielsen property toward the west. A piezometric highpoint was seen near the southwest area of the site and is thought to be due to the presence of low permeability tar materials in the fill at the well location.

CHEMICAL TESTING PROGRAM

Twelve soil samples taken during the field drilling program were submitted for chemical testing. The sample testing program focused on investigating the conditions of environmental concern listed earlier. The tests ordered for each sample were tailored to the objective of the source boring. The chemical tests most widely used were: total fuel hydrocarbons (TFH by IR) for oil and fuel residue, PCB's, select metals, and purgeable priority pollutants. Other tests used for selected soil samples included ethylene glycol, fuel hydrocarbons, extractable priority pollutants, and a priority pollutant metals scan.

One groundwater sample from each of the eight new monitoring wells was submitted for testing. A floating product and groundwater sample were also obtained from the existing well on the North Marketplace parcel. All of the groundwater samples were tested for purgeable priority pollutants and selected metals. Selected samples were also tested for extractable priority pollutants, ethylene glycol, TFH by IR, fuel hydrocarbon, and purgeable priority metals. Two samples were also tested for general wastewater parameters.

MAJOR FINDINGS

Based on the results of the field investigations, the following conclusions were made:

PCB's. Soil tests for the Nielsen parcel in this study and for the North Marketplace parcel from WCC (1982) indicate that no significant PCB contamination exists in the shallow fills. No PCB's were detected in shallow groundwater for the four monitoring wells tested in this study.

Trace Metals. The concentration of metals in the 12 soil samples tested for this study, when detected, were well below the TTLC. The predominant trace metals detected are lead and zinc, the higher lead concentrations being the metals detections closest to the applicable TTLC. Two soil samples collected during the field investigation for the gasoline tank and manifold closure were found to have total lead concentrations well below the TTLC and significantly below the average lead concentration for the soil samples tested for the current study. The lead concentration in the two samples, thus, do not necessarily indicate the presence of consequential concentrations of residual organic lead from gasoline.

Metals were generally undetected in the groundwater and, where detected, were generally well below the federal drinking water standards. Exceptions are lead in wells W-6A and W-7 and chromium in wells W-4 and W-7. The elevated metals levels at W-4, W-6A, and W-7 are thought to be due to the presence of tar paper and tar paper products in the fill. The possible wide distribution of tar paper materials in the fill of the region suggests that similar localized groundwater contamination may exist at many points in the region.

A lack of correlation of elevated lead concentrations in the groundwater to elevated lead concentrations in soil suggests that soluble metals testing of the site soil fill is unwarranted.

Oil and Fuel. In the current investigation, the test results for oil and fuel residue in the shallow fill soil for the Nielsen property indicate that some such accumulation has occurred and in a pattern consistent with the locations of likely surface deposition or collection. The affected fill soils do not appear to contain any substantial concentrations of volatile or extractable priority pollutants.

Black fluid observed in the shallow soil of Boring B-1 starting at a depth of 2 feet is believed to be leakage of oily materials from the oil/water separator sump located immediately north of the boring. The absence of the black fluid in boring B-4 located 14 feet south of the sump indicates that the shallow soil contamination condition is very localized.

The TFH, fuel, and EPA Methods 624 and 625 analyses results for shallow groundwater samples from the Nielsen parcel indicate that no substantial fuel or oil contamination is present in the groundwater. Fuel hydrocarbon test results for groundwater from the diesel tank excavation varied from <1 to 630 mg/l. Further investigation of the groundwater in this excavation appears warranted. Toluene was detected in monitoring well W-2 at a concentration less than the State's Action Level. Because no fuel hydrocarbons, benzene, or xylene were detected in that groundwater sample, it appears that the source is localized and is not associated with motor fuels. The source of the Freon 113 in the well W-2 groundwater sample is not known. The unidentified compounds detected in well W-7 are thought to be from the tar paper material fill which constitutes much of the profile screened by that monitoring well.

Antifreeze. The soil and groundwater sample tests for ethylene glycol (antifreeze) for well W-1 found no significant concentrations.

Tar Paper and Paint Components (Solvents). Hydrocarbon contamination due to early industrial operations were evidenced as a floating black fluid at well 5M; a kerosene-like contaminant in the shallow soils of well W-8; tar seeps in the area of B-3; and tar paper and tar paper materials in the shallow fill at wells W-6, W-6A, W-7, and B-4. The black fluid removed from well 5M is believed to be crude asphalt and was found to contain a number of PNA's. Low concentrations of PNA's were also found in the groundwater beneath the floating layer. Fuel-weight hydrocarbons are present in the shallow fill at well W-8. The groundwater from well W-8 also showed low concentrations of PNA's. PNA's were also detected in the soil sample taken from beneath a shallow wood slab at boring B-3. The presence of the PNA's together with the lack of purgeable priority pollutants indicates the asphaltic nature of these contaminants. A strong pungent odor was noted at B-3 when a buried wood slab was penetrated at a depth of about 4 feet. The odor is thought to be from volatile petroleum

distillates and could pose an off-gassing hazard should the wood slab be removed during site development. The extent of the wood slab is unknown.

Tar paper in organized layers was found in monitoring wells W-4 and W-6A. Tar materials were also found at the base of shallow boring B-4. Substantial thicknesses of fibrous paper, tar paper, and similar debris were found in monitoring wells W-6 and W-7. Extensive testing of the W-7 groundwater sample suggests that these materials contribute substantial amounts of unidentified non-priority pollutant compounds to the groundwater. Degradation of these buried materials is also believed to be the source of the elevated ammonia nitrogen concentration observed in the well W-7 groundwater sample. As was the case in the discussion of trace metals in groundwater, the contribution of these organic contaminants and nitrogen ammonia to the groundwater may be localized at each fill pocket but regional in scope, due to the wide distribution of tar paper materials in the regional fill.

RECOMMENDATIONS FOR CORRECTIVE MEASURES

Scope

Plans now exist for the development of the Nielsen parcel. Recommendations for corrective measures to address the environmental site features found to be of concern in this investigation are presented in this report and summarized in this section. General recommendations for the development of the Nielsen parcel in relation to the environmental conditions identified on that site are also given. Recommendations for remedial measures to address fuel leakage are summarized in the attached report in the section entitled "Summary of Fuel Tank and Manifold Closure Report."

Recommendations for Corrective Approaches - Soil and Shallow Fill

The following four environmental features for the shallow soil and site fill have been identified which may require some corrective action are as follows:

Oil and Fuel Residue Accumulation. Test results indicate that some oil and fuel residue accumulation in the shallow fill soil has occurred in a pattern consistent with the locations of likely surface deposition and collection. It is recommended that shallow soil exposed by the removal of pavement, particularly in the areas behind the maintenance shop and in the truck and parking areas, be tested for TFH by IR during site development. All exposed material with greater than 100 ppm of oil and fuel residue should be removed and treated on-site by biodegradation. As tests showed the shallow soils to be devoid of substantial concentrations of volatile or extractable priority pollutants, it is recommended that material below pavement areas not to be disturbed be left in place.

Items Related to Early Site Development. Tar paper materials were encountered in the drilling of wells W-6, W-6A, W-7, W-4, and B-4. The site development history and WCC's local experience would indicate that the presence of these materials in the fill is a regional problem and is, thus, not amenable to site specific remediation.

Boring B3 was placed through a tar seep on the north side of the Nielsen repair garage and within the bounds of an earlier storage tank area (see Figure 2A). Some visible tar and a wood slab or block were seen in this boring. Below the wood obstacle, the soil was found to have a pungent tarry odor. A further investigation of the area consisting of six to eight shallow borings and one groundwater monitoring well is recommended. The predominant soil test for this study will be fuel hydrocarbons. If the odoriferous contaminants are fuel-weight petroleum hydrocarbons, state and local guidelines for the remediation of fuel tank spills will likely be applied by the agencies.

The presence of a black petroleum fluid in Well B-5M, thought to be crude asphalt, and of related dissolved products in the groundwater of well B-5M on the North Marketplace parcel are thought to be related to previous petroleum refining activities on this area of the site (see Figure 2A). As the earlier refining facilities overlap the southeast corner of the Nielsen property, an additional investigation of this area consisting of three to four shallow borings, one completed as a groundwater well, is recommended to check for similar soil and groundwater conditions.

Oil/Water Separator Sump. The observation of black fluid and its absence in boring B-4 indicates that oily contamination of the shallow soil exists immediately adjacent to the oil/water separator sump. Sealing of the sanitary sewer line leading from the sump followed by removal of the sump is recommended. After sump removal, samples of the black fluid which collects in the excavation should be taken and analyzed for purgeable and extractable priority pollutants. Using the results of this testing, an appropriate excavation and treatment or disposal plan can be formulated for the affected soil.

Recommendations for Corrective Measures - Groundwater

The detected presence of low levels of metals in the groundwater of wells W-4, W-6A, and W-7 do not warrant remediation of the groundwater because these trace metal detections are thought to be due to the presence of the tar paper material in the fill. Tar paper materials are present in the fill on a regional scale. The other five site wells exhibit no other significant metals levels. The presence of high concentrations of unidentified organic material in the groundwater of well W7 is due in part to the high level of suspended organic material in the sample. The unidentified organic compound(s) are thought to be from the tar paper material in the fill, a condition which is once again regional in scale. The presence of elevated concentrations of ammonia nitrogen in the groundwater of well W-7 is thought to be due to degradation of the buried organic material.

A resampling of the diesel tank excavation is recommended. The new sample should be split and tested both unfiltered and after filtration through a 0.45 micron filter. From this test, a determination can be made as to the actual concentration of soluble petroleum products in the groundwater of the excavation.

Planning and Construction Considerations

Based on the results of the environmental assessment of the Nielsen property to date, the following general guidelines for site development are suggested:

- Unnecessary pavement removal and soil exposure and removal should be avoided.
- Construction procedures or details which may require the dewatering of excavations should be avoided.
- The tar paper fill materials may be quite compressible. Consultation with a qualified geotechnical engineer on the building foundation design is recommended.
- Air quality monitoring should be undertaken during both remedial excavations and other excavations for foundation purposes.
- The presence and decomposition of the organic material in the fill may result in the out-gassing or generation of organic vapors. Measures should be taken to allow for the escape of these vapors from beneath the building floor slab.

INTRODUCTION

The Martin Company proposes to develop a commercial structure and attendant parking in Emeryville, California. Woodward-Clyde Consultants (WCC) has been retained by The Martin Company to perform an environmental assessment of the proposed project site. The major components of this environmental assessment are as follows:

- review of site history;
- observation of underground fuel storage tank and fueling manifold removals; submittal of required documentation to the appropriate regulatory agencies;
- performance of field investigations including drilling and sampling, and well installation and sampling;
- chemical testing of selected soil and groundwater samples; and
- assessment and presentation of the study results in this report.

The report for the second of these items, observation and documentation of tank removals, has been transmitted under separate cover (WCC, 1987a). A summary of that report is included in this document. This report covers the other four work items listed.

SITE DESCRIPTION

The proposed development site consists of two adjacent parcels of land near the intersection of Christie and 64th Streets in Emeryville, California (Figure 1). The first and most northerly parcel of land is a 5.2 acre parcel, formerly occupied by Nielsen Freight Lines (Figure 2). The second parcel is about 1.7 acres and is the northern portion of the Marketplace

development which borders the Nielsen site on the south. For purposes of this report, the two parcels will be referred to as the Nielsen site or parcel, and the North Marketplace parcel, respectively.

The Nielsen parcel is currently occupied by a single building, an 80-foot by 340-foot cross-dock trucking terminal which includes a truck repair shop and some office space. The portion of the site not occupied by the structure is paved with asphaltic concrete.

The North Marketplace parcel is currently a parking lot.

SITE HISTORY

Site Filling

Both the Nielsen and the Marketplace properties are former tidal flats of San Francisco Bay which have been filled. The northeast corner of the Marketplace property was first occupied by the Paraffin Company in 1884. Little is known about the early operations of the Paraffin Company. However, it appears that these early operations may have been directed primarily towards research and development of bituminous and petroleum-based products, and possibly some small scale asphalt and kerosene refining. It appears that only limited landfilling, if any, would have been done at the Marketplace property during the period 1884 to about 1900. Beginning in approximately 1902, the Paraffin Company began making preparation for manufacture of roofing felt, roofing paper, roofing shingles and refined asphalt for use in linoleum and asphalt based paints. Much or most of the land within the historic Bay shoreline as shown on Figure 2A had been filled by approximately 1910. Manufacture of at least some of the products named above was being done at the site by 1910. In 1920, the Paraffin Company became Pabco. By about 1930, most of the current Marketplace site had been filled and populated with buildings. The property between 64th Street to the north, 63rd to the south, the railroad right-of-way to the east, and the Bayshore freeway to

the west were filled between 1935 and 1937. This parcel includes most of what is now the Nielsen site. In 1957, Pabco was purchased by the Fibreboard Corporation.

In a 1947 aerial photo, the eastern part of the present Nielsen parcel is seen to be under development. The construction activities include the construction of four large above ground tanks (Figure 2A). A small black area just south of the four large tanks is evident in the photo, but its cause is not known with certainty. By 1949, a single large building and outdoor storage areas are evident. The building tanks and storage area are shown on Figure 2A. The remaining portion of the area between this development and the current Eastshore freeway had not yet been developed.

By 1953, the single structure on the Nielsen site area had been added to and a parking lot built at the intersection of what is now 64th and Christie Streets. In the 1960's, the Nielsen Freight Lines building and main parking area had been constructed. In a 1969 aerial photo, the two low-rise commercial buildings to the west of the Nielsen building were also present. Nielsen operations appear to have been extended to include the "panhandle" area bordering Christie Street some time between 1971 and 1973.

Site Industrial Activities

Early industrial activities pursued in the Marketplace site buildings are shown in Figure 2A. The area which is now the northern portion of the Marketplace parking lot was occupied by buildings dedicated to the manufacture of roofing products. The two existing Marketplace buildings were used for paint manufacture and storage, and for warehousing. The northeast corner of the Marketplace property and the southern portion of the current Nielsen parcel were occupied by an asphalt refining plant. This plant distilled crude asphalt into refined asphalt for roofing manufacture by removing the light hydrocarbon fractions. The light fractions were sent to the powerhouse for use as fuel.

Paint manufacture at the site consisted of the blending and packaging of oil based paints and enamels from ingredients produced elsewhere. Paint mediums included mainly linseed oil and some synthetic resin varnishes for enamels. The primary medium solvent was apparently mineral spirits, although lesser amounts of other solvents including ethyl alcohol, xylene and toulene were also used.

A variety of paint pigments were used. A former operations manager for paint manufacturing at the site recalled during an interview that commonly used pigments included titanium oxide, red and white lead, zinc oxide, zinc chromate, magnesium silicate, barium sulfate and others.

The exact nature of the industrial activities pursued in the building and tankage on what is now the Nielsen parcel is not known.

Pertinent Existing Features on the Nielsen Parcel

The Nielsen parcel was developed by System 99 sometime between 1959 and 1969. This facility was purchased by Nielsen Freight Lines approximately nine years ago.

During an initial site visit in July of 1986, a number of features pertaining to this study were noted. These were as follows:

- a 10,000-gallon gasoline storage tank and fueling manifold;
- a 10,000-gallon diesel tank and fueling manifold;
- a 500-gallon waste oil tank;
- a 500-gallon lube oil tank;
- an antifreeze and motor oil drum storage area;

- o tar seeps through the pavement; and

- o solvent use in the facilities' repair garage.

During later field activities, an oil/water separator sump was also noted just south of the repair facility. As the sump stores oily sludge between clean outs, it too poses an environmental concern.

Potential Regional Concerns

In addition to the historic Pabco operations on the two subject parcels, other historical and current industrial activities in the region may have a bearing on the environmental conditions at the Nielsen and North Marketplace parcels. An inquiry was made to the California Department of Health Services regarding the existence of any active toxic waste sites north of Powell Street and within the City of Emeryville. There are currently no such active cases. A Westinghouse Company plant is located to the south of the Nielsen parcel and just east of the Southern Pacific Railroad tracks. The plant site has PCB soil and groundwater contamination. Trace levels of PCB's were found at several sampling locations on the Marketplace property in the 1982 environmental study (WCC, 1982). DHS indicated that a site visit to the ITT/Grinnell parcel just north of the Westinghouse property has also been made concerning PCB's. Access to the records from that site visit could not be obtained in a timely manner.

The industrial site immediately to the east of the Nielsen building is a rendering plant which, based on an aerial photo, has been present since before 1947. The plant appears to pose no significant imminent environmental concerns. During a cursory inspection of the neighborhood east of the Nielsen property, the rendering plant and the warehousing facility immediately to the north were observed to have gasoline pumps and, therefore, underground fuel tanks.

Summary of Potential Environmental Concerns

Based on the above discussion, the following potential environmental concerns were identified for the Nielsen parcel and the northern portion of the Marketplace development:

- o Early Industrial Operations
  - possible presence of tar paper and paint components in shallow fill and groundwater due to prior landfilling and industrial activities.

  - possible presence of crude asphalt and lighter distillate petroleum fractions in shallow fill and groundwater due to prior industrial activities, particularly in the area near the northeast corner of the Marketplace property.

- o Trucking Facility Operations
  - possible presence of oil and fuel residues in shallow fill and groundwater due to surface dripping or spillage; similarly for antifreeze in the drum storage area.

  - possible presence of gasoline or diesel fuel in and shallow fill and groundwater due to underground tank, piping, or manifold leakages.

- o Regional Concerns
  - possible presence of trace levels of PCB's or heavy metals in shallow fill due to transport from adjacent properties or inclusion of contaminated materials in the fill.

PREVIOUS MARKETPLACE STUDY

In 1982 an environmental assessment of the Marketplace property was performed (WCC, 1982). The assessment included the drilling of soil borings at 15 locations throughout the site. Four groundwater monitoring wells were also installed. The locations of the soil borings or monitoring well from this program on the North Marketplace parcel are shown in Figure 3.

The soil borings for the North Marketplace parcel show that site to be covered with mixed fine and coarse-grained fill about 5 feet thick. The fill contained assorted construction debris including brick chips and metal scraps. Several significant features within the North Marketplace parcel were also noted. These included a tar seep in the area of boring 11M and four groups of underground tanks labelled A, B, C, and D on Figure 3. Boring 11M was drilled through a tar seep and a 2-foot-thick layer of tar was encountered. The Group A tanks were reported to have contained crude asphalt, while the Group B, C, and D tanks were to have contained solvents for paint manufacture (WCC, 1982). Backhoe studies of the Group A, B, and C tank areas showed that these tanks are no longer present. A borehole study of the Group D area indicated that these tanks are not likely to be present. The shallow fill at the site was frequently noted to have a petroleum odor.

Shallow soil samples in the 1982 study were tested for the following: purgeable priority pollutant aromatics and halocarbons (EPA Methods 601 and 602); total identified chlorinated hydrocarbons including PCB's and pesticides (EPA Method 608); and, generally, eight metals (arsenic, cadmium, chromium, cobalt, copper, lead, nickel and zinc). For a number of the samples, speciation between chromium III and chromium VI was performed. Groundwater from monitoring well 5M on the North Marketplace parcel was tested for the eight metals listed above. A test of the groundwater for PCB's was reportedly done by the Regional Water Quality Control Board, but results were not received (WCC, 1982).

Of the soils samples tested from the North Marketplace parcel, only one PCB detection, 0.12 ppm at 7 feet in boring 5M, was observed. No metal detections above the TTLC were found in the soil samples or tar seep grab sample taken from this parcel. On a site-wide basis, no priority pollutant aromatics were found at levels above 0.1 ppm, except at boring 5M at about 7 feet where concentrations below 0.5 ppm were noted. None of the priority pollutant halocarbons tested by EPA Method 602 were found at levels above 0.09 ppm on the Marketplace site. The groundwater sample tested from monitoring well 5M contained no detectable concentrations of the eight metals listed above, with detection limits at or below drinking water standards.

SUMMARY OF UNDERGROUND STORAGE TANK REPORT (WCC, 1987)

A program of engineering field observations, soil and groundwater sampling, and analytical testing was undertaken to perform proper closure of the site underground tanks, piping, and manifolds in accordance with the applicable regulations for underground storage tanks (WCC, 1987). Major elements of this work included on-site observations during excavation and removal of the tanks and manifolds by Tom Daniels Excavating of Danville, California; collection and analyses of soil and groundwater samples from the tank and manifold excavations; and preparation of the report documenting the results of the studies. Recommendations for additional work necessary for the proper closure of the tanks are reported under separate cover (WCC, 1987). The major findings presented in that report are summarized in this section for each of the four tanks and related piping, two product manifolds, and an oil/water separator (not included in the original scope of work).

No corrosion or perforations were observed in the diesel tank, product line, or manifold. Free product of less than 1/16-inch thickness was observed to be floating on the groundwater in the tank excavation immediately following tank removal. Soil stains were observed at the

bottom of the product line trench and also beneath the former location of most of the manifold withdrawal ports. Thus, staining indicates that some diesel fuel spillage occurred during the trucking facility operation. As there is little value in testing soils in which concentrations of fuel is visually evidenced, an additional 2.5 feet of soil was removed from the entire length of the manifold trench. Soil samples were then taken at 50-foot intervals along the manifold excavation to confirm the continued presence of diesel fuel. Also, a water sample was taken from the diesel tank excavation, a soil sample from the product line trench, and a number of samples from the piles of excavated soil were also obtained. Chemical test results for total fuel hydrocarbons in these samples were obtained indicating that moderate soil contamination remains in the product line and manifold trenches. Only two trench samples were observed to have greater than 1000 ppm of TFH. Three samples taken from the stockpiled soil of the diesel tank and manifold excavations were found to have greater than 1000 ppm of diesel present. Mixed results were obtained for the groundwater samples from the tank excavation, as will be discussed later in this report.

The remedial action program presented for the diesel tank and manifold excavations calls for treatment of the soil already removed and stockpiled by bio-degradation techniques. The additional soil containing greater than 100 ppm of diesel fuel and above the groundwater table will be removed from the manifold trench and similarly treated. The excavations will be backfilled with the bio-degraded soil, if feasible. Monitoring wells would be installed down-gradient of the diesel manifold if levels of fuel at the water table exceed 100 ppm.

No corrosion or perforations were observed in the gasoline tank, product line, or manifold. No substantial free product was observed on the groundwater in the excavation at the time of tank removal. Minor soil stains were found in the manifold trench immediately beneath the former locations of most of the product withdrawal ports. The stains indicate

that some gasoline spillage occurred during the trucking facility operation. An additional 1.5 feet of soil was removed at 20-foot intervals along the gasoline manifold. Samples were taken from each point and screened using an organic vapor meter. A description of this field screening technique is given later in this report. This technique provides a means of assessing the relative fuel hydrocarbon concentrations in soil samples. Samples from the locations giving the higher head space readings were analyzed for fuel hydrocarbon content. The test results indicate only minor contamination remains along the gasoline manifold. A soil sample taken from the wall of the gasoline tank excavation showed no detectable fuel hydrocarbons or BTX.

Key elements of the remedial plan for the gasoline tank and manifold systems include excavation of the remaining soil along the manifold trench which contains concentrations of greater than 100 ppm of gasoline and is above the groundwater table. This soil, along with that already excavated, will be aerated on-site in accordance with Bay Area Air Quality Management District guidelines. The treated soil will be used to backfill the tank and manifold excavations, if feasible.

No corrosion or perforations of the waste oil tank or product line were observed. The product line was left in place. No groundwater was observed in the tank excavation at the time of tank removal. Two soil samples were taken from the bottom of the excavation. No fuel hydrocarbons were detected. No remedial steps are necessary for this tank, and the tank excavation will be backfilled with the same soil which was removed. Similar observations were made and sample results were obtained for the lube oil tank. This tank excavation will also be backfilled with the soil initially removed. If additional backfill is needed for the two oil tanks, clean fine-grained import fill will be used.

Observation of an existing oil/water (O/W) separator removal was not included in the original scope of work. This O/W separator is located

south and adjacent to the former truck repair shop. The concrete sump should be cleaned of all residue waste oil and sludge and closed in accordance with the state, county, and local underground storage tank regulations. The sanitary sewer line should be capped and sealed.

FIELD PROGRAM

Program Description

Based on the identified environmental items discussed in the preceding section, a field program of eight groundwater monitoring wells and two shallow borings was designed. In response to the discovery of the oil/water separator, an additional boring was added. Also, as requested by the County and authorized by The Martin Company, three vadose zone monitoring wells, i.e., wells to sample soil pore air between the groundwater table and ground surface, were installed.

The field program began on 30 March 1987 and is summarized in Table 1 and Figure 3. Ten soil borings were drilled to depths between 11.5 and 16 feet (W-1 to W-8). Two of these borings, W-5 and W-6, could not be completed as monitoring wells. W-6, the first boring of the field program, was abandoned due to the presence of tar paper in the fill profile. W-5 was not converted to a well due to drilling difficulties. Both these borings have been sealed with grout. Five shallow soil borings, 4- to 6.5-feet deep, were also drilled (B-1 to B-5). Three of these, B-2, B-3, and B-4, were completed as vadose zone monitoring wells. B-1, which is located by the oil/water separator sump, was found to contain black fluid at a shallow depth and was sealed with grout. B-5 has also been grouted.

Drilling Procedures

The ten deeper (11.5 to 16 feet) borings were drilled with 8-inch nominal diameter, hollow-stemmed auger. Soil samples were taken with 2-inch inside diameter, modified California samplers equipped with brass liner tubes. At each sampling depth, the sampler was driven into the soil at the bottom of

the borehole using a 140-pound hammer falling 30 inches. After each drive, the recovered samples were examined and logged. Samples to be kept for chemical testing were capped with teflon film and slip caps. The slip caps were taped to the brass sample tubes with vinyl tape, the samples labelled, and placed on ice. Samples selected for chemical testing were generally delivered to the chemical testing laboratory within twenty-four hours of being obtained. Other retained samples were delivered to WCC's Pleasant Hill laboratory and stored under refrigeration.

All augers, drill rods, drill tools, samplers, and brass tube liners were steam cleaned prior to use and between holes. Samplers were washed with detergent (Alconox) and double- or triple-rinsed in tap water between each sampling drive.

The five shallow borings were drilled using these same procedures, except that in some cases 6-inch diameter solid flight auger was used. This auger was also steam-cleaned prior to and between uses.

Logs for the soil borings are given in Appendix A.

Monitoring Well Construction Procedures

The groundwater monitoring wells were constructed with Schedule 40 PVC blank casing and well screens. The well screens are perforated with 0.02-inch slots. The screens are 8 to 10 feet long and extend from 2 to 4 feet below ground surface to the bottom of the well. The top slots of the well screens were placed at elevations thought to be above the static shallow groundwater levels, so that the wells could be used to check for any floating contaminants. Care was also taken to screen the wells below any surficial zones of obvious soil contamination, as the surficial contaminants were perceived in some cases to be from a different source and of a different nature than those potentially present in the groundwater.

Lonestar No. 3 sand was placed as a filter pack around each well screen. The filter pack extends from the bottom of each monitoring well to approximately 0.5 to 1 foot above the top slot. A bentonite pellet seal was placed from above the filter pack to within 0.5 to 1 foot of the surface. A locking cover was placed atop the bentonite seal. Bentonite-cement grout was placed atop the bentonite seal and around the locking cover to just above the ground surface level. Each well casing is capped with a PVC slip cap. Monitoring well W-8 is located in an actively used parking lot on the Marketplace property. For this monitoring well, the locking cover was placed just below surface grade, and a traffic-rated valve box was installed over it at surface level.

The vadose zone monitoring wells were installed in a similar manner. For these wells, the screened sections generally extend from 1 to 4 feet below surface grade. The bentonite seals were continued to about the surface. Locking covers were placed above the seals and set in place by bentonite-cement grout.

The construction details of the eight groundwater and four vadose zone monitoring wells are shown on the boring logs in Appendix A.

Monitoring Well Development and Sampling

Prior to developing each monitoring well, the groundwater level was taken, and a teflon bailer was used to check the groundwater surface for any floating contaminants. All wells were developed by surging and pumping during the period 9 April to 17 April 1987. Periodically during the development of each well, the temperature, specific conductance, and pH of the extracted groundwater were monitored for stability. Stability of these parameters indicates that the extracted water has been freshly drawn from the formation and is thus representative of formation groundwater.

Groundwater samples were generally taken from the monitoring well with teflon bailers immediately after development. The samples were stored in

an ice chest and delivered to the analytical laboratory, generally within twenty-four hours. In several cases, samples were taken some time after the completion of monitoring well development. In these cases, additional groundwater was extracted from the wells, and the aforementioned parameters were monitored for stability prior to the collection of samples. Additional information on the development and sampling of the groundwater monitoring wells is summarized on Table 3.

On 6 May 1987, the elevations of the tops of the monitoring well casings were surveyed. Also on this date, the depth to groundwater in each of the wells was measured, and the groundwater surface was checked for any floating contaminants using a teflon bailer.

Vadose Zone Well Sampling

Organic vapor concentrations were measured in vadose zone wells B-2, B-3, and B-4 on 24 June 1987. The concentrations were measured using an H-Nu (Model PI-101) photoionization detector equipped with a 10.2 eV probe.

The influence of purging the well was studied on well B-3. For this well, one air volume equal to the void space of the casing and sand pack was removed using a peristaltic pump after initial readings were taken. Purging was found to not significantly alter the vapor concentration readings. Readings were also taken in this well both near the top and bottom of the casing. The top reading was found to be the greater.

After testing the influence of purging well B-3, the well was allowed to equilibrate with the cap off for one hour. Thus for the other two wells, readings were taken by first removing the well slip caps and immediately recording values. After allowing the wells to stabilize with the cap off for one-half hour, the probe was inserted to 8 inches below the top of the casing, and the elevation in meter readings was then recorded.

Readings obtained for B-2, B-3, and B-4 were 17, 150, and 39 ppm. Well B-3 had a noticeable odor; the other wells did not.

SITE SOIL CONDITIONS

Fill Materials

As discussed above under "Site History," the Nielsen and Marketplace sites are former tidal flats of San Francisco Bay which have been filled. The shallow soil conditions on the North Marketplace parcel was discussed in the Previous Marketplace Study section. As most of the field exploration undertaken during the current study was on the Nielsen property, the discussion of shallow soil conditions which follows is restricted to that parcel.

The shallow fill at the site consists predominantly of silty and gravelly clays. Some coarse-grained materials are also present including fine grained, poorly graded sand as well as silty and gravelly sand. The depth of the fill appears to be about 9 to 15 feet at the east end of the Nielsen parcel and 14 to 17 feet at the west end. The variation in the fill depth may be due to the presence of a slough seen in early topographic maps of the area. The approximate position of this slough per these early maps is shown in Figure 2a.

Immediately below the site pavement are several inches of silty gravel base material underlain by a sandy gravel or gravelly sand containing varying amounts of silt and clay. This coarse-grained layer was present in nearly all the borings done on the Nielsen property and extends to a depth of 1.5 to 2.5 feet. It is believed that this gravel material was imported for the finish grading of the large pavement areas of the trucking facility.

Native Soil

Several borings have been done on the Nielsen site by Geomatrix Consultants as part of the geotechnical study for the foundation of the proposed

commercial building (Geomatrix, 1987). Several of these borings extend to a depth of approximately 30 to 32 feet. Based on these borings and WCC's drilling results, it appears that the underlying native soils to this depth are generally a stiff to very stiff sandy or silty clays or silts. There is an absence of the soft, compressible "recent Bay Mud" noted in prior explorations of the adjoining properties (WCC 1982, 1985). These fine-grained soils predominate to the depth of exploration of the Geomatrix study, although some sand was found in Geomatrix boring 3 (Figure 3) at a depth of 29 to 31.5 feet.

A typical geologic cross section extending from the adjacent Westinghouse site through the Watergate Peninsula in Emeryville is shown in Figure 5. This figure, presented in WCC's 1985 Westinghouse study, shows a thick and laterally continuous layer of "Old Bay Mud," a substantially regional clay aquitard, to be present from at least the Southern Pacific Railroad right-of-way to San Francisco Bay. It is expected that this layer exists beneath the Nielsen parcel and the North Marketplace parcel. The top of the layer was found in Geomatrix boring 1.

Subsurface Debris In Fill

Some debris, specifically wood and brick chips, were commonly found in the shallow fill of the Nielsen parcel. Also in this fill, pieces of fibrous paper believed to be roofing fill and bits of tar were located. Tar paper in organized layers was found in monitoring wells W-6A and W-4. Also tar materials were found at the base of shallow boring B-4. Substantial thicknesses of fibrous paper, tar paper, and similar debris were found in monitoring wells W-6 and W-7. The presence of the fibrous paper and tar materials is consistent with the site history, which includes the previous roofing paper production industry on the Marketplace property prior to the filling of the Nielsen parcel. The fibrous paper and tar fills seem more predominant in the central and western portions of this site. The lateral extent of these heterogeneous, non-soil fills is not known.

A number of subsurface obstacles were encountered during drilling. An 8-inch-thick concrete slab was found in boring B-4. Also, a large wooden slab or block was encountered in the drilling of boring B-3. A timber was seen in the side of the gasoline tank excavation just north of B-3 at a similar depth. It is possible that there exists an extensive wood mat in the area of boring B-3 and the repair garage, as this area was occupied by four large above ground tanks before construction of the freight lines facility.

SITE GROUNDWATER CONDITIONS

In March of 1985, groundwater level measurements were taken concurrently at the Marketplace property and the adjacent Westinghouse site to the east. The resulting piezometric surface map showed the shallow groundwater gradient and flow direction in the area to be towards the west-southwest. The groundwater level drop from east to west across the Marketplace site, a distance of about 450 feet, was approximately 3 feet (WCC, 1985). Piezometric data taken in 1982 at the Marketplace property alone showed a similar groundwater flow direction. The groundwater elevation drop across the Marketplace site for these measurements was also on the order of a couple of feet (WCC, 1982). Based on these results, monitoring wells selected for placement down-gradient of a specific site feature of interest on the Nielsen parcel were placed to the west-southwest of that feature.

Groundwater elevation measurements data were taken at the Nielsen parcel as part of the current study, and the results are shown in Figure 4. The groundwater flow direction at the north end of the Nielsen property is toward the west. A piezometric high point is seen in well No. 7. This high point may be due to the presence of low permeability tar paper fill materials at this location.

CHEMICAL TESTING PROGRAM

Soil Testing

The potential environmental concerns resulting from the past use of the Nielsen parcel and North Marketplace parcel were discussed previously in this report under "Site History." Twelve soil samples taken during the field drilling program were submitted for chemical analyses and are listed in Table 2. In this table, the testing objective for each sample is stated for comparison with the list of potential concerns given in the Site History section. A summary of the test results for these soil samples is given in Table 4A. The specific results of the purgeable and extractable priority pollutant tests (EPA Methods 8240 and 8270) are given in Tables 4B and 4C, respectively.

Groundwater

One groundwater sample from each of the eight new monitoring wells was submitted for testing. A sample floating product and a groundwater sample were also obtained from monitoring well 5M on the Marketplace property. The testing objective for each sample is given in Table 3 and may be compared against the list of potential environmental concerns given in the Site History section. A summary of the chemical test results obtained for these samples is given in Table 5A. The specific results of the purgeable and extractable priority pollutant scans (EPA Methods 624 and 625) are given in Tables 5B and 5C. Results of the wastewater analyses are given in Table 5D.

Copies of the data transmittals from the analytical testing laboratory, Brown and Caldwell in Emeryville, are given in Appendix B for the soil samples and Appendix C for the groundwater samples.

DISCUSSION OF CHEMICAL TEST RESULTS

Organization

In the Site History section, potential environmental concerns for the site were identified. In this section, the body of field data collected is examined and interpreted in the context of each of the identified potential environmental concerns.

PCB's in Shallow Soil and Groundwater

Seven of the 12 soil samples studied were tested for PCB's by EPA Method 8080, a gas chromatographic (GC) method. Two additional samples were checked for PCB's as part of an EPA Method 8270 test, a gas chromatographic/mass spectroscopic (GC/MS) method for identifying acid and base/neutral extractable priority pollutants. No PCB's were detected in any of these nine tests. The detection limits used for the two types of tests were 0.05 mg/kg and 1 or 2 mg/kg, respectively. These limits are far below the State's Total Threshold Limit Concentration (TTLC) for PCB's of 50 mg/kg. The TTLC defines the total concentration of a substance in a solid, such as soil, above which the solid is considered a hazardous waste. Therefore, the possible presence of PCB's in the shallow fill soils at this site does not appear to be a concern.

Four groundwater samples from the site were also checked for PCB's as part of GC/MS tests for extractable priority pollutant tests (EPA Method 625). Therefore, the possible presence of PCB's in the groundwater at this site does not appear to be a concern. No PCB's were detected in these samples with detection limits of 1 to 2 µg/ℓ.

Trace Metals in Shallow Soil and Groundwater

The presence and concentrations of trace metals in 9 of the 12 soil samples were analyzed by atomic absorption (AA) methods (see Table 4A). Concentrations of the 13 EPA priority pollutant metals plus cobalt were determined for three of these samples. The remaining six were tested for

lead, nickel, chromium (total), and zinc. These four indicator metals were selected based on WCC's study of the Marketplace site (WCC, 1982.)

The concentration of metals in the 12 soil samples tested for this study, when detected, were well below the TTLC as shown in Table 4A. The predominant trace metals detected are lead and zinc. These same two metals were amount those which were predominant in the earlier Marketplace study. The higher metals concentrations detected were for samples from wells W-3, W-4, W-6A and boring B-5. These higher concentrations, which again are well below the TTLC's, do not occur in correlation to any singular past surface activity.

Groundwater samples collected from the nine monitoring wells at the site were tested either for the four indicator metals discussed above or all 13 priority pollutant metals plus cobalt. Metals were generally undetected in the groundwater. Where metals were detected, the concentrations are generally well below the federal drinking water standard. Exceptions are lead in wells W-6A and W-7 and chromium in wells W-4 and W-7. The lead and chromium in well W-7 and lead in well W-6A are thought to be related to the tar paper materials which are present in the fills at these locations. Similarly, the log of well W-4 also suggests the likely presence of tar paper materials in the fill in the area of that well.

The metal concentration closest to the applicable TTLC are the 460, 360, and 380 ppm found in the shallow soil samples from wells W-4 and W-3 and boring B-5, respectively. Lead concentrations in the groundwater from wells W-4 and W-3 were minimal, 0.002 and less than 0.001, respectively. The lack of correlation of elevated lead concentrations in the groundwater to elevated lead concentrations in soil suggests that soluble metals testing of the site soil fill is unwarranted.

Two soil samples were collected and tested for total lead during the field investigation for the gasoline tank and manifold closure. The two samples

yielded lead concentrations of 14 and 83 mg/kg, the higher value being found in the sample with the higher fuel hydrocarbon concentration. Both these lead volumes are significantly below the average soil lead concentration of 180 mg/kg obtained for the samples of this current study and, thus, do not necessarily indicate the presence of consequential concentrations of residual organic lead from the gasoline.

Oil and Fuel in Shallow Soil and Groundwater

Two sources of fuel to the subsurface exist at the site, surface dripping or spillage, or leaks from underground tanks, piping, and manifolds. An investigation of the second of these was performed and reported under separate cover (WCC, 1987a). The findings were summarized in the earlier section of this report entitled "Summary of Fuel Tank and Manifold Closure Report." In the following paragraphs, the results of the tests on shallow soil samples to determine the degree of accumulation of oil and fuel residues from surficial sources are discussed.

Data on oil and fuel residue concentrations were obtained for all soil samples tested, except the two taken from well W-8 and the one taken from boring B-3. Testing objectives for those three samples pertain more directly to the presence of materials in the fill related to the early tar paper production activities at the site. This topic is discussed in a later section.

Eight of the nine soil samples tested were analyzed for the presence and concentration of total fuel hydrocarbons by infrared spectroscopy (TFH by IR by EPA Method 418.1). TFH by IR quantifies the concentrations of petroleum hydrocarbons, from the heavier fraction of the hydrocarbon components of motor fuels to motor oil. Values of less than 50 mg/kg to 650 mg/kg were obtained for the samples tested. The highest values were obtained at the location of monitoring well W-4, just off the concrete apron of the repair shop, and at boring B-5, drilled at a low area of the south parking lot where drainage water collects. An elevated concentration

(170 ppm) was also obtained at well W-6A which is located in a truck parking area. Non-detections were obtained for samples from wells W-2, W-3, and W-5. These monitoring wells are all located in open areas of pavement.

The ninth soil sample tested was analyzed by EPA Method 8015 normally used for fuel hydrocarbons. The fuel hydrocarbons concentration W2-4-3 was non-detectable (less than 10 mg/kg).

Purgeable priority pollutant tests (EPA Method 8240) were performed on shallow soil samples from the drum storage area (W1-1-4), the low pavement area (B5-1-3), and repair shop apron (W4-1-2). The only priority pollutant detected is 0.7 mg/kg of toluene in W4-1-2. An extractable priority pollutant test (EPA Method 8270) was also done on W4-1-2, a sample of the fill underlying the pavement areas of the Nielsen site. The sample contained no detectable concentrations of extractable priority pollutants.

The test results for oil and fuel residue in the shallow fill soils at the Nielsen property indicates that some such accumulation has occurred and in a pattern consistent with the locations of likely surface deposition or collection. However, the affected fill soils do not appear to contain substantial concentrations of any volatile or extractable priority pollutants chemicals.

A black oily fluid was found at a depth of about 2 feet in boring B-1, which was drilled immediately adjacent to the oil/water separator sump. When in operation, the sump received water from a parts steam cleaning area. The oily black fluid collected in the sump is thus expected to have consisted largely of engine oil and grease. The black fluid in the soil at boring B-1 is thought to be leakage from this sump. No black fluid was observed in the shallow soil at boring 4 located 15 feet south of the oil/water separator. This indicates that the contamination is localized near the sump.

With the exception of well W-3, all the monitoring wells at the Nielsen site were placed on or to the west-southwest of an existing site feature of possible environmental concern (Table 3 and Figure 3). The monitoring wells west-southwest of the diesel tank (W-2), gasoline tank (W-5A), and gasoline manifold (W-6A) were tested for the presence of fuels by EPA Method 8015. None were detected. Some fuel hydrocarbons were observed in groundwater samples taken from the diesel tank excavation (see WCC, 1987). The fuel concentration results are mixed, spanning the range from less than 1 mg/l to 630 mg/l. The higher values are thought to be due to the presence of suspended product rather than solution products, but additional sampling and testing to clarify the dissolved product concentration is needed. The sample containing 630 mg/l of fuel hydrocarbons was tested for BTX by EPA Method 602. None were detected. Groundwater samples from the monitoring wells west-southwest of the oil tanks (W-4), diesel tank (W-2), and through the drum storage area (W-1) were tested for TFH by IR. Again, none was detected.

Purgeable priority pollutant tests (EPA Method 624) were performed on groundwater samples from all the Nielsen site monitoring wells. Benzene, toluene, and xylene (BTX) are quantified by this test and are normal components of hydrocarbon fuels. The only priority pollutant detection was from monitoring well W-2 where 80 µg/ℓ of toluene was measured. This is below the California Department of Health Services Action Level of 100 ug/l (CSWRCB, 1985). Freon 113 was also detected at a concentration of 40 ug/l in the W-2 groundwater sample. The detection limits for the EPA Method 624 tests on groundwater samples from monitoring wells W-2, W-5A, W-6A, and W-7 were elevated compared with those obtained for the other wells on the Nielsen property (see Table 5B).

Extractable priority pollutant tests (EPA Method 625) were done for wells W-3, the up-gradient "background" well, and W-7, the well furthest to the southwest on the site. No extractable priority pollutants were detected.

A substantial concentration of unidentified organic materials was observed in the W-7 sample. This would account for the high detection limit observed for this sample in the EPA 624 analysis. The occurrence of non-priority pollutant organic chemicals from tar paper materials in the fill may also account for the higher detection limits in the EPA 624 analyses for wells W-6A and possibly W-2 and W-5A as well.

The TFH by IR, fuel hydrocarbons, and purgeable and extractable priority pollutant analysis results for shallow groundwater samples from the Nielsen parcel indicate that no substantial fuel or oil contamination is present in the groundwater. However, the mixed hydrocarbon test results for the diesel tank excavation warrant further investigation of the groundwater in that excavation. Toluene was detected in monitoring well W-2 at a concentration less than the State's Action Level. Because no fuel hydrocarbons, benzene, or xylene were detected in that groundwater sample, it appears that the source is localized and is not associated with motor fuels. The source of the Freon 113 in the well W-2 groundwater sample is not known. The unidentified compounds detected in well W-7 are thought to be from the tar paper material fill which constitutes much of the profile screened by that monitoring well.

Antifreeze in Soil and Groundwater

The concentration of ethylene glycol, the principal component of antifreeze, was determined for a shallow soil sample (W1-1-4) taken from below the former drum storage area. None was detected. The detection limit was 10 mg/kg. The sample of groundwater from monitoring well W-1 was also tested for ethylene glycol. 1 µg/ℓ was detected. This is far below the Safe Drinking Water Act Health Advisory level of 5.5 mg/l for chronic consumption.

Tar Paper and Paint Components (Solvents) in Shallow Soil and Groundwater

In the previous study of the Marketplace property (WCC, 1982), soil testing concentrated on trace metals and volatile halocarbon and aromatics (EPA

Method 601 and 602, respectively). This testing scope was developed in cooperation with the interested state regulatory agencies. With respect to previous industrial activities, materials, and products, the present study for the Nielsen and North Marketplace parcels is viewed as an extension of the Marketplace study. In this study, the EPA Methods 601 and 602 are replaced by the purgeable priority pollutant test (EPA Method 624) which covers both these previous tests. Because a number of semi-volatile compounds are known components of tar material, the extractable priority pollutant test (EPA Method 625) was also utilized.

In addition to the tar paper fill materials found in the borings for monitoring wells W-6, W-6A, and W-7, fill materials or buried features which appeared to be directly related to past industrial activities were also encountered in the drilling of boring B-3, well W-8, and in the resampling of well 5M.

Boring B-3 was drilled through a tar seep just north of the Nielsen repair garage. As mentioned previously, a wooden slab was encountered in this boring beneath which soil with a very pungent odor was found. A sample of this soil, B3-2-4, was chemically analyzed for purgeable and extractable priority pollutants (EPA Methods 8240 and 8270). The sample contained some visible tar but was found to contain no volatile priority pollutants. Some polynuclear aromatic compound (PNA's) on the extractable priority pollutant list were detected, along with 6000 mg/kg of an unidentified "complex matrix." The detection of these PNA's but no volatile priority pollutants and the visual evidence of tar in the sample indicates that the sample contamination is related to earlier tar paper and roofing materials manufacturing operations. The odor is likely that of volatile petroleum distillates which are not priority pollutants, but additional sampling and testing of soils from this area is required to conclusively identify the source compound(s).

Few, if any, regulatory enforcement standards exist regarding hazardous levels for PNA's; however, the levels detected in soil sample B3-2-4 are very low. The material may, however, be classified as hazardous based on fuel content as quantified by EPA Method 8015. Also, exposure of the material during construction could result in a significant amount of out-gassing. The extent of the area covered by the wood slab is unknown but may be substantial, as previously discussed under "Site Soil Conditions."

A kerosene-like odor was prevalent throughout the drilling of monitoring well W-8. Two soil samples were submitted for chemical analysis. The shallower of the two was tested for metals and PCB's; these results were included in an earlier discussion. The deeper sample was tested by EPA Method 8015 and found to contain 130 mg/kg of petroleum hydrocarbons. Examination of the laboratory chromatogram reveals that the detected hydrocarbons are similar in range of molecular weights to diesel fuel hydrocarbons. Examination of earlier aerial photos of the W-8 boring location reveals significant surface tankage. Surface spillage or leakage from these early tanks is thus a possible source of the detected material. The results of the chemical analysis of the W-8 groundwater sample are discussed later in this section.

A substantial thickness of a black floating fluid was encountered in monitoring well 5M on the North Marketplace parcel. This well was reported to have a oily film on the groundwater in the initial investigation of 1982 (WCC, 1982). A total of about 1 to 1.5 liters of the black fluid was removed from the well and was analyzed for metals and for purgeable and extractable priority pollutants. In these tests, the fluid was treated as a solid; thus detection limits were on the order of several to several ten's of mg/l for the purgeable priority pollutant test (EPA Method 8240) and hundred's of mg/l for the extractable priority pollutant test (EPA Method 8270). The black fluid was found to be a hydrocarbon matrix and to contain no detectable purgeable priority pollutants. A low concentration of xylene was detected in the purgeable priority pollutant test, however.

A number of PNA's were detected in the extractable priority pollutant scan. These included chrysene, fluorine, and phenanthrene at 170, 170, and 440 ug/kg. All metals concentrations were found to be below the TTLC. The black fluid is believed to be crude asphalt based on the site history.

A water sample was taken from below the floating product in monitoring well 5M. In collecting the sample, the well was not purged of several casing volumes before sampling because it was judged desirable to risk entraining floating product in the screen and sand pack of the well. The groundwater sample was analyzed for the same suite of constituents as the black floating fluid. In this case, however, the sample was analyzed as an aqueous solution. The groundwater was found to be devoid of purgeable priority pollutants, the analysis having detection limits of 1000 ug/l or greater. Chrysene and fluorine at 5 and 18 ug/l, respectively, were detected in the extractable priority pollutant analysis as well as some naphthalene and 90,000 ug/l of an unidentified "complex matrix". Trace metals concentrations in the groundwater were below drinking water standards. The presence of PNA's in the groundwater indicates that some solution of the PNA's from the floating product is occurring.

The potential impact of the tar paper and paint components in the shallow fill materials on groundwater quality was also studied at monitoring wells W-7 and W-8 using purgeable and extractable priority pollutant tests. A wastewater analysis of the W-7 groundwater sample was also performed. No priority pollutants were found in W-7 by either method, although detection limits for the purgeable priority pollutant analysis were elevated. Also, a number of semi-quantified compounds were found in the extractable priority pollutant analysis, including 40,000 µg/ℓ of an "unidentified matrix". For the well W-8 groundwater sample, the EPA 624 analysis detected no purgeable priority pollutants but the detection limits were high (100 ug/l and above). A number of PNA's were detected at low concentrations in the extractable priority pollutant analysis along with some semi-quantified compounds, most notably naphthalenes and 10,000 µg/ℓ

of C9-C35 hydrocarbons. The wastewater analysis showed the W7 groundwater sample to be brackish, to contain a large amount of suspended material, and to contain an elevated concentration of ammonia nitrogen. The elevated ammonia nitrogen concentration is thought to be a product of the biodegradation of the organics material in the fill.

CONCLUSIONS

Based on the results of the study presented in previous sections of this report, the following conclusions are made:

PCB's. Soil tests for the Nielsen parcel in this study and for the North Marketplace parcel from WCC (1982) indicate that no significant PCB contamination exists in the shallow fills. No PCB's were detected in shallow groundwater for the four monitoring wells tested in this study.

Trace Metals. The concentration of metals in the 12 soil samples tested for this study, when detected, were well below the TTLC. The predominant trace metals detected are lead and zinc, the higher lead concentrations being the metals detections closest to the applicable TTLC.

Two soil samples were collected and tested for total lead during the field investigation for the gasoline tank and manifold closure. Both samples yielded lead concentrations well below the TTLC for total lead and significantly below the average lead concentration for the soil samples tested for the current study. Thus, the lead concentration in the two samples do not necessarily indicate the presence of consequential concentrations of residual lead from gasoline.

Metals were generally undetected in the groundwater and, where detected, were generally well below the federal drinking water standards. Exceptions are lead in wells W-6A and W-7 and chromium in wells W-4 and W-7. The elevated metals levels at W-6A and W-7 are thought to be due to the

presence of tar paper and tar paper products in the fill. The drilling log for well W-4 also suggests the presence of these materials in the fill in the area of that well. If this assumption is correct, the elevated metals problem should be localized to pockets of such fill. However, the possible wide distribution of tar paper materials in the fill of the region suggests that similar localized groundwater contamination may exist at many points in the region.

A lack of correlation of elevated lead concentrations in the groundwater to elevated lead concentrations in soil suggests that soluble metals testing of the site soil fill is unwarranted.

Oil and Fuel. Two potential sources of fuel to the subsurface exist at the site, surface dripping or spillage; or leaks from underground tanks, piping, and manifolds. An investigation of the second of these was performed and reported under separate cover (WCC, 1987). The major findings of that report were summarized in the earlier section of this report entitled "Summary of Fuel Tank and Manifold Closure Report."

In this investigation, the test results for oil and fuel residue in the shallow fill soil for the Nielsen property indicate that some such accumulation has occurred and in a pattern consistent with the locations of likely surface deposition or collection. The affected fill soils do not appear to contain any substantial concentrations of volatile or extractable priority pollutants.

Black fluid observed in the shallow soil of Boring B-1 starting at a depth of 2 feet is believed to be leakage of oily materials from the oil/water separator sump located immediately north of the boring. The absence of the black fluid in boring B-4 located 14 feet south of the sump indicates that the shallow soil contamination condition is very localized.

The TFH, fuel, and EPA Method 624 and 625 analysis results for shallow groundwater samples from the Nielsen parcel indicate that no substantial fuel or oil contamination is present in the groundwater. However, the mixed hydrocarbon test results for the diesel tank excavation warrant further investigation of the groundwater in that excavation. Toluene was detected in monitoring well W-2 at a concentration less than the State's Action Level. Because no fuel hydrocarbons, benzene, or xylene were detected in that groundwater sample, it appears that the source is localized and is not associated with motor fuels. The source of the Freon 113 in the well W-2 groundwater sample is not known. The unidentified compounds detected in well W-7 are thought to be from the tar paper material fill which constitutes much of the profile screened by that monitoring well.

Antifreeze. The soil and groundwater sample tests for ethylene glycol (antifreeze) for well W-1 found no significant concentrations.

Tar Paper and Paint Components (Solvents). Hydrocarbon contamination due to past Pabco operations were evidenced by four discoveries during the site exploration;

- o a floating black fluid at well 5M;
- o a kerosene-like contaminant in the shallow soils of well W-8;
- o tar seeps in the area of B-3; and
- o tar paper and tar paper materials in the shallow fill at wells W-6, W-6A, W-7, and B-4.

The black fluid removed from well 5M is believed to be crude asphalt and was found to contain a number of PNA's. The thickness of the product in the ground cannot be accurately assessed from the data collected, as

floating product tends to collect in wells to thicknesses greater than is present on the groundwater surface in the general area. Low concentrations of PNA's were also found in the groundwater beneath the floating layer. Fuel-weight hydrocarbons are present in the shallow fill at well W-8. The groundwater from well W-8 also showed low concentrations of PNA's. Further information on the presence of hydrocarbons in the surficial soils in the area of wells 5M and W-8 and on the possible presence of fuel weight hydrocarbons in the groundwater at well W-8 is needed if future development of this area is to be undertaken.

PNA's were also detected in the soil sample taken from beneath a shallow wood slab at boring B-3. The presence of the PNA's together with the lack of purgeable priority pollutants indicates the asphaltic nature of these contaminants. A strong pungent odor was noted at B-3 when the buried wood slab was penetrated. The odor is thought to be from volatile petroleum distillates and could pose an off-gassing hazard should the wood slab be removed during site development. The extent of the wood slab is unknown. Additional exploration of the former tankage area which includes the location of B-3 is needed to define the extent of the wood slab and to conclusively identify the odiferous compound(s) discussed above.

Tar paper in organized layers was found in monitoring wells W-4 and W-6A. Tar materials were also found at the base of shallow boring B-4. Substantial thicknesses of fibrous paper, tar paper, and similar debris were found in monitoring well W-6 and W-7. Extensive testing of the W-7 groundwater sample suggests that these materials contribute substantial amounts of unidentified non-priority pollutant compounds to the groundwater. Degradation of these buried materials is also believed to be the source of the elevated ammonia nitrogen concentration observed in the well W-7 groundwater sample. As was the case in the discussion of trace metals in groundwater, the contribution of these organic contaminants and nitrogen ammonia to the groundwater may be localized at each fill pocket but regional in scope due to the wide distribution of tar paper materials in the regional fill.

RECOMMENDATIONS FOR CORRECTIVE MEASURES

Introduction

Plans now exist for the development of the Nielsen parcel. No definitive plan has as yet been formulated for the redevelopment of the North Marketplace parcel. In this section, recommendations for corrective measures to address the environmental site features found to be of concern are presented. A general discussion of environmental precautions to be taken during the development of the Marketplace site was given in WCC (1982). This discussion together with the additional data provided in this report for the North Marketplace should be considered during any future development planning for the Marketplace site.

Conditions of Concern

Four environmental features have been identified for the shallow soil and site fill which may require some corrective action. First, an accumulation of oil and fuel residue was documented in certain areas in the shallow soil immediately below the pavement. Second, several items related to the early industrial development and filling of the site were documented. These include the tar paper materials fill in Wells W6, W6A, W7, W4 and B-4; the tar seep and related sampling results at Boring B3; and the possible existence of petroleum contamination in the southeast corner of the Nielsen property akin to that identified in Boring B-5M on the Marketplace parcel. Third, black fluid in shallow soil near the oil/water separator sump was present. Fourth, diesel and gasoline spillage to the soil was discussed under separate cover (see WCC, 1987).

Environmental conditions in the groundwater of note include several metals detections above the drinking water standard; the presence of high concentrations of unidentified, non-priority pollutant organic compounds in wells W6 and W7; the presence of an elevated ammonia nitrogen level in well W7; and the possible presence of some TFH as diesel in the diesel tank

excavation as discussed in WCC (1987a). Recommendations on corrective approaches to these situations is given in this section.

Recommendations for Corrective Approaches - Soil and Shallow Fill

The test results for oil and fuel residue in the shallow fill soil for the Nielsen property indicate that some accumulation has occurred and in a pattern consistent with the location of likely surface deposition or collection. It is recommended that shallow soil exposed by the removal of pavement, particularly in the areas behind the maintenance shop and in the truck and parking areas, be tested for TFH by IR during site development. All exposed material with greater than 100 ppm of oil and fuel residue should be removed and treated on-site by biodegradation. As tests showed the shallow soils to be devoid of substantial concentrations of volatile or extractable priority pollutants, it is recommended that material below pavement areas not to be disturbed be left in place.

Shallow soil and fill conditions related to site filling and early industrial development include the presence of tar paper materials in Wells W6, W6A, W7, W4, and B4; the tar seep and related subsurface conditions at Boring B-3; and the possible presence of petroleum contamination in the southeast corner of the site. The first of these conditions, the occurrence of tar paper materials in the fill, seems more predominant in the central and western portions of the site. The site development history and WCC's local experience would indicate that the presence of these materials in the fill is a regional problem. The geotechnical consequences of the presence of the tar paper materials in the fill is addressed later in this section.

Boring B3 was placed through a tar seep on the north side of the Nielsen repair garage and within the bounds of an earlier storage tank area (see Figure 2A). Some visible tar was seen in the fill at this point, as well as a wood slab or block. Below the wood obstacle and at a depth of about 4 feet, the soil was found to have a pungent tarry odor. Very high vapor

levels were found in the vadose zone well installed in B-3. The features observed are thought to be related to the former tank farm. To define the nature and extent of the contamination in the area of the former tankage, a further investigation consisting of six to eight shallow borings and one groundwater monitoring well is recommended. The predominant soil test for this study will be fuel hydrocarbons by EPA Method 8015 with several samples also being tested for purgeable and extractable priority pollutants. If the odoriferous contaminants are fuel-weight petroleum hydrocarbons as the site history and study results to date suggest, state and local guidelines for the remediation of fuel tank spills will likely be applied by the agencies. Under these guidelines, all soil above the water table containing greater than 100 ppm of fuel hydrocarbons should be excavated. Treatment of the removed material on-site by aeration or biodegradation techniques may be possible. If contaminant levels above 100 ppm are present at or below the groundwater, a down-gradient monitoring well should be installed. If a floating product is present on the groundwater, it will have to be removed.

The observation of black fluid in boring B-1 and its absence in boring B-4 indicates that oily contamination of the shallow soil exists immediately adjacent to the oil/water separator sump. Sealing of the sanitary sewer line leading from the sump followed by removal of the sump is recommended. After sump removal, samples of the black fluid which collects in the excavation should be taken and analyzed for purgeable and extractable priority pollutants. Using the results of this testing, an appropriate excavation and treatment or disposal plan can be formulated for the affected soil.

A black petroleum fluid was found in Well B-5M of the North Marketplace parcel. The presence of this floating product and of related dissolved products in the groundwater are thought to be related to previous petroleum refining activities on this area of the site (see Figure 2A). As the earlier refining facilities overlap the southeast corner of the Nielsen

property, similar soil and groundwater conditions may exist there. An additional study of this area consisting of three to four shallow borings, one completed as a groundwater well, is recommended to check for the presence of soil contamination, floating product on the groundwater table, and solution products in the groundwater.

Details of the remedial measures recommended for addressing the fuel leaks to the subsurface soils from the gasoline and diesel piping and manifolds are reported under separate cover (WCC, 1987). In brief, chemical test results for fuel hydrocarbons for soils taken from beneath the diesel fuel product line and manifold indicate that moderate soil contamination is present in some areas. The remedial approach suggested in the underground tank closure report (WCC, 1987) is to complete the excavation of soil which contains greater than 100 ppm of total fuel hydrocarbons and which lies above the groundwater table from the diesel product line and manifold trench. This soil, along with that already excavated which contains greater than 100 ppm of fuel, will be treated on-site by bio-degradation techniques. The excavation will be filled with the treated soil or clean, fine-grained import soil. Monitoring wells will be installed down-gradient of the diesel manifold if concentrations of fuel in the soil at the water table exceed 100 ppm.

Fuel hydrocarbon tests on soil samples taken from beneath the gasoline manifold and tank excavations indicate that only minor soil contamination along the manifold trench remains. The remedial approach suggested in the underground tank closure report for the gasoline contamination situation is the same as for the diesel, except that the soil will, if possible, be treated by aeration in accordance with the guidelines established with the Bay Area Air Quality Management District.

Recommendations for Corrective Measures - Groundwater

Metals were generally undetected in the groundwater and, where detected, were generally well below the federal drinking water standards. Exceptions

are lead at 0.10 and 0.70 mg/l at wells W-6A and W-7, respectively, and chromium at 0.11 and 0.08 mg/l at wells W-4 and W-7, respectively. The federal drinking water standard for both these compounds is 0.05 mg/l. The elevated metals levels at wells W-6A and W-7 are thought to be due to the presence of tar paper and tar paper products in the fill. The drilling log for well W-4 also suggests the presence of these materials in the fill in the area of that well. A high concentration of unidentified, non-priority pollutant organic compounds and an elevated concentration of nitrogen ammonia were found in well W7. The presence of this material in well W7 is believed to be due to the tar paper materials present in the fill. Some petroleum hydrocarbons were observed in water samples taken from a diesel tank excavation. However, sample results are mixed, spanning the range from less than 1 mg/l to 640 mg/l. The higher values are thought to be due to the presence of suspended diesel product in the samples rather than solution products.

The detected presence of low levels of metals in the groundwater of wells W-4, W-6A, and W-7 does not warrant remediation of the groundwater because these trace metals detections are thought to be due to the presence of the tar paper material in the fill. As stated before, this material is present in the fill on a regional scale. The other five site wells exhibit no other significant metals levels. The presence of high concentrations of unidentified organic material of well W7 is due in part to the high level of suspended organic material in the sample. The unidentified organic compound(s) are thought to be from the tar paper material in the fill, a condition which is once again, regional in scale.

A resampling of the diesel tank excavation groundwater is recommended. The new sample should be split and tested both unfiltered and after filtration through a 0.45 micron filter. A determination can be made as to the actual concentration of soluble fuel products (BTX isomers) in the groundwater of the excavation.

Planning and Construction Considerations

Based on the results of the environmental assessment of the Nielsen property to date, the following general guidelines for site development are suggested. First, due to the presence of oil and fuel residue in the shallow soil over significant sections of the site and due to the random nature of the site fill, unnecessary pavement removal, and soil exposure and removal should be avoided. Second, construction procedures or details which may require the dewatering of excavations due to groundwater seepage should be avoided, as the quality of the site groundwater in relation to disposal criteria is questionable. Third, the tar paper fill materials may be quite compressible. A deep foundation system or the removal and replacement of the fill materials below spread footings may be necessary. Consultation with a qualified geotechnical engineer is recommended. Fourth, air quality monitoring should be undertaken during both remedial excavations and other excavations for foundation purposes. Last, the presence and decomposition of the organic material in the fill may result in the out-gassing or generation of organic vapors. If the footprint of the anticipated structures falls over such fill, measures should be taken in the form of an enhanced vapor barrier and vapor collection system to allow for the escape of this gas from beneath the building floor slab.

TABLE 1

SUMMARY OF FIELD INVESTIGATIONS

Item	Number	Location Description	Objective	Approx. Total Depth (ft.)	Approx. Well Screen Interval (ft.)
Ground-Water Well	W1	At antifreeze and motor oil drum storage area.	Check for spillage to shallow soil at drum storage.	13	3 to 13
	W2	Approx. 50 ft. WSW (i.e., down-gradient*) of diesel tank.	Check for shallow soil contamination and ground water quality down-gradient of diesel tank.	13.5	3.5 to 11.5
	W3	ENE (up-gradient*) of gasoline tank at eastern property line.	Check for shallow soil contamination and ground water quality at up-gradient side of site.	13.5	3.5 to 13.5
	W4	Approx. 30 ft. WSW (i.e., down-gradient*) of lube and waste oil tanks.	Check for shallow soil contaminations and ground water quality down-gradient of oil tanks.	13	5 to 13
	W5	Approx. 50 ft. WSW (i.e., down-gradient*) of diesel tank.	Drill hole abandoned due to well destruction difficulties. See W5A.	16	--
	W5A	Approx. 30 ft. WSW (i.e., down-gradient*) of gasoline tank.	Check for shallow soil contamination and ground water quality down-gradient of gasoline tank.	11.5	2.5 to 11.5
	W6	At western property line approx. WSW (i.e., down-gradient*) of gasoline manifold.	First well drilled. Abandoned due to tar paper fill in profile.	15	--
	W6A	About 40 ft. east of western property line, and approx. WSW (i.e., down-gradient*) of gasoline manifold.	Check for shallow soil contamination and general down-gradier water quality.	14	3.5 to 13.5

TABLE 1 (Cont.)

SUMMARY OF FIELD INVESTIGATIONS

Item	Number	Location Description	Objective	Approx. Total Depth (ft.)	Approx. Well Screen Interval (ft.)
	W7	At western side of site approx. 70 ft. from southern property line.	Check for shallow soil contamination and general down-gradient water quality.	12.5	2 to 12
	W8	Approx. 15 ft. west of eastern property line, and approx. 300 ft. south of Nielsen property in Marketplace parking lot.	Check for shallow soil contamination and ground water quality at up-gradient of site.	13	3 to 13
Shallow Borings with Vadose Zone Wells					
	B2	In open area of parking lot, approx. 60 ft. south of dock facility.	Open area vadose zone air sampling point	4	1 to 4
	B3	At tar seep and beneath former location of Pabco tanks.	Check shallow soil for tar or tar product contamination.	6.5	1 to 4
	B4	15 ft. SW of oil sump (See B1).	Check for sump leakage. Vadose monitoring of shallow soil of repair shop apron.	4	1 to 4
Shallow Borings					
	B1	Approx. 4 ft. south of oil/water separator sump.	Check for sump leakage.	4	--
	B5	Approx. 190 ft. south of dock facility in low area of parking lot.	Check low area for accumulation of oils and metals in shallow soil.	5	--

TABLE 2

SUMMARY OF SOIL TESTING

Well or Boring	Sample and Tube Number	Approx. Depth	Sample Description	Test Objective	Tests Performed
W1	1-4	1-1.5	Gravelly Sand Fill (SW)	Check lube oil, antifreeze and solvents at site.	EPA 624 TPH by IR Ethylene Glycol Select Metals
W2	2-4	4-4.5	Silty Clay Fill (CL) [Oily Odor]	General check for PCB and metals site fill. TPH and EPA 624 to check for accumulation of oils, fuel residue, or volatiles in shallow soil.	EPA 624 TPH by IR PCB Metals
W2	4-3	9-9.5	Sand (SP) [Black, strong petroleum odor]	Check for diesel.	Fuel Hydrocarbons
W3	1-4	2.5-3	Silty Clay Fill (CL)	General check for PCB and metals in site fill. TPH by IR to check for accumulation of oil/fuel residue in shallow fill.	TPH by IR PCB Select Metals
W4	1-4	2-2.5	Silty Clay Fill (CL) Oily odor	General check for PCB and metals in site fill. TPH by IR to check for accumulation of oil/fuel residue in shallow fill.	TPH by IR PCB Select Metals
W4	1-2	1-1.5	Clayey Sand Fill (SC) [Oily odor]	Check for organic priority pollutants in clayey sand backfill beneath pavement of site.	EPA 624 EPA 625 TPH by IR
W5	2-3	4.5-5	Clayey Silt/Silty Clay (ML/CL)	General check of metals and PCB in fill. TPH by IR to check for accumulation of oil/fuel residue in shallow fill.	TPH by IR PCB Select metals
W6A	2-4	4-4.5	Silty Clay Fill (CL) with tar and wood fragments	General check of metals and PCB in fill. TPH by IR as indicator of heavier hydrocarbons in fill.	TPH by IR PCB Select metals

TABLE 2

SUMMARY OF SOIL TESTING

Well or Boring	Sample and Tube Number	Approx. Depth	Sample Description	Test Objective	Tests Performed
W8	1-4	2.5-3	Silty Sand (SM) [Strong kerosene-like odor]	General check of metals and PCB in fill.	PCB Select Metals
W8	3-4	6.5-7	Silty Clay (CL) [Strong kerosene-like odor]	Check for moderate molecular weight hydrocarbons.	Fuel Hydrocarbons
B3	2-4	3-3.5	Silty Clay Fill (CL) [Strong tar odor]	Check for priority pollutant content of tarry materials at tar seep location.	EPA 624 EPA 625 Metals
B5	1-3	1.5-2	Silty Clay Fill (CL) [Strong tar odor]	General check for metals and PCB in fill. EPA 624 and TPH by IR to check for accumulation of oil, fuel residue or volatiles in shallow fill beneath low area of parking lot.	EPA 624 TPH by IR PCB Select Metals

Table 3

SUMMARY OF WELL DEVELOPMENT AND SAMPLING

Well No	Development Date	Sampling Date	Total Water Extracted (gallons)	pH	Spec.[a] Cond. (μmhos/cm)	Temperature (°C)	Comments	Ground-water Testing Objective	Tests Performed
W1	4-13	4-13	19	6.9	1600	18	Water greenish-tan, moderate turbidity, slight unidentified odor. Very slow recharge, repeatedly bailed dry.	Check for lube oil, antifreeze, volatiles, and metals.	TPH by IR EPA 624 Ethylene Glycol Select Metals
W2	4-15	4-15	85	-	2900	19	Water black, moderate turbidity, diesel odor.	Check for diesel, oil, volatiles, and metals.	TPH by IR Fuel Hydrocarbon EPA 624 Metals
W3	4-9, 4-14	4-15	44[b]	6.7	400	18	Water brown, high turbidity, no odor. Very slow recharge, repeatedly bailed dry.	General check of groundwater quality ESE (i.e., upgradient) of site[d].	EPA 624 EPA 625 Wastewater Metals
W4	4-14	4-14	44	6.5	1600	19	Water brown, very high turbidity, oily odor. Slow recharge, repeatedly bailed dry.	Check for oil, volatiles, and metals.	TPH by IR EPA 624 Select Metals
W5A	4-9	4-19	120	-	1600	18	Water greenish-gray, medium to low turbidity.	Check for gasoline, volatiles, and metals.	EPA 624 Fuel Hydrocarbons Select Metals
W6A	4-13	4-16	56	6.6	4200	16	Water black, medium to high turbidity, tarry odor.	As for W5A.	EPA 624 Fuel Hydrocarbons Select Metals
W7	4-15,16	4-16	45	-	4800[c]	19	Water dark gray to black, high turbidity, tar or diesel odor.	General check of groundwater quality WSW (i.e., downgradient)[d] of site.	EPA 624 EPA 625 Wastewater Metal

Table 3 (Cont.)

SUMMARY OF WELL DEVELOPMENT AND SAMPLING

Well No	Development Date	Sampling Date	Total Water Extracted (gallons)	pH	Spec.[a] Cond. (μmhos/cm)	Temperature (°C)	Comments	Testing Objective	Tests Performed
W-8	4-16,17	4-17	51	6.7	1100	19	Water lt. green/brown with brown floating product, moderate turbidity, very strong solvent odor.	General check of groundwater quality at south end of North Marketplace parcel.	EPA 624 EPA 625 Select Metals
B5M	-	4-16	<1	-	-	-	Black floating fluid sample.	Check priority pollutant and metals content of floating product; identify.	EPA 624 EPA 625 Metals
							Water sample removed from beneath floating layer.	Check groundwater quality below floating product.	EPA 624 EPA 625 Select Metals

a Rounded to nearest hundred.
b At completion of development.
c Parameter showing some variation at end of development.
d Groundwater flow direction was estimated from earlier data for the Marketplace and an adjacent site. Wells to be "up-gradient" and "down-gradient" of site features of concern were located use this estimated flow direction prior to commencement of field work.

TABLE 4A

SUMMARY OF CHEMICAL TEST RESULTS
SOIL SAMPLES

	W1-1-4	W2-2-4	W2-4-3	W3-1-4	W4-1-4	W4-1-2	W5-2-3	W6A-2-4	W8-1-4	W8-3-4	B3-2-4	B5-1-3	TTLC	STLC
DEPTH (FT)	1-1.5	4-4.5	9-9.5	2.5-3	2-2.5	1-1.5	4.5-5	4-4.5	2.5-3	6.5-7	3-3.5	1.5-2	--	--
ANTIMONY (ppm)	--	(10.00	--	(10.00	--	--	--	--	--	--	(10.00	--	500.00	15.00
ARSENIC (ppm)	--	(0.02	--	7.00	--	--	--	--	--	--	3.30	--	500.00	5.00
BERYLLIUM (ppm)	--	(0.02	--	0.20	--	--	--	--	--	--	0.64	--	75.00	0.75
CADMIUM (ppm)	--	(0.02	--	0.40	--	--	--	--	--	--	(0.20	--	100.00	1.00
CHROMIUM (ppm)	20.00	25.00	--	18.00	6.80	--	NR	13.00	26.00	--	20.00	39.00	2500.00	560.00
COBALT (ppm)	--	10.00	--	11.00	--	--	--	--	--	--	25.00	--	8000.00	80.00
COPPER (ppm)	--	22.00	--	170.00	--	--	--	--	--	--	28.00	--	25000.00	25.00
LEAD (ppm)	130.00	11.00	--	360.00	460.00	--	69.00	140.00	52.00	--	33.00	380.00	1000.00	5.00
MERCURY (ppm)	--	0.03	--	0.16	--	--	--	--	--	--	0.04	--	20.00	0.20
NICKEL (ppm)	34.00	29.00	--	37.00	49.00	--	18.00	32.00	26.00	--	45.00	71.00	2000.00	20.00
SELENIUM (ppm)	--	0.40	--	(0.2	--	--	--	--	--	--	(0.20	--	100.00	1.00
SILVER (ppm)	--	(1.00	--	(1.0	--	--	--	--	--	--	(1.00	--	500.00	5.00
THALLIUM (ppm)	--	7.00	--	5.00	--	--	--	--	--	--	7.00	--	700.00	7.00
ZINC (ppm)	120.00	41.00	--	260.00	760.00	--	50.00	570.00	52.00	--	7.00	220.00	5000.00	250.00
PCB by GC (ppm)		(0.05	--	(0.05	(0.05	--	(0.05	(0.05	(0.05	--	--	(0.05	50.00	5.00
TPH by IR (ppm)	78.00	(50.00	--	(50.00	650.00	160.00	(50.00	170.00	--	--	--	570.00	--	--
TPH by 8015 (ppm)	--	--	(10.00	--	--	--	--	--	--	130.00	--	--	--	--
ETH. GLYCOL	(10	--	--	--	--	--	--	--	--	--	--	--	--	--
EPA 8240	YES	--	--	--	--	YES	--	--	--	--	YES	YES	--	--
EPA 8270	--	--	--	--	--	YES	--	--	--	--	YES	--	--	--

TABLE 4B

RESULTS OF PURGEABLE PRIORITY POLLUTANT TESTS (EPA 8240)
SOIL SAMPLES

	W1-1-4	W4-1-2	B3-2-4	B5-1-3
PRIORITY POLLUTANTS (ppm):				
TOLUENE	---	0.7	---	---
SEMI-QUANTIFIED RESULTS (ppm):				
C7H14	---	---	---	2
DETECTION LIMITS (ppm):				
ACROLEIN	2	2	2	2
ACRYLONITRILE	2	2	2	2
BENZENE	---	1	1	1
METHYL CLORIDE	---	1	1	1
ALL OTHERS	0.2	0.2	0.2	0.2

TABLE 4C

RESULTS OF EXTRACTABLE PRIORITY POLLUTANT TESTS (EPA 8270)
SOIL SAMPLES

	W4-1-2	B3-2-4
PRIORITY POLLUTANTS (ppm):		
CHRYSENE	---	2
FLUORANTHENE	---	6
PHENANTHRENE	---	6
PYRENE	---	6
SEMI-QUANTIFIED RESULTS (ppm):		
A COMPLEX MATRIX	---	6000
DETECTION LIMITS (ppm):		
2,4-DINITROPHENOL	10	20
4-NITROPHENOL	20	40
BIS(2-ETHYLHEXYL)PHTHALATE	100	200
BENZIDINE	40	80
ALL OTHERS	1	2

TABLE 5A

SUMMARY OF CHEMICAL TEST RESULTS

GROUNDWATER AND FLOATING PRODUCT

SAMPLES

	W-1	W-2	W-3	W-4	W-5A	W-6A	W-7	W-8	BLANK	B-5M	B-5 OIL	D W STD.
pH	--	--	--	--	--	--	6500	1300	--	--	--	--
Sp. Cond. mhos/cm	--	--	--	--	--	--	6.5	6.4	--	--	--	--
ANTIMONY (ppm)	--	(0.1	(0.1	--	--	--	(0.1	--	--	--	(10	--
ARSENIC (ppm)	--	0.006	0.002	--	--	--	0.016	--	--	--	7.1	0.05
BERYLLIUM (ppm)	--	(0.01	(0.01	--	--	--	(0.01	--	--	--	(1	--
CADMIUM (ppm)	--	(0.01	(0.01	--	--	--	(0.01	--	--	--	(0.2	0.01
CHROMIUM (ppm)	0.050	(0.02	(0.02	0.110	(0.02	0.020	0.080	(0.02	--	(0.02	4.3	0.05
COBALT (ppm)	--	(0.05	(0.05	--	--	--	(0.05	--	--	--	23.0	--
COPPER (ppm)	--	(0.02	(0.02	--	--	--	0.160	--	--	--	6.6	1.00
LEAD (ppm)	0.004	(0.001	(0.001	0.002	(0.1	0.100	0.700	(0.1	--	(0.1	49.0	0.05
MERCURY (ppm)	--	0.0003	0.0002	--	--	--	0.0017	--	--	--	(0.01	0.002
NICKEL (ppm)	(0.05	(0.05	(0.05	0.150	(0.05	(0.05	0.200	(0.05	--	(0.05	40.0	--
SELENIUM (ppm)	--	(0.001	(0.001	--	--	--	(0.001	--	--	--	(1	0.01
SILVER (ppm)	--	(0.01	(0.01	--	--	--	(0.01	--	--	--	(1	0.05
THALLIUM (ppm)	--	(0.1	(0.1	--	--	--	0.100	--	--	--	27.0	--
ZINC (ppm)	0.020	0.030	(0.01	0.130	1.200	2.100	0.970	3.600	--	(0.01	3.0	5.00
PCB by GC (ppm)	--	--	--	--	--	--	--	--	--	--	--	--
TPH by IR (ppm)	(5.0	(5.0	--	(5.0	--	--	--	--	--	--	--	--
TPH by 8015 (ppm)	--	(1 (DIES)	--	--	(1.0	(1.0	--	--	--	--	--	--
ETH. GLYCOL	1.000	--	--	--	--	--	--	--	--	--	--	--
EPA 624	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	--
EPA 625	--	--	YES	--	--	--	YES	YES	--	YES	YES	--
WASTEWATER	--	--	YES	--	--	--	YES	--	--	--	--	--

NOTE: D W STD. = FEDERAL DRINKING WATER STANDARDS (40CFR 141 AND 143, 1986)

TABLE 5B

RESULTS OF PURGEABLE PRIORITY POLLUTANT TEST (EPA 624) GROUNDWATER AND FLOATING PRODUCT SAMPLES

	W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8	BLANK	B-5M	B-5 OIL
											(ppm)
PRIORITY POLLUTANTS: TOLUENE (ppb)	<1	80	<1	<1	<10	<10	<20	<100	1	<1000	<2
											(ppm)
SEMI-QUANTIFIED RESULTS (ppb):											
C10H20	---	---	---	---	---	---	---	---	---	---	30
C7H14	---	---	---	---	---	---	---	---	---	---	10
C8H16	---	---	---	---	---	---	---	---	---	---	10
C9H16	---	---	---	---	---	---	---	---	---	---	30
C9H18	---	---	---	---	---	---	---	---	---	---	20
XYLENE ISOMERS	---	---	---	---	---	---	---	---	---	---	6
FREON 113	---	40	---	---	---	---	---	---	---	---	---
											(ppm)
DETECTION LIMITS (ppb):											
ACROLEIN	10	200	10	10	100	100	200	1000	10	10000	20
ACRYLNITRILE	10	200	10	10	100	100	200	1000	10	10000	20
METHYLENE CHLORIDE	1	20	1	1	50	50	100	100	5	1000	2
ALL OTHERS	1	20	1	1	10	10	20	100	1	1000	2

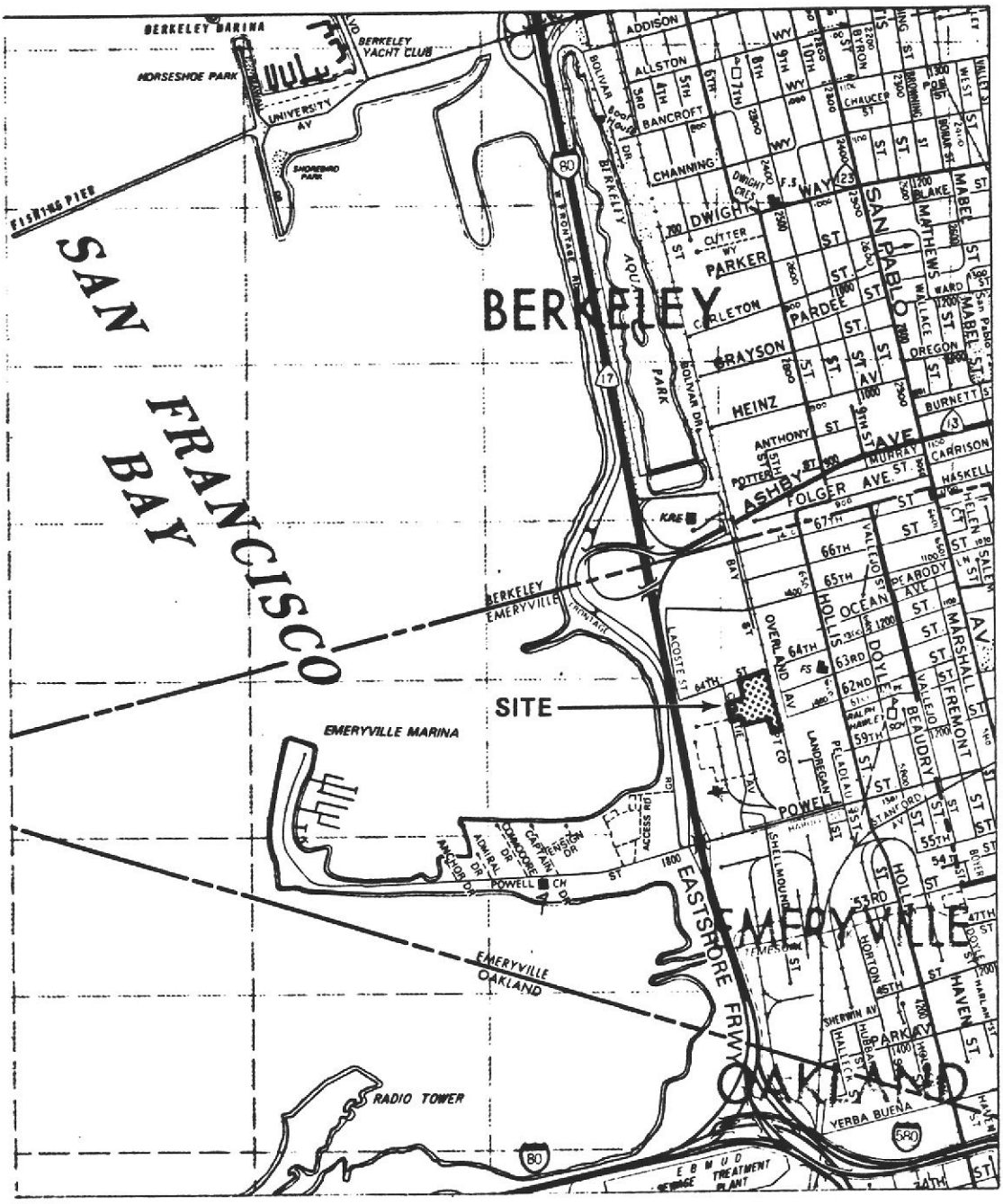
TABLE 5C

RESULTS OF EXTRACTABLE PRIORITY POLLUTANT TEST (EPA 625)
GROUNDWATER AND FLOATING PRODUCT SAMPLES

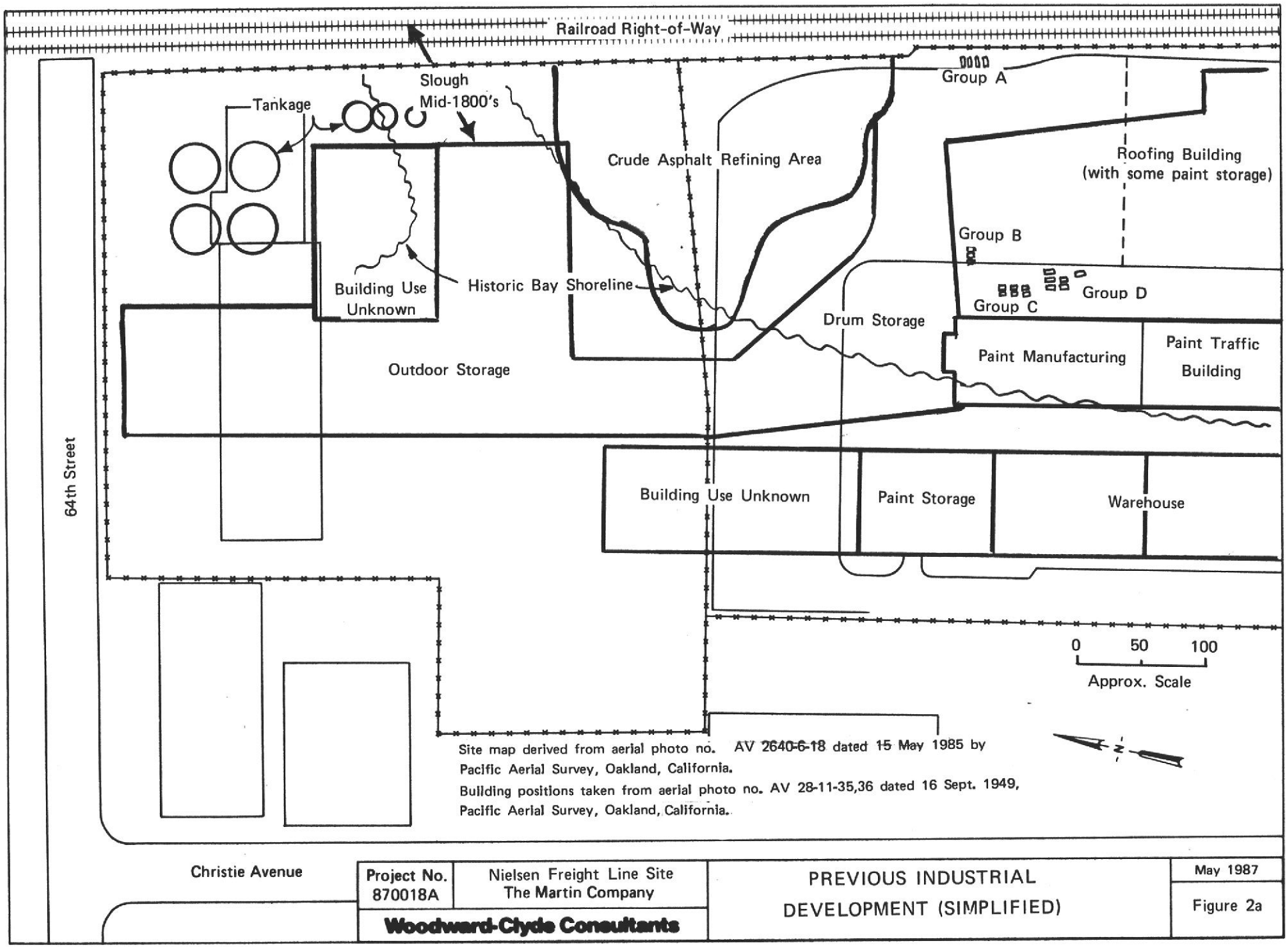
	W-3	W-7	W-8	B-5	B-5 OIL
PRIORITY POLLUTANTS (ppb):					(ppm)
ACENAPHTHENE	--	--	4	--	--
BENZO(a)ANTHRACENE	--	--	2	--	--
BENZO(b)FLUORANTHENE	--	--	1	--	--
BENZO(k)FLUORANTHENE	--	--	1	--	--
CHRYSENE	--	--	2	5	170
FLUORENE	--	--	9	18	170
FLUORANTHENE	--	--	4	--	--
NAPHTHALENE	--	--	30	--	--
PHENANTHRENE	--	--	5	--	440
PYRENE	--	--	5	--	--
SEMI-QUANTIFIED RESULTS (ppb):					(ppm)
C10H12	--	--	30	--	--
C1-NAPHTHALENE	--	--	50	--	--
C2-NAPHTHALENE	--	--	40	100	--
C2-PHENEANTHRENE	--	--	--	--	3000
C3-BENZENE	--	--	60	--	--
C8-C35 HYDROCARBONS	--	--	--	--	900000
C9-C35 HYDROCARBONS	--	--	10000	--	--
BUTANOIC ACID	--	400	--	--	--
HEXANOIC ACID	--	300	--	--	--
PENTANOIC ACID	--	200	--	--	--
PROPANOIC ACID	--	1000	--	--	--
UNIDENTIFIED MATRIX	--	40000	--	--	--
A COMPLEX MATRIX	--	--	--	90000	--
DETECTION LIMITS (ppb):					(ppm)
2,4-DINITROPHENOL	20	20	10	20	1000
4-NITROPHENOL	40	40	20	40	2000
BIS(2-ETHYLHEXYL)PHTHALATE	200	200	100	200	10000
BENZIDINE	80	80	40	80	4000
ALL OTHERS	2	2	1	2	100

TABLE 5D
RESULTS OF WASTE WATER ANALYSES
GROUNDWATER SAMPLES

PARAMETERS (mg/L)	W-3	W-7
ALKALINITY		
CARBONATE ALK (as CaCO3)	<1.0	<1.0
BICARBONATE ALK (asCaCO3)	210	1740
HYDROXIDE ALK (as CaCO3)	<1.0	<1.0
TOTAL ALKALINITY (as CaCO3)	210	1740
CHLORIDE	18	1290
MAGNESIUM	15	68
NITRATE (as N)	1.0	<0.10
NITRITE (as N)	<0.01	<0.01
AMMONIA NITROGEN	0.66	51
TOTAL KJELDAHL NITROGEN	0.66	63
TOTAL PHOSPHOROUS (as P)	0.71	4.7
POTASSIUM	1.7	56
SILICA (as SiO2)	50	72
SODIUM	53	800
SULFATE	57	37
CALCIUM	18	210
FLUORIDE	0.33	1.3
FILTERABLE RESIDUE (TDS)	370	3070
TURBIDITY, NTU	130	300
pH, UNITS	6.7	6.5
SPECIFIC CONDUCTANCE, mhos/cm	520	6500



Project No. 8710018A	Nielsen Freight Line Site The Martin Company	SITE LOCATION	May 1987 Figure 1
Woodward-Clyde Consultants			



Project No. 870018A	Nielsen Freight Line Site The Martin Company	PREVIOUS INDUSTRIAL DEVELOPMENT (SIMPLIFIED)	May 1987
Woodward-Clyde Consultants			Figure 2a

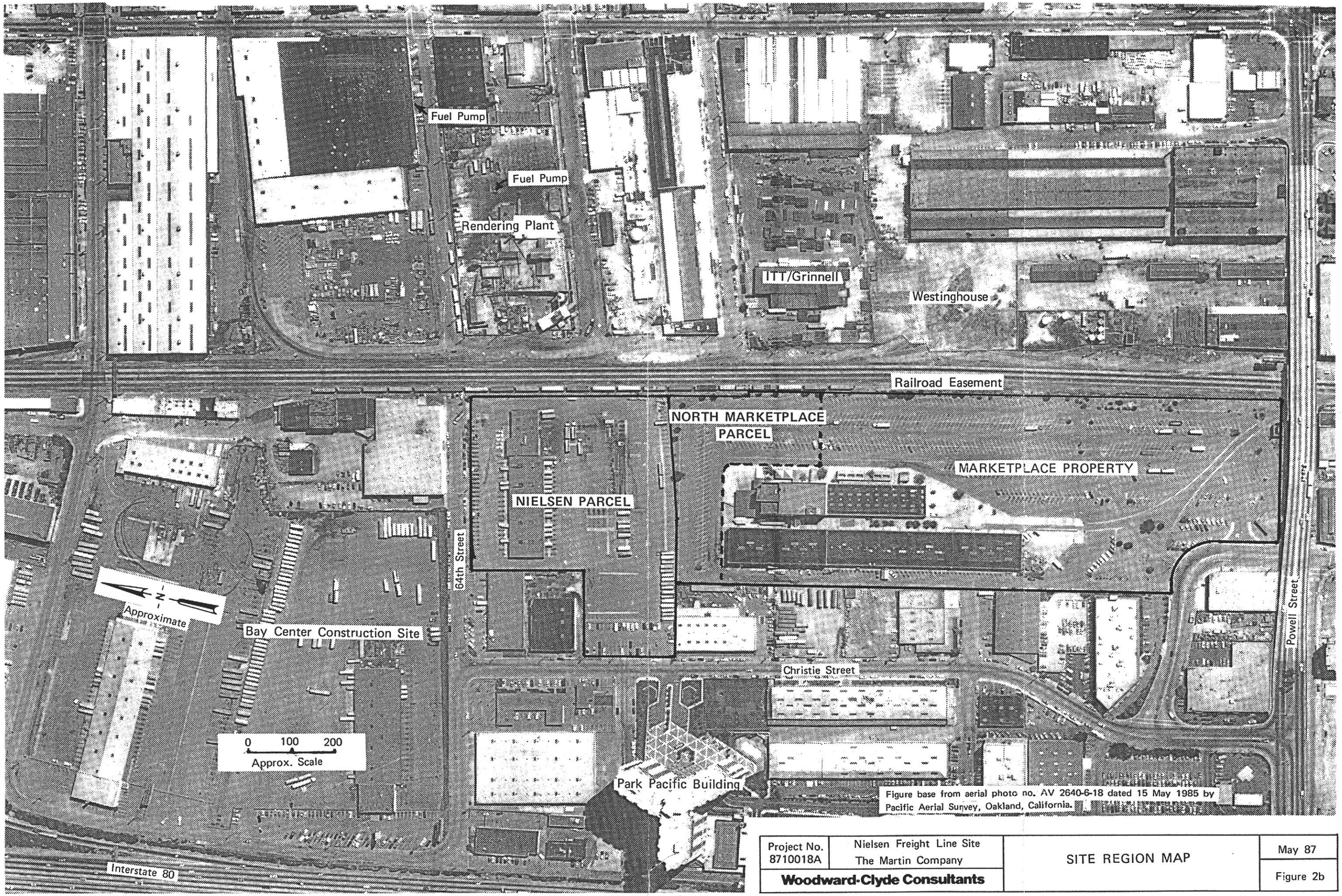
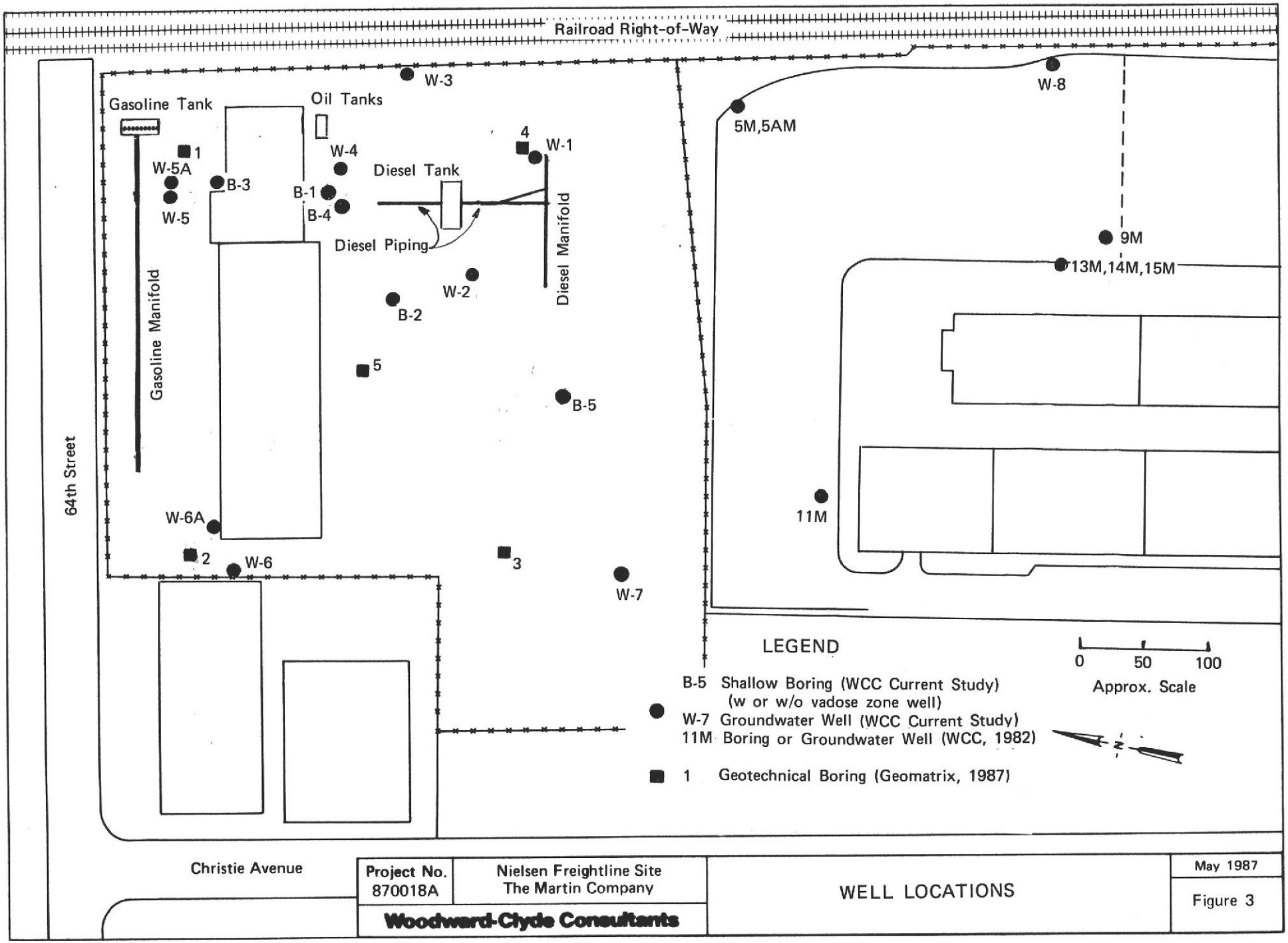
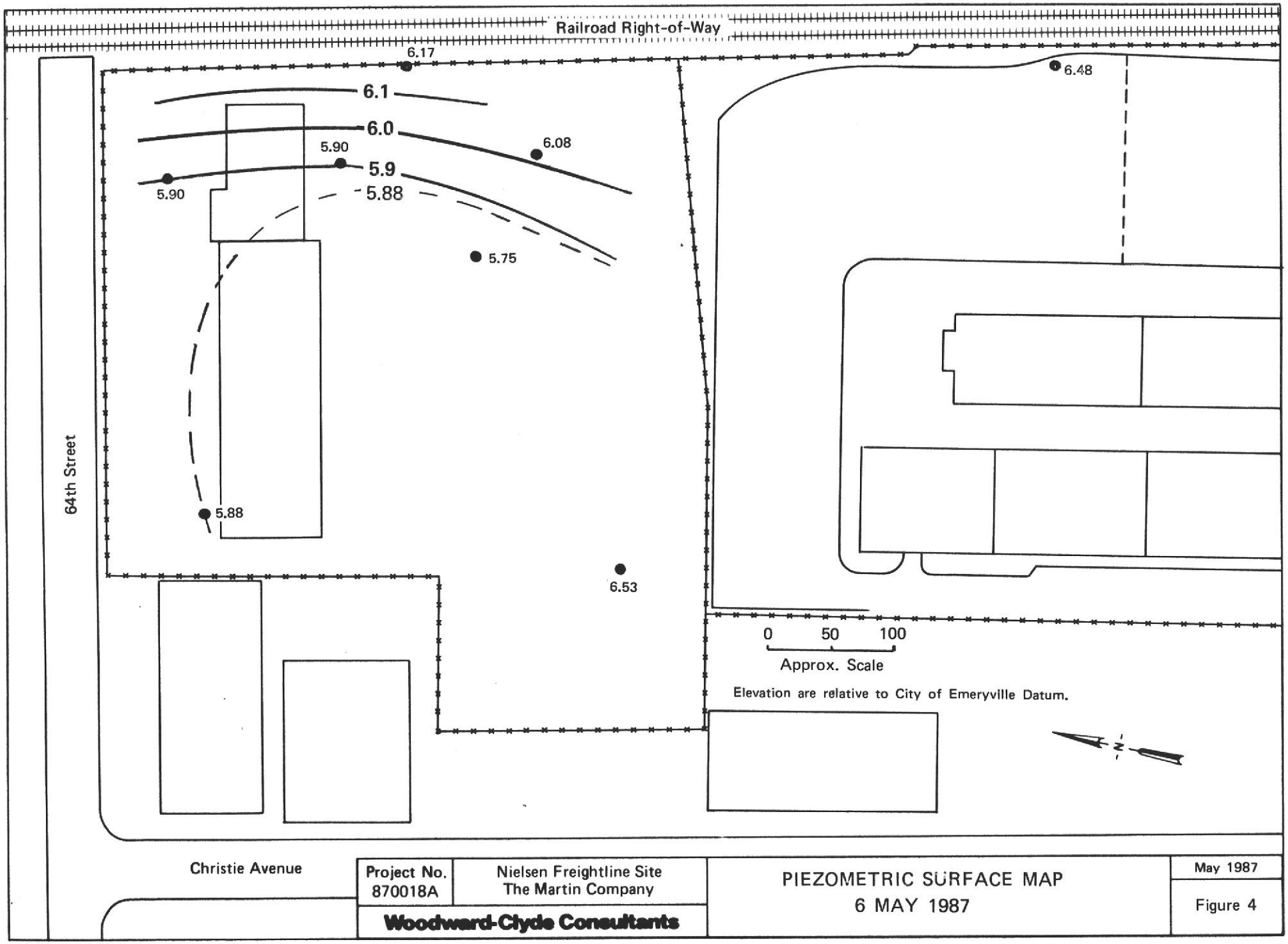


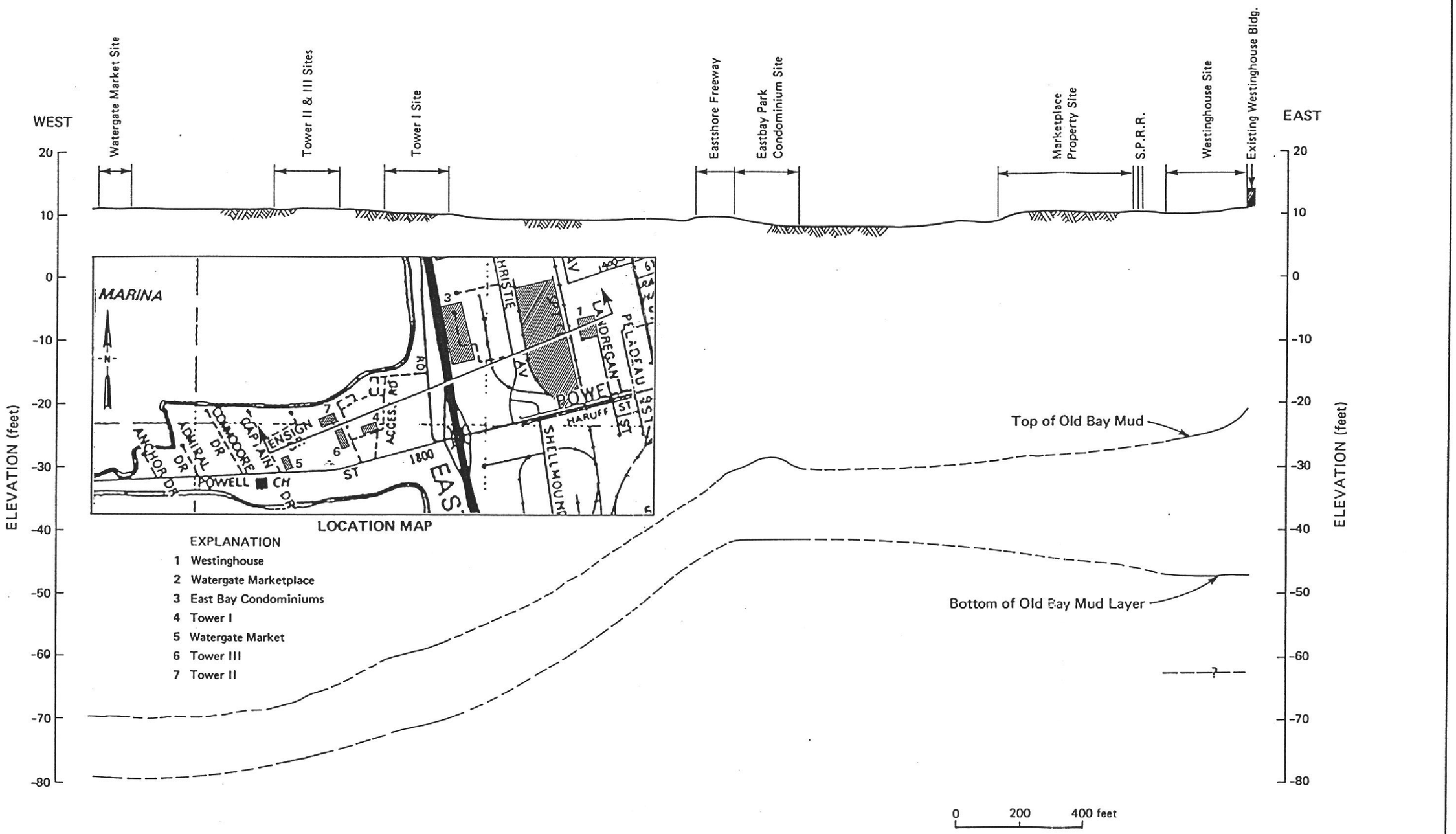
Figure base from aerial photo no. AV 2640-6-18 dated 15 May 1985 by Pacific Aerial Survey, Oakland, California.

Project No. 8710018A	Nielsen Freight Line Site The Martin Company	SITE REGION MAP	May 87
Woodward-Clyde Consultants			Figure 2b


Railroad Right-of-Way
W-3
W-8
Gasoline Tank
Oil Tanks
5M,5AM
4
W-1
1
W-4
W-5A
B-3
B-1
Diesel Tank
W-5
B-4
Diesel Piping
Diesel Manifold
9M
13M,14M,15M
Gasoline Manifold
W-2
B-2
5
B-5
64th Street
11M
W-6A
2
W-6
3
W-7
LEGEND
0
50
100
Approx. Scale
B-5 Shallow Boring (WCC Current Study)
(w or w/o vadose zone well)
W-7 Groundwater Well (WCC Current Study)
11M Boring or Groundwater Well (WCC, 1982)
1 Geotechnical Boring (Geomatrix, 1987)
Christie Avenue
Project No.
870018A
Nielsen Freightline Site
The Martin Company
Woodward-Clyde Consultants
WELL LOCATIONS
May 1987
Figure 3



Project No. 870018A	Nielsen Freightline Site The Martin Company	May 1987
Woodward-Clyde Consultants	PIEZOMETRIC SURFACE MAP 6 MAY 1987	Figure 4



NOTES:

1) Elevations correspond to Emeryville city datum
2) Ground surface elevations based on boring logs

IDENTIFIED PRESENCE OF OLD BAY MUD

Project No. 8710018A	The Martin Company Nielsen Freightline Site	Figure 5
Woodward-Clyde Consultants		

REFERENCES

California Administrative Code, 1986. Title 22, Chapter 30.

California State Water Resources Control Board, 1985. Resolution No. 85-26: Adoption of Interim Guidance for Hazardous Substance Site Cleanup.

Code of Federal Regulation, 1986. Title 40, Part 141 and 143.

Geomatrix Consultants, 1987. Logs of Borings, Proposed Home Depot Store, Emeryville. Private Correspondence. April.

Woodward-Clyde Consultants, 1982. Assessment of Subsurface Contaminants, Marketplace Property, Emeryville, California. Consultant report prepared for Equity Financial and Management Company. May.

Woodward-Clyde Consultants, 1985. Report on Investigations and Recommended Remedial Measures, Westinghouse Property, Emeryville, California. Consultant report prepared for Westinghouse Electric Corporation. April.

Woodward-Clyde Consultants, 1987. Second Draft Recommendation for Underground Storage Tank Closure, Former Nielsen Freight Lines Facility, Emeryville, California. Consultant report prepared for The Martin Company. August.

Project : Home Depot - Emeryville	Log of Boring No. B-1

Date Drilled: 4-8-87 Remarks: Immediately adjacent to oil sump

Type of Boring: 6" Solid

Hammer: 140 lb 2" California Sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
	1-4	14	150	CONCRETE Silty Sand (SM), moist, poorly compacted, occasional gravel to 0.75", dark brown, strong odor. Saturated with dark black/brown oily fluid in hole.
5				Bottom of boring at 4 feet.
10				
15				
20				
25				
30				

Project: 8710018A Woodward-Clyde Consultants Figure

Project : Home Depot - Emeryville

Log of Boring No. B-2

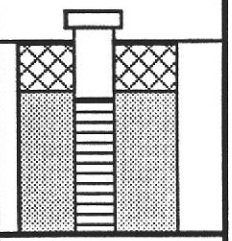
Date Drilled: 4-8-87

Remarks: Vadose zone well, 100 ft south of Bay 9

Type of Boring: 6" solid

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
	1-4	30	1	3" Asphalt Concrete Gravelly Sand (SW), moist, loose, gravel to 2", brown, no odor
	2-3	14	30	Silt (ML), moist, poorly compacted fill, gravel to 0.75", gray-green, strong tar odor, underlain by tar & wood Tar Material
5				Silty Sand (SM), moist, poorly compacted, tan
				Bottom of boring at 4 feet.
10				
15				
20				
25				
30				



Bentonite pellet seal

No. 3 Sand

Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. B-3

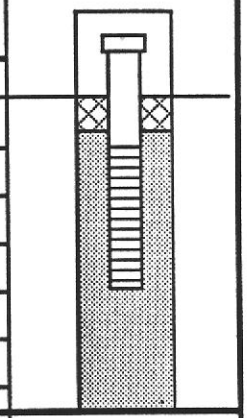
Date Drilled: 4-8-87

Remarks: Tar seep north of shop.

Type of Boring: 7" hollow, 3.25" I.D.

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				4" asphalt concrete
	NR	R		Gravelly Sand Fill (SW), medium dense, with gravel to 3.5", dark brown, slight oily odor. Tar layer 2' to 2.5'
	2-4	R	1	Silty Clay Fill (CL), moist, medium stiff, mottled grayish green with rust color
				Wood block or slab at 3.25', strong tar odor, HNu value for wood = 5 ppm
	3-4	R		
5	4-3		40	Gravelly Sand Fill (SW), moist, dense, light gray, strong tar odor
	4-4	3	2	Silt (ML), moist, very loose fill, soft, dark brown, oily odor
				Bottom of boring at 6.5 feet
				R = REFUSAL
10				
15				
20				
25				
30				



Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. B-4

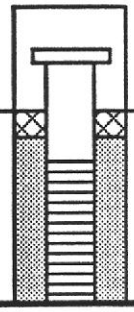
Date Drilled: 4/8/87

Type of Boring: 6" solid

Hammer: 140 lb 2" California sampler

Remarks: 15 ft SW of oil sump

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
	1-4	R	1	4" Asphalt Concrete Gravelly Sand Fill (SW), moist, medium dense, brown 8" concrete slab
	2-3 2-4	31	0	Silty Clay (CL), moist, medium soft, dark gray, oily odor Silty Sand (SW), moist, medium dense, light brown, oily odor Gravelly Clay (CL), moist, medium stiff, greenish gray, oily odor
5				Bottom of boring at 4 feet.
				R = Refusal
10				
15				
20				
25				
30				



Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. B-5

Date Drilled: 4-8-87
Type of Boring: 6" solid
Hammer: 140 lb 2" California sampler
Remarks: 300' south of bay 21 at sorface depression

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				3" Asphalt Concrete
	1-3	21	4	Gravelly Sand Fill (SW), moist, loose, green, gravel to 1.5", strong oily odor
	1-4		60	Clay Fill (CL), moist, soft, dark gray, with brick pieces, strong tar odor, tar paper in fourth tube and drive shoe
	2-3	11	5	ATD
	2-4			
5				
10				
15				
20				
25				
30				

Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. W-1

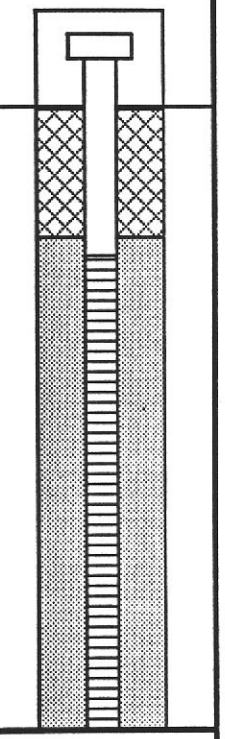
Date Drilled: 4-6-87

Remarks: At Antifreeze Tank Drum Storage Area

Type of Boring: 8" Hollow Auger

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
	1-4	R	50	3" Asphalt Concrete Gravelly Sand Fill (SW), moist, slightly loose, gravel to 2", strong odor
	2-3			Concrete Slab
	2-4	23	20	Gravely Sand Fill (SW), moist, medium dense, strong odor Gravelly Clay Fill (CL), moist, medium stiff, sand to .25", greenish gray, no odor, less gravel with depth
	NR	33		Sand Fill (SP), slightly moist, medium dense, light gray, slight odor
5				6 May 87 Silty Clay (CL), moist, very soft, dark gray, slight odor
	4-3	29	1	Gravely Clay Fill (CL), moist, soft, gray with green sandy particles, gravel to 0.5",
10	4-4		0	grades to
	5-3	22	0	Silty Clay (CL), moist, stiff, mottled geenish gray with rust stains
	5-4			
				Bottom of boring at 13 feet.
15				
20				
25				
30				



Project: 8710018A

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Figure

Project : Home Depot - Emeryville

Log of Boring No. W-2

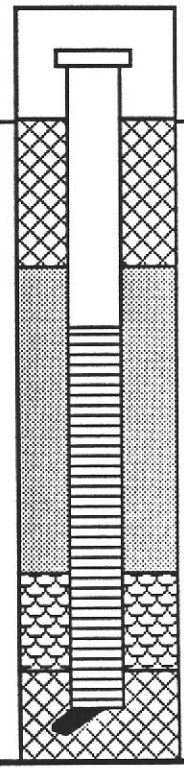
Date Drilled: 4-2-87

Remarks: Southwest of diesel tank.

Type of Boring: 8" Hollow Auguer

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				3" Asphalt Concrete
				Gravelly Sand Fill (SW), moist, light brown
	1-4	R		Sandy Gravel Fill (GW),moist, poorly compacted, green, gravel to 2"
	2-4	15	0	Gravelly Clay Fill (CL), moist, stiff, with dark greenish gray fiberous paper pieces and dark stains, strong oily odor
5				6 May 87 ▼ Silty Clay (CL), moist, stiff, greenish gray with rust and black spots, unidentifiable odor
	NR	22	10	Sand Fill (SP), wet, medium dense, fine grained with wood fibres, black, strong petroleum odor
	4-2		7	
	4-3	13		wire found on bit after drilling to 10'
10		14		
	6-2	35		MIXTURE SP as above and Silty Clay (CL), soft to med stiff, mottled green-brown with root holes and occasional gravel to .75"
15				Sand (SW), wet, dense, grayish green
				Bottom of boring at 13.5 feet
20				
25				
30				



Bentonite
No. 3 Sand
Caved sand
Tape weight

Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

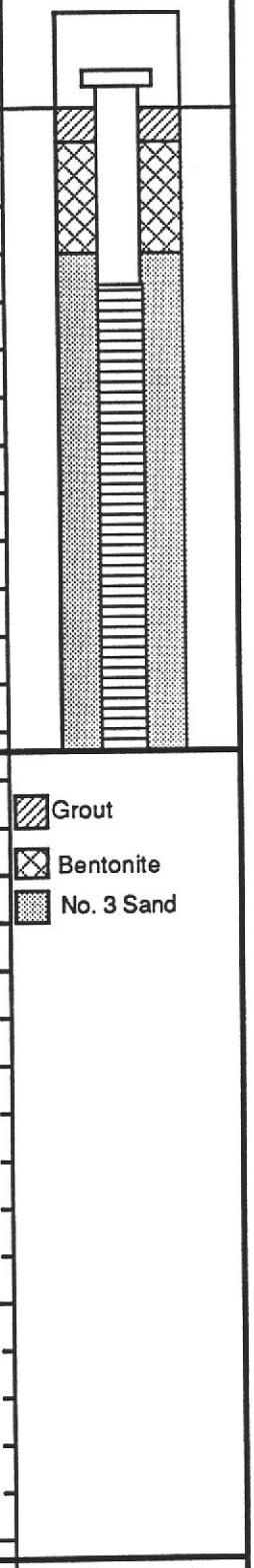
Log of Boring No. W-3

Date Drilled: 4-1-87 Remarks: East fence, upgradient well

Type of Boring: 8" Hollow Auguer

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				3" Asphalt Concrete
	1-3	12	1	Sandy Gravel/Silty Gravel (GW-GM),moist, light brown, sand fine to coarse with gravel to 1.25", very faint oil odor
	1-4		.5	Silty Clay Fill (CL) stiff, moist, brown with green stains, with some medium to coarse sand particles
				Wood chips at interface
5	2-3	4	0	6 May 87
	2-4			Silty Clay (CL), medium stiff, moist, dark brown, with some wood fibres, slightly oily
				No oily odor
10	3-4	14	0	Silty Sand (SM) to Sandy Silt (ML), moist, medium dense/stiff, mottled grayish green and rust colored, gravel to .75", no odor
				grades to Sand (SW) to Silty Sand (SM), wet, medium dense, sand fine to coarse, no odor
	4-3			Sandy Silt (ML), med stiff, moist, grayish green with rust coloration
	4-4	20	0	and black spots, gravel to .4", no odor
15				Bottom of boring at 13'-4"
20				
25				
30				



Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. W-4

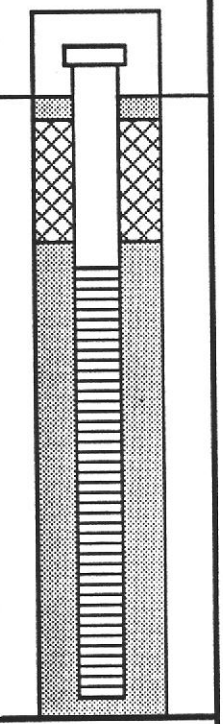
Date Drilled: 4-2-87

Remarks: 30' downgradient of oil tanks

Type of Boring: 8" hollow auguer

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				3" Asphalt Concrete
	1-2	37		Gravely Sand Fill (SP), moist, fine/medium with some gravel to 1" light brown, faint oil odor
	1-4			Clayey Sand (SC), moist, med dense fill, gray, gravel to 1", oily odor
				TAR PAPER
	2-3	9		Silty Clay Fill (CL), very stiff, moist, fiberous paper and brick pieces, oily odor
5	2-4			6 May 87
	3-3	32	0	Silty Clay (CL), moist, Very stiff fill, dark gray, with large particles of rust and green fine sand and occasional gravel to 1", slight oily odor
10				
	4x	16	0	Sandy Silt (ML), wet, very stiff, fine sand, with some medium coarse particles, greenish gray with rust stains
15				Bottom of boring at 13 feet
20				
25				
30				



Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. W-5

Date Drilled: 3-31-87

Remarks: 50' downgradient of gas tank

Type of Boring: 8" hollow auguer

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				2" Asphalt Concrete
				Sandy Gravel Fill (GM), moist at 6", dark brown, fine sand with some clayey material, faint odor
	1-4	24	15	Silty Clay Fill (CL), moist, stiff, dark brown, some gravelly sand
				Silty Sand Fill (SM), moist, loose, black and dark brown, with white and red particles, slight odor
5	2-3 2-4	7	0	Clayey Silt Fill (ML), medium stiff, moist, black, no odor
	3-3 3-4	16	0	... grades to .....
				Silty Clay Fill (CL), stiff, moist, tan-green, with some medium to coarse sand particles,
10	4-3	17	0	Sandy Clay (CL) siff, moist, mottled rust-gray, with rust streaks, fine sand, occasional gravel to .75"
	5-4	33	0	Gravelly Sand (SM/SP), wet, dense, brown, gravel to .75", no odor
15	6-4	20		Silty Clay (CL), moist, stiff, brown with dark brown, no odor, not fill
				Bottom of boring at 16 feet.
20				
25				
30				

Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. W-5A

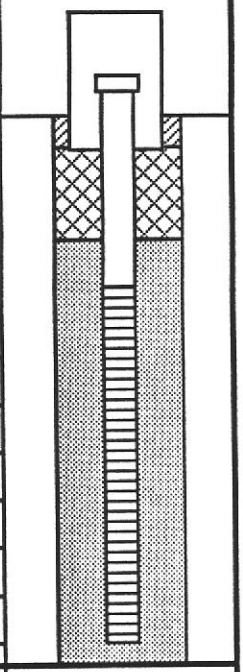
Date Drilled: 3-31-87

Remarks: 40' downgradient of gas tank

Type of Boring: 8" hollow auguer

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				2" Asphalt Concrete
				Clayey Gravel Fill (GC), moist , brown
5	1	4		Sandy Clay Fill (CL), moist, medium stiff, black, fine sand with some medium sand particles and wood fragments, petroleum/ tar odor
				6 May 87
10	2	4		Sandy Clay Fill (CL), wet, medium stiff, greenish-gray, medium and coarse sand with gravel to .75"
				Bottom of boring at 11.5 feet
15				
20				
25				
30				



Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. W-6

Date Drilled: 3-30-87 Remarks: North west of lot

Type of Boring: 8" hollow auguer

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				4" Asphalt Concrete
				Sandy Gravel Fill (GP-GM), dry to moist, brown, with some silt, gravel to 1"
	1-2	12		Silty Clay Fill (CL), moist, medium stiff to soft, light brown Interbedded with Silty Sand Fill (SM), moist, medium dense, light brown, with brick chips
5	2-3	14		Silty Clay (CL), moist, stiff, brown with rust and red particles, gravel to .75", no odor
	3-3			
10	3-4	44		Layers of tar paper, with gray, fine Sand Fill with metal chips and red particles, tar odor
				Paper and tar
	4-3	9	7.5	
15				Silty Clay (CL), moist, stiff with black stains (Bay Mud)
				Bottom of boring at 15 feet.
20				
25				
30				

Project: 8710018A **Woodward-Clyde Consultants** Figure

Project : Home Depot - Emeryville

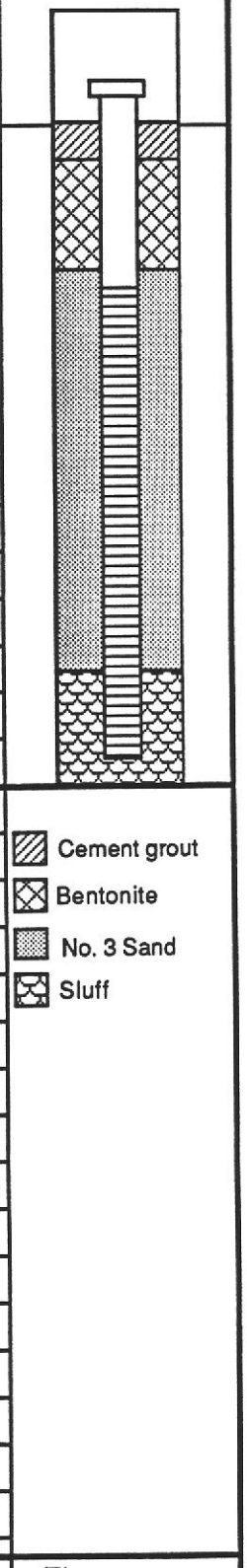
Log of Boring No. W-6A

Date Drilled: 3-30-87 Remarks: North west of lot

Type of Boring: 8" hollow auguer

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				4" Asphalt Concrete
	1X	grab		Silty Sand Fill (SM), dry to moist, brown, gravel to 1"
				} Oily
	2-4	16		Silty Clay Fill (CL), moisl, soft, dark brown mottled with green, with brick chips to 2", tar, charred wood chips and rubber
5				6 May 87
				Gravelly Clay Fill (CL), soft, dark brown, some medium sand, gravel to 1"
10	3-2	21		petroleum / tar odor
				Layers of tar paper, with fill of gray fine sand with metal chips and red particles, tar odor
	4-3	23		Sand Fill (SP), wet, dense, gray, fine to medium, with some shell material, strong tar odor
15				Becomes silty, no odor
				Bottom of boring at 14 feet.
20				
25				
30				



Project: 8710018A **Woodward-Clyde Consultants** Figure

Project : Home Depot - Emeryville

Log of Boring No. W-7

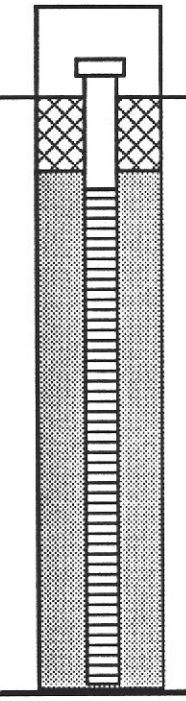
Date Drilled: 4-1-87

Remarks: Downgradient of site

Type of Boring: 8" hollow auguer

Hammer: 140 lb 2" California sampler

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				Surface Elevation:
				3" Asphalt Concrete
				Sandy Gravel Fill (GW/GM), moist, tan-green, no odor
				Silty Sand Fill (SM), moist, med. dense, black, some fine gravel
	1X	16		Clayey Sand Fill (SC), wet, medium dense, tan-green, with some fine gravel and clay zones
				6 May 87
	2-3 2-4	46		
5	3-3 3-4	15		
				Mixture of wood pieces, fiberous paper and gray Sand with red particles, strong tar odor
10	4-2 4-4	15		Silty Clay (CL), medium stiff, wet, mottled green-gray with rust, some sand, no odor
				Bottom of boring 12'-6".
15				
20				
25				
30				



Project: 8710018A

Woodward-Clyde Consultants

Figure

Project : Home Depot - Emeryville

Log of Boring No. W-8

Date Drilled: 4-3-87 Remarks: Market Place parking lot

Type of Boring: 8" hollow auguer

Hammer: 140 lb 2" California sampler

Surface Elevation:

Depth Ft.	Samples	Blows/Ft	H-Nu (ppm)	MATERIAL DESCRIPTION
				3-4" Asphalt Concrete
				Gravelly Sand Fill (SW), dry, medium dense, light brown, no odor, becomes clayey, gray, with slight odor below 1.5'
				Concrete Slab
	1-4	27		Silty Sand Fill (SM), moist, loose, dark grey, strong kerosine odor
	2-2	11		Silty Clay Fill (CL), dense, moist, grey, strong odor, H-Nu at well=70 ppm at breathing level= 7 ppm
				6 May 87
5	3-3	23		
	3-4		170	Silty Clay Fill (CL), moist, dense, green grey mottled with rust color
				Becomes sandy, strong odor
10	4-3	30		
	4-4		10	Gravelly Sand Fill (SW), wet, dense, grey, coarse sand to .25", with brick chips
	5-2	45		Becomes light brown, gravel to 0.5", strong solvent odor
	5-4		1	
				Bottom of boring at 13'.
15				
20				
25				
30				

Christy Box

Bentonite

No. 3 Sand

Project: 8710018A

Woodward-Clyde Consultants

Figure

APPENDIX B

LABORATORY DATA REPORTS - SOIL SAMPLES

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-004

Received: 01 APR 87
Reported: 20 APR 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-004-1	W6A-2-4	
04-004-2	W5-2-3	
04-004-3	W6-2-3	

PARAMETER	04-004-1	04-004-2	04-004-3
Sample Held, Not Analyzed	---	---	HELD
Hydrocarbons by IR, mg/kg	170	<50	---
Chromium, mg/kg	13	04.03.87	---
Lead, mg/kg	140	69	---
Nickel, mg/kg	32	18	---
Zinc, mg/kg	570	50	---
Nitric Acid Digestion, Date	04.10.87	04.10.87	---
Polychlorinated Biphenyls			
Date Extracted	04.07.87	04.07.87	---
Date Analyzed	04.17.87	04.17.87	---
Aroclor 1016, mg/kg	<0.05	<0.05	---
Aroclor 1221, mg/kg	<0.05	<0.05	---
Aroclor 1232, mg/kg	<0.05	<0.05	---
Aroclor 1242, mg/kg	<0.05	<0.05	---
Aroclor 1248, mg/kg	<0.05	<0.05	---
Aroclor 1254, mg/kg	<0.05	<0.05	---
Aroclor 1260, mg/kg	<0.05	<0.05	---
Aroclor 1262, mg/kg	<0.05	<0.05	---
Total PCB's, mg/kg	<0.05	<0.05	---

for

D. A. McLean, Laboratory Director

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-212

Received: 10 APR 87
Reported: 23 APR 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018 A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-212-1	B5-1-3	08 APR 87

PARAMETER	04-212-1
Hydrocarbons by IR, mg/kg	570
Chromium, mg/kg	39
Lead, mg/kg	380
Nickel, mg/kg	71
Zinc, mg/kg	220
Nitric Acid Digestion, Date	04.15.87
Polychlorinated Biphenyls	
Date Extracted	04.14.87
Date Analyzed	04.17.87
Aroclor 1016, mg/kg	<0.05
Aroclor 1221, mg/kg	<0.05
Aroclor 1232, mg/kg	<0.05
Aroclor 1242, mg/kg	<0.05
Aroclor 1248, mg/kg	<0.05
Aroclor 1254, mg/kg	<0.05
Aroclor 1260, mg/kg	<0.05
Aroclor 1262, mg/kg	<0.05
Total PCB's, mg/kg	<0.05

APPENDIX C

LABORATORY DATA REPORTS - GROUNDWATER SAMPLES

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-287

Received: 15 APR 87
Reported: 30 APR 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-287-1	W-1	14 APR 87
04-287-2	W-4	14 APR 87

PARAMETER	04-287-1	04-287-2	
Hydrocarbons by IR, mg/L	<5	<5	
Chromium, mg/L	0.05	0.11	
Lead, mg/L	0.004	0.002	
Nickel, mg/L	<0.05	0.15	
Zinc, mg/L	0.02	0.13	
Nitric Acid Digestion, Date	04.17.87	04.17.87	
Ethylene Glycol, ug/L	1	---	

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-287

Received: 15 APR 87
Reported: 30 APR 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-287-1	W-1	14 APR 87
04-287-2	W-4	14 APR 87

PARAMETER	04-287-1	04-287-2
Purgeable Priority Pollutants	04.23.87	04.23.87
Extraction	<1	<1
1,1,1-Trichloroethane, ug/L	<1	<1
1,1,2,2-Tetrachloroethane, ug/L	<1	<1
1,1,2-Trichloroethane, ug/L	<1	<1
1,1-Dichloroethane, ug/L	<1	<1
1,1-Dichloroethylene, ug/L	<1	<1
1,2-Dichloroethane, ug/L	<1	<1
1,2-Dichloropropane, ug/L	<1	<1
1,3-Dichloropropene, ug/L	<1	<1
2-Chloroethylvinylether, ug/L	<10	<10
Acrolein, ug/L	<10	<10
Acrylonitrile, ug/L	<1	<1
Bromodichloromethane, ug/L	<1	<1
Bromomethane, ug/L	<1	<1
Benzene, ug/L	<1	<1
Chlorobenzene, ug/L	<1	<1
Carbon Tetrachloride, ug/L	<1	<1
Chloroethane, ug/L	<1	<1
Bromoform, ug/L	<1	<1
Chloroform, ug/L	<1	<1
Chloromethane, ug/L	<1	<1
Dibromochloromethane, ug/L	<1	<1
Ethylbenzene, ug/L		

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-287

Received: 15 APR 87
Reported: 30 APR 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-287-1	W-1	14 APR 87
04-287-2	W-4	14 APR 87

PARAMETER	04-287-1	04-287-2
Methylene Chloride, ug/L	<1	<1
Tetrachloroethylene, ug/L	<1	<1
Trichloroethylene, ug/L	<1	<1
Trichlorofluoromethane, ug/L	<1	<1
Toluene, ug/L	<1	<1
Vinyl Chloride, ug/L	<1	<1
trans-1,2-Dichloroethylene, ug/L	<1	<1
trans-1,3-Dichloropropene, ug/L	<1	<1

D. A. McLean, Laboratory Director

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-305

Received: 15 APR 38
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-305-1	W-2	15 APR 87
04-305-2	W-3	15 APR 87

PARAMETER	04-305-1	04-305-2
Beryllium, mg/L	<0.01	<0.01
Cadmium, mg/L	<0.01	<0.01
Chromium, mg/L	<0.02	<0.02
Copper, mg/L	<0.02	<0.02
Lead, mg/L	<0.001	<0.001
Nickel, mg/L	<0.05	<0.05
Silver, mg/L	<0.01	<0.01
Thallium, mg/L	<0.1	<0.1
Zinc, mg/L	0.03	<0.01
Antimony, mg/L	<0.1	<0.1
Arsenic, mg/L	0.006	0.002
Selenium, mg/L	<0.001	<0.001
Mercury, mg/L	0.0003	<0.0002
Alkalinity		
Carbonate Alk (as CaCO3), mg/L	---	<1.0
Bicarb Alk (as CaCO3), mg/L	---	210
Hydroxide Alk (as CaCO3), mg/L	---	<1.0
Total Alkalinity (as CaCO3), mg/L	---	210
Chloride, mg/L	---	18
Magnesium, mg/L	---	15
Nitrate (as N), mg/L	---	1.0
Nitrite (as N), mg/L	---	<0.01
Ammonia Nitrogen (as N), mg/L	---	0.66
Total Kjeldahl Nitrogen, mg/L	---	0.66

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-305

Received: 15 APR 38
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-305-1	W-2	15 APR 87
04-305-2	W-3	15 APR 87

PARAMETER	04-305-1	04-305-2
Total Phosphorous (as P), mg/L	---	0.71
Potassium, mg/L	---	1.7
Silica (as SiO2), mg/L	---	50
Sodium, mg/L	---	53
Sulfate, mg/L	---	57
Filterable Residue (TDS), mg/L	---	370
pH, Units	---	6.7
Specific Conductance, umhos/cm	---	520
Calcium, mg/L	---	18
Fluoride, mg/L	---	0.33
Turbidity, NTU	---	130
Hydrocarbons by IR, mg/L	<5	---
Cobalt, mg/L	<0.05	<0.05
Nitric Acid Digestion, Date	04.17.87	04.20.87
Diesel Fingerprint, mg/L	<1	---

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-305

Received: 15 APR 38
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-305-1	W-2	15 APR 87
04-305-2	W-3	15 APR 87

PARAMETER	04-305-1	04-305-2
B/N,A Ext. Priority Pollutants	---	04.21.87
Extraction	---	04.28.87
Date Analyzed	---	<2
1,2,4-Trichlorobenzene, ug/L	---	<2
1,2-Dichlorobenzene, ug/L	---	<2
1,2-Diphenylhydrazine, ug/L	---	<2
1,3-Dichlorobenzene, ug/L	---	<2
1,4-Dichlorobenzene, ug/L	---	<2
2,4,6-Trichlorophenol, ug/L	---	<2
2,4-Dichlorophenol, ug/L	---	<2
2,4-Dimethylphenol, ug/L	---	<20
2,4-Dinitrotoluene, ug/L	---	<2
2,4-Dinitrophenol, ug/L	---	<2
2,6-Dinitrotoluene, ug/L	---	<2
2-Chloronaphthalene, ug/L	---	<2
2-Nitrophenol, ug/L	---	<2
2-Chlorophenol, ug/L	---	<2
2-Methyl-4,6-dinitrophenol, ug/L	---	<2
3,3'-Dichlorobenzidine, ug/L	---	<2
4-Bromophenylphenylether, ug/L	---	<2
4-Chloro-3-methylphenol, ug/L	---	<40
4-Chlorophenylphenylether, ug/L	---	<2
4-Nitrophenol, ug/L	---	
Acenaphthene, ug/L		

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-305

Received: 15 APR 38
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-305-1	W-2	15 APR 87
04-305-2	W-3	15 APR 87

PARAMETER	04-305-1	04-305-2
Acenaphthylene, ug/L	---	<2
Anthracene, ug/L	---	<2
Bis(2-ethylhexyl)phthalate, ug/L	---	<200
Benzidine, ug/L	---	<80
Bis(2-chloroethyl) Ether, ug/L	---	<2
Bis(2-Chloroisopropyl)ether, ug/L	---	<2
Bis(2-chloroethoxy)methane, ug/L	---	<2
Benzo(a)anthracene, ug/L	---	<2
Benzo(a)pyrene, ug/L	---	<2
Benzo(b)fluoranthene, ug/L	---	<2
Benzo(g,h,i)perylene, ug/L	---	<2
Benzo(k)Fluoranthene, ug/L	---	<2
Butylbenzylphthalate, ug/L	---	<2
Chrysene, ug/L	---	<2
Di-n-octylphthalate, ug/L	---	<2
Dibenzo(a,h)anthracene, ug/L	---	<2
Dibutylphthalate, ug/L	---	<2
Diethylphthalate, ug/L	---	<2
Dimethylphthalate, ug/L	---	<2
Fluorene, ug/L	---	<2
Fluoranthene, ug/L	---	<2
Hexachlorobenzene, ug/L	---	<2
Hexachlorobutadiene, ug/L	---	<2
Hexachlorocyclopentadiene, ug/L	---	<2

BROWN AND CALDWELL LABORATORIES
1256 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-305

Received: 15 APR 38
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-305-1	W-2	15 APR 87
04-305-2	W-3	15 APR 87

PARAMETER	04-305-1	04-305-2
Hexachloroethane, ug/L	---	<2
Indeno(1,2,3-c,d)Pyrene, ug/L	---	<2
Isophorone, ug/L	---	<2
N-Nitrosodi-n-propylamine, ug/L	---	<2
N-Nitrosodimethylamine, ug/L	---	<2
N-Nitrosodiphenylamine, ug/L	---	<2
Naphthalene, ug/L	---	<2
Nitrobenzene, ug/L	---	<2
Pentachlorophenol, ug/L	---	<2
Phenanthrene, ug/L	---	<2
Phenol, ug/L	---	<2
Pyrene, ug/L	---	<2

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-305

Received: 15 APR 38
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-305-1	W-2	15 APR 87
04-305-2	W-3	15 APR 87

PARAMETER	04-305-1	04-305-2
Purgeable Priority Pollutants		
Extraction	04.24.87	04.23.87
1,1,1-Trichloroethane, ug/L	<20	<1
1,1,2,2-Tetrachloroethane, ug/L	<20	<1
1,1,2-Trichloroethane, ug/L	<20	<1
1,1-Dichloroethane, ug/L	<20	<1
1,1-Dichloroethylene, ug/L	<20	<1
1,2-Dichloroethane, ug/L	<20	<1
1,2-Dichloropropane, ug/L	<20	<1
1,3-Dichloropropene, ug/L	<20	<1
2-Chloroethylvinylether, ug/L	<200	<10
Acrolein, ug/L	<200	<10
Acrylonitrile, ug/L	<20	<1
Bromodichloromethane, ug/L	<20	<1
Bromomethane, ug/L	<20	<1
Benzene, ug/L	<20	<1
Chlorobenzene, ug/L	<20	<1
Carbon Tetrachloride, ug/L	<20	<1
Chloroethane, ug/L	<20	<1
Bromoform, ug/L	<20	<1
Chloroform, ug/L	<20	<1
Chloromethane, ug/L	<20	<1
Dibromochloromethane, ug/L	<20	<1
Ethylbenzene, ug/L		

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-305

Received: 15 APR 38
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
04-305-1	W-2	15 APR 87
04-305-2	W-3	15 APR 87

PARAMETER	04-305-1	04-305-2
Methylene Chloride, ug/L	<20	<1
Tetrachloroethylene, ug/L	<20	<1
Trichloroethylene, ug/L	<20	<1
Trichlorofluoromethane, ug/L	<20	<1
Toluene, ug/L	80	<1
Vinyl Chloride, ug/L	<20	<1
trans-1,2-Dichloroethylene, ug/L	<20	<1
trans-1,3-Dichloropropene, ug/L	<20	<1
Semi-Quantified Results **		
Freon 113, ug/L	40	---

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

D. A. McLean, Laboratory Director

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-367

Received: 17 APR 87
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, WATER SAMPLES	DATE SAMPLED
04-367-1	W8	17 APR 87
04-367-2	W10	17 APR 87
04-367-3	W8	17 APR 87

PARAMETER	04-367-1	04-367-2	04-367-3
Specific Conductance, umhos/cm	1300	---	---
pH, Units	6.4	---	---
Chromium, mg/L	<0.02	---	---
Lead, mg/L	<0.1	---	---
Nickel, mg/L	<0.05	---	---
Zinc, mg/L	3.6	---	---
Nitric Acid Digestion, Date	04.20.87	---	---

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LOG NO	SAMPLE DESCRIPTION, WATER SAMPLES	DATE SAMPLED
04-367-1	W8	17 APR 87
04-367-2	W10	17 APR 87
04-367-3	W8	17 APR 87

PARAMETER	04-367-1	04-367-2	04-367-3
B/N,A Ext. Priority Pollutants			
Extraction	04.27.87	---	---
Date Analyzed	05.01.87	---	---
1,2,4-Trichlorobenzene, ug/L	<1	---	---
1,2-Dichlorobenzene, ug/L	<1	---	---
1,2-Diphenylhydrazine, ug/L	<1	---	---
1,3-Dichlorobenzene, ug/L	<1	---	---
1,4-Dichlorobenzene, ug/L	<1	---	---
2,4,6-Trichlorophenol, ug/L	<1	---	---
2,4-Dichlorophenol, ug/L	<1	---	---
2,4-Dimethylphenol, ug/L	<1	---	---
2,4-Dinitrotoluene, ug/L	<10	---	---
2,4-Dinitrophenol, ug/L	<1	---	---
2,6-Dinitrotoluene, ug/L	<1	---	---
2-Chloronaphthalene, ug/L	<1	---	---
2-Nitrophenol, ug/L	<1	---	---
2-Chlorophenol, ug/L	<1	---	---
2-Methyl-4,6-dinitrophenol, ug/L	<1	---	---
3,3'-Dichlorobenzidine, ug/L	<1	---	---
4-Bromophenylphenylether, ug/L	<1	---	---
4-Chloro-3-methylphenol, ug/L	<1	---	---
4-Chlorophenylphenylether, ug/L	<1	---	---
4-Nitrophenol, ug/L	<20	---	---

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04-367-1	W8	17 APR 87
04-367-2	W10	17 APR 87
04-367-3	W8	17 APR 87

PARAMETER	04-367-1	04-367-2	04-367-3
Acenaphthene, ug/L	4	---	---
Acenaphthylene, ug/L	<1	---	---
Anthracene, ug/L	<1	---	---
Bis(2-ethylhexyl)phthalate, ug/L	<100	---	---
Benzidine, ug/L	<40	---	---
Bis(2-chloroethyl) Ether, ug/L	<1	---	---
Bis(2-Chloroisopropyl)ether, ug/L	<1	---	---
Bis(2-chloroethoxy)methane, ug/L	<1	---	---
Benzo(a)anthracene, ug/L	2	---	---
Benzo(a)pyrene, ug/L	<1	---	---
Benzo(b)fluoranthene, ug/L	1	---	---
Benzo(g,h,i)perylene, ug/L	<1	---	---
Benzo(k)Fluoranthene, ug/L	1	---	---
Butylbenzylphthalate, ug/L	<1	---	---
Chrysene, ug/L	2	---	---
Di-n-octylphthalate, ug/L	<1	---	---
Dibenzo(a,h)anthracene, ug/L	<1	---	---
Dibutylphthalate, ug/L	<1	---	---
Diethylphthalate, ug/L	<1	---	---
Dimethylphthalate, ug/L	<1	---	---
Fluorene, ug/L	9	---	---
Fluoranthene, ug/L	4	---	---
Hexachlorobenzene, ug/L	<1	---	---

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04-367-1	W8	17 APR 87
04-367-2	W10	17 APR 87
04-367-3	W8	17 APR 87

PARAMETER	04-367-1	04-367-2	04-367-3
Hexachlorobutadiene, ug/L	<1	---	---
Hexachlorocyclopentadiene, ug/L	<1	---	---
Hexachloroethane, ug/L	<1	---	---
Indeno(1,2,3-c,d)Pyrene, ug/L	<1	---	---
Isophorone, ug/L	<1	---	---
N-Nitrosodi-n-propylamine, ug/L	<1	---	---
N-Nitrosodimethylamine, ug/L	<1	---	---
N-Nitrosodiphenylamine, ug/L	<1	---	---
Naphthalene, ug/L	30	---	---
Nitrobenzene, ug/L	<1	---	---
Pentachlorophenol, ug/L	<1	---	---
Phenanthrene, ug/L	5	---	---
Phenol, ug/L	<1	---	---
Pyrene, ug/L	5	---	---
Semi-Quantified Results **			
C10H12, ug/L	30	---	---
C1-Naphthalene, ug/L	50	---	---
C2 Naphthalene, ug/L	40	---	---
C3 Benzene, ug/L	60	---	---
C9-C35 Hydrocarbons, ug/L	10000	---	---

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, WATER SAMPLES	DATE SAMPLED
04-367-1	W8	17 APR 87
04-367-2	W10	17 APR 87
04-367-3	W8	17 APR 87

PARAMETER	04-367-1	04-367-2	04-367-3
Purgeable Priority Pollutants	---	04.29.87	05.02.87
Extraction	---	<1	<100
1,1,1-Trichloroethane, ug/L	---	<1	<100
1,1,2,2-Tetrachloroethane, ug/L	---	<1	<100
1,1,2-Trichloroethane, ug/L	---	<1	<100
1,1-Dichloroethane, ug/L	---	<1	<100
1,1-Dichloroethylene, ug/L	---	<1	<100
1,2-Dichloroethane, ug/L	---	<1	<100
1,2-Dichloropropane, ug/L	---	<1	<100
1,3-Dichloropropene, ug/L	---	<10	<1000
2-Chloroethylvinylether, ug/L	---	<10	<1000
Acrolein, ug/L	---	<1	<100
Acrylonitrile, ug/L	---	<1	<100
Bromodichloromethane, ug/L	---	<1	<100
Bromomethane, ug/L	---	<1	<100
Benzene, ug/L	---	<1	<100
Chlorobenzene, ug/L	---	<1	<100
Carbon Tetrachloride, ug/L	---	<1	<100
Chloroethane, ug/L	---	<1	<100
Bromoform, ug/L	---	<1	<100
Chloroform, ug/L	---	<1	<100
Chloromethane, ug/L	---	<1	<100
Dibromochloromethane, ug/L	---	<1	<100

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04-367-1	W8	17 APR 87
04-367-2	W10	17 APR 87
04-367-3	W8	17 APR 87

PARAMETER	04-367-1	04-367-2	04-367-3
Ethylbenzene, ug/L	---	<1	<100
Methylene Chloride, ug/L	---	<5	<100
Tetrachloroethylene, ug/L	---	<1	<100
Trichloroethylene, ug/L	---	<1	<100
Trichlorofluoromethane, ug/L	---	<1	<100
Toluene, ug/L	---	1	<100
Vinyl Chloride, ug/L	---	<1	<100
trans-1,2-Dichloroethylene, ug/L	---	<1	<100
trans-1,3-Dichloropropene, ug/L	---	<1	<100

D. A. McLean, Laboratory Director

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Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, WATER SAMPLES	DATE SAMPLED
04-356-1	B-5	16 APR 87
04-356-2	B-5-Oil	16 APR 87
04-356-3	W-5	16 APR 87
04-356-4	W-6	16 APR 87
04-356-5	W-7	16 APR 87

PARAMETER	04-356-1	04-356-2	04-356-3	04-356-4	04-356-5
Beryllium, mg/L	---	---	---	---	<0.01
Cadmium, mg/L	---	---	---	---	<0.01
Copper, mg/L	---	---	---	---	0.16
Silver, mg/L	---	---	---	---	<0.01
Thallium, mg/L	---	---	---	---	0.1
Antimony, mg/L	---	---	---	---	<0.1
Arsenic, mg/L	---	---	---	---	0.016
Selenium, mg/L	---	---	---	---	<0.001
Mercury, mg/L	---	---	---	---	0.0017
Alkalinity					
Carbonate Alk (as CaCO3), mg/L	---	---	---	---	<1.0
Bicarb Alk (as CaCO3), mg/L	---	---	---	---	1740
Hydroxide Alk (as CaCO3), mg/L	---	---	---	---	<1.0
Total Alkalinity (as CaCO3), mg/L	---	---	---	---	1740
Chloride, mg/L	---	---	---	---	1290
Magnesium, mg/L	---	---	---	---	68
Nitrate (as N), mg/L	---	---	---	---	<0.10
Nitrite (as N), mg/L	---	---	---	---	<0.01
Ammonia Nitrogen (as N), mg/L	---	---	---	---	51
Total Kjeldahl Nitrogen, mg/L	---	---	---	---	63
Total Phosphorous (as P), mg/L	---	---	---	---	4.7

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04-356-1	B-5	16 APR 87
04-356-2	B-5-Oil	16 APR 87
04-356-3	W-5	16 APR 87
04-356-4	W-6	16 APR 87
04-356-5	W-7	16 APR 87

PARAMETER	04-356-1	04-356-2	04-356-3	04-356-4	04-356-5
Potassium, mg/L	---	---	---	---	56
Silica (as SiO2), mg/L	---	---	---	---	72
Sodium, mg/L	---	---	---	---	800
Sulfate, mg/L	---	---	---	---	37
Filterable Residue (TDS), mg/L	---	---	---	---	3070
Calcium, mg/L	---	---	---	---	210
Fluoride, mg/L	---	---	---	---	1.3
Turbidity, NTU	---	---	---	---	300
Specific Conductance, umhos/cm	---	---	1840	5790	6500
pH, Units	---	---	7.0	7.2	6.5
Sample Held, Not Analyzed	---	HELD	---	---	---
Chromium, mg/L	<0.02	---	<0.02	<0.02	0.08
Cobalt, mg/L	---	---	---	---	<0.05
Lead, mg/L	<0.1	---	<0.1	0.1	0.7
Nickel, mg/L	<0.05	---	<0.05	<0.05	0.20
Zinc, mg/L	<0.01	---	1.2	2.1	0.97
Nitric Acid Digestion, Date	03.20.87	---	03.20.87	03.20.87	03.20.87
Total Fuel Hydrocarbons, mg/L	---	---	<1	<1	---

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04-356-2	B-5-Oil	16 APR 87
04-356-3	W-5	16 APR 87
04-356-4	W-6	16 APR 87
04-356-5	W-7	16 APR 87

PARAMETER	04-356-1	04-356-2	04-356-3	04-356-4	04-356-5
B/N,A Ext. Priority Pollutants					
Extraction	04.23.87	---	---	---	04.23.87
Date Analyzed	04.30.87	---	---	---	04.30.87
1,2,4-Trichlorobenzene, ug/L	<2	---	---	---	<2
1,2-Dichlorobenzene, ug/L	<2	---	---	---	<2
1,2-Diphenylhydrazine, ug/L	<2	---	---	---	<2
1,3-Dichlorobenzene, ug/L	<2	---	---	---	<2
1,4-Dichlorobenzene, ug/L	<2	---	---	---	<2
2,4,6-Trichlorophenol, ug/L	<2	---	---	---	<2
2,4-Dichlorophenol, ug/L	<2	---	---	---	<2
2,4-Dimethylphenol, ug/L	<2	---	---	---	<2
2,4-Dinitrotoluene, ug/L	<2	---	---	---	<2
2,4-Dinitrophenol, ug/L	<20	---	---	---	<20
2,6-Dinitrotoluene, ug/L	<2	---	---	---	<2
2-Chloronaphthalene, ug/L	<2	---	---	---	<2
2-Nitrophenol, ug/L	<2	---	---	---	<2
2-Chlorophenol, ug/L	<2	---	---	---	<2
2-Methyl-4,6-dinitrophenol, ug/L	<2	---	---	---	<2
3,3'-Dichlorobenzidine, ug/L	<2	---	---	---	<2
4-Bromophenylphenylether, ug/L	<2	---	---	---	<2
4-Chloro-3-methylphenol, ug/L	<2	---	---	---	<2

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04-356-3	W-5	16 APR 87
04-356-4	W-6	16 APR 87
04-356-5	W-7	16 APR 87

PARAMETER	04-356-1	04-356-2	04-356-3	04-356-4	04-356-5
4-Chlorophenylphenylether, ug/L	<2	---	---	---	<2
4-Nitrophenol, ug/L	<40	---	---	---	<40
Acenaphthene, ug/L	<2	---	---	---	<2
Acenaphthylene, ug/L	<2	---	---	---	<2
Anthracene, ug/L	32	---	---	---	<2
Bis(2-ethylhexyl)phthalate, ug/L	<200	---	---	---	<200
Benzidine, ug/L	<80	---	---	---	<80
Bis(2-chloroethyl) Ether, ug/L	<2	---	---	---	<2
Bis(2-Chloroisopropyl)ether, ug/L	<2	---	---	---	<2
Bis(2-chloroethoxy)methane, ug/L	<2	---	---	---	<2
Benzo(a)anthracene, ug/L	<2	---	---	---	<2
Benzo(a)pyrene, ug/L	<2	---	---	---	<2
Benzo(b)fluoranthene, ug/L	<2	---	---	---	<2
Benzo(g,h,i)perylene, ug/L	<2	---	---	---	<2
Benzo(k)Fluoranthene, ug/L	<2	---	---	---	<2
Butylbenzylphthalate, ug/L	<2	---	---	---	<2
Chrysene, ug/L	5	---	---	---	<2
Di-n-octylphthalate, ug/L	<2	---	---	---	<2
Dibenzo(a,h)anthracene, ug/L	<2	---	---	---	<2
Dibutylphthalate, ug/L	<2	---	---	---	<2
Diethylphthalate, ug/L	<2	---	---	---	<2

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04-356-3	W-5	16 APR 87
04-356-4	W-6	16 APR 87
04-356-5	W-7	16 APR 87

PARAMETER	04-356-1	04-356-2	04-356-3	04-356-4	04-356-5
Dimethylphthalate, ug/L	<2	---	---	---	<2
Fluorene, ug/L	18	---	---	---	<2
Fluoranthene, ug/L	<2	---	---	---	<2
Hexachlorobenzene, ug/L	<2	---	---	---	<2
Hexachlorobutadiene, ug/L	<2	---	---	---	<2
Hexachlorocyclopentadiene, ug/L	<2	---	---	---	<2
Hexachloroethane, ug/L	<2	---	---	---	<2
Indeno(1,2,3-c,d)Pyrene, ug/L	<2	---	---	---	<2
Isophorone, ug/L	<2	---	---	---	<2
N-Nitrosodi-n-propylamine, ug/L	<2	---	---	---	<2
N-Nitrosodimethylamine, ug/L	<2	---	---	---	<2
N-Nitrosodiphenylamine, ug/L	<2	---	---	---	<2
Naphthalene, ug/L	<2	---	---	---	<2
Nitrobenzene, ug/L	<2	---	---	---	<2
Pentachlorophenol, ug/L	<2	---	---	---	<2
Phenanthrene, ug/L	<2	---	---	---	<2
Phenol, ug/L	<2	---	---	---	<2
Pyrene, ug/L	<2	---	---	---	<2
Semi-Quantified Results **					
Butanoic Acid, ug/L	---	---	---	---	400

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04-356-3	W-5	16 APR 87
04-356-4	W-6	16 APR 87
04-356-5	W-7	16 APR 87

PARAMETER	04-356-1	04-356-2	04-356-3	04-356-4	04-356-5
C2 Naphthalene, ug/L	100	---	---	---	---
A Complex Matrix, ug/L	90000	---	---	---	---
Hexanoic Acid, ug/L	---	---	---	---	300
Pentanoic Acid, ug/L	---	---	---	---	200
Propanoic Acid, ug/L	---	---	---	---	1000
Unidentified Matrix, ug/L	---	---	---	---	40000

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

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04-356-2	B-5-Oil	16 APR 87
04-356-3	W-5	16 APR 87
04-356-4	W-6	16 APR 87
04-356-5	W-7	16 APR 87

PARAMETER	04-356-1	04-356-2	04-356-3	04-356-4	04-356-5
Purgeable Priority Pollutants					
Extraction	05.02.87	---	04.29.87	04.29.87	04.29.87
1,1,1-Trichloroethane, ug/L	<1000	---	<10	<10	<20
1,1,2,2-Tetrachloroethane, ug/L	<1000	---	<10	<10	<20
1,1,2-Trichloroethane, ug/L	<1000	---	<10	<10	<20
1,1-Dichloroethane, ug/L	<1000	---	<10	<10	<20
1,1-Dichloroethylene, ug/L	<1000	---	<10	<10	<20
1,2-Dichloroethane, ug/L	<1000	---	<10	<10	<20
1,2-Dichloropropane, ug/L	<1000	---	<10	<10	<20
1,3-Dichloropropene, ug/L	<1000	---	<10	<10	<20
2-Chloroethylvinylether, ug/L	<10000	---	<100	<100	<200
Acrolein, ug/L	<10000	---	<100	<100	<200
Acrylonitrile, ug/L	<1000	---	<10	<10	<20
Bromodichloromethane, ug/L	<1000	---	<10	<10	<20
Bromomethane, ug/L	<1000	---	<10	<10	<20
Benzene, ug/L	<1000	---	<10	<10	<20
Chlorobenzene, ug/L	<1000	---	<10	<10	<20
Carbon Tetrachloride, ug/L	<1000	---	<10	<10	<20
Chloroethane, ug/L	<1000	---	<10	<10	<20
Bromoform, ug/L	<1000	---	<10	<10	<20
Chloroform, ug/L					

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-04-356

Received: 16 APR 87
Reported: 06 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, WATER SAMPLES	DATE SAMPLED
04-356-1	B-5	16 APR 87
04-356-2	B-5-Oil	16 APR 87
04-356-3	W-5	16 APR 87
04-356-4	W-6	16 APR 87
04-356-5	W-7	16 APR 87

PARAMETER	04-356-1	04-356-2	04-356-3	04-356-4	04-356-5
Chloromethane, ug/L	<1000	---	<10	<10	<20
Dibromochloromethane, ug/L	<1000	---	<10	<10	<20
Ethylbenzene, ug/L	<1000	---	<10	<10	<20
Methylene Chloride, ug/L	<1000	---	<50	<50	<100
Tetrachloroethylene, ug/L	<1000	---	<10	<10	<20
Trichloroethylene, ug/L	<1000	---	<10	<10	<20
Trichlorofluoromethane, ug/L	<1000	---	<10	<10	<20
Toluene, ug/L	<1000	---	<10	<10	<20
Vinyl Chloride, ug/L	<1000	---	<10	<10	<20
trans-1,2-Dichloroethylene, ug/L	<1000	---	<10	<10	<20
trans-1,3-Dichloropropene, ug/L	<1000	---	<10	<10	<20

for

D. A. McLean, Laboratory Director

BROWN AND CALDWELL LABORATORIES
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ANALYTICAL REPORT

LOG NO: E87-04-540

Received: 24 APR 87
Reported: 15 MAY 87

Mr. John McMillan
Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, PETROLEUM SAMPLES	DATE SAMPLED
04-540-1	B-5 Oil (old Log # 8704356-2)	16 APR 87

PARAMETER	04-540-1
Beryllium, mg/kg	<1
Cadmium, mg/kg	<0.2
Chromium, mg/kg	4.3
Copper, mg/kg	6.6
Lead, mg/kg	49
Nickel, mg/kg	40
Silver, mg/kg	<1
Thallium, mg/kg	27
Zinc, mg/kg	3.5
Antimony, mg/kg	<10
Arsenic, mg/kg	7.1
Selenium, mg/kg	<1
Mercury, mg/kg	<0.01
Cobalt, mg/kg	23
Oil Extract, Date	04.29.87
Chlorophenoxy Acid Herbicides	
Date Extracted	05.05.87
Date Analyzed	05.08.87
2,4,5-T, mg/kg	0.068
2,4,5-TP (Silvex), mg/kg	<0.01
2,4-D, mg/kg	<0.01

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Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, PETROLEUM SAMPLES	DATE SAMPLED
04-540-1	B-5 Oil (old Log # 8704356-2)	16 APR 87

PARAMETER	04-540-1
B/N,A Ext. Priority Pollutants	
Extraction	04.29.87
Date Analyzed	05.01.87
1,2,4-Trichlorobenzene, mg/kg	<100
1,2-Dichlorobenzene, mg/kg	<100
1,2-Diphenylhydrazine, mg/kg	<100
1,3-Dichlorobenzene, mg/kg	<100
1,4-Dichlorobenzene, mg/kg	<100
2,4,6-Trichlorophenol, mg/kg	<100
2,4-Dichlorophenol, mg/kg	<100
2,4-Dimethylphenol, mg/kg	<100
2,4-Dinitrotoluene, mg/kg	<100
2,4-Dinitrophenol, mg/kg	<1000
2,6-Dinitrotoluene, mg/kg	<100
2-Chloronaphthalene, mg/kg	<100
2-Nitrophenol, mg/kg	<100
2-Chlorophenol, mg/kg	<100
2-Methyl-4,6-dinitrophenol, mg/kg	<100
3,3'-Dichlorobenzidine, mg/kg	<100
4-Bromophenylphenylether, mg/kg	<100
4-Chloro-3-methylphenol, mg/kg	<100
4-Chlorophenylphenylether, mg/kg	<100
4-Nitrophenol, mg/kg	<2000
Acenaphthene, mg/kg	<100
Acenaphthylene, mg/kg	<100

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Project: 8710018A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, PETROLEUM SAMPLES	DATE SAMPLED
04-540-1	B-5 Oil (old Log # 8704356-2)	16 APR 87

PARAMETER	04-540-1
Anthracene, mg/kg	<100
Bis(2-ethylhexyl)phthalate, mg/kg	<10000
Benzidine, mg/kg	<4000
Bis(2-chloroethyl) Ether, mg/kg	<100
Bis(2-Chloroisopropyl)ether, mg/kg	<100
Bis(2-chloroethoxy)methane, mg/kg	<100
Benzo(a)anthracene, mg/kg	<100
Benzo(a)pyrene, mg/kg	<100
Benzo(b)fluoranthene, mg/kg	<100
Benzo(g,h,i)perylene, mg/kg	<100
Benzo(k)Fluoranthene, mg/kg	<100
Butylbenzylphthalate, mg/kg	<100
Chrysene, mg/kg	170
Di-n-octylphthalate, mg/kg	<100
Dibenzo(a,h)anthracene, mg/kg	<100
Dibutylphthalate, mg/kg	<100
Diethylphthalate, mg/kg	<100
Dimethylphthalate, mg/kg	<100
Fluorene, mg/kg	170
Fluoranthene, mg/kg	<100
Hexachlorobenzene, mg/kg	<100
Hexachlorobutadiene, mg/kg	<100
Hexachlorocyclopentadiene, mg/kg	<100
Hexachloroethane, mg/kg	<100
Indeno(1,2,3-c,d)Pyrene, mg/kg	<100

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, PETROLEUM SAMPLES	DATE SAMPLED
04-540-1	B-5 Oil (old Log # 8704356-2)	16 APR 87

PARAMETER	04-540-1
Isophorone, mg/kg	<100
N-Nitrosodi-n-propylamine, mg/kg	<100
N-Nitrosodimethylamine, mg/kg	<100
N-Nitrosodiphenylamine, mg/kg	<100
Naphthalene, mg/kg	<100
Nitrobenzene, mg/kg	<100
Pentachlorophenol, mg/kg	<100
Phenanthrene, mg/kg	440
Phenol, mg/kg	<100
Pyrene, mg/kg	<100
Semi-Quantified Results **	
C2 Pheneanthrene, mg/kg	3000
C8-C35 Hydrocarbon Matrix, mg/kg	900000

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, PETROLEUM SAMPLES	DATE SAMPLED
04-540-1	B-5 Oil (old Log # 8704356-2)	16 APR 87

PARAMETER	04-540-1
Purgeable Priority Pollutants	05.13.87
Extraction	
1,1,1-Trichloroethane, mg/kg	<2
1,1,2,2-Tetrachloroethane, mg/kg	<2
1,1,2-Trichloroethane, mg/kg	<2
1,1-Dichloroethane, mg/kg	<2
1,1-Dichloroethylene, mg/kg	<2
1,2-Dichloroethane, mg/kg	<2
1,2-Dichloropropane, mg/kg	<2
1,3-Dichloropropene, mg/kg	<2
2-Chloroethylvinylether, mg/kg	<2
Acrolein, mg/kg	<20
Acrylonitrile, mg/kg	<20
Bromodichloromethane, mg/kg	<2
Bromomethane, mg/kg	<2
Benzene, mg/kg	<2
Chlorobenzene, mg/kg	<2
Carbon Tetrachloride, mg/kg	<2
Chloroethane, mg/kg	<2
Bromoform, mg/kg	<2
Chloroform, mg/kg	<2
Chloromethane, mg/kg	<2
Dibromochloromethane, mg/kg	<2
Ethylbenzene, mg/kg	<2
Methylene Chloride, mg/kg	<2

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, PETROLEUM SAMPLES	DATE SAMPLED
04-540-1	B-5 Oil (old Log # 8704356-2)	16 APR 87

PARAMETER	04-540-1
Tetrachloroethylene, mg/kg	<2
Trichloroethylene, mg/kg	<2
Trichlorofluoromethane, mg/kg	<2
Toluene, mg/kg	<2
Vinyl Chloride, mg/kg	<2
trans-1,2-Dichloroethylene, mg/kg	<2
trans-1,3-Dichloropropene, mg/kg	<2
Semi-Quantified Results **	
C10H20, mg/kg	30
C7H14, mg/kg	10
C8H16, mg/kg	10
C9H16, mg/kg	30
C9H18, mg/kg	20
Xylene Isomers, mg/kg	6

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

D. A. McLean, Laboratory Director