Field Sampling Plan for
Remedial Investigations
5050 Coliseum Way and 750-50th Avenue
Oakland, California

October 15, 1993
LF 2407.00-015

Prepared for
Volvo GM Heavy Truck Corporation
7900 National Service Road
Greensboro, North Carolina 27402-6115

LEVINE·FRICKE

LEVINE•FRICKE

ENGINEERS, HYDROGEOLOGISTS & APPLIED SCIENTISTS

October 15, 1993

LF 2407.00-015

Mr. Paul Smith
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Subject: Field Sampling Plan for Remedial Investigations, 5050 Coliseum Way and 750-50th Avenue, Oakland, California

Dear Mr. Smith:

On behalf of Volvo GM Heavy Truck Corporation, Levine•Fricke has prepared the enclosed field sampling plan (FSP) for your review. The FSP to be implemented as part of remedial investigations at property located at 5050 Coliseum Way, and adjoining property located at 750-50th Avenue (referred to in combination as "the Site"; see Figure 1) in Oakland, California.

This FSP was prepared in accordance with the Levine•Fricke work plan for remedial investigations, submitted on January 15, 1993 to the Alameda County Health Care Services Agency for its review and approval. As a result of our meeting on Spetember 28, 1993, your conditional approval was amended in a letter of the same date.

The FSP presents a brief summary of previous investigations and field work to be conducted at the Site, followed by discussions of sampling objectives, rationale, and frequency; methodology, including waste disposal; proposed sample handling and custody protocols; laboratory analyses to be made; and instrument calibration. The FSP also addresses quality assurance/quality control (QA/QC) procedures, project organization, and schedule.

As we discussed at our meeting, we will provide ample notice of the commencement of field work. Feel free to visit the site. Drilling is presently scheduled to start on October 21, 1993. Level C personal protection will be required within the drilling exclusion area. The Health and Safety Plan for the work will be sent to you in a day or two.

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If you have any questions or comments concerning the FSP, please do not hesitate to call me or Jenifer Beatty.

Sincerely,

Kathleen A. Isaacson, R.G. #5106
Senior Hydrogeologist

Enclosure

cc: Rich Hiett, California Regional Water Quality Control Board, San Francisco Bay Region
Bob Whelen, Volvo GM Heavy Truck Corporation
Larry Bazel, Beveridge and Diamond

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FIELD SAMPLING PLAN FOR REMEDIAL INVESTIGATIONS
5050 COLISEUM WAY and 750-50th AVENUE
OAKLAND, CALIFORNIA

1.0 INTRODUCTION

This field sampling plan (FSP) has been prepared as a part of remedial investigations at property located at 5050 Coliseum Way and adjoining property located at 750-50th Avenue (referred to in combination as "the Site"; see Figure 1) in Oakland, California.

The plan was prepared on behalf of Volvo GM Heavy Truck Corporation ("Volvo GM"), and in accordance with the Levine•Fricke work plan for remedial investigations, submitted on January 15, 1993 to the Alameda County Health Care Services Agency (ACHCSA) for its review and approval. The ACHCSA conditionally approved the work plan in a letter dated August 26, 1993.

This FSP presents a brief summary of previous investigations and field work to be conducted at the Site, followed by discussions of sampling objectives, rationale, and frequency; methodology, including waste disposal; proposed sample handling and custody protocols; laboratory analyses to be made; and instrument calibration.

The FSP also addresses quality assurance/quality control (QA/QC) procedures, project organization, and project scheduling. The procedures discussed in the FSP have been developed to ensure that data obtained during the investigation will be complete, well documented, technically accurate, representative of conditions at the time sampling occurred, reproducible (in the case of measurement data), and internally consistent.

The FSP has been reviewed by Levine•Fricke's QA/QC Officer to ensure that field procedures, analytical methods, and data obtained from the investigation are in accordance with QA/QC measures discussed in this FSP.

1.1 Site Setting and Description

The Site is located approximately 0.5 mile northeast of San Leandro Bay in a heavy industry area of Oakland, in Alameda

County, California (Figure 1). The Site occupies approximately 6 acres of land; its elevation is approximately 10 feet above sea level.

The property at 5050 Coliseum Way is currently vacant. There is one large warehouse-type building (Figure 2), which contains office space and large service bays formerly used to maintain heavy trucks and other large vehicles. The building is surrounded by a concrete apron, and the remainder of the Site is covered with asphalt. The adjoining property at 750-50th Avenue is occupied by a one-story office building and is surrounded by landscaping. The rest of the property is paved with asphalt.

In the surrounding area are salvage businesses and other industrial and commercial facilities. A Pacific Gas and Electric Company (PG&E) transformer station is located southwest of the Site. The Southern Pacific Railroad tracks parallel the northeast perimeter of the Site. A private storage facility is located on the southeast side of the Site. A concrete-lined storm-water canal runs parallel to Coliseum Way southwest of the Site and drains into San Leandro Bay.

1.2 Previous Investigations

The following is a brief summary of investigations conducted in September 1990 by Aqua Terra Technologies, Inc. (ATT) of Walnut Creek, California, at the 750-50th Avenue property, and investigations at the Site conducted by Levine·Fricke in November 1991 and October 1992. A more detailed discussion of previous investigations is presented in the January 15, 1993 work plan.

1.2.1 September 1990: Aqua Terra Technologies

ATT (1990) installed four shallow monitoring wells (MW-1 through MW-4) and drilled four additional borings at the 750-50th Avenue site (Figure 2).

Analysis of soil samples collected during drilling detected elevated metals concentrations (up to 14,900 parts per million [ppm] of zinc). Ground-water samples collected from these wells were also found to contain elevated metals concentrations, including zinc; the highest concentration of zinc found in ground water was 2,720 ppm, in the sample collected from well MW-2.

1.2.2 October/November 1992: Levine·Fricke

Investigations at the Site by Levine·Fricke included reviewing regulatory records to identify reported releases of hazardous materials at sites located within a 0.5-mile radius of the Site; drilling seven soil borings and collecting soil samples for chemical analyses; and installing seven ground-water monitoring wells (LF-1 through LF-7; see Figure 2) in the seven soil borings.

Results of the investigations indicated elevated concentrations of metals in soil and ground-water samples collected in portions of the Site. In general, elevated concentrations of metals appear to be restricted to the upper 10 feet of material beneath the Site, except in the vicinity of well LF-1, where concentrations of zinc up to 16,000 ppm were detected to a depth of 20 feet below ground surface (bgs). Elevated concentrations of metals were detected in ground-water samples collected from several of the wells. Concentrations of zinc and other metals detected in ground-water samples collected from wells LF-1, MW-2, and MW-3 appear to correlate with concentrations of metals in soil in that area and with low-pH conditions (4 standard units [SU]) in soil and ground water. The solubility and subsequent mobility of some metals such as zinc may be enhanced in low-pH environments.

Analytical results for semivolatile organic compounds (SVOCs), oil and grease (O&G), and hydrocarbons indicate that ground water in the vicinity of well LF-1, located approximately 50 feet downgradient from the former waste-oil tank pit, has not been affected by these compounds. O&G were only detected in a near-surface soil sample from boring LF-1; however, O&G were not detected in deeper soil or ground water.

Based on these results, a quarterly monitoring program was implemented at the Site in March 1993. The quarterly monitoring program consists of monthly water-level measurements and the collection of ground-water samples for metals analysis on a quarterly basis.

1.3 Site Geology and Hydrogeology

Information concerning site geology was obtained from well borings LF-1 through LF-7, logged by Levine·Fricke personnel, and the logs for well borings MW-1 through MW-4 completed by ATT. Shallow sediments encountered at the Site generally consist of up to 8 feet of fill material overlying silty and sandy clay sediments. The native sediments underlying the fill are heterogeneous and consist of interbedded sand, silt, and clay.

Depth-to-water measurements collected at the Site in March 1993 ranged from 3.94 to 6.05 feet. Ground-water elevation contours for August 31, 1993 were consistent with previous data for the Site and indicate that the general ground-water flow direction was toward the northwest under a variable hydraulic gradient ranging from approximately 0.001 foot per foot (ft/ft) in the northeastern portion of the Site to 0.01 ft/ft in the northwestern portion of the Site.

2.0 SAMPLING OBJECTIVES

The objective of the proposed remedial investigations presented in the January 15, 1993 work plan is to further characterize the Site by identifying possible source locations for certain inorganic constituents, including metals, and low-pH conditions in soil and ground water, and by characterizing the presence and extent of these constituents in soil and ground water at the Site.

The project activities proposed to meet these objectives and addressed in this FSP include the following:

- drilling
- surface and subsurface soil sampling and laboratory analysis
- installation of shallow and intermediate-depth monitoring wells
- well development
- water-level measurements and tidal study
- ground-water sampling and laboratory analysis
- evaluation of analytical laboratory results

3.0 SAMPLING RATIONALE AND FREQUENCY

To further investigate shallow soil quality at the Site, collection of soil samples for chemical analysis from 39 grid-generated and targeted locations is proposed.

3.1 Rationale for Proposed Soil Sampling Locations

To provide additional characterization of areas of the Site for which data have not been previously obtained, 14 additional grid-generated soil boring locations were selected and are presented on Figure 2. To select the grid-generated sampling locations, the site map was overlaid with a rectangular grid (100-foot spacing) as presented on Figure 2. Within each of the 24 boxes created by the grid, a sampling location was selected if a previously drilled boring or well was not already located within the box. Using this systematic approach, 14 sampling locations were identified, to be drilled to a maximum of 15 feet bgs. The borings at six of these soil sampling locations will be drilled to greater depth and completed as ground-water monitoring wells.

To address potential environmental concerns identified during review of information contained on the Sanborn maps, material-handling practices by the previous site occupants before 1964, and soil-quality data obtained from previous investigations, 25 additional soil sampling locations have also been targeted (Figure 3). At seven of these locations, soil borings will be drilled to a maximum of 15 feet bgs. The remaining 18 of these locations were selected for collection of near-surface samples (2 feet bgs) in areas where high concentrations of individual metals were previously detected. The rationale for selection of targeted sampling locations to be drilled to a maximum of 15 feet bgs is presented in detail in the remedial investigation (RI) work plan (Levine·Fricke 1993).

Two to three additional deeper borings will be installed to assess the vertical extent of metals in soil. The locations of these borings will be based on results from the grid-generated and targeted shallow soil borings. Deeper soil borings will generally be located in areas where high metals concentrations and low-pH conditions were detected in soil just above saturated material. Soil borings will be drilled to a depth where field measurements of soil pH indicate values above 6 SU. One pilot soil boring will be drilled to a depth of approximately 50 feet in the vicinity of well LF-1 to identify a deeper water-bearing unit.

3.2 Rationale for Proposed Monitoring Well Locations

To further assess the lateral extent of dissolved metals in ground water beneath the Site, six shallow monitoring wells will be installed. As discussed in Section 3.1, six of the shallow grid-generated soil borings will be completed as monitoring wells (Figure 2).

To assess whether metals detected in shallow ground water beneath the Site have affected deeper water-bearing sediments, two to three deeper-depth monitoring wells (less than 50 feet bgs) will be installed at the Site. The locations of the deeper wells will be determined following evaluation of soil and ground-water quality data obtained during the investigation. It is anticipated that one of the deeper wells will likely be located near well LF-1 where elevated concentrations of metals in soil and ground water have previously been detected.

During previous investigations, apparently perched water (ground water accumulated on top of an impermeable clay lens above the main water table) was encountered at approximately 4 feet bgs in the vicinity of well LF-1. Installation of two monitoring wells to depths of approximately 5 to 10 feet bgs and screened in the fill material at the Site is proposed to assess the source and quality of the apparently perched ground water.

The locations of these wells will be determined based on data obtained during drilling of shallow soil borings at the Site.

3.3 Sampling Frequency

3.3.1 Soil Sampling

Shallow soil borings will be drilled to a maximum depth of approximately 15 feet bgs and deeper borings will be drilled until a second water bearing unit has been encountered or to a maximum depth of 50 feet bgs. The first soil sample will be collected at approximately 2 feet bgs and every 2.5 feet beyond the first sample depth. One soil sample will be collected for possible chemical analysis from every sampling interval (i.e., every 2.5 feet). One to three soil samples from each shallow soil boring and two to six samples per deeper soil boring (including samples collected from saturated material) will be selected for chemical analysis based on review of boring log data, organic vapor analyzer (OVA) measurements, and field observations. Proposed sample intervals and associated laboratory analysis are presented in Table 1.

3.3.2 Ground-Water Sampling

One round of ground-water samples will be collected for laboratory analysis from all existing and newly installed wells following well development. A revised periodic monitoring program for future sampling at the Site, to be conducted starting in the first quarter of 1994, will be proposed for the Site following an evaluation of soil and ground-water quality data obtained during the RI investigation. The revised plan will be submitted to the ACHCSA for review, comment, and approval. The plan will be implemented and modified as necessary based on ACHCSA comments.

4.0 SAMPLE DESIGNATION

Shallow soil sample locations (2.5 feet bgs) will be labelled "SS," followed by the sample location number and the depth at which the sample was collected (i.e., SS-1-2.5). Targeted soil boring locations and grid-generated soil boring locations will be designated as "SB," followed by the boring location number and depth at which the sample was collected (i.e., SB-2-10.0). Monitoring wells will be designated as "LF," followed by the well number (i.e., LF-10). For soil samples collected from well borings, the depth of the soil sample will added to the well designation (i.e. LF-10-5.0). For ground-water samples, the sample will be designated according to the well designation (i.e., LF-10).

5.0 SAMPLING METHODOLOGY AND WASTE DISPOSAL PROCEDURES

<u>5.1 Sampling Methodology</u>

5.1.1 Soil Sampling

Soil Boring Installation. Soil boring permits will be obtained by the Alameda County Flood Control and Water District (ACFCWD). Before drilling begins, a utility locator subcontractor will be used to identify any subsurface utilities and to clear proposed soil sampling locations of underground utilities and obstacles using geophysical methods. Final soil sampling locations will be determined once underground utilities have been cleared. A concrete cutter subcontractor will be used for soil borings located within the GMC facility building.

Drilling will be conducted by a licensed contractor using a truck-mounted drilling rig equipped with hollow-stem augers. All drilling will be conducted under the supervision of Levine·Fricke personnel as directed by a California Registered Geologist. The borings will be logged using the Unified Soils Classification system.

Soil samples will be collected in acetate tubes at approximately 2.5-foot intervals for lithologic description and possible chemical analysis using a modified split-spoon sampler lined with clean acetate tubes. Soil samples will be screened with an OVA and measurements recorded on the boring log. Soil samples selected for chemical analysis will be immediately covered with aluminum foil, capped, labeled, and placed in a chilled cooler for delivery under chain of custody to a state-certified laboratory (see Section 7.0).

__Lithologic Description.__ All soil samples will be examined and described by a Levine·Fricke geologist or engineer, who will maintain a complete record of these descriptions. Sediments will be described in accordance with the Unified Soil Classification System. The lithologic log for each boring will contain the following information:

- borehole number and location
- sampling depth
- sediment color
- sediment odor
- sediment grain size
- estimated relative percentages of grain sizes
- descriptive comments
- estimated moisture content
- depth to ground water
- depth of fill material
- observer's signature and date

A copy of the lithologic log form is included in Appendix A. A Levine·Fricke California registered geologist will review and approve the lithologic logs.

5.1.2 Monitoring Well Installation, Development, and Sampling

Well Installation. Monitoring wells will be constructed in the completed borehole using 4-inch-diameter, flush threaded, 0.010-inch polyvinyl chloride (PVC) well screen and well casing. PVC is compatible material for well construction in the chemical environment anticipated for this project.

The length of slotted well screen and blank PVC casing will be based on the lithology of the sediments and depth to ground water observed during drilling. The well casings will be placed in the completed boreholes through the hollow-stem auger. The screen will extend above the static-water level. A filter pack consisting of appropriately graded sand (e.g., 2/16-size sand) will extend 1 to 2 feet above the top of the slotted casing. Bentonite will be placed above the top of the sandpack to prevent the entrance of cement-bentonite grout into the sandpack. A cement-bentonite grout will be placed above the bentonite seal to the land surface to seal the remainder of the borehole interval from surface-water infiltration. The grout will be pumped into place through a tremie pipe, and a locking well cover will be placed over the top of the well casing to protect well integrity. The wells will be installed according to California Regional Water Quality Control Board (RWQCB) guidelines. Newly installed wells will be surveyed to the nearest 0.01 foot, referenced to mean sea level (msl) by a licensed surveyor.

Intermediate-depth monitoring wells will be double-cased to prevent chemical-affected shallow ground water from mixing with deeper water during well construction. PVC conductor casing will be placed 2 to 3 feet into a clay interval below the first saturated sediments, as determined by lithologic information obtained from the deeper pilot boring, then grouted on the outside and bottom to seal off the shallow sediments from the borehole. After the grout has set overnight, the conductor casing will be flushed with clean water to remove ground water that has entered from the upper sediments. Drilling will proceed inside the conductor casing through the grout to the next permeable interval. The well will be constructed of 2-inch-diameter PVC by installing the screen and casing through the augers to the depth of the boring. A filter pack consisting of appropriately graded sand will be installed into the annular space between the borehole and the slotted PVC casing. Well construction will be completed in accordance with procedures described above.

Water-Level Measurements. The top of the PVC well casings will be surveyed relative to msl by a state-licensed land surveyor. Before sampling, water-level measurements will be collected from all existing and newly installed wells at the Site. Depth to water will be measured using an electric water-level sounding probe to the nearest 0.01 foot, relative to the top of the PVC casing. Depth-to-water will be recorded in the field on water-level forms. A copy of the water-level form that will be used is included in Appendix A.

Well Development. The newly installed wells will be developed by hand bailing, surging, or overpumping during the development process. Approximately 6 to 10 well casing volumes of ground water will be purged to remove sediments left in the well during well construction and to enhance hydraulic communication with the surrounding water-yielding sediments. Observations concerning the quantity and clarity of the water withdrawn will be recorded during this process. Temperature, pH, and specific conductivity also will be measured and recorded on water-quality sheets. A copy of the water-quality form that will be used is included in Appendix A.

Ground-Water Sampling. The following routine techniques are designed to ensure that data are of high quality and representative of field conditions, and that sample contamination is minimized. Guidelines for well sampling will be as follows.

Ground-water samples will be collected immediately following well development from the newly installed wells. Samples will be collected from the newly installed and existing wells using a clean Teflon bailer. Samples collected for analyses for metals will be field filtered into laboratory-supplied, nitric acid-preserved 1-liter plastic containers using 0.45-micron disposable filters. Ground-water samples for other analyses will be poured directly from the bailer into appropriate laboratory-supplied containers. Measurements of pH will be obtained and recorded in the field on water-quality forms.

Immediately after collection, samples will be labeled and placed in a chilled cooler for delivery under chain-of-custody protocols to a state-certified laboratory. For QA/QC measures, one QC trip blank will be included with the ground-water samples. Additionally, one field equipment blank and one or two duplicate samples will be collected for possible chemical analysis as discussed in Section 10.0.

5.2 Waste Disposal Procedures

Waste soil and water generated from drilling operations or from sampling will remain on site in appropriate storage containers until chemically tested to determine the proper means of disposal. Soil and water waste will be handled and disposed of according to the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) and San Francisco Bay RWQCB regulations.

Levine•Fricke will supply on-site waste disposal bins or drums for storing waste soil and a PVC holding tank for wastewater. After drilling and other field activities have been completed, debris and waste accumulated during field work will be removed and the work area returned to near-original condition.

As the generator of the wastes, Volvo GM will be responsible for their disposal. After receiving analytical results, Levine•Fricke will identify appropriate disposal methods and possible disposal sites. Disposal options will be reviewed according to DTSC and RWQCB regulations. Any wastes that are determined to be hazardous and that must be disposed of off site will be manifested and transported to an approved disposal site, using a registered hazardous waste hauler.

6.0 SAMPLE HANDLING

Each sample will be packaged and transported according to the following procedure:

- collect samples in laboratory-supplied, appropriately sized and prepared containers
- attach completed sample label to each sample
- properly seal and package sample containers
- complete lithologic log and chain-of-custody/analysis request forms
- chill cooler to 4 degrees Celsius (regular ice used in the coolers will be sealed in a plastic bag other than the one in which it was purchased; reusable "blue ice" packets also may be used)
- separate and place samples into coolers for shipment to the appropriate laboratory (samples will be packaged so the potential for shipping damage is minimized)

- seal the top two copies of the chain-of-custody form inside a zip-lock bag
- seal the cooler with several strips of strapping tape (if mailing)
- arrange for appropriate transport or shipment to the analytical laboratory

7.0 LABORATORY ANALYSIS

7.1 Soil Analysis

Table 1 presents a summary of shallow (15 feet bgs or less) soil boring locations, the depth at which samples will be collected, and proposed chemical analysis for samples collected from the boring. Table 1 was designed to provide general guidelines for the field personnel. However, samples submitted to the laboratory for analysis will be selected by the project manager based on review of the lithologic logs and field notes. One to three samples per shallow soil boring and two to six samples per deeper boring will be submitted for laboratory analysis.

In borings where slag or unusual fill material is encountered, a sample of the slag or fill material will be collected for possible analysis to characterize the constituents of the material. Sample containers, such as non-reactive glass jars, will be used for the storage of this material. Samples not sent to a laboratory for analysis will be stored in a locked metal cabinet at a Levine•Fricke facility.

Metals and pH. Soil samples collected from each boring will be submitted for chemical analyses for pH and Title 22 metals using Method 6010/7000 Series. Values for pH will also be measured and recorded in the field for comparison purposes between laboratory and field measurements. If analytical results for metals analysis indicate the presence of a metal in an individual soil sample at concentrations exceeding 10 times the Soluble Threshold Limit Concentration (STLC), a Waste Extraction Test (WET) for that metal will be conducted on that sample to assess the leachability of the metal.

Total Neutralizable Acidity. The total neutralizable acidity (TNA) of acidic soil samples collected from the Site will be evaluated to assess the amount of acid in soil and provide information regarding the amount of alkaline material required to neutralize soils and water. We anticipate that two to four soil samples will be selected for TNA tests.

X-Ray Diffraction for Baryte. Two to four soil samples will be submitted for analysis to confirm that barium in the soil is in the form of barium sulfite, otherwise known as baryte ($BaSO_4$), which was handled at the Site before 1963. The presence of baryte in the soils can be confirmed using x-ray diffraction technology (XRD).

TOC. Approximately four soil samples collected from the Site will be analyzed for total organic carbon (TOC). The TOC value will provide information that will be valuable for assessing the potential for organic compounds to leach from soils; for organic compounds to move in ground water; and for inorganic elements to be released from soils during future remediation by stabilization.

Sulfate and Sulfide. Sulfate and sulfide compounds were reportedly handled on the Site during previous site operations. To assess the possible effect of previous materials handling procedures on soil quality at the Site, selected samples will be analyzed for sulfate and sulfide.

Total Sulfur. Soil and fill material that show visual evidence of the potential presence of elemental or reduced forms of sulfur and selected samples from different parts of the Site will be analyzed for sulfur by EPA Method 6010.

Petroleum Hydrocarbons. Two to four samples per boring will be analyzed for petroleum compounds if field evidence, such as staining or elevated OVA measurements, is noted during sample collection from well boring LF-9 and LF-11. The samples will likely be analyzed for volatile and extractable hydrocarbons using EPA Method 8015, for O&G using EPA Method 5520 E & F (gravimetric), and for volatile organic compounds (VOCs) using EPA Method 8240.

Semivolatile Organic Compounds. Soil samples will be selected for analysis for SVOCs using EPA Method 8270.

7.2 Ground-Water Analysis

Table 2 presents a summary of ground-water samples to be collected and the associated laboratory analysis. Ground-water samples from all wells will be analyzed for Title 22 metals using methods designed to meet San Francisco Basin Plan detection limits, and for total dissolved solids (TDS) using standard methods. Ground-water samples collected from newly installed wells will be analyzed for VOCs using EPA Method 8240. Samples will be collected from four wells for analysis of general minerals.

Two ground-water samples collected from selected monitoring wells will also be tested for TNA.

Ground-water samples collected from wells LF-11 and LF-9 will also be analyzed for petroleum hydrocarbons using EPA Method 8015, for O&G using EPA Method 5520 B & F, and for VOCs and SVOCs using EPA Methods 8240 and 8270.

8.0 SAMPLE CUSTODY

Sample custody and documentation procedures link each reported datum with its associated sample. It consists of three linked documentation and custody procedures, for field, office, and laboratory. Chain-of-custody (COC)/analysis request forms, which are central to these procedures, will be attached to all samples and their associated data throughout the tracking process. A copy of the Levine•Fricke COC that will be used during the investigation has been included in Appendix A.

8.1 Field Custody Procedures

Field documentation consists of sample labels, lithologic logs, sample collection data forms, a field activities logbook, and COC/analysis request forms. These documents will be completed using indelible ink. Any corrections to a document will be made by drawing a line through the error and entering the correct value, without obliterating the original entry. Anyone correcting an original document will initial and date all changes.

Field documentation is described in detail below.

Sample Labels. Sample labels will be completed and attached to the sample container for all samples collected. Labels are made of a waterproof material backed with a water-resistant adhesive. Labels are to be filled out using waterproof ink and contain at least the following information: sampling date, sampling location, sampler's name, and the analyses to be conducted.

Lithologic Log. All sediments encountered during drilling will be examined and described by a Levine•Fricke hydrogeologist or engineer, who will maintain a complete record of the descriptions. Sediments will be described in accordance with the Unified Soil Classification System as discussed in Section 5.1. The log will be reviewed by a Levine•Fricke California registered geologist.

Sample Collection Data Forms. During ground-water sampling and water-level measurement field activities, water-quality sampling forms and water-level measurement forms will be completed by the Levine•Fricke project hydrogeologist for each well. Both forms will contain pertinent project and well location information. The water-quality sampling form will contain data including temperature, pH, and conductivity (Appendix A).

Field Activities Logbook. A field log will be used to record field activities daily. A field geologist, hydrogeologist, or engineer will be responsible for making sure that a copy of the field log is sent to the project file as soon as each sampling round is completed. In addition, field personnel will complete daily field reports. These reports will include the following:

- name of person making log entry
- date and time of entry
- location of activity
- log of field equipment calibration
- personnel present at the Site
- sampling and measurement methods
- total number of samples collected
- sample numbers
- well identification numbers
- laboratory to perform analysis
- field observations and comments

A copy of the daily field activities report form has been included in Appendix A.

COC/Analysis Request Form. A COC/analysis request form will be prepared for groups of samples collected at a given location on a given day. Each COC/analysis request form will be prepared in quadruplicate and will accompany every shipment of samples to the laboratory.

Two of the four copies (white and green) will accompany the samples to the laboratory. The yellow copy is kept in Levine•Fricke's QA/QC file, and the pink copy is retained in the project file. The COC form makes provision for documenting sample integrity and the identity of any persons involved in sample transfer.

Information entered on the COC consists of the following:

- project name and number
- field logbook number
- COC serial number
- project location
- sample numbers
- sampler/recorder's signature
- date and time of collection
- collection location
- sample type
- analyses requested
- inclusive dates of possession
- name of person receiving the sample
- laboratory sample number
- date and time of receipt of sample
- address of laboratory

Samples will be shipped so that no more than 24 hours elapse from the time of shipment to the time the laboratory receives the samples. The method of shipment may be hand delivery by field personnel, laboratory courier, or commercial shipping services (such as UPS or Federal Express). The method of sample shipment will be noted on the COC/analysis request form. If samples are to be held for longer than 24 hours, the samples will be placed in a refrigerator set at 4 degrees Celsius, and this information will be noted on the COC/analysis request form. The samples will be shipped in a timely manner, to ensure that holding times are not exceeded.

8.2 Office Documentation Procedures

Samples will be tracked and data archived at Levine•Fricke's Emeryville headquarters. Levine•Fricke's QA/QC Officer is responsible for ensuring that documentation is in order, linking all samples with data. The project file will be used in data tracking and documentation, as discussed below.

The project file contains documents including work plans, proposals, sampling plans, assessment reports, correspondence, the field log, COC/analysis request forms, and sampling information forms. The project file is the common location for all information required in data evaluation and interpretation and report preparation. The file is organized for easy retrieval and long-term storage of information (for two years or more). The project manager maintains the project file.

8.3 Laboratory Custody Procedures

The selected analytical laboratory, American Environmental Network (AEN), is a California state-certified laboratory and has all of the certifications necessary to conduct the analyses of samples submitted.

The laboratory will designate a sample custodian who will accept custody of the shipped samples and check that the information on the sample label matches that on the COC form(s). The custodian will then enter the appropriate data into the laboratory sample tracking system. The custodian will use the sample number on the sample label or will assign a unique laboratory number to each sample. As a record of sample receipt, the analytical laboratory will mail a copy of the COC form, with the assigned laboratory numbers, to the sampler. The custodian will then transfer the sample(s) to the proper analyst(s) or store the sample(s) under refrigeration until they are analyzed.

Laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted or disposed of. Material remaining after completion of the requested analyses will be stored until the end of the investigation (or specific phase of work). Disposal of unused samples must comply with all applicable federal, state, and local environmental regulations. All data sheets and laboratory records will be retained as permanent documentation.

9.0 INSTRUMENT CALIBRATION PROCEDURES AND FIELD DATA MEASUREMENT

During the investigation, field data will be gathered on specific activities related to single sampling events. The protocol for field measurement, described below, is designed so that measurements, if made by different people, are consistent and reproducible. Standard equipment calibration procedures for each instrument are also described below.

9.1 Instrument Calibration Procedures

Portable Air Monitoring Equipment Calibration. A hand-held portable photoionization detector (PID) instrument (such as a Photovac MicroTip) will be used during drilling to evaluate VOCs in soil headspace, as well as in ambient air. The manufacturer-supplied calibration standard span gas will be used to calibrate the span and to calibrate the ambient air to zero. Calibration of the PID will be performed before each day's sampling activities begin, and at intervals throughout the day (approximately every hour) if irregularities in the readings become apparent. A log of the instrument's calibration will be stored with the equipment.

Specific Conductance, Temperature, and pH. During water sampling at each well, specific conductance, water temperature, and pH will be measured. A representative water sample will be placed in a transfer bottle used solely for measuring field parameter values. Ground-water pH will be measured using a conventional pH meter with a combination electrode. For specific conductance measurements, a conventional conductivity meter or equivalent combination instrument will be used. Temperature will be measured with standard thermometers or temperature meters. Instruments that measure two or all three of these parameters may also be used. Instrument probes will be properly cleaned and rinsed before each use.

Digital conductivity meters will be calibrated before each sampling event using a reagent-grade potassium chloride standard. A temperature correction will be applied during calibration and measurement. The temperature of the standard solution at the time of calibration will be measured to 0.1 degree Celsius and recorded in the calibration log together with the certified and measured specific conductance values for the standard solution. The temperature of field samples will be recorded at the time of measurement.

The pH meter will be calibrated daily before use in the field using standard pH buffers (pH 4.01, 7.00, and 10.00). A two-buffer calibration will be performed before pH is measured, using buffers with pH values that bracket the anticipated values for the samples to be tested. The calibration will be checked at least once every 2 to 3 hours thereafter, and the meter will be recalibrated, if necessary. Temperature corrections will be made during calibration.

Water-Level Measurement and Tidal Study. Either an electric well sounder or a pressure transducer will be used to measure water levels at the Site. The identification number of the electric sounder or pressure transducer will be recorded in the field notes along with water-level measurements.

Electric Sounder. Calibration of each electric sounder will be checked at least once every three months and at the beginning of the tidal influence test. Markings will first be checked by measuring the spacings with a graduated steel tape.

Calibration will be checked again in the field by measuring the water level with the sounder and checking the measurement with a steel tape. If the difference between the two measurements is greater than 0.05 foot per 100 feet to water, the measurement will be repeated. Calibration checks will be recorded in the instrument logbook. The sounder also will be checked for calibration after any incident that may alter the instrument's accuracy.

If more than one electric sounder is used during the taking of a single set of measurements, all sounders used will be checked against each other by measuring water depth for at least two measurement stations. The results of these measurements will be recorded in the field notes. If the difference between measured values obtained at the same station exceeds 0.05 foot, the calibration of the sounders will be checked using a steel tape.

Pressure Transducers. Pressure transducers will be operated, maintained, and stored according to manufacturer specifications. Each pressure transducer is factory-calibrated once. Thereafter, quarterly in-house calibration will be conducted by the field geologist, who will check water columns against steel tape measurements. Calibration data will be entered in the logbook in the project file.

When a pressure transducer is set in a monitoring well, exact depth to the sensing tip will be measured and recorded. A transducer will be positioned at least 1 foot above the well bottom. The distance from the marked measuring point on each well to the reference point on each emplaced transducer will be recorded. Any electrical conditions that could affect transducer operation will be recorded in the field notes. When pressure transducers are used in aquifer or pump tests, water levels will be measured periodically with an electric sounder.

9.2 Field Measurement Data

Senior personnel will validate data obtained from field measurements by checking procedures used in the field and comparing current measurements with historical data. To allow comparison of data from different sampling episodes, results will have to be reported in the same units. The units to be used for the various parameters are identified below.

- **pH:** Field measurements will be reported to 0.1 standard pH units.

- **electrical conductivity:** Field measurements will be reported in micromhos per centimeter.
- **water levels:** Levels will be measured to the nearest 0.01 foot.
- **flow rates:** Rates will be reported to 0.5 gallon per minute (gpm) if discharge rates are less than 10 gpm. For higher flow rates, values will be reported to the nearest one or two significant digits.

9.3 Preventative Maintenance of Equipment

Equipment operation will be routinely checked to minimize breakdowns in the field. Field instrumentation will be checked using the calibration procedures described above. Nonfunctional equipment will be removed from service and the information on its removal entered in the field log. The equipment will be repaired or replaced, and the time and date of its return to service will also be noted in the calibration log.

10.0 DATA QUALITY OBJECTIVES AND QC CHECKS

10.1 Data Quality Objectives

All chemical analyses will be performed by a state-certified analytical laboratory. The QA/QC analysis will also be conducted by a state-certified analytical laboratory and QA/QC results will be presented and summarized in all laboratory reports. To further evaluate the laboratories' analytical procedures, field QC checks will be employed.

Before use in quantitative analysis or in any report, all analytical data will be reviewed by Levine•Fricke's QA/QC Officer or designee. The review will include evaluation of all data QA/QC parameters including all laboratory and field QC checks (such as blanks, spikes, and duplicates), and all other information associated with the laboratory analytical data. Levine•Fricke's QA/QC Officer or designee will also review all data reduction, evaluation, and interpretation procedures.

10.2 Field QC Checks

Field and laboratory QC checks will be used to evaluate the laboratory's analytical procedures. The QC checks will involve introduction of control samples into the sample analysis stream in an effort to evaluate the accuracy and precision of the sampling and analysis program.

Field QC checks will entail field collection of control samples to be introduced to the laboratories as blind samples. Each QC sample will be assigned a unique number that will not reveal to the laboratory that it is a control sample. Blanks and duplicates are the two sample types to be used for ground-water sampling. These samples will be identified in the field logbook according to type.

10.2.1 Blanks

Field blanks will be collected immediately before ground-water samples are collected by pouring organic-free deionized water supplied by the laboratory into the sampler and then into the appropriate sample containers. At least one field blank will be collected and analyzed for all project parameters for each day of sampling. Additional field blanks may be collected at the sampler's discretion. The sampler, after consultation with the Levine•Fricke project manager or project hydrogeologist, may instruct the laboratory either to analyze such additional samples or to hold them for possible analysis later, pending initial results. If initial results for a sample collected after a field blank is collected indicate detectable concentrations of constituents, or if a sample contains unexplainable concentrations of constituents, the field blank sample will be analyzed.

One trip blank will be included with each shipment of samples, to be prepared by the laboratory using organic-free deionized water supplied in appropriate pre-filled sample containers. Trip blanks will be analyzed for VOCs only. At least one trip blank will be included with each shipment of samples as a check for possible contamination of the sample bottles and/or the organic-free deionized water used for field blanks.

10.2.2 Field Duplicates

A minimum of one field duplicate or split sample will be collected for every 10 water samples collected. The duplicate or split samples will be submitted to the laboratory for analysis. Additional duplicate samples may be collected and submitted to the laboratory with instructions to hold the samples for possible analysis later (if, for example, analytical results for the one duplicate set indicate poor laboratory performance).

10.3 Laboratory QC Checks

The types of laboratory QC samples that may be analyzed include reagent or method blanks, calibration blanks, laboratory control samples and laboratory control sample duplicates, matrix spikes, and matrix spike duplicates.

11.0 QA AUDITS

Field personnel will participate in periodic internal performance and system audits conducted by the project manager and QA/QC Officer. Internal audits by the QA/QC Officer will also include evaluation of QC data and validation of all data collected at every phase of the investigation at the Site.

11.1 Field Personnel Performance

The project manager, QA/QC Officer, and Health and Safety Officer, or their designee, will randomly observe field staff to ascertain adherence to the sampling protocol described in this FSP and will conduct at least one field inspection during each major phase of work. Deviations from the field protocol as defined in this FSP and adherence to any procedures that could compromise the quality of data obtained in the field will be reported by the field geologist or engineer to the project manager, who will initiate a corrective action, as necessary. Field visits will be documented in daily field reports. Those documents and a record of corrective actions will be placed in the project files.

The drilling and well installation program will be audited once for each new phase of work. Those field audits will focus on whether drilling, soil sampling, and well installation procedures have been followed. The QA/QC Officer or project manager will observe drilling and well installation operations and review selected documentation of the field activities. The results of each field audit will be summarized in the report for that phase of work.

11.2 System Performance

The QA/QC Officer or designee will perform periodic system audits to evaluate the following:

- the appropriateness of the well design for the Site and the project objectives

- the effect of borehole drilling and well construction and development on the extent to which soil samples represent field conditions

- the effect of sampling protocol on data quality and validity

- the effect of sample custody and handling methods on sample integrity

- the effect of sample and data tracking and documentation procedures on data validation, field sampling, and analytical methodologies

- the appropriateness of the chemical analysis methods

- the sufficiency and appropriateness of QC checks for ensuring data quality

The QA/QC Officer or designee will prepare a summary of the system audit for presentation to the project manager.

12.0 HEALTH AND SAFETY PLAN

As required by the Occupational Health and Safety Administration (OSHA) 29 CFR 1910.120, Hazardous Waste Operations and Emergency Responses, a site health and safety plan (HSP) will be prepared to maintain a safe working environment while conducting proposed soil and ground-water remedial investigation activities. The existing HSP for the project (Levine•Fricke 1991) will be revised to incorporate the scope of work presented in the RI work plan dated January 15, 1993, and discussed in this FSP.

13.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The following Levine•Fricke personnel will manage the scope of work included in the RI work plan as long as the work is conducted on behalf of Volvo GM.

Mr. Thomas M. Johnson, R.G., Vice President and Principal Hydrogeologist, will be the project director for this project. As such, he will be responsible for the overall direction of this project, including project strategy development and corporate review of technical reports.

Ms. Kathleen A. Isaacson, R.G., Senior Hydrogeologist, will be project manager for this project. As such, she will make certain that project objectives are fulfilled in a timely manner and that final reports are of high quality. Ms. Isaacson will be the primary contact for the Client and regulatory agencies.

Ms. Shari Samuels, Director of Health and Safety, will be the Health and Safety Director for the project. As such, she will be responsible for assessing potential health and safety hazards at the Site, recommending appropriate safeguards and procedures, and modifying the HSP when necessary.

Mr. Glenn Leong, Senior Project Chemist, will be the QA/QC Officer for this project. As such he will design, monitor, and evaluate the projects QA/QC program.

14.0 SCHEDULE

A schedule of field activities is presented in Figure 4. The tasks outlined in this document will be conducted in a phased approach. The shallow soil and ground-water quality investigation will be completed first, and the resulting data will be evaluated before deeper soil borings and wells are drilled.

It is anticipated that field work will begin during the week of October 18, 1993, and that the first phase of field work can be completed within two to three weeks. As indicated in the schedule, it is anticipated that the second phase of field work (deeper soil borings and monitoring wells) will begin during the last week of November 1993, and that all proposed field work can be completed mid-January 1994.

15.0 REFERENCES

Aqua Terra Technologies, Inc. (ATT). 1990. Phase II Site Assessment for the Property Located at 750-50th Avenue, Oakland, California. October 23.

Levine•Fricke, Inc. 1991. Health and Safety Plan, Soil and Ground-Water Investigation, White GMC Truck Corporation, 5050 Coliseum Way, Oakland, California. October 25.

——. 1993. Remedial Investigation Work Plan, 5050 Coliseum Way and 750-50th Avenue, Oakland, California. January 15.

TABLE 1

SUMMARY OF PROPOSED SOIL SAMPLES AND ANTICIPATED CHEMICAL ANALYSES (1): VOLVO GM
5050 COLISEUM WAY AND 750-50TH AVENUE, OAKLAND, CALIFORNIA

Sample I.D.	Total Depth	Sample Interval	Title 22 Metals (6010/7000)	pH (150.1)	Sulfate and Sulfide	TPHg/ TPHd (8015)	Oil & Grease (5520)	VOCs (8240)	SVOCs (8270)
LF-8	15'	2.0-2.5	X	X	X				
		4.5-5.0							
		7.0-7.5	X	X	X				
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
LF-9	15'	2.0-2.5	X	X	X	X	X	X	X
		4.5-5.0							
		7.0-7.5	X	X	X	X	X	X	X
		9.5-10.0							
		12.0-12.5	X	X		X	X	X	X
		14.5-15.0							
LF-10	15'	2.0-2.5	X	X	X				
		4.5-5.0							
		7.0-7.5	X	X	X				
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
LF-11	15'	2.0-2.5	X	X	X	X	X	X	X
		4.5-5.0							
		7.0-7.5	X	X	X	X	X	X	X
		9.5-10.0							
		12.0-12.5	X	X		X	X	X	X
		14.5-15.0							
LF-12	15'	2.0-2.5	X	X	X				
		4.5-5.0							
		7.0-7.5	X	X	X				
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
LF-13	15'	2.0-2.5	X	X	X				
		4.5-5.0							
		7.0-7.5	X	X	X				
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-1	15'	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-2	15'	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							

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SUMMARY OF PROPOSED SOIL SAMPLES AND ANTICIPATED CHEMICAL ANALYSES (1): VOLVO GM
5050 COLISEUM WAY AND 750-50TH AVENUE, OAKLAND, CALIFORNIA

Sample I.D.	Total Depth	Sample Interval	Title 22 Metals (6010/7000)	pH (150.1)	Sulfate and Sulfide	TPHg/ TPHd (8015)	Oil & Grease (5520)	VOCs (8240)	SVOCs (8270)
SB-3	15′	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-4	15′	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-5	15′	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-6	15′	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-7	15′	2.0-2.5	X	X	X				
		4.5-5.0							
		7.0-7.5	X	X	X				
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-8	15′	2.0-2.5	X	X	X				
		4.5-5.0							
		7.0-7.5	X	X	X				
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-9	15′	2.0-2.5	X						
		4.5-5.0							
		7.0-7.5	X						
		9.5-10.0							
		12.0-12.5	X						
		14.5-15.0							
SB-10	15′	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							

TABLE 1

SUMMARY OF PROPOSED SOIL SAMPLES AND ANTICIPATED CHEMICAL ANALYSES (1): VOLVO GM
5050 COLISEUM WAY AND 750-50TH AVENUE, OAKLAND, CALIFORNIA

Sample I.D.	Total Depth	Sample Interval	Title 22 Metals (6010/7000)	pH (150.1)	Sulfate and Sulfide	TPHg/ TPHd (8015)	Oil & Grease (5520)	VOCs (8240)	SVOCs (8270)
SB-11	15'	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-12	15'	2.0-2.5	X	X	X				
		4.5-5.0							
		7.0-7.5	X	X	X				
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-13	15'	2.0-2.5	X	X	X				
		4.5-5.0							
		7.0-7.5	X	X	X				
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-14	15'	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SB-15	15'	2.0-2.5	X	X					
		4.5-5.0							
		7.0-7.5	X	X					
		9.5-10.0							
		12.0-12.5	X	X					
		14.5-15.0							
SS-1	2.5'	2.0-2.5	X	X	X				
SS-2	2.5'	2.0-2.5	X	X					
SS-3	2.5'	2.0-2.5	X	X	X				
SS-4	2.5'	2.0-2.5	X	X					
SS-5	2.5'	2.0-2.5	X	X					
SS-6	2.5'	2.0-2.5	X	X	X				
SS-7	2.5'	2.0-2.5	X	X					
SS-8	2.5'	2.0-2.5	X	X	X				
SS-9	2.5'	2.0-2.5	X	X					
SS-10	2.5'	2.0-2.5	X	X					
SS-11	2.5'	2.0-2.5	X	X					
SS-12	2.5'	2.0-2.5	X	X					

TABLE 1

SUMMARY OF PROPOSED SOIL SAMPLES AND ANTICIPATED CHEMICAL ANALYSES (1): VOLVO GM
5050 COLISEUM WAY AND 750-50TH AVENUE, OAKLAND, CALIFORNIA

Sample I.D.	Total Depth	Sample Interval	Title 22 Metals (6010/7000)	pH (150.1)	Sulfate and Sulfide	TPHg/ TPHd (8015)	Oil & Grease (5520)	VOCs (8240)	SVOCs (8270)
SS-13	2.5'	2.0-2.5	X	X					
SS-14	2.5'	2.0-2.5	X	X					
SS-15	2.5'	2.0-2.5	X	X					
SS-16	2.5'	2.0-2.5	X	X					
SS-17	2.5'	2.0-2.5	X	X					
SS-18	2.5'	2.0-2.5	X	X					

NOTES

SVOCs - semivolatile organic compounds
TPHd - total petroleum hydrocarbons as diesel
TPHg - total petroleum hydrocarbons as gasoline
VOCs - volatile organic compounds

Samples actually to be sent to the laboratory for analysis will be selected by the project manager based on review of lithologic logs and field notes.

(1) Additional analyses:

(a) Two to four samples will be selected for TNA tests. The total neutralizable acidity (TNA) test will be evaluated in the Levine Fricke laboratory.

(b) Two to four samples will be submitted to the U.S. Geological Survey in Sacramento, California, for the x-ray diffraction (XRD) technology, which will be used to confirm the presence of baryte.

(c) Approximately four soil samples will be analyzed for total organic carbon (TOC).

(d) Selected samples will be analyzed for sulfate and sulfide to assess the possible effect of previous materials handling on the Site.

(e) Soil and fill material that show visual evidence of the potential presence of elemental or reduced forms of sulfur and selected samples from different parts of the Site will be analyzed for sulfur by EPA Method 6010.

TABLE 2
SAMPLING AND ANALYSIS PLAN (1) FOR GROUND-WATER SAMPLES
COLLECTED FROM SHALLOW (less than 30 feet bgs) MONITORING WELLS
5050 COLISEUM WAY AND 750-50TH AVENUE, OAKLAND, CALIFORNIA

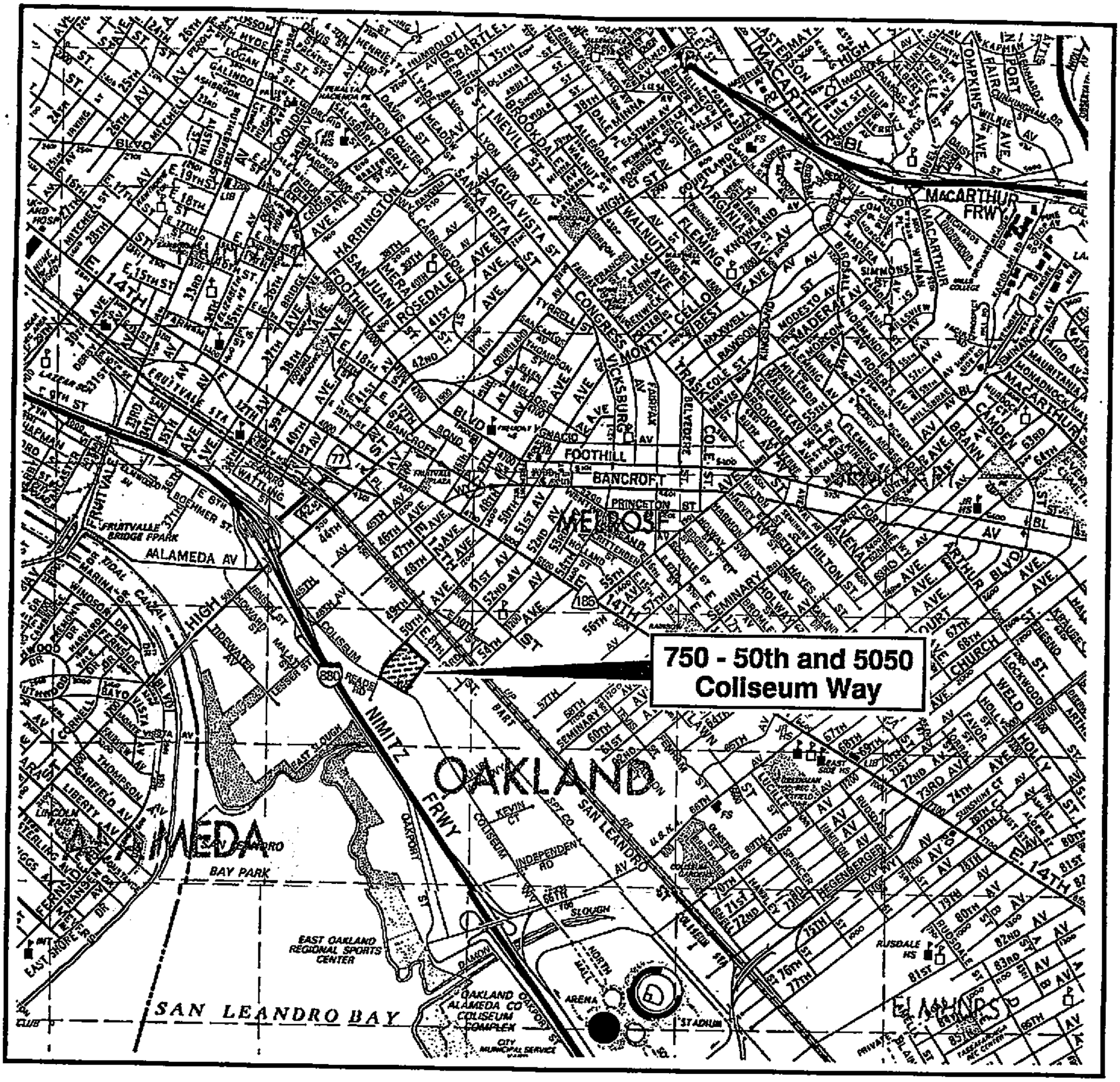
Sample I.D.	Title 22 Metals (6010/7000)	Total Dissolved Solids	VOCS (8240)	General Minerals	pH (measured in field)	TPHd/ TPHg (8015)	Oil & Grease (5520)	SVOCs (8270)
Existing Wells								
LF-1	X	X			X			
LF-2	X	X			X			
LF-3	X	X			X			
LF-4	X	X			X			
LF-5	X	X			X			
LF-6	X	X			X			
LF-7	X	X			X			
MW-1	X	X			X			
MW-2	X	X			X			
MW-3	X	X			X			
MW-4	X	X			X			
New Wells								
LF-8	X	X	X	X	X			
LF-9	X	X	X		X	X	X	X
LF-10	X	X	X	X	X			
LF-11	X	X	X	X	X	X	X	X
LF-12	X	X	X	X	X			
LF-13	X	X	X		X			

NOTES:

SVOCs - semivolatile organic compounds
TPHd - total petroleum hydrocarbons as diesel
TPHg - total petroleum hydrocarbons as gasoline
VOCs - volatile organic compounds

(1) Additional analyses:

(a) The total neutralizable acidity (TNA) test will be conducted on two selected ground-water samples based on pH values. The TNA test quantifies the amount of acid and provides information regarding the amount of alkaline material required to neutralize soils and water.



SOURCE: Thomas Bros. map
Alameda and Contra Costa
1990

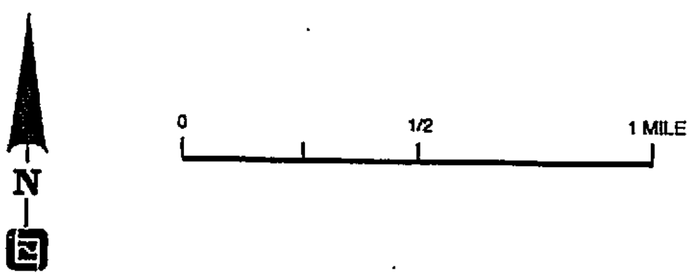


Figure 1 : SITE LOCATION MAP

Project No. 2407.02

LEVINE•FRICKE
ENGINEERS, HYDROGEOLOGISTS & APPLIED SCIENTISTS

15OCT93 RYL

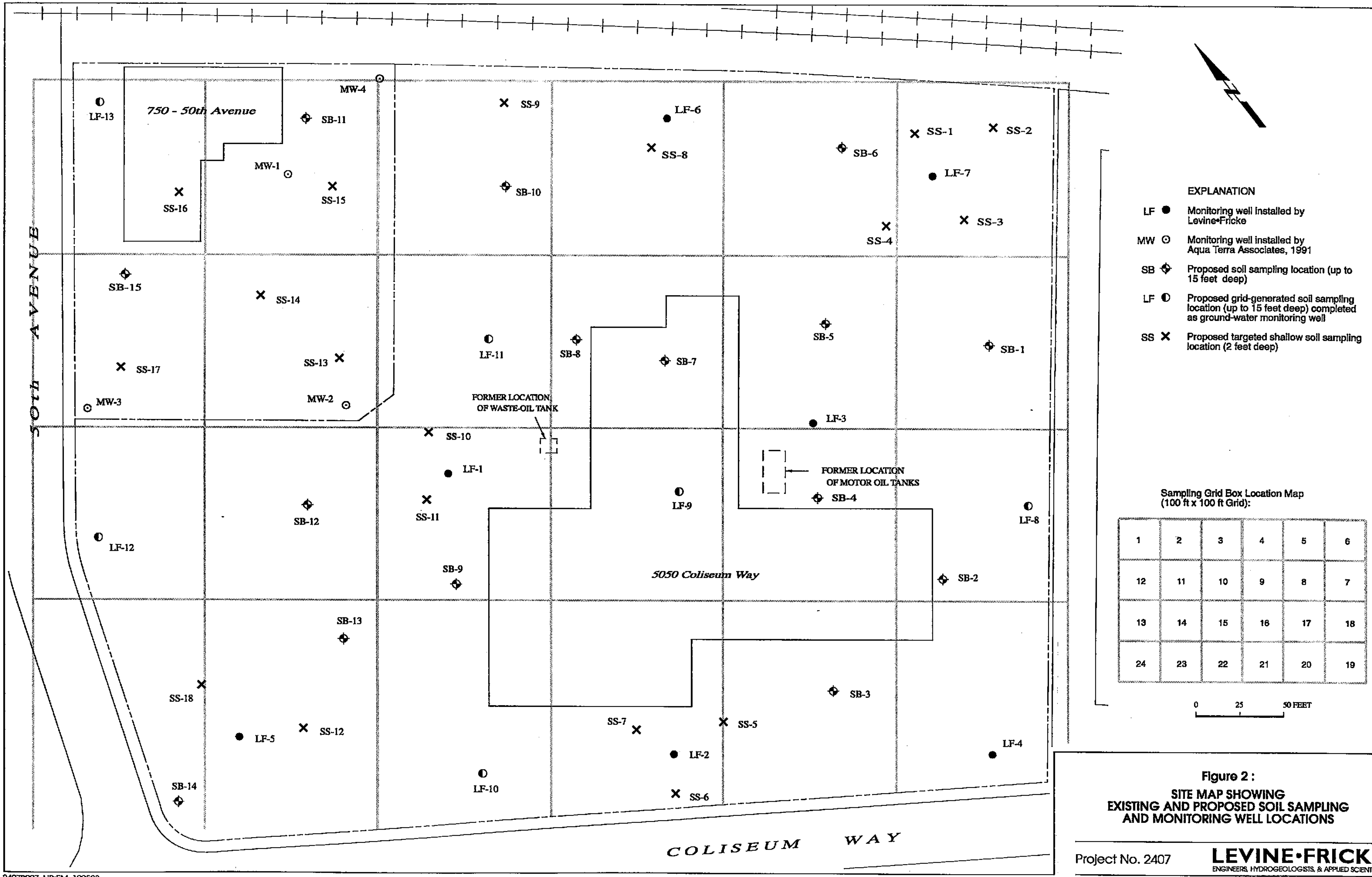


Figure 2 :

SITE MAP SHOWING EXISTING AND PROPOSED SOIL SAMPLING AND MONITORING WELL LOCATIONS

Project No. 2407

LEVINE•FRICKE
ENGINEERS, HYDROGEOLOGISTS, & APPLIED SCIENTISTS

2407S001.JJB:EM 101593

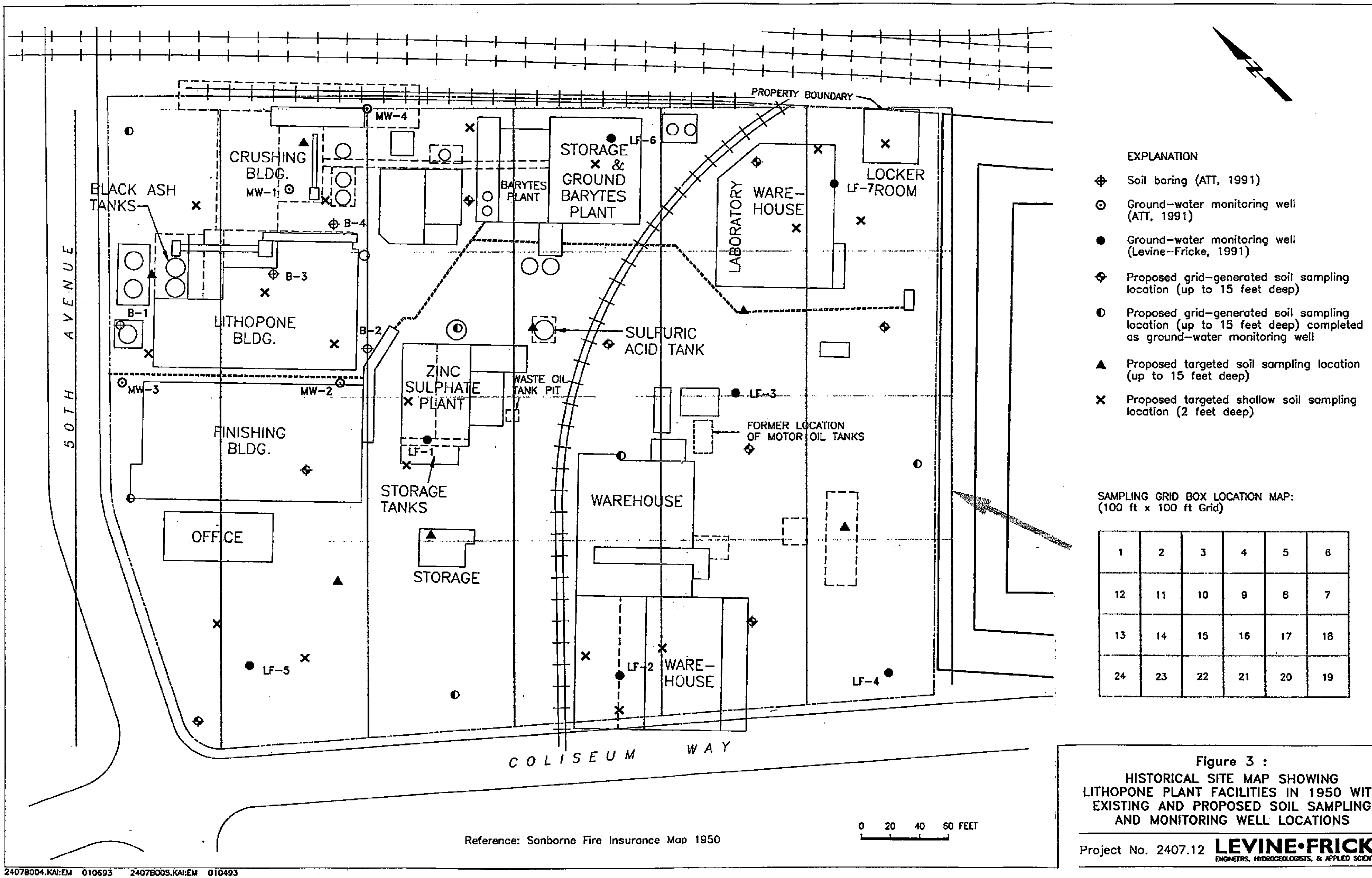
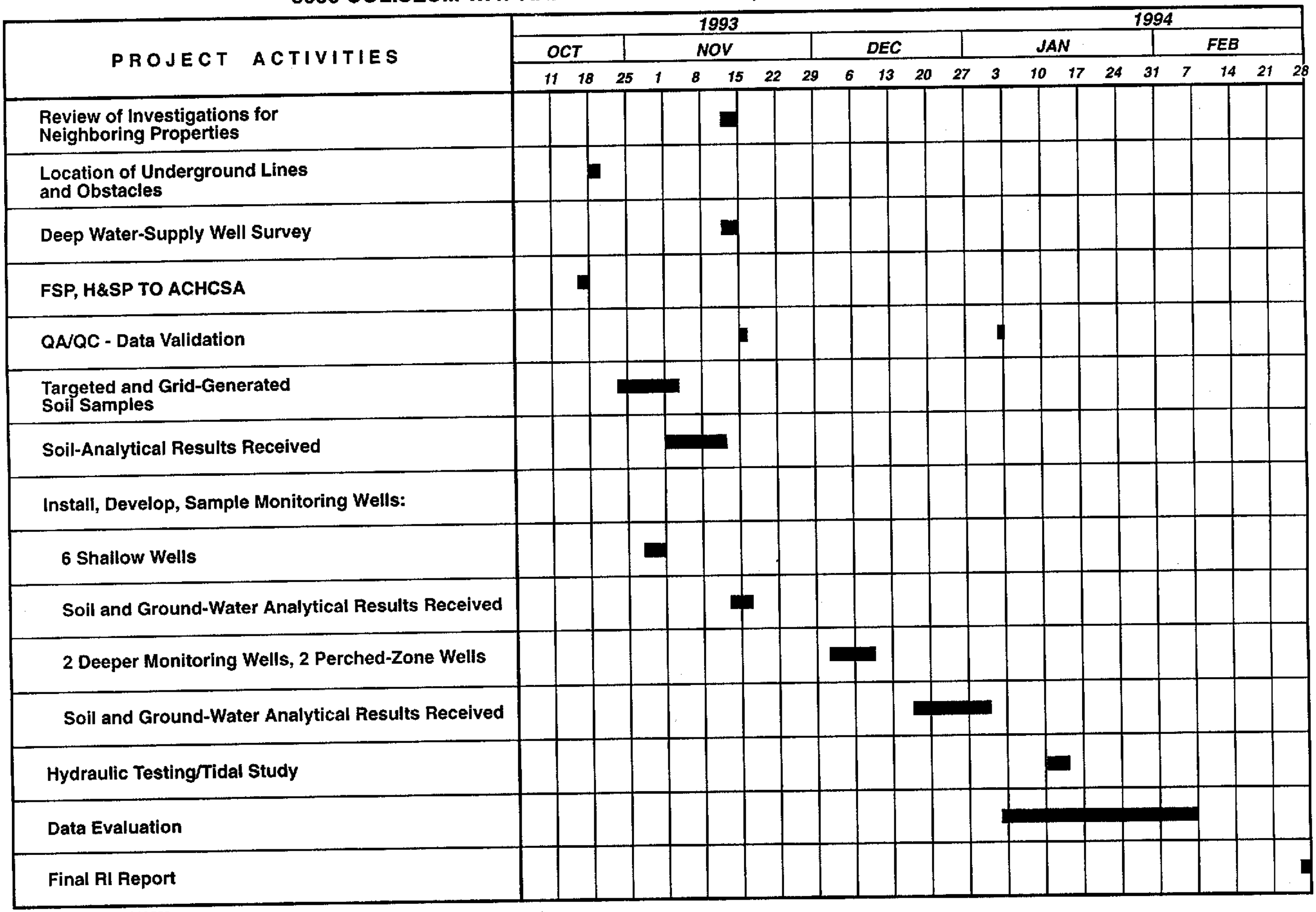


Figure 3 :
HISTORICAL SITE MAP SHOWING LITHOPONE PLANT FACILITIES IN 1950 WITH EXISTING AND PROPOSED SOIL SAMPLING AND MONITORING WELL LOCATIONS

Project No. 2407.12 LEVINE•FRICKE
ENGINEERS, HYDROGEOLOGISTS, & APPLIED SCIENTISTS

Figure 4:
TENTATIVE SCHEDULE TO COMPLETE REMEDIAL INVESTIGATION ACTIVITIES
5050 COLISEUM WAY AND 750 50th AVENUE, OAKLAND, CALIFORNIA



2407T01a.KAI:JSM 101593

APPENDIX A

SAMPLE DATA FORMS

WATER-LEVEL MEASUREMENTS

Project Name: 　　　　**Project No.:**

Field Personnel: 　　　　**Date:**

General Observations:

WELL NO.	WELL ELEVATION	DEPTH TO WATER MEASUREMENTS		WATER ELEVATION	REMARKS (UNITS = FEET)
		1	2		

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Depth, feet	WELL CONSTRUCTION	LITHOLOGY		SAMPLE DATA		
	Type of Security:	Graphic Log	Description	NUMBER	INTERVAL	PENETRATION RATE (Blows/ft.)

Well Permit No.: ____________
Date well drilled: ____________
Date water level measured: ____________
Well elevation: ____________

Drilling Company: ____________
Driller: ____________
Sampling Method: ____________
Hammer Weight: ____________

Sketch of Well Location:

LF Geologist/Engineer: ____________

FIELD LOG OF WELL CONSTRUCTION AND LITHOLOGY FOR

Project No.

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WATER-QUALITY SAMPLING INFORMATION

Project Name ______________________ Project No. __________

Date ______________________ Sample No. __________

Samplers Name ______________________

Sampling Location ______________________

Sampling Method ______________________

Analyses Requested ______________________

Number and Types of Sample Bottles used ______________________

Method of Shipment ______________________

GROUND WATER

Well No. __________

Well Diameter (in.) __________

Depth to Water, Static (ft) __________

Water in Well Box __________

Well Depth (ft) __________

Height of Water Column in Well __________

Water Volume in Well __________

SURFACE WATER

Stream Width __________

Stream Depth __________

Stream Velocity __________

Rained recently ? __________

Other __________

2-inch casing = 0.16 gal/ft

4-inch casing = 0.65 gal/ft

5-inch casing = 1.02 gal/ft

6-inch casing = 1.47 gal/ft

LOCATION MAP

TIME	DEPTH TO WATER (feet)	VOLUME WITHDRAWN (gallons)	TEMP (deg. C)	pH (S.U.)	COND (umhos/cm)	OTHER		REMARKS

Suggested Method for Purging Well ______________________

24-T91#yx

CHAIN OF CUSTODY / ANALYSES REQUEST FORM

Project No.:	Field Logbook No.:	Date:	Serial No.: 8398
Project Name:	Project Location:		
Sampler (Signature) :			Samplers:

SAMPLES						ANALYSES									
SAMPLE NO.	DATE	TIME	LAB SAMPLE NO.	NO. OF CON-TAINERS	SAMPLE TYPE	EPA 601	EPA 624					HOLD	RUSH	REMARKS

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
METHOD OF SHIPMENT:	DATE	TIME	LAB COMMENTS:		

Sample Collector: LEVINE-FRICKE 1900 Powell Street, 12th Floor Emeryville, Ca 94608 (415) 652-4500	Analytical Laboratory:

Shipping Copy (White) Lab Copy (Green) File Copy (Yellow) Field Copy (Pink) FORM NO. 86/COC/ARF