Remedial Investigation Work Plan
5050 Coliseum Way and 750-50th Avenue
Oakland, California 94601

January 15, 1993
LF 2407.12

Prepared for:

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

LEVINE·FRICKE

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ENGINEERS, HYDROGEOLOGISTS & APPLIED SCIENTISTS

January 15, 1993

LF 2407.12

Mr. Barney Chan
Alameda County Health Care Services
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Subject: Remedial Investigation Work Plan
5050 Coliseum Way and 750-50th Avenue
Oakland, California

Dear Mr. Chan:

This remedial investigation work plan has been prepared on behalf of Volvo GM Heavy Truck Corporation for the property located at 5050 Coliseum Way, and the adjoining property located at 750-50th Avenue (in combination "the Site"; Figure 1) in Oakland, California. This work plan has been prepared in response to the Alameda County Health Care Services Agency's August 5, 1992 letter requesting a remediation plan to address environmental concerns at the Site. This work plan presents a background summary of historical site usage and previous investigations conducted for the Site, followed by a proposed scope of work including detailed descriptions of tasks to conduct the next phase of remedial investigation and continue evaluation of soil and ground water at the Site.

If you have any questions or comments concerning this work plan, please do not hesitate to call me or Jenifer Beatty.

Sincerely,

Kathleen A. Isaacson, R.G.
Senior Hydrogeologist

Enclosure

cc: Rich Hiett, California Regional Water Quality Control Board - San Francisco Bay Region
Bob Whelen, Volvo GM Heavy Truck Corp.
Martha Boyd, Volvo GM Heavy Truck Corp.

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CERTIFICATION

All hydrogeologic and geologic information, conclusions, and recommendations have been prepared under the supervision of and reviewed by a Levine•Fricke California Registered Geologist.

Kathleen Isaacson
Senior Hydrogeologist
California Registered Geologist (5106)

1/6/93
Date

LEVINE·FRICKE

January 15, 1993 LF 2407.12

REMEDIAL INVESTIGATION WORK PLAN
5050 COLISEUM WAY and 750-50th AVENUE
OAKLAND, CALIFORNIA

1.0 INTRODUCTION

This remedial investigation (RI) work plan has been prepared by Levine•Fricke on behalf of Volvo GM Heavy Truck Corporation ("Volvo GM") for the property located at 5050 Coliseum Way and the adjoining property located at 750-50th Avenue (in combination "the Site"; Figure 1) in Oakland, California. This RI work plan was prepared in response to a request in the Alameda Health Care Services Agency's (ACHCSA) letter dated August 5, 1992, and in accordance with the letter, dated September 23, 1992, prepared by Levine•Fricke and submitted to the ACHCSA.

This RI work plan summarizes and evaluates facility investigations completed to date, identifies additional data, including investigative work, required to support analysis of remedial action alternatives and proposes ways in which additional data required should be obtained. Also included in this work plan is a description of each task to be completed during the RI process and a schedule for the project. The following documents were reviewed and elements incorporated, as appropriate, for preparation of this RI work plan.

- Environmental Response Compensation and Liability Act of 1980 (CERCLA), 42 USC Section 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), P.L. 99-499
- The National Contingency Plan (NCP), 40 C.F.R. Part 300, Subpart F
- The United States Environmental Protection Agency (U.S. EPA) interim final guidance document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (U.S. EPA, 1988)

1.1 Objectives of Proposed Remedial Investigation

The objective of the proposed RI presented in this 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 and in the vicinity of the Site.

1.2 Scope of This Work

This RI work plan includes the following:

- a summary of past site history and usage
- a review and evaluation of the results of previous investigations at the Site
- a proposed scope of work for further RI activities to provide information necessary to evaluate remedial action alternatives for the Site

2.0 BACKGROUND

2.1 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 occupied by a large warehouse-type building (Figure 2), which contains office space and large service bays to maintain heavy trucks and other large vehicles. This 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 (Figure 2). A Pacific Gas and Electric Company (PG&E) transformer station is located immediately 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 stormwater canal runs parallel to Coliseum Way southwest of the Site and drains into San Leandro Bay.

2.2 Historical Usage of the Site

Review of historical aerial photographs (Pacific Aerial Survey 1950, AV-28-18-17; 1957, AV-253--11-34; 1959, AV-337-7-35; 1990, AV-3845-10-34), and an environmental site assessment report (Blymyer, 1990) indicate that from approximately 1920 through 1963 the Site was owned by several chemical companies and used for the production of lithopone (a white paint pigment consisting of a mixture of barium sulfate and zinc sulfide). The Glidden Company (now HM Holdings, Inc.) owned the property from 1926 through 1954, and used it to manufacture lithopone, zinc sulfate, barium sulfate, and other products. Chemical & Pigment Co. (now ESI Chemicals, Inc.) owned the property from 1954 through 1963 and continued the production of these materials. All buildings were demolished in 1964, and the Site was not occupied until 1974, when White Motor Corporation constructed the existing facilities and paved the remainder of the property. White Motor Corporation went bankrupt, and in 1981 the Site was sold to Volvo-White Truck Corporation, which in 1988 sold the property to Volvo GM.

Facilities for the production of lithopone as they existed in 1950 are shown on Figure 3. Based on information obtained by Volvo GM, manufacturing operations at the facility included the following. Barytes ore (which contains barium sulfate) was brought to the facility by railroad and crushed at the crushing building. Some of the crushed ore was conveyed to the barytes plant and ground barytes plant, where it was ground into a product, also called barytes, used as an additive for drilling mud. The remainder of the ore was mixed with petroleum coke, heated in the rotary kiln in the lithopone building, and converted to barium sulfide, which was dissolved in water in the black ash tanks. Waste solids were discarded. The barium sulfide solution was mixed with a zinc sulfate solution that had been prepared in the zinc sulfate plant, and the two solutions reacted to form lithopone.

The zinc sulfate solution was prepared from zinc slag and sulfuric acid, both of which were brought to the facility by railcar. Sulfuric acid was stored in the sulfuric acid tank. Zinc slag was mixed with sulfuric acid to produce the zinc sulfate solution, which appears to have been stored in the storage and solution tanks adjacent to the zinc sulfate plant (Figure 3). Based on the review of the aerial photographs, it appears that waste solids from the process were spread in the open area west of the finishing building (Figure 3).

Wastes generated at the plant as part of the production of lithopone are likely to have contained barium and zinc as well as lead, arsenic, cadmium, and other heavy metals.

Since 1988, when Volvo GM purchased the Site, operations have included maintenance of trucks and other large vehicles. Three underground storage tanks on the southern side of the main building were used to store motor oil until their removal in 1991. On the northern side of the building, an underground clarifier was designed to receive wastewater discharges from steam-cleaning operations within the building, skim off the oil in the wastewater, and discharge the remaining wastewater to the sanitary sewer. Oil skimmed off would be stored in the clarifier and in an adjacent waste-oil storage tank, which was removed in 1991. Skimmed oil was routinely removed from the clarifier and waste-oil tank and appropriately disposed of.

Operations at the Site ceased at the end of 1992.

2.3 Tank Excavations

Three underground motor-oil tanks located immediately east of the building and one underground 550-gallon-capacity waste-oil tank located immediately north of the building were excavated and removed from the Site by Tank Protect Engineering (TPE) on March 18, 1991 (TPE, 1991; Figure 2).

2.3.1 Waste-Oil Tank

Soil and ground-water samples collected for chemical analysis from the waste-oil tank excavation by TPE were analyzed by Sequoia Analytical of Concord, California. Two sidewall soil samples were collected at depths just above the soil/ground-water interface at approximately 6 feet below ground surface (bgs) and a water sample was collected from the tank excavation.

Analytical results for sidewall samples indicated the presence of diesel, gasoline, and oil and grease (O&G) at concentrations up to 470 parts per million (ppm), 320 ppm, and 960 ppm, respectively. Benzene, toluene, ethylbenzene, and total xylenes (BTEX) were not detected in the sidewall samples, with the exception of 0.14 ppm ethylbenzene and 0.340 ppm total xylenes in one sidewall sample. The highest reported metals concentrations for the sidewall soil samples were 580 ppm cadmium, 29 ppm chromium, 1,900 ppm lead, 5,300 ppm zinc, and 25 ppm nickel. Cadmium, lead, and zinc in soil were reported at concentrations of 0.13 ppm, 0.32 ppm, and 100.0 ppm, respectively. Water samples collected from the tank pit contained very low concentrations of petroleum hydrocarbons including 0.0026 ppm benzene. How about metal concs.?

2.3.2 Motor-Oil Tanks

On March 18, 1991, five soil samples were collected under the supervision of TPE from the sidewalls of the motor-oil tank excavation at approximately 8.5 feet bgs, just above the soil-water interface. A grab ground-water sample was collected from the bottom of the excavation at a depth of approximately 9 feet bgs. The soil and ground-water samples were analyzed for TPHd and aromatic hydrocarbons.

Analytical results for the five soil samples indicated low concentrations of BTEX (less than 0.055 ppm) and TPHd concentrations ranging from below laboratory detection limits to 78 ppm. Results for the grab ground-water sample indicated 1.700 ppm TPHd and 0.00036 ppm total xylenes. Benzene, toluene, and ethylbenzene were not reported above the detection limit of 0.00030 ppm.

2.4 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.

2.4.1 750-50th Avenue

ATT (1990) installed four shallow monitoring wells and drilled four additional borings at the 750-50th Avenue site (Figure 2). The analytical results indicated that soil samples collected during drilling contained elevated concentrations of metals. Concentrations of zinc up to 14,900 ppm were detected in soil samples collected at 10 feet bgs from borings B2 and MW-2. The highest concentration of barium (9,540 ppm) was detected in a soil sample collected at 5 feet bgs from boring B-1, located near well MW-3.

Ground-water samples collected from wells MW-1 through MW-4 did not contain detectable concentrations of organic hydrocarbons based on analysis using EPA Methods 8240 (volatile organic compounds [VOCs]) and 8270 (semivolatile compounds [SVOCs]). Elevated concentrations of metals, including zinc, were detected in these ground-water samples. The highest concentration of zinc (2,720 ppm) was reported for water collected from well MW-2. Water sampling results indicated that the pH for the ground water measured during sampling ranged from 4.81 to 6.91 standard units (SU). The lowest pH value was reported for water collected from well MW-2.

Water-level measurements taken by ATT in August 1991 indicated that ground water was mounded in the area of well MW-2 and locally flowed to the northeast, away from San Leandro Bay. ATT attributed the mounding to tidal influences in the canal, which is located to the west across Coliseum Way.

2.4.2 Site Investigations Conducted by Levine•Fricke

Levine•Fricke conducted soil and ground-water investigations for the Site on behalf of Volvo GM in response to a letter from the ACHCSA dated April 10, 1991. The letter requested a soil and ground-water investigation in the vicinity of the waste-oil tank to further assess the extent of O&G and metals, and to assess the potential impact of previous activities conducted at the Site on soil and ground-water quality. These activities were conducted as outlined in the work plan dated September 3, 1991 (Levine•Fricke, 1991a). Detailed results of the investigations are presented in the "Report of Soil and Ground-Water Investigation, White GMC Truck Corporation Facility," prepared by Levine•Fricke and dated June 25, 1992 (Levine•Fricke, 1992a), and "Results of Ground-Water Sampling and Analysis, 5050 Coliseum Way and 750-50th Avenue, Oakland, California," dated November 12, 1992 (Levine•Fricke, 1992b).

The investigation activities conducted by LF included review of regulatory records to identify reported releases of hazardous materials at sites located within a 0.5-mile radius of the Site; drilling of seven soil borings and the collection of soil samples for chemical analyses; installation of seven ground-water monitoring wells (LF-1 through LF-7; Figure 2) in the seven soil borings; collection of two rounds of ground-water samples for chemical analysis from the seven new on-site wells and four existing wells located on adjacent property (MW-1 through MW-4; Figure 2); and the collection of several rounds of depth-to-ground-water measurements for the Site.

Results of the investigations indicated elevated concentrations of metals in soil and ground-water samples collected in portions of the Site. Figures 3 and 4 present analytical results for soil and ground water, respectively. 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 bgs. Elevated concentrations of metals were detected in ground-water samples collected from several of the wells (Figure 2). 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 SU) in soil and ground water. The solubility and subsequent mobility of some metals such as zinc may be enhanced in low pH environments.

The distribution of elevated concentrations of metals in near-surface soil at the Site is consistent with the manufacturing and handling of materials by occupants of the Site who manufactured lithopone. Elevated concentrations of metals and low pH conditions in the vicinity of well LF-1 are likely associated with activities in the zinc sulfate plant, and may be the result of leakage from pipes and tanks.

Analytical results for SVOCs, 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 only were detected in a near-surface soil sample from boring LF-1; however, O&G were not detected in deeper soil or ground water. Limitations during drilling, caused by subsurface obstructions, precluded investigation of soil and ground-water quality directly adjacent to the waste-oil tank pit.

2.5 Soil Disposal

Stockpiled soils generated during removal of the motor oil and waste-oil tanks and drill cuttings from previous investigations were sampled and profiled for appropriate disposal. On October 26, 1992, approximately 105 tons of soil were sent under manifest to U.S. Ecology, a Class I disposal facility in Beatty, Nevada.

2.6 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 ground surface surrounding the buildings is covered by 4 to 6 inches of asphalt. Approximately 2.5 to 7.5 feet of fill was encountered underlying the asphalt. The fill matrix consists of gravelly sandy clay, silty sand, and gravel. Red brick, concrete rubble, wood, white and yellow powdery materials, and other debris were observed in the fill. Additionally, 4 inches to 6.5 feet of metallic slag (waste product from the processing of mineral ores) was observed in borings LF-1, LF-4, and LF-6. The dusky red, silty sand observed in borings LF-2, LF-3, and LF-5 at depths of 3.5, 5.5, and 2.5 feet bgs, respectively, may also be fill, based on the type and amount of debris observed during drilling. Alternatively, this material may consist of native soil mixed with other manufacturing materials emplaced before the Site was paved in 1973.

The native sediments underlying the fill are heterogeneous and consist of interbedded sand, silt, and clay. Sandy units encountered at varying depths between 10 and 15 feet bgs do not appear to be laterally continuous. Based on well logs prepared by ATT, clayey material was observed in at least the lower 5 feet of borings MW-1 through MW-4 which indicates that a more laterally continuous layer of clayey sediments may underlie the Site below depths of about 22 feet.

Depth to ground water at the Site has ranged from 4.69 feet mean sea level (msl) to 11.63 feet msl during sampling activities conducted in November 1991 and October 1992. Ground-water elevation data collected in October 1992 (Figure 6) indicate apparent "mounding" of ground water (elevated ground-water levels forming a ridged or domed surface relative to the water levels in the vicinity) with flow direction radially away from the truck service building toward the north, east and west.

3.0 REMEDIAL INVESTIGATION

This section describes RI data requirements and data objectives for the Site based on the results of previous investigations, and presents a scope of work to complete the RI investigation.

3.1 Remedial Investigation Data Goals

The goals of the RI data collection activities should be focused to identify and characterize source areas, identify potential migration pathways, and identify potential receptors, to the extent necessary to determine whether, or to what extent, a threat to human health and the environment exists; and to develop and evaluate remedial action alternatives, if necessary. Previously conducted and proposed data collection activities at the Site include investigation of the following:

Site Characterization and History

- chemicals and materials used in the manufacturing processes that may be associated with potential source areas
- historical waste-disposal practices
- facilities used at the Site to store and transmit hazardous chemicals and wastes

Soil Characteristics

- soil type beneath the Site, including lithology, hydraulic characteristics, and attenuation capacity
- distribution of metals, other inorganic constituents, and abnormal pH conditions in the soil

Hydrogeologic Setting

- geology, including sediment and soils classification and characterization, stratigraphy, porosity, and structure
- ground-water quality
- ground-water use (well location, depth, construction, operating history, and intended use)
- hydrogeology, including depth to water, flow directions, gradients, hydraulic and physical-chemical properties, flow systems, recharge/discharge, boundary conditions, and ground water surface-water interaction
- surface-water hydrology
- distribution of chemicals in ground water (lateral and vertical extent, type and physical and chemical properties of chemicals)
- potential pathways, both natural and manmade
- potential receptors

Based on information presented in Section 2 of this work plan, additional information is required concerning on-site areas and potentially required for off-site areas. The need and justification for collecting this additional information are described in Section 3.3 (Remedial Investigation Scope of Work).

3.2 Data Quality Objectives

Procedures have been developed in this RI work plan to ensure that data are complete, well-documented, technically accurate, representative of conditions at the time sampling occurred, reproducible (for measurement data), and internally consistent.

All chemical analyses will be performed by a state-certified analytical laboratory. The quality assurance/quality control (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. A field sampling plan (FSP) will be prepared indicating the number and type of samples to be collected for QC purposes including QC checks, QA audits, and procedures for QA/QC assessment of chemical data. The FSP will include detailed procedures for drilling and soil sampling, monitoring well installation, and ground-water sampling. A discussion of the specific analytical procedures involved with conducting field, indicator, and compound-specific tests on various sample matrices will also be incorporated into the plan.

3.3 Remedial Investigation Scope of Work

To meet the RI data goals for the Site, the following scope of work is proposed:

Task 1: Review of Investigations Conducted for Neighboring Properties and Additional Investigation of Historical Site Usage
Task 2: Location of Underground Lines and Obstacles
Task 3: Deep Water-Supply Well Survey
Task 4: Project Field Sampling Plan, Health and Safety Plan, and Quality Control/Quality Assurance Measures
Task 5: Targeted and Grid-Generated Shallow Soil Sampling
Task 6: Drilling of Deeper Soil Borings and the Installation, Development, and Sampling of Monitoring Wells
Task 7: Off-Site Investigations
Task 8: Hydraulic Testing and Tidal Study

Task 9: Data Evaluation, Report Preparation, and Preliminary Recommendations for Possible Remedial Options
Task 10: Community Relations
Task 11: Periodic Monitoring and Reporting
Task 12: Project Management and Meetings
Task 13: Additional Soil and Ground-Water Investigations in the Vicinity of the Former Waste-Oil Tank
Task 14: Cleaning and Video Camera Inspection of Sewer Lines

Tasks 1 through 12 are associated with investigation and evaluation of elevated metals and low pH conditions in soil and ground water. Tasks 13 and 14 are intended to evaluate facility conditions and issues regarding waste oil in soil and ground water. A detailed description of each task is presented below.

Task 1: Review of Investigations Conducted for Neighboring Properties and Additional Investigation of Historical Site Usage

Available regulatory files will be reviewed for properties adjacent to the Site to obtain data regarding soil and ground-water conditions at those sites. These data will allow comparison of on-site conditions with those occurring on neighboring properties.

Additional available information concerning historical site usage will be obtained and reviewed to assess the potential impact of materials handling or storage and/or site usage on soil and ground water beneath the Site. This information will be used to assess proposed targeted soil sampling locations and analysis and identify any additional areas of environmental concern. The results of this investigation will be summarized in the RI report for the Site.

Task 2: Location of Underground Lines and Obstacles

A geophysical survey of the Site will be conducted by an underground utility locator subcontractor to locate on-site utilities and other underground obstacles. This survey will be performed in an effort to identify locations of piping and underground utility lines, and to clear proposed soil boring and monitoring well locations of utilities and/or subsurface obstructions before drilling. A map of the existing subsurface utilities will be prepared for the Site based on results of the utility survey and review of site construction plans and utility company records.

Task 3: Deep Water-Supply Well Survey

Review of selected Sanborn Fire Insurance Maps has indicated the possible presence of deep (100-foot to 200-foot) ground-water wells at the Site. The wells were apparently used as water-supply wells for fire fighting before 1950. A well survey for the Site is recommended to further assess the existence and location of these deep wells. The well survey will include the review of additional Sanborn maps, if available, and of available files maintained by the California Department of Water Resources or other appropriate regulatory agency. If available, information concerning the construction of the deep wells will be reviewed and evaluated to assess the potential for the wells to provide conduits to deeper ground water. An attempt will be made to locate the wells, but the abundance and variety of fill at the Site may preclude use of most standard techniques used to locate buried wells.

Task 4: Project Field Sampling Plan, Health and Safety Plan, and Quality Control/Quality Assurance Measures

The Sampling and Analysis Plan (SAP) and QA/QC Measures for the project are provided within this document. In addition, an FSP and a revised Health and Safety Plan (HSP) will be prepared for the Site.

Field Sampling Plan

An FSP will be prepared from the SAP provided in this document, as described in Section 3.2. Before field work begins, the FSP will be reviewed by Levine•Fricke's QA/QC Officer or designee to ensure that field procedures, analytical methods, and data obtained from the investigation are in accordance with QA/QC measures discussed below.

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 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, 1991b) will be revised to incorporate the scope of work presented in this work plan.

QA/QC Measures and Data Validation

Before field work begins, an FSP will be prepared as discussed above and in Section 3.2. The SAP and FSP will provide guidelines for QA procedures used to obtain and monitor technical data generated during the investigation for appropriateness, accuracy, precision, completeness, and representativeness of field conditions. The FSP will also describe the project organization and responsibilities of key technical and management personnel.

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.

Task 5: Targeted and Grid-Generated Shallow Soil Sampling

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

shallow borings

Soil Sampling Rationale. Two methods were used to select additional soil sampling locations. Fourteen additional grid-generated soil boring locations were selected to provide additional characterization of areas of the Site for which data have not been previously obtained. Based on information contained on the Sanborn maps, material-handling practices by the previous site occupants prior to 1964, and soil-quality data obtained from previous investigations, 25 additional soil sampling locations have also been targeted to address potential environmental concerns identified.

Grid-Generated Soil Boring Locations. The locations of the 14 additional grid-generated soil borings are presented on Figure 3. A systematic random approach was used to select these sampling locations in areas not already characterized during previous investigations.

To select the grid-generated sampling locations, the site map was overlaid with a rectangular grid with 100-foot spacing. Within each of the 24 boxes created by the grid, a sampling location was randomly selected if a previously drilled boring or well was not already located within the box. Using this method, 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 (discussed in Task 6).

Targeted Soil Boring Locations. The proposed locations for the 25 additional targeted soil boring locations are presented in Figure 4. 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 as follows (grid box locations are illustrated in Figure 4):

- grid box 2 - investigate soil quality in the area of former location of baryte loading dock and crushing building
- grid box 8 - investigate possible sources of elevated concentrations of arsenic detected in ground-water samples collected from well LF-3
- grid box 9 - investigate soil quality at location of former sulfuric acid storage tank
- grid box 12 - investigate soil quality in the area of the former location of the black ash tanks
- grid box 15 - evaluate the extent of elevated concentrations of metals detected in soil during drilling of well LF-1
- grid box 18 - evaluate the potential impact of previous industrial activities in the area of possible chemical handling
- grid box 23 - evaluate soil quality in the area reportedly used for disposal of waste from zinc sulfate production

Targeted near-surface soil sampling locations in grid boxes 1, 2, 3, 11, and 12 are intended to evaluate near-surface soil quality in areas where those data were not obtained during previous investigations. Targeted near-surface soil sampling locations around wells LF-1, LF-2, LF-5, and LF-7 are intended to evaluate the lateral extent of high concentrations of metals reported for near-surface samples previously collected in those areas.

Soil Sampling Methodology and Field Procedures. Shallow targeted and random soil borings will be drilled to a maximum depth of approximately 15 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 soil boring will be selected for chemical analysis based on review of boring log data, organic vapor analyzer (OVA) measurements, and field observations.

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.

Laboratory Analysis. One to three samples per boring will be collected 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 fill. 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.

Metals and pH. Soil samples 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 WET test for that metal will be conducted on that sample to assess the leachability of the metal. Other analyses to be conducted on selected samples are discussed below.

Good

Total Neutralizable Acidity. The total neutralizable acidity (TNA) of acidic soil samples collected from the Site will be evaluated in the Levine·Fricke laboratory. The measurement of TNA quantifies the amount of acid and provides information regarding the amount of alkaline material required to neutralize soils and water. The soils and water will be titrated with a known concentration of sodium hydroxide and the TNA calculated based on milliequivalents acid per 100 grams soil plus ground water. We anticipate that two to four soil samples will be selected for TNA tests.

X-Ray Diffraction for Baryte. In response to requests by the ACHCSA in its letter dated August 5, 1992, selected 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 (BaSO4), which was handled at the Site before 1963. The presence of baryte in the soils can be confirmed using X-ray diffraction technology (XRD). XRD, a common technique employed in soil mineralogical studies, can identify very small amounts of precipitated salts like baryte. The soils will be analyzed by the U.S. Geological Survey in Sacramento, California. We anticipated that two to four samples will be submitted for XRD analysis.

TOC. Approximately four soil samples collected from the Site will be analyzed for total organic carbon (TOC). The measurement of TOC in the soils is an important soil parameter that quantifies the native (i.e., natural) organic carbon content. 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.

why run this test?

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. Oxidation of sulfur in reduced or elemental forms can result in production of acidic conditions in material exposed to the atmosphere. The resulting increased acidic conditions can promote leaching of metals that were previously in a more stable environment. The oxidizing environment can occur during excavation of material that contain sulfur in those forms. 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.

Soil cuttings from drilling activities will be temporarily stored on site in labeled containers pending chemical characterization and disposal in accordance with applicable regulations.

Task 6: Drilling of Deeper Soil Borings and the Installation, Development, and Sampling of Monitoring Wells

Based on results obtained during sampling and analysis of soil conducted in Task 5, deeper soil borings and additional shallow- and intermediate-depth monitoring wells will be installed to further assess the extent of metals-affected soil and ground water at the Site.

Shallow Ground-Water Monitoring Wells. Six shallow monitoring wells will be installed to further assess the lateral extent of dissolved metals in ground water beneath the Site. The shallow soil borings in which the wells will be completed are discussed in Task 5. The approximate locations of the six proposed monitoring wells are indicated on Figure 3. The location for the remaining well will be determined following evaluation of soil-quality data obtained in Task 5.

Soil Borings. The objective of the deeper borings is to assess the vertical extent of metals-affected soil at the Site. 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. Soil boring drilling and soil sampling methodology will be conducted in accordance with procedures described in Task 5.

Is there a wide satd zone?

Intermediate-Depth Monitoring Wells. Two to three intermediate-depth monitoring wells (less than 50 feet bgs) will be installed at the Site to assess whether metals detected in shallow ground water beneath the Site have affected deeper water-bearing sediments. The locations of the intermediate wells will be determined following evaluation of soil-quality data obtained in Task 5, although one of the deeper wells will likely be located near well LF-1.

Ground-Water Monitoring Wells in Fill Material. 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 water. The exact locations for these wells will be determined following evaluation of soil-quality results obtained in Task 5 and identification of underground utilities at the Site.

<u>Field Procedures.</u>

Soil Boring and Well Installation. Soil borings will be drilled in accordance with field procedures discussed in Task 5. Before drilling begins, soil boring and well permits will be obtained from the ACFCWD and locations will be cleared for underground utilities and other possible subsurface obstructions.

Soil samples will be collected during drilling as discussed in Task 4. Soil samples will be collected approximately every 2.5 feet for lithologic description and possible chemical analysis. Two to six samples per boring, including samples collected from saturated material, will be analyzed Title 22 metals using the 6010/7000 Series, and for pH.

Monitoring wells will be constructed using 4-inch-diameter, flush threaded, 0.010-inch polyvinyl chloride (PVC) well screen and well casing. 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 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 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.

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.

Ground-Water Sampling. 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.

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.

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.

Possible that not needed for all wells

Two ground-water samples collected from selected monitoring wells will also be tested for TNA as discussed for soil samples in Task 5.

Waste Management. Water and soil cuttings generated during field activities will temporarily be stored on site, pending chemical characterization and disposal in accordance with applicable regulations.

Task 7: Off-Site Investigations

The need for possible off-site investigations will be based on soil and ground-water quality results obtained for the Site during this investigation and/or on information obtained during Task 1. If deemed necessary by the ACHCSA, then an addendum to the work plan will be prepared presenting proposed locations of additional off-site soil borings and/or monitoring wells.

Task 8: Hydraulic Testing and Tidal Study

Hydraulic testing and a tidal study will be conducted at the Site to assess hydraulic parameters for shallow water-bearing sediments and to evaluate possible tidal influences.

__Hydraulic Testing.__ Hydraulic testing of selected monitoring wells will be conducted at the Site. Before the tests are designed, an assessment of sediment types encountered in the water-bearing areas will be completed. This assessment should indicate whether a series of pumping tests and/or slug tests will be most appropriate for assessing the hydraulic parameters. Once the hydraulic tests have been completed, hydraulic parameters that will be used to evaluate possible remedial options for the Site can be calculated.

__Tidal Study.__ A tidal study will be conducted to better evaluate possible tidal influences or discharge from the channel south of the Site. Single channel data loggers and pressure transducers will be used to monitor water-level fluctuations in three monitoring wells over a 24-hour period. Tidal charts will be reviewed to identify optimal times (i.e., days when tides are extreme) to conduct the study. The three wells to be monitored will be selected based on review of historical ground-water elevation data for the Site.

wasn't this previously done

Pressure transducers will be placed at a level approximately 5 feet below the static water level and left in the wells overnight. The area will be appropriately secured and, if deemed necessary, a security guard will patrol this area at night. Water-level measurements will also be collected periodically during the day and water levels will be measured in the channel.

Data obtained during the tidal study will be reduced and evaluated. Results will be presented in tables and/or graphs in the RI report.

Task 9: Data Evaluation, Report Preparation, and Preliminary Recommendations for Possible Remedial Options

__Data Evaluation.__ Analytical results for soil samples will be compared to the applicable regulatory levels and site-specific factors, such as depth of ground water, location and fill, and sediment type at a given location.

Ground-water quality will be evaluated using the chemical data obtained from the analysis of ground-water samples to identify chemicals exceeding applicable regulatory levels. In addition, ground-water flow directions will be estimated using ground-water level measurements.

Data pertaining to elevated concentrations of metals or other compounds in soils will be correlated with ground-water data and pH conditions to assess patterns of contaminant migration from soil to ground water, and to monitor the fate of hazardous substances in the respective media.

Report Preparation. Following completion of the field work, laboratory analysis, and data evaluation, a report summarizing the methods, procedures, and results associated with the proposed investigations will be prepared for submittal to the ACHCSA. The RI report will contain graphic representations of sampling locations and distributions of contaminants identified in soil and ground water at the Site. Maps, descriptions of geology, geological cross sections, ground-water elevations and flow direction, water quality, soil composition, boring logs, and well construction data will be presented in the report. The report will also include an evaluation and interpretation of analytical results for soil and ground water, and an evaluation of hydraulic test data.

A discussion of the implications of the investigation results will be presented and preliminary recommendations for remedial alternatives to be evaluated in a feasibility study for the Site will be discussed.

Task 10: Community Relations

A community relations plan will be prepared with the objective of keeping the community in the vicinity of the Site informed of the investigation and remediation activities conducted at the Site. The community relations plan will likely provide a site mailing list and provide for an information repository where the public can view relevant investigation reports.

Task 11: Periodic Monitoring and Reporting

It is anticipated that one year of ground-water monitoring will be initiated at the Site in February 1993 (first quarter of 1993). The monitoring program will include collection on a monthly basis of water-level measurements from all wells located at the Site before sampling. Ground-water samples will be collected for chemical analysis from existing and newly installed wells on a quarterly basis.

Ground-Water Sampling and Analysis. Depth to water will be measured to the nearest 0.01 foot using an electric water-level sounding probe. Before sampling, approximately 3 to 5 well casing volumes of water will be purged from each well using a submersible or centrifugal pump, or a clean Teflon bailer. If a well cannot sustain a yield (i.e., pumps dry), it will be allowed to recover for two hours, or to 80 percent of the original, static water level before samples are collected. Specific conductance, pH, and temperature will be measured during this process to aid in evaluating overall ground-water quality sampling forms. Samples will be collected after these parameters have stabilized to within 15 percent of previous measurements.

Samples will be collected using a clean Teflon bailer or the bailer was used to purge the well. Samples collected for analyses will be placed into appropriate laboratory-supplied containers. Ground-water samples collected for metals analysis will be field filtered into nitric acid-preserved, 1-liter plastic bottles. Measurements of pH will be conducted in the field and recorded on water-sampling 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.

Ground-water samples will be analyzed for those metals using methods designed to meet San Francisco Basin Plan detection limits. If analytical results for analysis of VOCs using EPA Method 8240 indicates the presence of VOCs in any of the newly installed wells, samples from those wells will be analyzed for VOCs on a quarterly basis.

Periodic Reporting. Quarterly reports will be prepared and submitted to the ACHCSA and RWQCB in accordance with the schedule presented in Table 1. These reports will include a summary of work completed since the previous quarterly report and work projected to be completed during the next quarter. The following information will be included:

- a discussion of water-quality and ground-water elevation data collected at the Site during the quarterly period

- a site plan showing locations of all monitoring wells

- ground-water elevation maps and ground-water quality maps for data collected at the Site during the quarterly period

- tables presenting well construction and ground-water elevation data, and chemical analysis results

Task 12: Project Management

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. Ms. Kathleen A. Isaacson, R.G., Senior Hydrogeologist, will be project manager for this project. Mr. Robert Roat, Project Engineer, will be the project engineer for the project. Mr. Thomas M. Johnson, R.G., Vice President and Principal Hydrogeologist, will provide principal review for the project.

Task 13: Additional Soil and Ground-Water Investigations in the Vicinity of the Former Waste-Oil Tank

To further assess the possible impact of waste oil on petroleum-affected soil and ground water in the vicinity of the former waste-oil tank pit, soil and ground-water samples collected from wells to be installed in grid boxes 10 and 16 (Figure 3) will be analyzed for waste-oil constituents. As discussed previously in Section 2.4.2, analytical results for ground-water samples collected from monitoring well LF-1, installed approximately 50 feet downgradient from the former tank excavation, did not indicate the presence of SVOCs, O&G, or hydrocarbons.

Petroleum Hydrocarbons. One to two samples per boring will be analyzed for petroleum compounds if field evidence, such as staining or elevated OVA measurements, is noted during sample collection. These samples would potentially be analyzed for volatile and extractable hydrocarbons using EPA Method 8015, for O&G using EPA Method 5520 E & F (gravimetric), and for VOCs using EPA Method 8240.

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

A ground-water sample from each of the wells in grid boxes 10 and 16 will also be analyzed for the same constituents as discussed above for soil by appropriate methods.

Task 14: Cleaning and Video Camera Inspection of Sewer Lines

Previous investigations suggest that the sanitary sewer line from the service building may be leaking and may be contributing to perched water conditions in the vicinity of well LF-1. A visual inspection of the integrity of the sanitary sewer line in question will be accomplished through the use of a specialized self-propelled video camera apparatus designed to enter and move through sewer lines of 4-inch-diameter or larger. The apparatus is equipped with lights and a fisheye lens which produces images that are transmitted to monitors and a videocassette recorder during the procedure. Information regarding the apparatus' position will be recorded so that any cracks or leaks discovered in the line may be located with some precision at a later time.

For this procedure to be practical and effective, it is necessary for the sewer line to be as free of debris, sediment, deposits, and stains as possible. If an excessive amount of solids remains in the line, free movement of the camera and the production of clear visual images may not be possible. Hydroblast cleaning of the line is therefore almost always a necessary prelude to the use of the video camera apparatus.

The hydroblast cleaning procedure involves the use of a very high-pressure water stream delivered through a hose that is inserted into the sewer line through a clean-out or a manhole. The water blasts free the majority of the solids in the line and in most cases carries them downstream to a sewer main. However, the sewer line now in question may contain regulated compounds. Therefore, the rinsate from the hydroblast cleaning activities must be collected, stored, and sampled for chemical analysis before disposal to the sanitary sewer.

4.0 SCHEDULE

After final and written approval of the RI Work Plan by the ACHCSA, the FSP will be prepared and submitted within 45 days. Field activities will commence within 30 days of approval of the FSP.

The tasks outlined in the RI Work Plan will be conducted in a phased approach. The soils investigation presented in Task 5 and shallow monitoring wells included in Task 6 will be completed and the resulting data will be evaluated before deeper borings and wells described in Task 6 are drilled. Hydraulic testing and tidal influence studies (Task 8) will follow completion of the above activities. An RI investigation report will be proved to the ACHCSA within 90 days of completion of all field activities.

REFERENCES

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

Blymyer Engineers, Inc. 1990. Environmental site assessment, Charles Campanella, Oakland, California, for 750-50th Avenue, Oakland, California. June 21.

Levine•Fricke, Inc. 1991a. Work Plan for a Proposed Environmental Investigation, White GMC Truck Corporation, 5050 Coliseum Way, Oakland, California. September 3.

———. 1991b. Health and Safety Plan, Soil and Ground-Water Investigation, White GMC Truck Corporation, 5050 Coliseum Way, Oakland, California. October 25.

———. 1992a. Report of Soil and Ground-Water Investigation, White GMC Truck Corporation Facility, 5050 Coliseum Way, Oakland, California. June 25.

———. 1992b. Results of Ground-Water Sampling and Analysis, 5050 Coliseum Way and 750-50th Avenue, Oakland, California. November 12.

Tank Protect Engineering (TPE). 1991. Tank Closure Report, Volvo GM Heavy Truck Corporation, 5050 Coliseum Way, Oakland, California. July 2.

TABLE 1
SAMPLING AND ANALYSIS PLAN FOR GROUND-WATER MONITORING PROGRAM
5050 COLISEUM WAY AND 750-50th AVENUE
OAKLAND, CALIFORNIA

Quarter	Time Period	Wells to be Sampled	Analysis
First (1)	January - March 1993	LF-1 through LF-7 and MW-1 through MW-4	Title 22 Metals pH (Field Analysis)
Second	April - June 1993	LF-1 through LF-7 and MW-1 through MW-4	Title 22 Metals
Third	July - August 1993	LF-1 through LF-7, MW-1 through MW-4, and future on-site monitoring wells (2)	Title 22 Metals EPA Method 8240 (for samples collected from newly installed wells) Total Dissolved Solids (for newly installed wells) General Minerals (for samples collected from four selected wells)

TABLE 1
SAMPLING AND ANALYSIS PLAN FOR GROUND-WATER MONITORING PROGRAM
5050 COLISEUM WAY AND 750-50th AVENUE
OAKLAND, CALIFORNIA

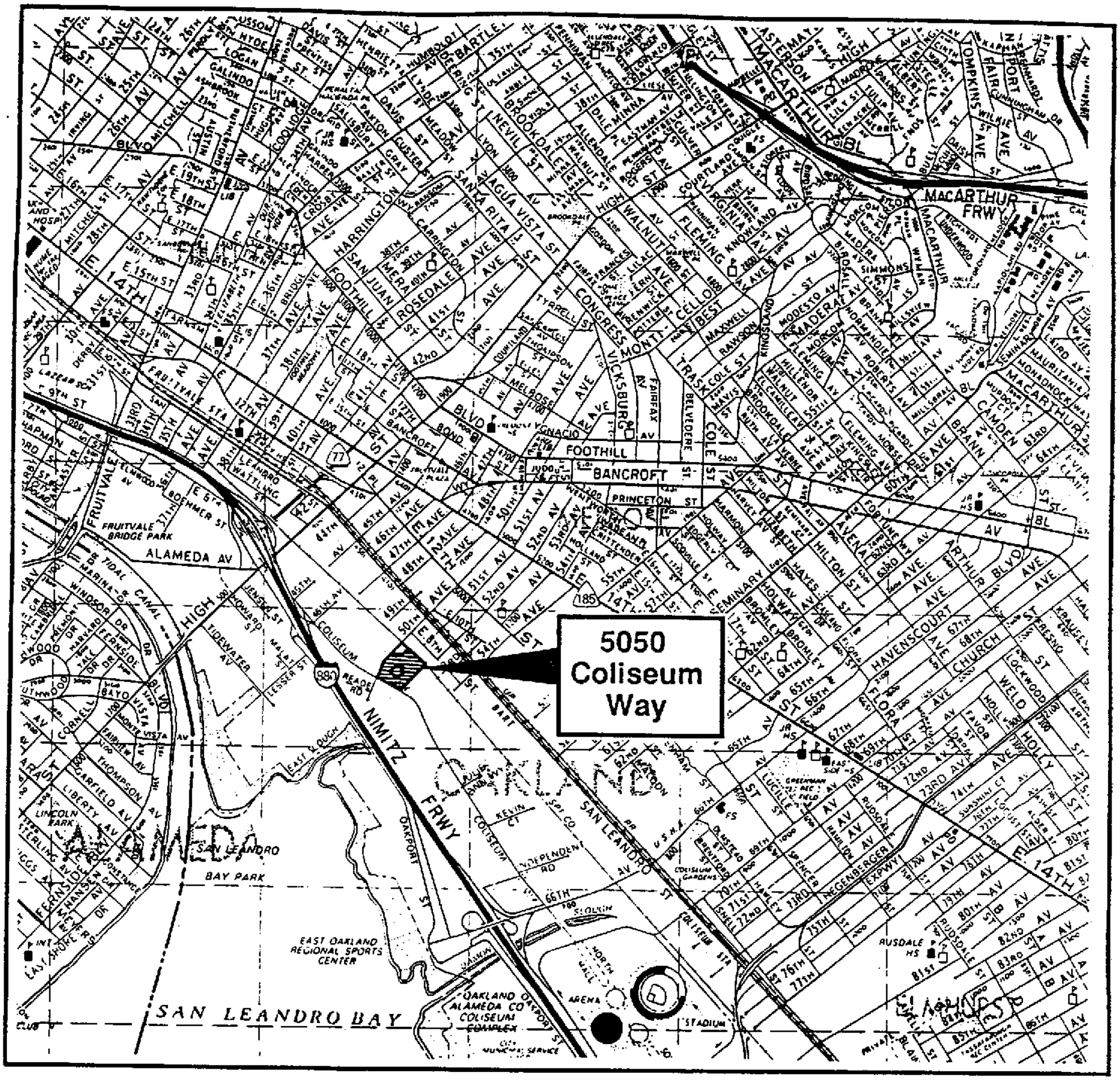
Quarter	Time Period	Wells to be Sampled	Analysis
Fourth	September - December 1993	LF-1 through LF-7, MW-1 through MW-4, and future on-site wells (2)	Title 22 Metals EPA Method 8240 (for samples collected from wells where 8240 compounds were detected during third quarter sampling)

Ok.

NOTES:

(1) The quarterly sampling program is expected to begin in the first quarter of 1993.

(2) It is anticipated that proposed wells will be installed before third quarter sampling. This table will be updated as additional wells are installed.



SOURCE: Thomas Bros. map
Alameda and Contra Costa
1990

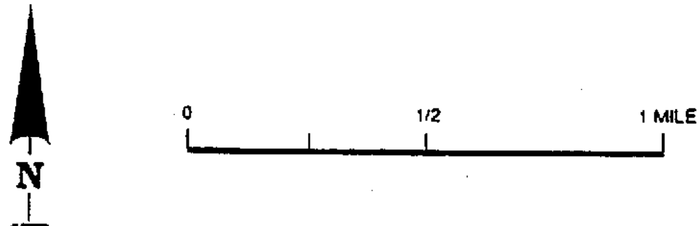


Figure 1 : SITE LOCATION MAP

Project No. 2407.02

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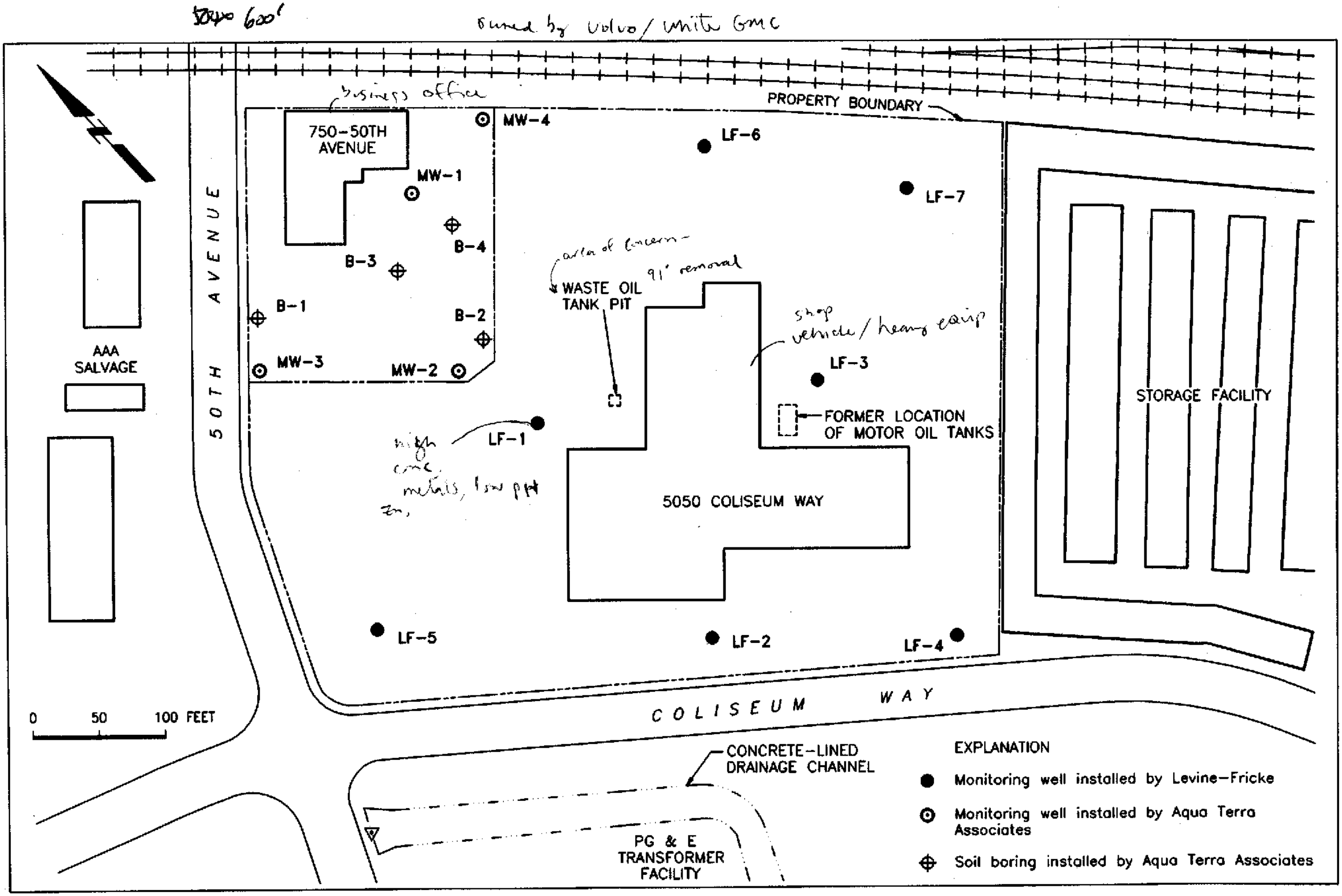

Figure 2 : SITE MAP WITH WELL LOCATIONS AND FORMER TANK LOCATIONS

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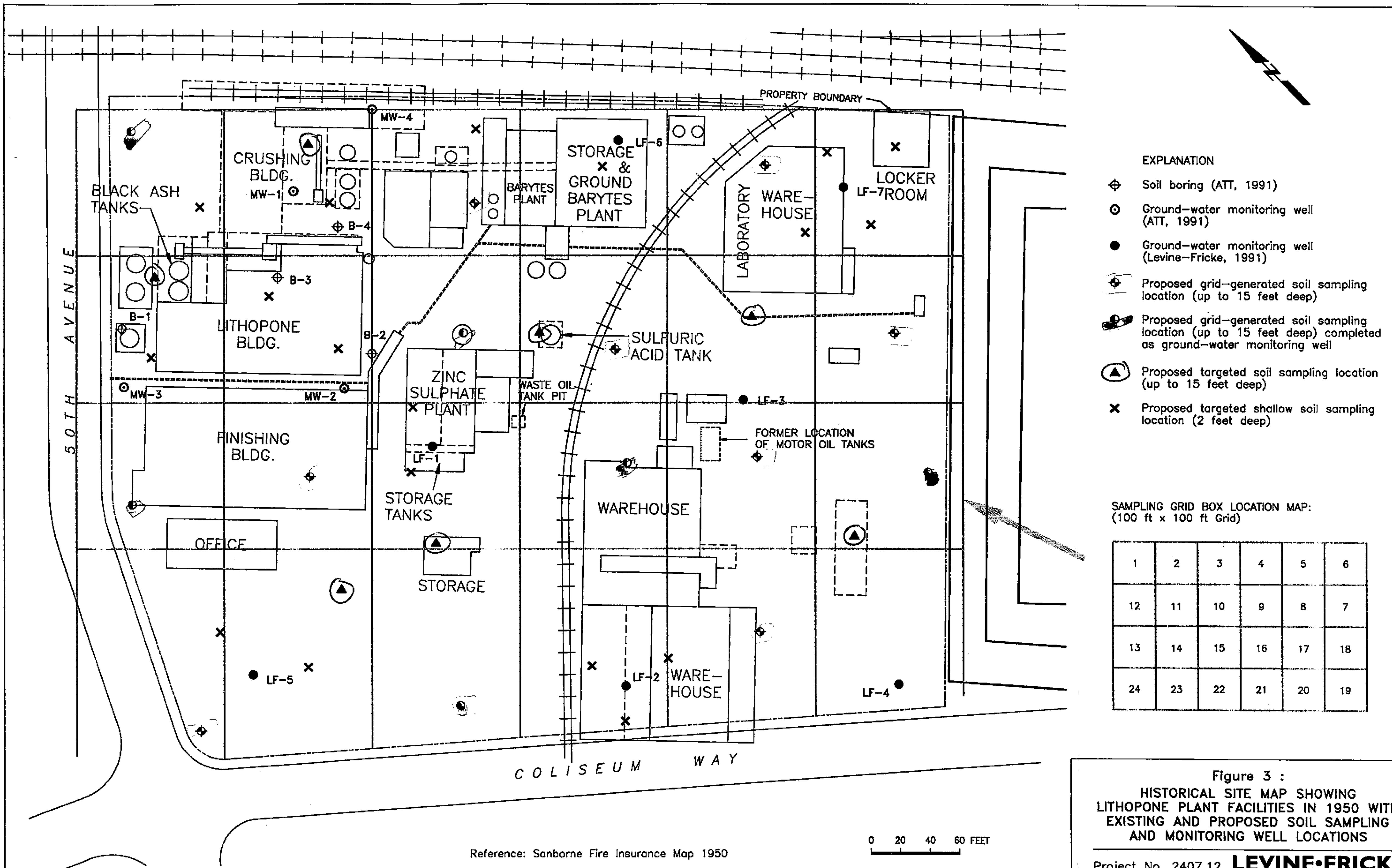

Reference: Sanborne Fire Insurance Map 1950

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

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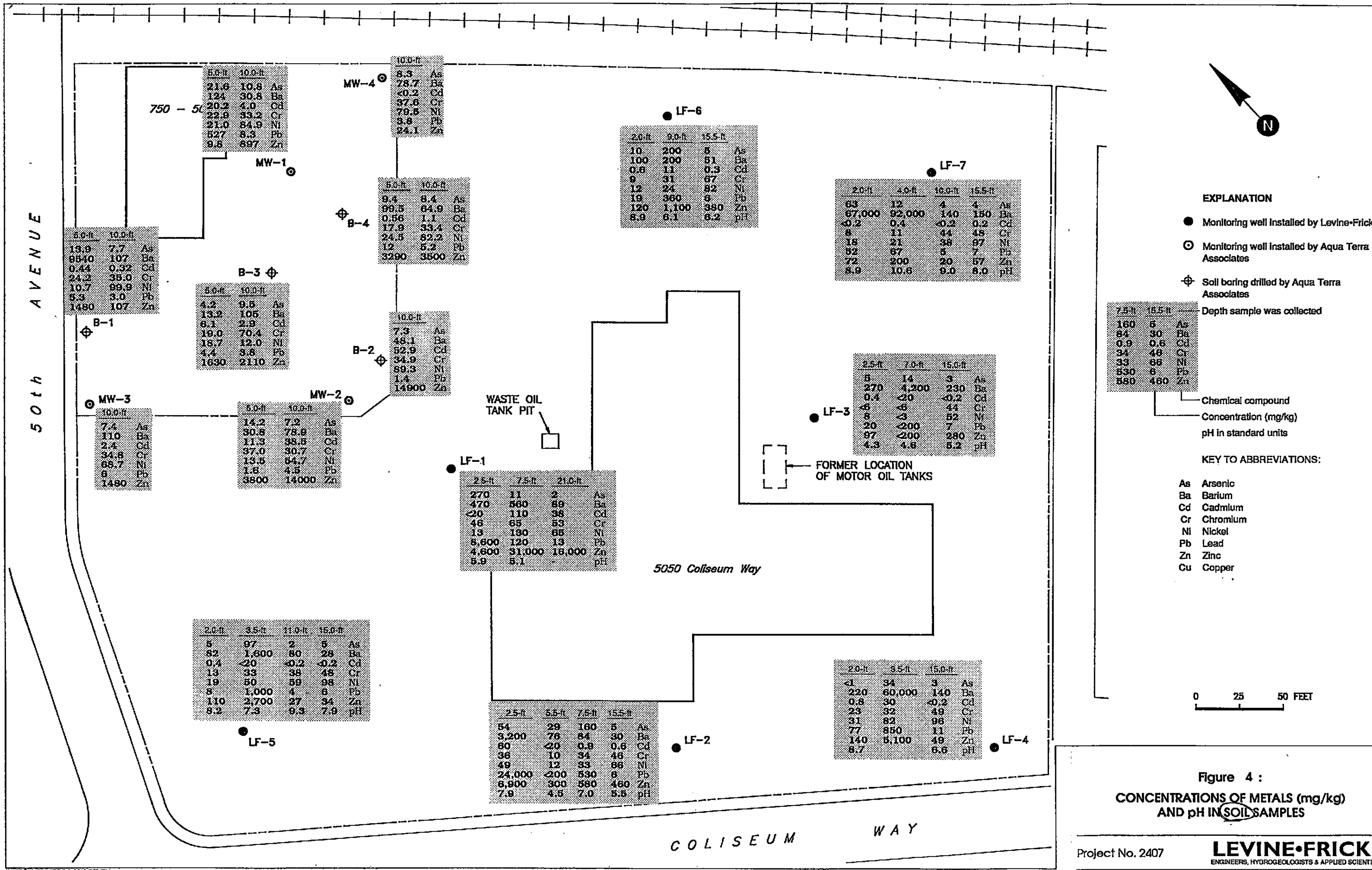

Figure 4 :

CONCENTRATIONS OF METALS (mg/kg) AND pH IN SOIL SAMPLES

Project No. 2407

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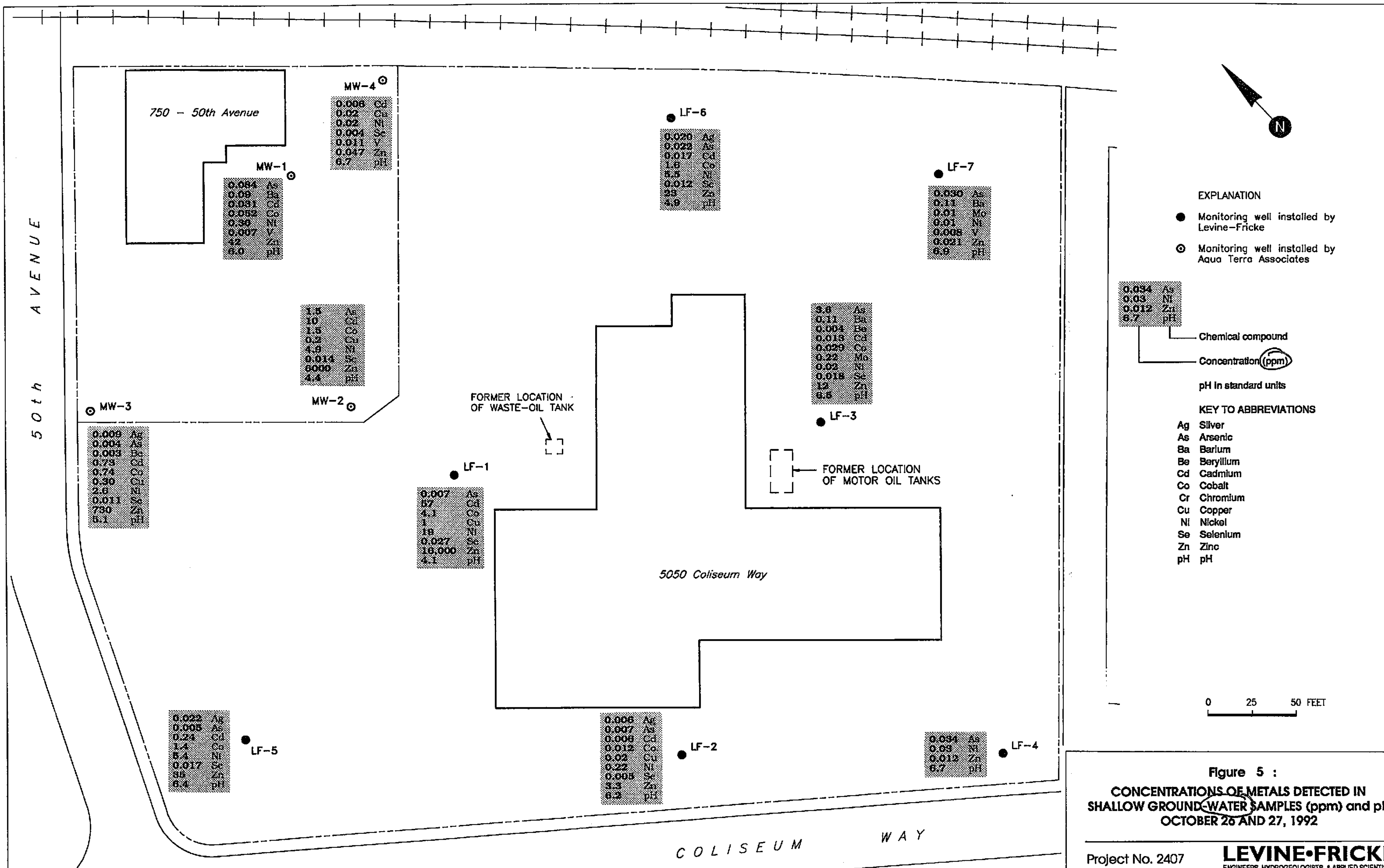

Figure 5 :

CONCENTRATIONS OF METALS DETECTED IN SHALLOW GROUND-WATER SAMPLES (ppm) and pH OCTOBER 26 AND 27, 1992

Project No. 2407

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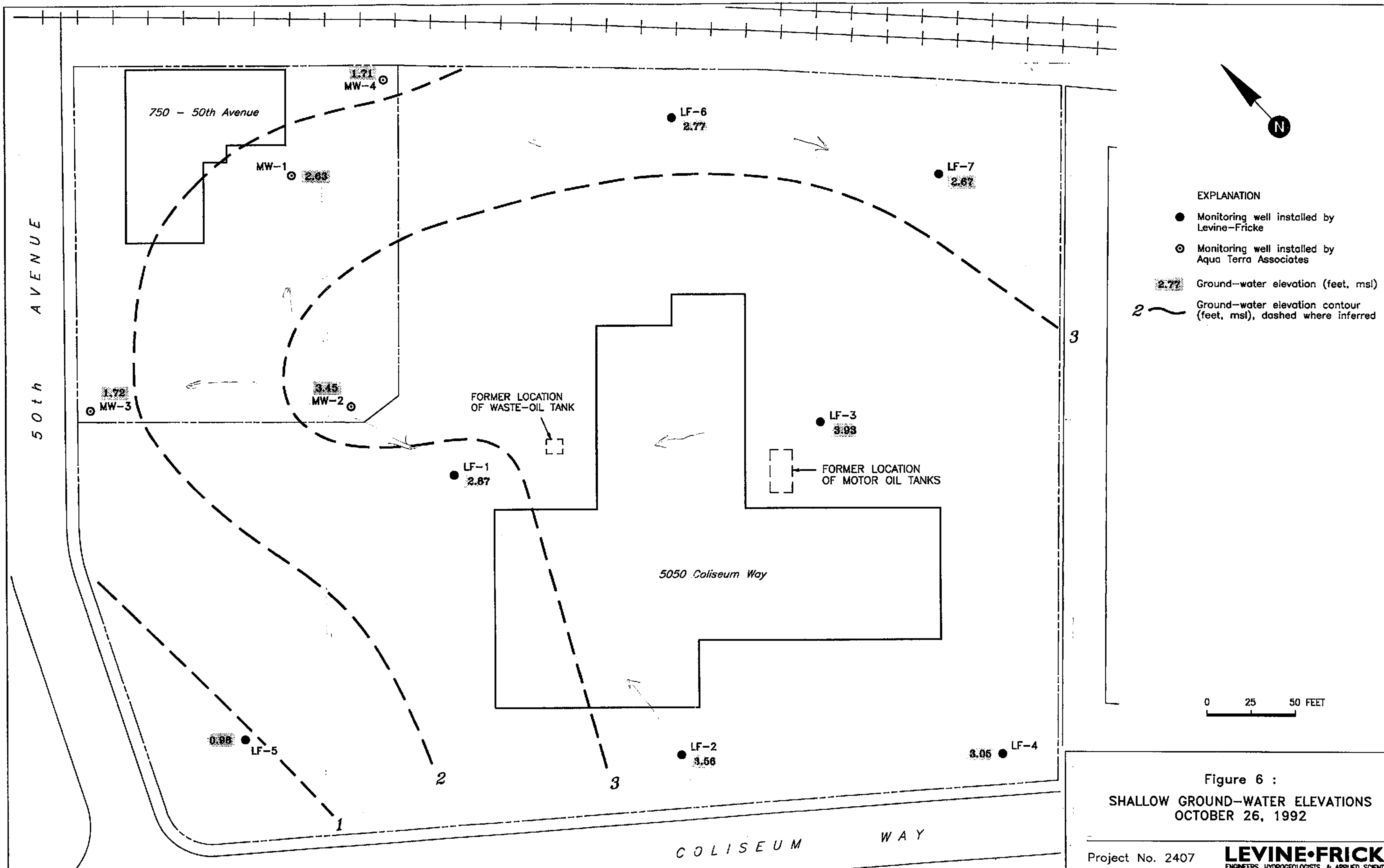

Figure 6 :

SHALLOW GROUND-WATER ELEVATIONS OCTOBER 26, 1992

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