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Soil excavation →

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Soil and Groundwater Investigations and Remedial Activities
July 1993 – September 1994

Cargill Salt – Alameda Facility
Alameda, California

July 1995

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Contents

Contents
(continued)

References
Professional Certification
Limitations

Tables

Illustrations

Appendices

Executive Summary

This report presents results of site investigations and remedial activities conducted by Groundworks Environmental, Inc. (Groundworks) at the Cargill Salt Dispensing Systems Division facility located at 2016 Clement Avenue in Alameda, California.

At the request of Cargill Salt, Groundworks initiated a soil sampling investigation at the Alameda facility in July 1993 to determine if facility operations had impacted site soils. Soil samples collected to depths of approximately 5 feet with hand-augering equipment indicated impact to soils in one area of the site by volatile organic compounds (VOCs), metals, and hydrocarbons (oil and grease).

Additional investigations were performed to characterize the extent of chemical impact to soils and groundwater. Surficial soils impacted by metals were excavated manually for disposal. Vadose-zone soils with the highest degree of chemical impact by VOCs, metals, and oil and grease were delineated and then excavated using a backhoe.

Results of the site investigations and remedial activities and recommendations for additional work are summarized below.

Soil Characterization and Remediation

The chemical impact to soil appeared to be the result of a discharge or spill to surficial soils in the area of boring ASB-1. Results from field programs indicated that the areal extent of chemical impact by VOCs to vadose zone soils was limited to within 10 feet of boring ASB-1.

At boring ASB-1, tetrachlorothene (PCE) was detected at a concentration of 740,000 micrograms per kilogram (μg/Kg), and 1,1-dichloroethene (1,1-DCE) was detected at 25,000 μg/Kg.

Elevated concentrations of metals were detected in surficial soils at three locations. The metals-impacted soils appeared to be associated with relatively small quantities of casting sands discarded or spilled on surficial soils at or near the boring ASB-1 location.

Surficial soils impacted by metals were excavated manually for disposal. Confirmation soil sampling showed that the metals-impacted soils were successfully removed. Soil impacted by VOCs and oil and grease at the boring ASB-1 location was excavated for disposal using a backhoe. The area with the highest degree of chemical impact was delineated prior to excavation and was then excavated using a backhoe. Approximately four cubic yards of soil were excavated from the ASB-1 location. The intent of this excavation was to remove vadose-zone soils with the highest degree of chemical impact and thereby reduce the potential for impact to groundwater quality.

The vertical extent of chemical impact to saturated soils remaining beneath and near the excavation at ASB-1 was delineated. Analysis of soil samples collected in borings beneath and adjacent to the excavation showed that PCE at concentrations up to 31,000 μg/Kg remains in saturated soil at depths between 5 and 10 feet. However, no VOCs were detected in soil samples collected at depths between 11 and 25 feet. A 1-foot-thick clay lens logged at a depth of 11 feet may help to retard the downward migration of VOCs.

Groundwater Characterization

Groundwater occurs at a depth of approximately 5 to 6 feet at the site and flows to the north-northeast towards Clement Avenue. Samples of groundwater were collected from shallow hand-augered borings and from groundwater probes at both on- and off-site locations. PCE was detected in groundwater samples collected beneath the site. PCE was detected at a concentration of 11,000 micrograms per liter (μg/L) at groundwater boring AGB-1 (immediately adjacent to soil boring ASB-1) and at lower concentrations in groundwater from 5 other borings across the site. The concentration of PCE in groundwater diminished markedly within a few feet of boring AGB-1. PCE was detected at only 22 μg/L in groundwater at boring AGB-2, located only 3 feet upgradient of AGB-1. Hydrocarbons (oil and grease) were detected at a concentration of 4.0 mg/L in groundwater from boring AGB-1. No semivolatile organic compounds were detected in groundwater at boring AGB-1.

No other VOCs were detected in groundwater on site except at groundwater boring AGB-6, where trichloroethene (TCE) was detected at a concentration of 79 μg/L. The TCE may be present as a degradation product of PCE.

A grab groundwater sample was collected from a depth of 25 feet to characterize the vertical extent of PCE in groundwater beneath the boring ASB-1 and soil excavation area. A relatively low concentration of PCE (14 μg/L) was detected, indicating that PCE may have migrated vertically to this depth from the ASB-1 area.

No VOCs were detected in shallow groundwater samples collected at an upgradient off-site probe location (AP-1), a crossgradient off-site location (AP-2), and a down- and cross-gradient on-site location (AP-5).

PCE was detected at concentrations of 0.6 and 4.2 μg/L at probes AP-3 and AP-4c, located 45 feet downgradient of the site, indicating that low concentrations of PCE may have migrated off site. However, four other VOCs (1,1,1-trichloroethane, chloroform, trichloroflouromethane [Freon], and 1,1-DCE) were detected at off-site location AP-3 at concentrations ranging from 1.6 to 32 μg/L. These four VOCs were not detected in on-site groundwater samples and three of these four VOCs (all but 1,1-DCE) are apparently not degradation products of PCE. Detection of VOCs downgradient of the site that were not detected in groundwater on site and are not degradation products of PCE indicates that the PCE and other VOCs detected downgradient of the site may be related to off-site sources. Sewer lines and utility trenches beneath Clement Avenue may be a potential source for these VOCs.

Concentrations of PCE and TCE detected on-site exceed California Primary Drinking Water Standards, but none of the VOC concentrations detected at the off-site locations exceed the standards. The comparison with drinking water standards is made to provide a general indication of groundwater quality at the site. Groundwater at the site is not used as a water supply source for drinking water, and, as noted below, the local shallow groundwater is not considered to be suitable as a source of drinking water.

Regional Groundwater Use

A survey of water supply wells within one-half mile of the site showed that the closest registered water supply well is an irrigation well approximately 1600 feet away and that there are no registered water supply wells downgradient of the site.

According to a hydrogeologic report prepared by the Alameda County Flood Control and Water Conservation District, the local shallow groundwater is not considered to be suitable as a source of drinking water.

Recommendations

Groundworks recommends that Cargill Salt review the results of the site investigations and remedial activities to date with the Alameda County Department of Environmental Health and the California Regional Water Quality Control Board - San Francisco Bay Region.

The lateral and vertical extent of VOCs in groundwater beneath the site should be further delineated using groundwater probe sampling techniques and monitoring wells. Groundworks recommends that the groundwater quality results obtained with probe sampling techniques be confirmed using groundwater monitoring wells

Sewer lines and other utilities beneath Clement Avenue should be investigated as possible sources of the VOCs detected at off-site locations and as possible conduits or pathways for migration of VOCs in groundwater.

1 Introduction

This report presents results of site investigations and remedial activities conducted by Groundworks Environmental, Inc. (Groundworks) at the Cargill Salt Dispensing Systems Division facility located at 2016 Clement Avenue in Alameda, California (see Figure 1). As part of a due-diligence assessment of site conditions, Cargill Salt is investigating environmental impacts to soil and groundwater at the site. This section reviews the site background and summarizes the investigative and remedial activities performed to date.

1.1 Site Background

The Alameda facility is located on a rectangular lot (approximately 150 feet by 92 feet), in an industrial and residential neighborhood (see Figure 2). The facility building occupies approximately one-third the area of the site. One side of the lot is a vacant, unpaved yard, and a paved driveway is located between the facility building and the vacant side of the lot. The facility lot is bordered by a sheet-metal shop and residential lot to the northwest, apartment complexes to the southwest, a residential lot to the southeast, and Clement Avenue to the northeast.

A small foundry was operated in the back room of the facility building from approximately 1951 to 1978. The foundry produced salt-dispensing units for use by clients of Leslie Salt (now Cargill Salt). Casting of the salt-dispensing units is now done off site, and the facility is currently used for milling and repair of salt-dispensing units.

According to site personnel, the foundry was used mainly for casting of aluminum and brass pieces and was not equipped to cast iron. Site personnel have also indicated that solvents were used to clean casting and milling equipment.

Constituents of concern that might be associated with waste products from facility operations include casting sands with elevated concentrations of metals, and solvents, machine oils, and grease used in the casting and milling operations.

1.2 Summary of Investigative and Remedial Activities

At the request of Cargill Salt, Groundworks initiated a soil sampling investigation at the Alameda facility in July 1993 to determine if facility operations had impacted site soils. Laboratory analysis of soil samples collected from 10 hand-augered borings to depths of approximately 5 feet indicated impact to soils in one area of the site by volatile organic compounds (VOCs), metals, and hydrocarbons (oil and grease). This area is on the vacant side of the facility lot near the rear, or southwest, property line. At boring ASB-1, apparently located at the center of the impacted soil area, tetrachlorothene (a VOC also known as perchloroethene or PCE) was detected at a concentration of 740,000 micrograms per kilogram (μg/Kg), and 1,1-dichloroethene (1,1-DCE) was detected at 25,000 μg/Kg.

The results of the July 1993 field investigation indicated that the lateral extent of chemical impact to soils by VOCs and oil and grease was limited to the area near boring ASB-1. The chemical impact to soil appeared to be the result of a discharge or spill to surficial soils in the area of boring ASB-1. The metals-impacted soils appeared to be associated with relatively small quantities of casting sands discarded or spilled on surficial soils at the boring ASB-1 location and two nearby locations (at borings ASB-2 and ASB-9). Groundwater was encountered at depths of approximately 5 feet in some of the hand-augered borings.

Results of the July 1993 soil sampling investigation and a workplan for excavation and disposal of impacted soils and assessment of potential impact to groundwater were submitted by Cargill Salt to the Alameda County Department of Environmental Health (ACDEH). A draft workplan dated September 30, 1993, was reviewed by Larry Seto of the ACDEH and accepted in a letter to Cargill Salt dated October 4, 1993. A final workplan (*Results of soil sampling and workplan for remedial activities, Alameda facility*, see Appendix A) was submitted on October 19, 1993.

In October 1993, groundwater samples were collected from six borings hand augered to a depth of 10 feet and the groundwater flow direction was determined with groundwater elevation data from the borings. Laboratory analysis of the groundwater samples indicated impact to groundwater at the site by VOCs and oil and grease compounds. The highest concentrations of VOCs in groundwater were detected at boring AGB-1, located adjacent to soil boring ASB-1. Here, PCE was detected at a concentration of 11,000 micrograms per liter (μg/L). Surficial soils impacted by metals at borings ASB-2 and ASB-9 were excavated manually and drummed for disposal. The extent of VOCs in soil was further delineated by advancing three additional soil borings near ASB-1 and monitoring for VOC vapors in the boreholes.

In February 1994, surficial soil impacted by metals at ASB-1 was excavated manually and drummed for disposal, and soil impacted by VOCs at the boring ASB-1 location was excavated using a backhoe and placed in 1-cubic-yard containers for disposal. Approximately four cubic yards of soil were excavated with the backhoe from the ASB-1 location.

In order to further assess the extent of VOCs in soil and groundwater at the site, additional characterization activities were conducted in September 1994. A soil-coring rig was used to sample soil to depths of 25 feet at the soil excavation area for characterization of the vertical extent of VOCs in saturated soil. Groundwater samples were collected using a probe system to characterize the lateral and vertical extent of VOCs in groundwater. Groundwater samples were collected upgradient, crossgradient, and downgradient of the site.

The results of the September 1994 soil and groundwater sampling program indicate that the concentration of VOCs in saturated soil at the excavation area attenuates quickly with depth. VOCs were detected in soil samples collected at depths between 5 and 10 feet but were not detected in soil samples between depths of 11 and 25 feet. Low concentrations of PCE (0.6 to 4.2 μg/L) were detected in groundwater downgradient of the site, indicating that PCE may have migrated off site. However, several VOCs were detected downgradient of the site that were not detected on site. This may indicate that the PCE and other VOCs detected downgradient of the site may be related to off-site sources.

This report presents the procedures and results for the site investigations and remedial activities conducted to date at the Alameda facility. Additional work to confirm the groundwater results to date and further characterize the extent of PCE in groundwater is recommended.

2 Initial Soil Sampling and Analysis - July 1993

The initial soil sampling and analysis was conducted by Cargill Salt in July 1993 to determine if waste products from facility operations had impacted soils on the vacant side of the facility lot (see Figure 2). The soil sampling and analysis program involved sampling of surficial and shallow soils from hand-augered borings and analysis for constituents of concern that might be associated with waste products from facility operations. The results from this program and a workplan for additional work were described in the October 19, 1993, letter report to Cargill Salt, *Results of soil sampling and workplan for remedial activities, Alameda facility* (See Appendix A).

2.1 Procedures

Soil samples were collected from borings advanced to depths of approximately 5 feet with hand-augering equipment on July 13, 1993. The soil boring locations are shown on Figure 3, and sample collection data and field observations are shown on Table 1. A total of 10 shallow borings (ASB-1 through ASB-10) were hand augered and 22 soil samples were collected by Groundworks field personnel. Each boring was monitored during hand augering for volatile organic vapors using a photoionization detector (PID).

The locations of the soil borings were chosen to provide a grid of six samples from the rear, or southwest, portion of the vacant side of the lot. This sampling grid consisted of soil borings ASB-1, -2, -3, -4, -6, and -7. Boring ASB-5 was aborted after an obstruction (possibly a storm drain) was encountered at a depth of approximately 1 foot. Before starting the borings, the ground surface near each of the planned boring locations was lightly scraped with a hoe to help identify areas where the soil appeared disturbed or discolored. Two areas were observed where surficial soils appeared disturbed or discolored and borings ASB-1 and ASB-2 were targeted for these areas. An additional three borings (ASB-8, -9, and -10) were located to explore the extent of volatile organic vapors detected with the PID at boring ASB-1.

The soil borings were manually advanced using a 3½-inch-diameter, stainless-steel bucket auger. Soil samples were collected by one of three methods: (1) scraping surficial soils into a sample tube, (2) manually advancing a hammer-driven soil sampler fitted with a sample tube into soils at the base of a soil boring, or (3) manually advancing a bucket auger into soils at the base of a soil boring and emptying soils collected in the bucket auger directly into a sealable plastic bag. The sample tubes used for soil sampling were 2-inch-diameter, 6-inch-long stainless-steel tubes. After sample collection, each sample tube was capped at both ends with Teflon® film and plastic end-caps. Sample tubes and sample bags were labeled and stored in a cooler chilled with blue ice for delivery to the laboratory. Samples were submitted with appropriate chain-of-custody documentation to Columbia Analytical Services

(CAS) for laboratory analysis. CAS is a state-certified analytical laboratory in San Jose, California.

Sampling equipment was cleaned before use in each boring by washing with laboratory-grade detergent and rinsing with distilled water. Rinsate was stored temporarily on site in a 55-gallon drum pending testing and disposal.

Based on field observations and the results of field monitoring for volatile organic vapors using the PID, five soil samples were selected for analysis of total metals and six samples were selected for analysis of volatile and semivolatile organic compounds and oil and grease. Metals selected for analysis included those commonly alloyed with brass and aluminum (i.e., copper, lead, nickel and zinc) and those commonly associated with petroleum hydrocarbon oils as residual metals in the refining process or as additives (i.e., barium, cadmium, chromium, lead, nickel, vanadium and zinc).

During soil sample collection, groundwater was noted in several of the hand-augered borings. Each boring was left open until sample collection had been completed at all the borings. Each boring was then checked for the presence of groundwater and the depth to water was recorded with a tape measure. After completion of sampling and groundwater measurements, the borings were backfilled with cement grout. Soil cuttings from the borings were stockpiled on, and covered with, plastic sheeting pending testing and disposal.

2.2 Findings

Field observations are noted on Table 1. Certified analytical reports for the soil sample analyses are presented in Appendix B along with chain-of-custody documentation. The results of the laboratory analyses are summarized on Tables 2 and 3.

2.2.1 Metals

Three locations were identified where lenses or stringers of light-colored and reddish-colored sands were mixed into soils at the ground surface or within 1.0 foot of the ground surface. Borings ASB-1 and ASB-2 were targeted for the two locations where these light- and reddish-colored sands were visible at or just below the ground surface. Reddish-colored sands were observed at a depth of 0.3 feet in boring ASB-9. These light-colored and reddish-colored sands contrasted with the predominantly brown color of the surficial soil at the site and were not observed below depths of 0.5 to 1.0 foot. It was noted in the field that these light-colored and reddish-colored sands might represent casting sands (see Table 1).

The shallow soil samples from borings ASB-1, ASB-2, and ASB-9 exhibited higher total metals concentrations than the samples from the two other borings selected for metals analysis (ASB-6 and ASB-8). As described in the field observations for these five shallow soil samples, the samples from ASB-1, ASB-2, and ASB-9 contained light-colored or reddish-colored sands but discoloration was not observed for the shallow soil samples at ASB-6 and ASB-8 (see Table 1). Thus, the higher metals concentrations detected for ASB-1, ASB-2, and ASB-9 are associated with these light-colored and reddish-colored sands. Based on the appearance and the total metals concentrations for these sands, it is likely that they represent casting sands from facility operations.

Cadmium and lead were detected in several samples at concentrations that exceed hazardous waste criteria established by Title 22 of the California Code of Regulations (CCR). A waste is considered hazardous if it contains specific substances at concentrations that exceed the soluble threshold limit concentration (STLC) or the total threshold limit concentration (TTLC). Total cadmium was detected in the shallow soil sample from ASB-1 at a concentration that exceeds the TTLC (see Table 2). Total cadmium in boring ASB-2 and total lead in borings ASB-1, ASB-2, and ASB-9 were detected at concentrations that exceed 10 times the STLC, indicating that if an extraction for soluble metals were performed with the Waste Extraction Test (WET), the soluble metals might exceed the STLC (the WET includes a 10-fold sample dilution).

The total cadmium in borings ASB-1 and ASB-2 and the total lead in borings ASB-1, ASB-2, and ASB-9 were detected at concentrations that exceed the U.S. Environmental Protection Agency (USEPA) Region IX Preliminary Remediation Goals (PRGs) for residential soil but do not exceed the PRGs for industrial soil (see Table 2).

None of the total metals concentrations detected at borings ASB-6 or ASB-8 exceeds PRGs, TTLCs, or 10 times the STLCs.

After receiving the results for the total metals analyses, the shallow soil samples from borings ASB-2 and ASB-9 were analyzed for soluble metals using the WET method; the ASB-2 sample was analyzed for cadmium and lead, and the ASB-9 sample was analyzed for lead. The ASB-1 sample was not analyzed for soluble metals because cadmium had been detected in this sample at a concentration greater than the TTLC. The results of the WET method analyses are shown on Table 2. Lead was detected at concentrations greater than the STLC in both the ASB-2 and ASB-9 samples. The concentration of cadmium from the ASB-2 sample was less than the STLC.

2.2.2 Organic Compounds

During the field program, VOCs were detected in boring ASB-1. Greenish-gray staining of soils and a chemical odor were noted for soils encountered between a depth of 3 feet and the bottom of the boring at 5.5 feet. VOCs measured with the PID in the borehole and in bagged cuttings between these depths were greater than 100 parts per million (ppm). The soil sample collected at 5.0 - 5.5 feet in boring ASB-1 was submitted for analysis of VOCs, semivolatile organic compounds, and oil and grease.

After detecting evidence of chemical impact to soils in boring ASB-1 with the PID, three borings were located to assess the lateral extent of chemical impact at ASB-1. Borings ASB-8, -9, and -10 were made within 10 feet of ASB-1. No odor or discoloration was noted in soils from these borings, and PID measurements registered background (0.0 to 0.4 ppm) to 1.6 ppm. Soil samples from each of these three borings and from borings ASB-2 and ASB-6 were submitted for analysis of VOCs, semivolatile organic compounds, and oil and grease.

Two VOCs, PCE and 1,1-DCE, were detected at concentrations of 740,000 and 25,000 μg/Kg, respectively, in the soil sample collected at 5.0-5.5 feet in boring ASB-1. The presence of 1,1-DCE could be related to the PCE, as 1,1-DCE is known to be a degradation product of PCE (Marshack, 1989). No semivolatile organic compounds were detected. Hydrocarbons (oil and grease) were detected at 1,100 milligrams per kilogram (mg/Kg) (see Table 3).

PCE was detected at a concentration of 25 μg/Kg for the soil sample from boring ASB-10, located 5.5 feet from boring ASB-1. No VOCs were detected in the soil samples from borings ASB-8 or ASB-9. No semivolatile organic compounds or hydrocarbons (oil and grease) were detected in any of the soil samples except the sample from boring ASB-1.

The results for the organic analyses indicated that the chemical impact to soils by VOCs and oil and grease was relatively limited laterally at the boring ASB-1 location. PCE was detected at 740,000 μg/Kg at ASB-1 but at only 25 μg/Kg at ASB-10, located 5.5 feet from boring ASB-1. 1,1-DCE was detected in the soil sample from ASB-1 at 25,000 μg/Kg but was not detected at ASB-10. No VOCs were detected at ASB-8 and ASB-9, located 10.0 and 9.5 feet from ASB-1, respectively (see Figure 3).

The analytical results for the soil samples are compared with regulatory criteria on Table 3. The concentrations of PCE and 1,1-DCE detected at ASB-1 exceed the USEPA Region IX PRGs for residential and industrial soil and the Title 22 hazardous waste criteria for a liquid extract [the Maximum Concentration of Contaminants when using the Toxicity Characteristic Leaching Procedure (shown as MC-TCLP on Table 3)]. However, the concentration of PCE detected at boring ASB-10, located 5.5 feet from boring ASB-1, is below the PRGs and the MC-TCLP. As described in Section 3, soil impacted by PCE and 1,1-DCE at the ASB-1 location was subsequently excavated for disposal.

2.2.3 Groundwater

Groundwater was detected in 5 of the borings at a depths of 4.7 to 5.2 feet. Because of the shallow depth to groundwater and the potential impact to groundwater by compounds detected in boring ASB-1, groundwater sampling and analysis and assessment of groundwater flow direction were proposed in the workplan for additional work (see Appendix A).

3 Soil Remediation - October 1993 and February 1994

The initial soil sampling and analysis program identified three locations (at borings ASB-1, ASB-2, and ASB-9) where surficial soils contained elevated concentrations of metals (See Section 2). These metals were most likely associated with casting sands from facility operations. Soils at one location (ASB-1) were also impacted by VOCs and oil and grease.

The purpose of the soil remediation activities was to remove and dispose of surficial soils impacted by metals at borings ASB-1, ASB-2 and ASB-9, and to remove and dispose of soil impacted by VOCs and oil and grease at the ASB-1 location.

3.1 Excavation of Soils Impacted by Metals

Metals-impacted soils at borings ASB-2 and ASB-9 were removed manually and drummed for disposal on October 1, 1993. Metals-impacted soil at boring ASB-1 was removed manually and drummed for disposal on February 28, 1994.

Soil excavation and confirmation sampling operations were conducted by Groundworks field personnel. Van Waters & Rogers, Inc. (VWR) of San Jose, California, assisted Cargill Salt with disposal of the drummed soil.

3.1.1 Procedures

Metals-impacted soils at ASB-1, ASB-2, and ASB-9 were excavated manually with a shovel and placed in 55-gallon drums. As described in Section 2, the results of chemical analysis showed that elevated metals concentrations were associated with light-colored and reddish-colored sands in the surficial soils. The extent of the excavation at each location was determined in the field based on the visual appearance of the soils. At each location, surficial soils were excavated to a depth of approximately 1 foot. A total of approximately one-half cubic yard of soil was excavated and drummed from these three locations.

A confirmation soil sample was collected at the base of each excavation by manually advancing a hammer-driven soil sampler fitted with a sample tube into soils at the base of the excavation. The sample tubes used for soil sampling were 2-inch-diameter, 6-inch-long stainless-steel sample tubes. After sample collection, each tube was capped at both ends with Teflon® film and plastic end-caps. Sample tubes were labeled and stored in a cooler chilled with blue ice for delivery to the laboratory. The samples were submitted with appropriate chain-of-custody documentation to CAS.

The confirmation soil samples from the excavations at ASB-2 and ASB-9 (samples ASB-2/E and ASB-9/E) were analyzed for total cadmium, copper, lead, nickel, vanadium, and zinc.

The soil sample from the excavation at ASB-1 (sample SE-1) was analyzed for total cadmium and lead.

Sampling equipment was cleaned before use at each location by washing with laboratory-grade detergent and rinsing with distilled water. Rinsate and used protective clothing were stored temporarily on site in 55-gallon drums pending testing and disposal. The excavations at borings ASB-2 and ASB-9 were backfilled with a cement-sand slurry (Portland cement mixed with sand). The excavation at boring ASB-1 was further excavated by backhoe for removal of VOC-impacted soils, as described in Section 3.2.

3.1.2 Findings

The results of the confirmation samples collected at the base of the excavations at the ASB-1, ASB-2, and ASB-9 locations show that the soils with elevated concentrations of metals were successfully removed (see Table 4). For samples ASB-2/E and ASB-9/E, concentrations of total cadmium, copper, lead, nickel, vanadium, and zinc were (1) either not detected or were below TTLCs, below 10 times the STLCs, and below PRGs and (2) below concentrations detected in overlying surficial soils. For sample SE-1 (from the base of the excavation at ASB-1), cadmium was not detected and the concentration of lead was below the TTLC, below 10 times the STLC, below PRGs, and below the concentration detected in overlying surficial soil.

3.2 Excavation of Soils Impacted by VOCs

Soil impacted by VOCs and oil and grease at ASB-1 was removed by backhoe and containerized for disposal on February 28, 1994. The intent of this excavation was to remove vadose-zone soils with the highest degree of chemical impact and thereby reduce the potential for impact to groundwater quality. The extent of the excavation was limited by the proximity to the property boundaries and the potential risk of damage to the utility shed on the property adjacent to the rear property line. The area with the highest degree of chemical impact was delineated prior to excavation and was then excavated using a backhoe. VWR assisted Cargill Salt with disposal of the containerized soil.

3.2.1 Delineation of Lateral Extent

The lateral extent of VOCs in vadose zone soils near boring ASB-1 was assessed prior to excavation of soil. As described in Section 2.2.2, PCE was detected at only 25 μg/Kg at ASB-10, located 5.5 feet from boring ASB-1. No VOCs were detected at ASB-8 and ASB-9, located 10.0 and 9.5 feet from ASB-1, respectively (see Figures 3 and 4). Borings ASB-8, -9 and -10 had been made during the July 13, 1993, field investigation.

On October 1, 1993, three additional borings (ASB-11, -12, and -13) were made to further assess the extent of VOCs in soil near ASB-1. These borings were made in a triangular pattern within 4 feet of boring ASB-1 (see Figure 4). The soil borings were manually advanced to a depth of 5 feet using a 3½-inch-diameter, stainless-steel bucket auger. Soil samples for headspace analysis were collected by manually advancing the bucket auger into soils at the base of the soil boring and emptying soils collected in the bucket auger directly into a sealable plastic bag. The bag was then sealed and the headspace in the bag was checked for VOCs by pushing the probe of a flame-ionization detector (FID) into the plastic bag. The boreholes were also checked for VOCs with the FID.

Sampling equipment was cleaned before use at each location by washing with laboratory-grade detergent and rinsing with distilled water. Rinsate and used protective clothing were stored temporarily on site in 55-gallon drums pending testing and disposal. The borings were backfilled with a cement-sand slurry (Portland cement mixed with sand).

The FID measurements for borings ASB-11, -12, and -13 (see Table 5) showed that the concentration of VOCs diminished rapidly within a few feet laterally from soil boring ASB-1. VOCs were detected at 3.0 to 33 parts per million (ppm) in the headspace analyses for the samples from a depth of 5 feet in the borings. VOCs had been detected in the borehole for ASB-1 at concentrations greater than 100 ppm with a PID.

3.2.2 Backhoe Excavation

After manually excavating surficial soils impacted by metals at boring ASB-1 and taking confirmation sample SE-1 for metals analysis, a backhoe was used to excavate soils impacted by VOCs and oil and grease at this location. The backhoe and a backhoe operator for these operations were contracted from W.A. Craig and Associates by Cargill Salt.

An excavation approximately 7 feet square at the bottom was made with the backhoe. The excavation was made normal to the property boundaries and was located 1.5 feet from the rear (southwestern) property boundary and 3 feet from the northwestern property boundary (see Figure 4). Three of the sidewalls were near vertical. The northeast sidewall was angled outward by the operator to facilitate removal of cuttings.

As the excavation was deepened, soils from the excavation were visually inspected for signs of staining and headspace analyses were performed on samples of the excavated soil. Headspace analyses were performed by placing a soil sample in a sealable plastic bag and using a Sensidyne® detector with PCE detector tubes to monitor for PCE vapors.

Soil to a depth of approximately 4 feet was determined to be non-impacted and was stockpiled for use in backfilling the excavation. Soil from depths of approximately 4 to 6 feet was determined to be impacted and was excavated and placed directly into one-cubic-yard bins for testing and disposal. Approximately 4 cubic yards of soil were excavated and containerized. The bins were DOT-approved Tri-Wall Hazardous Waste Containers manufactured by Weyerhauser and furnished to Cargill Salt by VWR. The excavation was backfilled to a depth of approximately 3 feet with flowable fill (a Portland cement and sand slurry) provided by RMC Lonestar for W.A. Craig. The upper 3 feet of the excavation was backfilled with the stockpiled soil.

Sampling equipment was cleaned before use at each location by washing with laboratory-grade detergent and rinsing with distilled water. Rinsate and used protective clothing were stored temporarily on site in 55-gallon drums pending testing and disposal. Samples of the containerized soil and of rinsate were collected and submitted for chemical analysis to help Cargill Salt determine appropriate disposal. Certified analytical reports and an explanation of the sample identifications for these analyses are shown in Appendix C.

Sampling of soils beneath the backhoe excavation area is described in Section 5.

4 Initial Groundwater Sampling and Analysis - October 1993

Potential impact to groundwater was assessed in two steps in October 1993. For Step 1, boring AGB-1 was hand augered at the location of soil boring ASB-1, temporary well casing was installed, and a sample of groundwater was collected. Laboratory analysis of the sample indicated impact to groundwater at this location by compounds detected in soil samples from boring ASB-1. Step 2 was performed to assess the extent of impact across the site and determine the groundwater flow direction. Groundwater samples for laboratory analysis were collected from five additional hand-augered borings with temporary well casing installed (AGB-2 through AGB-6). The groundwater flow direction was determined from groundwater elevation data obtained from borings AGB-2 through AGB-6.

4.1 Procedures

The Step 1 (AGB-1) and Step 2 (AGB-2 through AGB-6) groundwater sampling operations were conducted on October 1, 1993, and October 22, 1993, respectively, by Groundworks field personnel. Grab groundwater samples for both Step 1 and Step 2 were collected from hand-augered borings. Six borings (AGB-1 through AGB-6) were completed (see Figure 5). Borings AGB-2 through AGB-6 were augered and sampled in order of decreasing distance from the AGB-1 boring location to minimize the potential for cross contamination. Each boring was manually advanced to a depth of 10 feet using a 3½-inch-diameter, stainless-steel bucket auger. An FID was used to monitor for VOCs in the boreholes and from soil cuttings. FID measurements, observations on soil type, and soil moisture conditions for each boring were logged in a field notebook. Field notes are shown on Table 6. A drilling permit was obtained from the Zone 7 Water Agency of the Alameda County Flood Control and Water Conservation District (see Appendix D).

To facilitate collection of a sample of groundwater from borings AGB-1 through AGB-6, a 10-foot-long section of well casing with a slotted section at the bottom was temporarily installed in the boring. Groundwater samples for analysis of VOCs were collected from the temporary well casings using a ¾-inch-diameter PVC bailer. Groundwater samples for other analyses were collected using ¼-inch-diameter Teflon® tubing and a manually-operated vacuum pump. The pH, temperature, and electrical conductivity (EC) of groundwater sampled from AGB-1 and the EC of groundwater sampled from AGB-2 through AGB-6 were measured with field instruments.

Groundwater samples for analysis of VOCs were collected in 40-milliliter (ml) volatile organic analysis (VOA) bottles. Groundwater samples for other analyses were transferred to appropriate sample bottles. The groundwater sample bottles were labeled, placed in a cooler chilled with blue ice, and delivered under chain-of-custody to CAS for analysis.

The groundwater sample from AGB-1 was submitted for laboratory analysis of VOCs and hydrocarbons (oil and grease). For assessing general water quality, the sample was also analyzed for chloride and total dissolved solids (TDS). The groundwater samples from borings AGB-2 through AGB-6 were analyzed for VOCs and TDS.

The direction of shallow groundwater flow was determined using water-level information from borings AGB-2 through AGB-6. After sampling each boring, the temporary well casing was left in the boring for at least 1.5 hours to allow the water level in the boring to stabilize. Two sets of water-level measurements at least 1 hour apart were taken at each boring to ensure that the water levels had stabilized. The depth to water in each boring was measured from a survey stake placed next to the boring. The elevations of the survey stakes and ground elevations were surveyed relative to project datum on October 26, 1993, by a licensed land surveyor (L. Wade Hammond of Newark, California). The depth-to-water information was then used to calculate groundwater elevations, a groundwater contour map was prepared, and the horizontal groundwater flow direction and gradient were determined. Groundwater elevation data are shown on Table 7.

After sampling and water-level measurements were completed, the temporary well casing was removed from the boring and the boring was backfilled with a cement-sand slurry (Portland cement mixed with sand) using a tremie pipe.

Soil cuttings from the borings were placed on plastic sheeting and covered with plastic, and stored temporarily on site pending analytical testing and disposal. Sampling equipment and temporary well casing materials were cleaned before use at each location by washing with laboratory-grade detergent and rinsing with distilled water. Rinsate and used protective clothing were stored temporarily on site in 55-gallon drums pending testing and disposal.

4.2 Findings

4.2.1 Field Observations

The only area where VOCs were detected with an FID in vadose zone soils during the field program for groundwater sampling borings AGB-1 through AGB-6 was near boring ASB-1. (PCE and 1,1-DCE had been detected in soil samples from boring ASB-1 during the initial soil sampling and analysis program in July 1993). Monitoring for VOC vapors with an FID detected VOCs at concentrations of 20 to 600 ppm in vadose zone soils in boring AGB-1, located immediately adjacent to boring ASB-1, and in boring AGB-2, located within 3 feet of boring ASB-1. In boring AGB-3, located 7 feet from soil boring ASB-1, a VOC concentration of 1 ppm was detected in vadose zone soils with the FID. At AGB-4, AGB-5, and AGB-6, no VOCs were detected in vadose zone soils. Field notes for borings AGB-1 through AGB-6 are shown on Table 6.

Indications of VOCs in groundwater were detected with the FID at borings AGB-1, AGB-2, AGB-3, AGB-4, and AGB-6, but not at AGB-5. At borings AGB-1 and AGB-2, concentrations of VOCs of 20 to 400 ppm were detected with the FID on saturated soils, or in the borings after saturated soils were encountered. Lower concentrations of VOCs

(1 to 2 ppm) were detected with the FID on saturated soils, or in the borings after saturated soils were encountered, at borings AGB-3, AGB-4, and AGB-6. No VOCs were detected with the FID at boring ASB-5.

The soil profile was generally similar at each boring. Fine- to medium-grained silty sand was encountered from the surface to a depth of 10 feet in each boring. Saturated soil was first encountered at depths of 5.0 to 6.5 feet in the borings.

4.2.2 Groundwater Gradient

Groundwater levels measured in the five groundwater sampling borings stabilized quickly after the borings were completed. Depth to water measurements taken in two sets of measurements more than 1.5 hours apart were within 0.02 feet for each boring (see Table 7). The groundwater contour map (Figure 6) shows that the horizontal flow direction for shallow groundwater is towards the north-northeast. Thus, the direction of groundwater flow from the AGB-1 area is towards Clement Avenue. The horizontal groundwater gradient measured from the groundwater contour map is 0.011.

4.2.3 Analytical Results for Groundwater

The groundwater sampling locations are shown on Figure 5 and analytical results are shown on Figure 5 and Table 8. Certified analytical reports are presented in Appendix E.

4.2.3.1 Volatile organic compounds

The analytical results from groundwater sampling at borings AGB-1 through AGB-6 indicate that there are impacts to shallow groundwater at the site by VOCs. PCE was detected at a concentration of 11,000 μg/L at groundwater sampling boring AGB-1, located immediately adjacent to soil boring ASB-1. Previous soil sampling at boring ASB-1 had detected PCE in vadose zone soils at 740,000 μg/Kg.

PCE was detected in each of the groundwater samples from borings AGB-2 through AGB-6 at concentrations of 22 to 1,400 μg/L. The results indicate that the higher concentrations of PCE in groundwater are generally localized at the boring AGB-1 location. PCE was detected at only 22 μg/L at boring AGB-2, located only 3 feet upgradient of AGB-1. At cross-gradient locations AGB-3 and AGB-4, PCE was detected at 2.4 and 890 μg/L, respectively. At downgradient locations AGB-5 and AGB-6, PCE was detected at 240 and 1,400 μg/L, respectively.

Detection of a higher concentration of PCE at boring AGB-6 than at AGB-5 suggests that (1) AGB-5 is on the edge of a plume extending from AGB-1 to AGB-6, (2) a more concentrated slug of PCE-impacted groundwater is present at AGB-6 than at AGB-5, or (3) there may be an additional source for PCE in groundwater near AGB-6. As described in Section 5, a subsequent field investigation found no indication of a second source of PCE in vadose zone soils near AGB-6. Thus, the higher concentration of PCE at AGB-6 is probably a result of one of the first two explanations above.

PCE was the only VOC detected in groundwater at borings AGB-1 through AGB-5. A second VOC, trichloroethene (TCE), was detected at 79 μg/L at boring AGB-6. It is possible that TCE detected at AGB-6 formed by the breakdown of PCE. TCE is known to be a degradation product of PCE (Marshack, 1989).

The analytical results of the groundwater samples are compared with regulatory criteria on Table 8. The concentrations of PCE detected at AGB-1, -2, -3, -5, and -6 exceed the California Primary Drinking Water Standard Maximum Contaminant Level (MCL) for PCE of 5 μg/L. The concentration of PCE detected at AGB-4 is below the MCL. The concentration of TCE detected at AGB-6 is above the MCL for TCE of 5 μg/L.

The comparison with drinking water standards is made to provide a general indication of groundwater quality at the site. Groundwater at the site is not used as a water supply source for drinking water, and the local shallow groundwater is not considered to be suitable as a source of drinking water (see Section 6).

4.2.3.2 Oil and grease

Hydrocarbons (oil and grease) were detected in the groundwater sample from boring AGB-1 at a concentration of 4.0 milligrams per liter (mg/L). Previous soil sampling at adjacent soil boring ASB-1 had detected hydrocarbons (oil and grease) in vadose zone soils at a concentration of 1,100 mg/Kg.

4.2.3.3 Inorganic parameters

The results of the inorganic analyses show that concentrations of salinity-related parameters are relatively low in shallow groundwater at the site. The concentration of chloride at AGB-1 was 18 mg/L, and TDS values from the six borings ranged from 300 to 390 mg/L (see Table 8). Field measurement of EC yielded values of 392 to 565 micromhos/centimeter (μmhos/cm) (see Table 6).

5 Additional Soil and Groundwater Sampling and Analysis – September 1994

Additional characterization activities were conducted in September 1994 to further assess the extent of VOCs in soil and groundwater at the site. A soil-coring rig was used to advance two borings (AC-1 and AC-2) and collect soil samples to depths of 25 feet in the area of the soil excavation at boring ASB-1. Eight soil samples were analyzed to characterize the vertical extent of VOCs in saturated soil. A groundwater sample was collected with the soil-coring rig at a depth of 25 feet to characterize the vertical extent of VOCs in groundwater at this location.

A groundwater-sampling probe system was used to collect groundwater samples at five on- and off-site locations (AP-1, AP-2, AP-3, AP-4c, and AP-5) at depths of 10 to 23 feet to characterize the lateral and vertical extent of VOCs in groundwater. The groundwater flow direction was determined with water-level data from the groundwater probes. Groundwater samples were collected upgradient, crossgradient, and downgradient of the site.

A field investigation was also conducted near groundwater sampling boring AGB-6 to search vadose zone soils for a potential source of the VOCs previously detected in groundwater at AGB-6.

5.1 Procedures

The soil-coring and groundwater-sampling probe activities were conducted on September 6 and 7, 1994, by Precision Sampling, Inc. (PSI), a soil and groundwater sampling company located in San Rafael, California. These field activities were supervised by Groundworks personnel, and were performed under a drilling permit obtained from the Zone 7 Water Agency of the Alameda County Flood Control and Water Conservation District (see Appendix D).

The field investigation to search vadose-zone soils for VOCs near AGB-6 was conducted by Groundworks personnel on September 7, 1994.

5.1.1 Soil and Groundwater Sampling

The soil-core and groundwater-probe samples were collected by PSI with a portable, hydraulically-driven sampling rig mounted on an all-terrain vehicle. With this sampling rig, soil-core or groundwater-probe sampling rods are pushed into the ground with hydraulic pressure. Downward advancement may be assisted with vibrators or a hydraulic hammer.

5.1.1.1 Soil Coring

PSI's Enviro-Core™ rods were used to advance soil-core borings AC-1 and AC-2 at the ASB-1 soil excavation area (see Figure 4). With the Enviro-Core™ system, two nested sampling rods are driven simultaneously: small-diameter inner sampling rods are used to obtain and retrieve the soil cores, the larger diameter ($2^{3/8}$-inch outside diameter) outer rods serve as temporary drive casing. As the Enviro-Core™ rods are advanced, soil is driven into a $1^{5/8}$-inch-diameter, 3-foot-long sample barrel attached to the end of the inner rods. Soil samples are collected in $1^{1/2}$-inch-diameter by 6-inch-long stainless steel tubes inside the sample barrel as both rods are advanced. After being driven 3 feet, the inner rods and the sample barrel are removed from the borehole with a hydraulic winch. The stainless steel tubes containing the soil samples are removed from the sample barrel, and can then be preserved for chemical analyses or used for lithologic identification. After adding new stainless steel tubes, the sample barrel and inner rods are then lowered back into the borehole to the previous depth, additional Enviro-Core™ rods (both inner and outer) are attached, and the borehole is advanced another 3 feet. The process is repeated until the desired depth is reached. The use of outer rods prevents sloughing of the formation while the inner rods are withdrawn from the hole. This enables the sample barrel to sample soil from the desired interval, rather than from potentially contaminated soil that has sloughed in from higher in the hole.

Soil-core boring AC-2 was located approximately 1.5 feet outside the northeast edge of the soil excavation and was advanced to a depth of 25 feet. Soil-core boring AC-1 was also located approximately 1.5 feet outside the northeast edge of the soil excavation but was advanced 16 feet at an angle of approximately 25 degrees from vertical in order to sample soil beneath the soil excavation (see Figures 4 and 7).

The soil-core borings were logged by a California-registered geologist. Soils for lithologic logging were extruded from the stainless-steel sample tubes and were classified according to the Unified Soil Classification System (USCS). Exploratory boring logs were prepared for each boring (see Appendix D). Four soil samples from the borings were placed in plastic bags, labeled, and submitted to a soil laboratory for physical soil testing. Sieve analyses were performed to confirm field classifications.

Soil samples for headspace analysis were collected by removing soil from a stainless steel sample tube and placing the soil into a glass jar. The jar was then covered with aluminum foil and the headspace in the jar was checked for VOCs by pushing the probe of a PID through the foil.

Six soil samples from boring AC-2 and four soil samples from boring AC-1 were preserved for possible chemical analysis. After removing the stainless steel tube containing the soil samples from the sample barrel, the tube was capped at both ends with Teflon® film and plastic end caps. The sample tubes were labeled and placed in a cooler with blue ice. The sampling intervals for the headspace and preserved samples are shown on Figure 7 and on the exploratory boring logs in Appendix D.

After reviewing the results of the headspace analyses, four soil samples from each of the two soil-core borings were submitted for laboratory analysis of VOCs. Samples were submitted with appropriate chain-of-custody documentation to CAS for laboratory analysis.

The downhole sample barrel, sample rods, and tools were cleaned with a high-pressure hot water washer between holes. Drive samplers were washed with laboratory grade detergent and double-rinsed with deionized water between samples collected in the same hole. Rinsate was stored temporarily on site in a 55-gallon drum pending testing and disposal.

After sampling activities were completed in each boring, the boring was backfilled with Type II Portland cement using a tremie pipe lowered through the rods to the bottom of the hole.

5.1.1.2 Groundwater sampling

A groundwater sample was collected at the base of soil-core boring AC-1. The groundwater table had been encountered at a depth of 5 to 6 feet near this location during previous sampling activities. During soil-coring, groundwater did not enter the borehole until a depth of 25 feet was reached and the inner core rods were pulled back. At this depth, saturated flowing sands entered the outer rods. It was determined that groundwater entering the borehole at this point should be representative of groundwater entering the borehole from a depth of 25 feet, as the outer rods had apparently prevented groundwater from entering the borehole at shallower depths. However, there is a possibility that there was minor carry-down of groundwater from shallower depths in the boring. The groundwater sample from AC-1 was collected by lowering a 0.63-inch-diameter stainless steel bailer through the outer rods.

PSI's groundwater-sampling probe system was used to collect groundwater samples at five on- and off-site locations (AP-1, AP-2, AP-3, AP-4c, and AP-5; see Figure 9). The probe system is constructed of 3-foot-long sections of flushed-threaded, 1-inch-outside-diameter stainless steel rods equipped with a sacrificial drive point. The threads of the rods were sealed with Teflon® tape to minimize leakage into the rods. The rods were pushed into the ground until the target water-bearing zone was reached, after which the rods were pulled back a selected distance to detach the drive point and open the end of the rods to the formation, allowing groundwater to enter. To facilitate collection of a groundwater sample and measurement of the water level, a temporary well casing with a slotted section at the bottom was installed through the rods to the bottom of the boring. The temporary well casing was constructed of ¾-inch-diameter PVC with a 5-foot-long section of machine-slotted well screen. Groundwater was sampled by lowering a 0.63-inch-diameter stainless steel bailer through the rods. After groundwater was sampled, the probe rods were removed from the borehole. The temporary well casing was left in the borehole and the water level in the borehole was allowed to stabilize for water-level measurement. This system was used to advance probes at locations AP-1, AP-2, AP-3, and AP-5 and at two locations near AP-3 where samples could not be collected because formation refusal was encountered (AP-4a) or the sacrificial tip could not be dislodged (AP-4b). A similar system was used to collect a groundwater sample at location AP-4c. Here, larger diameter rods (2-¾-inch outside diameter) were used to advance the borings because of the subsurface conditions encountered at locations AP-4a and AP-4b.

It was necessary to push through asphalt at each of the AP locations. To accomplish this, a clearing barrel was used to pushed through the asphalt with the rig before using the groundwater probe rods. At AP-2, it was necessary to use a concrete-coring machine to core through concrete below the surficial asphalt.

Groundwater samples for analysis of VOCs were collected in 40 ml VOA bottles. The groundwater sample bottles were labeled, placed in a cooler chilled with blue ice, and delivered under chain-of-custody to CAS for analysis.

The direction of shallow groundwater flow was determined using groundwater elevation data from probe locations AP-1, AP-2, AP-3, and AP-5. After sampling each boring, the temporary well casing was left in the boring to allow the water level in the boring to stabilize. The depth to water in each boring was measured from the top of the well casing. The difference between the elevation of the top of casing and a survey nail driven into the asphalt next to the boring was measured. The elevations of the survey nails were surveyed relative to project datum on September 7, 1994, by a licensed land surveyor (L. Wade Hammond of Newark, California). The depth-to-water information was then used to calculate groundwater elevations, a groundwater contour map was prepared, and the horizontal groundwater flow direction and gradient were determined. Groundwater elevation data are shown on Table 7.

After sampling and water-level measurement activities were completed, the temporary PVC well casing was used as a tremie pipe for backfilling the boring with Type II Portland cement.

The downhole sampling equipment was cleaned with a high-pressure hot water washer before use in each hole. Soil cuttings, rinsate, used PVC casing, and used protective clothing were stored temporarily on site in 5-gallon and 55-gallon drums pending testing and disposal.

5.1.2 AGB-6 Field Investigation

A field investigation was conducted near groundwater sampling boring AGB-6 to search vadose zone soils for a potential source of VOCs detected in groundwater at AGB-6. A total of 16 soil borings (ASB-14 to ASB-29) were hand-augered to a depth of 3 feet in a grid pattern and a PID was used to monitor for VOCs in the borings and in headspace analyses of soils collected from the borings. The soil borings were manually advanced using a 2-½-inch-diameter, stainless-steel bucket auger. Soil samples for headspace analysis were collected by manually advancing the bucket auger into soils at the base of the soil boring and emptying soils collected in the bucket auger directly into a glass jar. The jar was then covered with aluminum foil and the headspace in the jar was checked for VOCs by pushing the probe of a PID through the foil.

The sampling grid is shown on Figure 8 and the results of the PID analyses are shown on Table 10.

5.2 Findings

5.2.1 Soil Types

Soils encountered in soil-core borings AC-1 and AC-2 are described on the Logs of Exploratory Borings in Appendix D. The field descriptions of soils were annotated with the results of laboratory sieve analyses. The laboratory reports for the sieve analyses are also included in Appendix D.

Boring AC-2 was advanced vertically to a depth of 25 feet. Boring AC-1 was advanced 16 feet at an angle of approximately 25 degrees from vertical to a depth of approximately 14.5 feet below the ground surface (see Figures 4 and 7). The soils encountered in each boring were similar. Silty sands with minor interbeds of sandy clay and clayey sand were encountered to a depth of 25 feet. In boring AC-2, fine- to medium-grained silty sands were encountered to a depth of approximately 11 feet. A sandy clay lens was encountered from approximately 11 to 12 feet. Beneath the sandy clay lens, fine- to medium-grained silty sands were encountered to a depth of approximately 18.5 feet. A clayey sand lens was encountered at 18.5 to 19 feet, and sand to silty sand was encountered from 19 feet to 25 feet. Groundwater (saturated soil) was first encountered at a depth of approximately 5.5 feet.

5.2.2 Groundwater Gradient

Groundwater elevation data for probe locations AP-1, AP-2, AP-3, and AP-5 are shown on Table 7. The groundwater contour map (Figure 10) shows that the horizontal flow direction for shallow groundwater is towards the north-northeast and is similar to the flow direction determined from borings AGB-2 through AGB-6 in October 1993. The horizontal groundwater gradient measured from the groundwater contour map is 0.011, similar to that determined in October 1993.

5.2.3 Analytical Results for Soil

Field monitoring for VOCs with the PID indicated that VOCs in the saturated soils near the ASB-1 soil excavation were not detected at depths greater than 11 feet. The results of the headspace analyses are shown on the boring logs in Appendix D and on Figure 7.

Laboratory results for soil analyses confirmed the results of the field monitoring. PCE was detected in the soil samples from 6.5 - 7.0 and 9.0 - 9.5 feet from boring AC-1 at 3,400 and 31,000 μg/Kg, respectively. No VOCs were detected in the soil samples from 12.0 - 12.5 and 15.0 - 15.5 feet in boring AC-1. PCE was detected at 830 μg/Kg in the soil sample from 8.0 - 8.5 feet in boring AC-2. No VOCs were detected in the soil samples from 12.0 - 12.5, 15.0 - 15.5, and 24.5 - 25.0 feet in boring AC-2. The results of the laboratory analyses are shown on Table 9 and on Figure 7. Certified analytical reports are presented in Appendix F.

Comparing the results to regulatory criteria (see Table 9), the concentration of PCE detected in two of the soil samples (AC-1 @ 6.5 - 7.0 feet and AC-2 @ 8.0 - 8.5 feet) exceed the MC-TCLP but not the PRGs. The concentration of PCE detected in the sample from

AC-1 @ 9.0 - 9.5 feet exceeds the MC-TCLP and the PRGs. However, as shown on Figure 7 and Table 9, the extent of PCE detected in the soils beneath the ASB-1 excavation area is limited vertically to within 10 feet of the ground surface. No VOCs were detected in soil samples collected between depths of 11 and 25 feet.

5.2.4 Analytical Results for Groundwater

The analytical results from groundwater sampling at AP-1, AP-2, AP-3, AP-4c, AP-5, and AC-2 are shown on Figure 9 and Table 8. Certified analytical reports are presented in Appendix F.

PCE was detected at a concentration of 14 μg/L in the groundwater sample collected at a depth of 25 feet from boring AC-2, indicating that PCE may have migrated vertically to this depth from the ASB-1 area. It should be noted that this sample was a grab sample from the soil-core rods and may have been subject to cross-contamination from elevations higher in the boring. The sample result should be regarded only as a preliminary indication of the vertical extent of PCE in groundwater at this location.

No VOCs were detected in shallow groundwater at upgradient location AP-1, cross-gradient location AP-2, or downgradient location AP-5. PCE was detected at a concentration of 4.2 μg/L at location AP-3, 45 feet downgradient of the site. The groundwater sample from AP-3 was collected at a depth of 10 feet. PCE was detected at 0.6 μg/L in the sample collected from a depth of 23 feet at AP-4c, located near AP-3. The low concentrations of PCE detected at these downgradient locations may indicate that PCE has migrated off site.

However, four other VOCs were detected at AP-3 at concentrations of 1.6 to 32 μg/L (see Table 8). These four compounds were not detected in on-site groundwater samples, although their detection may have been masked by elevated method reporting limits. One of the VOCs (1,1-DCE) detected in groundwater at off-site location AP-3 could be a breakdown product of PCE. Three compounds detected at AP-3 (1,1,1-trichloroethane [TCA], chloroform, and trichloroflouromethane [Freon]) are apparently not breakdown products of PCE (Marshack, 1989). One of these four compounds (1,1-DCE) had been detected earlier in a soil sample from on-site soil boring ASB-1 (see Table 3). TCE, which was detected in groundwater at boring AGB-6, was not detected off site.

Downgradient, off-site detection of VOCs that were not detected in soil or groundwater on site indicates that the VOCs detected downgradient of the site may be related to off-site sources. Sewer lines and utility trenches beneath Clement Avenue may be a potential source for these VOCs.

The analytical results of the groundwater samples are compared with regulatory criteria on Table 8. The PCE concentration (14 μg/L) detected in the AC-2 sample collected beneath the ASB-1 excavation area exceeds the MCL of 5 μg/L. As discussed in Section 4.2.3, the concentrations of PCE previously detected at on-site groundwater sampling locations AGB-1, -2, -3, -5, and -6 had also exceeded the MCL. However, as shown on Table 8, none of the VOC concentrations detected at the off-site locations (AP-3 and AP-4c) exceed the MCLs for the specific VOCs.

The comparison with drinking water standards is made to provide a general indication of groundwater quality at the site. Groundwater at the site is not used as a water supply source for drinking water, and the local shallow groundwater is not considered to be suitable as a source of drinking water (see Section 6).

5.2.5 AGB-6 Field Investigation

A source of VOCs in the vadose zone near boring AGB-6 was not detected. The results of PID measurements for the boreholes and headspace analyses of borings ASB-12 through ASB-29 are shown on Table 10. The sampling grid is shown on Figure 8. VOCs were not detected at most of the borings. There was a slight response (1.5 ppm or less) at borings ASB-21 and ASB-24 but this response was most likely due to soil moisture or to VOCs in soil vapor as a result of partitioning from groundwater. A much stronger response would most likely have been measured by the PID if a source of VOCs were present in the vadose zone soils near boring AGB-6.

6 Regional Groundwater Use

6.1 Stratigraphy and Groundwater Use

Alameda is an island on the east side of San Francisco Bay and is separated from Oakland by a tidal canal (see Figure 1). Alameda is underlain by unconsolidated marine and non-marine sediments and is located in the East Bay Plain Groundwater Basin. The site area is underlain by the Merritt Sand, and lies within a Merritt Sand Outcrop groundwater subarea (Muir, 1993, Figure 6).

> The Merritt Sand is a loose well-sorted, fine to medium grained sand and silt, with lenses of sandy clay and clay. It was derived chiefly as a wind and water deposited beach and near-shore deposit. It is exposed only in the Alameda and Oakland area. The Merritt Sand has a maximum thickness of about 65 feet. It is permeable, with the permeability decreasing toward the base of the deposit because it becomes more consolidated. The Merritt Sand contains some groundwater, but is not considered a primary source of supply because of its limited areal distribution and thickness. (Muir, 1993, p.15).

According to a hydrogeologic report prepared by the Alameda County Flood Control and Water Conservation District, wells in the Merritt Sand produce enough water for domestic use, but the water should only be used for irrigation or other non-potable uses because the Merritt Sand unit is a relatively thin, permeable unit that is susceptible to contamination from sewer systems, street runoff, leaking underground fuel tanks, etc. (Hickenbottom and Muir, 1988, p. 37).

The Merritt Sand is underlain by older alluvium consisting of a heterogeneous mixture of poorly consolidated to unconsolidated layers of clay, silt, sand, and gravel. The older alluvium is considered to be the major groundwater reservoir in the East Bay Plain Area but it is not used for regional domestic water supply. Most domestic water in the East Bay Plain Area is supplied from surface water sources outside of the area. Most groundwater in the East Bay Plain Area is used for irrigation or industrial uses. (Hickenbottom and Muir, 1988, pp. 2, 34).

6.2 Water Supply Wells Within One-Half Mile

Groundworks requested information on water wells within one-half mile of the site from the County of Alameda Public Works Agency in Hayward, California. Well location and identification information furnished by the Public Works Agency shows that there are five registered water supply wells within one-half mile of the site. Two of the wells are listed as industrial wells and three are listed as irrigation wells. There are no registered domestic water supply wells listed. According to information provided by the Public Works Agency, the industrial and irrigation well categories are defined as follows:

> Industrial well - A water well used to supply industry on an individual basis.
>
> Irrigation well - A water well used to supply water only for irrigation or other agricultural purposes. This category includes large capacity wells as well as small capacity wells for lawn irrigation.

The closest registered water supply well to the site is an irrigation well approximately 1,600 feet away (Well #2S/4W 12J1). Based on the current understanding of local groundwater flow direction, this well is upgradient of the site. There are no registered water supply wells downgradient of the site. Well information provided by the Public Works Agency for the registered water supply wells is shown on Table 11. Well locations are shown on Figure 11.

The well information provided by the Public Works Agency for registered wells within one-half mile of the site shows that there are a number of wells and borings used for purposes other than for water supply. These include 22 monitoring wells, 2 destroyed wells, 2 cathodic protection wells, 8 test wells, 1 boring, and 1 geotechnical boring.

7 Conclusions

7.1 Soil Characterization and Remediation

7.1.1 Soil Characterization prior to Excavation

Chemical impact to soils by VOCs was detected in the initial soil sampling and analysis program conducted in July 1993. PCE was detected at a concentration of 740,000 μg/Kg and 1,1-DCE was detected at 25,000 μg/Kg from soil at a depth of 5.5–6 feet in boring ASB-1, located on the vacant side of the facility lot near the rear, or southwest, property line. Results from the July 1993 and October 1993 field programs showed that the areal extent of chemical impact to vadose zone soils was limited to less than 10 feet from boring ASB-1. Hydrocarbons (oil and grease) were also detected in soils at boring ASB-1 at a concentration of 1,100 mg/Kg but were not detected in samples from five other borings at the site. No semivolatile organic compounds were detected in soil samples from boring ASB-1 or other borings at the site.

The chemical impact to soils at boring ASB-1 appeared to be the result of a discharge or spill to surficial soils at the boring ASB-1 location. It is possible that the VOCs and oil and grease detected at boring ASB-1 are associated with waste products from facility operations. The VOCs and oil and grease may be associated with solvents previously used for degreasing operations at the facility, although there are no records indicating use of PCE. Site records indicate that the solvents used for degreasing operations were not PCE-based solvents.

It is also possible that the VOCs and oil and grease are associated with waste products discarded from neighboring properties. There is an apartment complex next to the rear property line of the facility, and the laundry room for this complex is in the utility shed immediately adjacent to the rear property line. This laundry room is only 4 feet away from boring ASB-1. If PCE associated with laundry cleaning products were spilled in this laundry room, it is possible that it could have drained onto the Cargill Salt property. Also, site personnel have reported that the residential neighbor to the northwest owns a dry cleaning business that could be a potential source for PCE.

Chemical impact to soils by metals was also detected in the initial soil sampling and analysis program conducted in July 1993. Metals-impacted soils were detected at boring ASB-1 and two other nearby locations (at borings ASB-2 and ASB-9). The metals-impacted soils appeared to be related to casting sands that were discarded or spilled on surficial soils.

7.1.2 Soil Excavation

In October 1993 and February 1994, surficial soils impacted by metals were excavated manually and drummed for disposal.

In February 1994, soil impacted by VOCs and oil and grease at the boring ASB-1 location was excavated for disposal using a backhoe. Approximately four cubic yards of soil were excavated with the backhoe from the ASB-1 location. The intent of this excavation was to remove vadose-zone soils with the highest degree of chemical impact and thereby reduce the potential for impact to groundwater quality. The extent of the excavation was limited by the proximity to the property boundaries and the potential risk of damage to the utility shed on the property adjacent to the rear property line. The area with the highest degree of chemical impact was delineated prior to excavation and was then excavated using a backhoe.

7.1.3 Soil Characterization after Excavation

Confirmation soil sampling showed that the metals-impacted soils were successfully removed. Concentrations of metals detected in soils beneath the excavated areas are below Title 22 TTLCs and USEPA Region IX PRGs for residential and industrial soil.

The vertical extent of chemical impact to saturated soils remaining beneath and near the excavation at ASB-1 was delineated in the September 1994 soil coring program. Analysis of soil samples collected in the soil-core borings beneath and adjacent to the excavation showed that PCE at concentrations up to 31,000 μg/Kg remains in saturated soil at depths between 5 and 10 feet. These concentrations exceed the Title 22 MC-TCLP and the USEPA Region IX PRGs for residential and industrial soil. However, no VOCs were detected in soil samples collected at depths between 11 and 25 feet. A 1-foot-thick clay lens logged at a depth of 11 feet may help to retard the downward migration of VOCs. Soils logged above and below the clay lens are predominantly fine- to medium-grained silty sands.

7.2 On-Site Characterization of Groundwater

7.2.1 Initial Groundwater Sampling and Analysis - October 1993

Chemical impact to groundwater by VOCs was detected in the initial groundwater sampling and analysis program conducted in October 1993. PCE was detected at a concentration of 11,000 μg/L at groundwater boring AGB-1 (immediately adjacent to soil boring ASB-1) and at lower concentrations in groundwater from 5 other borings across the site. The concentration of PCE in groundwater diminished markedly within a few feet of boring AGB-1. PCE was detected at only 22 μg/L at boring AGB-2, located only 3 feet upgradient of AGB-1. PCE was detected at 890 μg/L at AGB-3, located 7 feet crossgradient of AGB-1, and at 2.4 μg/L at AGB-4, located 30 feet cross-gradient of AGB-1.

PCE was detected at a higher concentration at the furthest downgradient location (AGB-6) than at a downgradient location (AGB-5) closer to AGB-1. The PCE concentration at AGB-6 was 1,400 μg/L and at AGB-5 was 240 μg/L. Detection of a higher concentration of PCE in groundwater at boring AGB-6 than at AGB-5 suggests that (1) AGB-5 is on the edge of a plume extending from AGB-1 to AGB-6, (2) a more concentrated slug of PCE-impacted groundwater is present at AGB-6 than at AGB-5, or (3) there may be an additional source for PCE in groundwater near AGB-6. As discussed below in Section 7.2.2, the field investigation in September 1994 found no indication of a second source of PCE in vadose zone soils near AGB-6. Thus, the higher concentration of PCE at AGB-6 is probably a result of one of the first two explanations above.

TCE was detected at a concentration of 79 μg/L at groundwater boring AGB-6. The TCE may be present as a breakdown product of PCE.

Hydrocarbons (oil and grease) were detected at a concentration of 4.0 mg/L in groundwater from boring AGB-1.

7.2.2 Additional Groundwater Sampling and Analysis - September 1994

The lateral and vertical extent of VOCs in groundwater was further characterized during the additional groundwater sampling and analysis program conducted in September 1994.

PCE was detected at a concentration of 14 μg/L in the groundwater sample collected at a depth of 25 feet from boring AC-2, indicating that PCE may have migrated vertically to this depth from the ASB-1 area. It should be noted that this sample was a grab sample from the soil-core rods and may have been subject to cross-contamination from elevations higher in the boring. The sample result should be regarded as a preliminary indication of the vertical extent of PCE in groundwater at this location.

No VOCs were detected in a shallow groundwater sample collected at a down- and cross-gradient on-site location (AP-5).

The September 1994 field investigation near groundwater boring AGB-6 did not find a nearby vadose zone source for the PCE and TCE detected in groundwater at AGB-6. The PCE detected in soils at the ASB-1 area near the rear property line remains the apparent source for the PCE detected in groundwater at AGB-6 and at the other on-site groundwater borings.

7.2.3 Comparison to Regulatory Criteria

The concentrations of PCE detected at most of the on-site sampling locations and the concentration of TCE detected at one on-site sampling location exceed the California Primary Drinking Water Standard MCL of 5 μg/L. However, detection of PCE and TCE at concentrations exceeding the MCLs are limited to the on-site sampling locations, as discussed below.

7.3 Off-Site Characterization of Groundwater

7.3.1 Additional Groundwater Sampling and Analysis – September 1994

During the September 1994 groundwater sampling and analysis program, no VOCs were detected in shallow groundwater samples collected at an upgradient off-site location (AP-1) or a crossgradient off-site location (AP-2).

PCE was detected in groundwater at a concentration of 4.2 μg/L at location AP-3, 45 feet downgradient of the site. The groundwater sample from AP-3 was collected at a depth of 10 feet. PCE was detected at 0.6 μg/L in the groundwater sample collected from a depth of 23 feet at AP-4c, located near location AP-3. The low concentrations of PCE detected in groundwater at these downgradient locations may indicate that PCE has migrated off site.

However, four other VOCs were detected in groundwater at off-site locations AP-3 and AP-4c at concentrations ranging from 1.6 to 32 μg/L. These four compounds were not detected in on-site groundwater samples, although their detection may have been masked by some of the method reporting limits. One of the VOCs (1,1-DCE) detected at this location could be a breakdown product of PCE. Three compounds detected at AP-3 (1,1,1-trichloroethane [TCA], chloroform, and trichloroflouromethane [Freon]) are apparently not breakdown products of PCE (Marshack, 1989). One of these four compounds (1,1-DCE) had been detected earlier in a soil sample from on-site soil boring ASB-1. TCE, which was detected in groundwater at on-site boring AGB-6, was not detected at this off-site location.

Detection of VOCs in groundwater downgradient of the site that were not detected in either soil or groundwater on site may indicate that the PCE and other VOCs detected downgradient of the site may be related to off-site sources. Sewer lines and utility trenches beneath Clement Avenue may be a potential source for these VOCs.

7.3.2 Comparison to Regulatory Criteria

None of the VOC concentrations detected at the off-site locations (AP-3 and AP-4c) exceed the California Primary Drinking Water Standard MCLs for the specific VOCs.

7.4 Regional Groundwater Use

The survey of water supply wells within one-half mile of the site showed that the closest registered water supply well is an irrigation well approximately 1,600 feet away. Based on the current understanding of local groundwater flow direction, this well is upgradient of the site. There are no registered water supply wells downgradient of the site.

The local shallow groundwater is not considered to be suitable as a source of drinking water.

8 Recommendations

Groundworks recommends that Cargill Salt review the results of the site investigations and remedial activities to date with the ACDEH and the California Regional Water Quality Control Board - San Francisco Bay Region.

The groundwater characterization methods employed to date are generally considered to be screening or preliminary site assessment methods. Groundworks recommends that the groundwater quality results obtained with these methods be confirmed using groundwater monitoring wells. Shallow groundwater monitoring wells should be installed to confirm the distribution and concentration of VOCs (specifically PCE) and hydrocarbons (oil and grease) in groundwater at the site and to confirm the groundwater flow direction.

The lateral and vertical extent of VOCs in groundwater beneath the site should be further delineated using groundwater probe sampling techniques or monitoring wells. Groundworks recommends that the lateral extent on site be further delineated using groundwater sampling probes. Groundworks recommends that a groundwater monitoring well be placed at the downgradient property boundary near Clement Avenue to determine the concentration and identity of VOCs that may be migrating from the site. Results from this location should be compared to the results obtained at the off-site locations AP-3 and AP-4c on Clement Avenue to determine if the VOCs detected at the off-site locations originated from the site or other sources.

Sewer lines and other utilities beneath Clement Avenue should be investigated as possible sources of the VOCs detected at off-site locations AP-3 and AP-4c and as possible conduits or pathways for migration of VOCs in groundwater.

A deeper groundwater monitoring well should be installed to confirm the vertical extent of compounds detected in groundwater near boring ASB-1. This deeper well should be paired with a shallow well and the vertical groundwater gradient at this location should be determined.

As these recommendations are implemented and additional information on site conditions is obtained, the recommendations should be re-evaluated and revised if appropriate.

References

Hickenbottom, K., and Muir, K., 1988, *Geohydrology and Groundwater-Quality Overview, of the East Bay Plain Area, Alameda County, California, 205 (j) Report,* Prepared for California Regional Water Quality Control Board - San Francisco Bay Region, Prepared by Alameda County Flood Control and Water Conservation District, June 1988.

Muir, K. S., 1993, *Geologic Framework of the East Bay Plain Groundwater Basin, Alameda County, California*, Report prepared for Alameda County Flood Control and Water Conservation District, August 1993.

Marshack, J.B., 1989, *Relationship Between Chlorinated Two-Carbon Volatile Organic Contaminants (VOCs),* California Regional Water Quality Control Board - Central Valley Region, Memorandum, July 19, 1989 (amended September 14, 1989).

Professional Certification

Soil and Groundwater Investigations and Remedial Activities
July 1993 - September 1994
Cargill Salt - Alameda Facility
Alameda, California

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Limitations

This report and the evaluations presented herein have been prepared in accordance with generally accepted professional standards and is based solely on the scope of work and services described herein. This report has been prepared solely for the use of Cargill Salt for the purposes noted herein. Any use of this report, in whole or in part, by a third party for other than the purposes noted herein is at such party's sole risk.

Table 1
Sample Collection Data – Initial Soil Sampling Program (July 1993)
Cargill Salt – Alameda Facility

Boring No.	Sample Depth (feet)	Sample Tube Collection Method[1]	Laboratory Analyses Completed[2]	PID readings from borehole[3]	Field Observations
ASB-1	0.25	S	TM	Background[4]	Targeted light-colored sands (casting sands?) for sampling.
	1.0 - 1.5	HD		2 - 3 ppm	No odor, no discoloration.
	3	BA		>100 ppm	Chemical odor, greenish-gray staining (odor & staining in cuttings beginning at depth of 3 ft).
	5	BA		>100 ppm	Chemical odor, greenish-gray staining.
	5.0 - 5.5	HD*	V, SV, OG	>100 ppm	Chemical odor, greenish-gray staining.
ASB-2	0.25	S	TM, WET-M (Cd, Pb)	Background	Targeted reddish-colored sands (casting sands?) for sampling.
	0.5 - 1.0	HD		Background to 2 ppm	No odor or discoloration.
	4.5 - 5.0	HD*	V, SV, OG	Background	No odor or discoloration; Groundwater in borehole at 4.7 ft.
ASB-3	0.75 - 1.25	HD		Background	No odor or discoloration, possible glass fragments.
	4.25 - 4.75	BA		Background	No odor or discoloration; Augered boring to 5.5 ft, groundwater in borehole at 5.0 ft.
ASB-4	0.75 - 1.25	HD		Background	No odor or discoloration.
	4.25 - 4.75	HD*		Background	No odor or discoloration; Augered boring to 6.0 ft, groundwater in borehole at 4.7 ft.
ASB-5	0.75 - 1.25	HD		Background	No odor or discoloration, hit storm drain (?) at 1.25', aborted boring.
ASB-6	0.75 - 1.25	HD	TM	Background	No odor or discoloration.
	3.5 - 4.0	HD*	V, SV, OG	Background	No odor or discoloration; Augered boring to 5.4 ft, groundwater in borehole at 4.9 ft.
ASB-7	0.75 - 1.25	HD		Background	No odor or discoloration.
	3.5 - 4.0	BA		Background	No odor or discoloration.
ASB-8	0.75 - 1.25	HD	TM	Background	No odor or discoloration.
	4.0 - 4.5	BA	V, SV, OG	Background	No odor or discoloration.
ASB-9	0.3 - 0.8	HD	TM, WET-M (Pb)	Background	No odor, reddish discoloration and glass fragments at top of sampled interval (casting sands?).
	4.3 - 4.8	BA	V, SV, OG	Background to 1.6 ppm	No odor or discoloration.
ASB-10	4.5 - 5.0	BA	V, SV, OG	Background to 0.7 ppm	No odor or discoloration; Augered boring to 5.2 ft, groundwater in borehole at 5.15 ft.

[1] Key to sample tube collection method:

S = Scrape; Soil sample collected by scraping soils into stainless-steel sample tube.
HD = Hammer driven; Soil sample collected with hammer-driven sampler fitted with stainless-steel sample tube.
HD* = Sample tube in hammer-driven sampler was partially full upon retrieval from borehole, additional soil was added to sample tube from bucket auger.
BA = Bucket auger; Soil sample collected by emptying soils from hand-advanced bucket auger into a plastic bag and filling stainless-steel sample tube from plastic bag.

[2] Key to laboratory analyses completed:

TM = Total metals (Barium, Cadmium, Chromium, Copper, Lead, Nickel, Vanadium, Zinc)
V = Volatile organic compounds; SV = Semivolatile organic compounds; OG = Oil and grease
WET-M = Soluble metals using WET extraction

[3] PID = Photoionization detector

[4] Background = 0.0 to 0.4 ppm.

All soil samples collected 7/13/93.

Table 2
Analytical Results for Initial Soil Sampling Program (July 1993) – Metals
Cargill Salt – Alameda Facility

Boring no.	ASB-1	ASB-2	ASB-6	ASB-8	ASB-9	Regulatory Criteria			
Sample depth (feet)	0.25	0.25	0.75 - 1.25	0.75 - 1.25	0.3 - 0.8				
Date sampled	7/13/93	7/13/93	7/13/93	7/13/93	7/13/93	STLC[1]	TTLC[2]	PRG-R[3]	PRG-I[4]
Metals, Total *(mg/Kg)*[5]									
Barium	81	200	100	87	210	100	10,000	5,300	100,000
Cadmium	**280**	***18***	< 1	< 1	4	1.0	100	9†	850
Chromium	30	37	35	37	25	5	2,500	210	1,600
Copper	210	53	10	9	40	25	2,500	2,800	63,000
Lead	***210***	***390***	5	3	***280***	5.0	1,000	130†	1,000
Nickel	130	30	19	21	44	20	2,000	150†	34,000
Vanadium	11	22	18	20	21	24	2,400	540	12,000
Zinc	1,300	460	25	22	280	250	5,000	23,000	100,000
Metals, WET Extract[6] *(mg/L)*[7]									
Cadmium	na[8]	0.70	na	na	na	1.0	100	9†	850
Lead	na	**8.5**	na	na	**6.0**	5.0	1,000	130†	1,000

▨ Shading indicates sample taken from soils subsequently excavated for disposal (see Table 4).

[1] STLC = soluble threshold limit concentration (in milligrams per liter)

[2] TTLC = total threshold limit concentration (in milligrams per kilogram)

[3] PRG-R = USEPA Region IX Preliminary Remediation Goal for Residential Soil (in milligrams per kilogram); † indicates CAL-Modified PRG

[4] PRG-I = USEPA Region IX Preliminary Remediation Goal for Industrial Soil (in milligrams per kilogram); † indicates CAL-Modified PRG

[5] mg/kg = milligrams per kilogram

[6] WET = California Waste Extraction Test

[7] mg/L = milligrams per liter

[8] na = not analyzed (analysis not requested)

Total metals concentration in bold indicates concentration over TTLC.
Total metals concentration in bold italics indicates concentration 10 times greater than STLC.
WET extract metals concentration in bold indicates concentration over STLC.

Table 3
Analytical Results for Initial Soil Sampling Program (July 1993) – Volatile Organics, Semivolatile Organics, and Oil and Grease
Cargill Salt – Alameda Facility

Boring no.	ASB-1	ASB-2	ASB-6	ASB-8	ASB-9	ASB-10	Regulatory Criteria				
Sample depth (feet)	5.0 - 5.5	4.5 - 5.0	3.5 - 4.0	4.0 - 4.5	4.3 - 4.8	4.5 - 5.0					
Date sampled	7/13/93	7/13/93	7/13/93	7/13/93	7/13/93	7/13/93	STLC[1]	TTLC[2]	MC-TCLP[3]	PRG-R[4]	PRG-I[5]
Volatile Organics *EPA Method 8240* (µg/Kg)[6]											
1,1-Dichloroethene	**25,000**	<5	<5	<5	<5	<5	ne[7]	ne	700	38	82
Tetrachloroethene (PCE)	**740,000**	<5	<5	<5	<5	**25**	ne	ne	700	7,000	25,000
All other Method 8240 analytes	nd[8,9]	nd	nd	nd	nd	nd	-	-	-	-	-
Semivolatile Organics *EPA Method 8270* (mg/Kg)[10]											
All Method 8270 analytes	nd	nd	nd	nd	nd	nd	-	-	-	-	-
Hydrocarbons (Oil and Grease) *EPA Method 5520F* (mg/Kg)	**1,100**	<15	<15	<15	<15	<15	†	†	†	†	†

▨ Shading indicates sample taken from soils subsequently excavated for disposal.

[1] STLC = Soluble threshold limit concentration (in micrograms per liter [µg/L])

[2] TTLC = Total threshold limit concentration (in micrograms per kilogram [µg/Kg])

[3] MC-TCLP = Maximum concentration (in µg/L) of contaminants for the toxicity characteristic for a liquid extract (when using the Toxicity Characteristic Leaching Procedure [TCLP])

[4] PRG-R = USEPA Region IX Preliminary Remediation Goal for Residential Soil (in µg/Kg)

[5] PRG-I = USEPA Region IX Preliminary Remediation Goal for Industrial Soil (in µg/Kg)

[6] µg/Kg = micrograms per kilogram (equivalent to ppb)

[7] ne = none established or none applicable

[8] nd = none detected at or above the method reporting limit (See Certified Analytical Reports for method reporting limit.)

[9] For sample ASB-1, method reporting limit (MRL) raised to 25,000 µg/Kg or higher for all analytes because high analyte concentrations required sample dilution.

[10] mg/Kg = milligrams per kilogram (equivalent to parts per million [ppm])

† Regulatory criteria for petroleum hydrocarbons are typically established on a case by case basis.

Table 4
Confirmation Sample Results for Excavated Metals-Impacted Soils
Cargill Salt - Alameda Facility

Boring no.	ASB-1	Confirmation sample SE-1 *@ASB-1*	ASB-2	Confirmation sample ASB-2/E	ASB-9	Confirmation sample ASB-9/E	Regulatory Criteria			
Sample depth (feet)	0.25	1	0.25	1	0.3 - 0.8	1				
Date sampled	7/13/93	2/28/94	7/13/93	10/1/93	7/13/93	10/1/93	STLC[1]	TTLC[2]	PRG-R[3]	PRG-I[4]
Metals, Total *(mg/Kg)*[5]										
Barium	81	na[6]	200	na	210	na	100	10,000	5,300	100,000
Cadmium	**280**	<1	***18***	<1	4	<1	1.0	100	9†	850
Chromium	30	na	37	na	25	na	5	2,500	210	1,600
Copper	210	na	53	10	40	12	25	2,500	2,800	63,000
Lead	***210***	15	***390***	2	***280***	14	5.0	1,000	130†	1,000
Nickel	130	na	30	19	44	19	20	2,000	150†	34,000
Vanadium	11	na	22	na	21	na	24	2,400	540	12,000
Zinc	1,300	na	460	21	280	40	250	5,000	23,000	100,000
Metals, WET Extract[7] *(mg/L)*[8]										
Cadmium	na[6]	na	0.70	na	na	na	1.0	100	9†	850
Lead	na	na	**8.5**	na	**6.0**	na	5.0	1,000	130†	1,000

▨ Shading indicates sample taken from soils subsequently excavated for disposal.

Confirmation samples collected after overlying metals-impacted soils were excavated for disposal.

[1] STLC = soluble threshold limit concentration (in milligrams per liter)

[2] TTLC = total threshold limit concentration (in milligrams per kilogram)

[3] PRG-R = USEPA Region IX Preliminary Remediation Goal for Residential Soil (in milligrams per kilogram); † indicates CAL-Modified PRG

[4] PRG-I = USEPA Region IX Preliminary Remediation Goal for Industrial Soil (in milligrams per kilogram); † indicates CAL-Modified PRG

[5] mg/kg = milligrams per kilogram

[6] na = not analyzed (analysis not requested)

[7] WET = California Waste Extraction Test

[8] mg/L = milligrams per liter

Total metals concentration in bold indicates concentration over TTLC.

Total metals concentration in bold italics indicates concentration 10 times greater than STLC.

WET extract metals concentration in bold indicates concentration over STLC.

Table 5
FID Measurements from Soil Borings ASB-11 through ASB-13
Cargill Salt - Alameda Facility

		FID[1] Measurement (in ppm[2])		
Boring	Depth (in feet)	In borehole	On cuttings	In headspace
ASB-11	3	2	1.5	-
	4	1	0	3.5
	5	-	-	3.0
ASB-12	3	1	0	-
	5	2	0	5
ASB-13	3	1.5	2.5	-
	5	3	-	33

[1] FID = flame-ionization detector.
[2] ppm = parts per million

General notes:
Borings hand-augered on 10/1/93.
Borings listed in order of completion.

Table 6
Field Notes from Groundwater Sampling Borings AGB-1 through AGB-6
Cargill Salt - Alameda Facility

Boring	Depth (in feet)	Field Notes
AGB-1	0	Light brown silty sand; fine grained; dry
	0.5	Damp; dark brown color
	2.0	FID[1] measurement on soil cuttings = 1 ppm[2]; minor amount of bluish powdery material in soil
	2.5	FID measurement in borehole = 4 ppm
	3.5	Lighter color; medium grained; FID measurement in borehole = 50 ppm, on cuttings = 20 ppm
	5.0	Moist; FID measurement on soil cuttings = 600 ppm
	5.5	Mottled appearance
	6.5	Wet; FID measurement on soil cuttings = 400 ppm
	10.0	Boring terminated; installed temporary PVC casing
		Field measurement of water sample: pH=5.7; EC=465 µmhos/cm, T=71.5° F
AGB-6	0	Dark brown silty sand; fine grained; dry to damp
	2.0	FID measurement in borehole = 0 ppm
	2.5	Piece of glass in cuttings
	3.5	Medium brown color; FID measurement in borehole = 0 ppm
	4.0	Moist
	5.5	Wet
	9.0	FID measurement in borehole = 2 ppm, cuttings = 0 ppm
	10.0	Boring terminated; installed temporary PVC casing; FID measurement in borehole = 0 ppm
		Field measurement of water sample: EC=565 µmhos/cm
AGB-5	0	Dark brown silty sand; fine grained; uniform grain size
	3.0	FID measurement in borehole and on cuttings = 0 ppm
	3.5	Grayish brown color
	4.3	Moist
	5.5	Wet
	7.5	FID measurement in borehole and on cuttings = 0 ppm
	10.0	Boring terminated; installed temporary PVC casing; FID measurement in borehole = 0 ppm
		Field measurement of water sample: EC=436 µmhos/cm
AGB-4	0	Dark brown silty sand
	3.5	Medium brown color
	4.0	FID measurement in borehole and on cuttings = 0 ppm
	5.0	Wet; slight bluish grey mottling
	5.5	FID measurement in borehole = 0.5 ppm, on cuttings = 0 ppm
	7.0	FID measurement in borehole = 2 ppm, on cuttings = 0 ppm
	10.0	Boring terminated; installed temporary PVC casing
		Field measurement of water sample: EC=392 µmhos/cm
AGB-3	0	Dark brown silty sand
	2.5	FID measurement in borehole and on cuttings = 0 ppm
	3.5	Medium brown color
	4.0	FID measurement in borehole = 1 ppm, on cuttings = 0 ppm
	5.0	Wet
	5.5	Grayish brown color
	7.0	FID measurement in borehole = 2 ppm, on cuttings = 0 ppm
	10.0	Boring terminated; installed temporary PVC casing; FID measurement in borehole = 1 ppm
		Field measurement of water sample: EC=458 µmhos/cm
AGB-2	0	Dark brown silty sand
	3.0	FID measurement in borehole = 4 ppm, on cuttings = 1 ppm
	3.5	Medium brown color
	5.0	Wet; grayish brown color; iron-oxide staining; roots.
	10.0	Boring terminated; installed temporary PVC casing; FID measurement in borehole = 20 ppm
		Field measurement of water sample: EC=467 µmhos/cm

[1] FID = flame-ionization detector.

[2] ppm = parts per million

General notes:

Boring AGB-1 hand-augered on 10/1/93; Borings AGB-2 through AGB-6 hand-augered on 10/22/93.

Borings listed in order of completion.

Field notes annotated from observations recorded in field notebook.

Table 7
Groundwater Elevation Data
Cargill Salt – Alameda Facility

Initial Groundwater Sampling Program

Boring	Date	Time	Ground elevation[1] (feet)		Elevation of survey stake[1,2] (feet)	Depth to water from survey stake (feet)	Groundwater elevation (feet)
First round of measurements							
AGB-2	10/22/93	13:09	52.46	-	52.80	5.89	46.91
AGB-3	10/22/93	13:08	52.75	-	53.08	6.19	46.89
AGB-4	10/22/93	13:06	52.11	-	52.46	5.56	46.90
AGB-5	10/22/93	13:01	51.79	-	52.34	5.72	46.62
AGB-6	10/22/93	12:58	50.82	-	51.17	5.49	45.68
Second round of measurements							
AGB-2	10/22/93	14:45	52.46	-	52.80	5.87	46.93
AGB-3	10/22/93	14:44	52.75	-	53.08	6.18	46.90
AGB-4	10/22/93	14:43	52.11	-	52.46	5.55	46.91
AGB-5	10/22/93	14:42	51.79	-	52.34	5.71	46.63
AGB-6	10/22/93	14:41	50.82	-	51.17	5.48	45.69

Additional Groundwater Sampling Program

Boring	Date	Time	Elevation of survey nail[1,3] (feet)	PVC casing stickup (feet)	Top of PVC casing elevation (feet)	Depth to water from top of casing (feet)	Groundwater elevation (feet)
AP-1	9/6/94	10:28	54.50	1.10	55.60	7.00	48.60
AP-2	9/6/94	16:15	50.64	1.08	51.72	5.79	45.93
AP-3	9/6/94	13:10	48.52	1.05	49.57	4.80	44.77
AP-5	9/6/94	14:18	49.28	1.06	50.34	5.12	45.22

[1] Elevations surveyed relative to ground elevation at corner of facility building (assumed elevation = 50.00 feet).
[2] Survey stake driven into ground next to boring.
[3] PK survey nail driven into asphalt next to boring.

Table 8
Summary of Analytical Results for Groundwater Samples
Cargill Salt – Alameda Facility

Boring no.	AGB-1	AGB-2	AGB-3	AGB-4	AGB-5	AGB-6	AP-1	AP-2	AP-3	AP-4c	AP-5	AC-2	Regulatory Criteria	
Boring depth (feet)	10	10	10	10	10	10	12	10	10	23	10	25		
Date sampled	10/1/93	10/22/93	10/22/93	10/22/93	10/22/93	10/22/93	9/6/94	9/6/94	9/6/94	9/7/94	9/6/94	9/7/94	MCL[1]	AL[2]
	On-site						*Off-Site*				*On-Site*			
Volatile Organics														
EPA Methods 5030/8010 (μg/L)[3]														
Trichloroflouromethane (CFC 11)	<500	<0.5	<50	<0.5	<10	<50	<0.5	<0.5	**32**	<0.5	<0.5	<0.5	150	ne[4]
1,1-Dichloroethene (1,1-DCE)	<500	<0.5	<50	<0.5	<10	<50	<0.5	<0.5	**1.6**	<0.5	<0.5	<0.5	6	ne
Chloroform	<500	<0.5	<50	<0.5	<10	<50	<0.5	<0.5	**23**	<0.5	<0.5	<0.5	ne[5]	ne
1,1,1-Trichloroethane (TCA)	<500	<0.5	<50	<0.5	<10	<50	<0.5	<0.5	**1.8**	<0.5	<0.5	<0.5	200	ne
Trichloroethene (TCE)	<500	<0.5	<50	<0.5	<10	**79**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	ne
Tetrachloroethene (PCE)	**11,000**	**22**	**890**	**2.4**	**240**	**1,400**	<0.5	<0.5	**4.2**	**0.6**	<0.5	**14**	5	ne
All other Methods 5030/8010 analytes	nd[6] †	nd	nd †	nd	nd †	nd †	nd	nd	nd	nd	nd	nd	-	-
Hydrocarbons (Oil and Grease)														
EPA Method SM 5520F (mg/L)[7]	**4.0**	na[8]	na	na	na	na	na	na	na	na	na	na	‡	‡
Inorganics														
(mg/L)														
Chloride	**18**	na	na	na	na	na	na	na	na	na	na	na	250[9]	ne
Total Dissolved Solids (TDS)	**360**	**340**	**340**	**300**	**340**	**390**	na	na	na	na	na	na	500[9]	ne

[1] MCL = California Primary Drinking Water Standard – Maximum Contaminant Level (in micrograms per liter [μg/L])

[2] AL = Action Level for drinking water, set by California Department of Toxic Substances Control (in micrograms per liter [μg/L])

[3] μg/L = micrograms per liter (equivalent to ppb)

[4] ne = none established or none applicable

[5] MCL for total trihalomethanes (sum of bromoform, bromodichloromethane, chloroform, and dibromochloromethane) = 100 μg/L

[6] nd = none detected at or above the method reporting limit

[7] mg/L = milligrams per liter (equivalent to parts per million [ppm])

[8] na = not analyzed (analysis not requested)

[9] California Secondary Drinking Water Standard - Maximum Recommended Contaminant Level (mg/L)

† Method reporting limit (MRL) raised for all analytes because high analyte concentrations required sample dilution (see Certified Analytical Reports).

‡ Regulatory criteria for petroleum hydrocarbons are established on a case by case basis.

Table 9
Analytical Results for Additional Soil Sampling Program (September 1994)
Cargill Salt – Alameda Facility

Boring no.	AC-1	AC-1	AC-1	AC-1	AC-2	AC-2	AC-2	AC-2					
Sample depth (feet)	6.5-7.0	9.0-9.5	12.0-12.5	15.0-15.5	8.0-8.5	12.0-12.5	15.0-15.5	24.5-25.0	Regulatory Criteria				
Date sampled	9/7/94	9/7/94	9/7/94	9/7/94	9/7/94	9/7/94	9/7/94	9/7/94	STLC[1]	TTLC[2]	MC-TCLP[3]	PRG-R[4]	PRG-I[5]
Halogenated Volatile Organic Compounds *EPA Methods 5030/8010* (μg/Kg)[6]													
Tetrachloroethene (PCE)	**3,400**	**31,000**	<50	<50	**830**	<50	<50	<50	ne[7]	ne	700	7,000	25,000
All other Method 8010 analytes	nd[8]	nd	nd	nd	nd	nd	nd	nd	-	-	-	-	-

[1] STLC = Soluble threshold limit concentration (in micrograms per liter [μg/L])
[2] TTLC = Total threshold limit concentration (in micrograms per kilogram [μg/Kg])
[3] MC-TCLP = Maximum concentration (in μg/L) of contaminants for the toxicity characteristic for a liquid extract (when using the Toxicity Characteristic Leaching Procedure [TCLP])
[4] PRG-R = USEPA Region IX Preliminary Remediation Goal for Residential Soil (in μg/Kg)
[5] PRG-I = USEPA Region IX Preliminary Remediation Goal for Industrial Soil (in μg/Kg)
[6] μg/Kg = micrograms per kilogram (equivalent to ppb)
[7] ne = none established or none applicable
[8] nd = none detected at or above the method reporting limit (See Certified Analytical Reports for method reporting limit.)

Table 10
PID Measurements from Soil Borings ASB-14 through ASB-29
Cargill Salt – Alameda Facility

Boring	Depth (in feet)	PID[1] Measurement (in ppm[2]) In borehole	In headspace
ASB-14	3	0.0	0.0
ASB-15	3	0.0	0.0
ASB-16	3	0.0	0.0
ASB-17	3	0.0	0.0
ASB-18	3	0.0	0.0
ASB-19	3	0.0	0.0
ASB-20	3	0.0	0.0
ASB-21	3	0.1	0.1
ASB-22	3	0.0	0.0
ASB-23	3	0.0	0.0
ASB-24	3	1.5	0.0
ASB-25	3	0.0	0.0
ASB-26	3	0.0	0.0
ASB-27	3	0.0	0.0
ASB-28	3	0.0	0.0
ASB-29	3	0.0	0.0

[1] PID = photo-ionization detector.

[2] ppm = parts per million

General notes:

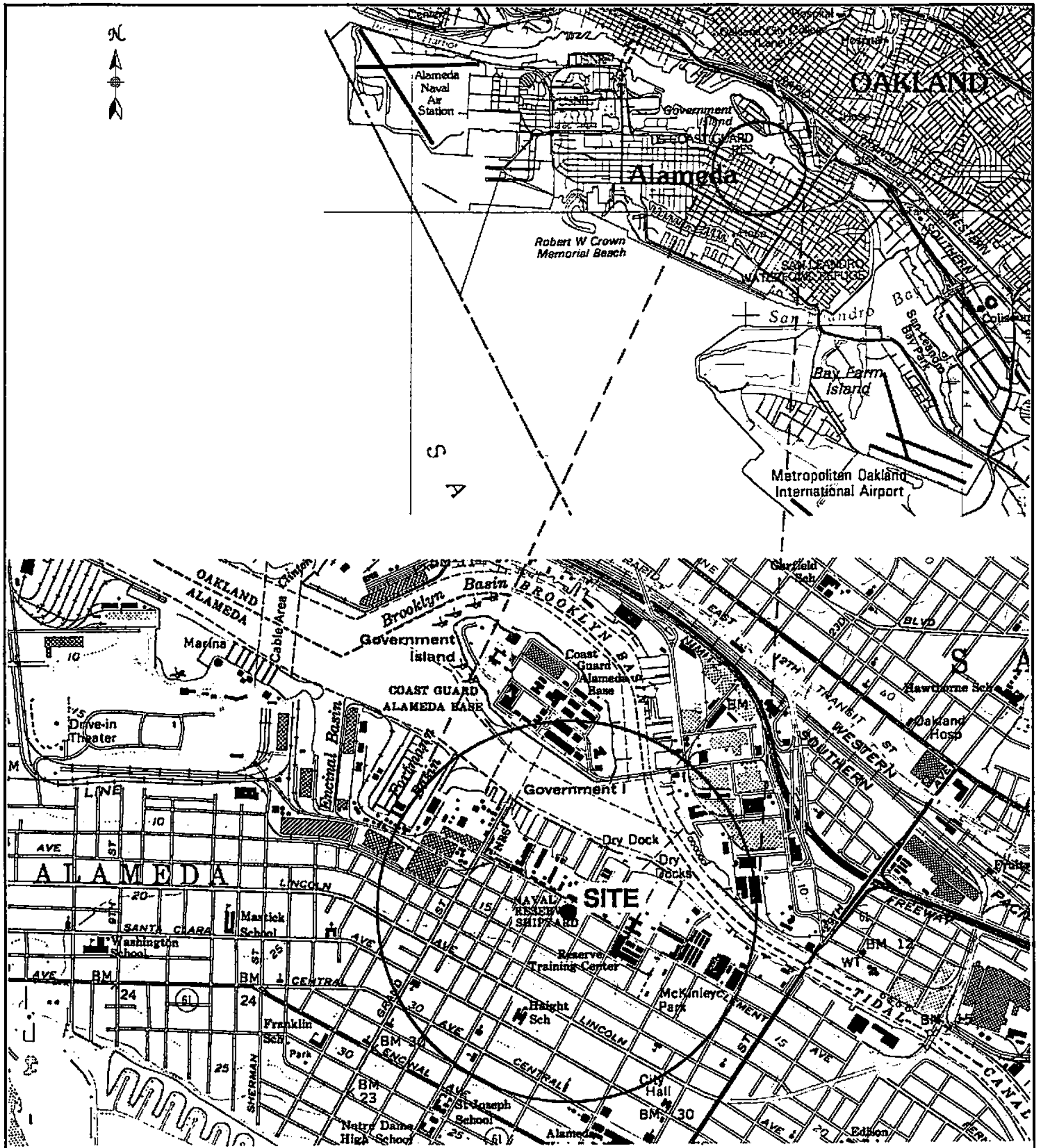
Borings hand-augered on 9/7/94.

Borings listed in order of completion.

Table 11
Data for Water Supply Wells Within One-Half Mile
Cargill Salt – Alameda Facility

Well #	Address	Owner	Use	Date Drilled	Diameter inches	Total Depth (feet)	Depth to Water (feet)	Log Available
2S/3W 7M1	2307 Clement Ave.	Bob Tennant	Industrial	4/77	6	72	–	Yes
2S/3W 7M2	2307 Clement Ave.	Bob Tennant	Industrial	4/77	6	82	6	Yes
2S/4W 12J1	2138 Pacific Ave.	Han Hyong Chang	Irrigation	8/77	6	29	9	Yes
2S/4W 12P1	1616 Grand St.	Jerome Healy	Irrigation	2/77	4	62	11	Yes
2S/4W 12P3	1538 Lafayette St.	Harlon Ogle	Irrigation	6/77	-	19	10	Yes

Data furnished by County of Alameda Public Works Agency for registered water supply wells within one-half mile of 2016 Clement Avenue, Alameda.



Base map (upper): U.S.G.S. 1:1,000,000-scale series (Topographic)
San Francisco Quadrangle, California, 1978.
Base map (lower): U.S.G.S. 7.5 minute series (Topographic)
Oakland East and Oakland West Quadrangles, California, 1959, Photorevised 1980.

0 2,000 4,000
Scale in feet (lower map)

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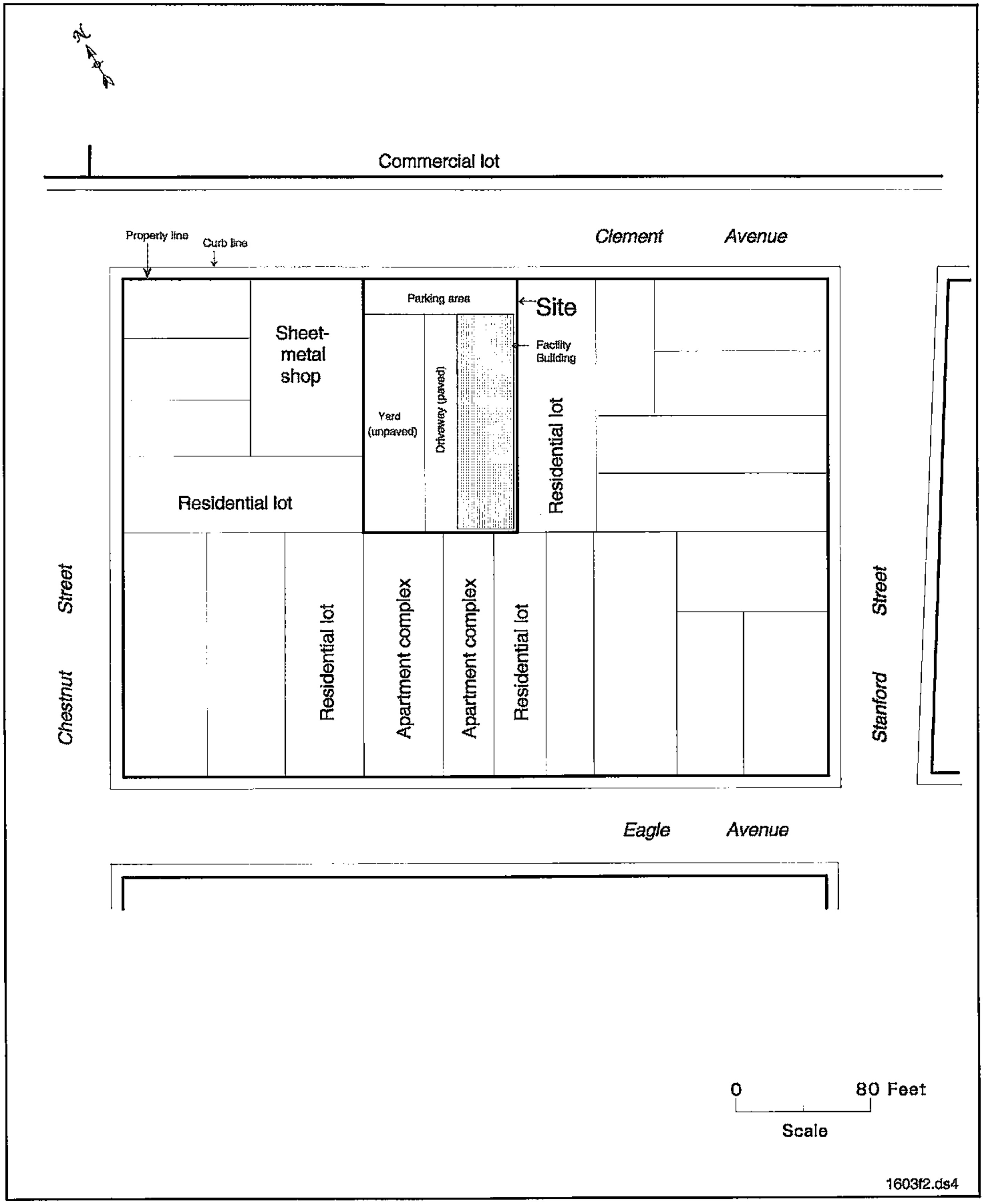
Cargill Salt Dispensing Systems Division
2016 Clement Avenue, Alameda, California
Figure 1. Site Location

1603f1.ds4



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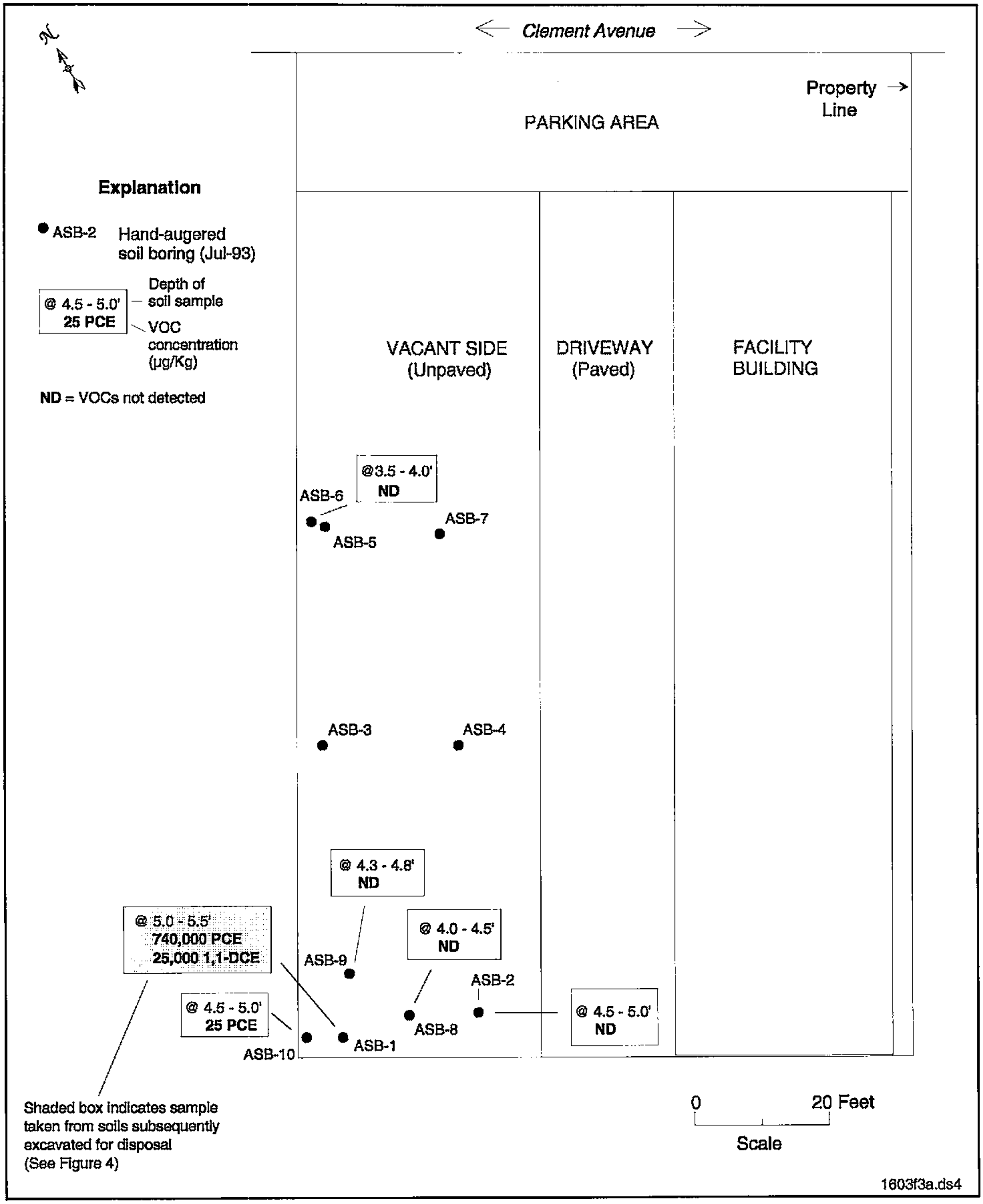
2016 Clement Avenue, Alameda, California
Figure 2. Facility Setting



Shaded box indicates sample taken from soils subsequently excavated for disposal (See Figure 4)

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Figure 3. VOC Concentrations in Soil (July 1993)

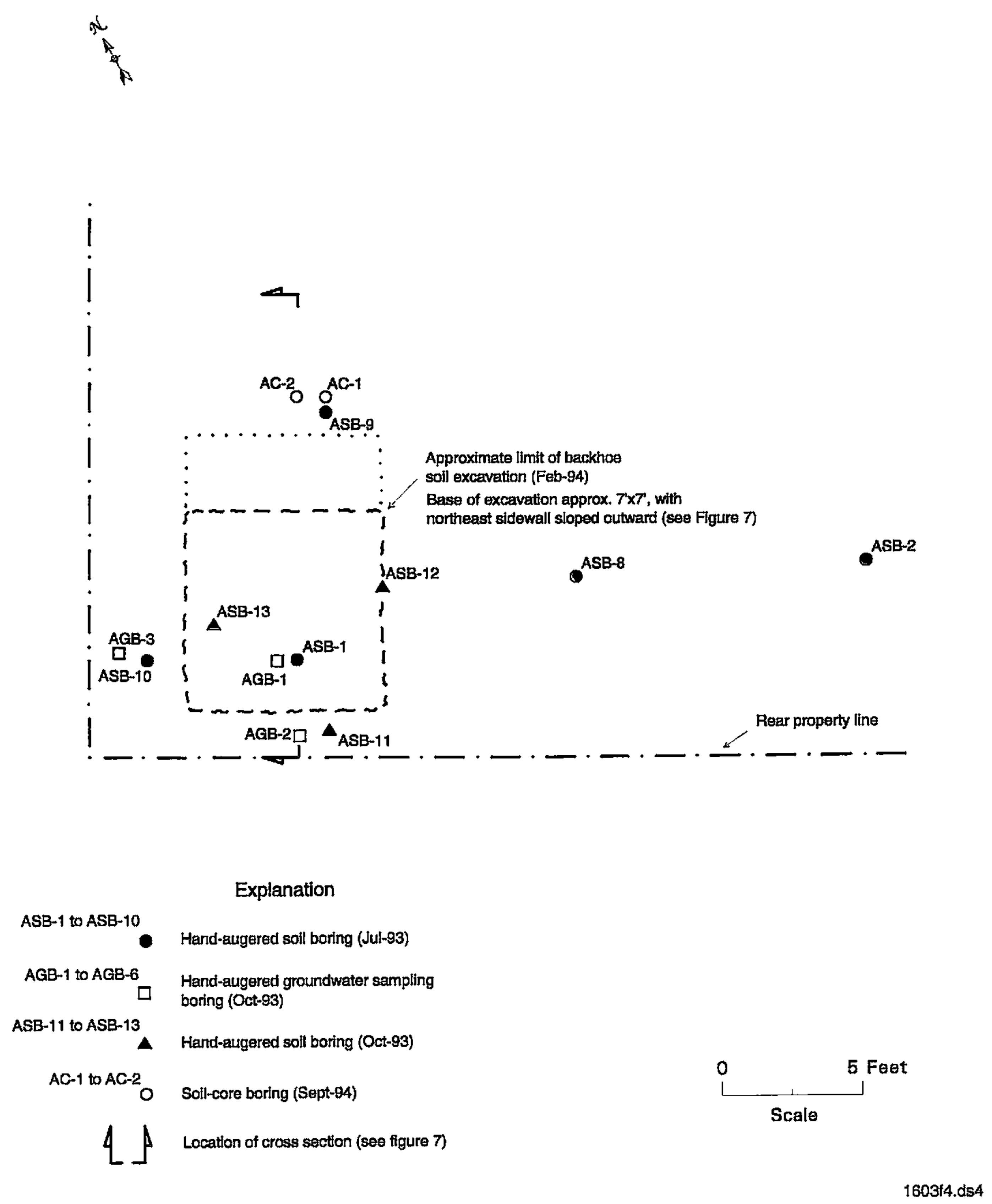

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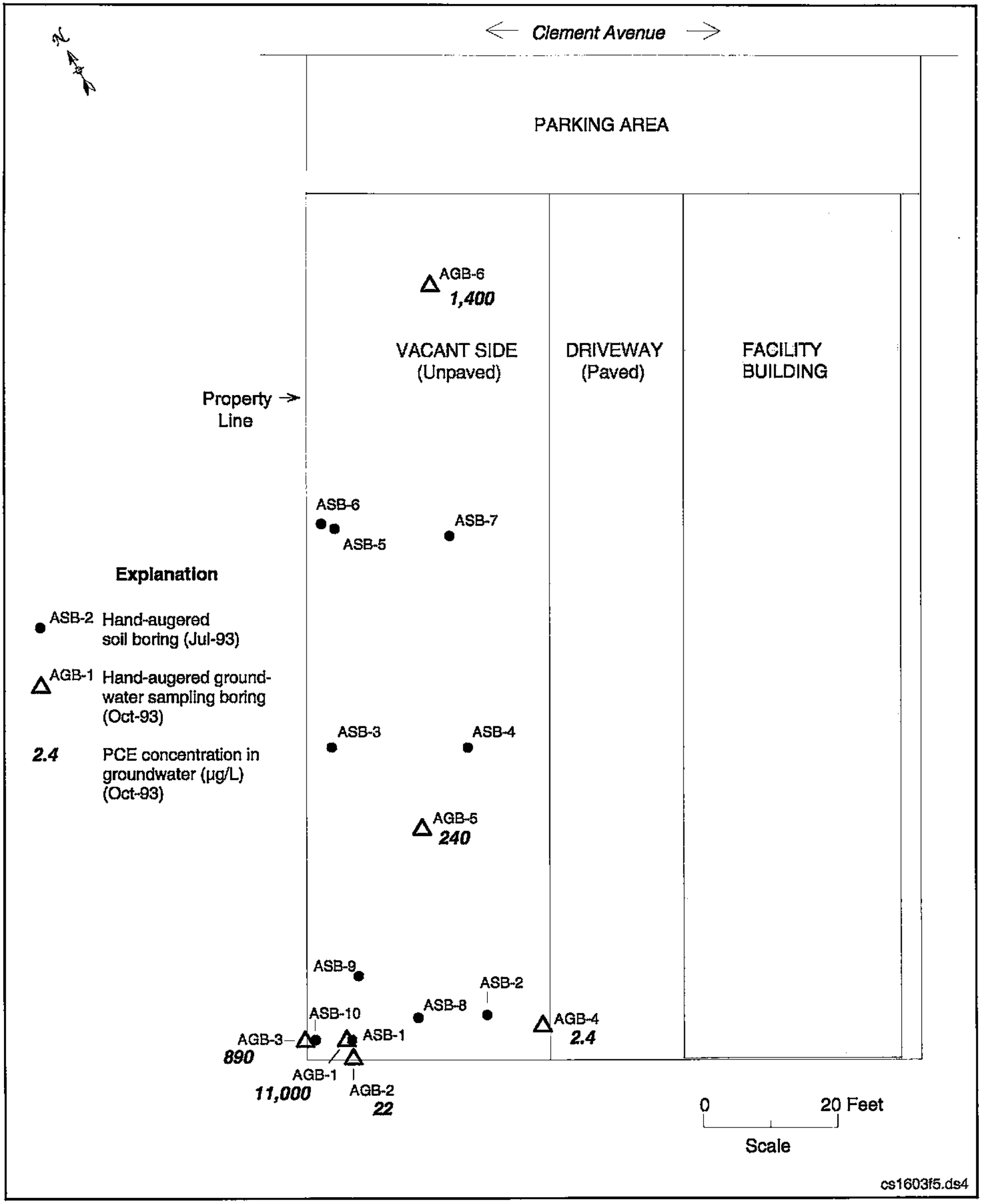
Figure 4. ASB-1 Excavation Area



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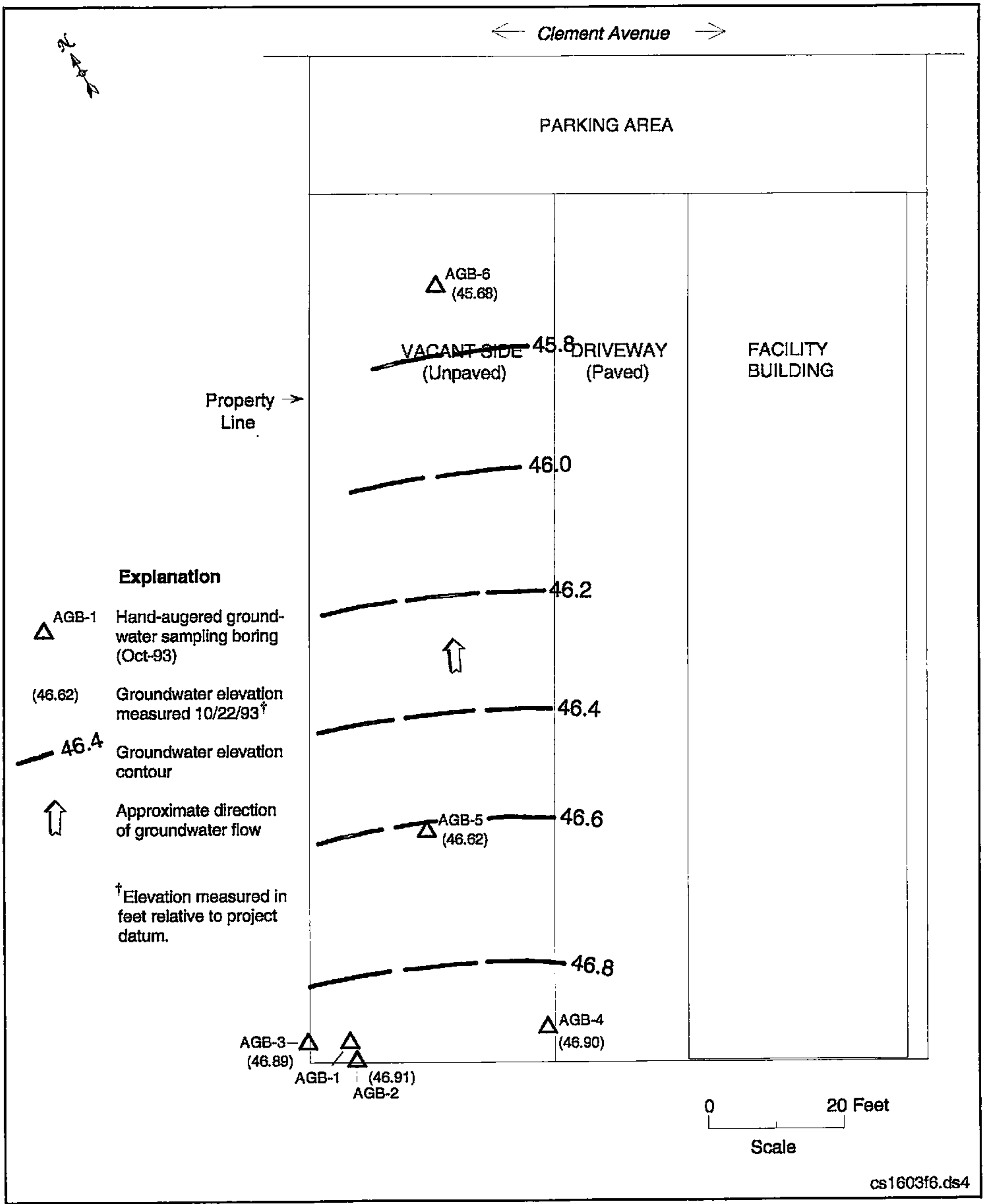
2016 Clement Avenue, Alameda, California
Figure 5. PCE Concentrations in Groundwater (October 1993)



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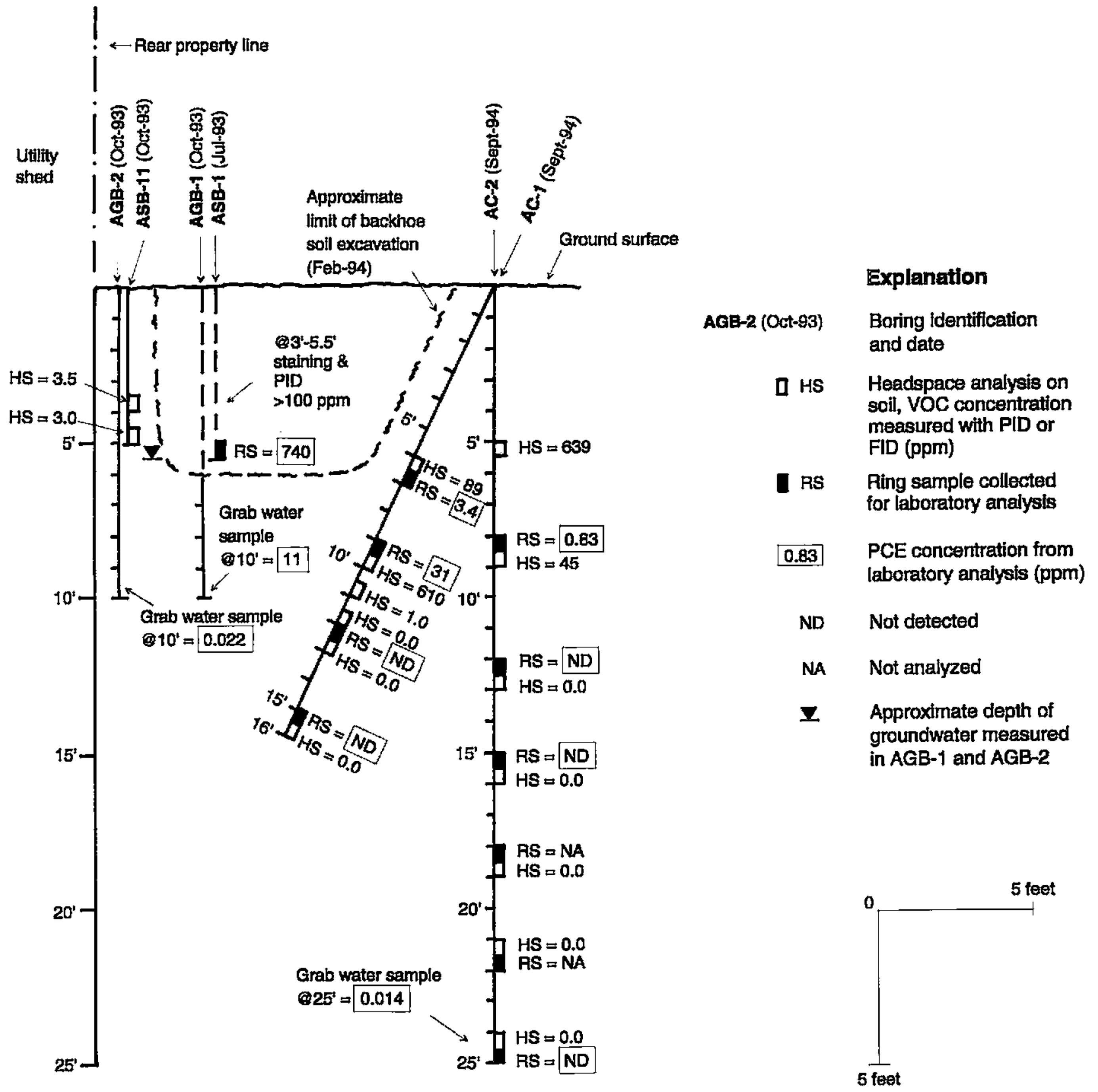
2016 Clement Avenue, Alameda, California

Figure 6. Groundwater Contours (October 1993)

Vapor intrusion Soil res. ESL 0.087 ppm
Gw res. ESL 120 ppb



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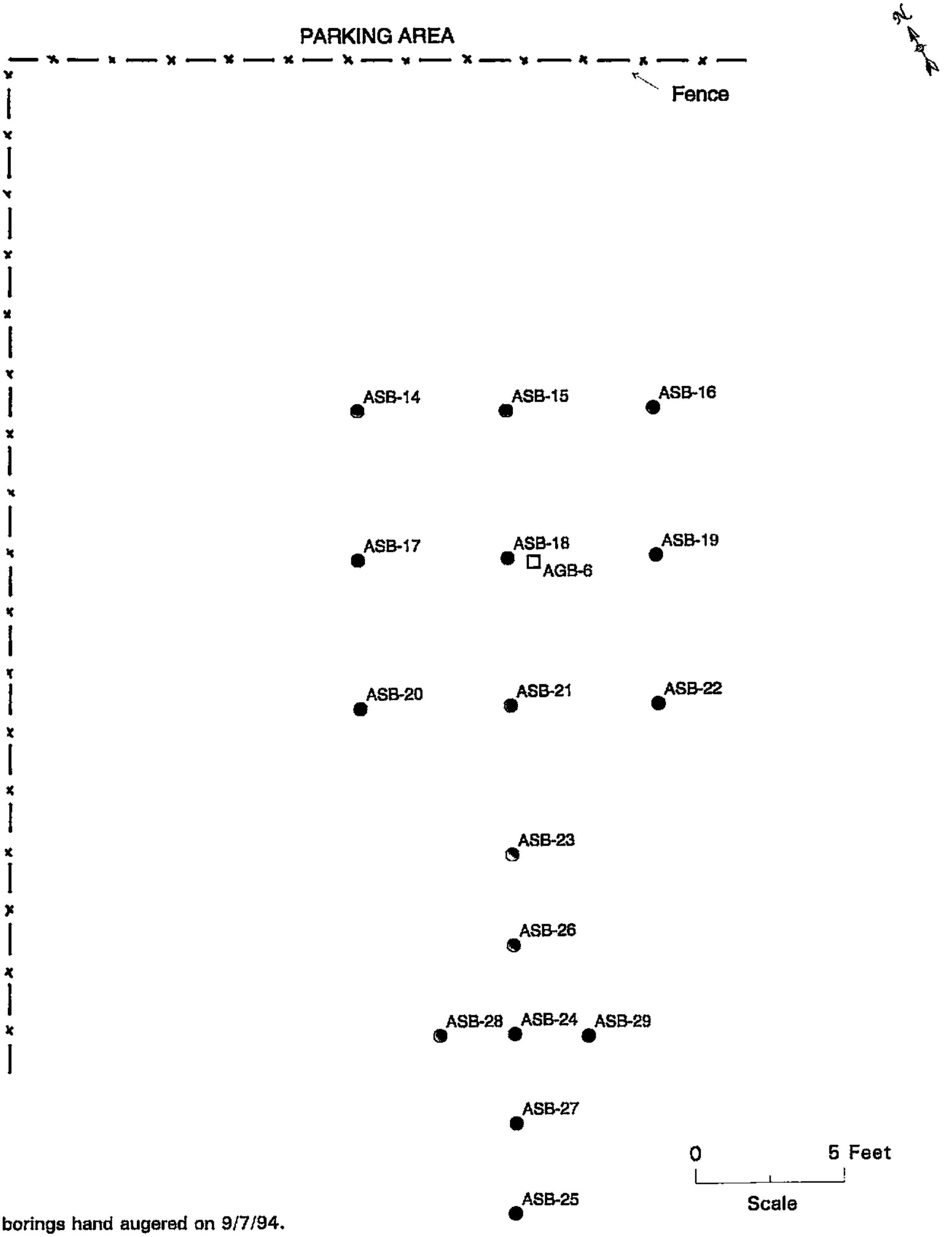
2016 Clement Avenue, Alameda, California

Figure 7. Cross Section at ASB-1 Location



ASB soil borings hand augered on 9/7/94. Results of PID measurements from ASB soil borings shown on Table 10. Groundwater boring AGB-6 hand augered on 10/22/93.

1603f8.ds4

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Figure 8. Soil Sampling Grid at AGB-6

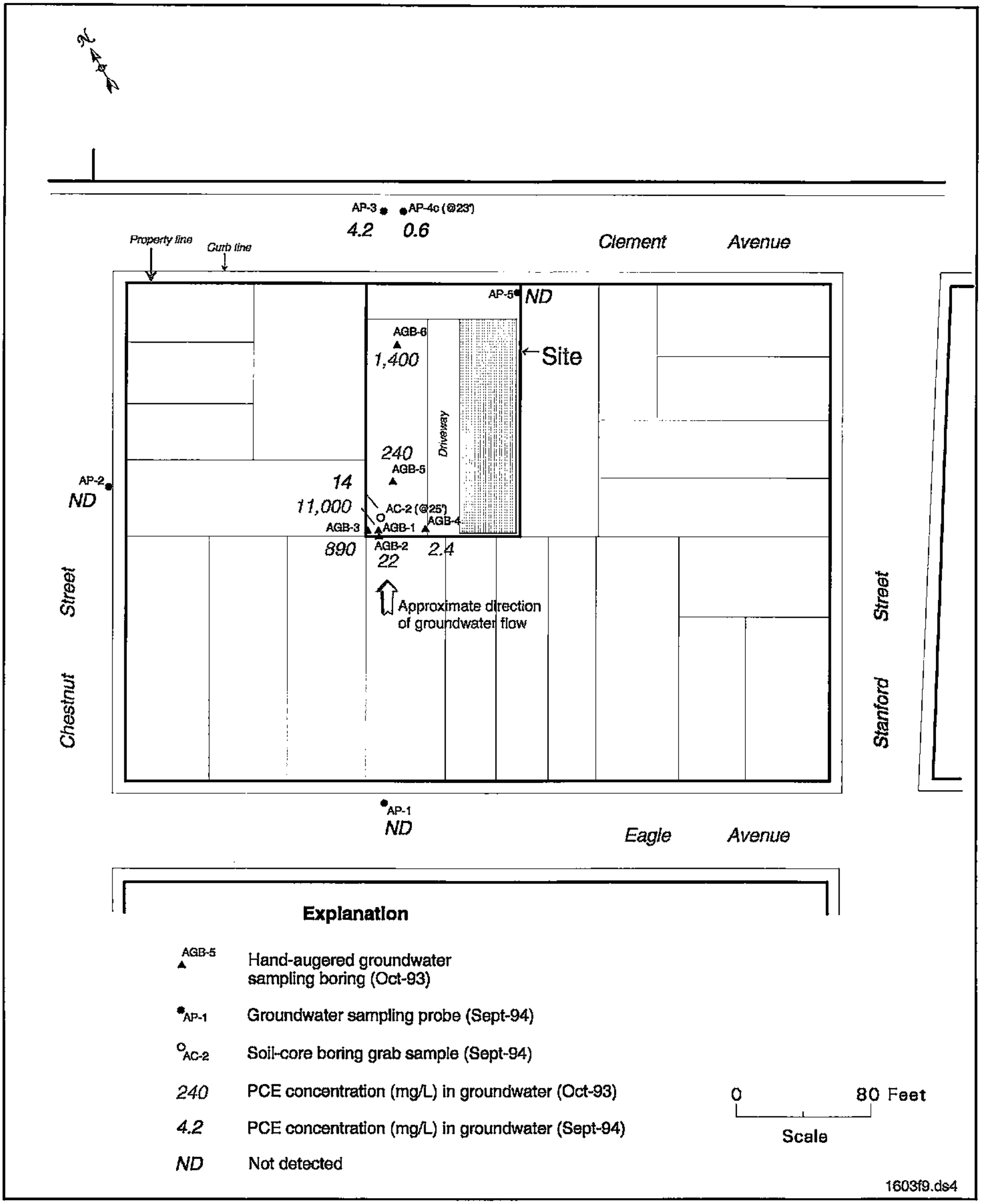

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Figure 9. PCE Concentrations in Groundwater (October 1993 and September 1994)

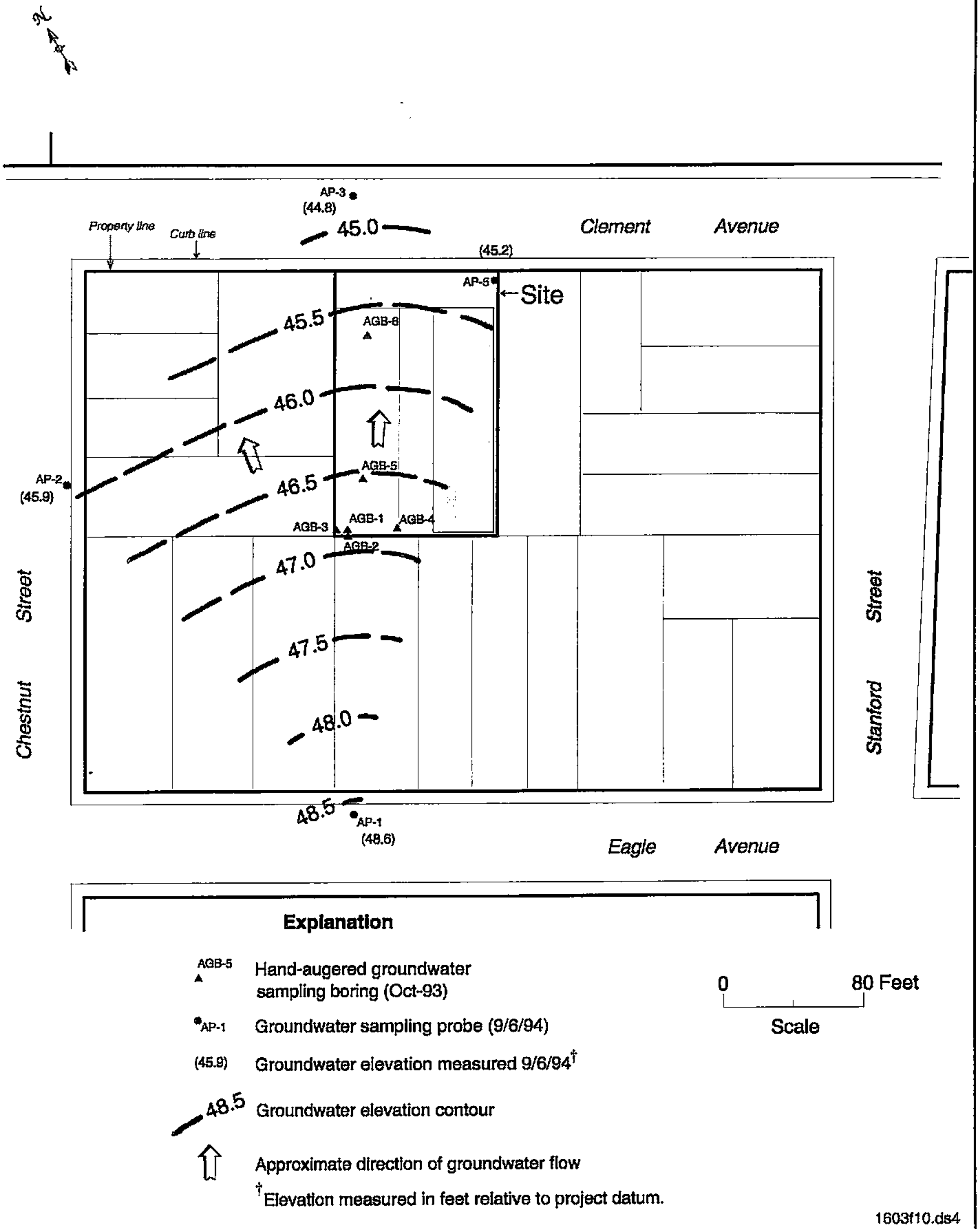

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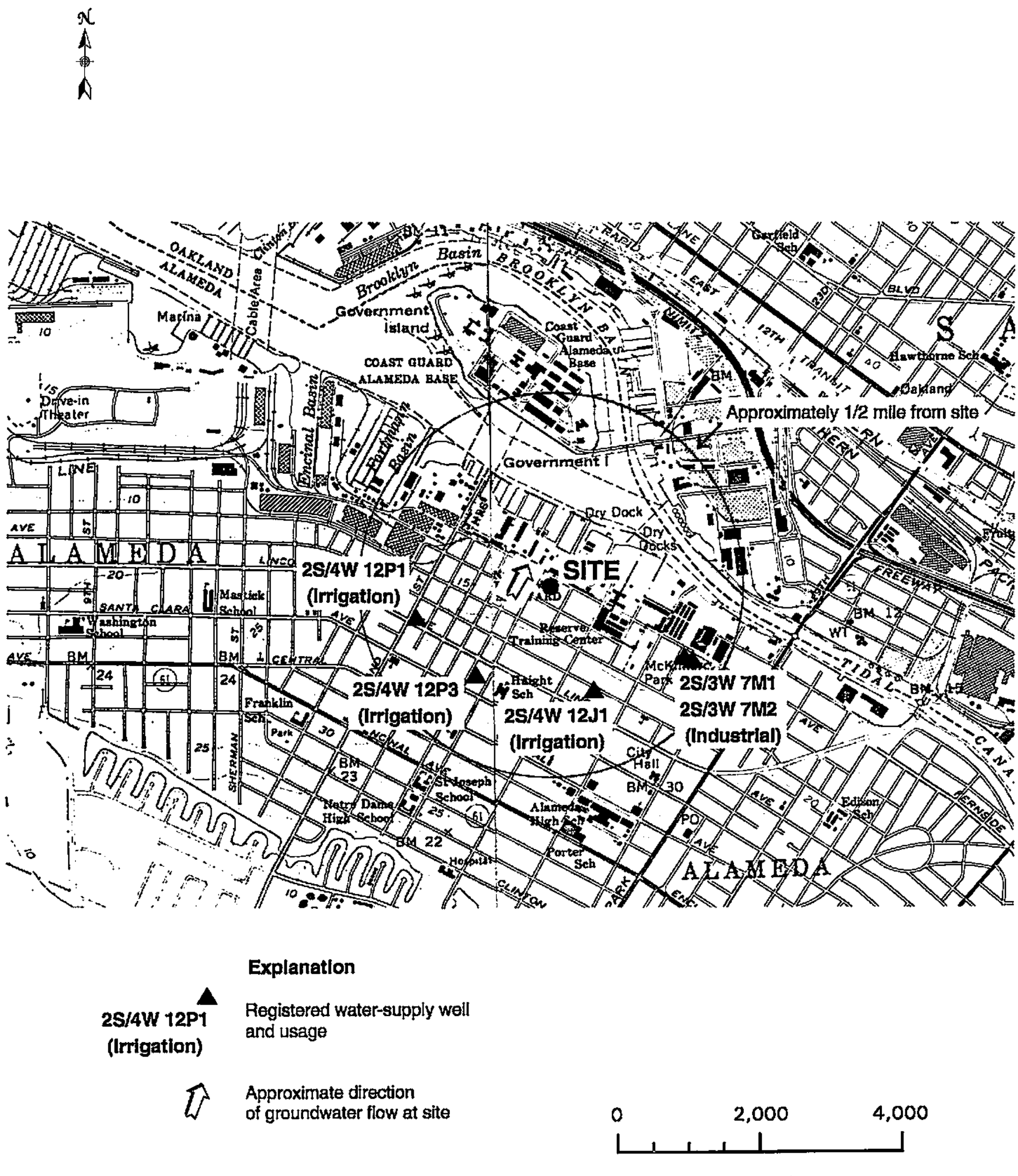
Figure 10. Groundwater Contours (September 1994)



Base map: U.S.G.S. 7.5 minute series (Topographic)
Oakland East and Oakland West Quadrangles, California,
1959, Photorevised 1980.

1603f11.ds4

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Cargill Salt Dispensing Systems Division
2016 Clement Avenue, Alameda, California

Figure 11. Water Supply Wells Within One-Half Mile

Appendix A

October 19, 1993, letter report to Cargill Salt,
Results of soil sampling and workplan for remedial activities, Alameda facility

GROUNDWORKS
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October 19, 1993
Project CS1602

Ms. Barbara Ransom
Cargill Salt
7220 Central Avenue
Newark, California 94560-4206

Re: Results of soil sampling and workplan for remedial activities, Alameda facility

Dear Ms. Ransom;

This letter presents results of soil sampling and a workplan for remedial activities for the Cargill Salt Dispensing Systems Division facility located at 2016 Clement Avenue in Alameda, California (Alameda facility). Results of a soil sampling and analysis investigation conducted in July 1993 at the Alameda facility indicate impact to soils in one area of the site by volatile organic compounds, metals, and petroleum hydrocarbons (oil and grease). At the request of Cargill Salt, Groundworks Environmental, Inc. (Groundworks) has prepared the enclosed workplan for remedial activities at the Alameda facility, including assessment of potential impact to groundwater and excavation and disposal of impacted soils.

The proposed workplan involves two phases. During the first phase, the extent of impact to soils by organic compounds will be further defined, potential impact to groundwater will be assessed, and metals-impacted surficial soils will be excavated for disposal. During the second phase, soils impacted by organic compounds will be excavated for disposal. The results of the first phase will be used in defining the area and depth for soil excavation.

The site background and results of the July 1993 soil sampling investigation are summarized below, and are followed by the proposed scope of work.

Site Background

The Alameda facility is located on a rectangular lot (approximately 150 feet by 92 feet), in an industrial and residential neighborhood. The facility building occupies approximately one-third the area of the site and is separated from the vacant side of the lot by an asphalt driveway, as shown on Figure 1. The facility lot is bordered by a sheet-metal shop and residential lot to the northwest, an apartment complex to the southwest, and a residential lot to the southeast.

A small foundry was operated in the back room of the facility building from approximately 1951 to 1978. The foundry produced salt-dispensing units for use by clients of Leslie Salt. Casting of the salt-dispensing units is now done off site, and the facility is currently used for milling and repair of salt-dispensing units.

According to site personnel, the foundry was used mainly for casting of aluminum and brass pieces and was not equipped to cast iron. Site personnel have also indicated that solvents were used to clean casting and milling equipment.

Constituents of concern that might be associated with waste products from facility operations include casting sands with elevated concentrations of metals, and solvents, machine oils, and grease used in the casting and milling operations. Cargill Salt is investigating the possibility that waste products from facility operations might have been discarded on or in the ground on the vacant side of the facility lot.

Results of Soil Sampling and Analysis

Soil samples were collected from shallow borings advanced with hand-augering equipment on July 13, 1993. The soil boring locations are shown on Figure 1, and sample collection data and field observations are shown on Table 1. A total of 10 shallow borings were hand augered and 21 soil samples were collected. Each boring was monitored during hand-augering for volatile organic vapors using a photoionization detector (PID).

The locations of the soil borings were chosen to provide a grid of six samples from the rear portion of the vacant side of the lot. This sampling grid consisted of soil borings ASB-1, -2, -3, -4, -6, and -7. Boring ASB-5 was aborted after an obstruction (possibly a storm drain) was encountered. Borings ASB-1 and ASB-2 were targeted for areas where surficial soils appeared disturbed or discolored. An additional three borings (ASB-8, -9, and -10) were located to explore the extent of volatile organic vapors detected with the PID at boring ASB-1.

Based on field observations and the results of field monitoring for volatile organic vapors using the PID (Table 1), five soil samples were selected for analysis of total metals and six samples were selected for analysis of volatile and semivolatile organic compounds and oil and grease. Metals selected for analysis included those commonly alloyed with brass and aluminum (i.e., copper, lead, nickel and zinc) and those commonly associated with petroleum hydrocarbon oils as residual metals in the refining process or as additives (i.e., barium, cadmium, chromium, lead, nickel, vanadium and zinc).

The results of the laboratory analyses are summarized on Tables 2 and 3. Two volatile organic compounds, 1,1-dichloroethene and tetrachloroethene, were detected in one soil boring (ASB-1) at concentrations of 25,000 and 740,000 micrograms per Kilogram (μg/Kg), respectively. Tetrachloroethene was detected at a lower concentration (25 μg/Kg) in boring ASB-10, located 5.5 feet from boring ASB-1. No volatile organic compounds were detected in the samples from the other borings, and no semivolatile organic compounds were detected in any of the samples analyzed. Petroleum hydrocarbons (oil and grease) were detected at 1,100 milligrams per kilogram (mg/Kg) in boring ASB-1 but were not detected in any of the other samples analyzed.

Shallow soil samples from three borings (ASB-1, ASB-2, and ASB-9) exhibited higher total metals concentrations than the samples from two other borings (ASB-6 and ASB-8). As described in the field observations for these five shallow soil samples (see Table 1), the shallow soil samples from ASB-1, ASB-2, and ASB-9 contained light-colored or reddish-colored sands that might be casting sands. Discoloration was not observed for the shallow soil samples at ASB-6 and ASB-8. Thus, the higher metals concentrations detected for ASB-1, ASB-2, and ASB-9 appear to be associated with these light-colored and reddish-colored sands.

Total cadmium was detected in the shallow soil sample from ASB-1 at a concentration that exceeds the total threshold limit concentration (TTLC). Total cadmium in boring ASB-2 and total lead in borings ASB-1, ASB-2, and ASB-9 were detected at concentrations that exceed 10 times the soluble threshold limit concentration (STLC), indicating that if an extraction for soluble metals was performed with the Waste Extraction Test (WET), the soluble metals might exceed the STLC (the WET includes a 10-fold sample dilution).

After receiving these results for the total metals analyses, the shallow soil samples from borings ASB-2 and ASB-9 were analyzed for soluble metals using the WET method; the ASB-2 sample was analyzed for cadmium and lead, and the ASB-9 sample was analyzed for lead. The ASB-1 sample was not analyzed for soluble metals because cadmium had been detected in this sample at a concentration over the TTLC. The results of the WET method analyses are shown on Table 3. Lead was detected at concentrations over the STLC in both the ASB-2 and ASB-9 samples. The concentration of cadmium from the ASB-2 sample was below the STLC.

During sample collection, groundwater was noted in several of the hand-augered borings at a depth of approximately 5 feet (see Table 1). Because of the proximity of shallow groundwater to impacted soils at the site, there is potential for impact to shallow groundwater by the constituents detected in the soil samples.

Proposed Scope of Work

The purpose of the proposed scope of work is to excavate and dispose of soil impacted by volatile organic compounds, metals, and petroleum hydrocarbons, and to assess potential impact to groundwater by these compounds.

During the first phase of the proposed work, the extent of impact to soils by organic compounds will be further defined, potential impact to groundwater will be assessed, and metals-impacted surficial soils will be excavated for disposal. During the second phase, soils impacted by organic compounds will be excavated for disposal. The results of the first phase will be used in defining the area and depth for soil excavation.

Phase I Activities

Excavate Soils Impacted by Metals

Surficial soil at the locations of borings ASB-1, ASB-2, and ASB-9 will be excavated for disposal. At these locations, chemical impact by metals appears to be associated with light-colored and reddish-colored sands that might represent discarded casting sands. These light-colored and reddish-colored sands will be excavated using a hand shovel or a backhoe. It is estimated that removal of 1 to 2 cubic feet of soil at each of these locations will be sufficient to remove these sands. One soil sample will be collected at the base of each of these three shallow excavations and submitted for total metals analysis for confirmation that the metals-impacted soils have been removed. The excavated soil will be placed in drums for temporary on-site storage pending chemical profiling and disposal by a licensed contractor. The excavations will be filled with a sand-cement slurry.

Define Lateral Extent of Organic Impact to Soils

The extent of impact to soils by organic compounds will be further defined by hand-augering three to four shallow borings (less than 5 feet deep) around boring ASB-1 and testing soils from the borings for volatile organic vapors with a PID. One of the borings will be made between ASB-1 and the rear property line to determine if the area of soil impact extends to the property line. Upon completion, the borings will be filled with a sand-cement slurry. Soil cuttings will be placed on plastic sheeting, covered with plastic, and stored temporarily on site pending analytical testing and disposal.

Assess Potential Impact to Groundwater

Potential impact to groundwater will be assessed using a two-step approach. For Step 1, potential impact to groundwater will be assessed by hand augering a boring (AGB-1) at the location of soil boring ASB-1 and collecting a groundwater grab sample for laboratory analysis. If impact to groundwater by volatile organic compounds is detected at AGB-1, Step 2 will be performed to assess (1) the extent of impact across the site and (2) the groundwater flow direction at the site. An additional five locations (AGB-2 through AGB-6) are proposed if Step 2 is needed (see Figure 2).

Groundwater grab samples for both Step 1 and Step 2 will be collected from hand-augered borings. Each soil boring will be advanced to a depth of 8 to 10 feet using hand-augering equipment. A 1-¼-inch-diameter well point constructed of polyvinyl chloride (PVC) or stainless steel will be placed in the boring and a groundwater sample will be collected from the well point using a small-diameter PVC bailer. Each boring will be backfilled with cement slurry. Soils augered from the borings will either be placed in drums or placed on plastic sheeting and covered with plastic, and stored temporarily on site pending analytical testing and disposal.

For Step 1, the groundwater sample will be submitted for laboratory analysis of volatile organic compounds and oil and grease. For assessing general water quality, the sample will also be analyzed for chloride and total dissolved solids (TDS). If volatile organic compounds are detected in Step 1, the Step 2 groundwater samples will be analyzed for volatile organic compounds and TDS.

If Step 2 is performed, the direction of shallow groundwater flow will be assessed using water-level information from the hand-augered borings. After sampling each boring, the well point will be left in the boring to allow the water level in the boring to stabilize. (Based on water level measurements from the July 1993 sampling event, groundwater levels appear to stabilize quickly in soil borings at the site). At the end of the field day, the depth to water will be measured in each boring. The depth to water will be measured from a reference point (survey stake) placed next to each boring. The elevations of the reference points will be surveyed relative to project datum, the depth-to-water information will be converted to groundwater elevations, and the flow direction will be determined from this information.

The analytical data from Steps 1 and 2 will be evaluated to assess the need for additional groundwater characterization activities.

Phase II Activities

The general plan for Phase II is to excavate and dispose of soil impacted by volatile organic compounds and petroleum hydrocarbons. After defining the lateral extent of organic impact to soils and assessing the potential impact to groundwater in Phase I, the plans for Phase II activities will be re-evaluated and finalized. The area and depth of soils to be excavated and the method of soil containment (containerizing versus stockpiling) will be determined.

Excavate Impacted Soil at ASB-1

Soil impacted by volatile organic compounds and oil and grease at boring ASB-1 will be excavated using a backhoe. As indicated by field observations and the results of chemical analysis to date, the extent of impact to soil appears to be relatively limited near boring ASB-1. It is estimated that the excavation will be approximately 5 feet wide and 6 feet deep and that approximately 5.5 cubic yards of soil will be excavated from the location of boring ASB-1. This estimate will be re-evaluated based on the results of the Phase I activities.

It is possible that the area of chemical impact to soil at the ASB-1 location extends more than 3 feet towards the rear property line and beneath the utility shed immediately adjacent to this property line. Because the area to be excavated is within 3 feet of the rear property line and the sandy soil material may tend to cave during excavation, precautions will be taken to avoid caving of the excavation sidewall nearest the property line. This may involve placing temporary shoring next to this sidewall during excavation.

The intent of the planned excavation is to remove soils with the highest degree of chemical impact. It may not be possible to remove all impacted soils at this location during the proposed work because of the potential risk of damage to the utility shed at the rear of the property. If the area of chemical impact to soil at the ASB-1 location extends beyond the rear property line, these soils will not be removed during the proposed phase of field work. A soil sample will be collected from each sidewall of the excavation and from the base of the excavation for analysis of VOCs, metals, and oil and grease. The need for further soil excavation will be assessed after analyzing these soil samples.

The excavated soil will be placed in drums, bins, or stockpiles for temporary on-site storage pending chemical profiling and disposal by a licensed contractor. If stockpiled, the soils will be placed on plastic sheeting and covered with plastic. After soil samples have been collected from the sidewalls and base of the excavation, the excavation will be filled with pumpable sand-cement slurry.

Sampling and Analysis

The Step 1 groundwater sample will be submitted for laboratory analysis of the following parameters:

- Volatile organic compounds by EPA Method 8010
- Hydrocarbons (Oil and grease) by EPA Method 5520(F)
- Chloride and TDS (for general water quality assessment)

If Step 2 groundwater sampling is performed, the groundwater samples will be submitted for laboratory analysis of the following parameters:

- Volatile organic compounds by EPA Method 8010
- TDS

The soil samples for chemical analysis will be collected in 2-inch-diameter, 6-inch-long stainless-steel liners inserted in a hand-driven sampling tool. The tool will be driven into soil at the bottom or sides of the excavation. The soil samples will be preserved in the stainless steel liners by covering the ends of the liners with Teflon® film and capping them with plastic end caps. The groundwater sample(s) will be poured from the sample collection bailer into appropriate EPA-approved sample containers. The soil and groundwater samples will be stored in a cooler packed with blue ice for transportation to a state-certified laboratory. Chain of custody documentation will accompany the samples to the laboratory.

The soil samples collected from the shallow excavations at borings ASB-1, ASB-2 and ASB-9 will be submitted for laboratory analysis of the following metals: cadmium, copper, lead, nickel, zinc.

The soils samples collected from the sidewalls and base of the backhoe excavation at boring ASB-1 will be submitted for laboratory analysis of the following parameters:

- Volatile organic compounds by EPA Method 8010
- Metals (cadmium, copper, lead, nickel, zinc)
- Hydrocarbons (Oil and grease) by EPA Method 5520(F)

Project Team

Groundworks will perform the Phase I field activities. For Phase II activities, soil excavation and disposal services will be provided by a licensed contractor. Groundworks will collect confirmation soil samples from the excavated areas. The chemical analyses will be performed by Columbia Analytical Services, a state-certified laboratory.

Permitting and Utility Clearance

Before beginning the proposed field activities, this workplan will be submitted to the Alameda County Department of Environmental Health (ACDEH) and the field work schedule will be coordinated with the ACDEH. A drilling permit application for the groundwater sampling boring and the PID borings will be filed with the Zone 7 Water Agency of the Alameda County Flood Control and Water Conservation District. The proposed areas of excavation will be checked for underground utilities by a utility locating service.

Health and Safety Plan

A site-specific health and safety plan has been prepared for the proposed field . It is anticipated that "Level C" personal protective gear will be appropriate for the proposed field activities. Breathing-zone air will be monitored for volatile organics using a PID or a flame-ionization detector (FID). If conditions are encountered that may warrant an upgrade to a higher level of protection, work activities will cease until appropriate arrangements can be made. Cleaning fluids and personnel protective gear will be containerized for proper disposal.

Report Preparation

Groundworks will prepare of report of findings that will include a description of field procedures and observations, an assessment of potential impact to groundwater, and an assessment of the need for further soil or groundwater characterization or remediation.

Please call if you have any questions concerning this letter.

Sincerely yours,

Mark C Wheeler

REGISTERED GEOLOGIST
MARK C. WHEELER
4563
STATE OF CALIFORNIA

Mark C. Wheeler
Project Manager
RG 4563

MCW:jlc

Attachments: Table 1. Soil Sample Collection Data
Table 2. Summary of Analytical Results for Soil Samples - Volatile Organics, Semivolatile Organics, and Oil and Grease
Table 3. Summary of Analytical Results for Soil Samples - Metals
Figure 1. Soil Boring Locations
Figure 2. Proposed Groundwater Sampling Locations
Attachment A. Site Health and Safety Plan

Table 1
Soil Sample Collection Data
Cargill Salt - Alameda Facility

Boring No.	Sample Depth (feet)	Sample Tube Collection Method (1)	Laboratory Analyses Completed (2)	PID readings from borehole (3)	Field Observations
ASB-1	0.25'	S	TM	Background (4)	Targeted light-colored sands (casting sands?) for sampling.
ASB-1	1.0 - 1.5'	HD		2 - 3 ppm	No odor, no discoloration.
ASB-1	5'	BA		>100 ppm	Chemical odor, greenish staining (noticed odor and staining beginning at depth of 3 ft).
ASB-1	5 - 5.5'	HD*	V, SV, OG	>100 ppm	Chemical odor, greenish staining.
ASB-2	0.25'	S	TM, WET-M (Cd, Pb)	Background	Targeted reddish-colored sands (casting sands?) for sampling.
ASB-2	0.5 - 1.0'	HD		Background to 2 ppm	No odor or discoloration.
ASB-2	4.5 - 5.0'	HD	V, SV, OG	Background	No odor or discoloration; Groundwater in borehole at 4.7 ft.
ASB-3	0.75 - 1.25'	HD		Background	No odor or discoloration, possible glass fragments.
ASB-3	4.25 - 4.75'	BA		Background	No odor or discoloration; Augered boring to 5.5 ft, groundwater in borehole at 5.0 ft.
ASB-4	0.75 - 1.25'	HD		Background	No odor or discoloration.
ASB-4	4.25 - 4.75'	BA		Background	No odor or discoloration; Augered boring to 6.0 ft, groundwater in borehole at 4.7 ft.
ASB-5	0.75 - 1.25'	HD		Background	No odor or discoloration, hit storm drain (?) at 1.25', aborted boring.
ASB-6	0.75 - 1.25'	HD	TM	Background	No odor or discoloration.
ASB-6	3.5 - 4.0'	HD*	V, SV, OG	Background	No odor or discoloration; Augered boring to 5.4 ft, groundwater in borehole at 4.9 ft.
ASB-7	0.75 - 1.25'	HD		Background	No odor or discoloration.
ASB-7	3.5 - 4.0'	BA		Background	No odor or discoloration.
ASB-8	0.75 - 1.25'	HD	TM	Background	No odor or discoloration.
ASB-8	4.0 - 4.5'	BA	V, SV, OG	Background	No odor or discoloration.
ASB-9	0.3 - 0.8'	HD	TM, WET-M (Pb)	Background	No odor, reddish discoloration and glass fragments at top of sampled interval (casting sands?).
ASB-9	4.3 - 4.8'	BA	V, SV, OG	Background to 1.6 ppm	No odor or discoloration.
ASB-10	4.5 - 5.0'	BA	V, SV, OG	Background to 0.7 ppm	No odor or discoloration; Augered boring to 5.2 ft, groundwater in borehole at 5.15 ft.

(1) S = Scrape; Soil sample collected by scraping soils into sample tube.
HD = Hammer driven; Soil sample collected with hammer-driven sampler fitted with sample tube.
BA = Bucket auger; Soil sample collected by emptying soils from hand-advanced bucket auger into a plastic bag and filling sample tube from plastic bag.
(2) TM = Total metals (Barium, Cadmium, Chromium, Copper, Lead, Nickel, Vanadium, Zinc)
V = Volatile organic compounds; SV = Semivolatile organic compounds; OG = Oil and grease
WET-M = Soluble metals using WET extraction
(3) PID = Photoionization detector (Thermo Environmental Instruments OVM Model 580 A; Minimum detectable concentration 0.1 parts per million [ppm]).
(4) Background = 0.0 to 0.4 ppm.
* Sample tube in hammer-driven sampler was partially full upon retrieval from borehole, additional soil was added to tube from bucket auger.
Note: All soil samples collected 7/13/93.

Table 2
Summary of Analytical Results for Soil Samples - Volatile Organics, Semivolatile Organics, and Oil and Grease
Cargill Salt - Alameda Facility

Boring No.	ASB-1	ASB-2	ASB-6	ASB-8	ASB-9	ASB-10	Regulatory Criteria				
Sample Depth (feet)	5.0-5.5	4.5-5.0	3.5-4.0	4.0-4.5	4.3-4.8	4.5-5.0	STLC (1)	TTLC (2)	MCCTC (3)	MCL (4)	AL (5)
Volatile Organics *EPA Method 8240 (μg/Kg) (6)*											
1,1-Dichloroethene	**25,000**	nd (7)	nd	nd	nd	nd	ne (8)	ne	700	6	ne
Tetrachloroethene (PCE)	**740,000**	nd	nd	nd	nd	**25**	ne	ne	700	5	ne
All other Method 8240 analytes	nd †	nd	nd	nd	nd	nd	-	-	-	-	-
Semivolatile Organics *EPA Method 8270 (mg/Kg) (9)*											
All Method 8270 analytes	nd	nd	nd	nd	nd	nd	-	-	-	-	-
Hydrocarbons (Oil and Grease) *EPA Method 5520F (mg/Kg)*	**1,100**	nd	nd	nd	nd	nd	‡	‡	‡	‡	‡

(1) STLC = Soluble threshold limit concentration (in micrograms per liter [μg/L])
(2) TTLC = Total threshold limit concentration (in micrograms per kilogram [μg/Kg])
(3) MCCTC = Maximum concentration (in μg/L) of contaminants for the toxicity characteristic for a liquid extract (when using the Toxicity Characteristic Leaching Procedure [TCLP])
(4) MCL = California Primary Drinking Water Standard - Maximum Contaminant Level (in parts per billion [ppb])
(5) AL = Action Level for drinking water, set by California Department of Toxic Substances Control (in ppb)
(6) μg/Kg = micrograms per kilogram (equivalent to ppb)
(7) nd = none detected at or above the method reporting limit
(8) ne = none established or none applicable
(9) mg/Kg = milligrams per kilogram (equivalent to parts per million [ppm])

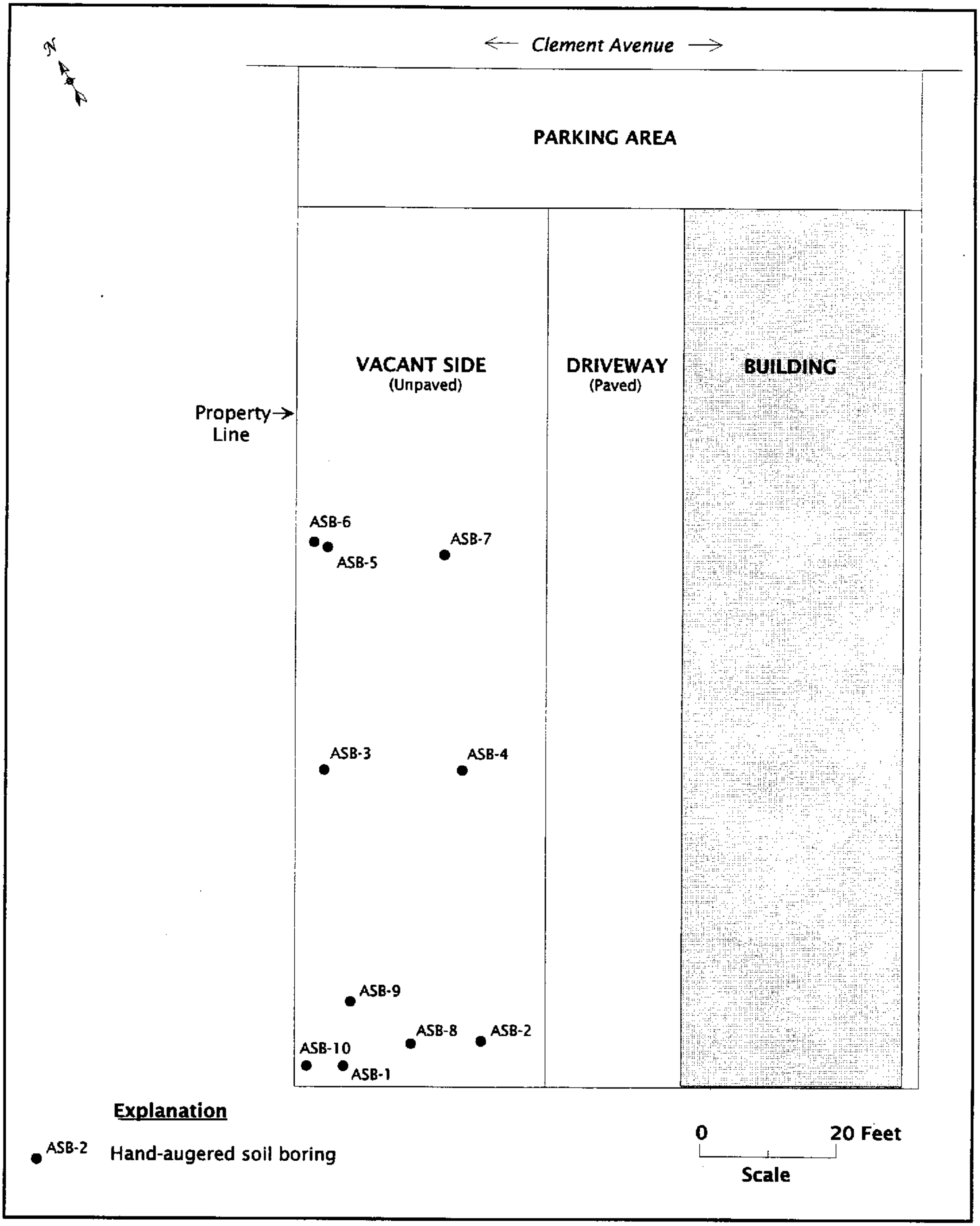
† For sample ASB-1, method reporting limit (MRL) raised to 25,000 μg/Kg or higher for all analytes because high analyte concentrations required sample dilution.
‡ Regulatory criteria for petroleum hydrocarbons are established on a case by case basis.

Table 3
Summary of Analytical Results for Soil Samples - Metals
Cargill Salt - Alameda Facility

Boring No.	ASB-1	ASB-2	ASB-6	ASB-8	ASB-9	Regulatory Criteria	
Sample Depth (feet)	0.25	0.25	0.75-1.25	0.75-1.25	0.3-0.8	STLC (1)	TTLC (2)
Metals, Total *(mg/Kg) (3)*							
Barium	81	200	100	87	210	100	10,000
Cadmium	**280**	***18***	nd (4)	nd	4	1.0	100
Chromium	30	37	35	37	25	5	2,500
Copper	210	53	10	9	40	25	2,500
Lead	***210***	***390***	5	3	***280***	5.0	1,000
Nickel	130	30	19	21	44	20	2,000
Vanadium	11	22	18	20	21	24	2,400
Zinc	1,300	460	25	22	280	250	5,000
Metals, WET Extract *(mg/L) (5)*							
Cadmium	na (6)	0.7	na	na	na	1.0	100
Lead	na	**8.5**	na	na	**6.0**	5.0	1,000

(1) STLC = soluble threshold limit concentration (in milligrams per liter)
(2) TTLC = total threshold limit concentration (in milligrams per kilogram)
(3) mg/kg = milligrams per kilogram
(4) nd = none detected at or above the method reporting limit
(5) mg/L = milligrams per liter
(6) na = not analyzed

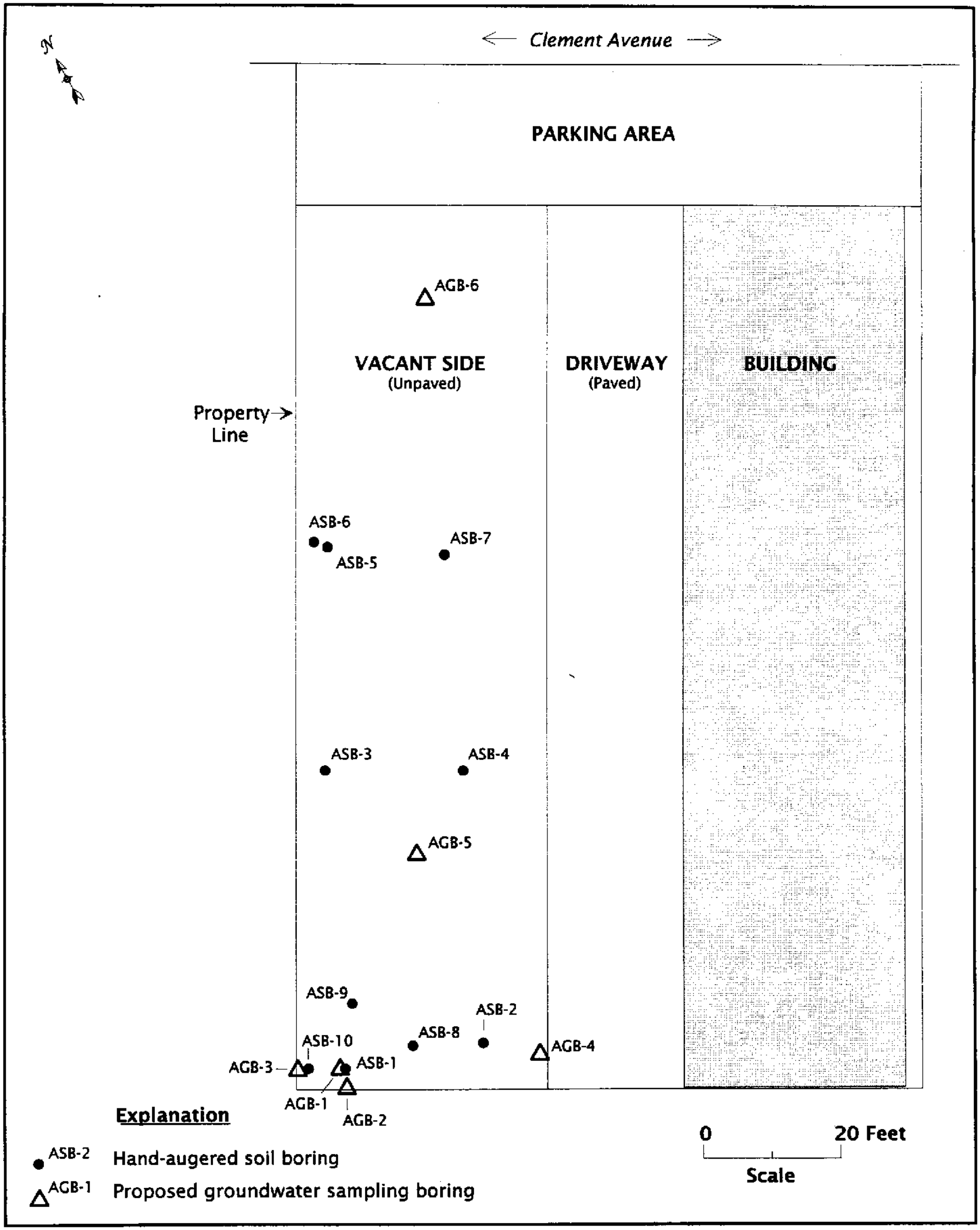
Total metals concentration in bold indicates concentration over TTLC.
Total metals concentration in bold italics indicates concentration 10 times greater than STLC.
WET extract metals concentration in bold indicates concentration over STLC.



GROUNDWORKS
ENVIRONMENTAL, INC.

Cargill Salt Dispensing Systems Division
2016 Clement Avenue
Alameda, California

Figure 1. Soil Boring Locations



GROUNDWORKS
ENVIRONMENTAL, INC.

Cargill Salt Dispensing Systems Division
2016 Clement Avenue
Alameda, California
Figure 2. Proposed Groundwater Sampling Locations

SITE SAFETY EVALUATION (Continued)

Lead: *Exposure routes*: inhalation, ingestion, skin or eye contact. *Exposure symptoms*: weakness, lassitude, facial pallor, abdominal pain, irritated eyes. First aid same as for tetrachloroethene.
OSHA TWA = 0.050 mg/m^3. IDLH = 700 mg/m^3.
Respiratory protection: At all times in work zone: minimum half-face air-purifying respirator with high-efficiency dust/mist filters.
Goggles advised for reasonable probability of exposure. Non-impervious clothing recommended.

Cadmium: Considered by NIOSH as an occupational carcinogen. Reduce exposure to lowest feasible concentration. *Exposure routes*: inhalation, ingestion. *Exposure symptoms*: pulmonary edema, dyspnea, cough, tight chest, substernal pain, headache, chills, muscle aches, nausea, vomiting, diarrhea.
OSHA TWA = 0.2 mg/m^3; TLV = 0.05 mg/m^3; IDLH = 50 mg/m^3
Respiratory protection: At all times in work zone: minimum half-face air-purifying respirator with high-efficiency dust/mist filters (adequate to 10x TLV).
Goggles for any possible exposure. First aid same as for tetrachloroethene.

Physical Hazards

Underground:	None known. Site to be checked by utility locator.
Overhead:	None known.
Excavations:	Hand augering during Phase I, Backhoe excavation during Phase II.

Potential Explosion and Fire Hazards: None known.

Level of Personal Protective Equipment: Level C. ***Must stop work if organic vapors detected at any concentration in the breathing zone***. If detected, leave work zone. May return in Level C if no organic vapors detected in breathing zone. Must upgrade to supplied-air, full-face respirators if organic vapors continue to be detected in breathing zone.

Personal Protective Equipment (required):
Half-mask or full-face air-purifying respirator with organic vapor cartridges and high-efficiency dust/mist filters. Chemical-resistant, poly-coated Tyvek suit. Chemical resistant gloves (Ansell Edmont Sol-Vex Nitrile NBR or equivalent) for all field work involving soil disruption and groundwater sampling, for handling samples and cleaning equipment. Chemical resistant boots or disposable chemical booties. Chemical-resistant goggles. Hard hat if working near machinery on site. Have eye wash available.

Ambient Air Monitoring Requirements:
FID or PID - measure breathing zone for organic vapors minimum of every 15 minutes. During Phase II soil excavation work, check breathing zone with detection tube sampling pump fitted with tetrachloroethene detection tube (eg., Sensidyne model).

SITE SAFETY EVALUATION (Continued)

Field Personnel Training Requirements:

Current OSHA 29 CFR 1910.120 training. Medical surveillance program required.

Decontamination/Disposal:
Setup decon station with Alconox wash and rinse for respirators, gloves, boots. Sampling tools to be cleaned in Alconox, rinsed in distilled water, fluids to be containerized. After use, containerize Tyvek suits and gloves and other disposable protective equipment.

Site Control Measures:
Establish exclusion zone. No non-OSHA trained (29 CFR 1910.120) personnel allowed to enter exclusion zone, or handle samples or cleaning fluids.

General Safety Guidelines for Field Operations

Personal Protective Equipment

- Field personnel must use safety equipment specified in Site Safety Evaluation.

Work Practices

- Groundworks Environmental, Inc. employees conducting or supervising field operations at sites potentially containing chemical or physical health hazards must participate in the company's medical surveillance program and hazardous waste operations training program.
- Employees shall not enter any excavation greater than 4 feet deep or confined space without written approval from the company health and safety officer.
- Employees must be trained in the proper use of field and safety equipment specified for the work site.
- Observe vehicular laws. Wear seat belts. Be familiar with and observe any work-site vehicle restrictions and speed limits.
- Field and safety equipment must be maintained in good operating condition and inspected as appropriate.
- Conduct field operations in upwind position of areas of known or suspected chemical contamination whenever possible.
- First aid supplies and fire extinguishers must be kept in all field vehicles and available at the work site

Site Health and Safety Plan prepared by Mark C. Wheeler.
Attachments: Remedial activities workplan.

Appendix B

Certified Analytical Reports and Chain-of-Custody Documentation – Initial Soil Sampling Program (July 1993)

Columbia
Analytical
Services inc.

July 27, 1993 Service Request No: SJ93-0893

Mark Wheeler
Groundworks Environmental, Inc.
1022 North Second Street
San Jose, CA 95112

Re: **Cargill Salt-Alameda/CS1601**

Dear Mr. Wheeler:

Attached are the results of the soil samples submitted to our lab on July 15, 1993. For your reference, these analyses have been assigned our service request number SJ93-0893.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

Keoni A Murphy

Keoni A. Murphy
COLUMBIA ANALYTICAL SERVICES, INC.

KAM/kmh

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NR	Not Requested
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
VPH	Volatile Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	07/15/93
Project:	Cargill Salt-Alameda/CS1601	**Service Request No.:**	SJ93-0893
Sample Matrix:	Soil		

Hydrocarbons, IR
EPA Method 5520F[1]
mg/kg (ppm)

Sample Name	Date Sampled	MRL	Result
ASB-1 (5.0-5.5)	07/13/93	15	1,100.
ASB-2 (4.5-5.0)	07/13/93	15	ND
ASB-8 (4.0-4.5)	07/13/93	15	ND
ASB-9 (4.3-4.8)	07/13/93	15	ND
ASB-10 (4.5-5.0)	07/13/93	15	ND
ASB-6 (3.5-4.0)	07/13/93	15	ND
Method Blank	07/13/93	15	ND

[1] Unless otherwise noted, all analyses were performed within EPA recommended maximum holding times specified in *Test Methods for Evaluating Solid Waste,* (SW-846, 3rd Edition) and *Methods for Chemical Analysis of Water and Waste* (E{A-600/4-79-020, Revised March 1983).

Approved by: ____________ Date: July 27, 1993

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	07/15/93
Project:	Cargill Salt-Alameda/CS1601	**Service Request No.:**	SJ93-0893
Sample Matrix:	Soil		

Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)

Sample Name	**Date Analyzed**	**Percent Recovery**		
		1,2-Dichloroethane - D_4	Toluene - D_8	4-Bromofluorobenzene
ASB-1 (5.0-5.5)	07/21/93	98.	97.	99.
ASB-2 (4.5-5.0)	07/23/93	102.	103.	99.
ASB-8 (4.0-4.5)	07/23/93	102.	102.	100.
ASB-9 (4.3-4.8)	07/23/93	107.	101.	100.
ASB-10 (4.5-5.0)	07/23/93	102.	100.	100.
ASB-6 (3.5-4.0)	07/23/93	102.	102.	99.
Method Blank	07/21/93	105.	99.	100.
Method Blank	07/23/93	109.	100.	102.
	EPA Acceptance Criteria	70-121	81-117	74-121

Approved by: K Dermott Murphy Date: July 27, 1993

Columbia Analytical Services inc.
1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 7/15/93 PAGE 1 OF 2

PROJECT NAME CARGILL SALT - ALAMEDA # CS1601
PROJECT MNGR. MARK WHEELER
COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL, INC
1022 NORTH SECOND ST.
SAN JOSE, CA 95112 PHONE 408 292 5592
SAMPLERS SIGNATURE Mark C Wheeler

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated ☐ or Aromatic Volatiles ☐ 601/8010 602/8020	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method	Metals [✓ total] or dissolved List Below	pH, Cond, Cl, SO4, PO4, F, NO2, Alk, TDS, TSS (circle)	NH3-N, COD, Total-P, TKN, NO3 (circle)	Total Organic Carbon TOC 415/9060	Total Phenols					REMARKS
ASB-1; 0.25'	7.13.93	10:40	1	Soil	1								✓									
ASB-2; 0.25'	↓	11:55	2	↓	1								✓									
ASB-6; 0.75-1.25'		-	3		1								✓									
ASB-8; 0.75-1.25'		17:45	4		1								✓									
ASB-9 0.3-0.8'	↓	18:20	5	↓	1								✓									Analyze from top of ring

RELINQUISHED BY:
Signature Mark C Wheeler
Printed Name MARK C. WHEELER
Firm GROUNDWORKS
Date/Time 7/15/93 17:05

RECEIVED BY:
Signature Kevin Howard
Printed Name Kevin Howard
Firm CAS
Date/Time 7-15-93 1705

TURNAROUND REQUIREMENTS:
___ 24 hr ___ 48 hr ___ 5 day
✓ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
✓ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV.CLP Deliverable Report

INVOICE INFORMATION:
P.O. # CS160102
Bill to: Groundworks

SAMPLE RECEIPT:
Shipping VIA: Sampler
Shipping #:
Condition: OKAY
Lab No. S593-~~0894~~

RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

GSISR 3083 metals 0893

Per Quotation No. 032315

Metals: Barium, Cadmium, Copper, Chromium, Lead, Nickel, Vanadium, Zinc

(KH)

DISTRIB[illegible] WHIT[illegible] to origi[illegible] YELLO[illegible] PINK[illegible] d by or[illegible]

Columbia Analytical Services inc.

1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 7/15/93 PAGE 2 OF 2

PROJECT NAME CARGILL SALT - ALAMEDA # CS1601
PROJECT MNGR. MARK WHEELER
COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL, INC.
1022 NORTH SECOND ST
SAN JOSE CA 95112 PHONE 408 292-5592
SAMPLERS SIGNATURE Mark C. Wheeler

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/[✓ 8270]	Volatile Organics GC/MS 624/[✓ 8240]	Halogenated or Aromatic Volatiles 601/8010 ☐ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method 5520 *	Metals (total or dissolved) List Below	pH, Cond, Cl, SO_4, PO_4, F, NO_2, Alk, TDS, TSS (circle)	NH_3-N, COD, Total-P, TKN, NO_3 (circle)	Total Organic Carbon TOC 415/9060	Total Phenols					REMARKS
ASB-1; 5-5.5'	7-13-93	-	1	SOIL	1	✓	✓					✓										Sample has odor
ASB-2; 4.5-5.0'		-	2		1	✓	✓					✓										
ASB-8; 4.0-4.5'		18:00	3		1	✓	✓					✓										
ASB-9; 4.3-4.8'		18:45	4		1	✓	✓					✓										
ASB-10; 4.5-5.0'		19:30	5		1	✓	✓					✓										
ASB-6; 3.5-4.0'	↓	16:40	6	↓	1	✓	✓					✓										

RELINQUISHED BY:
Mark C. Wheeler
Signature
MARK C. WHEELER
Printed Name
GROUNDWORKS ENV.
Firm
7-15-93 17:05
Date/Time

RECEIVED BY:
Kevin Howard
Signature
Kevin Howard
Printed Name
CAS
Firm
7-15-93 1705
Date/Time

TURNAROUND REQUIREMENTS:
___ 24 hr ___ 48 hr ___ 5 day
✓ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
✓ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV. CLP Deliverable Report

INVOICE INFORMATION:
P.O. # CS160102
Bill to: Groundworks

SAMPLE RECEIPT:
Shipping VIA: Sampler
Shipping #:
Condition: OKAY
Lab No.: SJ93-0893

RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:
*Oil & grease by 5520 with non-polar ('F'), IR

GS ISR 3083
8270

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05

RECEIVED JUL 30 1993

GOLDEN STATE/CAS
LABORATORIES, INC.

July 29, 1993

Mark Wheeler
Groundworks Environmental
1022 N. 2nd Street
San Jose, CA 95112

Re: **Cargill Salt - Alameda/Project #SJ93-0893**

Dear Mark:

Enclosed are the results of the samples submitted to our lab on July 20, 1993. For your reference, these analyses have been assigned our service request number LA932386.

All analyses were performed in accordance with our laboratory's quality assurance program. Golden State / CAS is certified for environmental analyses by the California Department of Health Services (Certificate # 1296).

Please call if you have any questions.

Respectfully Submitted,

Golden State / CAS Laboratories Inc.

Dr. B. Gene Bennett
Laboratory Manager

GB/iz

6925 CANOGA AVENUE ■ CANOGA PARK, CA 91303 ■ 818 587-5550 ■ FAX 818 587-5555

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	Date Collected:	07/13/93
Project:	Cargill Salt - Alameda/#CS1601	Date Received:	07/20/93
Sample Matrix:	Soil	Date Analyzed:	07/23-26/93
		Service Request No.:	LA932386

Total Metals
mg/Kg (ppm)

		Sample Name:	ASB-1;0.25'	ASB-2;0.25'	ASB-6;0.75-1.25'
		Lab Code:	LA2386-1	LA2386-2	LA2386-3
Analyte	EPA Method	MRL			
Barium	3050/6010	1	*81	200	100
Cadmium	3050/6010	1	*280	18	ND
Chromium	3050/6010	2	30	37	35
Copper	3050/6010	2	*210	53	10
Lead	3050/7421	1	*210	390	5
Nickel	3050/6010	10	130	30	19
Vanadium	3050/6010	2	11	22	18
Zinc	3050/6010	1	*1300	460	25

MRL Method Reporting Limit

* Sample 2386-1 in the batch was spiked, and spike recoveries were outside acceptance limits due to high level of analyte in sample. The laboratory control spike was acceptable, therefore, data was approved.

ND None Detected at or above the method reporting limit

Approved by ________________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	**Date Collected:**	07/13/93
Project:	Cargill Salt - Alameda/#CS1601	**Date Received:**	07/20/93
Sample Matrix:	Soil	**Date Analyzed:**	07/23-26/93
		Service Request No.:	LA932386

Total Metals
mg/Kg (ppm)

		Sample Name: **Lab Code:**	**ASB-8;0.75-1.25'** **LA2386-4**	**ASB-9;0.3-0.8'** **LA2386-5**	**Method Blank** **LA2386-MB**
Analyte	**EPA Method**	**MRL**			
Barium	3050/6010	1	87	210	ND
Cadmium	3050/6010	1	ND	4	ND
Chromium	3050/6010	2	37	25	ND
Copper	3050/6010	2	9	40	ND
Lead	3050/7421	1	3	280	ND
Nickel	3050/6010	10	21	44	ND
Vanadium	3050/6010	2	20	21	ND
Zinc	3050/6010	1	22	280	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by ______________________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	Date Collected:	07/13/93
Project:	Cargill Salt - Alameda/#CS1601	Date Received:	07/20/93
Sample Matrix:	Soil	Date Extracted:	07/21/93
		Date Analyzed:	07/21/93
		Service Request No.:	LA932386

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
mg/Kg (ppm)

Sample Name: ASB-1;5-5.5'
Lab Code: LA2386-6

Base Neutral Analyte	MRL	Result	Base Neutral Analyte	MRL	Result
N-Nitrosodimethylamine	2	ND	2,6-Dinitrotoluene	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND	Diethyl Phthalate	0.3	ND
1,2-Dichlorobenzene	0.3	ND	4-Chlorophenyl Phenyl Ether	0.3	ND
1,3-Dichlorobenzene	0.3	ND	Fluorene	0.3	ND
1,4-Dichlorobenzene	0.3	ND	4-Nitroaniline	2	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	N-Nitrosodiphenylamine	0.3	ND
N-Nitrosodi-n-propylamine	0.3	ND	4-Bromophenyl Phenyl Ether	0.3	ND
Hexachloroethane	0.3	ND	Hexachlorobenzene	0.3	ND
Nitrobenzene	0.3	ND	Phenanthrene	0.3	ND
Isophorone	0.3	ND	Anthracene	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND	Di-n-butyl Phthalate	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND	Fluoranthene	0.3	ND
Naphthalene	0.3	ND	Pyrene	0.3	ND
4-Chloroaniline	0.3	ND	Butylbenzyl Phthalate	0.3	ND
Hexachlorobutadiene	0.3	ND	3,3'-Dichlorobenzidine	0.3	ND
2-Methylnaphthalene	0.3	ND	Benz(a)anthracene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND	Bis(2-ethylhexyl) Phthalate	0.3	ND
2-Chloronaphthalene	0.3	ND	Chrysene	0.3	ND
2-Nitroaniline	2	ND	Di-n-octyl Phthalate	0.3	ND
Dimethyl Phthalate	0.3	ND	Benzo(b)fluoranthene	0.3	ND
Acenaphthylene	0.3	ND	Benzo(k)fluoranthene	0.3	ND
3-Nitroaniline	2	ND	Benzo(a)pyrene	0.3	ND
Acenaphthene	0.3	ND	Indeno(1,2,3-c,d)pyrene	0.3	ND
Dibenzofuran	0.3	ND	Dibenz(a,h)anthracene	0.3	ND
2,4-Dinitrotoluene	0.3	ND	Benzo(g,h,i)perylene	0.3	ND

Acid Analyte	MRL	Result	Acid Analyte	MRL	Result
Phenol	0.3	ND	2,4-Dichlorophenol	0.3	ND
2-Chlorophenol	0.3	ND	4-Chloro-3-methylphenol	0.3	ND
Benzyl Alcohol	0.3	ND	2,4,6-Trichlorophenol	0.3	ND
2-Methylphenol	0.3	ND	2,4,5-Trichlorophenol	0.3	ND
3- and 4-Methylphenol◆	0.3	ND	2,4-Dinitrophenol	2	ND
2-Nitrophenol	0.3	ND	4-Nitrophenol	2	ND
2,4-Dimethylphenol	0.3	ND	2-Methyl-4,6-dinitrophenol	2	ND
Benzoic Acid	2	ND	Pentachlorophenol	2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
◆ Quantified as 4-methylphenol.

Approved by ________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.
Analytical Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda/#CS1601
Sample Matrix: Soil

Date Collected: 07/13/93
Date Received: 07/20/93
Date Extracted: 07/21/93
Date Analyzed: 07/21/93
Service Request No.: LA932386

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
mg/Kg (ppm)

Sample Name: ASB-2;4.5-5.0'
Lab Code: LA2386-7

Base Neutral Analyte	MRL	Result	Base Neutral Analyte	MRL	Result
N-Nitrosodimethylamine	2	ND	2,6-Dinitrotoluene	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND	Diethyl Phthalate	0.3	ND
1,2-Dichlorobenzene	0.3	ND	4-Chlorophenyl Phenyl Ether	0.3	ND
1,3-Dichlorobenzene	0.3	ND	Fluorene	0.3	ND
1,4-Dichlorobenzene	0.3	ND	4-Nitroaniline	2	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	N-Nitrosodiphenylamine	0.3	ND
N-Nitrosodi-n-propylamine	0.3	ND	4-Bromophenyl Phenyl Ether	0.3	ND
Hexachloroethane	0.3	ND	Hexachlorobenzene	0.3	ND
Nitrobenzene	0.3	ND	Phenanthrene	0.3	ND
Isophorone	0.3	ND	Anthracene	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND	Di-n-butyl Phthalate	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND	Fluoranthene	0.3	ND
Naphthalene	0.3	ND	Pyrene	0.3	ND
4-Chloroaniline	0.3	ND	Butylbenzyl Phthalate	0.3	ND
Hexachlorobutadiene	0.3	ND	3,3'-Dichlorobenzidine	0.3	ND
2-Methylnaphthalene	0.3	ND	Benz(a)anthracene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND	Bis(2-ethylhexyl) Phthalate	0.3	ND
2-Chloronaphthalene	0.3	ND	Chrysene	0.3	ND
2-Nitroaniline	2	ND	Di-n-octyl Phthalate	0.3	ND
Dimethyl Phthalate	0.3	ND	Benzo(b)fluoranthene	0.3	ND
Acenaphthylene	0.3	ND	Benzo(k)fluoranthene	0.3	ND
3-Nitroaniline	2	ND	Benzo(a)pyrene	0.3	ND
Acenaphthene	0.3	ND	Indeno(1,2,3-c,d)pyrene	0.3	ND
Dibenzofuran	0.3	ND	Dibenz(a,h)anthracene	0.3	ND
2,4-Dinitrotoluene	0.3	ND	Benzo(g,h,i)perylene	0.3	ND

Acid Analyte	MRL	Result	Acid Analyte	MRL	Result
Phenol	0.3	ND	2,4-Dichlorophenol	0.3	ND
2-Chlorophenol	0.3	ND	4-Chloro-3-methylphenol	0.3	ND
Benzyl Alcohol	0.3	ND	2,4,6-Trichlorophenol	0.3	ND
2-Methylphenol	0.3	ND	2,4,5-Trichlorophenol	0.3	ND
3- and 4-Methylphenol◆	0.3	ND	2,4-Dinitrophenol	2	ND
2-Nitrophenol	0.3	ND	4-Nitrophenol	2	ND
2,4-Dimethylphenol	0.3	ND	2-Methyl-4,6-dinitrophenol	2	ND
Benzoic Acid	2	ND	Pentachlorophenol	2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
◆ Quantified as 4-methylphenol.

Approved by ______________________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.
Analytical Report

Client:	Groundworks Environmental	Date Collected:	07/13/93
Project:	Cargill Salt - Alameda/#CS1601	Date Received:	07/20/93
Sample Matrix:	Soil	Date Extracted:	07/21/93
		Date Analyzed:	07/21/93
		Service Request No.:	LA932386

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
mg/Kg (ppm)

Sample Name: ASB-8;4.0-4.5'
Lab Code: LA2386-8

Base Neutral Analyte	MRL	Result	Base Neutral Analyte	MRL	Result
N-Nitrosodimethylamine	2	ND	2,6-Dinitrotoluene	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND	Diethyl Phthalate	0.3	ND
1,2-Dichlorobenzene	0.3	ND	4-Chlorophenyl Phenyl Ether	0.3	ND
1,3-Dichlorobenzene	0.3	ND	Fluorene	0.3	ND
1,4-Dichlorobenzene	0.3	ND	4-Nitroaniline	2	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	N-Nitrosodiphenylamine	0.3	ND
N-Nitrosodi-n-propylamine	0.3	ND	4-Bromophenyl Phenyl Ether	0.3	ND
Hexachloroethane	0.3	ND	Hexachlorobenzene	0.3	ND
Nitrobenzene	0.3	ND	Phenanthrene	0.3	ND
Isophorone	0.3	ND	Anthracene	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND	Di-n-butyl Phthalate	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND	Fluoranthene	0.3	ND
Naphthalene	0.3	ND	Pyrene	0.3	ND
4-Chloroaniline	0.3	ND	Butylbenzyl Phthalate	0.3	ND
Hexachlorobutadiene	0.3	ND	3,3'-Dichlorobenzidine	0.3	ND
2-Methylnaphthalene	0.3	ND	Benz(a)anthracene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND	Bis(2-ethylhexyl) Phthalate	0.3	ND
2-Chloronaphthalene	0.3	ND	Chrysene	0.3	ND
2-Nitroaniline	2	ND	Di-n-octyl Phthalate	0.3	ND
Dimethyl Phthalate	0.3	ND	Benzo(b)fluoranthene	0.3	ND
Acenaphthylene	0.3	ND	Benzo(k)fluoranthene	0.3	ND
3-Nitroaniline	2	ND	Benzo(a)pyrene	0.3	ND
Acenaphthene	0.3	ND	Indeno(1,2,3-c,d)pyrene	0.3	ND
Dibenzofuran	0.3	ND	Dibenz(a,h)anthracene	0.3	ND
2,4-Dinitrotoluene	0.3	ND	Benzo(g,h,i)perylene	0.3	ND

Acid Analyte	MRL	Result	Acid Analyte	MRL	Result
Phenol	0.3	ND	2,4-Dichlorophenol	0.3	ND
2-Chlorophenol	0.3	ND	4-Chloro-3-methylphenol	0.3	ND
Benzyl Alcohol	0.3	ND	2,4,6-Trichlorophenol	0.3	ND
2-Methylphenol	0.3	ND	2,4,5-Trichlorophenol	0.3	ND
3- and 4-Methylphenol♦	0.3	ND	2,4-Dinitrophenol	2	ND
2-Nitrophenol	0.3	ND	4-Nitrophenol	2	ND
2,4-Dimethylphenol	0.3	ND	2-Methyl-4,6-dinitrophenol	2	ND
Benzoic Acid	2	ND	Pentachlorophenol	2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
♦ Quantified as 4-methylphenol.

Approved by __________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.
Analytical Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda/#CS1601
Sample Matrix: Soil

Date Collected: 07/13/93
Date Received: 07/20/93
Date Extracted: 07/21/93
Date Analyzed: 07/21/93
Service Request No.: LA932386

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
mg/Kg (ppm)

Sample Name: ASB-9;4.3-4.8'
Lab Code: LA2386-9

Base Neutral Analyte	MRL	Result	Base Neutral Analyte	MRL	Result
N-Nitrosodimethylamine	2	ND	2,6-Dinitrotoluene	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND	Diethyl Phthalate	0.3	ND
1,2-Dichlorobenzene	0.3	ND	4-Chlorophenyl Phenyl Ether	0.3	ND
1,3-Dichlorobenzene	0.3	ND	Fluorene	0.3	ND
1,4-Dichlorobenzene	0.3	ND	4-Nitroaniline	2	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	N-Nitrosodiphenylamine	0.3	ND
N-Nitrosodi-n-propylamine	0.3	ND	4-Bromophenyl Phenyl Ether	0.3	ND
Hexachloroethane	0.3	ND	Hexachlorobenzene	0.3	ND
Nitrobenzene	0.3	ND	Phenanthrene	0.3	ND
Isophorone	0.3	ND	Anthracene	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND	Di-n-butyl Phthalate	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND	Fluoranthene	0.3	ND
Naphthalene	0.3	ND	Pyrene	0.3	ND
4-Chloroaniline	0.3	ND	Butylbenzyl Phthalate	0.3	ND
Hexachlorobutadiene	0.3	ND	3,3'-Dichlorobenzidine	0.3	ND
2-Methylnaphthalene	0.3	ND	Benz(a)anthracene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND	Bis(2-ethylhexyl) Phthalate	0.3	ND
2-Chloronaphthalene	0.3	ND	Chrysene	0.3	ND
2-Nitroaniline	2	ND	Di-n-octyl Phthalate	0.3	ND
Dimethyl Phthalate	0.3	ND	Benzo(b)fluoranthene	0.3	ND
Acenaphthylene	0.3	ND	Benzo(k)fluoranthene	0.3	ND
3-Nitroaniline	2	ND	Benzo(a)pyrene	0.3	ND
Acenaphthene	0.3	ND	Indeno(1,2,3-c,d)pyrene	0.3	ND
Dibenzofuran	0.3	ND	Dibenz(a,h)anthracene	0.3	ND
2,4-Dinitrotoluene	0.3	ND	Benzo(g,h,i)perylene	0.3	ND

Acid Analyte	MRL	Result	Acid Analyte	MRL	Result
Phenol	0.3	ND	2,4-Dichlorophenol	0.3	ND
2-Chlorophenol	0.3	ND	4-Chloro-3-methylphenol	0.3	ND
Benzyl Alcohol	0.3	ND	2,4,6-Trichlorophenol	0.3	ND
2-Methylphenol	0.3	ND	2,4,5-Trichlorophenol	0.3	ND
3- and 4-Methylphenol♦	0.3	ND	2,4-Dinitrophenol	2	ND
2-Nitrophenol	0.3	ND	4-Nitrophenol	2	ND
2,4-Dimethylphenol	0.3	ND	2-Methyl-4,6-dinitrophenol	2	ND
Benzoic Acid	2	ND	Pentachlorophenol	2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
♦ Quantified as 4-methylphenol.

Approved by ______________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	Date Collected:	07/13/93
Project:	Cargill Salt - Alameda/#CS1601	Date Received:	07/20/93
Sample Matrix:	Soil	Date Extracted:	07/21/93
		Date Analyzed:	07/21/93
		Service Request No.:	LA932386

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
mg/Kg (ppm)

Sample Name: ASB-10;4.5-5.0'
Lab Code: LA2386-10

Base Neutral Analyte	MRL	Result	Base Neutral Analyte	MRL	Result
N-Nitrosodimethylamine	2	ND	2,6-Dinitrotoluene	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND	Diethyl Phthalate	0.3	ND
1,2-Dichlorobenzene	0.3	ND	4-Chlorophenyl Phenyl Ether	0.3	ND
1,3-Dichlorobenzene	0.3	ND	Fluorene	0.3	ND
1,4-Dichlorobenzene	0.3	ND	4-Nitroaniline	2	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	N-Nitrosodiphenylamine	0.3	ND
N-Nitrosodi-n-propylamine	0.3	ND	4-Bromophenyl Phenyl Ether	0.3	ND
Hexachloroethane	0.3	ND	Hexachlorobenzene	0.3	ND
Nitrobenzene	0.3	ND	Phenanthrene	0.3	ND
Isophorone	0.3	ND	Anthracene	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND	Di-n-butyl Phthalate	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND	Fluoranthene	0.3	ND
Naphthalene	0.3	ND	Pyrene	0.3	ND
4-Chloroaniline	0.3	ND	Butylbenzyl Phthalate	0.3	ND
Hexachlorobutadiene	0.3	ND	3,3'-Dichlorobenzidine	0.3	ND
2-Methylnaphthalene	0.3	ND	Benz(a)anthracene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND	Bis(2-ethylhexyl) Phthalate	0.3	ND
2-Chloronaphthalene	0.3	ND	Chrysene	0.3	ND
2-Nitroaniline	2	ND	Di-n-octyl Phthalate	0.3	ND
Dimethyl Phthalate	0.3	ND	Benzo(b)fluoranthene	0.3	ND
Acenaphthylene	0.3	ND	Benzo(k)fluoranthene	0.3	ND
3-Nitroaniline	2	ND	Benzo(a)pyrene	0.3	ND
Acenaphthene	0.3	ND	Indeno(1,2,3-c,d)pyrene	0.3	ND
Dibenzofuran	0.3	ND	Dibenz(a,h)anthracene	0.3	ND
2,4-Dinitrotoluene	0.3	ND	Benzo(g,h,i)perylene	0.3	ND

Acid Analyte	MRL	Result	Acid Analyte	MRL	Result
Phenol	0.3	ND	2,4-Dichlorophenol	0.3	ND
2-Chlorophenol	0.3	ND	4-Chloro-3-methylphenol	0.3	ND
Benzyl Alcohol	0.3	ND	2,4,6-Trichlorophenol	0.3	ND
2-Methylphenol	0.3	ND	2,4,5-Trichlorophenol	0.3	ND
3- and 4-Methylphenol◆	0.3	ND	2,4-Dinitrophenol	2	ND
2-Nitrophenol	0.3	ND	4-Nitrophenol	2	ND
2,4-Dimethylphenol	0.3	ND	2-Methyl-4,6-dinitrophenol	2	ND
Benzoic Acid	2	ND	Pentachlorophenol	2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
◆ Quantified as 4-methylphenol.

Approved by ______________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	**Date Collected:**	07/13/93
Project:	Cargill Salt - Alameda/#CS1601	**Date Received:**	07/20/93
Sample Matrix:	Soil	**Date Extracted:**	07/21/93
		Date Analyzed:	07/21/93
		Service Request No.:	LA932386

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
mg/Kg (ppm)

Sample Name: ASB-6;3.5-4.0'
Lab Code: LA2386-11

Base Neutral Analyte	MRL	Result	Base Neutral Analyte	MRL	Result
N-Nitrosodimethylamine	2	ND	2,6-Dinitrotoluene	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND	Diethyl Phthalate	0.3	ND
1,2-Dichlorobenzene	0.3	ND	4-Chlorophenyl Phenyl Ether	0.3	ND
1,3-Dichlorobenzene	0.3	ND	Fluorene	0.3	ND
1,4-Dichlorobenzene	0.3	ND	4-Nitroaniline	2	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	N-Nitrosodiphenylamine	0.3	ND
N-Nitrosodi-n-propylamine	0.3	ND	4-Bromophenyl Phenyl Ether	0.3	ND
Hexachloroethane	0.3	ND	Hexachlorobenzene	0.3	ND
Nitrobenzene	0.3	ND	Phenanthrene	0.3	ND
Isophorone	0.3	ND	Anthracene	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND	Di-n-butyl Phthalate	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND	Fluoranthene	0.3	ND
Naphthalene	0.3	ND	Pyrene	0.3	ND
4-Chloroaniline	0.3	ND	Butylbenzyl Phthalate	0.3	ND
Hexachlorobutadiene	0.3	ND	3,3'-Dichlorobenzidine	0.3	ND
2-Methylnaphthalene	0.3	ND	Benz(a)anthracene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND	Bis(2-ethylhexyl) Phthalate	0.3	ND
2-Chloronaphthalene	0.3	ND	Chrysene	0.3	ND
2-Nitroaniline	2	ND	Di-n-octyl Phthalate	0.3	ND
Dimethyl Phthalate	0.3	ND	Benzo(b)fluoranthene	0.3	ND
Acenaphthylene	0.3	ND	Benzo(k)fluoranthene	0.3	ND
3-Nitroaniline	2	ND	Benzo(a)pyrene	0.3	ND
Acenaphthene	0.3	ND	Indeno(1,2,3-c,d)pyrene	0.3	ND
Dibenzofuran	0.3	ND	Dibenz(a,h)anthracene	0.3	ND
2,4-Dinitrotoluene	0.3	ND	Benzo(g,h,i)perylene	0.3	ND

Acid Analyte	MRL	Result	Acid Analyte	MRL	Result
Phenol	0.3	ND	2,4-Dichlorophenol	0.3	ND
2-Chlorophenol	0.3	ND	4-Chloro-3-methylphenol	0.3	ND
Benzyl Alcohol	0.3	ND	2,4,6-Trichlorophenol	0.3	ND
2-Methylphenol	0.3	ND	2,4,5-Trichlorophenol	0.3	ND
3- and 4-Methylphenol♦	0.3	ND	2,4-Dinitrophenol	2	ND
2-Nitrophenol	0.3	ND	4-Nitrophenol	2	ND
2,4-Dimethylphenol	0.3	ND	2-Methyl-4,6-dinitrophenol	2	ND
Benzoic Acid	2	ND	Pentachlorophenol	2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
♦ Quantified as 4-methylphenol.

Approved by ________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.
Analytical Report

Client:	Groundworks Environmental	**Date Collected:**	07/13/93
Project:	Cargill Salt - Alameda/#CS1601	**Date Received:**	07/20/93
Sample Matrix:	Soil	**Date Extracted:**	07/21/93
		Date Analyzed:	07/21/93
		Service Request No.:	LA932386

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
mg/Kg (ppm)

Sample Name: Method Blank
Lab Code: LA2386-MB

Base Neutral Analyte	MRL	Result	Base Neutral Analyte	MRL	Result
N-Nitrosodimethylamine	2	ND	2,6-Dinitrotoluene	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND	Diethyl Phthalate	0.3	ND
1,2-Dichlorobenzene	0.3	ND	4-Chlorophenyl Phenyl Ether	0.3	ND
1,3-Dichlorobenzene	0.3	ND	Fluorene	0.3	ND
1,4-Dichlorobenzene	0.3	ND	4-Nitroaniline	2	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	N-Nitrosodiphenylamine	0.3	ND
N-Nitrosodi-n-propylamine	0.3	ND	4-Bromophenyl Phenyl Ether	0.3	ND
Hexachloroethane	0.3	ND	Hexachlorobenzene	0.3	ND
Nitrobenzene	0.3	ND	Phenanthrene	0.3	ND
Isophorone	0.3	ND	Anthracene	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND	Di-n-butyl Phthalate	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND	Fluoranthene	0.3	ND
Naphthalene	0.3	ND	Pyrene	0.3	ND
4-Chloroaniline	0.3	ND	Butylbenzyl Phthalate	0.3	ND
Hexachlorobutadiene	0.3	ND	3,3'-Dichlorobenzidine	0.3	ND
2-Methylnaphthalene	0.3	ND	Benz(a)anthracene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND	Bis(2-ethylhexyl) Phthalate	0.3	ND
2-Chloronaphthalene	0.3	ND	Chrysene	0.3	ND
2-Nitroaniline	2	ND	Di-n-octyl Phthalate	0.3	ND
Dimethyl Phthalate	0.3	ND	Benzo(b)fluoranthene	0.3	ND
Acenaphthylene	0.3	ND	Benzo(k)fluoranthene	0.3	ND
3-Nitroaniline	2	ND	Benzo(a)pyrene	0.3	ND
Acenaphthene	0.3	ND	Indeno(1,2,3-c,d)pyrene	0.3	ND
Dibenzofuran	0.3	ND	Dibenz(a,h)anthracene	0.3	ND
2,4-Dinitrotoluene	0.3	ND	Benzo(g,h,i)perylene	0.3	ND

Acid Analyte	MRL	Result	Acid Analyte	MRL	Result
Phenol	0.3	ND	2,4-Dichlorophenol	0.3	ND
2-Chlorophenol	0.3	ND	4-Chloro-3-methylphenol	0.3	ND
Benzyl Alcohol	0.3	ND	2,4,6-Trichlorophenol	0.3	ND
2-Methylphenol	0.3	ND	2,4,5-Trichlorophenol	0.3	ND
3- and 4-Methylphenol♦	0.3	ND	2,4-Dinitrophenol	2	ND
2-Nitrophenol	0.3	ND	4-Nitrophenol	2	ND
2,4-Dimethylphenol	0.3	ND	2-Methyl-4,6-dinitrophenol	2	ND
Benzoic Acid	2	ND	Pentachlorophenol	2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
♦ Quantified as 4-methylphenol.

Approved by ______________ Date 7-29-93

GOLDEN STATE / CAS LABORATORIES, INC.

QA/QC Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda/#CS1601
Sample Matrix: Soil

Service Request No.: LA932386

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270

Sample Name	Lab Code	Percent Recovery					
		2FP	PHL	TBP	NBZ	FBP	TPH
ASB-1;5-5.5'	LA2386-6	98	49	53	73	76	55
ASB-2;4.5-5.0'	LA2386-7	43	38	20	35	42	58
ASB-8;4.0-4.5'	LA2386-8	88	72	53	36	38	74
ASB-9;4.3-4.8'	LA2386-9	49	51	32	43	49	58
ASB-10;4.5-5.0'	LA2386-10	43	44	39	38	43	68
ASB-6;3.5-4.0'	LA2386-11	65	67	50	59	67	89
Method Blank	LA2386-MB	76	81	64	78	84	91
EPA Acceptance Criteria		25-121	24-113	19-122	23-128	30-115	18-137

2FP	2-Fluorophenol
PHL	Phenol-D_6
TBP	2,4,6-Tribromophenol
NBZ	Nitrobenzene-D_5
FBP	2-Fluorobiphenyl
TPH	Terphenyl-D_{14}

Approved by ______________________ Date 7-29-93

Columbia Analytical Services inc.

1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 7/15/93 PAGE 2 OF 2

PROJECT NAME CARGILL SALT - ALAMEDA, CS1601

PROJECT MNGR. MARK WHEELER

COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL, INC.
1022 NORTH SECOND ST
SAN JOSE, CA 95112 PHONE 408 292-5592

SAMPLERS SIGNATURE Mark C. Wheeler

ANALYSIS REQUESTED GS Job # LA932386

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 ☐ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method 5520 *	Metals (total or dissolved) List Below	pH, Cond, Cl, SO₄, PO₄, F, NO₂, Alk, TDS, TSS (circle)	NH₃-N, COD, Total-P, TKN, NO₃ (circle)	Total Organic Carbon TOC 415/9060	Total Phenols		GS Sample # LA2386			REMARKS
ASB-1; 5-5.5'	7.13.93	-		Soil	1	✓	✓					✓							6			Sample has odor
ASB-2; 4.5-5.0'	↓	-		↓	1	✓	✓					✓							7			
ASB-8; 4.0-4.5'		18:00			1	✓	✓					✓							8			
ASB-9; 4.3-4.8'		18:45			1	✓	✓					✓							9			
ASB-10; 4.5-5.0'		19:30			1	✓	✓					✓							10			
ASB-6; 3.5-4.0'		16:40			1	✓	✓					✓							11			

RELINQUISHED BY:
Mark C. Wheeler
Signature
MARK C. WHEELER
Printed Name
GROUNDWORKS ENV.
Firm
7-15-93 1705
Date/Time

RECEIVED BY:
Kevin Howard
Signature
Kevin Howard
Printed Name
CAS
Firm
7-15-93 1705
Date/Time

RELINQUISHED BY:
John Truong
Signature
JOHN TRUONG
Printed Name
CAS/SJ
Firm
7/19/93 1600
Date/Time

RECEIVED BY:
Signature
DARIN KUIDA
Printed Name
GS/CAS
Firm
7-20-93 0915
Date/Time

TURNAROUND REQUIREMENTS:
___ 24 hr ___ 48 hr ___ 5 day
✓ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
✓ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV. CLP Deliverable Report

INVOICE INFORMATION:
P.O. # CS160102
Bill to: Groundworks

SAMPLE RECEIPT:
Shipping VIA: Sampler
Shipping #:
Condition: OKAY
Lab No.: SJ93-0893

SPECIAL INSTRUCTIONS/COMMENTS:
*Oil & grease by 5520 with non-polar, IR
('F')

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05

Columbia Analytical Services inc.

1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 7/15/93 PAGE 1 OF 2

PROJECT NAME CARGILL SALT-ALAMEDA # CS1601

PROJECT MNGR. MARK WHEELER

COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL, INC
1022 NORTH SECOND ST.
SAN JOSE, CA 95112 PHONE 408 292 5592

SAMPLERS SIGNATURE Mark C Wheeler

ANALYSIS REQUESTED GS Job# CA932386

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 ☐ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method	Metals (total) or dissolved) List Below	pH, Cond, Cl, SO4, PO4, F, NO2, Alk, TDS, TSS (circle)	NH3-N, COD, Total-P, TKN, NO3 (circle)	Total Organic Carbon TOC 415/9060	Total Phenols	GS Sample LA2386-				REMARKS
ASB-1; 0.25'	7.13.93	10:40	~~1~~	Soil	1								✓					1				
ASB-2; 0.25'	↓	11:55	~~2~~	↓	1								✓					2				
ASB-6; 0.75-1.25'	↓	-	~~3~~	↓	1								✓					3				
ASB-8; 0.75-1.25'	↓	17:45	~~4~~	↓	1								✓					4				
ASB-9 0.3-0.8'	↓	18:20	~~5~~	↓	1								✓					5				Analyze from top of ring

RELINQUISHED BY:

Mark C Wheeler
Signature
MARK C. WHEELER
Printed Name
GROUNDWORKS
Firm
7/15/93 17:05
Date/Time

RECEIVED BY:

Kevin Howard
Signature
Kevin Howard
Printed Name
CAS
Firm
7-15-93 1705
Date/Time

TURNAROUND REQUIREMENTS:

___ 24 hr ___ 48 hr ___ 5 day
✓ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS

✓ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV.CLP Deliverable Report

INVOICE INFORMATION:

P.O. # CS160102
Bill to: Groundworks

SAMPLE RECEIPT:

Shipping VIA: Sampler
Shipping #:
Condition: OKAY
Lab No. S593-~~0894~~

RELINQUISHED BY:

Signature
Printed Name
Firm
Date/Time

RECEIVED BY:

Signature
DAREN KUIDA
Printed Name
GS/CAS
Firm
7-20-93 0915
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

0893

Per Quotation No. 032315

Metals: Barium, Cadmium, Copper, Chromium, Lead, Nickel, Vanadium, Zinc

(KH)

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator 400

RECEIVED AUG 25 1993

GOLDEN STATE/CAS
LABORATORIES, INC.

August 23, 1993

Mark Wheeler
Groundworks Environmental, Inc
1022 N. 2nd Street
San Jose, CA 95112

Re: **Cargill Salt-Alameda/Project #CS1601/SJ93-0893A**

Dear Mark:

Enclosed are the results of the samples submitted to our lab on July 20, 1993. Additional analyses requested per Lisa Fernandez (ISR #3148) on August 17, 1993. For your reference, these analyses have been assigned our service request number LA932386A.

All analyses were performed in accordance with our laboratory's quality assurance program. Golden State / CAS is certified for environmental analyses by the California Department of Health Services (Certificate # 1296).

Please call if you have any questions.

Respectfully Submitted,

Golden State / CAS Laboratories Inc.

Dr. B. Gene Bennett
Laboratory Manager

GB/iz

6925 CANOGA AVENUE ■ CANOGA PARK, CA 91303 ■ 818 587-5550 ■ FAX 818 587-5555

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental, Inc.	**Date Collected:**	07/13/93
Project:	Cargill Salt/#CS1601	**Date Received:**	07/20/93
Sample Matrix:	Soil	**Date WET Performed:**	08/17/93
		Date Analyzed:	08/20/93
		Service Request No.:	LA932386A

Persistent and Bioaccumulative Toxic Substances
California Waste Extraction Test (WET)◆
Metals
mg/L (ppm) in WET Extract

			Sample Name: Lab Code:	ASB-2;0.25' LA2386-2	ASB-9;0.3-0.8' LA2386-5
Analyte	**EPA Method**	**MRL**	**STLC◆**		
Cadmium	3010/6010	0.05	1.0	•0.70	NA
Lead	3010/6010	0.5	5.0	•8.5	•6.0

◆	State of California Code of Regulations, Title 22, Division 4.5, Chapter 10, Section 66261.24.
MRL	Method Reporting Limit
STLC	Soluble Threshold Limit Concentration
•	Spike recoveries outside acceptance limits due to high level of analyte in sample. Laboratory control spike was acceptable, therefore, data was approved.
NA	Not Analyzed

Approved by ______________________ Date 8-23-93

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client: Groundworks Environmental, Inc.
Project: Cargill Salt/#CS1601
Sample Matrix: Soil

Date WET Performed: 08/17/93
Date Analyzed: 08/20/93
Service Request No.: LA932386A

Persistent and Bioaccumulative Toxic Substances
California Waste Extraction Test (WET)◆
Metals
mg/L (ppm) in WET Extract

Sample Name: **Method Blank**
Lab Code: **LA2386-MB**

Analyte	EPA Method	MRL	STLC◆	
Cadmium	3010/6010	0.05	1.0	ND
Lead	3010/6010	0.5	5.0	ND

◆	State of California Code of Regulations, Title 22, Division 4.5, Chapter 10, Section 66261.24.
MRL	Method Reporting Limit
STLC	Soluble Threshold Limit Concentration
ND	None Detected at or above the method reporting limit

Approved by ____________ Date 8-23-93

GOLDEN STATE/CAS
LABORATORIES, INC.

6925 CANOGA AVENUE,
CANOGA PARK, CA 91304
818 587 5550 ■ FAX # 818 587 5555

Chain of Custody Record
Analytical Services Request

CLIENT NAME: Groundworks Environmental

ADDRESS/PHONE/FAX: 1022 N 2nd St San Jose, CA 95112

ANALYSES REQUESTED

GSAS JOB #: LA932386-A

PROJECT NAME/LOCATION: Cargill Salt - Alameda

CLIENT PROJECT NO.: CS1601

PROJECT MANAGER: Mark Wheeler

SAMPLER(S):

P.O. NO.:

SAMPLE IDENTIFICATION NO.	DATE	TIME	LAB SAMPLE NO.	SAMPLE MATRIX	Wet Pb, Cd	Wet Pb						REQUESTED TURNAROUND TIME	REMARKS
ASB-2 ; 0.25'	7-13-93	1155	LA2386-2	Soil	X								Samples rec'd 7-20-93
ASB-9 ; 0.3-0.8'	↓	1820	-5	↓		X							Request for additional
													analyses per Lisa
													Fernandez ISR.

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

SEND INVOICE TO:

WHITE COPY: Accompanies Samples

YELLOW COPY: Sampler

Appendix C

Certified Analytical Reports and Chain-of-Custody Documentation – Confirmation Sampling and Containerized Materials (October 1993 – April 1994)

Explanation of Sample Identification Codes

Samples of Containerized Materials

Bin 1 (A+B) - Bin 4 (A+B): Soils excavated from Boring ASB-1 area; excavated with backhoe and contained in Tri-Wall Container. (A+B) indicates that two discrete field samples from the container were laboratory composited for analysis.

SP (A+B): Stockpile of soil cuttings from soil- and groundwater-sampling borings. (A+B) indicates that two discrete field samples from the stockpile were laboratory composited for analysis.

Drum 1: Surficial soils excavated at borings ASB-2 and ASB-9.

Drum 2: Fluids from equipment cleaning and decontamination operations, and groundwater purged from groundwater-sampling borings.

Drum 4: Surficial soils excavated at boring ASB-1.

Confirmation samples

ASB-2/E: Soil sampled from excavation at boring ASB-2 after removing surficial soils

ASB-9/E: Soil sampled from excavation at boring ASB-9 after removing surficial soils

SE-1: Soil sampled from excavation at boring ASB-1 after removing surficial soils.

RECEIVED OCT 1 8 1993

GOLDEN STATE/CAS
LABORATORIES, INC.

October 14, 1993

Mark Wheeler
Groundworks Environmental, Inc.
1022 North Second Street
San Jose, CA 95112

Re: **Project #CS1602/SJ93-1220**

Dear Mark:

Enclosed are the results of the samples submitted to our lab on October 5, 1993. For your reference, these analyses have been assigned our service request number LA932962.

All analyses were performed in accordance with our laboratory's quality assurance program. Golden State / CAS is certified for environmental analyses by the California Department of Health Services (Certificate # 1296).

Please call if you have any questions.

Respectfully submitted,

Golden State / CAS Laboratories, Inc.

Gary Pechter

Gary Pechter
Project Chemist

GP/ib

6925 CANOGA AVENUE ■ CANOGA PARK, CA 91303 ■ 818 587-5550 ■ FAX 818 587-5555

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client: Groundworks Environmental, Inc.
Project: #CS1602
Sample Matrix: Soil

Date Collected: 10/01/93
Date Received: 10/05/93
Date Analyzed: 10/06-14/93
Service Request No.: LA932962

Total Metals
mg/Kg (ppm)

	Sample Name:		ASB-9/E	ASB-2/E	Method Blank
	Lab Code:		LA2962-1	LA2962-2	LA2962-MB
Analyte	**EPA Method**	**MRL**			
Cadmium	3050/6010	1	ND	ND	ND
Copper	3050/6010	2	12	10	ND
Lead	3050/7421	1	*14	*2	ND
Nickel	3050/6010	5	19	19	ND
Zinc	3050/6010	1	40	21	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Spike recoveries outside acceptance limits. Other QC parameters were acceptable, therefore data was approved.

Approved by ______________________ Date 10/14/93

Columbia Analytical Services inc.

1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 10-4-93 PAGE 1 OF 1

PROJECT NAME CARGILL SALT- ALAMEDA # CS1602

PROJECT MNGR MARK WHEELER

COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL, INC.

1022 NORTH SECOND ST.

SAN JOSE, CA 95112 PHONE (408) 292-5582

SAMPLERS SIGNATURE Mark C. Wheeler

ANALYSIS REQUESTED GS Job# LA932962

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/[✓ 8010] ☑ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT/8020	TPH as Diesel/HBHC DHS LUFT	TRPH-418.1	Oil and Grease Method * 5520 F	Metals ([✓ total] or dissolved) List Below	pH, Cond, [✓ Cl], SO4, PO4, F, NO2, Alk, [✓ TDS], TSS (circle)	NH3-N, COD, Total-P, TKN, NO3 (circle)	Total Organic Carbon 415/9060 TOC	Total Phenols					REMARKS
AGB-1	10-1-93	1230	1-8	water	10			✓				✓		✓								HOLD ON 2 L PE HNO3, NO ANALYZE PER MW 10/4/93
ASB-9/E	10-1-93	–	LA2962-1	Soil	1								✓									
ASB-2/E	10-1-93	–	2	Soil	1								✓									

RELINQUISHED BY:

Mark C. Wheeler
Signature

MARK C. WHEELER
Printed Name

GROUNDWORKS ENV.
Firm

10/4/93 0845
Date/Time

RECEIVED BY:

A. Waldman
Signature

ALLEN J. WALDMAN
Printed Name

GROUNDWORKS ENV
Firm

10/4/93 0845
Date/Time

TURNAROUND REQUIREMENTS:

✓ 24 hr → FOR 8010 only ___ 48 hr ___ 5 day

✓ Standard (~ 10-15 working days)

___ Provide Verbal Preliminary Results

___ Provide FAX Preliminary Results

Requested Report Date ___

REPORT REQUIREMENTS

✓ I. Routine Report

___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)

___ III. Data Validation Report (includes All Raw Data)

___ IV. CLP Deliverable Report

INVOICE INFORMATION:

P.O.# CS1602

Bill to: GROUNDWORKS ENV., INC.

SAMPLE RECEIPT:

Shipping VIA: SAMPLER

Shipping #:

Condition: OKAY

Lab No.: SJ93-1220

RELINQUISHED BY:

A. Waldman
Signature

ALLEN J. WALDMAN
Printed Name

GROUNDWORKS ENV.
Firm

10/4/93 915
Date/Time

RECEIVED BY:

Signature

JOHN KUONG
Printed Name

CAS/SJ
Firm

10/4/93 915
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

METALS: Cadmium, copper, lead, nickel, zinc

24 hr turnaround for 8010 only, all others standard

* Hydrocarbons (oil & Grease) by 5520 (F)

NOTE: water sample may have ppm level VOAs

CAS/SJ 10/4/93 0600

10-5-93 0830

GS/CAS DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05

RECEIVED APR 0 4 1994

GOLDEN STATE/CAS
LABORATORIES, INC.

April 1, 1994

Mark Wheeler
Groundworks Environmental
624 E. Evelyn Avenue, Suite D
Sunnyvale, CA 94086

Re: **Cargill Salt, Alameda/Project #CS1602/SJ94-0339**

Dear Mark:

Enclosed are the results of the samples submitted to our lab on March 23, 1994. For your reference, these analyses have been assigned our service request number LA941550.

All analyses were performed in accordance with our laboratory's quality assurance program. Golden State / CAS is certified for environmental analyses by the California Department of Health Services (Certificate # 1296/Expiration - August 1994).

Please call if you have any questions.

Respectfully submitted,

Golden State / CAS Laboratories, Inc.

Elaine R. Thomas for Dr. B. Gene Bennett

Dr. B. Gene Bennett
Laboratory Director

GB/ib

6925 CANOGA AVENUE ■ CANOGA PARK, CA 91303 ■ 818 587-5550 ■ FAX 818 587-5555

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	**Date Collected:**	03/22/94
Project:	Cargill Salt, Alameda/#CS1602	**Date Received:**	03/23/94
Sample Matrix:	Water	**Service Request No.:**	LA941550

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
µg/L (ppb)

Sample Name:		**DRUM 2**
Lab Code:		**LA1550-4**
Date Analyzed:		**03/27/94**
Analyte	**MRL***	
Dichlorodifluoromethane (Freon 12)	100	ND
Chloromethane	100	ND
Vinyl Chloride	100	ND
Bromomethane	100	ND
Chloroethane	100	ND
Trichlorofluoromethane (Freon 11)	10	ND
1,1-Dichloroethene	40	ND
Methylene Chloride	40	ND
trans-1,2-Dichloroethene	10	ND
cis-1,2-Dichloroethene	10	ND
1,1-Dichloroethane	10	ND
Chloroform	10	ND
1,1,1-Trichloroethane (TCA)	20	ND
Carbon Tetrachloride	10	ND
1,2-Dichloroethane	10	ND
Trichloroethene (TCE)	10	ND
1,2-Dichloropropane	10	ND
Bromodichloromethane	10	ND
2-Chloroethyl Vinyl Ether	100	ND
trans-1,3-Dichloropropene	10	ND
cis-1,3-Dichloropropene	10	ND
1,1,2-Trichloroethane	10	ND
Tetrachloroethene (PCE)	10	ND
Dibromochloromethane	10	ND
Chlorobenzene	10	ND
Bromoform	10	ND
1,1,2,2-Tetrachloroethane	10	ND
1,3-Dichlorobenzene	20	ND
1,4-Dichlorobenzene	20	ND
1,2-Dichlorobenzene	20	ND

MRL Method Reporting Limit
* MRLs are elevated because of matrix interferences and because the sample required diluting.
ND None Detected at or above the method reporting limit

001

Approved by Elaine R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	**Service Request No.:**	LA941550
Project:	Cargill Salt, Alameda/#CS1602		
Sample Matrix:	Water		

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
μg/L (ppb)

Sample Name:		**Method Blank**
Lab Code:		**LA1550-MB**
Date Analyzed:		**03/26/94**
Analyte	**MRL**	
Dichlorodifluoromethane (Freon 12)	5	ND
Chloromethane	5	ND
Vinyl Chloride	5	ND
Bromomethane	5	ND
Chloroethane	5	ND
Trichlorofluoromethane (Freon 11)	0.5	ND
1,1-Dichloroethene	2	ND
Methylene Chloride	2	ND
trans-1,2-Dichloroethene	0.5	ND
cis-1,2-Dichloroethene	0.5	ND
1,1-Dichloroethane	0.5	ND
Chloroform	0.5	ND
1,1,1-Trichloroethane (TCA)	1	ND
Carbon Tetrachloride	0.5	ND
1,2-Dichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND
1,2-Dichloropropane	0.5	ND
Bromodichloromethane	0.5	ND
2-Chloroethyl Vinyl Ether	5	ND
trans-1,3-Dichloropropene	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Dibromochloromethane	0.5	ND
Chlorobenzene	0.5	ND
Bromoform	0.5	ND
1,1,2,2-Tetrachloroethane	0.5	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND

MRL	Method Reporting Limit
ND	None Detected at or above the method reporting limit

002

Approved by Elaine R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	**Date Collected:**	03/22/94
Project:	Cargill Salt, Alameda/#CS1602	**Date Received:**	03/23/94
Sample Matrix:	Soil	**Date TCLP Performed:**	03/26/94
		Service Request No.:	LA941550

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
μg/L (ppb) in TCLP Extract

	Sample Name:	**BIN 1 (A+B)**	**BIN 2 (A+B)**	**BIN 3 (A+B)**
	Lab Code:	**LA1550-5,6**	**LA1550-7,8**	**LA1550-9,10**
	Date Analyzed:	**03/28/94**	**03/28/94**	**03/28/94**
Analyte	**MRL**			
Dichlorodifluoromethane (Freon 12)	50	ND	ND	ND
Chloromethane	50	ND	ND	ND
Vinyl Chloride	50	ND	ND	ND
Bromomethane	50	ND	ND	ND
Chloroethane	50	ND	ND	ND
Trichlorofluoromethane (Freon 11)	50	ND	ND	ND
1,1-Dichloroethene	50	ND	ND	ND
Methylene Chloride	200	ND	ND	ND
trans-1,2-Dichloroethene	50	ND	ND	ND
cis-1,2-Dichloroethene	50	ND	ND	ND
1,1-Dichloroethane	50	ND	ND	ND
Chloroform	50	ND	ND	ND
1,1,1-Trichloroethane (TCA)	50	ND	ND	ND
Carbon Tetrachloride	50	ND	ND	ND
1,2-Dichloroethane	50	ND	ND	ND
Trichloroethene (TCE)	50	ND	ND	ND
1,2-Dichloropropane	50	ND	ND	ND
Bromodichloromethane	50	ND	ND	ND
2-Chloroethyl Vinyl Ether	500	ND	ND	ND
trans-1,3-Dichloropropene	50	ND	ND	ND
cis-1,3-Dichloropropene	50	ND	ND	ND
1,1,2-Trichloroethane	50	ND	ND	ND
Tetrachloroethene (PCE)	50	ND	ND	ND
Dibromochloromethane	50	ND	ND	ND
Chlorobenzene	50	ND	ND	ND
Bromoform	50	ND	ND	ND
1,1,2,2-Tetrachloroethane	50	ND	ND	ND
1,3-Dichlorobenzene	100	ND	ND	ND
1,4-Dichlorobenzene	100	ND	ND	ND
1,2-Dichlorobenzene	100	ND	ND	ND

MRL	Method Reporting Limit
ND	None Detected at or above the method reporting limit

Approved by Elaine R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	**Date Collected:**	03/22/94
Project:	Cargill Salt, Alameda/#CS1602	**Date Received:**	03/23/94
Sample Matrix:	Soil	**Date TCLP Performed:**	03/27/94
		Service Request No.:	LA941550

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
μg/L (ppb) in TCLP Extract

	Sample Name:	**BIN 4 (A+B)**	**SP (A+B)**	**Method Blank**
	Lab Code:	**LA1550-11,12**	**LA1550-13,14**	**LA1550-MB**
	Date Analyzed:	**03/28/94**	**03/28/94**	**03/28/94**
Analyte	**MRL**			
Dichlorodifluoromethane (Freon 12)	50	ND	ND	ND
Chloromethane	50	ND	ND	ND
Vinyl Chloride	50	ND	ND	ND
Bromomethane	50	ND	ND	ND
Chloroethane	50	ND	ND	ND
Trichlorofluoromethane (Freon 11)	50	ND	ND	ND
1,1-Dichloroethene	50	ND	ND	ND
Methylene Chloride	200	ND	ND	ND
trans-1,2-Dichloroethene	50	ND	ND	ND
cis-1,2-Dichloroethene	50	ND	ND	ND
1,1-Dichloroethane	50	ND	ND	ND
Chloroform	50	ND	ND	ND
1,1,1-Trichloroethane (TCA)	50	ND	ND	ND
Carbon Tetrachloride	50	ND	ND	ND
1,2-Dichloroethane	50	ND	ND	ND
Trichloroethene (TCE)	50	ND	ND	ND
1,2-Dichloropropane	50	ND	ND	ND
Bromodichloromethane	50	ND	ND	ND
2-Chloroethyl Vinyl Ether	500	ND	ND	ND
trans-1,3-Dichloropropene	50	ND	ND	ND
cis-1,3-Dichloropropene	50	ND	ND	ND
1,1,2-Trichloroethane	50	ND	ND	ND
Tetrachloroethene (PCE)	50	ND	ND	ND
Dibromochloromethane	50	ND	ND	ND
Chlorobenzene	50	ND	ND	ND
Bromoform	50	ND	ND	ND
1,1,2,2-Tetrachloroethane	50	ND	ND	ND
1,3-Dichlorobenzene	100	ND	ND	ND
1,4-Dichlorobenzene	100	ND	ND	ND
1,2-Dichlorobenzene	100	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

004

Approved by Elaine R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	**Date Collected:**	02/28/94
Project:	Cargill Salt, Alameda/#CS1602	**Date Received:**	03/23/94
Sample Matrix:	Soil	**Date Analyzed:**	03/24/94
		Service Request No.:	LA941550

Total Metals
mg/Kg (ppm)

		Sample Name: Lab Code:	**SE-1** **LA1550-1**	**Method Blank** **LA1550-MB**
Analyte	**EPA Method**	**MRL**		
Cadmium	3050/6010	1	ND	ND
Lead	3050/6010	5	15	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

005

Approved by Elaine R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client: Groundworks Environmental
Project: Cargill Salt, Alameda/#CS1602
Sample Matrix: Water

Date Collected: 03/22/94
Date Received: 03/23/94
Date Analyzed: 03/24/94
Service Request No.: LA941550

Total Metals
mg/L (ppm)

		Sample Name:	DRUM 2	Method Blank
		Lab Code:	LA1550-4	LA1550-MB
Analyte	**EPA Method**	**MRL**		
Cadmium	3010/6010	0.005	0.041	ND
Lead	3010/6010	0.05	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Elaine R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client: Groundworks Environmental
Project: Cargill Salt, Alameda/#CS1602
Sample Matrix: Soil

Date Collected: 02/28/94
Date Received: 03/23/94
Date TCLP Performed: 03/23/94
Date Analyzed: 03/24/94
Service Request No.: LA941550

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

			Sample Name:	**DRUM 1**	**DRUM 4**
			Lab Code:	**LA1550-2**	**LA1550-3**
Analyte	**EPA Method**	**MRL**	**Regulatory Limit**◆		
Cadmium	3010/6010	0.01	1.0	0.36	0.29
Lead	3010/6010	0.05	5.0	0.12	0.06

MRL Method Reporting Limit
◆ From 40 CFR Part 261, et al., and *Federal Register*, March 29, 1990 and June 29, 1990

Approved by Elaine R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

Analytical Report

Client:	Groundworks Environmental	**Date TCLP Performed:**	03/23/94
Project:	Cargill Salt, Alameda/#CS1602	**Date Analyzed:**	03/24/94
Sample Matrix:	Soil	**Service Request No.:**	LA941550

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

Sample Name: **Method Blank**
Lab Code: **LA1550-MB**

Analyte	**EPA Method**	**MRL**	**Regulatory Limit**♦	
Cadmium	3010/6010	0.01	1.0	ND
Lead	3010/6010	0.05	5.0	ND

MRL	Method Reporting Limit
♦	From 40 CFR Part 261, et al., and *Federal Register*, March 29, 1990 and June 29, 1990
ND	None Detected at or above the method reporting limit

Approved by Elaine R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

QA/QC Report

Client:	Groundworks Environmental	**Service Request No.:**	LA941550
Project:	Cargill Salt, Alameda/#CS1602		
Sample Matrix:	Water		

Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	**Lab Code**	**Percent Recovery** 4-Bromofluorobenzene
DRUM 2	LA1550-4	86
Method Blank	LA1550-MB	97
CAS Acceptance Criteria		50-130

Approved by Claire R. Thomas Date 4-1-94

GOLDEN STATE / CAS LABORATORIES, INC.

QA/QC Report

Client: Groundworks Environmental
Project: Cargill Salt, Alameda/#CS1602
Sample Matrix: Soil

Service Request No.: LA941550

Surrogate Recovery Summary
Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	Lab Code	Percent Recovery 2,3-Dichloro-1-propene
BIN 1 (A+B)	LA1550-5,6	122
BIN 2 (A+B)	LA1550-7,8	111
BIN 3 (A+B)	LA1550-9,10	78
BIN 4 (A+B)	LA1550-11,12	107
SP (A+B)	LA1550-13,14	111
Method Blank	LA1550-MB	103

CAS Acceptance Criteria 50-130

Approved by Elaine R. Thomas Date 4-1-94

Columbia Analytical Services inc.
1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

GS# CA941550

DATE 3-22-94 PAGE 1 OF 1

PROJECT NAME CARGILL SALT ALAMEDA # CS1602
PROJECT MNGR. MARK WHEELER
COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL
624 E. EVELYN AVE SUITE D
SUNNYVALE CA 94086 PHONE 730-3600
SAMPLERS SIGNATURE Mark C. Wheeler A. Waldman

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GCMS 625/8270	Volatile Organics GCMS 624/8240	Halogenated or Aromatic Volatiles 601/8010 ☑ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method ___	Metals (total or dissolved) List Below	pH, Cond, Cl, SO4, PO4, F, NO2, Alk, TDS, TSS (circle)	NH3-N, COD, Total-P, TKN, NO3 (circle)	Total Organic Carbon TOC 415/9060	Total Phenols					REMARKS
* SE-1	2/28/94	10:25	CA1550-1	SOIL	1								A									
* DRUM 1	2/28/94	16:15	2	SOIL	1								B									
* DRUM 4	2/28/94	16:18	3	SOIL	1								B									
DRUM 2	3/22/94	1020	4	WATER	3			✓					A									
BIN 1 (A+B) 5+6		1047	5/6	SOIL	2			C					~~C~~	AW								
BIN 2 (A+B) 7+8		1057	7/8		2			C					~~C~~	AW								
BIN 3 (A+B) 9+10		1103	9/10		2			C					~~C~~	AW								
BIN 4 (A+B) 11+12	↓	1110	11/12	↓	2			C					~~C~~	AW								
SP (A+B) 13+14	↓	1115	13/14	↓	2			C					~~C~~	AW								
								AW														

* RELINQUISHED BY:	RECEIVED BY:
Signature: Mark C. Wheeler	Signature: A. Waldman
Printed Name: MARK C WHEELER	Printed Name: Allen Waldman
Firm: GROUNDWORKS ENV	Firm: Groundworks
Date/Time: 3/22/94 0840	Date/Time: 3/22/94 0840

RELINQUISHED BY:	RECEIVED BY:
Signature: A. Waldman	Signature:
Printed Name: Allen Waldman	Printed Name: E Fernandes
Firm: Groundworks	Firm: CAS/SJ
Date/Time: 3/22/94 1:05	Date/Time: 3-22-94 1:05

TURNAROUND REQUIREMENTS:
___ 24 hr ___ 48 hr ___ 5 day
✓ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
✓ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV.CLP Deliverable Report

INVOICE INFORMATION:
P.O. # ___
Bill to: GROUNDWORKS ENV.

SAMPLE RECEIPT:
Shipping VIA: Sampler
Shipping #: ___
Condition: OK
Lab No.: SJ94-0339

SPECIAL INSTRUCTIONS/COMMENTS:
Ⓐ Metals: Total (TTLC): Cadmium and Lead
Ⓑ Metals: TCLP (6010/7000) Cadmium & Lead
Ⓒ TCLP for 8010 w/ 2-1 composite
PER CAS LAB QUOTE # 030894.01 GS3576

CAS-SJ 3/22/94 16:00 GS/CAS 3-23-94 0830

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05

Appendix D

Drilling Permits, Logs of Borings AC-1 and AC-2, and Physical Soil Analyses

Drilling Permits

ZONE 7 WATER RESOURCES MANAGEMENT

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94588 • (510) 484-2600

TELEFAX TRANSMITTAL

DATE: 29 Sep 93

DELIVER TO: Mark Wheeler

NAME OF FIRM: Groundworks Environmental

FAX PHONE #: (408) 292-5593

FROM: Wyman Hong

NUMBER OF PAGES: 2
(Including transmittal)

FOR VOICE CONTACT CALL: (510) 484-2600

FOR RETURN FAX: (510) 462-3914

REMARKS: Transmitting drilling permit 93531 for a contamination investigation at 2016 Clement avenue in Alameda for Cargill Salt.

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588
VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT CARGILL SALT DISPENSING SYSTEMS FACILITY 2016 Clement Ave. Alameda CA

CLIENT
Name Cargill Salt, Attn Ms. Barbara Ransom
Address 7220 Central Ave Voice 510-790-8192
City Newark, CA Zip 94560

APPLICANT
Name Groundworks Environmental Inc
Attn. Mark Wheeler Fax 408 737-1411
Address 524 E. Evelyn Ave, Suite D Voice 408-730-3600
City Sunnyvale CA Zip 94086

TYPE OF PROJECT
Well Construction
Cathodic Protection ____
Water Supply ____
Monitoring ____
Geotechnical Investigation
General ____
Contamination ✓
Well Destruction ____

PROPOSED WATER SUPPLY WELL USE
Domestic ____ Industrial ____ Other ____
Municipal ____ Irrigation ____

DRILLING METHOD:
Mud Rotary ____ Air Rotary ____ Auger ____
Cable ____ Other Hydraulic probe

DRILLER'S LICENSE NO. 636387

WELL PROJECTS
Drill Hole Diameter ____ in. Maximum
Casing Diameter ____ in. Depth ____ ft.
Surface Seal Depth ____ ft. Number ____

GEOTECHNICAL PROJECTS
Number of Borings 15 Maximum
Hole Diameter 1-5/8 in. Depth 40 ft.

ESTIMATED STARTING DATE 9/6/94
ESTIMATED COMPLETION DATE 9/7/94

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE Mark C Wheeler Date 8/19/94

FOR OFFICE USE

PERMIT NUMBER 94494
LOCATION NUMBER ____

PERMIT CONDITIONS

Circled Permit Requirements Apply

A. GENERAL
[✓ 1.] A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
[✓ 3.] Permit is void if project not begun within 90 days of approval date.

B. WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

[✓ C.] GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 26 Aug 94
Wyman Hong

91992

Logs of Borings AC-1 and AC-2

SOIL CLASSIFICATION

Major Divisions	Symbols	Typical Soil Descriptions

COARSE-GRAINED SOILS (More than half of soil material is larger than No. 200 sieve)

Major Divisions	Symbols	Typical Soil Descriptions
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.
	GM	Silty gravels, gravel-sand-silt mixtures.
	GC	Clayey gravels, gravel-sand-clay mixtures.
SANDS More than half of coarse fraction is smaller than No. 4 sieve size	SW	Well-graded sands, gravelly sands, little or no fines.
	SP	Poorly-graded sands, gravelly sands, little or no fines.
	SM	Silty sands, sand-silt mixtures.
	SC	Clayey sands, sand-clay mixtures.

FINE-GRAINED SOILS (More than half of soil material is smaller than No. 200 sieve)

Major Divisions	Symbols	Typical Soil Descriptions
SILTS AND CLAYS Liquid limit less than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	OL	Organic silts and organic silty clays of low plasticity.
SILTS AND CLAYS Liquid limit greater than 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
	CH	Inorganic clays of high plasticity, fat clays.
	OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils.

Notes: 1. Soil classification is based on soil material exclusive of particles larger than 3 inches.
2. Sieve sizes on this chart are U.S. Standard.
Ref.: Unified Soil Classification System chart after ASTM D-2487.

GRAIN SIZE CLASSIFICATION

Grain Size Range (U.S. Standard Sieve Series)				Grain Size Range (in inches)			
< 200	200 - 40	40 - 10	10 - 4	0.19 - 3/4	3/4 - 3	3 - 12	>12
	SAND			GRAVEL			
SILT AND CLAY	Fine	Medium	Coarse	Fine	Coarse	COBBLES	BOULDERS

GROUNDWORKS ENVIRONMENTAL, INC.	**Soil Classification and Grain Size Charts**

Sampler Type

SS - Split-spoon sampler (Modified California)

SPT - Standard penetration test split-spoon sampler

SBS - Split-barrel sampler (Continuous sampler)

PB - Pitcher barrel sampler

RC - Rock core sampler

HC - Hand driven sampler

BK - Bulk sample (Grab sample)

EC - Envirocore sampler

Soil/Rock Description Column

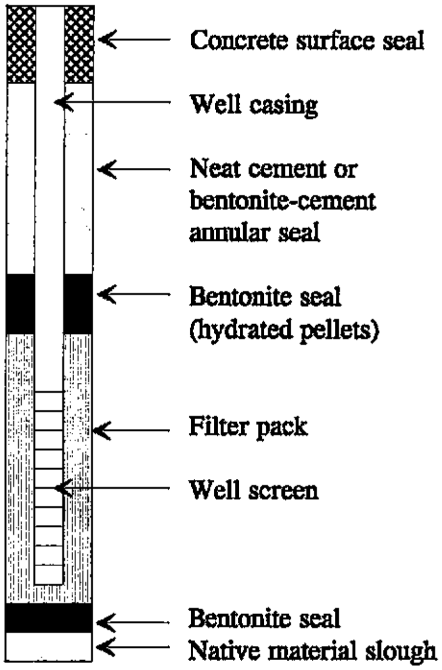
5Y 3/1 Denotes color designation selected from Munsell Soil Color Charts (1975 Edition) or from Geological Society of America Rock Color Chart (Reprinted 1984).

Depth Column

▽ Denotes depth to first encountered ground water

▼ Denotes depth to static groundwater level

Well Construction Column



Miscellaneous

Blows/6 in. - Blows required to drive sampler 6 inches into soil.
Standard drive hammer weight: 140 pounds.
Standard hammer drop: 30 inches.

TSF - Tons per square foot

PSI - Pounds per square inch

logkey02.drw\7/95

GROUNDWORKS
ENVIRONMENTAL, INC.

Explanation of Symbols on Logs of Exploratory Borings

Field Log of Exploratory Boring†

Groundworks Environmental Inc.

Boring No. AC-1 Sheet 1 of 1

Client CARGILL SALT	Date begin 9/7/94	Hole diameter 2-3/8"	Total depth of boring 16' @ 25°
Project No. CS1603	Date finish 9/7/94	Boring completion data Grouted hole with neat cement using PVC tremie pipe.	
Site Alameda Facility			
Logged by Mark C. Wheeler R.G. 4563			
Drilling Co. Precision Sampling, Inc.	Drill rig model VD-1	Depth to first encountered water (date/time/depth) 5.5'	
Driller Sean		Depth to water in borehole (date/time/depth)	
Drilling method Hydraulic push with hammer assist		Depth to water in well (date/time/depth)	

Note: Used PSI's EnviroCore rod system with 2-3/8" outer rods and 1-5/8"-diameter sample barrel.

*Boring advanced at 25° angle. Depths logged are drilling "lengths."

PID (ppm)	Blows / 6 in	Pressure (PSI)	Recovery (ft/ft)	Penetrometer (TSF)	Sampler Type	Sampling Interval	Depth (ft)*	Soil/Rock Symbol	Graphic Log	Soil/Rock Description	Well Construction
		CLEARING PIPE						SM (Fill)		FILL: SILTY SAND; grayish brown (10YR 5/2); 30-40% fines; fine sand; disturbed structure; excavation backfill; dry.	
							1				
	ENVIROCORE SAMPLER (EC)										
							2				
							3	Fill		FILL: CEMENT SLURRY (aggregate and cement for boring backfill); dry.	
								SM		SILTY SAND; very dark grayish brown (10 YR 3/2); 30-40% fines; fine to medium sand; damp.	
							4				
					EC						
							5 ∇				
							6			@5.5': brown (10 YR 4/3); 10-20% fines; some iron-oxide mottling; wet.	
89					Headspace						
					Ring		7			@6.5-10': clayey fines; variation in fines content 10-30%; some iron-oxide mottling.	
					EC						
							8				
							9				
					Ring						
610					Headspace		10				
					EC					@10': dark yellowish brown (10YR 4/4); 10-15% fines; slightly clayey; looser than above.	
1.0					Headspace		11				
0.0					Headspace		12				
					Ring			CL		SANDY CLAY; dark yellowish brown (10YR 4/4); 53% clay- to silt-size fines; 47% fine to medium sand [From laboratory sieve analysis for AC-2 sample]; wet.	
0.0			Bag		Headspace		13				
					EC			SM		SILTY SAND; dark yellowish brown (10YR 4/4); 42% fines; 58% sand, predom. fine to medium sand [From laboratory sieve analysis for AC-2 sample]; clayey, wet.	
					Bag		14				
							15				
					Ring						
0.0					Headspace		16			@ 16': Terminated boring; sufficient information obtained.	

Ring size = 1-11/16 x 6"
(Used stainless steel rings)

† Log has been annotated with results of physical soil analyses.

Field Log of Exploratory Boring†

Groundworks Environmental Inc.

Boring No. AC-2 Sheet 1 of 2

Client CARGILL SALT Date begin 9/7/94

Project No. CS1603 Date finish 9/7/94

Site Alameda Facility

Logged by Mark C. Wheeler R.G. 4563

Drilling Co. Precision Sampling, Inc Drill rig model XD-1

Driller Sean

Drilling method Hydraulic push with hammer assist

Hole diameter 2 3/8" Total depth of boring 25'

Boring completion data Grouted hole with neat cement using PVC tremie pipe to 25'

Depth to first encountered water (date/time/depth) 5.5'

Depth to water in borehole (date/time/depth) 10' in rods after T.D.

Depth to water in well (date/time/depth)

Note: used PSI's Envirocore rod system with 2-3/8" outer rods and 1-5/8"-diameter sample barrel

	PID (ppm)	Blows / 6 in	Pressure (PSI)	Recovery (ft/ft)	Penetrometer (TSF)	Sampler Type	Sampling Interval	Depth (ft)	Soil/Rock Symbol	Graphic Log	Soil/Rock Description	Well Construction
						CLEARING			SM		FILL: SILTY SAND; grayish brown	
						PIPE		1	(FILL)		(10 YR 5/2); 30-40 % fines;	
						EC					fine sand; disturbed structure	
						ENVIROCORE		2			(excavation backfill); dry.	
						SAMPLER						
						(EC)		3	SM		SILTY SAND; very dark grayish brown	
											(10YR 3/2); 30-40 % Fines;	
								4			fine sand ; dry.	
						EC					@3.9': dark grayish brown (10YR 4/2);	
								5			10-15 % fines; slightly clayey;	
	639					Headspace		▽			Fine to medium sand.	
								6			@3.9-5.5': some iron-oxide mottling	
											@5.5': brown (10YR 4/3); wet.	
						EC		7			SAND TO SILTY SAND; yellowish brown	
								8			(10YR 5/4); 5-10 % fines; very slightly	
						Ring					clayey; fine to med. sand; wet.	
	45					Headspace		9				
									SP-SM			
								10			SILTY SAND; yellowish brown (10YR 5/4)	
						EC			SM		25% clay- to silt-size fines;	
						Bag		11			75% fine to medium sand	
						Bag			CL		[From laboratory sieve analysis];	
								12			gradational increase in fines; clayey;	
						Ring			SM		iron oxide mottling; wet.	
	0.0					Headspace		13			SANDY CLAY; yellowish brown (10YR 5/4);	
						EC					53 % clay- to silt-size fines; 47% fine	
								14			to medium sand [From laboratory	
						Bag					sieve analysis]; wet.	
								15			SILTY SAND; yellowish brown (10YR 5/4);	
						Ring					42 % fines; 58 % sand; predom. f-med;	
	0.0					Headspace		16			from laboratory sieve analysis]; clayey; wet.	
						EC					@16' denser sand; harder to push.	
								17				
								18			CLAYEY SAND; dark grayish brown	
						Ring			SC		(2.5Y 4/2); 40-50 % fines; fine to medium	
	0.0			Headspace		Bag					sand; wet.	
						EC		19	SP-SM		SAND TO SILTY SAND; olive brown	
								20			(2.5Y 4/2); 10-15 % fines; slightly	

Field Log of Exploratory Boring†

Groundworks Environmental Inc.

Boring No. AC-2 Sheet 2 of 2

Client CARGILL SALT
Date begin 9/7/94
Project No. CS1603
Date finish 9/7/94
Site
Logged by
Drilling Co.
Drill rig model
Driller
Drilling method
Hole diameter
Total depth of boring
Boring completion data
Depth to first encountered water (date/time/depth)
Depth to water in borehole (date/time/depth)
Depth to water in well (date/time/depth)

	PID (ppm)	Blows / 6 in	Pressure (PSI)	Recovery (ft/ft)	Penetrometer (TSF)	Sampler Type	Sampling Interval	Depth (ft)	Soil/Rock Symbol	Graphic Log	Soil/Rock Description	Well Construction
						Bag			SP-SM		SAND TO SILTY SAND (Continued)	
								21			clayey; fine to medium sand; wet.	
	0.0				Headspace							
						Ring		22				
						EC						
								23				
						Bag					@23': decrease in percent fines:	
								24			6 % Fines; 94% fine to medium	
	0.0				Headspace						sand [From laboratory sieve	
						Ring		25			analysis]; looser than above;	
											wet.	

@25': Flowing sands (rose into core rods after removing inner sample barrel); terminated boring (sufficient information collected).

Ring size = 1-11/16 x 6"
(used stainless steel rings)

Collection of water sample "AC-2": Before the 22-25' sample run, inner barrel had been dry (had teflon-taped the outer joints). Water rose in the rods to 10.' Collected water sample "AC-2" with stainless steel bailer. Also, did headspace analysis on split from bailer: using 8-oz. jar with foil lid; PID = 0.0 ppm.

† Log has been annotated with results of physical soil analyses.

Physical Soil Analyses

GRAIN SIZE DISTRIBUTION

ASTM D422

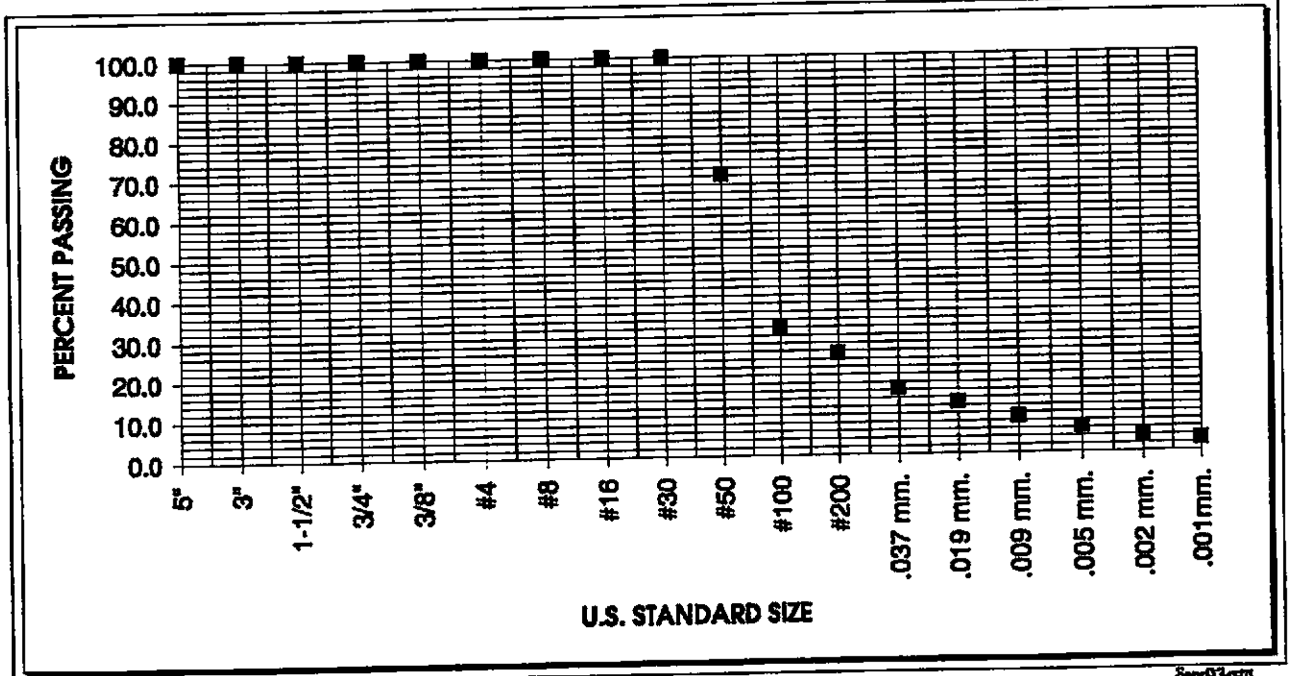
PROJ. NAME: ALAMEDA
PROJECT NO.: CS1603
LAB #: 94-156
SAMPLE NO.: AC-2
DEPTH, FT. 10-11'
TESTED BY: RMM
SAMPLE DESCRIPTION: CLAYEY SAND, BROWN.
DATE: 9/20/94
CHECKED BY: DGC

MOISTURE CONTENT DETERMINATION:

PAN ID	D-3	(gm)
PAN+WET SOIL	689.55	(gm)
PAN+DRY SOIL	610.03	(gm)
PAN WEIGHT	119.23	(gm)
DRY SOIL	490.80	(gm)
% MOISTURE	16.2	(%)

TOTAL DRY WEIGHT: 490.8

SIEVE SIZE (U.S. STANDARD)	PARTICLE INCHES (inch.)	DIAMETER MILLIMETER (mm)	WEIGHT RETAINED (gm)	ACCUMULATED WGT. RETAINED (gm)	WEIGHT PASSING (gm)	PERCENT PASSING
5"	5.0				490.800	100.0
3"	3.0	76.2			490.800	100.0
1-1/2"	1.5	38.1			490.800	100.0
3/4"	0.7	18.9			490.800	100.0
3/8"	0.371	9.42			490.800	100.0
#4	0.185	4.70			490.800	100.0
#8	0.093	2.36			490.800	100.0
#16	0.046	1.17			490.800	100.0
#30	0.0232	0.59	0.83	0.83	489.970	99.8
#50	0.0116	0.30	145.12	145.95	344.850	70.3
#100	0.0058	0.15	188.50	334.45	156.350	31.9
#200	0.0029	0.07	31.85	366.30	124.500	25.4
TOTAL			366.30			
					.037 mm.	16.3
					.019 mm.	12.8
					.009 mm.	8.9
					.005 mm.	6.2
					.002 mm.	3.7
					.001 mm.	2.9



GRAIN SIZE DISTRIBUTION

ASTM D422

PROJ. NAME:	ALAMEDA	**PROJECT NO.:**	CS1603
SAMPLE NO.:	AC-2	**DEPTH, FT.**	11-12'
SAMPLE DESCRIPTION:	SANDY CLAY, BROWN.		

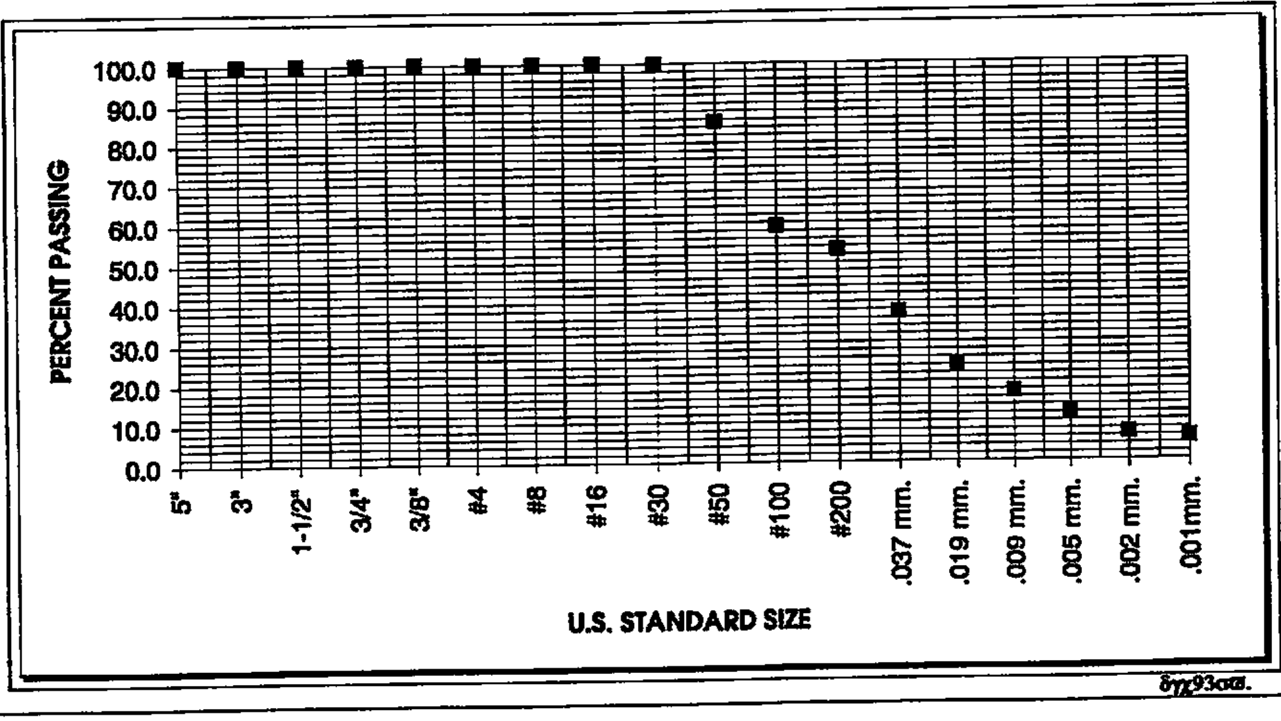
LAB #: 94-156
TESTED BY: RMM
DATE: 9/20/94
CHECKED BY: DGC

TOTAL DRY WEIGHT: 626.5

MOISTURE CONTENT DETERMINATION:

PAN ID	#5001	(gm)
PAN+WET SOIL	823.00	(gm)
PAN+DRY SOIL	718.72	(gm)
PAN WEIGHT	92.22	(gm)
DRY SOIL	626.50	(gm)
% MOISTURE	16.6	(%)

SIEVE SIZE (U.S. STANDARD)	PARTICLE INCHES (inch.)	DIAMETER MILLIMETER (mm)	WEIGHT RETAINED (gm)	ACCUMULATED WGT. RETAINED (gm)	WEIGHT PASSING (gm)	PERCENT PASSING
5"	5.0				626.500	100.0
3"	3.0	76.2			626.500	100.0
1-1/2"	1.5	38.1			626.500	100.0
3/4"	0.7	18.9			626.500	100.0
3/8"	0.371	9.42			626.500	100.0
#4	0.185	4.70			626.500	100.0
#8	0.093	2.36			626.500	100.0
#16	0.046	1.17	0.43	0.43	626.070	99.9
#30	0.0232	0.59	0.75	1.18	625.320	99.8
#50	0.0116	0.30	91.57	92.75	533.750	85.2
#100	0.0058	0.15	163.63	256.38	370.120	59.1
#200	0.0029	0.07	37.36	293.74	332.760	53.1
TOTAL			293.74			
					.037 mm.	37.4
					.019 mm.	23.8
					.009 mm.	17.3
					.005 mm.	11.8
					.002 mm.	6.8
					.001 mm.	5.5



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GRAIN SIZE DISTRIBUTION

ASTM D422

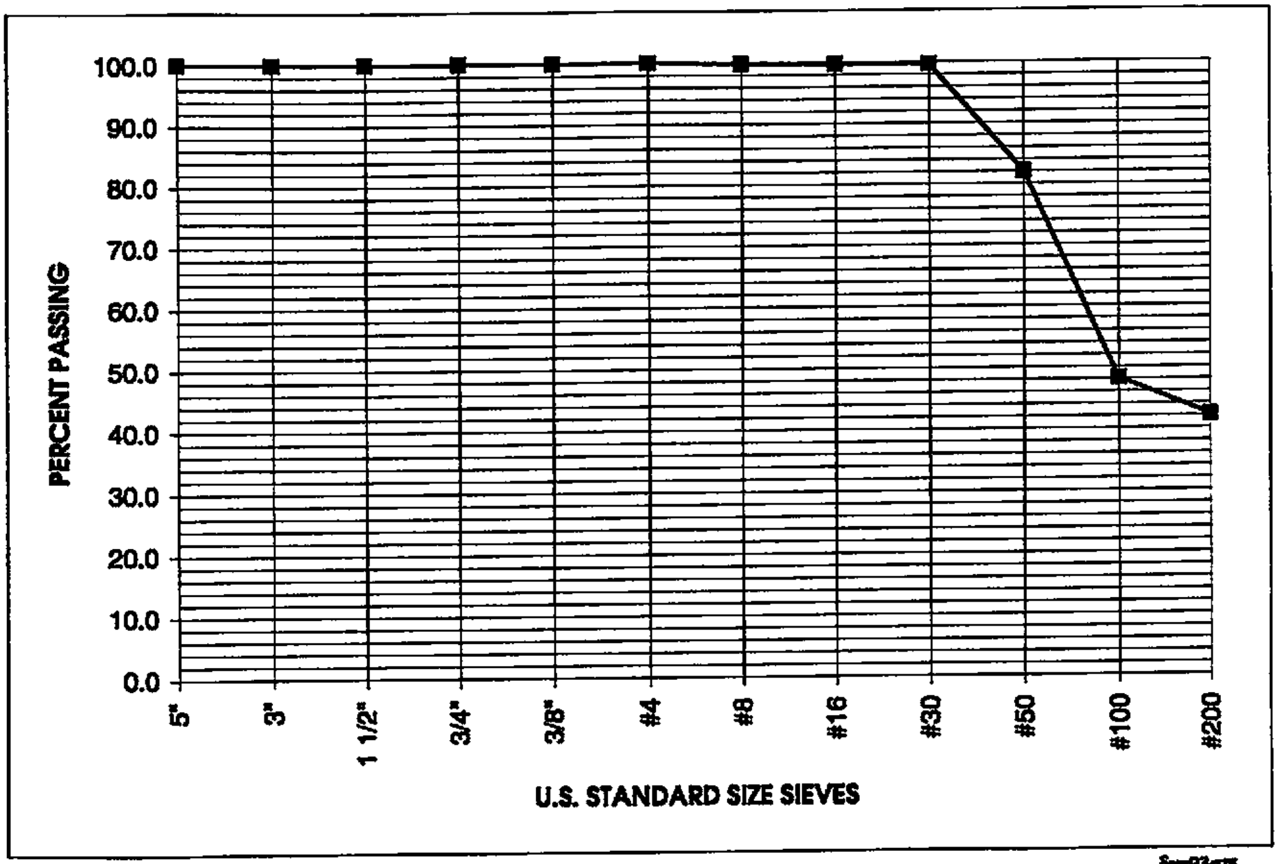
PROJ. NAME:	ALAMEDA	**PROJECT NO.:**	CS1603	**LAB #:**	94-156
SAMPLE NO.:	AC-2	**DEPTH, FT.**	14-15'	**TESTED BY:**	RMM
SAMPLE DESCRIPTION:	CLAYEY SAND, BROWN.			**DATE:**	9/20/94
				CHECKED BY:	DGC

MOISTURE CONTENT DETERMINATION:

PAN ID	#500	(gm)
PAN+WET SOIL	677.31	(gm)
PAN+DRY SOIL	602.86	(gm)
PAN WEIGHT	92.58	(gm)
DRY SOIL	510.28	(gm)
% MOISTURE	14.6	(%)

TOTAL DRY WEIGHT: 510.28

SIEVE SIZE (U.S. STANDARD)	PARTICLE INCHES (inch.)	DIAMETER MILLIMETER (mm)	WEIGHT RETAINED (gm)	ACCUMULATED WGT. RETAINED (gm)	WEIGHT PASSING (gm)	PERCENT PASSING
5"					510.280	100.0
3"	3.0	76.2			510.280	100.0
1 1/2"	1.5	38.1			510.280	100.0
3/4"	0.7	18.9			510.280	100.0
3/8"	0.371	9.42			510.280	100.0
#4	0.185	4.70			510.280	100.0
#8	0.093	2.36	0.94	0.94	509.340	99.8
#16	0.046	1.17	0.77	1.71	508.570	99.7
#30	0.0232	0.59	0.68	2.39	507.890	99.5
#50	0.0116	0.30	89.43	91.82	418.460	82.0
#100	0.0058	0.15	172.79	264.61	245.670	48.1
#200	0.0029	0.07	30.84	295.45	214.830	42.1
TOTAL			295.45			



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GRAIN SIZE DISTRIBUTION
ASTM D422

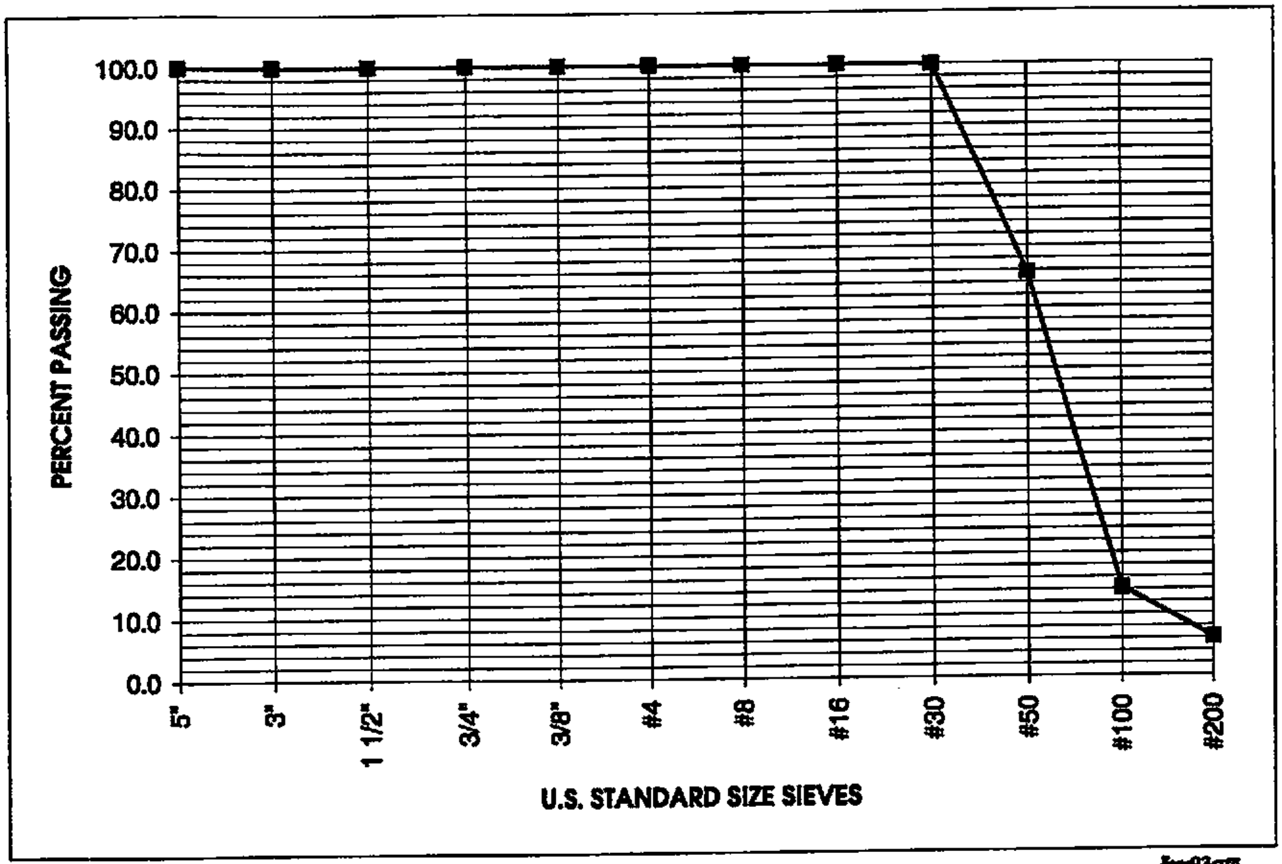
PROJ. NAME:	ALAMEDA	**PROJECT NO.:**	CSA003	**LAB #:**	94-156
SAMPLE NO.:	AC-2	**DEPTH, FT.**	23-24'	**TESTED BY:**	RMM
SAMPLE DESCRIPTION:	SILTY SAND, GRAY BROWN.			**DATE:**	9/20/94
				CHECKED BY:	DGC

MOISTURE CONTENT DETERMINATION:

PAN ID	#508	(gm)
PAN+WET SOIL	675.74	(gm)
PAN+DRY SOIL	596.67	(gm)
PAN WEIGHT	92.00	(gm)
DRY SOIL	504.67	(gm)
% MOISTURE	15.7	(%)

TOTAL DRY WEIGHT: 504.67

SIEVE SIZE (U.S. STANDARD)	PARTICLE INCHES (inch.)	DIAMETER MILLIMETER (mm)	WEIGHT RETAINED (gm)	ACCUMULATED WGT. RETAINED (gm)	WEIGHT PASSING (gm)	PERCENT PASSING
5"					504.670	100.0
3"	3.0	76.2			504.670	100.0
1 1/2"	1.5	38.1			504.670	100.0
3/4"	0.7	18.9			504.670	100.0
3/8"	0.371	9.42			504.670	100.0
#4	0.185	4.70			504.670	100.0
#8	0.093	2.36			504.670	100.0
#16	0.046	1.17			504.670	100.0
#30	0.0232	0.59	0.77	0.77	503.900	99.8
#50	0.0116	0.30	172.90	173.67	331.000	65.6
#100	0.0058	0.15	259.45	433.12	71.550	14.2
#200	0.0029	0.07	40.62	473.74	30.930	6.1
TOTAL			473.74			



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Appendix E

Certified Analytical Reports and Chain-of-Custody Documentation – Initial Groundwater Sampling Program (October 1993)

Columbia
Analytical
Services inc.

October 22, 1993

Service Request No: SJ93-1220

Mark Wheeler
Groundworks Environmental, Inc.
1022 North Second Street
San Jose, CA 95112

Re: **Cargill Salt-Alameda/CS1602**

Dear Mr. Wheeler:

Attached are the results of the water sample submitted to our lab on October 4, 1993. For your reference, these analyses have been assigned our service request number SJ93-1220.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

Keoni A Murphy

Keoni A. Murphy
COLUMBIA ANALYTICAL SERVICES, INC.

KAM/kmh

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NR	Not Requested
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
VPH	Volatile Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	10/04/93
Project:	Cargill Salt-Alameda/CS1602	**Service Request No.:**	SJ93-1220
Sample Matrix:	Water		

Inorganic Parameters[1]
mg/L (ppm)

Analyte	EPA **Method**	**MRL**	Sample Name: **AGB-1** Date Sampled: **10/01/93**	**Method Blank**
Hydrocarbons, IR	SM 5520F	0.5	4.0	ND
Chloride	300.0	1	18.	ND
Solids, Total Dissolved (TDS)	160.1	20	360.	ND

SM *Standard Methods for the Examination of Water and Wastewater*, 17th Ed., 1989

[1] Unless otherwise noted, all analyses were performed within EPA recommended maximum holding times specified in *Test Methods for Evaluating Solid Waste,* (SW-846, 3rd Edition) and *Methods for Chemical Analysis of Water and Waste* (EPA-600/4-79-020, Revised March 1983).

Approved by: Kevin A Murphy Date: October 22, 1993

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	10/04/93
Project:	Cargill Salt-Alameda/CS1602	**Service Request No.:**	SJ93-1220
Sample Matrix:	Water		

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
μg/L (ppb)

Sample Name:		**AGB-1 ***	**Method Blank**
Date Analyzed:		**10/04/93**	**10/04/93**
Analyte	**MRL**		
Dichlorodifluoromethane (Freon 12)	1	<1,000.	ND
Chloromethane	1	<1,000.	ND
Vinyl Chloride	0.5	<500.	ND
Bromomethane	0.5	<500.	ND
Chloroethane	0.5	<500.	ND
Trichlorofluoromethane (Freon 11)	0.5	<500.	ND
1,1-Dichloroethene	0.5	<500.	ND
Trichlorotrifluoroethane (Freon 113)	0.5	<500.	ND
Methylene Chloride	0.5	<500.	ND
trans-1,2-Dichloroethene	0.5	<500.	ND
cis-1,2-Dichloroethene	0.5	<500.	ND
1,1-Dichloroethane	0.5	<500.	ND
Chloroform	0.5	<500.	ND
1,1,1-Trichloroethane (TCA)	0.5	<500.	ND
Carbon Tetrachloride	0.5	<500.	ND
1,2-Dichloroethane	0.5	<500.	ND
Trichloroethene (TCE)	0.5	<500.	ND
1,2-Dichloropropane	0.5	<500.	ND
Bromodichloromethane	0.5	<500.	ND
2-Chloroethyl Vinyl Ether	5	<5,000.	ND
trans-1,3-Dichloropropene	0.5	<500.	ND
cis-1,3-Dichloropropene	0.5	<500.	ND
1,1,2-Trichloroethane	0.5	<500.	ND
Tetrachloroethene (PCE)	0.5	11,000.	ND
Dibromochloromethane	0.5	<500.	ND
Chlorobenzene	0.5	<500.	ND
Bromoform	0.5	<500.	ND
1,1,2,2-Tetrachloroethane	0.5	<500.	ND
1,3-Dichlorobenzene	1	<1,000.	ND
1,4-Dichlorobenzene	1	<1,000.	ND
1,2-Dichlorobenzene	1	<1,000.	ND

* Raised MRL due to high analyte concentration requiring sample dilution.

Approved by: ______________________ Date: October 22, 1993

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	10/04/93
Project:	Cargill Salt-Alameda/CS1602	**Service Request No.:**	SJ93-1220
Sample Matrix:	Water		

Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	**Date Analyzed**	**Percent Recovery** 4-Bromofluorobenzene
AGB-1	10/04/93	102.
Method Blank	10/04/93	93.
	CAS Acceptance Criteria	70-130

Approved by: __________ Date: October 22, 1993

Columbia Analytical Services^{inc.}

1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 10-4-93 PAGE 1 OF 1

PROJECT NAME CARGILL SALT- ALAMEDA # CS1602

PROJECT MNGR. MARK WHEELER

COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL, INC.
1022 NORTH SECOND ST.
SAN JOSE, CA 95112 PHONE (408) 292-5572

SAMPLERS SIGNATURE Mark C. Wheeler

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601 [✓ 8010] ☑ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method * 5520 F	Metals ([✓ total] or dissolved) List Below	pH, Cond, [✓ Cl], SO₄, PO₄, F, NO₂, Alk, [✓ TDS], TSS (circle)	NH₃-N, COD, Total-P, TKN, NO₃ (circle)	Total Organic Carbon TOC 415/9060	Total Phenols					REMARKS
AGB-1	10-1-93	1230	1-8	water	10			✓				✓		✓								HOLD ON 2 LPE HNO₃, NO ANALYZE PER MW 10/4/93
ASB-9/E	10-1-93	–		Soil	1								✓									
ASB-2/E	10-1-93	–		Soil	1								✓									

RELINQUISHED BY:	RECEIVED BY:
Signature: Mark C. Wheeler	Signature: A. Waldman
Printed Name: MARK C. WHEELER	Printed Name: ALLEN J. WALDMAN
Firm: GROUNDWORKS ENV.	Firm: GROUNDWORKS ENV
Date/Time: 10/4/93 0845	Date/Time: 10/4/93 0845

RELINQUISHED BY:	RECEIVED BY:
Signature: A. Waldman	Signature:
Printed Name: ALLEN J. WALDMAN	Printed Name: JOHN TRUONG
Firm: GROUNDWORKS ENV.	Firm: CAS/SJ
Date/Time: 10/4/93 915	Date/Time: 10/4/93 915

TURNAROUND REQUIREMENTS:
→ FOR 8010 only
✓ [✓ 24 hr] ____ 48 hr ____ 5 day
✓ Standard (~ 10-15 working days)
____ Provide Verbal Preliminary Results
____ Provide FAX Preliminary Results
Requested Report Date ____

REPORT REQUIREMENTS
✓ I. Routine Report
____ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
____ III. Data Validation Report (includes All Raw Data)
____ IV.CLP Deliverable Report

INVOICE INFORMATION:
P.O. # CS1602
Bill to: GROUNDWORKS ENV, INC.

SAMPLE RECEIPT:
Shipping VIA: SAMPLER
Shipping #:
Condition: OKAY
Lab No.: SJ93-1220

SPECIAL INSTRUCTIONS/COMMENTS:
METALS: Cadmium, copper lead, nickel, zinc
24 hr turnaround for 8010 only, all others standard
* Hydrocarbons (oil & Grease) by 5520 (F)
NOTE! water sample may have ppm level VOAs

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

CS 3237; METALS

400-05

Columbia
Analytical
Services inc.

November 9, 1993

Service Request No: SJ93-1308

Mark Wheeler
Groundworks Environmental, Inc.
1022 North Second Street
San Jose, CA 95112

Re: **Cargill Salt-Alameda/CS1602**

Dear Mr. Wheeler:

Attached are the results of the water samples submitted to our lab on October 25, 1993. For your reference, these analyses have been assigned our service request number SJ93-1308.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

Carol Klein for

Keoni A. Murphy
COLUMBIA ANALYTICAL SERVICES, INC.

KAM/kmh

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NR	Not Requested
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
VPH	Volatile Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	10/25/93
Project:	Cargill Salt-Alameda	**Service Request No.:**	SJ93-1308
Sample Matrix:	Water		

Solids, Total Dissolved
EPA Method 160.1[1]
mg/L (ppm)

Sample Name	Date Sampled	Result
AGB-2	10/22/93	340.
AGB-3	10/22/93	340.
AGB-4	10/22/93	300.
AGB-5	10/22/93	340.
AGB-6	10/22/93	390.
Method Blank		ND
MRL		20

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[1] Unless otherwise noted, all analyses were performed within EPA recommended maximum holding times specified in *Test Methods for Evaluating Solid Waste,* (SW-846, 3rd Edition) and *Methods for Chemical Analysis of Water and Waste* (EPA-600/4-79-020, Revised March 1983).

Approved by: Carol Klein Date: 11-9-93

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	10/25/93
Project:	Cargill Salt-Alameda	**Service Request No.:**	SJ93-1308
Sample Matrix:	Water		

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
μg/L (ppb)

Sample Name:		AGB-2	AGB-3 *	AGB-4
Date Analyzed:		10/29/93	11/02/93 **	10/29/93
Analyte	**MRL**			
Dichlorodifluoromethane (Freon 12)	1	ND	<100.	ND
Chloromethane	1	ND	<100.	ND
Vinyl Chloride	0.5	ND	<50.	ND
Bromomethane	0.5	ND	<50.	ND
Chloroethane	0.5	ND	<50.	ND
Trichlorofluoromethane (Freon 11)	0.5	ND	<50.	ND
1,1-Dichloroethene	0.5	ND	<50.	ND
Trichlorotrifluoroethane (Freon 113)	0.5	ND	<50.	ND
Methylene Chloride	0.5	ND	<50.	ND
trans-1,2-Dichloroethene	0.5	ND	<50.	ND
cis-1,2-Dichloroethene	0.5	ND	<50.	ND
1,1-Dichloroethane	0.5	ND	<50.	ND
Chloroform	0.5	ND	<50.	ND
1,1,1-Trichloroethane (TCA)	0.5	ND	<50.	ND
Carbon Tetrachloride	0.5	ND	<50.	ND
1,2-Dichloroethane	0.5	ND	<50.	ND
Trichloroethene (TCE)	0.5	ND	<50.	ND
1,2-Dichloropropane	0.5	ND	<50.	ND
Bromodichloromethane	0.5	ND	<50.	ND
2-Chloroethyl Vinyl Ether	5	ND	<500.	ND
trans-1,3-Dichloropropene	0.5	ND	<50.	ND
cis-1,3-Dichloropropene	0.5	ND	<50.	ND
1,1,2-Trichloroethane	0.5	ND	<50.	ND
Tetrachloroethene (PCE)	0.5	22.	890.	2.4
Dibromochloromethane	0.5	ND	<50.	ND
Chlorobenzene	0.5	ND	<50.	ND
Bromoform	0.5	ND	<50.	ND
1,1,2,2-Tetrachloroethane	0.5	ND	<50.	ND
1,3-Dichlorobenzene	1	ND	<100.	ND
1,4-Dichlorobenzene	1	ND	<100.	ND
1,2-Dichlorobenzene	1	ND	<100.	ND

* Raised MRL due to high analyte concentration requiring sample dilution.

** This sample was part of the analytical batch started on November 2, 1993. However, it was analyzed after midnight so the actual date analyzed is November 3, 1993.

Approved by: Carol Klein Date: 11-9-93

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	10/25/93
Project:	Cargill Salt-Alameda	**Service Request No.:**	SJ93-1308
Sample Matrix:	Water		

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
μg/L (ppb)

Sample Name:		**AGB-5 ***	**AGB-6 ***	**Method Blank**
Date Analyzed:		11/02/93 **	11/02/93 **	10/29/93
Analyte	**MRL**			
Dichlorodifluoromethane (Freon 12)	1	<20.	<100.	ND
Chloromethane	1	<20.	<100.	ND
Vinyl Chloride	0.5	<10.	<50.	ND
Bromomethane	0.5	<10.	<50.	ND
Chloroethane	0.5	<10.	<50.	ND
Trichlorofluoromethane (Freon 11)	0.5	<10.	<50.	ND
1,1-Dichloroethene	0.5	<10.	<50.	ND
Trichlorotrifluoroethane (Freon 113)	0.5	<10.	<50.	ND
Methylene Chloride	0.5	<10.	<50.	ND
trans-1,2-Dichloroethene	0.5	<10.	<50.	ND
cis-1,2-Dichloroethene	0.5	<10.	<50.	ND
1,1-Dichloroethane	0.5	<10.	<50.	ND
Chloroform	0.5	<10.	<50.	ND
1,1,1-Trichloroethane (TCA)	0.5	<10.	<50.	ND
Carbon Tetrachloride	0.5	<10.	<50.	ND
1,2-Dichloroethane	0.5	<10.	<50.	ND
Trichloroethene (TCE)	0.5	<10.	79.	ND
1,2-Dichloropropane	0.5	<10.	<50.	ND
Bromodichloromethane	0.5	<10.	<50.	ND
2-Chloroethyl Vinyl Ether	5	<100.	<500.	ND
trans-1,3-Dichloropropene	0.5	<10.	<50.	ND
cis-1,3-Dichloropropene	0.5	<10.	<50.	ND
1,1,2-Trichloroethane	0.5	<10.	<50.	ND
Tetrachloroethene (PCE)	0.5	240.	1,400.	ND
Dibromochloromethane	0.5	<10.	<50.	ND
Chlorobenzene	0.5	<10.	<50.	ND
Bromoform	0.5	<10.	<50.	ND
1,1,2,2-Tetrachloroethane	0.5	<10.	<50.	ND
1,3-Dichlorobenzene	1	<20.	<100.	ND
1,4-Dichlorobenzene	1	<20.	<100.	ND
1,2-Dichlorobenzene	1	<20.	<100.	ND

* Raised MRL due to high analyte concentration requiring sample dilution.

** This sample was part of the analytical batch started on November 2, 1993. However, it was analyzed after midnight so the actual date analyzed is November 3, 1993.

Approved by: Carol Klein Date: 11-9-93

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	10/25/93
Project:	Cargill Salt-Alameda	**Service Request No.:**	SJ93-1308
Sample Matrix:	Water		

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
μg/L (ppb)

Sample Name:		Method Blank
Date Analyzed:		11/02/93
Analyte	**MRL**	
Dichlorodifluoromethane (Freon 12)	1	ND
Chloromethane	1	ND
Vinyl Chloride	0.5	ND
Bromomethane	0.5	ND
Chloroethane	0.5	ND
Trichlorofluoromethane (Freon 11)	0.5	ND
1,1-Dichloroethene	0.5	ND
Trichlorotrifluoroethane (Freon 113)	0.5	ND
Methylene Chloride	0.5	ND
trans-1,2-Dichloroethene	0.5	ND
cis-1,2-Dichloroethene	0.5	ND
1,1-Dichloroethane	0.5	ND
Chloroform	0.5	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
Carbon Tetrachloride	0.5	ND
1,2-Dichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND
1,2-Dichloropropane	0.5	ND
Bromodichloromethane	0.5	ND
2-Chloroethyl Vinyl Ether	5	ND
trans-1,3-Dichloropropene	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Dibromochloromethane	0.5	ND
Chlorobenzene	0.5	ND
Bromoform	0.5	ND
1,1,2,2-Tetrachloroethane	0.5	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND

Approved by: Carol Klein Date: 11-9-93

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Groundworks Environmental, Inc.	**Date Received:**	10/25/93
Project:	Cargill Salt-Alameda	**Service Request No.:**	SJ93-1308
Sample Matrix:	Water		

Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	**Date Analyzed**	**Percent Recovery** 4-Bromofluorobenzene
AGB-2	10/29/93	116.
AGB-3	11/02/93	129.
AGB-4	10/29/93	101.
AGB-5	11/02/93	126.
AGB-6	11/02/93	126.
Method Blank	10/29/93	95.
Method Blank	11/02/93	88.
	CAS Acceptance Criteria	70-130

Approved by: Carol Klein Date: 11-9-93

Columbia Analytical Services, Inc.
1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 10/25/93 PAGE 1 OF 1

PROJECT NAME Cargill Salt - Alameda # CS1602
PROJECT MNGR. Mark Wheeler
COMPANY/ADDRESS Groundworks Environmental, Inc.
1022 North Second St
San Jose, CA 95112 PHONE (408)292-5592
SAMPLERS SIGNATURE A. Waldman

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles [✓ 601/8010] ☑ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method	Metals (total or dissolved) List Below	pH, Cond, Cl, SO4, PO4, F, NO2, Alk, [✓ TDS] TSS (circle)	NH3-N, COD, Total-P, TKN, NO3 (circle)	Total Organic Carbon TOC 415/9060	Total Phenols					REMARKS
AGB-2	10/22/93	1410	1-3	GW	3			✓						✓								
AGB-3	↓	1400	4-6	↓	3			✓						✓								
AGB-4		1350	7-9		3			✓						✓								
AGB-5		1338	10-12		3			✓						✓								
AGB-6		1325	13-15		3			✓						✓								

RELINQUISHED BY:
A. Waldman
Signature
Allen Waldman
Printed Name
Groundworks Environmental
Firm
10/25/93 9:35
Date/Time

RECEIVED BY:
Vu Huynh
Signature
VU HUYNH
Printed Name
CAS - SJ
Firm
10-25-93 9:35
Date/Time

TURNAROUND REQUIREMENTS:
___ 24 hr ___ 48 hr ___ 5 day
✓ Standard (~ 10-15 working days)
✓ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ______

REPORT REQUIREMENTS
✓ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV.CLP Deliverable Report

INVOICE INFORMATION:
P.O. # CS1602
Bill to: Groundworks Environmental, Inc

SAMPLE RECEIPT:
Shipping VIA: Sampler
Shipping #:
Condition: Ok
Lab No.: SJ93-1308

RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

DISTRIBUTION: WHITE - return to originator YELLOW - lab PINK - retained by originator 400-05

Appendix F

Certified Analytical Reports and Chain-of-Custody Documentation – Additional Soil and Groundwater Sampling Program (September 1994)

Columbia
Analytical
Services inc.

September 20, 1994 Service Request No: S941017

Mark Wheeler
Groundworks Environmental, Inc.
1022 North Second Street
San Jose, CA 95112

Re: **Cargill Salt - Alameda / CS1603**

Dear Mr. Wheeler:

Attached are the results of the water samples submitted to our lab on September 8, 1994. For your reference, these analyses have been assigned our service request number S941017.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

Keoni A Murphy

Keoni A. Murphy
COLUMBIA ANALYTICAL SERVICES, INC.

KAM/ajb

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NR	Not Requested
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
VPH	Volatile Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental	**Service Request:**	S941017
Project:	Cargill Salt - Alameda / CS1603	**Date Collected:**	9/6,7/94
Sample Matrix:	Water	**Date Received:**	9/8/94
		Date Extracted:	NA

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Units: ug/L (ppb)

		Sample Name:	**AP-1**	**AP-2**	**AP-5**
		Lab Code:	S941017-001	S941017-002	S941017-003
		Date Analyzed:	9/15/94	9/15/94	9/15/94
Analyte	**MRL**				
Dichlorodifluoromethane (CFC 12)	1		ND	ND	ND
Chloromethane	1		ND	ND	ND
Vinyl Chloride	0.5		ND	ND	ND
Bromomethane	0.5		ND	ND	ND
Chloroethane	0.5		ND	ND	ND
Trichlorofluoromethane (CFC 11)	0.5		ND	ND	ND
1,1-Dichloroethene	0.5		ND	ND	ND
Trichlorotrifluoroethane (CFC 113)	0.5		ND	ND	ND
Methylene Chloride	0.5		ND	ND	ND
trans-1,2-Dichloroethene	0.5		ND	ND	ND
cis-1,2-Dichloroethene	0.5		ND	ND	ND
1,1-Dichloroethane	0.5		ND	ND	ND
Chloroform	0.5		ND	ND	ND
1,1,1-Trichloroethane (TCA)	0.5		ND	ND	ND
Carbon Tetrachloride	0.5		ND	ND	ND
1,2-Dichloroethane	0.5		ND	ND	ND
Trichloroethene (TCE)	0.5		ND	ND	ND
1,2-Dichloropropane	0.5		ND	ND	ND
Bromodichloromethane	0.5		ND	ND	ND
2-Chloroethyl Vinyl Ether	5		ND	ND	ND
trans-1,3-Dichloropropene	0.5		ND	ND	ND
cis-1,3-Dichloropropene	0.5		ND	ND	ND
1,1,2-Trichloroethane	0.5		ND	ND	ND
Tetrachloroethene (PCE)	0.5		ND	ND	ND
Dibromochloromethane	0.5		ND	ND	ND
Chlorobenzene	0.5		ND	ND	ND
Bromoform	0.5		ND	ND	ND
1,1,2,2-Tetrachloroethane	0.5		ND	ND	ND
1,3-Dichlorobenzene	1		ND	ND	ND
1,4-Dichlorobenzene	1		ND	ND	ND
1,2-Dichlorobenzene	1		ND	ND	ND

Approved By: ____________________ Date: September 20, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda / CS1603
Sample Matrix: Water

Service Request: S941017
Date Collected: 9/6,7/94
Date Received: 9/8/94
Date Extracted: NA

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Units: ug/L (ppb)

		Sample Name: Lab Code: Date Analyzed:	**AC-2** S941017-004 9/15/94	**Method Blank** S940914-WB 9/14/94
Analyte	**MRL**			
Dichlorodifluoromethane (CFC 12)	1		ND	ND
Chloromethane	1		ND	ND
Vinyl Chloride	0.5		ND	ND
Bromomethane	0.5		ND	ND
Chloroethane	0.5		ND	ND
Trichlorofluoromethane (CFC 11)	0.5		ND	ND
1,1-Dichloroethene	0.5		ND	ND
Trichlorotrifluoroethane (CFC 113)	0.5		ND	ND
Methylene Chloride	0.5		ND	ND
trans-1,2-Dichloroethene	0.5		ND	ND
cis-1,2-Dichloroethene	0.5		ND	ND
1,1-Dichloroethane	0.5		ND	ND
Chloroform	0.5		ND	ND
1,1,1-Trichloroethane (TCA)	0.5		ND	ND
Carbon Tetrachloride	0.5		ND	ND
1,2-Dichloroethane	0.5		ND	ND
Trichloroethene (TCE)	0.5		ND	ND
1,2-Dichloropropane	0.5		ND	ND
Bromodichloromethane	0.5		ND	ND
2-Chloroethyl Vinyl Ether	5		ND	ND
trans-1,3-Dichloropropene	0.5		ND	ND
cis-1,3-Dichloropropene	0.5		ND	ND
1,1,2-Trichloroethane	0.5		ND	ND
Tetrachloroethene (PCE)	0.5		14	ND
Dibromochloromethane	0.5		ND	ND
Chlorobenzene	0.5		ND	ND
Bromoform	0.5		ND	ND
1,1,2,2-Tetrachloroethane	0.5		ND	ND
1,3-Dichlorobenzene	1		ND	ND
1,4-Dichlorobenzene	1		ND	ND
1,2-Dichlorobenzene	1		ND	ND

Approved By: Kevin A Murphy Date: September 20, 1994

3S44/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Groundworks Environmental	**Service Request:**	S941017
Project:	Cargill Salt - Alameda / CS1603	**Date Collected:**	9/6,7/94
Sample Matrix:	Water	**Date Received:**	9/8/94
		Date Extracted:	NA
		Date Analyzed:	9/14,15/94

Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	**Lab Code**	**Percent Recovery** 4-Bromofluorobenzene
AP-1	S941017-001	104
AP-2	S941017-002	107
AP-5	S941017-003	105
AC-2	S941017-004	105
Method Blank	S940914-WB	99

CAS Acceptance Limits: 76-138

Approved By: ______________________ Date: September 20, 1994

SUR1/062994

Columbia Analytical Services Inc.

1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 9/8/94 PAGE 1 OF 1

PROJECT NAME CARGILL SALT-ALAMEDA CS1603

PROJECT MNGR. MARK C WHEELER

COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL

624 E. EVELYN AVE, SUITE D

SUNNYVALE CA 94086 PHONE 408 730 3600

SAMPLERS SIGNATURE Mark C. Wheeler

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 ☑ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method ___	Metals (total or dissolved) List Below	pH, Cond, Cl, SO_4, PO_4, F, NO_2, Alk, TDS, TSS (circle)	NH_3-N, COD, Total-P, TKN, NO_3 (circle)	Total Organic Carbon TOC 415/9060	Total Phenols					REMARKS
AP-1	9.6.94	0940	1	GW	2			✓														
AP-2	9.6.94	1525	2	GW	2			✓														
AP-5	9.6.94	1150	3	GW	2			✓														
AC-2	9.7.94	1112	4	GW	2			✓														

RELINQUISHED BY:	RECEIVED BY:
Mark C. Wheeler Signature	Signature
MARK C. WHEELER Printed Name	JOHN TRUONG Printed Name
Groundworks Env. Firm	CAS/88 Firm
9/8/94 1650 Date/Time	9/8/94 1651 Date/Time

TURNAROUND REQUIREMENTS:

___ 24 hr ___ 48 hr ___ 5 day

✓ Standard (~ 10-15 working days)

✓ Provide Verbal Preliminary Results

___ Provide FAX Preliminary Results

Requested Report Date ___

REPORT REQUIREMENTS

✓ I. Routine Report

___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)

___ III. Data Validation Report (includes All Raw Data)

___ IV.CLP Deliverable Report

INVOICE INFORMATION:

P.O. # CS1603

Bill to: Groundworks Env.

SAMPLE RECEIPT:

Shipping VIA: Sampler

Shipping #: ___

Condition: Okay

Lab No.: S941017

RELINQUISHED BY:	RECEIVED BY:
Signature	Signature
Printed Name	Printed Name
Firm	Firm
Date/Time	Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

DIS[illegible]ON: W[illegible]return t[illegible]or; YE[illegible]lab; P[illegible]ained b[illegible]tor

Columbia
Analytical
Services inc.

September 15, 1994

Service Request No: S941018

Mark Wheeler
Groundworks Environmental, Inc.
1022 North Second Street
San Jose, CA 95112

Re: **Cargill Salt - Alameda / CS1603**

Dear Mr. Wheeler:

Attached are the results of the water samples submitted to our lab on September 8, 1994. For your reference, these analyses have been assigned our service request number S941018.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted,

Keoni A. Murphy
COLUMBIA ANALYTICAL SERVICES, INC.

KAM/ajb

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NR	Not Requested
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
VPH	Volatile Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental	**Service Request:**	S941018
Project:	Cargill Salt - Alameda / CS1603	**Date Collected:**	9/6,7/94
Sample Matrix:	Water	**Date Received:**	9/8/94
		Date Extracted:	NA

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Units: ug/L (ppb)

		Sample Name:	**AP-3**	**AP-4C**	**Method Blank**
		Lab Code:	S941018-001	S941018-002	S940912-WB
		Date Analyzed:	9/12/94	9/12/94	9/12/94
Analyte	**MRL**				
Dichlorodifluoromethane (CFC 12)	1		ND	ND	ND
Chloromethane	1		ND	ND	ND
Vinyl Chloride	0.5		ND	ND	ND
Bromomethane	0.5		ND	ND	ND
Chloroethane	0.5		ND	ND	ND
Trichlorofluoromethane (CFC 11)	0.5		32	ND	ND
1,1-Dichloroethene	0.5		1.6	ND	ND
Trichlorotrifluoroethane (CFC 113)	0.5		ND	ND	ND
Methylene Chloride	0.5		ND	ND	ND
trans-1,2-Dichloroethene	0.5		ND	ND	ND
cis-1,2-Dichloroethene	0.5		ND	ND	ND
1,1-Dichloroethane	0.5		ND	ND	ND
Chloroform	0.5		23	ND	ND
1,1,1-Trichloroethane (TCA)	0.5		1.8	ND	ND
Carbon Tetrachloride	0.5		ND	ND	ND
1,2-Dichloroethane	0.5		ND	ND	ND
Trichloroethene (TCE)	0.5		ND	ND	ND
1,2-Dichloropropane	0.5		ND	ND	ND
Bromodichloromethane	0.5		ND	ND	ND
2-Chloroethyl Vinyl Ether	5		ND	ND	ND
trans-1,3-Dichloropropene	0.5		ND	ND	ND
cis-1,3-Dichloropropene	0.5		ND	ND	ND
1,1,2-Trichloroethane	0.5		ND	ND	ND
Tetrachloroethene (PCE)	0.5		4.2	0.6	ND
Dibromochloromethane	0.5		ND	ND	ND
Chlorobenzene	0.5		ND	ND	ND
Bromoform	0.5		ND	ND	ND
1,1,2,2-Tetrachloroethane	0.5		ND	ND	ND
1,3-Dichlorobenzene	1		ND	ND	ND
1,4-Dichlorobenzene	1		ND	ND	ND
1,2-Dichlorobenzene	1		ND	ND	ND

Approved By: Kenneth A Murphy Date: September 15, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda / CS1603
Sample Matrix: Water

Service Request: S941018
Date Collected: 9/6,7/94
Date Received: 9/8/94
Date Extracted: NA
Date Analyzed: 9/12/94

Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	Lab Code	Percent Recovery 4-Bromofluorobenzene
AP-3	S941018-001	108
AP-4C	S941018-002	102
Method Blank	S940912-WB	107

CAS Acceptance Limits: 76-138

Approved By: Kevin A Murphy Date: September 15, 1994

Columbia Analytical Services inc.

1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 9/8/94 PAGE 1 OF 1

PROJECT NAME CARGILL SALT-ALAMEDA # CS1603

PROJECT MNGR. MARK C. WHEELER

COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL
624 E. EVELYN AVE, SUITE D
SUNNYVALE CA 94086 PHONE 423 7303600

SAMPLERS SIGNATURE Mark C. Wheeler

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 ☑ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method	Metals (total or dissolved) List Below	pH, Cond, Cl, SO_4, PO_4, F, NO_2, Alk, TDS, TSS (circle)	NH_3-N, COD, Total-P, TKN, NO_3 (circle)	Total Organic Carbon 415/9060 TOC	Total Phenols					REMARKS
AP-3	9-6-94	11:15	1	GW	2			✓														
AP-4C	9-7-94	15:00	2	GW	2			✓														

RELINQUISHED BY:

Signature
MARK C. WHEELER
Printed Name
Groundworks Environmental
Firm
9/8/94 1650
Date/Time

RECEIVED BY:

Signature
JOHN [illegible]
Printed Name
CAS/SJ
Firm
9/8/94 1650
Date/Time

TURNAROUND REQUIREMENTS:

___ 24 hr ___ 48 hr ✓ 5 day
___ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS

✓ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV. CLP Deliverable Report

INVOICE INFORMATION:

P.O. # CS1603
Bill to: GROUNDWORKS ENVIRONMENTAL

SAMPLE RECEIPT:

Shipping VIA: Angler
Shipping #:
Condition: Okay
Lab No.: S941018

RELINQUISHED BY:

Signature
Printed Name
Firm
Date/Time

RECEIVED BY:

Signature
Printed Name
Firm
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05

Columbia
Analytical
Services inc.

September 20, 1994

Service Request No: S941019

Mark Wheeler
Groundworks Environmental, Inc.
1022 North Second Street
San Jose, CA 95112

Re: **Cargill Salt - Alameda / CS1603**

Dear Mr. Wheeler:

Attached are the results of the soil samples submitted to our lab on September 8, 1994. For your reference, these analyses have been assigned our service request number S941019.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

Keoni A. Murphy
COLUMBIA ANALYTICAL SERVICES, INC.

KAM/ajb

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NR	Not Requested
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
VPH	Volatile Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda / CS1603
Sample Matrix: Soil

Service Request: S941019
Date Collected: 9/7/94
Date Received: 9/8/94
Date Extracted: NA

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Units: mg/Kg (ppm)
As Received Basis

	Sample Name:	**AC-1; 6.5-7 ***	**AC-1; 9-9.5 ***	**AC-1; 12-12.5**
	Lab Code:	S941019-001	S941019-002	S941019-003
	Date Analyzed:	9/13/94	9/14/94	9/13/94
Analyte	**MRL**			
Dichlorodifluoromethane (CFC 12)	0.1	<0.2	<1	ND
Chloromethane	0.1	<0.2	<1	ND
Vinyl Chloride	0.05	<0.1	<0.5	ND
Bromomethane	0.05	<0.1	<0.5	ND
Chloroethane	0.05	<0.1	<0.5	ND
Trichlorofluoromethane (CFC 11)	0.05	<0.1	<0.5	ND
1,1-Dichloroethene	0.05	<0.1	<0.5	ND
Trichlorotrifluoroethane (CFC 113)	0.05	<0.1	<0.5	ND
Methylene Chloride	0.05	<0.1	<0.5	ND
trans-1,2-Dichloroethene	0.05	<0.1	<0.5	ND
cis-1,2-Dichloroethene	0.05	<0.1	<0.5	ND
1,1-Dichloroethane	0.05	<0.1	<0.5	ND
Chloroform	0.05	<0.1	<0.5	ND
1,1,1-Trichloroethane (TCA)	0.05	<0.1	<0.5	ND
Carbon Tetrachloride	0.05	<0.1	<0.5	ND
1,2-Dichloroethane	0.05	<0.1	<0.5	ND
Trichloroethene (TCE)	0.05	<0.1	<0.5	ND
1,2-Dichloropropane	0.05	<0.1	<0.5	ND
Bromodichloromethane	0.05	<0.1	<0.5	ND
2-Chloroethyl Vinyl Ether	0.5	<1	<5	ND
trans-1,3-Dichloropropene	0.05	<0.1	<0.5	ND
cis-1,3-Dichloropropene	0.05	<0.1	<0.5	ND
1,1,2-Trichloroethane	0.05	<0.1	<0.5	ND
Tetrachloroethene (PCE)	0.05	3.4	31	ND
Dibromochloromethane	0.05	<0.1	<0.5	ND
Chlorobenzene	0.05	<0.1	<0.5	ND
Bromoform	0.05	<0.1	<0.5	ND
1,1,2,2-Tetrachloroethane	0.05	<0.1	<0.5	ND
1,3-Dichlorobenzene	0.1	<0.2	<1	ND
1,4-Dichlorobenzene	0.1	<0.2	<1	ND
1,2-Dichlorobenzene	0.1	<0.2	<1	ND

* Raised MRL due to high analyte concentration requiring sample dilution.

Approved By: Kevin A Murphy Date: September 20, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Groundworks Environmental	**Service Request:**	S941019
Project:	Cargill Salt - Alameda / CS1603	**Date Collected:**	9/7/94
Sample Matrix:	Soil	**Date Received:**	9/8/94
		Date Extracted:	NA

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Units: mg/Kg (ppm)
As Received Basis

	Sample Name:	**AC-1; 15-15.5**	**AC-2; 8-8.5**	**AC-2; 12-12.5**
	Lab Code:	S941019-004	S941019-005	S941019-006
	Date Analyzed:	9/13/94	9/14/94	9/14/94
Analyte	**MRL**			
Dichlorodifluoromethane (CFC 12)	0.1	ND	ND	ND
Chloromethane	0.1	ND	ND	ND
Vinyl Chloride	0.05	ND	ND	ND
Bromomethane	0.05	ND	ND	ND
Chloroethane	0.05	ND	ND	ND
Trichlorofluoromethane (CFC 11)	0.05	ND	ND	ND
1,1-Dichloroethene	0.05	ND	ND	ND
Trichlorotrifluoroethane (CFC 113)	0.05	ND	ND	ND
Methylene Chloride	0.05	ND	ND	ND
trans-1,2-Dichloroethene	0.05	ND	ND	ND
cis-1,2-Dichloroethene	0.05	ND	ND	ND
1,1-Dichloroethane	0.05	ND	ND	ND
Chloroform	0.05	ND	ND	ND
1,1,1-Trichloroethane (TCA)	0.05	ND	ND	ND
Carbon Tetrachloride	0.05	ND	ND	ND
1,2-Dichloroethane	0.05	ND	ND	ND
Trichloroethene (TCE)	0.05	ND	ND	ND
1,2-Dichloropropane	0.05	ND	ND	ND
Bromodichloromethane	0.05	ND	ND	ND
2-Chloroethyl Vinyl Ether	0.5	ND	ND	ND
trans-1,3-Dichloropropene	0.05	ND	ND	ND
cis-1,3-Dichloropropene	0.05	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND
Tetrachloroethene (PCE)	0.05	ND	0.83	ND
Dibromochloromethane	0.05	ND	ND	ND
Chlorobenzene	0.05	ND	ND	ND
Bromoform	0.05	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND
1,3-Dichlorobenzene	0.1	ND	ND	ND
1,4-Dichlorobenzene	0.1	ND	ND	ND
1,2-Dichlorobenzene	0.1	ND	ND	ND

Approved By: Kevin A Murphy Date: September 20, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda / CS1603
Sample Matrix: Soil

Service Request: S941019
Date Collected: 9/7/94
Date Received: 9/8/94
Date Extracted: NA

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Units: mg/Kg (ppm)
As Received Basis

	Sample Name:	**AC-2;15-15.5**	**AC-2;24.5-25**	**Method Blank**
	Lab Code:	S941019-007	S941019-010	S940913-SB
	Date Analyzed:	9/13/94	9/14/94	9/13/94
Analyte	**MRL**			
Dichlorodifluoromethane (CFC 12)	0.1	ND	ND	ND
Chloromethane	0.1	ND	ND	ND
Vinyl Chloride	0.05	ND	ND	ND
Bromomethane	0.05	ND	ND	ND
Chloroethane	0.05	ND	ND	ND
Trichlorofluoromethane (CFC 11)	0.05	ND	ND	ND
1,1-Dichloroethene	0.05	ND	ND	ND
Trichlorotrifluoroethane (CFC 113)	0.05	ND	ND	ND
Methylene Chloride	0.05	ND	ND	ND
trans-1,2-Dichloroethene	0.05	ND	ND	ND
cis-1,2-Dichloroethene	0.05	ND	ND	ND
1,1-Dichloroethane	0.05	ND	ND	ND
Chloroform	0.05	ND	ND	ND
1,1,1-Trichloroethane (TCA)	0.05	ND	ND	ND
Carbon Tetrachloride	0.05	ND	ND	ND
1,2-Dichloroethane	0.05	ND	ND	ND
Trichloroethene (TCE)	0.05	ND	ND	ND
1,2-Dichloropropane	0.05	ND	ND	ND
Bromodichloromethane	0.05	ND	ND	ND
2-Chloroethyl Vinyl Ether	0.5	ND	ND	ND
trans-1,3-Dichloropropene	0.05	ND	ND	ND
cis-1,3-Dichloropropene	0.05	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND
Tetrachloroethene (PCE)	0.05	ND	ND	ND
Dibromochloromethane	0.05	ND	ND	ND
Chlorobenzene	0.05	ND	ND	ND
Bromoform	0.05	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND
1,3-Dichlorobenzene	0.1	ND	ND	ND
1,4-Dichlorobenzene	0.1	ND	ND	ND
1,2-Dichlorobenzene	0.1	ND	ND	ND

Approved By: Kevin A Murphy Date: September 20, 1994

Analytical Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda / CS1603
Sample Matrix: Soil

Service Request: S941019
Date Collected: 9/7/94
Date Received: 9/8/94
Date Extracted: NA

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Units: mg/Kg (ppm)
As Received Basis

		Sample Name: **Method Blank**
		Lab Code: S940914-SB
		Date Analyzed: 9/14/94
Analyte	**MRL**	
Dichlorodifluoromethane (CFC 12)	0.1	ND
Chloromethane	0.1	ND
Vinyl Chloride	0.05	ND
Bromomethane	0.05	ND
Chloroethane	0.05	ND
Trichlorofluoromethane (CFC 11)	0.05	ND
1,1-Dichloroethene	0.05	ND
Trichlorotrifluoroethane (CFC 113)	0.05	ND
Methylene Chloride	0.05	ND
trans-1,2-Dichloroethene	0.05	ND
cis-1,2-Dichloroethene	0.05	ND
1,1-Dichloroethane	0.05	ND
Chloroform	0.05	ND
1,1,1-Trichloroethane (TCA)	0.05	ND
Carbon Tetrachloride	0.05	ND
1,2-Dichloroethane	0.05	ND
Trichloroethene (TCE)	0.05	ND
1,2-Dichloropropane	0.05	ND
Bromodichloromethane	0.05	ND
2-Chloroethyl Vinyl Ether	0.5	ND
trans-1,3-Dichloropropene	0.05	ND
cis-1,3-Dichloropropene	0.05	ND
1,1,2-Trichloroethane	0.05	ND
Tetrachloroethene (PCE)	0.05	ND
Dibromochloromethane	0.05	ND
Chlorobenzene	0.05	ND
Bromoform	0.05	ND
1,1,2,2-Tetrachloroethane	0.05	ND
1,3-Dichlorobenzene	0.1	ND
1,4-Dichlorobenzene	0.1	ND
1,2-Dichlorobenzene	0.1	ND

Approved By: ______________________ Date: September 20, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Groundworks Environmental
Project: Cargill Salt - Alameda / CS1603
Sample Matrix: Soil

Service Request: S941019
Date Collected: 9/7/94
Date Received: 9/8/94
Date Extracted: NA
Date Analyzed: 9/13,14/94

Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	**Lab Code**	**Percent Recovery** 4-Bromofluorobenzene
AC-1; 6.5-7	S941019-001	102
AC-1; 9-9.5	S941019-002	109
AC-1; 12-12.5	S941019-003	108
AC-1; 15-15.5	S941019-004	109
AC-2; 8-8.5	S941019-005	107
AC-2; 12-12.5	S941019-006	105
AC-2; 15-15.5	S941019-007	108
AC-2; 24.5-25	S941019-010	104
Method Blank	S940913-SB	106
Method Blank	S940914-SB	109

CAS Acceptance Limits: 79-141

Approved By: Kenneth Murphy Date: September 20, 1994

SUR1/062994

Columbia Analytical Services inc.

1921 Ringwood Ave. • San Jose, CA 95131 • (408) 437-2400, FAX (408)437-9356

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 9/8/94 PAGE 1 OF 1

PROJECT NAME CARGILL SALT-ALAMEDA # CS1603

PROJECT MNGR. MARK C. WHEELER

COMPANY/ADDRESS GROUNDWORKS ENVIRONMENTAL
624 E. EVELYN AVE, SUITE D
SUNNYVALE, CA 94086 PHONE 408 730 5600

SAMPLERS SIGNATURE Mark C Wheeler

ANALYSIS REQUESTED

	SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 ☑ 602/8020 ☐	TPH as Gas/BTEX DHS LUFT / 8020	TPH as Diesel/HBHC DHS LUFT	TRPH - 418.1	Oil and Grease Method	Metals (total or dissolved) List Below	pH, Cond, Cl, SO4, PO4, F, NO2, Alk, TDS, TSS (circle)	NH3-N, COD, Total-P, TKN, NO3 (circle)	Total Organic Carbon TOC 415/9060	Total Phenols					REMARKS
	AC-1; 6.5-7'	9.7.94	1313	1	Soil	1			✓														HOLD
	AC-1; 9-9.5'	9.7.94	1323	2	Soil	1			✓														
	AC-1; 12-12.5'	9.7.94	1355	3	Soil	1			✓														
	AC-1; 15-15.5	9.7.94	1403	4	Soil	1			✓														
	AC-2; 8-8.5	9.7.94	0935	5	Soil	1			✓														
	AC-2; 12-12.5	9.7.94	0953	6	Soil	1			✓														
	AC-2; 15-15.5	9.7.94	0957	7	Soil	1			✓														
*	AC-2; 18-18.5	9.7.94	1035	8	Soil	1			✓														
*	AC-2; 21.5-22	9.7.94	1055	9	Soil	1			✓														
	AC-2; 24.5-25	9.7.94	1137	10	Soil	1			✓														↓

RELINQUISHED BY:
Mark C Wheeler
Signature
MARK C. WHEELER
Printed Name
GROUNDWORKS ENV.
Firm
9.8.94 1700
Date/Time

RECEIVED BY:
Signature
JOHN TRUONG
Printed Name
CAS/SJ
Firm
9/8/94 1700
Date/Time

TURNAROUND REQUIREMENTS:
___ 24 hr ___ 48 hr ___ 5 day
✓ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
✓ I. Routine Report
✓ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV.CLP Deliverable Report

INVOICE INFORMATION:
P.O. # CS1603
Bill to: GROUNDWORKS ENV.

SAMPLE RECEIPT:
Shipping VIA: Sampler
Shipping #:
Condition: Okay
Lab No.: S941019

RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:
Analyze all sample except AC-2; 18-18.5 *
per M Wheeler 9/9/94 AC-2; 21.5-22 *

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05