REPORT OF
DOWNGRADIENT INVESTIGATION

B&C Gas Mini Mart
Livermore, California

NW 97

Prepared for
B & C Gas Mini Mart

Prepared by
EINARSON, FOWLER, & WATSON
2560 East Bayshore Road
Palo Alto, California 94303
November 7, 1997

Project BNC101

EINARSON
FOWLER & WATSON
Consultants In Environmental Hydrogeology & Engineering

November 7, 1997
Project No. BNC101

Ms. Eva Chu
Alameda County Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: Report of Downgradient Investigation, B&C Gas Mini Mart, 2008 First Street, Livermore, California

Dear Ms. Chu:

Einarson, Fowler & Watson (EFW) has prepared the following report presenting results of two phases of additional site investigation performed in September 1997 for the B&C Gas Mini Mart at 2008 First Street, Livermore, California (Figure 1).

Alameda County Environmental Health Services (ACEHS) requested that further investigation of the petroleum hydrocarbon release at 2008 First Street be conducted, because evidence of petroleum hydrocarbon impacts to groundwater have been detected at a relatively significant distance downgradient from (west of) the property. Also, two municipal water-supply wells are located to the west of the site, and ACEHS requested that the investigation assess the potential for the contaminant plume to impact the water supply wells. In 1995, the extent of groundwater impact was mapped to be at least 1,000 feet downgradient. The municipal water supply wells are located approximately 2,500 feet west of the site. The constituents of concern have been defined to be gasoline and its components, particularly benzene and the oxygenate methyl-tertiary-butyl-ether (MTBE).

This investigation focused on the B&C Gas Mini Mart and the water table downgradient from the site. The scope of work is detailed below. A description of the site, including the hydrogeologic setting and site history, is provided. The investigation findings are then presented for the two phases of the investigation, followed by a discussion of the results. In conclusion, recommendations for further action are provided.

The extent of groundwater impact at the water table does not appear to have changed significantly since 1995. Biodegradation of gasoline constituents has been occurring at the site and the potential for considerable biodegradation downgradient exists. The potential for the petroleum constituents to impact the water-supply wells west of the site has not been

2650 East Bayshore Road • Palo Alto, California 94303 • Telephone 415.843.3828 • FAX 415.843.3815

determined, as the approved workplan and subsurface conditions only allowed for investigation of the downgradient groundwater impact at the water table. The location and downgradient extent of the dissolved plume at depth has not been directly addressed in this investigation. However, there is some evidence from various studies made with regard to adjacent groundwater contamination sites that suggests that downward migration may be prevented by a reportedly laterally continuous aquitard.[1]

SITE INFORMATION

Contact and Site Address:

Mr. Balaji Angle
B&C Gas Mini Mart
2008 First Street
Livermore, California 94550

PROJECT OBJECTIVES AND SCOPE

A workplan for further investigation of the B&C Gas Mini Mart and the downgradient area was developed by Geomatrix Consultants (Geomatrix) and submitted to ACEHS in April 1997.[2] The workplan was approved by ACEHS,[3] but the Underground Storage Tank Cleanup Fund (USTCF) staff deemed that only part of the workplan was eligible for pre-approval of costs.[4] Therefore, the investigative work completed by EFW was limited to the scope approved by the USTCF.

As defined in the workplan, the objective of this investigation was to evaluate the following: (1) the downgradient extent of groundwater impact, specifically with regard to MTBE and benzene, (2) the potential for future migration of groundwater contaminants, (3) the potential for other sources contributing to the contamination, and (4) the potential risk to human health, if any, resulting from the plume.

To complete the project objectives, the scope of work included two phases of investigation: (1) a review of available data and (2) a field investigation to collect further data regarding groundwater chemistry at the site and the area downgradient of the site. The specific tasks completed for each phase are listed below. The properties and sampling locations referenced below are shown on Figure 2.

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[1] H[+]GCL, Inc. *Deep Groundwater Conduit Study, Livermore Arcade Shopping Center, First Street and South P Street, Livermore, California.* December 6, 1993.

[2] Geomatrix Consultants. *Workplan for Phase I Investigation, B&C Gas Mini Mart, 2008 First Street, Livermore, California.* April 1997.

[3] Alameda County Environmental Health Services. Letter to B. Angle re: "Workplan Approval for 2008 First Street, Livermore, California." April 23, 1997.

[4] Underground Storage Tank Cleanup Fund. Letter to B. Angle re: "Pre-approval of Corrective Action Costs, Claim No. 3272, 2008 First St., Livermore, California." June 19, 1997.

Data Review

- Public records for surrounding properties, primarily site assessments and investigative reports, were reviewed.
- Information on the municipal water-supply wells, located approximately one-half mile downgradient from the site, was obtained from the well owner, California Water Service Company (CWS).

Field Investigation

- Downgradient from the property, five soil borings (B97-1 through B97-5) were completed to groundwater. Two of these borings were continuously logged to further define the local geology.
- Grab groundwater samples were collected from each of the downgradient borings and were analyzed for total petroleum hydrocarbons as gasoline (TPH-G); benzene, toluene, ethylbenzene, and xylenes (aromatic compounds collectively referred to as BTEX); and MTBE. At two of the locations, groundwater samples were also analyzed for gasoline additives and parameters indicative of biodegradation.
- One downgradient groundwater monitoring well (MW-24) at the former Livermore Arcade Shopping Center (Livermore Arcade) property (currently Vintner's Square) was sampled for TPH-G, BTEX, MTBE, gasoline additives, and biodegradation indicators. Sampling of this well replaced the installation of one of the borings proposed in the workplan.
- Three site monitoring wells (MW-1, MW-2, and MW-4) were sampled for biodegradation indicators. Site well MW-2 was also sampled for gasoline additives.
- A sample of the free product in downgradient groundwater monitoring well MW-01 which is located at the Mill Springs Park Apartments (MSP), a former bulk fuel terminal, was collected and product analysis was conducted.

BACKGROUND

The following site information has been compiled from reports on file with ACEHS. Site information was also provided by the site owner and ACEHS. A description of the local hydrogeologic setting is presented below. A chronological site history including summaries of previous site investigations, remedial activities, and historical groundwater monitoring results, is also provided in this section. All properties and groundwater sample locations referenced below are designated in Figure 2, an aerial photograph of the site area.

Hydrogeologic Setting

The site is located in the Livermore Valley groundwater basin. The sediments found in the Livermore Valley are a combination of lacustrine to alluvial clay facies and alluvial gravel facies, consisting of cemented gravels and cobbles, and reworked terrace deposits. Sediments consist of oxidized yellowish-brown clay, silt, sand, and gravel deposited in alluvial fans and marsh/deltaic environments. This area of deposition contains braided channel systems and complex interfingering.

In the site vicinity, subsurface investigations at the Livermore Arcade have found an upper unconfined aquifer consisting primarily of gravels with sand and clay. A low-permeability clay unit is found at depths of approximately 75 to 110 feet below ground surface (bgs). Below the clayey unit, the top of a lower, semi-confined aquifer is found at depths ranging from 110 to 145 feet bgs. No evidence of communication between the upper and lower aquifers in the site vicinity has been documented. However, given the complex alluvial depositional environment, and based on the alluvial fan geometry, it is possible that these aquifers converge at some point (north) in the subsurface.[5]

Subsurface work conducted at the site has found the soil to be predominantly sandy clay, silty sand, silty gravel, and sandy gravel to a maximum explored depth of 77 feet. Over the last nine years, static water levels have ranged from 68.7 feet bgs (January 1992) to 17.0 feet bgs (February 1997). The groundwater flow generally is to the west.[6]

Site History

The B&C Gas Mini Mart property is located on the northeast corner of First and South L Streets in Livermore, California, and currently operates as a gasoline station and mini market. From at least 1988 until 1994, Desert Petroleum (DP) owned and operated the site. In January 1994, DP sold the site to Mr. Balaji Angle.

Previous Investigations and Corrective Actions

In May 1988, as part of permitting for possible tank replacement, soil contamination was noted when borings were being completed in the tank backfill. As a result of finding this soil contamination, new tanks were not installed at this time. A preliminary site assessment was conducted in September 1988. Three soil borings were completed, one of which was converted to a monitoring well (MW-1). The highest concentrations of petroleum hydrocarbons in groundwater from well MW-1 were detected in August 1990. TPH-G was detected at a concentration of 24,000 micrograms per liter (µg/l) and benzene at a concentration of 1,300 µg/l. MTBE was not monitored for in 1990. In March 1994 a 280-

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[5] H[+]GCL, Inc. *Deep Groundwater Conduit Study, Livermore Arcade Shopping Center, First Street and South P Street, Livermore, California.* December 6, 1993.

[6] Remediation Service Int'l. *Soil & Groundwater Investigation Report for 2008 First Street, Livermore, California.* July 22, 1994.

gallon waste oil underground storage tank (UST) and 25 cubic yards of soil were removed as part of closing the auto repair shop portion of the station.. Three months later in June, wells MW-2, MW-3, and MW-4 were installed.

In August 1994, free product was encountered in well MW-2, and product removal commenced twice a month. In December 1994, the product thickness was measured to be 0.07 feet. In the beginning of January 1995, product thickness was measured to be 0.04 feet. By the end of January 1995, no measurable thickness of product remained, only a sheen could be detected. The last documentation of a sheen in well MW-2 was made in June 1995.[7]

In March 1995, soil borings (H-1 through H-5) were advanced around the perimeter of the B&C Gas Mini Mart site. In completing one of the soil borings about 75 feet downgradient from the site, free product was found on the augers. A release from the union between a tank subpump and product line was reported to have occurred. The quantity of the release is unknown.

Mill Springs Apts

In March 1995, free product was found in well MW-01 at the MSP property, 1809 Railroad Avenue, approximately 850 feet downgradient from the site. This detection of free product initiated additional work. In April 1995, an investigation was conducted at the MSP property, a former bulk fuel terminal, concluding that the free product found in MSP well MW-01 was from an off-site source.[8] Eleven temporary borings (H-1 through H-11) were completed and groundwater samples collected. Results from the groundwater analyses indicated high concentrations of MTBE and benzene on the eastern portion of the site, and non-detectable concentrations on the southwestern portion of the site (Figure 3).

One gasoline UST at the B&C Gas Mini Mart site failed an integrity test in September 1995. The tank was immediately taken out of commission and ACEHS was notified. In July 1996 further source removal was conducted. Two more gasoline USTs were removed, and new double-walled fiberglass USTs and fiberglass piping with automated leak detection were installed. Other remedial activities included the removal of two hydraulic lifts and approximately 700 cubic yards of impacted soil. Also, one 1,000-gallon UST discovered during excavation activities was closed in place with approval from ACEHS and the Livermore Fire Department by grouting with a cement sand slurry.

In October 1995, two additional monitoring wells (off-site well MW-5 and well MW-6) were installed for the B&C Gas Mini Mart site.

Historical Groundwater Trends

Table 1 presents a summary of historical groundwater monitoring results at B&C Gas Mini Mart. Over the last three years of monitoring at the site, concentrations of benzene in

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[7] Product thickness information from Remediation Service, Int'l field records, "Free Product Removal Logs."
[8] Earth Tech, *Final Report LNAPL Assessment and Groundwater Characterization Evaluation, Mill Springs Park Apartments, 1809 Railroad Avenue, Livermore, California*, October 9, 1995.

groundwater have steadily decreased. In 1994, benzene was detected in well MW-1 at concentrations ranging from 690 to 290 µg/l. The most recent sample from well MW-1 collected in February 1996, contained 4.2 µg/l. Similar decreases have been seen in wells MW-3 and MW-4. In November 1994, benzene was detected in well MW-3 at a concentration of 8,000 µg/l. The most recent sample, collected February 1997, contained 260 µg/l benzene. In November 1994, benzene was detected in well MW-4 at a concentration of 110 µg/l. In February 1996 and 1997, benzene was not detectable. Well MW-2, which previously contained floating product until 1995, was reported to contain benzene at a concentration of 860 µg/l in February 1997. Fewer samples have been collected from wells MW-5 and MW-6; however, benzene concentrations have decreased significantly over the last three sampling events. In October 1995, wells MW-5 and MW-6 contained benzene at concentrations of 16,000 and 9,900 µg/l, respectively. In February 1997, benzene was detected at a concentration of 1,300 and 450 µg/l, respectively.

Analysis of site groundwater samples for MTBE began in June 1995. Since then, concentrations of MTBE have decreased significantly. Initial analysis for MTBE from site wells in June 1995 detected concentrations ranging from 4,200 µg/l in well MW-3 to 47,000 µg/l in well MW-6. By February 1997, site wells contained significantly lower concentrations of MTBE. Well MW-3 contained 900 µg/l and well MW-6 contained 790 µg/l.

INVESTIGATION FINDINGS

Following is a summary of our findings from both phases of the investigation. A detailed discussion of the specific investigation methods used, including soil coring, groundwater sampling, and laboratory analysis, is presented in Appendix A.

Data Review

File Reviews

Available files from ACEHS pertaining to properties in the site area were reviewed. The most recent benzene and MTBE groundwater analytical data in the site area was compiled from the surrounding property files, and is presented as Figure 3. As was customary when many of the investigations were initiated, samples were not always analyzed for MTBE. In addition to reviewing the groundwater quality in the site vicinity, two specific site files were reviewed in greater detail. The Groth Brothers Oldsmobile (Groth) property files were reviewed to assess the potential for having contamination sources contributing to the groundwater plume. Files from the Livermore Arcade were reviewed to gain information on the local hydrogeologic conditions. Across Railroad Avenue from the Livermore Arcade site is the former Miller's Outpost Shopping Center (Miller's Outpost), currently named Livermore Valley Square Shopping Center. Plumes from the Livermore Arcade and Miller's Outpost have commingled; therefore, information from the Miller's Outpost site was also

reviewed. All properties and sampling locations referred to below are presented in Figures 2 and 3.

No data was obtained regarding the abandoned gasoline station located south of the site, at the corner of South "L" Street and Second Street.

Groth Brothers Property

The Groth property is west of the B&C Mini Mart site, on South L Street between First Street and Railroad Avenue. Seven USTs have been in use at the Groth property. In October 1990, five USTs were removed. Three of these USTs were located at the northern corner of the property (a 1,500-gallon and a 1,000-gallon gasoline UST, and a 1,500-gallon diesel UST. The concentrations of petroleum hydrocarbons detected in soil beneath these tanks were below action levels. The other two USTs removed at this time included a 550-gallon gasoline UST, located at the eastern side of the property, and a 550-gallon waste oil UST, located on the southern corner of the property. The soil beneath the gasoline tank did not contain significant levels of petroleum hydrocarbons. Soil beneath the waste oil tank contained elevated concentrations of total petroleum hydrocarbons as motor oil (TPH-MO), total oil and grease (TOG), and two volatile organic compounds (VOCs). The soil in the waste oil tank pit was overexcavated, and soil samples from the overexcavation were analyzed for BTEX and VOCs, none of which were detected.

Two motor oil USTs, located on the southern corner of the property were closed in place in March 1991. A soil sample collected from beneath one of the waste oil tanks contained 260 mg/l TPH-MO. In April 1994, four soil borings were completed around the former waste oil tank; one of the borings was converted to a groundwater monitoring well (MW-1). Soil samples did not contain remarkable levels of TPH-G, TPH-D, TPH-MO, TOG, or VOCs. The most recent results available for groundwater sampled from Groth Brothers well MW-1 (August 1995) contained 110 µg/l TPH-D, 160 µg/l TPH-G, and 150 µg/l tetrachloroethene (PCE). BTEX compounds, MTBE, and TOG were non-detectable (Figure 3).

As part of investigations related to the B&C Gas Mini Mart, in October 1995, four more borings (G-1 through G-4) were completed on the northern portion of the Groth property (Figures 2 and 3). Grab groundwater samples were collected from these borings. Sample G-3 contained high concentrations of benzene (1,300 µg/l) and MTBE (18,000 µg/l). Lower concentrations were detected at the other locations; benzene values ranged from 2.5 to 61 µg/l and MTBE values ranged from 9.4 to 150 µg/l. No records after this date were found.

Livermore Arcade and Miller's Outpost Shopping Centers

The Livermore Arcade site is west of South P Street, between First Street and Railroad Avenue. Miller's Outpost is across the street from the Livermore Arcade, on the northwest

corner of Railroad Avenue and North P Street. Within the Livermore Arcade is Mike's One Hour Cleaners (Mike's) and within Miller's Outpost is Paul's Sparkle Cleaners (Paul's), located 450 feet downgradient from Mike's. During operations at these dry cleaning sites, there were spills of PCE and disposal of PCE wastes to the sanitary sewer, which has lead to soil contamination and a commingled groundwater plume. The lateral and vertical extent of PCE and its breakdown products (i.e., other VOCs) in soil and groundwater have been defined through numerous investigations.

Groundwater at this site has been found to occur within two distinct water-bearing zones.[9] An upper or shallow unconfined water-bearing zone occurs to a depth of approximately 70 feet. Underlying the shallow aquifer is a reportedly continuous silty-clay aquitard, about 40 feet thick. Beneath the silty-clay unit is the deeper aquifer. Site monitoring wells have been completed in both the shallow and deep aquifers.

According to H⁺GCL, Inc., the VOC plume extends to approximately 1,000 feet northwest of the Livermore Arcade, between wells CWS #3 and CWS #8.[10] The impacts are reportedly limited to the shallow aquifer. A study to assess the potential for VOC contamination to reach the deeper aquifer was conducted in 1993.[11] The study concluded that the confining silty/clay unit overlying the lower aquifer is laterally continuous in the area of the site, and it was estimated that the low-permeability unit extends continually in the subsurface for at least a one-mile radius from the subject site. Therefore, according to H⁺GCL, Inc., the VOC plume should not impact the deep aquifer in the vicinity of the Livermore Arcade site. It was also suggested that the plume could impact the deep aquifer further north, where the upper and lower water-bearing zones may merge.

Using a soil vapor extraction (SVE) and air sparging remedial system, the concentrations of PCE in the groundwater plume have been reduced to approximately 100 µg/l. The two cleaners and the VOC plume are considered to be one site, and the site has obtained non-attainment status for the shallow water-bearing zone in the vicinity of the cleaners.[12] No detections of PCE or its breakdown products (other VOCs) in deep-aquifer monitoring well samples have been recorded, with the following exception. PCE concentrations less than 5 µg/l have been intermittently detected in one of the site's deep monitoring wells, DMW-01 (Figure 2). These low-level detections of PCE are likely a result of cross-contamination

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[9] California Regional Water Quality Control Board San Francisco Bay Region. "Tentative Order, Adoption of Final Site Cleanup Requirements and Rescission of Order No. 93-139." March 3, 1996.

[10] California Regional Water Quality Control Board San Francisco Bay Region. "Tentative Order, Adoption of Final Site Cleanup Requirements and Rescission of Order No. 93-139." March 3, 1996.

[11] H⁺GCL, Inc. *Deep Groundwater Conduit Study, Livermore Arcade Shopping Center, First Street and South P Street, Livermore, California.* December 6, 1993.

[12] Non-attainment status is defined as an area of groundwater where water quality objectives cannot reasonably be achieved, after considering what is technologically and economically feasible within a reasonable time period. Water quality objectives must continue to be met at the boundary outside of the designated non-attainment area.

during the well installation, and samples collected after these detections had PCE concentrations that were less than 0.5 µg/l.[13]

Municipal Well Information

The California Water Service Company owns and operates two municipal water-supply wells downgradient from the site. Well CWS #3 is located about 2,800 feet west-southwest of the site (Figure 2). Relative to the site, this well is in the general downgradient direction, but it lies far enough west that it does not appear to be in line with the current direction of plume migration. This well is completed to a depth of 415 feet, and is screened from a depth of 280 to 412 feet bgs. Historic static (non-pumping) water-level measurements from 1940 to 1997 indicate that groundwater elevations in well CWS #3 have ranged from approximately 187 to 37 feet bgs (277 to 427 feet, mean sea level [MSL]). In the last two years, groundwater elevations have ranged from approximately 96 to 40 feet bgs (368 to 424 feet MSL). In May 1997, groundwater was measured to be 78 feet bgs. According to CWS personnel, well CWS #3 currently extracts groundwater 24 hours per day from about April to October at a rate of approximately 340 to 350 gallons per minute (gpm). This well is one of CWS' least efficient water supply wells.

Well CWS #8 is located about 2,300 feet west of the site. This well is completed to a depth of 273 feet. The well perforations are intermittent from 122 feet to 263 feet bgs. Historic water-level measurements from 1950 to 1997 indicate that groundwater elevations in well CWS #8 have ranged from approximately 238 to 27 feet bgs (228 to 439 feet MSL). In the last two years, groundwater elevations have ranged from 49 to 27 feet bgs (417 to 439 feet MSL). In May 1997, groundwater was measured to be 113 feet bgs. According to CWS personnel, well CWS #8 currently extracts groundwater 15 hours per day from about April to October at a rate of approximately 400 to 450 gpm.

According to CWS staff, the use of these wells is quite variable, depending on the seasonal weather changes and status of other water supplies. Both CWS wells were sampled for MTBE this year and no detectable concentrations were reported.

Field Investigation

Soil Borings

To further delineate the lateral extent of dissolved petroleum constituents in groundwater, at the water table, five downgradient soil borings were completed to fifty-five feet bgs and grab groundwater samples were collected. EFW subcontracted Precision Sampling Inc. (PSI) to drill soil borings B97-1 through B97-5 using direct-push methods, on September 8 to 10, 1997 (Figures 2 and 3). The April 1997 workplan stated that six borings were to be continuously cored. However, due to access problems, only five of the borings could be

[13] California Regional Water Quality Control Board San Francisco Bay Region. "Tentative Order, Adoption of Final Site Cleanup Requirements and Rescission of Order No. 93-139." March 3, 1996.

completed. As a replacement for the boring designated B-4 in the workplan (at the southeast corner of Railroad Avenue and South P Street), monitoring well MW-24 on the former Livermore Arcade property was sampled. Due to the restricted hours imposed by the City of Livermore for conducting work in the streets, three of the borings (B97-2 through B97-4) were not sampled continuously as stated in the workplan, but were driven directly to depths of 55 feet bgs to collect of grab groundwater samples.

In borings B97-1 and B97-5, soil samples were continuously collected and logged by an EFW geologist, according to the Unified Soil Classification System (USCS). Detailed hydrostratigraphic profiles (boring logs) of these two borings are located in Appendix B. Select soil samples were collected and analyzed in the field with a flame ionization detector (FID) to evaluate the presence of hydrocarbons in the soil. These results are included on the hydrostratigraphic profiles. No impacts to soil were detected.

In borings B97-1 and B97-5, primarily clayey gravels and well-graded gravels with sand and clay were present to a depth of about 44 feet. At 44 feet to about 52 feet bgs, fine-grained sediments were present, including clayey sand, silt, and gravelly clay. Underlying the fine-grained sediments, to the total depth of the boring, were clayey gravels and well-graded gravel with sand. Water was first encountered at 52 feet bgs in boring B97-1, and at 40 feet bgs in boring B97-5. In boring B97-5 an attempt to collect a groundwater sample at 40 feet bgs was made, however, sufficient groundwater did not enter the borehole within one-half hour. The boring was continued and the next saturated zone was encountered at 47 feet bgs.

At all locations the borings were completed to 55 feet bgs, temporary PVC well casing was installed, and the drive casing was pulled back. Depth to water was measured about one-half hour after pulling back the drive casing and was 50 feet bgs in B97-1 and 54.5 feet bgs in B97-5, indicating slow recovery of groundwater into the borehole. Recovery of groundwater in boring B97-4 was also slow; about two hours after pulling back the drive casing, no groundwater was encountered in the boring. The temporary PVC was left in B97-4 overnight. The following morning (17 hours later), depth to water was 46 feet bgs. Borings B97-2 and B97-3 recovered faster. After pulling back the drive casing, depth to water in B97-2 was 42 feet, within 14 hours, depth to water was 34 feet. At location B97-3, depth to water was 38 feet immediately after pulling back the drive casing.

Grab Groundwater Samples from Soil Borings

Groundwater samples were collected from each boring (and Livermore Arcade well MW-24) and were analyzed for TPH-G, BTEX, and MTBE using U.S. Environmental Protection Agency (EPA) methods 5030/8015M/8020. Groundwater samples from borings B97-1, B97-3, and replacement well MW-24 were also analyzed for two water-soluble gasoline additives and parameters indicative of biodegradation. Gasoline additives 1,2-dibromoethane (also known as ethylene dibromide [EDB]) and 1,2-dichloroethane (also known as ethylene dichloride [EDC]) were analyzed for using U.S. EPA methods 8010 and 504, respectively. Analysis of parameters indicating biodegradation included measuring both electron acceptors

and oxidation-reduction products. Electron acceptors include dissolved oxygen (DO), nitrate, sulfate, and carbon dioxide (CO_2). Oxidation-reduction products include soluble iron (ferrous iron, Fe^{2+}) and soluble manganese (Mn^{3+}). Measurements of total alkalinity and oxidation-reduction potential (ORP) were also collected.

Electron acceptors are essential for metabolism of an organic compound that allows microbial growth. Decreased levels of DO, nitrate, and sulfate indicate that electron acceptors are being consumed and biodegradation is occurring. The consumption of nitrate and sulfate indicate anaerobic metabolism (biodegradation). When ferric iron (Fe^{3+}) acts as an electron acceptor, soluble (ferrous) iron is created, indicating anaerobic biodegradation. A similar process occurs with manganese, and the presence of soluble manganese also can indicate anaerobic biodegradation.

CO_2 is both an end product of biodegradation and an electron acceptor. CO_2 measurements are interpreted with alkalinity and pH measurements. Analysis of total alkalinity provides a measurement of dissolved forms of carbonate in the groundwater. If biological activity is producing CO_2, elevated alkalinity concentrations may also be indicative of biological activity. Low or negative ORP values indicate a highly reduced environment produced by biological activity.

Field measurements and groundwater analytical results from the boring program are presented in Table 2. Water sample field data sheets documenting sample collection and field measurements are included in Appendix B. No petroleum hydrocarbons detected in the range of gasoline were found to resemble gasoline. No petroleum hydrocarbons were detected in B97-2 and B97-5. Low concentrations of MTBE were detected in the samples from B97-1 and B97-3 at 60 and 46 µg/l, respectively. The sample from B97-4 contained MTBE at a concentration of 470 µg/l (Figure 3). BTEX concentrations were generally non-detectable, with two exceptions. A low concentration of benzene was detected in boring B97-1 (1.2 µg/l) and a low concentration of toluene (0.68 µg/l) was detected in boring B97-4. The additives EDB and EDC were not detected.

Field measurements of DO were consistently high at all the locations, ranging from 1.6 to 3.0 milligrams per liter (mg/l). ORP results were all positive, ranging between 71 and 162 millivolts (mv). Analytical results for nitrate and sulfate in samples from B97-1, B97-3, and MW-24 were also consistent and relatively high. Nitrate values ranged from 8.6 to 12 mg/l and sulfate values ranged from 60 to 66 mg/l. Concentrations of soluble iron and manganese varied at the three locations. Low concentrations of soluble iron were detected in borings B97-1 and B97-3 at 0.14 and 0.77 mg/l, respectively. Well MW-24 contained less than 0.1 mg/l soluble iron. Soluble manganese concentrations at locations B97-1 and B97-3 were 0.68 mg/l and 1.4 mg/l and, respectively. The sample from well MW-24 contained less than 0.005 mg/l soluble manganese.

Total alkalinity values were consistent, ranging from 330 to 370 mg/l. CO_2 concentrations ranged from 12 to 35 mg/l.

Monitoring Well Groundwater Sampling

To evaluate whether intrinsic biodegradation of petroleum hydrocarbons in groundwater is occurring at the site, well MW-4 (upgradient), and wells MW-1 and MW-2 (within the plume), were sampled for biodegradation indicators. Well MW-2 was also sampled for EDB and EDC. The workplan stated that well MW-6 would be sampled; however, well MW-6 was inaccessible so MW-2 (former product-containing well) was sampled in its place. Well MW-2, located about 15 feet north of well MW-6, is constructed similarly to well MW-6.

On September 17, 1997, EFW sampled the site groundwater monitoring wells according to EFW's standard groundwater sampling methods (Appendix A). Field measurements of electrical conductivity (EC), DO, ORP, temperature, and pH were taken at each monitoring well and recorded on water sample field data sheets (Appendix B). All purge water was contained and will be properly disposed of consistent with analytical results. Site groundwater samples were analyzed for the same biodegradation parameters as the downgradient samples: alkalinity, CO_2, DO, ORP, nitrate, sulfate, soluble iron, and soluble manganese. These results are presented in Table 2.

Field measurements of DO were high for upgradient well MW-4 (3.3 mg/l), and relatively low for wells MW-1 and MW-2 (0.9 and 0.6 mg/l, respectively). ORP measurements were similar for wells MW-1 (152 mv) and MW-4 (174 mv). The ORP value for well MW-2 was negative 147 (-147) mv.

Nitrate concentrations in the site samples ranged from 0.5 to 1.9 mg/l. Sulfate concentrations in wells MW-1 and MW-2 were 22 and 15 mg/l, respectively, lower than upgradient well MW-4 (55 mg/l). Well MW-2 contained 1.4 mg/l soluble iron, a relatively high concentration. Wells MW-1 and MW-4 contained less than 0.1 mg/l soluble iron. Well MW-2 contained 1.7 mg/l soluble manganese, a relatively high concentration. Wells MW-1 and MW-4 contained 0.084 and 0.41 mg/l soluble manganese, respectively.

Upgradient well MW-4 contained the lowest alkalinity concentration at 320 mg/l. Wells MW-1 and MW-2 contained 400 and 410 mg/l, respectively. Well MW-2 contained CO_2 at a concentration of 34 mg/l. Concentrations in wells MW-1 and MW-4 were slightly lower at 26 and 27 mg/l, respectively.

Product Sampling

The workplan proposed collecting a sample of free product from site well MW-2 and from well MW-01 on the MSP property. However, free product has not been detected in site well MW-2 since January 1995. A sample of product was collected from MSP well MW-01, and a groundwater sample was collected from site well MW-2. Product encountered in MSP well MW-01 is estimated to be less than three inches thick.

The product sample from MSP well MW-01 showed the presence of low-boiling compounds indicative of weathered gasoline. The product appears to have relatively low concentrations

of BTEX compounds and likely has low concentrations of MTBE, indicating that the product has undergone transformation by water-solubilization.[14] Product from this well was previously analyzed in 1995 and was found to be primarily "fresh" gasoline, resulting from a "recent" release.[15] Because the 1995 product analysis was attempting to determine whether the product came from a 50-year old release from the former bulk fuel terminal, the time definition of "fresh" versus "weathered" product is relative to that 50-year time frame. The current product analytical results are consistent with the previous results, given the elapsed time and the opportunity for the product to degrade further. Low-boiling compounds were detected in the water sample from site well MW-2 indicative of the water-soluble fraction of gasoline, including BTEX. Laboratory results of the product and water characterization are included in Appendix C.

DISCUSSION

The following discussion addresses the main objectives of the April 1997 workplan.

Delineate the downgradient extent of MTBE and benzene in groundwater.

No significant concentrations of benzene were detected in the downgradient investigation and the highest concentration of MTBE detected was 470 µg/l in boring B97-4. By using reported groundwater impacts at surrounding properties and the analytical data collected in the downgradient field investigation, the current lateral extent of groundwater at the water table impacted by elevated benzene and MTBE concentrations has been mapped in Figure 3. Benzene concentrations greater than 100 µg/l extend 1,100-feet downgradient from the site, and MTBE concentrations greater than 100 µg/l extend to about 1,400-feet downgradient from the site. Due to boring location constraints, the downgradient extent of MTBE at the water table has not been completely defined, but is not expected to be much different than that shown in Figure 3.

The groundwater samples used in defining the extent of MTBE and benzene in groundwater were obtained at the groundwater table, two years apart, 1995 and 1997. We have assumed that the 1995 data is still representative of the plume conditions, and that the 1997 data is valid with respect to the 1995 results. Given our estimates of groundwater flow velocity (discussed below), these assumptions seem valid.

It was not within the scope of this investigation to define any possible vertical stratification of the plume. Research of plumes at leaking UST sites has shown that vertical chemical stratification can exist within the plume.[16] Some plumes have been shown to have long,

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[14] Freedman and Bruya, Inc., 1997, verbal communication.

[15] Earth Tech, *Final Report LNAPL Assessment and Groundwater Characterization Evaluation, Mill Springs Park Apartments, 1809 Railroad Avenue, Livermore, California*, October 9, 1995.

[16] Hubbard, C.E. and M.D. Einarson. "Overview of the Borden MTBE Field Experiments: Implications for Assessing Natural Attenuation of MTBE at Real LUST Sites." Workshop notes from Santa Clara Valley Water District Workshop, MTBE: A New LUFT Challenge. April 25, 1997.

narrow cores or areas with high concentrations, with the edges of the plume containing significantly lower concentrations (more dilute). The location of the plume core is believed to depend primarily on the geometry of the source zone and the regional groundwater flowpath, not necessarily the location of the water table.[17] This dependence on the regional groundwater flowpath is important, because as the plume gets closer to the water supply wells, it may be drawn downward, if there is a sufficient hydraulic connection between the upper and lower aquifers.

A stormwater/groundwater sump is located at the base of the railroad grade separation at North P Street. Information from staff of the Alameda County Flood Control and Water Conservation District, Zone 7 indicated that groundwater is shallow enough during wet winters to reach the base of the sump. Information was requested, but not received, from the City of Livermore regarding operation and or configuration of the sump. It is unlikely that the sump, except during the winter, influences groundwater flow in the area.

Evaluate the potential for future migration of MTBE and benzene in groundwater.

To evaluate the potential for future migration of the groundwater plume, several topics are discussed below. First the properties of the chemicals of concern are presented, followed by an estimate of the groundwater flow velocity, an evaluation of biodegradation, and finally the possibility of vertical migration.

Chemical Properties

Relative to other organic compounds the ether MTBE is a recalcitrant compound, one that does not readily biodegrade in the subsurface. Some studies have shown that MTBE may begin to degrade after a period of several years and after other plume constituents have been consumed.[18] MTBE is very mobile in soil and groundwater. MTBE is over 20 times more water soluble than benzene, and in the dissolved-phase, MTBE migrates essentially at the same rate as groundwater. MTBE is not believed to influence the biodegradation rates of BTEX compounds. Benzene, a monoaromatic compound, does biodegrade in the subsurface. Benzene migrates more slowly than MTBE and groundwater.

Groundwater Velocity

An estimate of groundwater velocity in the site area was made using site-specific hydrogeologic data and generalized published data regarding aquifer properties. The site and

[17] Hubbard, C.E. and M.D. Einarson. "Overview of the Borden MTBE Field Experiments: Implications for Assessing Natural Attenuation of MTBE at Real LUST Sites." Workshop notes from Santa Clara Valley Water District Workshop, MTBE: A New LUFT Challenge. April 25, 1997.

[18] Kavanaugh, M.C., Jones, K., and Eylers, H., *Effects of MTBE on LUFT Remediation*, Workshop notes from Santa Clara Valley Water District Workshop, MTBE: A New LUFT Challenge. April 25, 1997.

regional hydraulic gradient has been determined to be approximately 0.02.[19] Hydraulic testing conducted at a neighboring property (Arrow Rentals, Figure 2) determined that the hydraulic conductivity of the shallow aquifer was 10^{-4} centimeters per second (cm/sec). As a conservative measure, and to account for more permeable zones within the aquifer, when determining the groundwater velocity, we used a conductivity value of 10^{-3} cm/sec, one order of magnitude greater than the hydraulic testing results. The effective porosity for clayey and silty gravels is estimated to be 20%.[20] Using these values, the groundwater flow velocity in the site vicinity is calculated to be approximately 100 feet per year (ft/yr). It is likely that more permeable channels exist in the subsurface and that groundwater may flow at a higher velocity within these channels. The groundwater velocity calculated above should be considered an average for the water-bearing zone.

Based on the known site conditions, the extent of the hydrocarbon contamination documented in 1995 is unlikely to have resulted from a release initiated in 1994. However, there was a release from the B&C site prior to 1990, evidenced by the high concentrations of gasoline constituents in groundwater detected in 1990 in well MW-1 at the then DP site. Given the calculated groundwater velocity, the hydrocarbons released prior to 1990 could have traveled over 1,000 feet downgradient of the site. There is also a possibility of another unidentified source for the hydrocarbons.

Biodegradation of Petroleum Hydrocarbons

Biodegradation, compared to other mechanisms of natural attenuation, is the major process that results in significant reduction of petroleum hydrocarbon mass.[21] Analysis for biodegradation indicators was conducted during this investigation to evaluate the potential effects of biodegradation on plume migration and to evaluate natural attenuation as a form of remediation. Analytical results from the site and downgradient vicinity indicate that the groundwater contains the essential electron acceptors to promote biodegradation.

At the site (former source area), analytical results show that aerobic and anaerobic metabolism is occurring. Samples from MW-2, located within the plume, resulted in decreased levels of electron acceptors (DO, nitrate, and sulfate) and elevated levels of oxidation-reduction products (soluble forms of iron and manganese). Levels of alkalinity and CO_2 were relatively high. The ORP measurement was negative (-147 mv), indicating considerable biological activity in the plume.

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[19] Geomatrix Consultants. *Workplan for Phase I Investigation, B&C Gas Mini Mart, 2008 First Street, Livermore, California.* April 1997.

[20] U.S. Environmental Protection Agency. *Criteria for Identifying Areas of Vulnerable Hydrogeology Under RCRA.*

[21] Rice, D.W., and others. *Recommendations to Improve the Cleanup Process for California's Leaking Underground Fuel Tanks (LUFTs).* Lawrence Livermore National Laboratory UCRL-AR-121762. October 16, 1995.

Areas of the plume with higher concentrations of DO (plume perimeter) are capable of supporting aerobic biodegradation of hydrocarbon concentrations. This will control and eventually reduce the hydrocarbon plume (except possibly for MTBE). However, there is still a source in the form of free product, as found at MSP well MW-01. This free product will continue to solubilize and add some BTEX and MTBE, if present, to the groundwater.

The historical groundwater analytical results for the site indicate that concentrations at the site have decreased significantly. This decrease may be due to the combination of source removal, source dissolution, downgradient migration, and biodegradation of the petroleum hydrocarbons. Because site concentrations (upgradient portion of the plume) have decreased significantly, it is not expected that concentrations detected downgradient will increase significantly.

Vertical Migration

Because the detailed subsurface stratigraphy and the vertical distribution of the contaminants has not been defined, limited conclusions about the potential for downward migration of contaminants to the lower aquifer or the water bearing zones where the water supply wells are screened can be made. The vertical migration of groundwater within the area is probably impeded by the stratification (layering) of the subsurface alluvial sediments. However, the upper and lower aquifers may be connected in the subsurface, because they share common groundwater elevations.

According to the Livermore Arcade study, the CWS water supply wells are separated from the upper aquifer in the vicinity of the VOC plume (for approximately a one-mile radius).[22] No indication of the VOC contamination in the upper aquifer migrating downward to the area of the CWS water supply wells has been observed. This aquifer separation may also prevent the potential downward migration of the plume from the B&C Gas Mini Mart to the CWS water-supply wells.

If the VOC contaminant plume has not migrated downward, it is likely that the MTBE and benzene plume will not progress downward to the lower aquifer. However, this assessment is based on the assumption that similar subsurface conditions exist between the VOC contaminant plume and the B&C Gas Mini Mart site; no information regarding the deep aquifer (or aquifer separation) between the site and the CWS wells was determined during this investigation. However, the Livermore Arcade study states that similar geologic conditions may exist for a one-mile radius from the VOC plume area. B&C Gas Mini Mart is within one mile from the VOC plume. Increased gradients and groundwater flowpath changes due to operation of the well CWS #8 may increase the possibility of downward hydrocarbon migration. Therefore, if the CWS increased their pumping rate or seasonal pumping period, the likelihood of drawing down dissolved constituents is likely.

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[22] H⁺GCL, Inc., *Deep Groundwater Conduit Study, Livermore Arcade Shopping Center, First Street and South P Street, Livermore, California.* December 6, 1993.

Evaluate the potential for other sources contributing to the contamination,

Based on the analytical results of investigative work conducted at the Groth property, there is no evidence that the property contains sources of petroleum hydrocarbons that are contributing to the contaminant plume. The highest concentrations of benzene and MTBE on the Groth property were detected at boring G-3 (October 1995), located downgradient from the source area at B&C Gas Mini Mart. Also, in October 1995, well MW-5, located between the source area and boring G-3, contained benzene and MTBE at concentrations similar to those in G-3. Well MW-5 is slightly upgradient from the Groth property.

The former bulk fuel terminal at the MSP property is the other known area that has the potential to contribute to the petroleum hydrocarbon plume. This site stored primarily fuel oil during the 1920's and 1930's. Analysis of the product from MSP well MW-01 indicates that it is weathered gasoline that has been weathered by water solubilization. The distribution of MTBE, which was not added to gasoline in California prior to the mid 1980's, in groundwater beneath the site also adds to discounting this property as being a potential contributor.

Groundwater contamination from two other local spill sites, the Beacon Station and Arrow Rentals, are located cross-gradient from the site and the groundwater plume. There is no evidence that these sites contribute to the plume.

Evaluate the potential risk to human health resulting from the contaminant plume.

The maximum contaminant level (MCL) for benzene in drinking water is 1 µg/l. The drinking water action level for MTBE is 35 µg/l, established by the California Department of Health Services. Benzene is a confirmed human carcinogen. MTBE has been classified as a possible human carcinogen based on limited evidence.

The most likely scenario of exposure to MTBE from this site would be through the consumption of contaminated groundwater. Based on the estimated migration rates of the MTBE plume along the water table, it is possible that the MTBE plume could reach the closest water supply well (CWS #8) within several years. Aquifer separation may impede or even prevent the contaminant plume from impacting the supply wells. However, the lateral continuity, thickness, or integrity of the reported aquitard is not known. Even if the MTBE plume were to reach the water supply wells, it may not be detected because of the long well-screen intervals. This is due to the greater volume of groundwater without MTBE versus the volume of MTBE-impacted groundwater that enters the well. Presently, there is no evidence of impact to the water supply wells.

RECOMMENDATIONS

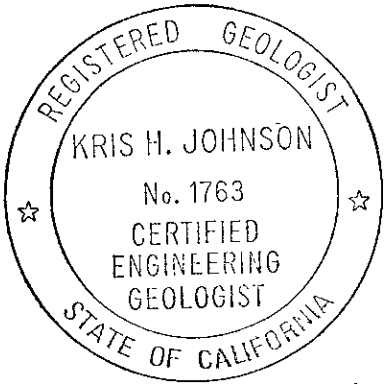
Based on the results of this investigation and the discussions above, EFW recommends the following actions to monitor plume migration and stabilization, and possibly reduce the source:

- Continue groundwater monitoring at the B&C Gas Mini Mart.
- Install a passive product removal device (i.e., bailer (an oliophilic sock)) in well MW-01 at the MSP property to reduce the product source at this well and to help evaluate the amount of free product in the subsurface. Also, even though product has not been detected in a site well since 1995, site source control measures at B&C Gas Mini Mart should be maintained (i.e., product removal if detected in a site well).
- Install perimeter monitoring well(s) in the upper aquifer between the farthest downgradient extent of the plume and well CWS #8 to monitor plume migration toward the well. Also, groundwater elevations in the perimeter well(s) should be monitored for effects of extraction from well CWS #8 to evaluate the extent of hydraulic connection between the upper and lower aquifers, if any.
- Install a monitoring well within the plume to monitor plume migration and the progress of biodegradation. Alternatively, use the MSP well MW-01 for this purpose if product removal is completed.
- Following completion of the previous recommendations, if the results warrant, it may be desirable to investigate the possible vertical stratification of the plume in the upper and possibly the lower aquifer, and the competence and lateral continuity of the aquitard that reportedly separates the upper and lower aquifers in the plume area. This could involve installation of monitoring well pairs that monitor either the upper or lower aquifers, or both, to determine the potential for the plume to migrate downward. This could also include multiple, depth-discrete groundwater sampling of either the upper or lower aquifers, or both, and detailed stratigraphic analysis of the subsurface conditions. Because of the risk of drilling through the aquitard and the considerable additional costs, these tasks should be performed in a phased approach.

Because of access constraints in the area of the plume perimeter, the specific locations of the recommended perimeter wells cannot be determined at this time. Negotiations with the City of Livermore and surrounding private property owners will need to be made prior to proposing well locations.

Please call if you have any questions about this report.

Sincerely,
Einarson, Fowler & Watson



Kris H. Johnson
Senior Engineering Geologist
C.E.G. 1763

Martha J. Watson
Principal Environmental Engineer

Attachments:

Tables

Table 1 - Historical Site Groundwater Analytical Results
Table 2 - Groundwater Analytical Results

Figures

Figure 1 - Site Location
Figure 2 - Site Vicinity
Figure 3 - MTBE and Benzene Concentrations in Groundwater

Appendices

Appendix A - Investigation Methods
Appendix B - Drilling Permits, Boring Logs, Water Sample Field Data Sheets
Appendix C - Certified Analytical Reports

cc: Mr. Balaji Angle, B&C Gas Mini Mart
Mr. Craig Mayfield, Alameda County Zone 7
Mr. Kevin Graves, RWQCB, San Francisco Bay

Table 1
Historical Groundwater Analytical Results
B&C Gas Mini Mart
Livermore, California

Well No.	Sample Date	TPH-G (mg/L)	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)	MTBE (ug/L)
MW-1	Aug-90	24	1,300	1,300	400	2,700	NA
	Oct-91	2	430	170	100	290	NA
	Jan-92	1	200	120	30	150	NA
	May-93	0.96	66	8	41	90	NA
	Sep-93	1.9	311	118	34	112	NA
	May-94	10	690	1,100	340	1,200	NA
	Aug-94	13	290	690	120	670	NA
	Nov-94	19	400	770	230	130	NA
	Mar-95	6	900	100	980	740	NA
	Jun-95	2.4	210	380	53	280	13,000
	Sep-95	7.8	69	1,300	220	1,200	2,000
	Feb-96	0.12	4.2	1.4	4.7	5.6	14
	Feb-97	NS*	NS*	NS*	NS*	NS*	NS*
MW-2	Jun-94	290	18,000	36,000	4,600	26,000	NA
	Aug-94	NS**	NS**	NS**	NS**	NS**	NA
	Nov-94	NS**	NS**	NS**	NS**	NS**	NA
	Mar-95	NS**	NS**	NS**	NS**	NS**	NA
	Jun-95	25	2,300	3,400	720	3,100	16,000
	Sep-95	NS**	NS**	NS**	NS**	NS**	NS**
	Feb-96	57	2,500	650	3,700	3,100	6,500
	Feb-97	20	860	1,500	480	1,000	1,300
MW-3	Jun-94	11	640	580	270	790	NA
	Aug-94	41	1,600	2,300	330	1,800	NA
	Nov-94	18	8,000	10,000	900	5,000	NA
	Mar-95	44	1,600	1,300	5,000	6,600	NA
	Jun-95	15	600	1,900	490	2,600	4,200
	Sep-95	8	710	1,100	180	870	2,700
	Feb-96	13	260	200	200	1,100	1,500
	Feb-97	11	260	550	170	600	900
MW-4	Jun-94	0.81	12	25	<0.5	22	NA
	Aug-94	0.85	37	51	9.5	35	NA
	Nov-94	1.7	110	110	5.8	58	NA
	Mar-95	1.3	180	8	52	77	NA
	Jun-95	ND	3	1	ND	1	ND
	Sep-95	<0.05	0.69	<0.5	<0.5	<0.5	<2.5
	Feb-96	87	<0.5	<0.5	<0.5	<0.5	<0.5
	Feb-97	<0.05	<0.5	<0.5	<0.5	<0.5	2.9
MW-5	Oct-95	120	16,000	26,000	3,100	15,000	39,000
	Feb-96	47	3,400	4,200	860	4,100	20,000
	Feb-97	28	1,300	1,500	480	1,000	2,200
MW-6	Oct-95	110	9,900	22,000	3,200	17,000	47,000
	Feb-96	23	2,000	460	2,900	2,600	6,300
	Feb-97	12	450	780	200	590	790

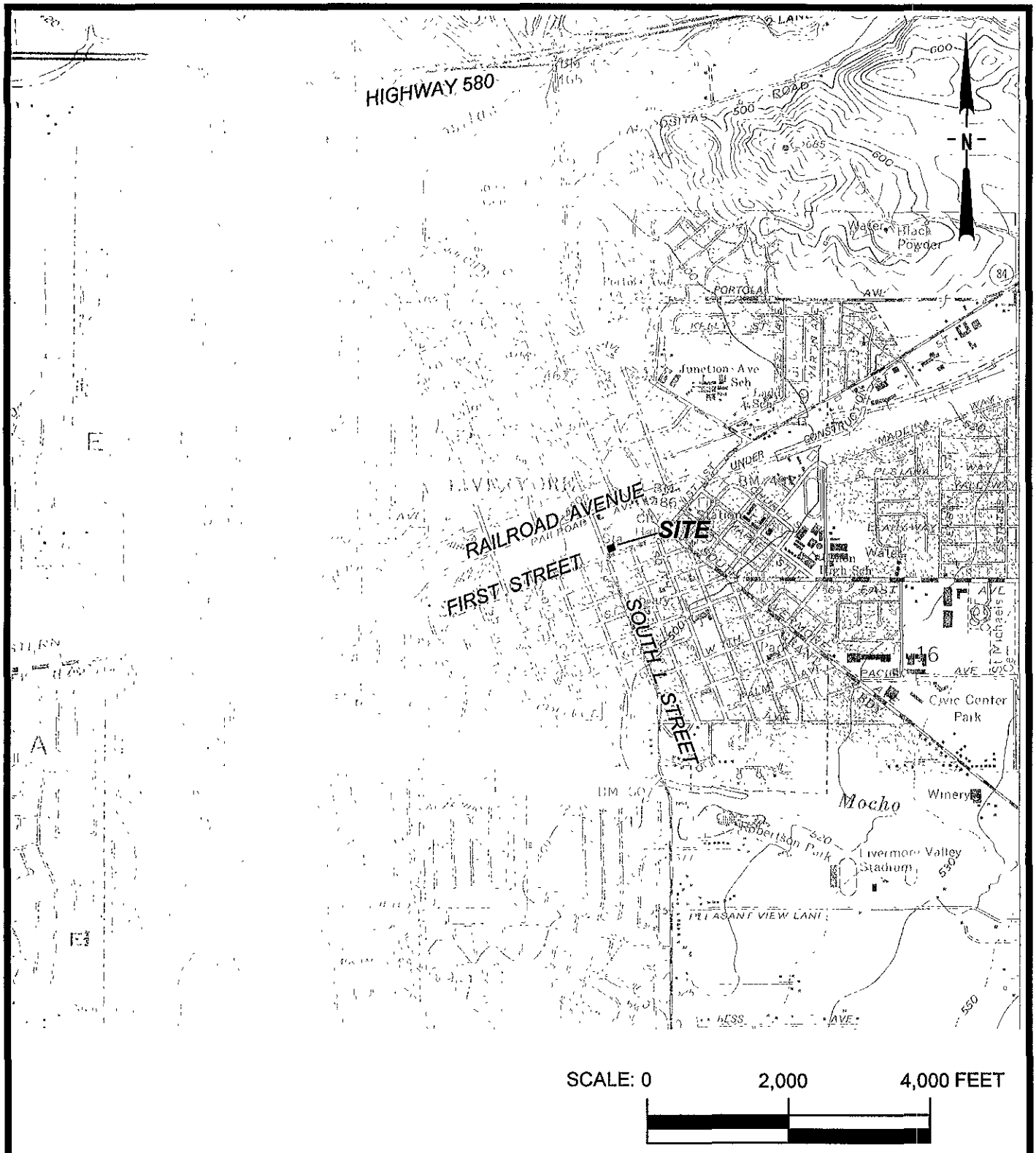
mg/l = milligrams per liter
TPH-G = Total Petroleum Hydrocarbons as Gasoline
MTBE = Methyl-tert-butyl Ether
NA= not analyzed
NS= not sampled * = well inaccessible ** = floating hydrocarbon present
ND = not detected above reporting limit, limit not available

Table 2
Groundwater Analytical Results
B&C Gas Mini Mart
Livermore, California

Location		1997 Downgradient Investigation Borings					Vintner's Sq.	Site Wells		
Sample Identification		B97-1	B97-2	B97-3	B97-4	B97-5	MW-24	MW-1	MW-2	MW-4
Parameter	Units	9/8/97	9/9/97	9/9/97	9/10/97	9/10/97	9/17/97	9/17/97	9/17/97	9/17/97
General Chemistry										
Alkalinity, total	mg/l	350	-	370	-	-	330	400	410	320
Carbon Dioxide	mg/l	35	-	12	-	-	17	26	34	27
Dissolved Oxygen	mg/l	3.0	2.0	2.9	2.0	-	1.6	0.9	0.6	3.3
Electrical Conductivity	umhos/cm	970	950	940	950	-	793	920	930	755
Iron (soluble)	mg/l	0.14	-	0.77	-	-	<0.10	<0.10	1.4	<0.10
Manganese (soluble)	mg/l	0.68	-	1.4	-	-	<0.0050	0.084	1.7	0.41
Nitrate	mg/l	8.6	-	8.8	-	-	12	1.3	0.50	1.9
O-R Potential	mv	71	75	139	162	-	140	152	-147	174
pH	std. units	7.3	7.3	7.3	7.3	-	7.2	7.3	7.1	7.2
Sulfate	mg/l	66	-	60	-	-	61	22	15	55
Temperature	deg. C	22.9	20.0	21.0	19.8	-	20.3	21.5	20.8	20.2
Turbidity	NTU	451	>999	>999	>999	-	606	273	88	44
Petroleum Hydrocarbons, U.S. EPA Method 8015M/8020										
TPH-G [(1)]	ug/l	<50	<50 (51)	<50 (58)	<50 (340)	<50	<50	-	-	-
MTBE	ug/l	60	<5.0	46	470	<5.0	<5.0	-	-	-
Benzene	ug/l	1.2	<0.50	<0.50	<0.50	<0.50	<0.50	-	-	-
Toluene	ug/l	<0.50	<0.50	<0.50	0.68	<0.50	<0.50	-	-	-
Ethylbenzene	ug/l	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	-	-
Xylenes	ug/l	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	-	-
Volatile Organic Compounds, U.S. EPA Methods 8010 and 504										
1,2-Dibromoethane (EBD)	ug/l	<0.01	-	<0.01	-	-	<0.01	-	<0.01	-
1,2-Dichloroethane (EDC)	ug/l	<0.50	-	<0.50	-	-	<0.50	-	<0.50	-

umhos/cm - microohms per centimeter at 25^{0}C
mg/l - milligrams per liter (ppm)
O-R - oxidation-reduction
mv - millivolts
NTU - nephelometric turbidity units
ug/l - micrograms per liter (ppb)

TPH-G - total petroleum hydrocarbons as gasoline, EPA Method 8015M.
MTBE - methyl-tertiary-butyl-ether
[(1)] Hydrocarbons found in the gasoline range are uncharacteristic of a gasoline standard.
If the hydrocarbons were quantified using gasoline's response factor, concentration would equal the value given in parentheses.
Dashes present where data was not requested or not collected due to insufficient sample volume.



Base map: USGS 7.5' topography, Livermore, California (1961; photorevised 1980)

I/BNC/101/FIGURES/SITELOC.DSF 10/97

EINARSON FOWLER & WATSON

WATER QUALITY EVALUATION
B & C GAS MINI MART
LIVERMORE, CALIFORINA

SITE LOCATION MAP

FIGURE
1

PROJECT NO.
BNC101

deep well

DMW-01

CWS#8

UNION PACIFIC RAILROAD

FORMER MILLER'S OUTPOST SHOPPING CENTER (Currently Livermore Valley Square)

PAUL'S CLEANERS

NORTH P STREET

B97-5

B97-3

B97-4

B97-2

B97-1

W-E

W-B

W-1

W-A

ARROW RENTALS

NORTH L STREET

RAILROAD AVENUE

CWS#3

MW-24

MIKE'S CLEANERS

H-8

H-7

H-6

H-5

MW-4

H-9

H-10

H-11

H-1

H-2

H-3

H-4

G-1

G-2

GROTH BROTHERS OLDSMOBILE

G-3

G-4

SOUTH L STREET

MW-5

B & C GAS MINI MART

MW-1

MW-2

MW-6

MW-4

MW-3

H-4

H-5

FORMER LIVERMORE ARCADE SHOPPING CENTER (Currently Vintner's Square)

SOUTH P STREET

MW-6

MW-5

MW-3

MW-4

MW-2

MW-7

MW-1

BEACON STATION

FIRST STREET

ABANDONED GAS STATION

SECOND STREET

EXPLANATION

- Groundwater Monitoring Well
- Soil Boring with Grab Groundwater Sample (1997)
- Soil Sample with Grab Groundwater Sample
- Municipal Water Supply Well

Date of photography 4/30/96

SCALE 0 200 400 FEET
(APPROXIMATE)

WATER QUALITY EVALUATION
B & C GAS MINI MART
LIVERMORE CALIFORNIA

SITE VICINITY

FIGURE
2

PROJECT NO.
BNC101

DMW-01

CWS#8

UNION PACIFIC RAILROAD

NORTH P STREET

NORTH L STREET

W-E
<5, <0.5 (3/96)

B97-2
<5, <0.5 (9/97)

W-3
<5, 13 (3/96)

W-B <5,000, 9,800 (3/96)
W-1 <500, 580 (3/96)
W-A NA, 6,800 (4/91)
W-2
ND, ND (9/95)

ARROW RENTALS

PAUL'S CLEANERS

FORMER MILLER'S OUTPOST SHOPPING CENTER
(Currently Livermore Valley Square)

Approximate lateral extent of 100 ug/l MTBE in groundwater

Approximate lateral extent of 100 ug/l benzene in groundwater

B97-5
<5, <0.5 (9/97)

B97-3 46, <0.5 (9/97)

B97-4 470, <0.5 (9/97)

B97-1
60, 1.2 (9/97)

RAILROAD AVENUE

MW-24
<5, <0.5 (9/97)

CWS#3

MIKE'S CLEANERS

FORMER LIVERMORE ARCADE SHOPPING CENTER
(Currently Vintner's Square)

150, 46 (10/95)

15,000, 3,000 H-8 (8/95)

14,000, 3,200 H-7 (8/95)

G-4

9.4, 2.5 (10/95) G-2

MILL SPRINGS PARK APARTMENTS

67,000 7,700 H-6 (8/95)

GROTH BROTHERS OLDSMOBILE

MW-1
210, 190 (8/95)

14,000 1,300 H-5 (8/95)

<2, <0.5 H-9 (8/95)

18,000 11,000 G-3 (10/95)

G-1 80, 61 (10/95)

H-10 <2, <0.5 (8/95)

H-11 <2, <0.5 (8/95)

H-1 <2, <0.5 (8/95)

H-2 <2, <0.5 (8/95)

H-3 28,10 (8/95)

H-4 29, 9.2 (8/95)

2,200 1,300 MW-5 (2/97)

B & C GAS MINI MART

MW-2 1,300, 860 (2/97)
MW-1 14, 4.2 (2/97)
MW-4 ND, 2.9 (2/96)

MW-1
<2, <0.5 (8/95)

790, 450 (2/97) MW-6

900, 260 (2/97) MW-3

NA, 57 (3/95) H-4

H-5 NA, 22 (3/95)

SOUTH P STREET

<5, 5.3 (6/97) MW-5

MW-6
<100, 3,900 (6/97)

NA, <0.5 (12/95) MW-3

MW-4 NA, <0.5, (12/95)

<500, 7,860 (6/97) MW-2

<5, 29 (6/97) MW-7

MW-1
<50, 180 (6/97)

BEACON STATION

FIRST STREET

SECOND STREET

L STREET

APPROXIMATE GROUNDWATER FLOW DIRECTION (Hydraulic gradient is 0.02)

ABANDONED GAS STATION

EXPLANATION

- Groundwater Monitoring Well
- Soil Boring with Grab Groundwater Sample (1997)
- Soil Boring with Grab Groundwater Sample
- Municipal Water Supply Well

60, 180 (12/95)
- 60 — Benzene Concentration (ug/l)
- 180 — MTBE Concentration (ug/l)
- 12/95 — Month/Year Analyzed

NA Not Analyzed

ND Not Detected

NOTES
Most recent data for each sampling location is presented
Lateral extent of MTBE and benzene in groundwater based on analytical data from 1995 and 1997

SCALE 0 200 400 FEET
(APPROXIMATE)

WATER QUALITY EVALUATION
B & C GAS MINI MART
LIVERMORE, CALIFORNIA

MTBE AND BENZENE CONCENTRATIONS IN GROUNDWATER

FIGURE
3

PROJECT NO
BNC101

APPENDIX A

FIELD METHODS

APPENDIX A

INVESTIGATION METHODS

SOIL CORING

EFW subcontracted Precision Sampling, Inc. (PSI) of San Rafael, California, to drill soil five borings using direct-push methods (i.e., Enviro-Core). PSI's hydraulic soil-sampling rig collected continuous soil cores to a depth of 55 feet at two of the boring locations (B97-1 and B97-5). At three locations B97-2 through B97-4), the drive casing, with a watertight drive point seated in the tip, was advanced to a depth of 55 feet, and no soil core was collected.

The Enviro-Core system consists of a small-diameter drive casing (2-3/8-inch diameter) and an inner sample barrel (1.75-inch-diameter) that are simultaneously advanced using a percussion hammer and vibrator. Continuous soil samples (core) are collected in a butyrate liner (plastic) inside the inner sample barrel. After being advanced three feet, the inner sample barrel (with internal liner) is retrieved and the liner removed, while the drive casing is left in place to maintain the integrity of the borehole and act as a conductor casing. The sample barrel is then re-loaded with a new liner, re-positioned at the bottom of the drive casing, and advanced an additional three feet. The process is repeated until the desired coring depth has been obtained. The outer drive casing is not withdrawn until the boring is advanced to its total depth, thereby preventing cross contamination of deeper soil samples.

Soil core was logged by an EFW geologist under the supervision of a California state-certified engineering geologist. The Unified Soils Classification System (USCS) was used for logging the soil core. Hydrostratigraphic profiles (boring logs) are included in Appendix B. In general, at each location borings were advanced 55 feet below ground surface, temporary polyvinyl chloride (PVC) casing was installed, the drive casing was withdrawn, and a groundwater grab sample was collected from the temporary PVC casing (described below). The boring was then grouted from the base of the boring to the ground surface as the temporary casing was incrementally removed.

GROUNDWATER SAMPLING

To further evaluate the presence petroleum hydrocarbons in the downgradient vicinity, groundwater grab samples were collected for analysis from the borings. Samples were collected from within the temporary PVC casing using a steam-cleaned, small-diameter, stainless steel bailer, and immediately transferred to appropriate pre-preserved containers. Groundwater samples collected from monitoring wells were not collected as grab samples. The monitoring wells were purged using a submersible pump until three casing volumes were removed or field parameters stabilized. Groundwater samples were then collected using a disposable teflon bailer, and immediately transferred to appropriate pre-preserved containers. Samples were stored in coolers at approximately 4°C and transported to the analytical laboratory under appropriate chain-of-custody

documentation. Groundwater samples that were collected for analysis of soluble metals were filtered in the field with a 0.45-micron (µm) filter, prior to preserving the sample.

Field measurements including dissolved oxygen (DO), electrical conductivity (EC), pH, temperature, and turbidity were collected using a Horiba water quality meter. Oxidation-reduction potential (ORP) measurements were also collected using a hand-held probe. Water Sample Field Data sheets are included in Appendix

LABORATORY ANALYSIS

Chromalab and Clayton Environmental Services of Pleasanton, California performed the groundwater chemical analyses. Friedman and Bruya, Inc. (FBI) of Seattle, Washington performed product analysis. The above labs are certified by the state of California. Analyses were conducted within specified hold times and met laboratory quality control standards. The product and water samples analyzed by FBI were analyzed using capillary gas chromatography (GC) with a flame ionization detector (FID) and electron capture detector (ECD).

APPENDIX B

DRILLING PERMITS, BORING LOGS, AND
WATER SAMPLE FIELD DATA SHEETS

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE, PLEASANTON, CALIFORNIA 94588-5127 PHONE (510) 484-2600 X235
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 'N' Street between Railroad Ave. + tracks
North 'P' Street between Railroad Ave. + tracks
Railroad Ave. between 'N' and 'P' Streets
in Livermore, all work in city streets (see map)
California Coordinates Source _____ ft. Accuracy ± _____ ft.
CCN _____ ft. CCE _____ ft.
APN _____

CLIENT
Name B.S. Angle, B+C Gas Mini Mart
Address 2008 First Street Phone 510-654-3461
City Livermore Zip 94550

APPLICANT
Name Einarson, Fowler & Watson
Fax 415-843-3815
Address 2650 E. Bayshore Rd. Phone 415-843-3828
City Palo Alto Zip 94303

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	☐	General	☐
Water Supply	☐	Contamination	☒
Monitoring	☒	Well Destruction	☐

PROPOSED WATER SUPPLY WELL USE

New Domestic	☐	Replacement Domestic	☐
Municipal	☐	Irrigation	☐
Industrial	☐	Other _____	☐

DRILLING METHOD:

Mud Rotary	☐	Air Rotary	☐	Auger	☐
Cable	☐	Other	☒ (Direct Push)		

DRILLER'S LICENSE NO. C57-636387

WELL PROJECTS

Drill Hole Diameter	_____ in.	Maximum Depth	_____ ft.
Casing Diameter	_____ in.	Number	_____
Surface Seal Depth	_____ ft.		

GEOTECHNICAL PROJECTS

Number of Borings	6	Maximum Depth	50 ft.
Hole Diameter	2 5/8 in.		

ESTIMATED STARTING DATE 9/3/97
ESTIMATED COMPLETION DATE 9/5/97

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

APPLICANT'S SIGNATURE Kris H. Johnson Date 8/13/97

FOR OFFICE USE

PERMIT NUMBER 97445
WELL NUMBER _____
APN _____

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 SUPPLY WELLS
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.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

(D.) 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.

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

F. WELL DESTRUCTION. See attached.

G. SPECIAL CONDITIONS

Approved Wyman Hong Date 15 Aug 97
Wyman Hong

101996

Hydrostratigraphic Profile

Boring No B97-1
Sheet 1 of 2

Site: B&C GAS MINI MART
Client: B&C GAS MINI MART
Boring No B97-1
Well No NA
Project No BNC101.
Date(s) Drilled 9.8.97
Date(s) Well Inst NA
Drilling Co/Driller PRECISION/C. FRICKE

Borehole Total Depth (Ft) 55'
Final Borehole Dia. (in) 2 3/8
Logged by J.L. PANDERS Checked by K Johnson CEG 1763
Ground Elev. APPROX. 48.0 FT MSL T.O.C Elev. NA
Coordinates N ___ E ___
Drilling Method & Summary: Drill using direct-push methods; sample continuously to total depth. Install temp. PVC, pull out drilling rods, collect grab groundwater sample. Grout boring to surface.

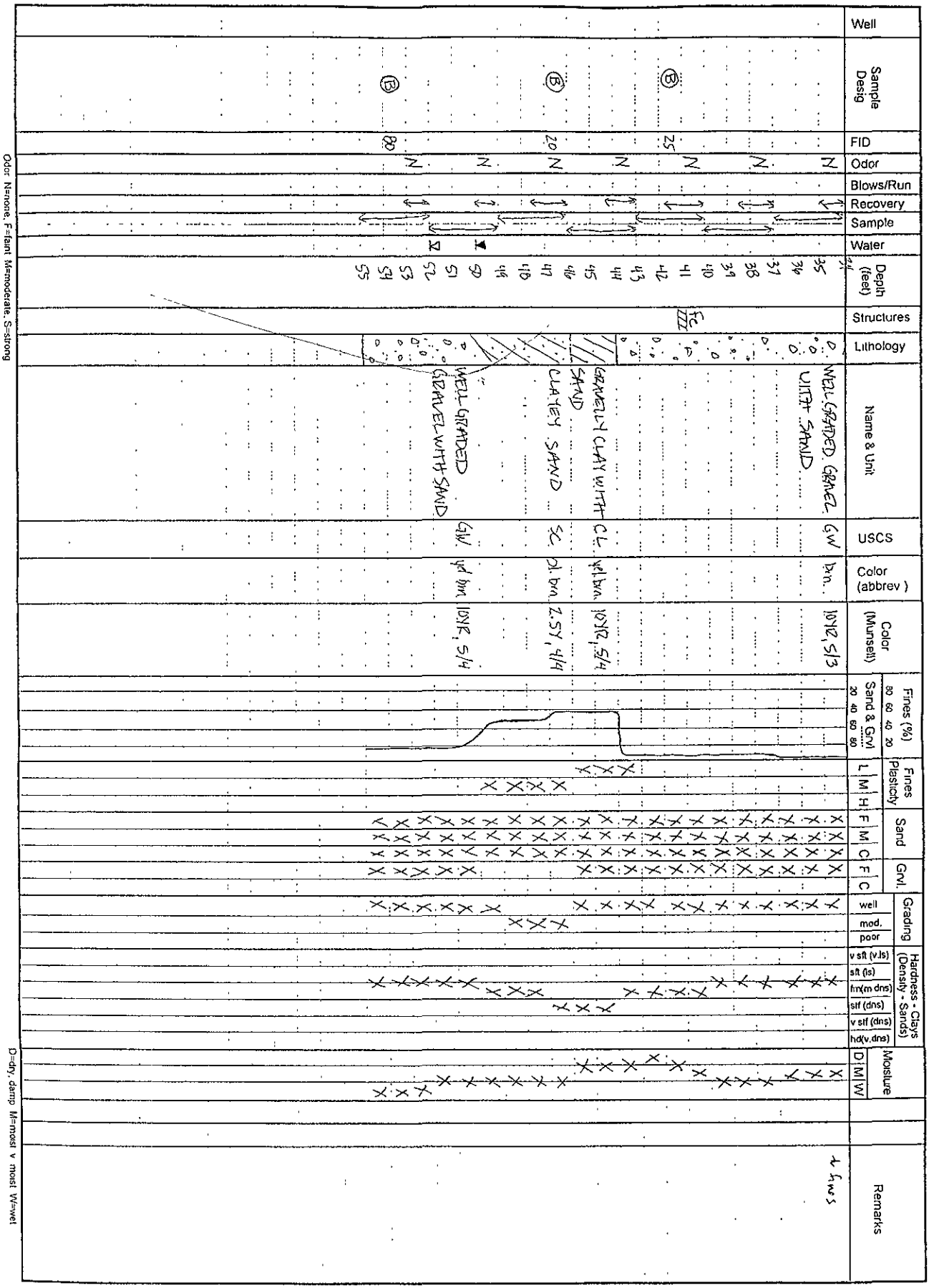
Well: (N/A)

Depth (feet)	Sample Desig	FID	Odor	Structures	Name & Unit	USCS	Color (abbrev)	Color (Munsell)	Remarks
1					SILTY GRAVEL FILL	GM	lt. brn	10YR, 6/2	
2			N				gray		ang. gravel to 3-cm diam.
3									
4									
5			N						
6									
7					SILTY GRAVEL WITH SAND	GM	lt. gray	10YR, 7/2	grvl rnd to subrnd
8			N						
9									
10									
11			N				brown	10YR, 5/3	grvl subang. to subrnd, tr clay on frac surfaces of wx grvl
12									
13									
14			N		WELL GRADED GRAVEL WITH CLAY	GW-GC	gr. brown	10YR, 5/2	grvl ang to subang to 5-cm diam
15									
16									
17			N		WELL GRADED GRAVEL WITH SILT & SAND	GW-GM	lt. brn gray	10YR, 6/2	damp on frac. surfaces of wx grvls
18									
19									
20			N		CLAYEY GRAVEL WITH SAND	GC	brn	10YR, 5/3	
21									
22									trace carbon bits
23			N						
24									
25									
26			N						
27									
28									
29			N						grvl subrnd to ang to 5-cm diam
30				Fe					
31									
32	B	60	M						
33									
34 OVER									

OVJK

EINARSON FOWLER & WATSON

[redacted] Odor: [redacted] F=faint [redacted] rate, S= [redacted]
D=dry, damp M=moist, v moist W=wet [redacted]



EIN ARSON FOWLER & WATSON

Site
Client
Boring No
Well No
Project No
Date(s) Drilled
Date(s) Well Inst
Drilling Co /Driller

Borehole Total Depth (Ft).
Final Borehole Dia. (in)
Logged by _____ Checked by _____
Ground Elev. _____ T O C. Elev _____
Coordinates N _____ E _____
Drilling Method & Summary

Hydrostratigraphic Profile

Boring No B97-1
Sheet 2 of 2

Hydrostratigraphic Profile

Boring No B97-5
Sheet 1 of 2

Well	Sample Desig	FID	Odor	Depth (feet)	Structures	Name & Unit	USCS	Color (abbrev.)	Color (Munsell)	Fines Plasticity	Sand	Grvl	Grading	Hardness - Clays (Density - Sands)	Moisture	Remarks
NA						ASPHALT										
				1												
			N	2		WELL GRADED GRAVEL	GW-	brn	10YR, 5/3		F M	F	well	sft (ls)	D	grvl subrnd to ang
				3		WITH SILT & SAND	GM				F M	F	well	sft (ls)	D	to 3-cm diam
				4		FILL					F M	F	well	sft (ls)	D	
			N	5							F M	F	well	m dns	D	
				6							F M	F	well	m dns	D	
				7							F M	F	well	m dns	D	
			N	8		WELL GRADED GRAVEL	GW	v drk	10YR, 3/2		F M	F	mod	m dns	D	grvl subrnd to
				9		WITH SAND		gry brn			F M	F	mod	m dns	D	ang. to 3-cm diam
				10							F M	F	mod	m dns	D	
		20	N	11							F M	F	mod	m dns	D	
				12							F M	F	mod	m dns	D	
				13							F M	F	mod	m dns	D	
			N	14		SANDY CLAY WITH	CL	drk yel brn	10YR, 4/4	M	M	F	poor	m dns	M	
	Ⓑ	5		15		GRAVEL				M	M	F	poor	m dns	M	grvl to 1.5cm
				16						M	M	F	poor	m dns	M	
			N	17		CLAYEY GRAVEL WITH	GC	brn	10YR, 4/3	L	M C	F	mod	m dns	M	grvl to 2cm
				18		SAND				L	M C	F	mod	m dns	M	
				19						L	M C	F	mod	m dns	M	
			N	20		WELL GRADED GRAVEL	GW-	gry	10YR, 5/2	L	F M	F	well	stf (dns)	D	grvl to 2.5cm
				21		WITH CLAY & SAND	GC	brn		L	F M	F	well	stf (dns)	D	subrnd to ang.
				22	Fe					L	F M	F	well	stf (dns)	D	
			N	23						L	F M	F	mod	stf (dns)	D	
				24						L	F M	F	mod	stf (dns)	M	
	Ⓑ	20	N	25		SILT	ML	yel brn	10YR, 5/4	L	F		poor	sft (ls)	W	
				26			GW				C	F	well	m dns	D	
				27		WELL GRADED GRAVEL		gr. brn	10YR, 5/2		C	F	well	m dns	D	
				28		WITH SAND					C	F	well	m dns	D	
	Ⓑ	35	N	29							F M C	F	well	sft (ls)	M	
				30							F M C	F	well	sft (ls)	M	
				31							F M C	F	well	sft (ls)	M	Grvl to 2-cm diam.
	Ⓑ	40	N	32							F M C	F	well	sft (ls)	M	Fe staining
				33							F M C	F	well	sft (ls)	M	Water on frac
				34							F M C	F	well	sft (ls)	W	surfaces of wx grvl
				OVER												OVER

Site B&C GAS MINI MART
Client B&C GAS MINI MART
Boring No B97-5
Well No NA
Project No BNC101
Date(s) Drilled 9.10.97
Date(s) Well Inst NA
Drilling Co./Driller PRECISION/C. FRICKE

Borehole Total Depth (Ft) 55
Final Borehole Dia (in) 2 7/8
Logged by J.L. PANDERS Checked by K. Johnson CEG 1763
Ground Elev. APPROX. 480 FT MSL T.O.C. Elev NA
Coordinates N ____ E ____
Drilling Method & Summary: Drill using direct-push methods. Sample continuously to total depth. Install temp PVC, pull and drilling rods, collect grab groundwater sample. Grout boring to surface.

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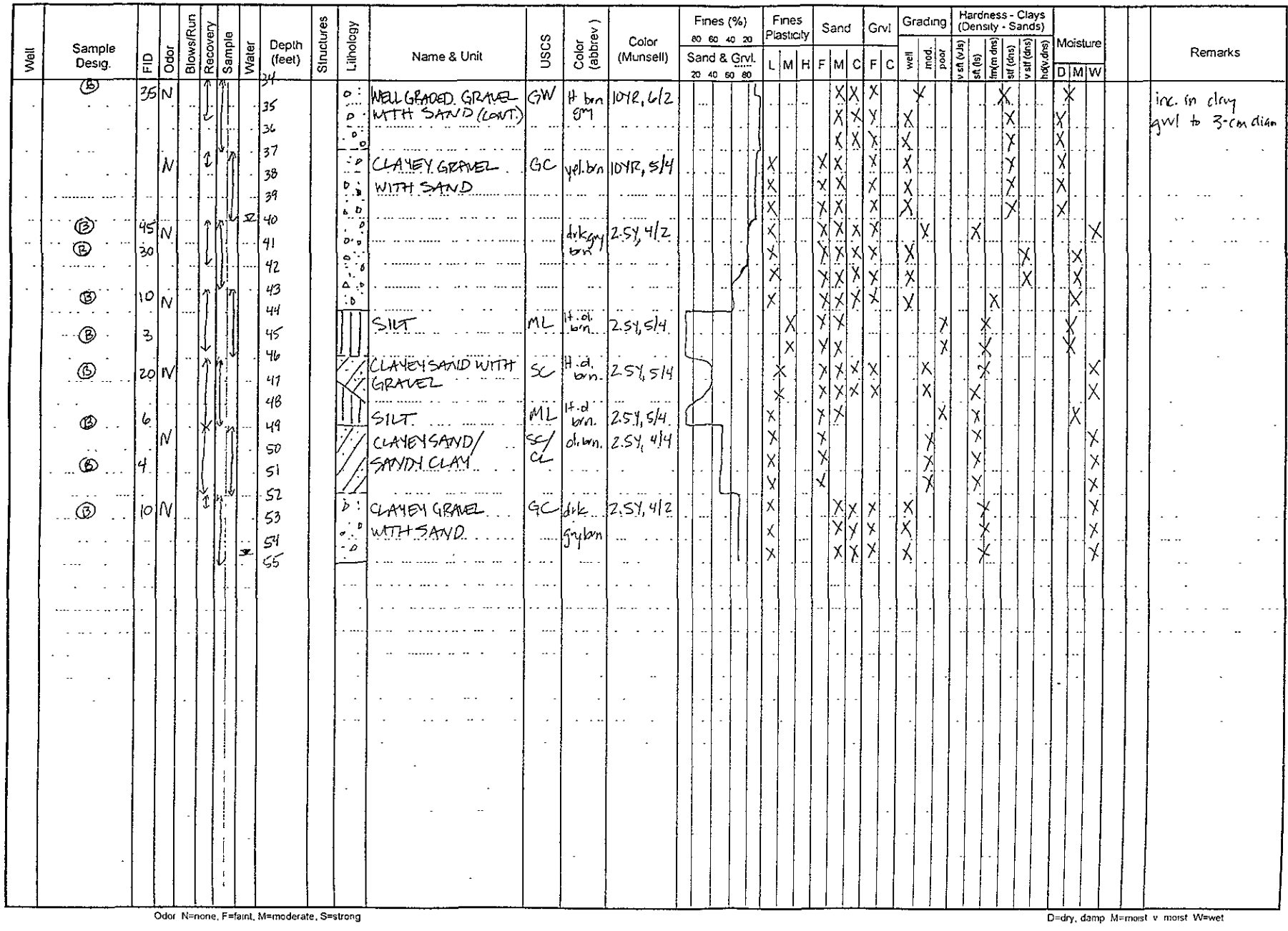
Odor [redacted] F=faint [redacted] erate, S [redacted] ry, dam [redacted] st v mo [redacted] et


Hydrostratigraphic Profile
Boring No B97-4
Sheet 2 of 2
Well
Sample Desig.
FID
Odor
Blows/Run
Recovery
Sample
Water
Depth (feet)
Structures
Lithology
Name & Unit
USCS
Color (abbrev)
Color (Munsell)
Fines (%)
Sand & Grvl.
Fines Plasticity
Sand
Grvl
Grading
Hardness - Clays (Density - Sands)
Moisture
Remarks
WELL GRADED GRAVEL WITH SAND (LOWT.)
GW
CLAYEY GRAVEL WITH SAND
GC
SILT
ML
CLAYEY SAND WITH GRAVEL
SC
SILT
ML
CLAYEY SAND/ SANDY CLAY
SC/ CL
CLAYEY GRAVEL WITH SAND
GC
inc. in clay
gvl to 3-cm diam
Site
Client
Boring No
Well No
Project No
Date(s) Drilled
Date(s) Well Inst
Drilling Co./Driller
Borehole Total Depth (Ft)
Final Borehole Dia (in)
Logged by
Checked by
Ground Elev.
T.O.C. Elev
Coordinates N
E
Drilling Method & Summary
Odor N=none, F=faint, M=moderate, S=strong
D=dry, damp M=moist v moist W=wet
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WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE, CA
SAMPLE ID: B97-1
PROJECT NO: BNC 101
SAMPLED BY: J.L. PANDERS
LIENT NAME: B&C GAS MINI MART
REGULATORY AGENCY: ALAMEDA CO. EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ✓ 2 ___ 4 ___ 4.5 ___ 6 ___ 8 ___ Other ___

Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): 49.7' @ 1545 9.8.97
CALCULATED PURGE (gal): ___
DEPTH OF WELL (feet): ___
ACTUAL PRE-SAMPLING PURGE (gal): ___
VOLUME IN CASING (gal): ___
ACTUAL POST-SAMPLING PURGE (gal): ___

PURGE:

Purging Equipment (depth of intake from TOC): *Submersible Pump* ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Purge Water Containment: ___

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity (visual)	Observations
							No purge - grab groundwater sample collected

DATE ___

SAMPLE:

Sampling Equipment (depth of intake from TOC): *Submersible Pump* ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ✓ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Dissolved Oxygen (ppm)	Color (visual)	Turbidity (NTU)
1445	✓	22.9	970	7.28	3.0	brn	451

Sheen none Odor none ORP 71 mv 9.8.97 DATE

REMARKS: Field measurements with the Horiba.

SIGNATURE: J.L. Panders Date: 9-8-97

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WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE, CA
SAMPLE ID: B97-2
PROJECT NO: BNC 101
SAMPLED BY: J.L. PANDERS
LIENT NAME: B&C GAS MINI MART
REGULATORY AGENCY: ALAMEDA CO. EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ✓ 2 ___ 4 ___ 4.5 ___ 6 ___ 8 ___ Other ___

Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): 34.4' @ 0742 9.9.97
DEPTH OF WELL (feet): ___
VOLUME IN CASING (gal): ___
CALCULATED PURGE (gal): ___
ACTUAL PRE-SAMPLING PURGE (gal): ___
ACTUAL POST-SAMPLING PURGE (gal): ___

PURGE:

Purging Equipment (depth of intake from TOC): *Submersible Pump* ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Purge Water Containment: ___

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity (visual)	Observations
No purge - grab groundwater sample collected							

DATE ___

SAMPLE:

Sampling Equipment (depth of intake from TOC): *Submersible Pump* ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ✓ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Dissolved Oxygen (ppm)	Color (visual)	Turbidity (NTU)
0750	✓	20.0	950	7.32	2.02	lt. brn	>999

Sheen none Odor none ORP 75 mv 9.9.97 DATE

REMARKS: Field measurements with the Horiba.

SIGNATURE: J. Panders Date: 9.9.97

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EINARSON FOWLER & WATSON

WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE, CA
SAMPLE ID: B97-3
PROJECT NO: BNC 101
SAMPLED BY: J.L. PANDERS
LIENT NAME: B&C GAS MINI MART
REGULATORY AGENCY: ALAMEDA CO. EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ✓ 2 ___ 4 ___ 4.5 ___ 6 ___ 8 ___ Other ___

Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): 38.1' @ 1115 9.9.97
DEPTH OF WELL (feet): ___
VOLUME IN CASING (gal): ___
CALCULATED PURGE (gal): ___
ACTUAL PRE-SAMPLING PURGE (gal): ___
ACTUAL POST-SAMPLING PURGE (gal): ___

PURGE:

Purging Equipment (depth of intake from TOC): *Submersible Pump* ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Purge Water Containment: ___

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity (visual)	Observations
No purge - grab groundwater sample collected							

DATE ___

SAMPLE:

Sampling Equipment (depth of intake from TOC): *Submersible Pump* ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ✓ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Dissolved Oxygen (ppm)	Color (visual)	Turbidity (NTU)
1130	✓	21.0	940	7.31	2.89	brn	>999

Sheen none Odor none ORP 139mv 9.9.97 DATE

REMARKS: Field measurements with the Horiba.

SIGNATURE: JL Panders Date: 9.9.97

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EINARSON FOWLER & WATSON

WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE, CA
SAMPLE ID: B97-4
PROJECT NO: BNC 101
SAMPLED BY: J.L. PANDERS
LIENT NAME: B & C GAS MINI MART
REGULATORY AGENCY: ALAMEDA CO. EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ✓ 2 ___ 4 ___ 4.5 ___ 6 ___ 8 ___ Other ___

Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): 46.2' @ 0715 9.10.97
DEPTH OF WELL (feet): ___
VOLUME IN CASING (gal): ___
CALCULATED PURGE (gal): ___
ACTUAL PRE-SAMPLING PURGE (gal): ___
ACTUAL POST-SAMPLING PURGE (gal): ___

PURGE:

Purging Equipment (depth of intake from TOC): *Submersible Pump* ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Purge Water Containment: ___

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity (visual)	Observations
No purge - grab groundwater sample collected							

___ **DATE**

SAMPLE:

Sampling Equipment (depth of intake from TOC): *Submersible Pump* ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ✓ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Dissolved Oxygen (ppm)	Color (visual)	Turbidity (NTU)
0718	✓	19.8	950	7.28	2.01	brn	>999

Sheen none Odor none ORP 162 mV 9.10.97 **DATE**

REMARKS: Field measurements with the Horiba.

SIGNATURE: J.L. Panders Date: 9.10.97

EINARSON FOWLER & WATSON

WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE, CA
SAMPLE ID: B97-5
PROJECT NO: BNC 101
SAMPLED BY: J.L. PANDERS
LIENT NAME: B&C GAS MINI MART
REGULATORY AGENCY: ALAMEDA CO. EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ✓ 2 ___ 4 ___ 4.5 ___ 6 ___ 8 ___ Other ___

Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): ~54.5' @ 13:30 9.10.97
CALCULATED PURGE (gal): ___
DEPTH OF WELL (feet): ___
ACTUAL PRE-SAMPLING PURGE (gal): ___
VOLUME IN CASING (gal): ___
ACTUAL POST-SAMPLING PURGE (gal): ___

PURGE:

Purging Equipment (depth of intake from TOC): Submersible Pump ___ Well Wizard ___ PVC Bailer ___ SS Bailer ___ Teflon Bailer ___ PVC Hand Pump ___ Other ___

Purge Water Containment: ___

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity (visual)	Observations
No purge - grab groundwater sample collected							

DATE ___

SAMPLE:

Sampling Equipment (depth of intake from TOC): Submersible Pump ___ Well Wizard ___ PVC Bailer ___ SS Bailer ✓ Teflon Bailer ___ PVC Hand Pump ___ Other ___

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Dissolved Oxygen (ppm)	Color (visual)	Turbidity (NTU)
1400	/	NM	NM	NM	NM	brn	NM

Sheen: none Odor: none ORP: NM 9.10.97 DATE

REMARKS: Field measurements with the Horiba.

SIGNATURE: J.L. Panders Date: 9.10.97

EINARSON FOWLER & WATSON

WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE, CA
SAMPLE ID: MW-1
PROJECT NO: BNC101
SAMPLED BY: J.L. Panders / R.E. Langdon
CLIENT NAME: B&C Gas Mini Mart
REGULATORY AGENCY: Alameda Co. EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ___ 2 ✓ 4 ___ 4.5 ___ 6 ___ 8 ___ Other ___

Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): 32.50
DEPTH OF WELL (feet): 76.35
VOLUME IN CASING (gal): ~~7.9~~ 7.5

CALCULATED PURGE (gal): 3 vol = 22.4
ACTUAL PRE-SAMPLING PURGE (gal): 23
ACTUAL POST-SAMPLING PURGE (gal): ✓

PURGE:

Purging Equipment (depth of intake from TOC): Submersible Pump 73.3 *Well Wizard* ___ *PVC Bailer* ___
SS Bailer ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Purge Water Containment: 55 gal. drum

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): ✓

Time (2400 Hr)	Volume (gal)	Temp. (~~°F~~) °C	E.C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity (~~visual~~) NTU	Observations
1252	2	21.5	950	7.35	brwn	999	D.O 1.38 O.R.P 175 → sheen
1256	7	21.3	960	7.31	gry	776	1.37 " 173
1302	12	21.2	837	7.30	gry	312	1.58 " 167
1306	17	21.3	845	7.34	lt. gry	173	0.75 " 166
1310	20	21.2	844	7.33	lt. gry	130	0.97 " 166
1312	23	21.2	842	7.32	lt. gry	147	0.94 " 171

9/17/97 DATE

SAMPLE:

Sampling Equipment (depth of intake from TOC): Submersible Pump ___ *Well Wizard* ___ *PVC Bailer* ___
SS Bailer ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* disp. bailer

Time (2400 Hr)	Volume (gal)	Temp. (~~°F~~) °C	E.C. (umhos/cm @ 25°C)	pH (units) 7.25	Dissolved Oxygen (ppm)	Color (visual)	Turbidity (NTU)
1315	✓	21.5	920	~~7.30~~ 7.28	~~2.50~~ 0.66	lt. gry	273

Sheen Yes Odor Slight Hydrocarb Odor 9/17/97 DATE

REMARKS: ORP @ Sample = 152, Horiba all other Parameters

SIGNATURE: Robert E. Langdon Date: 9/17/97

EINARSON FOWLER & WATSON

WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE, CA
PROJECT NO: BNC 101
CLIENT NAME: B&C GAS MINI MART

SAMPLE ID: MW-2
SAMPLED BY: J. Landers / R.E. Langdon
REGULATORY AGENCY: Alameda Co. EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ___ 2 ___ 4 ✓ 4.5 ___ 6 ___ 8 ___ Other ___

Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): 32.87
DEPTH OF WELL (feet): 55.75
VOLUME IN CASING (gal): 15.1 gal

CALCULATED PURGE (gal): 45.3 gal = 3 Vol
ACTUAL PRE-SAMPLING PURGE (gal): 47
ACTUAL POST-SAMPLING PURGE (gal): ___

PURGE:

Purging Equipment (depth of intake from TOC): Submersible Pump 35' *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Purge Water Containment: ___

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): ___

Time (2400 Hr)	Volume (gal)	Temp. (°F) C	E.C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity (visual)	D.O. Observations	ORP
1551	3	23.8	940	7.21	cloudy gry	75	2.0	
1557	7	21.8	832	7.17	cloudy gry	95	0.43	-227
1601	12	21.4	830	7.16	cldy gry	153	0.37	-210
1605	17	21.4	826	7.14	cldy gry	183	0.27	-163
1608	22	21.1	826	7.17	cldy gry	157	0.51	-168
1612	32	21.1	824	7.12	cldy gry	147	0.27	-162
1616	37	21.0	824	7.14	cldy gry	110	0.55	-161
1619	42	21.0	823	7.14	cldy gry	85	0.51	-142
1621	47	21.0	823	7.13	cldy gry	93	0.55	-147

DATE

SAMPLE:

Sampling Equipment (depth of intake from TOC): Submersible Pump ___ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* Disp. bailer

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Dissolved Oxygen (ppm)	Color (visual)	Turbidity (NTU)
1625	✓	20.8	930	7.14	1.02	cldy gry	88

Sheen None Odor strong Hydrocarb odor 9/17/97 DATE

REMARKS: pump in to 140' ORP = -114
Horiba all other parameters

SIGNATURE: J. Landers Date: 9.17.97

forms\sampling\wtrsmpl.dsf

EINARSON FOWLER & WATSON

WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE, CA
SAMPLE ID: MW-4
PROJECT NO: BNC 101
SAMPLED BY: J. Pandes / R. Langdon
CLIENT NAME: B & C GAS MINI MART
REGULATORY AGENCY: Alameda Co. EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ___ 2 ___ 4 ✓ 4.5 ___ 6 ___ 8 ___ Other ___
Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): 31.61
DEPTH OF WELL (feet): 59.75
VOLUME IN CASING (gal): 19.0
CALCULATED PURGE (gal): 3 vol = 57
ACTUAL PRE-SAMPLING PURGE (gal): 55
ACTUAL POST-SAMPLING PURGE (gal): /

PURGE:

Purging Equipment (depth of intake from TOC): Submersible Pump 57.75 *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* ___

Purge Water Containment: 55 gal drum

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): /

Time (2400 Hr)	Volume (gal)	Temp. (°F) C	E.C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity (~~visual~~) NTU	Observations	
1133	5	20.9	787	7.23	grey	200	D.O.	O.R.P.
1137	15	20.5	798	7.25	cloudy	179	3.26	152
							3.20	143
1139	25	20.4	805	7.22	cloudy	110	3.01	144
1141	30	20.3	804	7.27	cloudy	78	2.96	144
1145	40	20.4	806	7.19	cloudy	54	2.80	174
1148	45	20.0	809	7.20	cloudy	39	3.25	NM
1150	50	20.3	809	7.22	cloudy	40	3.65	184
1153	55	20.3	809	7.22	cloudy	35	3.30	174

DATE 9/17/97

SAMPLE:

Sampling Equipment (depth of intake from TOC): Submersible Pump ~~57.75~~ *Well Wizard* ___ *PVC Bailer* ___ *SS Bailer* ___ *Teflon Bailer* ___ *PVC Hand Pump* ___ *Other* Disp. bailer

Time (2400 Hr)	Volume (gal)	Temp. (°F) C	E.C. (umhos/cm @ 25°C)	pH (units)	Dissolved Oxygen (~~ppm~~) mg/L	Color (visual)	Turbidity (NTU)
1200	/	20.2	755	7.20	1.05	cloudy	44

Sheen None Odor None

9/17/97 DATE

REMARKS: Sample ORP = 203, Horiba all other parameters

SIGNATURE: Robert C Langdon Date: 9/17/97

EINARSON FOWLER & WATSON

WATER SAMPLE FIELD DATA

LOCATION: LIVERMORE ARCADE
PROJECT NO: BNC101
CLIENT NAME: B&C GAS MINI MART

SAMPLE ID: MW-24
SAMPLED BY: J. Landers
REGULATORY AGENCY: Alameda County EHS

SAMPLE TYPE: Ground Water ✓ Surface Water ___ Leachate ___ Treatment Effluent ___ Other ___

CASING DIAMETER (ID-inches): 3/4 ___ 1 ___ 2 ✓ 4 ___ 4.5 ___ 6 ___ 8 ___ Other ___

Gallons per linear foot: (0.02) (0.04) (0.17) (0.66) (0.83) (1.5) (2.6)

DEPTH TO WATER (feet): 38.51
DEPTH OF WELL (feet): 83.15 soft tag
VOLUME IN CASING (gal): 7.6

CALCULATED PURGE (gal): 3 vol = 23
ACTUAL PRE-SAMPLING PURGE (gal): 25
ACTUAL POST-SAMPLING PURGE (gal): ✓

PURGE:

Purging Equipment (depth of intake from TOC): Submersible Pump 80' Well Wizard ___ PVC Bailer ___ SS Bailer ___ Teflon Bailer ___ PVC Hand Pump ___ Other ___

Purge Water Containment: 55g drum

FIELD QC SAMPLES COLLECTED AT THIS WELL (Equipment or Field Blank): none

Time (2400 Hr)	Volume (gal)	Temp. ~~(°F)~~ °C	E.C. (umhos/cm @ 25°C)	pH (units)	Color (visual)	Turbidity ~~(visual)~~ NTU	Observations
0949	5	20.4	784	7.35	gry-brwn	957	ORP
0955	9	20.8	830	7.28	gry	191	ORP = 145
958	12	20.6	840	7.31	clear	95	
1001	15	20.9	838	7.29	clear	85	
1005	20	20.8	844	7.33	clear	85	DO
1011	25	20.9	847	7.29	clear	68	DO = 1.62

9/17/97 DATE

SAMPLE:

Sampling Equipment (depth of intake from TOC): Submersible Pump ___ Well Wizard ___ PVC Bailer ___ SS Bailer ___ Teflon Bailer ___ PVC Hand Pump ___ Other Disp. bailer

Time (2400 Hr)	Volume (gal)	Temp. (°F)	E.C. (umhos/cm @ 25°C)	pH (units)	Dissolved Oxygen ~~(ppm)~~ mg/L	Color (visual)	Turbidity (NTU)
1020	✓	20.3	793	7.23	2.16	Clear	606

Sheen None Odor None

9/17/97 DATE

REMARKS: ORP = 140, Horiba all other parameters

SIGNATURE: Robert Langdon Date: 9/17/97

APPENDIX C

CERTIFIED ANALYTICAL REPORTS

CHROMALAB, INC.

Environmental Services (SDB)

September 16, 1997 *Submission #:* 9709109

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B & C GAS MINI MART *Project#:* BNC 101
Received: September 8, 1997

re: One sample for Gasoline BTEX MTBE analysis.
Method: SW846 8020A Nov 1990 / 8015Mod

Client Sample ID: **B97-1**
Spl#: 146702 *Matrix:* WATER
Sampled: September 8, 1997 *Run#:* 8623 *Analyzed:* September 13, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
GASOLINE	N.D.	50	N.D.	91	1
MTBE	60	5.0	N.D.	105	1
BENZENE	1.2	0.50	N.D.	94	1
TOLUENE	N.D.	0.50	N.D.	93	1
ETHYL BENZENE	N.D.	0.50	N.D.	92	1
XYLENES	N.D.	0.50	N.D.	90	1

Kayvan Kimyai
Chemist

Marianne Alexander
Gas/BTEX Supervisor

415-843-3815

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 15, 1997 *Submission #:* 9709109

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B & C GAS MINI MART *Project#:* BNC 101
Received: September 8, 1997

re: One sample for Soluble Miscellaneous Metals analysis.
Method: *EPA 3005A/6010A Nov 1990*

Client Sample ID: **B97-1**
Spl#: 146702 *Matrix:* WATER *Extracted:* September 15, 1997
Sampled: September 8, 1997 *Run#:* 8640 *Analyzed:* September 15, 1997

ANALYTE	RESULT (mg/L)	REPORTING LIMIT (mg/L)	BLANK RESULT (mg/L)	BLANK SPIKE (%)	DILUTION FACTOR
IRON	0.14	0.10	N.D.	96.6	1
MANGANESE	0.68	0.0050	N.D.	99.0	1

Christopher Arndt
Chemist

John S. Labash
Inorganics Supervisor

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

October 7, 1997

Submission #: 9709109
revised

EINARSON, WATSON, & FOWLER

Atten: Jennifer Panders

Project: B & C GAS MINI MART *Project#:* BNC 101
Received: September 8, 1997

re: One sample for Volatile Halogenated Organics analysis.
Method: *SW846 Method 8010A July 1992*

Client Sample ID: **B97-1**
Spl#: 146702 *Matrix:* WATER
Sampled: September 8, 1997 *Run#:* 8566 *Analyzed:* September 10, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
1,2-DICHLOROETHANE	N.D.	0.50	N.D.	--	1

June Zhao
Chemist

Michael Verona
Operations Manager

415-843-3815 GC 09/15

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

San Francisco Regional Office

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

Clayton
ENVIRONMENTAL
CONSULTANTS

September 15, 1997

Ms. Criselda Laluces
CHROMALAB, INC.
1220 Quarry Lane
Pleasanton, CA 94566

Client Ref.: 9709109
Clayton Project No.: 97090.87

Dear Ms. Laluces:

Attached is our analytical laboratory report for the samples received on September 9, 1997. Also enclosed is a copy of the Chain-of-Custody record acknowledging receipt of these samples.

Please note that any unused portion of the samples will be discarded after October 15, 1997, unless you have requested otherwise.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact Client Services, at (510) 426-2657.

Sincerely,

Andrew Bradley for

Harriotte A. Hurley, CIH
Director, Laboratory Services
San Francisco Regional Office

HAH/caa

Attachments

Analytical Results
for
CHROMALAB, INC.
Client Reference: 9709109
Clayton Project No. 97090.87

Sample Identification:	B97-1	Date Sampled:	09/08/97
Lab Number:	9709087-01C	Date Received:	09/09/97
Sample Matrix/Media:	WATER	Date Extracted:	09/10/97
Extraction Method:	EPA 504	Date Analyzed:	09/10/97
Method Reference:	EPA 504	Analyst:	CTS

Analyte	CAS #	Concentration (ug/L)	MCL (ug/L)	Method Detection Limit (ug/L)
1,2-Dibromo-3-chloropropane	96-12-8	ND	0.2	0.01
1,2-Dibromoethane (EDB)	106-93-4	ND	0.02	0.01

ND: Not detected at or above limit of detection
--: Information not available or not applicable
MCL: Maximum Contaminant Level, Title 22

Analytical Results
for
CHROMALAB, INC.
Client Reference: 9709109
Clayton Project No. 97090.87

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9709087-02A	Date Received:	--
Sample Matrix/Media:	WATER	Date Extracted:	09/10/97
Extraction Method:	EPA 504	Date Analyzed:	09/10/97
Method Reference:	EPA 504	Analyst:	CTS

Analyte	CAS #	Concentration (ug/L)	MCL (ug/L)	Method Detection Limit (ug/L)
1,2-Dibromo-3-chloropropane	96-12-8	ND	0.2	0.01
1,2-Dibromoethane (EDB)	106-93-4	ND	0.02	0.01

ND: Not detected at or above limit of detection
--: Information not available or not applicable
MCL: Maximum Contaminant Level, Title 22

Analytical Results
for
CHROMALAB, INC.
Client Reference: 9709109
Clayton Project No. 97090.87

Sample Identification: B97-1
Lab Number: 9709087-01
Sample Matrix/Media: WATER

Date Sampled: 09/08/97
Date Received: 09/09/97

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	350	5	mg/L	--	09/10/97	--	EPA 310.1
Free Carbon Dioxide	35	0.1	mg/L	--	09/10/97	--	SM 4500-CO
Nitrate-N	8.6	0.05	mg/L	--	09/10/97	--	EPA 300.0
Sulfate	66	0.1	mg/L	--	09/10/97	--	EPA 300.0
pH	7.3	--	S.U.	--	09/09/97	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
CHROMALAB, INC.
Client Reference: 9709109
Clayton Project No. 97090.87

Sample Identification: METHOD BLANK
Lab Number: 9709087-02
Sample Matrix/Media: WATER

Date Sampled: --
Date Received: --

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	<5	5	mg/L	--	09/10/97	--	EPA 310.1
Free Carbon Dioxide	<0.1	0.1	mg/L	--	09/10/97	--	SM 4500-C
Nitrate-N	<0.05	0.05	mg/L	--	09/10/97	--	EPA 300.0
Sulfate	<2	2	mg/L	--	09/10/97	--	EPA 300.0

ND: Not detected at or above limit of detection
--: Information not available or not applicable

EINARSON FOWLER & WATSON

CHAIN C. CUSTODY

35392

PO # 42357

CONTRACT LABORATORY: Chromalab TURN-AROUND TIME: Stnd.

Project No.	Site Name
BNC 101	B&C GAS MINI MART

Sampler(s): (printed) J.L. PANDERS (signature)

Sample I.D.	Lab I.D.	Collection Date	Collection Time	Matrix	Depth	Container Information Type/Volume	Qnty	Filt	Prsrv.	Analyses: TPH-G/BTEX/MTBE	EDB/DCA **	Nitrate Sulfate	CO_2	Soluble Fe+2 and Mn+3
B97-1		9.8.97	1445	H_2O	—	VOA / 40 mL	6	No	HCl	X	X			
						VOA / 40mL	4	No	None				X	
						HDPE / 500mL	1	No	None			X	X	
						HDPE / 500mL	1	Yes	None					XX

SUBM #: 9709109 REP: G
CLIENT: EINARSON
DUE: 09/15/97
REF #: 35392

Prices as quoted on 9.4.97

Please preserve this sample w/ HNO_3.

* Note low volume. Sample has been filtered, but has not been preserved. If more volume is needed, could filter from other HDPE for NO_3/SO_4.

** 8010 cmpds
EDB = 1,2-dibromoethane
DCA = 1,2-dichloroethane

Relinquished by: (signature)	Received by: (signature)	Date/Time:
J.L. Panders		9.8.97 17:33
Relinquished by: (signature)	Received by: (signature)	Date/Time:
Relinquished by: (signature)	Received by: (signature)	Date/Time:
	Chris Fowler	9/8/97 17:33

Send Results To:
Attn: KRIS H. JOHNSON
EINARSON, FOWLER & WATSON
2650 East Bayshore Road
Palo Alto, CA 94303
Phone (415) 843-3828
Fax (415) 843-3815

white: lab copy yellow: project file

CHROMALAB, INC.

Environmental Service (SDB)

Sample Receipt Checklist

Client Name: **EINARSON GEOSCIENCE INC** Date/Time Received: 09/08/97 | 17

Reference/Submis: 35392 | 9709109 Received by: CR

Checklist completed by: Chris Rowley 9/9/97 Reviewed by: MN 9/9/97
Signature Date Initials | Date

Matrix: H2O Carrier name: (Client) - C/L _____

Shipping container/cooler in good condition?	Yes ✓	No ___	Not Present ___
Custody seals intact on shipping container/cooler?	Yes ___	No ___	Not Present ✓
Custody seals intact on sample bottles?	Yes ___	No ___	Not Present ✓

Chain of custody present?	Yes ✓	No ___
Chain of custody signed when relinquished and received?	Yes ✓	No ___
Chain of custody agrees with sample labels?	Yes ✓	No ___
Samples in proper container/bottle?	Yes ✓	No ___
Sample containers intact?	Yes ✓	No ___
Sufficient sample volume for indicated test?	Yes ✓	No ___
All samples received within holding time?	Yes ✓	No ___
Container/Temp Blank temperature in compliance? Temp: 7.9 °C	Yes ✓	No ___
Water - VOA vials have zero headspace? No VOA vials submitted ___	Yes ✓	No ___

Water - pH acceptable upon receipt? NO Adjusted? YES Checked by CR (chemist for VOAs)

Any No and/or NA (not applicable) response must be detailed in the comments section below.

==========

Client contacted: _____ **Date contacted:** _____ **Person contacted:** _____

Contacted by: _____ **Regarding:** _____

Comments: _____

Corrective Action: _____

CHROMALAB, INC.

Environmental Services (SDB)

October 7, 1997

Submission #: 9709141

revised

EINARSON, WATSON, & FOWLER

Atten: Jennifer Panders

Project: B &C GAS MINI MART *Project#:* BNC 101
Received: September 9, 1997

re: One sample for Volatile Halogenated Organics analysis.
Method: *SW846 Method 8010A July 1992*

Client Sample ID: **B97-3**
Spl#: 146914 *Matrix:* WATER
Sampled: September 9, 1997 *Run#:* 8566 *Analyzed:* September 10, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
1,2-DICHLOROETHANE	N.D.	0.50	N.D.	--	1

June Zhao
Chemist

Michael Verona
Operations Manager

415-843-3815 GC 09/16

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 16, 1997 *Submission #:* 9709141

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B &C GAS MINI MART *Project#:* BNC 101
Received: September 9, 1997

re: One sample for Gasoline BTEX MTBE analysis.
Method: SW846 8020A Nov 1990 / 8015Mod

Client Sample ID: **B97-3**
Spl#: 146914 *Matrix:* WATER
Sampled: September 9, 1997 *Run#:* 8630 *Analyzed:* September 14, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
GASOLINE	N.D.	50	N.D.	99	1
MTBE	46	5.0	N.D.	99	1
BENZENE	N.D.	0.50	N.D.	106	1
TOLUENE	N.D.	0.50	N.D.	112	1
ETHYL BENZENE	N.D.	0.50	N.D.	111	1
XYLENES	N.D.	0.50	N.D.	107	1

Note: Hydrocarbon found in Gasoline Range is uncharacteristic of Gasoline Profile. If quantified using Gasoline's response factor, concentration would equal 58ug/L.

Kayvan Kimyai
Chemist

Marianne Alexander
Gas/BTEX Supervisor

415-843-3815

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 16, 1997 *Submission #:* 9709141

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B &C GAS MINI MART *Project#:* BNC 101
Received: September 9, 1997

re: One sample for Gasoline BTEX MTBE analysis.
Method: SW846 8020A Nov 1990 / 8015Mod

Client Sample ID: **B97-2**
Spl#: 146913 *Matrix:* WATER
Sampled: September 9, 1997 *Run#:* 8630 *Analyzed:* September 14, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
GASOLINE	N.D.	50	N.D.	99	1
MTBE	N.D.	5.0	N.D.	99	1
BENZENE	N.D.	0.50	N.D.	106	1
TOLUENE	N.D.	0.50	N.D.	112	1
ETHYL BENZENE	N.D.	0.50	N.D.	111	1
XYLENES	N.D.	0.50	N.D.	107	1

Note: Hydrocarbon found in Gasoline Range is uncharacteristic of Gasoline Profile. If quantified using Gasoline's response factor, concentration would equal 51ug/L.

Kayvan Kimyai
Chemist

Marianne Alexander
Gas/BTEX Supervisor

415-843-3815

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

GC V132 O:BTEXQC0220
KAYVAN 16:17

CHROMALAB, INC.

Environmental Services (SDB)

September 16, 1997 *Submission #:* 9709141

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B &C GAS MINI MART *Project#:* BNC 101
Received: September 9, 1997

re: One sample for Soluble Miscellaneous Metals analysis.
Method: *EPA 3005A/6010A Nov 1990*

Client Sample ID: **B97-3**
Spl#: 146914 *Matrix:* WATER *Extracted:* September 15, 1997
Sampled: September 9, 1997 *Run#:* 8640 *Analyzed:* September 15, 1997

ANALYTE	RESULT (mg/L)	REPORTING LIMIT (mg/L)	BLANK RESULT (mg/L)	BLANK SPIKE (%)	DILUTION FACTOR
IRON	0.77	0.10	N.D.	96.6	1
MANGANESE	1.4	0.0050	N.D.	99.0	1

Christopher Arndt
Chemist

John S. Labash
Inorganics Supervisor

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

San Francisco Regional Office

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

Clayton
ENVIRONMENTAL
CONSULTANTS

September 15, 1997

Ms. Criselda Laluces
CHROMALAB, INC.
1220 Quarry Lane
Pleasanton, CA 94566

Client Ref.: 35413
Clayton Project No.: 97091.09

Dear Ms. Laluces:

Attached is our analytical laboratory report for the samples received on September 10, 1997. Also enclosed is a copy of the Chain-of-Custody record acknowledging receipt of these samples.

Please note that any unused portion of the samples will be discarded after October 15, 1997, unless you have requested otherwise.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact Client Services, at (510) 426-2657.

Sincerely,

Andrew Bradeen for
Harriotte A. Hurley, CIH
Director, Laboratory Services
San Francisco Regional Office

HAH/caa

Attachments

Analytical Results
for
CHROMALAB, INC.
Client Reference: 35413
Clayton Project No. 97091.09

Sample Identification:	B97-3	Date Sampled:	09/09/97
Lab Number:	9709109-01A	Date Received:	09/10/97
Sample Matrix/Media:	WATER	Date Extracted:	09/10/97
Extraction Method:	EPA 504	Date Analyzed:	09/10/97
Method Reference:	EPA 504	Analyst:	CTS

Analyte	CAS #	Concentration (ug/L)	MCL (ug/L)	Method Detection Limit (ug/L)
1,2-Dibromo-3-chloropropane	96-12-8	ND	0.2	0.01
1,2-Dibromoethane (EDB)	106-93-4	ND	0.02	0.01

ND: Not detected at or above limit of detection
--: Information not available or not applicable
MCL: Maximum Contaminant Level, Title 22

Analytical Results
for
CHROMALAB, INC.
Client Reference: 35413
Clayton Project No. 97091.09

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9709109-02A	Date Received:	--
Sample Matrix/Media:	WATER	Date Extracted:	09/10/97
Extraction Method:	EPA 504	Date Analyzed:	09/10/97
Method Reference:	EPA 504	Analyst:	CTS

Analyte	CAS #	Concentration (ug/L)	MCL (ug/L)	Method Detection Limit (ug/L)
1,2-Dibromo-3-chloropropane	96-12-8	ND	0.2	0.01
1,2-Dibromoethane (EDB)	106-93-4	ND	0.02	0.01

ND: Not detected at or above limit of detection
--: Information not available or not applicable
MCL: Maximum Contaminant Level, Title 22

Analytical Results
for
CHROMALAB, INC.
Client Reference: 35413
Clayton Project No. 97091.09

Sample Identification: B97-3
Lab Number: 9709109-01
Sample Matrix/Media: WATER

Date Sampled: 09/09/97
Date Received: 09/10/97

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	370	5	mg/L	--	09/10/97	--	EPA 310.1
Free Carbon Dioxide	12	0.1	mg/L	--	09/10/97	--	SM 4500-C
Nitrate-N	8.8	0.05	mg/L	--	09/10/97	--	EPA 300.0
Sulfate	60	0.1	mg/L	--	09/10/97	--	EPA 300.0
pH	7.8	--	S.U.	--	09/10/97	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
CHROMALAB, INC.
Client Reference: 35413
Clayton Project No. 97091.09

Sample Identification: METHOD BLANK
Lab Number: 9709109-02
Sample Matrix/Media: WATER

Date Sampled: --
Date Received: --

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	<5	5	mg/L	--	09/10/97	--	EPA 310.1
Free Carbon Dioxide	<0.1	0.1	mg/L	--	09/10/97	--	SM 4500-CO
Nitrate-N	<0.05	0.05	mg/L	--	09/10/97	--	EPA 300.0
Sulfate	<0.1	0.1	mg/L	--	09/10/97	--	EPA 300.0

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
CHROMALAB, INC.
Client Reference: 35413
Clayton Project No. 97091.09

Sample Identification: METHOD BLANK
Lab Number: 9709109-02
Sample Matrix/Media: WATER

Date Sampled: --
Date Received: --

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	<5	5	mg/L	--	09/10/97	--	EPA 310.1
Free Carbon Dioxide	<0.1	0.1	mg/L	--	09/10/97	--	SM 4500-CO
Nitrate-N	<0.05	0.05	mg/L	--	09/10/97	--	EPA 300.0
Sulfate	<0.1	0.1	mg/L	--	09/10/97	--	EPA 300.0

ND: Not detected at or above limit of detection
--: Information not available or not applicable

EINARSON FOWLER & WATSON

SUBN #: 9709141 REP: GC
CLIENT: EINARSON
DUE: 09/16/97
REF #:35413

35413

Page 1 of 1

PO # 42357

TURNAROUND TIME: Stnd.

Project No.	Site Name
BNC 101	B+C GAS MINI MART

Sampler(s): (printed) J.L. PANDERS (signature) J.L. Panders

Sample I.D.	Lab I.D.	Collection Date	Collection Time	Matrix	Depth	Container Information Type/Volume	Qnty	Filt	Prsrv.	Analyses: TPH-G/BTEX/MTBE	EDB, DCA *	Sulfate	Nitrate	COD	Soluble Mn	Remarks
B97-2		9.9.97	0750	H2O	NA	VOA/40mL	4	No	HCl	X						see Gamut code for method.
B97-3			1130			VOA/40mL	5	No	HCl	X	X					* [redacted] compounds
						HDPE/500mL	1	No	None			X				EDB = 1,2-dibromoethane
						HDPE/500mL	1	No	H2SO4				X			DCA = 1,2-dichloroethane
						VOA/40mL	4	No	—					X		
						HDPE/1L	1	Yes	None						X	→ Please preserve the soluble metals sample, HNO3. The sample has been filtered, but has not been preserved. Thanks!
~~B97-4~~						~~VOA/40mL~~	~~4~~	~~No~~	~~HCl~~							

Field Filter kit sent by Chromalab returned.

Relinquished by: (signature)	Received by: (signature)	Date/Time:	Send Results To:
J.L. Panders	MRE Naranjo	9.9.97 1539	Attn: KRIS H. JOHNSON
Relinquished by: (signature)	Received by: (signature)	Date/Time.	EINARSON, FOWLER & WATSON
			2650 East Bayshore Road
Relinquished by: (signature)	Received by: (signature)	Date/Time:	Palo Alto, CA 94303
			Phone (415) 843-3828
			Fax (415) 843-3815

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CHROMALAB, INC.

Environmental Service (SDB)

Sample Receipt Checklist

Client Name: **EINARSON GEOSCIENCE INC** Date/Time Received: 09/09/97 | 1539

Reference/Submis: 35413 (19709141) Received by: MN

Checklist completed by: Chris Rowley 9/10/97 Reviewed by: MN 9/10/97
Signature Date Initials | Date

Matrix: H2O Carrier name: (Client) - C/L _____

Shipping container/cooler in good condition?	Yes ✓	No ___	Not Present ___
Custody seals intact on shipping container/cooler?	Yes ___	No ___	Not Present ✓
Custody seals intact on sample bottles?	Yes ___	No ___	Not Present ✓
Chain of custody present?	Yes ✓	No ___	
Chain of custody signed when relinquished and received?	Yes ✓	No ___	
Chain of custody agrees with sample labels?	Yes ✓	No ___	
Samples in proper container/bottle?	Yes ✓	No ___	
Sample containers intact?	Yes ✓	No ___	
Sufficient sample volume for indicated test?	Yes ✓	No ___	
All samples received within holding time?	Yes ✓	No ___	
Container/Temp Blank temperature in compliance?	Temp: RT °C Yes ___	No ✓	
Water - VOA vials have zero headspace?	No VOA vials submitted ___ Yes ✓	No ___	
Water - pH acceptable upon receipt? NO	Adjusted? YES	Checked by CR (chemist for VOAs)	

Any No and/or NA (not applicable) response must be detailed in the comments section below.

Client contacted: _____ **Date contacted:** _____ **Person contacted:** _____

Contacted by: _____ **Regarding:** _____

Comments: SAMPLES RECD OUT OF STANDARD TEMP RANGE OF 2-8°C

Corrective Action: SAMPLES RECD WITHIN 4 HOURS OF COLLECTION TIME

CHROMALAB, INC.

Environmental Services (SDB)

September 17, 1997 *Submission #:* 9709159

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B & C MINI MART *Project#:* BNC 101
Received: September 10, 1997

re: One sample for Gasoline BTEX MTBE analysis.
Method: SW846 8020A Nov 1990 / 8015Mod

Client Sample ID: **B97-4**
Spl#: 147051 *Matrix:* WATER
Sampled: September 10, 1997 *Run#:* 8630 *Analyzed:* September 14, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
GASOLINE	N.D.	50	N.D.	99	1
BENZENE	N.D.	0.50	N.D.	106	1
TOLUENE	0.68	0.50	N.D.	112	1
ETHYL BENZENE	N.D.	0.50	N.D.	111	1
XYLENES	N.D.	0.50	N.D.	107	1
MTBE	470	120	N.D.	99	25

Note: Hydrocarbon found in Gasoline Range is uncharacteristic of Gasoline Profile. If quantified using Gasoline's response factor, concentration would equal 340 ug/L.

Kayvan Kimyai
Chemist

Marianne Alexander
Gas/BTEX Supervisor

415-843-3815

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 17, 1997 *Submission #:* 9709159

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B & C MINI MART *Project#:* BNC 101
Received: September 10, 1997

re: One sample for Gasoline BTEX MTBE analysis.
Method: SW846 8020A Nov 1990 / 8015Mod

Client Sample ID: **B97-5**
Spl#: 147052 *Matrix:* WATER
Sampled: September 10, 1997 *Run#:* 8634 *Analyzed:* September 14, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
GASOLINE	N.D.	50	N.D.	97	1
MTBE	N.D.	5.0	N.D.	112	1
BENZENE	N.D.	0.50	N.D.	101	1
TOLUENE	N.D.	0.50	N.D.	99	1
ETHYL BENZENE	N.D.	0.50	N.D.	98	1
XYLENES	N.D.	0.50	N.D.	96	1

Kayvan Kimyai
Chemist

Marianne Alexander
Gas/BTEX Supervisor

415-843-3815

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

EINARSON FOWLER & WATSON

CHAIN C. CUSTODY

35440

PO # 42357

CONTRACT LABORATORY: Chromalab TURN-AROUND TIME: Standard

Project No.	Site Name
BNC101	B&C Gas Mini Mart

Sampler(s): (printed) J.L. Panders (signature) J.L. Panders

Analyses: TPH-G/BTEX/MTBE

SUBN #: 9709159 RFP: GC
CLIENT: EINARSON
DUE: 09/17/97
RLF #: 35440

Sample I.D.	Lab I.D.	Collection Date	Collection Time	Matrix	Depth	Container Information Type/Volume	Qnty	Filt	Prsrv.	Analyses
B97-4		9.10.97	0718	H2O	NA	VOA/40mL	4	No	HCl	X
B97-5		9.10.97	1400	↓	↓	VOA/40mL	4	No	HCl	X

Prices as quoted by G. Look

Relinquished by: (signature)	Received by: (signature)	Date/Time:
J.L. Panders	Mike Narcinjo	9.10.97 1516
Relinquished by: (signature)	Received by: (signature)	Date/Time.
Relinquished by: (signature)	Received by: (signature)	Date/Time:

Send Results To:
Attn: Kris Johnson
EINARSON, FOWLER & WATSON
2650 East Bayshore Road
Palo Alto, CA 94303
Phone (415) 843-3828
Fax (415) 843-3815

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CHROMALAB, INC.

Environmental Service (SDB)

Sample Receipt Checklist

Client Name: **EINARSON GEOSCIENCE INC** Date/Time Received: 09/10/97 | 1516

Reference/Submis: 35440 / 9709159 Received by: MN

Checklist completed by: Chris Rowley 9/11/97 Reviewed by: MN 9/11/97

Signature Date Initials | Date

Matrix: H2O Carrier name: Client C/L _____

Shipping container/cooler in good condition?	Yes ✓	No	Not Present
Custody seals intact on shipping container/cooler?	Yes	No	Not Present ✓
Custody seals intact on sample bottles?	Yes	No	Not Present ✓
Chain of custody present?	Yes ✓	No	
Chain of custody signed when relinquished and received?	Yes ✓	No	
Chain of custody agrees with sample labels?	Yes ✓	No	
Samples in proper container/bottle?	Yes ✓	No	
Sample containers intact?	Yes ✓	No	
Sufficient sample volume for indicated test?	Yes ✓	No	
All samples received within holding time?	Yes ✓	No	
Container/Temp Blank temperature in compliance?	Temp: 15.0 °C Yes	No ✓	
Water - VOA vials have zero headspace?	No VOA vials submitted	Yes ✓	No
Water - pH acceptable upon receipt?	Adjusted?	Checked by chemist for VOAs	

Any No and/or NA (not applicable) response must be detailed in the comments section below.

Client contacted: _____ **Date contacted:** _____ **Person contacted:** _____

Contacted by: _____ **Regarding:** _____

Comments: SAMPLES REC'D OUT OF STANDARD TEMP RANGE OF 2-8°C

Corrective Action: SAMPLES REC'D WITHIN 1 15min. OF COLLECTION TIME

CHROMALAB, INC.
Environmental Services (SDB)

September 29, 1997 *Submission #:* 9709293

EINARSON, WATSON, & FOWLER

Atten: Jennifer Panders

Project: B&C GAS MINI MART *Project#:* BNC 101
Received: September 17, 1997

re: One sample for Volatile Halogenated Organics analysis.
Method: *SW846 Method 8010A July 1992*

Client Sample ID: **MW-24**
Spl#: 148291 *Matrix:* WATER
Sampled: September 17, 1997 *Run#:* 8806 *Analyzed:* September 23, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
1,2-DICHLOROETHANE	N.D.	0.50	N.D.	--	1

Oleg Nemtsov
Chemist

Michael Verona
Operations Manager

415-843-3815 GC 09/24

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 24, 1997 *Submission #:* 9709293

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B&C GAS MINI MART *Project#:* BNC 101
Received: September 17, 1997

re: One sample for Soluble Miscellaneous Metals analysis.
Method: *EPA 3005A/6010A Nov 1990*

Client Sample ID: **MW-24**
Spl#: 148291 *Matrix:* WATER *Extracted:* September 23, 1997
Sampled: September 17, 1997 *Run#:* 8760 *Analyzed:* September 23, 1997

ANALYTE	RESULT (mg/L)	REPORTING LIMIT (mg/L)	BLANK RESULT (mg/L)	BLANK SPIKE (%)	DILUTION FACTOR
IRON	N.D.	0.10	N.D.	98.6	1
MANGANESE	N.D.	0.0050	N.D.	97.8	1

Christopher Arndt
Chemist

John S. Labash
Inorganics Supervisor

415-843-3815 GC 08/24

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 29, 1997 *Submission #:* 9709293

EINARSON, WATSON, & FOWLER

Atten: Jennifer Panders

Project: B&C GAS MINI MART *Project#:* BNC 101
Received: September 17, 1997

re: One sample for Volatile Halogenated Organics analysis.
Method: *SW846 Method 8010A July 1992*

Client Sample ID: **MW-2**
Spl#: 148300 *Matrix:* WATER
Sampled: September 17, 1997 *Run#:* 8806 *Analyzed:* September 23, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
1,2-DICHLOROETHANE	N.D.	0.50	N.D.	--	1

Oleg Nemtsov
Chemist

Michael Verona
Operations Manager

415-843-3815 GC 09/24

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 26, 1997 *Submission #:* 9709293

EINARSON, WATSON, & FOWLER

Atten: Jennifer Panders

Project: B&C GAS MINI MART *Project#:* BNC 101
Received: September 17, 1997

re: One sample for Gasoline BTEX MTBE analysis.
Method: SW846 8020A Nov 1990 / 8015Mod

Client Sample ID: **MW-24**
Spl#: 148291 *Matrix:* WATER
Sampled: September 17, 1997 *Run#:* 8770 *Analyzed:* September 24, 1997

ANALYTE	RESULT (ug/L)	REPORTING LIMIT (ug/L)	BLANK RESULT (ug/L)	BLANK SPIKE (%)	DILUTION FACTOR
GASOLINE	N.D.	50	N.D.	101	1
MTBE	N.D.	5.0	N.D.	89	1
BENZENE	N.D.	0.50	N.D.	106	1
TOLUENE	N.D.	0.50	N.D.	113	1
ETHYL BENZENE	N.D.	0.50	N.D.	115	1
XYLENES	N.D.	0.50	N.D.	112	1

Kayvan Kimyai
Chemist

Marianne Alexander
Gas/BTEX Supervisor

415-843-3815

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 24, 1997 *Submission #:* 9709293

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B&C GAS MINI MART *Project#:* BNC 101
Received: September 17, 1997

re: One sample for Soluble Miscellaneous Metals analysis.
Method: *EPA 3005A/6010A Nov 1990*

Client Sample ID: **MW-4**
Spl#: 148293 *Matrix:* WATER *Extracted:* September 23, 1997
Sampled: September 17, 1997 *Run#:* 8760 *Analyzed:* September 24, 1997

ANALYTE	RESULT (mg/L)	REPORTING LIMIT (mg/L)	BLANK RESULT (mg/L)	BLANK SPIKE (%)	DILUTION FACTOR
IRON	N.D.	0.10	N.D.	98.6	1
MANGANESE	0.41	0.0050	N.D.	97.8	1

Christopher Arndt
Chemist

John S. Labash
Inorganics Supervisor

415-843-3815 GC 09/24

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 24, 1997 *Submission #:* 9709293

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B&C GAS MINI MART *Project#:* BNC 101
Received: September 17, 1997

re: One sample for Soluble Miscellaneous Metals analysis.
Method: *EPA 3005A/6010A Nov 1990*

Client Sample ID: **MW-1**
Spl#: 148294 *Matrix:* WATER *Extracted:* September 23, 1997
Sampled: September 17, 1997 *Run#:* 8760 *Analyzed:* September 24, 1997

ANALYTE	RESULT (mg/L)	REPORTING LIMIT (mg/L)	BLANK RESULT (mg/L)	BLANK SPIKE (%)	DILUTION FACTOR
IRON	N.D.	0.10	N.D.	98.6	1
MANGANESE	0.084	0.0050	N.D.	97.8	1

Christopher Arndt
Chemist

John S. Labash
Inorganics Supervisor

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

CHROMALAB, INC.

Environmental Services (SDB)

September 24, 1997 *Submission #:* 9709293

EINARSON GEOSCIENCE INC

Atten: Jennifer Panders

Project: B&C GAS MINI MART *Project#:* BNC 101
Received: September 17, 1997

re: One sample for Soluble Miscellaneous Metals analysis.
Method: *EPA 3005A/6010A Nov 1990*

Client Sample ID: **MW-2**
Spl#: 148300 *Matrix:* WATER *Extracted:* September 23, 1997
Sampled: September 17, 1997 *Run#:* 8760 *Analyzed:* September 24, 1997

ANALYTE	RESULT (mg/L)	REPORTING LIMIT (mg/L)	BLANK RESULT (mg/L)	BLANK SPIKE (%)	DILUTION FACTOR
IRON	1.4	0.10	N.D.	98.6	1
MANGANESE	1.7	0.0050	N.D.	97.8	1

Christopher Arndt
Chemist

John S. Labash
Inorganics Supervisor

1220 Quarry Lane • Pleasanton, California 94566-4756
(510) 484-1919 • Facsimile (510) 484-1096
Federal ID #68-0140157

San Francisco Regional Office

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

Clayton
ENVIRONMENTAL
CONSULTANTS

September 24, 1997

Ms. Criselda Laluces
CHROMALAB, INC.
1220 Quarry Lane
Pleasanton, CA 94566

Client Ref.: 35586
Clayton Project No.: 97091.99

Dear Ms. Laluces:

Attached is our analytical laboratory report for the samples received on September 18, 1997. Also enclosed is a copy of the Chain-of-Custody record acknowledging receipt of these samples.

Please note that any unused portion of the samples will be discarded after October 24, 1997, unless you have requested otherwise.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact Client Services, at (510) 426-2657.

Sincerely,

Andrew Bradley for
Harriotte A. Hurley, CIH
Director, Laboratory Services
San Francisco Regional Office

HAH/las

Attachments

Analytical Results
for
CHROMALAB, INC.
Client Reference: 35586
Clayton Project No. 97091.99

Sample Identification:	MW-24	Date Sampled:	09/17/97
Lab Number:	9709199-01A	Date Received:	09/18/97
Sample Matrix/Media:	WATER	Date Extracted:	09/19/97
Extraction Method:	EPA 504	Date Analyzed:	09/19/97
Method Reference:	EPA 504	Analyst:	CTS

Analyte	CAS #	Concentration (ug/L)	MCL (ug/L)	Method Detection Limit (ug/L)
1,2-Dibromoethane (EDB)	106-93-4	ND	0.02	0.01

ND: Not detected at or above limit of detection
--: Information not available or not applicable
MCL: Maximum Contaminant Level, Title 22

Analytical Results
for
CHROMALAB, INC.
Client Reference: 35586
Clayton Project No. 97091.99

Sample Identification:	MW-2	Date Sampled:	09/17/97
Lab Number:	9709199-02A	Date Received:	09/18/97
Sample Matrix/Media:	WATER	Date Extracted:	09/19/97
Extraction Method:	EPA 504	Date Analyzed:	09/19/97
Method Reference:	EPA 504	Analyst:	CTS

Analyte	CAS #	Concentration (ug/L)	MCL (ug/L)	Method Detection Limit (ug/L)
1,2-Dibromoethane (EDB)	106-93-4	ND	0.02	0.01

ND: Not detected at or above limit of detection
--: Information not available or not applicable
MCL: Maximum Contaminant Level, Title 22

Analytical Results
for
CHROMALAB, INC.
Client Reference: 35586
Clayton Project No. 97091.99

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9709199-03A	Date Received:	--
Sample Matrix/Media:	WATER	Date Extracted:	09/19/97
Extraction Method:	EPA 504	Date Analyzed:	09/19/97
Method Reference:	EPA 504	Analyst:	CTS

Analyte	CAS #	Concentration (ug/L)	MCL (ug/L)	Method Detection Limit (ug/L)
1,2-Dibromoethane (EDB)	106-93-4	ND	0.02	0.01

ND: Not detected at or above limit of detection
--: Information not available or not applicable
MCL: Maximum Contaminant Level, Title 22

San Francisco Regional Office

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

Clayton
ENVIRONMENTAL
CONSULTANTS

September 25, 1997

Ms. Criselda Laluces
CHROMALAB, INC.
1220 Quarry Lane
Pleasanton, CA 94566

Client Ref.: T35586
Clayton Project No.: 97091.97

Dear Ms. Laluces:

Attached is our analytical laboratory report for the samples received on September 18, 1997. Also enclosed is a copy of the Chain-of-Custody record acknowledging receipt of these samples.

Please note that any unused portion of the samples will be discarded after October 25, 1997, unless you have requested otherwise.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact Client Services, at (510) 426-2657.

Sincerely,

Andrew Bradeen for

Harriotte A. Hurley, CIH
Director, Laboratory Services
San Francisco Regional Office

HAH/las

Attachments

Analytical Results
for
CHROMALAB, INC.
Client Reference: T35586
Clayton Project No. 97091.97

Sample Identification: MW-24
Lab Number: 9709197-01
Sample Matrix/Media: WATER

Date Sampled: 09/17/97
Date Received: 09/18/97

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	330	5	mg/L	--	09/19/97	--	EPA 310.1
Free Carbon Dioxide	17	0.1	mg/L	--	09/19/97	--	SM 4500-CO
Nitrate-N	12	0.05	mg/L	--	09/18/97	--	EPA 300.0
Sulfate	61	0.1	mg/L	--	09/18/97	--	EPA 300.0
pH	7.5	--	S.U.	--	09/18/97	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
CHROMALAB, INC.
Client Reference: T35586
Clayton Project No. 97091.97

Sample Identification: MW-4
Lab Number: 9709197-02
Sample Matrix/Media: WATER

Date Sampled: 09/17/97
Date Received: 09/18/97

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	320	5	mg/L	--	09/19/97	--	EPA 310.1
Free Carbon Dioxide	27	0.1	mg/L	--	09/19/97	--	SM 4500-C
Nitrate-N	1.9	0.05	mg/L	--	09/18/97	--	EPA 300.0
Sulfate	59	0.1	mg/L	--	09/18/97	--	EPA 300.0
pH	7.1	--	S.U.	--	09/18/97	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
CHROMALAB, INC.
Client Reference: T35586
Clayton Project No. 97091.97

Sample Identification: MW-1
Lab Number: 9709197-03
Sample Matrix/Media: WATER

Date Sampled: 09/17/97
Date Received: 09/18/97

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	400	5	mg/L	--	09/19/97	--	EPA 310.1
Free Carbon Dioxide	26	0.1	mg/L	--	09/19/97	--	SM 4500-CO
Nitrate-N	1.3	0.05	mg/L	--	09/18/97	--	EPA 300.0
Sulfate	22	0.1	mg/L	--	09/18/97	--	EPA 300.0
pH	7.3	--	S.U.	--	09/18/97	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
CHROMALAB, INC.
Client Reference: T35586
Clayton Project No. 97091.97

Sample Identification: MW-2
Lab Number: 9709197-04
Sample Matrix/Media: WATER

Date Sampled: 09/17/97
Date Received: 09/18/97

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	410	5	mg/L	--	09/19/97	--	EPA 310.1
Free Carbon Dioxide	34	0.1	mg/L	--	09/19/97	--	SM 4500-C
Nitrate-N	0.50	0.05	mg/L	--	09/18/97	--	EPA 300.0
Sulfate	15	0.1	mg/L	--	09/18/97	--	EPA 300.0
pH	7.2	--	S.U.	--	09/18/97	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
CHROMALAB, INC.
Client Reference: T35586
Clayton Project No. 97091.97

Sample Identification: METHOD BLANK
Lab Number: 9709197-05
Sample Matrix/Media: WATER

Date Sampled: --
Date Received: --

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Alkalinity, Tot.(CaCO3)	<5	5	mg/L	--	09/19/97	--	EPA 310.1
Free Carbon Dioxide	<0.1	0.1	mg/L	--	09/19/97	--	SM 4500-CO
Nitrate-N	<0.05	0.05	mg/L	--	09/18/97	--	EPA 300.0
Sulfate	<0.1	0.1	mg/L	--	09/18/97	--	EPA 300.0

ND: Not detected at or above limit of detection
--: Information not available or not applicable

EINARSON FOWLER & WATSON

CHAIN OF CUSTODY

35586

Page 1 of 1

PO # _____

CONTRACT LABORATORY: Chromalab TURN-AROUND TIME: Stnd.

Project No.	Site Name
BNC 101	B&C GAS MINI MART

Sampler(s): (printed) J.L. PANDERS/R.E. LANGDON (signature) J Landers

Sample I.D.	Lab I.D.	Collection Date	Collection Time	Matrix	Depth	Container Information Type/Volume	Qnty	Filt	Prsrv.	Analyses: TPH-g/BTEX/MTBE	Sulfate	Nitrate	CO_2	Soluble Fe/Mn	EDB only	1,2-DCA only	Remarks
MW-24		9.17.97	1020	H_2O	NA	VOA	6	No	HCl	X					X	X	
↓		↓	↓	↓	↓	HDPE / 1L	1	No	—		X	X					EDB = 1,2 dibromoethane by 504.
↓	Sample was		filtered.			HDPE/250mL	1	No	—				X				
↓						HDPE/250mL	1	Yes	HNO_3					X			
MW-4		9.17.97	1200			HDPE/1L	1	No	—		X	X					1,2-DCA by 8010
↓		↓	↓	↓	↓	HDPE/250mL	1	No	—				X				
↓	Sample was		filtered.			HDPE/250mL	1	Yes	HNO_3					X			Please report these 2 compounds ONLY.
MW-1		9.17.97	1315			HDPE/1L	1	No	—		X	X					
↓		↓	↓	↓	↓	HDPE/250mL	1	No	—				X				
↓	Sample was		filtered			HDPE/250mL	1	Yes	HNO_3					X			
MW-2		9.17.97	1625			VOAs/40mL	4	No	HCl						X	X	
↓		↓	↓	↓	↓	HDPE/1L	1	No	—		X	X					
↓	Sample was		filtered			HDPE/250mL	1	No	—				X				
						HDPE/250mL	1	Yes	HNO_3					X			

SUBM #: 9709293 REP: GC
CLIENT: EINARSON
DUE: 09/24/97
REF #: 35586

Relinquished by: (signature)	Received by: (signature)	Date/Time:
J Landers	Michael Naranjo	9-17-97 / 1822
Relinquished by: (signature)	Received by: (signature)	Date/Time:
Relinquished by: (signature)	Received by: (signature)	Date/Time:

Send Results To:
Attn: KRIS H. JOHNSON
EINARSON, FOWLER & WATSON
2650 East Bayshore Road
Palo Alto, CA 94303
Phone (415) 843-3828
Fax (415) 843-3815

white: lab copy yellow: project file

CHROMALAB, INC.

Environmental Service (SDB)

Sample Receipt Checklist

Client Name: **EINARSON GEOSCIENCE INC** Date/Time Received: 09/17/97 | 822

Reference/Submis: 35586 | 9709293 Received by: MN

Checklist completed by: Chris Rowley 9/19/97 Reviewed by: _____
Signature | Date | Initials | Date

Matrix: H2O Carrier name: Client - C/L _____

Shipping container/cooler in good condition?	Yes ✓	No ____	Not Present ____
Custody seals intact on shipping container/cooler?	Yes ____	No ____	Not Present ✓
Custody seals intact on sample bottles?	Yes ____	No ____	Not Present ✓

Chain of custody present?	Yes ✓	No ____
Chain of custody signed when relinquished and received?	Yes ✓	No ____
Chain of custody agrees with sample labels?	Yes ✓	No ____
Samples in proper container/bottle?	Yes ✓	No ____
Sample containers intact?	Yes ✓	No ____
Sufficient sample volume for indicated test?	Yes ✓	No ____
All samples received within holding time?	Yes ✓	No ____
Container/Temp Blank temperature in compliance? Temp: 6.5 °C	Yes ✓	No ____
Water - VOA vials have zero headspace? No VOA vials submitted ____	Yes ✓	No ____
Water - pH acceptable upon receipt? YES Adjusted? ____ Checked by CR (chemist for VOAs)		

Any No and/or NA (not applicable) response must be detailed in the comments section below.

==========

Client contacted: _____ **Date contacted:** _____ **Person contacted:** _____

Contacted by: _____ **Regarding:** _____

Comments: _____

Corrective Action: _____

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Charlene Jensen, M.S.
Bradley T. Benson, B.S.
Kurt Johnson, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
TEL: (206) 285-8282
FAX: (206) 283-5044
e-mail: fbi@isomedia.com

October 7, 1997

Kris Johnson, Project Manager
Einarson, Fowler, & Watson
2650 East Bayshore Road
Palo Alto, CA 94303

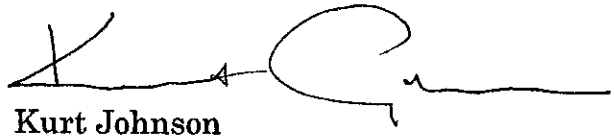
Dear Ms. Johnson:

Included are the results from the testing of material submitted on September 19, 1997 from your B & C Gas Mini Mart, BNC 101 project. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Kurt Johnson
Chemist

Enclosures
FAX: (415) 843-3815
NAA1007R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/07/97
Date Received: 09/19/97
Project: B & C Gas Mini Mart, BNC 101
Date Extracted: 09/23/97
Date Analyzed: 09/24/97

RESULTS FROM THE ANALYSIS OF THE PRODUCT SAMPLE FOR FINGERPRINT CHARACTERIZATION BY CAPILLARY GAS CHROMATOGRAPHY USING A FLAME IONIZATION DETECTOR (FID) AND ELECTRON CAPTURE DETECTOR (ECD)

Sample ID	GC Characterization
MW-01 Mill Springs Apts.	The GC trace using the flame ionization detector (FID) showed the presence of low boiling compounds. The patterns displayed by these peaks are indicative of weathered gasoline. The low boiling compounds appeared as a pattern of peaks eluting from *n*-C_7 to *n*-C_{13}. The low boiling product appears to have a decreased level of benzene, toluene, ethylbenzene and the xylenes. The low boiling product appears to have undergone degradation by water solubilization processes. The large peak seen near 25 minutes on the GC/FID trace is pentacosane, added as a quality assurance check for this GC analysis. There is a second surrogate present that is seen on the GC/ECD trace at about 26 minutes which is dibutyl chlorendate.

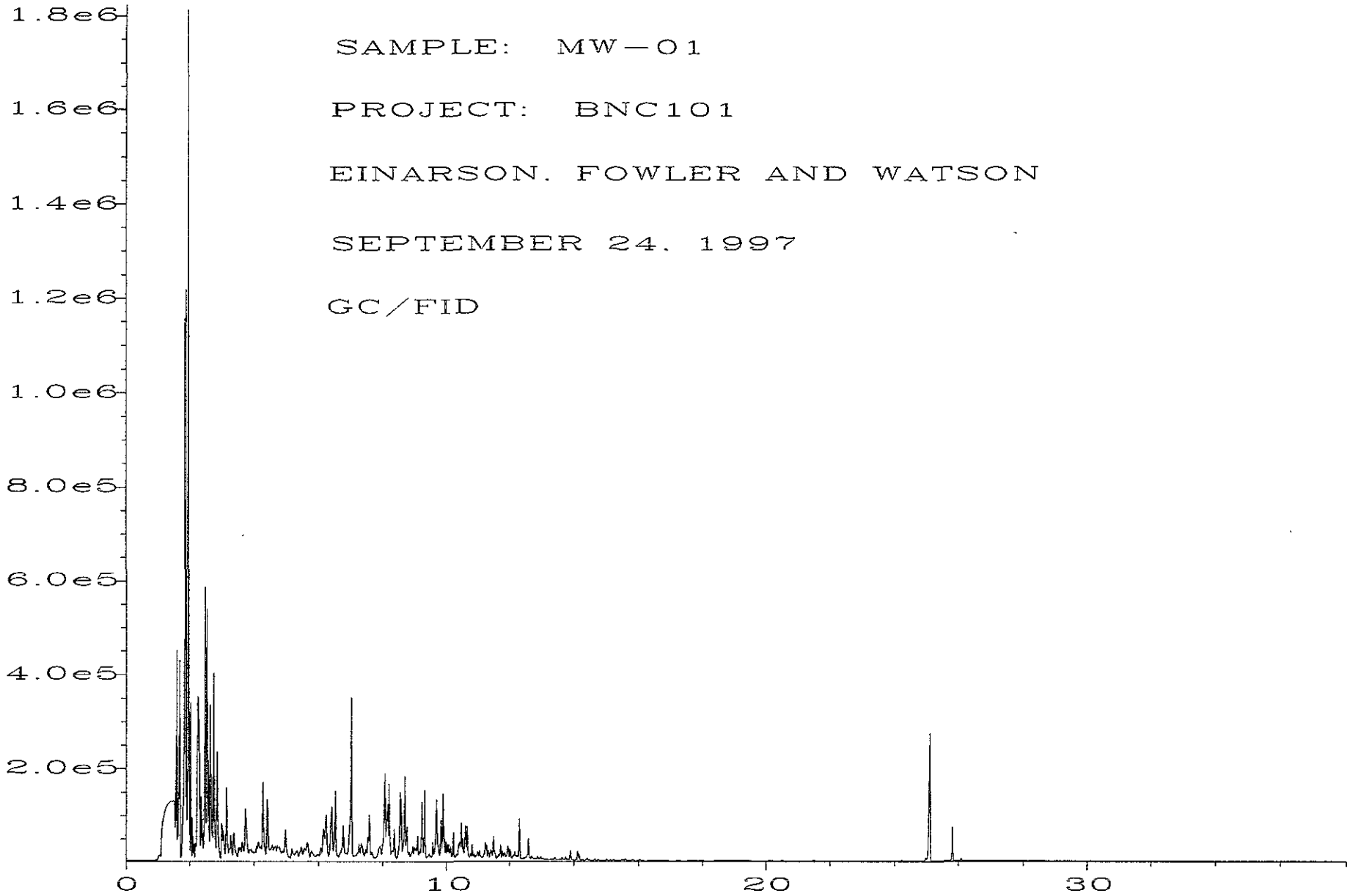
FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/07/97
Date Received: 09/19/97
Project: B & C Gas Mini Mart, BNC 101
Date Extracted: 09/23/97
Date Analyzed: 09/24/97

RESULTS FROM THE ANALYSIS OF THE WATER SAMPLE FOR FINGERPRINT CHARACTERIZATION BY CAPILLARY GAS CHROMATOGRAPHY USING A FLAME IONIZATION DETECTOR (FID) AND ELECTRON CAPTURE DETECTOR (ECD)

Sample ID	GC Characterization
MW-2	The GC trace using the flame ionization detector (FID) showed the presence of low boiling compounds. The patterns displayed by these peaks are indicative of the water soluble fraction of gasoline. The low boiling compounds appeared as a of peaks eluting from *n*-C_7 to *n*-C_{13}. The GC/FID trace showed the presence of peaks that appeared to be indicative of benzene, toluene, ethylbenzene, and the xylenes. The large peak seen near 25 minutes on the GC/FID trace is pentacosane, added as a quality assurance check for this GC analysis. There is a second surrogate present that is seen on the GC/ECD trace at about 26 minutes which is dibutyl chlorendate.



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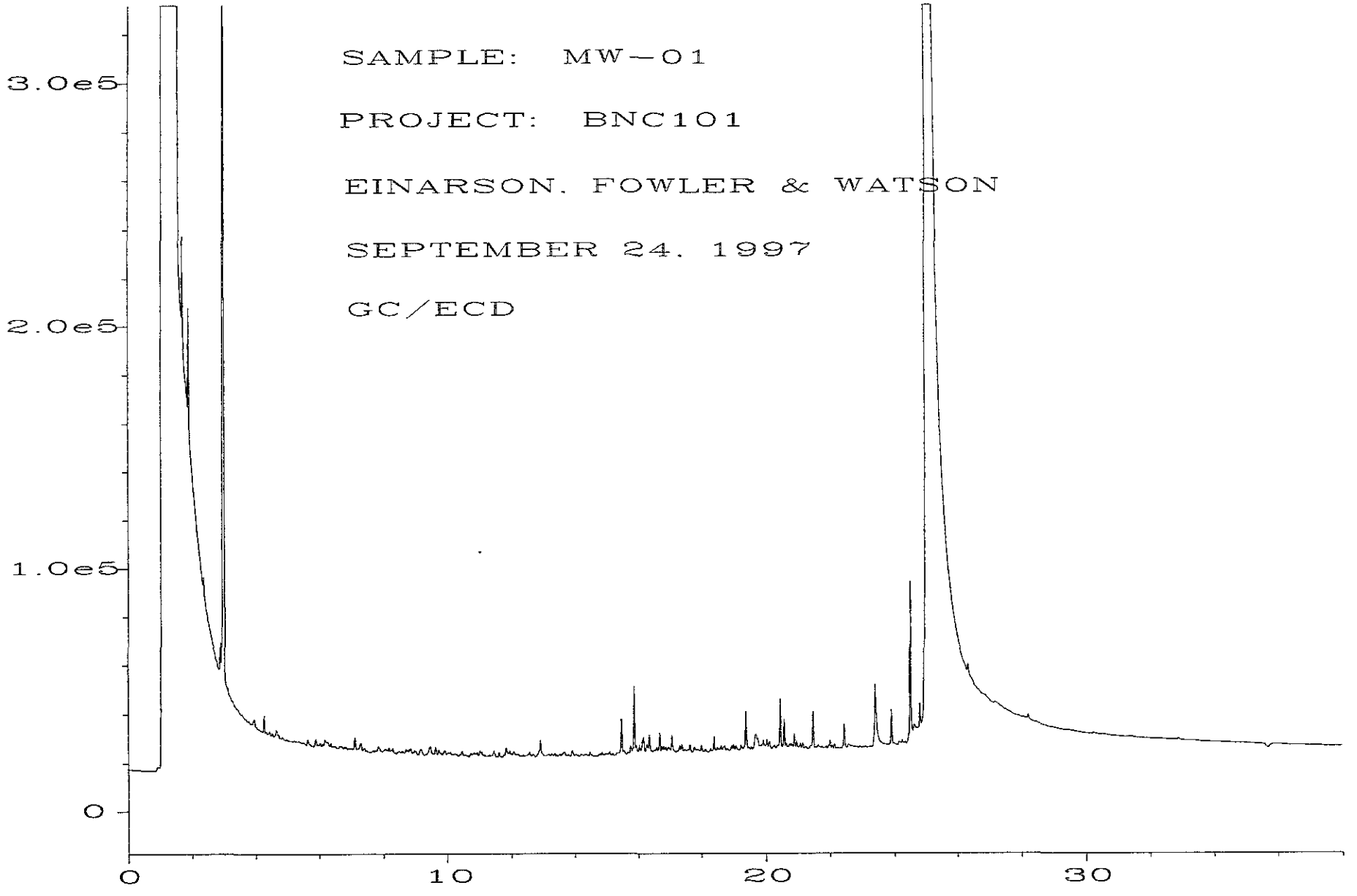

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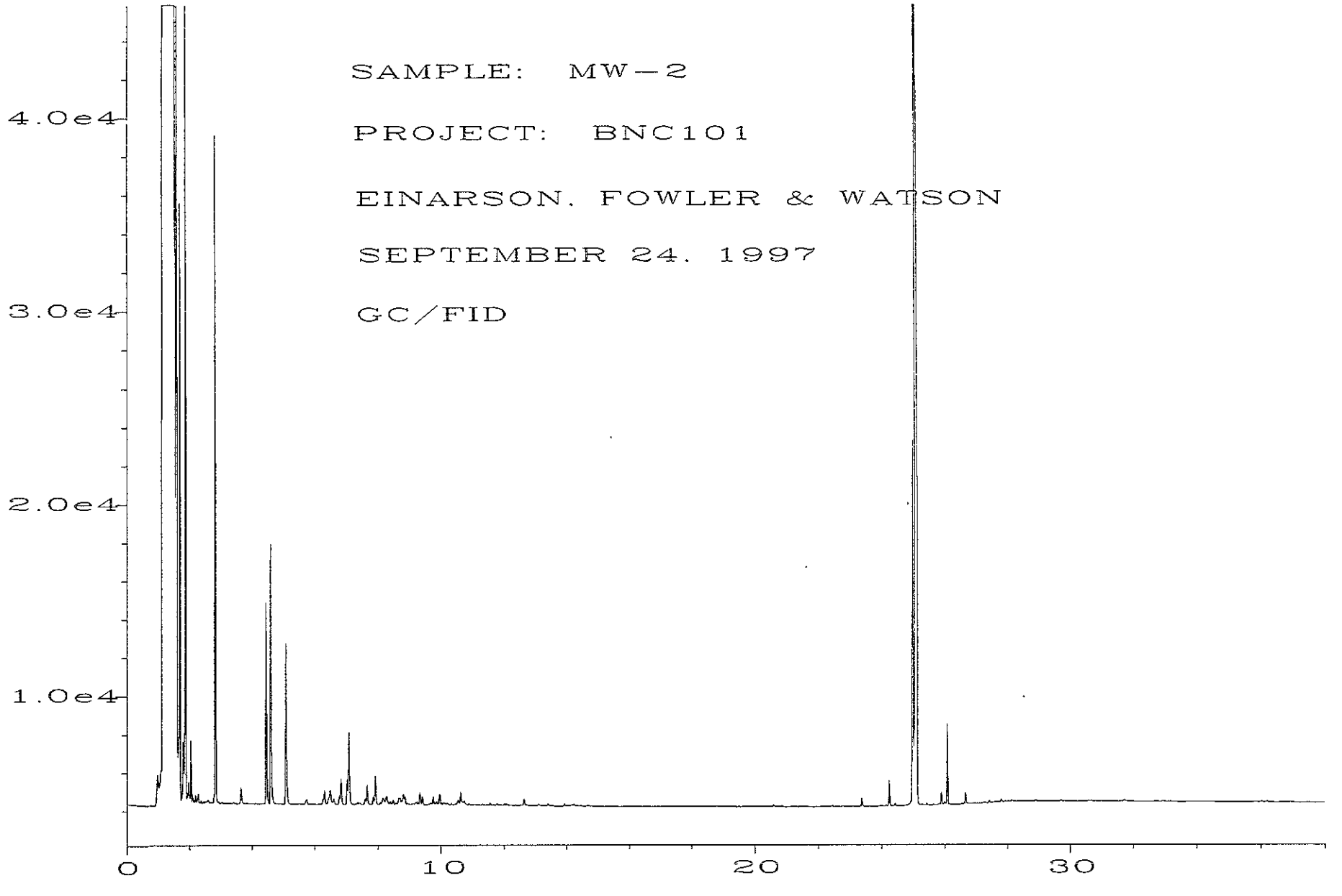

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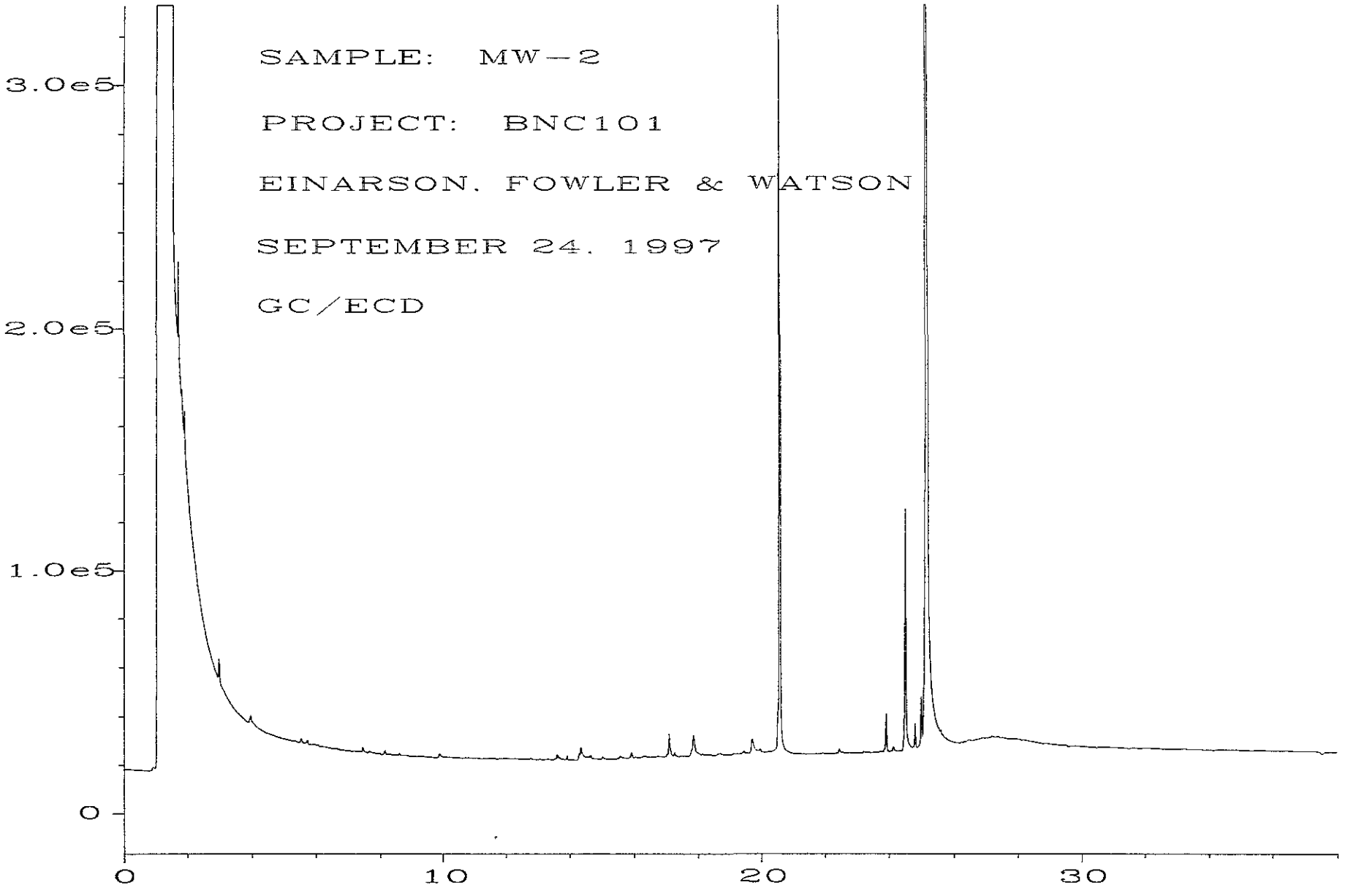

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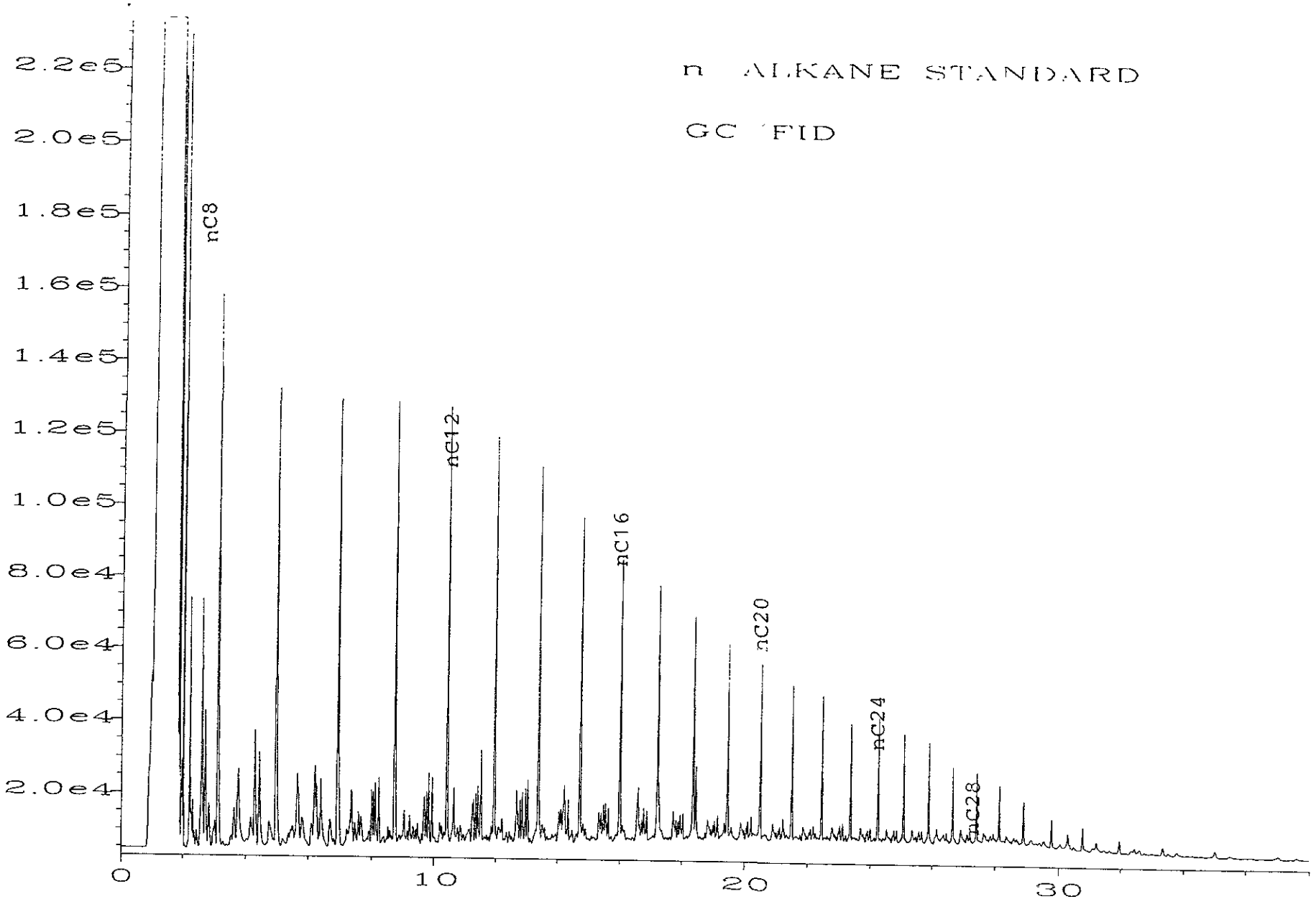

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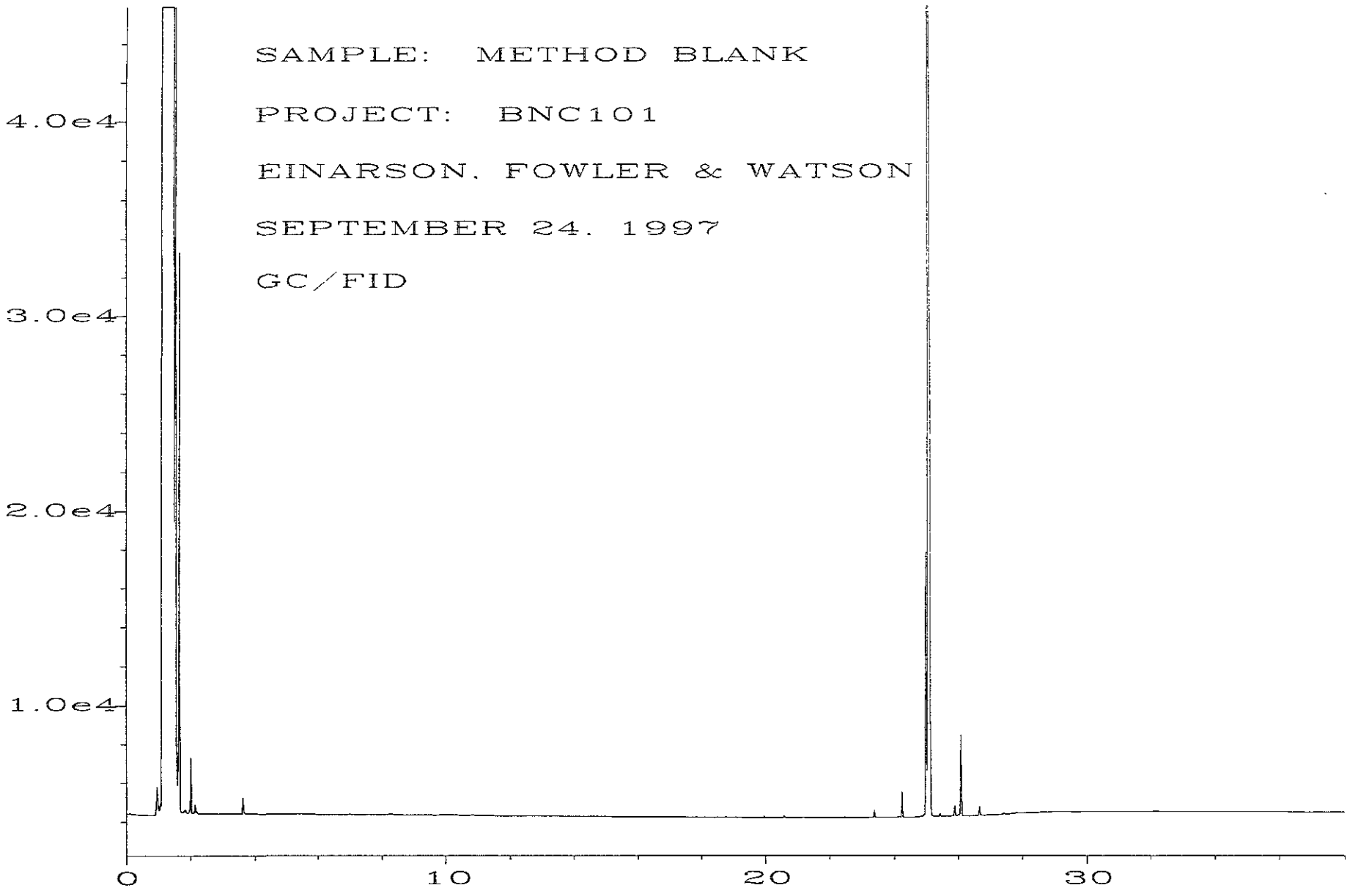

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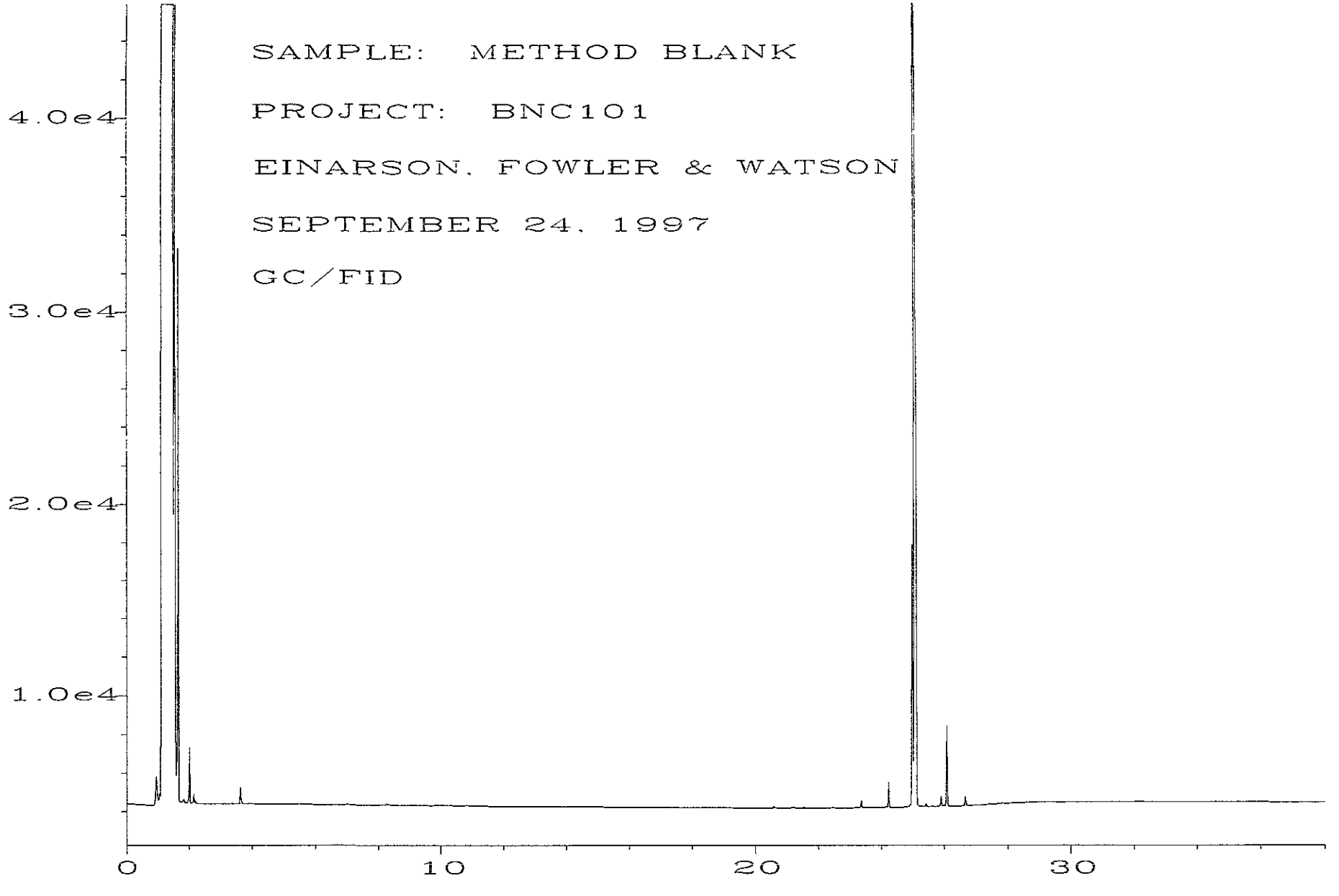

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EINARSON FOWLER & WATSON

CHAIN OF CUSTODY

PJ# 7091... BO 9-18-19-97

Page 1 of 1

PO # 42315

CONTRACT LABORATORY: F&BI

TURN-AROUND TIME: standard

Project No.	Site Name
BNC 101	B & C GAS MINI MART

Sampler(s): (printed) J. PANDERS (signature) JPanders

Sample I.D.	Lab I.D.	Collection Date	Collection Time	Matrix	Depth	Type/Volume	Qnty	Filt	Prsrv.	GC FINGERPRINT	ETHERS	ORGANIC Pb							Remarks
MW-01		9-17-97	1800	Product H_2O	NA	VOA 140mL	2	-	—	X	X	X						01	
MW-2		9-17-97	1700	H_2O	NA	VOA/40mL	2	-	----	(circled)	X							02	Is there any possibility for fingerprinting MW-2?

Also we discussed the possibility of a PIANO analysis rather than a GC fingerprint.

Please call Jennifer Panders 650-843-3828 ext. 601

Relinquished by (signature)	Received by (signature)	Date/Time
[illegible]		9-19-97
Relinquished by (signature)	Received by (signature)	Date/Time
		[illegible]

Send Results To:
Attn: [illegible] JOHNSON
EINARSON, FOWLER & WATSON
2650 East Bayshore Road
Palo Alto, CA 94303