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September 26, 1991

Mr. Dennis Byrne
Alameda County Health Care Services Agency
Division of Hazardous Materials
80 Swan Way, Room 200
Oakland, CA 994621

Subject: **Additional Subsurface Investigations**
Former Servisco Facility at 958 28th Street, Oakland, CA

Dear Dennis:

Enclosed is one original of the report documenting additional subsurface investigations at the former Servisco Corporation site, 958 28th Street in Oakland, California. The work was performed in general accordance with the Work Plan (RMT, June 1991) and submitted to you before the start of field work. Field work, including ground water sampling, was completed during the week of July 15, 1991.

Investigations of both the former "Storage Yard" area and former fuel oil tank/"Loading Dock" area detected limited zones of soils containing fuel range total petroleum hydrocarbons. Dissolved gasoline range hydrocarbons and aromatic compounds were detected in wells MW-6 and MW-4A, which replaces well MW-4. Relative to historical data, ground water concentrations have decreased generally.

We look forward to the meeting scheduled for October 7, 1991. Please call either Becky W. Armbruster or Gerry Van Gils if you have any questions or require additional information.

Respectfully,

Zoran Batchko pm

Zoran Batchko, P.E.

Enclosure: Additional Subsurface Investigations Report of Former Servisco Facility

cc: Ms. Rebecca Armbruster, ARATEX
Mr. Frank Pfizenmeyer, ARATEX
Mr. R. Simpson, ARATEX
Mr. Phil Krejci, ARATEX, w/o enclosures
Ms. Beatrice Slater
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Mr. Howard Hatamata, CDHS

1. INTRODUCTION

This report documents the additional subsurface investigations (ASI) performed in July of 1991 at 958-28th Street in Oakland, California (site). The general location of the site is shown on Figure 1. *The investigation addressed three areas of concern at the site:* gasoline-range hydrocarbons in area of ground water well MW-4; diesel and hydraulic range total petroleum hydrocarbons in the near surface soils of the former fuel oil tank area; and continuation of the semi-annual ground water monitoring initiated in November of 1990. This investigation was performed by RMT, Inc (RMT) for Aratex Services, Inc of Schaumburg, Illinois (ARATEX). The investigations were performed in accordance with the Work Plan dated June 1991 (RMT). The Work Plan was submitted to Mr. Dennis Byrne of Alameda County Health Care Services Agency (AC-HCSA), which is the local enforcement agency governing underground storage tanks and their effects on ground water.

1.1 Historical Background

Available development and operations history of the site is limited. Through 1986 the site was leased by Servisco Corp. from Golden State Linen Service, which remains the property owner of record. Servisco operated an industrial laundry at the site. Their starting lease date and beginning of operations is not known. However, available data indicates that their operation included vehicle maintenance and use of three underground storage tanks (USTs), which were located as shown approximately on Figure 2. ARATEX acquired Servisco in 1986 and continued site operations until vacating in 1988. As part of vacating the leased site, ARATEX had the three USTs removed in May of 1988 (International Technology (IT) Corp.; July 5, 1988). In 1989, the owner leased portions of the site for mixed commercial and light industrial use, including automotive repair/rebuilding. This lease was terminated some time prior to July of 1991. Presently, parts of the facility are being leased for residential purposes. As of July 1991, we are not aware of the site being used for any commercial endeavors. However, it is known that site renovations were initiated in early 1991 including resurfacing of the open areas at the southeast and northwest property corners, demolition of the structure added [date unknown] on to the north side of the main building, demolition of the former boiler room, replacement fencing, and addition of new power service.

A summary of known site investigations is summarized in the following paragraphs. Sources of more detailed information are referenced or included in the appendices for reference.

1.2 Previous Investigations

The 1988 tanks abandonment by removal was performed by IT Corp. for ARATEX (IT Corp.; July 5, 1988). These closure(s) were reported to Alameda County, Department of Hazardous Material Division (AC-DHMD) and was observed, at least in part, by one of their representatives. A minimum of two soil samples were obtained from the base of the tank excavations and tested for fuel-type contamination such as total petroleum hydrocarbons (TPH) and the aromatic compounds benzene, toluene, ethylbenzene, and xylene (BTEX).

Soil sampling locations and analyses results for the three UST closures is summarized on Table 1. Neither low boiling point hydrocarbons (gasoline range or TPH-G) nor BTEX were detected in either of the two soil samples obtained from the subgrade of the 1,000 gallon gasoline tank. No additional investigation of this area was required by AC-DHMD following their review of the closure documentation.

Testing performed for the closure of the 500 gallon fuel oil tank ("Loading Dock/Boiler Room" area) detected 98 mg/kg of high boiling point, total petroleum hydrocarbons in the subgrade sample from the east end of the excavation; neither sample was tested for low boiling TPH nor BTEX. An additional 5 to 7 yards of soil was removed from the east end by extending the excavation down to about 15 feet. Because no confirmation sample was obtained from the deepened excavation the AC-DHMD requested that a confirmation sample be obtained to determine if the over-excavation had removed all the contaminated soils. The east end was subsequently investigated by one boring extending down to 17-foot depth. The sample obtained from 16.5 feet was analyzed for TPH and BTEX concentrations. [It is not known if the sample was from below the ground water table.] Only benzene was detected and this at a concentration of 80 μg/ kg (IT Corp.; March 1989). There is no indication in the available records that any additional/follow up investigations of this area were required.

Benzene, toluene or low boiling point hydrocarbons were detected in the six samples obtained from the exposed side walls and subgrade for the 7,000 gallon gasoline UST excavation. The excavation was extended down to about 14 feet [an additional 30 to 40 cubic yards of "contaminated soil" removed] and the excavation backfilled with imported pea gravel. The AC-HCSA required supplementary investigation of the area to determine if any contaminants remained in the surrounding soil and if ground water had been affected (IT Corp.; March 29, 1989). The AC-DHMD requested soil and ground water investigations to determine the extent of hydrocarbons detected in the subgrade during closure (IT Corp.; March 29, 1989). The initial post-closure investigations, which included the installation of three ground water monitoring wells, is detailed in the IT Corp. report dated March 29, 1989; investigation/well locations are shown on Figure 3. Ground water samples and selected soil samples were analyzed for hydrocarbon contamination. Both low boiling point hydrocarbons and aromatic compounds were detected in soil and ground water samples. High boiling point hydrocarbons were not detected. The AC-HCSA [and the Regional Water Quality Control Board, San Francisco Region (RWQCB)] required ground water monitoring (AC-HCSA; May 8, 1989) and supplementary subsurface investigations (AC-HCSA; August 17, 1989) to further evaluate subsurface conditions around the former 7,000-gallon UST location.

ARATEX retained RMT to perform the additional investigations required including: 1) one year of quarterly ground water monitoring of the existing wells MW-A1 through MW-A3; 2) installation of additional wells to better define site ground water conditions; and 3) supplementary investigations south of the former 7,000 gallon tank's location to evaluate the lateral extent of affected soil. Three additional borings were drilled in the immediate area of the tank and completed as ground water monitoring wells. Both soil and ground water sample were analyzed for TPH-G and BTEX.

The results of the four quarterly ground water monitoring and supplementary investigations are presented in Supplementary Subsurface Investigation, Former Servisco Facility (RMT, July 1990). The supplementary investigation locations along with the existing on-site ground water monitoring wells are shown on Figure 3. Key findings and conclusions of the supplementary investigation and quarterly ground water monitoring were:

1. Petroleum hydrocarbons were detected in vadose samples from boring SB-1 and SB-2 which were about 20 feet south of MW-A2. No petroleum hydrocarbons were detected in vadose zone samples obtained from locations SB-3, MW-5 and MW-6, which were within about 35 feet of the former tank's location.

2. Gasoline range hydrocarbons and aromatic volatile compounds were detected in soils samples from location MW-4. Free product that was characterized [by laboratory testing] as gasoline accumulated in well MW-4 in the two weeks following well development and the initial sampling. Well MW-4 is located approximately 70 feet northwest of the former 7,000 gallon tank and about 20 feet north of the former 500 gallon gasoline tank's estimated location.

3. The ground water flow direction computed from all ground water monitoring completed to date has generally been to the south by southwest at a gradient of 1% or less.

4. Ground water analyses/monitoring results for wells MW-A1 through MW-A3 show a significant decrease in both hydrocarbons and aromatics concentrations from previous analyses results.

5. Neither fuel range hydrocarbons nor aromatic compounds were detected in the initial [March 1990] ground water analyses of samples from wells MW-5 and MW-6. Analyses results for the subsequent monitoring of November 1990 was non-detect for well MW-5 and 8 µg/L of benzene and 70 µg/L of TPH-G for MW-6.

6. Based on the ground water analyses results, the former 7,000 gallon tank does not appear to have affected ground water outside the immediate area of its former location.

A meeting was convened on October 17, 1990, in the AC-HCSA Oakland office to review the findings and conclusions of the Supplementary Subsurface Investigation report (RMT, July 1990) and discuss project direction. Mr. Byrne of AC-HCSA, ARATEX representatives, Ms. Beatrice Slater of Golden Gate Linen, and the RMT project engineer attended the meeting. The discussions and agreements of the meeting are summarized in Ms. Whitsett's [Armbruster] letter to AC-HCSA dated October 19, 1990. Most notably, it was agreed that Aratex 1) continue ground water monitoring for the next year at frequency of six months and 2) to separately, investigate the potential source of free product detected in MW-4.

1.3 Recent Site Development

In early 1991 "petroleum odors" were noted and soil staining observed in the former 500 gallon oil tank area at the northwest corner of the site during construction of new parking lots. Subsurface Consultants, Inc. (SCI) of Oakland, California was retained to investigate the odors and staining. SCI obtained soil samples from a depth of approximately 0.5 feet below then existing grade for hydrocarbon analyses. Sampling locations were indicated to be in the general area of what was estimated to be the former 500 gallon fuel tank's location; exact measurements relative to fixed references were not available for this review. As shown on Table 2, the analyses detected both heavy hydrocarbons and aromatic compounds at concentrations requiring further investigation. The paving contractor stripped and [from disposal records] stockpiled approximately 60 cubic yards (c.y.) of soil from the "Loading Dock/Boiler Room" area, which in their judgement, showed indications of being contaminated.

1.4 Purpose and Scope

These additional site investigations were performed to address concerns about the environmental state of the site: 1) continuation of semiannual ground water monitoring begun in November of 1990 [per the October 1990 agreement with AC-HCSA]; 2) additional investigation of the source and extent of low boiling point hydrocarbons in the "Storage Yard"; and 3) investigation of the former 500 gallon fuel oil tank ["Loading Dock/Boiler Room"] area where both high boiling point hydrocarbons and aromatic compounds were recently discovered in the near surface soils.

The "Storage Yard" area was investigated by drilling and sampling four shallow borings extending down to the top of ground water [about 13 feet deep]. The "Loading Dock" area was investigated by ten shallow borings also typically extending down to the top of ground water. Soil sampling was nearly continuous from 5-foot depth to completion. The collected samples were screened in the field for volatile organic compound (VOC) emissions and inspected for indications of hydrocarbon contamination. Selected samples were analyzed for fuel range hydrocarbons and aromatic compounds. In each of the two areas, one boring was extended about ten feet below ground water and completed as a 4-inch diameter ground water monitoring well. Additionally, existing well MW-4 [a 2-inch well] was abandoned and all seven ground water monitoring wells sampled and analyzed per the semi-annual ground water monitoring plan.

1.5 Organization

This report is organized into sections describing the site setting, documenting field investigations, detailing laboratory analyses, and discussing the findings. Section 2 presents information on the site setting and a narrative description of the site. Soil related field investigation work is documented in Section 3; ground water monitoring well sampling field activities are detailed in Section 4. Soil and ground water analyses are covered in Section 5. Findings and conclusions are discussed in Section 6. References are listed in Section 7. Figures and Tables are included within text body after their first reference. Additional documentation is included in the appendices which complete this report.

2. SITE BACKGROUND

The former site is located in southwestern Oakland, Alameda County, California, within a couple miles of San Francisco Bay. It is in an older section of the city in which use of the surrounding properties range from residential to light commercial. Near surface geology consists of alluvial deposits. First ground water is encountered at the relatively shallow depth of approximately 15 feet. Ground water measurements obtained from site wells indicate that ground water levels fluctuate seasonally by several feet. Published accounts indicate that shallow ground water in the west Oakland area is not used for human consumption nor irrigation because of its generally poor quality and susceptibility to surface inflows.

2.1 Site Location and Setting

The site is located at 958-28th Street, Oakland, California. The site's boundaries and neighboring uses are indicated on Figure 3. The site fronts on 28th Street and is bounded to the east by Myrtle Street and to the west by Filburt Street. Residences border the site along its northern property limit. Generally, the site area is residential with a public school on the south side of 28th Street. Small commercial and industrial facilities are interspersed throughout a several block radius of the site. There is a meat packing facility, which doesn't appear to be operational, on the east side of Myrtle Street.

Topography of the site and vicinity grades toward San Francisco Bay at approximately 0.5%. Site elevations determined by survey range from about 24 feet above mean sea level (MSL) to less than 21 feet above MSL near the western property limit. These elevations are comparable to elevations indicated on the U.S.G.S. Oakland West Quadrangle Map (7.5 minute series). Although existing site grades have been influenced by recent pavement related activities, site elevations, and the general trend of sloping to the west is also consistent with regional data.

2.2 Geology

Local geology is described in the U.S.G.S. report Areal and Engineering Geology Of The Oakland West Quadrangle, California by Dorothy H. Radbruch (Map I-239). The site area is mapped as Pleistocene-aged Temascal Formation. The formation is characterized as "interfingering layers of moderate yellowish-brown clayey gravel, sandy silty, clay, and various clay-silt-sand mixtures." A gravel layer is at the base where the formation is exposed. Further, "In some places the gravel grades upward into sand and then clay within a few feet...several similar sequences of gravel grading upward into clay may overlie the first sequence." The various layers are characterized as irregularly shaped, discontinuous, and interfingered. The surficial 2 to 4 feet are typically, dark clayey soil. The Temascal formation is estimated to be about 5 feet thick along the bank of the Bay and up to 25 feet thick at its eastern boundary along Temascal Creek.

The underlying Alameda Formation is several hundred feet thick and sedimentary in origin. It's lithology is described in the above reference:

> "Upper exposed part is clay, sandy, silty, with few pebbles...Olive gray to moderate-yellowish. Consolidation increases with depth, except that the upper portion has been preconsolidated...in places an old soil is exposed at the top of the formation. Overlain by Temascal formation, Merrit sand, or bay mud."

Near-surface lithologic conditions at the site have been investigated by nearly 20 borings. Specific details on the investigations are contained in the investigative reports completed to date [IT Corp.; July 1988 and March 1989; and RMT; July 1990 and January 1991], including this investigation. Based on the logs developed from drilling and sampling at the site, the near surface lithology consists of interbedded sequences of clays, silts, sands, and occasional thin gravel zones.

2.3 Hydrogeology

The site is located in the East Bay Plain Area of Alameda County. First ground water within the East Bay Plain is located near the ground surface and typically not used for domestic water supply (Hickenbottom and Muir, June 1988). Ground water also occurs at depth. Deeper ground water occurs under both confined and unconfined conditions. Recharge to the reservoirs occurs from infiltration [rain and stream flows] and subsurface inflow from adjacent hydraulically connected areas. Hickenbottom and Muir (June 1988) identified less than a dozen ground water wells within a mile radius of the site. Further, they determined that the density of wells in the general area, which has long been urbanized, to be less than five per square mile. First ground water at the site has been observed at depths varying from about 13 feet to 15 feet.

3. INVESTIGATION

Field work for these additional site investigations was performed during the week of July 15, 1991, under the direction of a California-registered Civil Engineer. Geologic logs were prepared under the direction of a California-registered Geologist. The Health and Safety Plan prepared for RMT's personnel site work is included in Appendix A. Drilling and sampling observations, field screening, health and safety air monitoring, soil classifications, field logging, and sample preparations were by an RMT staff engineer. Drilling, soil sampling, monitoring, well construction, ground water sampling, and environmental protocols followed procedures outlined in the Work Plan (RMT; June 1991), which was submitted to AC-HCSA prior to initiating the investigation. All necessary permitting (Appendix B) and subsurface clearances were obtained by RMT prior to beginning drilling. Field work and related activities are discussed below. Monitoring well and ground water related activities are discussed in Section 4. Laboratory analyses results are discussed in Section 5.

Field investigations consisted of investigating the former "Storage Yard" and "Loading Dock" areas and evaluating ground water conditions. Soil samples obtained during the investigation were logged in the field and screened for volatile organic compound (VOC) emissions. Monitoring wells were installed at two locations to supplement ground water quality data. These borings and existing wells were surveyed to establish locations and elevations. Field notes were maintained for subsequent use in evaluating all the data developed.

3.1 Locations

A total of fourteen locations were investigated: four in the "Storage Yard" area around well MW-4 [abandoned] and ten across the former "Loading Dock" area surrounding the purported location of the former fuel oil tank. Location of previously completed investigation locations are shown on Figure 3, including the previously completed *shallow soil borings SB-1 through SB-3. Survey plan* locations of the fourteen new borings, including two new wells, and six existing wells are shown on Figure 4.

The four borings completed in the former "Storage Yard" area were in an approximately square configuration around well MW-4. Borings SB-4 and SB-6 were within seven feet of the fence establishing the northern property limit; borings SB-5 and SB-7 were located approximately south from these two borings and as close as possible to the wall bounding the south side of the yard. Boring SB-4 was located in the northeast corner of the site, which is the up gradient site limit, and within ten feet of the eastern and northern fences bounding the yard. Boring SB-5, which was originally planned for the estimated eastern limit of the former 1000 gallon tank (RMT, June 1991), was relocated to the western edge of the former tank's location [estimated in the field from the asphalt patch]. SB-7 was located approximately twenty feet west of SB-4. SB-6 was located even with SB-4 across from SB-7. No additional borings were drilled west of SB-6 and SB-7 based on the field screening results which did not indicate VOC in either soil profile.

On the morning the investigations began both the paving contractor and property owner were interviewed for background and their site observations during renovations of the "Loading Dock" area. This information was used to locate borings, as discussed in the following paragraph. Both indicated the area of staining and location for the SCI samples. The contractor also stated that they observed pea gravel about five to ten feet east of this location. He further noted discoloration at the base of the northwestern support for the canopy over the northwest building entrance. The other areas of discoloration and suspect hydrocarbon contamination identified by the contractor were spots which they had removed to the stockpile. Suspect soils were stockpiled parallel to the northern fence line in the area bounded by SB-15 and SB-14. Additionally, the contractor indicated that they had aerated up to an approximately 8-foot depth of the subgrade beneath the former building addition, which they had demolished, and that they did not observe any indications of hydrocarbon contamination in this area. The effects of grading, equipment traffic, and paving [south of SB-8 and SB-11] eliminated any possibility of evaluating site conditions from surface appearance.

The "Loading Dock" area investigation locations were revised from the geometric pattern originally planned (RMT, June 1991). The revision in investigation locations was necessary because the two soil stockpiles covered the northern third of the work area and ongoing site activities further restricted accessibility. These ten borings are numbered consecutively from SB-8 through SB-17. Boring SB-10 was located in the area where the paving contractor observed black [hydrocarbon] staining, the area of SCI's sampling [see section 1.3] and the former fuel oil tank's location. Borings SB-9, SB-11 and SB-13 were located approximately twenty feet away from SB-10 to investigate the possible lateral extent of suspected hydrocarbon contamination. Borings SB-16 and SB-17 were located south and east, respectively, of SB-8 after field data indicated the presence of hydrocarbons at that location.

3.2 Drilling

Drilling was by truck-mounted CME-75 rig using small-diameter, hollow stem auger. Soil sampling and well construction was through the auger string. Drilling and sampling began on the morning of July 15, 1991 and was completed in the late evening of July 18, 1991. Existing well MW-4, which was in the "Storage Yard" and north of the former 1,000 gallon gasoline tank, was overdrilled, well casing removed, and boring sealed with 8% Volclay, neat cement grout. Subsurface conditions in the area of MW-4 were investigated by three borings to top of ground water (vadose zone) and one boring extending down into ground water (deep). Subsurface conditions in the area of the former fuel oil tank were investigated by nine vadose borings and one deep boring. Each deep boring, in both cases, was completed as ground water monitoring wells. Locations are shown on Figure 4.

3.3 Sampling

All borings were sampled at two feet and thereafter at intervals not greater than five feet. The depth interval between five feet and fifteen feet [or completion] was sampled continuously or at 2-foot intervals. Generally, this same sampling frequency was maintained at deeper intervals during advancement of the two borings completed as wells. The reasons for using nearly continuous sampling were: 1) stratigraphic delineation and soil classification, 2) screening the profile for indications of hydrocarbon contamination [by VOC emissions testing], and 3) obtaining representative samples for laboratory analyses.

Sampling was through the stem of the augers by *Modified California split spoon sampler*, which has a 2.5-inch inside diameter. Over each 18-inch sampling interval, the sampler was driven by a 140-pound hammer [tube-type] falling approximately 30 inches; the hammer was by actuated wire line. The sampler and sample liners were decontaminated as described subsequently in this section.

The stainless steel split barrel was lined with three, 6-inch long brass liners to obtain compositionally, "undisturbed" samples. Of the three liners within the sampler barrel, the uppermost is referred to as #1 and the bottom-most [closest to the "shoe"] as #3. Generally, sample #1 or the soil within the "shoe" were used for classification purposes, sample #2 was used for field monitoring, and sample #3 preserved for laboratory hydrocarbons analyses.

Typically, a representative lithology sample was retained from each sampling interval (#1 or "shoe"). Samples were retained in a clear container for future evaluation and review by RMT's registered geologist. These samples were used to validate field descriptions and develop final descriptions, which are based on the Unified Soil Classification System (USCS). Descriptions of the soils encountered, sampling intervals, sample recoveries, penetration resistance measurements, and general drilling observations are presented on the Logs in Appendix C.

The bottom-most and full sample liner [typically #3 or #2] was preserved in brass liners for laboratory hydrocarbons analyses. Both ends of the soil filled liner were trimmed flush, covered with aluminum foil, capped with tightly-fitting [plastic] end caps, and then sealed further with electric tape. After labeling, the samples were individually sealed in zip lock bags, typically, and packed in an ice-filled cooler (sample shuttle). All retained samples destined for laboratory testing were logged onto Chain of Custody forms and delivered by RMT or courier to the testing laboratory.

3.4 Field Screening

Representative materials from each sampling interval were screened for VOC emissions. This screening was typically performed in the field on sample #2. In no instance was the laboratory sample used for field VOC monitoring. The sample was prepared by first sealing the bottom of the liner as noted above, creating an approximately 1/2-inch cavity (headspace) in the soils at the other end, covering with aluminum foil, and allowing sufficient time for headspace equilibration. Field monitoring results are discussed in Section 5 along with the other sample analyses and noted on the geologic logs.

An OVM photo ionization detector (PID) equipped with 10 electron volt lamp and calibrated daily [hexane standard] was used for the screening. Recorded readings are the maximums for each sample surveyed; at least 15 minutes was allowed for equilibration of the headspace. OVM readings are noted on the Logs in parts per million (ppm) relative to head space air volume. Screening was used as a qualitative measure/indication of volatile hydrocarbons at the sampled interval.

3.5 Decontamination

Preparation of the field machinery and equipment for the subsurface investigation consisted of inspecting mechanized components for hydraulic fluid leaks or other malfunctions which could impact the investigation. Equipment which would be directly contacting the soils or ground water was steam cleaned before each use, i.e., augers, swabs, and bailers.

All soil sampling equipment contacting the soil was decontaminated to prevent sample cross contamination. The stainless steel split spoon samplers, including the cutting "shoe", and individual brass liners were decontaminated prior to each down hole trip, i.e. for each sampling interval. The decontamination procedure is detailed below.

1. An initial brushing and wash with tap water to remove particulate matter and any visible surficial films.

2. The equipment was then washed with a tri-sodium phosphate (TSP) and deionized water solution to remove any remaining particulate matter or residuals.

3. The TSP-washed equipment was then rinsed thoroughly with deionized water to remove TSP residuals.

The cleaned brass liners were placed on clean aluminum foil to air dry before use. The frequency at which the split spoon sampler was used only allowed for drip drying.

3.6 Subsurface Stratigraphy

Stratigraphic conditions reflect the reported alluvial origin of the near surface soils with gradational changes over relatively short depths and coarse materials overlying fines. A cross section of subsurface conditions through locations SB-4 and SB-5 in the former "Storage Yard" area is shown on Figure 5; cross sections through the former fuel oil tank area are shown on Figures 6 and 7. Section line locations are indicated on Figure 4. The variation in stratigraphy evident on the three sections is attributed to the nature of the deposits' alluvial origins. Generally, fine-grained and cohesive soils overly one or more layers that grade coarser with depth. The three sections are self explanatory and discussed in general terms below for each of the two investigation areas.

In the "Storage Yard", approximately one to two feet of dark gray silt underlies the approximately 9-inch thick pavement section. Debris such as brick was observed in this layer at location SB-5, which suggests that this stratum may be fill. Underlying the silt is an approximately ten foot thick stratum that grades from a stiff clay under the silt to a well graded sand or gravel. The sequence appears to repeat starting at about 11-foot depth. At location SB-4, which extended down to 26.5 feet the second stratum appears to extend down to about 21-foot depth where the silty clay layer contacts the underlying stiff clay. VOC readings appear to parallel the olive green [dis]coloration (staining) noted in the field at locations SB-4 and SB-5. Generally, both the staining and OVM readings in excess of 2,000 ppm begin at about seven to eight foot depth and continue down to about 15 feet depth, which is where the sands typically terminate. VOC readings in the underlying clay strata(s) were less than 300 ppm. At investigation locations SB-6 and SB-7, which are 35 feet and 23 feet west of SB-4 and SB-5, respectively, no staining was observed nor did any of the VOC screening register on the OVM.

In the "Loading Dock" area, the subsurface stratigraphy and soil conditions appears to follow the same general pattern. Clays overly silts, which appear to grade rapidly to sands and sandy gravels to gravelly sand. This same general sequence repeats itself within about ten feet. Additionally, the VOC readings appear to parallel the observed staining and discoloration with the greatest readings being in the area of SB-10. VOC readings were non-detect for northerly borings.

3.7 Wastes Containment and Disposal

All drilling cuttings were drummed in U.S Department of Transportation approved drums (17H). Each drum was sealed and then labeled with: date generated, location, depth interval, and wetted condition of the cuttings. The drums were stored in the north lot [along the wall of the structure], which is secured by locked gates at each entrance. The soil stockpiled by the paving contractor prior to this investigation and drummed soil cuttings were removed from the site on August 7, 1991, by Laidlaw Environmental Services of Martinez, California for disposal at a suitable facility. Transport and disposal manifests are presented in Appendix G. The waste water generated during the investigation and ground water sampling was picked up in bulk [vacuum truck] on August 27, 1991, by Romic Chemical Corporation of East Palo Alto, California. All seventeen of the emptied soil drums were also removed by Romic Chemical Corp for disposal. The sixteen remaining drums are being retained on-site for ground water monitoring needs.

3.8 Locations Survey

Locations of the investigations borings and monitoring wells were determined on July 19, 1991, by precision survey based on state plane coordinates and mean sea level (MSL) elevation. The survey was performed by Kier & Wright Civil Engineers & Surveyors of Hayward, California. The survey included the five existing ground water monitoring wells and the building's northern limits. Surveyed locations and elevations were used to develop the investigation plan and ground water monitoring data. A record of the survey is available in RMT's office.

4. GROUND WATER MONITORING WELLS

Borings SB-4 and SB-11, which extended at least ten feet below the top of ground water, were completed as ground water monitoring wells MW-4A and MW-7, respectively. Additionally, 2-inch diameter monitoring well MW-4 was abandoned. The Alameda County Flood Control District, Zone 7 well construction and abandonment permits are contained in Appendix B. The well completion/construction diagrams for both the five existing wells and new wells MW-4A and MW-1 are included in Appendix D. Table 3 summarizes well construction details and survey data for the five existing and two newly installed ground water monitoring wells at the site.

Screened intervals for the two new wells were designed based on observed subsurface conditions; the wells were sized, as for previous RMT-installed wells, using current-practice procedures. Well construction and abandonment was observed and documented by RMT's field engineer. Materials, equipment, and labor was supplied by the drilling subcontractor.

4.1 Well Design

"Storage Yard" area replacement ground water monitoring well MW-4A was constructed in boring SB-4, which was augured down to 25-foot depth. The well filter pack/screen interval was designed to monitor in situ ground water while excluding potential impacts from the coarse-grained vadose zone materials in which field observations noted staining and screening indicated VOC readings greater than 2,000 ppm. The 1-foot thick clayey sand layer at thirteen feet was selected as the separator because of its [estimated] low permeability, natural color [void of staining], and relatively low OVM reading of 277 ppm. Thus, the filter pack interval extends from 13.8 feet below ground surface to 25 feet, the bottom of the auger boring. Ten feet of well screen extends from the bottom of the boring to fifteen feet, which is slightly more than one foot of filter pack buffer. Based on the descriptions provided on the geologic logs and estimation of permeability characteristics the majority of the screened interval is through materials with low production capabilities. The poorly graded sand layer at 14-foot to 15-foot depth is estimated to be the most pervious of the materials monitored and likely the major source of water into this well.

"Loading Dock/Boiler Room" area monitoring well MW-7 was constructed in boring SB-11, which extended down to 30-foot depth. Field observations and screening did not indicate the presence of hydrocarbons along any section of the profile. The clay layer encountered over the depth interval of seven feet to 11 feet was selected as a natural infiltration barrier to percolation as evidenced by the trace OVM reading obtained at seven feet and zero readings at greater depths. Thus, the filter pack for well MW-7 extends from 13.5 feet down to boring bottom at 30 feet. A fifteen foot long slotted well screen extends from 15-foot depth down to the boring bottom. Permeability of the monitored soils generally increases with depth. The clays extending down to about 26-foot depth are characteristically low permeability materials; the sand and gravel layers observed in the bottom four feet of the boring are highly pervious relative to typical silts and clays. Therefore the coarse grained soils observed at the base of the well MW-7 are expected to be the major contributors to water developed in the well.

4.2 Well Sizing

Generally, the filter pack sand gradation and well screen size were based on previous well design parameters. Because of the observed variability in soils over the planned monitoring intervals, a "#3" monterey sand was used for the well screen filter pack; well screens were 0.01-inch, machine-slotted schedule 40 PVC. Table 4 summarizes the filter pack and well screen sizes for the seven wells completed by RMT. Design considerations are summarized below.

Representative soil samples obtained from below prevailing ground water levels were analyzed to determine the range of particle size distributions [gradations]. Analyses were performed by RMT's soils laboratory. Based on the range of in situ conditions gradations and past experience, a commercially available sand known as "#3 sand", which is medium and uniformly graded, was selected for the filter pack [to prevent the in situ soils from migration into the well]. Vendor supplied specifications for the filter pack are included on Table 4. Filter selection criteria and well screen slot sizing are summarized below.

Filter Pack Selection: The design of natural filter and drains has been studied by a number of investigators including the Soil Conservation Service, U.S Army Corps of Engineers, and U.S. Bureau of Reclamation (Sherman, 1977 and Sherard et.al., 1984). The two criteria used for filter pack selection were the permeability ratio and piping ratio methods. These are based on comparisons of filter to in situ (base) materials' sizes for the equivalent size of specific percents passing [e.g. D_{85} is the size of material for which 85% are finer]. Design criteria are noted on the table.

Well Screen Slot Sizing: Well screen size selection was based on the ratio of the selected filter pack D_{85} size to the slot width. Sherman (1977) recommends a minimum ratio of 1.2 to protect the screen from excessive infiltration/movement of the filter pack into the well casing. The ratio of #1C sand D_{85}, which is about 0.9 mm, to 0.01-inch well screen slot is about 3. Thus the 0.01-inch slot size was selected to retain the filter pack and yet maximize ground water in flow rates. Additionally, this screen size was recommended by the sand supplier based on their experience and in-house testing.

4.3 Well Construction

The wells were constructed by the drilling subcontractor, through the hollow of the augers. The assembled well casing was centered in the augers and the annular space backfilled with the materials indicated on the Well Construction diagrams [Appendix D]. Construction proceeded in small increments to prevent binding of the backfill materials with the well casing during auger extraction. Monitoring well construction was observed by RMT's engineer.

Both wells MW-4A and MW-7 were constructed of nominal 4-inch diameter Schedule 40, PVC casing and well screen. All connections were threaded; no glues or other foreign fasteners were used in assembling the wells. Monitoring intervals extend ten and fifteen feet, respectively, from the top of prevailing ground water [approximately thirteen feet deep]. Monitoring interval design is discussed above. Static water levels were based on depth measurements made in the open boreholes just prior to well construction.

The well diagrams in Appendix D summarize all pertinent well construction measurements, material types, and well development data. The well screen sections were packed with "# 1C" sand to about 1 foot above the top of well screen. The filter pack was overlain with 2 feet of bentonite pellets, which were hydrated before proceeding with the remainder of the seal. The overlying annular space was sealed to within several inches of the ground surface with neat cement [6-sack mix] grout. Both wells were finished by installing traffic-rated, well covers set into concrete. Well covers were set above the surrounding grade to minimize surface ponding and the possibility of run off infiltration. Locking, casing covers were installed around the well standpipes to secure access to the wells.

4.4 Well Development

Both wells were developed not less than 24 hours after construction. Depths to ground water were measured before the start of development. Development was by the drilling contractor under the direction of RMT's engineer. Details on the well development are summarized on the Well Diagrams presented in Appendix D. Development waters were drummed, labeled, and stored as described previously for the drill cuttings. Surge blocks and bailers were steam cleaned before each use.

The screened intervals of each well were surged by swabbing in overlapping 2- to 3-foot increments. This was done to "set" the filter pack and facilitate development of the natural filter zone in the in situ materials surrounding the filter pack. After surging, at least 55 gallons of water was bailed from each well by the drilling subcontractor; 110 gallons was bailed from well MW-7. Bailed waters were monitored for changes in coloration, indications of hydrocarbons [odors and sheen], and drawdown. Bailed volumes were estimated from the height to which the 55-gallon containment drums were filled. Well development was terminated when it was judged that no discernible change in the turbidity was being achieved.

Approximately 55 gallons were bailed over a several hour period for the development of MW-4A; the water level would draw down approximately five feet for each seven to eight gallons purged [approximately 2 minute interval]. Recovery to initial ground water levels would take about fifteen to twenty minutes. Development of MW-7 did not experience any appreciable drawdown. Approximately 110 gallons were bailed from this well in about one hour.

No indications of hydrocarbons free product or odors were noted in the well development purge waters obtained from either well. Development waters from both wells were relatively cloudy at the end of development.

4.5 Ground Water Sampling

Monitoring wells MW-A1 through MW-6 were sampled on July 18, 1991 by RMT's field engineer; wells MW-4A and MW-7 were sampled on the morning of July 19, 1991. The order of sampling proceeded from the least to greatest known hydrocarbon concentrations. Standing water was purged by hand operated peristaltic pump. Purge waters were monitored for stabilization of properties and changing turbidity. Purge and decontamination waters were drummed, labeled, and sealed as described previously. Purge equipment was decontaminated before each use and at the completion of the days work as described in Section 3.5.

Pre-sampling Purging: Pre-sampling purge volumes, times, properties monitoring, and turbidity measurements are summarized on Table 5. Each 5 gallons of purge water was monitored for temperature, specific conductance, and pH using a Yellowline digital meter; turbidity was measured by a portable turbidity meter [Hach Model No. 16800]. Generally, at least three casing volumes of standing water were purged from each of the wells before the sampling, which for 4-inch wells equals 20 gallons per 10 feet of standing water. As summarized on the table, at least 25 gallons and up to 70 gallons was purged from the wells over time periods ranging from less than half an hour to nearly three hours. Generally, purging in excess of the 25-gallons was continued for wells where the properties had not stabilized to within ten percent over three successive readings or water turbidity exceeded 10 NTU. pre-sampling purging of well MW-4A was terminated at 25 gallons even though still cloudy [maximum gauge reading of 100 NTU; i.e. over range] because of slow recovery rate; temperature, specific conductivity, and pH readings were stabilized. Pre-sampling purging of MW-7 was terminated after evacuation of 70 gallons; turbidity remained relatively cloudy from start to finish.

Sampling: Ground water samples were obtained immediately after purging using a disposable bailer: approximately 4-foot long by 1.5-inch diameter and bottom filling. As indicated on Table 5, turbidity readings of samples from the five existing wells were less than 10 NTU; turbidity of water samples from the wells MW-4A and MW-7 were greater than 100 NTU. A disposable stop cock [insert] was used for each well. A clean nylon rope was used to slowly lower the sampler three to five feet below standing water level. After extraction from the well, the stop cock was inserted into the bottom of the bailer to prevent aeration of the sample during sample bottle filling. Sample bottles were provided by the testing laboratory.

Sampling consisted of filling at least two, 40 milliliter (ml) clear "VOA" vials and one 1-liter jar for the planned hydrocarbon testing. Both the VOA vials and 1 liter jars were over-filled, covered with a teflon septum, tightly capped, checked for air bubbles, and then labeled. The filled sample vials and jars were preserved in a separate ice-filled cooler until transported to the testing laboratory. Chain of Custody forms were completed for all the collected ground water samples.

Quality Control: Field sampling quality control consisted of one blind sample that was a duplicate of well MW-4A. The field method blanks were not considered necessary since a disposable bailer and stop cock were used for the sampling.

4.6 Elevation Measurements

Ground water measurements dating back to March 1990 [date of the supplementary investigation] through September 23, 1991, are summarized on Table 6. All of the ground water elevations indicated on the table are referenced to the top of casing elevations determined by the recently completed survey. Reference point markings established by the [July 19, 1991] survey were not always coincident with those used for earlier measurements. Thus the earlier measurements are considered only approximate.

As indicated on the table, ground water elevations for previously existing wells screened above 25-foot depth [first aquifer] have varied from as little as 1.0 feet in MW-6 to 1.3 feet in MW-5. Well MW-A3 which monitors the interval from 23.5 feet to 34.5 feet has varied by over 1.7 feet over this same time period. Variations in ground water elevation for MW-4 were not possible because of free product accumulations. However, the general trend in variation appears to coincide with the local wet and dry periods.

Figure 8 depicts the interpreted top of first ground water based on the most recent [September 23, 1991] measurements and using the data from wells MW-4A, and MW-5 through MW-7. As shown on the figure, ground water flow is to the southwest at a gradient of 0.5%, which is consistent with previous findings.

Ground water elevation data from well MW-A3 was not used in the interpretation since the drilling and well construction data indicate that it monitors a different water bearing zone than the other wells. Ground water elevation data for wells MW-A1 and MW-A2 are anomalous and would at first appear to be problematic relative to the other well's data. However, closer examination of the two wells data indicates that 1) MW-A2 has typically been higher than MW-A1 by approximately 0.35 feet and 2) that the local trend suggests a localized sink. This observed behavior is consistent with the wells' locations relative to the pea gravel filled tank excavation which would act as sink/buffer and thereby affect ground water measurements. Thus, the wells installed by RMT and removed from any known sinks/sources are considered most representative of prevailing ground water conditions at the site.

[submission of samples over several days] are presented in Appendix E along with completed Chain Of Custody forms. A total of 45 soil samples were analyzed as described below. Three of these samples were obtained from the stockpiled soil for disposal characterization; these results are summarized in Appendix G.

5.2.1 TPH Analyses

TPH testing was by EPA Test Method 8015M [gas chromatography]. Samples were analyzed for gasoline range (low boiling or TPH-G) and diesel range (high boiling point or TPH-D) compounds. Sample preparations for the gasoline range analyses was by EPA Method 5030, which is purge and trap. Preparation for high boiling point analyses was by EPA Method 3520 , which is an extraction. Method detection limits (MDL) for the TPH-G and TPH-D analyses were 1 mg/kg; the several samples analyzed for hydraulic range compounds had a MDL of 5 mg/kg.

In the "Storage Yard" gasoline range compounds were detected in only 2 of the 13 samples tested by Method 8015M. The 150 mg/kg of jet fuel range materials reported for SB-4 at 9-foot depth is assumed to be aged gasoline residual. The only other TPH detected was in another SB-4 sample from 15-foot depth which is reported as 1.07 mg/kg of TPH-G. No heavier [than gasoline] fuel range compounds were detected in "Storage Yard" area samples tested. Analyses completed during previous investigations of this area [MW-4] detected 3,300 mg/kg of TPH-G and 145 mg/kg of TPH-D in one sample.

In the "Loading Dock" area, both TPH-D and hydraulic range compounds were detected in several of the borings. Additionally, what was reported as jet fuel range compound was detected in a sample from SB-10 obtained from 10-foot depth. Diesel range residuals were detected in all three test samples from SB-8 at concentrations ranging from 24 mg/kg at 2.5 feet to 2110 mg/kg at 9.0 feet, which decreased to 310 mg/kg in the sample from 10 feet. Additionally, 98 mg/kg of hydraulic range TPH was detected in the shallow sample from SB-8. TPH-D was also detected at 77 mg/kg in the 10-foot deep sample from SB-10; 344 mg/kg of jet fuel range, which are assumed to be light diesel residuals, were detected in the sample from 6.0 feet. Both TPH-D [120 mg/kg] and hydraulic range [23 mg/kg] compounds were detected in the 2-foot sample from SB-11. Both diesel range and hydraulic range were detected in the 3.5-foot and 5.0-foot deep samples from SB-17; total concentrations were 140 mg/kg and 610 mg/kg, respectively.

5.2.2 AVO Analyses

All samples analyzed for TPH were also tested for aromatic volatile organic compounds by EPA Method 8020. Sample preparations were by EPA Method 5030 [purge and trap]. MDLs for the four AVOs [benzene, toluene, ethylbenzene, and xylenes] were all 2.5 μg/kg. These analyses results indicate that the lateral and vertical extent of affected areas is greater than indicated by the TPH analyses. Analyses dilutions are included on Table 7.

In the "Storage Yard" area investigation samples, BTEX was detected in samples from borings SB-4 an SB-5 [at the west end of the former gasoline tank location] and only toluene [at less than 13 μg/kg] in tested samples from SB-6 and SB-7. Benzene was detected in the 12-foot [130 μg/kg] and 15-foot [85 μg/kg] deep samples from location SB-4. Toluene [5 μg/kg], ethylbenzene [30 μg/kg], and xylenes [55 μg/kg] were also detected in the sample from 15 feet. Benzene was detected in the 8-foot deep and 12.5-foot deep samples from location SB-5 at concentrations of 500 μg/kg and 5 μg/kg, respectively. Toluene was detected in all three SB-5 test samples; the maximum of 100 μg/kg was detected in the 8-foot sample. Ethylbenzene and xylenes were also detected in the 8-foot sample from SB-5 at concentrations of 450 μg/kg and 750 μg/kg.

The AVO analyses results for the "Loading Dock" area detected benzene, toluene, and xylenes at various locations, but at considerably lesser concentrations than in the "Storage Yard" area. Benzene was detected at location SB-8, SB-9, and SB-10 at concentrations ranging from 5 μg/kg to a maximum 40 μg/kg in the 10-foot deep sample from SB-8. Toluene was detected in nine samples at concentrations ranging from 4 μg/kg to 330 μg/kg [SB-16 at 9-foot depth]. Xylenes were detected in only four of the test samples; concentrations ranged from 450 μg/kg [SB-17] to 65 μg/kg [SB-8]. Generally, the affected area appears to be limited to the southern investigation area. Only benzene concentrations exceed the RWQCB suggested soil action levels for soil [approximately ten times the MCL for ground water, which for benzene is 1 ppb (1 μg/L)].

5.3 Ground Water Samples Testing

All seven ground water monitoring wells were sampled on July 18 and 19, 1991. Analyses were performed in accordance with the Work Plan (RMT, June 1991) and included testing for dissolved TPH and BTEX. Analyses results are reported in Appendix F and summarized on Table 8, including the blind duplicate; previous analyses results are included as Table 9.

5.3.1 General

The ground water samples were analyzed for TPH-D and TPH-G/BTEX constituents in accordance with EPA Methods 8015M and 8020 by TMA/Norcal. The TPH-D analyses samples were extracted per EPA Method 3520; gasoline range and BTEX samples were prepared by purge and trap in accordance with EPA Method 5030. Analyses MDLs were 0.05 mg/L for TPH and 0.5 μg/L for BTEX. Testing was completed within two weeks of sampling.

5.3.2 TPH Analyses

Only Gasoline range dissolved constituents were detected and this in only two of the wells. A TPH-G concentration of 0.30 mg/L was detected in MW-6 and 2.60 mg/L in the sample from new ground water monitoring well MW-4A. No diesel range or hydraulic constituents were detected. Additionally, the duplicate sample from MW-4A contained a comparable concentration of TPH-G [2.50 mg/L].

5.3.3 BTEX Analyses

BTEX were detected in ground water samples of wells MW-A2,MW-4A and MW-6 (see Table 8). Additionally, BTEX concentrations in the blind duplicate were about 50% greater than MW-4A concentrations. Benzene concentrations exceed the RWQCB's MCL of 1 μg/L for ground water. The MCLs for ethylbenzene and xylenes are 680 μg/L and 1750 μg/L, respectively.

6. DISCUSSION

The vadose zone soils and first ground water in the "Storage Yard" area have been affected by gasoline-like product. Based on past usage, the affects seem attributable to the former 1000 gallon gasoline tank that was located along side the building at the eastern entrance. Interpretations made from the results of these and previous investigations in the area indicate that the affected area is limited in extent. Field and laboratory data from borings SB-6 and SB-7 indicate that the affected soils extend no more than 20 to 30 feet radially from the former tank's location. Laboratory data, field screenings, and field observations for the three borings where TPH-G was detected indicate that the majority of any remaining residuals lies within the sand to gravely sand layer observed between seven and ten feet. The underlying finer grained soils, although affected to a lesser extent, appear to be migration barriers for further degradation of ground waters. The concentrations of TPH-G and BTEX observed by the monitoring results for MW-4A are believed to be due to the past influence of near by well MW-4 on which there was free floating product. [Well MW-4 was abandoned and sealed only a few days before sampling MW-4A.]

The extent of the affected soils in the "Loading Dock" area appear to be limited approximately to ten to twelve foot depth and an estimated 20-foot radius around what is understood to be the former fuel oil tanks location. Investigation locations SB-12 through SB-15 on the north end were not observed to contain any contamination in the field; the laboratory analyses detected only traces of toluene in several of the samples. The laboratory analyses results for samples from boring SB-11 [well MW-7] indicate that high OVM readings obtained in the field for near surface samples are probably the result of hydraulic range compounds, which are likely the result of past site operations. At location SB-16, the southern-most investigation location, the field VOC readings noted on the logs are attributed to the nominal toluene and ethylbenzene concentrations detected in the analyzed samples. No TPH or benzene concentrations were detected at this location which would require remediation.

At locations SB-8, SB-9, SB-10, and SB-17 varying concentrations of TPH-D and/or benzene were detected which exceed published soil action levels. High boiling affected zone is judged to extend from approximately 2-foot depth, down to the top of the clay layer, which was encountered at approximately 10-foot depth. The benzene affected zone extends several feet down into the clay. At location SB-17, only the upper 10 feet appear to be affected by TPH-D and this at concentrations of less mg/kg.

Based on published regulatory guidelines for TPH-affected and benzene affected areas, it appears that a relatively small area surrounding the former fuel oil tank and former 1,000 gallon gasoline tank requires remediation. Figure 9 show the interpreted TPH-G affected area around the former gasoline tank in the "Storage Yard" area. Also shown on the figure is the interpreted extent of the TPH and benzene affected area in the former "Loading Dock" area.

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12/10/90

TABLE 2
RESULTS OF GROUND WATER SAMPLE ANALYSES - SUMMARY
(in µg/L)

958 28th Street
Oakland, California

COMPOUND(s)	G W MCL	MW - A1 3/8/89	MW - A1 5/31/89	MW - A1 9/13/89	MW - A1 12/5/89	MW - A1 3/21/90	MW - A2 3/8/89	MW - A2 5/31/89	MW - A2 9/13/89	MW - A2 12/5/89	MW - A2 3/21/90
TPH-G (8015M)	-	7,200	5,800	2,700	500	1,300	5,200	n.d.	1,900	3,500	1,400
TPH-D (8015M)	-	12,000	5,070	1,000	n.d.	n.d.	7,700	n.d.	600	n.d.	n.d.
AVOCs (602)											
Benzene	1.0	120	250	16.0	2.1	3.6	380	150	56	35	35
Toluene	-	150	57	12		n.d.	200	4.0	4.4	2.4	2.4
Ethylbenzene	680.0	60	11	9		5	n.d.	n.d.	5	n.d.	n.d.
Total Xylenes	Note 5	2,100	210	37		24	700	10.0	11.0	18.9	18.9

COMPOUND(s)	G W MCL	MW - A3 3/8/89	MW - A3 5/31/89	MW - A3 9/13/89	MW - A3 12/5/89	MW - A3 3/21/90	MW -4 3/8/89	MW -4 5/31/89	MW -4 9/13/89	MW -4 12/5/89	MW -4 3/21/90
TPH-G (8015M)	-	n.d.	n.d.	n.d.	n.d.	n.d.	<- - not drilled yet - ->				F.P.
TPH-D (8015M)	-	n.d.	930	n.d.	n.d.	n.d.	<- - not drilled yet - ->				n.d.
AVOCs (602)											
Benzene	1.0	n.d.	n.d.	n.d.	n.d.	n.d.	<- - not drilled yet - ->				detected
Toluene	-	n.d.	n.d.	n.d.	n.d.	n.d.	<- - not drilled yet - ->				detected
Ethylbenzene	680.0	n.d.	n.d.	n.d.	n.d.	n.d.	<- - not drilled yet - ->				detected
Total Xylenes	Note 5	n.d.	n.d.	n.d.	n.d.	n.d.	<- - not drilled yet - ->				detected

COMPOUND(s)	G W MCL	MW -5 3/8/89	MW -5 5/31/89	MW -5 9/13/89	MW -5 12/5/89	MW -5 3/21/90	MW -6 3/8/89	MW -6 5/31/89	MW -6 9/13/89	MW -6 12/5/89	MW -6 3/21/90
TPH-G (8015M)	-	<- - not drilled yet - ->				n.d.	<- - not drilled yet - ->				n.d.
TPH-D (8015M)	-	<- - not drilled yet - ->				n.d.	<- - not drilled yet - ->				n.d.
AVOCs (602)											
Benzene	1.0	<- - not drilled yet - ->				n.d.	<- - not drilled yet - ->				n.d.
Toluene	-	<- - not drilled yet - ->				n.d.	<- - not drilled yet - ->				n.d.
Ethylbenzene	680.0	<- - not drilled yet - ->				n.d.	<- - not drilled yet - ->				n.d.
Total Xylenes	Note 5	<- - not drilled yet - ->				n.d.	<- - not drilled yet - ->				n.d.

NOTES:

1. "n.d." indicates not detected subject to noted detection limit.
2. MCL concentrations are in ug/L; obtained from RWQCB, LA Office.
3. Dissolved constituents sample MW-4 obtained after removing floating products and purging 25 gallons of well water. Concentrations noted may not be representative of actual dissolved constitiuents in ground water.
4. Pressampling specimen of MW-4 [Prod+H2O] results not included; free product with some water intermixed.
5. RWQCB MCL is for TOTAL Xylenes: 1750 mg/L.

TABLE 3

1990 GROUND WATER MEASURMENTS SUMMARY

958-28th Street
Oakland, CA

	WELL (depth)/Elevation						
	MW-A1	MW-A2	MW-A3	MW-4	MW-5	MW-6	REMARKS
T.O.C. (ft.)	15.03	14.40	14.58	15.65	14.40	14.46	Surveyed by RMT w.r.t. to site datum of 15'.
21-Mar-90	(13.64)	(13.13)	(13.26)	(14.48)	(13.26)	(13.69)	0.65 feet of free product measured in W-4.
	1.39	1.27	1.32	1.17	1.14	0.77	
16-May-90	(14.71)	(14.18)	(14.33)	(13.43)	(14.29)	(14.71)	MW-4: free product detected at 13.34 ft; top
	0.32	0.22	0.25	2.22	0.11	-0.25	of ground water not distinguishable
12-Nov-90	(14.50)	(13.06)	(14.87)	n.a.	(14.20)	(14.48)	MW-4 not measured; free product MW-A2
8:30 - 9:00 a.	0.53	1.34	-0.29	n.a.	0.20	-0.02	considered anamolous
13-Nov-90	(14.59)	(13.15)	(14.98)	n.a.	(14.60)	(14.02)	MW-4 not measured; free product assumed.
7:00 - 7:30 a.	0.44	1.25	-0.40	n.a.	-0.20	0.44	

TABLE 1

MONITORING WELLS CONSTRUCTION SUMMARY

SUPPLEMENTARY SUBSURFACE INVESTIGATION

958-28th STREET; OAKLAND, CALIFORNIA

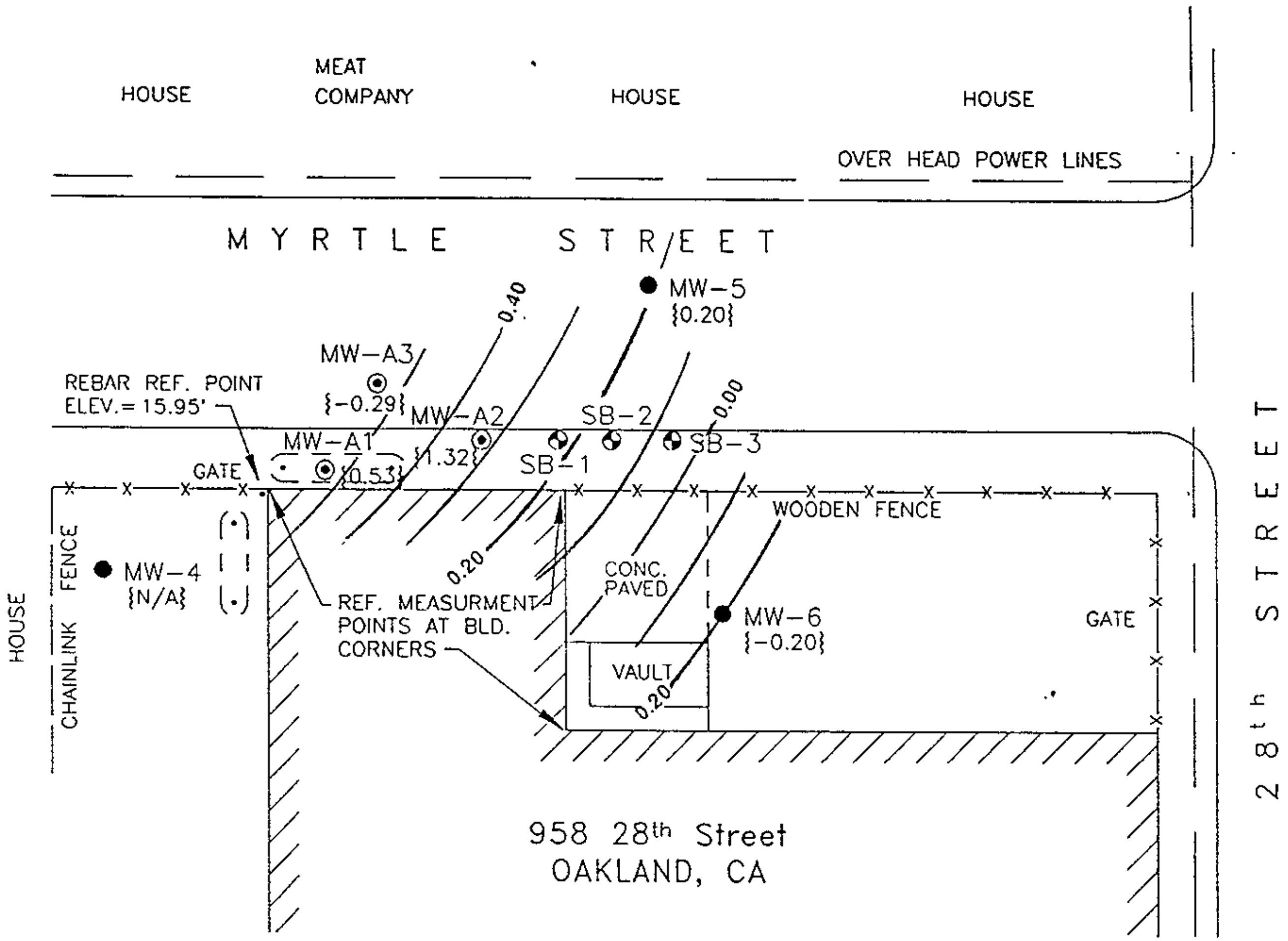
	MW-A1	MW-A2	MW-A3	MW-4	MW-5	MW-6
CNSTR BY:	IT Corp.	IT Corp.	IT Corp.	RMT	RMT	RMT
DATE:	2-17-89	2-17-89	2-17-89	3-05-90	3-06-90	3-05-90
WELL DIA:	4-inch	4-inch	4-inch	2-inch	4-inch	4-inch
FILTER:	#3 Sand	#3 Sand	#3 Sand	#1C Sand	#1C Sand	#1C Sand
From	16-ft	16.5-ft	23.5-ft	8-ft	8-ft	8-ft
To	28-ft	28-ft	34.5-ft	25-ft	30-ft	30-ft
SCREEN:	0.02-inch	0.02-inch	0.02-inch	0.01-inch	0.01-inch	0.01-inch
From	16.5-ft	18-ft	24.5-ft	10-ft	10-ft	10-ft
To	26.5-ft	28-ft	34.5-ft	25-ft	30-ft	30-ft
T.O.C.:	15.03 ft	14.40 ft	14.48 ft	15.65 ft	14.40 ft	14.46 ft

NOTES:

1. International Technology Corporation: March 29, 1989; Ground Water Monitoring Well Installation [958-28th Street; Oakland, California]; by John P. McGuire.

2. Details of well construction for wells installed by IT Corp. obtained from Boring Logs included in above 1.

3. Well top of casing (T.O.C.) surveyed by RMT on March 21, 1990. Reference datum established bolt at northeast building corner having reference elevation 15.95 feet.



Legend:

- ⊙ Ground water monitoring wells installed by IT corp. February 1989.
- ● Ground water monitoring wells installed by RMT; March 1990.
- Soil borings installed by RMT, March 1990.
- [14.40] Top of well casing elevation
- {0.53} Water elevation Nov.12,1990 Pre-Sampling
- – – Interpreted top of Ground Water Table.

NOTES:

1. Well and soil boring plan locations determined by precission tape measure relative to fixed site points.
2. Top of casing elevations based on survey relative to reference site elevation.
3. MW-4 not measured.
4. Ground water elevation in MW-A2 considered questionable; Readings inconsistant with previously observed behavior.
5. Ground water contours and gradient based on triangulation of data for wells MW-A1, MW-5, and MW-6.

Scale: 1"=30'

Site Investigation Plan
Former Servisco Facility

RMT INC.

DWN BY:	RAS
DATE:	DEC. 1990
PROJ.#	1660.08
FILE #	16600804

FIGURE 4

file: SRVSCGW4.wk1/xls
Date: 1/4/90

#1660.08

TABLE 4
ANALYTICAL RESULTS OF GROUND WATER SAMPLE ANALYSES
(in μg/L)

958 28th Street
Oakland, California

November 12 & 13 1990 Sampling:

TEST METHOD		MDL	G W MCL	MW-A1	MW-A2	MW-A3	MW-5	MW-6	FB #1	MW-4	FB #2	METHOD BLANK	MW-4-A1 [Prod+H2O]
8015M	Low Boiling Pt. [Method 5030 Prep]	50 μg/L	-	n.d.	719	n.d.	n.d.	70	n.d.	N/A	n.d.	n.d.	N/A
602	AROMATIC VOCs												
	Benzene	0.5 μg/L	1 μg/L	1.3	32.5	n.d.	n.d.	7.9	n.d.	N/A	n.d.	n.d.	N/A
	Toluene	0.5 μg/L	-	n.d.	2.4	n.d.	n.d.	n.d.	n.d.	N/A	n.d.	n.d.	N/A
	Ethylbenzene	0.5 μg/L	680 μg/L	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	N/A	n.d.	n.d.	N/A
	Total Xylenes	0.5 μg/L	1750 mg/L	35.3	3.4	n.d.	n.d.	1.8	n.d.	N/A	n.d.	n.d.	N/A

Supplementary Subsurface Investigation Sampling [March 1990]

TEST METHOD	COMPOUND(s)	MDL	G W MCL	MW-A1	MW-A2	MW-A3	MW-5	MW-6	FIELD BLANK	MW-4 Note 4	FIELD BLANK	TRIP BLANK	MW-4-A1 Note 5
8015M	Low Boiling Pt. [Method 5030 Prep]	0.5 mg/L	-	1,300	1,100	n.d.	n.d.	n.d.	700	20,000	n.d.	n.d.	37,500,000
8015M	High Boiling Pt. [Method 3510 Prep]	0.5 mg/L	-	n.d.	n.d.	n.d.	n.d.	n.d.	-	n.d.	-	-	-
602	AROMATIC VOCs												
	Benzene	0.2 μg/L	1 μg/L	3.6	35	n.d.	n.d.	n.d.	n.d.	<5 x> 1,500	0.28	n.d.	<50,000 x> 980,000
	Toluene	0.2 μg/L	-	n.d.	2.4	n.d.	n.d.	n.d.	n.d.	17	n.d.	n.d.	240,000
	Ethylbenzene	0.2 μg/L	680 μg/L	4.7	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	3.3	n.d.	2,300,000
	m-Xylene	0.5 μg/L	Note 6	3.3	3.9	n.d.	n.d.	n.d.	1.0	1,200	22.0	n.d.	11,000,000
	o/p-Xylenes	1.0 μg/L	Note 6	21	15	n.d.	n.d.	n.d.	0.9	820	12	n.d.	6,400,000

NOTES:

n.d. = not detected at noted method detection limit (MDL); N/A = not applicable, i.e. not tested or analyzed.

1. Testing's Minimum Detection Levels (MDL) as noted; Maximum Concentration Levels (MCLs) obtained from RWQCB, LA Office.
2. Results in same units as test method MDL; excepting the March '90 TPH analyses all results in μg/L.
3. "n.d." indicates not detected subject to noted detection limit; "n.t" indicates not tested.
4. Dissolved constituents sample MW-4 obtained after removing floating products and purging 25 gallons from well; the concentrations noted may not be representative of actual dissolved constitiuents in ground water.
5. MW-4-A1 [Prod+H2O intermixed with well water during sampling; noted concentrations considered minimums.
6. RWQCB 's MCL is for Toyal Xylenes: 1750 mg/L.

APPENDIX A

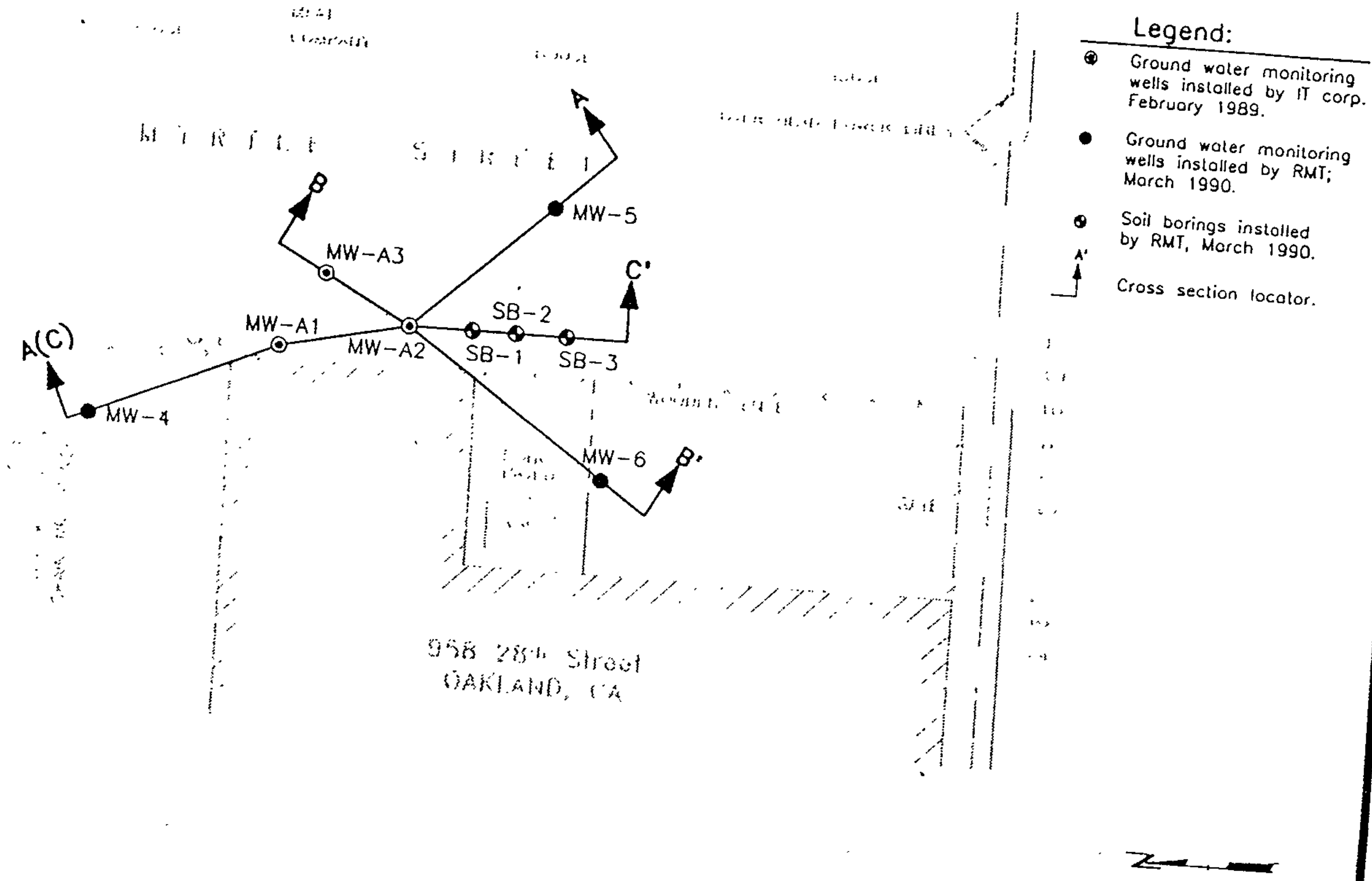
TABLE A-1
ANALYTICAL RESULTS OF SOIL SAMPLES ANALYSES

Date: 4/04/90

Supplementary Subsurface Investigation
958 28th Street; Oakland, California

TEST METHOD	PREP METHOD	TEST/Coumpound	REPORT UNIT	DETECT LIMITS	SB-1 10-#3	SB-1 15-#2	SB-2 10-#3	SB-2 15-#3	SB-3 9.5	SB-3 13-#2	MW-4 10-#3	MW-4 15-#3	MW-5 10-#2	MW-5 15-#2	MW-6 10-#2	MW-6 15-#3	METHOD BLANK
8015M	3510	TPH as diesel-soil matrix	mg/kg	10	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	145	n.d.	n.d.	n.d.	n.d.	n.d.	n.a.
8015M	5030	TPH as gasoline-soil matrix	mg/kg	10	145	n.d.	18	260	n.d.	n.d.	3,300	12	n.d.	n.d.	38	44	n.d.
8020	5030	AVO's by GC/MS															
		Benzene	ug/Kg	5	13	10	n.d.	11	n.d.	n.d.	350	29	n.d.	n.d.	5.5	26	n.d.
		Toluene	ug/Kg	5	10	6.2	8.5	290	n.d.	n.d.	570	22	8.2	6.2	74	80	n.d.
		Ethylbenzene	ug/Kg	5	n.d.	37	n.d.	n.d.	n.d.	n.d.	1,500	66	n.d.	n.d.	n.d.	n.d.	n.d.
		m-Xylene	ug/Kg	5	35	n.d.	47	510	n.d.	n.d.	3,100	160	n.d.	n.d.	130	95	n.d.
		o/p-Xylenes	ug/Kg	10	n.d.	68	n.d.	n.d.	n.d.	n.d.	1,500	79	n.d.	n.d.	n.d.	n.d.	n.d.
		TOTAL AVO	ug/Kg		58	151	55	811	n.d.	n.d.	7,020	356	8.2	6.2	210	201	n.d.

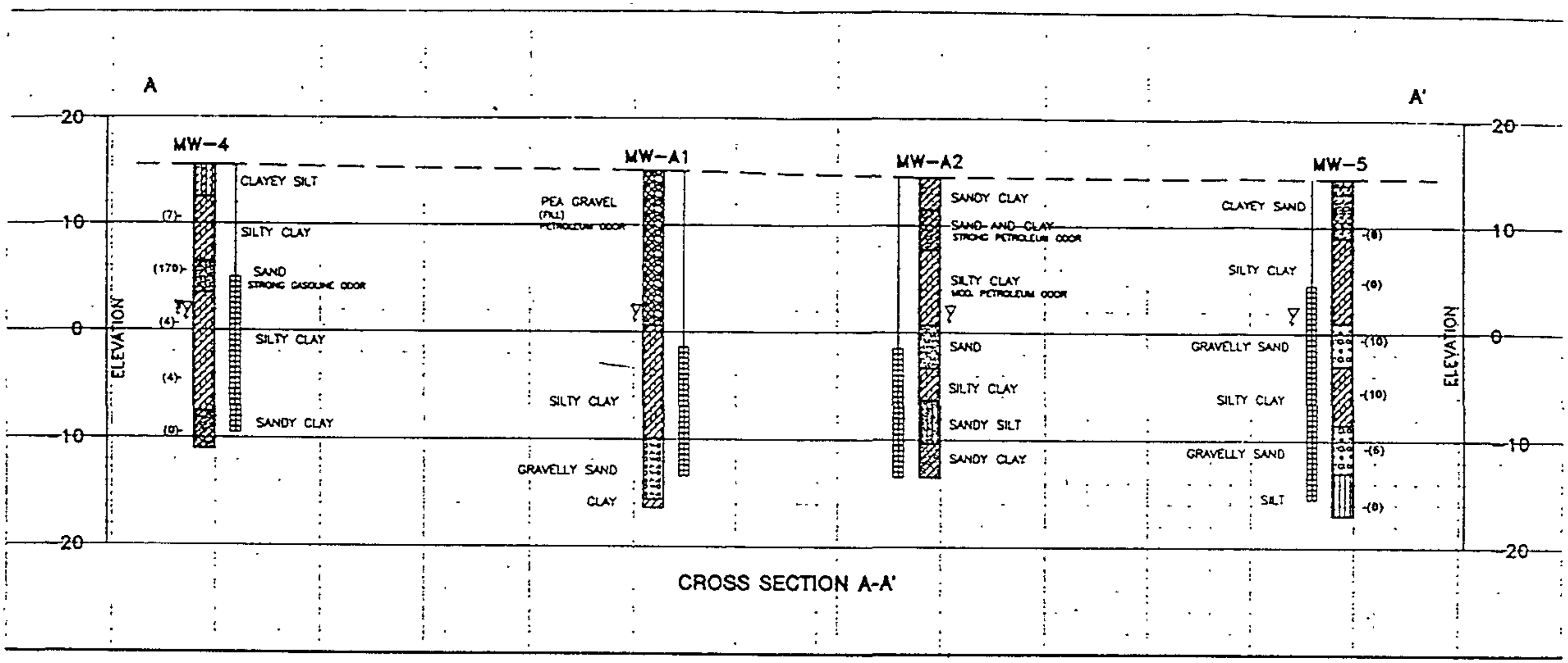
166005SL.wk1



Cross Section Locator Map
Former Servisco Facility

RMT INC.

DWN. BY:	DRB
DATE:	JUNE, 1990
PROJ.#	1660.05



LEGEND

- FLOATING PRODUCT ELEVATION (WHERE DETECTED)
- GROUND WATER ELEVATION (MARCH 22, 1990).
- FILTER PACKED BORING INTERVAL, TOP SEAL NOT SHOWN
- SILT
- CLAY
- SILTY CLAY
- CLAYEY SILT
- SANDY SILT
- SANDY GRAVEL
- GRAVEL
- SAND
- SANDY CLAY
- ( ) P.I.D. Reading, ppm

NOTES:

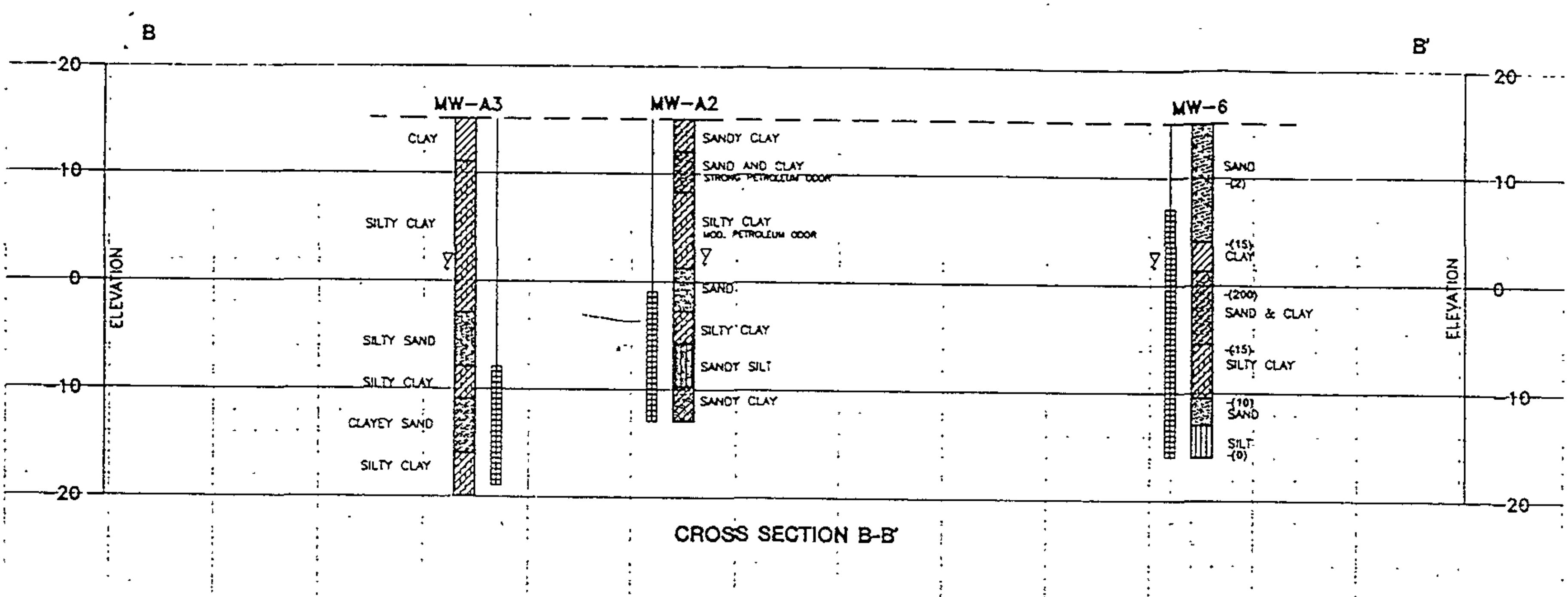
1. Lithology for borings MW-A1 thru MW-A3 obtained from IT Corp., report dated March, 1989.
2. Ground water levels indicated measured on March 21, and March 22, 1990.
3. Odor noted where detected else omitted.
4. Elevations are relative to an arbitrary site datum which is within several feet of mean sea level.
5. **Photoionization detector (PID) readings noted where applicable; HNU systems,inc., model PI-101 with 10 ev lamp used.**

SCALE: 1" = 10'

RMT inc.

DWN. BY	DRB
DATE	JUNE, 1990
PROJ.#	1660.05
FILE #	1660506

FIGURE A-2



CROSS SECTION B-B'

LEGEND

- FLOATING PRODUCT ELEVATION (WHERE DETECTED)
- GROUND WATER ELEVATION (MARCH 22, 1990)
- FILTER PACKED BORING INTERVAL, TOP SEAL NOT SHOWN
- SILT
- CLAY
- SILTY CLAY
- CLAYEY SILT
- SANDY SILT
- SANDY GRAVEL
- GRAVEL
- SAND
- SANDY CLAY
- SILTY SAND
- ( ) P.I.D. Reading, ppm

NOTES:

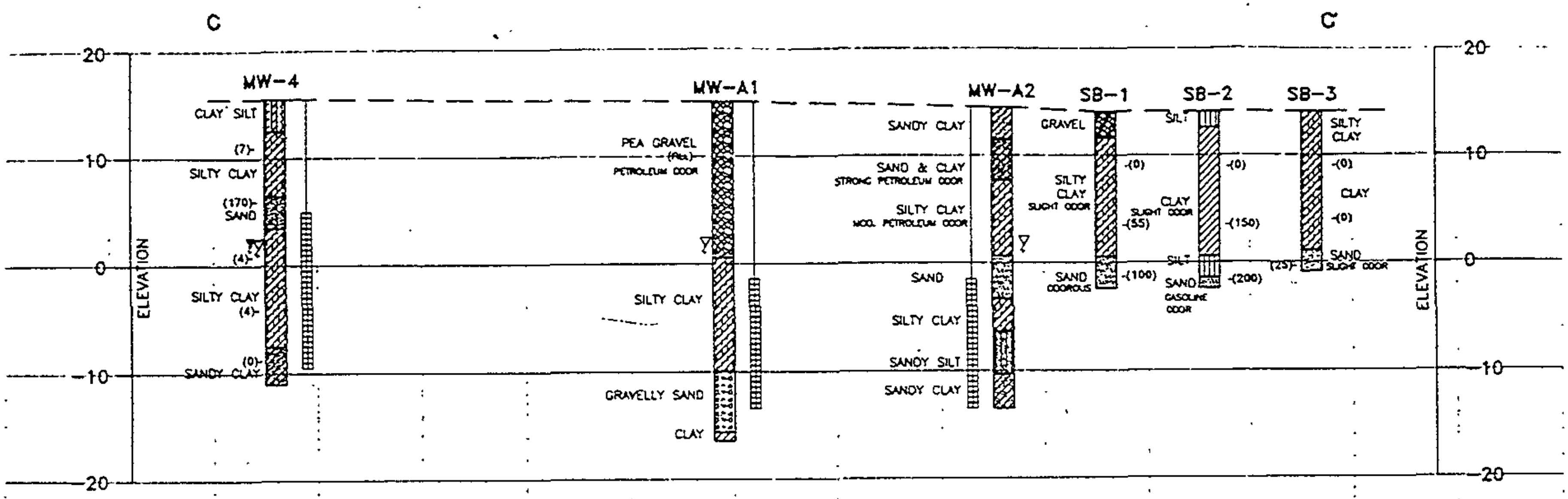
1. Lithology for borings MW-A1 thru MW-A3 obtained from IT Corp., report dated March, 1989.
2. Ground water levels indicated measured on March 21, and March 22, 1990.
3. Odor noted where detected else omitted.
4. Elevations are relative to an arbitrary site datum which is within several feet of mean sea level.
5. **Photoionization detector (PID) readings noted where applicable; HNU systems, inc. model PI-101 with 10 ev lamp used.**

SCALE: 1" = 10'

RMT INC.

DWN BY:	DRB
DATE:	JUNE, 1990
PROJ.#	1660.05
FILE #	16600507

FIGURE A-3



CROSS SECTION C-C'

LEGEND

- FLOATING PRODUCT ELEVATION (WHERE DETECTED)
- GROUND WATER ELEVATION (MARCH 22, 1990)
- FILTER PACKED BORING INTERVAL, TOP SEAL NOT SHOWN
- SILT
- CLAY
- SILTY CLAY
- CLAYEY SILT
- SANDY SILT
- SANDY GRAVEL
- GRAVEL
- SAND
- SANDY CLAY
- ( ) P.I.D. Reading, ppm

NOTES:

1. Lithology for borings MW-A1 thru MW-A3 obtained from IT Corp., report dated March, 1989.
2. Ground water levels indicated measured on March 21, and March 22, 1990.
3. Odor noted where detected else omitted.
4. Elevations are relative to an arbitrary site datum which is within several feet of mean sea level.
5. Photoionization detected (PID) readings noted where applicable; HNU systems, inc. model PI-101 ev lamp used.

SCALE: 1" = 10'

RMT INC.

DWN BY:	DRB
DATE	JUNE, 1990
PROJ.#	1660 05
FILE #	16600505

FIGURE A-4