RAP

KLEINFELDER

28 December 1990
File: 10-1682-06/69

Mr. Gilbert Wistar
Alameda County Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, CA 94621

SUBJECT: Remedial Investigation Report, Industrial Asphalt, Pleasanton, California

Dear Mr. Wistar:

Kleinfelder, Inc., on behalf on Industrial Asphalt, submits the attached Remedial Investigation (RI) Report for their site at 52 El Charro Road in Pleasanton, California.

The RI report describes the field investigation, analyses of collected data and conclusions and recommendations. The investigation followed the Remedial Investigation Work Plan/Remedial Action Plan prepared and submitted by Kleinfelder, dated 15 January 1990, and approved by your organization 9 February 1990.

This RI report is also a 1990 Annual Report as it includes an analysis of monitoring data collected in 1990.

If you have any questions or require additional information, please call the undersigned.

Sincerely,

KLEINFELDER, INC.

Krzysztof (Krys) S. Jesionek
Project Manager

Lloyd C. Venburg, R.G.
Project Supervisor

cc: Dennis Hunt - Industrial Asphalt
Dwight Beavers - Industrial Asphalt
Rico Duazo - California Regional Water Quality Control Board
Jerry Killingsted - Alameda County Water District, Zone 7

KSJ:LCV:cd

KLEINFELDER 2121 N. California Blvd., Suite 570, Walnut Creek, CA 94596 (415) 938-5610

KLEINFELDER

REMEDIAL INVESTIGATION (RI)
REPORT
INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

28 December 1990

Very poorly
done Report.
5/14/91

KLEINFELDER

A Report Prepared for:

Industrial Asphalt
52 El Charro Road
Pleasanton, California 94566

REMEDIAL INVESTIGATION REPORT
INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

Kleinfelder Job No. 10-1682-06

by

J. Friedman

Jeffrey Friedman
Staff Geologist

Krzysztof (Krys) S. Jesionek
Project Manager

Lloyd C. Venburg, R.G.
Project Supervisor

Lloyd C. Venburg
No. 1417
Exp. 6/30/92

KLEINFELDER, INC.
California Plaza, Suite 570
2121 North California Boulevard
Walnut Creek, California 94596
(415) 938-5610

28 December 1990

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1 EXECUTIVE SUMMARY

Kleinfelder has recently completed a remedial investigation (RI) for Industrial Asphalt, Inc., an asphalt manufacturing company. This RI was conducted to characterize the environmental conditions at Industrial Asphalt's facility located at 52 El Charro Road, Pleasanton, California.

Recent RI activities were conducted by Kleinfelder to supplement data gathered during earlier investigations (prior to 1990) in response to a request by the Alameda County Department of Environmental Health dated 13 November, 1989. It follows the scope of work, procedures and guidelines described in Kleinfelder's "Remedial Investigation/Remedial Action Plan", dated January 15, 1990.

The RI workplan described the following activities necessary for site characterization and assessment of risks to health and environment.

RI work tasks overall objectives were to:

- Collect and review data necessary to assess soil and ground water quality
- Assess the nature and extent of affected soil and ground water at the site
- Evaluate the potential hazards and risks to public health and the environment that may results from constituents of concern at the site
- Conduct field investigations to collect site specific data necessary to meet the overall RI objectives.

This RI Report includes a compilation and analysis of data collected during the 1990 field investigation, historical data from earlier investigations, and a baseline health risk assessment.

Data collected and analyzed during the RI is intended to be used to evaluate remedial alternatives and to support the selection of an appropriate remedial action consistent with requirements of regulatory agencies.

A baseline risk assessment was developed to identify the existing or potential risks that may be posed to human health and the environment at the Industrial Asphalt site.

The 1990 RI included:

- Drilling 14 soil borings, of which 3 were completed as monitoring wells and 1 as an extraction well
- Collection and analysis of soil and ground water samples
- Completion of a pumping test
- Sampling and analysis of impacted soils which were removed as a component of interim site remediation.

2 CONCLUSIONS AND RECOMMENDATIONS

2.1 CONCLUSIONS

The additional data obtained from this investigation added to the understanding of diesel/waste oil and PCBs distribution in the subsurface and migration pathways. Results of the site characterization program indicate both soils and ground water have been impacted by releases of chemicals from the tank storage area. Total petroleum hydrocarbons (as diesel/waste oil) have migrated from the source area and have been detected in soils analyzed from six of sixteen monitoring well/soil borings tested, and from site closure samples. PCBs were only detected in 2 soil samples at depths of 45 feet (SB-3) and 61 feet (SB-4). The hydrocarbon plume extends beyond the previously investigated area to the northeast, toward the Arroyo Mocho. Soil analyses indicate that TPH-D/WO and PCBs diminish in concentration away from their source in the subsurface.

Total petroleum hydrocarbons, detected in all monitoring wells (excepting MW-16) at varying concentrations, are often more prevalent and at higher concentrations during those time periods when ground water table is at shallower depths (above 90 feet below ground surface). This is indicative of retention of hydrocarbons in the soil matrix.

PCBs were detected in water samples collected from monitoring wells MW-1, MW-2, MW-3, and MW-8, again, at varying concentrations. Migration from source areas is limited, which is indicative of retardation or retention of PCBs in the soil matrix.

Analysis performed on one soil sample obtained from boring SB-4 did not reveal the presence of any compounds tested for (EPA Method 8270) at or above laboratory detection limits. The analysis was performed to evaluate types of hydrocarbons contained in the released product.

The distribution of TPH-D/WO may indicate complex geologic conditions beneath the project site characterized by irregular, discontinuous more permeable zones (lenses). These lenses create preferential pathways for chemicals to migrate in the unsaturated zone.

None of the soil samples analyzed contained total petroleum hydrocarbons concentration of 1000 mg/kg or more or PCBs concentration of 50 mg/kg or more. Therefore, impacted soils beneath the Industrial Asphalt site are classified as a non-hazardous waste by California regulatory agencies. - FOR TRANSPORT ONLY

Ground water samples obtained from monitoring wells at the IA site did not contain PCBs at concentrations greater than 5 mg/l. Therefore, according to California (STLC) criterion, ground water is considered as non-hazardous material.

Based on pumping test data from several observation wells, the average transmissivity of the water bearing zone is 2,500 gpd/ft (0.00036 m^2/sec). The average storativity value of that zone is 0.0017, which is a characteristic value for semi-confined to confined hydraulic conditions. The observed sustained yield of the extraction well MW-13 to maintain approximately 15 feet of drawdown in the pumping well is between 2.0 and 2.6 gpm. The estimated downgradient extent of the capture zone (at the pumping rate of 2.6 gpm) is 23 feet. The corresponding maximum width of the capture zone was calculated to be approximately 145 feet.

Based on hydraulic conductivity calculated from pumping test data, the monitored ground water flow rate is approximately 2 ft/day (0.6 m/day) toward the northeast. This assumes an effective porosity value of 30 per cent and an average hydraulic gradient of 0.035. However, the calculated flow rate assumes isotropic and homogeneous conditions of the water bearing zone. Actual transport of hydrocarbons/PCBs will be slower due to retardation effects of the soils on chemical transport. Accordingly, the total organic carbon content of the soils and other adsorptive properties of the soils would tend to inhibit the movement of chemicals in ground water.

During the RI, a well canvass was completed. Twenty three water wells were identified within a one mile radius of the IA site. Fifteen of these wells are listed as active wells. One well, designated as water supply/domestic well (14A2) is of particular interest. This well is reported to be 220 feet deep and is located approximately 900 feet northeast from the site (downgradient). Screened intervals of this well are reported to be 135-160 and 170-205 feet. The well is owned by Jamieson Co. and is primarily used for industrial water supply in addition to small quantities used for domestic (drinking/washing) purposes.

Analyses of water samples collected from two water supply wells 11P4 and 14A2 located north and downgradient from the site indicate the absence of the target compounds (TPH-D/WO, PCBs) in the samples at or above laboratory detection limits.

What Det. limits at Jamieson well? Assumed [illegible]

A Baseline Health Risk Assessment (BHRA) was performed using benzene, naphthalene and PCBs as chemicals of interest on which the risk screening was based. → WRONG ON RISK

Assuming that the 70 year average concentration of benzene in drinking water is 0.00020 mg/l, an intake of benzene was calculated to be 0.0000059 (5.9×10^{-6}) mg of benzene per kilogram of receptor body weight per day. This allowed an estimate of the cancer risk, due to potential ingestion of benzene in drinking water from well 14A2, to be 2 in 10,000,000.

This calculated cancer risk of 2×10^{-7} is below the "one-in-a-million" risk level of concern cited by U.S. Environmental Protection Agency. As discussed in Chapter 10, this calculated risk is likely to be an over-estimate since worst-case assumptions were used.

A BHRA, to qualify potential non-carcinogenic human health effects due to ingestion of naphthalene, indicated no significant risk of an adverse health impact. Due to a relative immobility of PCBs, no exposure is likely to potential receptors.

NO FS complete

2.2 RECOMMENDATIONS

Mon Program
Need BTEX Napthalene etc) in all wells qtrly.

Based on our findings during the RI phase of work at the Industrial Asphalt site and the results of the Baseline Health Risk Assessment (Chapter 10), it is recommended that quarterly ground water monitoring of the site's existing wells and Jamieson well 14A2 be continued followed by quarterly progress reports and annual reports.

The monitoring program should continue for approximately 2 years followed by the semi-annual monitoring program, if deemed necessary. Required chemical analyses on ground water samples should include TPH-D/WO and PCBs. Well 14A2 should be sampled once for Aromatic Volatile Organics using EPA Method 8020.

The 13 November 1989 letter from the Alameda County Department of Environmental Health (Ref. 1), requested that hydrocarbon and PCBs levels in soils be reduced to a point that they will not further degrade ground water quality in any way. In addition,

- Surface + GW

hydrocarbon and PCBs levels in ground water are to be reduced to "not detectable" or MCL's concentrations, and an effectiveness evaluation of all components of the remediation operation will need to be performed. Routine Mon.

Additional interim remedial actions to excavate impacted shallow soils detected during the RI are planned in February 1991. Further remedial actions, if deemed necessary by the regulatory agencies, would require a feasibility study which would address necessary steps for site clean-up.

If free product in any of the site monitoring wells is detected (during periods of higher ground water levels), a specific gravity skimmer should be used by the Industrial Asphalt personnel to remove it and appropriately store it.

3 INTRODUCTION

3.1 SITE DESCRIPTION

Industrial Asphalt, Inc., is an asphalt manufacturing company located at 52 El Charro Road, Pleasanton, California. A regional locality map is presented as Plate 1. The site location is shown on Plate 2.

Industrial Asphalt is a California based company currently employing 6 employees at its Pleasanton facility. The company has been at the site since 1963. Asphalt for industrial, commercial, and residential purposes is manufactured at the 53 El Charro Road facility.

The manufacture of asphalt at the facility involves the combination of approximately 5682 pounds of rock material with approximately 318 pounds of heavy hydrocarbon oil per 6000 pound batch of asphalt product.

At the present time, there are no underground storage tanks at the Industrial Asphalt site. Most of the site is paved with asphalt.

3.2 SITE HISTORY

Industrial Asphalt maintained six underground asphalt and two underground diesel storage tanks at the facility (Plate 3). The diesel product purchased during 1983 and 1984 was used as a burner fuel in its batch plant. Following 1984, the plant began utilizing natural gas due to its lower cost. In 1985, a leaking fill pipe serving the diesel tanks was identified and repaired.

Upon removal of two diesel tanks (6,700 and 4,920 gallon capacities) in February 1987, diesel product was observed in the bottom of the excavation. Chemical analysis of the product indicated the presence of total petroleum hydrocarbons as diesel (TPH-D) at a concentration of 340,000 mg/kg and polychlorinated biphenyls (PCBs) at a concentration of 12 mg/kg. Approximately 5,000 gallons of a mixture of diesel product and water was removed and disposed of at a Class I disposal facility. At that time, two adjacent asphalt tanks were also excavated and removed.

In March 1987, seven soil borings were drilled by Kleinfelder, Inc., at locations around the tank storage area. Several soil samples were collected to a depth of 45 feet. Selected samples were analyzed for the presence of TPH-D and PCBs. Diesel product was identified in several borings at a depth of 45 feet. The concentrations ranged from 170 mg/kg to 4,600 mg/kg of TPH-D. PCBs concentrations in two borings ranged from 0.030 mg/kg to 0.073 mg/kg.

Three ground water monitoring wells, namely MW-1, MW-2, and MW-3, were installed, developed and sampled in June 1987. At the same time, one soil sample of the tank backfill gravel was obtained. Chemical analyses for TPH-D and PCBs on the three ground water samples and one soil sample revealed that the chemicals of concern have migrated to the ground water table, and have impacted ground water. The PCBs analysis of the free product sample collected from well MW-2 indicated concentration of 18 mg/l as Aroclor 1260.

In September 1987, the four remaining underground tanks used for asphalt storage and contaminated backfill were excavated (Plate 3). TPH-D in samples of soil and backfill excavated during the tank removal ranged from 1,500 mg/kg to 150,000 mg/kg. Closure samples representative of the soil remaining in the excavated area had 26 mg/kg TPH-D or had no detectable concentrations. PCBs were detected at concentration of 0.51 mg/kg in one sample only. Disposal of excavated soils containing TPH-D in concentration in excess of 1,000 mg/kg was by onsite recycling. Typically, TPH-D concentrations in the ground water samples were at or less than 100 mg/l, with PCBs concentrations at or less than 0.0057 mg/l.

A soil gas vapor survey was conducted to aid in plume definition in June 1988. Collected data from the survey were used to identify the locations of five additional ground water monitoring wells installed at the site (MW-4, MW-5, MW-6, MW-7 and MW-8). A sample of free product collected from well MW-2 on 15 July 1988, indicated that the gross composition of the free product is comparable to a diesel standard. Analysis for PCBs indicated a concentration of 25 mg/kg, comparable to analytical results for a sample analyzed on 7 August 1987, which indicated 18 mg/kg of PCBs in the free product.

Two ground water monitoring wells (MW-9, MW-10) and one observation well (MW-11) were installed in July 1989 at the project site. In addition, a staff gauge was installed in the gravel pit located north of the site, to monitor the elevation of surface water.

Monitoring of the free product thickness and depth to ground water as well as the onsite ground water monitoring well sampling and sample testing for TPH-D and PCBs concentrations have generally been performed on an monthly basis since well installation.

In October 1989, the Alameda County Department of Environmental Health (ACDEH) reviewed the Industrial Asphalt file and consulted with the San Francisco Bay California Regional Water Quality Control Board (CRWQCB) in order to develop guidelines for further characterization and remediation at the site (Ref. 1). In response, Kleinfelder, Inc., on behalf of Industrial Asphalt, submitted a Remedial Investigation/Remedial Action Plan (RI/RAP) dated 15 January 1990 (Ref. 2). This report summarizes the RI investigation portion of the work plan.

3.3 PURPOSE AND SCOPE OF WORK

Previous work at the site (prior to 1990) served to identify and characterize primary areas impacted by target chemicals, however, the horizontal and vertical extent of migration of chemicals in soil and ground water was not fully identified.

The purpose of this remedial investigation was as follows:

- To further characterize the hydrogeologic conditions beneath the site
- To further characterize the horizontal and vertical extent of soil and ground water impacted by chemicals
- To obtain the data necessary for screening and selecting remedial alternatives.

The following scope of work was completed during the 1990 remedial investigation:

- Drilling of fourteen soil borings with sample collection for stratigraphic and analytical purposes
- Installation of three ground water monitoring wells and one extraction well
- Excavation of impacted soils from the vicinity of well MW-13 and closure soil sample collection and analysis
- Development, purging and sampling of the four new wells
- Laboratory analysis of soil and ground water samples for TPH as diesel (D)/*waste oil* (WO) and PCBs
- Completion of a pumping test in the extraction well
- Completion of a local well canvass
- Evaluation of hydrogeological conditions and chemical data
- Preparation of this report including conclusions and recommendations

4 FIELD ACTIVITIES AND OBSERVATIONS

4.1 SOIL BORINGS

Fourteen soil borings were completed during this remedial investigation (borings SB-1 through SB -10 and MW-13 through MW-16). Plate 4 shows the location of each boring. The field work was completed within three separate field events. Delays were due to difficult drilling conditions and scheduling of drilling equipment. The first event was performed during the period of time from 28 February 1990 through 6 March 1990. The second field event occurred between 29 May 1990 through 27 June 1990. The final period of drilling was completed from 6 August 1990 through 8 August 1990. Prior to the commencement of any field activities, a Health and Safety Plan (HSP) was developed by a Kleinfelder Industrial Hygienist. The HSP was implemented during all phases of the field work. Appropriate drilling/well construction permits were obtained from the Alameda County Flood Control and Water Conservation District - Zone 7 (ACFCWCD). Drilling and sampling equipment was steam cleaned prior to drilling/sampling at each boring location. Soil samples collected for lithologic description were described using the Unified Soil Clarification System (USCS) and the Muncell Color Clarification System. Upon completion of the work, water well driller reports were filed with the State of California Department of Water Resources. The work was supervised by a Kleinfelder staff geologist under the direct supervision of a registered geologist. The following summary provides the methodology and field observations from these field events.

First Field Event (28 February 1990 through 6 March 1990)

Three soil borings were attempted during this period (SB-2, SB- and SB-4) using a truck mounted drill rig (CME 75) equipped with 8-inch diameter continuous hollow stem augers. The drilling was performed by Spectrum Exploration of Stockton, California. Previous experience with this type of rig at the site justified the selection of this particular drilling equipment. Soil samples were collected for soil description and chemical analysis using both a five foot long continuous sampler and a standard split barrel two inch diameter down-hole sampler. Soil samples obtained using the down-hole sampler were collected at five foot intervals from approximately 10 feet below grade to the total depth of each boring. Samples obtained for chemical analyses were selected based on field inspection of visual discoloration and odor of the recovered materials.

The samples collected for chemical analysis were obtained primarily with the down-hole soil sampler equipped with laboratory prepared brass tubes. The tubes were capped with Teflon lined plastic caps, labelled, and placed in an iced cooler for transportation to the California State Department of Health Services (DHS) certified laboratory. In some cases where sampling refusal was encountered, soil samples were collected for chemical analysis by removing a sufficient volume of soil obtained from the continuous soil sampler which was then compacted into brass tubes.

All soil samples were delivered to Chromalab, Inc., laboratory in San Ramon, California along with the sampler's chain-of-custody forms. Copies of these forms are included in Appendix B. Once soil samples collected from the continuous soil sampler were described, each sample was placed in heavy duty zip lock plastic bags, purged with nitrogen gas, sealed, labelled with the sampling interval and boring number, and stored in a core box for later reinspection, as necessary.

The drilling commenced at the location of SB-4 followed by borings at SB-2 and SB-3. However, the bore holes had to be abandoned at approximate depths of 73.5 feet, 81 feet and 56 feet, respectively, due to auger refusal by cobbles and boulders.

Therefore, it was proposed that the drilling to the desired depths of 95 to 100 feet in these three borings and the drilling of the remaining seven soil borings be accomplished with a dual tube percussion drill rig, also previously utilized at the site.

Second Field Event (29 May 1990 through 27 June 1990)

In order to drill each boring to its proposed depths, Kleinfelder arranged for Water Well Development Corporation of Woodland, California, to mobilize a dual tube percussion drill rig to Industrial Asphalt. Upon arriving, borings SB-2, SB-3 and SB-4 were redrilled in order to collect both geologic and geochemical data down to the proposed depth of 95 to 100 feet. The redrilled boring locations for SB-2 and SB-3 were slightly different from the original boring locations due to access problems incurred with the larger drill rig. The redrilled boring location for SB-2 was approximately 10 feet east of its original location and the redrill location of SB-3 was approximately 10 feet west of its original location. The redrill location for SB-4 was at the original location. The remaining borings SB-1, SB-5 through SB-10 and MW-14 through MW-16 were also all completed during this field event.

Soil samples were collected at five foot intervals from approximately fifteen feet below grade to the total depth of each boring. The boring logs included in Appendix A provide information on the depths and stratigraphy encountered of each boring. These soil samples were obtained using a modified California sampler equipped with brass tubes. As in the previous field event, each of these soil sampling tubes were sealed and labelled for transportation to the DHS certified laboratory. At depths, where sampling refusal was encountered, soil samples were collected as a grab sample from the discharge of the drill rig cyclone. Each of these samples were compacted into a laboratory prepared brass tube and processed for delivery to the laboratory as previously described.

Soil samples collected for stratigraphic description were also processed as described in the first phase of the field investigation and stored in core boxes for future use.

Third Field Event (6 August 1990 through 8 August 1990)

A soil boring MW-13 was drilled and sampled and an extraction well MW-13 was completed during this field event using a direct air rotary drill rig equipped with a casing hammer. The drill rig was supplied by Water Well Development Corporation. Both the drilling and the construction of the well were observed by a Kleinfelder staff geologist. The drive casing diameter used was 11-5/8 inches. Soil samples were collected for logging purposes only as grab samples from the drill rig discharge and by down-hole sampler. As described in previous field events, once the soil samples were described, they were placed in plastic bags and stored in core boxes.

During this field event, monitoring well MW-11 was abandoned. This well was constructed in 1989 in order to detect free product at a gravelly clay/clayey gravel layer at a depth of approximately 75 feet (Ref. 3). However, no free product or water was ever detected in the well.

Prior to the well abandonment, an appropriate permit was obtained from the ACFC WCD-Zone 7. A description of methods and materials used to destroy the well are described in the well destruction report (Ref. 4).

After completion, all soil boring holes were backfilled with cement/bentonite grout using tremie technique, and the locations surveyed. Soil cuttings were recycled in the asphalt manufacturing process used by Industrial Asphalt.

4.2 SOIL EXCAVATION

Since free product was encountered in borehole SB-1 at an approximate depth of 15 feet, product, the impacted soil and overlying fill materials were removed.

This operation was conducted on 14 July 1990, when approximately 300 cubic yards of contaminated soils and approximately 700 cubic yards of the overlying materials were excavated in the vicinity of boring SB-1. Clean materials were used to backfill the excavation, and stockpiled hydrocarbon containing materials were recycled onsite through the asphalt and batch plants at the Industrial Asphalt facility.

Two soil closure samples were collected from the bottom of the excavation. The samples were analyzed for TPH-D/WO and PCBs. Plate 5 show approximate boundaries of the excavation and locations of the two closure samples.

The samples were delivered to Med-Tox Associates, Inc., of Pleasant Hill, California, a DHS certified analytical laboratory, under chain-of-custody control (Appendix B).

Due to limited space for stockpiled materials, not all apparently impacted soils were excavated during the field work phase. Therefore, the removal of the remaining impacted soils from the vicinity of boring SB-1 has been scheduled for 12 January 1991.

4.3 WELL CONSTRUCTION

Following drilling, borings MW-14, MW-15 and MW-16 were completed as ground water monitoring wells and boring MW-13 was completed as an extraction well (Plate 4). The total depth and screen length of each well was selected based on the subsurface information gathered during the soil boring phase (Chapter 4.1). Well construction was supervised by a Kleinfelder field geologist.

4.3.1 Monitoring Wells

Monitoring wells MW-14 and MW-16 replaced wells MW-2 and MW-3, which normally are dry or have insufficient water to obtain representative ground water samples.

Monitoring well MW-15 evaluate ground water quality immediately downgradient of the former tank farm area.

Ground water monitoring wells MW-14, MW-15 and MW-16 were completed with 4-inch inside diameter (ID) Schedule 40 PVC pipe with slip PVC caps at the top and threaded plugs at the bottom. The slot size chosen for screens (0.020 inch) was based on the construction of the monitoring wells previously installed on the site and based on gradations of materials recovered during bore hole drilling.

The boring annular space surrounding the screened section of each newly completed well was backfilled with #2 Monterey sand by tremie to approximately 1 to 2 feet above the screened intervals. A bentonite seal was placed above the sand pack in each boring with the remainder of the borehole grouted using a neat Portland cement/bentonite grout to the surface. The grout mixture for well seals was comprised of approximately 3 to 5% bentonite powder mixed with each 94 pound sack of cement and then slurried. This grout slurry was thoroughly mixed by pumping. Seals were placed using a tremie pipe. All well heads were finished in a water-resistant aluminum Christy boxes placed one to two inches below present ground surface. No solvents or glues were used during monitoring well construction.

The construction details of the three monitoring wells are included in Appendix A (refer to boring logs MW-14, MW-15 and MW-16). Monitoring well construction details of all site wells (old and new) are summarized on Table 1.

4.3.2 Extraction Well

Well MW-13, in addition to be used as an extraction well, replaces monitoring well MW-1 which has been dry since 1988.

The extraction well MW-13 was completed in the 11 5/8 inch diameter borehole. The well was constructed of 6-inch diameter Schedule 40 PVC blank casing and of 6-inch diameter Schedule 304 stainless steel, wire round, Johnson screen with a stainless steel bottom plug. The screen was 40 feet long with 0.045 inch size slots. The slot size for this screen was based on sieve analyses performed on soil samples collected from boreholes SB-1 and SB-4. These two borings were the closest located to the well MW-13. Sieve analysis results are included in Appendix C.

Monterey medium gradation aquarium sand was placed by tremie opposite the screen section. The top of the sand pack was finished at an elevation approximately equal to 12 feet above the top of the screen section. A bentonite seal, approximately 2 feet thick, was placed above the sand pack and the remainder of the borehole was backfilled to the surface with a neat Portland cement/bentonite grout. The sand pack was placed by gravity with a tremie pipe. Cement/bentonite grout was placed by pumping the grout through a one-inch diameter tremie pipe. The well was finished with a slip PVC cap and the well head was completed in a water resistant aluminum Christy box placed one to two inches below present ground surface. The extraction well construction details are included in Appendix A (refer to boring MW-13).

4.4 WELL DEVELOPMENT

Three new monitoring wells (MW-14, MW-15 and MW-16) and the extraction well (MW-13) were developed by Water Development Corporation. Wells MW-14, MW-15 and MW-16 were developed on 27 and 28 June 1990. The extraction well was developed on 10 August 1990.

A surge block and a bailer were used to remove suspended sediment within the well water and to settle and stabilize the well filter pack. The wells were developed until discharged ground water was relatively free of suspended sediment. Development water was collected in 55-gallon drums and left onsite for recycling in the Industrial Asphalt plant.

4.5 WELL SAMPLING

4.5.1 Onsite Wells

All site monitoring wells were sampled on a monthly basis since the well installation. However, since July 1990, monitoring at the Industrial Asphalt site has been rescheduled to occur every other month.

The Kleinfelder technician collected *ground* water samples from the onsite wells. Prior to purging, water level measurements were taken and observed for floating free product. In order to obtain representative water samples, only wells which had sufficient volume of water were sampled.

During pumping, discharge water was monitored for temperature, electrical conductance, turbidity, and pH. The wells were bailed or pumped until these parameters had stabilized or at least three to four well water volumes had been removed and the water was reasonably free of suspended sediment. Purged water was collected in 55-gallon drums and left onsite for later disposal by Industrial Asphalt. The wells were purged using a Well Wizard purge pump or an air lift pump or a Teflon bailer. The wells were sampled using disposable bailers. Between each well, the pump or bailer was steam cleaned to minimize potential for cross contamination.

Water samples were collected from each monitoring well just after purging, placed in appropriate containers supplied by the contract analytical laboratory, labelled, and placed in a cold ice chest.

Samples were delivered to Med-Tox Associates, Inc., of Pleasant Hill, California, an analytical laboratory state-certified for the analyses performed.

Analytical results on water samples are summarized in Table 2 and were reported in our 1990 monthly/bimonthly reports. Copies of laboratory reports and chain-of-custody records are available in Kleinfelder's files.

4.5.2 Offsite Wells

On 29 November 1990, a Kleinfelder technician purged and sampled two water supply wells located downgradient from the Industrial Asphalt site. These two wells are designated as 11P4 and 14A2 on Plate 7.

The wells were purged by opening a tap and running water for about 30 minutes in order to empty the surge tanks. Approximately 300 gallons of water were purged prior to well sampling. Water samples were collected into containers supplied by the contract analytical laboratory.

Copies of chain-of-custody records and laboratory reports are included in Appendix B and D, respectively.

4.6 SOIL BORING/WELL SURVEY

A survey of all new monitoring wells at the site and the ten soil borings was completed by Associated Professions, Inc., of Livermore, California, a licensed land surveyor.

A mean sea level (MSL) benchmark (USGS datum) was used for this survey. Additionally, horizontal location of each well and boring with respect to the existing previously surveyed monitoring wells was surveyed at that time.

The results of the survey are presented on Table 3 along with appropriate data for all other existing onsite wells.

Ground water level measurements along with ground water elevation contour lines and the estimated average ground water flow direction and the hydraulic gradient were given in our monthly/bimonthly reports.

5 HYDROGEOLOGY

5.1 GEOMORPHOLOGY

The Industrial Asphalt facility is in the Amador Subbasin of the Amador Valley, approximately 35 miles southeast of San Francisco. As such, it is a portion of the Alameda Creek watershed which is completely surrounded by hills of the Diablo Range. Most of the subbasin is used for agriculture and gravel extraction. The site is bordered on the north by a gravel pit and El Charro Road on the east. Neighboring facilities and structures include Jamieson Co. to the south and west.

Topographic relief across the 53 El Charro Road site is minor and ground surface elevations range from approximate elevation 380 feet above mean sea level (AMSL) to approximate elevation 376 feet AMSL, northeast to southwest across the Industrial Asphalt's property, a distance of about 900 feet (0.4%).

There are no drainage facilities at the site. Storm water infiltrates into the ground, flows with the surface gradient, or creates ponds on the ground surface.

The area not covered by structures is not paved and is heavily used for traffic, storage and automobile parking.

5.2 REGIONAL HYDROGEOLOGY

The Industrial Asphalt site is located in the northern part of the Alameda County. The oldest water-bearing formation in the area is the Tassajara Formation. This formation is of Pliocene age and occurs north of Livermore-Amador Valley and also beneath the central portion of the valley at depths ranging from 200 feet to 750 feet. Post depositional deformation has folded and tilted the beds of the Tassajara Formation into a number of northwest-southeast trending anticlines and synclines. These beds are composed of sandstone, siltstone, shale, conglomerate, and limestone. Wells tapping the Tassajara Formation yield only sufficient water for domestic, stock or limited irrigation purposes. Ground water contained in this formation is of sodium bicarbonate character of moderately good quality (Ref. 5).

The next youngest geologic unit in Livermore-Amador Valley is the Livermore Formation, which is of Plio-Pleistocene age. The formation occurs generally as beds of clayey gravel in a sandy clay matrix. To the south of the Livermore-Amador Valley, these beds dip toward the north. They are nearly flat under the valley, and they dip gently to the south along the north edge of the valley where they lap onto the Tassajara Formation. This formation is a significant water-bearing formation in the valley area. Yields to wells are adequate for most irrigation, industrial, or municipal purposes. Like the underlying Tassajara Formation, ground water in the Livermore Formation is of sodium bicarbonate character and of good quality (Ref. 5).

The surficial valley-fill materials overlie the Tassajara and Livermore Formations and range in thickness from a few feet to nearly 400 feet. These alluvial materials are composed of unconsolidated sand, gravel, silt, and clay, all of Holocene age. Wells located in these materials yield ground water from both confined and unconfined aquifers. These materials generally produce an excellent quality sodium, calcium, and magnesium bicarbonate water. Exceptions are local areas containing significant quantities of chloride and nitrate ions (Ref. 5).

The Amador Subbasin is bounded on the east by the middle zone of the Livermore Fault and on the west by the Pleasanton Fault. The north boundary, east of Santa Rita Road, is formed by a permeability barrier which has been formed by the interfingering of alluvial deposits. West of Santa Rita Road, the northern boundary is formed by the Parks Fault. The south boundary of the subbasin is formed partly by the contact of the water-bearing Livermore Formation with non-water bearing rocks (Ref. 5).

Amador Subbasin is drained by Arroyo Valle and Arroyo Mocho, the two principal streams of Livermore-Amador Valley. Minor streams such as Tassajara Creek, Cottonwood Creek, and Arroyo las Positas also cross the subbasin. All streams drain in a generally westward direction.

Much of the ground water produced in the Amador Subbasin is derived from thick water-bearing zones in the valley-fill material. These aquifers are composed of sandy gravel and sandy clayey gravel that are up to 150 feet in thickness. Separating the aquifers are confining beds of silty clay that are up to 50 feet in thickness (Ref. 5).

Regional ground water movement in the valley is generally in a northwesterly and westerly direction. However, locally, ground water flow direction is in the general direction of the gravel pits (Ref. 5). The gravel operations pump large quantities of water from the pits to facilitate gravel mining, thus creating a large artificial depression in the valley ground water system. The gravel pit operators also back fill some of the pits with silt and clay to minimize further recharge and ground water movement in the area.

In most of the valley, vertical flow is minimal because of the many clay layers that tend to separate parts of the permeable aquifer material. The clay layers are not continuous, however, and some vertical flow does occur. In much of the southern parts of the Amador and Mocho II subbasins, the clay layers are less extensive and vertical flow is more apparent from water-quality measurements (Ref. 6).

Until 1962, most of the water used in the Livermore-Amador Valley was provided by ground water, with small quantities supplied by local streams. This almost total dependence on ground water caused a serious overdraft in the valley, with water levels dropping 100 feet or more in some areas. In order to correct this overdraft situation, water has been provided from the South Bay aqueduct since 1962. The South Bay aqueduct water is treated for domestic and industrial uses. Also, water from the aqueduct is released to Arroyo Mocho and Arroyo Valle for ground water recharge (Ref. 6).

Available data indicate that the yield of the production wells in the Amador Subbasin ranges from approximately 40 to 2,800 gallons per minute. The specific capacity ranges from 1.1 gallons per minute per foot of drawdown for a well drilled in the Livermore Formation to 217 gallons per minute per foot of drawdown for a well drilled in the valley-fill (alluvial) materials. This corresponds to transmissivities in the range of 75,000 to 375,000 gallons per day (Ref. 5).

5.3 LOCAL HYDROGEOLOGY

An evaluation of the subsurface geologic conditions was performed using boring log information from previously completed field work (1987 through 1989) as well as the work completed in spring and summer of 1990 (RI investigation). The evaluation is based primarily on subsurface cross sections developed from these boring logs and included in Plates 8 and 9. Logs of borings are included in Appendix A. Locations of geologic cross-sections are shown on Plate 7.

Materials encountered in the borings were fairly continuous and correlates relatively well between the boreholes. Based on these cross sections, it appears the site is underlain from the surface to depths of as much as 60 feet with what will be referred to in this report as fill materials (Unit 1, Plate 8 and 9). Generally, the fill material is characterized by brown silty clay to clayey silt with floating subangular clasts up to two inches in diameter. Typically this material is underlain by sandy gravel with cobbles and boulders to gravel and cobbles and boulders with minor amounts of sand. Typically, the clasts range between two and four inches in diameter. However, numerous clasts which exceeded the inside diameter of the drill pipe (5 3/8 inch) were encountered in most borings. It is estimated, based on fragments of these clasts, that some may be larger than six inches in diameter. The granular material encountered in this zone, as well as the larger clasts appear to be subrounded to subangular and composed of granitic and metamorphic looking material. Thin lenses of this gravelly material were also encountered within the brown clayey fill material; however, they do not appear to be laterally extensive.

Beneath the fill material to a depth of approximately 130 feet below land surface is a lithologic unit which appears to be predominantly composed of silty gravel with varying amounts of clay and fine to medium sand (Unit 2, Plates 8 and 9). Lenses of both sandy gravel and silt to clayey silt were encountered within this unit. The contacts between these lenses of sandy gravel and silt to clayey silt are very gradational, and therefore, were difficult to define during drilling. Overall, the unit is brown to olive brown with subrounded clasts which appear to be igneous and metamorphic in origin. As in the fill materials, some of these clast may be as large as six inches in diameter.

For the most part, the sediments encountered beneath the fill material were moist to almost wet from a depth of sixty feet to the first production zone noted in the discharge of the drill rig. This first water bearing zone was encountered at various depths over the site from approximately 90 feet to as much as 110 feet below grade. Typically, this zone was identified by the presence of sand to sandy gravel with little or no silt or clay (Unit 3, Plates 8 and 9). Water production from the cyclone of the drill rig would range from one to three gallons per minute. This estimation of flow volume was made by timing the filling of a five gallon plastic bucket from the cyclone. As the boring depth increased, flow would decrease and cease as the amount of silt or clay increased with depth. In some of the deeper borings, (e.g., borings SB-5), a second water production zone was encountered at a depth of approximately 120 feet. In most cases, this second zone (Unit 3, Plates 8 and 9) was defined only to be a decrease in silt content and with limited water production from the discharge of the drill rig as observed in the first water production zone. However, at some of the boring locations (SB-1, SB-9, and MW-14) this second water production zone was separated from the first water producing zone by the presence of a damp brown silt to clayey silt (Unit 4, Plates 8 and 9). This lithologic unit was observed to be as much as four feet thick. However, since this unit was encountered at only three boring locations, the unit is not believed to be laterally extensive and probably represents localized lenses.

Ground water levels in the Amador Subbasin are variable because of gravel mining operations utilizing gravel pits and ground water wells, Arroyo Valle and Arroyo Mocho creeks recharge and boundary effects with other subbasins. In addition, deep irrigation and domestic wells in the area contribute to the dynamite hydraulic regime of the upper water bearing zone (Ref. 5, 6).

Gravel mining dewatering in the Amador Subbasin, particularly by Kaiser, produced the lowest ground water levels in the basin during spring of 1990. The current active Kaiser mining area, located northwest of the Industrial Asphalt site (west of well 11P4), have essentially removed the upper aquifer to elevation 220 feet or below and refilling the mined pits with silts and clays washed from the gravel during processing. Ground water pumped from the mining area was discharged to the Arroyo Valle (Ref. 7).

Gravel mining operations by Lonestar, located south of the Industrial Asphalt site dewatered the area within the 290 feet contour to below elevation 260 feet (Ref. 7).

Gravel mining operations by the Jamieson Co. located northeast of well 11P4 (Plate 7) maintained ground water levels below elevation 300 feet. The Jamieson operation pumped their excess water to recharge pits located near well 13E1 and maintained higher ground water levels adjacent to the Arroyo Mocho Creek in that area (Ref. 7)

There is little information available on the deeper aquifer in the Amador Subbasin. Reference 7 includes a ground water elevation contour map for the deeper aquifer. Generally, water levels in deeper wells are 10 to 100 feet lower than in the upper zone and the deeper zone hydraulic gradient is towards northwest and west.

It appears, that local geologic and hydrogeologic conditions are rather consistent with the regional geology and hydrology. Materials encountered at the site during the RI are of alluvial origin. Ground water measured at the site has fluctuated considerably since well installation and ranged from approximately 76 feet in 1987 to approximately 95 feet below surface in 1989. Table 2 shows depth to water data obtained from the site monitoring wells.

6 WELL CANVASS

Because ground water is the principal medium carrying dissolved chemical constituents suspected of originating from the source on the site, private and municipal water wells are the primary receptors for chemicals of concern.

The Alameda County Flood Control and Water Conservation District - Zone 7 (ACFCWCD) files were reviewed to locate ground water wells in the vicinity of the Industrial Asphalt site.

Plate 6 is a well survey location map showing the approximate locations of wells potentially withdrawing ground water within a one mile radius of the site. A list of the wells shown on this map is presented in Table 5. The approximate direction of ground water flow for the area and the region is also depicted on the map. Regional flow (or hydraulic gradient) is to the northwest and west (Ref. 7). However, the local hydraulic gradient it to the north and northeast. Wells located north and northeast of the site are, therefore, downgradient, and wells located in all other directions of the site are upgradient.

The well inventory includes 23 wells located within a one-mile radius of the Industrial Asphalt site. Fifteen of these 23 wells are listed as active wells. Of these fifteen active wells, four are domestic wells, five are irrigation wells, two are monitoring wells and four are industrial wells.

The wells designated as 14A2, 11P4, 11J1 and 11G1 are the ones which are located closest to the Industrial Asphalt site. Well 14A2 is a domestic well 220 feet deep and is located approximately 900 feet northeast from the site (downgradient from the site). Screened intervals of this well: 135-160 and 170-205 feet (Table 5).

Well 11P4 is a domestic well located approximately 2,100 feet north/northwest from the site. However, it is likely that in the area of this well, the regional hydraulic gradient prevails (i.e., to the west) (Ref. 7).

Wells 14J1 and 14K2 are Lone-Star wells used for industrial water supply. These wells are located approximately 1750 and 2050 feet, respectively, upgradient from the site.

Well 14G1 is located approximately 950 feet southwest from the site and is 500 feet deep. This well is also located upgradient from the project site.

There are several municipal water supply wells located in Pleasanton and Livermore. The closest municipal wells are located approximately 12,800 feet to the west and 9000 feet to the northeast.

The total volume of ground water extracted from each of these wells (located within a one mile radius of the site) on an annual basis is unknown. Therefore, any attempt to describe the hydrogeologic regime in a watershed (water balance) will not be performed at this time.

It appears that only one well (14A2) may be potentially effected by dissolved chemicals migrating off the Industrial Asphalt site. The well is owned by Jamieson Co. and is primarily used for industrial water supply in addition to small quantities used for drinking/washing purposes.

7 ANALYTICAL RESULTS

7.1 SOIL SAMPLES

Sixty-three soil samples collected from soil borings were delivered to Chromalab, Inc., in San Ramon, California. Two soil samples obtained from the excavation bottom were delivered to Med-Tox Associates, Inc., of Pleasant Hill, California. Both laboratories are the State of California DHS certified for the chemical analyses requested in this investigation.

As proposed in the RI work plan (Ref. 1), all soil samples were analyzed for TPH as diesel (D)/waste oil (WO) using EPA Method 3550/8015 and for PCBs using EPA Method 8080. In addition, one sample taken from the soil boring SB-4 (depth 61 feet) was analyzed for semi-volatile organics using EPA Method 8270. This soil sample was selected for this analysis because it was saturated with diesel and was analyzed to evaluate types of hydrocarbons contained in the released product and proportions (by weight or by volume) of particular hydrocarbons in the product. However, none of the compounds tested for (EPA Method 8270) was detected at or above laboratory detection limits.

Table 4 presents a summary of the analytical results obtained from the soil samples. Complete laboratory reports are given in Appendix D.

7.2 GROUND WATER SAMPLES

As discussed, Industrial Asphalt performed monitoring of the site's existing wells on a monthly basis until June 1990. At that time, the monitoring program was rescheduled to occur every other month. Since commencement of the monitoring program, all collected ground water samples were analyzed for TPH-D, TPH-WO and PCBs by a state certified analytical laboratory using EPA Methods 8015 and 8080, respectively.

Additionally, water samples from all wells, with the exception of MW-1, were analyzed once for benzene, toluene, xylenes and ethylbenzene (BTXE) using EPA Method 8020.

Analytical data are given in Table 2. Laboratory results for BTXE are not shown in this table, however, the analyses on water samples indicated no presence of these compounds in the samples.

Monitoring data, including ground water elevation and gradient, an average water flow direction, free product thickness and chemical analyses results, have also been given in our monthly/bimonthly reports.

In addition, two water samples were collected from two domestic wells 11P4 and 11A2 (Plate 6). These two wells have been used for domestic purposes and are located north and northeast of the Industrial Asphalt site. Laboratory results for the two wells are not shown in Table 2 since chemical analyses indicated non-detectable concentrations of the target chemicals in the water samples.

8 DISTRIBUTION OF CHEMICALS

8.1 SOILS

Based on observations during field activities and analytical results of soil samples collected during this and previous site assessments, it appears that target chemicals (diesel, waste oil) in soils have migrated from the source. Impacted soils were found at different depths (elevations) in borings SB-8, SB-9 and MW-10 to the west, borings MW-11 and MW-14 to the north, a boring MW-9 to the east, and a boring SB-3 to the south.

Plate 10 shows inferred outlines of soil contamination (at various depths) at the Industrial Asphalt site.

The highest concentration of TPH-D/WO (560 mg/kg) was found in boring SB-1 at a depth of 21 feet and at the excavation bottom (600 mg/kg). It appears that these hydrocarbons were present in all soil samples taken from SB-1. However, soils in the vicinity of SB-1 were already excavated (Chapter 4.2).

Detected concentrations in samples obtained from the other borings (Table 4) ranged from 5 mg/kg to 370 mg/kg.

The distribution of TPH-D/WO may indicate complex geologic conditions beneath the project site characterized by irregular discontinuous more permeable zones (lenses). These lenses create preferable pathways for chemicals to migrate in the unsaturated zone (e.g., 370 mg/kg in SB-4).

The State of California Department of Health Services (DHS) has set a TPH (gasoline, diesel, waste oil) concentration of 1,000 mg/kg in soils as a hazardous waste classification criterion (Ref. 8).

Polychlorinated biphenyls (PCBs) as Aroclor 1260 were found only in two soil samples. These samples were obtained from depths of 45 feet and 61 feet in borings SB-3 and SB-4, respectively. Aroclor 1260 was found in both samples at concentrations of 0.110 to 0.120 mg/kg.

The presence of PCBs only in soil samples collected from the vicinity of the former tank farm indicates relatively low mobility of PCBs and high sorbency of these compounds to the soils.

U. S. EPA recommends that for spills of low concentration PCBs of more than one pound in industrial areas, cleanup of soil, sand and gravel up to 25 mg/kg should be required (Ref. 9). The State of California DHS designates soils with less than 50 mg/kg PCBs as non-hazardous (Ref. 10).

8.2 GROUND WATER

According to the data in Table 2, dissolved target chemicals including TPH-D/WO have been detected in samples collected from all site monitoring/extraction wells except well MW-16. However, in some wells, detected concentrations of these compounds have been relatively low and occurred on a sporadic basis (e.g., 0.7 mg/l on 25 September 1989, 0.2 mg/l on 29 May 1990 and 0.1 mg/l on 28 June 1990 in well MW-5). Plate 11 shows inferred outline of dissolved hydrocarbons plume beneath the Industrial Asphalt site on 22 October 1990.

No detectable levels of PCBs as Aroclor 1260 have ever been detected in wells MW-4, MW-5, MW-6, MW-7, MW-9, MW-10, MW-11, MW-13, MW-14, MW-15 and MW-16. In the remaining wells, concentrations of Aroclor 1260 were found as high as 56 g/l in well MW-1, 33 g/l in well MW-2 and 62 g/l in well MW-3 on 30 November 1987. The highest concentration of PCBs in well MW-8 was found to be 5 g/l in the water sample taken on 1 June 1989. Title 22, Division 4, Article 11, Section 66699 (c) presents toxicity criteria for several substances including PCBs. A Soluble Threshold Limit Concentration (STLC) for PCBs is 5000 g/l (Ref. 10). According to this criterion, ground water beneath the Industrial Asphalt site impacted by PCBs is considered by the State of California as non-hazardous material.

Under the Safe Drinking Water Act, Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLG) are established. An MCL of 0.5 g/l was proposed for PCBs in May 1989 (Ref. 9). The MCLG is zero because PCBs are possible carcinogens. As a proposed MCL, the 0.5 g/l level is to be considered in determining the appropriate cleanup level for potentially drinkable ground water. Therefore, MCLs must be attained by public water supply.

Analyses of water samples collected from two water supply wells 11P4 and 14A2 located north and downgradient from the site (Plate 6) indicate the absence of the target compounds (TPH-D/WO, PCBs) in the samples at or above laboratory detection limits.

9 PUMPING TEST

A pumping test was conducted to provide estimates of transmissivity and storativity of the upper water bearing zone. Results of the pumping test were used to estimate maximum pumping rates from the extraction well, and to predict the extent of the ground water capture zone during pumping.

9.1 INSTALLATION AND EQUIPMENT

Extraction well MW-13 was used as the pumping well for the pumping test. As discussed (Chapter 4.3.2) this well was constructed using a 40 ft. long wire-wrapped stainless steel screen with 0.045-inch slots to maximize flow into the well.

A 4-inch diameter submersible pump (rated 25 gpm @ 130 ft) was installed in the well MW-13 at a depth of 115 feet, approximately one foot above the well bottom, to pump water from the water bearing zone. The rate of flow from the pump was regulated by a valve located in the effluent line adjacent to a piezometer tube. The piezometer tube was used to measure the water head in the discharge pipe in order to determine the pumping rate. Pumped waters were discharged to a 21,000 gallon "Baker" tank and stored for later disposal. The tank was temporarily located near well MW-14.

Water levels in all monitoring/extraction wells were monitored with conductivity based water level indicators. Additionally, during the pumping test, water levels in monitoring wells MW-8, MW-14, MW-15, MW-9, MW-16 and MW-6 were monitored with pressure transducers connected to two dataloggers for automatic data recording. During the recovery period, wells MW-16 and MW-6 were disconnected and a pressure transducer was installed in the extraction well MW-13 to record water levels.

9.2 PRELIMINARY PUMPING TEST

A step-drawdown pumping test was conducted to establish the maximum rate at which water could be pumped from the well. The flow rate from the pump was adjusted with the valve, then the water level in the well was monitored over a period of approximately 0.75 hours. The flow rate was again adjusted until stability was reached. Stable conditions were achieved at a discharge of approximately 2.9 gallons per minute (gpm) at a drawdown to a depth of approximately 110.81 feet.

9.3 CONSTANT RATE PUMPING

The constant rate pumping test was conducted on 19 and 20 September, 1990. Immediately prior to the test, depth to ground water was measured in all site wells to provide data on the potentiometric levels in the wells.

The 24.5 hour pumping test was started at 11:30 a.m. on 19 September 1990. Water level measurements were made in the pumped well approximately every 30 seconds for the first 10 minutes. Measurements of the 11 wells (MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-13, MW-14, MW-15 and MW-16) were recorded at approximately 10 to 15 minute intervals for five hours. Measurements of all wells at the site were recorded at approximately 1 to 2 hour intervals throughout the duration of the pumping test.

Measurements of the rate of discharge were periodically made at the top of the "Baker" tank by measuring the time taken to fill a 5-gallon bucket to confirm the discharge rate as read from the piezometer tube.

After 4.5 hours into the test, the discharge rate was reduced to 2.6 gpm at the depth of 110.50 feet. However, this rate was again reduced to 2.4 gpm at 6:00 a.m. on 20 September 1990.

The pump was shut off at 12:00 a.m. on 20 September 1990. The final depth recorded in well MW-13 was 109.30 feet. At that time, recovery data were obtained by recording water level measurements in monitoring wells. Pressure transducers were removed from wells MW-6 and MW-16 and one placed in well MW-13. The other pressure transducers remained in wells MW-8, MW-14, MW-15 and MW-9 during the recovery period. Back up measurements as well water level readings in wells without transducers were made with a conductivity based water level indicator assigned to each well. Between 12:00 a.m. and 15:35 (3:35 p.m)., five to seven rounds of water level measurements were recorded in all monitoring wells at the site. Approximately 97% recovery was achieved when the last measurement was taken.

9.4 AUTOMATED DATA LOGGING

The in-situ "Hermit" and the Campbell "21X" dataloggers were operated during the entire pumping test with the intention of recording water level data at 5 minute (maximum) intervals. Periodic review of the data recorded by the instrument indicated proper operation during the test and that data was being properly recorded. Data recorded by both dataloggers were used to evaluate the water bearing zone hydraulic characteristics including hydraulic conductivity, transmissivity and storativity.

9.5 DATA ANALYSIS

The 24.5 hour (1470 minute) pumping test performed at the Industrial Asphalt site did not create a sizeable drawdown in the site monitoring wells. Table 6 shows the residual drawdown in each well. It can be seen, that beside the pumped well (MW-13), the drawdowns in all monitoring wells are less than 0.60 feet with an average drawdown of 0.30 feet. The analysis of the pumping test data was performed to obtain a range of the hydraulic conductivity and storativity values of the water bearing zone.

The analysis of the pumping test data from the selected wells was completed using the AQTESOLV computer program (Ref. 11). Time drawdown data for the pumping well and observation wells were analyzed using both the Theis non-equilibrium method and the Jacob approximation (Ref. 12).

The recovery data for the pumping well (MW-13) and the selected monitoring wells (MW-7, MW-9, MW-14 and MW-15) were analyzed using the time-recovery curve data (i.e., calculated recovery and residual recovery) (Ref. 12).

Analysis of pumping test data by these methods requires that certain assumptions be made about the ground water flow system. These assumptions include the following:

- The aquifer is homogeneous and isotropic
- The aquifer thickness is constant and the aquifer is infinite in areal extent
- The pumping well fully penetrates the aquifer
- Water removed from aquifer storage is discharged instantaneously when the head is lowered
- Prior to pumping, the piezometric surface is nearly horizontal over the area influenced by the pumping test
- The aquifer does not receive recharge
- All flow within the aquifer is laminar.

Most of the assumptions are isolated to some degree in almost all pumping test situations. In particular, the assumption that the aquifer is homogeneous, isotropic, and infinite in areal extent are almost never met in actual field situations. At Industrial Asphalt the water bearing zone consists largely of sand, gravel and silt deposits. Because the characteristics of these units varies across the site, the assumptions that the aquifer is homogeneous, isotropic and infinite in areal extent is isolated to some degree. However, the aquifer parameter values computed using the Theis and Jacob equations are nonetheless very useful for estimating hydraulic parameters.

An additional factor that must be considered when analyzing the Industrial Asphalt pumping test data is that the well may not fully penetrate the water bearing zone. The clayey deposits which separate the various water bearing strata are discontinuous, indicating that there may be some degree of hydraulic connection between shallow deposits and deeper deposits located below the depth at which well MW-13 is screened. However, because of the stratified nature of the deposits, the lateral component of ground water flow is probably much larger than the vertical component. Therefore, results from the pumping test analyses by these methods probably provide reasonable values of aquifer parameters for the screened portion of the deposits.

An additional assumption is implicit when applying the Jacobs approximation. This assumption is that the quantity "u" is less than 0.05. The value "u" is equal to:

$$u = 1.87\, r^2S/Tt$$

where:

r = distance from the pumping well (feet)
s = storativity (-)
T = tranmissivity (gpd/ft)
t = time since pumping began (days)

If the value of "u" exceeds 0.05, the Jacob approximation is not generally considered valid. Calculated "u" values for the Industrial Asphalt site wells were less than 0.05 and, therefore, the Jacob approximation technique could be used. The Theis curve matching is not affected by this assumption.

For this investigation, both the Theis and Jacob methods of analysis were used for comparison purposes. The value for "u" was computed as a check of the applicability of the Jacob method; however, a comparison of transmissivity and storativity values computed using the two methods probably represents a more reliable measure of the reliability of the computed hydraulic parameters.

0.6 RESULTS

The maximum drawdown in the pumping well (MW-13) was 15.30 feet after 24.5 hours of pumping. The maximum drawdown in the site monitoring wells of 0.60 feet was observed in a monitoring well MW-7, which is located about 220 feet from the pumping well. Residual drawdowns for all the wells are shown in Table 6. As discussed, drawdown was observed in all the monitoring wells. A relatively small response in drawdown in the wells, however, may indicate that the water bearing material is anisotropic, the wells were located a considerable distance from the pumping well, or that a hydraulic barrier exists which separates those wells from the aquifer material which supplies water to well MW-13. Such a barrier may either be a recharge source, such as a buried channel, or a noflow of low-flow zone, such as a clay deposit. Either type of feature could effectively isolate those wells from the remainder of the aquifer. However, no evidence was found in plots of the data to indicate that a hydraulic barrier actually exists at the site, or whether the observed pattern of responses was caused by anisotropic conditions.

Appendix E includes the pumping test data collected with pressure transducers and dataloggers (MW-8, MW-14, MW-15, MW-9, MW-6 and MW-16) or collected manually with the water level indicators (MW-4, MW-5, MW-7, MW-10).

Data obtained during the recovery period using dataloggers (MW-8, MW-14, MW-15, MW-9 and MW-13) and obtained manually with the water level indicator (MW-4, MW-5, MW-6, MW-7, MW-10 and MW-16) are included in Appendix F.

9.6.1 Hydraulic Parameters

Results of the pumping and recovery data analyses are summarized in Table 7. Data from monitoring well MW-6 was not analyzed because of the erratic nature of the collected data. Transmissivity (T) values computed for the selected observation wells using Theis equation range from approximately 1,500 gpd/ft to 4,200 gpd/ft. Values computed using the Jacob method range from 1,150 gpd/ft to 4,000 gpd/ft.

Transmissivity values calculated from the recovery data using the calculated recovery and residual recovery methods range from 2,000 gpd/ft to 3,800 gpd/ft for the monitoring wells.

Storativity (S) values computed using the Theis, Jacob and calculated drawdown methods range from 8E-2 to 9E-4. These values are characteristic of confined to semi-confined hydraulic conditions (Ref. 12). The residual drawdown curve cannot be used for determining the S value, even though that curve is valid for calculating the transmissibility (Ref. 12).

Based on the results of the pumping test as summarized in Table 7, an average value of transmissivity and storativity for the water bearing zone beneath the Industrial Asphalt site were estimated. These values are 2,500 gpd/ft (0.00036 m^2/sec) and 0.0017, respectively.

9.6.2 Capture Zone Analysis

The capture zones for the pumping rate under various pumping rate scenarios was computed using a method described in Reference 13. The equation to compute the downgradient extent of capture is as follows:

$$r = Q/2\pi h v n_e$$

where:

r = downgradient extent of capture (ft)
Q = pumping rate (ft^3/day)
h = the effective saturated thickness of the aquifer zone yielding water to the well
v = Darcy flow velocity (ft/day)
n_e = effective porosity (-)

For this analysis, an average aquifer thickness of 20 feet was assumed (based on information from boring MW-13). The pumping velocity was computed using an average gradient of 0.035 feet/foot as estimated from field measurements of ground water levels. Using an average transmissivity of 334 ft^2/day (2,500 gpd/ft) from the pumping test data (Chapter 9.6.1) and an assumed effective porosity of 0.3, the pumping velocity was computed as follows:

$$v = (i \quad k)/n_e = (i \quad T)/(m \quad n_e)$$
$$v = (0.035\ ft/ft \quad 334\ ft^2/day)/(20\ ft \quad 0.3)$$
$$v = 1.95\ ft/day\ (0.59\ m/day)$$

The pumping velocity and other parameters were then used to estimate the downgradient extent of the capture zone using the above equation. the maximum width of the capture zone is estimated using the following equation (Ref. 13):

$$w = 2\pi r$$

where:
w = maximum width of the capture zone, ft.

Table 8 shows computed capture zone configurations for pumping rates of 1 gpm, 1.5 gpm, 2 gpm and 2.6 gpm. The estimated extent of the capture zones are shown on Plate 13.

As shown in Table 8, ground water pumping rate from the extraction well MW-13 would create a downgradient stagnation point approximately 23 feet from the well and the maximum width of the capture zone of approximately 145 feet. Note that the stagnation point (velocity divide) occurs well within the cone of depression caused by pumping. The relationship is such that the greater the pumping stream, the farther downgradient the velocity divide occurs (for a given natural flow velocity). Conversely, the greater the natural flow velocity, the closer the divide comes to the pumping well (for a given pumping stream) (Ref.13).

10 BASELINE RISK ASSESSMENT

10.1 SUMMARY

On behalf of Industrial Asphalt, Inc. (IA), Kleinfelder, Inc., completed a screening-level baseline assessment of risks to human health and the environment due to diesel fuel hydrocarbons and polychlorinated biphenyls (PCBs) present in the subsurface at the Industrial Asphalt facility, 52 El Charro Road, Pleasanton, Alameda County, California. The project site is located in a somewhat rural setting in an unincorporated part of Alameda County. The site, on Alameda County Assessor's Parcel #5, Block #1350, Map #946, is zoned A, which is primarily reserved for agricultural use and which designates a maximum population density of one residence per 100 acres. No future change for this zoning classification is currently foreseeable. The primary land use in the immediate vicinity of the Industrial Asphalt site is gravel mining. The nearest residential developments are approximately one mile east in the City of Livermore and one and a half miles west in the City of Pleasanton.

The objective of the baseline assessment was to quantify potential risks to human health and the environment due to exposure to these chemicals that would occur without implementing remedial measures. The assessment was conducted as a "screening-level" assessment, in that the assessment did not encompass the level of detail and effort that constitute a formal baseline risk assessment. Many conservative (i.e., worst-case) assumptions were made in this analysis for selecting chemicals on which to base the assessment (chemicals of interest), for modeling the environmental fate and transport of the chemicals of interest, and for calculating potential exposure concentrations.

Field and laboratory data from the recent Remedial Investigation (RI) and from previous subsurface investigations were used to compile the site background, exposure setting, and physical and chemical characteristics of the site.

The major steps in the risk screening process were as follows:

- Identification of potential hazard - The Industrial site was evaluated for amounts of diesel fuel chemicals and PCBs in soil and ground water, and whether adverse impacts to human health and the environment could occur from their presence. Benzene, naphthalene and PCBs were selected as "chemicals of interest", i.e., those chemicals which are likely to pose the highest risks to human health and the environment. It should be noted that the presence of benzene and naphthalene, typical components of diesel fuel, have only been analyzed for during select sampling rounds of soil and ground water at the Industrial Asphalt site. Neither were reported in results of laboratory analyses, but were selected for the risk assessment due to their documented toxicity and mobility in subsurface environments. PCBs, not typically associated with diesel fuel, have been reported in results of laboratory analyses of soil and ground water samples collected at the Industrial Asphalt facility and were selected for the risk assessment due to their documented toxicity and long lifetime (persistence) in subsurface environments.

- Exposure Assessment - Potential exposure pathways of the three chemicals through environmental media (soil, water, air) were assessed. The migration of chemicals through ground water was selected as the highest risk pathway, and a water supply well at the Jamieson Sand and Gravel Company adjacent to the Industrial Asphalt site was selected as a key exposure point for possible human receptors. Migration of chemicals in ground water was modeled using worst-case assumptions to calculate quantitative, conservative long-term concentrations of each chemical of interest at the Jamieson well. Model output showed that of the three chemicals, benzene and napthalene could potentially reach the water supply well at the Jamieson site, i.e., no exposure pathway for PCBs was found in this analysis.

- Dose-Response Evaluation - Toxicological information on the chemicals of interest was researched and described. Pertinent health criteria established by California Department of Health Services (DHS) and United States Environmental Protection Agency (EPA) were cited.

- Risk Characterization - To quantify potential carcinogenic human health effects, the risk characterization approach promulgated by the EPA Risk Assessment Guidance for Superfund was used in conjunction with EPA-established oral slope factors to assess impacts of human exposure to benzene (Ref. 14, 23). To quantify potential noncarcinogenic human health effects, the risk characterization approach promulgated by the DHS Site Mitigation Decision Tree (Ref. 15) was used in conjunction with DHS-established Applied Action Levels (AALs) to assess impacts of human exposure to naphthalene.

This screening-level assessment concluded that no adverse impacts to human health or the environment are likely to occur as a result of exposure to diesel fuel-related chemicals or PCBs in the soil and ground water at the Industrial Asphalt site. Potential exposures for human or environmental receptors to chemicals in ground water are likely to be below any currently established health criteria or regulatory concern. Furthermore, it is questionable whether any of the chemicals of interest would reach potential points of exposure, given the conservative assumptions made in this analysis.

10.2 INTRODUCTION TO THE SCREENING-LEVEL RISK ASSESSMENT

This screening-level risk assessment does not include the level of detail and effort of a formal risk assessment, nor does it include steps and procedures such as data evaluation, statistical methods, evaluation of uncertainties, and setting cleanup goals, that are included in a typical formal risk assessment. The level of detail and effort in this analysis is intended to give a relatively rapid and inexpensive method of indicating potential risks to human health and the environment related to exposure by receptors to chemicals that have migrated via environmental pathways. The assumptions and simplifications made in such an analysis are intended to give a conservative estimate of the potential risks, and therefore should only be used as an indicator of such risks. Actual risks would be most likely lower than the results of such a screening indicate.

The four major steps in the screening-level assessment are:

(1) identification of potential hazard, where the site is evaluated for chemicals of concern and the potential for impacts to human health and the environment

(2) exposure assessment, where potential environmental migration pathways are evaluated and subsequent concentrations of chemicals of interest at key exposure points are quantified

(3) dose-response evaluation, where toxicological properties of the chemicals of interest are described. The response of receptors to the chemicals of interest are described and available established health criteria are cited

(4) risk characterization, where exposure concentrations of the chemicals of concern are compared to the dose response or the established relevant health criteria in order to quantify risk.

The previous background chapter described a release of diesel fuel containing PCBs to the subsurface at the Industrial Asphalt site. Chapter 10.3 examines the characteristics of diesel fuel and its components in order to identify a potential hazard due to the release. Because diesel fuel is a mixture of many chemicals, chemicals of interest were selected on which to base the risk screening. A conceptual model of the subsurface migration of the chemicals of interest at the Industrial Asphalt site is also presented.

Chapter 10.4 is the exposure assessment. Potential exposure pathways are evaluated against features particular to the Industrial Asphalt site. Quantified estimates of the amounts of diesel fuel in the subsurface at the Industrial Asphalt site are presented in this chapter. The migrations of the chemicals of interest are quantified and potential exposure concentrations of the chemicals of interest at a nearby ground water supply well are calculated.

Chapter 10.5 is the dose-response evaluation which describes the toxicological properties to the chemicals of interest. Pertinent health criteria are also described.

Chapter 10.6 presents the risk characterization, where risks to human health and the environment due to exposure to the chemicals of interest are quantified by comparing the exposure concentrations to health criteria established by DHS and EPA.

Chapter 10.7 includes a discussion of uncertainties in the analysis, and Chapter 10.8 is a brief discussion of the calculated risk values.

10.3 SELECTION OF CHEMICALS OF INTEREST AND CONCEPTUAL MODEL OF MIGRATION

Releases of diesel fuel containing PCBs have been documented at the Industrial Asphalt facility. This chapter presents a description of diesel fuel. Chemical and physical properties of the constituents of diesel are presented and the environmental significance of selected properties is discussed. The chapter then provides a rationale for selecting benzene, naphthalene, and PCBs as chemicals of interest on which the risk screening will be based, and a qualitative conceptual model of the migration of chemicals of interest is presented.

10.3.1 Description of Diesel Fuel

Diesel fuel is produced by distilling petroleum and is a complex mixture of more than 200 hydrocarbons (Ref. 22,24). The hydrocarbons generally consist of molecules with eight to fourteen carbon atoms. Eighty per cent of the hydrocarbons distill at temperatures between 215 and 288 degrees Celsius (300 - 700 degrees Fahrenheit). Diesel fuel is a brown, slightly viscous fluid and is considerably less volatile than gasoline. Table 9 shows a typical composition of petroleum hydrocarbon classifications in diesel fuel.

Table 10 shows constituents of diesel fuel and No. 2 fuel oil (which is similar to diesel) along with their concentration ranges. Also shown are chemical and physical properties such as Henry's constants, molecular weights, water solubilities, organic carbon and octanol/water partitioning coefficients, and volatilities. Information on the impacts to human health and the environment by diesel fuel constituents is generally limited. The two righthand columns of Table 10 present DHS-established health-based classifications and environmental-based classifications where available.

10.3.2 Environmental Significance of Select Properties

The environmental significance of selected chemical and physical properties of the constituents of diesel fuel is discussed in this chapter.

Water solubility is an important property of a substance when evaluating environmental impacts. Chemicals with relatively high solubility are more likely to dissolve into ground water, and hence are more likely to migrate in the subsurface (see Chapter 10.3.4). The water solubilities of benzene and naphthalene are high, relative to other diesel constituents. The solubility for PCBs is relatively low.

K_{OC} (organic carbon partitioning coefficient) and K_{OW} (octanol/water partitioning coefficient) indicate the tendency of a chemical to adsorb to organic matter or to dissolve in water. High values of these parameters indicate that a chemical is likely to adsorb to organic matter and is less likely to dissolve in water, and hence would be less likely to migrate in the subsurface. The Kocs or Kows of benzene and naphthalene are relatively low, where as the K_{OC} and K_{OW} for PCBs are relatively high.

Vapor pressure is related to the volatility of a chemical, which refers to the ability to change state (evaporate) from a liquid to gaseous state. The vapor pressures of diesel constituents indicate that benzene qualifies as a volatile organic chemical (VOC) and could evaporate at ambient temperatures.

10.3.3 Selection of Chemicals of Interest

The straight chain paraffins, isoparaffins, and cycloparaffins that constitute most of the hydrocarbons in typical diesel fuel (see Table 9) are generally regarded as immobile in subsurface environments and are considered to pose less of a serious threat to human health, relative to aromatic and polyaromatic chemicals (Ref. 8).

Table 10 indicates that benzene, an aromatic compound, has a relatively moderate concentration range in No. 2 fuel oil, relatively high water solubility, relatively low partitioning to organic matter, and is an established human carcinogen. Naphthalene, classified as a polyaromatic hydrocarbon (PAH), has a relatively high concentration range in diesel fuel and No. 2 fuel oil, relatively moderate water solubility, relatively low partitioning to organic matter, and is established as a non-carcinogenic toxin to humans. In addition, benzene and naphthalene have been established by DHS as toxic agents to freshwater species.

PCBs, which are a group of chlorinated organic chemicals not typically found in diesel fuel, have been reported in analyses of samples soil, ground water, and free diesel product collected at the Industrial Asphalt site. Table 10 indicates that PCBs have relatively low water solubility, relatively high partitioning to organic matter, and are classified by EPA as probable human carcinogens (Ref. 9). PCBs are noted for their resistance to breakdown by biological or chemical processes in subsurface environments.

The rationale for selecting benzene, naphthalene, and PCBs as the chemicals of interest on which to focus the risk screening is summarized:

- Though benzene and naphthalene have not been reported in analyses of soil and ground water at the Industrial Asphalt site, they are typical components of diesel, have known toxicological properties, and show potential for mobility through subsurface environments..

- Though PCBs are not typical components of diesel, they have been reported in soil and ground water samples collected at the Industrial Asphalt site, have known toxicological properties, and are persistent in subsurface environments.

10.3.4 Conceptual Model of Migration

This chapter provides a qualitative conceptual model of what is generally known about environmental fate and transport (migration) of chemical compounds such as those found in the subsurface at the Industrial Asphalt site. Site specific features are incorporated into the model in Chapter 10.3.4b.

10.3.4a General Subsurface Migration Model of Chemicals of Interest

Organic chemicals released into the shallow subsurface will generally move downward through unsaturated soil by gravity flow. Spreading (dispersion) will occur, due to tortuous pathways through the soil matrix. Organic liquids are retained in a liquid state (non-aqueous phase liquid, or NAPL) by capillary forces in the spaces between soil particles and in an adsorbed state by adsorption to organic material in the soil matrix. If soluble chemicals reach ground water they will dissolve, and a plume of affected water will develop in the saturated zone. Plume shape will depend on subsurface characteristics such as hydrogeology and stratigraphy.

The dissolved chemicals will be transported in the saturated zone by advection, which refers to the bulk motion of flowing ground water. Dissolved chemicals will spread as they move with ground water. The spreading process, called dispersion, results from variations in ground water velocity due to friction, pore geometry, and tortuous pathways through the soil matrix.

As organic chemicals move through the saturated zone, they may be adsorbed when they come in contact with organic matter or clay particles. Adsorption tends to retard the dissolved chemicals in the soil matrix, resulting in reduction of mobility of the chemical.

There is evidence of biotransformation of organic chemicals by microorganisms attached to soil surfaces, though chlorinated organics such as PCBs seem less prone to biotransformation. Biotransformation will reduce the concentrations of chemicals in the subsurface.

10.3.4b Conceptual Model of Fate and Transport of Chemicals of Interest in the Subsurface at the Industrial Asphalt Site

The environmental phenomena described above could potentially apply to fate and transport of the chemicals of interest found in the subsurface at the Industrial Asphalt site. Plate 14 shows a pictorial model of the likely fate and transport of chemicals of interest at the Industrial Asphalt site.

During the release of diesel fuel into the subsurface, chemicals may have been held in four states or phases in the soil and ground water environment, namely, vapor phase, non-aqueous phase liquid (NAPL), dissolved phase, and adsorbed phase. The amounts of diesel fuel chemicals currently held in the vapor phase at the Industrial Asphalt site are likely to be insignificant due to the facts that (1) fresh diesel fuel has not been released to the subsurface since 1985; (2) volatile chemicals make up only a small fraction of typical diesel fuel; and (3) volatile chemicals are likely to have evaporated and dispersed during the time period subsequent to the release. For the current conditions at the Industrial Asphalt site, chemicals of interest are assumed to be held in the remaining three phases.

Chemicals of interest at the Industrial Asphalt site held in the NAPL phase in the unsaturated zone will migrate by dissolution into ground water. Ground water that rises into the unsaturated zone due to seasonal variations and variations due to nearby well pumping operations will cause a change of state of chemicals of interest from NAPL to the dissolved phase.

Chemicals of interest held in the dissolved phase will migrate due to advection and dispersion. Ground water gradients in the subsurface at the Industrial Asphalt site are significant. Operations at nearby pumping wells have significant impacts on the subsurface hydraulics at the Industrial Asphalt site, altering the direction of ground water flow and increasing the gradient.

The adsorption phenomena previously described may apply in varying degrees to the chemicals of interest at the Industrial Asphalt site, due to the wide range of Koc and K_{OW}

values for these substances. Adsorption results in change of state from the NAPL and dissolved phases to the adsorbed phase. Estimates of retardation effects due to adsorption are presented in Chapter 10.4.2.

Biotransformation of benzene and naphthalene in subsurface environments has been documented (Ref. 16). However, estimates of concentration reduction due to biotransformation were not included in this risk screening analysis in order to make health-conservative estimates of risk from exposure to these chemicals.

10.4 ASSESSMENT OF EXPOSURE TO CHEMICALS OF INTEREST

Exposure is the contact of a receptor with a chemical. This chapter assesses the potential exposure by human and other receptors to chemicals of interest present in soil and ground water at the Industrial Asphalt site. Potential exposure pathways are described and evaluated against site specific characteristics and data gathered during the RI and previous environmental investigations. Migration rates of chemicals of interest are quantified, and chemical concentrations at key potential exposure points are calculated.

10.4.1 Potential Exposure Pathways for Chemicals of Interest

Exposure pathways are the means through which a receptor may come into contact with a chemical. Exposure pathways are determined by environmental conditions, potential for a chemical to move from one environmental medium to another (e.g., soil to ground water), and by behavior of the potentially exposed population (e.g., construction workers, well drillers, etc.).

Exposure pathways typically have the following elements:

- chemical source or chemical release area
- release mechanism (e.g., volatilization, ground water seepage)
- environmental retention or transport medium (e.g., soil, ground water)
- exposure point, where receptors are exposed to chemicals
- exposure route, such as ingestion, inhalation, skin contact, etc.

Potential exposure pathways of the chemicals of interest at the Industrial Asphalt site are evaluated in the following chapters.

10.4.1a Exposure Pathway by Soil

A potential exposure pathway exists if receptors come into contact with or ingest affected soil, or breathe air containing affected dust particles. Most of the Industrial Asphalt site is paved with asphalt and the majority of affected soils are found at depth below ground surface. Therefore, there is no significant opportunity of exposure by receptors to the chemicals of interest due to direct contact with soil under normal facility operations. Pica behavior (ingestion of soil) is not considered a significant exposure pathway due to the depth of the affected soil and the negligible access to the Industrial Asphalt site. Fugitive dust emissions from the Industrial Asphalt site would likely not contain affected soil particles as the affected soils are for the most part below ground surface and would not be subject to wind action. Exposure to chemicals of interest in soil is considered negligible.

10.4.1b Exposure Pathway by Ground Water

A potential exposure pathway exists if receptors come into contact with or ingest affected ground water. At the Industrial Asphalt site, there are indications that chemicals of interest in ground water may move downgradient and offsite. A recent well canvass conducted by Kleinfelder (Chapter 6) revealed pumping wells within a mile radius of the Industrial Asphalt site. These wells could also be impacted by offsite migration of chemicals of interest in ground water, representing potential exposure points to human receptors. The surface impoundment immediately north of the site is a surface water body that could be impacted by offsite migration of chemicals of interest in ground water, representing a potential exposure point to freshwater species.

By preliminary evaluation, there is a potential for exposure of receptors, both human and freshwater species, to the chemicals of interest which could migrate through ground water from the Industrial Asphalt site.

10.4.1c Exposure to Vapors

A potential exposure pathway exists if receptors inhale chemical vapors. At the Industrial Asphalt site, vapor phase chemicals of interest are likely to be insignificant due to previously described site specific factors. Exposure to chemicals of interest in the vapor phase is considered negligible.

10.4.2 Evaluation of Exposure Points

Exposure points are the locations at which a potential receptor is exposed to chemicals that have migrated via an environmental medium such as air or water. For this risk screening, the significant exposure points are those locations where receptors would come into contact with or ingest chemicals in ground water. The potential exposure points for humans are water supply wells in the vicinity of the Industrial Asphalt site. A potential exposure point for aquatic species is the surface impoundment located just north of the Industrial Asphalt site. These potential exposure points are evaluated in this chapter.

10.4.2a Water Supply Wells

A recent canvass by Kleinfelder indicated that various water supply wells exist in the vicinity of the Industrial Asphalt site (see Plate 6). Well number 14A2, at the Jamieson Sand and Gravel Company (Jamieson) property, is of particular interest for this risk screening in that it is located approximately 900 feet northeast of the Industrial Asphalt site and the direction of horizontal ground water flow at the Industrial Asphalt site is generally to the northeast.

Water from the Jamieson well is reportedly used for industrial purposes and also for drinking by employees. The well reportedly has two screening intervals, from 135 to 160 feet and from 170 to 205 feet below ground surface. Pumping rates and frequency of well usage have not been reported.

To evaluate potential health effects to human receptors, this risk screening uses the water supply well at the Jamieson site (14A2) as the worst-case exposure point in that it is the closest well to the Industrial Asphalt site and that horizontal ground water flow from the site is towards this well.

10.4.2b Surface Impoundment

An abandoned gravel pit. now used exclusively for water storage for industrial operations by Jamieson, borders the Industrial Asphalt site on the north. This storage pond is located on private property and is inaccessible to the public.

Water from this pond is recycled, i.e., is pumped to a gravel washing facility and returned to the pit. The Alameda County Flood Control and Water Conservation District, Zone 7, (Ref. 17) give the following physical data on this mined pit.

Pit Number	R4
Original Ground Elevation	380 feet MSL
Nominal Mined Depth	140 feet
Water Surface Elevation	316 feet MSL (spring 1989)
Water Surface Elevation	316 feet MSL (fall 1989)
Pit Area	16 acres

The water surface elevation in this pit, measured October 22, 1990, was 300.0 feet MSL (Mean Sea Level).

Assuming an average water depth in the pond of 60 feet, the total volume of water within this 16 acre storage pond would exceed 300 million gallons. Based on our measurements, the water surface elevation in this pit is normally a minimum of 10 feet higher than water level elevations measured in monitoring wells at the Industrial Asphalt site.

Although the presence of fine materials from the gravel washing operation will tend to form a seal on the pit bottom, this impoundment may act as a hydraulic barrier to ground water flow and prevents migration of chemicals in ground water from the Industrial Asphalt site to the north. The water body also influences ground water gradients at the Industrial Asphalt site and recharges ground water zones beneath the site.

Due to the factors described above, the surface impoundment is not considered a potential exposure point for human or aquatic receptors to chemicals of interest at the Industrial Asphalt site.

10.4.3 Quantification of Exposure by Human Receptors to Chemicals of Interest by Ingestion of Ground Water

This chapter quantifies worst case exposure by human receptors who would drink water at the supply well at the Jamieson property, approximately 900 feet from the Industrial Asphalt site. The process for quantifying exposure concentrations included the following steps:

(1) the mass amount of diesel presently held in soil and ground water at the Industrial Asphalt site was estimated based on analytical results of sampling rounds

(2) it was assumed that this amount of diesel was originally spilled from the location of the original tank excavation

(3) the migration of chemicals of interest was modeled by using a simple two-dimensional analytical model for transport. Model output included chemical concentrations in ground water at the location of the exposure point, i.e., the Jamieson supply well averaged over a seventy year time period

(4) ingestion of chemicals in drinking water by human receptors was calculated using an approach promulgated by EPA (Ref. 14). The approach assumes a maximum exposure to chemicals in that the seventy year average concentrations of chemicals in ground water as indicated by the migration model were assumed to be the concentration at the exposure point (tap), and that the exposure frequency would be daily over a seventy year exposure duration.

10.4.3.1 Quantification of Amounts of Diesel in the Subsurface

The most recent and relevant data were reviewed in order to calculate a quantitative estimate of the amounts of diesel fuel currently present in soil and ground water at the Industrial Asphalt site. For this analysis, Total Petroleum Hydrocarbons (TPH) reported as diesel fuel and as waste oil detected in soil and ground water samples by EPA Methods 8015 were grouped together and assumed to be diesel fuel hydrocarbons.

10.4.3.1a Amount of Diesel Fuel in Soil

Average concentrations of TPH in soil for the affected area were calculated. Analytical results of soil sampling rounds conducted during the RI and previous subsurface investigations were used to first calculate depth-weighted average concentrations of chemicals in soil at borehole locations. For example, if a soil sample collected from a borehole at five foot depth showed a concentration of TPH at 10 parts per million (ppm), and a soil sample collected from the same borehole at ten foot depth showed a concentration of TPH at 20 ppm, the average TPH concentration for the soil interval between five and ten feet would be 15 ppm. The values obtained for each interval were then weighted by depth (i.e. percent depth) and averaged for the entire borehole. This rationale was extended to obtain an average for each soil borehole showing evidence of affected soil at the Industrial Asphalt site.

The concentrations calculated at soil boring locations were used to plot areal concentration isocontours for TPH (Plate 15). An isohyetal approach was used, in that a weighted area (i.e. percent area) for each contour interval was calculated using a planimeter. The weighted areas were multiplied by the average of the two surrounding contour line concentrations. The results were added to obtain a final average concentration in the area of affected soil.

The volume of affected soil was calculated by multiplying the overall affected area by the greatest depth at which a soil sample indicated presences of TPH. This calculation is a worst case estimate (overestimate) in that soil samples collected at shallow depths (less than forty feet) do not indicate the presence of TPH, except for SB-1. For an affected area of about 114,300 square feet and a depth of 91 feet, the total affected volume is about 385,200 cubic yards.

The total amount of diesel fuel was then estimated using the overall affected volume and the average concentration. For an affected volume of 385,200 yards, an average diesel fuel concentration of 33 mg/kg, and a soil bulk density of 2.1 g/cm^3 the amount of diesel is 20,000 kilograms.

10.4.3.1b Amount of Diesel Fuel in Ground Water

Average concentrations of diesel fuel hydrocarbons in ground water were calculated by initially plotting areal concentration contours based on analytical laboratory results (Plate 16). An overall average was obtained by using the isohyetal (weighted areal average) approach previously described.

The amount of TPH in ground water was estimated using the average concentrations. For an average concentration of 32 mg/l, an affected area of 83,800 square feet, a water bearing zone thickness of 20 feet, and an overall porosity of 0.35, the amount of diesel fuel in ground water is estimated to be 0.532 kilograms.

10.4.3.2 Migration of Chemicals of Interest

This chapter quantifies the migration of dissolved chemicals in ground water using a transport model suggested by EPA. The model is described, explanations of model input parameters using site specific characteristics combined with assumptions are provided, and model output, i.e., concentrations of chemicals of interest at potential exposure points, is presented.

10.4.3.2a Description of Analytical Model for Migration in Ground Water

An analytical model from EPA literature (Ref. 18) was used to model the migration of dissolved chemicals of interest in ground water at the Industrial Asphalt site. The model was developed to calculate chemical concentrations for a given time and location for an instantaneous chemical discharge into an aquifer from a fully penetrating line source. Major assumptions in applying the model are:

- the local ground water flow is horizontal, uniform and steady
- the released chemicals enter the aquifer over the full saturated thickness of the aquifer
- adsorption of the chemical to the soil matrix is linear and governed by equilibrium

The governing equation of the model is the following:

$$c(x, y, t) = \frac{c_0 Q}{b 4 \pi n_e t \, (D_x \, D_y)^{1/2}} \exp\left(\frac{(xR_d - v_x t)^2}{4D_x t R_d}\right)$$

where

c_o = initial concentration of discharged contaminant (mg/l)
Q = volume of contaminant being discharged (m^3)
b = aquifer saturated thickness (m)
n_e = effective porosity (unitless)
t = time (days)
D_x, D_y = dispersion coefficients (m^2/day)
V_x = seepage velocity of the regional flow (m/day)
x, y = spatial coordinates (m)
R_d = retardation coefficient for linear adsorption (unitless)

10.4.3.2b Application of Migration Model to the Industrial Asphalt Site

This chapter describes the application of the model to the Industrial Asphalt site, including the rationale for quantifying certain variables necessary for model input.

c_0 - initial concentration of chemical of interest in diesel

It was assumed that the concentrations of benzene, naphthalene, and PCBs in the fresh diesel were 50 ppm, 1300 ppm, and 50 ppm, respectively. This assumption is supported by the published estimates of diesel fuel constituents and, in the case of PCBs, by the reported results of analyses of samples collected at the site at the time of tank removal.

Q - the volume of discharge

The assumption that 20 cubic meters of diesel were released into the subsurface is supported by calculations of amounts of diesel that remain in soil and ground water at the site. The assumption may be non-conservative in that breakdown of diesel was ignored, but is conservative in assuming that all petroleum hydrocarbons detected in laboratory analyses are grouped together as diesel.

b - thickness of the water bearing zone

In the area near the original tank excavation, ground water is approximately at 90 feet below ground surface. The zone containing this ground water is approximately 20 feet (6 meters) thick and is separated from lower sediments by a clayey gravel or silty layers in the vicinity of the former tank storage area. The layers apparently act as an aquitard which retards or impedes vertical movement of ground water between water bearing zones. For this reason, i.e., to prevent movement of chemicals in a well conduit, the extraction well depth extended to a total depth of 116 feet, above the assumed depth of silty layers (Unit 4, Plates 8 and 9)

n_e = effective porosity

Effective porosity is a measure of the water yielding capacity of the soil. Effective porosity has a value less than normal porosity in that some water is retained in interstices largely by molecular forces such as adhesion and cohesion, and that "dead end" pores exist in the soil matrix, through which no flow occurs. An effective porosity of 0.3 was assumed for the water bearing soil zone at the Industrial Asphalt site. This value falls in the range of values found in scientific literature of effective porosities for the types of soil encountered at the site (Ref. 12).

V_X = ground water velocity in the X direction

A recent pumping test conducted by Kleinfelder at the Industrial Asphalt site (Chapter 9) indicated that for unconfined conditions, the transmissivity (T) equals $0.00036 m^2/sec$. The most recent ground water monitoring well survey indicated a ground water gradient in the northeast direction (towards the Jamieson supply well) of 0.035 feet per foot. Assuming an aquifer thickness of 20 feet, and an effective porosity of 0.3, the seepage velocity was calculated to be 0.59 m/day (Chapter 9.6.2).

To apply the model at the Industrial Asphalt site, the X direction was chosen to be along an imaginary line between the former underground storage tank excavation and the Jamieson supply well. The Y direction is tranverse to the X direction.

D_X, D_y = Dispersion coefficients in the X and Y directions, respectively.

The dispersion coefficient is a function of dispersivity and seepage velocity, usually expressed in ground water applications as $D = a \times V^2$, where a is the dispersivity in meters. A rough estimate of longitudinal dispersivity (along the direction of flow) is 10% of the average travel distance. The characteristic average distance is usually chosen as a distance of particular interest. To apply the model to the Industrial Asphalt site, the characteristic distance was chosen as the distance from the site of the former underground storage tank excavation to the Jamieson supply well, i.e., approximately 900 feet or 274 meters. Transverse dispersivity is typically assumed to be one third the value of the longitudinal dispersivity. For a seepage velocity of 0.60 meters per day and a characteristic distance of 274 meters, the longitudinal dispersion coefficient is 16 $meters^2/day$ and the transverse dispersion coefficient is 5.5 $meters^2/day$.

R_d = Retardation coefficient

The rate of migration of chemicals in comparison to that of ground water can be represented by the retardation coefficient, which represents the ratio of ground water velocity to chemical velocity. Retardation is a function of hydrophobicity of the chemical, i.e., how easily the chemical is adsorbed to organic matter, and the fraction of organic matter in the soil matrix. To calculate retardation coefficients for the three chemicals of interest, the following equations were used along with published values for Koc (organic carbon partitioning coefficient):

K_p (partitioning coefficient) = $K_{oc} \times f_{oc}$

where

K_{oc} = organic carbon partitioning coefficient

f_{oc} = weight fraction of organic carbon in the soil matrix

Rd = $1 + (K_p \cdot \gamma_b)$ where

γ_b = bulk density of soil

n = porosity

For a f_{oc} of 0.001 (typical for Bay area soils), a γ_b of 2.1 g/cm³, and a porosity of 0.35, R_d values for benzene, naphthalene and PCBs were calculated at 1.5, 9.6, and 3180, respectively. A value of 100 was used for the R_d of PCBs, as a higher value results in model output showing no concentrations of PCBs at the location of interest.

Table 11 shows the model input data cards for the three chemicals of interest.

10.4.3.3 Exposure Point Concentrations

Model output for the three chemicals of interest is shown in Appendix G. The concentrations are in milligrams per liter (mg/l) or parts per million (ppm) at a downgradient location corresponding to the Jamieson site supply well. The relative immobility of PCBs is shown in that no PCBs are detected at the Jamieson well, even when inputting a retardation factor of 100, which is an order of magnitude lower than the estimated value of 3180.

Concentrations at the exposure point were averaged over a seventy year period, as the health impacts of benzene and napthalene are due to chronic (i.e., lifetime) exposures. The seventy year averaged concentrations for benzene and napthalene are 0.00020 mg/l and 0.0051 mg/l, respectively.

10.5 DOSE-RESPONSE EVALUATION

This chapter qualitatively describes the toxicological properties of the three chemicals of interest at the Industrial Asphalt site and quantitatively characterizes the relationship between chemical dose and incidence of adverse health effects by citing and describing health criteria established by EPA and DHS for the chemicals of interest. Sax (Ref. 19) and the IRIS data base (Ref. 20) were used as references for most of the toxicological information presented in this chapter. A glossary of toxicological acronyms and terms is included.

10.5.1 Glossary of Toxicological Terms

AAL - Applied Action Level set by DHS specific for chemical, exposure media (air, soil, water), and receptor (aquatic organisms, humans). See Chapter 10.5.3b for explanation of AALs.

carcinogenic - causing production of malignant tumors (cancer).

edema - an excessive accumulation of fluid in body tissues.

epidemiological - referring to studies of diseases.

hematuria - the presence of blood in the urine.

intraperitoneal - administration into the abdominal cavity.

mutagen - causes heritable changes in DNA.

neoplastingenesis - production of benign tumors.

oral slope factor - see Chapter 10.5.3a for explanation of oral slope factors.

subcutaneous - administration beneath the skin.

effect and a toxic action on the liver. PCBs are toxic by ingestion. Systemic effects of poisoning include nausea, loss of weight, jaundice, edema and abdominal pain.

10.5.3 Health Criteria for Chemicals of Interest

Chapter 10.4 described and quantified potential exposure concentrations of benzene and napthalene in ground water at a distance from the Industrial Asphalt site correlating to the location of the Jamieson supply well. Potential health impacts may exist for humans drinking water from the well. Table 12 shows the health criteria established by DHS and EPA which can be used to assess risks related to exposure of chemicals of concern in water by human receptors. The origin and significance of these health criteria are described in the following paragraphs.

10.5.3a Oral Slope Factors

EPA has established oral slope factors for certain chemicals. Oral slope factors are health-based criteria set forth in the Integrated Risk Information System (IRIS) data base (Ref. 20) and are used in conjunction with CERCLA (Superfund) guidance from EPA to assess potential cancer risks due to long-term (chronic) exposure to chemicals in the environment. Health criteria are included in IRIS only after a comprehensive review of toxicity data by groups of EPA scientists. Oral slope factors are typically the result of applying a low-dose extrapolation procedure to results of scientifically valid epidemiological studies to results of laboratory experiments on animals. The slope factor is presented as the risk per milligram of chemical per kilogram of receptor body weight per day.

The oral slope factor for benzene in Table 12 is specific for carcinogenic effects to human receptors due to longterm oral exposure by ingestion of benzene in water. Chapter 10.6, Risk Characterization, will quantify the cancer risk due to potential exposure by ingestion of benzene in water from the Jamieson well.

10.5.3b AALs

DHS has established AALs for certain chemicals. AALs are health-based criteria and are used in conjunction with the risk appraisal mechanism in the California Site Mitigation Decision Tree (Ref. 15) to assess the potential of risks due to exposure to chemicals in the environment. DHS uses a conventional methodology in conjunction with EPA and

National Academy of Sciences procedures for assessing toxicological data. For non-carcinogenic health effects, a threshold for an adverse effect is assumed in that AALs are set, with a margin of safety, at the maximum exposure concentration which does not produce an adverse effect. Uncertainties are factored into the criteria to ensure a margin of protection for the biological receptor.

The AAL for napthalene shown in Table 12 is specific for non-carcinogenic health effects to human receptors due to long-term exposure by ingestion of water. Chapter 10.6, Risk Characterization, will assess the possible noncarcinogenic health risk due to potential exposure by ingestion of napthalene in water from the Jamieson well.

10.6 RISK CHARACTERIZATION

This chapter uses established health criteria from EPA and DHS with recommended risk appraisal procedures from EPA and DHS to assess the potential impacts to human health as a result of possible exposure to chemicals of interest which may have migrated from the Industrial Asphalt site. Specifically, risks will be assessed for potential receptors who ingest benzene and napthalene in water from the Jamieson supply well. Potential exposure concentrations of benzene and napthalene in water at the Jamieson supply well were assumed to be the concentrations averaged over seventy years derived from the transport model output (Appendix G).

10.6.1 Potential Carcinogenic Effects

To calculate worst-case potential carcinogenic risks to human receptors due to ingestion of benzene, it was assumed that daily ingestion would take place daily over a seventy year lifetime. To calculate potential intakes of benzene in drinking water, equation 10.1 from the EPA Human Health Evaluation Manual (Ref. 14) was used. The equation is as follows:

$$\text{Intake (mg/kg-day)} = \frac{\text{CW xIR x EF x ED}}{\text{BW x AT}}$$

where

CW = Chemical concentration in water, assumed to be the maximum concentration as calculated in the transport model

IR = Ingestion rate, assumed to be 2 liters/day (approximately 0.5 gallons per day)

EF = Pathway specific value, assumed to be yearly (i.e., ground water flows continuously to the well)

ED = Exposure duration, assumed to be 70 years

BW = Body weight, assumed to be 70 kilograms (154 pounds)

AT = Pathway-specific period of exposure or averaging time, assumed to be equal to the product of 70 years times 365 days/year

Assuming that the 70-year average concentration of benzene in drinking water is 0.00020 mg/l, the equation gives an intake of benzene at 0.0000059 milligrams of benzene per kilogram of receptor body weight per day.

To quantify the potential carcinogenic risk due to this intake, equation below from EPA was used. The equation is as follows:

$$\text{Risk} = 1 - \exp(-\text{CDI} \times \text{SF})$$

where:

Risk = a unitless probability of an individual developing cancer
exp = the exponential
CDI = chronic daily intake averaged over 70 years in mg/kg-day
SF = slope factor in $(\text{mg/kg-day})^{-1}$

Using the intake of benzene at 0.0000059 mg/kg-day and a slope factor of 0.029 $(\text{mg/kg-day})^{-1}$, the cancer risk due to potential ingestion of benzene in drinking water from well 14A2 at the Jamieson site is 2 in 10,000,000 (2 x 10-7).

10.6.2 Potential Noncarcinogenic Effects

To quantify potential noncarcinogenic human health effects due to ingestion of napthalene, the risk appraisal method promulgated by DHS was used in conjunction with DHS-established AALs to assess impacts of human exposure to naphthalene. The method evaluates whether receptors are at risk by comparing exposure point concentrations directly with the AAL specific for the chemical, exposed receptor, exposure medium, and health effect. Any calculated ratio of exposure concentration/AAL exceeding unity (one) implies that the receptor is at significant risk of an adverse health impact.

The ratio of the calculated long-term exposure concentration of napthalene (0.0051 mg/l) and the AAL for napthalene in water (0.02 mg/l) is equal to 0.26. As this ratio is less than unity, no significant risk of an adverse health impact is indicated.

10.7 UNCERTAINTIES

This chapter is a brief discussion of the uncertainties involved in this screening-level risk assessment. No attempt is made here to quantitatively assess the effects of uncertainties on the calculated risk numbers.

10.7.1 Uncertainties in Identifying Potential Hazards

Uncertainties in identifying potential hazards exist. The precise extent of petroleum hydrocarbons in the subsurface has not been fully characterized. Worst case assumptions were made for drawing areal concentration contours, in that if a borehole from which samples showed non-detectable hydrocarbon concentrations was located in a region generally affected with hydrocarbons (based on the results of analyses of samples collected from surrounding boreholes), the non-affected borehole was ignored. Also, the amount of total petroleum hydrocarbons detected as diesel fuel and waste oil by EPA Method 8015 in subsurface sampling rounds at the Industrial Asphalt site was assumed to be diesel.

Benzene and napthalene were selected as chemicals of interest though they have not been detected in subsurface sampling rounds at the project site. Benzene and napthalene are typical components of diesel fuel. The chemicals could be present in the subsurface at concentrations below the limits of the analytical procedure. The chemicals could be present in other locations or depths at the site. Another possibility is that these substances have migrated away from the site or undergone biotransformation.

10.7.2 Uncertainties in Exposure Assessment

This chapter examines selected assumptions that were used in the modeling process and the exposure assessment.

The transport model used in this analysis was selected to give worst case concentrations at the key exposure point. Many assumptions were made in selecting values of variables in the model input. Site specific data were incorporated where available. For those variables where few site data were available, reasonable worst-case values were used by drawing on empirical experience or data from scientific literature. A formal discussion and statistical evaluation of uncertainties of variables is beyond the scope of this screening-level assessment.

The assumption that the concentrations calculated by the transport model are equal to concentrations in water from supply well 14A2 at the Jamieson property is a worst-case assumption. The model assumes that an instantaneous discharge of diesel occurred and that the discharge was distributed to the bottom of the water bearing zone such that the resultant concentration in the water bearing zone is uniform with depth at the point of discharge. In actual fact, the water bearing zone at the site was likely 50 feet or more below the point of release of diesel (i.e., a leaking pipe approximately ten feet below ground surface). Additionally, the discharge of diesel was likely to have occurred over a significant time period, perhaps six months to a year.

The transport model was run assuming uniform, steady horizontal flow in a homogeneous water bearing zone 20 feet thick located above an aquitard layer approximately 116 feet below ground surface. The actual areal and vertical extents of the aquitard are unknown. The screened intervals of well 14A2 at the Jamieson site are 135 to 160 feet below grade and 170 to 205 feet below grade. If the aquitard observed at the site extends to the Jamieson site, it would serve as a barrier to flow of constituents in the upper water bearing zone to the screened water bearing zone below.

The transport model was run assuming that no decay or degradation of benzene or napthalene would occur, though biodegradation of benzene and naphthalene in ground water has been observed and documented (Ref. 21). The estimated half life of benzene in ground water at a landfill in Ontario, Canada, was estimated to range from 1.5 years to 11 years (Ibid). The effects of dilution of chemicals of interest in the zone of influence of the Jamieson supply well were ignored.

Worst-case assumptions were made in calculating chemical intakes at the Jamieson well, in that daily exposure was assumed over a seventy year duration. These parameters are likely to be overestimates when applied to workers at the Jamieson site.

10.7.3 Uncertainties of Health Criteria (Dose-Response Evaluation)

10.7.3a Benzene

Benzene is classified as a human carcinogen by EPA with a weight-of-evidence classification of A. This classification means that evidence exists that benzene is a carcinogen both in human epidemiological studies and in animal laboratory tests.

Generally, the oral slope factor is an upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. The slope factor is used to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular concentration of a chemical.

10.7.3b Napthalene

Napthalene is classified by DHS as a noncarcinogenic chemical which can cause blood serum aberrations due to long-term (chronic exposure). The AAL for human exposure to napthalene in water was extrapolated from animal studies and uncertainty factors were utilized by DHS in establishing the AAL for human receptors.

10.8 DISCUSSION OF CALCULATED RISKS

A brief discussion of the calculated risks in light of the uncertainties is included in this chapter.

10.8.1 Discussion of Risk of Carcinogenic Health Impacts

The risk characterization approach promulgated by EPA indicated a cancer risk of 2 x 10^{-7} (2 in 10,000,000) to potential receptors due to possible ingestion of benzene in drinking water at the Jamieson site. The approach included the use of EPA-established oral slope factor for benzene.

As described previously, slope factors directly convert the estimated daily intakes by a receptor to a chemical, averaged over a lifetime of exposure, to incremental risk of an individual developing cancer. The slope factor for benzene used here represents the upper 95th percentile confidence limit of the probability of response based on experimental animal data, and resulting carcinogenic risk estimates will generally be an upper-bound estimate.

EPA often cites the "one-in-a-million" (1 x 10-6) cancer risk as a standard risk level of concern to use in setting health criteria and cleanup goals at impacted sites. However, higher risks are sometimes deemed acceptable, and the recent Toxicity Characteristic Leaching Potential ruling from EPA used a 1 x 10-5 level of concern for Group A carcinogens such as benzene (Ref. 20).

The calculated cancer risk of 2 x 10-7 is below the one-in-a-million risk level of concern cited by EPA. Even so, this calculated risk is likely to be an overestimate since worst-case assumptions were used in this risk screening process and in setting the slope factor for benzene.

10.8.2 Discussion of Risk of Noncarcinogenic Health Impacts

The risk appraisal approach promulgated by DHS indicated an insignificant risk of adverse noncarcinogenic health impacts to potential receptors due to possible ingestion of napthalene in water at the Jamieson site. The approach used the DHS-established AAL for napthalene in water.

As previously described, an AAL is "a criterion which delineates a concentration of a substance in a media which, when exceeded, is determined to present a significant risk of an adverse impact to a biological receptor" (Ref. 15). The seventy year averaged concentration of napthalene at the Jamieson well does not exceed the AAL, indicating that no significant health impact to possible receptors exists. The fact that model output suggests that the napthalene concentration at the supply well may exceed the AAL at some point in time is not considered significant, in that; (1) many worst-case assumptions were made in the modeling the transport process; (2) napthalene has not been detected in soil or ground water samples during environmental investigations at the Industrial Asphalt site; (3) the ratio of the maximum exposure seen at the exposure point calculated by the model to the AAL is less than 2; and (4) the AAL for napthalene was derived for chronic (i.e., long-term or lifetime) exposure.

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TABLE I
WELL CONSTRUCTION DATA

Well No.	Total Depth[1] (ft)	Top of Casing[2] (ft)	Screen Interval[3] (ft)	Well Diameter[4] (inch)	Slot Size (inch)	Screen/Casing Material[5]	Top of Filter Pack[3] (ft)	Type of Filter Pack	Depth of Well Seal[5] (ft)	Completion Date
MW-1	88	379.41	58-88	2	0.020	PVC/PVC	56	#3	53	JUNE 1987
MW-2	90	379.80	65-90	4	0.020	PVC/PVC	62	#3	59	JULY 1987
MW-3	90	378.54	65-90	4	0.020	PVC/PVC	62	#3	59	JULY 1987
MW-4	95	376.26	55-95	4	0.020	PVC/PVC	52	#3	48	MARCH 1988
MW-5	110	382.55	57-107	4	0.020	PVC/PVC	53	#3	49	MARCH 1988
MW-6	109	379.15	69-109	4	0.020	PVC/PVC	64	2/12	61	JUNE 1988
MW-7	109	378.94	69-109	4	0.020	PVC/PVC	64	#3	61	JUNE 1988
MW-8	109	378.56	69-109	4	0.020	PVC/PVC	64	2/12	61	JUNE 1988
MW-9	108	377.40	78-108	4	0.020	PVC/PVC	75.4	2/12	70	JULY 1989
MW-10	111	378.04	81-111	4	0.020	PVC/PVC	78.2	2/12	73	JULY 1989
MW-11[6]	75	379.02	55-75	2	0.040	PVC/PVC	53	LA	51	JULY 1989
MW-13[7]	116	380.21	76-116	6	0.045	SS/PVC	64	MA	62	AUGUST 1990
MW-14	114.5	380.09	99.5-114.5	4	0.020	PVC/PVC	96.5	2M	94	JUNE 1990
MW-15	117	378.12	97-117	4	0.020	PVC/PVC	94	2M	91	JUNE 1990
MW-16	110	379.65	90-110	4	0.020	PVC/PVC	86.5	2M	83.5	JUNE 1990

NOTES:

1	Total depth of borehole below ground surface
2	Elevation in feet above mean sea level (USGS Datum)
3	Depth below ground surface
4	Nominal casing/screen diameter
5	PVC - Polyvinyl Chloride plastic (Schedule 40), SS - stainless steel
6	Well abandoned on 8 August 1990
7	Extraction well
MA	Medium aquarium sand
#2M	No. 2 Monterey sand
#3	No. 3 Monterey sand
LA	Lonestar aquarium sand

TABLE 2
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water(1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-1	06-11-87	75.0	304.41	NE	NT	NT	NT
(TD=88')	07-09-87	75.9	303.51	<0.1	NT	NT	NT
	08-06-87	79.1	300.31	3.2	350	NT	5.7
	09-29-87	79.3	300.11	1.84	510(3)	NT	22(3)
	10-30-87	78.23	301.18	0.95	780(3)	NT	22(3)
	11-30-87	77.68	301.73	1.10	1800(3)	NT	56(3)
	12-21-87	79.53	299.88	2.52	55	NT	1
	01-25-88	77.88	301.53	1.63	96	NT	ND
	02-25-88	79.46	299.95	2.49	120	NT	ND
	03-18-88	81.61	297.80	2.93	3.6	NT	ND
	04-27-88	81.10	298.31	2.26	23	NT	ND
	05-20-88	82.97	296.44	2.29	NT(6)	NT(6)	NT(6)
	06-22-88	83.48	295.93	0.93	NT	NT	NT
	07-26-88	85.78	293.63	0.99	NT	NT	NT
	08-11-88(5)	84.55	294.86	0.05	NT	NT	NT
	08-15-88(5)	87.90	291.51	0.05	NT	NT	NT
	08-26-88	84.80	294.61	0.05	NT	NT	NT
	10-04-88	84.84	294.57	0.11	NT	NT	NT
	10-28-88	84.94	294.47	0.04	NT	NT	NT
	12-22-88	84.92	294.49	TRACE	NT	NT	NT
	01-26-89	DRY	NA	NE	NT	NT	NT
	03-02-89	84.74	294.67	NE	NT	NT	NT
	04-07-89	DRY	NA	NE	NT	NT	NT
	05-08-89	DRY	NA	NE	NT	NT	NT
	06-01-89	DRY	NA	NE	NT	NT	NT
	07-05-89	DRY	NA	NE	NT	NT	NT
	08-15-89	DRY	NA	NE	NT	NT	NT
	09-25-89	68.56	310.85	0.04	130	37	1.6
	10-17-89	DRY	NA	NE	NT	NT	NT
	11-28-89	DRY	NA	NE	NT	NT	NT
	12-27-89	DRY	NA	NE	NT	NT	NT
	01-22-90	DRY	NA	NE	NT	NT	NT
	02-21-90	DRY	NA	NE	NT	NT	NT
	03-21-90	DRY	NA	NE	NT	NT	NT
	05-01-90	86.92	292.49	SHEEN	NT	NT	NT
	05-29-90	86.33	293.08	SHEEN	NT	NT	NT
	06-28-90	86.25	293.15	SHEEN	NT	NT	NT
	08-20-90	DRY	NA	NE	NT	NT	NT
	10-22-90	87.48	291.93	SHEEN	NT	NT	NT

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water(1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-2	08-06-87	NE	NA	14.0	NT	NT	NT
(TD=90')	09-29-87	NE	NA	12.05	NT	NT	NT
	10-30-87	82.67	297.04	5.34	1100(3)	NT	14(3)
	11-30-87	84.12	295.68	7.79	1100(3)	NT	33(3)
	12-21-87	84.28	295.52	7.31	27	NT	2
	01-25-88	84.26	295.54	8.07	150	NT	ND
	02-25-88	84.21	295.59	7.28	15	NT	ND
	03-18-88	86.18	293.62	7.56	3.6	NT	ND
	04-27-88	85.57	294.23	5.64	6.1	NT	ND
	05-20-88	88.48	291.32	6.93	NT(6)	NT(6)	NT(6)
	06-22-88	87.30	292.50	4.52	NT	NT	NT
	07-26-88	NE	NA	5.02(4)	NT	NT	NT
	08-11-88(5)	88.70	291.10	1.40	NT	NT	NT
	08-15-88(5)	88.05	291.75	0.35	NT	NT	NT
	08-26-88	88.35	291.45	0.10	NT	NT	NT
	10-04-88	89.46	290.34	0.03	NT	NT	NT
	11-28-88	NE	NA	NE	NT	NT	NT
	12-22-88	89.10	290.70	NE	NT	NT	NT
	01-26-89	87.83	291.97	SHEEN	NT	NT	NT
	03-02-89	87.55	292.25	0.02	NT	NT	NT
	04-07-89	86.68	293.12	0.01	NT	NT	NT
	05-08-89	DRY	NA	NE	NT	NT	NT
	06-01-89	DRY	NA	NE	NT	NT	NT
	07-05-89	DRY	NA	NE	NT	NT	NT
	08-15-89	DRY	NA	NE	NT	NT	NT
	09-25-89	71.39	308.41	SHEEN	100	43	3.5
	10-17-89	DRY	NA	NE	NT	NT	NT
	11-28-89	DRY	NA	NE	NT	NT	NT
	12-27-89	DRY	NA	NE	NT	NT	NT
	01-22-90	DRY	NA	NE	NT	NT	NT
	02-21-90	DRY	NA	NE	NT	NT	NT
	03-21-90	DRY	NA	NE	NT	NT	NT
	05-01-90	86.52	293.28	SHEEN	300	150	2.6
	05-29-90	85.98	293.82	SHEEN	65	29	0.6
	06-28-90	85.35	294.45	SHEEN	NT	NT	NT
	08-20-90	DRY	NA	NE	NT	NT	NT
	10-22-90	87.32	292.48	SHEEN	190	110	4

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water(1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-3	08-06-87	75.00	303.54	NE	0.6	NT	ND
(TD=90')	09-29-87	78.77	299.77	1.84	7.6	NT	2.7
	10-30-87	78.44	300.10	2.11	1100(3)	NT	24(3)
	11-30-87	77.76	300.78	2.22	340(3)	NT	62(3)
	12-21-87	77.88	300.66	1.68	46	NT	2
	01-25-88	76.88	301.66	1.21	27	NT	ND
	02-25-88	77.80	300.74	1.60	6	NT	ND
	03-18-88	80.50	298.04	2.59	3.8	NT	ND
	04-27-88	79.40	299.14	1.32	4.5	NT	ND
	05-20-88	81.48	297.06	1.73	14	NT	4.7
	06-22-88	82.14	296.40	0.53	44	NT	4.3
	07-26-88	84.36	294.18	0.54	NT(6)	NT(6)	NT(6)
	08-11-88(5)	86.45	292.09	0.50	NT	NT	NT
	08-15-88(5)	86.74	291.80	0.44	NT	NT	NT
	08-26-88	87.18	291.36	0.28	NT	NT	NT
	10-04-88	88.72	289.82	0.30	NT	NT	NT
	10-28-88	89.49	289.05	0.29	NT	NT	NT
	12-22-88	84.74	293.80	0.02	NT	NT	NT
	01-26-89	86.57	291.97	SHEEN	NT	NT	NT
	03-02-89	86.26	292.28	0.02	NT	NT	NT
	04-07-89	85.31	293.23	SHEEN	NT	NT	NT
	05-08-89	88.35	290.19	SHEEN	NT	NT	NT
	06-01-89	89.67	288.87	SHEEN	NT	NT	NT
	07-05-89	89.52	289.02	SHEEN	NT	NT	NT
	08-15-89	DRY	NA	NE	NT	NT	NT
	09-25-89	70.30	307.24	SHEEN	120	58	3.6
	10-17-89	DRY	NA	NE	NT	NT	NT
	11-28-89	DRY	NA	NE	NT	NT	NT
	12-27-89	DRY	NA	NE	NT	NT	NT
	01-22-90	DRY	NA	NE	NT	NT	NT
	02-21-90	DRY	NA	NE	NT	NT	NT
	03-21-90	DRY	NA	NE	NT	NT	NT
	05-01-90	84.15	294.39	SHEEN	63	42	0.9
	05-29-90	83.59	294.95	SHEEN	13	6.1	ND
	06-28-90	82.78	295.76	SHEEN	520	330	10
	08-20-90	NC	NA	NA	NT	NT	NT
	10-22-90	84.72	293.82	SHEEN	34	24	2

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water(1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-4	04-08-88	76.59	299.67	NE	ND	NT	ND
(TD=95')	04-27-88	75.96	300.30	NE	NT	NT	NT
	05-20-88	77.71	298.55	NE	ND	NT	NT
	06-22-88	79.41	296.85	NE	ND	NT	ND
	07-26-88	81.74	294.52	NE	ND	NT	ND
	08-11-88(5)	83.80	292.46	NE	NT	NT	NT
	08-15-88(5)	84.06	292.20	NE	NT	NT	NT
	08-26-88	84.62	291.64	NE	ND	NT	ND
	10-04-88	86.16	290.10	NE	ND	NT	ND
	10-28-88	87.02	289.24	NE	0.46	NT	ND
	12-22-88	85.42	290.84	NE	0.6	NT	ND
	01-26-89	84.20	292.06	NE	ND	NT	ND
	03-02-89	84.06	292.20	NE	ND	ND	ND
	04-07-89	83.22	293.04	NE	ND	ND	ND
	05-08-89	86.18	290.08	NE	NT	NT	NT
	06-01-89	87.78	288.48	NE	ND	ND	ND
	07-05-89	89.86	286.40	NE	ND	ND	ND
	08-15-89	90.68	285.58	NE	ND	ND	ND
	09-25-89	69.68	306.58	NE	2.7	ND	ND
	10-17-89	89.69	286.57	NE	ND	0.7	ND
	11-28-89	92.01	284.25	NE	ND	ND	ND
	12-27-89	93.50	282.76	NE	ND	ND	ND
	01-22-90	91.54	284.72	NE	ND	ND	ND
	02-21-90	88.04	288.22	NE	ND	ND	ND
	03-21-90	89.02	287.24	NE	ND	ND	ND
	05-01-90	82.68	293.58	NE	ND	ND	ND
	05-29-90	82.17	294.09	NE	ND	0.4	ND
	06-28-90	81.65	294.61	NE	ND	ND	ND
	08-20-90	87.37	288.89	NE	ND	ND	ND
	10-22-90	83.51	292.75	NE	ND	ND	ND

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water(1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-5	04-08-88	86.76	295.79	NE	ND	NT	ND
(td=110')	04-27-88	82.34	300.21	NE	NT	NT	NT
	05-20-88	84.38	298.17	NE	ND	NT	ND
	07-26-88	88.84	293.71	NE	ND	NT	ND
	08-11-88(5)	91.70	290.85	NE	NT	NT	NT
	08-15-88(5)	91.94	290.61	NE	NT	NT	NT
	08-26-88	92.88	289.67	NE	ND	NT	ND
	10-04-88	95.65	286.90	NE	ND	NT	ND
	10-28-88	97.32	285.23	NE	ND	NT	ND
	12-22-88	90.64	291.91	NE	ND	NT	ND
	01-26-89	91.29	291.26	NE	ND	NT	ND
	03-02-89	88.58	293.97	NE	ND	ND	ND
	04-07-89	87.95	294.60	NE	ND	ND	ND
	05-08-89	91.56	290.99	NE	NT	NT	NT
	06-01-89	94.85	287.70	NE	ND	ND	ND
	07-05-89	96.91	285.64	NE	ND	ND	ND
	08-15-89	98.93	283.62	NE	ND	ND	ND
	09-25-89	66.51	316.04	NE	0.7(7)	ND	ND
	10-17-89	98.83	283.72	NE	ND	ND	ND
	11-28-89	98.09	284.46	NE	ND	ND	ND
	12-27-89	98.09	284.46	NE	ND	ND	ND
	12-27-89	>100	<282.55	NE	ND	ND	ND
	01-21-90	101.97	280.58	NE	ND	ND	ND
	02-21-90	86.53	296.02	NE	ND	ND	ND
	03-21-90	99.34	283.21	NE	ND	ND	ND
	05-01-90	99.21	283.34	NE	ND	ND	ND
	05-29-90	93.70	288.85	NE	ND	0.2	ND
	06-28-90	106.05	276.50	NE	0.1	ND	ND
	08-20-90	106.79	275.76	NE	ND	ND	ND
	10-22-10	103.43	279.12	NE	ND	ND	ND

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water(1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-6	06-22-88	82.11	297.04	NE	17	NT	ND
(TD = 109')	07-01-88	82.38	296.77	SHEEN	ND	NT	ND
	07-26-88	84.37	294.78	SHEEN	ND	NT	ND
	08-11-88(5)	86.46	292.69	SHEEN	NT	NT	NT
	08-15-88(5)	86.78	292.37	SHEEN	NT	NT	NT
	08-26-88	87.35	291.80	SHEEN	ND	NT	ND
	10-04-88	88.90	290.25	NE	ND	NT	ND
	10-28-88	89.72	289.43	NE	ND	NT	ND
	12-22-88	87.94	291.21	NE	9.3	NT	ND
	01-26-89	86.95	292.20	NE	ND	NT	ND
	03-02-89	85.91	293.24	NE	ND	ND	ND
	04-07-89	85.57	293.58	NE	ND	ND	ND
	05-08-89	88.60	290.55	NE	NT	NT	NT
	06-01-89	90.30	288.85	NE	ND	ND	ND
	07-05-89	92.35	286.80	NE	ND	ND	ND
	08-15-89	93.28	285.87	NE	ND	ND	ND
	09-25-89	70.24	308.91	NE	ND	0.6	ND
	10-17-89	91.98	287.17	NE	ND	ND	ND
	11-28-89	94.22	284.93	NE	ND	ND	ND
	12-27-89	95.90	283.25	NE	ND	ND	ND
	01-22-90	94.00	285.15	NE	ND	ND	ND
	02-21-90	88.99	290.16	NE	0.5	ND	ND
	03-21-90	91.13	288.02	NE	ND	ND	ND
	05-01-90	84.42	294.73	NE	ND	ND	ND
	05-29-90	83.84	295.31	NE	ND	ND	ND
	06-28-90	83.05	296.10	NE	ND	ND	ND
	08-20-90	89.05	290.10	NE	ND	ND	ND
	10-22-90	84.80	294.35	NE	ND	ND	ND

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water(1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-7 (TD=109')	06-22-88	82.20	296.74	NE	140	NT	ND
	07-01-88	82.60	296.34	SHEEN	17	NT	ND
	07-26-88	84.65	294.29	SHEEN	ND	NT	ND
	08-11-88(5)	86.94	292.00	SHEEN	NT	NT	NT
	08-15-88(5)	87.27	291.67	NE	NT	NT	NT
	08-26-88	88.02	290.92	SHEEN	ND	NT	ND
	10-04-88	84.80	294.14	NE	ND	NT	ND
	10-28-88	90.76	288.18	NE	1.4	NT	ND
	12-22-88	88.05	290.89	NE	1.0	NT	ND
	01-26-89	87.21	291.73	NE	ND	NT	ND
	03-02-89	86.49	292.45	NE	22	9	ND
	04-07-89	84.97	293.97	NE	4	ND	ND
	05-08-89	88.39	290.55	NE	NT	NT	NT
	06-01-89	91.56	287.38	NE	ND	ND	ND
	07-05-89	92.75	286.19	NE	1.6	ND	ND
	08-15-89	94.28	284.66	NE	0.5	ND	ND
	09-25-89	67.40	311.54	SHEEN	2	0.9	ND
	10-17-89	93.40	285.54	NE	1.2	ND	ND
	11-28-89	94.90	284.04	NE	0.6	ND	ND
	12-27-89	98.42	280.52	NE	ND	ND	ND
	01-22-90	96.32	282.62	NE	ND	ND	ND
	02-21-90	85.40	293.54	NE	4.7	2.3	ND
	03-21-90	93.23	285.71	NE	0.1	ND	ND
	05-01-90	88.32	290.62	NE	ND	ND	ND
	05-29-90	83.90	295.04	NE	1.1	0.4	ND
	06-28-90	86.84	292.10	NE	ND	ND	ND
	08-20-90	91.88	287.06	NE	ND	ND	ND
	10-22-90	88.43	290.51	NE	ND	ND	ND

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water(1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-8	06-22-88	81.70	296.86	NE	NT	NT	NT
(TD = 109')	07-01-88	82.00	296.56	SHEEN	ND	NT	ND
	07-26-88	86.19	292.37	2.44	87	NT	ND
	08-11-88(5)	87.22	291.34	1.27	NT	NT	NT
	08-15-88(5)	87.02	291.54	2.12	NT	NT	NT
	08-26-88	87.40	291.16	0.75	ND	NT	1.2
	10-04-88	88.93	289.63	0.43	NT(6)	NT	NT(6)
	10-28-88	89.71	288.85	0.37	NT	NT	NT
	12-22-88	87.70	290.86	0.13	NT	NT	NT
	01-26-89	86.52	292.04	SHEEN	NT	NT	NT
	03-02-89	86.30	292.26	0.01	NT	NT	NT
	04-07-89	86.41	292.15	0.01	NT	NT	NT
	05-08-89	88.45	290.11	0.01	NT	NT	NT
	06-01-89	90.29	288.27	0.02	81	ND	5
	07-05-89	92.22	286.34	0.03	8.8	4.2	ND
	08-15-89	93.08	285.48	SHEEN	12	6	0.9
	09-25-89	84.18(8)	294.38(8)	SHEEN	3.3	2	ND
	10-17-90	92.04	286.52	SHEEN	17	6.7	0.7
	11-28-89	94.40	284.16	NE	ND	ND	ND
	12-27-89	95.97	282.59	NE	0.4	ND	ND
	01-22-90	94.03	284.53	NE	6.6	6.1	0.6
	02-21-90	89.92	288.64	SHEEN	130	ND	6.3
	03-21-90	91.35	287.21	NE	ND	ND	ND
	05-01-90	84.96	293.60	SHEEN	0.39	0.2	ND
	05-29-90	84.38	294.18	SHEEN	31	20	1.6
	06-28-90	83.77	294.79	NE	0.06	ND	ND
	08-20-90	89.64	288.92	SHEEN	ND	ND	ND
	10-22-90	85.75	292.81	SHEEN	0.7	0.5	ND

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water$^{(1)}$ (ft)	Ground Water Elevation$^{(2)}$ (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-9	08-15-89	92.95	284.45	NE	ND	ND	ND
(TD = 108')	09-25-89	64.12	313.28	SHEEN	0.3$^{(7)}$	ND	ND
	10-17-89	92.72	284.68	NE	NT	NT	NT
	11-28-89	NC	NA	NT	NT	NT	NT
	12-27-89	97.17	280.23	NE	ND	ND	ND
	01-22-90	NC	NA	NA	NT	NT	NT
	02-21-90	NC	NA	NA	NT	NT	NT
	03-21-90	92.95	284.45	NE	ND	ND	ND
	05-01-90	89.75	287.65	NE	ND	ND	ND
	05-29-90	NC	NA	NA	NT	NT	NT
	06-28-90	90.65	286.75	NE	0.6	ND	ND
	08-20-90	95.28	282.12	NE	0.1	ND	ND
	10-22-90	91.22	286.18	NE	0.2	ND	ND

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water]$^{(1)}$ (ft)	Ground Water Elevation$^{(2)}$ (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-10	08-15-89	92.40	285.64	NE	ND	ND	ND
(TD = 111')	09-25-89	70.62	307.42	NE	ND	ND	ND
	10-17-89	91.14	286.90	NE	ND	ND	ND
	11-28-89	93.35	284.69	NE	ND	ND	ND
	12-27-89	94.70	283.34	NE	ND	ND	ND
	01-22-90	92.86	285.18	NE	ND	ND	ND
	02-21-90	89.30	288.74	NE	0.5	ND	ND
	03-21-90	90.36	287.68	NE	ND	ND	ND
	05-01-90	83.82	294.22	NE	ND	ND	ND
	05-29-90	83.31	294.73	NE	ND	0.2	ND
	06-28-90	82.62	295.42	NE	ND	ND	ND
	08-20-90	88.55	289.49	NE	0.1	ND	ND
	10-22-90	84.53	293.51	NE	ND	ND	ND
MW-11^{12}	08-15-89	DRY	NA	NE	NT	NT	NT
(TD-75')	09-25-89	71.35	307.67	SHEEN	5.8	ND	ND
	10-17-89	DRY	NA	NE	NT	NT	NT
	11-28-89	DRY	NA	NE	NT	NT	NT
	12-27-89	DRY	NA	NE	NT	NT	NT
	01-22-90	DRY	NA	NE	NT	NT	NT
	02-21-90	DRY	NA	NE	NT	NT	NT
	03-21-90	DRY	NA	NE	NT	NT	NT
	05-01-90	DRY	NA	NE	NT	NT	NT
	05-29-90	DRY	NA	NE	NT	NT	NT
	06-28-90	DRY	NA	NE	NT	NT	NT
	08-20-90	NA	NA	NA	NA	NA	NA
	10-22-90	NA	NA	NA	NA	NA	NA
MW-13^{11}	08-20-90	91.19	NS	NE	0.3	ND	ND
(TD = 116')	10-22-90	87.43	292.78	SHEEN	0.2	ND	ND
MW-14	06-28-90	NC	NA	NE	ND	ND	ND
(TD = 114.5')	08-20-90	91.39	288.70	NE	ND	0.6	ND
	10-22-90	87.50	292.59	NE	ND	ND	ND

TABLE 2 (continued)
MONITORING PARAMETERS
INDUSTRIAL ASPHALT

Well	Date	Depth to Water](1) (ft)	Ground Water Elevation(2) (ft)	Product Thickness (ft)	TPH as Diesel (mg/l)	TPH as Waste Oil (mg/l)	PCBs (μg/l)
MW-15	06-28-90	86.62	291.50	NE	0.4	ND	ND
TD = 117')	08-20-90	91.85	286.27	NE	0.6	ND	ND
	10-22-90	88.20	289.92	NE	0.1	ND	ND
MW-16	06-28-90	83.65	296.00	NE	ND	ND	ND
(TD = 110')	08-20-90	89.71	289.94	NE	ND	ND	ND
	10-22-90	85.52	294.13	NE	ND	ND	ND
SG	09-25-89	1.10(9)	301.10(10)	NA	NA	NA	NA
	10-17-89	0.40(9)	300.40(10)	NA	NA	NA	NA
	11-28-89	1.50(9)	301.50(10)	NA	NA	NA	NA
	12-27-89	1.60(9)	310.60(10)	NA	NA	NA	NA
	01-22-90	0.65(9)	300.65(10)	NA	NA	NA	NA
	02-21-90	0.11(9)	300.11(10)	NA	NA	NA	NA
	03-21-90	-2.87(9)	297.13(10)	NA	NA	NA	NA
	05-01-90	1.30(9)	301.30(10)	NA	NA	NA	NA
	05-29-90	0.48(9)	300.48(10)	NA	NA	NA	NA
	06-28-90	-2.80(9)	297.20(10)	NA	NA	NA	NA
	08-20-90	-0.75(9)	299.25(10)	NA	NA	NA	NA
	10-22-90	0.00(3)	300.00(10)	NA	NA	NA	NA

NOTES:

(1)	Below top of casing
(2)	Feet Above Mean Sea level (USGS Datum)
(3)	These samples may have been contaminated; analytical results may therefore be suspect.
(4)	Minimum thickness of product based on no water encountered within total depth of well.
(5)	Pre- and post- well skimming demonstration; approximately two gallons of product skimmed from wells MW-2 and MW-8 on 08-11-88
(6)	Sampling of ground water in wells MW-1, MW-2, MW-3, and MW-8 terminated due to the presence of free product in these wells
(7)	"Weathered diesel" (includes higher molecular weight hydrocarbons that those typically contained in a diesel fuel)
(8)	Measurement taken on September 18, 1989
(9)	Reading on the staff gauge
(10)	Surface water elevation in the pit (USGS Datum)
(11)	Extraction well
(12)	Well abandoned on 8 August 1990
TPH	Total Petroleum Hydrocarbons
PCBs	Polychlorinated Biphenyls (as Aroclor 1260)
NE	Not Encountered
ND	Not Detected at or above laboratory detection limits
NA	Not Applicable
SG	Staff Gauge
NC	Not Accessible
NS	Not Surveyed
TD	Total Depth

TABLE 3

SOIL BORING/WELL COORDINATES
INDUSTRIAL ASPHALT

Boring/Well No.	N[1]	E[1]	Z[2]
MW-1	2,369.874	1,337.315	379.410[3]
MW-2	2,414.248	1,204.657	379.800[3]
MW-3	2,290.736	1,200.250	378.540[3]
MW-4	2,373.626	823.788	376.260[3]
MW-5	2,500.294	1,709.679	382.550[3]
MW-6	2,243.173	1,309.269	379.150$_3$
MW-7	2,300.504	1,520.508	378.940[3]
MW-8	2,404.606	1,118.216	378.560[3]
MW-9	2,444.380	1,528.650	377.400[3]
MW-10	2,309.490	1,048.850	378.040[3]
MW-11[6]	2,403.640	1,141.250	379.020[3]
MW-13[7,9]	NS	NS	380.21[3]
MW-14	2,414.128	1,215.807	380.090[3]
MW-15	2,464.895	1,347.050	378.120[3]
MW-16	2,266.950	1,202.165	379.650[3]
SG[8]	NS	NS	300.00[4]
SB-1	2,377.885	1,284.137	380.410[5]
SB-2	2,350.656	1,325.085	379.020[5]
SB-3	2,332.869	1,229.740	379.260[5]
SB-4	2,372.307	1,226.800	380.300[5]
SB-5	2,507.581	1,566.071	379.030[5]
SB-6	2,364.396	1,549.339	378.660[5]
SB-7	2,289.138	1,418.772	379.080[5]
SB-8	2,333.715	1,041.101	378.910[5]
SB-9	2,383.927	986.203	377.760[5]
SB-10	2,265.668	879.633	378.020[5]

NOTES:

1	Coordinates are on assumed datum
2	Elevation in feet above mean sea level (USGS datum)
3	Elevation of the top of a PVC casing
4	Elevation of the "O" mark on the staff gage
5	Elevation of the ground surface
6	Well abandoned on 8 August 1990
7	Extraction well
8	Staff gage
9	Surveyed by Kleinfelder, Inc.
MW	Monitoring well
SB	Soil boring
NS	Not surveyed

TABLE 4

SOIL SAMPLES - SUMMARY OF ANALYTICAL RESULTS
INDUSTRIAL ASPHALT

Soil Boring	Sample No.	Depth[1] (ft)	TPH-D[2] (mg/kg)	TPH-WO[3] (mg/kg)	PCBs[4] (μg/kg)
SB-1	43075	21	23	560	ND
	43076	31	490	ND	ND
	43077	41	6.4	ND	ND
	43078	51	20	ND	ND
	43079[6]	64	79	ND	ND
	43080	76	46	ND	ND
	43082	86	11	ND	ND
SB-2	43032	41	ND	ND	ND
	43033	50	ND	ND	ND
	43034	70	ND	ND	ND
	43035	80	ND	ND	ND
	44482	91	ND	ND	ND
SB-3	43036	21	ND	ND	ND
	43037	35	ND	ND	ND
	43038	41	ND	ND	ND
	43039[5]	45	130	ND	120
	44485	71	ND	ND	ND
	44486	81	22	ND	ND
	44487	91	7.8	ND	ND
SB-4	44022	32	ND	ND	ND
	43023	41	ND	ND	ND
	43024	51	ND	ND	ND
	43026[5,7]	61	370	ND	110
	43028[5]	72	ND	ND	ND
	44480	81	ND	ND	ND
	44481	91	ND	ND	ND
SB-5	43105	21	ND	ND	ND
	43107	41	ND	ND	ND
	43109	61	ND	ND	ND
	43111[6]	83	ND	ND	ND
SB-6	43098	21	ND	ND	ND
	43099[6]	31	ND	ND	ND
	43101[6]	62	ND	ND	ND
	43103	81	ND	ND	ND
	43104	91	ND	ND	ND

TABLE 4 (Continued)

SOIL SAMPLES - SUMMARY OF ANALYTICAL RESULTS
INDUSTRIAL ASPHALT

Soil Boring	Sample No.	Depth[1] (ft)	TPH-D[2] (mg/kg)	TPH-WO[3] (mg/kg)	PCBs[4] (μg/kg)
SB-7	43113	21	ND	ND	ND
	43115	41	ND	ND	ND
	43117[6]	62	ND	ND	ND
	43119	81	ND	ND	ND
SB-8	43090	21	ND	ND	ND
	43092	41	ND	ND	ND
	43094	61	ND	ND	ND
	43096	76	62	ND	ND
	43097	81	11	ND	ND
SB-9	43083	21	ND	ND	ND
	43084[6]	42	ND	ND	ND
	43086[6]	58	5	ND	ND
	43088	76	23	ND	ND
	43089	86	ND	ND	ND
SB-10	43120	31	ND	ND	ND
	43121[6]	42	ND	ND	ND
	43123	61	ND	ND	ND
	43125	81	ND	ND	ND
MW-14	43126	21	ND	ND	ND
	43127	41	ND	ND	ND
	43129	71	18	ND	ND
	43130	81	13	ND	ND
	43131	91	14	ND	ND
MW-15	43133[6]	60	ND	ND	ND
	43135[6]	80	ND	ND	ND
MW-16	43138[6]	42	ND	ND	ND
	43139[6]	60	ND	ND	ND
	43140[6]	82	ND	ND	ND
SCS	44947	14	ND[8]	ND[9]	ND[10]
	44948	16	20[8]	600[9]	ND[10]

NOTES:

1	Depth below ground surface
2	Laboratory detection limit - 5 mg/kg
3	Laboratory detection limit - 50 mg/kg
4	Laboratory detection limit - 10 μg/kg
5	Composite sample from continuous sampler
6	Grab sample from discharge cyclone
7	EPA Method 8270 performed on this sample. All constituents reported as ND
8	Laboratory detection limit - 10 mg/kg
9	Laboratory detection limit - 20 mg/kg
10	Laboratory detection limit - 50 μg/kg
ND	Not detected at or above laboratory detection limits
SCS	Soil closure sample from the excavation bottom.

TABLE 5

WELL INVENTORY DATA

Well No.[1]	Township Range Section	Use(s)[2]	Total Depth[3] (ft)	Perforation Interval[4] (ft)	Distance from I.A. Site (ft)
11H1	3S/1E/11	Irrigation	303	223-231,262-295	5250(N)
11P4	3S/1E/11	Domestic	150	UN	2100 (NNW)
12Q1	3S/1E/12	Not Used	98	UN	5250 (NE)
12Q3	3S/1E/12	Monitoring	95	UN	5100 (NE)
12P5	3S/1E/12	Irrigation	346	262-290,315-326, 336-346	4700(NE)
13E1	3S/1E/13	Monitoring	97	92-97	2500(E)
13G1	3S/1E/13	Not Used	331	UN	950(E)
13K1	3S/1E/13	Not Used	750	180-200,220-260, 300-340,380-420, 460-500,640-660	5000(SE)
13K2	3S/1E/13	Not Used	600	UN	4900(SE)
13P1	3S/1E/13	Not Used	652	UN	5500(SE)
14A2	3S/1E/14	Domestic	220	135-160,170-205	900(NE)
14J1	3S/1E/14	Industrial	654	110-122,158-170 182-194,200-206	1750(SSE)
14K2	3S/1E/14	Industrial	508	120-181,187-245, 260-281	2050(S)
14P1	3S/1E/14	Not Used	48	UN	4500(SW)
14G1	3S/1E/14	Industrial	500	150-300,350-500	950(SWW)
14F3	3S/1E/14	Industrial	535	200-250,250-533	1400(SWW)
15J3	3S/1E/15	Domestic	196	154-184	4700(SWW)
23D3	3S/1E/23	Domestic	288	UN	4800(SW)
23D2	3S/1E/23	Not Used(?)	157	UN	5000(SW)
23C1	3S/1E/23	Not Used	UN	UN	4650(SSW)
23C2	3S/1E/23	Irrigation	280	UN	4950(SSW)
23B2	3S/1E/23	Irrigation	UN	UN	4900(S)
23H1	3S/1E/23	Irrigation	200	UN	5280(S)

Notes:

This list is compiled from the Alameda County Flood Control and Water Conservation District - Zone 7 files. Accuracy of this information has not been verified in the field. Specific well construction details and location should be confirmed by direct observation.

UN Unknown
1 Well numbers are based on well numbering system used by ACFCWCDd - Zone 7
2 Primary uses of water, as designated by owner, driller or ACFCWCD - Zone 7 personnel
3 Depth below grade (land surface datum) of completed well, as reported by driller or agency staff
4 Interval in which well casing is perforated in feet below land surface; in some wells this may be the interval between the bottom of the solid casing and the maximum depth.

TABLE 6
RESIDUAL DRAWDOWN
INDUSTRIAL ASPHALT

Well No.	DTW at the Start of Test (ft)	DTW at the End of Test (ft)	Drawdown (ft)
4	90.00	90.10	0.10
5	108.75	109.02	0.27
6	91.70	91.97	0.27
7	95.65	96.25	0.60
8	92.21	92.41	0.20
9	97.43	97.86	0.43
10	91.18	91.39	0.21
13	94.00	109.30	15.30
14	93.98	94.35	0.37
15	94.54	95.05	0.51
16	97.35	92.55	0.20

Note:

DTW Depth to water below the measuring point.

TABLE 7
PUMPING TEST RESULTS
INDUSTRIAL ASPHALT

Well No.	Distance From Pumping Well (ft)	TRANSMISSIVITY (gpd/ft)				STORATIVITY (-)			
		Theis	Jacob	Recovery		Theis	Jacob	Recovery	
				Calculated	Residual			Calculated	Residual
MW-4	500	1,500	2,500	NC	NC	1E-3	7E-4	NC	NA
MW-5	400	2,900	2,200	NC	NC	5E-4	4E-4	NC	NA
MW-6	140	NC	NC	NC	NC	NC	NC	NC	NA
MW-7	220	NC	1,150	NC	NC	NC	7E-4	NC	NA
MW-8	210	3,000	2,200	NC	2,000	3E-3	4E-3	NC	NA
MW-9	220	1,450	1,750	NC	2,250	1E-3	1E-3	NC	NA
MW-10	290	4,200	4,000	NC	NC	9E-4	8E-4	NC	NA
MW-13	0	NC	170	60	70	NC	NC	8E-2	NA
MW-14	115	NC	NC	3,800	3,800	NC	NC	2E-3	NA
MW-15	90	NC	NC	2,000	2,500	NC	NC	6E-4	NA
MW-16	170	NC	2,650	NC	NC	NC	5E-3	NC	NA

Notes:

NA	Not Applicable
NC	Not Calculated

TABLE 8
CAPTURE ZONE SIZES(1)
INDUSTRIAL ASPHALT

Pumping Rate (gpm)	Distance To Stagnation Point (feet)(2)	Maximum Width of Capture Zone (feet)
1.0	9	56
1.5	13	82
2.0	18	113
2.6	23	145

Notes:

1. For well MW-13 as pumping well. Assumptions: T=2,500 gpd/ft, m=20 ft, i=0.035 feet/foot.
2. Downgradient extent of Capture Zone.

TABLE 9

TYPICAL COMPOSITION OF DIESEL FUEL BY HYDROCARBON CLASSIFICATIONS

INDUSTRIAL ASPHALT

Compound	Weight Per Cent
Straight-chain Paraffins and Isoparaffins	**37-43**
Cycloparaffins:	
mono-	23
di-	8
tri-	2
Total Cycloparaffins	**26-33**
Aromatics: (substituted benzenes and polyaromatic hydrocarbons (PAHs))	
alkybenzenes	9
indans and tetralins	5
dinaphthenobenzenes	1
alkylnapthalenes	6
biphenyls, etc.	2
fluorenes, napthalenes, etc.	1-3
tricyclic aromatics	1
benzene	47 parts per million
Total Aromatics	**23-28**

TABLE 10

Constituents of Diesel Fuel and No. 2 Fuel Oil

Chemical	CASRN	Concentration Range In Diesel* (ppm)	Concentration Range In No. 2 Fuel Oil (ppm)	Molecular Weight (grams/mole)	Water Solubility (mg/l)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m^3/mole)	K_{oc} (ml/g)	Log K_{ow}	DHS-Established Classification by Health Effects****	DHS-Estblished Classification by Environmental Effect****
Volatile Organics											
Benzene	71-43-2	--	6-82	78	1.8×10^{3}	9.5×10^{1}	5.6×10^{-3}	83	2.1	Carcinogen	Toxic to Fresh Water Species
Ethylbenzene	100-41-4	--	100-800	106	1.5×10^{2}	7.0	6.4×10^{-3}	1100	3.2	Developmental Toxin	NE
Toluene	108-88-3	--	100-800	92	5.3×10^{2}	2.8×10^{1}	6.4×10^{-3}	300	2.7	Developmental Toxin	Toxic to Fresh Water Species
Xylene**	1330-20-7	--	100-800	106	2.0×10^{2}	1.0×10^{1}	7.0×10^{-3}	240	3.3	Developmental Toxin	Toxic to Fresh Water Species
Polycyclic Aromatic Hydrocarbons											
Benzo(a)pyrene	50-32-8	0.00007	0.001-0.6	252	1.2×10^{-3}	5.6×10^{-9}	1.6×10^{-6}	5500000	6.1	Carcinogen	NE
Benzanthracene	56-55-3	--	0.001-1.2	228	5.7×10^{-3}	2.2×10^{-8}	1.2×10^{-6}	20000	5.6	NE	NE
Chrysene	218-01-9	--	1.4	228	1.8×10^{-3}	6.4×10^{-9}	1.0×10^{-6}	1380000	5.6	NE	NE
Cresol	1319-77-3	--	54.3	108	3.1×10^{4}	2.4×10^{-4}	1.0×10^{-6}	500	2.0	NE	NE
Methylnaphthalene	1321944	--	5700-9100	--	--	--	--	--	--	NE	NE
2-Methylnaphthalene	91-57-6	--	6,700	142	--	--	--	--	--	NE	NE
Naphthalene	91-20-3	1300	2,730	128	3.0×10^{1}	1mm at 53°	--	--	3.3	Noncarcinogenic PAH	Toxic to Fresh Water Species
Phenanthrene	85-01-8	--	1,500	178	1.0	6.8×10^{-4}	1.6×10^{-4}	14000	4.5	Noncarcinogenic PAH	Toxic to Fresh Water Species
Phenol	108-95-2	--	6.8	94	9.3×10^{4}	3.4×10^{-1}	4.5×10^{-7}	14.2	1.5	NE	NE
Quinoline	91-22-5	--	9.2	129	6.0×10^{4}	1 mm at 60°C	--	--	2.0	NE	NE
Polychlorinated Biphenyls* **	1336-36-3	--	--	328	3.1×10^{-2}	7.7×10^{-5}	1.1×10^{-3}	530000	6.0	Probable Carcinogen*****	NE

NOTES:

CASRN	Chemical Abstract Service Registry Number
ND	Not Detected
NE	Not Established
PAH	Polyaromatic Hydrocarbon
ppm	Parts per million
*	From Ref. 8
**	Entries for xylene are for mixtures of three isomers
***	Polychlorinated biphenyls are not a typical component of diesel or fuel oil. They are included here because they have been detected at 20 ppm in samples of diesel fuel product at the Industrial Asphalt site.
****	Based on Applied Action Level list, June 1990
*****	Based on EPA toxicity data

K_{oc} = organic carbon partitioning coefficient

K_{ow} = octanol/water partitioning coefficient

TABLE 11
MODEL INPUT DATA FOR THREE CHEMICALS OF INTEREST
INDUSTRIAL ASPHALT

Parameter	Units	Benzene	Naphthalene	PCBs
C_o	mg/l	50	1300	50
Q	m^3	20	20	20
b	m	6.1	6.1	6.1
n_e	unitless	0.2	0.2	0.2
D_x, D_y	m^2/day	16.4, 5.5	16.4, 5.5	16.4, 5.5
V_x	m/day	0.60	0.60	0.60
x, y	m	274.0	274.0	274.0
R_d	unitless	1.5	9.6	100*

NOTE:

* A value of 100 was used for the R_d of PCBs, as a higher value results in model output showing no concentrations of PCBs at the location of interest.

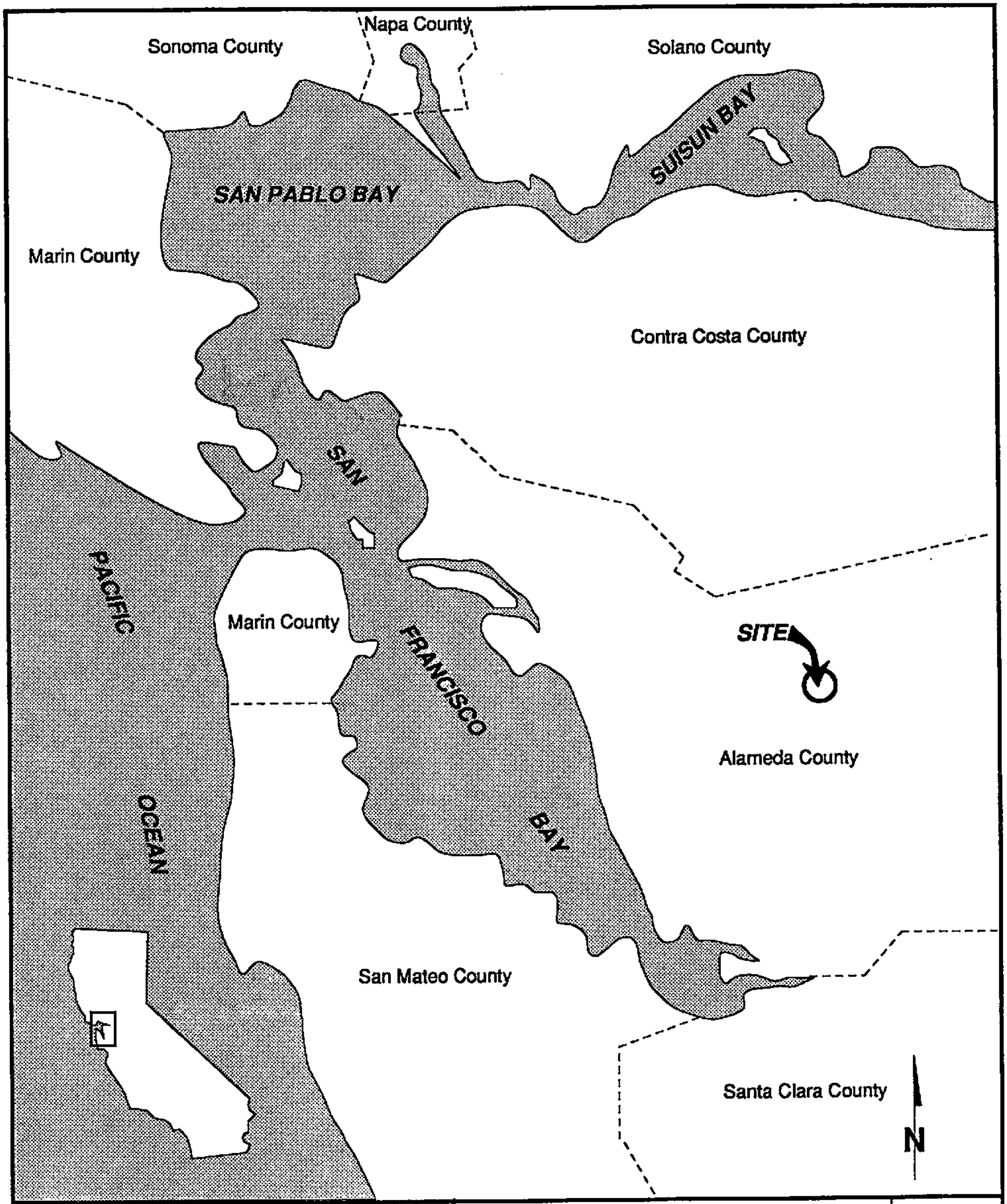
TABLE 12

HEALTH CRITERIA FOR ASSESSING RISK OF EXPOSURE TO CHEMICALS OF INTEREST AT INDUSTRIAL ASPHALT

Chemical	Oral Slope Factor	AAL for Human Receptors	AAL for Fresh Water Receptors
benzene	0.029 mg/kg/day	NU	0.001 ppm
fluoranthene	NE	0.020 mg/l	
naphthalene	NE	0.020 mg/l	0.60 ppm

NOTES:

NE	Not Established.
NU	Not Used in this risk screening



KLEINFELDER

DRAFTED BY: L. Sue DATE: 12-28-90

CHECKED BY: K. Jesionek DATE: 12-28-90

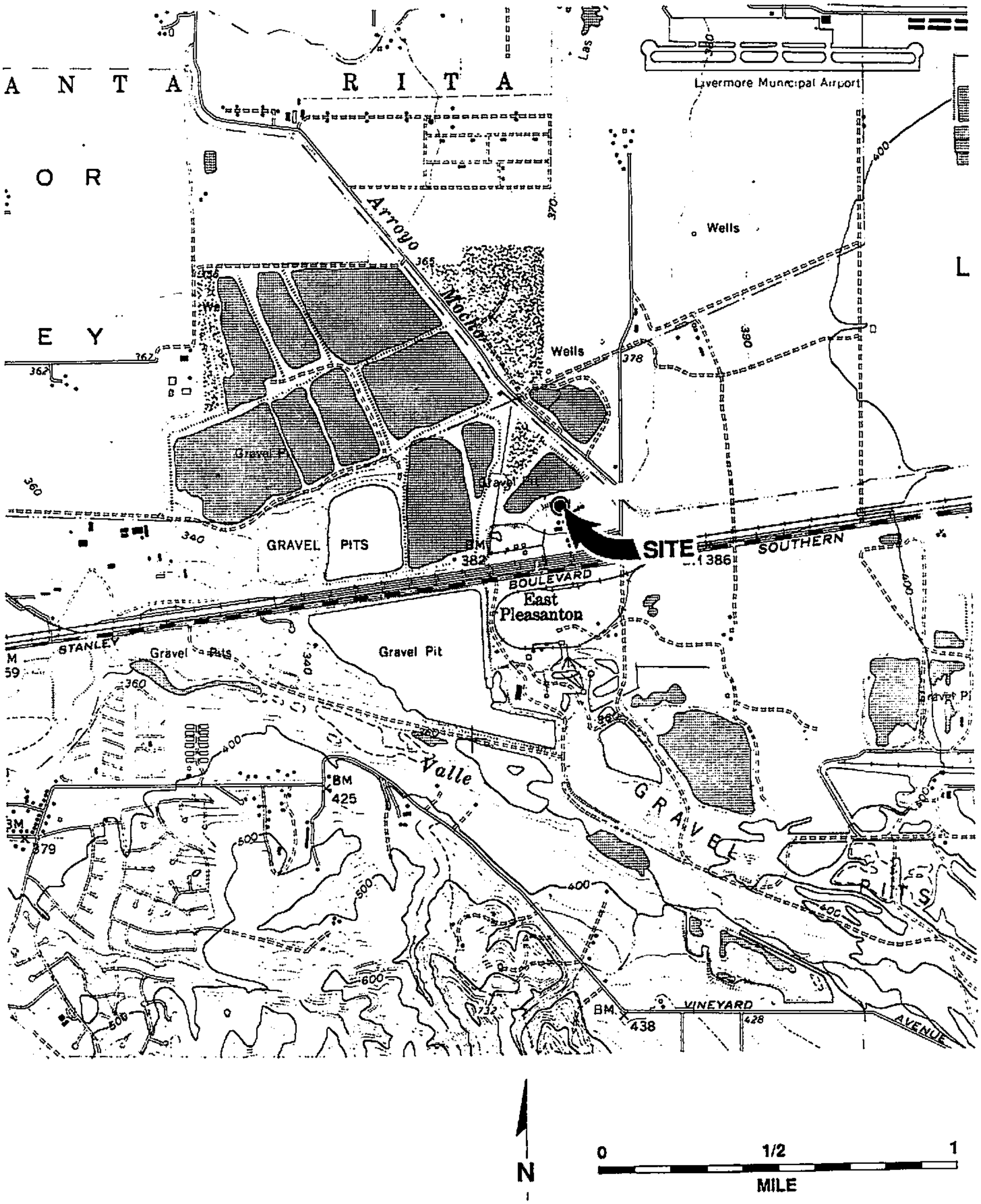
REGIONAL LOCALITY MAP

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE

1



KLEINFELDER

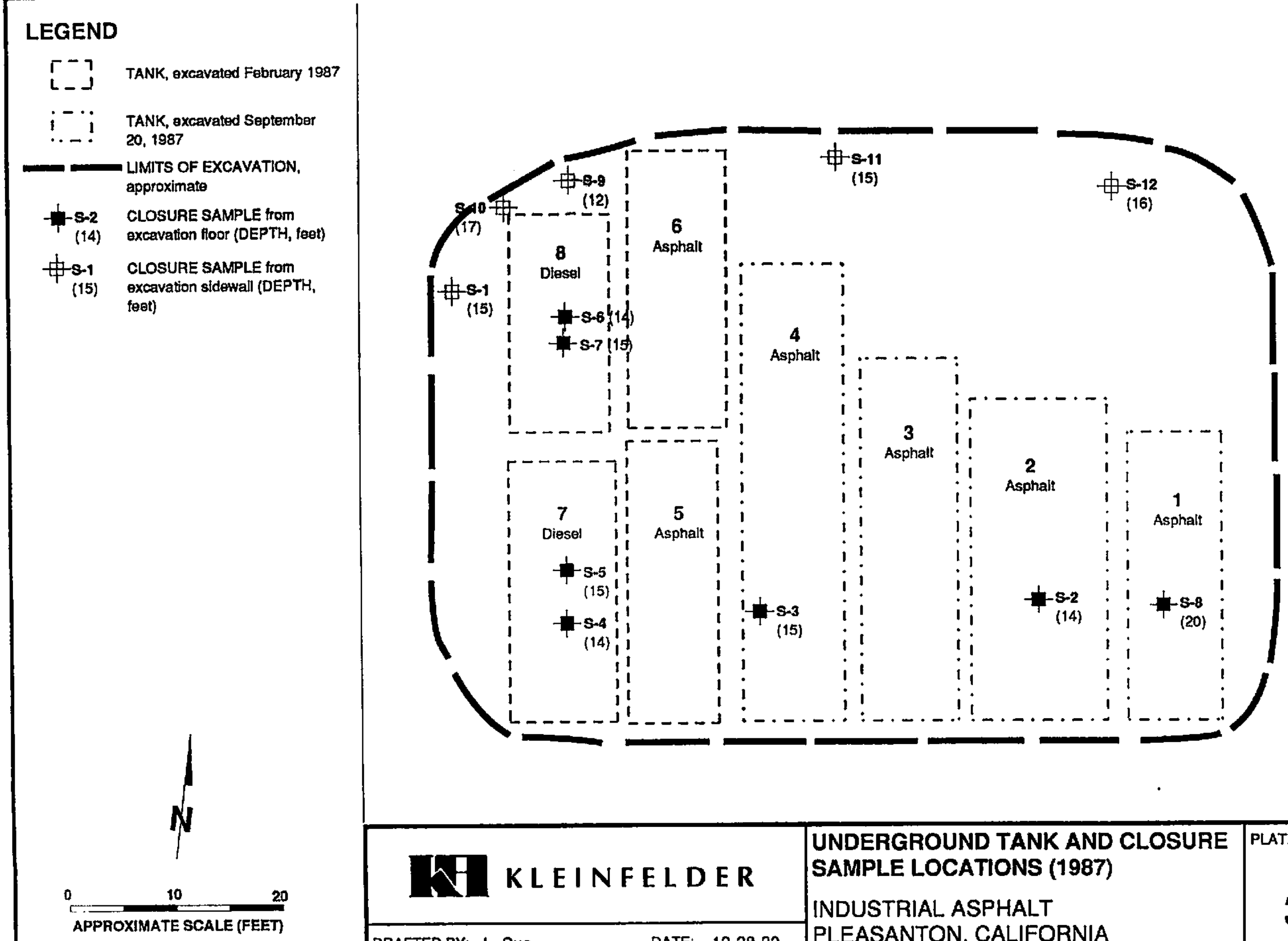
PROJECT NO. 10-1682-06

SITE LOCATION MAP

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PLATE

2



KLEINFELDER

DRAFTED BY: L. Sue DATE: 12-28-90

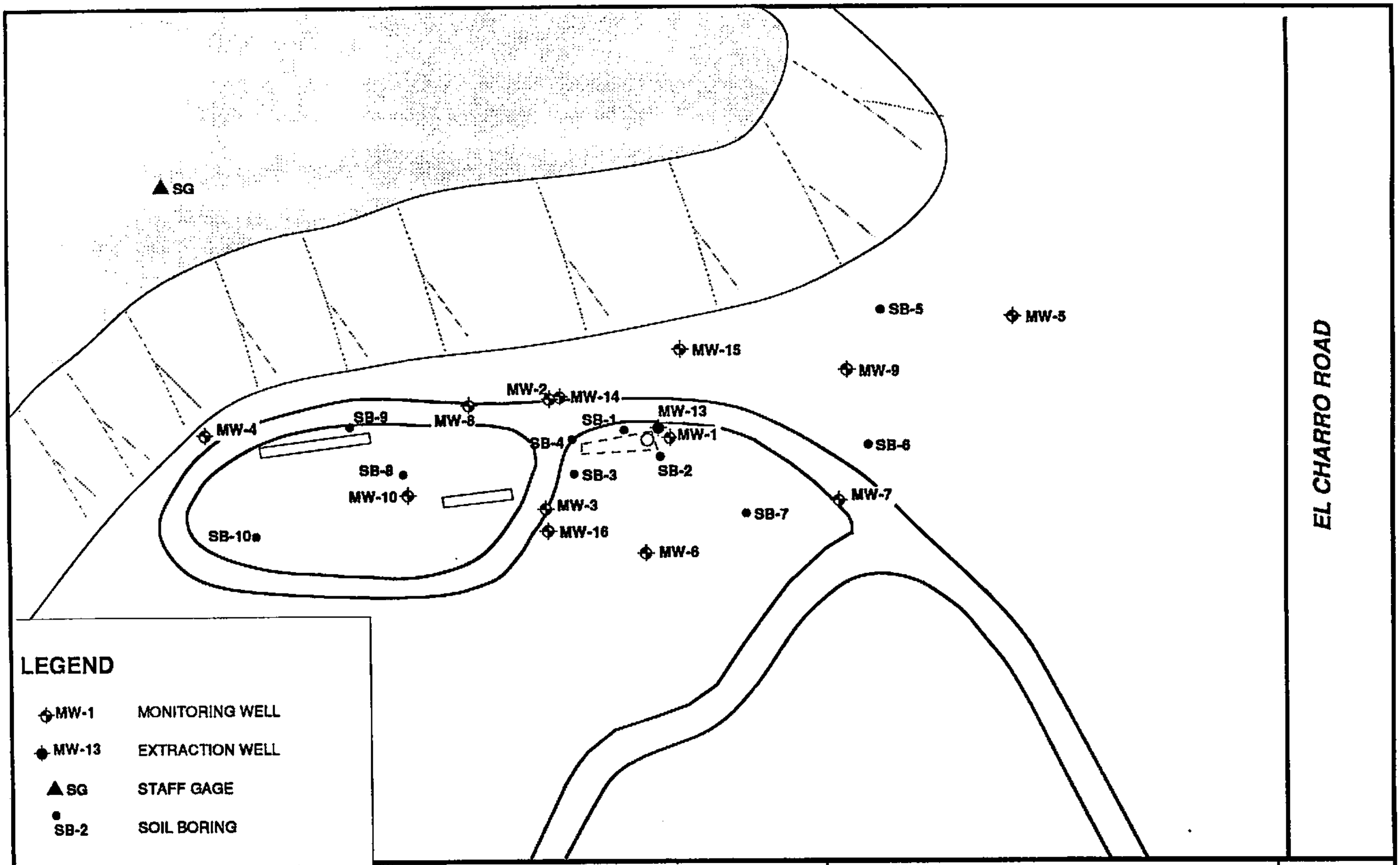
CHECKED BY: K. Jesionek DATE: 12-28-90

UNDERGROUND TANK AND CLOSURE SAMPLE LOCATIONS (1987)

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE 3



LEGEND

- ⊕ MW-1 MONITORING WELL
- ● MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE
- ● SB-2 SOIL BORING

0 150
Approximate Scale (feet)

N

BASE MAP SOURCE:
Wells surveyed by Associated Professions Inc. and Kleinfelder, Inc.
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

KLEINFELDER

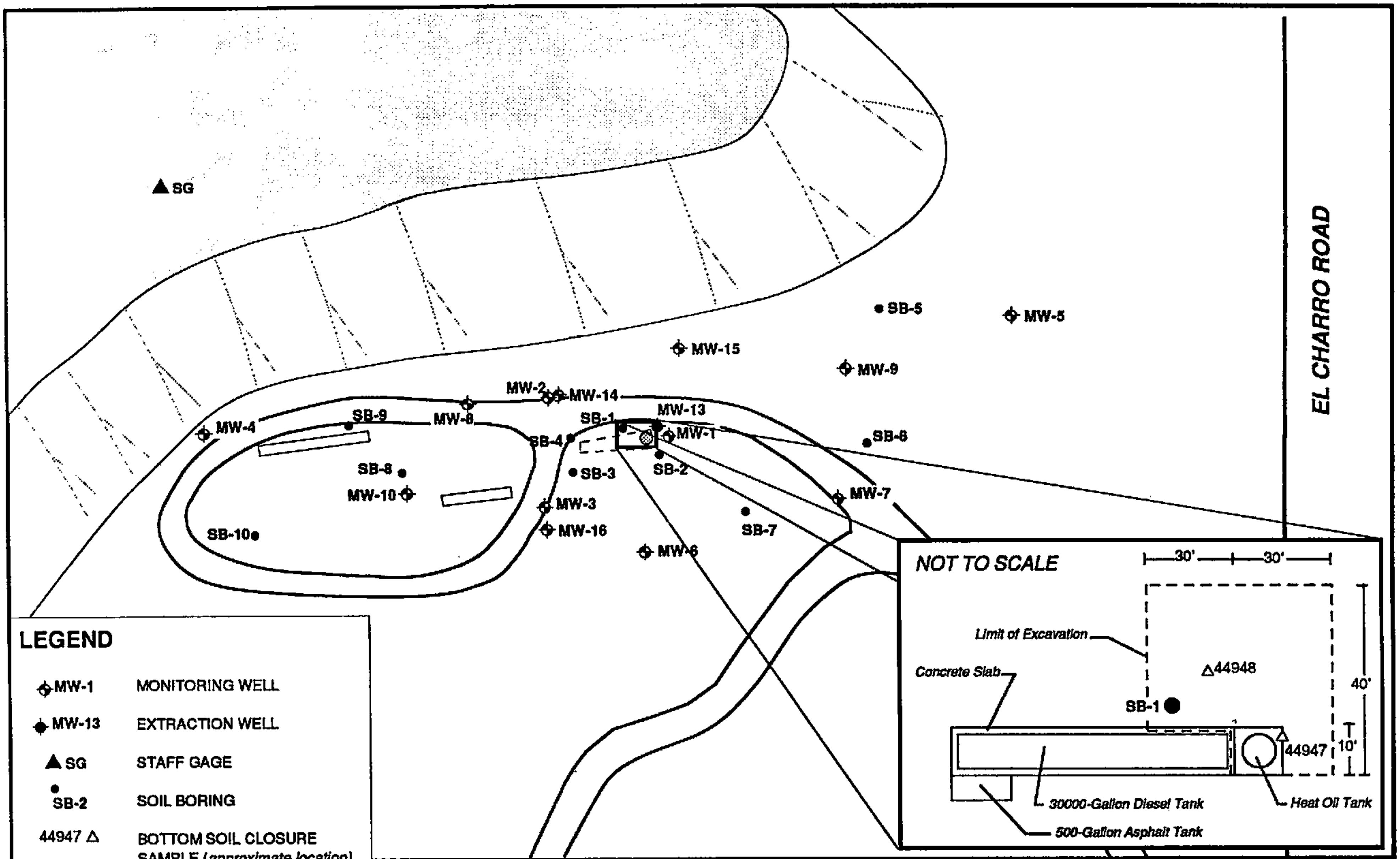
DRAFTED BY: L. Sue DATE: 12-12-90
CHECKED BY: K. Jesionek DATE: 12-14-90

SOIL BORING/MONITORING WELL LOCATION MAP (1990)

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE
4



LEGEND

MW-1	MONITORING WELL
MW-13	EXTRACTION WELL
▲ SG	STAFF GAGE
● SB-2	SOIL BORING
44947 △	BOTTOM SOIL CLOSURE SAMPLE (*approximate location*)

0 150
Approximate Scale (feet)

N

BASE MAP SOURCE:
Wells surveyed by Associated Professions Inc. and Kleinfelder, Inc.
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

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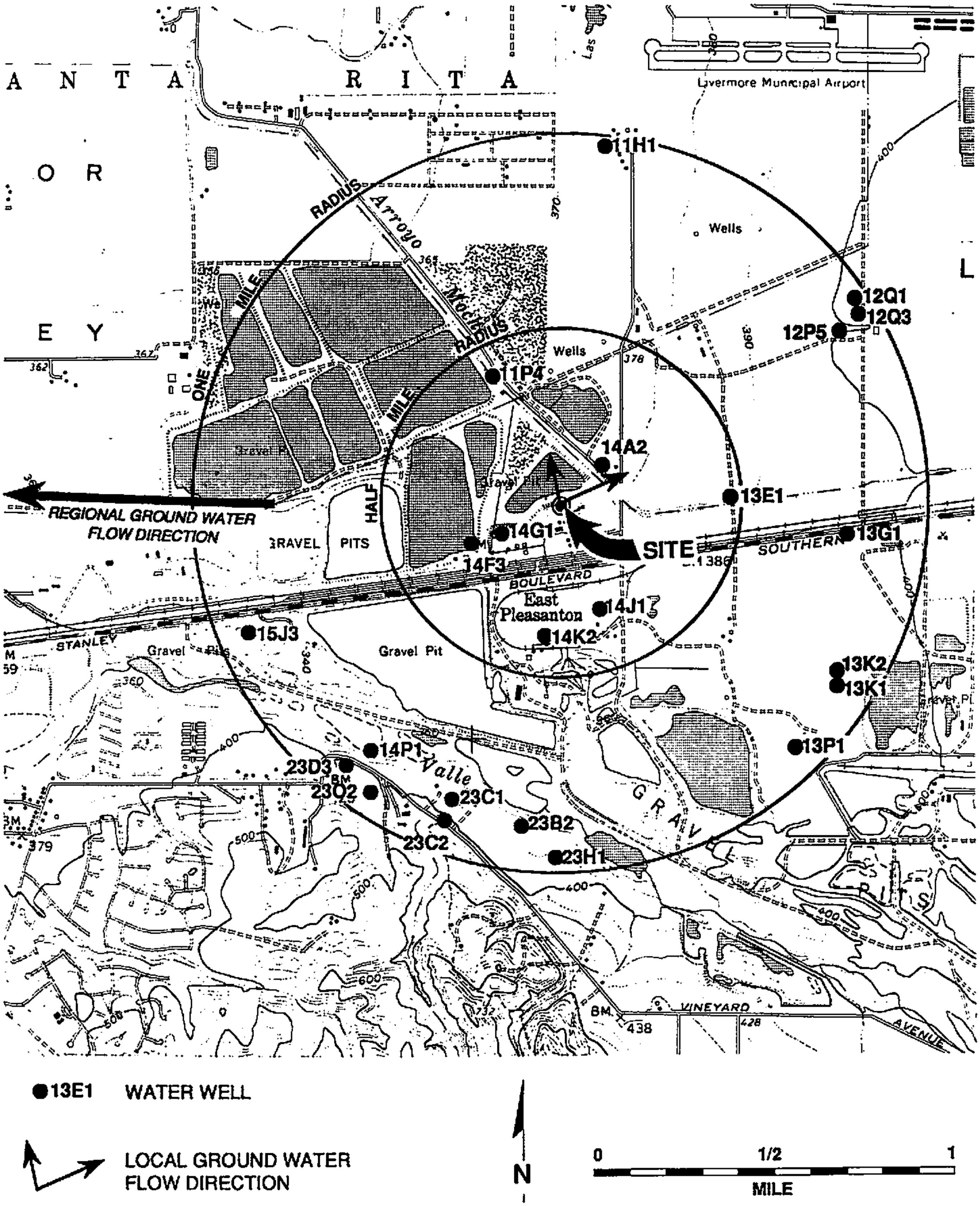
DRAFTED BY: L. Sue DATE: 12-12-90
CHECKED BY: K. Jesionek DATE: 12-14-90

SOIL EXCAVATION PLAN

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE
5



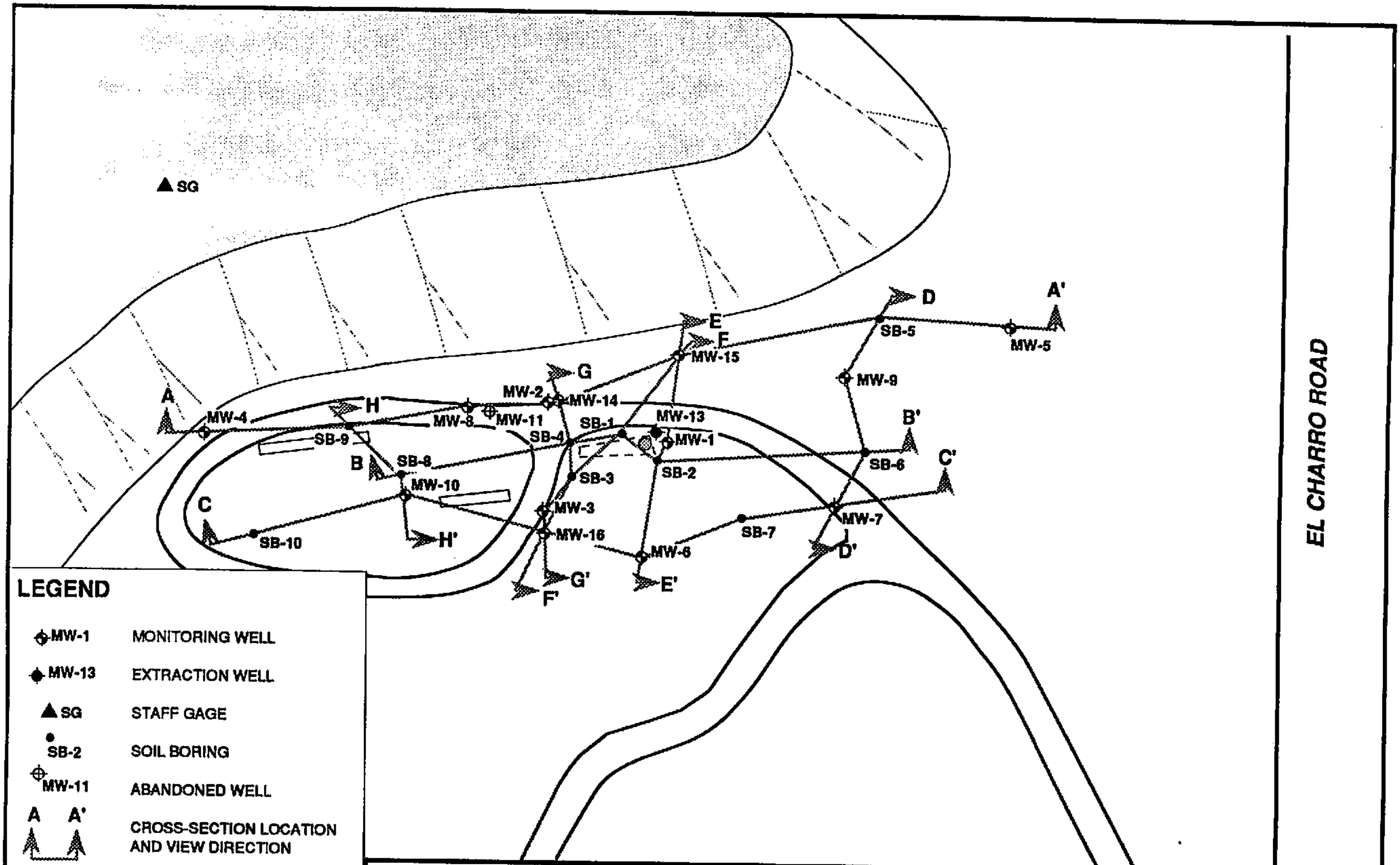
KLEINFELDER

PROJECT NO. 10-1682-06

WELL CANVASS MAP

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PLATE
6



LEGEND

⊕ MW-1	MONITORING WELL
● MW-13	EXTRACTION WELL
▲ SG	STAFF GAGE
● SB-2	SOIL BORING
⊕ MW-11	ABANDONED WELL
A A'	CROSS-SECTION LOCATION AND VIEW DIRECTION

0 150
Approximate Scale (feet)

N

BASE MAP SOURCE:
Wells surveyed by Associated Professions Inc. and Kleinfelder, Inc.
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

KLEINFELDER

DRAFTED BY: L. Sue DATE: 12-12-90

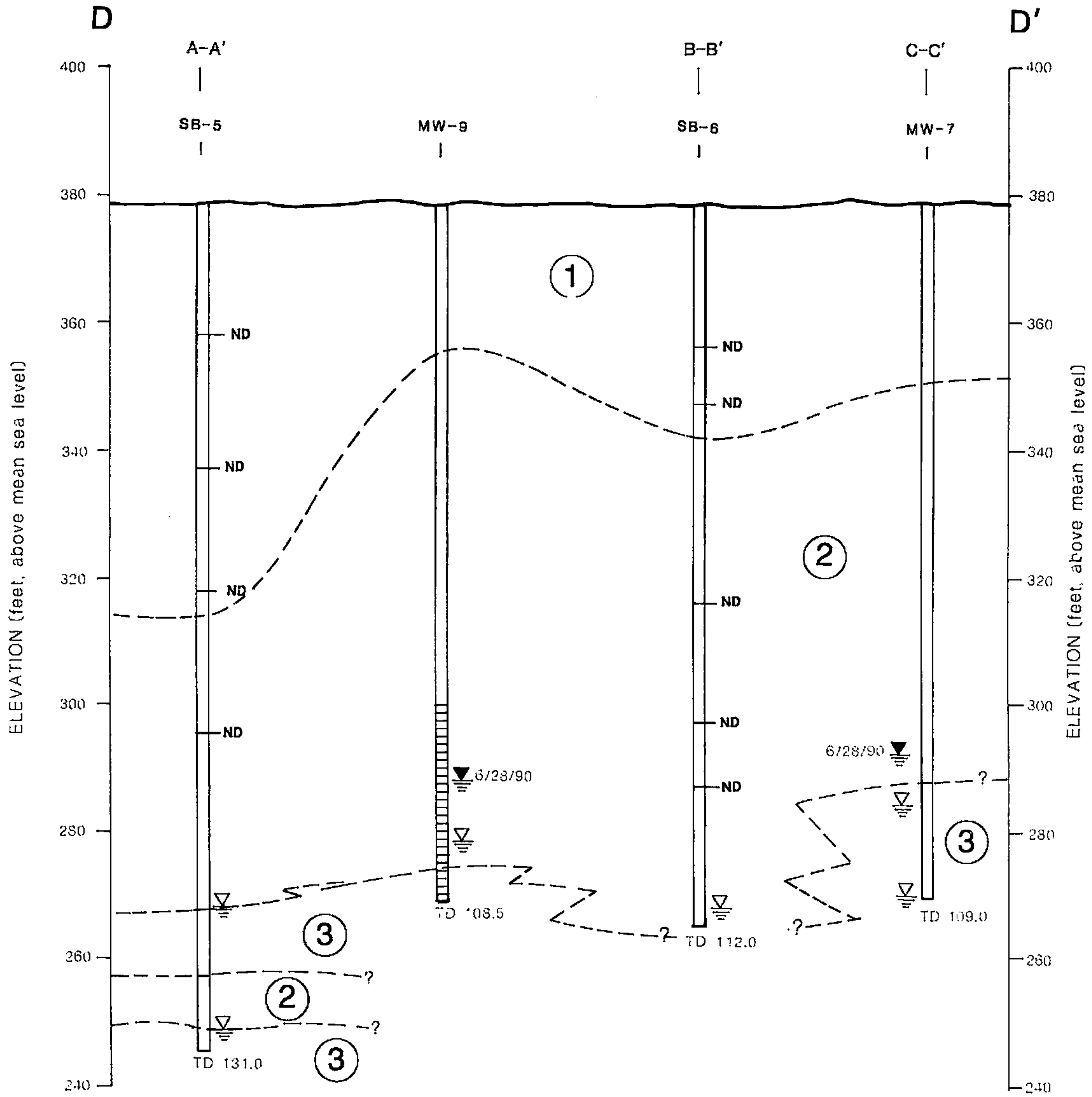
CHECKED BY: K. Jesionek DATE: 12-14-90

CROSS-SECTION LOCATION MAP

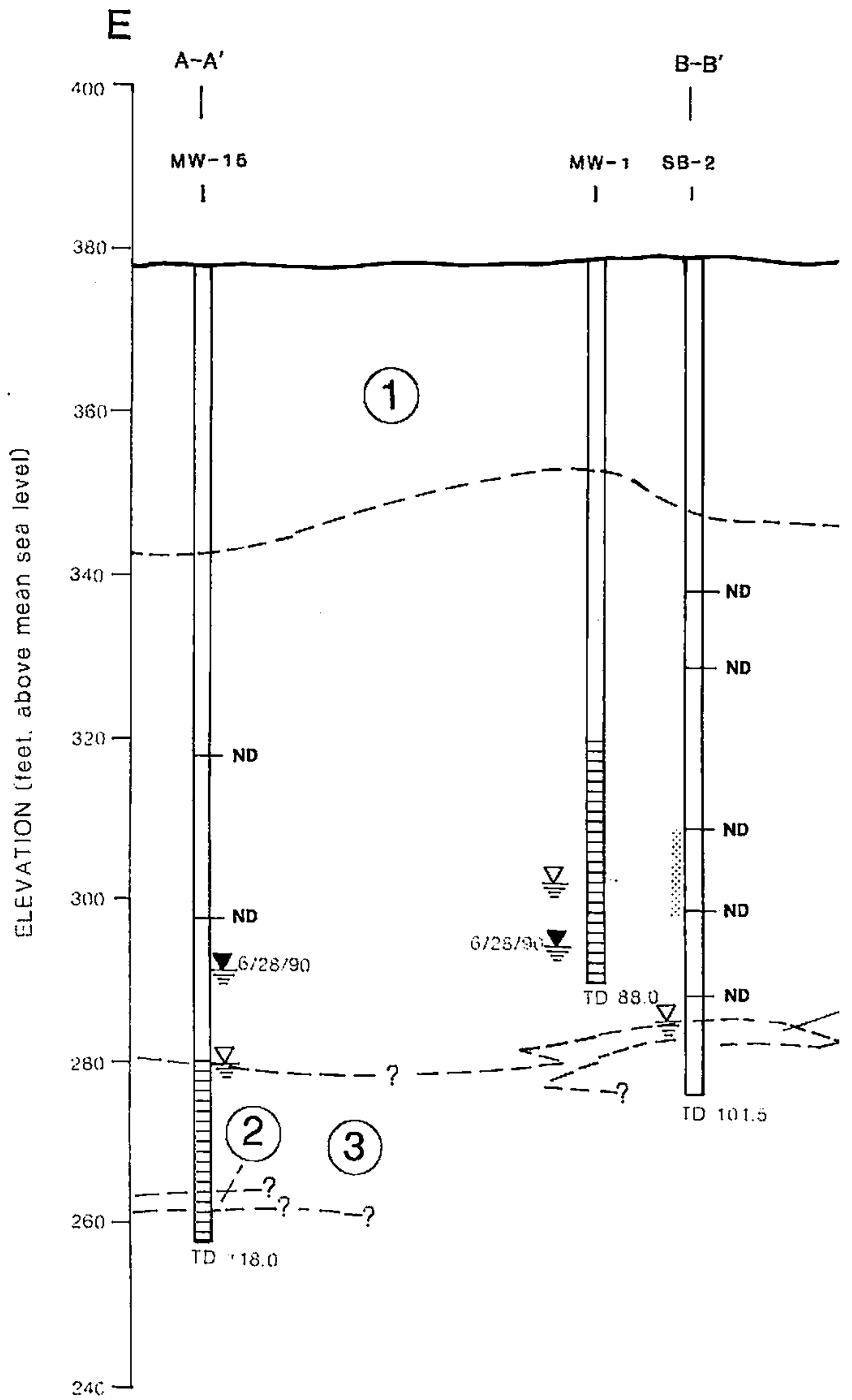
INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

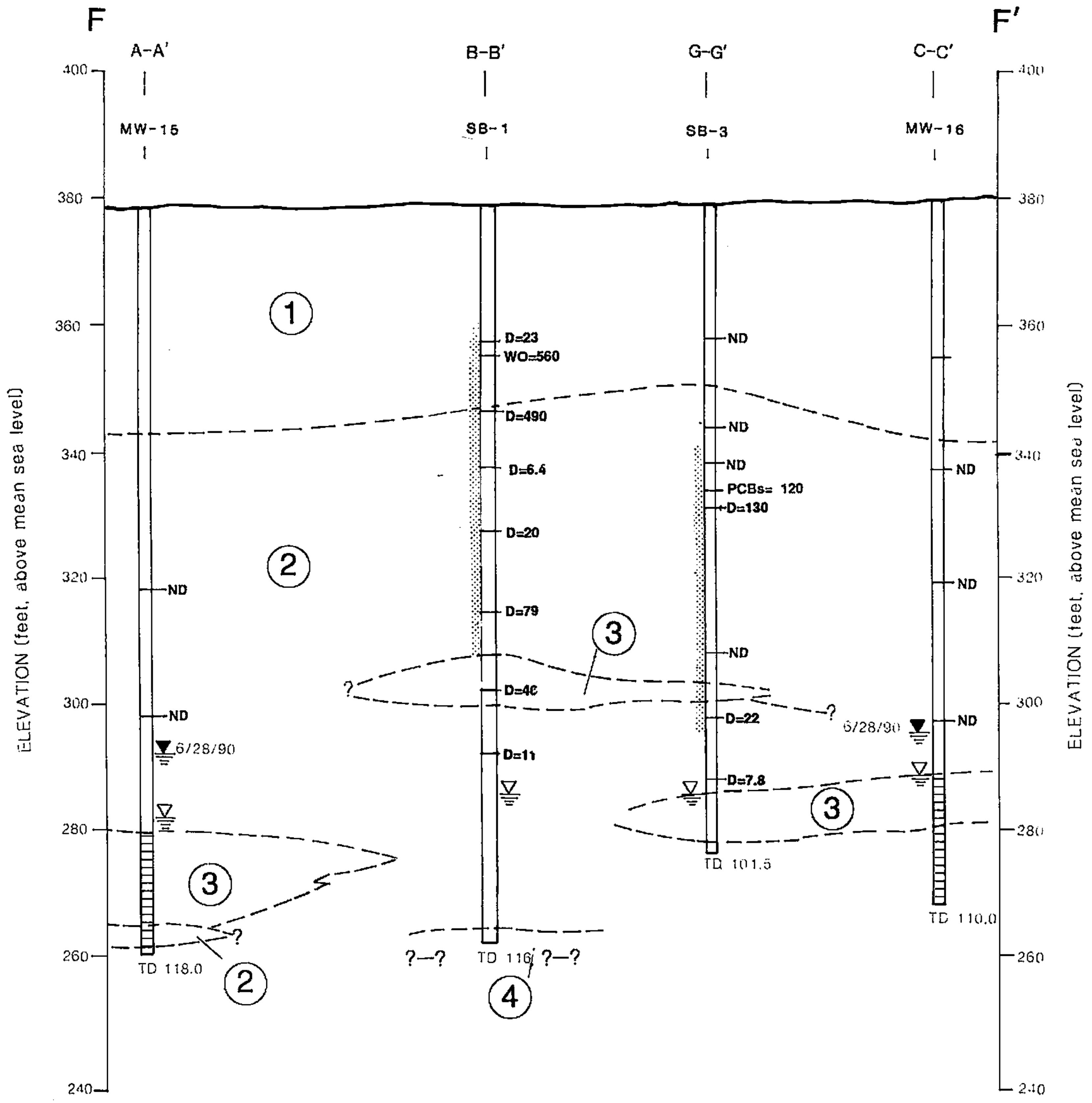
PLATE
7

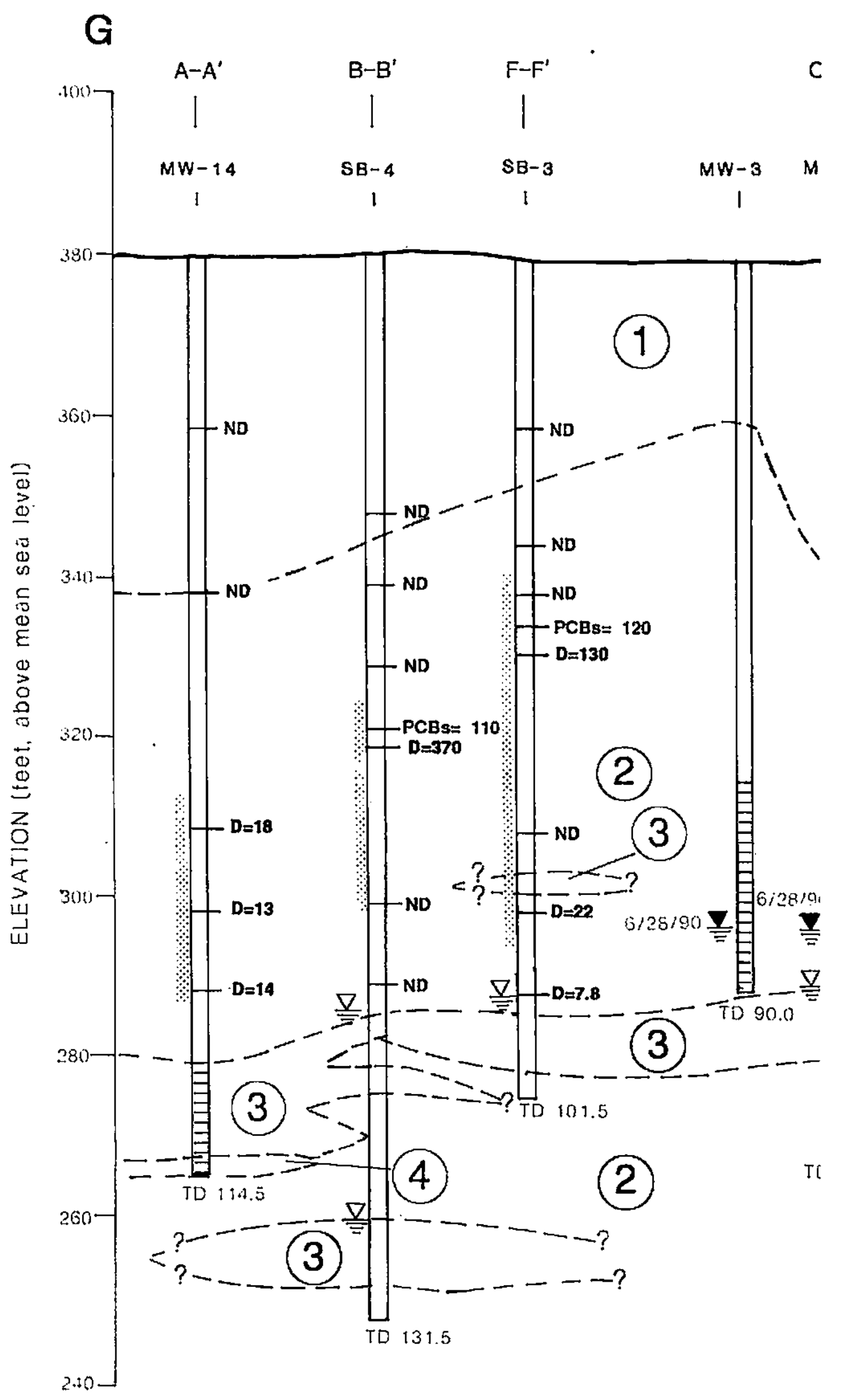


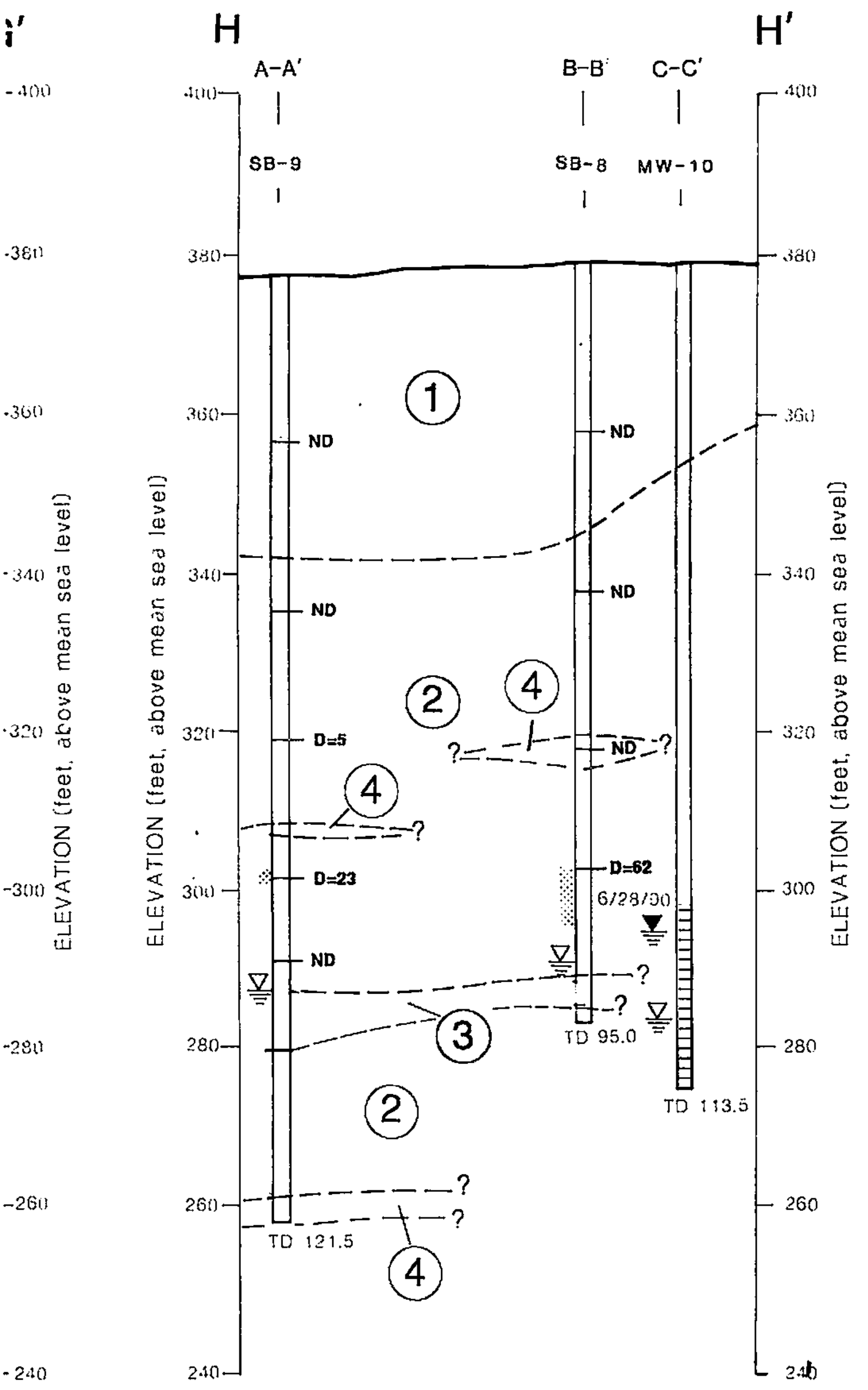
D
D′
A–A′
B–B′
C–C′
SB–5
MW–9
SB–6
MW–7
400
380
360
340
320
300
280
260
240
ELEVATION (feet, above mean sea level)
①
②
③
②
③
③
ND
6/28/90
TD 131.0
TD 108.5
TD 112.0
TD 109.0
?



E
A–A′
B–B′
MW–15
MW–1
SB–2
400
380
360
340
320
300
280
260
240
ELEVATION (feet, above mean sea level)
①
②
③
ND
6/28/90
6/28/90
TD 118.0
TD 88.0
TD 101.5
?

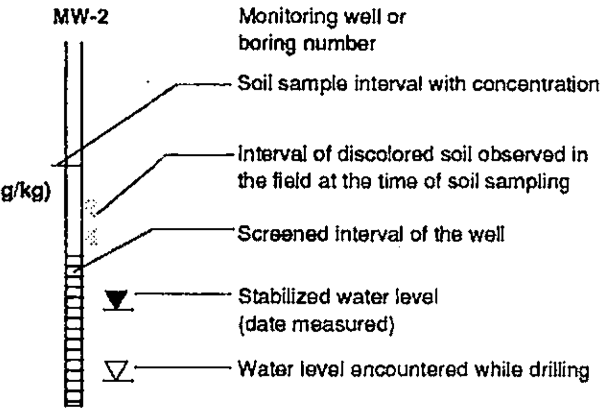

F
F'
A-A'
B-B'
G-G'
C-C'
MW-15
SB-1
SB-3
MW-16
400
380
360
340
320
300
280
260
240
ELEVATION (feet, above mean sea level)
①
②
③
④
D=23
WO=560
D=490
D=6.4
D=20
D=79
D=46
D=11
ND
ND
ND
ND
PCBs= 120
D=130
ND
D=22
D=7.8
ND
ND
ND
6/28/90
6/28/90
TD 118.0
TD 116
TD 101.5
TD 110.0
?
?—?
?—?


G
A-A'
B-B'
F-F'
C
MW-14
SB-4
SB-3
MW-3
M
400
380
360
340
320
300
280
260
240
ELEVATION (feet, above mean sea level)
①
②
③
④
ND
ND
D=18
D=13
D=14
ND
ND
ND
PCBs= 110
D=370
ND
ND
ND
ND
ND
PCBs= 120
D=130
ND
D=22
D=7.8
6/28/90
6/28/9
TD 114.5
TD 131.5
TD 101.5
TD 90.0
TI
?
?



LEGEND

A A' Cross-section designation



Monitoring well or boring number

Soil sample interval with concentration

Interval of discolored soil observed in the field at the time of soil sampling

Screened interval of the well

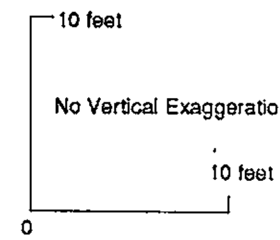
▼ Stabilized water level (date measured)

▽ Water level encountered while drilling

D =Diesel (mg/kg)
PCB =Polychlorinated Biphenyls (µg/kg)
WO =Waste oil (mg/kg)
ND =Not detected at or above laboratory detection limits

LITHOLOGIES

CL	Clays and clayey soils
ML	Silts and silty soils
SC, SM, SP, SW	Sands and sandy soils
GC GM, GP, GW	Gravels and gravelly soils



NOTE: All contacts are approximate.

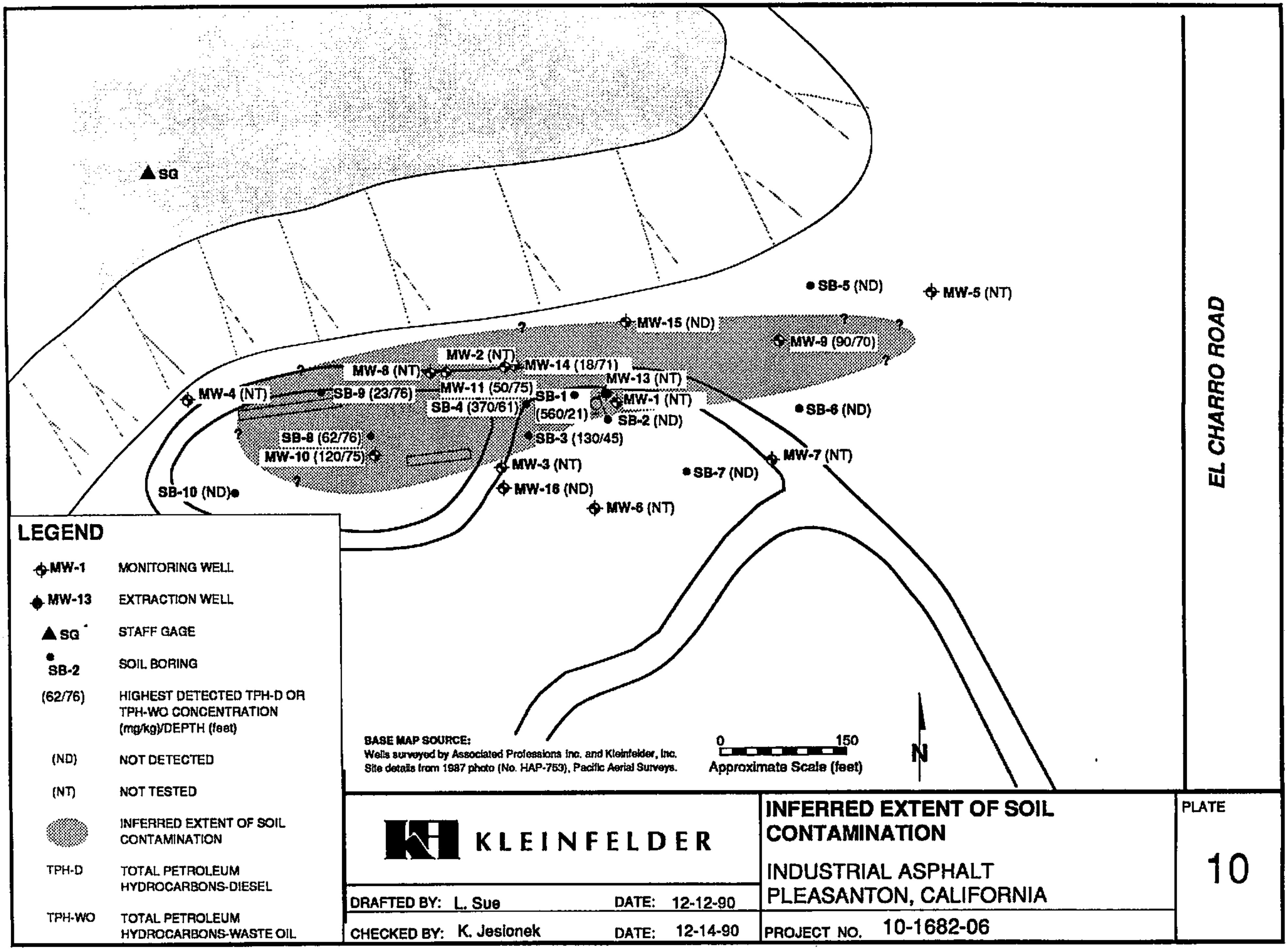
UNIT	STRATIGRAPHY
①	**FILL** - The fill material has been divided into two subunits; an upper clayey silt unit and a lower sandy gravel unit. The upper unit is characterized as brown clayey silt with floating subangular to subrounded clasts which vary in size from 0.25 to 2 inches in diameter. The lower subunit is composed of primarily gravel to sandy gravel with little or no silt or clay. Numerous clasts up to six inches in diameter are common. Clasts are generally subrounded to subangular and igneous or metamorphic in origin.
②	**SANDY to CLAYEY SILTY GRAVEL to GRAVELLY SANDY CLAYEY SILT** - mostly gravel with varying amounts of fine sand, silt, and clay. Unit is generally olive brown in color except where petroleum hydrocarbons have discolored the soil to gray to greenish gray. Cobbles up to 6 inches in diameter are common. Clasts in the gravel and cobbles range are typically subrounded to subangular. The unit grades both laterally and vertically with no discrete bedding contacts.
③	**SANDY GRAVEL to GRAVELLY SAND** - mostly gravel with varying amounts of fine to coarse grained sand. Sand content ranges fron less than 5 percent to as much as 50 percent. Cobbles are typical of this unit and can be as large as 6 inches in diameter and are subrounded to subangular. The sandy matrix is typically olive brown.
④	**SILT** - mostly nonplastic to low plasticity silt with minor clay, light yellowish brown with thin beds of darker brown. Occasional floating gravel-size clasts. Contacts between this unit and sandy gravel units appear sharp Contacts between this unit and silty to clayey grav units tend to be gradational.

KLEINFELDER

GEOLOGIC CROSS-SECTIONS D—D', E—E', F—F', G—G' AND H—H'

INDUSTRIAL ASPHALT

PLATE
9



BASE MAP SOURCE:
Wells surveyed by Associated Professions Inc. and Kleinfelder, Inc.
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

KLEINFELDER

DRAFTED BY: L. Sue DATE: 12-12-90

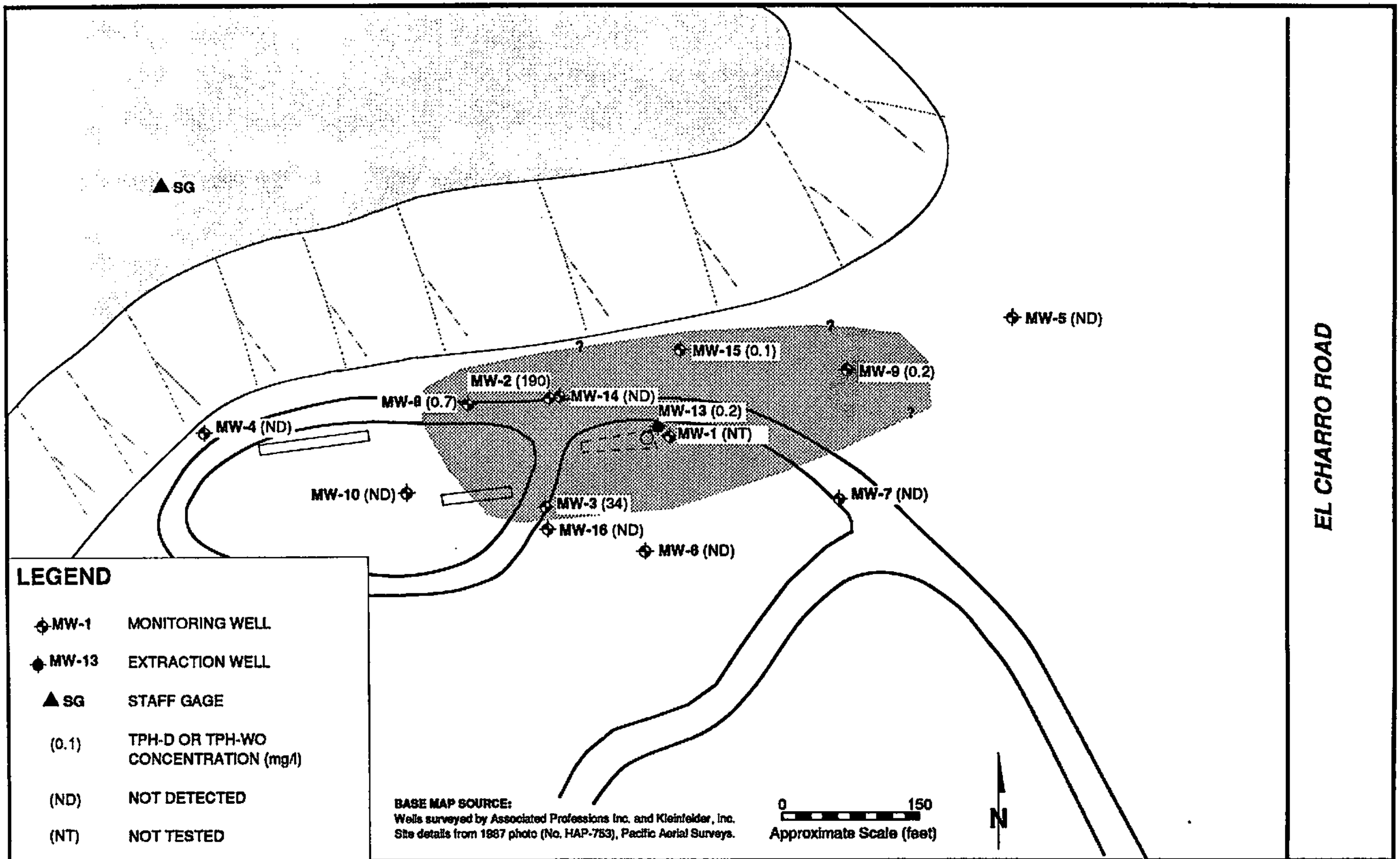
CHECKED BY: K. Jesionek DATE: 12-14-90

INFERRED EXTENT OF SOIL CONTAMINATION

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE
10



BASE MAP SOURCE:
Wells surveyed by Associated Professions Inc. and Kleinfelder, Inc.
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

LEGEND

⌖ MW-1	MONITORING WELL
● MW-13	EXTRACTION WELL
▲ SG	STAFF GAGE
(0.1)	TPH-D OR TPH-WO CONCENTRATION (mg/l)
(ND)	NOT DETECTED
(NT)	NOT TESTED
▨	INFERRED EXTENT OF IMPACTED GROUND WATER
TPH-D	TOTAL PETROLEUM HYDROCARBONS-DIESEL
TPH-WO	TOTAL PETROLEUM HYDROCARBONS-WASTE OIL

KLEINFELDER

DRAFTED BY: L. Sue DATE: 12-12-90

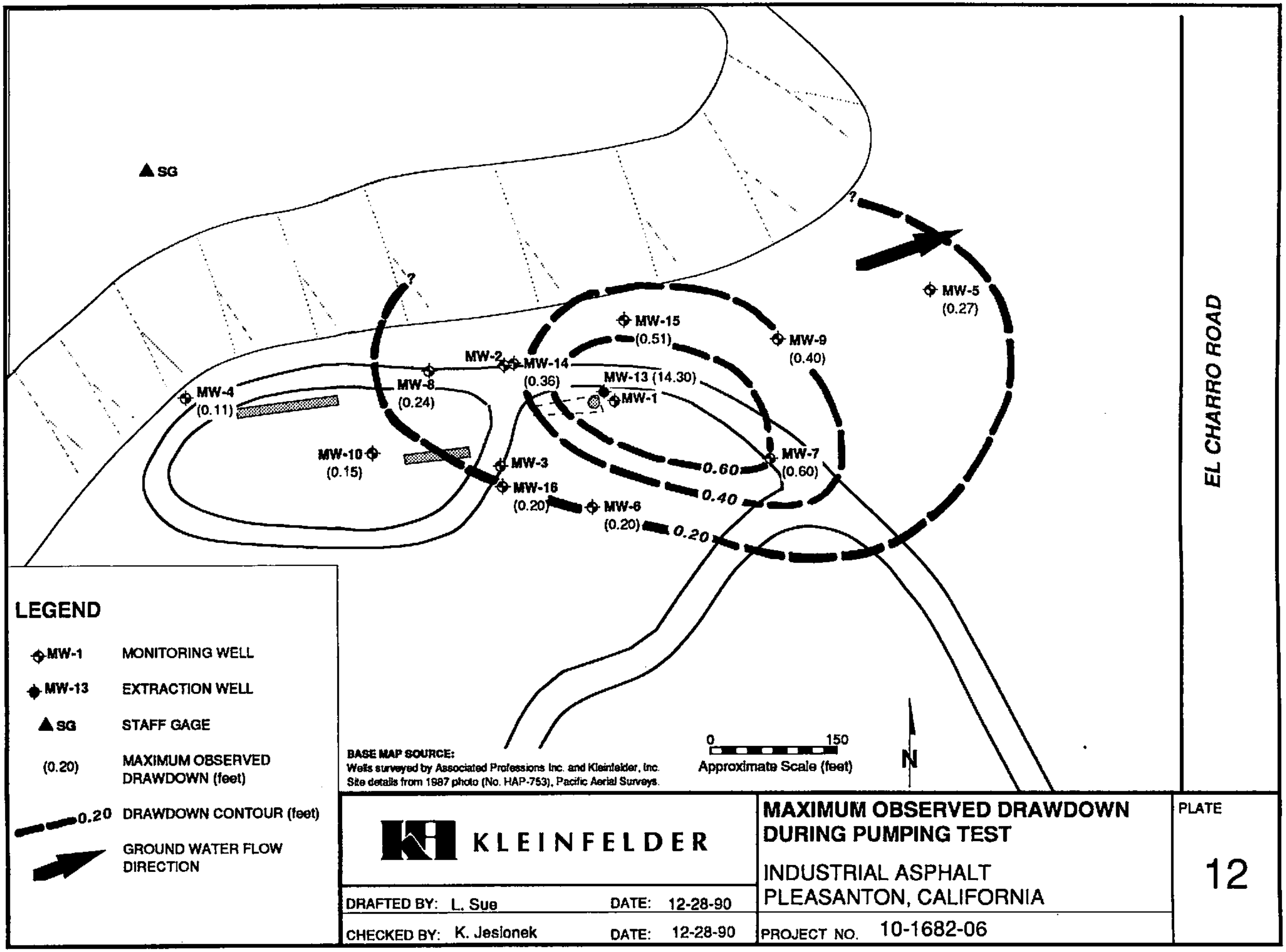
CHECKED BY: K. Jesionek DATE: 12-14-90

INFERRED EXTENT OF DISSOLVED HYDROCARBONS — 22 OCTOBER 1990

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE
11



BASE MAP SOURCE:
Wells surveyed by Associated Professions Inc. and Kleinfelder, Inc.
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

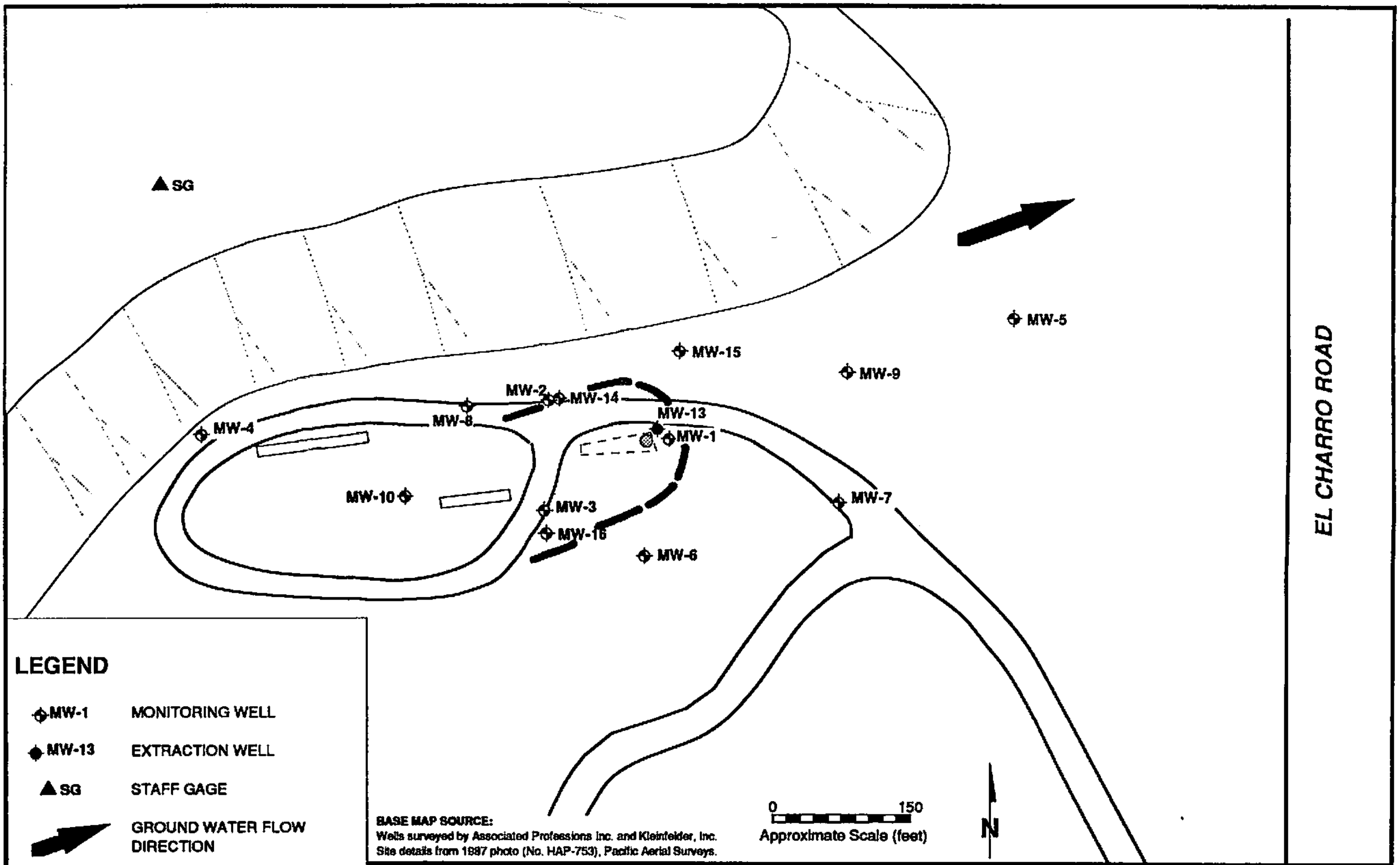
KLEINFELDER

MAXIMUM OBSERVED DRAWDOWN DURING PUMPING TEST

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PLATE
12

DRAFTED BY: L. Sue DATE: 12-28-90
CHECKED BY: K. Jeslonek DATE: 12-28-90
PROJECT NO. 10-1682-06



BASE MAP SOURCE:
Wells surveyed by Associated Professions Inc. and Kleinfelder, Inc.
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

KLEINFELDER

DRAFTED BY: L. Sue DATE: 12-28-90

CHECKED BY: K. Jesionek DATE: 12-28-90

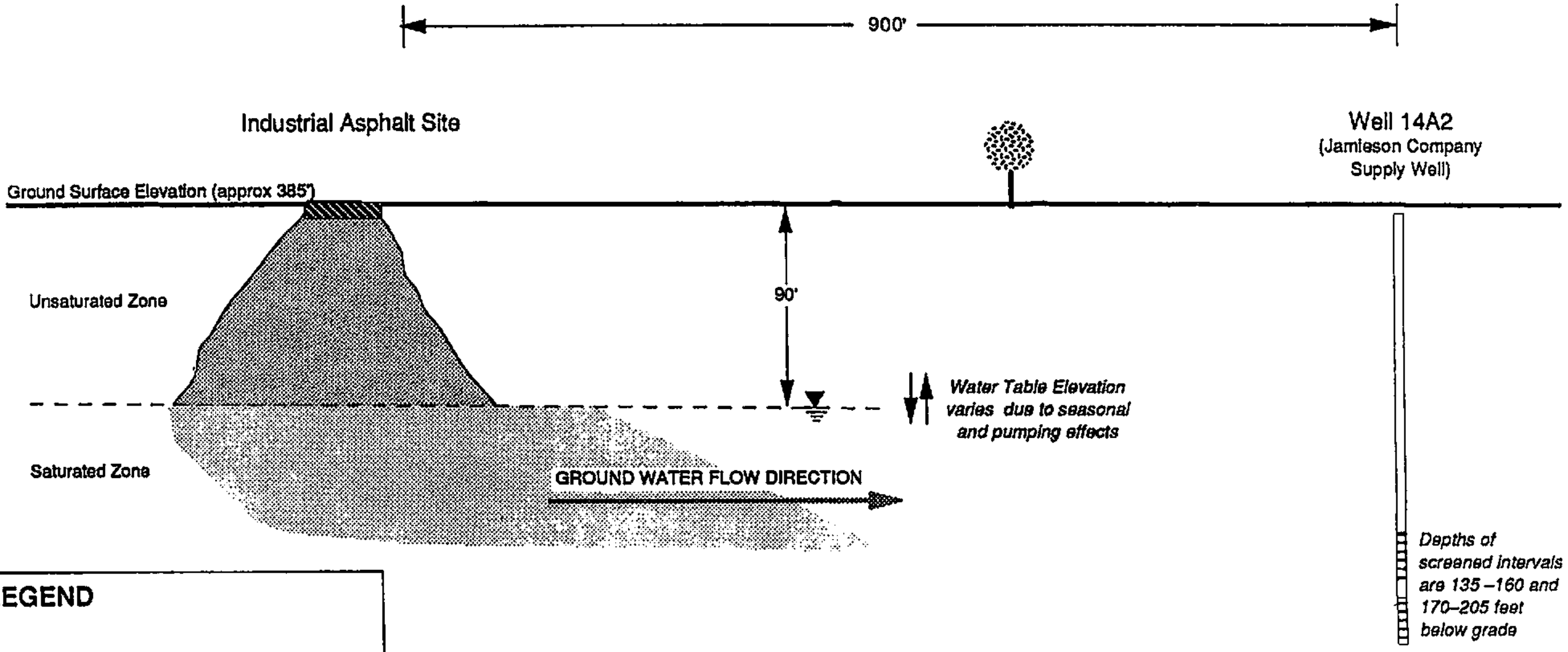
ESTIMATED GROUND WATER CAPTURE ZONE, Q = 2.6 gpm

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE

13



LEGEND

▽	WATER TABLE
▩	AFFECTED SOIL
░	AFFECTED SOIL AND GROUND WATER
▨	FORMER LOCATION OF UNDERGROUND STORAGE TANKS

NOT TO SCALE

NOTE:
Elevations are in feet, relative to mean sea level (MSL).

KLEINFELDER

DRAFTED BY: L. Sue DATE: 12-20-90

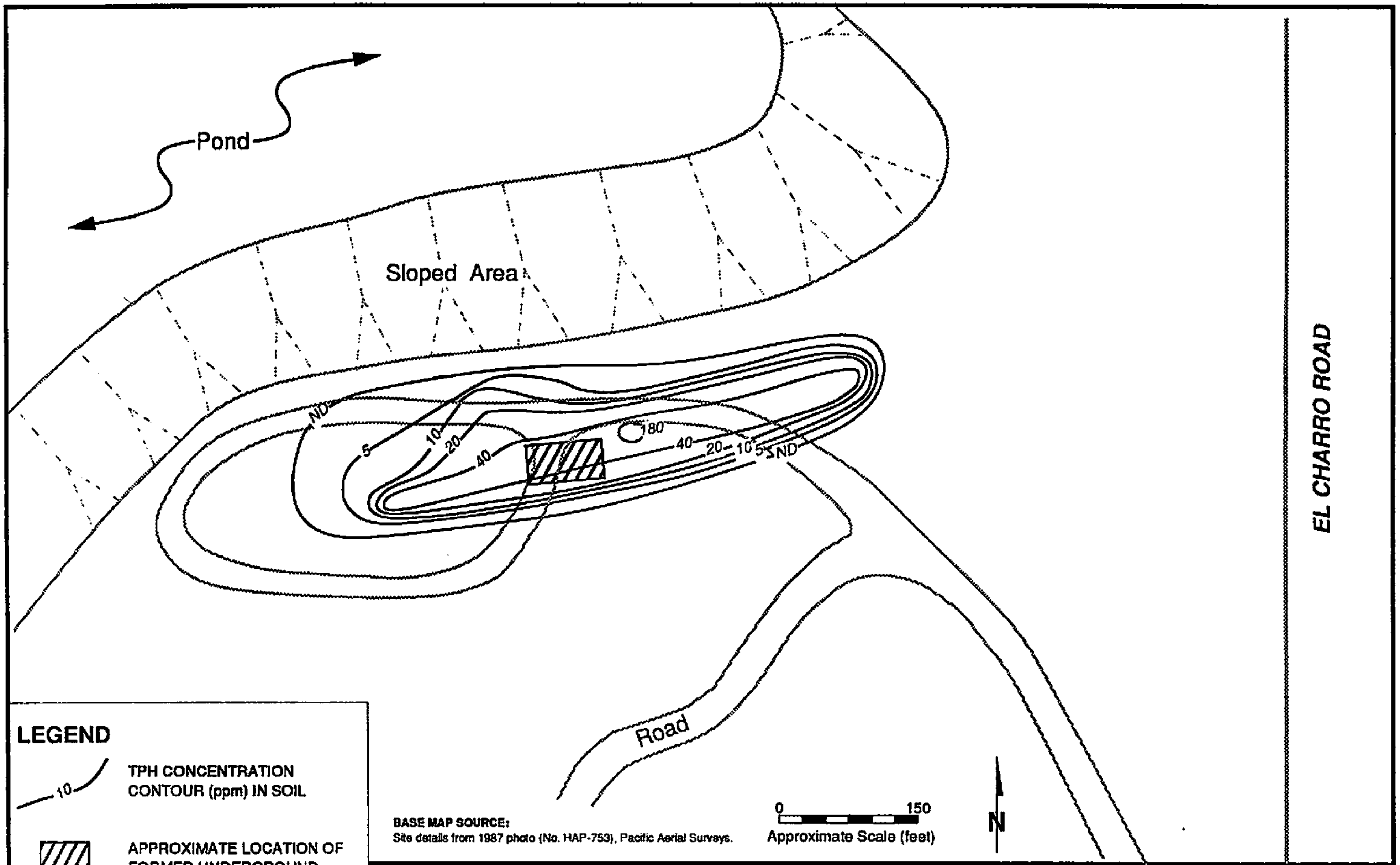
CHECKED BY: R. Lindfors DATE: 12-20-90

CONCEPTUAL SUBSURFACE MODEL

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE
14



BASE MAP SOURCE:
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

LEGEND

10	TPH CONCENTRATION CONTOUR (ppm) IN SOIL
▨	APPROXIMATE LOCATION OF FORMER UNDERGROUND STORAGE TANKS
TPH	TOTAL PETROLEUM HYDROCARBONS
ND	NOT DETECTED

KLEINFELDER

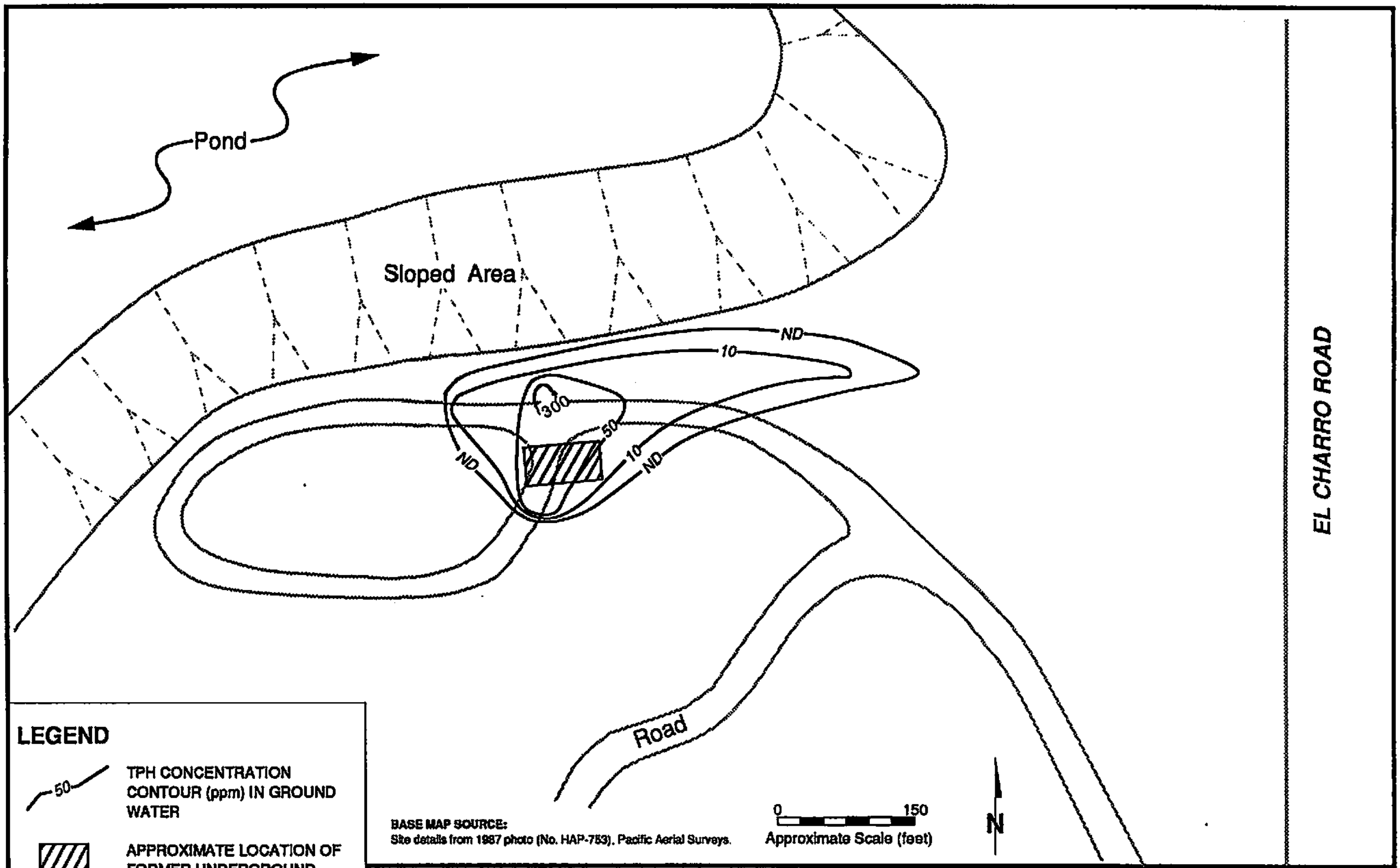
DRAFTED BY: L. Sue DATE: 12-28-90
CHECKED BY: R. Lindfors DATE: 12-28-90

INFERRED TPH CONCENTRATION ISOCONTOURS IN SOIL

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE
15



BASE MAP SOURCE:
Site details from 1987 photo (No. HAP-753), Pacific Aerial Surveys.

LEGEND

∕50∕	TPH CONCENTRATION CONTOUR (ppm) IN GROUND WATER
▨	APPROXIMATE LOCATION OF FORMER UNDERGROUND STORAGE TANKS
TPH	TOTAL PETROLEUM HYDROCARBONS
ND	NOT DETECTED

KLEINFELDER

DRAFTED BY: L. Sue DATE: 12-20-90
CHECKED BY: R. Lindfors DATE: 12-21-90

INFERRED TPH CONCENTRATION ISOCONTOURS IN GROUND WATER

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PROJECT NO. 10-1682-06

PLATE
16

REMEDIAL INVESTIGATION (RI)
REPORT
INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

APPENDIX A - G

28 December 1990

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	G W	Well-graded gravels or gravel sand mixtures, little or no fines
		G P	Poorly-graded gravels or gravel sand mixture, little or no fines
		G M	Silty gravels, gravel-sand-silt mixtures
		G C	Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS	S W	Well-graded sands or gravelly sands, little or no fines
		S P	Poorly-graded sands or gravelly sands, little or no fines
		S M	Silty sands, sand, and silt mixtures
		S C	Clayey sands and clay mixtures

MAJOR DIVISIONS		LTR	DESCRIPTION
FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	M L	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		C L	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		O L	Organic silts and organic silt-clays of low plasticity
	SILTS AND CLAYS LL > 50	M H	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts
		C H	Inorganic clays of high plasticity, fat clays
		O H	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS		P t	Peat and other highly organic soils

◩	Standard penetration split spoon sample
▮ ⊟	Modified California (Porter) sample
I	Shelby tube sample
∇	Water level observed in boring
▼	Stabilized water level
NFWE	No free water encountered
NOSC	No odor, scent, or fluid cut
OVA	Organic Vapor Analyzer
PID	Total organic vapors (parts per million) measured by a photoionization device

□	Blank casing
⬚	Screened casing
⬚	Cement grout
▨	Bentonite
░	Sand pack or gravel pack
□	Discolored soil

NOTES Blow counts represent the number of blows of a 140-pound hammer falling 30 inches required to drive a sampler through the last 12 inches of an 18-inch penetration.

The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

References to plasticity of cohesive soils are based on qualitative field observations and not on quantitative field or laboratory tests. Qualitative soil plasticity is noted solely to aid in stratigraphic correlation and is not intended for geotechnical characterization of soils.

KLEINFELDER

PROJECT NO 10-1682-06

BORING LOG LEGEND

INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

PLATE
A-1

KLEINFELDER

Project Industrial Asphalt	Boring No. SB-1
Number 10-1682-06	
Total Depth 116.5 feet	Sheet 1 of 5

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information Industrial Asphalt 52 El Charro Road Pleasanton, CA	Township/Range/Section 3S/1E/11
Site Location (if different)	Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company	Water Development Company
Driller/Crew	Rob/Mac. Braden
Rig Make/Model	Drill Tech D640
Bit & Size	8-inch diam., 10-inch Crow-end Bit
Hammer Data	Wt. 750 pounds Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-4-90	6-6-90
Completion		
Development		

Well Development and Construction

Monumentation	Development Info.
Ref. Pt. Description *See Table 3*	
Elevations Ref. Pt. Ground	
Datum	
Markings	

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% Bentonite	0 feet	116.5 feet

Field Hydrologic Operations

Weather	Date	Time	Water Level	Other Observations
Recent Rainfall? Irrigation?				
Nearby Wells Pumping?				
Ditches? Utility Courses?				

Remarks

Plate
A-2

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 116.5 feet
Sheet: 2 of 5
Boring No.: SB-1

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					SP	SAND- light olive brown (2.5Y 5/4), damp, medium with occasional fine gravel to 1 inches in diameter, subrounded to subangular	NOSC	
2									
4									
6									
8									
10									
12						GM	SILTY SANDY GRAVEL- olive (5Y 5/6), moist, fine to medium sand, fine to medium gravel, 10% silt, brownish liquid mixture	very strong odor	
14									
16			100	24					
18									
20	43075			22		GP	GRAVEL- moist to wet, no sand or silt, angular to subangular to 3/4 inch diameter, brown liquid present	strong odor	
22									
24						GM	SILTY to CLAYEY GRAVEL- olive (5Y 5/4), moist, fine grain silty clay mixed with gravel to 1/2 inch diameter		
26				19					
28							thin veins of discolored soil, slight odor	moderate odor	
	Grab					SP	SAND- gray (5Y 4/0), dry, fine to coarse, subrounded		
30									

Designated Purpose(s) of Log: Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman Date: 6-4-90
Drafted by: J. Leong Date: 7-11-90
Supervised by: K. Jesionek

Plate A-2

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-1
Number 10-1682-06/69		
Total Depth 116.5 feet	Sheet 3 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						SP	SAND- as above		
	43076	■	30	24		GP	SANDY GRAVEL- gray (5Y 5/1), dry, fine to coarse sand, medium to coarse gravel with cobbles to 3 inches in diameter	moderate odor	
32									
						GM	SILTY to slightly CLAYEY GRAVEL- very dark gray (5Y 3/1), moist, subrounded gravel to 4 inches in diameter, asphalt-like material in coarse fraction of sample	very strong odor	
34									
36		■		22					
38	Grab		50						
40									
	43077	■	100	21				very strong odor	
42									
44	Grab							strong odor	
46		■	0	18				no recovery	
48									
50									
	43078	■	75	22				strong odor	
52									
54									
56		■	30	32			SILTY to slightly CLAYEY GRAVEL- very dark grayish brown (2.5Y 3/2), moist, asphalt-like material present in finer material, rounded clasts to 4 inches in diameter	very strong odor	
58							slight increase in sand content 5% to 10%		
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-4-90	Plate A-2
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-1
Number 10-1682-06/69		
Total Depth 116.5 feet	Sheet 4 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SILTY to slightly CLAYEY GRAVEL- as above	no recovery	
62	*Grab*		0				increasing clay content *asphalt-like material* absent	strong odor	
64	43079 *Grab*							strong odor	
66			0						
68							sampler came up wet- very little recovery due to cobble which are larger than 2.5 inches in diameter. Producing 1 to 2 gpm of water from zone 70 to 72 feet. Water has no apparent odor		
70						GP	SANDY GRAVEL- olive (5Y 5/4), wet, rounded to subrounded, clasts to 3 inches in diameter	water production stopped	
	Grab		0	29				▼	
72								No apparent petroleum odor	
74	*Grab*					GP/ SP	SANDY GRAVEL- as above	NOSC	
76	43080		30	27		GP/ GM	SANDY to SILTY GRAVEL- olive (5Y 5/4), moist to wet, medium to coarse sand, fine to coarse gravel to 3 inches in diameter	slight odor	
78									
	Grab					SM	SILTY SAND- olive gray (2.5Y 4/2), moist to wet, medium to coarse, subrounded to subangular		
80								no recovery	
82	*Grab* 43081		0	23				moderate odor	
84									
86	*Drive* *43082*		100	28		SM	SILTY SAND- light olive brown (2.5 Y 5/4), moist, fine to coarse grained with occasional cobbles	possible slight odor	
88									
90									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-4-90	Plate A-2
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 116.5 feet
Sheet: 5 of 5
Boring No.: SB-1

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						SM	SILTY SAND- as above		
			0					water production = 1 gpm	
92	Grab							▼	
						GM	SILTY to SANDY GRAVELLY SAND- olive brown (2.5Y 4/4), wet, fine to medium grained, fine to coarse gravel, round to subrounded; 5% to 10% silt, 5% to 10% sand, 70% gravel; occasional cobbles to 6 inches in diameter		
94								Water production from discharge has stopped	
96			100	25			wet		
98	Grab								
100							apparent saturated zone		
102	Grab								
104	Grab								
106	Grab		17	40			silt content increasing		
108	Bag								
110	Drive		70	30			very little sand, silt content increasing to 40%		
112	Grab								
114	Grab					ML	Slightly CLAYEY SILT- light yellowish brown (2.5Y 5/4) with strong brown (7.5YR 4/6), damp, some floating gravel	Base of water zone	
	Drive								
116			70	22					
118									
120									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman Date: 6-4-90
Drafted by: J. Leong Date: 7-11-90
Supervised by: K. Jesionek

Plate A-2

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-2
Number 10-1682-06		
Total Depth 101.5 feet	Sheet 1 of 5	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information Industrial Asphalt 52 El Charro Road Pleasanton, CA	Township/Range/Section 3S/1E/11
Site Location (if different)	Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew: Garry/Mario

Rig Make/Model: Drill Tech D640

Bit & Size: 8-inch diam., 10-inch Crow-end Bit

Hammer Data: Wt. 140 pounds Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	3-1-90	5-31-90
Completion		
Development		

Well Development and Construction

Monumentation

Ref. Pt. Description: *See Table 3*

Elevations

Ref. Pt. Ground

Datum

Markings

Development Info.

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% Bentonite	0 feet	101.5 feet

Field Hydrologic Operations

Weather

Recent Rainfall? Irrigation?

Nearby Wells Pumping?

Ditches? Utility Courses?

Date	Time	Water Level	Other Observations

Remarks

Grout with cement/bentonite mixture; boring redrilled 5-31-90 by Water Development Corporation using a Drill-Tech Dk-40 (Air) rig with 10-inch with Crow-end bit.

Plate A-3

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

Project	Boring No.
Industrial Asphalt	SB-2
Number: 10-1682-06/69	
Total Depth: 101.5 feet	Sheet: 2 of 5

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks
0						SP	SAND- brown (10YR 5/3), fine coarse gravel, rounded to subrounded clasts, 20% gravel	NOSC
5						CL	SILTY CLAY- dark brown (10YR 3/3) dry, stiff, moderate plasticity	
6	43029		100	12				
13								NOSC
16			100	16				
21	43030		100	18			GRAVELLY CLAY- dark brown (10YR 3/3), damp, stiff, moderate plasticity, 5% gravel	
23.5						GP	SANDY GRAVEL- dark brown (10YR 3/3), damp, very coarse sand, subrounded clasts, 30% to 40% sand	NOSC
25			40	48 50/5"				

Designated Purpose(s) of Log: Site Characterization

Note: Logs are to be used only for designated purpose(s).

		Plate
Logged by: J. Friedman	Date: 5-31-90	A–3
Drafted by: J. Leong	Date: 7-11-90	
Supervised by: K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-2
Number 10-1682-06/69		
Total Depth 101.5 feet	Sheet 3 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	SANDY GRAVEL- dark brown (10YR 3/3), dry, medium to coarse sand, 10% to 20% sand		
	43031		50	38 50/5"					
32									
								NOSC	
34						GP	SILTY SANDY GRAVEL- dark brown (10YR 3/3), damp, subangular clasts to 3/4 inches in diameter		
			80	40 50/4"					
36									
38									
40							no clasts		
	43032		50	30 50/3"					
42									
44								no recovery	
46			0	50/2"					
48									
50	43033						moist to damp		
			100	70/6"					
52									
54								no recovery	
56			0	50/3"					
								NOSC no cutting returns	
58									
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 5-31-90	Plate A–3
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project
Industrial Asphalt
Number
10-1682-06/69
Total Depth
101.5 feet
Sheet
4 of 5
Boring No.
SB-2

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SILTY SANDY GRAVEL- brown (10YR 5/3), with indication of clay lenses, discoloration (?)	No recovery	
			0	50/3"					
62									
64								No recovery	
66			0	50/2"					
68									
70	43034		100	90/6"					
72									
74			0	50/2"					
76									
78									
80	43035		100	60/5"			SILTY to CLAYEY SANDY GRAVEL- brown (10YR 5/3), with yellowish brown clay stringers (10YR 5/4), greenish gray discoloration, very moist	TD= 81 feet of hole completed 3/1/90	
82						CL	GRAVELLY CLAY- olive (5Y 4/4), moist, minor amount of *silt and sand* is clay matrix		
84									
86	*Grab*		13	24				NOSC, no discoloration	
88							some large clasts to 6 inches in diameter		
90									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by
J. Friedman
Date:
5-31-90
Drafted by
J. Leong
Date:
7-11-90
Supervised by
K. Jesionek

Plate
A–3

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-2
Number 10-1682-06/69		
Total Depth 101.5 feet	Sheet 5 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	44482		30	24		SM	SILTY SAND with GRAVEL- olive (5Y 5/6), very moist to wet, medium to coarse gravel, 10% gravel	NOSC, no discoloration ▼ DTW to first water approximately 91 to 92 feet	
92	Grab Grab					GP	GRAVEL- no color change, wet, rounded to subrounded to 2 inch diameter, little to no fines	NOSC	
94						GM	SILTY to SANDY GRAVEL- moist to wet		
						SM	SILTY to GRAVELLY SAND- moist to wet, medium to coarse subangular to subrounded		
96				20					
							decreasing moisture content		
98	Grab								
100	44483		30	17		SM	increasing silt content		
102									
104									
106									
108									
110									
112									
114									
116									
118									
120									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 5-31-90	Plate A–3
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-4
Number 10-1682-06		
Total Depth 131.5 feet	Sheet 1 of 6	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information Industrial Asphalt 52 El Charro Road Pleasanton, CA	Township/Range/Section 3S/1E/11
	Other Identifiers
Site Location (if different)	

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company Water Development Company	Driller/Crew Garry/Mario
Rig Make/Model Drill Tech D640	
Bit & Size 8-inch diam., 10-inch Crow-end Bit	
Hammer Data Wt. 750 pounds Drop 30 inches	

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	2-28-90	5-30-90
Completion		
Development		

Well Development and Construction

Monumentation	Development Info.
Ref. Pt. Description *See Table 3*	
Elevations Ref. Pt. Ground	
Datum	
Markings	

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% bentonite	0	131.5 feet

Field Hydrologic Operations

	Date	Time	Water Level	Other Observations
Weather				
Recent Rainfall? Irrigation?				
Nearby Wells Pumping?				
Ditches? Utility Courses?				

Remarks

Drilling refusal at 73.5 feet, did not go through dislocation zone. Redrilled on 5-29-90 by Water Development Corporation, using Drill Tech Dk 40 10-inch Crow-end bit.

Plate

A-5

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-4
Number 10-1682-06/69		
Total Depth 131.5 feet	Sheet 2 of 6	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	GRAVEL with SAND- brown (10YR 5/3), damp, rounded clasts		
2									
4									
6									
8									
10									
			60						
12								NOSC	
14									
16			20	14					
			100						
18						ML	CLAYEY SILT- dark yellowish brown (10YR 3/6), damp, hard occasional floating coarse sand		
20									
			100	46					
22	43021					CL	SILTY CLAY- dark yellowish brown (10YR 3/6), 1 inch floating clast		
						GM	SILTY GRAVEL-3 inch thick lens		
			100			CL	SILTY CLAY fine sand, fine gravel to 2 inches diameter, rounded to subrounded, floating gravel at 23.75 feet		
24									
26									
			60				increasing clast size to 5 inches diameter		
28						GP	SANDY GRAVEL- dark brown (10YR 3/3), damp, medium sand, rounded to subrounded clasts; estimated 60% to 70% large clasts, 40% to 30% coarse sand		
30									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 5-30-90	Plate A-5
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-4
Number 10-1682-06/69		
Total Depth 131.5 feet	Sheet 3 of 6	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
				50/6 50/6 48		GP	SANDY GRAVEL- as above		
								no recovery — rock in tip	
32	43022		100			SP	GRAVELLY SAND- dark brown (10YR 3/3), damp, rounded to subrounded igneous clasts; estimate 20% to 10% large clasts, 80% to 90% sand		
34			70				GRAVELLY SAND- dark brown (10YR 3/3), damp, 10% to 20% clasts 5 inches, fine to medium sand with some silt		
36			60			GM	SILTY GRAVEL- dark brown (10YR 3/3), very moist to wet, rounded clasts, very fine sand, increasing silt content to 50%		
38									
40	43023		60	28 50/6					
42			50			GP	SANDY GRAVEL- dark brown (10YR 3/3), wet, rounded to subrounded clasts, 5% silt	NOSC	
44									
46			60			GC	CLAYEY SANDY GRAVEL- yellowish brown (10YR 5/4), wet; estimate 10% to 20% clay, 10% to 20% sand, 50% to 60% gravel		
48						GM	SILTY SANDY GRAVEL- dark brown (10YR 3/3), estimate 10% to 20% silt, 20% to 30% gravelly sand, 50% to 60% gravel		
50	43024		50	35 50/3		GM/ GP	SILTY to SANDY GRAVEL- dark brown (10YR 3/3), wet, increase in fines to 50%		
52						GC	CLAYEY SANDY GRAVEL- yellowish brown (10YR 5/4), wet		
54			50						
56							At 56.25 feet first indication of soil; no change in lithology discoloration	petroleum odor	
58			0			GC/ GM	SILTY to CLAYEY GRAVEL- color change from to greenish gray , rounded clasts to 6 inches in diameter, contact defined by color change		
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 5-30-90	Plate A-5
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project	Industrial Asphalt
Number	10-1682-06/69
Total Depth	131.5 feet
Sheet	4 of 6
Boring No.	SB-4

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
							SILTY to CLAYEY GRAVEL- as above	Sample 43026 composited from core barrel	
	43026		75	87				no recovery	
62				50/3					
								very difficult drilling from 60 to 65 feet (.1 foot/minute)	
			50				color change to brown (10YR 5/3) at 63 feet,		
								slight odor	
64						GM	SILTY to slightly CLAYEY GRAVEL- very moist	strong odor in greenish gray zone	
			100						
66	43025			63/6			discoloration zone, 4 inches thick		
							SAME SILTY GRAVEL- greenish gray, brown mottling, discoloration along less clayey area, at 66 to 67 feet		
68			55						
70	43027			50/6		GP/ GM	SILTY to SANDY GRAVEL- brown (10YR 5/3), damp	slight odor	
72	43028 *Grab*					CL	SILTY CLAY- light olive brown (2.5Y 5/4), moist, moderate plasticity	slight petroleum odor	
74							SILTY to CLAYEY GRAVEL- yellowish brown (10YR 5/4) with green discoloration, moist to wet, rounded to subrounded clasts, low plasticity		
						GM		moderate odor	
76			100	28					
78							SAND- medium to coarse, rounded to subrounded	moderate odor	
						SP	SAND- olive brown (2.5Y 4/4), moist, very fine	moderate odor	
80									
82	44480 *Grab*		30	22		CL	SANDY to GRAVELLY CLAY- olive (5Y 4/3), moist, rounded to subrounded clasts		
84	*Grab*								
						GM	SILTY GRAVEL- olive (5Y 4/3), rounded to subrounded clasts to 6 inches in diameter	NOSC	
86			30	26					
	Grab						increasing in gravel size		
88	*Grab*								
90									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	J. Friedman	Date: 5-30-90
Drafted by	J. Leong	Date: 7-11-90
Supervised by	K. Jesionek	

Plate

A-5

KLEINFELDER

LOG OF BORING

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 131.5 feet
Sheet: 5 of 6
Boring No.: SB-4

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SILTY GRAVEL- as above		
	44481 *Grab*		30	26		SM	SILTY SAND- olive (5Y 4/3), moist, medium to coarse	NOSC	
92									
94	*Grab*							First water production at 94.5 feet	
			70	24		GP	SANDY GRAVEL- olive gray (5Y 4/2), wet, medium sand, fine gravel to 3/4 inch in diameter, rounded to subrounded	Producing 1 to 2 gpm from discharge NOSC	
96	*Grab*								
98	*Grab*					GM	SILTY to SANDY GRAVEL- light olive brown (2.5Y5/4), very wet decreasing silt and fine sand content		
100						GP	GRAVEL- 10% to 20% sand		
			20	30					
102	*Grab*								
104	*Grab*					CL	SANDY to GRAVELLY CLAY- olive brown (2.5Y 4/4), moist, fine to coarse sand, moderate plasticity, gravel clast to 5 inches in diameter	Approximate bottom of first producing zone 95 to 104 ft. = 9 ft.	
106	*Grab*								
108	*Grab*								
110								appears to be producing water	
112	*Grab*								
114	*Grab*								
116									
118									
120	*Grab*								

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman Date: 5-30-90
Drafted by: J. Leong Date: 7-11-90
Supervised by: K. Jesionek
Plate A-5

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-4
Number 10-1682-06/69		
Total Depth 131.5 feet	Sheet 6 of 6	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					GP	GRAVEL- olive brown (2.5 Y 4/4), very wet, rounded to subrounded clasts to 2 inches diameter; estimate 5% to 10% coarse sand	Second water bearing zone at 120 feet ▼	
122									
124									
	Grab								
126									
128									
		■	100	28		GM	SILTY SANDY GRAVEL- same as above, wet, increasing silt content		
130									
132									
134									
136									
138									
140									
142									
144									
146									
148									
150									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 5-30-90	Plate A-5
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-5
Number 10-1682-06		
Total Depth 131 feet	Sheet 1 of 6	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information

Industrial Asphalt
52 El Charro Road
Pleasanton, CA

Site Location (if different)

Township/Range/Section: 3S/1E/11

Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew: Bill Braden/Felix

Rig Make/Model: Drill Tech D640

Bit & Size: 10-inch Crow-end Bit

Hammer Data Wt. 740 pounds Drop 30 inches

Task	*Start* (Date, Time)	Finish (Date, Time)
Drilling	6-13-90	6-14-90
Completion		
Development		

Well Development and Construction

Monumentation

Ref. Pt. Description

See Table 3

Elevations

Ref. Pt. Ground

Datum

Markings

Development Info.

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% Bentonite	0 feet	131.0 feet

Field Hydrologic Operations

Weather	Date	Time	Water Level	Other Observations
Recent Rainfall? Irrigation?				
Nearby Wells Pumping?				
Ditches? Utility Courses?				

Remarks

Plate

A-6

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

Project Industrial Asphalt		Boring No.
Number 10-1682-06/69		SB-5
Total Depth 131 feet	Sheet 2 of 6	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						ML	Slightly CLAYEY SILT- dark yellowish brown (10YR 3/6), dry, coarse sand to fine gravel, rounded to subrounded floating clasts		
	Grab								
2									
4									
6									
8									
10	*Grab*								
12									
14									
16			70	24					
							color change to dark brown (10YR 3/3)		
18									
20									
	43105		*80*	28					
22									
24									
26			100	31					
							very gradational contact		
28						CL	SILTY CLAY- dark brown (10YR 3/3), dry, low plasticity, subrounded to subangular clasts to 1/2 inches, coarse sand to fine gravel		
30									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-14-90	Plate
Drafted by J. Leong	Date: 7-11-90	A-6
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-5
Number 10-1682-06/69		
Total Depth 131 feet	Sheet 3 of 6	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						CL	SILTY CLAY- as above		
	43106		100	30					
32									
34									
36			100	24		ML	CLAYEY SILT- dark brown (10YR 3/3), dry, floating clasts		
38									
40									
	43107		100	24			slight increase in clast content 10%		
42									
44									
46			100	24					
48							very gradational contact		
						CL	SILTY CLAY- very dark brown (10YR 2/2), dry, moderate plasticity, very coarse sand, occasional floating clasts	NOSC	
50									
	43108		70	18					
52									
54									
56			70	27					
58									
60						ML	CLAYEY SILT- as below		

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-14-90	Plate A-6
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project	Boring No.
Industrial Asphalt	SB-5
Number: 10-1682-06/69	
Total Depth: 131 feet	Sheet: 4 of 6

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	43109		45	15		ML	CLAYEY SILT- very dark grayish brown (10YR 3/2), damp, floating clasts to 1/2 inch in diameter	NOSC	
62								base of clayey fill material?	
						GM	SILTY to slightly SANDY GRAVEL- dark yellowish brown (10YR 4/4), moist, subrounded to rounded, clasts to 4 inches in diameter, some cobbles		
64									
66			30	16					
68									
70									
	43110		30	20			color change to olive brown (2.5Y 4/4), very moist, subrounded to rounded cobbles to 6 inches in diameter		
72									
74								No Recovery	
	Grab								
76			0						
78									
								No attempt to sample- too many large cobbles	
80									
	Grab 43111						very moist to wet, clasts to 1/2 inch in diameter		
82									
84									
	Grab								
86									
88									
	43112 Grab								
90									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	Date:	Plate
J. Friedman	6-14-90	A-6
Drafted by: J. Leong	Date: 7-11-90	
Supervised by: K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt	Boring No. SB-5
Number 10-1682-06/69	
Total Depth 131 feet	Sheet 5 of 6

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SILTY GRAVEL- as above		
92									
94									
	Grab								
96									
98									
100	*Grab*								
102									
104									
106									
108									
	Grab								
	Grab							first water at 110 feet ▽	
110						GP	GRAVEL- very wet, minor sand (10%), clast subrounded to subangular to 3 inches diameter		
112									
114									
116									
118									
	Grab					GM/SM	SILTY SAND with fine GRAVEL- olive brown (2.5Y6/6), wet	water production ceases	
120	*Grab*								

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-14-90	Plate A-6
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project	Boring No.
Industrial Asphalt	SB-5
Number 10-1682-06/69	
Total Depth 131 feet / Sheet 6 of 6	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					GM/ SM	SILTY SAND with *fine GRAVEL*- as above		
122									
124							moist to wet		
	Grab								
126								second water bearing zone at 127 feet; difficult to remove cuttings. Stopped to take drive sample and try and clear drill pipe ▽	
128						GP	GRAVEL- little or no fines, coarse foundation from 127 to 130 feet which may cause drill rig losing circulation		
130			100	36					
132									
134									
136									
138									
140									
142									
144									
146									
148									
150									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	Date:	Plate
J. Friedman		A-6
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-6
Number 10-1682-06		
Total Depth 112 feet	Sheet 1 of 5	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information

Industrial Asphalt
52 El Charro Road
Pleasanton, CA

Site Location (if different)

Township/Range/Section
3S/1E/11

Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew: Bill Braden/Felix

Rig Make/Model: Drill Tech D640

Bit & Size: 10-inch Crow-end Bit

Hammer Data: Wt. 740 pounds Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-12-90	6-13-90
Completion		
Development		

Well Development and Construction

Monumentation

Ref. Pt. Description

See Table 3

Elevations

Ref. Pt. Ground

Datum

Markings

Development Info.

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% Bentonite	0 feet	112 feet

Field Hydrologic Operations

Weather

Recent Rainfall? Irrigation?

Nearby Wells Pumping?

Ditches? Utility Courses?

Date	Time	Water Level	Other Observations

Remarks

Plate

A-7

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-6
Number 10-1682-06/69		
Total Depth 112 feet	Sheet 2 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	SANDY GRAVEL- probably fill material gravel angular to subangular 1/2 to 3/4 inch in diameter; 50% sand, 50% gravel		
2	Grab								
4	Grab								
6									
8									
10	Grab								
12									
14									
						CL	SILTY CLAY- dark yellowish brown (10YR 3/6), damp, moderate plasticity, occasional floating rounded coarse sand grains, no apparent bedding		
16			100	23					
18							very gradational contact		
20									
	43098		100	26		ML	Slightly CLAYEY SILT- dark yellowish brown (10YR 3/6), *dry*, abundant floating rounded to subrounded clasts to 1/2 inch in diameter		
22						GP	*SANDY GRAVEL*- with cobbles up to 6 inches in diameter, grayish brown (10YR 5/2), dry		
24									
26			20	53					
28									
30									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-13-90	Plate A-7
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project	Industrial Asphalt
Number	10-1682-06/69
Total Depth	112 feet
Sheet	3 of 5
Boring No.	SB-6

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	Limited recovery, fractured rock clasts with sand		
			20	49					
32									
							color change to olive brown (2.5Y 4/4)		
34									
						GM	SILTY to SANDY GRAVEL- olive brown (2.5Y 4/4), dry, clasts rounded to subrounded, less than 5% sand, 20% to 30% silt, 40% to 60% gravel of cobbles		
36									
	Grab		0						
38									
40									
	43099 *Grab*								
42									
44									
46			20	40					
48									
50									
	Grab 43100		0						
52									
							slight decrease in gravel component to 50%		
54									
56			0	45					
58									
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	J. Friedman
Date:	6-13-90
Drafted by	J. Leong
Date:	7-11-90
Supervised by	K. Jesionek
Plate	A-7

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-6
Number 10-1682-06/69		
Total Depth 112 feet	Sheet 4 of 5	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SILTY GRAVEL- as above		
62	Grab 43101		0						
66			0				very moist to wet at 68 feet		
72	Grab 43102		0						
76			30	40			very moist		
82	43103		25	40					
86			30	28		GM/ ML	SILTY to slightly CLAYEY GRAVEL- with cobbles, olive brown (2.5Y4/4), damp to moist, clasts rounded to subrounded, finer matrix very moist, silt/gravel mixture approximately 50-50		
90									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-13-90	Plate A-7
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-6
Number 10-1682-06/69		
Total Depth 112 feet	Sheet 5 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	43104		60	44		GM	SILTY to SANDY GRAVEL- olive brown (2.5Y 4/4), moist, with cobbles to 5 inches in diameter		
92									
94									
96				46		GM	SILTY to SANDY GRAVEL- with cobbles, olive brown (2.5Y 4/4), moist, with cobbles		
98									
100	Grab								
							Same- olive brown, silty gravel to 109 feet		
102	Grab								
104	Grab								
106									
108									
	Grab Grab								
110							Large cobbles up to 6 inches in diameter, moist to wet, slight increase in sand content	First water at 110 ft., 1 to 2 gpm of water produced ▽	
112									
114									
116									
118									
120									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-13-90	Plate A-7
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-7
Number 10-1682-06		
Total Depth 112 feet	Sheet 1 of 5	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information Industrial Asphalt 52 El Charro Road Pleasanton, CA	Township/Range/Section 3S/1E/11
Site Location (if different)	Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company Water Development Company	Driller/Crew Bill/ Braden/Felix
Rig Make/Model Drill Tech D640	
Bit & Size 10-inch Crow-end Bit	
Hammer Data Wt. 740 pounds Drop 30 inches	

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-15-90	6-16-90
Completion		
Development		

Well Development and Construction

Monumentation	Development Info.
Ref. Pt. Description *See Table 3*	
Elevations Ref. Pt. Ground	
Datum	
Markings	

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% Bentonite	0 feet	112 feet

Field Hydrologic Operations

	Date	Time	Water Level	Other Observations
Weather				
Recent Rainfall? Irrigation?				
Nearby Wells Pumping?				
Ditches? Utility Courses?				

Remarks

Plate

A-8

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 112 feet
Sheet: 2 of 5
Boring No.: SB-7

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	Fill- GRAVEL and SAND	NOSC	
2									
4									
6									
8									
10						GP	Same fill material, appears to be composed of black volcanic looking material (coke from asphalt plant?)		
12									
14							sample collected of volcanic looking material		
	Grab		0			CL	Slightly SILTY CLAY- strong brown (7.5YR 4/6) damp		
16	Grab								
18							floating clast in clay, clast range in size from coarse sand to gravel (3/4 inch in diameter), angular & subrounded, (probably fill)		
20	43113		60	18		CL	SILTY CLAY with floating clast, strong brown (7.5 YR 4/6), angular to subrounded clasts to 3/4 inch in diameter		
22						GP	Fine GRAVEL- no sand, subrounded to subangular 1/2 to 3/4 inch in diameter		
24							increase in clast size to 4 to 5 inches in diameter, subrounded, granite clasts	no attempt to take sample	
26									
28						GM	SILTY to SANDY GRAVEL- with cobbles, dark grayish brown, (2.5Y 3/2), damp; sand: medium to coarse, subangular; fine to coarse gravel to 3/4 inch in diameter; estimate 40% to 50% silt, 5% to 10%, cobbles subrounded 1 to 5 inches in diameter 5% to 10%		
30									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman — Date: 6-16-90
Drafted by: J. Leong — Date: 7-11-90
Supervised by: K. Jesionek

Plate A-8

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-7
Number 10-1682-06/69		
Total Depth 112 feet	Sheet 3 of 5	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SILTY GRAVEL- as above		
	43114 *Grab*								
32									
34									
			100 100 100					Sampling not attempted due to presence of cobbles	
36									
38	*Grab*						damp		
40									
	43115		60	24					
42							decreasing sand content to 10%, cobble size decrease to 3 inches in diameter, very damp		
44									
46			0						
	Grab						color change to olive brown (2.5Y 4/4), very damp		
48									
50									
	43116 *Grab*		0				very damp		
52									
54									
							large cobbles >6 inches in diameter, sand content increases to 30%		
56			0						
58									
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-16-90	Plate A-8
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project
Industrial Asphalt
Number
10-1682-06/69
Total Depth
112 feet
Sheet
4 of 5
Boring No.
SB-7

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SANDY to SILTY GRAVEL- with cobbles, clast size 1/4 to over 5 inches in diameter		
62	*Grab* 43117		0						
64									
66									
68									
70									
	Grab 43118		0				increasing cobble content		
72									
74									
	Grab							No sample attempted--cobbles	
76									
78									
	Grab								
80									
	43119		50	24					
82									
84									
	Grab					GP	Slightly SILTY SANDY GRAVEL- moist to wet; estimate 10% to 20% sand, 70% to 80% gravel subrounded to subangular		
86									
88									
90									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by
J. Friedman
Date:
6-16-90
Drafted by
J. Leong
Date:
7-11-90
Supervised by
K. Jesionek

Plate
A-8

KLEINFELDER

Project Industrial Asphalt		Boring No.
Number 10-1682-06/69		SB-7
Total Depth 112 feet	Sheet 5 of 5	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					SM	SILTY SAND- light yellowish brown (2.5Y 6/4) , very wet, fine to coarse sand, subrounded to subangular	DTW 90 to 91 ft.	
92								Production to 1 gpm	
94									
96									
98	Grab								
	Grab					GC/ CL	SILTY CLAYEY GRAVEL to GRAVELLY CLAY- olive brown (2.5Y 4/4), moist		
100	Grab								
102									
						CL	GRAVELLY CLAY- olive brown (2.5Y 4/4), moist, poor plasticity; estimate 10% to 20% subrounded gravel		
104									
106									
	Grab							Top of 2nd water production zone	
108						SM	SILTY SAND- olive brown (2.5Y 4/4), very moist to wet, medium to coarse		
110						GP	SAND with GRAVEL- very wet,very coarse sand, medium to coarse gravel little or no sand fraction between clasts;subrounded to subangular		
			10	23					
112									
114									
116									
118									
120									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-16-90	Plate
Drafted by J. Leong	Date: 7-11-90	A-8
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt	Boring No. SB-8
Number 10-1682-06	
Total Depth 95 feet	Sheet 1 of 5

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information

Industrial Asphalt
52 El Charro Road
Pleasanton, CA

Site Location (if different)

Township/Range/Section
3S/1E/11

Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company
Water Development Company

Driller/Crew
Bill/Braden, Felix

Rig Make/Model
Drill Tech D640

Bit & Size
10-inch Crow-end Bit

Hammer Data Wt. 740 pounds Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-11-90	6-12-90
Completion		
Development		

Well Development and Construction

Monumentation

Ref. Pt. Description
See Table 3

Elevations
Ref. Pt. Ground

Datum

Markings

Development Info.

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% bentonite	0	95 feet

Field Hydrologic Operations

Weather

Recent Rainfall? Irrigation?

Nearby Wells Pumping?

Ditches? Utility Courses?

Date	Time	Water Level	Other Observations

Remarks

Plate
A-9

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-8
Number 10-1682-06/69		
Total Depth 95 feet	Sheet 2 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						ML	SILT- olive brown (2.5Y 4/4), dry		
2									
4	Grab								
6									
8									
10	Grab					ML	SILT- olive brown (2.5Y 4/4), dry, rounded to subrounded clasts to 1/2 inch diameter, with fine gravel		
12									
14									
16			0 6 6	18					
18									
20	43090		6 6 6	23		ML	SILT- olive brown (2.5Y 4/4), dry, slight indication of laminated bedding		
22						GM	SILTY GRAVEL- olive brown (2.5Y 4/.4), dry, gravel 1/2 inch in diameter, subrounded, minor amounts of sand		
24				40					
26									
28						GP	GRAVEL to COBBLES- clasts 1/2 to 6 inches in diameter, subrounded to subangular		
30									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-12-90	Plate A-9
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-8
Number 10-1682-06/69		
Total Depth 95 feet	Sheet 3 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	SANDY GRAVEL with COBBLES- light olive brown (2.5Y 5/4), dry, fine to medium sand, fine gravel, coarse (1/4 to 1/2 inch in diameter) cobbles 4 inches in diameter clasts rounded to subrounded		
	43091		100	31					
32									
34									
36			30	31					
38						GM	SILTY to SANDY GRAVEL- olive brown (2.5Y 4/4), damp, subrounded clasts to 4 inches in diameter; estimate 20% to 30% silt, 5% to 10% fine sand, 40% to 50% gravel		
40	43092								
	Grab		30	33		SM/ GM	SILTY SAND with GRAVEL- olive brown (2.5Y4/4), damp		
42									
44									
46			20	36			damp		
48									
50									
	43093		70	35					
52									
54									
56			30	38			less than 5% increase in sand		
58									
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-12-90	Plate A-9
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-8
Number 10-1682-06/69		
Total Depth 95 feet	Sheet 4 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	43094		70	28		GM	SILTY to SANDY GRAVEL with COBBLES- olive brown (2.5Y 4/4), dry, 10% to 15% fine to medium sand, 20% to 30% silt, 40% to 50% gravel, fine to coarse gravel, clasts up to 5 inches in diameter		
62						ML	CLAYEY SILT- light olive brown (2.5Y 5/3), damp		
64	Grab					GM	Very SILTY GRAVEL- olive brown (2.5Y 4/4), moist		
66			70	35					
68									
70	43095		70	37		GM	moist to wet		
72									
74								First indication of discoloration	
						GM	SANDY to SILTY GRAVEL- dark gray (10YR 4/1), in dark yellowish brown (10YR 4/0), liquid asphalt in sandy portion	dark gray represents diesel odor	
76	43096		70	63					
78									
80								discolored, moderate odor	
	43097		100	51					
82									
84									
86			30	39			moist to wet	NOSC no discoloration	
88									
90								First water at 90 ft. ▽	

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-12-90	Plate A-9
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-8
Number 10-1682-06/69		
Total Depth 95 feet	Sheet 5 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	GRAVEL & COBBLES- little or no fines	Producing ~1 gpm	▨
92							SILTY GRAVEL- very wet		▨
94	Grab					GM			▨
96									
98									
100									
102									
104									
106									
108									
110									
112									
114									
116									
118									
120									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-12-90	Plate A-9
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-9
Number 10-1682-06		
Total Depth 121.5 feet	Sheet 1 of 6	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information

Industrial Asphalt
52 El Charro Road
Pleasanton, CA

Site Location (if different)

Township/Range/Section: 3S/1E/11

Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew: Castro Pineda/Louis Ponce

Rig Make/Model: Drill Tech D640

Bit & Size: 10-inch Crow-end Bit

Hammer Data — Wt. 740 pounds — Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-7-90	6-8-90
Completion		
Development		

Well Development and Construction

Monumentation

Ref. Pt. Description

See Table 3

Elevations

Ref. Pt. Ground

Datum

Markings

Development Info.

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% Bentonite	0 feet	121.5 feet

Field Hydrologic Operations

Weather

Recent Rainfall? Irrigation?

Nearby Wells Pumping?

Ditches? Utility Courses?

Date	Time	Water Level	Other Observations

Remarks

Plate A-10

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-9
Number 10-1682-06/69		
Total Depth 121.5 feet	Sheet 2 of 6	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						ML	SILT with minor gravel and sand- brown (7.5YR 5/4), dry		
2									
4									
6									
8									
10									
12									
14									
16			70	17		ML	SILT- minor amount of sand, brown (7.5YR 5/4), dry		
18									
20									
22	43083 *Grab*		100	36		GP	GRAVEL to COBBLE- little or no fines, clasts to 3 inches in diameter, subrounded to subangular, appears to be granite		
24									
26			0						
28									
30	*Grab*							NOSC	

Designated Purpose(s) of Log Site Characterization		
Logged by J. Friedman	Date: 6-8-90	Plate A-10
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

Note: Logs are to be used only for designated purpose(s).

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. SB-9
Number 10-1682-06/69		
Total Depth 121.5 feet	Sheet 3 of 6	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP/ GM	GRAVEL and COBBLES- as above		
			0						
32									
34	Grab								
36			0						
	Grab					GM	SILTY to SANDY GRAVEL- olive brown (2.5Y 4/4), damp, 60% fine to medium gravel, 10% to 20% sand, 10% to 25% silt	NOSC	
38									
40									
	43084 Grab		0						
42									
44									
46			100	23			cobble to 6 inches in diameter	NOSC	
48									
50									
	43085		30	20			damp to moist, clast decreasing in size	NOSC	
52									
	Grab								
54									
	Grab						finer material is moist to wet, may have slight silt increase in sand		
56								no recovery	
	43086 Grab		0						
58									
							very moist to wet		
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-8-90	Plate A-10
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-9
Number 10-1682-06/69		
Total Depth 121.5 feet	Sheet 4 of 6	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SILTY to SANDY GRAVEL- light olive brown (2.5Y 5/4), moist, clasts up to 2 inches in diameter 5% to 10% sand and silt		
62									
64	Grab								
66			0						
68									
70	43087		70	29		ML	GRAVELLY to SLIGHTLY SANDY CLAYEY SILT- light olive brown (2.5Y 5/4), moist to wet, 10% to 20% gravel, 1/4 to 3/4 inch diameter subangular,10% to 20% fine to medium sand 40% to 60% slightly clayey silt, very low plasticity		
72						GM	SILTY to SANDY GRAVEL- very dark grayish olive brown (2.5Y 3/2), moist, clasts to 6 inches in diameter	odor at 72 feet	
74									
76	43088		30	31			wet	diesel odor	
78									
80			0				large cobbles 6 inches in diameter or larger		
82									
84									
86	43099		30	22		GM	color change to olive brown (2.5Y 5/4), very moist to wet	NOSC	
88									
90						GP	GRAVEL- as below	First water encountered at 89-90 ft. ▽	

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	Date:	Plate
J. Friedman	6-8-90	A-10
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt			Boring No. SB-9
Number 10-1682-06/69			
Total Depth 121.5 feet	Sheet 5 of 6		

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	GRAVEL- very wet, little or no fines	production ~1 gpm from 90 to 92 feet then no free water production	
			30	20					
92									
							SILTY & SANDY GRAVEL with cobbles-very moist to wet	rapid gradation change	
94	Grab								
96									
98									
100	Grab					GM	SANDY to SILTY GRAVEL- with cobbles up to 6 inches in diameter, rounded up to 2%, gravel 1/2 to 1 inch subrounded 50% to 60%,fine to medium sand 5% to 10%, silt 10% to 20%		
102	Grab								
104									
106									
	Grab						ncreasing silt content, decreasing water content		
108	Grab								
110									
112									
114									
								Bottom of water zone	
	Grab								
116	Grab					CL/ ML	Very SILTY CLAY- strong brown (7.5YR 5/6), damp to dry		
118									
	Grab								
120						GP	SANDY GRAVEL- as below		

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-8-90	Plate A-10
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project
Industrial Asphalt
Number
10-1682-06/69
Total Depth
121.5 feet
Sheet
6 of 6
Boring No.
SB-9

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
		■	100	24		GP	SANDY GRAVEL- gray (10YR 5/1), very wet, medium to coarse sand, fine to coarse gravel, some cobble size clasts, minor silt <5%, 30% to 40% sand, 40% to 50% gravel		
122									
124									
126									
128									
130									
132									
134									
136									
138									
140									
142									
144									
146									
148									
150									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by
J. Friedman
Date:
6-8-90
Drafted by
J. Leong
Date:
7-11-90
Supervised by
K. Jesionek
Plate
A-10

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-10
Number 10-1682-06		
Total Depth 124 feet	Sheet 1 of 6	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information

Industrial Asphalt
52 El Charro Road
Pleasanton, CA

Township/Range/Section: 3S/1E/11

Other Identifiers:

Site Location (if different):

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew: Bill/ Braden/Felix

Rig Make/Model: Drill Tech D640

Bit & Size: 10-inch Crow-end Bit

Hammer Data Wt. 740 pounds Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-18-90	6-19-90
Completion		
Development		

Well Development and Construction

Monumentation

Ref. Pt. Description

See Table 3

Elevations

Ref. Pt. Ground

Datum

Markings

Development Info.

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing			
Well Screen			
Gravel Pack			
Bentonite			
Concrete	5% Bentonite	0 feet	124 feet

Field Hydrologic Operations

Weather

Recent Rainfall? Irrigation?

Nearby Wells Pumping?

Ditches? Utility Courses?

Date	Time	Water Level	Other Observations

Remarks

Plate

A-11

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project	Industrial Asphalt
Number	10-1682-06/69
Total Depth	124 feet
Sheet	2 of 6
Boring No.	SB-10

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	SANDY GRAVEL- fine to medium, cobbler to 4 inches in diameter, clast subrounded		
2									
4									
6							Slightly CLAYEY SILT- dark brown (10YR 3/3), damp		
8						ML			
10									
12									
14									
16			100	23					
18						GP	SANDY GRAVEL- with cobbles		
20									
			0				CLAYEY SILT- dark brown (10YR 4/3), damp, subangular clasts with floating clasts to 1/2 inch diameter		
22						ML			
24						GP	SANDY GRAVEL- dark brown (10YR 4/3), dry, fine to medium sand, fine to coarse gravel with cobbles to 4 inches in diameter		
26			100	16					
28							Base of fill material		
30						GM	SILTY GRAVEL- as below		

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	J. Friedman
Date:	6-19-90
Drafted by	J. Leong
Date:	7-11-90
Supervised by	K. Jesionek
Plate	A-11

KLEINFELDER

Project	Industrial Asphalt
Number	10-1682-06/69
Total Depth	124 feet
Sheet	3 of 6
Boring No.	SB-10

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	43120	■	30	20		GM	SILTY GRAVEL- olive brown (2.5Y 4/4), damp, *medium to coarse gravel* with cobbles 4 inches in diameter subrounded, *40% silt 60% gravel*	NOSC	
32									
34									
36		■	80	20			SILTY to slightly SANDY GRAVEL- olive brown (2.5Y 4/4), damp, clast subrounded to subangular, fine to medium sand, 30% to 40% silt, 40% to 50% gravel, sand>10%		
38									
40									
42	43121 *Grab*	■	0	*24*			slight increase in clay content <5%, slightly moist		
44									
46									
48									
50									
52	*Grab*	■	0				very damp; approximately 10%, medium to coarse sand		
54									
56	*Grab*	■	0				moist, sand content decreasing to 5%		
58									
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	J. Friedman
Date:	6-19-90
Drafted by	J. Leong
Date:	7-11-90
Supervised by	K. Jesionek
Plate	A-11

KLEINFELDER

LOG OF BORING

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 124 feet
Sheet: 4 of 6
Boring No.: SB-10

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	43123		70	24		GM	SILTY GRAVEL- as above, olive brown (2.5Y4/4), damp to moist	NOSC	
62									
64							damp to moist		
66	Grab		0						
68									
70								Too many large cobblers, no attempt to collect a soil sample by driving	
	43124 Grab						many cobbles over 5 inches in diameter		
72									
74							slightly more moist, abundant large cobbles		
76			0						
78									
80							color change to light olive brown (2.5YR 5/4), very moist		
	43125		30						
82									
84									
86	Grab					GM/ GC	CLAYEY to SILTY GRAVEL- olive brown (2.5YR 4/4), very moist		
88								First water at 89 ft. ▽	
90	Grab					GP	GRAVEL- with cobbles, very wet, clasts up to 4 inches in diameter, subrounded	Production approximately 2 gpm	

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman — Date: 6-19-90
Drafted by: J. Leong — Date: 7-11-90
Supervised by: K. Jesionek
Plate A-11

KLEINFELDER

LOG OF BORING

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 124 feet
Sheet: 5 of 6
Boring No.: SB-10

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	GRAVEL- as above		
92									
								product stopped	
94						SM/ GM	SILTY SAND with GRAVEL & COBBLES- very moist to wet		
	Grab								
96									
98									
							Increasing clay content		
100									
								Base of first water zone ?	
102						GC/ CL	CLAYEY GRAVEL to GRAVELLY CLAY- damp to moist		
	Grab								
104									
106						GM	SILTY to CLAYEY GRAVEL- with coarse sand, very damp to moist		
108									
	Grab								
110									
112									
						GP	SANDY GRAVEL- very coarse sand and gravel		
114						CL	SILTY CLAY- light olive brown (2.5Y 5/6), damp		
116									
118									
			100	10		GM	SANDY SILTY GRAVEL- light olive brown (2.5Y5/6), moist		
120									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman Date: 6-19-90
Drafted by: J. Leong Date: 7-11-90
Supervised by: K. Jesionek

Plate A-11

KLEINFELDER

Project Industrial Asphalt		Boring No. SB-10
Number 10-1682-06/69		
Total Depth 124 feet	Sheet 6 of 6	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SANDY SILTY GRAVEL- as above		▨
122								2nd water zone ▼	▨
						GP	SAND & GRAVEL- fine to coarse, subangular to subrounded, mostly igneous	Production <1 gpm	▨
124									
126									
128									
130									
132									
134									
136									
138									
140									
142									
144									
146									
148									
150									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-19-90	Plate A-11
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. MW-13
Number 10-1682-06		
Total Depth 116 feet	Sheet 1 of 5	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information

Industrial Asphalt
52 El Charro Road
Pleasanton, CA

Township/Range/Section: 3S/1E/11

Other Identifiers:

Site Location (if different):

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew:

Rig Make/Model: Speedstar SS-16

Bit & Size: 10 1/4-inch Crow-end Bit

Hammer Data: Wt. 170 pounds Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	8-6-90	8-8-90
Completion	8-8-90	8-10-90
Development	8-14-90	8-14-90

Well Development and Construction

Monumentation

Ref. Pt. Description: *See Table 3*

Elevations: Ref. Pt. Ground

Datum:

Markings:

Development Info.:

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing	6", Sched 40 PVC	0	76 feet
Well Screen	Stainless Steel 0.045 Slot	76 feet	116 feet
Gravel Pack	Medium Aquarium	64 feet	116 feet
Bentonite	Bentonite Pellets	62 feet	64 feet
Concrete	Cement/bentonite	0	62 feet

Field Hydrologic Operations

Weather: Hot

Recent Rainfall? Irrigation? No

Nearby Wells Pumping? Yes

Ditches? Utility Courses? Yes

Date	Time	Water Level	Other Observations

Remarks

Air rotary with casing- 11 5/8" diameter threaded casing

Plate A-12

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 116 feet
Sheet: 2 of 5
Boring No. MW-13

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					GM/ GP	SILTY SANDY GRAVEL- grayish brown (2.5Y 5/2), dry, subrounded to subangular clasts to 1.5 inches in diameter		
2									
4									
6									
8						CL	CLAY- very dark grayish brown (2.5Y 3/2), dry	moderate odor	
10	Grab								
12									
14									
16									
18									
20	Grab							Approximate base of discolored soil	
22									
			100	14		CL	SILTY CLAY- olive brown (2.5Y 4/4), damp, rounded clasts to 1 inch in diameter		
24	Grab								
						GP	SANDY GRAVEL with COBBLES- light olive brown (2.5Y 5/6), dry, subrounded clasts up to 1/2 inches in diameter, unknown cobbles size		
26									
28									
30	Grab								

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman
Date: 8-6-90
Drafted by: J. Leong
Date: 8-13-90
Supervised by: K. Jesionek

Plate A-12

KLEINFELDER

Project	Boring No.
Industrial Asphalt	MW-13
Number 10-1682-06/69	
Total Depth 116 feet · Sheet 3 of 5	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					GP	SANDY GRAVEL- as above		
32									
34									
36									
38									
	Grab						Drive sample not attempted due to presence of cobbles		
40									
						GM	SILTY GRAVEL- olive brown (2.5Y 4/4), damp		
42									
44									
46									
48									
	Grab								
50									
52									
54									
56									
58									
	Grab								
60						CL	CLAY with fine GRAVEL- as below		

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 8-6-90	Plate
Drafted by J. Leong	Date: 8-13-90	A-12
Supervised by K. Jesionek		

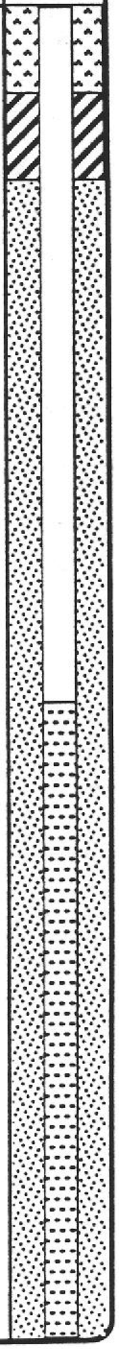
KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. MW-13
Number 10-1682-06/69		
Total Depth 116 feet	Sheet 4 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks
		■	30	7/12		GM/ GC	SILTY to CLAYEY GRAVEL- olive brown (2.5Y 4/4), dry	NOSC, no discoloration
62								
64								
66								
68	Grab							
70								
72								
74								
76								
78								
80	Grab							
82							Same SILTY to CLAYEY GRAVEL- very moist, increasing moisture content, increasing clay content	
84								
86								
88								
90	Grab							

Well Construction



Designated Purpose(s) of Log	Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 8-6-90	Plate A-12
Drafted by J. Leong	Date: 8-13-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project	Boring No.
Industrial Asphalt	MW-13
Number 10-1682-06/69	
Total Depth 116 feet	Sheet 5 of 5

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					GM/ GC	SILTY to CLAYEY GRAVEL- olive brown (2.5Y 4/4), very moist, increasing moisture content, increasing clay content	water production ~ 2 gpm	
92						GP/ GW	SANDY GRAVEL- very wet, medium to coarse sand, fine to coarse gravel	▼	
94									
96									
98									
100									
	Grab								
102									
104									
106									
108									
110	*Grab*					GP/ GM	SANDY GRAVEL- minor silt content	water production ~ 1 gpm	
112									
114									
116									
118									
120									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	Date:	Plate
J. Friedman	8-6-90	A-12
Drafted by J. Leong	Date: 8-13-90	
Supervised by K. Jesionek		

KLEINFELDER

BORING AND MONITORING-WELL DATA SHEET

Project Industrial Asphalt		Boring No. MW-14
Number 10-1682-06		
Total Depth 114.5 feet	Sheet 1 of 5	

Location

Owner & Mailing Information

Industrial Asphalt
52 El Charro Road
Pleasanton, CA

Site Location (if different)

Township/Range/Section: 3S/1E/11

Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew: Bill/Friedman

Rig Make/Model: Drill Tech D640

Bit & Size: 10-inch Crow-end Bit

Hammer Data: Wt. 740 pounds Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-20-90	6-21-90
Completion	6-21-90	6-22-90
Development	7-3-90	7-3-90

Well Development and Construction

Monumentation

Ref. Pt. Description

See Table 3

Elevations

Ref. Pt. Ground

Datum

Markings

Development Info.

Well Design	Size & Type	Top	Bottom
Surface Casing	Below ground diversified	WH	
Casing	4" PVC blank	0	99.5 feet
Well Screen	20 slot PVC	99.5 feet	114.5 feet
Gravel Pack	#2 Monterey	96.5 feet	114.5 feet
Bentonite	Bentonite Slurry	94 feet	96.5 feet
Concrete	with 5% bentonite	0	94 feet

Field Hydrologic Operations

Weather

Recent Rainfall? Irrigation? No

Nearby Wells Pumping? Yes

Ditches? Utility Courses? Yes

Date	Time	Water Level	Other Observations

Remarks

Plate A-13

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project
Industrial Asphalt
Number
10-1682-06/69
Total Depth
114.5 feet
Sheet
2 of 5
Boring No.
MW-14

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
							Asphalt		
						ML	SILT- dark yellowish brown (10YR 4/4), dry		
2									
4									
	Grab								
6									
8									
10									
12									
14									
			0						
			6						
16			6	13					
							color change to dark brown (10YR 4/3)		
18									
20									
			6						
	43126		6	15					
22									
						GP	SANDY GRAVEL- yellowish brown (10YR 5/4), dry, clast 1/2 to 3/4 inch in diameter, subrounded, fine to coarse sand, 50-50 mixture, clast appears to be composed of granitic type material		
24									
	Grab								
26									
28									
30									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman — Date: 6-19-90
Drafted by J. Leong — Date: 7-11-90
Supervised by K. Jesionek

Plate
A-13

KLEINFELDER

LOG OF BORING

Project	Industrial Asphalt
Number	10-1682-06/69
Total Depth	114.5 feet
Sheet	3 of 5
Boring No.	MW-14

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					GP	SANDY GRAVEL- as above	NOSC no attempt to take a drive sample due to large cobbles	
32						GP	GRAVEL- with cobbles, no sand, clasts from 1/2 to 3 inches in diameter, subrounded to subangular	Soil sampling by down hole sampler not attempted from 30 to 50 feet due to pressure of cobbles	
34									
36									
38									
40	43127 Grab					GM	SILTY to SANDY GRAVEL- with cobbles, light olive brown (2.5Y 5/4), dry, silt 20% to 30%, fine to medium sand 20% to 30%, fine to coarse gravel 30% to 40%, 5% to 10% cobbles; size to 6 inches in diameter, subrounded		
42									
44									
46									
48							cobbles (10% to 20%)		
50									
52	43128 Grab								
54									
56			30	24					
58									
60									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman	Date: 6-21-90
Drafted by: J. Leong	Date: 7-11-90
Supervised by: K. Jesionek	
Plate	A-13

KLEINFELDER

LOG OF BORING

Project
Industrial Asphalt
Number
10-1682-06/69
Total Depth
114.5 feet
Sheet
4 of 5
Boring No.
MW-14

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GM	SILTY to SANDY GRAVEL- as above		
			0						
62									
64									
								Abundant cobbles 30%, no attempt to drive a sample	
66						GM	SILTY GRAVEL- light olive brown (2.5Y 5/4), damp, with cobbles		
68								First indication of discolored soil with strong odor	
70	43129								
	Grab		30	20		GM	SILTY to SANDY GRAVEL- gray (2.5Y 5/4), moist	first sample with petroleum odor	
72									
74	Grab								
	Grab								
						SM	SILTY SAND with abundant GRAVEL- gray (2.5Y 5/1), damp, 30% silt, 40% fine to medium sand, 10% to 20% fine gravel, clasts subrounded	strong odor	
76									
78									
	Grab								
80									
								strong odor	
	43130		30	16					
82									
						GM	SILTY GRAVEL- gray (2.5Y 5/0), damp, slight discoloration	slight odor	
84									
86									
88									
90									

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by
J. Friedman
Date:
6-21-90
Drafted by
J. Leong
Date:
7-11-90
Supervised by
K. Jesionek

Plate
A-13

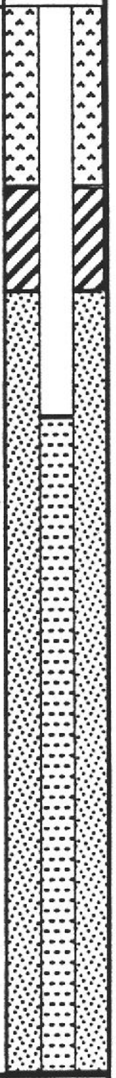
KLEINFELDER

LOG OF BORING

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 114.5 feet
Sheet: 5 of 5
Boring No.: MW-14

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks
	43131			16		GM	SILTY GRAVEL- slight discoloration, approximate discoloration at 92 feet	
92	Grab					GM	SILTY SANDY GRAVEL with cobbles- damp to moist	
94	Grab					SM/ SC	SILTY to CLAY- very moist,coarse sand with gravel and cobbles	
96	Grab							
98						GC	SILTY CLAYEY GRAVEL- damp to moist	
100								First flowing water, 2-3 gpm, first producing water ▼
						SP	GRAVELLY SAND- very wet, 70% medium to coarse sand, 30% fine to coarse gravel, clasts subrounded to subangular	
102	Grab							
104								
106								
108								
	Grab							
110								
								Unit stopped producing water
112	Grab					ML	SLIGHTLY CLAYEY SILT- light olive brown (2.5Y 5/4), damp	
	Drive							
114		■	100	7				
116								
118								
120								

Well Construction



Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman Date: 6-21-90
Drafted by: J. Leong Date: 7-11-90
Supervised by: K. Jesionek
Plate: A-13

KLEINFELDER

Project Industrial Asphalt		Boring No. MW-15
Number 10-1682-06		
Total Depth 117 feet	Sheet 1 of 5	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information Industrial Asphalt 52 El Charro Road Pleasanton, CA	Township/Range/Section 3S/1E/11
Site Location (if different)	Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew: Bill/ Friedman

Rig Make/Model: Drill Tech D640

Bit & Size: 10-inch Crow-end Bit

Hammer Data — Wt. 740 pounds — Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-22-90	6-25-90
Completion	6-25-90	6-26-90
Development	7-2-90	7-2-90

Well Development and Construction

Monumentation	Development Info.
Ref. Pt. Description *See Table 3*	
Elevations Ref. Pt. Ground	
Datum	
Markings	

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing	4" PVC Blk	0	97 feet
Well Screen	4" PVC 20 slot	97 feet	117 feet
Gravel Pack	#2 Monterey	94 feet	117 feet
Bentonite	Bentonite Slurry	91 feet	94 feet
Concrete	5% bentonite	0	91 feet

Field Hydrologic Operations

Weather

Recent Rainfall? Irrigation?
No

Nearby Wells Pumping?
Yes

Ditches? Utility Courses?
Yes

Date	Time	Water Level	Other Observations

Remarks

Boring drilled to total depth of 118 feet. Total depth of well is 117 feet.

Plate
A–14

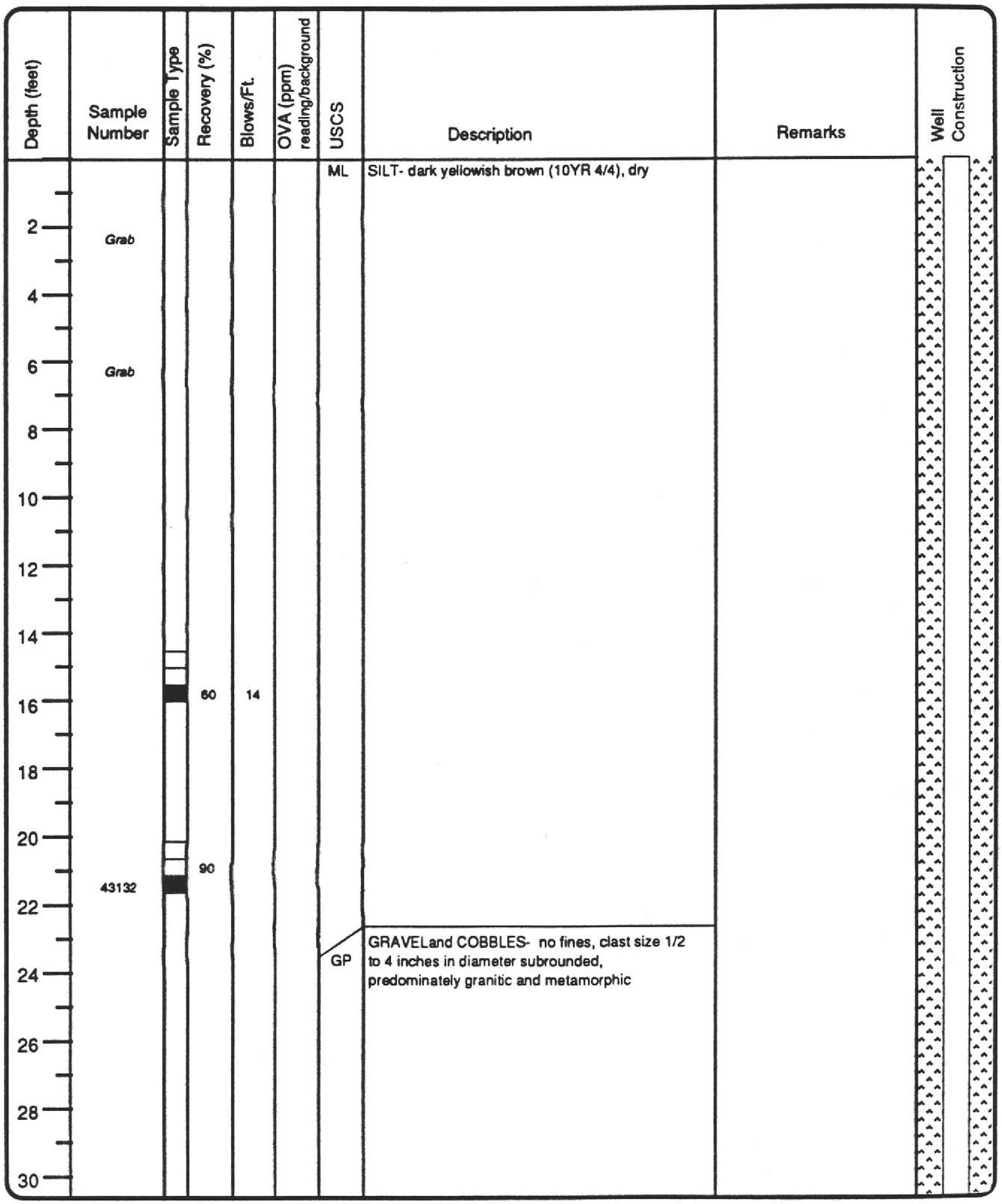
Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project	Industrial Asphalt
Number	10-1682-06/69
Total Depth	117 feet
Sheet	2 of 5
Boring No.	MW-15



Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						ML	SILT- dark yellowish brown (10YR 4/4), dry		
2	Grab								
4									
6	Grab								
8									
10									
12									
14									
16			60	14					
18									
20									
	43132		90						
22									
24						GP	GRAVELand COBBLES- no fines, clast size 1/2 to 4 inches in diameter subrounded, predominately granitic and metamorphic		
26									
28									
30									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by	J. Friedman
Date:	6-25-90
Drafted by	J. Leong
Date:	7-11-90
Supervised by	K. Jesionek
Plate	A-14

KLEINFELDER

Project: Industrial Asphalt
Number: 10-1682-06/69
Total Depth: 117 feet
Sheet: 3 of 5
Boring No. MW-15

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	GRAVEL and COBBLE- as above		
32									
34						GM	SILTY to SANDY GRAVEL- olive brown (2.5Y 4/4), dry, 10% to 20% fine to medium sand, 5% to 10% silt, 40% to 60% fine to medium gravel, subrounded to subangular clasts		
36									
38									
40	Grab							Large cobbles encountered; no attempt to drive the sampler	
42									
44								Sample collection not attempted large cobbles >6 inches in diameter	
46									
48									
50	Grab						increasing moisture		
52									
54	Grab						damp to moist	Sample collection not attempted	
56									
58									
60	Grab								

Designated Purpose(s) of Log
Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by: J. Friedman Date: 6-25-90
Drafted by: J. Leong Date: 7-11-90
Supervised by: K. Jesionek

Plate A-14

KLEINFELDER

Project Industrial Asphalt		Boring No. MW-15
Number 10-1682-06/69		
Total Depth 117 feet	Sheet 4 of 5	

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	43133 *Grab*					GM	SILTY to CLAYEY GRAVEL with COBBLES- damp		
62									
64									
66									
68									
70	43134 *Grab*					SM/ GM	SILTY SAND with GRAVEL and COBBLES to SILTY SANDY GRAVEL- olive brown (2.5Y 4/4), moist to wet	NOSC	
72									
74									
						SM/ GM	SILTY SAND to SILTY GRAVEL- very moist to wet, some large cobbles		
76									
78									
80	43135 *Grab*								
82						GC/ SC	Very CLAYEY GRAVEL/SAND mixture- wet		
84									
	Grab								
86									
							decreasing moisture content		
88									
90	*Grab*						moist		

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-25-90	Plate A-14
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

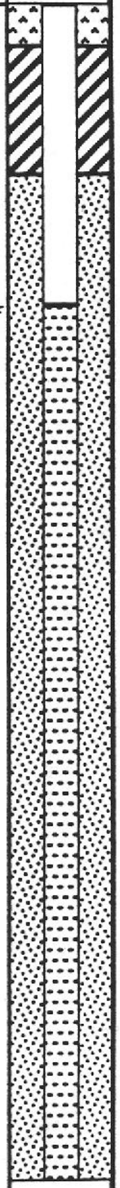
KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. MW-15
Number 10-1682-06/69		
Total Depth 117 feet	Sheet 5 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks
						GC/ SC	Very CLAYEY/ GRAVEL/SAND- as above	
92								
94								
	Grab							
96						SM/ GM	SILTY GRAVELLY SAND to SANDY SILTY GRAVEL- very moist to wet, medium to coarse sand, fine to coarse gravel with cobbles	
98						GP/ SP	SANDY GRAVEL- very wet, medium to coarse sand, fine to coarse gravel approximately 70%	First water production approximately 97-99 feet ~1-2 gpm
	Grab Grab							
100								
102								Production increasing
104								
106								
108								Production increase ~3-5 gpm
110								
112								
114						GM	SILTY to slightly CLAYEY GRAVEL and SAND- very moist to wet	
116						GP	GRAVEL with COBBLES- very wet, little to no sand	drive sample collected from 116.5 to 118 feet
				19				
118								
120								

Well Construction



Designated Purpose(s) of Log	
Site Characterization	

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-25-90	Plate A-14
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

Project Industrial Asphalt		Boring No. MW-16
Number 10-1682-06		
Total Depth 110 feet	Sheet 1 of 5	

BORING AND MONITORING-WELL DATA SHEET

Location

Owner & Mailing Information

Industrial Asphalt
52 El Charro Road
Pleasanton, CA

Site Location (if different)

Township/Range/Section: 3S/1E/11

Other Identifiers

Well Location

Show coordinates or distances from surveyed reference point.

Drilling Operations

Drilling Company: Water Development Company

Driller/Crew: Bill/ Friedman

Rig Make/Model: Drill Tech D640

Bit & Size: 10-inch Crow-end Bit

Hammer Data Wt. 740 pounds Drop 30 inches

Task	Start (Date, Time)	Finish (Date, Time)
Drilling	6-26-90	6-26-90
Completion		
Development	7-2-90	7-2-90

Well Development and Construction

Monumentation

Ref. Pt. Description

See Table 3

Elevations

Ref. Pt. Ground

Datum

Markings

Development Info.

Well Design	Size & Type	Top	Bottom
Surface Casing			
Casing	2-in diam, Sched 40	0	90 feet
Well Screen	0.020 Slot	90 feet	110 feet
Gravel Pack	#2 Monterey	86.5 feet	110 feet
Bentonite	3/8-in Pellets	83.5 feet	86.5 feet
Concrete	5% bentonite	0	83.5 feet

Field Hydrologic Operations

Weather

Recent Rainfall? Irrigation? No

Nearby Wells Pumping? Yes

Ditches? Utility Courses? Yes

Date	Time	Water Level	Other Observations

Remarks

Plate

A-15

Date: 6-4-90 JF

Revision Date:

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. MW-16
Number 10-1682-06/69		
Total Depth 110 feet	Sheet 2 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						ML	*SILT-* with subangular floating clasts of fine gravel, olive brown, dry, clast content <5%	NOSC	
	43137	■	100	14		ML	Slightly CLAYEY SILT- olive brown (2.5Y 4/4), damp, occasional floating coarse grained sand		
						GP	SANDY GRAVEL -light olive gray (2.5Y 5/2), dry, fine to coarse sand, fine to coarse gravel with cobbles to 6 inches in diameter clasts subrounded to subangular, sand to gravel fraction 50/50		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-26-90	Plate A-15
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

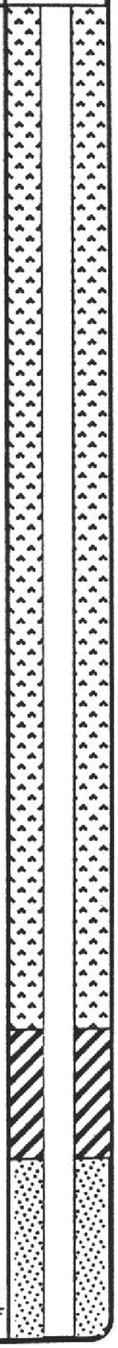
KLEINFELDER

Project Industrial Asphalt	Boring No. MW-16
Number 10-1682-06/69	
Total Depth 110 feet	Sheet 4 of 5

LOG OF BORING

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks
						GM	SILTY to SANDY GRAVEL- as above	
62								
64								
66								
68								
70	Grab						moisture content increases	
72								
74								
	Grab						increasing clay and water content	
76								
78								
						GM/ GC	SILTY to CLAYEY SANDY GRAVEL with COBBLES- light olive brown (2.5Y 5/4), very moist	
80	Grab							
82	Grab 43140							slight odor
84							very gradational contact	
							CLAYEY SANDY GRAVEL- very moist to wet, 30% clay, 20% medium to coarse sand, 50% fine to coarse gravel with cobbler	
86								
						GC		
88								
								First water production at 90 ft. ▽
90							GRAVELLY SAND- as below	

Well Construction



Designated Purpose(s) of Log Site Characterization	

Note: Logs are to be used only for designated purpose(s).

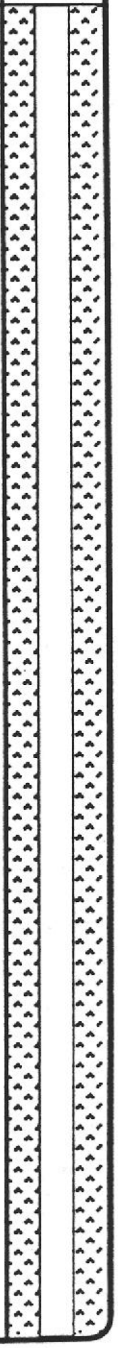
Logged by J. Friedman	Date: 6-26-90	Plate A-15
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. MW-16
Number 10-1682-06/69		
Total Depth 110 feet	Sheet 3 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
						GP	SANDY GRAVEL- as above		
32									
34									
36									
38						GM	SILTY to SANDY GRAVEL -light olive brown (2.5Y 5/4), dry, subrounded to subangular granitic clasts; estimate 50% gravel, 20% to 30% silt, 10% to 20% sand, 5% cobbles	NOSC no discoloration	
40									
42	43138 *Grab*						increasing moisture content		
44									
46									
48									
50							cobbles	NOSC	
52									
54									
56									
58									
60	43139 *Grab*							NOSC	



Designated Purpose(s) of Log Site Characterization		

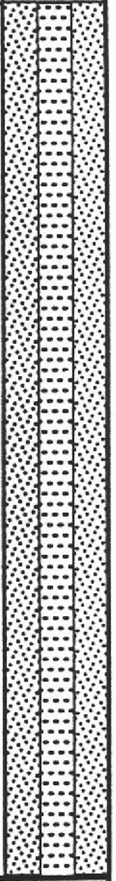
Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date: 6-26-90	Plate A-15
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

LOG OF BORING

Project Industrial Asphalt		Boring No. MW-16
Number 10-1682-06/69		
Total Depth 110 feet	Sheet 5 of 5	

Depth (feet)	Sample Number	Sample Type	Recovery (%)	Blows/Ft.	OVA (ppm) reading/background	USCS	Description	Remarks	Well Construction
	Grab					SP/ GP	GRAVELLY SAND to SAND with COBBLES- wet, medium to coarse sand, fine gravel, cobbles to 4 inches in diameter, clasts subangular to subrounded	NOSC Production ~ 2 gpm	
92									
94									
96									
98	*Grab*					SM/ SP	SILTY SAND and GRAVEL- very wet, medium to coarse sand, fine to medium gravel	Production stopped	
100									
102									
104									
	Grab					SM	Very SILTY SAND with GRAVEL	Water production from discharge ~ 1 gpm	
106									
108									
	Grab					GC	SILTY to CLAYEY SANDY GRAVEL- very moist	Water production stopped	
110									
112									
114									
116									
118									
120									

Designated Purpose(s) of Log

Site Characterization

Note: Logs are to be used only for designated purpose(s).

Logged by J. Friedman	Date:	Plate A-15
Drafted by J. Leong	Date: 7-11-90	
Supervised by K. Jesionek		

KLEINFELDER

9011202

PROJ. NO.	PROJECT NAME
10-1682-06	INDUSTRIAL ASPHALT (I.A.)
L.P. NO. (P.O. NO.)	SAMPLERS (Signature/Number) Chris Scott emp 1834

DATE MM/DD/YY	SAMPLE I.D. TIME HH:MM:SS	SAMPLE I.D.	NO OF CONTAINERS	ANALYSIS: TPH As Diesel	Waste/Oil	PCBs	REMARKS
11/29/90	2:45	49244 P-1 w/Hcl	1	↓		↓	STANDARD Turn around
11/29/90	2:45	49244 P-1 w/Hcl	1				Time!
11/29/90	2:45	49244 P-1 Amber	1				
11/29/90	2:45	49244 P-1 Amber	1				P-1 is located by
							THE road
11/29/90	3:05	49234 P-2 w/Hcl	1				
11/29/90	3:05	49234 P-2 w/Hcl	1				
11/29/90	3:05	49234 P-2 Amber	1				P-2 is located next
11/29/90	3:05	49234 P-2 Amber	1	↓		↓	To THE HOUSE.

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Chris Scott	11/29/90 1535	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
	1535 11/29/90	Denise Harrington

Remarks: Please fax results To Mrs J. Kleinfelder Fax # 938-5419 or Chris Scott Thank You

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

No 0554

CHAIN OF CUSTODY

KLEINFELDER

9007071

PROJ. NO. 10168206

PROJECT NAME IA

L.P. NO. (P.O. NO.)

SAMPLERS (Signature/Number)

DATE MM/DD/YY	SAMPLE I.D. TIME HH.MM.SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS: TPH - Diesel (Motor Oil)	PCBs	REMARKS
7/14/90	10:55	44947		X	X	SOIL SAMPLES FROM
7/14/90	17:28	44948		X	X	THE EXCAVATION BOTTOM

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	7/16/90 0855	G. Van Vleck
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

Remarks

Results to KSJesionek

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 0268

'H. I O 'US OD

KLEINFELDER

PROJ. NO.	PROJECT NAME
10-1682-06	Industrial Asphalt
L.P. NO. (P.O NO.)	SAMPLERS: (Signature/Number)
	Jeff Friedman 543

DATE MM/DD/YY	SAMPLE I.D. TIME HH MM SS	SAMPLE I.D.	NO OF CON-TAINERS	ANALYSIS TPH as diesel	EPA 8080 PCBs only	Hold	REMARKS
6/26/90		✓ 43137	1			X	
		✓ 43138	1	X	X		
		✓ 43139	1	X	X		
		✓ 43140	1	X	X		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jeff Friedman	6/24/90	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
	06/26/90 3:45 pm	

Remarks

Standard 5 day Turnaround

Report attention to Keys

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

HA OI US DY

№ 05

KLEINFELDER

PROJ. NO. 10-1682-06

PROJECT NAME Industrial Asphalt

L.P. NO. (P.O. NO.)

SAMPLERS: (Signature/Number) (543)

DATE MM/DD/YY	SAMPLE I.D. TIME HH:MM:SS	SAMPLE I.D.	NO. OF CONTAINERS	TPH as diesel	EPA Method 8080 PCBs only	Hold	Call Keys for type of Analysis.	REMARKS
4/22/90		✓ 43132	1			X		Report all peaks
		✓ 43133	1	X	X			
		✓ 43134	1			X		
		✓ 43135	1	X	X			
		✓ 43136					X	P-1, Product from I.A.

Relinquished by: (Signature)

Date/Time 4/22/90 245 pm

Received by: (Signature)

Relinquished by: (Signature)

Date/Time

Received by: (Signature)

Relinquished by: (Signature)

Date/Time

Received for Laboratory by: (Signature)

Remarks

Standard 5 day Turnaround

Report to Keys

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 057

KLEINFELDER

PROJ. NO.	PROJECT NAME
10-1682-06	Industrial Asphalt

L.P. NO. (P.O. NO.)

SAMPLERS (Signature/Number) (543)

DATE MM/DD/YY	SAMPLE I.D. TIME HH MM SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS: TPH as diesel	EPA method 8080 (PCBs only)	Hold	REMARKS
6/20/90		✓43126	1	X	X		Report all peaks
		✓43127	1	X	X		
		✓43128	1			X	
		✓43129	1	X	X		
		✓43130	1	X	X		
		✓43131	1	X	X		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	6/21/90	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
	6/21/90 1:20 PM	

Remarks

Standard 5 day Turnaround

Reports to Kiys

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 04

KLEINFELDER

PROJ. NO.	PROJECT NAME
10-1682-06	Industrial Asphalt
L.P. NO. (P.O. NO.)	SAMPLERS (Signature/Number) (543)

DATE MM/DD/YY	SAMPLE I.D. TIME HH MM SS	SAMPLE I.D	NO. OF CONTAINERS	ANALYSIS TPH as Diesel	EPA 8080 PCBs only	Hold	REMARKS
6/19/90							Report all Peaks
		43120 ✓		X	X		
		43121 ✓		X	X		
		43122 ✓				X	
		43123 ✓		X	X		
		43124 ✓				X	
↓		43125 ✓		X	X		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	6/19/90	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
	6/19/90 2:00pm	

Remarks

Standard 5 day Turnaround

Reports Attn: Krys

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

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N

KLEINFELDER

PROJ. NO. 10-1682-06	**PROJECT NAME** Industrial Asphalt
L.P. NO. (P.O. NO.)	**SAMPLERS:** (Signature/Number) 543

DATE MM/DD/YY	SAMPLE I.D. TIME HH MM SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS TPH as diesel	EPA 8080 PCBs only	Hold	REMARKS
6/15/90		43113	1	X	Y		Report all peaks
		43114	1			Y	
		43115	1	X	Y		
		43116	1			X	
		43117	1	X	Y		
		43118	1			X	
		43119	1	X	Y		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	6/15/90 3:15 pm	
Relinquished by: (Signature)	**Date/Time**	**Received by:** (Signature)
Relinquished by: (Signature)	**Date/Time**	**Received for Laboratory by:** (Signature)

Remarks

Standard 5 day turnaround

Reports Attn to Keys

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

CHAIN OF CUSTODY

№ 057

KLEINFELDER

PROJ. NO 10-1682-06

PROJECT NAME Industrial Asphalt

L.P. NO. (P.O NO.)

SAMPLERS (Signature/Number) (543)

DATE MM/DD/YY	SAMPLE I.D. TIME HH MM SS	SAMPLE I.D	NO. OF CONTAINERS	ANALYSIS TPH diesel	EPA 8080 PCBs only	Hold.	REMARKS
6/13/90		✓ 43105	1	X	X		Report all peaks
6/13/90		✓ 43106	1			X	
6/13/90		✓ 43107	1	X	X		
6/14/90		✓ 43108	1			X	
		✓ 43109	1	X	X		
		✓ 43110	1			X	
		✓ 43111	1	X	X		
		✓ 43112	1			X	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	6/14/90	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
	6/14/90 1:14 PM	

Remarks

STANDARD 5 day turnaround

Reports to Krys

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

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№ 05

KLEINFELDER

PROJ. NO. 10-1682-06

PROJECT NAME Industrial Asphalt

L.P. NO. (P.O. NO.)

SAMPLERS (Signature/Number) Jeff Friedman (543)

DATE MM/DD/YY	SAMPLE I.D. TIME HH:MM:SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS TPH diesel	EPA 8080 PCBs only	hold	REMARKS
6/12/90		✓ 43098	1	X	X		report all peaks
		✓ 43099	1	X	X		
		✓ 43100	1			X	
		✓ 43101	1	X	X		
		✓ 43102	1			X	
		✓ 43103	1	X	X		
6/13/90		✓ 43104	1	X	X		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jeff Friedman	6/12/90 1020	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
	6/13/90 1020	

Remarks

Standard 5 day turn around

Reports to Krys.

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 0493

KLEINFELDER

PROJ. NO. 10-1682-06	**PROJECT NAME** Industrial Asphalt
L.P. NO. (P.O. NO.)	**SAMPLERS:** (Signature/Number) (543)

DATE MM/DD/YY	**SAMPLE I.D. TIME** HH MM SS	**SAMPLE I.D.**	**NO. OF CON-TAINERS**	**ANALYSIS** TPH as diesel	EPA 8080 PCB only	hold	**REMARKS**
6/11/90		✓ 43090	1	X	X		report all peaks
		✓ 43091	1			X	
		✓ 43092	1	X	X		
		✓ 43093	1			X	
		✓ 43094	1	X	X		
		✓ 43095	1			X	
		✓ 43096	1	X	X		
		✓ 43097	1	X	X		

Relinquished by: (Signature)	**Date/Time** 6/12/90 | 9:05 Am.	**Received by:** (Signature)
Relinquished by: (Signature)	**Date/Time**	**Received by:** (Signature)
Relinquished by: (Signature)	**Date/Time** 6/12/90 | 9:00 am	**Received for Laboratory by:** (Signature)

Remarks

STAndard 5 day Turnaround

Reports to Kiyo

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 0491

KLEINFELDER

PROJ. NO.	PROJECT NAME
10-1682-06	Industrial Asphalt
L.P. NO. (P.O. NO.)	SAMPLERS. (Signature/Number) Jeff Truden (543)

DATE MM/DD/YY	SAMPLE TIME HH:MM:SS	SAMPLE I.D.	NO. OF CON-TAINERS	ANALYSIS TPH as diesel	EPA 8080 PCB only	Hold										REMARKS
6/6/90		~~43077~~ JT	~~1~~	~~X~~	~~X~~											report all peaks
		43078	1	X	X											
		43079	1	X	X											
		43080	1	X	X											
		43081	1			X										
		43082	1	X	X											
6/7/90		43083	1	X	X											
		43084	1	X	X											
		43085	1			X										
		43086	1	X	X											
		43087	1			X										
		43088	1	X	X											
		43089	1	X	X											

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Remarks	Send Results To
Jeff Truden	6/7/90 400		Standard 5 day turnaround Reports to ~~Key~~ Krys	KLEINFELDER 2121 N. CALIFORNIA BLVD. SUITE 570 WALNUT CREEK, CA 94596 (415) 938-5610
Relinquished by: (Signature)	Date/Time	Received by: (Signature)		
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)		

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 04

KLEINFELDER

PROJ. NO.	PROJECT NAME
10-1682-06	Industrial Asphalt
L.P. NO. (P.O. NO.)	**SAMPLERS: (Signature/Number)**
	Jeff Freedman (543)

DATE MM/DD/YY	SAMPLE TIME HH:MM:SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS TPH as Diesel	EPA Method 8080 (PCB Only)											REMARKS
6/4/90		43075	1	X	X											report all peaks
		43076	1	X	X											
		43077	1	X	X											

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jeff Freedman	6/4/90 430	
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**
Relinquished by: (Signature)	**Date/Time**	**Received for Laboratory by: (Signature)**
	6/4 4:30	

Remarks

STANDARD 5 day turnaround

Reports to Krys.

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 0015

KLEINFELDER

PROJ. NO. 10-1682-06

PROJECT NAME Industrial Asphalt

L.P. NO. (P.O. NO.)

SAMPLERS: (Signature/Number) (543)

DATE MM/DD/YY	SAMPLE I.D./ TIME HH:MM:SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS: TPH as diesel *	EPA method 8080 PCB only	Hold	REMARKS
5/31/90		44482	1	X	X		*report all peaks
5/31/90		44483	1			X	
6/1/90		44484	1			X	
		44485	1	X	X		
		44486	1	X	X		
		44487	1	X	X		
		44488	1			X	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	6/1/90	
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**
Relinquished by: (Signature)	**Date/Time**	**Received for Laboratory by: (Signature)**
	6/1/90 1:10	

Remarks

STANDard 5 day turnaround
Reports to Keys.

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

KLEINFELDER

PROJ. NO.	PROJECT NAME
10-1682-06	Industrial Asphalt
L.P. NO. (P.O NO.)	SAMPLERS (Signature/Number)
	Jeff Friedmier (543)

DATE MM/DD/YY	SAMPLE I.D. TIME HH:MM:SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS 8080 on PCBs only	8015 as diesel/*	REMARKS
5/29/90		44480	1	X	X	* report Any compound not
5/30/90		44481	1	X	X	equal to diesel standard

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jeff Friedmier	5/30/90 1400	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

Remarks
STAndard 5 day turnaround
reports to Krys

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 0492

KLEINFELDER

PROJ. NO. 10-168206	PROJECT NAME Industrial Asphalt
L.P. NO. (P.O. NO.)	SAMPLERS (Signature/Number) (543)

CHROMALAB FILE #- 390029

DATE MM/DD/YY	SAMPLE I.D. TIME HH:MM:SS	SAMPLE I.D.	NO OF CONTAINERS	ANALYSIS TPH diesel	PCB's only										REMARKS
3/6/90		43036		X	X										
		43037		X	X										
		43038		X	X										
		43039		X	X										

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	3/6/90 ~~17~~ 1710	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
	3/6/90 1710	

Remarks
Attn: Chromalab
San Ramon, CAL.
Please make lab
Reports to Kyrs Jesimek
standard turnaround

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 0012

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KLEINFELDER

PROJ. NO.	10-1682-06
PROJECT NAME	Industrial Asphalt
L.P. NO. (P.O. NO.)	
SAMPLERS: (Signature/Number)	Jeff Friedman (543)

DATE MM/DD/YY	SAMPLE I.D. TIME HH:MM:SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS TPH as diesel	PCB's only	REMARKS
3/5/90		43034		X	X	
3/5/90		43035		X	X	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jeff Friedman	3/5/90 1636	
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**
Relinquished by: (Signature)	**Date/Time**	**Received for Laboratory by: (Signature)**
		C. Coulter

Remarks

Attn: Chromalabs, Inc
SAN RAMON, CA

Please make Lab Report
Attn: to Keys Jesionek
standard turnaround

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 0017

KLEINFELDER

PROJ. NO.	PROJECT NAME
10-1682-06	Industrial Asphalt

L.P. NO. (P.O. NO.)	SAMPLERS: (Signature/Number)
	Jeff Friedman (543)

DATE MM/DD/YY	~~SAMPLE I.D.~~ TIME HH:MM:SS	SAMPLE I.D.	NO. OF CON-TAINERS	ANALYSIS Hold	TPH as diesel	PCB's only	REMARKS
		43029	1	X			
		43030	1	X			
		43031	1	X			
		43032	1		+	+	
		43033	1		+	+	

Relinquished by: (Signature)	Date/Time		Received by: (Signature)
Jeff Friedman	3/2/90	1030	
Relinquished by: (Signature)	**Date/Time**		**Received by:** (Signature)
Relinquished by: (Signature)	**Date/Time**		**Received for Laboratory by:** (Signature)
	3/2/90	1030	

Remarks

Attn: Chromalab, Inc.
San Ramon, CA

Please make lab reports to Krysti Jesionek

standard turnaround

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 0011

KLEINFELDER

PROJ. NO.	PROJECT NAME
10-168206	Industrial Asphalt
L.P. NO. (P.O. NO.)	SAMPLERS: (Signature/Number) Jeff Friedman (543)

DATE MM/DD/YY	SAMPLE I.D. TIME HH:MM SS	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS TPH diesel	PCB only	EPA 8270	Hold	REMARKS
2/28/90	4~~30~~21	43021	1				X	Hold
2/28/90	~~22~~	43022	1	X	+			
2/28/90	~~23~~	43023	1	X	+			
2/28/90	~~24~~	43024	1	X	+			
3/1/90	~~25~~	43025	1				X	Hold
3/1/90	~~26~~	43026	1	X	+	X		
3/1/90	~~27~~	43027	1				X	Hold
3/1/90	~~28~~	43028	1	X	+			

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jeff Friedman		
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
	3/1/90 1238	

Remarks
Attn: Chromalab, Inc
San Ramon, CAL.
Please make Lab reports
Kyrs Jesionek
STANDard Turnaround ~~Today~~

Send Results To

KLEINFELDER
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596
(415) 938-5610

M-60 White Sampler Canary Return Copy To Shipper Pink Lab Copy

№ 00

INDUSTRIAL ASPHALT
SIEVE ANALYSIS
PLEASANTON

TOTAL SAMPLE WEIGHT 3212

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
2"	0	0	100
1 1/2"	0	0	100
1"	48	2	99
3/4"	122	4	96
1/2"	332	10	90
3/8"	572	18	82
NO. 4	1202	37	63
	WASHED WEIGHT	476	
NO. 8	91	19	51
NO. 16	166	35	41
NO. 30	225	47	33
NO. 50	273	57	27
NO. 100	305	64	23
NO. 200	323	68	20

DATE 06/07/90
TIME 14:50:23

SB4
fine zone

PLEASANTON

By

INDUSTRIAL ASPHALT
SIEVE ANALYSIS
PLEASANTON

TOTAL SAMPLE WEIGHT 6717

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
2"	0	0	100
1 1/2"	0	0	100
1"	209	3	97
3/4"	804	12	88
1/2"	1477	22	78
3/8"	1835	27	73
NO. 4	2634	39	61
	WASHED WEIGHT	478	
NO. 8	95	20	49
NO. 16	181	38	38
NO. 30	246	52	30
NO. 50	295	62	23
NO. 100	329	69	19
NO. 200	348	73	17

DATE 06/07/90
TIME 14:18:43

SB-4
Production zone

PLEASANTON

By

INDUSTRIAL ASPHALT
SIEVE ANALYSIS
PLEASANTON

TOTAL SAMPLE WEIGHT 4995

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
2"	0	0	100
1 1/2"	0	0	100
1"	155	3	97
3/4"	525	11	90
1/2"	1103	22	78
3/8"	1589	32	68
NO. 4	2404	48	52
	WASHED WEIGHT	485	
NO. 8	94	19	42
NO. 16	175	36	33
NO. 30	243	50	26
NO. 50	301	62	20
NO. 100	339	70	16
NO. 200	358	74	14

DATE 06/07/90
TIME 15:39:53

SB1-
85-112

PLEASANTON

By

MED-TOX
ASSOCIATES, INC.

ENVIRONMENTAL & OCCUPATIONAL HEALTH SERVICES
3440 Vincent Road Pleasant Hill, CA 94523 • (415) 930-9090 • FAX# (415) 930-0256

LABORATORY ANALYSIS REPORT

KLEINFELDER, INC.
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596

ATTN: KRYS JESIONEK

CLIENT ID NO: 10-1682-06

REPORT DATE: 12/19/90

DATE SAMPLED: 11/29/90
DATE RECEIVED: 11/29/90
DATE EXTRACTED: 12/10/90
DATE ANALYZED: 12/10/90

MED-TOX JOB NO: 9011202

ANALYSIS OF: WATER SAMPLES

Sample Identification Client Id.	Lab No.	Extractable Hydrocarbons as Diesel (mg/L)	Extractable Hydrocarbons as Oil (mg/L)
49244P1	01A	ND	ND
49234P2	02A	ND	ND
Detection Limit		0.05	0.1

Method: 3510 GCFID

Instrument: C

Andrew Bradeen
Andrew Bradeen, Manager
Organic Laboratory

Results FAXed to Krys Jesionek 12/14/90

KLEINFELDER, INC.

CLIENT ID: 49244P1
CLIENT JOB NO: 10-1682-06
DATE SAMPLED: 11/29/90
DATE RECEIVED: 11/29/90
REPORT DATE: 12/19/90

MED-TOX LAB NO: 9011202-01C
MED-TOX JOB NO: 9011202
DATE EXTRACTED: 12/04/90
DATE ANALYZED: 12/07/90
INSTRUMENT: A

EPA METHOD 8080

POLYCHLORINATED BIPHENYLS

AROCLOR	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Aroclor 1016	12674-11-2	ND	0.5
Aroclor 1221	11104-28-2	ND	0.5
Aroclor 1232	11141-16-5	ND	0.5
Aroclor 1242	53469-21-9	ND	0.5
Aroclor 1248	12672-29-6	ND	0.5
Aroclor 1254	11097-69-1	ND	0.5
Aroclor 1260	11096-82-5	ND	0.5

ND = Not Detected

Analytical Method: EPA 8080, SW-846 3rd Edition, 1986

KLEINFELDER, INC.

CLIENT ID: 49234P2
CLIENT JOB NO: 10-1682-06
DATE SAMPLED: 11/29/90
DATE RECEIVED: 11/29/90
REPORT DATE: 12/19/90

MED-TOX LAB NO: 9011202-02C
MED-TOX JOB NO: 9011202
DATE EXTRACTED: 12/04/90
DATE ANALYZED: 12/07/90
INSTRUMENT: A

EPA METHOD 8080

POLYCHLORINATED BIPHENYLS

AROCLOR	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Aroclor 1016	12674-11-2	ND	0.5
Aroclor 1221	11104-28-2	ND	0.5
Aroclor 1232	11141-16-5	ND	0.5
Aroclor 1242	53469-21-9	ND	0.5
Aroclor 1248	12672-29-6	ND	0.5
Aroclor 1254	11097-69-1	ND	0.5
Aroclor 1260	11096-82-5	ND	0.5

ND = Not Detected

Analytical Method: EPA 8080, SW-846 3rd Edition, 1986

QUALITY CONTROL DATA

KLEINFELDER, INC.

CLIENT JOB NO: 10-1682-06

MED-TOX JOB NO: 9011202

DATE EXTRACTED: 12/10/90
DATE ANALYZED: 12/10/90
INSTRUMENT: C

MED-TOX JOB NO: 9011202

CLIENT REF: 10-1682-06

MATRIX SPIKE RECOVERY SUMMARY
TPH EXTRACTABLE WATERS
METHOD 3510
(WATER MATRIX; EXTRACTION METHOD)

ANALYTE	Spike Conc. (mg/L)	Sample Result (mg/L)	MS Result (mg/L)	MSD Result (mg/L)	Average Percent Recovery	RPD
Diesel	0.51	ND	0.34	0.28	60.8	19.4

CURRENT QC LIMITS (Revised 08/31/90)

Analyte	Percent Recovery	RPD
Diesel	(112-30)	26.2

MS = Matrix Spike
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference
ND = Not Detected

DATE EXTRACTED: 12/04/90

INSTRUMENT: B

MED-TOX JOB NO: 9011202

CLIENT REF: 10-1682-06

SURROGATE STANDARD RECOVERY SUMMARY

METHOD 8080
(WATER MATRIX)

SAMPLE IDENTIFICATION			SURROGATE RECOVERY (PERCENT)
Date Analyzed	**Client Id.**	**Lab No.**	**2,4,5,6-Tetrachloro-meta-xylene**
12/07/90	49244P1	01C	82
12/07/90	49234P2	02C	63

CURRENT QC LIMITS

ANALYTE	PERCENT RECOVERY
2,4,5,6-Tetrachloro-meta-xylene	(46-134)

DATE EXTRACTED: 12/04/90
DATE ANALYZED: 12/07/90
INSTRUMENT: B

MED-TOX JOB NO: 9011202

CLIENT REF: 10-1682-06

MATRIX SPIKE RECOVERY SUMMARY

METHOD 8080 (PCB)
(WATER MATRIX)

COMPOUND	Spike Conc. (ug/L)	Sample Result (ug/L)	MS Result (ug/L)	MSD Result (ug/L)	Average Percent Recovery	RPD
A1260	4.20	ND	3.57	3.13	79.8	13.1

CURRENT QC LIMITS

Analyte	Percent Recovery	RPD
A1260	(57-127)	24

MS = Matrix Spike
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference
ND = Not Detected

MED-TOX
ASSOCIATES, INC.

ENVIRONMENTAL & OCCUPATIONAL HEALTH SERVICES

3440 Vincent Road Pleasant Hill, CA 94523 • (415) 930-9090 • FAX# (415) 930-0256

WORKING COPY

LABORATORY ANALYSIS REPORT

KLEINFELDER, INC.
2121 N. CALIFORNIA BLVD.
SUITE 570
WALNUT CREEK, CA 94596

ATTN: KRYS JESIONEK

CLIENT ID NO: 10-1682-06

REPORT DATE: 08/08/90

DATE SAMPLED: 07/14/90
DATE RECEIVED: 07/16/90

DATE EXTRACTED: 07/16/90
DATE ANALYZED: 07/16/90

MED-TOX JOB NO: 9007071

ANALYSIS OF: SOIL SAMPLES

Sample Identification Client Id.	Lab No.	Extractable Hydrocarbons as Diesel (mg/kg)	Extractable Hydrocarbons as Oil (mg/kg)
44947	01A	ND	ND
44948	02A	20	600
Detection Limit		10	20

Method: 8015

Instrument: 3

ND = Not Detected

Michael Lynch

Michael Lynch, Manager
Organic Laboratory

Results FAXed to Krys Jesionek 07/30/90

KLEINFELDER, INC.

CLIENT ID: 44947
CLIENT JOB NO: 10-1682-06
DATE SAMPLED: 07/14/90
DATE RECEIVED: 07/16/90
REPORT DATE: 08/08/90

MED-TOX LAB NO: 9007071-01A
MED-TOX JOB NO: 9007071
DATE EXTRACTED: 07/27, 08/03/90
DATE ANALYZED: 07/27-08/06/90
INSTRUMENT: 1

EPA METHOD 8080

POLYCHLORINATED BIPHENYLS

AROCLOR	CAS #	CONCENTRATION (mg/kg)	DETECTION LIMIT (mg/kg)
Aroclor 1016	12674-11-2	ND	0.05
Aroclor 1221	11104-28-2	ND	0.05
Aroclor 1232	11141-16-5	ND	0.05
Aroclor 1242	53469-21-9	ND	0.05
Aroclor 1248	12672-29-6	ND	0.05
Aroclor 1254	11097-69-1	ND	0.05
Aroclor 1260	11096-82-5	ND	0.05

ND = Not Detected

Analytical Method: EPA 8080, SW-846 3rd Edition, 1986

KLEINFELDER, INC.

CLIENT ID: 44948
CLIENT JOB NO: 10-1682-06
DATE SAMPLED: 07/14/90
DATE RECEIVED: 07/16/90
REPORT DATE: 08/08/90

MED-TOX LAB NO: 9007071-02A
MED-TOX JOB NO: 9007071
DATE EXTRACTED: 07/27, 08/03/90
DATE ANALYZED: 07/27-08/06/90
INSTRUMENT: 1

EPA METHOD 8080

POLYCHLORINATED BIPHENYLS

AROCLOR		CAS #	CONCENTRATION (mg/kg)	DETECTION LIMIT (mg/kg)
Aroclor	1016	12674-11-2	ND	0.05
Aroclor	1221	11104-28-2	ND	0.05
Aroclor	1232	11141-16-5	ND	0.05
Aroclor	1242	53469-21-9	ND	0.05
Aroclor	1248	12672-29-6	ND	0.05
Aroclor	1254	11097-69-1	ND	0.05
Aroclor	1260	11096-82-5	ND	0.05

ND = Not Detected

Analytical Method: EPA 8080, SW-846 3rd Edition, 1986

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

July 18, 1990

ChromaLab File No.: 0390009

KLEINFELDER, INC.

Attn: Kyrs Jesionek

RE: Two soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Duration of Analysis: March 3-8, 1990

RESULTS:

Sample No.	Motor Oil (mg/Kg)	Diesel (mg/Kg)	PCB (µg/Kg)
43032	N.D.	N.D.	N.D.
43033	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKED RECOVERY	----	98.8%	99.7%
DETECTION LIMIT	50	5	10
METHOD OF ANALYSIS	3550/8015	3550/8015	8080

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

July 18, 1990

ChromaLab File No.: 0390005

KLEINFELDER, INC.

Attn: Kyrs Jesionek

RE: Five soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Duration of Analysis: March 3-8, 1990

RESULTS:

Sample No.	Motor Oil (mg/Kg)	Diesel (mg/Kg)	PCB (µg/Kg)
43022	N.D.	N.D.	N.D.
43023	N.D.	N.D.	N.D.
43024	N.D.	N.D.	N.D.
43026	N.D.	370	110
43028	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKED RECOVERY	----	98.8%	99.7%
DETECTION LIMIT	50	5	10
METHOD OF ANALYSIS	3550/8015	3550/8015	8080

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798
Federal ID #68-0140157

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

July 18, 1990 ChromaLab File No.: 0390023

KLEINFELDER, INC.

Attn: Kyrs Jesionek

RE: Two soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Duration of Analysis: March 7-12, 1990

RESULTS:

Sample No.	Motor Oil (mg/Kg)	Diesel (mg/Kg)	PCB (µg/Kg)
43034	N.D.	N.D.	N.D.
43035	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKED RECOVERY	----	82.9%	97.6%
DETECTION LIMIT	50	5	10
METHOD OF ANALYSIS	3550/8015	3550/8015	8080

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798
Federal ID #68-0140157

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

July 18, 1990

ChromaLab File No.: 0390029

KLEINFELDER, INC.

Attn: Kyrs Jesionek

RE: Four soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Duration of Analysis: March 8-12, 1990

RESULTS:

Sample No.	Motor Oil (mg/Kg)	Diesel (mg/Kg)	PCB (µg/Kg)
43036	N.D.	N.D.	N.D.
43037	N.D.	N.D.	N.D.
43038	N.D.	N.D.	N.D.
43039	N.D.	130	120
BLANK	N.D.	N.D.	N.D.
SPIKED RECOVERY	----	82.9%	97.6%
DETECTION LIMIT	50	5	10
METHOD OF ANALYSIS	3550/8015	3550/8015	8080

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 29, 1990 ChromaLab File No.: 0690207

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Two soil samples for PCB's and TEPH analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 22, 1990
Date Submitted: June 22, 1990
Date Extracted: June 25-28, 1990
Date Analyzed: June 25-28,1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43133	N.D.	N.D.	N.D.
43135	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	91.2%	108.0%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

~~David Duong~~
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 26, 1990

ChromaLab File No.: 0690164

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Four soil samples for Diesel and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 19, 1990
Date Submitted: June 19, 1990
Date Extracted: June 22-25, 1990
Date Analyzed: June 20-25,1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43120	N.D.	N.D.	N.D.
43121	N.D.	N.D.	N.D.
43123	N.D.	N.D.	N.D.
43125	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	91.4%	89.2%	----
DUPLICATED SPIKE RECOVERY	89.8%	104.3%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 28, 1990

ChromaLab File No.: 0690198

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Five soil samples for PCB's and TEPH analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 20, 1990 Date Submitted: June 21, 1990
Date Extracted: June 22-28, 1990 Date Analyzed: June 22-28,1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43126	N.D.	N.D.	N.D.
43127	N.D.	N.D.	N.D.
43129	N.D.	18	N.D.
43130	N.D.	13	N.D.
43131	N.D.	14	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	91.5%	85.6%	----
DUPLICATED SPIKE RECOVERY	101.3%	89.2%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 21, 1990 ChromaLab File No.: 0690131

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Four soil samples for PCB's and TEPH analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 14, 1990 Date Submitted: June 14, 1990
Date Extracted: June 18-21, 1990 Date Analyzed: June 18-21,1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43105	N.D.	N.D.	N.D.
43107	N.D.	N.D.	N.D.
43109	N.D.	N.D.	N.D.
43111	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	91.4%	85.6%	----
DUPLICATED SPIKE RECOVERY	89.7%	114.0%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Eric Tam
Laboratory Director

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 21, 1990

ChromaLab File No.: 0690150

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Four soil samples for PCB's and TEPH analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 15, 1990
Date Submitted: June 15, 1990
Date Extracted: June 18-20, 1990
Date Analyzed: June 18-20,1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43113	N.D.	N.D.	N.D.
43115	N.D.	N.D.	N.D.
43117	N.D.	N.D.	N.D.
43119	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	98.1%	85.6%	----
DUPLICATED SPIKE RECOVERY	97.6%	92.3%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

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415/831-1788 • Facsimile 415/831-8798
Federal ID #68-0140157

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 20, 1990

ChromaLab File No.: 0690120

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Five soil samples for PCB's and TEPH analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 13, 1990
Date Submitted: June 13, 1990
Date Extracted: June 16-20, 1990
Date Analyzed: June 16-20,1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43098	N.D.	N.D.	N.D.
43099	N.D.	N.D.	N.D.
43101	N.D.	N.D.	N.D.
43103	N.D.	N.D.	N.D.
43104	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	91.8%	85.6%	----
DUPLICATED SPIKE RECOVERY	101.3%	92.3%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798
Federal ID #68-0140157

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 20, 1990

ChromaLab File No.: 0690106

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Five soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 12, 1990
Date Submitted: June 12, 1990
Date Extracted: June 14-19, 1990
Date Analyzed: June 14-19,1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43090	N.D.	N.D.	N.D.
43092	N.D.	N.D.	N.D.
43094	N.D.	N.D.	N.D.
43096	N.D.	62	N.D.
43097	N.D.	11	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	107.6%	85.6%	----
DUP SPIKE RECOVERY	91.8%	92.3%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
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Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 14, 1990

ChromaLab File No.: 0690071

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Nine soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 7, 1990
Date Submitted: June 7, 1990
Date Extracted: June 9-14,1990
Date Analyzed: June 9-14,1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43078	N.D.	20	N.D.
43079	N.D.	79	N.D.
43080	N.D.	46	N.D.
43082	N.D.	11	N.D.
43083	N.D.	N.D.	N.D.
43084	N.D.	N.D.	N.D.
43086	N.D.	5.0	N.D.
43088	N.D.	23	N.D.
43089	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	101.3%	92.3%	----
DUP SPIKE RECOVERY	98.8%	114.0%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

July 18, 1990

ChromaLab File No.: 0690035

KLEINFELDER, INC.

Attn: Kyrs Jesionek

RE: Three soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 4, 1990
Date Extrated: June 6-10, 1990
Date Submitted: June 4, 1990
Date Analyzed: June 6-10, 1990

RESULTS:

Sample No.	Motor Oil (mg/Kg)	Diesel (mg/Kg)	PCB (µg/Kg)
43075	560	23	N.D.
43076	N.D.	490	N.D.
43077	N.D.	6.4	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKED RECOVERY	----	92.3%	97.6%
DUPLICATED SPIKED RECOVERY	----	84.6%	89.7%
DETECTION LIMIT	50	5	10
METHOD OF ANALYSIS	3550/8015	3550/8015	8080

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798
Federal ID #68-0140157

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 8, 1990 ChromaLab File No.: 0690003

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Four soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: June 1, 1990 Date Submitted: June 1, 1990
Date Extracted: June 2-8, 1990 Date Analyzed: June 2-8, 1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
44482	N.D.	N.D.	N.D.
44485	N.D.	N.D.	N.D.
44486	N.D.	22	N.D.
44487	N.D.	7.8	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	97.6%	93.2%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798
Federal ID #68-0140157

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

June 7, 1990

ChromaLab File No.: 0590219

KLEINFELDER, INC.

Attn: Krys Jesionek

RE: Two soil samples for TEPH and PCB's analyses

Project Name: INDUSTRIAL ASPHALT
Project Number: 10-1682-06
Date Sampled: May 30, 1990
Date Submitted: May 30, 1990
Date Extracted: June 1-7, 1990
Date Analyzed: June 1-7, 1990

RESULTS:

Sample No.	PCB's (µg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
44480	N.D.	N.D.	N.D.
44481	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	97.6%	93.2%	----
DETECTION LIMIT	10	5	50
METHOD OF ANALYSIS	8080	3550/8015	3550/8015

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#238)
- Drinking Water (#955)
- Waste Water
- Consultation

MAR 28 1990

March 27, 1990

ChromaLab File # 0390005
0390029

Kleinfelder

Attn: Kyrs Jesionek

Re: Fingerprinting for two soil samples.

Results:

For sample # 43026 and 43039, the diesel found in the samples has a boiling point range of 180 - 520 degree Celsius.

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

July 3, 1990

ChromaLab File No.: 0690227

KLEINFELDER, INC.

Attn: Krys

RE: Three soil samples for PCB's, Diesel and Motor Oil analyses

Project Name: Industrial Asphalt
Project Number: 10-1682-06
Date Sampled: June 26, 1990
Date Submitted: June 26, 1990
Date Extracted: June 28 - July 02, 1990
Date Analyzed: June 28 - July 02, 1990

RESULTS:

Sample No.	PCB's (mg/Kg)	Diesel (mg/Kg)	Motor Oil (mg/Kg)
43138	N.D.	N.D.	N.D.
43139	N.D.	N.D.	N.D.
43140	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.
SPIKE RECOVERY	91.7%	81.6%	----
DUP. SPIKE RECOVERY	----	82.1%	----
DETECTION LIMIT	0.01	5	50
METHOD OF ANALYSIS	8080	3550/ 8015	3550/ 8015

ChromaLab, Inc.

David Duong
David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#238)
- Drinking Water (#955)
- Waste Water
- Consultation

March 14, 1990

ChromaLab File # 0390005 D

Client: Kleinfelder

Attn: Kyrs Jesionek

Date Submitted: Mar. 01, 1990

Date of Analysis: Mar. 13, 1990

Project Name: Industrial Asphalt

Project No.: 10-1682-06

Sample I.D.: 43026 *(Dilution Factor = 1 : 10)

Method of Analysis: EPA 8270

Matrix: soil

COMPOUND NAME	Sample mg/Kg	MDL* mg/Kg	Spike Recovery
PHENOL	N.D.	0.5	-----
BIS(2-CHLOROETHYL) ETHER	N.D.	0.5	98.6%
2-CHLOROPHENOL	N.D.	0.5	-----
1,3-DICHLOROBENZENE	N.D.	0.5	-----
1,4-DICHLOROBENZENE	N.D.	0.5	-----
BENZYL ALCOHOL	N.D.	1.0	-----
1,2-DICHLOROBENZENE	N.D.	0.5	-----
2-METHYLPHENOL	N.D.	0.5	-----
BIS(2-CHLOROISOPROPYL)ETHER	N.D.	0.5	-----
4-METHYLPHENOL	N.D.	0.5	-----
N-NITROSO-DI-N-PROPYLAMINE	N.D.	0.5	-----
HEXACHLOROETHANE	N.D.	0.5	-----
NITROBENZENE	N.D.	0.5	-----
ISOPHORONE	N.D.	0.5	-----
2-NITROPHENOL	N.D.	0.5	-----
2,4-DIMETHYLPHENOL	N.D.	0.5	-----
BENZOIC ACID	N.D.	2.5	-----
BIS(2-CHLOROETHOXY)METHANE	N.D.	0.5	91.2%
2,4-DICHLOROPHENOL	N.D.	0.5	-----
1,2,4-TRICHLOROBENZENE	N.D.	0.5	-----
NAPHTHALENE	N.D.	0.5	-----
4-CHLOROANILINE	N.D.	1.0	-----
HEXACHLOROBUTADIENE	N.D.	0.5	-----
4-CHLORO-3-METHYLPHENOL	N.D.	1.0	-----
2-METHYLNAPHTHALENE	N.D.	0.5	-----
HEXACHLOROCYCLOPENTADIENE	N.D.	0.5	-----
2,4,6-TRICHLOROPHENOL	N.D.	0.5	-----
2,4,5-TRICHLOROPHENOL	N.D.	0.5	-----
2-CHLORONAPHTHALENE	N.D.	0.5	-----
2-NITROANILINE	N.D.	2.5	-----
DIMETHYL PHTHALATE	N.D.	0.5	-----
ACENAPHTHYLENE	N.D.	0.5	-----
3-NITROANILINE	N.D.	2.5	-----
ACENAPHTHENE	N.D.	0.5	102.4%
2,4-DINITROPHENOL	N.D.	2.5	-----
4-NITROPHENOL	N.D.	2.5	-----
DIBENZOFURAN	N.D.	0.5	-----

(continued on next page)

ChromaLab File # 0390005 D

Project Name: Industrial Asphalt Project No.: 10-1682-06
Sample I.D.: 43026 *(Dilution Factor = 1 : 10)
Method of Analysis: EPA 8270 Matrix: soil

COMPOUND NAME	Sample mg/Kg	MDL* mg/Kg	Spike Recovery
2,4-DINITROTOLUENE	N.D.	0.5	-----
2,6-DINITROTOLUENE	N.D.	0.5	108.5%
DIETHYL PHTHALATE	N.D.	0.5	-----
4-CHLORO-PHENYL PHENYL ETHER	N.D.	0.5	-----
FLUORENE	N.D.	0.5	-----
4-NITROANILINE	N.D.	2.5	-----
4,6-DINITRO-2-METHYL PHENOL	N.D.	2.5	-----
N-NITROSODIPHENYLAMINE	N.D.	0.5	57.3%
4-BROMOPHENYL PHENYL ETHER	N.D.	0.5	-----
HEXACHLOROBENZENE	N.D.	0.5	-----
PENTACHLOROPHENOL	N.D.	2.5	104.7%
PHENANTHRENE	N.D.	0.5	-----
ANTHRACENE	N.D.	0.5	-----
DI-N-BUTYL PHTHALATE	N.D.	0.5	-----
FLUORANTHENE	N.D.	0.5	-----
PYRENE	N.D.	0.5	-----
BUTYLBENZYLPHTHALATE	N.D.	0.5	-----
3,3'-DICHLOROBENZIDINE	N.D.	1.0	-----
BENZO(A)ANTHRACENE	N.D.	0.5	-----
BIS(2-ETHYLHEXYL)PHTHALATE	N.D.	0.5	-----
CHRYSENE	N.D.	0.5	100.9%
DI-N-OCTYLPHTHALATE	N.D.	0.5	-----
BENZO(B)FLUORANTHENE	N.D.	0.5	-----
BENZO(K)FLUORANTHENE	N.D.	0.5	-----
BENZO(A)PYRENE	N.D.	0.5	-----
INDENO(1,2,3 C,D)PYRENE	N.D.	0.5	-----
DIBENZO(A,H)ANTHRACENE	N.D.	0.5	-----
BENZO(G,H,I)PERYLENE	N.D.	0.5	101.1%

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-4

(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0						
23	0						
62	0						
110	-0.01						
204	-0.06						
267	-0.06						
322	-0.05						
382	-0.04						
442	-0.03						
472	-0.02						
534	-0.01						
594	0.01						
670	0.01						
765	0.02						
884	0.04						
1002	0.06						
1123	0.1						
1238	0.1						
1369	0.1						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-5

(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0						
30	0						
85	0.03						
233	0.07						
294	0.14						
352	0.17						
413	0.19						
503	0.23						
562	0.23						
624	0.25						
681	0.25						
777	0.24						
895	0.25						
1013	0.25						
1138	0.26						
1248	0.27						
1384	0.27						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-6
(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0	0.6667	-0.01	10	-0.01	74	0.02
0.0033	0	0.75	-0.01	12	0	76	0.02
0.0066	-0.01	0.8333	0	14	0.01	78	0.02
0.0099	0	0.9167	-0.02	16	-0.02	80	0.04
0.0133	-0.02	1	0	18	-0.01	82	0.03
0.0166	-0.01	1.0833	-0.02	20	-0.01	84	0.02
0.02	0	1.1667	-0.01	22	0	86	0.03
0.0233	0	1.25	0	24	0	88	0.04
0.0266	-0.01	1.3333	0	26	0.01	90	0.04
0.03	-0.02	1.4166	0	28	0	92	0.02
0.0333	-0.01	1.5	-0.01	30	0	94	0.03
0.05	-0.01	1.5833	-0.02	32	-0.01	96	0.04
0.0666	-0.03	1.6667	-0.01	34	0.01	98	0.03
0.0833	-0.01	1.75	-0.01	36	0	100	0.02
0.1	0	1.8333	-0.01	38	0.01	110	0.03
0.1166	-0.01	1.9167	-0.01	40	0.01	120	0.03
0.1333	-0.01	2	-0.01	42	0	130	0.04
0.15	-0.02	2.5	-0.03	44	0.01	140	0.05
0.1666	-0.01	3	-0.01	46	0.02	150	0.04
0.1833	-0.01	3.5	-0.02	48	0.02	160	0.05
0.2	-0.01	4	-0.01	50	-0.01	170	0.05
0.2166	-0.01	4.5	-0.02	52	0.02	180	0.06
0.2333	0	5	0	54	0.01	190	0.05
0.25	-0.02	5.5	-0.01	56	0	200	0.07
0.2666	0	6	0	58	0.01	210	0.06
0.2833	-0.01	6.5	-0.01	60	0.03	220	0.07
0.3	-0.01	7	-0.02	62	0	230	0.06
0.3166	-0.01	7.5	-0.02	64	0.01	240	0.06
0.3333	0	8	-0.02	66	0.01	250	0.09
0.4167	-0.01	8.5	-0.01	68	0.01	260	0.09
0.5	-0.02	9	-0.02	70	0.03	270	0.07
0.5833	-0.01	9.5	-0.02	72	0.01	280	0.09

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-6
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
290	0.08	610	0.15	930	0.19	1250	0.26
300	0.08	620	0.15	940	0.18	1260	0.24
310	0.09	630	0.16	950	0.19	1270	0.27
320	0.11	640	0.14	960	0.21	1280	0.24
330	0.08	650	0.15	970	0.2	1290	0.25
340	0.1	660	0.16	980	0.2	1300	0.26
350	0.1	670	0.16	990	0.22	1310	0.25
360	0.09	680	0.17	1000	0.2	1320	0.26
370	0.1	690	0.16	1010	0.2	1330	0.27
380	0.11	700	0.18	1020	0.19	1340	0.25
390	0.1	710	0.17	1030	0.2	1350	0.27
400	0.11	720	0.17	1040	0.2	1360	0.28
410	0.12	730	0.15	1050	0.21	1370	0.28
420	0.1	740	0.18	1060	0.21	1380	0.27
430	0.11	750	0.16	1070	0.21	1390	0.28
440	0.11	760	0.17	1080	0.24	1400	0.26
450	0.11	770	0.18	1090	0.23	1410	0.27
460	0.13	780	0.19	1100	0.23		
470	0.14	790	0.17	1110	0.21		
480	0.13	800	0.17	1120	0.23		
490	0.13	810	0.2	1130	0.21		
500	0.13	820	0.18	1140	0.21		
510	0.14	830	0.2	1150	0.22		
520	0.14	840	0.18	1160	0.22		
530	0.14	850	0.18	1170	0.25		
540	0.14	860	0.19	1180	0.22		
550	0.14	870	0.19	1190	0.25		
560	0.15	880	0.17	1200	0.25		
570	0.15	890	0.21	1210	0.23		
580	0.15	900	0.21	1220	0.27		
590	0.14	910	0.18	1230	0.24		
600	0.14	920	0.18	1240	0.23		

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-6

(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0	1113	0.19				
10	0	1172	0.19				
59	-0.06	1231	0.19				
67	-0.06	1292	0.19				
77	-0.05	1361	0.2				
88	-0.05	1412	0.2				
97	-0.04						
113	-0.03						
142	-0.02						
162	-0.02						
182	-0.01						
212	0						
242	0.01						
272	0.02						
302	0.02						
332	0.03						
364	0.04						
392	0.04						
422	0.06						
452	0.06						
482	0.08						
512	0.08						
542	0.08						
575	0.08						
634	0.1						
693	0.13						
757	0.11						
814	0.13						
876	0.15						
934	0.15						
993	0.17						
1059	0.17						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-7

(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0.00						
45	0.05						
94	0.11						
228	0.16						
288	0.21						
347	0.24						
407	0.28						
497	0.34						
557	0.38						
617	0.41						
674	0.44						
787	0.47						
899	0.52						
1019	0.54						
1132	0.58						
1252	0.60						
1387	0.60						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
0	0	0.53333	0.001	1.0667	0.002	1.6	0.001
0.01667	0.001	0.55	0.001	1.0833	0.002	1.6167	0
0.03333	0	0.56667	0.001	1.1	0.001	1.6333	0.001
0.05	0.001	0.58333	0.001	1.1167	0.001	1.65	0.001
0.06667	0.001	0.6	0.002	1.1333	0.001	1.6667	0.001
0.08333	0.001	0.61667	0.002	1.15	0.002	1.6833	0.002
0.1	0.001	0.63333	0.002	1.1667	0	1.7	0.002
0.11667	0.002	0.65	0	1.1833	0.001	1.7167	0.002
0.13333	0.001	0.66667	0	1.2	0.001	1.7333	-0.001
0.15	0	0.68333	0	1.2167	0.001	1.75	0.001
0.16667	0.001	0.7	0.001	1.2333	0.001	1.7667	0.001
0.18333	0.002	0.71667	0.001	1.25	0.001	1.7833	0.001
0.2	0.001	0.73333	0.002	1.2667	0.001	1.8	0.001
0.21667	0.002	0.75	0.001	1.2833	0.004	1.8167	0.002
0.23333	0.004	0.76667	0.002	1.3	0	1.8333	0.002
0.25	0.002	0.78333	0	1.3167	0	1.85	0.001
0.26667	0.002	0.8	0.001	1.3333	0	1.8667	0.004
0.28333	0.001	0.81667	0.002	1.35	0.001	1.8833	0.001
0.3	0.001	0.83333	0.001	1.3667	0	1.9	0.004
0.31667	0.002	0.85	0.002	1.3833	0	1.9167	0.002
0.33333	0.002	0.86667	0.001	1.4	0.002	1.9333	0.001
0.35	0.001	0.88333	0.001	1.4167	0.004	1.95	0.002
0.36667	0	0.9	0.001	1.4333	0.002	1.9667	0.002
0.38333	0.002	0.91667	0.001	1.45	0.002	1.9833	0.001
0.4	0.001	0.93333	0.001	1.4667	0.002	2	0
0.41667	0.001	0.95	0.001	1.4833	0.002	2.0167	0
0.43333	0.002	0.96667	0.001	1.5	0	2.0333	0.001
0.45	0.001	0.98333	0.001	1.5167	0	2.05	0.001
0.46667	0.002	1	0	1.5333	0.002	2.0667	0.002
0.48333	0.001	1.0167	0.001	1.55	0.001	2.0833	0.004
0.5	0	1.0333	0.001	1.5667	0.002	2.1	0.002
0.51667	0.002	1.05	0.001	1.5833	0.002	2.1167	0.002

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
2.1333	0	2.6667	0.001	3.2	0	3.7333	0
2.15	0.001	2.6833	0.001	3.2167	-0.001	3.75	0
2.1667	0.001	2.7	0.001	3.2333	0.001	3.7667	0.001
2.1833	0	2.7167	0	3.25	0	3.7833	0.001
2.2	0.002	2.7333	0.001	3.2667	-0.002	3.8	0.001
2.2167	0.004	2.75	0	3.2833	-0.001	3.8167	0.003
2.2333	0.002	2.7667	0	3.3	0	3.8333	0.001
2.25	0.002	2.7833	0.002	3.3167	0.001	3.85	0.001
2.2667	0.002	2.8	0.002	3.3333	0.001	3.8667	0
2.2833	0.002	2.8167	0.002	3.35	-0.001	3.8833	0.001
2.3	0.001	2.8333	0.002	3.3667	0	3.9	0
2.3167	0.002	2.85	0.001	3.3833	-0.001	3.9167	0.001
2.3333	0.002	2.8667	0.001	3.4	0.002	3.9333	0
2.35	0.002	2.8833	0.002	3.4167	-0.001	3.95	0
2.3667	0.002	2.9	0	3.4333	0	3.9667	0
2.3833	0	2.9167	0.001	3.45	0	3.9833	0.001
2.4	0.001	2.9333	0.001	3.4667	0.001	4	0.001
2.4167	0.002	2.95	0.001	3.4833	0.003	4.0167	0.003
2.4333	0.002	2.9667	0.001	3.5	0	4.0333	0.003
2.45	0.002	2.9833	0	3.5167	0	4.05	0.003
2.4667	0.001	3	0	3.5333	-0.001	4.0667	0.001
2.4833	0	3.0167	0	3.55	0	4.0833	0
2.5	0	3.0333	0.001	3.5667	-0.001	4.1	0
2.5167	0.001	3.05	0	3.5833	0	4.1167	0
2.5333	0.001	3.0667	0	3.6	0.001	4.1333	0.003
2.55	0.001	3.0833	0	3.6167	0	4.15	0.001
2.5667	0	3.1	0.001	3.6333	-0.001	4.1667	0
2.5833	0	3.1167	0	3.65	0	4.1833	0
2.6	0.001	3.1333	-0.001	3.6667	0	4.2	0
2.6167	0	3.15	-0.001	3.6833	0	4.2167	0
2.6333	0.001	3.1667	0	3.7	0	4.2333	0.001
2.65	0	3.1833	0.001	3.7167	0	4.25	0.001

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
4.2667	0.003	4.8	0.001	6.6667	0	9.3333	0.001
4.2833	0	4.8167	0.001	6.75	-0.001	9.4167	-0.001
4.3	0.001	4.8333	0.001	6.8333	0	9.5	0.001
4.3167	0.001	4.85	0	6.9167	0.001	9.5833	0.001
4.3333	0	4.8667	0	7	0	9.6667	0
4.35	0	4.8833	0	7.0833	-0.001	9.75	-0.001
4.3667	0.001	4.9	0	7.1667	0	9.8333	0.001
4.3833	0	4.9167	0	7.25	0	9.9167	0
4.4	0.001	4.9333	0.001	7.3333	0	10	0
4.4167	0	4.95	0.001	7.4167	-0.001	10.083	0
4.4333	0.001	4.9667	-0.001	7.5	-0.001	10.167	-0.001
4.45	0	4.9833	0.001	7.5833	-0.001	10.25	-0.001
4.4667	0.001	5	0	7.6667	0	10.333	0
4.4833	-0.001	5.0833	-0.001	7.75	-0.001	10.417	0
4.5	-0.001	5.1667	0	7.8333	-0.001	10.5	0.001
4.5167	-0.001	5.25	0	7.9167	-0.001	10.583	0
4.5333	0.001	5.3333	-0.001	8	-0.001	10.667	-0.001
4.55	0	5.4167	-0.002	8.0833	-0.001	10.75	0.002
4.5667	0	5.5	-0.001	8.1667	-0.002	10.833	0
4.5833	0	5.5833	-0.002	8.25	-0.001	10.917	-0.001
4.6	0	5.6667	0	8.3333	-0.001	11	-0.001
4.6167	0.001	5.75	-0.001	8.4167	-0.001	11.083	0
4.6333	0.001	5.8333	0	8.5	-0.001	11.167	-0.001
4.65	0.001	5.9167	0.001	8.5833	0	11.25	-0.001
4.6667	0	6	-0.001	8.6667	-0.001	11.333	-0.001
4.6833	0.003	6.0833	0.001	8.75	0.001	11.417	0.002
4.7	0	6.1667	0	8.8333	0	11.5	-0.001
4.7167	0.003	6.25	0	8.9167	-0.001	11.583	0
4.7333	0.003	6.3333	-0.002	9	-0.001	11.667	-0.001
4.75	0	6.4167	0.001	9.0833	-0.001	11.75	-0.001
4.7667	0	6.5	0	9.1667	0	11.833	0
4.7833	0	6.5833	0	9.25	0	11.917	-0.001

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
12	0	14.667	-0.001	43	0.006	75	0.012
12.083	-0.001	14.75	-0.001	44	0.007	76	0.012
12.167	-0.001	14.833	0	45	0.006	77	0.012
12.25	-0.002	14.917	-0.002	46	0.006	78	0.013
12.333	-0.001	15	0	47	0.006	79	0.016
12.417	0	16	-0.002	48	0.007	80	0.015
12.5	0	17	-0.001	49	0.007	81	0.015
12.583	-0.002	18	-0.002	50	0.007	82	0.015
12.667	-0.001	19	-0.002	51	0.007	83	0.015
12.75	-0.001	20	-0.002	52	0.007	84	0.015
12.833	-0.001	21	-0.002	53	0.007	85	0.015
12.917	0	22	-0.001	54	0.007	86	0.015
13	0	23	-0.001	55	0.01	87	0.015
13.083	-0.001	24	0	56	0.009	88	0.016
13.167	-0.002	25	0	57	0.009	89	0.017
13.25	-0.001	26	0.001	58	0.009	91.983	0.017
13.333	0	27	0	59	0.009	101.98	0.016
13.417	-0.001	28	0.001	60	0.009	111.98	0.021
13.5	-0.001	29	0.001	61	0.01	121.98	0.027
13.583	-0.001	30	0.002	62	0.01	131.98	0.023
13.667	0	31	0.002	63	0.009	141.98	0.026
13.75	-0.001	32	0.002	64	0.011	151.98	0.027
13.833	-0.002	33	0.002	65	0.01	161.98	0.033
13.917	-0.001	34	0.002	66	0.014	171.98	0.033
14	-0.002	35	0.002	67	0.011	181.98	0.033
14.083	-0.001	36	0.003	68	0.012	191.98	0.036
14.167	-0.002	37	0.003	69	0.012	201.98	0.039
14.25	-0.001	38	0.005	70	0.015	211.98	0.041
14.333	-0.002	39	0.003	71	0.012	221.98	0.042
14.417	-0.001	40	0.005	72	0.012	231.98	0.046
14.5	-0.001	41	0.005	73	0.011	241.98	0.048
14.583	-0.001	42	0.005	74	0.013	251.98	0.05

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
261.98	0.05	581.98	0.089	901.98	0.133	1222	0.183
271.98	0.05	591.98	0.089	911.98	0.131	1232	0.182
281.98	0.054	601.98	0.094	921.98	0.133	1242	0.184
291.98	0.056	611.98	0.094	931.98	0.135	1252	0.186
301.98	0.059	621.98	0.094	941.98	0.136	1262	0.186
311.98	0.059	631.98	0.093	951.98	0.141	1272	0.187
321.98	0.047	641.98	0.096	961.98	0.136	1282	0.187
331.98	0.05	651.98	0.096	971.98	0.141	1292	0.188
341.98	0.053	661.98	0.098	981.98	0.141	1302	0.193
351.98	0.054	671.98	0.101	991.98	0.142	1312	0.193
361.98	0.057	681.98	0.102	1002	0.145	1322	0.196
371.98	0.057	691.98	0.102	1012	0.146	1332	0.197
381.98	0.059	701.98	0.102	1022	0.146	1342	0.197
391.98	0.062	711.98	0.104	1032	0.15	1352	0.197
401.98	0.063	721.98	0.104	1042	0.152	1362	0.2
411.98	0.065	731.98	0.107	1052	0.15	1372	0.2
421.98	0.066	741.98	0.109	1062	0.154	1382	0.199
431.98	0.07	751.98	0.11	1072	0.156	1392	0.201
441.98	0.071	761.98	0.111	1082	0.157	1402	0.202
451.98	0.073	771.98	0.114	1092	0.161	1412	0.195
461.98	0.074	781.98	0.114	1102	0.161	1422	0.201
471.98	0.078	791.98	0.115	1112	0.165	1432	0.2
481.98	0.077	801.98	0.118	1122	0.168	1442	0.202
491.98	0.082	811.98	0.118	1132	0.168		
501.98	0.082	821.98	0.121	1142	0.166		
511.98	0.087	831.98	0.121	1152	0.172		
521.98	0.089	841.98	0.12	1162	0.171		
531.98	0.081	851.98	0.126	1172	0.174		
541.98	0.079	861.98	0.125	1182	0.173		
551.98	0.082	871.98	0.129	1192	0.177		
561.98	0.082	881.98	0.128	1202	0.179		
571.98	0.083	891.98	0.129	1212	0.181		

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8

(data collected using a conductivity-based water level indicator)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
0	0.00						
68	0.08						
120	0.09						
197	0.05						
262	0.06						
317	0.07						
377	0.09						
437	0.10						
467	0.12						
529	0.13						
606	0.14						
664	0.16						
769	0.17						
887	0.19						
1004	0.20						
1128	0.23						
1377	0.25						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
0	0	0.53333	-0.002	1.0667	0	1.6	0.002
0.01667	0	0.55	0	1.0833	-0.002	1.6167	0.001
0.03333	0	0.56667	0	1.1	0	1.6333	0.002
0.05	0	0.58333	0	1.1167	-0.002	1.65	0.001
0.06667	-0.002	0.6	0	1.1333	0.001	1.6667	0.001
0.08333	-0.002	0.61667	0	1.15	0.001	1.6833	0.002
0.1	0	0.63333	0	1.1667	0.001	1.7	0.002
0.11667	0	0.65	0	1.1833	0	1.7167	0.001
0.13333	0	0.66667	0	1.2	0	1.7333	0.001
0.15	0	0.68333	0	1.2167	0.002	1.75	0.001
0.16667	0	0.7	0	1.2333	0.001	1.7667	0.001
0.18333	0	0.71667	0	1.25	0	1.7833	0.001
0.2	0	0.73333	0	1.2667	0.001	1.8	0.001
0.21667	0	0.75	0	1.2833	0.002	1.8167	0.002
0.23333	0	0.76667	0	1.3	0.001	1.8333	0.002
0.25	0	0.78333	0.001	1.3167	0.002	1.85	0.001
0.26667	0	0.8	0	1.3333	0.001	1.8667	0.001
0.28333	0	0.81667	0	1.35	0	1.8833	0.002
0.3	0	0.83333	0	1.3667	0	1.9	0.001
0.31667	0	0.85	0	1.3833	0.002	1.9167	0.001
0.33333	0	0.86667	0	1.4	0	1.9333	0.001
0.35	0	0.88333	0	1.4167	0.001	1.95	0.001
0.36667	0	0.9	-0.002	1.4333	0	1.9667	0.002
0.38333	0	0.91667	0	1.45	0.001	1.9833	0.002
0.4	0	0.93333	0	1.4667	0	2	0.002
0.41667	0	0.95	0	1.4833	0	2.0167	0
0.43333	0	0.96667	0.001	1.5	0.001	2.0333	0.001
0.45	0	0.98333	0	1.5167	0.001	2.05	0.001
0.46667	0	1	0	1.5333	0.001	2.0667	0.001
0.48333	0.001	1.0167	0	1.55	0.002	2.0833	0.001
0.5	0	1.0333	0.001	1.5667	0	2.1	0.001
0.51667	-0.002	1.05	0	1.5833	0.001	2.1167	0.001

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
2.1333	0.001	2.6667	0.001	3.2	0.002	3.7333	0.002
2.15	0.001	2.6833	0	3.2167	0.002	3.75	0.002
2.1667	0.002	2.7	0.002	3.2333	0.002	3.7667	0.002
2.1833	0.001	2.7167	0.002	3.25	0.002	3.7833	0.004
2.2	0.001	2.7333	0	3.2667	0.002	3.8	0.002
2.2167	0.001	2.75	0.003	3.2833	0.003	3.8167	0.003
2.2333	0.002	2.7667	0.001	3.3	0.002	3.8333	0.002
2.25	0	2.7833	0	3.3167	0.002	3.85	0
2.2667	0.001	2.8	0.002	3.3333	0.002	3.8667	0
2.2833	0.002	2.8167	0.002	3.35	0.002	3.8833	0
2.3	0.002	2.8333	0	3.3667	0	3.9	0.001
2.3167	0.001	2.85	0.001	3.3833	0.003	3.9167	0.001
2.3333	0.001	2.8667	0	3.4	0	3.9333	0
2.35	0.002	2.8833	0.001	3.4167	0.002	3.95	0.001
2.3667	0.001	2.9	0.001	3.4333	0.002	3.9667	0.001
2.3833	0.002	2.9167	0.001	3.45	0.003	3.9833	0
2.4	0.001	2.9333	0.002	3.4667	0.002	4	0.001
2.4167	0.002	2.95	0.001	3.4833	0.004	4.0167	0
2.4333	0.001	2.9667	0	3.5	0.004	4.0333	0.001
2.45	0	2.9833	0	3.5167	0.003	4.05	0.001
2.4667	0.002	3	0.002	3.5333	0.004	4.0667	0.002
2.4833	0.001	3.0167	0.002	3.55	0.002	4.0833	0.002
2.5	0.002	3.0333	0	3.5667	0.002	4.1	0.002
2.5167	0.002	3.05	0.002	3.5833	0.002	4.1167	0.001
2.5333	0.002	3.0667	0.002	3.6	0.003	4.1333	0.001
2.55	0.002	3.0833	0.003	3.6167	0.002	4.15	0.002
2.5667	0.001	3.1	0	3.6333	0.003	4.1667	0.001
2.5833	0.002	3.1167	0.003	3.65	0.002	4.1833	0.002
2.6	0.001	3.1333	0.003	3.6667	0.002	4.2	0.002
2.6167	0.002	3.15	0.002	3.6833	0.002	4.2167	0.002
2.6333	0	3.1667	0	3.7	0.002	4.2333	0
2.65	0.001	3.1833	0.002	3.7167	0.002	4.25	0.001

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9

(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
4.2667	0.002	4.8	0.003	6.6667	0.003	9.3333	0.004
4.2833	0.002	4.8167	0.003	6.75	0.002	9.4167	0.004
4.3	0.002	4.8333	0.004	6.8333	0.002	9.5	0.004
4.3167	0.002	4.85	0.002	6.9167	0.002	9.5833	0.004
4.3333	0.002	4.8667	0.004	7	0.003	9.6667	0.004
4.35	0.001	4.8833	0.003	7.0833	0.004	9.75	0.003
4.3667	0.001	4.9	0.002	7.1667	0.003	9.8333	0.002
4.3833	0.002	4.9167	0.002	7.25	0.002	9.9167	0.002
4.4	0.001	4.9333	0.003	7.3333	0.003	10	0.002
4.4167	0.001	4.95	0.004	7.4167	0.004	10.083	0.002
4.4333	0.001	4.9667	0.002	7.5	0.002	10.167	0.002
4.45	0.002	4.9833	0.002	7.5833	0	10.25	0.002
4.4667	0.002	5	0.004	7.6667	0	10.333	0.003
4.4833	0.001	5.0833	0.004	7.75	0.003	10.417	0.001
4.5	0.001	5.1667	0.002	7.8333	0.002	10.5	0.003
4.5167	0.004	5.25	0.003	7.9167	0.001	10.583	0.003
4.5333	0.002	5.3333	0.002	8	0.002	10.667	0.002
4.55	0.002	5.4167	0.003	8.0833	0.002	10.75	0.003
4.5667	0.001	5.5	0.002	8.1667	0.002	10.833	0.003
4.5833	0.002	5.5833	0.004	8.25	0.002	10.917	0.003
4.6	0.001	5.6667	0.002	8.3333	0.002	11	0.003
4.6167	0.002	5.75	0.004	8.4167	0.002	11.083	0.003
4.6333	0.002	5.8333	0.003	8.5	0.002	11.167	0.004
4.65	0.001	5.9167	0.003	8.5833	0.003	11.25	0.003
4.6667	0.002	6	0.004	8.6667	0.002	11.333	0.004
4.6833	0.002	6.0833	0	8.75	0.002	11.417	0.003
4.7	0.002	6.1667	0.003	8.8333	0.003	11.5	0.004
4.7167	0.003	6.25	0.002	8.9167	0.002	11.583	0.002
4.7333	0.002	6.3333	0.003	9	0.002	11.667	0.004
4.75	0.002	6.4167	0.003	9.0833	0.002	11.75	0.004
4.7667	0.003	6.5	0.004	9.1667	0.004	11.833	0.004
4.7833	0.002	6.5833	0.004	9.25	0.004	11.917	0.003

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
12	0.002	14.667	0.005	43	0.013	75	0.033
12.083	0.003	14.75	0.004	44	0.02	76	0.034
12.167	0.004	14.833	0.003	45	0.017	77	0.034
12.25	0.004	14.917	0.003	46	0.016	78	0.035
12.333	0.004	15	0.005	47	0.016	79	0.036
12.417	0.004	16	0.005	48	0.017	80	0.038
12.5	0.003	17	0.005	49	0.019	81	0.038
12.583	0.003	18	0.005	50	0.019	82	0.038
12.667	0.004	19	0.006	51	0.018	83	0.04
12.75	0.003	20	0.004	52	0.019	84	0.041
12.833	0.004	21	0.005	53	0.019	85	0.041
12.917	0.003	22	0.004	54	0.021	86	0.042
13	0.003	23	0.005	55	0.022	87	0.043
13.083	0.004	24	0.006	56	0.023	88	0.041
13.167	0.003	25	0.006	57	0.023	89	0.045
13.25	0.004	26	0.005	58	0.024	91.983	0.045
13.333	0.004	27	0.006	59	0.025	101.98	0.045
13.417	0.004	28	0.005	60	0.024	111.98	0.051
13.5	0.003	29	0.007	61	0.026	121.98	0.058
13.583	0.003	30	0.007	62	0.026	131.98	0.061
13.667	0.004	31	0.008	63	0.028	141.98	0.07
13.75	0.004	32	0.008	64	0.027	151.98	0.077
13.833	0.003	33	0.007	65	0.027	161.98	0.087
13.917	0.004	34	0.008	66	0.028	171.98	0.091
14	0.003	35	0.009	67	0.028	181.98	0.098
14.083	0.005	36	0.011	68	0.029	191.98	0.104
14.167	0.005	37	0.011	69	0.029	201.98	0.112
14.25	0.004	38	0.012	70	0.03	211.98	0.117
14.333	0.005	39	0.012	71	0.031	221.98	0.125
14.417	0.004	40	0.013	72	0.03	231.98	0.132
14.5	0.003	41	0.013	73	0.033	241.98	0.132
14.583	0.003	42	0.014	74	0.033	251.98	0.142

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
261.98	0.146	581.98	0.271	901.98	0.35	1222	0.385
271.98	0.151	591.98	0.274	911.98	0.348	1232	0.386
281.98	0.157	601.98	0.279	921.98	0.351	1242	0.387
291.98	0.163	611.98	0.283	931.98	0.353	1252	0.386
301.98	0.15	621.98	0.286	941.98	0.356	1262	0.388
311.98	0.155	631.98	0.284	951.98	0.356	1272	0.387
321.98	0.16	641.98	0.287	961.98	0.358	1282	0.391
331.98	0.163	651.98	0.292	971.98	0.359	1292	0.392
341.98	0.168	661.98	0.293	981.98	0.358	1302	0.396
351.98	0.175	671.98	0.297	991.98	0.361	1312	0.399
361.98	0.178	681.98	0.296	1002	0.365	1322	0.402
371.98	0.181	691.98	0.301	1012	0.366	1332	0.404
381.98	0.187	701.98	0.301	1022	0.366	1342	0.407
391.98	0.194	711.98	0.305	1032	0.369	1352	0.409
401.98	0.196	721.98	0.306	1042	0.369	1362	0.411
411.98	0.196	731.98	0.31	1052	0.37	1372	0.414
421.98	0.204	741.98	0.311	1062	0.371	1382	0.416
431.98	0.21	751.98	0.315	1072	0.373	1392	0.418
441.98	0.214	761.98	0.317	1082	0.377	1402	0.42
451.98	0.22	771.98	0.321	1092	0.378	1412	0.421
461.98	0.221	781.98	0.322	1102	0.38	1422	0.426
471.98	0.229	791.98	0.329	1112	0.382	1432	0.428
481.98	0.234	801.98	0.331	1122	0.386	1442	0.43
491.98	0.24	811.98	0.333	1132	0.386		
501.98	0.246	821.98	0.336	1142	0.376		
511.98	0.245	831.98	0.338	1152	0.372		
521.98	0.252	841.98	0.341	1162	0.372		
531.98	0.257	851.98	0.341	1172	0.376		
541.98	0.256	861.98	0.343	1182	0.375		
551.98	0.26	871.98	0.345	1192	0.377		
561.98	0.264	881.98	0.348	1202	0.379		
571.98	0.265	891.98	0.35	1212	0.382		

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0.00						
42	0.03						
91	0.05						
230	0.08						
291	0.13						
349	0.16						
411	0.19						
500	0.23						
559	0.26						
620	0.28						
677	0.29						
784	0.32						
897	0.36						
1016	0.36						
1135	0.39						
1250	0.41						
1388	0.41						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-10

(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0.00						
18	0.06						
58	0.06						
106	0.06						
200	0.01						
264	0.03						
315	0.04						
380	0.05						
439	0.06						
469	0.07						
531	0.08						
608	0.10						
666	0.10						
762	0.11						
882	0.15						
998	0.16						
1125	0.19						
1235	0.20						
1366	0.21						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-13
(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Pumping Rate (gpm)
0	0.00	2.9
0.25	0.33	
0.5	0.56	
0.75	0.85	
1	0.95	
1.5	1.19	
2.25	1.91	
2.5	2.08	
2.75	2.21	
3	2.36	
3.25	2.50	
3.5	2.60	
3.75	2.73	
4	2.82	
4.25	2.92	
4.5	3.03	
4.75	3.11	
5	3.21	
5.25	3.29	
5.5	3.38	
5.75	3.47	
6	3.55	
6.25	3.63	
6.5	3.72	
6.75	3.80	
7	3.88	
7.25	3.97	
7.5	4.05	
7.75	4.14	
8	4.22	
8.25	4.31	
8.5	4.39	
8.75	4.40	
9	4.54	
9.25	4.61	
9.5	4.68	
9.75	4.76	
10	4.84	
10.25	4.91	
10.5	4.98	
10.75	5.05	
11	5.10	
11.25	5.17	
11.5	5.24	
11.75	5.30	
12	5.36	
12.25	5.42	
12.5	5.48	
12.75	5.52	
13	5.58	
13.25	5.64	
13.5	5.67	
13.75	5.72	
14	5.77	
14.25	5.82	
14.5	5.87	
14.75	5.91	
15	5.95	
15.33	6.00	
15.5	6.04	
15.75	6.08	
16	6.11	
16.25	6.15	
16.5	6.19	
16.75	6.23	
17	6.27	
17.25	6.31	
17.5	6.35	
17.75	6.38	
18	6.42	
18.25	6.45	
18.5	6.48	
18.75	6.48	
19.5	6.61	
21.5	6.82	
21.75	6.85	
22	6.88	
34	8.00	
49	9.32	
57	9.81	
65	10.28	
70	10.52	
75	10.77	
80	10.99	
90	11.40	
95	11.58	
100	11.75	
111	12.03	
115	12.13	
120	12.27	
140	12.78	
145	12.88	
151	12.98	
160	13.13	
180	13.41	
195	14.21	

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-13

(data collected using a conductivity-based water level indicator)

Time (min)	Draw- down (feet)	Pumping Rate (gpm)	Time (min)	Draw- down (feet)	Pumping Rate (gpm)	Time (min)	Draw- down (feet)	Pumping Rate (gpm)
210	14.96		811	14.20				
225	15.57		841	14.40				
240	16.02		872	14.61				
260	16.51	2.6	902	14.80				
270	15.43		930	14.97				
286	14.12		990	15.30				
300	13.22		1021	15.49				
315	12.66		1052	15.69				
330	12.23		1080	15.85				
345	12.05		1110	16.05	2.4			
360	11.97		1140	14.76	2.6			
375	11.95		1170	15.36				
390	11.98		1200	15.67				
406	12.03		1230	15.91				
420	12.10		1260	16.14	2.4			
435	12.17		1290	15.39				
450	12.25		1320	14.91				
465	12.34		1359	14.95				
480	12.43		1380	14.98				
495	12.53		1410	15.08				
510	12.62		1440	15.16				
525	12.70		1469	15.28				
540	12.78		1470	15.30				
555	12.85							
571	12.91							
601	13.07							
630	13.20							
660	13.35							
690	13.48							
721	13.65							
774	13.83							
780	14.06							

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-14
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
0	0	0.53333	0.001	1.0667	0.003	1.6	0.001
0.01667	0	0.55	0.001	1.0833	0.001	1.6167	0.003
0.03333	0.001	0.56667	0.001	1.1	0	1.6333	0.001
0.05	0	0.58333	0.004	1.1167	0.001	1.65	0.001
0.06667	0.001	0.6	0	1.1333	0.003	1.6667	0
0.08333	0.001	0.61667	0.001	1.15	0.001	1.6833	0
0.1	0.001	0.63333	0.001	1.1667	0.001	1.7	0.003
0.11667	0.002	0.65	0.001	1.1833	0.001	1.7167	0.002
0.13333	0.002	0.66667	0.001	1.2	0.003	1.7333	0
0.15	0.001	0.68333	0	1.2167	0.003	1.75	0.002
0.16667	0.001	0.7	0	1.2333	0.004	1.7667	0.002
0.18333	0.001	0.71667	0	1.25	0.003	1.7833	0.002
0.2	0.002	0.73333	0	1.2667	0.004	1.8	0
0.21667	0.001	0.75	0	1.2833	0.003	1.8167	0.003
0.23333	0.003	0.76667	0.001	1.3	0.003	1.8333	0
0.25	0	0.78333	0.003	1.3167	0.001	1.85	0
0.26667	0	0.8	0.004	1.3333	0.001	1.8667	0.004
0.28333	0.002	0.81667	0.003	1.35	0.001	1.8833	0.003
0.3	0	0.83333	0.001	1.3667	0	1.9	0.003
0.31667	0.004	0.85	0.003	1.3833	0.001	1.9167	0.003
0.33333	0.001	0.86667	0.003	1.4	0.001	1.9333	0.002
0.35	0.002	0.88333	0.003	1.4167	0.003	1.95	0.002
0.36667	0.003	0.9	0	1.4333	0.003	1.9667	0.003
0.38333	0.001	0.91667	0	1.45	0.003	1.9833	0.003
0.4	0	0.93333	0.001	1.4667	0.002	2	0.002
0.41667	0	0.95	0.001	1.4833	0.002	2.0167	0.002
0.43333	0.003	0.96667	0.003	1.5	0.004	2.0333	0
0.45	0.001	0.98333	0.001	1.5167	0	2.05	0
0.46667	0.002	1	0.001	1.5333	0	2.0667	0
0.48333	0	1.0167	0.004	1.55	0	2.0833	0
0.5	0	1.0333	0.001	1.5667	0.003	2.1	0
0.51667	0.003	1.05	0.001	1.5833	0.003	2.1167	0.002

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-14
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
2.1333	0.002	2.6667	0	3.2	0.002	3.7333	0.002
2.15	0.002	2.6833	0	3.2167	0.002	3.75	0.003
2.1667	0	2.7	0	3.2333	0.001	3.7667	0.003
2.1833	0	2.7167	-0.001	3.25	0.001	3.7833	0.002
2.2	0	2.7333	0.001	3.2667	0.002	3.8	0.002
2.2167	0.002	2.75	0	3.2833	0	3.8167	0.002
2.2333	0	2.7667	0	3.3	0.002	3.8333	0.003
2.25	0	2.7833	0.001	3.3167	0	3.85	0.002
2.2667	0.002	2.8	0.001	3.3333	0	3.8667	0.003
2.2833	0.002	2.8167	0.002	3.35	0.001	3.8833	0.002
2.3	0	2.8333	0.002	3.3667	-0.002	3.9	0.002
2.3167	0	2.85	0	3.3833	0	3.9167	0.001
2.3333	0.002	2.8667	0.002	3.4	-0.002	3.9333	0.002
2.35	0	2.8833	0.002	3.4167	0	3.95	0.002
2.3667	0	2.9	0.001	3.4333	0	3.9667	0.003
2.3833	0.002	2.9167	0.001	3.45	0.002	3.9833	0.003
2.4	0.003	2.9333	0.001	3.4667	0.001	4	0.003
2.4167	0	2.95	0	3.4833	0.001	4.0167	0.001
2.4333	0.002	2.9667	0	3.5	0.002	4.0333	0.003
2.45	0.002	2.9833	0.002	3.5167	0.002	4.05	0.002
2.4667	0.002	3	0.001	3.5333	0.002	4.0667	0.002
2.4833	0.001	3.0167	0	3.55	0.001	4.0833	0.002
2.5	0.002	3.0333	0.001	3.5667	0.001	4.1	0.002
2.5167	0.002	3.05	0.002	3.5833	0.002	4.1167	0.002
2.5333	0.001	3.0667	0.001	3.6	0.001	4.1333	0.002
2.55	0	3.0833	0.001	3.6167	0.002	4.15	0.003
2.5667	0	3.1	0	3.6333	0.002	4.1667	0.001
2.5833	0	3.1167	0.002	3.65	0	4.1833	0.001
2.6	0	3.1333	0.001	3.6667	0.002	4.2	0.003
2.6167	0	3.15	0.002	3.6833	0.002	4.2167	0.002
2.6333	-0.003	3.1667	0	3.7	0.002	4.2333	0.003
2.65	0	3.1833	0.001	3.7167	0.003	4.25	0.003

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-14
(data collected by datalogger)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
4.2667	0.005	4.8	0.005	6.6667	0.006	9.3333	0.011
4.2833	0.003	4.8167	0.005	6.75	0.006	9.4167	0.011
4.3	0.002	4.8333	0.003	6.8333	0.006	9.5	0.01
4.3167	0.003	4.85	0.005	6.9167	0.005	9.5833	0.011
4.3333	0.002	4.8667	0.003	7	0.005	9.6667	0.011
4.35	0.003	4.8833	0.003	7.0833	0.007	9.75	0.012
4.3667	0.002	4.9	0.005	7.1667	0.006	9.8333	0.011
4.3833	0.003	4.9167	0.005	7.25	0.007	9.9167	0.012
4.4	0.001	4.9333	0.005	7.3333	0.007	10	0.013
4.4167	0.001	4.95	0.003	7.4167	0.007	10.083	0.012
4.4333	0.003	4.9667	0.002	7.5	0.007	10.167	0.012
4.45	0.002	4.9833	0.002	7.5833	0.01	10.25	0.013
4.4667	0.003	5	0.005	7.6667	0.007	10.333	0.013
4.4833	0.002	5.0833	0.005	7.75	0.008	10.417	0.015
4.5	0.004	5.1667	0.005	7.8333	0.007	10.5	0.014
4.5167	0.002	5.25	0.003	7.9167	0.01	10.583	0.014
4.5333	0.003	5.3333	0.002	8	0.007	10.667	0.016
4.55	0.003	5.4167	0.002	8.0833	0.007	10.75	0.013
4.5667	0.003	5.5	0.003	8.1667	0.008	10.833	0.016
4.5833	0.002	5.5833	0.005	8.25	0.008	10.917	0.013
4.6	0.002	5.6667	0.005	8.3333	0.007	11	0.012
4.6167	0.001	5.75	0.003	8.4167	0.007	11.083	0.015
4.6333	0.002	5.8333	0.006	8.5	0.01	11.167	0.013
4.65	0.003	5.9167	0.005	8.5833	0.007	11.25	0.016
4.6667	0.005	6	0.005	8.6667	0.008	11.333	0.018
4.6833	0.005	6.0833	0.005	8.75	0.01	11.417	0.018
4.7	0.003	6.1667	0.003	8.8333	0.01	11.5	0.017
4.7167	0.005	6.25	0.005	8.9167	0.01	11.583	0.018
4.7333	0.003	6.3333	0.006	9	0.01	11.667	0.017
4.75	0.005	6.4167	0.006	9.0833	0.011	11.75	0.017
4.7667	0.005	6.5	0.006	9.1667	0.012	11.833	0.019
4.7833	0.003	6.5833	0.005	9.25	0.012	11.917	0.018

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-14
(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
12	0.019	14.667	0.022	43	0.048	75	0.081
12.083	0.018	14.75	0.024	44	0.047	76	0.079
12.167	0.018	14.833	0.022	45	0.05	77	0.079
12.25	0.019	14.917	0.022	46	0.053	78	0.079
12.333	0.019	15	0.022	47	0.056	79	0.075
12.417	0.019	16	0.025	48	0.056	80	0.074
12.5	0.017	17	0.025	49	0.057	81	0.073
12.583	0.018	18	0.028	50	0.057	82	0.074
12.667	0.017	19	0.029	51	0.056	83	0.075
12.75	0.018	20	0.029	52	0.056	84	0.074
12.833	0.018	21	0.033	53	0.058	85	0.075
12.917	0.018	22	0.036	54	0.058	86	0.077
13	0.019	23	0.035	55	0.062	87	0.08
13.083	0.018	24	0.039	56	0.065	88	0.079
13.167	0.018	25	0.04	57	0.066	89	0.079
13.25	0.02	26	0.022	58	0.065	91.983	0.081
13.333	0.02	27	0.028	59	0.066	101.98	0.086
13.417	0.021	28	0.025	60	0.063	111.98	0.092
13.5	0.02	29	0.03	61	0.066	121.98	0.037
13.583	0.021	30	0.031	62	0.068	131.98	0.039
13.667	0.021	31	0.032	63	0.069	141.98	0.049
13.75	0.02	32	0.033	64	0.069	151.98	0.051
13.833	0.021	33	0.033	65	0.072	161.98	0.057
13.917	0.02	34	0.032	66	0.071	171.98	0.032
14	0.02	35	0.036	67	0.072	181.98	0.037
14.083	0.021	36	0.036	68	0.076	191.98	0.038
14.167	0.02	37	0.037	69	0.074	201.98	0.043
14.25	0.022	38	0.04	70	0.076	211.98	0.046
14.333	0.021	39	0.041	71	0.076	221.98	0.05
14.417	0.024	40	0.042	72	0.078	231.98	0.052
14.5	0.021	41	0.045	73	0.079	241.98	0.054
14.583	0.022	42	0.046	74	0.079	251.98	0.059

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-14
(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
261.98	0.059	581.98	0.121	901.98	0.158	1222	0.204
271.98	0.062	591.98	0.121	911.98	0.156	1232	0.206
281.98	0.062	601.98	0.127	921.98	0.157	1242	0.206
291.98	0.066	611.98	0.129	931.98	0.159	1252	0.208
301.98	0.069	621.98	0.124	941.98	0.16	1262	0.207
311.98	0.07	631.98	0.128	951.98	0.165	1272	0.209
321.98	0.072	641.98	0.129	961.98	0.163	1282	0.206
331.98	0.074	651.98	0.13	971.98	0.163	1292	0.206
341.98	0.076	661.98	0.131	981.98	0.163	1302	0.214
351.98	0.077	671.98	0.136	991.98	0.163	1312	0.213
361.98	0.08	681.98	0.133	1002	0.168	1322	0.216
371.98	0.083	691.98	0.135	1012	0.172	1332	0.218
381.98	0.088	701.98	0.137	1022	0.173	1342	0.22
391.98	0.092	711.98	0.138	1032	0.171	1352	0.218
401.98	0.087	721.98	0.137	1042	0.173	1362	0.217
411.98	0.09	731.98	0.14	1052	0.176	1372	0.223
421.98	0.091	741.98	0.142	1062	0.176	1382	0.224
431.98	0.094	751.98	0.146	1072	0.181	1392	0.222
441.98	0.098	761.98	0.144	1082	0.179	1402	0.223
451.98	0.099	771.98	0.147	1092	0.184	1412	0.22
461.98	0.098	781.98	0.146	1102	0.183	1422	0.225
471.98	0.103	791.98	0.149	1112	0.187	1432	0.226
481.98	0.104	801.98	0.149	1122	0.19	1442	0.226
491.98	0.108	811.98	0.152	1132	0.187		
501.98	0.108	821.98	0.147	1142	0.191		
511.98	0.112	831.98	0.147	1152	0.192		
521.98	0.116	841.98	0.148	1162	0.193		
531.98	0.117	851.98	0.15	1172	0.196		
541.98	0.116	861.98	0.15	1182	0.196		
551.98	0.116	871.98	0.154	1192	0.199		
561.98	0.117	881.98	0.157	1202	0.201		
571.98	0.118	891.98	0.154	1212	0.203		

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-14
(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0.00						
75	0.17						
117	0.18						
167	0.15						
186	0.15						
216	0.16						
246	0.16						
277	0.18						
306	0.18						
336	0.19						
369	0.21						
396	0.22						
426	0.21						
456	0.23						
486	0.24						
516	0.25						
547	0.25						
578	0.26						
640	0.27						
699	0.26						
772	0.27						
820	0.31						
890	0.32						
939	0.32						
997	0.33						
1066	0.35						
1117	0.35						
1177	0.35						
1243	0.37						
1297	0.37						
1379	0.37						
1417	0.37						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-15
(data collected using a conductivity-based water level indicator)

Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)	Time (min)	Draw-down (feet)
0	0.00	1068	0.48				
1	0.00	1120	0.51				
3	0.01	1179	0.51				
5	0.02	1245	0.51				
27	0.03	1299	0.51				
30	0.11	1383	0.51				
55	0.09	1419	0.51				
72	0.13						
78	0.14						
92	0.15						
97	0.17						
122	0.18						
147	0.21						
169	0.23						
188	0.24						
218	0.26						
249	0.29						
279	0.29						
308	0.30						
338	0.31						
458	0.35						
488	0.36						
520	0.37						
549	0.37						
583	0.38						
642	0.39						
703	0.40						
775	0.40						
823	0.44						
892	0.45						
928	0.46						
1009	0.47						

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-16
(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0	0.6667	0	10	-0.01	74	0
0.0033	-0.03	0.75	-0.01	12	-0.02	76	0.01
0.0066	-0.01	0.8333	-0.01	14	0	78	-0.01
0.0099	0	0.9167	-0.01	16	0	80	-0.01
0.0133	-0.01	1	-0.01	18	0	82	0
0.0166	-0.01	1.0833	-0.02	20	-0.02	84	0.01
0.02	-0.01	1.1667	-0.01	22	0	86	0
0.0233	-0.02	1.25	-0.01	24	-0.01	88	0.02
0.0266	-0.01	1.3333	-0.01	26	-0.01	90	0.02
0.03	-0.02	1.4166	-0.02	28	-0.03	92	0.02
0.0333	-0.02	1.5	-0.03	30	-0.01	94	0.01
0.05	-0.01	1.5833	0	32	-0.02	96	-0.01
0.0666	-0.02	1.6667	0	34	-0.01	98	0.02
0.0833	-0.02	1.75	-0.02	36	-0.02	100	0.02
0.1	-0.01	1.8333	-0.02	38	0	110	0.01
0.1166	-0.02	1.9167	0	40	-0.01	120	0.02
0.1333	-0.02	2	0	42	-0.01	130	0.02
0.15	-0.01	2.5	-0.01	44	-0.03	140	0.02
0.1666	-0.02	3	-0.02	46	0	150	0.02
0.1833	-0.01	3.5	-0.02	48	-0.01	160	0.03
0.2	0	4	-0.01	50	-0.02	170	0.03
0.2166	0.01	4.5	-0.02	52	-0.02	180	0.02
0.2333	-0.01	5	-0.04	54	0.01	190	0.03
0.25	-0.01	5.5	-0.01	56	-0.01	200	0.02
0.2666	-0.01	6	-0.01	58	-0.02	210	0.04
0.2833	-0.03	6.5	-0.01	60	0	220	0.03
0.3	-0.01	7	-0.01	62	-0.01	230	0.03
0.3166	-0.01	7.5	-0.02	64	0	240	0.05
0.3333	-0.01	8	-0.01	66	0.01	250	0.04
0.4167	-0.01	8.5	-0.03	68	0.01	260	0.05
0.5	-0.02	9	0	70	0.01	270	0.03
0.5833	-0.01	9.5	-0.01	72	0.02	280	0.03

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-16
(data collected by datalogger)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
290	0.05	610	0.09	930	0.12	1250	0.19
300	0.03	620	0.08	940	0.14	1260	0.17
310	0.04	630	0.09	950	0.13	1270	0.18
320	0.04	640	0.09	960	0.13	1280	0.18
330	0.06	650	0.08	970	0.15	1290	0.18
340	0.06	660	0.1	980	0.11	1300	0.18
350	0.06	670	0.09	990	0.14	1310	0.18
360	0.05	680	0.1	1000	0.15	1320	0.17
370	0.03	690	0.09	1010	0.16	1330	0.21
380	0.06	700	0.09	1020	0.13	1340	0.19
390	0.06	710	0.12	1030	0.13	1350	0.2
400	0.05	720	0.12	1040	0.13	1360	0.19
410	0.04	730	0.09	1050	0.15	1370	0.2
420	0.06	740	0.12	1060	0.16	1380	0.19
430	0.05	750	0.09	1070	0.15	1390	0.18
440	0.06	760	0.1	1080	0.13	1400	0.2
450	0.06	770	0.1	1090	0.14	1410	0.2
460	0.04	780	0.09	1100	0.16		
470	0.07	790	0.1	1110	0.15		
480	0.07	800	0.13	1120	0.17		
490	0.06	810	0.13	1130	0.15		
500	0.07	820	0.12	1140	0.16		
510	0.07	830	0.11	1150	0.16		
520	0.08	840	0.13	1160	0.18		
530	0.08	850	0.12	1170	0.16		
540	0.08	860	0.12	1180	0.15		
550	0.06	870	0.13	1190	0.15		
560	0.07	880	0.12	1200	0.15		
570	0.09	890	0.14	1210	0.16		
580	0.08	900	0.13	1220	0.19		
590	0.08	910	0.12	1230	0.16		
600	0.08	920	0.12	1240	0.19		

PUMPING TEST DATA
INDUSTRIAL ASPHALT
WELL MW-16
(data collected using a conductivity-based water level indicator)

Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)	Time (min)	Drawdown (feet)
0	0.00	1415	0.23				
15	0.06						
55	0.06						
100	0.08						
163	0.03						
184	0.03						
214	0.04						
244	0.05						
274	0.05						
304	0.06						
334	0.06						
366	0.08						
394	0.08						
424	0.09						
454	0.09						
484	0.10						
514	0.11						
544	0.12						
586	0.13						
637	0.13						
696	0.13						
760	0.14						
816	0.16						
879	0.17						
936	0.18						
995	0.20						
1064	0.21						
1115	0.21						
1174	0.21						
1234	0.22						
1293	0.22						
1363	0.22						

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-6

(data collected using a conductivity-based water level indicator)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
0	0.00						
13	0.00						
20	-0.01						
27	-0.01						
41	0.00						
48	0.00						
56	0.00						
83	0.01						

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
0	0	0.55	-0.001	1.1	0	1.65	0.001
0.01666	-0.001	0.56666	0	1.1167	0	1.6667	0.002
0.03333	0	0.58333	0.001	1.1333	0	1.6833	0.002
0.05	0	0.6	0	1.15	-0.001	1.7	0.002
0.06666	0	0.61666	-0.001	1.1667	0	1.7167	0.002
0.08333	-0.001	0.63333	0	1.1833	0.001	1.7333	0.002
0.1	0	0.65	0.001	1.2	0.001	1.75	0.002
0.11666	0	0.66666	0.001	1.2167	0	1.7667	0.002
0.13333	0	0.68333	0	1.2333	0.002	1.7833	0.001
0.15	-0.001	0.7	0.001	1.25	0.001	1.8	0.003
0.16666	-0.001	0.71666	0.001	1.2667	0	1.8167	0.003
0.18333	0	0.73333	0.001	1.2833	0.002	1.8333	0.002
0.2	-0.001	0.75	-0.001	1.3	0.002	1.85	0.002
0.21666	-0.001	0.76666	0.001	1.3167	0.002	1.8667	0.003
0.23333	-0.001	0.78333	0.001	1.3333	0.003	1.8833	0.002
0.25	0	0.8	0	1.35	0.002	1.9	0.001
0.26666	-0.001	0.81666	0	1.3667	0	1.9167	0.002
0.28333	-0.001	0.83333	0	1.3833	0.001	1.9333	0.002
0.3	-0.001	0.85	0	1.4	0.001	1.95	0.002
0.31666	0.001	0.86666	-0.001	1.4167	0.002	1.9667	0.002
0.33333	0	0.88333	0	1.4333	0.002	1.9833	0.002
0.35	-0.001	0.9	0	1.45	0.001	2	0.003
0.36666	0	0.91666	0.001	1.4667	0.002	2.0167	0.001
0.38333	0	0.93333	0	1.4833	0.002	2.0333	0.001
0.4	-0.001	0.95	-0.001	1.5	0	2.05	0.002
0.41666	0	0.96666	0.001	1.5167	0.002	2.0667	0.003
0.43333	-0.001	0.98333	-0.001	1.5333	0.001	2.0833	0.002
0.45	0	1	-0.001	1.55	0.002	2.1	0.002
0.46666	0	1.0167	-0.001	1.5667	0.002	2.1167	0.001
0.48333	0.001	1.0333	0	1.5833	0.001	2.1333	0
0.5	0	1.05	-0.001	1.6	0.002	2.15	0.001
0.51666	0	1.0667	0	1.6167	0.002	2.1667	0.002
0.53333	0	1.0833	0	1.6333	0.002	2.1833	0.001

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
2.2	0.001	2.75	0.002	3.3	0.002	3.85	0.004
2.2167	0.003	2.7667	0.002	3.3167	0.001	3.8667	0.002
2.2333	0.002	2.7833	0.002	3.3333	0.002	3.8833	0.003
2.25	0.002	2.8	0.003	3.35	0.002	3.9	0.003
2.2667	0.002	2.8167	0.002	3.3667	0.001	3.9167	0.003
2.2833	0.002	2.8333	0.003	3.3833	0.002	3.9333	0.003
2.3	0.001	2.85	0.002	3.4	0.002	3.95	0.002
2.3167	0.002	2.8667	0.002	3.4167	0.002	3.9667	0.001
2.3333	0.002	2.8833	0.002	3.4333	0.002	3.9833	0.003
2.35	0.003	2.9	0.002	3.45	0.002	4	0.004
2.3667	0.002	2.9167	0.001	3.4667	0.004	4.0167	0.003
2.3833	0.002	2.9333	0.002	3.4833	0.002	4.0333	0.004
2.4	0.003	2.95	0.003	3.5	0.002	4.05	0.002
2.4167	0.003	2.9667	0.001	3.5167	0.002	4.0667	0.002
2.4333	0.002	2.9833	0.002	3.5333	0.002	4.0833	0.004
2.45	0.002	3	0.002	3.55	0.002	4.1	0.004
2.4667	0	3.0167	0.002	3.5667	0.002	4.1167	0.004
2.4833	0.002	3.0333	0.002	3.5833	0.004	4.1333	0.003
2.5	0.002	3.05	0.001	3.6	0.002	4.15	0.003
2.5167	0.001	3.0667	0	3.6167	0.002	4.1667	0.004
2.5333	0	3.0833	0	3.6333	0.002	4.1833	0.001
2.55	0.001	3.1	0.002	3.65	0.002	4.2	0.002
2.5667	0.002	3.1167	0	3.6667	0.002	4.2167	0.002
2.5833	0.002	3.1333	0.002	3.6833	0.002	4.2333	0.003
2.6	0	3.15	0.002	3.7	0.002	4.25	0.004
2.6167	0.002	3.1667	0.001	3.7167	0.002	4.2667	0.002
2.6333	0.002	3.1833	0.001	3.7333	0.002	4.2833	0.002
2.65	0.001	3.2	0	3.75	0.002	4.3	0.002
2.6667	0.002	3.2167	0	3.7667	0.002	4.3167	0.003
2.6833	0.002	3.2333	0.001	3.7833	0.004	4.3333	0.002
2.7	0.002	3.25	0.002	3.8	0.002	4.35	0.003
2.7167	0.002	3.2667	0.001	3.8167	0.002	4.3667	0.003
2.7333	0.002	3.2833	0.002	3.8333	0.002	4.3833	0.001

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
4.4	0.002	4.95	0.004	7.5	0.004	10.25	0.004
4.4167	0.002	4.9667	0.002	7.5833	0.003	10.333	0.004
4.4333	0.001	4.9833	0.004	7.6667	0.005	10.417	0.004
4.45	0.001	5	0.004	7.75	0.003	10.5	0.004
4.4667	0.002	5.0833	0.004	7.8333	0.003	10.583	0.003
4.4833	0.002	5.1667	0.004	7.9167	0.003	10.667	0.003
4.5	0.002	5.25	0.004	8	0.004	10.75	0.004
4.5167	0.003	5.3333	0.005	8.0833	0.004	10.833	0.003
4.5333	0.002	5.4167	0.005	8.1667	0.003	10.917	0.004
4.55	0.002	5.5	0.005	8.25	0.002	11	0.004
4.5667	0.002	5.5833	0.002	8.3333	0.002	11.083	0.004
4.5833	0.002	5.6667	0.002	8.4167	0.003	11.167	0.004
4.6	0.004	5.75	0.004	8.5	0.004	11.25	0.004
4.6167	0.004	5.8333	0.004	8.5833	0.004	11.333	0.004
4.6333	0.004	5.9167	0.004	8.6667	0.005	11.417	0.004
4.65	0.002	6	0.004	8.75	0.004	11.5	0.003
4.6667	0.002	6.0833	0.005	8.8333	0.005	11.583	0.004
4.6833	0.002	6.1667	0.004	8.9167	0.005	11.667	0.004
4.7	0.004	6.25	0.002	9	0.005	11.75	0.004
4.7167	0.004	6.3333	0.004	9.0833	0.005	11.833	0.004
4.7333	0.004	6.4167	0.005	9.1667	0.005	11.917	0.004
4.75	0.002	6.5	0.005	9.25	0.004	12.002	0.004
4.7667	0.002	6.5833	0.003	9.3333	0.005	12.083	0.004
4.7833	0.004	6.6667	0.003	9.4167	0.004	12.167	0.004
4.8	0.004	6.75	0.005	9.5	0.005	12.25	0.004
4.8167	0.004	6.8333	0.003	9.5833	0.005	12.333	0.005
4.8333	0.004	6.9167	0.004	9.6667	0.005	12.417	0.004
4.85	0.004	7	0.003	9.75	0.004	12.5	0.004
4.8667	0.004	7.0833	0.004	9.8333	0.005	12.583	0.004
4.8833	0.004	7.1667	0.004	9.9167	0.004	12.667	0.004
4.9	0.004	7.25	0.004	10	0.003	12.75	0.005
4.9167	0.004	7.3333	0.004	10.083	0.003	12.833	0.005
4.9333	0.004	7.4167	0.005	10.167	0.004	12.917	0.004

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
13	0.005	24	0.009	57	0.007	91.967	0
13.083	0.005	25	0.007	58	0.006	101.97	-0.004
13.167	0.004	26	0.008	59	0.007	111.97	-0.005
13.25	0.006	27	0.008	60	0.005	121.97	-0.005
13.333	0.005	28	0.008	61	0.006	131.97	-0.005
13.417	0.004	29	0.007	62	0.006	141.97	-0.009
13.5	0.005	30	0.007	63	0.005	151.97	-0.005
13.583	0.005	31	0.007	64	0.005	161.97	-0.006
13.667	0.005	32	0.007	65	0.005	171.97	-0.009
13.75	0.004	33	0.007	66	0.005	181.97	-0.009
13.833	0.004	34	0.007	67	0.004	191.97	-0.009
13.917	0.006	35	0.007	68	0.005	201.97	-0.009
14	0.004	36	0.007	69	0.004	211.97	-0.008
14.083	0.005	37	0.007	70	0.003	221.97	-0.009
14.167	0.003	38	0.008	71	0.004	231.97	-0.008
14.25	0.004	39	0.007	72	0.002	241.97	-0.006
14.333	0.005	40	0.009	73	0.004	251.97	-0.004
14.417	0.004	41	0.008	74	0.003	261.97	-0.003
14.5	0.005	42	0.009	75	0.002	271.97	-0.001
14.583	0.005	43	0.008	76	0	281.97	0.001
14.667	0.005	44	0.008	77	0	291.97	0
14.75	0.005	45	0.008	78	0.001	301.97	0.002
14.833	0.005	46	0.006	79	0.001	311.97	0.004
14.917	0.007	47	0.006	80	0	321.97	0.004
15	0.006	48	0.007	81	0	331.97	0.005
16	0.007	49	0.008	82	0	341.97	0.006
17	0.006	50	0.007	83	0	351.97	0.009
18	0.007	51	0.008	84	-0.001	361.97	0.009
19	0.007	52	0.008	85	0	371.97	0.009
20	0.007	53	0.007	86	0	381.97	0.01
21	0.007	54	0.007	87	0	391.97	0.011
22	0.009	55	0.007	88	0	401.97	0.013
23	0.006	56	0.007	89	0	411.97	0.016

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-8
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
421.97	0.016	751.97	0.06	1082	0.094	1412	0.151
431.97	0.018	761.97	0.061	1092	0.096	1422	0.152
441.97	0.021	771.97	0.062	1102	0.099	1432	0.151
451.97	0.022	781.97	0.065	1112	0.097	1442	0.155
461.97	0.022	791.97	0.064	1122	0.098	1452	0.157
471.97	0.025	801.97	0.067	1132	0.098	1462	0.156
481.97	0.025	811.97	0.068	1142	0.103	1472	0.159
491.97	0.028	821.97	0.069	1152	0.103	1482	0.162
501.97	0.03	831.97	0.069	1162	0.106	1492	0.169
511.97	0.031	841.97	0.07	1172	0.108	1502	0.162
521.97	0.033	851.97	0.073	1182	0.111	1512	0.169
531.97	0.033	861.97	0.072	1192	0.113		
541.97	0.032	871.97	0.074	1202	0.111		
551.97	0.036	881.97	0.075	1212	0.111		
561.97	0.038	891.97	0.075	1222	0.114		
571.97	0.037	901.97	0.075	1232	0.115		
581.97	0.036	911.97	0.078	1242	0.117		
591.97	0.041	921.97	0.078	1252	0.118		
601.97	0.04	931.97	0.08	1262	0.12		
611.97	0.042	941.97	0.08	1272	0.121		
621.97	0.044	951.97	0.082	1282	0.122		
631.97	0.046	961.97	0.083	1292	0.126		
641.97	0.046	971.97	0.085	1302	0.126		
651.97	0.046	981.97	0.085	1312	0.126		
661.97	0.05	991.97	0.085	1322	0.131		
671.97	0.05	1002	0.085	1332	0.13		
681.97	0.051	1012	0.088	1342	0.132		
691.97	0.055	1022	0.088	1352	0.134		
701.97	0.056	1032	0.091	1362	0.139		
711.97	0.055	1042	0.089	1372	0.141		
721.97	0.06	1052	0.091	1382	0.143		
731.97	0.061	1062	0.092	1392	0.146		
741.97	0.06	1072	0.096	1402	0.15		

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
0	0	0.55	-0.001	1.1	0	1.65	0.001
0.01666	-0.001	0.56666	0	1.1167	0	1.6667	0.002
0.03333	0	0.58333	0.001	1.1333	0	1.6833	0.002
0.05	0	0.6	0	1.15	-0.001	1.7	0.002
0.06666	0	0.61666	-0.001	1.1667	0	1.7167	0.002
0.08333	-0.001	0.63333	0	1.1833	0.001	1.7333	0.002
0.1	0	0.65	0.001	1.2	0.001	1.75	0.002
0.11666	0	0.66666	0.001	1.2167	0	1.7667	0.002
0.13333	0	0.68333	0	1.2333	0.002	1.7833	0.001
0.15	-0.001	0.7	0.001	1.25	0.001	1.8	0.003
0.16666	-0.001	0.71666	0.001	1.2667	0	1.8167	0.003
0.18333	0	0.73333	0.001	1.2833	0.002	1.8333	0.002
0.2	-0.001	0.75	-0.001	1.3	0.002	1.85	0.002
0.21666	-0.001	0.76666	0.001	1.3167	0.002	1.8667	0.003
0.23333	-0.001	0.78333	0.001	1.3333	0.003	1.8833	0.002
0.25	0	0.8	0	1.35	0.002	1.9	0.001
0.26666	-0.001	0.81666	0	1.3667	0	1.9167	0.002
0.28333	-0.001	0.83333	0	1.3833	0.001	1.9333	0.002
0.3	-0.001	0.85	0	1.4	0.001	1.95	0.002
0.31666	0.001	0.86666	-0.001	1.4167	0.002	1.9667	0.002
0.33333	0	0.88333	0	1.4333	0.002	1.9833	0.002
0.35	-0.001	0.9	0	1.45	0.001	2	0.003
0.36666	0	0.91666	0.001	1.4667	0.002	2.0167	0.001
0.38333	0	0.93333	0	1.4833	0.002	2.0333	0.001
0.4	-0.001	0.95	-0.001	1.5	0	2.05	0.002
0.41666	0	0.96666	0.001	1.5167	0.002	2.0667	0.003
0.43333	-0.001	0.98333	-0.001	1.5333	0.001	2.0833	0.002
0.45	0	1	-0.001	1.55	0.002	2.1	0.002
0.46666	0	1.0167	-0.001	1.5667	0.002	2.1167	0.001
0.48333	0.001	1.0333	0	1.5833	0.001	2.1333	0
0.5	0	1.05	-0.001	1.6	0.002	2.15	0.001
0.51666	0	1.0667	0	1.6167	0.002	2.1667	0.002
0.53333	0	1.0833	0	1.6333	0.002	2.1833	0.001

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
2.2	0.001	2.75	0.002	3.3	0.002	3.85	0.004
2.2167	0.003	2.7667	0.002	3.3167	0.001	3.8667	0.002
2.2333	0.002	2.7833	0.002	3.3333	0.002	3.8833	0.003
2.25	0.002	2.8	0.003	3.35	0.002	3.9	0.003
2.2667	0.002	2.8167	0.002	3.3667	0.001	3.9167	0.003
2.2833	0.002	2.8333	0.003	3.3833	0.002	3.9333	0.003
2.3	0.001	2.85	0.002	3.4	0.002	3.95	0.002
2.3167	0.002	2.8667	0.002	3.4167	0.002	3.9667	0.001
2.3333	0.002	2.8833	0.002	3.4333	0.002	3.9833	0.003
2.35	0.003	2.9	0.002	3.45	0.002	4	0.004
2.3667	0.002	2.9167	0.001	3.4667	0.004	4.0167	0.003
2.3833	0.002	2.9333	0.002	3.4833	0.002	4.0333	0.004
2.4	0.003	2.95	0.003	3.5	0.002	4.05	0.002
2.4167	0.003	2.9667	0.001	3.5167	0.002	4.0667	0.002
2.4333	0.002	2.9833	0.002	3.5333	0.002	4.0833	0.004
2.45	0.002	3	0.002	3.55	0.002	4.1	0.004
2.4667	0	3.0167	0.002	3.5667	0.002	4.1167	0.004
2.4833	0.002	3.0333	0.002	3.5833	0.004	4.1333	0.003
2.5	0.002	3.05	0.001	3.6	0.002	4.15	0.003
2.5167	0.001	3.0667	0	3.6167	0.002	4.1667	0.004
2.5333	0	3.0833	0	3.6333	0.002	4.1833	0.001
2.55	0.001	3.1	0.002	3.65	0.002	4.2	0.002
2.5667	0.002	3.1167	0	3.6667	0.002	4.2167	0.002
2.5833	0.002	3.1333	0.002	3.6833	0.002	4.2333	0.003
2.6	0	3.15	0.002	3.7	0.002	4.25	0.004
2.6167	0.002	3.1667	0.001	3.7167	0.002	4.2667	0.002
2.6333	0.002	3.1833	0.001	3.7333	0.002	4.2833	0.002
2.65	0.001	3.2	0	3.75	0.002	4.3	0.002
2.6667	0.002	3.2167	0	3.7667	0.002	4.3167	0.003
2.6833	0.002	3.2333	0.001	3.7833	0.004	4.3333	0.002
2.7	0.002	3.25	0.002	3.8	0.002	4.35	0.003
2.7167	0.002	3.2667	0.001	3.8167	0.002	4.3667	0.003
2.7333	0.002	3.2833	0.002	3.8333	0.002	4.3833	0.001

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
4.4	0.002	4.95	0.004	7.5	0.004	10.25	0.004
4.4167	0.002	4.9667	0.002	7.5833	0.003	10.333	0.004
4.4333	0.001	4.9833	0.004	7.6667	0.005	10.417	0.004
4.45	0.001	5	0.004	7.75	0.003	10.5	0.004
4.4667	0.002	5.0833	0.004	7.8333	0.003	10.583	0.003
4.4833	0.002	5.1667	0.004	7.9167	0.003	10.667	0.003
4.5	0.002	5.25	0.004	8	0.004	10.75	0.004
4.5167	0.003	5.3333	0.005	8.0833	0.004	10.833	0.003
4.5333	0.002	5.4167	0.005	8.1667	0.003	10.917	0.004
4.55	0.002	5.5	0.005	8.25	0.002	11	0.004
4.5667	0.002	5.5833	0.002	8.3333	0.002	11.083	0.004
4.5833	0.002	5.6667	0.002	8.4167	0.003	11.167	0.004
4.6	0.004	5.75	0.004	8.5	0.004	11.25	0.004
4.6167	0.004	5.8333	0.004	8.5833	0.004	11.333	0.004
4.6333	0.004	5.9167	0.004	8.6667	0.005	11.417	0.004
4.65	0.002	6	0.004	8.75	0.004	11.5	0.003
4.6667	0.002	6.0833	0.005	8.8333	0.005	11.583	0.004
4.6833	0.002	6.1667	0.004	8.9167	0.005	11.667	0.004
4.7	0.004	6.25	0.002	9	0.005	11.75	0.004
4.7167	0.004	6.3333	0.004	9.0833	0.005	11.833	0.004
4.7333	0.004	6.4167	0.005	9.1667	0.005	11.917	0.004
4.75	0.002	6.5	0.005	9.25	0.004	12.002	0.004
4.7667	0.002	6.5833	0.003	9.3333	0.005	12.083	0.004
4.7833	0.004	6.6667	0.003	9.4167	0.004	12.167	0.004
4.8	0.004	6.75	0.005	9.5	0.005	12.25	0.004
4.8167	0.004	6.8333	0.003	9.5833	0.005	12.333	0.005
4.8333	0.004	6.9167	0.004	9.6667	0.005	12.417	0.004
4.85	0.004	7	0.003	9.75	0.004	12.5	0.004
4.8667	0.004	7.0833	0.004	9.8333	0.005	12.583	0.004
4.8833	0.004	7.1667	0.004	9.9167	0.004	12.667	0.004
4.9	0.004	7.25	0.004	10	0.003	12.75	0.005
4.9167	0.004	7.3333	0.004	10.083	0.003	12.833	0.005
4.9333	0.004	7.4167	0.005	10.167	0.004	12.917	0.004

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9

(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
13	0.005	24	0.009	57	0.007	91.967	0
13.083	0.005	25	0.007	58	0.006	101.97	-0.004
13.167	0.004	26	0.008	59	0.007	111.97	-0.005
13.25	0.006	27	0.008	60	0.005	121.97	-0.005
13.333	0.005	28	0.008	61	0.006	131.97	-0.005
13.417	0.004	29	0.007	62	0.006	141.97	-0.009
13.5	0.005	30	0.007	63	0.005	151.97	-0.005
13.583	0.005	31	0.007	64	0.005	161.97	-0.006
13.667	0.005	32	0.007	65	0.005	171.97	-0.009
13.75	0.004	33	0.007	66	0.005	181.97	-0.009
13.833	0.004	34	0.007	67	0.004	191.97	-0.009
13.917	0.006	35	0.007	68	0.005	201.97	-0.009
14	0.004	36	0.007	69	0.004	211.97	-0.008
14.083	0.005	37	0.007	70	0.003	221.97	-0.009
14.167	0.003	38	0.008	71	0.004	231.97	-0.008
14.25	0.004	39	0.007	72	0.002	241.97	-0.006
14.333	0.005	40	0.009	73	0.004	251.97	-0.004
14.417	0.004	41	0.008	74	0.003	261.97	-0.003
14.5	0.005	42	0.009	75	0.002	271.97	-0.001
14.583	0.005	43	0.008	76	0	281.97	0.001
14.667	0.005	44	0.008	77	0	291.97	0
14.75	0.005	45	0.008	78	0.001	301.97	0.002
14.833	0.005	46	0.006	79	0.001	311.97	0.004
14.917	0.007	47	0.006	80	0	321.97	0.004
15	0.006	48	0.007	81	0	331.97	0.005
16	0.007	49	0.008	82	0	341.97	0.006
17	0.006	50	0.007	83	0	351.97	0.009
18	0.007	51	0.008	84	-0.001	361.97	0.009
19	0.007	52	0.008	85	0	371.97	0.009
20	0.007	53	0.007	86	0	381.97	0.01
21	0.007	54	0.007	87	0	391.97	0.011
22	0.009	55	0.007	88	0	401.97	0.013
23	0.006	56	0.007	89	0	411.97	0.016

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-9
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
421.97	0.016	751.97	0.06	1082	0.094	1412	0.151
431.97	0.018	761.97	0.061	1092	0.096	1422	0.152
441.97	0.021	771.97	0.062	1102	0.099	1432	0.151
451.97	0.022	781.97	0.065	1112	0.097	1442	0.155
461.97	0.022	791.97	0.064	1122	0.098	1452	0.157
471.97	0.025	801.97	0.067	1132	0.098	1462	0.156
481.97	0.025	811.97	0.068	1142	0.103	1472	0.159
491.97	0.028	821.97	0.069	1152	0.103	1482	0.162
501.97	0.03	831.97	0.069	1162	0.106	1492	0.169
511.97	0.031	841.97	0.07	1172	0.108	1502	0.162
521.97	0.033	851.97	0.073	1182	0.111	1512	0.169
531.97	0.033	861.97	0.072	1192	0.113		
541.97	0.032	871.97	0.074	1202	0.111		
551.97	0.036	881.97	0.075	1212	0.111		
561.97	0.038	891.97	0.075	1222	0.114		
571.97	0.037	901.97	0.075	1232	0.115		
581.97	0.036	911.97	0.078	1242	0.117		
591.97	0.041	921.97	0.078	1252	0.118		
601.97	0.04	931.97	0.08	1262	0.12		
611.97	0.042	941.97	0.08	1272	0.121		
621.97	0.044	951.97	0.082	1282	0.122		
631.97	0.046	961.97	0.083	1292	0.126		
641.97	0.046	971.97	0.085	1302	0.126		
651.97	0.046	981.97	0.085	1312	0.126		
661.97	0.05	991.97	0.085	1322	0.131		
671.97	0.05	1002	0.085	1332	0.13		
681.97	0.051	1012	0.088	1342	0.132		
691.97	0.055	1022	0.088	1352	0.134		
701.97	0.056	1032	0.091	1362	0.139		
711.97	0.055	1042	0.089	1372	0.141		
721.97	0.06	1052	0.091	1382	0.143		
731.97	0.061	1062	0.092	1392	0.146		
741.97	0.06	1072	0.096	1402	0.15		

RECOVERY TEST DATA
INDUSTRIAL ASPHALT
WELL MW-13
(data collected by datalogger)

Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)	Time (min)	Recovery (feet)
0	0	0.75	0.93	14	10.52	80	14.27
0.0033	-0.02	0.8333	1.04	16	11.19	82	14.28
0.0066	0	0.9167	1.15	18	11.67	84	14.29
0.0099	0.01	1	1.25	20	12.06	86	14.32
0.0133	0.01	1.0833	1.35	22	12.42	88	14.32
0.0166	0.01	1.1667	1.44	24	12.71	90	14.33
0.02	0.02	1.25	1.53	26	12.97	92	14.35
0.0233	0.01	1.3333	1.6	28	13.19	94	14.34
0.0266	0.01	1.4166	1.68	30	13.37	96	14.34
0.03	0.04	1.5	1.77	32	13.52	98	14.36
0.0333	0.03	1.5833	1.83	34	13.62	100	14.36
0.05	0.05	1.6667	1.92	36	13.73	110	14.4
0.0666	0.07	1.75	2.01	38	13.78	120	14.44
0.0833	0.09	1.8333	2.08	40	13.84	130	14.45
0.1	0.12	1.9167	2.16	42	13.91	140	14.47
0.1166	0.13	2	2.24	44	13.94	150	14.5
0.1333	0.16	2.5	2.82	46	13.98	160	14.5
0.15	0.18	3	3.35	48	14	170	14.52
0.1666	0.19	3.5	3.89	50	14.03	180	14.54
0.1833	0.21	4	4.36	52	14.06	190	14.53
0.2	0.24	4.5	4.76	54	14.08	200	14.56
0.2166	0.26	5	5.14	56	14.11	210	14.55
0.2333	0.27	5.5	5.52	58	14.13	220	14.56
0.25	0.3	6	5.93	60	14.13	230	14.58
0.2666	0.32	6.5	6.4	62	14.17	240	14.59
0.2833	0.33	7	6.76	64	14.18	250	14.59
0.3	0.36	7.5	7.07	66	14.19	260	14.6
0.3166	0.38	8	7.37	68	14.2	270	14.61
0.3333	0.4	8.5	7.7	70	14.22	280	14.6
0.4167	0.49	9	8.02	72	14.22	290	14.63
0.5	0.6	9.5	8.3	74	14.24	300	14.63
0.5833	0.71	10	8.61	76	14.25	310	14.64
0.6667	0.81	12	9.67	78	14.27	320	14.66

BENZENE

	PARAMETER INPUT	TIME (YEARS)	TIME (DAYS)	CONCENTRATION
Co	50	0.082191	30	2.893E-24
Q	20	0.164383	60	3.454E-12
b	6.1	0.246575	90	0.000000
n_ϵ	0.3	0.5	182	0.000155
Dx	16.4	1	365	0.004494
Dy	5.5	1.5	547.5	0.007370
Vx	0.6	2	730	0.006208
X	274	2.5	912	0.004082
Y	0	3	1095	0.002384
k	0	3.5	1278	0.001309
Rd	1.5	4	1460	0.000696
		4.5	1642	0.000362
		5	1825	0.000185
		5.5	2008	0.000093
		6	2190	0.000047
		6.5	2372	0.000023
		7	2555	0.000011
		7.5	2738	0.000005
		8	2920	0.000003
		8.5	3102	0.000001
		9	3285	0.000000
		9.5	3468	0.000000
		10	3650	0.000000
		10.5	3832	0.000000
		11	4015	0.000000
		11.5	4198	0.000000
		12	4380	0.000000
		12.5	4562	0.000000
		13	4745	0.000000
		13.5	4928	0.000000
		14	5110	0.000000
		14.5	5292	0.000000
		15	5475	1.836E-10
		15.5	5658	9.187E-11
		16	5840	4.617E-11
		16.5	6022	2.321E-11
		17	6205	1.163E-11
		17.5	6388	5.830E-12
		18	6570	2.934E-12
		18.5	6752	1.477E-12
		19	6935	7.414E-13
		19.5	7118	3.722E-13

20	7300	1.876E-13
20.5	7482	9.459E-14
21	7665	4.753E-14
21.5	7848	2.389E-14
22	8030	1.206E-14
22.5	8212	6.086E-15
23	8395	3.062E-15
23.5	8578	1.541E-15
24	8760	7.785E-16
24.5	8942	3.935E-16
25	9125	1.982E-16
25.5	9307.5	1.000E-16
26	9490	5.049E-17
26.5	9672.5	2.549E-17
27	9855	1.288E-17
27.5	10037.5	6.504E-18
28	10220	3.286E-18
28.5	10402.5	1.661E-18
29	10585	8.396E-19
29.5	10767.5	4.245E-19
30	10950	2.147E-19
30.5	11132.5	1.086E-19
31	11315	5.492E-20
31.5	11497.5	2.779E-20
32	11680	1.406E-20
32.5	11862.5	7.118E-21
33	12045	3.603E-21
33.5	12227.5	1.824E-21
34	12410	9.239E-22
34.5	12592.5	4.679E-22
35	12775	2.370E-22
35.5	12957.5	1.201E-22
36	13140	6.085E-23
36.5	13322.5	3.084E-23
37	13505	1.563E-23
37.5	13687.5	7.923E-24
38	13870	4.017E-24
38.5	14052.5	2.037E-24
39	14235	1.033E-24
39.5	14417.5	5.238E-25
40	14600	2.657E-25
40.5	14782.5	1.348E-25
41	14965	6.839E-26
41.5	15147.5	3.470E-26
42	15330	1.761E-26
42.5	15512.5	8.938E-27
43	15695	4.537E-27

43.5	15877.5	2.303E-27
44	16060	1.169E-27
44.5	16242.5	5.937E-28
45	16425	3.015E-28
45.5	16607.5	1.531E-28
46	16790	7.775E-29
46.5	16972.5	3.949E-29
47	17155	2.006E-29
47.5	17337.5	1.019E-29
48	17520	5.178E-30
48.5	17702.5	2.631E-30
49	17885	1.337E-30
49.5	18067.5	6.795E-31
50	18250	3.454E-31
50.5	18432.5	1.756E-31
51	18615	8.924E-32
51.5	18797.5	4.537E-32
52	18980	2.306E-32
52.5	19162.5	1.173E-32
53	19345	5.963E-33
53.5	19527.5	3.032E-33
54	19710	1.542E-33
54.5	19892.5	7.843E-34
55	20075	3.989E-34
55.5	20257.5	2.029E-34
56	20440	1.032E-34
56.5	20622.5	5.252E-35
57	20805	2.672E-35
57.5	20987.5	1.359E-35
58	21170	6.917E-36
58.5	21352.5	3.520E-36
59	21535	1.791E-36
59.5	21717.5	9.116E-37
60	21900	4.640E-37
60.5	22082.5	2.362E-37
61	22265	1.202E-37
61.5	22447.5	6.119E-38
62	22630	3.115E-38
62.5	22812.5	1.586E-38
63	22995	8.074E-39
63.5	23177.5	4.111E-39
64	23360	2.093E-39
64.5	23542.5	1.066E-39
65	23725	5.428E-40
65.5	23907.5	2.764E-40
66	24090	1.408E-40
66.5	24272.5	7.170E-41

67	24455	3.652E-41
67.5	24637.5	1.860E-41
68	24820	9.476E-42
68.5	25002.5	4.827E-42
69	25185	2.459E-42
69.5	25367.5	1.253E-42
70	25550	6.383E-43

Seventy ye ear average: 0.000195 mg/l

NAPTHALENE

	PARAMETER INPUT	TIME (YEARS)	TIME (DAYS)	CONCENTRATION
Co	1300	0.082191	30	************
Q	20	0.164383	60	1.278E-78
b	6.1	0.246575	90	5.099E-52
n_e	0.3	0.5	182	2.869E-25
Dx	16.4	1	365	2.465E-12
Dy	5.5	1.5	547.5	0.000000
Vx	0.6	2	730	0.000004
X	274	2.5	912	0.000060
Y	0	3	1095	0.000347
k	0	3.5	1278	0.001146
Rd	9.7	4	1460	0.002674
		4.5	1642	0.004983
		5	1825	0.007962
		5.5	2008	0.011359
		6	2190	0.014876
		6.5	2372	0.018281
		7	2555	0.021397
		7.5	2738	0.024069
		8	2920	0.026215
		8.5	3102	0.027825
		9	3285	0.028918
		9.5	3468	0.029519
		10	3650	0.029682
		10.5	3832	0.029469
		11	4015	0.028940
		11.5	4198	0.028153
		12	4380	0.027170
		12.5	4562	0.026038
		13	4745	0.024792
		13.5	4928	0.023477
		14	5110	0.022132
		14.5	5292	0.020776
		15	5475	0.019421
		15.5	5658	0.018093
		16	5840	0.016811
		16.5	6022	0.015578
		17	6205	0.014393
		17.5	6388	0.013268
		18	6570	0.012213
		18.5	6752	0.011220
		19	6935	0.010286
		19.5	7118	0.009416

20	7300	0.008611
20.5	7482	0.007865
21	7665	0.007172
21.5	7848	0.006533
22	8030	0.005947
22.5	8212	0.005410
23	8395	0.004914
23.5	8578	0.004460
24	8760	0.004048
24.5	8942	0.003671
25	9125	0.003325
25.5	9307.5	0.003011
26	9490	0.002725
26.5	9672.5	0.002465
27	9855	0.002229
27.5	10037.5	0.002015
28	10220	0.001820
28.5	10402.5	0.001644
29	10585	0.001484
29.5	10767.5	0.001339
30	10950	0.001208
30.5	11132.5	0.001090
31	11315	0.000983
31.5	11497.5	0.000886
32	11680	0.000798
32.5	11862.5	0.000719
33	12045	0.000648
33.5	12227.5	0.000584
34	12410	0.000526
34.5	12592.5	0.000473
35	12775	0.000426
35.5	12957.5	0.000383
36	13140	0.000345
36.5	13322.5	0.000310
37	13505	0.000279
37.5	13687.5	0.000251
38	13870	0.000226
38.5	14052.5	0.000203
39	14235	0.000183
39.5	14417.5	0.000164
40	14600	0.000148
40.5	14782.5	0.000133
41	14965	0.000119
41.5	15147.5	0.000107
42	15330	0.000096
42.5	15512.5	0.000087
43	15695	0.000078

43.5	15877.5	0.000070
44	16060	0.000063
44.5	16242.5	0.000056
45	16425	0.000051
45.5	16607.5	0.000045
46	16790	0.000041
46.5	16972.5	0.000037
47	17155	0.000033
47.5	17337.5	0.000029
48	17520	0.000026
48.5	17702.5	0.000024
49	17885	0.000021
49.5	18067.5	0.000019
50	18250	0.000017
50.5	18432.5	0.000015
51	18615	0.000014
51.5	18797.5	0.000012
52	18980	0.000011
52.5	19162.5	0.000010
53	19345	0.000009
53.5	19527.5	0.000008
54	19710	0.000007
54.5	19892.5	0.000006
55	20075	0.000005
55.5	20257.5	0.000005
56	20440	0.000004
56.5	20622.5	0.000004
57	20805	0.000003
57.5	20987.5	0.000003
58	21170	0.000003
58.5	21352.5	0.000002
59	21535	0.000002
59.5	21717.5	0.000002
60	21900	0.000002
60.5	22082.5	0.000001
61	22265	0.000001
61.5	22447.5	0.000001
62	22630	0.000001
62.5	22812.5	0.000001
63	22995	0.000001
63.5	23177.5	0.000000
64	23360	0.000000
64.5	23542.5	0.000000
65	23725	0.000000
65.5	23907.5	0.000000
66	24090	0.000000
66.5	24272.5	0.000000

67	24455	0.000000
67.5	24637.5	0.000000
68	24820	0.000000
68.5	25002.5	0.000000
69	25185	0.000000
69.5	25367.5	0.000000
70	25550	0.000000

Seventy ye ear average: 0.005098 mg/l

PCBs

	PARAMETER INPUT	TIME (YEARS)	TIME (DAYS)	CONCENTRATION
Co	50	0.082191	30	0
Q	20	0.164383	60	0
b	6.1	0.246575	90	0
n_e	0.3	0.5	182	************
Dx	16.4	1	365	************
Dy	5.5	1.5	547.5	2.016E-91
Vx	0.6	2	730	7.424E-69
X	274	10	3650	3.724E-15
Y	0	20	7300	0.000000
k	0	30	10950	0.000000
Rd	100	40	14600	0.000008
		50	18250	0.000026
		60	21900	0.000050
		70	25550	0.000075
		80	29200	0.000094
		90	32850	0.000105
		100	36500	0.000110
		150	54750	0.000076
		200	73000	0.000035
		300	109500	0.000005