



EVALUATION MONITORING PROGRAM REPORT
An Interim Report For Phase I Investigations

VISALIA SOLID WASTE DISPOSAL SITE
VISALIA, CALIFORNIA

Prepared for:

COUNTY OF TULARE
RESOURCE MANAGEMENT AGENCY
SOLID WASTE DIVISION
VISALIA, CALIFORNIA

MAY 2001

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VOLUME 1 OF 2

May 4, 2001

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Re: Transmittal - Evaluation Monitoring Program Report — An Interim Report For Phase I Investigations, Visalia Solid Waste Disposal Site (SWDS) Visalia, California

Dear Dan:

This letter transmits the final report titled *Evaluation Monitoring Program Report — An Interim Report For Phase I Investigations, Visalia Solid Waste Disposal Site (SWDS) Visalia, California*. The report was prepared by Malcolm Pirnie, Inc. for the Solid Waste Division of the Tulare County Resource Management Agency.

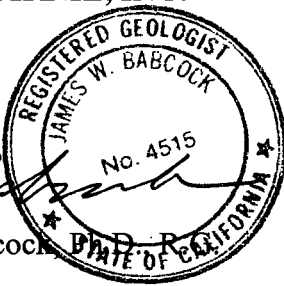
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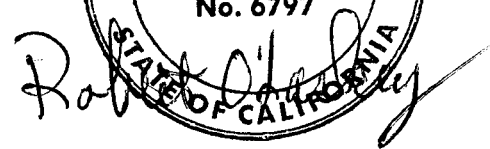
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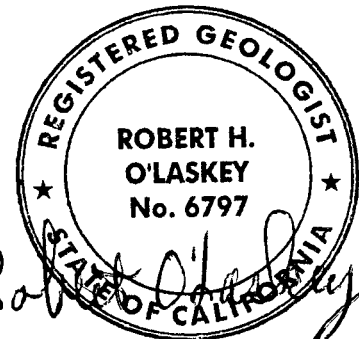
Very truly yours,

MALCOLM PIRNIE, INC.


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Enclosures

c: Jeff Monaco, Tulare County Resource Management Agency, Solid Waste Division

EVALUATION MONITORING PROGRAM REPORT
— An Interim Report For Phase I Investigations
VISALIA SOLID WASTE DISPOSAL SITE

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ABBREVIATIONS

µg/kg	micrograms per kilogram
µg/l	micrograms per liter
1,1-DCA	1,1-Dichloroethane
1,2-DCA	1,2-Dichloroethane
1,4-DCB	1,4-Dichlorobenzene
1,1-DCE	1,1-Dichloroethene
cis-1,2-DCE	cis-1,2-Dichloroethene
trans-1,2-DCE	trans-1,2-Dichloroethene
1,2-DCP	1,2-Dichloropropane
trans-1,3-DCP	trans-1,3-Dichloropropene
1,1,1-TCA	1,1,1-Trichloroethane
bgs	Below ground surface
Cal-EPA	California Environmental Protection Agency
CAO	Cleanup and Abatement Order
CCR	California Code of Regulations
DMP	Detection Monitoring Program
dtw	Depth to Water
DWR	California Department of Water Resources
EPA	United States Environmental Protection Agency
Freon™ 11	trichlorofluoromethane
Freon™ 12	dichlorodifluoromethane
gpm	gallons per minute
MBAS	Methylene Blue Active Surfactants
MDL	Method Detection Limit
mg/l	milligram per liter
ml	milliliter
MTBE	Methyl Tertiary Butyl Ether
OSHA	Occupational Health and Safety Administration
PCE	Tetrachloroethene (also known as perchloroethene)
ppb	Parts per Billion
PPE	Personal Protective Equipment
ppm	Parts per Million
PQL	Practical Quantitation Limit
PVC	Polyvinyl Chloride
RMA	Tulare County Resource Management Agency
rpm	Revolutions per minute
RWQCB	Cal-EPA Regional Water Quality Control Board
SWDS	Solid Waste Disposal Site
TCE	Trichloroethene
TOC	Total Organic Carbon
TSP	Tri-sodium Phosphate
USCS	Unified Soil Classification System
USGS	United States Geological Survey
VOCs	Volatile Organic Compounds
VC	Vinyl Chloride

1.0 INTRODUCTION

This report presents the results of investigations performed by Malcolm Pirnie, Inc., at the Visalia Solid Waste Disposal Site (Visalia SWDS, or Visalia Landfill) between September 2000 and February 2001. The Visalia Landfill is owned and operated by Tulare County (County), and is located northwest of Visalia, California (Figure 1-1 and 1-2) on the northeast corner of Road 80 and Avenue 328. The work was performed at the request of the Tulare County Resource Management Agency (RMA), Solid Waste Division as part of the investigations required in accordance with; (1) Evaluation Monitoring Program (EMP) regulations [California Code of Regulations (CCR) Title 27, Section 20425(g)]; (2) requirements of the Cleanup and Abatement Order No. 99-718 issued by the California Environmental Protection Agency (Cal-EPA) Regional Water Quality Control Board (RWQCB) in September, 1999; and (3) the County's evaluation of potential groundwater impact to two off-site water supply wells located near the Visalia Landfill.

1.1 BACKGROUND

The Visalia Landfill (Landfill) is located in Section 5, Township 18 South, Range 24E, Mount Diablo Base & Meridian (T18S, R24E, MDB&M) about seven miles northwest of Visalia, California. It is a municipal Class III solid waste landfill that accepts waste in accordance with CCR Title 27. The Landfill started operations in 1952. Currently the County owns about 636 acres with the unlined waste management unit covering about 127 acres.

The RWQCB adopted Waste Discharge Requirements (Order No. 99-047) on April 30, 1999, and issued Cleanup and Abatement Order (CAO) No. 99-718 on September 16, 1999. The CAO requires Tulare County to complete an evaluation monitoring program and implement a corrective action program that complies with the provisions of Title 27. Results of the evaluation monitoring program have identified a potential threat to two water supply wells that

provide water for consumption by humans and livestock at the Rob Van Grouw Dairy (Dairy), which is located west of the Landfill (Figure 1-3).

1.2 PREVIOUS INVESTIGATIONS

1.2.1 Groundwater Monitoring Well Network

Prior to the present investigations, the groundwater monitoring well network was comprised of 27 wells installed during various phases of investigation dating from 1985 to 2000. These monitoring wells are numbered M-1 through M-16B. Twenty-one wells are located on-site, and six (M-13A/13B, M-14A/14B, and M-15A/15B) are located to the west and southwest of the Landfill adjacent to the Dairy. Well locations are illustrated on Figure 1-3. Twenty-four of the monitoring wells are 2-inch diameter casings with either 10-foot or 20-foot screen lengths and total depths ranging between 35 and 100 feet.

Four deeper monitoring wells (M-13B, M-14B, M-15B, and M-16B) were installed west and southwest of the Landfill to depths ranging from 125 to 150 feet below ground surface (bgs).

1.2.2 Hydropunch™ Investigation

A series of investigations were performed by BSK & Associates (BSK) for Tulare County between 1990 and 1992. A groundwater investigation was conducted in 1991 consisting of 25 Hydropunch™ locations with samples collected at depths of 65 feet and 85 feet bgs, and at one location with a sample collected at 145 feet bgs. At the time of investigation, depth to groundwater was about 60 feet bgs. Figure 1-4 presents the estimated limit of volatile organic compound (VOC) contamination based on the Hydropunch™ sampling conducted in 1991. The results identified a groundwater plume of chlorinated VOCs on the west side of the Landfill and extending off-site between monitoring wells M-3 and M-4; and on the south side of the waste management unit extending southward between M-2 and M-3. The primary contaminants encountered at that time were:

- tetrachloroethene (PCE)
- trichloroethene (TCE)
- dichlorodifluoromethane (Freon™ 12)

1.2.3 Detection Monitoring and Water Supply Well Sampling

The existing monitoring wells are sampled semi-annually as part of the Landfill detection monitoring program (DMP) required under Title 27. Sampling results obtained prior to the present investigations identified the presence of PCE, TCE, Freon™ 12, 1,1-dichloroethane (1,1-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), trichlorofluoromethane (Freon™ 11), vinyl chloride (VC), and toluene in groundwater west and southwest of the Landfill.

In January and February 2000, Tulare County personnel sampled five agricultural and two dairy water supply wells located west and southwest of the Landfill. The results of the water supply well sampling conducted under the evaluation monitoring program are discussed in Section 4.0.

1.3 OBJECTIVES

The EMP investigations were conducted to delineate the lateral and vertical extent of groundwater contamination emanating from the Landfill, to expand the groundwater monitoring system, and to obtain data needed for remedial measures to address the groundwater contamination in accordance with EMP regulations (CCR Title 27) and requirements of the Cleanup and Abatement Order.

This report also presents the results of investigations involving the potential threat to off-site water supply wells and the data collected for the interim corrective measures along the western edge of the unlined waste management unit.

2.0 FIELD INVESTIGATIONS

The field investigation was conducted to evaluate the impact of the dissolved chlorinated VOC plume on the off-site water supply wells, determine the vertical and lateral extent of the groundwater impacts, determine the mechanism for vertical transport below a low permeability zone, and characterize the flow components of the aquifer. Table 2-1 summarizes the borings and wells installed as part of this investigation. The following sections describe the methodologies used for each aspect of the field investigation.

2.1 SIMULPROBE™ SOIL BORINGS

2.1.1 Drilling and Logging

Soil borings constructed for the collection of discrete interval groundwater samples using a SimulProbe™ groundwater sampler are referred to as SimulProbe soil borings. SimulProbe™ soil borings were drilled by Consolidated Testing Laboratory (CTL) of Porterville, California, a State of California licensed well driller. Each soil boring was constructed using mud rotary drilling methods, with a 5 ½ inch diameter drill bit. The drilling fluid was a bentonite mud slurry. The water initially used to prepare and maintain the drilling mud was obtained from the upgradient Landfill Operations Supply Well. Beginning with the drilling operations at the M-17 well cluster City of Visalia water was used for drilling. The reason for using City of Visalia water is discussed in Section 2.3.5.

Malcolm Pirnie obtained permits to drill soil borings from Tulare County Environmental Health. Soil borings which are not completed as wells, require one permit per Assessor's Parcel Number (APN). Copies of the permits are provided in Appendix D.

The SimulProbe™ soil boring nomenclature consisted of a prefix: DSB, IRB, or EMP to designate Dairy Soil Boring, Interim Remedial Boring or Environmental Monitoring Program, respectively. Each prefix is provided a numerical designation and the boring locations are depicted on Figure 1-3.

Soil samples were continuously collected from IRB-3, EMP-13, and EMP-14, to characterize the stratigraphy and provide verification of the geophysical log interpretations. Limited soil coring was performed at AG-13R and EMP-12 to better characterize a regional aquitard zone. All stratigraphic soil logs were prepared under the direction of a California Registered Geologist in accordance with CCR Title 27. Samples were not collected for stratigraphic profiling from the remainder of the SimulProbe™ soil borings.

Discrete interval groundwater samples were collected from DSB and EMP SimulProbe™ soil borings at approximately 50-foot intervals. Discrete level groundwater samples were collected from the IRB SimulProbe™ soil borings at approximately 30-foot intervals. In addition, discrete level groundwater samples were collected at various depths in several of the monitoring well soil borings (Section 2.2). The drill fluid returns were inspected for sand during borehole advancement to target the water bearing units for SimulProbe™ sampling. SimulProbe™ sampling procedures are described in Section 2.1.2.

Once the final groundwater sample was collected, the drill rods were removed from the boring and stratigraphic information was obtained indirectly by geophysical logging performed by Welenco, Inc. of Bakersfield, California. Each of the SimulProbe™ soil borings were geophysically logged using electric logs (spontaneous potential, single point resistivity, long normal and short normal resistivity) and gamma ray. The resultant logs are provided in Appendix H. The geophysical logs were used to determine the stratigraphic sequence to ascertain the vertical locations of low permeability sediments, and to correlate soil types between boreholes.

After completing the geophysical logging, the SimulProbe™ soil borings were properly abandoned by backfilling the borehole with cement-bentonite grout through a tremie pipe, using a pressurized grout pump. Because soil boring EMP-12 was located within the footprint of the proposed new lined WMU, the consultant designing the WMU requested that the soil boring be abandoned using Volclay™ grout by pressure grouting (EBA Wastechologies, 2001). EMP-12 was abandoned in accordance with the specifications requested by the landfill design consultant.

2.1.2 SimulProbe™ Sampling

Discrete groundwater samples were collected using one of two SimulProbe™ sampling devices; H₂Vape™ or MaxiProbe™. The H₂Vape™ was utilized in the upper two hundred feet and was equipped with a 15-inch, PVC inlet screen. A sacrificial Latex™ condom was placed around the outside of the device and the canister was pressurized with nitrogen gas. The H₂Vape™ was driven below the base of the drilling mud a minimum of 14 inches using a 140-pound hammer. The H₂Vape™ sampler was retracted a minimum of 14 inches to expose the PVC screen section and the pressure was released, which allowed groundwater to fill the canister. For groundwater samples below 200 feet or in the event of H₂Vape™ refusal in the shallower intervals, the MaxiProbe™ was utilized. Sampling procedures and illustrations of the MaxiProbe™ sampling device were included as Appendix B of the Work Plan dated June 2000.

The amount of time required to fill the canister of the sampling devices varied depending on the nature of the soils. Fill times ranged from less than one minute to overnight. However, in general the maximum time allowed to fill the chamber was one-hour. Once the canister was filled, or one hour had elapsed, the sampler was re-pressurized using nitrogen gas and retracted from the borehole. Once the sampler was retrieved from the borehole, the pressure was released and the groundwater sample was dispensed into 40-milliliter (ml) vials for VOC analysis.

The sampling devices were decontaminated between uses as described in Section 2.4 of this text. The Teflon™ airline was purged using compressed nitrogen between sampling intervals and was replaced with new tubing between boreholes.

2.2 MONITORING WELLS

2.2.1 Drilling, Logging, and Monitoring Well Installation

Soil boring nomenclature follows Tulare County's general monitoring well nomenclature. Monitoring well networks are numbered sequentially prefixed with "M" to represent "monitoring well" and suffixed with S, A, B, and C to indicate the vertical monitoring zone. The suffix S represents those wells in the network that are screened from 40 to 60 feet bgs; suffix "A" represents those wells in the network that are screened to approximately 100 feet bgs; suffix "B"

represents those wells in the network that are screened to approximately 150 feet bgs; and suffix "C" represents those wells in the network that are screened to approximately 240 feet bgs. Some existing wells in the older Landfill monitoring well network have designations that vary from the current system because they were installed during a time when the water table was deeper. Soil boring logs and well completion diagrams are provided in Appendices A and B.

Malcolm Pirnie obtained permits to drill soil borings from Tulare County Environmental Health. For soil borings completed as groundwater wells, the County requires one permit per well, or one permit per well cluster, on each individual parcel. Copies of the permits are provided in Appendix D.

One soil boring per monitoring well cluster (deepest monitoring well) was drilled below 150 feet to collect soil samples for characterization. Soil borings with continuous sampling include: M-11C, M-14C, M-17C, M-18B, and M-20C. Soil was collected continuously using a five-foot long, two-inch diameter, split spoon sampler. Malcolm Pirnie's on-site representative, under the direct supervision of a California Registered Geologist, observed the samples and described them for soil characteristics that include grain size distribution, soil classification using the Unified Soil Classification System (USCS) nomenclature, and color. Subsequently, soil boring logs were prepared and copies are provided in Appendix A.

Once the terminal depth was reached, each deep soil boring was geophysically logged by Welenco as described in Section 2.1.1. After completing the geophysical logging, and prior to well construction, the boring was flushed out by recirculating dilute drilling fluids.

The "B" and "C" series groundwater monitoring wells were constructed of four-inch outer diameter, Schedule 40, PVC casing and 0.02-inch slotted PVC, schedule 40 screen section. The length of the screen section was 10 feet. The "S" and "A" series monitoring wells were constructed using two-inch diameter Schedule 40 PVC 0.02-inch screen and blank casing. The "S" series groundwater monitoring wells were designed to overlap the water table, and accommodate a fluctuating groundwater level, with a 20-foot screen. The "A" series wells have a 10-foot screen section.

A silica sand filter pack, generally Silver Sand #12 or Lonestar #3, was placed into the annular space around the screen section. This filter pack was brought two feet above the top of

the screen section and protected with a three foot thick bentonite pellet seal (exceptions are noted on the boring logs in Appendix A). Above the bentonite seal, the annular space was filled with a cement-bentonite grout slurry mixture, applied by pressure through a tremie pipe. The monitoring well was completed above-ground and protected with a locking, steel, monument casing.

After a minimum of 24 hours following the grout application, each groundwater monitoring well was developed by CTL to remove the drilling fluids. Well development was performed utilizing a surge block, a stainless steel bailer, and a submersible pump. Development water from the monitoring wells, the drilling mud, and drill cuttings were placed in the County of Tulare's borrow pit located north of the Landfill gate house. After a period of drying, the County transferred the dried drilling mud and cuttings to the active waste disposal area.

2.2.2 Survey

Each of the groundwater monitoring wells and the SimulProbe™ soil borings were surveyed by Tulare County. The survey included the well location and top of well casing elevations as referenced by the County's local coordinate system. The Northings, Eastings, and top of well casing elevations are summarized in Table 2-2 and on each boring log submitted in Appendix A.

2.2.3 Groundwater Sampling

Groundwater samples were collected during the first weeks of April 2001 by County of Tulare personnel. The results are not yet available. Results will be reported by the County in its Semi-annual Groundwater Monitoring Report, and will be incorporated into the data set used in the proposed Phase II Evaluation Monitoring Program Report.

2.2.4 Groundwater Levels

Depths to water measurements were collected by County of Tulare personnel on March 12, 2001, utilizing an electronic measuring device incremented to 0.01-feet. Groundwater depth measurements were referenced to the top of the steel casing of the well, from which the surveyed

elevation was available. The depth to groundwater was subtracted from the top of well casing elevation to provide the groundwater elevation. Table 2-3 summarizes the results.

2.3 FIELD QUALITY CONTROL

Quality control samples were collected to evaluate whether groundwater samples were representative of natural conditions and not a result of cross-contamination. Malcolm Pirnie's quality control program included the collection of:

- raw rinse water (bottled distilled water),
- equipment rinsate samples,
- drilling water
- trip blanks

Quality control samples were analyzed for volatile organic compounds by EPA Method 8260B at Agricultural & Priority Pollutants Laboratories, Inc. (APPL) in Fresno, California.

2.3.1 Standard Operating Procedures

To maintain the integrity of the water or groundwater samples, certain standard operating procedures were followed during sample collection, handling, and shipment. The standard operating procedures included:

1. The use of Latex™ disposable gloves for personnel collecting the groundwater sample, personnel collecting the field quality control samples, and for personnel decontaminating the field sampling equipment.
2. Elimination of headspace in the sample vials. The vials were carefully filled so that the preservative was not lost as a result of overfills.
3. Proper labeling of the sample vials/jars.
4. Completing the chain-of-custody.

5. Storing samples at 4-degrees Celsius.
6. Timely transport of samples to the laboratory. The samples were transported to APPL laboratory by a Malcolm Pirnie representative within 48-hours of sample collection.

The sampling methodologies and results for each of the quality control samples collected and analyzed are discussed in the following subsections.

2.3.2 Groundwater Sampling Equipment Decontamination

The groundwater sampling equipment consisted of the H₂Vape™ or the MaxiProbe™ patented and manufactured by BESST, Inc. headquartered in Larkspur, California. Each of these devices is constructed of stainless steel. In addition, each device is equipped with disposable internal parts. The internal parts consist of rubber o-rings and reed valves, and PVC screen (H₂VAPE™) or stainless steel mesh screen (MaxiProbe™). Disposable parts were discarded after use and replaced with new parts prior to the collection of each groundwater sample. The stainless steel sampling device was cleaned prior to the collection of each groundwater sample using pressurized steam, triple rinsing with distilled water, and air drying. The water used to steam clean the equipment was obtained from the County's Landfill Operation Supply Well located about 3,000 feet upgradient of the WMU (Figure 1-3). The distilled water used to rinse the equipment was purchased in gallon-sized containers at stores in Visalia because the quantity required, about 20 gallons per day, was in excess of the amount that the laboratory could provide to Malcolm Pirnie. Approximately 1 to 2 gallons of distilled water were used for each final rinse per sample.

2.3.3 Distilled Water Samples

Quality control samples were collected from two distilled water containers that were used to rinse the sampling equipment. The one-gallon water containers were chosen at random and the representative water samples were labeled: DI-WATER and DI-H2O-2. The water samples

were collected by dispensing the distilled water directly from the bottle into one of three 40-ml vials following standard operating procedures.

VOCs detected in at least one of the two distilled water samples are summarized in Table 2-4. The compounds detected (and their maximum concentrations) include: 1,4-dichlorobenzene [0.15J microgram per liter ($\mu\text{g/L}$)], acetone (6.8J $\mu\text{g/L}$), benzene (0.11J $\mu\text{g/L}$), chloroform (0.22J $\mu\text{g/L}$), and toluene (0.23J $\mu\text{g/L}$).

Laboratory Artifacts

The RWQCB analytical reporting requirements specify that the laboratory report any detection between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL). Detections within this range are termed “trace” concentrations. APPL attributes the universal detection of benzene in the quality control and groundwater samples to the carbon absorption process used in the purge and trap analytical method (see correspondence provided in Appendix G). As a result, trace values of benzene associated with the EPA Method 8260B sampling for this investigation should not be considered significant.

Detections of acetone, chlorination by-products (trihalomethanes), methylene chloride, and toluene at trace concentrations are often artifacts of the analytical process or of the laboratory environment. Both acetone and methylene chloride are used extensively within the laboratory to clean the equipment and are considered artifacts of the process.

2.3.4 Rinsate Water Samples

Rinsate water samples were collected by placing unused, unwashed disposable internal parts into the cleaned sample collection chamber of the SimulProbe™ sampler. The bottled, distilled water was poured into the chamber and the sampler was inverted repeatedly to allow the distilled water to contact the internal parts and the cleaned sample chamber. Once the distilled water had been adequately displaced throughout the chamber, three 40-ml amber vials were filled with distilled water dispensed from the chamber through the Viton reed valve, following standard procedures for sample collection.

Rinsate samples were collected from the SimulProbe™ sampler used in each of the following borings: IRB-1, IRB-2, IRB-3, IRB-4, IRB-5, EMP-2, EMP-13, EMP-15, M-20C, M-11C, DSB-3 and AG-I3R. Sampling nomenclature consisted of the boring number and "Rinsate" to designate the location and type of quality control sample.

Results

VOCs detected in the 12 rinsate samples are summarized in Table 2-4. These compounds (and their maximum concentrations) include: acetone (6.8 µg/L), 2-butanone (0.34J µg/L), benzene (0.15J µg/L), bromodichloromethane (0.53 µg/L), chloroform (6.2 µg/L), dibromochloromethane (0.17J µg/L), o-xylene (0.86 µg/L), toluene (0.52 µg/L), 1,2-dichlorobenzene (1,2-DCB) (0.07J µg/L), 1,4-dichlorobenzene (1,4-DCB) (0.37J µg/L), carbon disulfide (20J µg/L), and PCE (7.5 µg/L).

Benzene was reported in each of the rinsate samples. Carbon disulfide and toluene were reported in 11 of the 12 rinsate samples. 1,4-DCB was reported in five of the rinsate samples. Chlorination byproducts (chloroform, bromodichloromethane, or dibromochloromethane) were detected in 5 rinsate samples.

PCE was reported in two of the rinsate samples at 0.32J µg/l and 7.5 µg/l. The origin of this compound is unknown. In each case, the rinsate sample was collected following the collection of a groundwater sample in which PCE was detected. The 7.5 µg/l detection followed a collection of a sample in which 20 µg/l of PCE (IRB4-322) was detected. The 0.32 µg/l detection followed a collection of a sample in which 2.6 µg/l of PCE (EMP15-241) was detected. It is not certain whether the rinsate results for PCE indicate incomplete decontamination of the PCE present in groundwater, or the presence of an unknown source of PCE in the decontamination process. These two detections of PCE in groundwater must be qualified due to the detection of PCE in the associated rinsate sample.

Carbon Disulfide

Trace values of carbon disulfide was reported in 91% of the rinsate samples collected (11 of 12). As discussed later in Section 4.4, carbon disulfide was also reported in 70% of the

SimulProbe™ samples (73 of 103). Historically, carbon disulfide has been detected in groundwater samples collected from upgradient, background groundwater monitoring well M-6A and downgradient well M-3A. Carbon disulfide was not detected in water used for drilling or distilled water samples collected from the one-gallon containers.

Carbon disulfide is a highly volatile compound used as an agricultural fumigant, and many industrial processes including vulcanizing. Carbon disulfide is used in the manufacture of Latex™ and n-butyl rubber. Both personal protective equipment and the sacrificial condom used in the SimulProbe™ sampling contained Latex™. The o-ring for the SimulProbe™ sampler was made of n-butyl rubber. At Malcolm Pirnie's request, BESST, Inc. contacted the suppliers of the Simulprobe™ rubber materials to determine whether carbon disulfide was used in the manufacturing process. Carbon disulfide was not used. Trace levels of carbon disulfide may be an artifact of the personal protective equipment (PPE). However, the origin of the trace amounts of carbon disulfide is not known.

Conclusions

Analytical results qualified with a "J" indicate the results are between the MDL and PQL. RWQCB requires reporting "J" values as trace values. This data qualifier indicates that the analyte was positively identified, but that the result is estimated. The analytical results from the distilled water and rinsate blanks suggests that trace contaminants are present in the commercially available distilled water or in the air in the vicinity of the drilling equipment. Therefore, trace values associated with the SimulProbe™ sampling should not be considered significant and may not be an indication of groundwater quality.

2.3.5 Drilling Water Quality Control Samples

Initial Landfill Operations Supply Well Samples

A series of water samples were collected from the source water well (Landfill Operation Supply Well) located on the northeast end of the landfill property, and the water tanks used by the drilling crew for quality control purposes. During the project, the drilling company, Consolidated Testing Laboratories, Inc. (CTL), supplied one water truck for each drilling site.

One of the water trucks had a 2,000-gallon capacity water tank, and the other a 4,000-gallon capacity water tank. Prior to initiating the project, a representative sample was collected from each of the water trucks, after being filled from the Landfill Operations Supply Well. Both samples were collected by a Malcolm Pirnie representative on October 19, 2000 and the samples were labeled TANKER-1 (2,000-gallon capacity water tank) and TANKER-2 (4,000-gallon capacity water tank). From the inception of the project through January 19, 2001, each of these water tanks were filled from the Landfill Operations Supply Well and mixed with bentonite clay in the preparation of the drilling fluid.

The results for these two samples are listed in Table 2-5. Estimated concentrations of acetone and benzene were detected at levels between the PQL and MDL. These are considered laboratory artifacts, as discussed in Section 2.2.3.

Alternative Drilling Water Sources

During the installation of M-17B in January 2001, the Landfill Operations Supply Well became contaminated. A sheen was noticed on the drilling fluid in the mud-pit during the installation of M-17B on January 19, 2001, after water for the drilling fluid was obtained from the Landfill Operations Supply Well. Drilling operations were terminated until an alternative water source could be obtained and the water tanks could be decontaminated.

Later investigations determined that pump oil had accumulated in the Landfill Operations Supply Well to the point where, under frequent pumping, the oil would enter the pump discharge. A video log performed on the County's Landfill Operations Supply Well showed a nine foot layer of turbine pump oil on the water surface.

Representative groundwater samples were collected from the well on January 20, 2001 and January 23, 2001 for chemical analyses per EPA Method 8260B and labeled, LFWS-1 and LFWS-2, respectively. These samples were collected by dispensing water from the well tap into a decontaminated, five-gallon bucket. The water was carefully poured from the bucket into each of the 40-ml vials and standard operating procedures were followed. The sample results are listed in Table 2-5. Benzene and toluene were reported at concentrations that may be laboratory artifacts.

Because the CTL water truck was contaminated with pump oil, CTL obtained a 4,000-gallon replacement water truck to enable the drilling operations to continue. A water sample was collected from the replacement 4,000-gallon water tank, after having filled the tank with City of Visalia water. This water was used for the installation of the conductor casing in M-17B. A representative water sample, PETR-1, was collected on January 23, 2001 for VOC analyses from the water tank. The water samples were collected by dispensing the water from the tank tap directly into the sampling container and following standard operating procedures. The sample results are listed in Table 2-5. Benzene, a suspected laboratory artifact, and chlorination by-products from the public drinking water treatment process, were reported in the sample by APPL.

A sheen was noticed on the water in the replacement water truck used for the installation of the conductor casing. The water tank was subsequently flushed using City of Visalia water, Tri-sodium Phosphate (TSP), Castrol "Super Clean", and Dawn Dishwashing Liquid. The tank was then repeatedly filled and flushed with City of Visalia water from a fire hydrant located on Road 80. A slight sheen was observed on water obtained directly from the hydrant and in the water truck. When questioned about the sheen, California Water Service, the water purveyor for the City of Visalia, indicated that water from their hydrant system consistently had trace amount of pump oil. This water was used to prepare the drilling fluid used during drilling of soil boring M-17B and for the installation of the monitoring well, M-17B. A quality control water sample was collected from the water tank on January 26, 2001 and identified as PETR-2. The water sample was collected by dispensing the water from the tank tap directly into the sampling container and following standard operating procedures. The sample results are listed in Table 2-5. Benzene, a suspected laboratory artifact, chlorination by-products from the public drinking water treatment process, and ethanol were reported.

During construction of well M-17B, the detergents used in the decontamination process began to formulate as bubbles near the surface of the borehole. On January 30, 2001, prior to well development, the County's representative obtained a series of groundwater samples from the completed well for quality assurance purposes. These samples were identified as VIM-17B (Pre-Development) and were analyzed for Methylene Blue Active Surfactants (MBAS), water

quality parameters, metals, TOC, and EPA Method 8141, 8150, 8270 and 8260B parameters. The MBAS method is used to detect anionic surfactants. The results indicate the presence of MBAS at 0.23 mg/L. No organic compounds or toxic metals were detected.

Subsequently, CTL's 2,000 gallon water tank was decontaminated and filled with chlorinated City of Visalia water. This water was used to drill M-17A because no other viable water supply was available within the time constraints of the on-going drilling program. A quality control water sample was obtained for VOC analysis from the water tank on January 29, 2001 and identified as CTL-1. The water samples were collected by dispensing the water from the tank tap directly into the sampling container and following standard operating procedures. The sample results are listed in Table 2-5. Benzene, a suspected laboratory artifact, and chlorination by-products from the public drinking water treatment process, and methyl tertiary butyl ether (MTBE) were reported.

The remainder of the drilling program was completed using CTL's decontaminated 4,000-gallon water tank and City of Visalia water obtained from the fire hydrant located on Road 80. A quality control water sample was collected for VOC analysis from the water tank on February 8, 2001 and identified as CTL-2. The water samples were collected by dispensing the water from the tank tap directly into the sampling container following standard operating procedures. The sample results are listed in Table 2-5. Benzene, a suspected laboratory artifact, and chlorination by-products from the public drinking water treatment process, were reported.

Conclusions

Groundwater sampling results should be evaluated with respect for the potential presence of chlorination by-products and trace amounts of hydrocarbons originating from the drilling water.

2.3.6 Trip Blanks

Trip blanks, supplied by APPL Laboratories, accompanied groundwater and water samples to the laboratory in an ice-filled cooler. Each trip blank was prepared by APPL in the laboratory and sealed with a custody seal affixed to the lid and bottle. During the sampling

program, a trip blank was placed in a cooler with ice along with the water/groundwater samples. The trip blank was recorded on the chain-of-custody.

Results

VOCs detected in the 22 trip blank samples are summarized in Table 2-6. These compounds (and their maximum concentrations) include: acetone (5.6J $\mu\text{g/l}$), benzene (0.13J $\mu\text{g/l}$), methylene chloride (0.58B $\mu\text{g/l}$), and carbon disulfide (0.12J $\mu\text{g/l}$). With the possible exception of carbon disulfide (see Section 2.3.4), these compounds are probably laboratory artifacts.

2.4 EMP AGRICULTURAL WELL EVALUATIONS

Groundwater quality west of the Landfill was known to be degraded by VOC contamination from the Landfill based on earlier HydropunchTM and groundwater monitoring well data. The agricultural well evaluation was designed to provide current information about the lateral and vertical extent of the contamination, and to evaluate selected wells as vertical conduits.

2.4.1 Available Well Information

As illustrated in Figure 1-2, 34 agricultural/water supply wells are in the vicinity of the Landfill. Well completion reports are unavailable for most the agricultural and water supply wells in the area. Table 2-7 details the known construction and use of the agricultural/water supply wells. The pumping rates for these wells range from approximately 900 to 2,000 gallons per minute (gpm) and the well depths range from approximately 100 to 600 feet bgs. Well diagrams based on Table 2-7 are presented in Appendix E. The gravel pack intervals are unknown for most of the wells. The potential influence of the agricultural wells on contaminated groundwater movement depends on the well location, the length and position of the open or screened interval and the gravel pack, the regional hydraulic gradient, and the pumping history of the well.

The North and South wells at the Van Grouw Dairy were installed in May 1991 by Grabow Well Drilling of Hanford, California. According to the well completion reports, the construction details for the two wells are identical, with completed well depths of 425 feet bgs and screened intervals between 300 and 400 feet bgs (see Appendix E). The wells are cased to 300 feet bgs, but are cement sealed to only 200 feet bgs. Each well has two intervals of gravel pack from 200 to 260 feet bgs and from 270 to 425 feet bgs. A bentonite seal is located between 260 and 270 feet bgs. Any loss of integrity in the bentonite seal would allow pumping in the screened interval to induce water flow from the higher filter pack to the lower filter pack creating a vertical conduit.

The bentonite seal placed in the interval from 260 to 270 feet bgs was required because the driller observed a "clay" zone in a 30-foot interval from 255 to 285 feet bgs. Geologic logging of the stratigraphic soil boring located less than 600 feet to the east indicates the 255 to 285 feet bgs zone to be silt with interbedded fine grained sands. This suggests that either the "clay" zone in the Dairy wells is not continuous to the east, or that the well driller's description of "clay" could be better classified as a silt. Silt, which is more permeable than a clay, may not provide the protection necessary to prevent contamination from moving vertically downward into the screened interval of the Dairy wells.

2.4.2 Agricultural and Water Supply Well Sampling

Tulare County personnel from the Health and Human Services Agency (HHSA) Environmental Quality Division sampled 21 agricultural wells and six water supply wells located in the vicinity of the Landfill between the Second Quarter 2000 and the First Quarter 2001. The results are discussed in Section 4.0.

2.4.3 Vertical Conduit Investigations

As part of the EMP, Malcolm Pirnie investigated agricultural wells, AG-8, AG-13, and AG-15 to determine whether the well is acting as a vertical conduit between shallow and deep groundwater zones. The investigations included removing the pump bowls and piping, video logging the well, and collecting groundwater samples. In addition, for AG-13 and AG-15, a

video flowmeter log was conducted to determine groundwater flow velocity, and inflow or outflow zones under non-pumping conditions. Video flowmeter logging is provided by Welenco under the trade name FloVision™. A video flowmeter consists of a flapper valve, a video camera, and light source on a wireline. Under downward flow conditions, the wireline is advanced at a rate required to stabilize the flapper valve as viewed on the video monitor. Under upward flow conditions, the wireline is retracted at a rate required to stabilize the flapper valve. The wireline speed, in feet per second, is converted to volumetric flow in gpm. Zones with changing flow values are interpreted as inflow or out flow zones.

Welenco collected groundwater samples at several discrete intervals in AG-8, AG-13 and AG-15 to determine vertical water quality profiles. The discrete interval sampler consisted of a stainless steel cylinder, closed at one end and with a motor actuated valve at the other end. Welenco lowered the sampler on a wireline and collected groundwater samples at inflow zones, vertical flow zones, or outflow zones identified on the video flowmeter log. Investigation results for AG-8, AG-13 and AG-15 are presented below.

2.4.3.1 AG-13

Welenco obtained video and video flowmeter logs of AG-13 on September 14, 2000. The video log identified the top of the perforations at 153 feet bgs, numerous holes and corroded perforations in the casing, and an accumulation of sediment up to the level of the pump bowls at 269 feet bgs. Video flowmeter data indicated vertically downward water flow between the top of the perforations and the top of the sediment at flow rates as high as 400 gpm (Run 1, Figure 2-1). Johnson Drilling Company of Reedley, California then removed 91 feet of coarse sand and fine gravel from the base of the well using the air-lift method. Welenco re-ran the video and video flowmeter logs on September 29, 2001.

The second video log identified additional holes and corroded perforations in the lower 91 feet of the well, and also verified that the well had been cleaned out to the total depth of 360 feet. The second video flowmeter log identified increasing downward water flow rates up to approximately 400 gpm between 153 feet (top of perforations) and 203 feet to 220 feet bgs. Increasing flow rates indicates inflow to the well. Below 220 feet the water flow rate decreases

indicating outflow from the well. A substantial fraction of the water flow exits from the well above 230 feet bgs, where the water flow rate decreases to 120 gpm. However, downward water flow rates greater than 100 gpm continue to occur down to approximately 310 feet bgs (see Run 2 on Figure 2-1). Based on the video log and video flowmeter results, AG-13 is a vertical conduit between a shallow groundwater zone above 200 feet and groundwater zones deeper than 200 feet bgs.

Discrete level groundwater samples were collected for analysis of VOCs following both video flowmeter logs (see Table 2-8). Low levels of VOCs (PCE up to 8.2 $\mu\text{g/l}$, TCE up to 3.4 $\mu\text{g/l}$, 1,1-DCA up to 0.74 $\mu\text{g/l}$, Freon 11 up to 0.66 $\mu\text{g/l}$) and traces of cis-1,2-DCE, 1,2-DCE, and 1,2-dichloropropane were detected at all sampling depths.

2.4.3.2 AG-15

Welenco obtained video and video flowmeter logs of AG-15 on October 24, 2000. The video log identified the top of the perforations at 201 feet bgs, minor incrustations associated with perforations, and the base of the casing at 373 feet bgs. Video flowmeter data indicated stagnant water above 210 feet bgs. Downward water flow begins at approximately 210 feet bgs and increases to 275 feet bgs. Flow decreases below 310 feet bgs. Maximum water flow rates were approximately 10 gpm. Based on the video flowmeter log, water flow in the well appears to respond to small head differences within the deep groundwater zone. A hydraulic connection between the shallow groundwater zones (above 200 feet) and deeper zones may occur along the well gravel pack, if the gravel pack extends to the surface. However, the magnitude of any such connection appears to be minor.

Discrete interval groundwater samples were collected for analysis of VOCs following the video flowmeter log (Table 2-8). Trace levels of PCE and TCE were detected at 225 feet bgs. Trace levels of PCE were detected at 300 feet and 340 feet bgs.

2.4.3.3 AG-8

Welenco conducted video and video flowmeter logging of AG-8 on September 29, 2000. The video log identified blank casing with no holes or perforations to 157 feet bgs, and 7 feet of open hole below the casing. The open hole interval is wider than it is deep. Because no potential inflow zones were visible in the video log, the video flowmeter log was not run. One discrete interval groundwater sample was collected within the open interval (see Table 2-8). Trace levels of TCE were detected. A thin layer of pump oil was present in the well, and is the likely origin of the trace amounts of hydrocarbon compounds and styrene detected in the sample.

2.4.4 AG-13 Replacement Well

A replacement well (AG-13R) was installed along the north boundary of the Dairy (Figure 1-2) in April 2001 prior to abandoning AG-13 (see Section 2.5). In December 2000, an exploratory boring named AG-13R-PB was drilled to 457 feet bgs to identify likely water producing zones, confirm the presence of an aquitard zone, and determine groundwater quality at the new well location. Discrete interval groundwater samples were collected in selected sand layers using the Simulprobe™. No VOCs were detected. An electric log run in the boring (see Appendix H) indicated that few water producing zones occur below 350 feet.

The replacement well was completed to a depth of 458 feet bgs (see the well construction diagram in Appendix E). To provide adequate water for irrigation, the well is screened in two intervals: an upper screen between 118 feet and 168 feet bgs, and a lower screen between 238 feet and 458 feet bgs. The well annulus is cement sealed to 95 feet, and has two intervals of gravel pack separated by a 34.5 foot bentonite seal between 173 feet and 211.5 feet bgs. The bentonite seal is situated across an aquitard that was delineated in the exploratory boring.

2.5 WELL ABANDONMENTS

Agricultural well AG-13 is in the process of being abandoned during the preparation of this report. In January and February 2001, Johnson Drilling Company, of Reedley, California

feet. The present casing depth of 223 feet suggests that the well casing was extended 11 feet. Therefore, the original depth of the well may have been 231 feet below the present land surface.

Malcolm Pirnie collected a groundwater grab sample on January 31, 2001 prior to abandoning the well. The sample was collected with bailer lowered to 224 feet. No water was purged from the well. Analytical results are presented Table 2-8. Detected compounds include several chlorinated solvents, trace concentrations of hydrocarbons, and MTBE.

The former water supply well was abandoned by perforating the casing with a star perforating tool, injecting cement under pressure through a tremie pipe from 220 feet to the surface, and then plunging the cement column with a swabbing tool. The cement column was replenished and plunged six times until the casing accepted no more cement. A total of 8 1/2 cubic yards of cement, or 4.1 cubic yards greater than the casing volume, was added to the well. The wellhead was excavated to 7 feet and the casing separated at a joint 11 feet below the top. This upper 11 feet of casing was removed. Below 4 feet, the excavated material was a mixture of soil and waste. This material was segregated and returned to the excavation first. The original upper four feet of excavated material was clean fill and was returned to the excavation last. A copy of the California Department of Water Resources Well Completion Report prepared by Johnson Drilling Company is presented in Appendix E.

3.0 SITE HYDROGEOLOGY

3.1 REGIONAL GEOLOGY

The Visalia Landfill site is located in the southeastern San Joaquin Valley approximately 15 miles from the Sierra Nevada foothills. This portion of the San Joaquin Valley is an area of internal drainage called the Tulare Basin (Gronberg and others, 1998). Surficial geologic conditions of the Tulare Basin are illustrated in Figure 3-1. In the Tulare Basin the upper several hundred to 1,000 feet of valley deposits consist of arkosic sediment derived from the Sierra Nevada and deposited in a broad alluvial fans along rivers that drain the Sierra Nevada. Alluvial fan sediments are characterized by coarse-grained sediment near the foothills. Coarse-grained sediments are also found along major river channels. Finer grained sediment occurs along distributary channels, within interfluvial areas, and with increasing distance from the valley-foothill boundary. Stream channel deposits are flanked by basin deposits comprised of interbedded lacustrine, marsh, overbank, and stream channel sediments deposited by numerous sloughs and meanders of distributary streams.

North of Fresno, alluvial sediment deposited along the eastern San Joaquin Valley in the past 600,000 years are divided into alluvial units based on physiography, degree of weathering, and soil type observed in surficial exposures (Marchand and Allwardt, 1981). Each alluvial unit represents a period of comparatively rapid sediment deposition, which is correlated with climatic conditions affecting erosion rates in the Sierra Nevada. Because the alluvial units have very similar lithology, and are defined using criteria difficult to apply to subsurface core samples or geophysical methods, usage of the formal stratigraphy is difficult to apply to groundwater investigations in the Tulare basin (Page, 1986).

Croft and Gordon (1968) subdivided the subsurface in the Hanford /Visalia area into an informal sequence of deposits based on the type of deposit and the degree of weathering. The generalized stratigraphy included:

- Flood basin deposits
- Younger Alluvium
- Oxidized Older Alluvium
- Reduced Older Alluvium
- Lacustrine/Marsh deposits
- Oxidized Continental deposits
- Reduced Continental deposits

According to Croft and Gordon, the major water bearing beds are found in the alluvial and reduced continental deposits. Based on the yield of wells screened in the lacustrine clays and the continental deposits, both deposits are significantly less permeable in comparison to the alluvium. The lacustrine clay occurs within the alluvium and, where present, acts as a regional aquitard.

Regional hydrogeologic information on the Tulare Basin presented by the U.S. Geological Survey (USGS) in Water Supply Paper 1999-H (Croft, 1972) indicates that a clayey lacustrine deposit termed the E-Clay may be present under the Visalia Landfill site. Based on the information presented by Croft (1972), the Landfill is located near the eastern depositional boundary of the E-Clay. Figure 3-2 shows the location of the regional cross-section presented in Figure 3-3. Figure 3-3 shows a regional cross-section illustrating the E-Clay. Near the boundaries, less clay was deposited in shallow water along the edge of the basin, and was also subject to erosion by streams entering the basin. Therefore, the clay may be thin and laterally discontinuous. Previous drilling at the Landfill site (Malcolm Pirnie, March 2000) indicated that a thin clay is present at the appropriate depth.

3.2 SITE GEOLOGY

3.2.1 General Geologic Characterization

The site is underlain by unconsolidated alluvial fan deposits of the Kaweah River system. The site geology is characterized as heterogeneous with silt, clayey silt, and clay interbedded

with sand and silty sand. Soil deposits beneath the site have been investigated by continuous soil coring to a depth of 350 feet. Driller's logs from wells in the vicinity are available to 484 feet. Electric logs are available to a depth of 457 feet.

Soil types observed beneath the site consist of interbedded clay, silt, sandy silt, silty sand, and fine to medium sand deposited in stream channels and flood basins adjacent to distributary channels (Figure 3-4). Gravel deposits were not encountered during the EMP investigation. The distribution of coarse sand is limited to thin basal layers of thicker fine to medium sand, and as scattered grains in fine-grained matrices. The sand layers commonly grade upward into silty sand, sandy silt, and silt. These fining upward sequences represent comparatively short-lived depositional periods, which are associated with meandering distributary channels on an alluvial plain. Between the stream channel deposits occur poorly sorted fine sand and silt with coarse sand embedded in the matrix. These deposits represent flood basin sediments deposited in areas between distributary channels.

In this depositional environment there is unlikely to be widespread lateral continuity of the more permeable sands. However, at a local scale distributary streams will deposit nearly continuous sands (point bars) as the channel meanders.

Geologic conditions along cross-sections lines A-A' , B-B' , and C-C' (see Figure 3-5) are illustrated on Figures 3-6 , 3-7 and 3-8, respectively. Cross-section A-A' parallels the western Landfill boundary and is aligned across the regional groundwater flow direction. Cross-Section B-B' is constructed from EMP-15, west of the Van Grouw Dairy, to EMP-14, northeast of the Landfill. Cross-section C-C' is constructed from DSB-3, west of the Van Grouw Dairy, subparallel with Avenue 328 to EMP-12, southeast of the Landfill.

3.2.2 Definition of Monitoring Zones

For the purpose of developing a groundwater monitoring network, the alluvial deposits beneath the Landfill are divided into soil intervals in which the heterogeneous soil can be classified as predominately sand, predominately silt, or interbedded sand and silt. Figure 3-4 is a stratigraphic column depicting the soil intervals, approximate depths, and a graphic representation of USCS soil types logged at IRB-3.

Laterally continuous, predominately sand soil intervals are potential preferred contaminant pathways. Therefore, the site geology was evaluated to define monitoring zones within predominately sandy soil intervals. The selected monitoring zones and the approximately depth range for each zone include:

- S-Zone - 40 to 60 feet bgs
- A-Zone - 80 to 100 feet bgs
- B-Zone - 130 to 150 feet bgs
- C-Zone - 220 to 240 feet bgs

The monitoring wells were installed with 10-foot screens located in the coarsest interval within these zones. However, the S-Zone wells have 20-foot screens to accommodate water table fluctuations.

3.2.3 Description of Local Stratigraphy

The soil intervals, as determined by either soil sampling and/or interpretation of the electric logs, are illustrated on the cross-sections. There is substantial lateral and vertical variability within each interval, as should be expected due to the nature of the alluvial environment. The cross-sections illustrate the deviations from the typical depths presented on Figure 3-4. A description of each soil interval is presented below in order to place the monitoring zones in the context of the local stratigraphy.

0 to ~50 ft: Predominately Sand

This zone extends from the surface to approximately 50 feet, where there is a sharp contact between coarse to medium sand and underlying fine-grained soils. The sand is yellowish brown to gray brown, locally calcareous, and locally oxidized to red brown. In the southern portion of the site at IRB-5, M-11C, M-17C and M-18B a 7-foot to 15-foot thick sequence of silt, clayey silt, or greenish gray clay occurs between 15 and 40 feet. The lower 10 feet (40 to 50 feet bgs) is a laterally extensive, well sorted, coarse to medium sand, which was

partially saturated during the investigation. This is the primary water-bearing interval for the "S" monitoring zone.

50 to ~110 ft: Interbedded Sand and Silt

This zone is comprised of repeating packets of thin bedded, fluvial fine to medium grained sands that grade upward to silts. Soil colors are typically brown or yellow brown, to light olive brown with some reddish brown oxidation features. Occasional flood basin deposits comprised of fine sandy silts with coarse to medium sand occur between the fluvial deposits. A laterally extensive, two- to ten-foot thick, fine- to medium-grained sand occurs between 80 and 100 feet. This was identifiable along cross-sections A-A' and B-B', and is the primary water-bearing interval for the "A" monitoring zone.

110 to ~125 ft: Predominately Silt

A low resistivity layer within this interval occurs on the electric logs for cross-section A-A'. The thickness ranges from approximately 5 to 20 feet, including minor interbedded sands. Soils logged within this low resistivity interval are described as silt or fine sandy silt with traces of coarse to medium sand. These appear to be flood basin deposits with minor interbedded sand. This zone appears on geophysical logs along each cross-section. Therefore, it appears to be laterally extensive beneath the site.

125 to ~175 or 185 ft: Predominately Sand

This zone is comprised of thick bedded (5 to 15 ft), well sorted fine- to medium-grained sand, interbedded with silty sands, and minor silts. Soil colors are typically brown or gray brown, to light olive brown with occasional red brown oxidation features. The resistivity signature of the sands can be correlated to nearly all of the soil borings. Therefore this zone is laterally extensive beneath the site. This is the primary water-bearing interval for the "B" monitoring zone, and for the shallow irrigation wells located in the vicinity of the site.

175-185 to 210 ft: Predominately Silt (E-Clay Zone)

Near the Landfill, a series of prominent very low resistivity layers are present on electric logs between 175 and 210 feet. Northeast of the Landfill (at EMP-14), the base of the low resistivity layer occurs at 186 feet. Southwest of the dairy the base of the low resistivity layers occurs at 222 feet. Therefore, the low resistivity layers appears to be dipping to the southwest.

This zone is characterized by two or three, thin (1 to 4 feet) very low resistivity layers interbedded with substantially thicker (3 to 10 feet) well sorted sands. In soil samples, the sand layers generally have sharp basal contacts and fine upward to a very hard silt or clay. The uppermost silt or clay layer is generally associated with a sharp color change from gray brown to olive or olive gray. The deepest low resistivity layer is associated with very dark colors, black or greenish black, and various fractions of organic matter, including fibrous peat. At M-17C, 24 feet of silt and clay is present in this interval with no interbedded sand. The E-Clay zone at some locations (M-11C and IRB-2) has as much sand as silt or clay. However, the color, the cumulative low resistivity, and the sequence of soil types suggest that the entire zone was deposited under lacustrine, rather than alluvial, conditions.

Regional stratigraphic relationships and the descriptions provided above suggest that this zone is a continuation of the regional aquitard termed the E-Clay. Croft (1972) mapped the E-Clay in the subsurface as far east as Goshen, approximately 2.5 miles southeast of the landfill. Near Goshen, Croft places the E-Clay between approximately 200 and 225 feet bgs (see Figures 3-3 and 3-4).

210 to ~245 ft: Predominately Sand

This zone is predominately gray, gray brown, or olive gray silty, fine to medium sand that coarsens downward from the base of the E-Clay zone. This is the primary water-bearing interval for the "C" monitoring zone.

245 to ~310 ft.: Interbedded Silt and Sand

This zone is comprised of repeating packets of thin to thick bedded, calcareous fine to medium grained fluvial sands that grade upward to silts. Soil colors are typically brown or

yellow brown, to red brown. Where soil coring was performed, flood basin deposits comprised of fine sandy silts with coarse to medium sand in the matrix occur near the base of the interval. At DSB-1A, DSB-3 and IRB-2 low resistivity intervals appear to correlate with the flood basin deposits at IRB 3, and possibly EMP-13 and EMP-14.

310 to 330 ft: Predominately Sand

This zone has one or two thick bedded, well sorted, fine to medium sands, and is a prominent water-bearing zone.

330 - 400 ft. Interbedded Silt and Silty Sand

Soil coring was performed as deep as approximately 350 feet at IRB-3, EMP-13, and EMP-14. The soil conditions below 350-feet are interpreted from electric logs run to approximately 400-feet at the DSB borings, and to 457-feet at AG-13R. Between 330 to 330 feet, the soils are reddish, very hard, calcareous interbedded alluvial sands and silts. Below 350-feet, the resistivity curves flatten out (see electric logs for AG-13R and the DSB borings in Appendix D), suggesting that water-bearing sands are rare and there is a substantial change in the character of the subsurface soils. This change is interpreted to be the top of the oxidized continental deposits described by Croft and Gordon (1968).

3.3 HYDROSTRATIGRAPHIC UNITS

Hydrostratigraphic units are geologic deposits with continuous lateral extent, and similar hydraulic conductivity and porosity, which define a distinct hydrologic system. Beneath the Landfill, there are four reasonably distinct hydrologic systems:

- upper alluvial aquifer (water table to about 180 feet bgs),
- the E-Clay aquitard (about 180 feet to 210 feet bgs),
- the lower alluvial aquifer (about 210 feet to about 340 feet bgs), and
- the deeper aquifer (about 340 feet and deeper).

Each unit is described below. It is recognized that there are additional deeper aquifer zones beneath the Landfill, but the lower alluvial aquifer zone is the deepest aquifer zone of importance to Landfill investigations.

3.3.1 Upper Alluvial Aquifer

The upper aquifer extends from the water table to the top of the E-Clay aquitard. Monitoring wells screened in the S-zone, A-zone, and B-zone fall within the upper aquifer. Although the soil deposits are highly heterogeneous, the water levels screened at different levels within the aquifer have similar elevations. Based on the March 12, 2001 groundwater levels (Table 2-3), differences between the S-zone and A-zone wells are generally on the order of hundredths of a foot. Groundwater level differences between the S and B zones are on the order of tenths of a foot. These values may change seasonally and under pumping conditions that differ substantially from March 2001.

3.3.2 Aquitard Zone

The aquitard zone is physically distinct from the overlying and underlying alluvial deposits. The hydraulic conductivity of the hard silt and clay that comprise the aquitard cause these soils to retard groundwater movement. The geophysical logs and the nature of the deposits suggests that the low resistivity layers are laterally continuous. Regional information in Figure 3-3 indicates that the aquitard thickens to the west and southwest.

3.3.3 Lower Alluvial Aquifer

The lower aquifer extends from the base of the E-Clay aquitard to the top of the oxidized continental deposits. Four monitoring wells (M-11C, M-14C, M-17C, and M-20C) are screened in the C-zone and fall within the lower aquifer. Based on the March 12, 2001 groundwater levels presented on Table 2-3, water level in the C-zone wells are 15 to 25 feet lower than water levels in the B-zone wells.

3.3.4 Deeper Aquifer

The oxidized continental deposits below approximately 330 to 350 feet may be a fourth hydrostratigraphic unit. Evidence from the geophysical logs indicates that high resistivity layers, (interpreted as water-bearing sands) are uncommon. Croft and Gordon (1968) indicate that the yield of wells screened in the oxidized continental deposits is substantially lower than in the alluvial aquifers. However, there is no data on groundwater conditions below the C-zone at the Landfill.

3.4 GROUNDWATER FLOW

3.4.1 Upper Alluvial Aquifer

The regional groundwater flow direction is to the southwest (DWR, 1996). Water level data collected from the Landfill monitoring well network indicate that a portion of the groundwater under the Landfill flows southwest beneath the Dairy. Through 1998, the magnitude of the hydraulic gradient ranged from 0.004 to 0.006. Local deviations from the general direction and magnitude occurred due to seasonal recharge and groundwater pumping.

A water table isopotential contour map based on March 12, 2001 groundwater level data is presented in Figure 3-9. The overall flow direction is southwest with an average hydraulic gradient of 0.002. Where S-zone wells are absent (e.g. well clusters M-13, M-14, M-15, and M-16), the groundwater elevation of the A-zone is used.

The isopotential lines illustrate the local influence of agricultural wells on the groundwater flow directions in the upper alluvial aquifer. The County sampling team recorded that AG-E4 was pumping while groundwater levels were measured on March 12. The magnitude of the pumping influence is not known, due to the absence of sufficient groundwater elevation data in the north portion of the Landfill site. Therefore, the groundwater elevations at M-6A and M-6C were not used in constructing Figure 3-9.

Due to the well design of AG-13 and the presence of downward, regional vertical gradients, water from the upper alluvial aquifer is continuously entering AG-13 above the aquitard and exiting the well below the aquitard during periods of non-pumping. Flovision

survey results (see Section 2.4.3) from AG-13 indicates that the downward flow rate at AG-13 is between 300 and 400 gpm. The flow of water into AG-13 is expected to depress water levels in the vicinity of the well, however the extent of its influence is not known.

Similar to AG-13, there are two wells located southeast of the WMU that may locally have downward flow from the upper alluvial aquifer into the lower alluvial aquifer. These wells are the former Cotton Gin well and the agricultural well East Ag Well, both are either upgradient or cross-gradient from the WMU.

3.4.2 Lower Alluvial Aquifer

Figure 3-10 is an isopotential contour map for the four C-zone wells. The flow direction is west-northwest with a hydraulic gradient of 0.004. Based on the March 12, 2001 groundwater levels, M-17C is the upgradient well for the C-zone; M-20C and M-14C are downgradient wells relative to groundwater flow. The groundwater flow directions in the upper and lower alluvial aquifers vary by approximately 40 degrees. The groundwater flow direction in the lower alluvial aquifer may change due to seasonal conditions or local pumping operations.

4.0 GROUNDWATER QUALITY

4.1 EMP SAMPLING PROGRAM

Water quality data used in this report includes the following sampling types: monitoring well, discrete level groundwater samples, and agricultural and water supply samples. The data from all the sampling types, except for the monitoring wells, should be consider reconnaissance in nature. The reporting requirements included reporting all target analytes between the MDL and the PQL in accordance with the *Standard Provisions and Reporting Requirements for Waste Discharge Requirements for Discharges Regulated by Title 27 and/or Part 258, August 1997*. As shown by analyses performed for quality control (Section 2.0), MDL test results may be questionable as false positive detections of analytes may occur.

4.1.1 SimulProbe™ Borings

Malcolm Pirnie collected 103 discrete level groundwater samples between September 19, 2000 and February 02, 2001, using the procedures discussed in Section 2.0. All samples were analyzed for VOCs by APPL using EPA Method 8260B.

The vertical sampling intervals established in the project work plan were approximately 50-foot intervals for the DSB and EMP soil borings, and approximately 30-foot intervals for the IRB soil borings. These intervals were modified in the field based on the presence of nearby monitoring wells that were screened at the target sampling depth, on the absence of sand at target depth, and on failure to obtain a water sample at the target depth.

Tables 4-1, 4-2, 4-3, and 4-4 summarize the analytical results for the DSB soil borings, IRB soil borings, EMP soil borings, and monitoring well soil borings, respectively. The primary compounds of concern include VOCs PCE, TCE, 1,1,1-trichloroethane (1,1,1-TCA), and their breakdown products, including cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), VC, and chloroethane. The sum of the concentrations for these

chlorinated VOCs is listed for each sample in the tables and is discussed in Section 4.2. The term *total chlorinated VOCs*, as used in this report, does not include Freon™ compounds.

Other chlorinated compounds that were detected in the Simulprobe™ samples include Freon 11, Freon 12, Freon 21, 1,2-dichloropropane, chloroform, 1,2-DCB, 1,4-DCB, and chlorobenzene. With few exceptions, these compounds were only detected in the presence of one or more of the chlorinated VOCs.

Non-chlorinated compounds detected in the SimulProbe™ samples included 2-butanone (MEK), acetone, benzene, carbon disulfide, benzene, ethylbenzene, toluene, and xylenes. Acrylonitrile, styrene, vinyl acetate, 1-propene, hexanal, and 3-methyl-butanal were each detected from one to three times.

4.1.2 Monitoring Wells

Personnel from the Tulare County Resource Management Agency (RMA) Solid Waste Division perform compliance monitoring of the well network. Data collected in October and November 2000, and reported in the Second Semi-annual Compliance Monitoring Report for 2000 is used as the data set for monitoring well locations. Data are available from a total of 22 wells (Tables 4-5 and 4-6).

The samples were collected using the County's standard practices of purging three well volumes with dedicated bladder pumps, monitoring field parameters, and collecting groundwater samples through a flow cell. The County submitted all volatile organic compound samples to APPL for analysis by EPA Method 8260B using standard sample handling procedures. APPL ran these samples with the same parameter list, and reporting requirements used for samples submitted by Malcolm Pirnie.

The new EMP monitoring wells were installed after the October-November 2000 sampling event. Therefore, none of the data from the new wells was available for this report. The County is presently conducting semi-annual monitoring at the Landfill, which includes new and existing wells.

Results of the VOC analyses from October-November monitoring event for the S-zone wells are summarized in Table 4-5; results for the A-zone and B-zone wells are summarized in

Table 4-6. The constituents listed in Tables 4-5 and 4-6 include all parameters detected during the Simulprobe™ sampling program. Non-detections for a specific sample indicate that the constituent was not present in the sample above the MDL, however, the constituent was detected in other samples during the sampling program.

The sum of the concentrations for the primary compounds of concern (PCE, TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, 1,1,1-TCA, 1,1-DCA, 1,2-DCA, vinyl chloride, and chloroethane) is listed for each sample in Table 4-5 and 4-6 and is discussed in Section 4.2.

4.1.3 Agricultural Wells and Water Supply Wells

Tulare County personnel from the Health and Human Services Agency (HHSA) Environmental Quality Division (EQD) have teamed with Malcolm Pirnie personnel to assist the RMA Solid Waste Division in obtaining regional groundwater samples from agricultural wells and water supply wells on property not owned by the County. EQD personnel sampled 23 agricultural wells and six water supply wells located in the vicinity of the Landfill between the First Quarter 2000 and the First Quarter 2001. Sampling locations are illustrated on Figure 4-7. Groundwater samples were collected from taps installed in the well discharge piping. Samples were taken after about 30 to 45 minutes of operating the pumps. Samples were analyzed for VOCs by EPA Method 524.2 and other water quality parameters. Two of these wells, the primary (South) and secondary (North) water supply wells at the Van Grouw Dairy, are sampled on a monthly schedule.

4.2 DISTRIBUTION OF CHLORINATED VOLATILE ORGANIC COMPOUNDS

Figures 4-1, 4-2, 4-3, 4-4, 4-5, and 4-6 illustrate the distribution of total chlorinated VOCs that were detected in the S, A, B, aquitard, C, and deeper zones (equal to or greater than 250 feet bgs), respectively. The VOC distribution in each monitoring zone is discussed below.

4.2.1 S-Zone

As illustrated in Figure 4-1, chlorinated VOCs were detected in the S-zone primarily along the western and southern boundaries of the waste management unit. Chlorinated VOCs appear to have migrated beyond the waste boundary at IRB-5 (up gradient of AG-13), and at EMP-2 (west of AG-15). Trace levels of chlorinated VOCs were detected at EMP-12, which is southeast and cross-gradient of the waste management unit. Chlorinated VOCs were not detected in the S-zone in the DSB borings, which are adjacent to Dairy facilities. Additional data is needed to define the extent of chlorinated VOCs in the S-zone.

4.2.2 A-Zone

The distribution of total chlorinated VOCs in the A-zone is similar to the S-zone distribution down to approximately 100 feet below the land surface. Low levels (4.8 µg/l) of total chlorinated VOCs were detected in the A-zone at M-14A adjacent to Dairy facilities.

4.2.3 B-Zone

The concentration of total chlorinated VOCs detected in the B-zone at locations adjacent to the waste boundary range from 0.10J µg/L to 7.71 µg/L, indicating that the concentrations are decreasing with depth (see Figure 4-3). This distribution likely reflects the distribution of total chlorinated VOCs beneath the landfill.

Adjacent to the dairy facilities, at M-14, the concentrations of total chlorinated VOCs increase with depth. Specifically, the concentrations at M-14 increase from 4.8 µg/L in the S-zone, to 13.5 µg/L at 135-feet, and to 23.2 µg/L at 165-feet. Trace concentrations of total chlorinated VOCs were also detected adjacent to the dairy facilities at DSB-1A and M-13B.

4.2.4 Aquitard Zone

Twelve Simulprobe™ samples were collected from sands located within the E-Clay aquitard. Trace levels of total chlorinated VOCs ranging from 0.071J µg/L to 0.32J µg/L were detected at IRB 1, IRB-2, IRB-4, and IRB-5 (see Figure 4-4). The presence of trace concentrations of contaminants within the aquitard zone is consistent with the strong vertically

downward gradient and the generally more silty nature of the upper aquitard soils. The basal portion of the aquitard zone is harder and more coherent than the upper fine grained layers.

4.2.5 C-Zone

Chlorinated VOCs were detected in the C-zone. The concentration of total chlorinated VOCs in IRB-4 was relatively low at 0.13J $\mu\text{g/L}$. IRB-4 is downgradient of the former water supply well located on the southwest corner of the landfill perimeter berm (see Figure 4-5). This well was abandoned by the County in February 2001. A grab groundwater sample collected prior to well abandonment indicated the presence of 15.3 $\mu\text{g/L}$ total chlorinated VOCs. Available well information indicates that the former water supply well was open to below the E-Clay aquitard.

IRB-5 is approximately 150-feet up gradient of AG-13. As discussed previously, AG-13 is known to be a vertical conduit through the E-Clay aquitard. The concentration of total chlorinated VOVs detected at IRB-5 was 6.35 $\mu\text{g/L}$.

Chlorinated VOCs were also detected in the C-zone at Simulprobe™ location EMP-15. EMP-15 is located approximately 500 feet west of the Dairy facilities and is one of the more distant Simulprobe™ sampling location. A concentration of 2.6 $\mu\text{g/L}$ was detected in a sample collected at a depth of 241 feet. This sample was associated with a rinsate sample in which 0.32 $\mu\text{g/L}$ of PCE was detected. The rinsate sample was prepared immediately after collection of sample EMP15-241 (the sample collected in boring EMP15 at a depth of 241 feet bgs). Therefore, it is not known whether the rinsate result reflects incomplete decontamination of equipment containing PCE contaminated groundwater, or the presence of PCE in the decontamination process. There was no known use of PCE at the drilling site during drilling operations.

4.2.6 Deeper Aquifer Zones

Twenty-seven samples were collected from sampling intervals below the C-zone (see Figure 4-6). Chlorinated VOCs were only detected at two locations, including a concentration of 0.21J $\mu\text{g/L}$ at 251-feet in IRB-5; and a concentration of 20.1 $\mu\text{g/L}$ at 322 feet in IRB-4. The presence of chlorinated VOCs in the lower aquifer is likely related to the close proximity of AG-13. However, this sample was also associated with a rinsate sample in which PCE (7.5 $\mu\text{g/l}$)

was detected. The rinsate sample was prepared immediately after collection of IRB4-322. Therefore, it is not known whether the rinsate result reflects incomplete decontamination of equipment containing PCE contaminated groundwater, or the presence of PCE in the decontamination process. Again, there was no known use of PCE at the drilling site during drilling operations.

4.2.7 Western Landfill Boundary

Figure 4-7 illustrates the distribution of total chlorinated VOCs in profile along cross-section A-A', whose location is shown on Figure 3-5. Based on the available data and contaminant mass estimates, the primary impact to groundwater is in the upper 50-feet of the saturated zone. The primary impact to groundwater is defined as groundwater with total VOC concentrations greater than 100 µg/L.

Appendix F presents calculations of the mass of total chlorinated VOCs in a unit thickness of the aquifer between the isopleth intervals illustrated in Figure 4-7. Based on these calculations, 95% of the total chlorinated VOC mass occurs above the 100 µg/l isopleth, or approximately in the upper 50 feet of the plume.

Deeper detections of chlorinated VOCs occur in the southwest corner of the waste management unit. These deeper detections are separated from the shallow groundwater plume by sample intervals with only trace levels to nondetect levels of total chlorinated solvents. This pattern suggest that the contaminants have migrated to depth via an improperly sealed well rather than by seepage through the E-Clay aquitard.

4.2.8 Agricultural/Water Supply Wells

Sampling results from 27 agricultural and water supply wells located west and south of the Landfill are presented on Figure 4-8. Low levels (<5 µg/L) of Freon™ 11, Freon™ 12, PCE, TCE, and 1,1-DCA were detected in three agricultural wells west of the Landfill (AG-8, AG-9, AG-13). Trace levels (<1 µg/L) of Freon™ 12 and PCE have been detected periodically in samples collected at the secondary Dairy supply well (South well- a non-drinking water well), and trace levels of PCE have been detected in the domestic well serving the Gun Club facilities (a drinking water supply well). Well AG-13 is upgradient of the Dairy supply wells and has the

highest concentrations detected in the agricultural wells. The Gun Club well is the furthest downgradient in which potential contaminants from the Landfill were detected. AG-8, AG-9, and the Gun Club well reportedly produce water from B-zone.

4.3 WATER QUALITY PARAMETERS

Stiff Diagrams

Tulare County obtained groundwater samples for water quality analysis from 27 agricultural and water supply wells in the vicinity of the Landfill. Malcolm Pirnie prepared Stiff diagrams to identify distinctions among the sources of water produced from these wells. Figure 4-9 illustrates the wells that were sampled, and the associated Stiff diagram. A Stiff diagram is a graphical technique used to discern differences between relative proportions of major anions and cations in a water sample (Figure 4-9). There are two general classes of Stiff diagrams on Figure 4-9. One has comparatively low alkalinity and low calcium levels producing a thin diagram. Another has comparatively high alkalinity and calcium levels producing a broad diagram.

The broad diagrams are associated with shallow wells known to produce water from B-zone (e.g. AG-8). The thin diagrams are associated with wells known to produce water from greater than 300 feet (e.g. Dairy wells). It is noted that AG-13 has a broad diagram indicating it has primarily a shallow water source; although AG-13 is 360 feet deep. However, a video flowmeter survey indicated that the well has significant inflow from the shallow zone.

4.4 CARBON DISULFIDE DISTRIBUTION

Carbon disulfide was detected at 73 of 103 SimulProbe™ groundwater samples. Of these samples, 12 detections range from 0.21 to 160 µg/l. The remaining 61 detections were reported between the PQL (25 µg/l) and the MDL (0.11 µg/l) and, therefore are trace values. The distribution of the 12 quantifiable detections are posted on Figure 4-10. As illustrated on Figure 4-10, the quantifiable detections of carbon disulfide are generally deep, only five are above the E-Clay aquitard, and are not coincident with the distribution of total chlorinated

solvents. A substantial concentration of carbon disulfide (110 µg/l) was reported at an upgradient location (EMP-12). Therefore, the distribution of carbon disulfide does not appear to be Landfill derived, suggesting an upgradient source, if carbon disulfide is not an artifact of the SimulProbe™ sampling.

Carbon disulfide was detected historically in groundwater samples collected from groundwater monitoring wells M-6A (upgradient) and M-3A (downgradient) at the Landfill. It is not certain whether the carbon disulfide detections are a sampling artifact (as discussed in Section 2.4), a regional groundwater contaminant, a Landfill derived contaminant, or an airborne pesticide contaminant. Further investigations into the potential source of the carbon disulfide is recommended.

4.5 OTHER DETECTED CONSTITUENTS

This section presents a review of parameters detected in Simulprobe™ and monitoring well samples other than the suite of chlorinated solvents and carbon disulfide previously discussed. Several compounds were detected predominately in Simulprobe™ samples, but not in monitoring well samples. The two types of samples represent water quality from different volumes of the aquifer. The monitoring well samples are representative of an aquifer thickness of up to 10 feet, the length of the well screen. Simulprobe™ samples are representative of aquifer intervals only 4 to 15 inches thick. Therefore, differences in detected compounds and their concentrations may be observed between a Simulprobe™ sample and an adjacent well sample. In addition, sampling procedures for the Simulprobe™ samples included extensive decontamination and potential exposure to drilling fluids. Monitoring well samples are collected through dedicated equipment. The detected compounds are grouped below according to chemical type.

Other Chlorinated Plume Constituents

Ten chlorinated compounds are likely groundwater plume constituents based on the frequency of detection, and the consistency between discrete level samples and monitoring well samples. These compounds include Freon™ 11, Freon™ 12, Freon™ 21, 1,2-dichloropropane,

chlorobenzene, 1,4-DCB, 1,2-DCB, chloroform, and methylene chloride. Methylene chloride and chloroform, where detected at trace concentrations, may also represent laboratory contamination.

Petroleum Hydrocarbons

Toluene, ethylbenzene, and xylenes were detected in approximately 10% of the Simulprobe™ samples, and about 5% of the well samples. The maximum concentrations for any of these three compounds was 2.6 µg/l. Benzene was detected in almost all samples. However, as discussed in Section 2.0, trace detections of benzene are a result of the analytical procedure.

Additional petroleum hydrocarbon compounds were detected, but are very uncommon. These include 1-propene, 1-methylethylbenzene, butane, 3-methylbutanal, hexanal, vinyl acetate, and MTBE. The origin of these compounds is uncertain.

Styrene and acrylonitrile were detected at low (<1.4 µg/l) to trace concentrations in Simulprobe™ samples, but not in monitoring well samples. The origin of these compounds is not certain. Because the compound is not detected in monitoring well samples, the detections may be an artifact of the Simulprobe™ sampling procedure.

Methyl Ethyl Ketone and Acetone

Detections of methyl ethyl ketone (MEK or 2-butanone) occurred in 20% of the analyzed samples, and at every Simulprobe™ boring location except EMP-12, EMP-15, IRB-2, and IRB-4. MEK was not detected in monitoring well samples, nor in historic well sampling events dating back to 1995. Detections of MEK above trace levels occurred in four Simulprobe™ samples with a maximum concentration of 960 µg/l. The origin of the MEK is not certain. Because the compound is not detected in monitoring well samples, the detections may be an artifact of the Simulprobe™ sampling procedure. Malcolm Pirnie has not been able to identify a source of MEK in the sampling or decontamination procedures. The potential presence of MEK in groundwater will continue to be evaluated during the Phase II EMP.

Acetone was detected at trace concentrations in 46 Simulprobe™ samples, and slightly above trace levels in one sample. No monitoring well detections were reported. The acetone detections are probable laboratory artifacts.

5.0 CONCLUSIONS

The initiation of the current investigations had three objectives:

- Evaluate the impact to off-site water supply wells,
- Investigate the need for an interim corrective measures,
- Continue the EMP investigations started in 1991.

5.1 IMPACT TO OFF-SITE WATER SUPPLY WELLS

Three potential well impact scenarios were proposed in the project work plan (Malcolm Pirnie, June 2000). These are illustrated on Figure 5-1 and included:

- ***Scenario 1***

The plume migrates in the upper aquifer toward the Dairy by regional groundwater flow and is drawn down by daily pumping of the Dairy water supply wells. This scenario requires that the capture zone of the dairy wells extend through the E-Clay aquitard and other low permeable strata present above the screen and gravel pack of the Dairy wells.

- ***Scenario 2***

The plume is drawn toward AG-13 during pumping operations. During nonpumping periods the passive downward vertical flow in AG-13 transmits contaminated water into the lower aquifer. Pumping operations of the Dairy wells may capture some portion of the contaminated water that exits AG-13 at depth.

- ***Scenario 3***

The plume migrates in the upper aquifer towards the Dairy and beyond by regional groundwater flow. The plume does not impact lower aquifer zones. It does not impact the Dairy supply wells.

Based on the results of current investigations, Scenario 1 and 2 appear viable. Scenario 3 is not viable, because it depended on identifying no contamination below the first aquitard.

Scenario 1 is viable because trace concentrations of Landfill contaminants were detected in the secondary Dairy water supply well, and no deep aquifer contamination was detected in the soil boring DSB-1 between the Dairy water supply wells and AG-13. This suggests that well construction of the secondary well may be allowing contamination to move vertically downward within the secondary well. Fortunately, the secondary well is not used as a drinking water source. The details of the secondary well analysis follows.

Both Dairy supply wells reportedly are constructed the same with two intervals of gravel pack from 200 to 260 feet bgs and from 270 to 425 feet bgs. A bentonite seal is located between 260 and 270 feet bgs. Any loss of integrity in the bentonite seal would allow pumping in the screened interval to induce water flow from the higher filter pack to the lower filter pack creating a vertical conduit.

The North (primary) and South (secondary) wells are 50-feet apart, but only the South well is impacted by chlorinated solvents. If contaminants were moving down AG-13, and then laterally to the vicinity of the Dairy wells at horizons below the deeper seal, both wells should be impacted. If contaminants were moving downward from the S- and A-zones, or from the C-zone, under the pumping stress of the primary and/or secondary well, an ineffective seal or some other well construction difference in the secondary (South) well, combined with an effective seal in the primary (North) well could result in the observed contaminants in the secondary well.

Scenario 2 is viable because AG-13 has been established as a vertical conduit of contamination into the deeper aquifer zones. Based on a video flowmeter survey, a majority of the downward flow exits AG-13 into the C-zone (210 to 240-feet), but a portion exits into the aquifer deeper than 300 feet. No immediate downgradient data is available near AG-13, however, as discussed above, contaminants from AG-13 appear not to have impacted the Dairy supply wells, at this time.

Vertical conduits, AG-13 and the former water supply well at the southwest corner of the unlined waste management unit, have impacted groundwater below the first aquitard.

The presence of chlorinated VOCs in the C-zone at EMP-15 and in one of the Dairy wells can be explained by either Scenario 1 or 2. In particular, the C-zone is a likely receptor for contaminated water discharging from AG-13 in the subsurface, and may serve as a permeable pathway to wells downgradient of AG-13.

The presence of chlorinated VOCs at 322 feet bgs in IRB-4 is best explained by migration down a well acting as a vertical conduit. The particular well impacting IRB-4 is not certain, however, the former water supply well at the southwest corner of the unlined waste management unit is the most likely source. The well records indicate it penetrated, and was completed below the aquitard. AG-13 does not appear to be upgradient of IRB-4. However, because seasonal variations in flow directions in the C-zone are not available, AG-13 cannot be eliminated as the source of contamination near IRB-4. The apparent more significant vertical conduits are abandoned or are being abandoned; thus eliminating the deeper pathway of contaminants to the Dairy supply wells.

The shallow groundwater contamination on the Dairy property remains a threat to the Dairy supply wells if the Dairy supply well construction allows leakage of contaminants into the deeper screened interval of the wells.

Landfill derived contaminants have been identified below the E-clay aquitard at three locations, including one of the two Dairy water supply wells, at a depth of 322 feet bgs in IRB-4 (qualified sample), and at a depth of 241 feet bgs in EMP-15 (qualified sample). Contaminants have also been identified at a far downgradient position in the upper aquifer at the Gun Club well.

5.2 INTERIM CORRECTIVE MEASURES INVESTIGATION

The interim corrective measures soil boring program identified the upper 50 feet of the saturated zone exiting the western edge of the unlined waste management unit as the groundwater zone contributing about 98 percent of the mass of contaminants to the off-site contaminant plume. Figure 4-6 shows the zone of VOC concentrations greater than 100 $\mu\text{g/l}$ that requires control during the interim corrective measures program to minimize the on-going impact to groundwater quality and downgradient water supplies.

Interim Hydraulic Barrier

An interim hydraulic barrier along a portion of the western Landfill boundary appears feasible based on the data collected. The conceptual plan for the interim hydraulic barrier is presented in the Engineering Feasibility Study (EFS) letter report prepared by Malcolm Pirnie.

5.3 EVALUATION MONITORING PROGRAM INVESTIGATION

The conclusions from the EMP investigation are presented in the following groups:

Extent of contamination

- The S-, A-, B-zones are contaminated on-site and off-site. Groundwater contamination extends beyond the current network of monitoring wells to the west and southwest,
- C-zone monitoring well data is not available for this report, although C-zone depth contamination was observed in AG-13 and possibly in IRB-5, and EMP-15.
- S-, A-, B-zone contamination extends to the Gun Club Well, about 0.9 miles southwest of the WMU.

Monitoring Well Network

- Monitoring wells are not necessary deeper than the C-zone,
- Additional C-zone wells are necessary downgradient and upgradient of the Landfill to document groundwater flow direction variations with season, and the influence of local agricultural wells,
- Additional S-, A-, and B-zone wells are necessary to document the lateral and vertical extent of contamination south and west of the current well network,

Chemicals of Concern

- Chlorinated hydrocarbon compounds including Freons are the primary chemicals of concern in groundwater,
- PCE appears to be the chlorinated solvent that is one of the first Landfill chemicals to impact downgradient wells, as shown by the water sample from the Gun Club Well.

6.0 PHASE II EVALUATION MONITORING PROGRAM

6.1 OBJECTIVE

Based on groundwater data collected during the EMP, further delineation of the degradation of groundwater quality is required. The objective of the Phase II EMP is to define the vertical and lateral extent of contaminated groundwater emanating from the Landfill. Once the plume extent is established, a long-term monitoring network is needed to monitor plume movement.

6.2 PROPOSED TASKS

The results of the current EMP work indicate that the contaminant plume from the Landfill has extended beyond the existing groundwater monitoring well network. Additional monitoring wells will be required by the RWQCB. Prior to installing new wells, SimulProbe™ borings will be installed to assist in properly locating the new wells. At this time, the extent of the plume is not bounded by monitoring wells to the southwest and west of the Landfill. Also, the groundwater flow direction in the C-zone requires further documentation with the addition of upgradient and cross-gradient wells.

SimulProbe™ Borings

Discrete level groundwater sampling will be conducted at locations illustrated in Figure 6-1. The boring locations are described below:

- a. EMP-16 and EMP-17: located between known contamination at EMP-15 and teVelde agricultural well AG-3. Boring EMP-26 is planned north of EMP-16 to investigate the width of the plume passing under the dairy.
- b. EMP-18, EMP-19, and EMP-20 located up gradient and downgradient of the known contamination at the Gun Club well.

- c. EMP-21, EMP-22 and EMP-23 located downgradient of the known contamination at AG- 13 in the upper alluvial aquifer.
- d. EMP-24 and EMP-25 located south of the Landfill to evaluate the potential migration of a plume.
- e. EMP soil borings will be completed in a sequence from the closest to the Landfill to the farthest and, based on results from the earlier borings, some of the Phase II soil borings and monitoring wells may be moved to new locations or eliminated.

Monitoring Wells

Monitoring wells will be located as illustrated on Figure 6-1, providing the soil borings and discrete level groundwater sampling has defined the extent of the plume. Also, monitoring wells are required immediately downgradient of the proposed hydraulic barrier to document the effectiveness of the barrier system.

6.3 SCHEDULE

Tulare County and Malcolm Pirnie propose a meeting with the RWQCB approximately one month after submission of this report to discuss the implementation of the Phase II EMP, and establish submittal dates for the Phase II EMP report and the final engineering feasibility study report.

7.0 REFERENCES

- BSK & Associates, 1990, *Proposed Work Plan Groundwater Degradation Assessment, Visalia Landfill, Tulare County, California*, Prepared for Tulare County Department of Public Works, dated June 12.
- BSK & Associates, 1991, *Interim Report Groundwater Degradation Assessment, Visalia Landfill, Tulare County, California*, Prepared for Tulare County Department of Public Works, dated May 16.
- BSK & Associates, 1992, *Report Groundwater Degradation Assessment, Monitoring Well Installation and Sampling, Visalia Landfill, Tulare County, California*, Prepared for Tulare County Department of Public Works, dated June 22.
- California Dept. of Water Resources (DWR), *Lines of Equal Elevation of Water in Wells - Unconfined Aquifer - San Joaquin Valley*, Spring 1996.
- Croft, M.G., and G.V. Gordon, 1968, *Geology, Hydrology, and Quality of Water in the Hanford-Visalia Area, San Joaquin Valley, California*. U.S. Geological Survey, Water Resources Division, Open File Report, 63p.
- Croft, M.G., 1972, *Subsurface geology of the Late Tertiary and Quaternary water-bearing deposits of the southern part of the San Joaquin Valley, California*, U.S. Geological Survey Water Supply Paper 1999-H.
- Driscoll, F.G., 1986, *Groundwater and Wells*. The Johnson Division. Appendix 11C, page 938.
- EBA WasteTechnologies, Inc. 2001, Correspondence from Mr. Duane Butler, P.E., (President EBA WasteTechnologies) to Mr. Kevin Shannon (Tulare County, RMA), dated February 15, 2001.
- Gas Research Institute, 1988, *Trace Constituents in landfill gas, Task Report on Inventory and Assessment of Cleaning Technologies - Final Report*: GRI 5083-253-0937, April.
- Gronberg, J. M., N.M. Dubrovsky, C.R. Kratzer, J.L. Domagalski, L.R. Brown, K.R. Burow, 1998, *Environmental Setting of the San Joaquin-Tulare Basins, California*. U.S. Geological Survey, Water-Resources Investigations Report 97-4205.
- Malcolm Pirnie, Inc., 1999, *Well Abandonment Work Plan, Visalia Landfill, Tulare County, California*, Prepared for Tulare County Resource Management Agency, dated April 22, 1999.

Malcolm Pirnie, Inc., 2000, *Groundwater Monitoring Well Installation Report, Visalia solid Waste Disposal Site, Visalia, California*, Prepared for Tulare County Resource Management Agency, dated March, 2000.

Marchand, D., and A. Allwardt, 1981, *Late Cenozoic Stratigraphic Units, Northeastern San Joaquin Valley, California*. U.S. Geological Survey, Bulletin 1470

Page, R.W., 1986, *Geology of the Fresh Ground-Water Basin of the Central Valley, California, with Texture Maps and Sections*. U.S. Geological Survey, Professional Paper 1401-C, 54p.

Sax, N.I., and R.J. Lewis, 1987, *Hawley's Condensed Chemical Dictionary*. Eleventh Edition, Van Nostrand Reinhold Co., New York, 1288 pp.

U.S. Environmental Protection Agency, 1997a, *Innovative Treatment Technologies, Annual Status Report, Eighth Edition*. EPA/542/R-96/010.

U.S. Environmental Protection Agency, 1997b, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*. Office of Solid Waste and Emergency Response (OSWER) Directive 9200.4-17, November 1997.

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**TABLE 2-1
SUMMARY OF DRILLING ACTIVITIES**

Location	Total Boring Depth	No. Of Discrete Level GW Samples Analyzed	Soil Coring Interval	Geophysical Logging Performed	Well Screen Interval
Soil Borings					
DSB-1A	405	8	na	Yes	na
DSB-2	396	6	na	Yes	na
DSB-3	407	6	na	Yes	na
AG13R	457	3	185 - 242	Yes	na
IRB-1	330	11	na	Yes	na
IRB-2	315	11	na	Yes	na
IRB-3	355	7	0 - 355	Yes	na
IRB-4	320	6	na	Yes	na
IRB-5	342	11	na	Yes	na
EMP-2	248	5	na	Yes	na
EMP-12	262	7	166 - 262	Yes	na
EMP-13	354	7	0 - 354	Yes	na
EMP-14	345	4	0 - 345	Yes	na
EMP-15	241	5	na	Yes	na
Groundwater Monitoring Wells					
M-11S	65	0	na	No	44 - 64
M-11B	147	0	na	No	137 - 147
M-11C	245	1	0 - 245	Yes	225 - 235
M-14C	245	3	150 - 245	Yes	228 - 238
M-17S	60	0	na	No	39 - 59
M-17A	107	0	na	No	96 - 106

Note: "na" Not applicable to location

**TABLE 2-1
SUMMARY OF DRILLING ACTIVITIES**

Location	Total Boring Depth	No. Of Discrete Level GW Samples Analyzed	Soil Coring Interval	Geophysical Logging Performed	Well Screen Interval
Soil Borings					
M-17B	151	0	na	No	139 - 149
M-17C	230	0	0 - 230	Yes	218 - 228
M-18S	60	0	na	No	40 - 60
M-18A	101	0	na	No	90 - 100
M-18B	161	0	0 - 160	Yes	135 - 145
M-20S	50	0	na	No	29.5 - 49.5
M-20A	91	0	na	No	80.5 - 90.5
M-20B	166	0	na	No	155 - 165
M-20C	220	3	0 - 220	Yes	209 - 219

Note: "na" Not applicable to location

TABLE 2-2
GROUNDWATER MONITORING WELL CONSTRUCTION DATA AND
SIMULPROBE SOIL BORING DATA

WELL	NORTHING	EASTING	GUARD ELEVATION (Ref. Pt.)	ORIGINAL GROUND ELEVATION	DEPTH FROM O.G. TO TOP OF SCREEN	DEPTH FROM O.G. TO BOTTOM OF SCREEN	DEPTH FROM O.G. TO BOTTOM OF WELL/BORING	TOP OF SCREEN ELEVATION	BOTTOM OF SCREEN ELEVATION	BOTTOM OF WELL/BORING ELEVATION	DATE INSTALLED OR DRILLED
S-ZONE MONITORING WELLS											
M-1	11350.742	12611.912	297.41	293.8	35.00	55.00	55.00	258.84	238.84	238.84	09/06/1985
M-2A	11350.003	11375.809	300.18	292.0	33.00	53.00	53.00	258.99	238.99	238.99	09/09/1985
M-3A	11353.288	10034.366	294.12	291.3	34.50	54.50	54.50	256.84	236.84	236.84	09/05/1985
M-4A	13407.181	10007.437	292.16	290.8	29.00	49.00	49.00	261.78	241.78	241.78	09/11/1985
M-5	15289.571	9996.706	291.19	289.9	25.00	45.00	45.00	264.90	244.90	244.90	09/17/1985
M-6A	15321.874	12600.840	296.46	294.1	30.00	50.00	50.00	264.10	244.10	244.10	09/12/1985
M-6C	15323.922	12603.078	295.56	294.1	40.00	50.00	50.00	254.11	244.11	244.11	NA
M-7A	14045.005	15216.901	297.16	296.2	30.00	50.00	50.00	266.24	246.24	246.24	09/13/1985
M-8	13926.770	11242.607	292.60	292.0	30.00	50.00	50.00	262.00	242.00	242.00	09/16/1985
M-9	13351.432	11556.300	298.91	294.0	39.00	59.00	59.00	255.03	235.03	235.03	09/18/1985
M-10	13227.758	12481.126	296.92	294.2	35.00	55.00	55.00	259.20	239.20	239.20	09/18/1985
M-11S	10448.486	10042.506	292.90	290.7	44.90	65.00	65.00	245.79	225.69	225.69	12/13/2000
M-16S	12721.876	10022.445	293.22	290.0	39.60	59.60	60.00	250.85	230.85	230.45	03/21/2001
M-17S	10061.390	11373.096	294.37	292.8	38.70	58.80	60.50	254.09	233.99	232.29	02/21/2001
M-18S	10703.915	12633.810	296.23	293.8	39.90	60.00	60.00	253.90	233.80	233.80	02/14/2001
M-20S	14399.376	10066.359	292.81	290.3	29.30	49.40	49.50	260.99	240.48	240.79	12/19/2000

NOTES:

ALL MEASUREMENTS IN FEET, ELEVATIONS RELATIVE TO M.S.L., U.S.G.S DATUM.

TABLE CONTAINS BEST AVAILABLE DATA DERIVED FROM REVIEW OF CONSULTANT WELL INSTALLATION REPORTS, FIELD OBSERVATIONS, AND SURVEY DATA.
SOME WELLS HAVE HAD CASINGS EXTENDED UPWARD SINCE ORIGINAL WELL INSTALLATION.
SURVEY DATA DETERMINED BY TULARE COUNTY RMA SURVEY CREW.

O.G. - ORIGINAL GROUND SURFACE

EXB - EXPLORATORY BORING

DSB - DAIRY SOIL BORING

EMP - EVALUATION MONITORING PROGRAM SOIL BORING

IRB - INTERIM REMEDIAL MEASURE SOIL BORING

NA - NOT AVAILABLE

TABLE 2-2
GROUNDWATER MONITORING WELL CONSTRUCTION DATA AND
SIMULPROBE SOIL BORING DATA

WELL	NORTHING	EASTING	GUARD ELEVATION (Ref. Pt.)	ORIGINAL GROUND ELEVATION	DEPTH FROM O.G. TO TOP OF SCREEN	DEPTH FROM O.G. TO BOTTOM OF SCREEN	DEPTH FROM O.G. TO BOTTOM OF WELL/BORING	TOP OF SCREEN ELEVATION	BOTTOM OF SCREEN ELEVATION	BOTTOM OF WELL/BORING ELEVATION	DATE INSTALLED OR DRILLED
A-ZONE MONITORING WELLS											
M-2B	11343.996	11386.365	301.14	292.8	73.00	93.00	93.55	219.81	199.81	199.26	12/13/1994
M-3B	11344.904	10036.473	294.20	291.1	70.90	90.90	91.45	220.15	200.15	199.60	12/14/1994
M-4B	13414.426	10007.229	293.60	290.2	69.60	89.60	90.15	220.55	200.55	200.00	12/14/1994
M-6B	15323.922	12603.078	295.56	294.1	100.00	110.00	110.00	194.11	184.11	184.11	12/04/1986
M-7C	14045.773	15209.597	298.09	295.6	81.88	91.88	91.88	213.75	203.75	203.75	NA
M-11	10451.640	10036.279	293.29	290.7	90.56	100.56	100.56	200.14	190.14	190.14	05/11/1992
M-12	11342.108	12573.786	296.48	294.0	90.12	100.12	100.12	203.91	193.91	193.91	05/11/1992
M-13	10578.697	8549.981	292.75	290.3	90.32	100.32	100.32	200.01	190.01	190.01	05/12/1993
M-14	12165.500	8534.486	289.54	287.3	90.54	100.54	100.54	196.76	186.76	186.76	05/12/1992
M-15	13107.965	7364.841	290.45	288.0	91.20	101.20	101.20	196.77	186.77	186.77	05/14/1992
M-16A	12717.112	10013.330	292.48	290.0	90.88	100.88	100.88	199.13	189.13	189.13	05/13/1992
M-17A	10060.976	11351.097	294.49	292.0	96.40	106.50	107.00	195.59	185.49	184.99	01/30/2001
M-18A	10694.258	12634.275	296.07	294.0	90.60	100.65	100.70	203.37	193.32	193.27	02/13/2001
M-20A	14400.469	10056.304	292.39	290.6	80.30	90.35	90.50	210.35	200.30	200.15	12/19/2000

NOTES:

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TABLE 2-2
GROUNDWATER MONITORING WELL CONSTRUCTION DATA AND
SIMULPROBE SOIL BORING DATA

WELL	NORTHING	EASTING	GUARD ELEVATION (Ref. Pt.)	ORIGINAL GROUND ELEVATION	DEPTH FROM O.G. TO TOP OF SCREEN	DEPTH FROM O.G. TO BOTTOM OF SCREEN	DEPTH FROM O.G. TO BOTTOM OF WELL/BORING	TOP OF SCREEN ELEVATION	BOTTOM OF SCREEN ELEVATION	BOTTOM OF WELL/BORING ELEVATION	DATE INSTALLED OR DRILLED
B-ZONE MONITORING WELLS											
M-7B	14045.949	15213.200	298.06	295.7	115.00	125.00	125.00	180.73	170.73	170.73	01/14/1987
M-11B	10461.242	10041.665	292.63	291.1	137.00	147.00	147.00	154.09	144.09	144.09	11/01/2000
M-13B	10562.260	8549.810	292.72	290.6	138.80	148.80	149.30	151.75	141.75	141.25	01/07/2000
M-14B	12146.330	8336.010	289.57	287.2	126.20	136.20	136.60	161.00	151.00	150.60	01/18/2000
M-15B	13093.900	7364.440	289.96	287.3	127.30	137.30	137.70	160.00	150.00	149.60	01/12/2000
M-16B	12729.084	10012.610	293.22	290.0	140.00	150.00	150.00	150.05	140.05	140.05	05/14/1992
M-17B	10061.154	11340.129	294.28	292.1	139.20	149.20	151.00	152.92	142.91	141.11	01/26/2001
M-18B	10682.849	12633.783	296.13	294.1	135.60	145.67	160.00	158.55	148.48	134.15	02/02/2001
M-20B	14390.720	10055.866	292.45	290.4	156.30	166.32	168.00	134.05	124.03	122.35	02/14/2001
C-ZONE MONITORING WELLS											
M-11C	10437.213	10042.007	292.70	290.4	225.00	235.00	245.00	65.41	55.41	45.41	10/07/2000
M-14C	12127.285	8537.394	289.68	287.3	227.90	237.90	240.00	59.39	49.39	47.29	02/07/2001
M-17C	10059.854	11318.921	294.58	292.2	216.70	226.70	231.00	75.88	66.08	61.78	04/10/2001
M-20C	14401.910	10046.649	292.54	291.3	210.00	220.00	220.00	81.25	71.25	71.25	11/16/2000

NOTES:

ALL MEASUREMENTS IN FEET, ELEVATIONS RELATIVE TO M.S.L., U.S.G.S DATUM.

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NA - NOT AVAILABLE

TABLE 2-2
GROUNDWATER MONITORING WELL CONSTRUCTION DATA AND
SIMULPROBE SOIL BORING DATA

WELL	NORTHING	EASTING	GUARD ELEVATION (Ref. Pt.)	ORIGINAL GROUND ELEVATION	DEPTH FROM O.G. TO TOP OF SCREEN	DEPTH FROM O.G. TO BOTTOM OF SCREEN	DEPTH FROM O.G. TO BOTTOM OF WELL/BORING	TOP OF SCREEN ELEVATION	BOTTOM OF SCREEN ELEVATION	BOTTOM OF WELL/BORING ELEVATION	DATE INSTALLED OR DRILLED
EXTRACTION/OBSERVATION WELLS											
EW1	12663.860	10026.053	293.53	290.9	39.70	99.70	101.00	251.24	191.24	192.24	03/24/2001
OW1	12567.168	10025.970	294.33	291.5	39.40	99.50	100.00	252.14	192.04	191.54	03/22/2001
SIMULPROBE SOIL BORINGS											
DSB-1A	10633.646	8549.507	--	291.0	--	--	400	--	--	-109	10/02/2000
DSB-2	12099.690	8546.315	--	289.1	--	--	396	--	--	-107	10/16/2000
DSB-3	10104.613	7174.339	--	287.7	--	--	407	--	--	-119	10/20/2000
EMP-2	13501.797	9644.330	--	288.6	--	--	248	--	--	41	02/02/2001
EMP12	11356.309	13106.878	--	294.9	--	--	262	--	--	33	02/17/2001
EMP-13	13297.675	12582.161	--	294.7	--	--	354	--	--	-59	11/02/2000
EMP-14	14017.691	15176.487	--	295.8	--	--	340	--	--	-44	10/12/2000
EMP-15	11346.488	6978.615	--	287.4	--	--	241	--	--	46	01/17/2001
EXB-M13	10551.110	8549.330	--	290.3	--	--	--	--	--	--	01/05/2000
IRB-1	13462.757	10014.061	--	289.4	--	--	330	--	--	-41	11/13/2000
IRB-2	12783.564	10026.245	--	290.9	--	--	315	--	--	-24	01/08/2001
IRB-3	11987.255	10037.080	--	292.7	--	--	350	--	--	-57	12/21/2000
IRB-4	11382.856	10043.243	--	292.5	--	--	320	--	--	-27	01/09/2001
IRB-5	10926.386	10044.630	--	290.9	--	--	342	--	--	-51	11/22/2000
AG-13R-PB	15335.414	8017.964	--	288.0	--	--	457	--	--	-169	12/08/2000

NOTES:

ALL MEASUREMENTS IN FEET, ELEVATIONS RELATIVE TO M.S.L., U.S.G.S DATUM.

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IRB - INTERIM REMEDIAL MEASURE SOIL BORING

NA - NOT AVAILABLE

TABLE 2-3
GROUNDWATER ELEVATIONS
MARCH 12, 2001

WELL	MONITOR- ING ZONE	REFERENCE ELEVATION (Ref. Pt.)	SOUNDER READING	WATER ELEVATION
MONITORING WELLS				
M-1	S	297.41	47.69	249.72
M-2A	S	300.18	51.62	248.56
M-2B	A	301.14	52.61	248.53
M-3A	S	294.12	48.24	245.88
M-3B	A	294.20	48.35	245.85
M-4A	S	292.16	42.41	249.75
M-4B	A	293.60	43.97	249.63
M-5	S	291.19	37.63	253.56
M-6A	S	296.46	45.77	250.69
M-6B	A	295.56	47.48	248.08
M-6C	S	295.56	47.80	247.76
M-7A	S	297.16	40.77	256.39
M-7B	B	298.06	42.20	255.86
M-7C	A	298.09	42.12	255.97
M-8	S	292.60	40.90	251.70
M-9	S	298.91	47.70	251.21
M-10	S	296.92	44.99	251.93
M-11S *	S	293.02	48.23	244.79
M-11	A	293.29	48.76	244.53
M-11B	B	292.63	48.17	244.46
M-11C	C	292.70	63.72	228.98
M-12	A	296.48	46.06	250.42
M-13	A	292.75	50.56	242.19
M-13B	B	292.72	50.55	242.17
M-14	A	289.54	45.46	244.08
M-14B	B	289.57	45.91	243.66
M-14C	C	289.68	68.85	220.83
M-15	A	290.45	50.23	240.22
M-15B	B	289.96	50.34	239.62
M-16A	A	292.48	44.24	248.24
M-16B	B	293.22	45.01	248.21
M-17S *	S	294.49	46.31	248.18
M-17A	A	294.49	46.50	247.99
M-17B	B	294.28	46.35	247.93
M-17C	C	294.72	62.65	232.07
M-18S	S	296.23	45.86	250.37
M-18A *	A	296.09	45.79	250.30
M-18B	B	296.13	45.94	250.19
M-20S	S	292.81	40.92	251.89
M-20A	A	292.39	40.65	251.74
M-20B	B	292.45	41.12	251.33
M-20C *	C	292.56	67.44	225.12

*

Measured from top of PVC casing
All other wells were measured from top of Steel casing

TABLE 2-4
RINSATE AND DISTILLED WATER SAMPLES
QUALITY CONTROL DETECTIONS

VOC Parameter	Concentration in micrograms per liter (ug/L)						
	Sample ID: DI-Water Date Collected: 10/19/2000	DIH2O-2 10/31/2000	EMP15- Rinsate 01/17/2001	EMP2- Rinsate 02/02/2001	IRB-1 Rinsate 11/13/2000	IRB-4 Rinsate 01/10/2001	IRB2- Rinsate 01/09/2001
1,2-DCB	<0.5	<0.5	<0.5	0.07J	<0.5	<0.5	<0.5
1,4-DCB	0.15J	<0.5	<0.5	0.37J	<0.5	<0.5	<0.5
Acetone	1.8J	6.8J	<50	6.8	5.8J	<50	2.4J
2-Butanone (MEK)	<50	<50	<50	<50	<50	<50	<50
Benzene	0.086J	0.11J	0.14J	0.19	0.13J	0.13J	0.086J
Bromodichloromethane	<0.5	<0.5	0.52	<0.5	0.26J	0.53	0.5
Carbon disulfide	<25	<25	0.56J	0.17J	20J	1.1J	11J
Chloroform	<0.5	0.22J	1.5	<0.5	4.8	1.4	1.1
Dibromochloromethane	<0.05	<0.5	<0.5	<0.5	<0.5	0.17J	0.15J
O-Xylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	<0.5	<0.5	0.32J	<0.5	<0.5	7.5	<0.5
Toluene	0.1J	0.23J	0.33J	0.32J	0.45J	0.32J	0.27J

VOC Parameter	Concentration in micrograms per liter (ug/L)						
	Sample ID: IRB3- Rinsate Date Collected: 12/20/2000	IRB5- Rinsate 11/21/2000	M-20C Rinsate 11/13/2000	Rinsate M-11C 10/23/2000	Rinsate- AGI3R 10/24/2000	Rinsate- DSB3 10/19/2000	Rinsate- EMP13 10/13/2000
1,2-DCB	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-DCB	0.13J	0.36J	<0.5	0.24J	<0.5	0.097J	<0.5
Acetone	2.7J	4.3J	4.9J	<50	2.6J	4.4J	<50
2-Butanone (MEK)	<50	<50	<50	<50	0.34J	<50	1.8J
Benzene	0.13J	0.15J	0.11J	0.099J	0.13J	0.084J	0.12J
Bromodichloromethane	<0.5	<0.5	0.3J	<0.5	<0.5	<0.5	<0.5
Carbon disulfide	0.16J	2.6J	1.2J	2.3J	<25	1.1J	0.34J
Chloroform	<0.5	<0.5	6.2	<0.5	<0.5	<0.5	0.28J
Dibromochloromethane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
O-Xylene	<0.5	<0.5	<0.5	<0.5	0.1J	0.86	<0.5
Tetrachloroethene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	0.36J	0.28J	0.52	0.2J	0.16J	<0.5	0.26J

DCB - Dichlorobenzene

DI- Denotes Distilled water sample.

Concentration with suffix "J" denotes that the constituent has been identified by the laboratory, but can not be quantified.

"<" - constituent concentration is below the laboratory detection limit.

-- Constituent not analyzed

Bold numbers represent quantifiable concentrations above the laboratory detection limits.

TABLE 2-5
DRILLING WATER SAMPLE RESULTS
QUALITY CONTROL DETECTIONS

VOC Parameter	Concentration in micrograms per liter (ug/L)									
	TANKER-1 10/19/2000	TANKER-2 10/19/2000	LFSW-1 01/20/2000	LFSW-2 01/23/2000	PETR-1 01/23/2001	PETR-2 01/26/2001	CTL-1 01/29/2001	CTL-2 01/29/2001		
1,1,-DCA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,4-DCB	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Acetone	2.5J	2.2J	<50	<50	<50	<50	<50	<50		
Benzene	<0.5	0.076J	0.13J	0.12	0.13J	0.15J	0.15J	0.78J		
Bromodichloromethane	<0.5	<0.5	<0.5	<0.5	0.17J	0.24J	0.31J	0.21J		
Bromoform	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.57	0.35J		
Chloroform	<0.5	<0.5	<0.5	<0.5	0.12J	0.17J	0.19J	0.21J		
Dibromochloromethane	<0.5	<0.5	<0.5	<0.5	0.24J	0.37J	0.7	0.33J		
Toluene	<0.5	<0.5	0.88J	<0.5	<0.5	<0.5	<0.5	<0.5		
Ethanol	--	--	--	--	--	6.4	--	--		
MTBE	--	--	--	--	--	--	0.17	--		

DCB - Dichlorobromide

DCA - Dichloroethane

MTBE- Methyl tert-Butyl Ether

Concentration with suffix "J" denotes that the constituent has been identified by the laboratory, but can not be quantified.

"<" - constituent concentration is below the laboratory detection limit.

TABLE 2-6
TRIP BLANK SAMPLE RESULTS
QUALITY CONTROL DETECTIONS

VOC Parameter	Concentration in micrograms per liter (ug/L)								
	TB-9-14-00 09/14/2000	TB-9-29-00 09/29/2000	TB 10/20/2000	Trip Blank 05-01 12/14/2000	Trip Blank 01-09-2000 11/02/2000	Trip Blank 9-20 09/20/2000	Trip Blank 01/17/2001	Trip Blank 01/31/2001	Trip Blank 02/12/2001
Sample ID:									
Date Collected:									
Acetone	<50	5.6J	<50	<50	<50	<50	3.6J	<50	1.11.1J
Benzene	<0.5	0.086J	0.078J	0.13J	0.1J	0.08J	0.11J	0.078J	0.089J
Carbon Disulfide	<25	<25	<25	<25	<25	<25	0.12J	<25	<25

Sample ID: Date Collected:	Trip Blank 09/18/2000	Trip Blank 09/28/2000	Trip Blank 10/02/2000	Trip Blank 10/06/2000	Trip Blank 10/17/2000	Trip Blank 10/20/2000	Trip Blank 10/23/2000	Trip Blank 10/27/2000	Trip Blank 11/02/2000
Acetone	<50	<50	<50	<50	<50	2.9J	<50	<50	<50
Benzene	0.083J	0.13J	0.11	0.092J	0.1J	0.081J	0.099J	0.092J	0.12J
Methylene Chloride	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon Disulfide	<25	<25	<25	<25	<25	<25	<25	<25	<25

Sample ID: Date Collected:	Trip Blank 11/07/2000	Trip Blank 11/14/2000	Trip Blank 12/07/2000	Trip Blank 12/14/2000
Acetone	<50	<50	2.8J	1.7J
Benzene	0.11J	0.13J	0.11J	0.12J
Methylene Chloride	<0.5	0.58B	<0.5	<0.5
Carbon Disulfide	<25	<25	<25	<25

Concentration with suffix "J" denotes that the constituent has been identified by the laboratory, but can not be quantified.

"<" - constituent concentration is below the laboratory detection limit.

TABLE 2-7
REGIONAL AGRICULTURAL/
WATER SUPPLY WELL INFORMATION ^(1,2)

Well	Owner	EMP Investig- ations	Well Depth	Casing Size	Gravel Pack Interval	Screen Interval	Pump Rating	Power Source	Pumping Rate (gpm)
AG#3	teVelde	Sampled	610-ft	10-inch	0 to 610-ft	270-ft to 610-ft	unk	unk	unk
AG #8	Van Grouw	Sampled Video Log	164-ft	12-inch	Open Bottom	Base of Casing at 157-ft	30 Hp	Electric	1,250
AG #9	Van Grouw	Sampled	128-ft ?	14-inch	Open Bottom	Open Bottom	40 Hp	Electric	Unk
AG #10	Van Grouw	Sampled	158-ft ?	14-inch	Open Bottom	Open Bottom	30 Hp	Electric	Unk
AG #13	Van Grouw	Sampled Video Log Flovision Sand Flushed Pumping Rate	360-ft	14-inch	Unk	153-ft to 360-ft	100 Hp	Diesel	1550 at 1750 rpm
AG #13R	Van Grouw	Installed as Replacement for AG #13R	458-ft	16-inch	95 to 175-ft 211.5 to 470-ft	118 to 168-ft 238 to 458-ft	Unk	Diesel	Unk
AG #15	Van Grouw	Sampled Video Log Flovision	373-ft	17-inch	Unk	201-ft to 371-ft	100 Hp	Diesel	1,600 to 1,700
AG #20	teVelde	Sampled	400-ft ?	Unk.	Unk	Unk	60 Hp	Unk	Unk
AG-E3	teVelde	Sampled	400-ft ?	14-inch	Unk	Unk	75 Hp	Diesel	Unk
AG-E4	teVelde	Sampled	400-ft ?	14-inch	Unk	Unk	75 Hp	Diesel	Unk

- 1) Information obtained from well owners, pump service contractors,
or on-site EMP investigations as indicated.
2) Unk - Unknown

TABLE 2-7
REGIONAL AGRICULTURAL/
WATER SUPPLY WELL INFORMATION ^(1,2)

Well	Owner	EMP Investig- ations	Well Depth	Casing Size	Gravel Pack Interval	Screen Interval	Pump Rating	Power Source	Pumping Rate (gpm)
Well # 6329	Shotanus/ teVelde	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk
Well # 6629	Shotanus	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk
TeVelde / Rodriguez Well	teVelde	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk
AG#D6	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Electric	Unk
AG#D7	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Electric	Unk
AG#D8	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Electric	Unk
AG#D9	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Electric	Unk
AG#D10	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Electric	Unk
AG#D12	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Electric	Unk
AG#1089	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk
AG #D _	Doe	None	Unk	Unk	Unk	Unk	Unk	Unk	Unk
AG#D31	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk
AG#D32	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk
AG#D33	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk
AG#D34	Doe	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk

- 1) Information obtained from well owners, pump service contractors,
or on-site EMP investigations as indicated.
2) Unk - Unknown

TABLE 2-7
REGIONAL AGRICULTURAL/
WATER SUPPLY WELL INFORMATION ^(1,2)

Well	Owner	EMP Investig- ations	Well Depth	Casing Size	Gravel Pack Interval	Screen Interval	Pump Rating	Power Source	Pumping Rate (gpm)
Gun Club Well	City of Visalia	Sampled	150-ft ?	Unk	Unk	Unk	Unk	Electric	Unk
Dairy North Well	Van Grouw	Sampled	425-ft	10-inch	200 to 260-ft 270 to 425-ft	300 to 400-ft	40-Hp	Electric	~160 gpm
Dairy South Well	Van Grouw	Sampled	425-ft	10-inch	200 to 260-ft 270 to 425-ft	300 to 400-ft	25 Hp	Electric	Unk
Landfill Operations Supply Well	Tulare County	Sampled Video Log	369-ft	14-inch	0 - 380-ft	124 to 369-ft	Unk	Electric	Unk
Cotton Gin Well	Tulare County	Electrical Repairs	354-ft	10-inch	0 - 365-ft	210 to 354-ft	Unk	Electric	Unk
East Ag Well	Tulare County	Sampled	Unk	Unk	Unk	Unk	Unk	Unk	Unk
Inactive Ag Well	Tulare County	Abandoned	< 133-ft	14-inch	Unk	Unk	none	none	none
Former Water Supply Well	Tulare County	Abandoned	224-ft	10-inch	Unk	Unk	none	none	none

1) Information obtained from well owners, pump service contractors,
or on-site EMP investigations as indicated.

2) Unk - Unknown

TABLE 2-8

AGRICULTURAL WELL EVALUATION SAMPLING RESULTS (1)

Sample ID with Sample Depth:	Well ID:		AG-13					AG-15				AG-8		IDSW (2)
	AG-13-142	AG-13-165	AG-13-230	AG-13-265	AG-13-290	AG-13-315	AG-13-350	AG-15-225	AG-15-245	AG-15-300	AG-15-340	AG-8-157	AG-8-157	
	09/14/00	09/14/00	09/14/00	09/14/00	09/29/00	09/29/00	09/29/00	10/24/00	10/24/00	10/24/00	10/24/00	09/29/00	09/29/00	01/31/01
Volatle Organics (µg/L)														
Tetrachloroethene	8.2	5.7	5.3	5.6	6.8	6.4	6.1	0.27 J	<0.5	0.1 J	0.11 J	0.11 J	0.11 J	0.96
TCE	3.4	1.9	1.8	1.9	2.3	2.1	2.1	0.18 J	<0.5	<0.5	<0.5	<0.5	<0.5	0.39J
1,1-DCE	0.13 J	<0.5	<0.5	<0.5	0.15 J	0.12 J	0.11 J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cis-1,2-DCE	0.39 J	0.2 J	0.16 J	0.16 J	0.2 J	0.2 J	0.18 J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-DCA	0.74	0.55	0.48 J	0.51	0.58	0.54	0.55	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.54
Chloroethane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	11
Trichlorofluoromethane	0.66	0.44 J	0.43 J	0.43 J	0.55	0.5	0.41 J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.4
1,2-Dichloropropane	<0.5	<0.5	<0.5	<0.5	0.044 J	0.042 J	0.051 J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-DCB	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	<0.5	<0.5	<0.5	<0.5	0.07 J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.78
Carbon disulfide	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Acetone	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
MTBE	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	21
Benzene	0.11 J	<0.5	<0.5	<0.5	0.12 J	0.11 J	0.1 J	0.088 J	0.09 J	0.09 J	0.12 J	2.4	0.18J	0.05J
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.37 J	0.05J	0.48J
m&p-Xylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	0.87	0.45J
o-Xylene	0.27 J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.057 J	2.5	<0.5
Toluene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.64	<0.5	<0.5

Note 1: Analytical detections, U.S. EPA Method 8260B

Note 2: Inactive water supply well at SW corner of landfill

TABLE 4-1
DSB-1/DSB-1A
DAIRY SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	DSB-1	DSB-1A	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylo-nitrile (µg/L)	Carbon Disulfide (µg/L)	Styrene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)
0													
10													
20													
30													
40													
50													
60													
70	72'			ND	ND	ND	77	ND	ND	ND	0.88	ND	0.54 J
80													
90													
100	99'			ND	ND	ND	ND	ND	ND	ND	ND	0.084 J	ND
110													
120													
130													
140													
150	147'			0.84	0.22 J	1.06	960	ND	0.98 J	0.32 J	1.4	0.07 J	0.23 J
160													
170													
180													
190													
200	205'			ND	ND	ND	ND	2.3 J	ND	0.40 J	ND	0.085 J	ND
210													
220													
230													
240	240'			ND	ND	ND	1.5 J	6.8 J	ND	120 E	ND	0.13 J	ND
250													
260													
270													
280													
290	290'			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
300													
310													
320													
330													
340	340'			ND	ND	ND	ND	ND	ND	12 J	ND	ND	ND
350													
360													
370													
380													
390													
400	400'			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

□ -Water sample collected ■ -Water sample attempted, no water obtained.

TABLE 4-1
DSB-2
DAIRY SOIL BORING - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	DSB-2	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylonitrile (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	m&p-Xylene (µg/L)	o-Xylene (µg/L)
0														
10														
20														
30														
40														
50	53'													
60	65'		0.38 J	ND	0.38 J	9.7 J	ND	ND	ND	0.25 J	ND	ND	ND	ND
70														
80														
90														
100														
110														
120														
130														
140														
150														
160														
170														
180														
190														
200														
210	206'		ND	ND	ND	200	6.7 J	1.0 J	160	0.79	0.19	0.14 J	0.17 J	0.085 J
220														
230														
240	248'													
250	249'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
260														
270														
280														
290														
300	300'													
310														
320														
330	327'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
340														
350														
360														
370	366'		ND	ND	ND	ND	ND	ND	41	ND	ND	ND	ND	ND
380														
390														
400	396'		ND	ND	ND	ND	3.7 J	ND	ND	ND	ND	ND	ND	ND

☐ -Water sample collected ☒ -Water sample attempted, no water obtained.

TABLE 4-1
DSB-3
DAIRY SOIL BORING - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	DSB-3 Sampling Depth (ft)	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	Methylene Chloride (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylonitrile (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Toluene (µg/L)
0											
10											
20											
30											
40											
50											
60	64'	ND	ND	ND	ND	11 J	2.8 J	ND	8.4 J	0.20 J	ND
70											
80											
90											
100	96'	ND	ND	ND	ND	ND	3.4 J	ND	0.42 J	ND	ND
110											
120											
130											
140											
150											
160	161'	ND	ND	ND	ND	ND	6.1 J	ND	0.42 J	ND	0.096 J
170											
180											
190											
200											
210	213'	ND	ND	ND	0.40 J	ND	11 J	ND	0.89	ND	0.078 J
220											
230											
240	243'	ND	ND	ND	ND	ND	2.6 J	ND	ND	ND	ND
250											
260											
270											
280											
290											
300											
310	309'	ND	ND	ND	ND	ND	2.8 J	ND	0.12 J	ND	ND
320											
330											
340											
350	347'	ND	ND	ND	ND	ND	2.6 J	ND	ND	ND	ND
360											
370											
380											
390	397'										
400	407'										

☐ -Water sample collected
 ☒ - Water sample attempted, no water obtained.

TABLE 4-1
AG-13R
DAIRY SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	AG-13R	PCE ($\mu\text{g/L}$)	TCE ($\mu\text{g/L}$)	Sum of Chlorinated Solvents ($\mu\text{g/L}$)	Methylene Chloride ($\mu\text{g/L}$)	MEK ($\mu\text{g/L}$)	Acetone ($\mu\text{g/L}$)	Arcyionitrile ($\mu\text{g/L}$)	CS ₂ ($\mu\text{g/L}$)	Styrene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)
0											
10											
20											
30											
40											
50											
60											
70											
80											
90											
100											
110											
120											
130											
140											
147'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
150											
160											
170											
180											
190											
200											
210		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
213'											
220											
230											
240		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
240'											
250											
260											
270											
280											
290											
300											
310											
320											
330											
340											
350											
360											
370											
380											
390											
400											

☐ -Water sample collected
 ☒ - Water sample attempted, no water obtained.

TABLE 4-2
IRB-1
IRB SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	IRB-1 Sampling Depth (ft)	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	Cis-1,2-DCE (µg/L)	Trans-1,2-DCE (µg/L)	1,1-DCA (µg/L)	1,2-DCA (µg/L)	Vinyl chloride (µg/L)	Sum of Chlorinated Solvents (µg/L)
0										
10										
20										
30										
40										
50	50'	14	7.9	0.16 J	47	1.2	0.69	0.29 J	9.1	80.34
60										
70										
80	80'	23	17	0.26 J	81 E	2	ND	0.39 J	7.9	131.55
90										
100										
110	110'	1.5	0.67	ND	1.2	ND	ND	ND	ND	3.37
120										
130										
140	145'	ND	0.10 J	ND	ND	ND	ND	ND	ND	0.10J
150										
160										
170	170'	ND	ND	ND	ND	ND	ND	ND	ND	ND
180										
190										
200										
210	200'	0.11 J	ND	ND	ND	ND	ND	ND	ND	0.11J
220										
230										
240										
250	237'	ND	ND	ND	ND	ND	ND	ND	ND	ND
260										
270	270'	ND	ND	ND	ND	ND	ND	ND	ND	ND
280										
290										
300										
310	304'	ND	ND	ND	ND	ND	ND	ND	ND	ND
320										
330										
340	337'	ND	ND	ND	ND	ND	ND	ND	ND	ND
350										
360										
370										
380										
390										
400										

☐ - Water sample collected ☒ - Water sample attempted, no water obtained.

TABLE 4-2
IRB-1
IRB SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	IRB-1	Freon 12 ($\mu\text{g/L}$)	1,2-Dichloro propane ($\mu\text{g/L}$)	Methylene Chloride ($\mu\text{g/L}$)	1,2-DCB ($\mu\text{g/L}$)	1,4-DCB ($\mu\text{g/L}$)	MEK ($\mu\text{g/L}$)	Acetone ($\mu\text{g/L}$)	Acrylo nitrile ($\mu\text{g/L}$)	CS ₂ ($\mu\text{g/L}$)	Styrene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Benzene ($\mu\text{g/L}$)
0													
10													
20													
30													
40													
50'		ND	0.47 J	ND	0.12 J	1.6	1.8	ND	ND	0.17 J	ND	ND	ND
60													
70													
80'		2.4	1	0.9	0.10 J	1.3	1.0 J	ND	ND	ND	ND	ND	0.67
90													
100													
110'		0.23 J	ND	ND	ND	ND	ND	2.1 J	ND	0.21 J	ND	ND	ND
120													
130													
140		ND	ND	ND	ND	ND	ND	ND	ND	0.49 J	ND	ND	ND
150													
160													
170'		ND	ND	ND	ND	ND	1.1 J	2.2 J	ND	39	ND	ND	ND
180													
190													
200'		ND	ND	ND	ND	ND	ND	ND	ND	0.13 J	ND	ND	ND
210													
220													
230													
240													
250		ND	ND	ND	ND	ND	ND	ND	ND	0.68'	ND	ND	ND
260													
270'		ND	ND	ND	ND	ND	ND	2.6 J	ND	ND	ND	ND	ND
280													
290													
300		ND	ND	ND	ND	ND	ND	ND	ND	0.13 J	ND	ND	ND
310													
320													
330													
340'		ND	ND	ND	ND	ND	ND	ND	ND	0.11 J	ND	ND	ND
350													
360													
370													
380													
390													
400													

☐ -Water sample collected ☒ - Water sample attempted, no water obtained.

TABLE 4-2
IRB-2
IRB SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	IRB-2	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	Cis-1,2-DCE (µg/L)	Trans-1,2- DCE (µg/L)	1,1-DCA (µg/L)	1,2-DCA (µg/L)	Vinyl chloride (µg/L)	Sum of Chlorinated Solvents (µg/L)	Freon 11 (µg/L)	Freon 12 (µg/L)	Freon 21 (µg/L)	1,2- Dichloro propane (µg/L)	Chloro benzene (µg/L)	1,2-DCB (µg/L)	1,4-DCB (µg/L)
0																	
10																	
20																	
30																	
40																	
50																	
65'		76	32	1	14	1.8	11	0.61	5.9	142.31	2.2	43	12	1.2	0.19 J	ND	0.91
67'																	
86'		30	5.9	0.32 J	1.4	ND	2	ND	ND	39.62	1.5	11	NM	0.20 J	ND	ND	0.14 J
100																	
110																	
124'		6.1	1.1	ND	0.17 J	ND	0.34 J	ND	ND	7.71	0.44 J	4.2	NM	ND	ND	ND	ND
130																	
140																	
150		0.079 J	ND	ND	ND	ND	ND	ND	ND	0.079J	ND	ND	NM	ND	ND	ND	ND
160																	
177'		0.19 J	ND	ND	ND	ND	ND	ND	ND	0.19J	ND	ND	NM	ND	ND	ND	ND
180																	
190																	
200																	
203'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND	ND
210																	
220																	
228'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND	ND
230																	
240																	
254'																	
260																	
270																	
272'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND	ND
280																	
290																	
292'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND	ND
300																	
310																	
315'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND	ND
320																	
330																	
340																	
350																	
360																	
370																	
380																	
390																	
400																	

* NM - Not normally measured (values indicate tentatively identified compounds (TIC))
☐ - Water sample collected
☐ - Water sample attempted, no water obtained.

TABLE 4-2
IRB-2
IRB SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling (ft)	IRB-2	Chloro form (µg/L)	Methylene Chloride (µg/L)	Acetone (µg/L)	Acrylo nitrile (µg/L)	CS ₂ (µg/L)	MEK (µg/L)	Styrene (µg/L)	Vinyl acetate (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	m&p-Xylene (µg/L)	o-Xylene (µg/L)
0															
10															
20															
30															
40															
50	65'		0.49 J	1.9	ND	ND	0.20 J	ND	ND	0.18 J	ND	ND	ND	ND	ND
60	67'														
70															
80	86'		0.17 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
90															
100															
110															
120	124'		ND	ND	ND	ND	0.95 J	ND	ND	ND	ND	2.1	0.32 J	2.1	1.3
130															
140															
150	157'		ND	ND	ND	ND	0.33 J	ND	ND	ND	ND	0.39 J	0.054 J	0.36 J	0.23 J
160															
170	177'		ND	ND	ND	ND	52	ND	ND	ND	ND	0.66	0.093 J	0.25J	0.33 J
180															
190															
200															
210	203'		ND	ND	ND	ND	0.31 J	ND	ND	ND	ND	0.10 J	ND	ND	ND
220															
230	228'		ND	ND	ND	ND	ND	ND	ND	ND	ND	0.16 J	ND	ND	ND
240															
250	254'														
260															
270															
280	272'		ND	ND	4.0 J	ND	0.18 J	ND	ND	ND	ND	2.4	0.29 J	0.84	1.5
290															
300	292'		ND	ND	1.4 J	ND	ND	ND	ND	ND	ND	0.15 J	ND	ND	ND
310															
320	315'		ND	ND	1.1 J	ND	0.12 J	ND	ND	ND	ND	0.41 J	ND	0.20 J	ND
330															
340															
350															
360															
370															
380															
390															
400															

* NM - Not normally measured (values indicate tentatively identified compounds (TIC))
☐ - Water sample collected
☐ - Water sample attempted, no water obtained.

TABLE 4-2
IRB-3
IRB SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	IRB-3	PCE (µg/L)	TCE (µg/L)	Cis-1,2- DCE (µg/L)	Trans-1,2- DCE (µg/L)	1,1-DCE (µg/L)	1,1-DCA (µg/L)	1,2-DCA (µg/L)	Vinyl chloride (µg/L)	Sum of Chlorinated Solvents (µg/L)	Freon 11 (µg/L)	Freon 12 (µg/L)	Freon 21 (µg/L)	1,2- Dichloro propane (µg/L)	1,4-DCB (µg/L)	Chloro benzene (µg/L)	Methylene Chloride (µg/L)	MEK (µg/L)	CS ₂ (µg/L)
0																			
10																			
20																			
30																			
40																			
50																			
60																			
70																			
80																			
91'		30	13	30	1.1	0.53	6.1	0.36 J	2	83.09	2.4	17	8.6	0.69	0.99	0.094 J	ND	ND	1.2 J
100																			
110																			
120																			
131'		1.9	1.2	0.12 J	ND	ND	0.36 J	ND	ND	3.58	0.51	4.1	NM	ND	ND	ND	ND	0.98 J	0.17 J
140																			
151'		1.7	1	ND	ND	ND	0.59	ND	ND	3.29	0.87	3.1	NM	ND	ND	ND	ND	ND	0.73 J
160																			
176'		0.098 J	ND	ND	ND	ND	ND	ND	ND	0.098J	ND	ND	NM	ND	ND	ND	ND	ND	1.4 J
180																			
190																			
200																			
215'																			
220'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND	ND	ND	ND
230																			
240																			
250																			
260'																			
270																			
285'																			
290																			
300																			
310																			
320'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND	ND	ND	ND
330																			
340																			
350'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND	0.15 J	ND	16 J
360																			
370																			
380																			
390																			
400																			

* NM - Not normally measured (values indicate tentatively identified compounds (TIC))
☐ - Water sample collected ☒ - Water sample attempted, no water obtained.

TABLE 4-2

IRB-4

IRB SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	IRB-4	PCE ($\mu\text{g/L}$)	TCE ($\mu\text{g/L}$)	1,1-DCE ($\mu\text{g/L}$)	Cis-1,2-DCE ($\mu\text{g/L}$)	Trans-1,2- DCE ($\mu\text{g/L}$)	1,1-DCA ($\mu\text{g/L}$)	1,2-DCA ($\mu\text{g/L}$)	Vinyl chloride ($\mu\text{g/L}$)	Sum of Chlorinated Solvents ($\mu\text{g/L}$)	Freon 11 ($\mu\text{g/L}$)	Freon 12 ($\mu\text{g/L}$)	Freon 21 ($\mu\text{g/L}$)	1,2-Dichloro propane ($\mu\text{g/L}$)
0														
10														
20														
30														
40														
50														
60														
70														
80														
99'		19	11	0.36 J	1.7	0.34 J	1.9	0.12 J	ND	34.42	2	20	3.9	0.32 J
100														
110														
120														
134'		0.49 J	0.27 J	ND	0.20 J	ND	0.19 J	ND	ND	1.15J	0.13 J	1.9	NM	ND
140														
150														
160														
169'														
180														
190														
204'		0.071 J	ND	ND	ND	ND	ND	ND	ND	0.071J	ND	ND	NM	ND
210														
220														
230														
240'		0.13 J	ND	ND	ND	ND	ND	ND	ND	0.13J	ND	0.28 J	NM	ND
250														
260'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND
270														
280														
290														
300'														
320'		20	ND	ND	ND	ND	0.094 J	ND	ND	20.094	ND	ND	NM	ND
322'														
330														
340														
350														
360														
370														
380														
390														
400														

* NM - Not normally measured (values indicate tentatively identified compounds (TIC))

☐ - Water sample collected

■ - Water sample attempted, no water obtained.

TABLE 4-2
IRB-4
IRB SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	IRB-4	Chloro form (µg/L)	1,2-DCB (µg/L)	1,4-DCB (µg/L)	Methylene Chloride (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylo nitrile (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Toluene (µg/L)	Benzene (µg/L)
0													
10													
20													
30													
40													
50													
60													
70													
80													
90	99'		0.17 J	ND	0.13 J	ND	ND	ND	ND	0.21	ND	ND	ND
100													
110													
120													
130	134'		ND	ND	ND	ND	ND	0.67 J	ND	0.40 J	ND	ND	ND
140													
150													
160													
170	169'												
180													
190													
200	204'		ND	ND	ND	ND	ND	ND	ND	0.16 J	ND	ND	ND
210													
220													
230													
240	240'		ND	ND	ND	ND	ND	ND	ND	0.96 J	ND	ND	ND
250													
260	260'		ND	ND	ND	ND	ND	1.7 J	ND	0.37 J	ND	ND	ND
270													
280													
290													
300	300'												
310	320'												
320	322'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.13 J
330													
340													
350													
360													
370													
380													
390													
400													

* NM - Not normally measured (values indicate tentatively identified compounds (TIC))
☐ - Water sample collected
☒ - Water sample attempted, no water obtained.

TABLE 4-2
IRB-5
IRB SOIL BORING - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	IRB-5 Sampling Depth (ft)	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	Cis-1,2- DCE (µg/L)	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	Sum of Chlorinated Solvents (µg/L)	Freon 12 (µg/L)	Freon 11 (µg/L)	1-Propene (µg/L)	MEK (µg/L)	Acetone (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	3-Methyl- Butanal (µg/L)
0																		
10																		
20																		
30																		
40																		
50																		
60	65'	17	2.5	1	0.56	0.25 J	1.1	22.41	6.4	1.2	NM	3.6 J	1.6 J	0.17 J	ND	ND	ND	NM
70	68'																	
80																		
90	93'	0.15 J	ND	ND	ND	ND	ND	0.15J	ND	ND	NM	2.1 J	14 J	130	ND	0.18 J	ND	23
100																		
110																		
120	123'	0.76	0.17 J	ND	ND	ND	ND	0.93	4.4	0.42 J	NM	ND	ND	0.57 J	ND	ND	ND	NM
130																		
140																		
150																		
160	155'	0.35 J	0.27 J	ND	ND	ND	ND	0.62	1.5	0.13 J	NM	ND	ND	0.14 J	ND	ND	ND	NM
170	175'																	
180	188'	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	0.15 J	ND	ND	ND	NM
190																		
200	205'	0.32 J	ND	ND	ND	ND	ND	0.32J	1	ND	NM	ND	ND	76	0.28 J	ND	0.057 J	NM
210																		
220	228'	4.4	1.5	ND	ND	ND	0.45 J	6.35	3.9	0.56	NM	ND	ND	0.19 J	ND	ND	ND	NM
230																		
240																		
250	251'	0.21 J	ND	ND	ND	ND	ND	.21J	0.7	ND	4	ND	15.0 J	6.2 J	ND	0.14 J	ND	NM
260																		
270																		
280																		
290	290'																	
300																		
310	313'	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	2.4 J	8.1 J	ND	ND	ND	NM
320																		
330																		
340	342'	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	5.1 J	49	ND	ND	ND	NM
350																		
360																		
370																		
380																		
390																		
400																		

* Airline broke while retrieving sampler, collected 120 milliliters
 NM - Not normally measured (values indicate tentatively identified compounds (TIC))
 - Water sample collected

TABLE 4-3
EMP-2
EMP SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	EMP-2	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	Cis-1,2-DCE (µg/L)	Trans-1,2-DCE (µg/L)	1,1-DCA (µg/L)	1,2-DCA (µg/L)	Vinyl chloride (µg/L)	Sum of Chlorinated Solvents (µg/L)	Freon 12 (µg/L)	Chloro form (µg/L)	1,2-Dichloro propane (µg/L)	Chloro benzene (µg/L)	1,4-DCB (µg/L)	MEK (µg/L)	Ace-tone (µg/L)	Acrylo nitrile (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Hexanol (µg/L)	m&p-Xylene (µg/L)	o-Xylene (µg/L)	
0																											
10																											
20																											
30																											
40																											
50	48'		23	11	0.13 J	42 E	1.3	4.6	0.49 J	4.2	86.72	3.7	0.11 J	2.5	0.14 J	1	1.2 J	ND	ND	ND	ND	ND	ND	NM	ND	ND	
60																											
70																											
80																											
90																											
100	96'		2.5	ND	ND	ND	ND	ND	ND	ND	2.5	1.6	ND	ND	ND	ND	ND	ND	ND	ND	2.1 J	ND	0.19 J	ND	29	ND	ND
110																											
120																											
130																											
140																											
150	147'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11 J	ND	ND	1.5 J	1.4	0.78	ND	NM	0.39 J	0.17 J
160																											
170																											
180																											
190																											
200	200'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM	ND	ND	ND
210																											
220																											
230																											
240	248'																										
250																											
260	265'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11 J	ND	0.44 J	0.054 J	NM	0.29 J	0.16 J
270																											
280																											
290																											
300																											
310																											
320																											
330																											
340																											
350																											
360																											
370																											
380																											
390																											
400																											

☐ -Water sample collected
 ☒ - Water sample attempted, no water obtained.

TABLE 4-3
EMP-12
EMP SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	EMP-12	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	Freon 12 (µg/L)	Freon 11 (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylonitrile (µg/L)	Carbon Disulfide (µg/L)	Styrene (µg/L)	Toluene (µg/L)	Hexanol (µg/L)
0	45		0.64	ND	0.64	1.5	0.29J	ND	ND	ND	0.45J	ND	ND	ND
10														
20														
30														
40														
50														
60														
70														
80														
90														
100	97'		ND	ND	ND	ND	ND	ND	ND	ND	0.17 J	ND	ND	NM
110														
120	113'		ND	ND	ND	0.32 J	ND	ND	ND	ND	ND	ND	ND	NM
130														
140														
150	141'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NM
160														
170	166'		ND	ND	ND	ND	ND	ND	ND	ND	0.27 J	ND	ND	NM
180														
190														
200														
210														
220														
230	231'		ND	ND	ND	ND	ND	ND	ND	ND	0.14 J	ND	0.15 J	NM
240														
250														
260	262'		ND	ND	ND	ND	ND	ND	3.8	ND	110 E	ND	0.19 J	3.9
270														
280														
290														
300														
310														
320														
330														
340														
350														
360														
370														
380														
390														
400														

TABLE 4-3
EMP-13
EMP SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	EMP-13	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylonitrile (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Chloroform (µg/L)	Ethylbenzene (µg/L)
0												
10												
20												
30												
40												
50												
60	65'		ND	ND	ND	1.1 J	ND	ND	0.29 J	ND	ND	ND
70												
80												
90												
100	105'		ND	ND	ND	0.48 J	ND	ND	ND	ND	ND	ND
110												
120												
130												
140	145'		ND	ND	ND	0.39 J	ND	ND	0.26 J	ND	0.13 J	ND
150												
160												
170												
180												
190	195'		ND	ND	ND	3.6 J	1.6 J	ND	16 J	ND	ND	0.060 J
200												
210												
220												
230												
240	242'		ND	ND	ND	1.8 J	5.5 J	ND	0.10 J	ND	ND	ND
250												
260												
270												
280												
290												
300												
310	310'											
320	323'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
330												
340												
350	351'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
360												
370												
380												
390												
400												

□ - Water sample collected

■ - Water sample attempted, no water obtained.

TABLE 4-3
EMP-14
EMP SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	EMP-14	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylonitrile (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Toluene (µg/L)
0											
10											
20											
30											
40											
50											
60											
70											
80											
90											
100											
110											
120											
130											
140											
150	155'		ND	ND	ND	13 J	ND	ND	ND	ND	ND
160											
170											
180											
190											
200											
210	215'		ND	ND	ND	1.1 J	1.9 J	ND	5.7 J	ND	ND
220											
230											
240											
250	250'		ND	ND	ND	ND	3.1 J	ND	ND	ND	ND
260											
270											
280											
290											
300	300'		ND	ND	ND	ND	ND	ND	0.38 J	ND	ND
310											
320											
330											
340	340'										
350											
360											
370											
380											
390											
400											

☐ -Water sample collected

☒ - Water sample attempted, no water obtained.

TABLE 4-3
EMP-15
EMP SOIL BORINGS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	EMP-15	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylonitrile (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Toluene (µg/L)	o-Xylene (µg/L)
0												
10												
20												
30												
40												
50	57											
60	61											
70												
80												
90												
100	90'		ND	ND	ND	ND	ND	ND	42	0.11 J	0.23 J	0.087 J
110												
120												
130												
140	134'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
150												
160												
170												
180	174'		ND	ND	ND	ND	ND	ND	ND	ND	0.085	ND
190												
200	203'		ND	ND	ND	ND	ND	ND	ND	0.17 J	ND	ND
210												
220												
230												
240	241'		2.6	ND	2.6	ND	ND	ND	ND	ND	0.13 J	ND
250												
260												
270												
280												
290												
300												
310												
320												
330												
340												
350												
360												
370												
380												
390												
400												

☐ -Water sample collected ☒ - Water sample attempted, no water obtained.

TABLE 4-4
M-20C
SOIL BORINGS FOR MONITORING WELLS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	M-20C	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylo-nitrile (µg/L)	Carbon Disulfide (µg/L)	Styrene (µg/L)	Toluene (µg/L)
0											
10											
20											
30											
40											
50											
60											
70											
80	86'		ND	ND	ND	22	2.4	ND	0.99 J	0.11 J	ND
90											
100											
110											
120											
130											
140	146'										
150											
160	163'		ND	ND	ND	0.83 J	3.4 J	ND	1.5 J	ND	ND
170											
180											
190											
200											
210											
220	217'										
230	220'		ND	ND	ND	ND	ND	ND	ND	ND	ND
240											
250											
260											
270											
280											
290											
300											
310											
320											
330											
340											
350											
360											
370											
380											
390											
400											

□ - Water sample collected

■ - Water sample attempted, no water obtained.

TABLE 4-4
M-14C
SOIL BORINGS FOR MONITORING WELLS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	M-14C	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	Cis-1,2-DCE (µg/L)	1,1-DCA (µg/L)	Sum of Chlorinated Solvents (µg/L)	Freon 11 (µg/L)	Freon 12 (µg/L)	1,2-Dichloro propane (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylo. nitrile (µg/L)	Carbon Disulfide (µg/L)	Styrene (µg/L)	Toluene (µg/L)
0																	
10																	
20																	
30																	
40	46'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11 J	ND	ND
50																	
60																	
70																	
80																	
90																	
100																	
110																	
120																	
130																	
140																	
150																	
160	165'		19	2.5	0.30 J	0.40 J	0.98	23.18	0.45 J	17	0.21 J	ND	ND	ND	ND	ND	ND
170																	
180																	
190																	
200	205'		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	ND	ND
210																	
220																	
230																	
240																	
250																	
260																	
270																	
280																	
290																	
300																	
310																	
320																	
330																	
340																	
350																	
360																	
370																	
380																	
390																	
400																	

TABLE 4-4
M-11C
SOIL BORINGS FOR MONITORING WELLS - GROUNDWATER ANALYTICAL RESULTS

Depth (ft)	Sampling Depth (ft)	M-11C	PCE (µg/L)	TCE (µg/L)	Sum of Chlorinated Solvents (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylonitrile (µg/L)	CS ₂ (µg/L)	Styrene (µg/L)	Toluene (µg/L)
0											
10											
20											
30											
40											
50											
60											
70	72'		ND	ND	ND	10 J	ND	ND	0.19 J	ND	ND
80											
90											
100											
110											
120											
130											
140											
150											
160											
170											
180											
190											
200											
210											
220											
230											
240											
250											
260											
270											
280											
290											
300											
310											
320											
330											
340											
350											
360											
370											
380											
390											
400											

TABLE 4-5
S-ZONE MONITORING WELLS
GROUNDWATER ANALYTICAL RESULTS

Well	Sampling Date	Screened Interval	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	Cis-1,2-DCE (µg/L)	Trans-1,2-DCE (µg/L)	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,2-DCA (µg/L)	Vinyl chloride (µg/L)	Chloroethane (µg/L)	Sum of Chlorinated Solvents (µg/L)
S-Zone Wells													
M-1	10/23/2000	33' - 53'	4.5	1.4	0.30 J	0.62	ND	ND	0.84	ND	ND	ND	7.66
M-2A	10/30/2000	33' - 53'	28	32	3.7	13	0.94	ND	16	0.33 J	24	ND	117.97
M-3A	10/30/2000	34.5'-54.5'	25	17	2.5	4.9	0.22 J	0.26 J	46	0.13 J	0.88 J	2	98.89
M-4A	11/04/2000	29'-49'	0.071 J	0.99	ND	13	1.4	ND	0.96	ND	44	ND	60.421
M-5	10/27/2000	25'-45'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-6A	10/27/2000	30'-50'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-6C	NS	40'-50'											
M-7A	10/18/2000	30'-50'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-8	10/27/2000	30'-50'	0.24 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.24J
M-9	11/04/2000	39'-59'	ND	0.29 J	ND	4	ND	ND	0.62	ND	0.20 J	ND	5.11
M-10	NS	35'-55'											
ND	Not Detected												
NS	Not Sampled												
J	Compound detected at concentrations below quantifiable limits. Value estimated.												

TABLE 4-5
S-ZONE MONITORING WELLS
GROUNDWATER ANALYTICAL RESULTS

Well	Sampling Date	Screened Interval	Freon 11 (µg/L)	Freon 12 (µg/L)	Freon 21 (µg/L)	1,2-Dichloro propane (µg/L)	Chloro- form (µg/L)	Methylene Chloride (µg/L)	Chloro- benzene (µg/L)	1,2-DCB (µg/L)	1,4-DCB (µg/L)
S-Zone Wells											
M-1	10/23/2000	33' - 53'	1.2	ND	ND	ND	ND	ND	ND	ND	ND
M-2A	10/30/2000	33' - 53'	1.7	11	50	0.84	0.49 J	11	0.060 J	ND	0.49 J
M-3A	10/30/2000	34.5'-54.5	0.29 J	23	52	0.31 J	0.088 J	ND	0.065 J	ND	0.61
M-4A	11/04/2000	29'-49'	ND	ND	ND	0.96	ND	ND	0.14 J	0.10 J	1.8
M-5	10/27/2000	25'-45'	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-6A	10/27/2000	30'-50'	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-6C	NS	40'-50'									
M-7A	10/18/2000	30'-50'	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-8	10/27/2000	30'-50'	ND	ND	ND	ND	0.094 J	ND	ND	ND	ND
M-9	11/04/2000	39'-59'	ND	ND	ND	ND	ND	ND	ND	0.071 J	0.19 J
M-10	NS	35'-55'									

ND Not Detected

NS Not Sampled

J Compound detected at concentrations below quantifiable limits. Value estimated.

TABLE 4-5
S-ZONE MONITORING WELLS
GROUNDWATER ANALYTICAL RESULTS

Well	Sampling Date	Screened Interval	MEK (µg/L)	Acetone (µg/L)	Acrylonitrile (µg/L)	Carbon Disulfide (µg/L)	Styrene (µg/L)	Vinyl Acetate (µg/L)	Toluene (µg/L)	Benzene (µg/L)	O-Xylene (µg/L)	m&p-Xylene (µg/L)	1-methyl-ethylbenzene (µg/L)
S-Zone Wells													
M-1	10/23/2000	33' - 53'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-2A	10/30/2000	33' - 53'	ND	ND	ND	ND	ND	0.18 J	ND	1.9	0.49 J	ND	ND
M-3A	10/30/2000	34.5'-54.5'	ND	ND	ND	ND	ND	ND	ND	2.1	ND	ND	ND
M-4A	11/04/2000	29'-49'	ND	ND	ND	ND	ND	ND	2.6	0.5	0.18 J	0.25 J	4.4
M-5	10/27/2000	25'-45'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-6A	10/27/2000	30'-50'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-6C	NS	40'-50'											
M-7A	10/18/2000	30'-50'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-8	10/27/2000	30'-50'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-9	11/04/2000	39'-59'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-10	NS	35'-55'											
ND Not Detected													
NS Not Sampled													
J Compound detected at concentrations below quantifiable limits. Value estimated.													

TABLE 4-6
A-ZONE AND B-ZONE MONITORING WELLS
GROUNDWATER ANALYTICAL RESULTS

Well	Sampling Date	Screened Interval	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	Cis-1,2-DCE (µg/L)	Trans-1,2-DCE (µg/L)	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,2-DCA (µg/L)	Vinyl chloride (µg/L)	Chloroethane (µg/L)	Sum of Chlorinated Solvents (µg/L)	Freon 11 (µg/L)
A-Zone Wells														
M-2B	10/30/2000	73' - 93'	77	35	1.3	1.2	1.2	ND	13	0.36 J	2.2	ND	131.26	14
M-3B	10/30/2000	70.9'-90.9'	38	19	0.59	3.6	0.82	ND	5.7	0.16 J	0.93 J	ND	68.8	2.7
M-4B	10/31/2000	69.6'-89.6'	20	14	0.26 J	52	1.7 J	ND	2.2	0.32 J	7.7	ND	98.18	ND
M-6B	NS	100'-110'												
M-7C	10/23/2000	81.9'-91.9'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-11	11/04/2000	90.6'-100.6'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-12	10/27/2000	90.1'-100.1'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-13A	10/26/2000	90.3'-100.3'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-14A	10/17/2000	90.5'-100.5'	4.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.8	0.11 J
M-15A	10/26/2000	91.2'-101.2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-16A	10/31/2000	90.9'-100.9'	38	13	0.58	8.1	0.44 J	ND	5.2	ND	2.2	ND	67.52	2.7
B-Zone Wells														
M-7B	10/18/2000	115'-125'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-13B	10/26/2000	140'-150'	0.55	0.13 J	ND	ND	ND	ND	ND	ND	ND	ND	0.68	ND
M-14B	10/17/2000	125'-135'	13	0.45 J	ND	ND	ND	ND	0.066 J	ND	ND	ND	13.516	0.49 J
M-15B	10/26/2000	135'-145'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-16B	10/31/2000	140'-150'	4.4	1.5	0.18 J	0.14 J	ND	ND	0.62	ND	ND	ND	6.84	0.7

ND Not Detected

NS Not Sampled

J Compound detected at concentrations below quantifiable limits. Value estimated.

TABLE 4-6
A-ZONE AND B-ZONE MONITORING WELLS
GROUNDWATER ANALYTICAL RESULTS

Well	Sampling Date	Screened Interval	Freon 12 (µg/L)	Freon 21 (µg/L)	1,2-Dichloro propane (µg/L)	Chloro- form (µg/L)	Methylene Chloride (µg/L)	Chloro- benzene (µg/L)	1,2-DCB (µg/L)	1,4-DCB (µg/L)	MEK (µg/L)	Acetone (µg/L)	Acrylo nitrile (µg/L)	Carbon Disulfide (µg/L)
A-Zone Wells														
M-2B	10/30/2000	73' - 93'	21	32	0.91	0.76	35	0.083 J	ND	0.28 J	ND	ND	ND	ND
M-3B	10/30/2000	70.9'-90.9'	9.9	16	0.33 J	0.35 J	3.4	ND	ND	0.34 J	ND	ND	ND	ND
M-4B	10/31/2000	69.6'-89.6'	6.2	3.9	0.89	ND	0.49 J	0.11 J	0.068 J	1	ND	ND	ND	ND
M-6B	NS	100'-110'												
M-7C	10/23/2000	81.9'-91.9'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-11	11/04/2000	90.6'-100.6'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-12	10/27/2000	90.1'-100.1'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-13A	10/26/2000	90.3'-100.3'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-14A	10/17/2000	90.5'-100.5'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-15A	10/26/2000	91.2'-101.2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-16A	10/31/2000	90.9'-100.9'	6.3	8	0.52	0.29 J	ND	0.063 J	ND	0.48 J	ND	ND	ND	ND
B-Zone Wells														
M-7B	10/18/2000	115'-125'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-13B	10/26/2000	140'-150'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-14B	10/17/2000	125'-135'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-15B	10/26/2000	135'-145'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M-16B	10/31/2000	140'-150'	ND	ND	ND	0.073 J	ND	ND	ND	ND	ND	ND	ND	ND

ND Not Detected
NS Not Sampled
J Compound detected at concentrations below quantifiable limits. Value estimated.

TABLE 4-6
A-ZONE AND B-ZONE MONITORING WELLS
GROUNDWATER ANALYTICAL RESULTS

Well	Sampling Date	Screened Interval	Styrene (µg/L)	Vinyl Acetate (µg/L)	Toluene (µg/L)	Benzene (µg/L)	O-Xylene (µg/L)	m&p-Xylene (µg/L)	1-methyl-ethyl-benzene (µg/L)
A-Zone Wells									
M-2B	10/30/2000	73' - 93'	ND	0.32 J	ND	0.45 J	ND	ND	ND
M-3B	10/30/2000	70.9'-90.9'	ND	ND	ND	ND	ND	ND	ND
M-4B	10/31/2000	69.6'-89.6'	ND	ND	ND	0.53	ND	ND	ND
M-6B	NS	100'-110'							
M-7C	10/23/2000	81.9'-91.9'	ND	ND	ND	ND	ND	ND	ND
M-11	11/04/2000	90.6'-100.6'	ND	ND	ND	ND	ND	ND	ND
M-12	10/27/2000	90.1'-100.1'	ND	ND	ND	ND	ND	ND	ND
M-13A	10/26/2000	90.3'-100.3'	ND	ND	ND	ND	ND	ND	ND
M-14A	10/17/2000	90.5'-100.5'	ND	ND	ND	ND	ND	ND	ND
M-15A	10/26/2000	91.2'-101.2'	ND	ND	ND	ND	ND	ND	ND
M-16A	10/31/2000	90.9'-100.9'	ND	ND	ND	ND	ND	ND	ND
B-Zone Wells									
M-7B	10/18/2000	115'-125'	ND	ND	ND	ND	ND	ND	ND
M-13B	10/26/2000	140'-150'	ND	ND	ND	ND	ND	ND	ND
M-14B	10/17/2000	125'-135'	ND	ND	ND	ND	ND	ND	ND
M-15B	10/26/2000	135'-145'	ND	ND	ND	ND	ND	ND	ND
M-16B	10/31/2000	140'-150'	ND	ND	ND	ND	ND	ND	ND

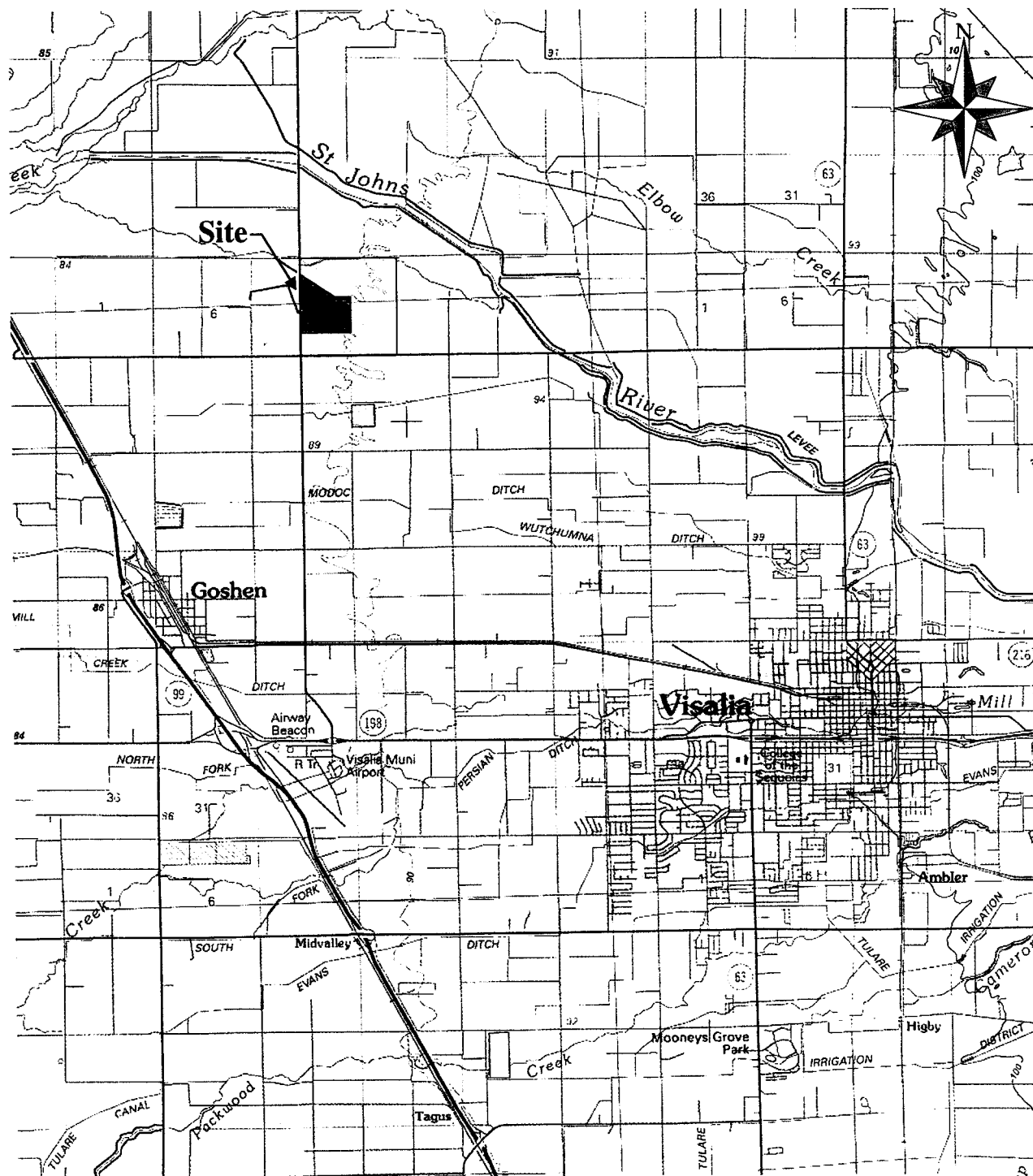
ND Not Detected
NS Not Sampled
J Compound detected at concentrations below quantifiable limits. Value estimated.

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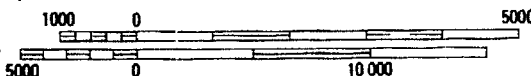
No. Description

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SCALE 1:100 000

1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND
 CONTOUR INTERVAL 20 METERS
 SUPPLEMENTARY CONTOUR INTERVAL 10 METERS



Source: United States Geological Survey, 1993

**MALCOLM
PIRNIE**

VISALIA SOLID WASTE DISPOSAL SITE
VISALIA, CALIFORNIA
Location Map

MALCOLM PIRNIE, INC

Figure 1-1

Legend

- ▲ Monitoring, Observation,
and Extraction Wells
■ Agricultural/Water Supply Wells
● Deep Simulprobe Boring
⊙ Shallow Simulprobe Boring
● Stratigraphic Soil Boring
△ Abandoned Water Well
▨ Unlined Unit/Stormwater Pond
● IRB Boring
▤ Potential hydraulic barrier
▦ Landfill Property
▧ Streams and Canals

EMP well designation suffix
S = Watertable
A = approx. 100 ft. Deep
B = approx. 150 ft. Deep
C = approx. 230 ft. Deep
M-7D Screened = approx. 230 ft. Deep

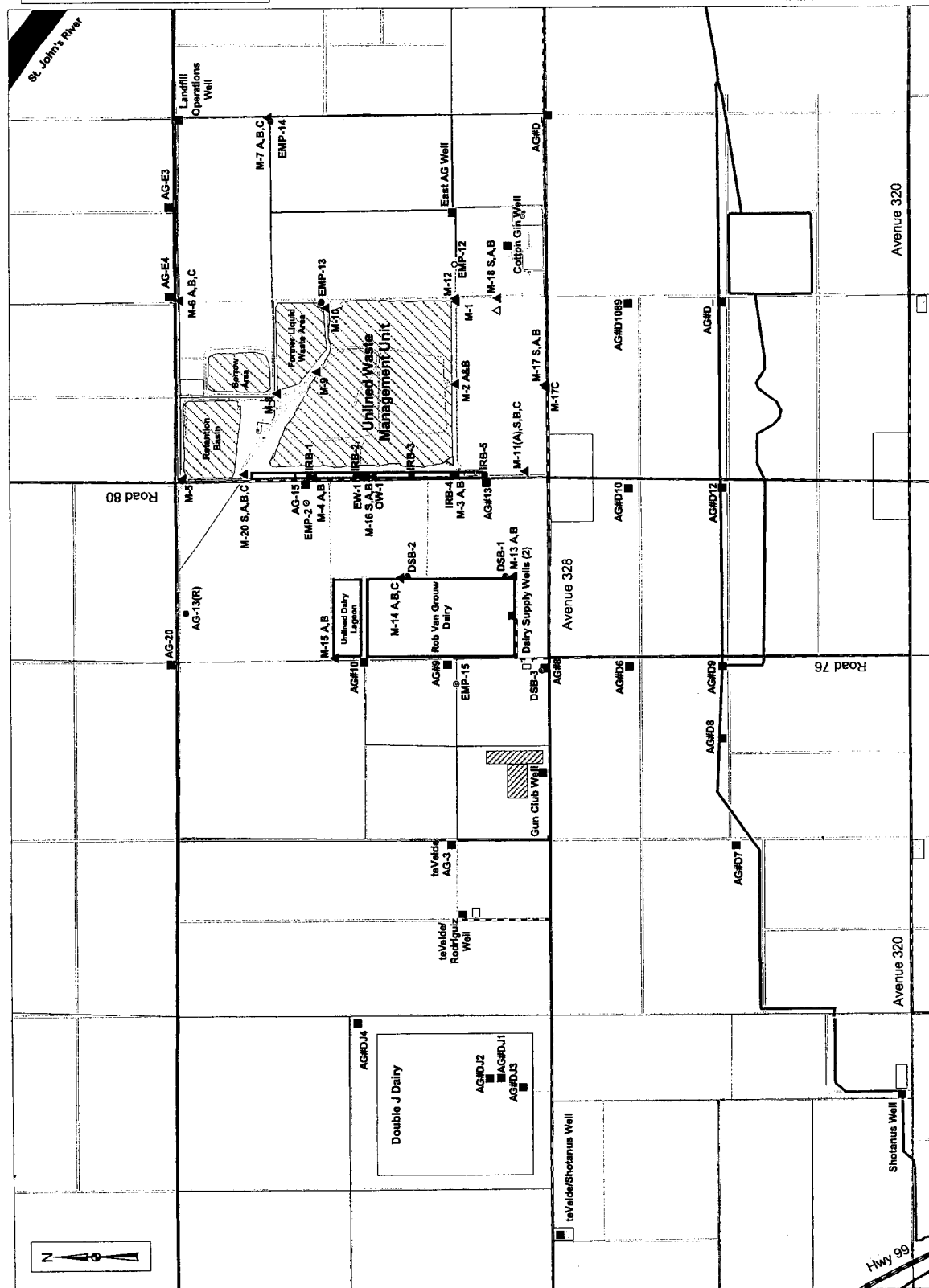
Scale = 1 inch to 1500 feet

Site Vicinity Map

**MALCOLM
PIRNIE**

Figure 1-2

DATE: 4-13-01
DRW: 2966-009-B2



1000	0	1000	2000	Feet
------	---	------	------	------

Legend

- ▲ Monitoring, Observation,
and Extraction Wells
- Agricultural/Water Supply Wells
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- △ Abandoned Water Well
- ▨ Unlined Unit/Stormwater Pond
- IRB Boring
- ▤ Potential hydraulic barrier
- ▥ Landfill Property
- ▧ Streams and Canals

EMP well designation suffix

S = Waterable
A = approx. 100 ft. Deep
B = approx. 150 ft. Deep
C = approx. 230 ft. Deep
M-7D Screened = approx. 230 ft. Deep

Scale = 1 inch to 1000 feet

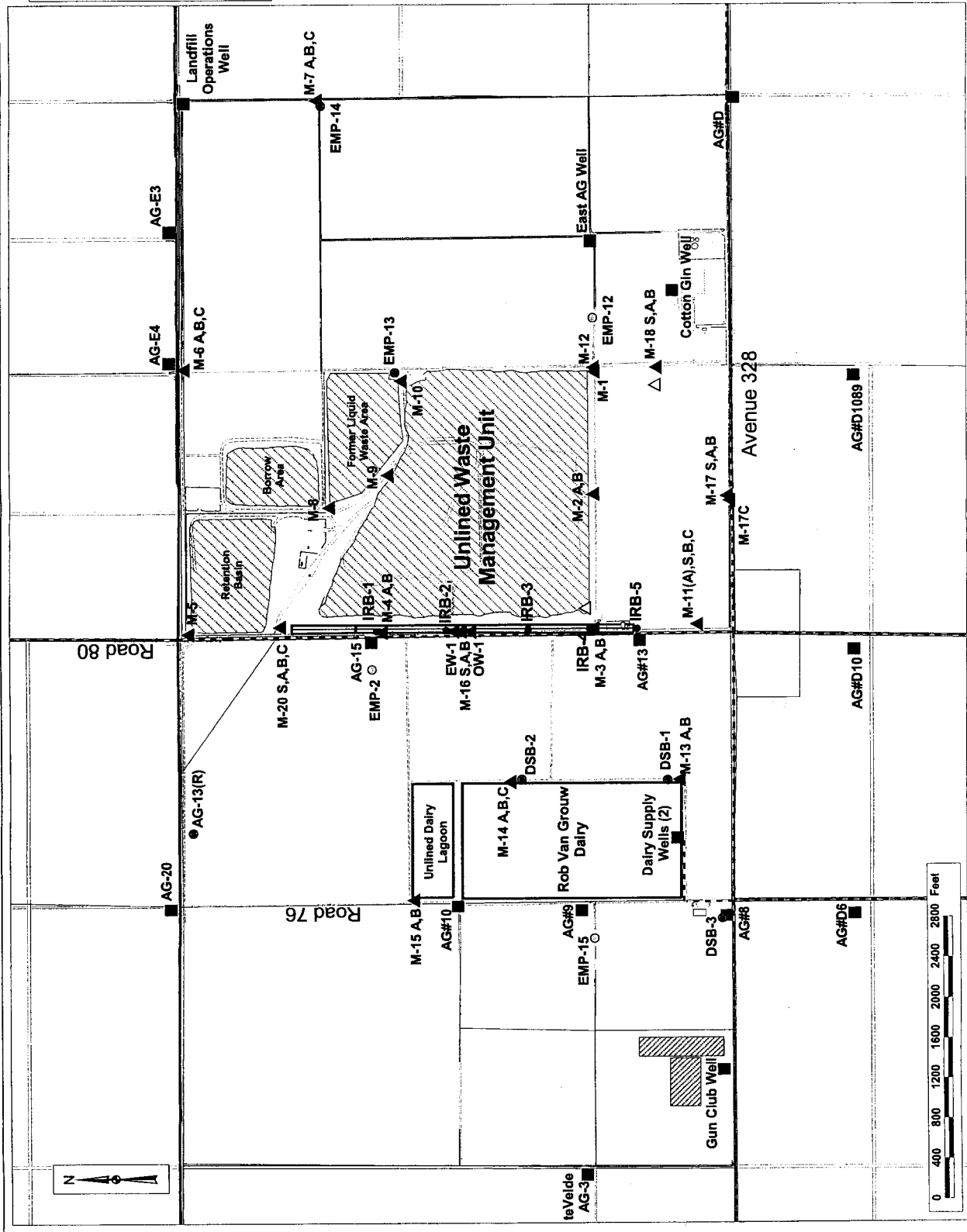
Site Plan

MALCOLM
PIRNIE

Figure 1-3

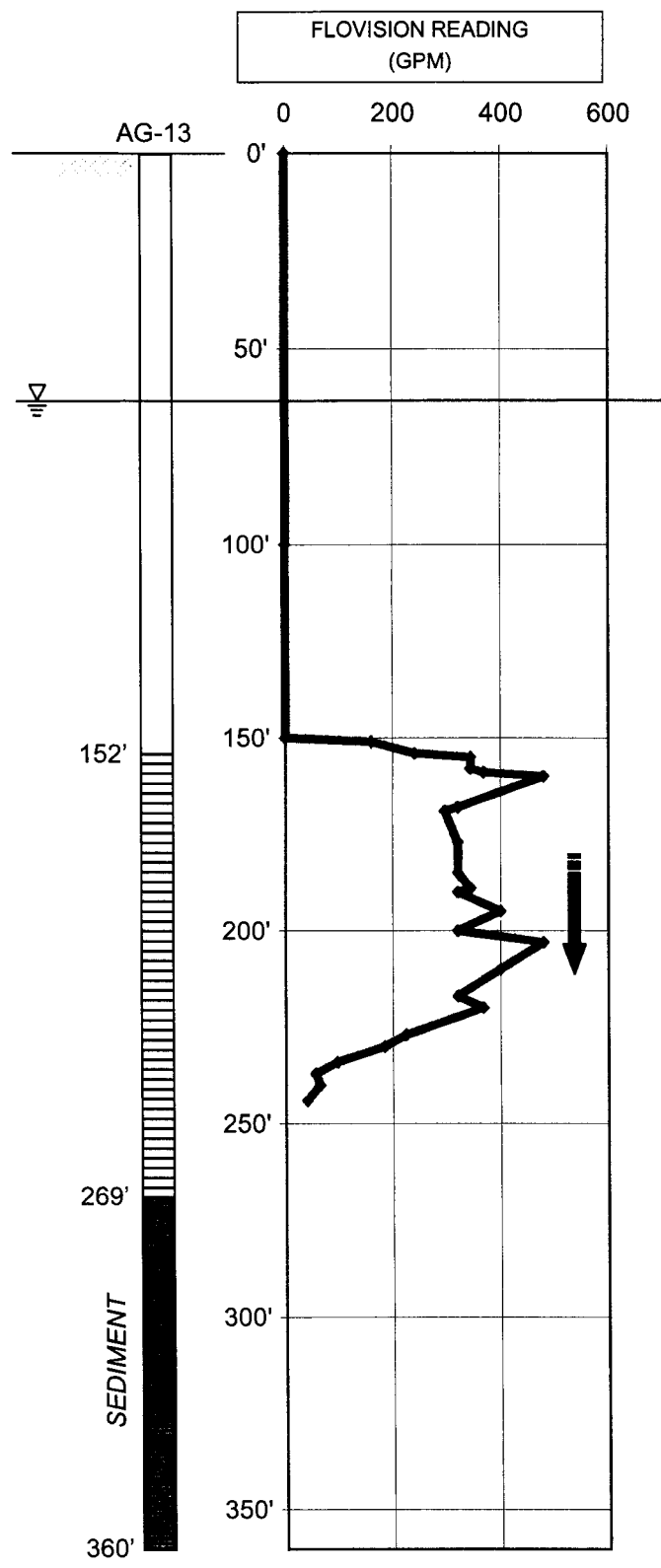
DRW: 2966-009-B3

DATE: 4-13-01

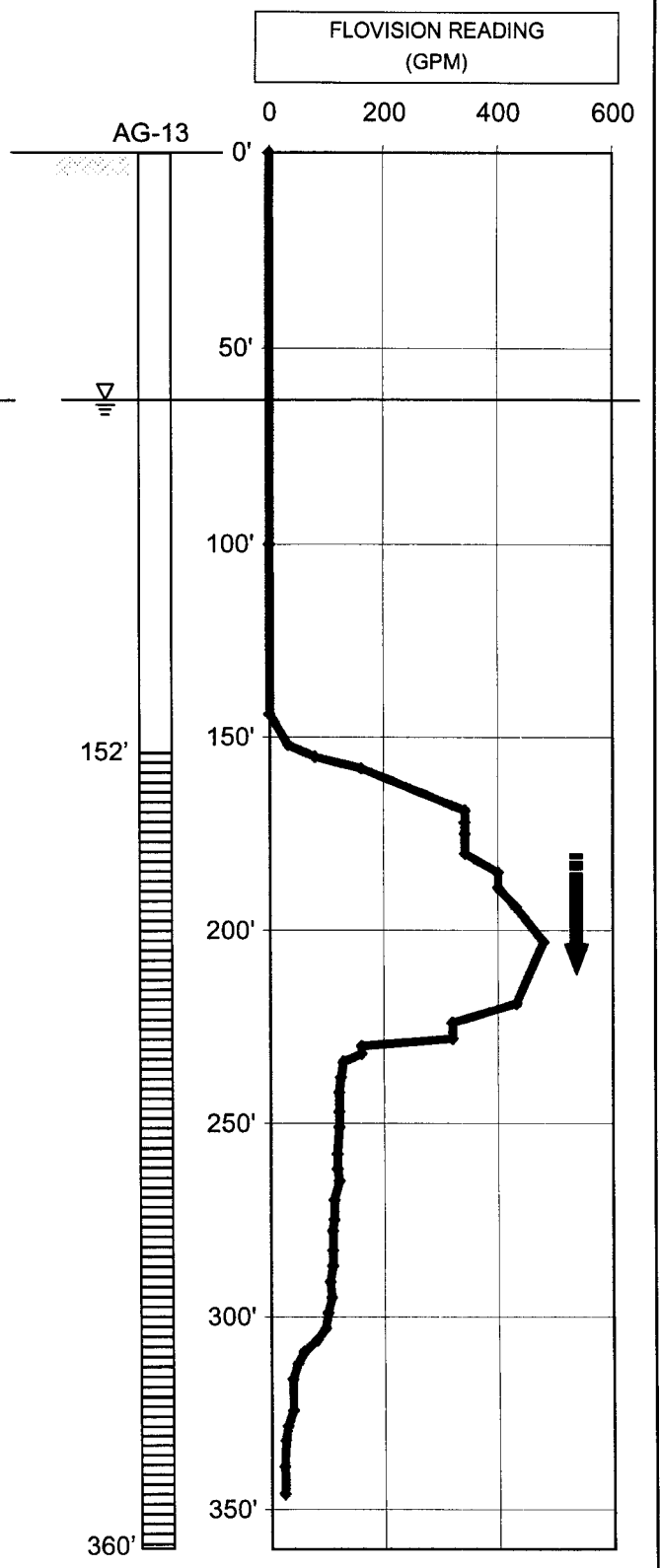




P:\PROJECTS\2966\009\GRAPHICS\AG13_FV.PPT Scale: 1:1 Date: 10/13/2000 Time: 12:24



RUN 1
(Prior to removal of sediment)



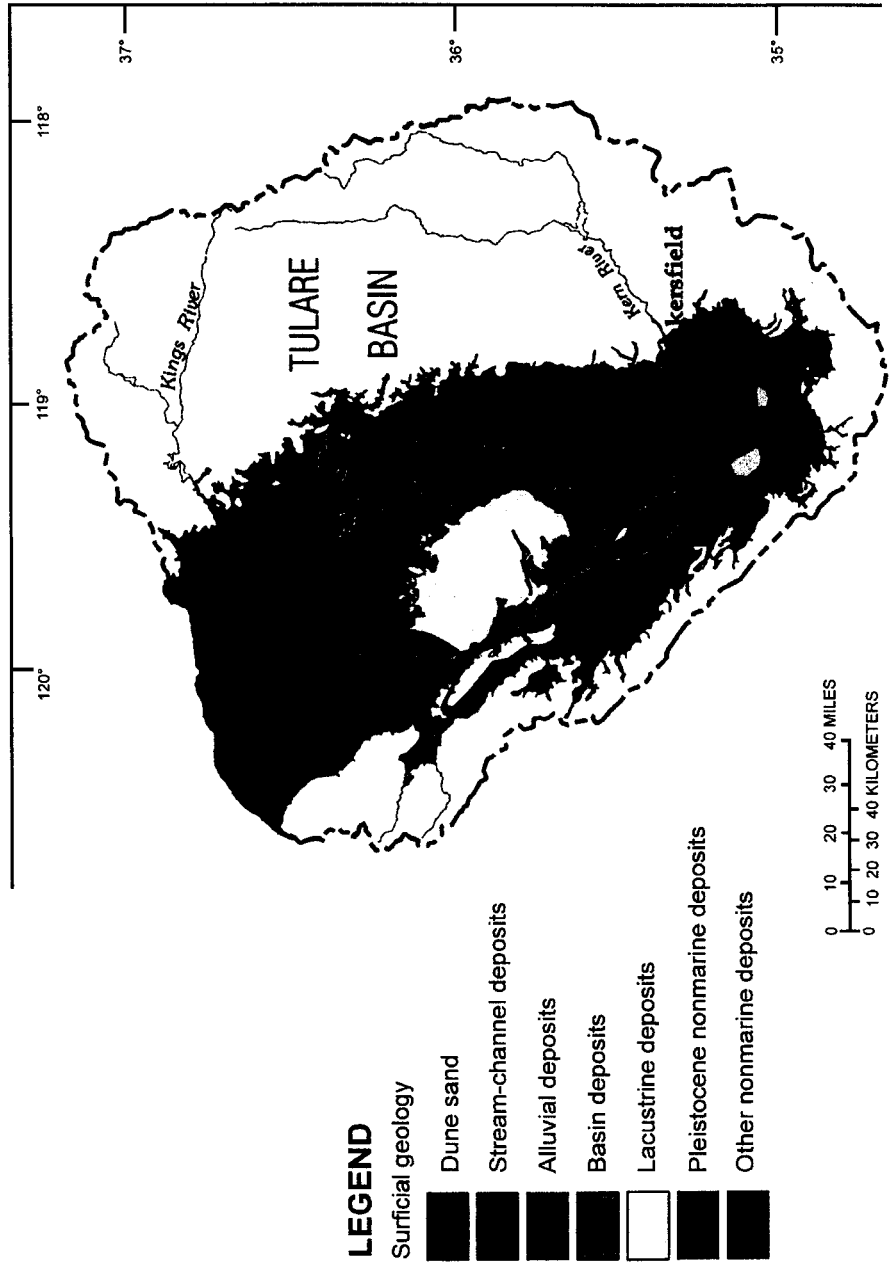
RUN 2
(Following removal of sediment)

MALCOLM PIRNIE	VISALIA SOLID WASTE DISPOSAL SITE VISALIA, CALIFORNIA	FLOVISION RESULTS AG-13	MALCOLM PIRNIE, INC.
			FIGURE 2-1

)

)

)

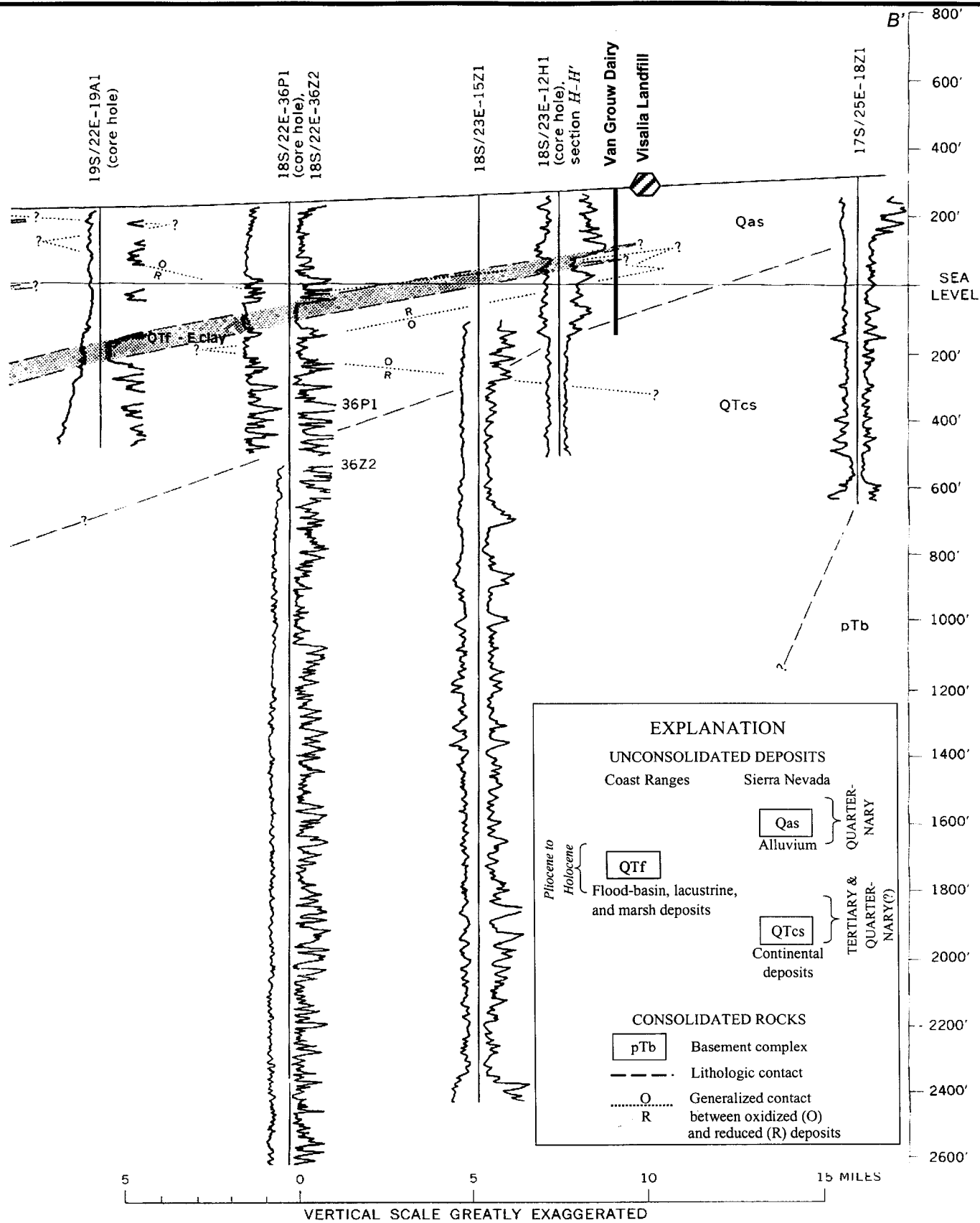


**MALCOLM
PIRNIE**

VISALIA SOLID WASTE DISPOSAL SITE
VISALIA, CALIFORNIA
Geologic Map of the Tulare basin

MALCOLM PIRNIE, INC.

Figure 3-1

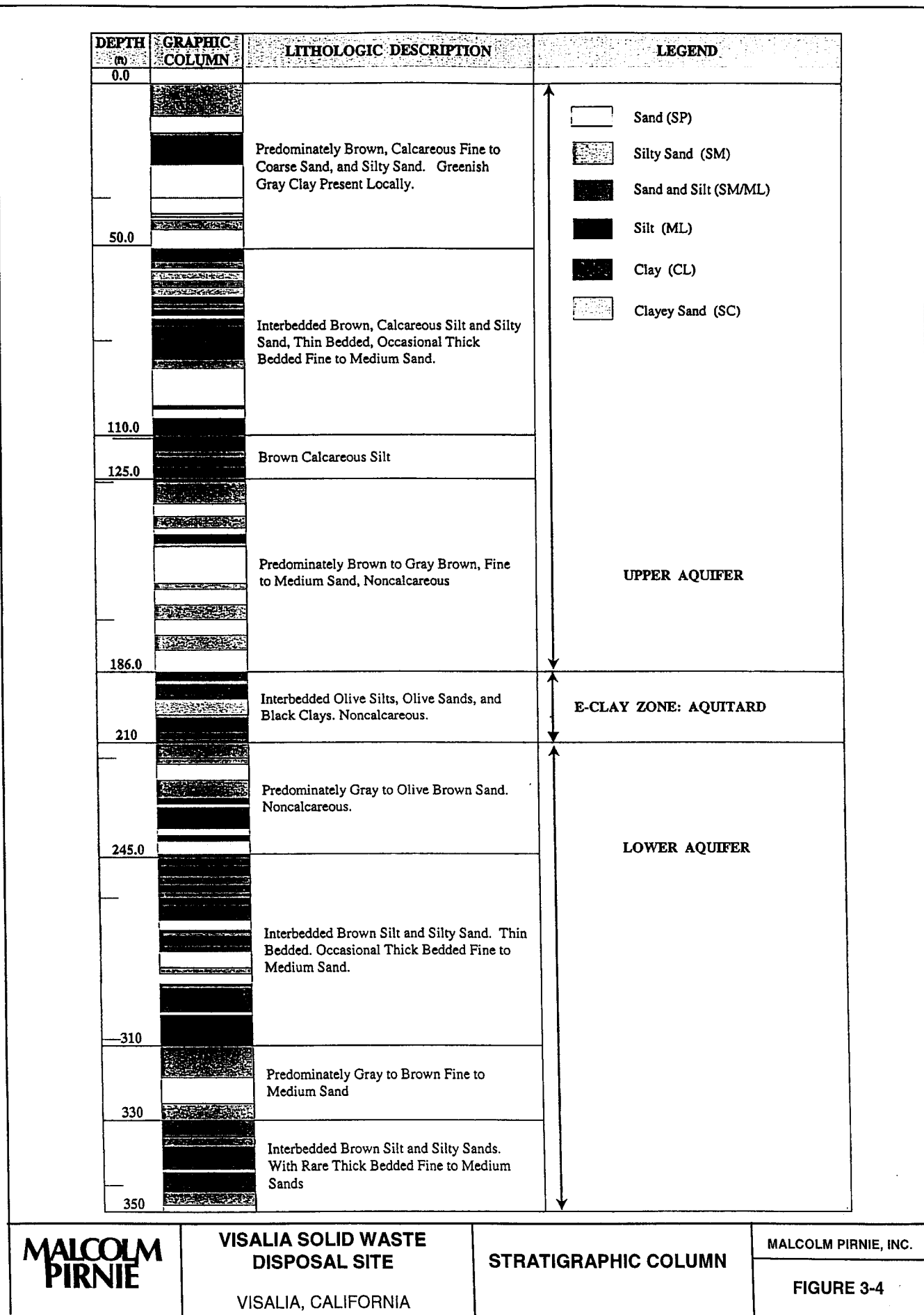


**MALCOLM
PIRNIE**

**VISALIA SOLID WASTE DISPOSAL SITE
VISALIA, CALIFORNIA
Regional Geologic Section**

MALCOLM PIRNIE, INC

Figure 3-3



Legend

- ▲ Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Wells
- Deep Simulprobe Boring
- ⊙ Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- △ Abandoned Water Well
- IRB Boring
- ▲ Cross-Section Lines
- ▨ Unlined Unit/Stormwater Pond
- ▨ Potential hydraulic barrier
- ▨ Landfill Property
- ▨ Streams and Canals

EMP well designation suffix	
S	Water table
A	Approx. 100 ft. Deep
B	Approx. 150 ft. Deep
C	Approx. 200 ft. Deep
M-7D	Screened - approx. 230 ft. Deep

Scale = 1 inch to 800 feet

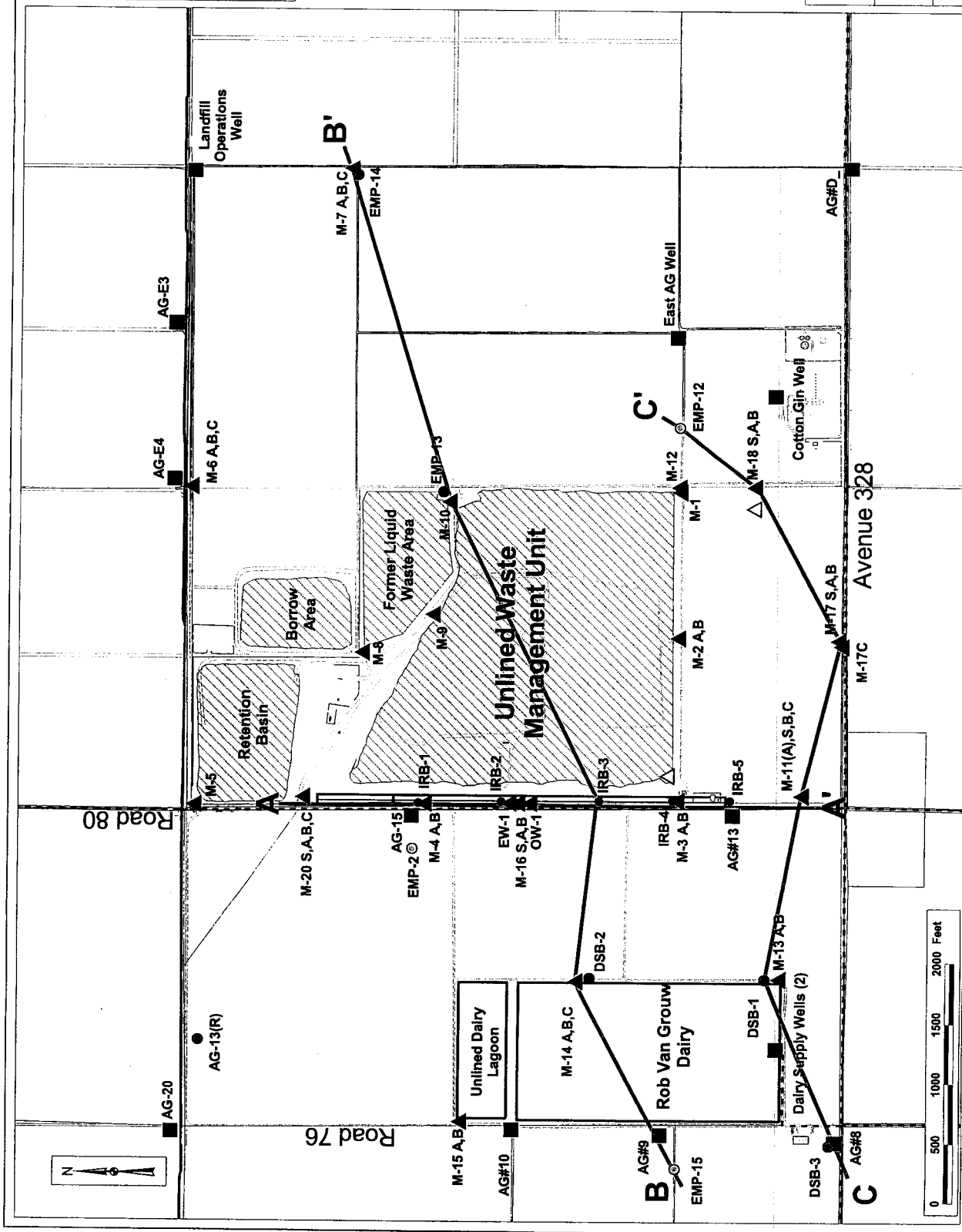
Site Plan With Cross-Section Lines

**MALCOLM
PIRRIE**

Figure 3-5

DATE: 4-13-01

DRW: 2966-009-B4



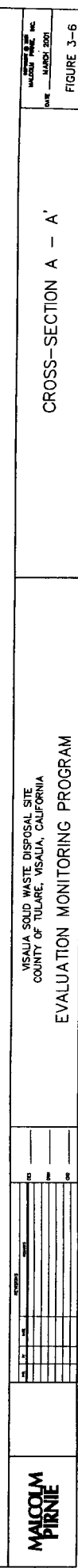
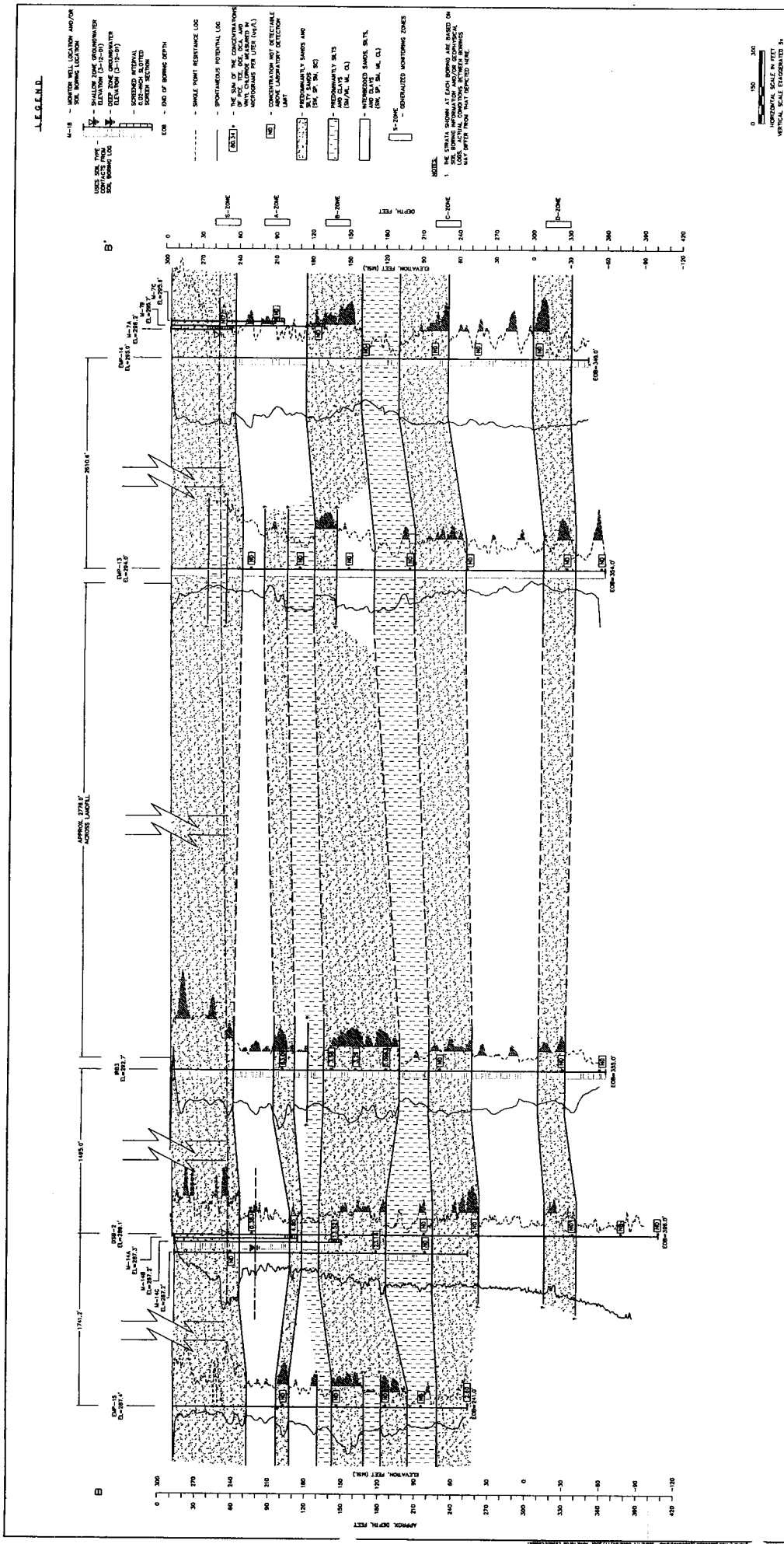


FIGURE 3-6



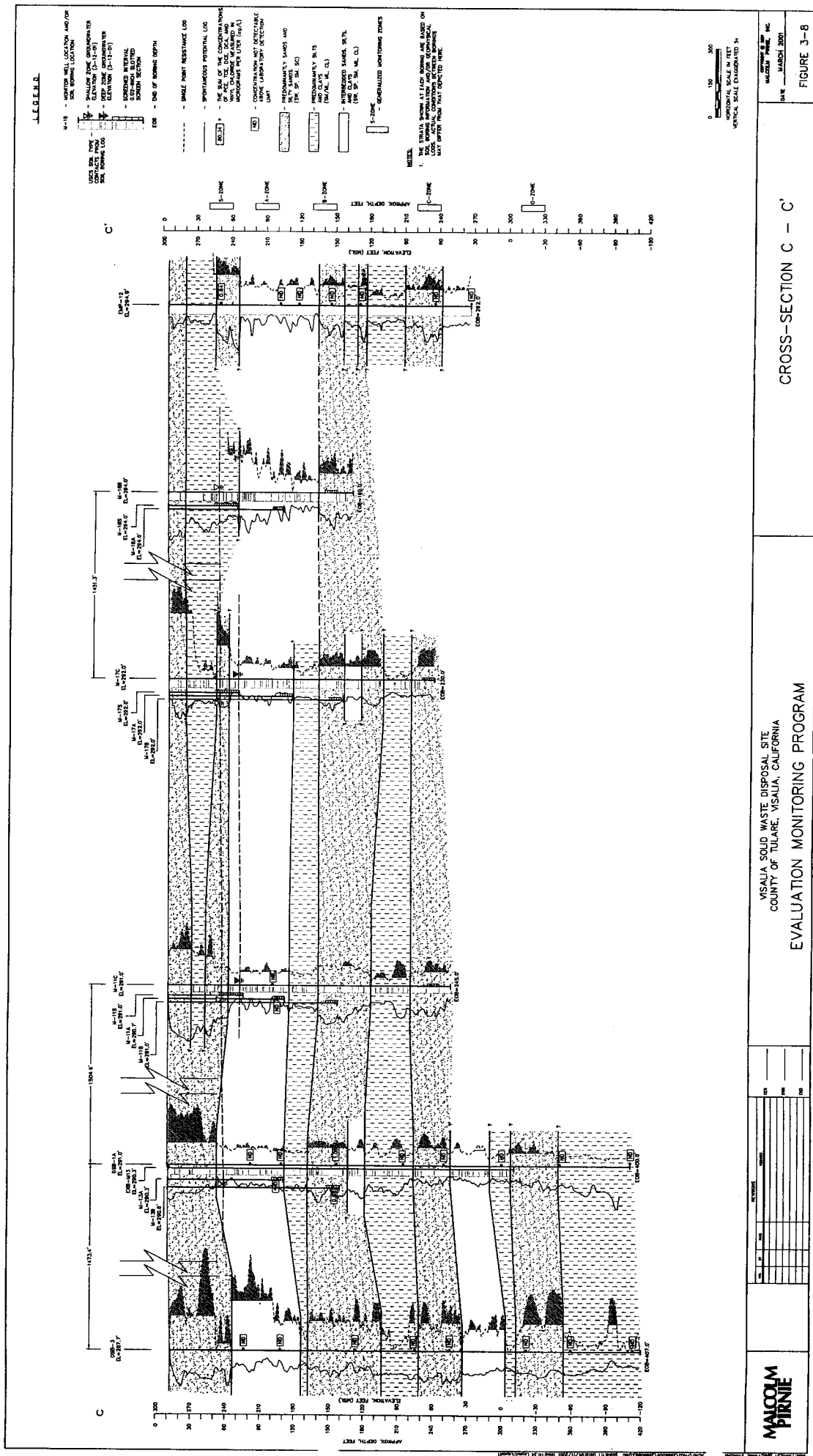
COUNTY OF TULARE, VISALIA, CALIFORNIA
EVALUATION MONITORING PROGRAM

**MALCOLM
PIRNIE**

CROSS-SECTION B - B'

FIGURE 3-7

DATE: MARCH 2001
 COMPANY: MALCOLM PIRNIE, INC.



Legend

- ▲ Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Wells
- Deep Simulprobe Boring
- ⊙ Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- △ Abandoned Water Well
- ▨ Isopotential Contours
- ▨ Unlined Unit/Stormwater Pond
- IRB Boring
- Potential hydraulic barrier
- ▨ Landfill Property
- ▨ Streams and Canals

Legend

Water Level Boxes

Well Name

M-20

220.10

Water Level Measurement /
(feet, msl)

All Measurements
Taken on
March 12, 2001

SWP well designation suffix

S = Watertable

A = approx. 100 ft. Deep

B = approx. 150 ft. Deep

C = approx. 230 ft. Deep

M-70 Screened = approx. 230 ft. Deep

Scale = 1 inch to 800 feet

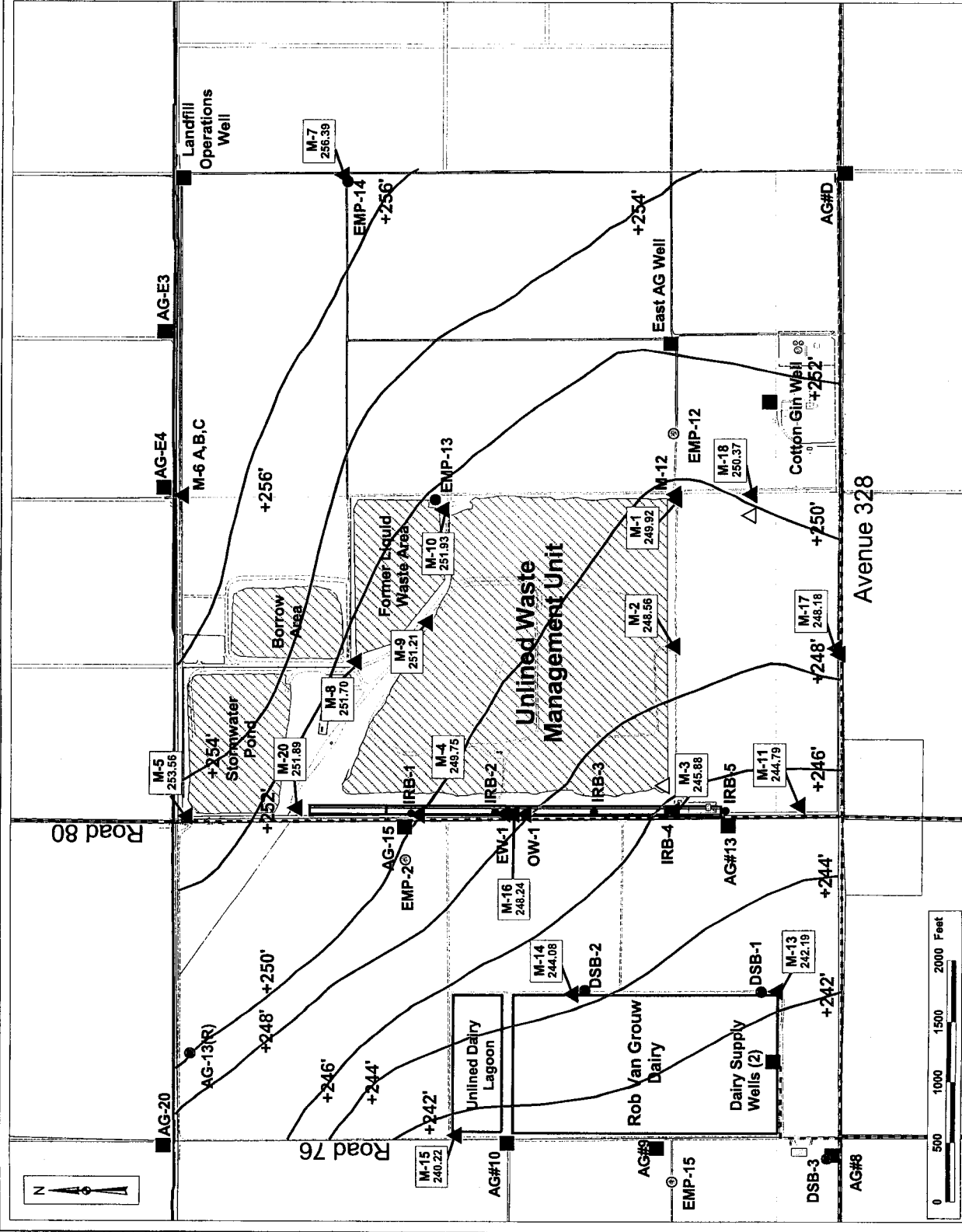
Water Table Isopotential Contours

**MALCOLM
PIRNIE**

Figure 3-9

DATE: 4-13-01

DRW: 2966-009-B5



Legend

- ▲ Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Wells
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- ⊙ Stratigraphic Soil Boring
- △ Abandoned Water Well
- IRB Boring
- ▧ Isopotential Contours
- ▨ Unlined Unit/Stormwater Pond
- ▩ Potential hydraulic barrier
- ▤ Landfill Property
- ▥ Streams and Canals

Legend

Water Level Boxes

Well Name

M-20
220.10

Water Level Measurement /
(feet, msl)

All Measurements
Taken on
March 12, 2001

BMP well designation suffix

S	= Waterfable
A	= APPROX. 100 ft. Deep
B	= APPROX. 150 ft. Deep
C	= APPROX. 200 ft. Deep
D	= APPROX. 250 ft. Deep
M-7D	Screened - APPROX. 230 ft. Deep

Scale = 1 inch to 800 feet

C-Zone

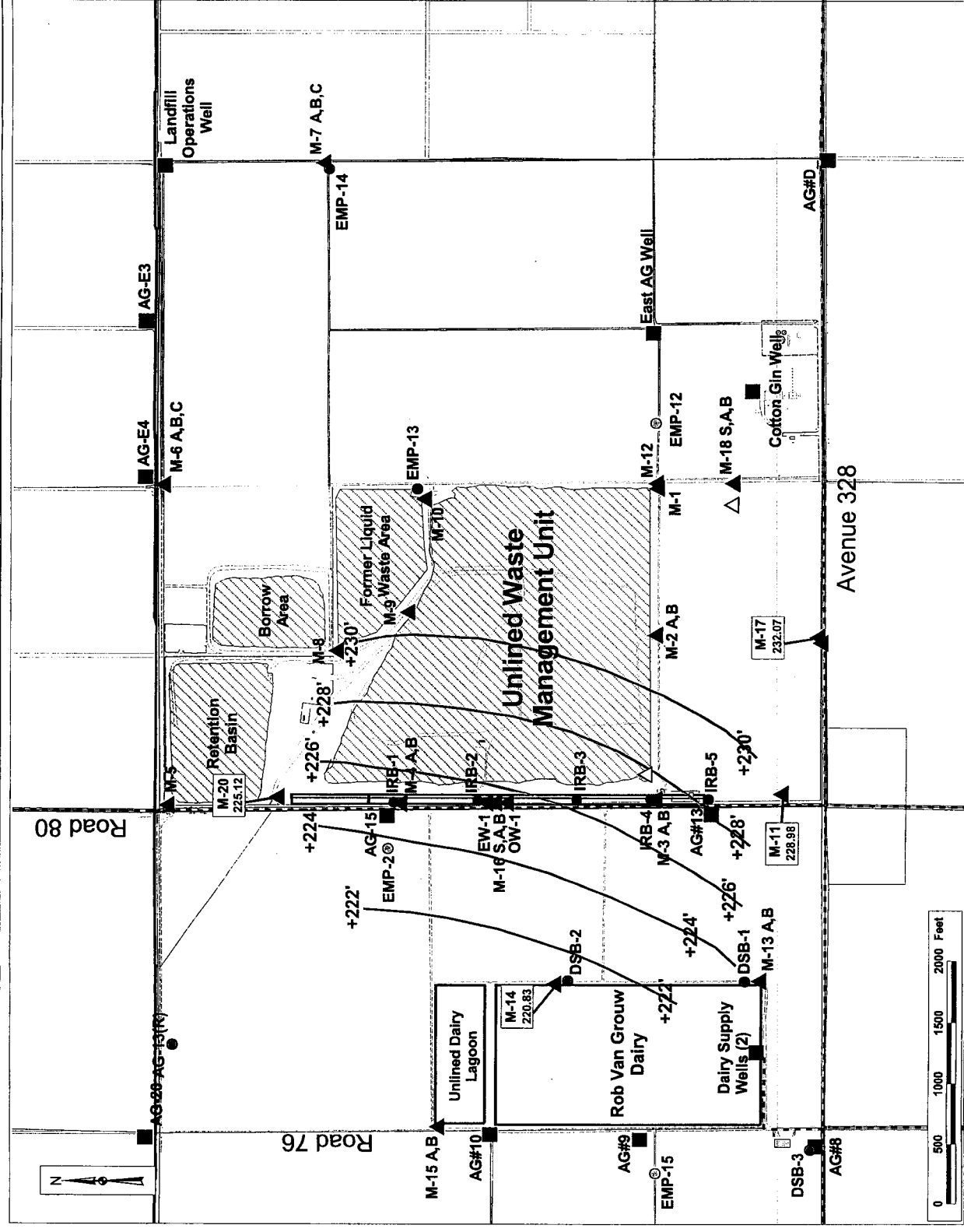
Isopotential Contours

MALCOLM
PIRNIE

Figure 3-10

DATE: 4-13-01

DRW: 2966-009-B6



Legend - Map Symbols

- ▲ Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Wells
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- △ Abandoned Water Well
- ▨ Unlined Unit/Stormwater Pond
- IRB Boring
- ▨ Potential hydraulic barrier
- ▨ Landfill Property
- ▨ Streams and Canals

Legend - VOC Boxes

Well Name	M-2A		Sum of Chlorinated Solvents / (micrograms/L)
Sample Interval	33'-53'	117.97	
*	Simulprobe Sample at Monitoring Well Location		
ND	Not Detected		
NS	Not Sampled		
Compounds in Measurement			
PCE TCE			
1,1-DCE c-1,2-DCE t-1,2-DCE			
1,1,1-TCA 1,1-DCA 1,2-DCA			
Vinyl Chloride Chloroethane			
Monitoring Wells Sampled October and November 2000.			

BMP well designation suffix
S = Water table
A = approx. 100 ft. Deep
B = approx. 150 ft. Deep
C = approx. 230 ft. Deep
M-7D Screened = approx. 230 ft. Deep

Scale = 1 inch to 1000 feet

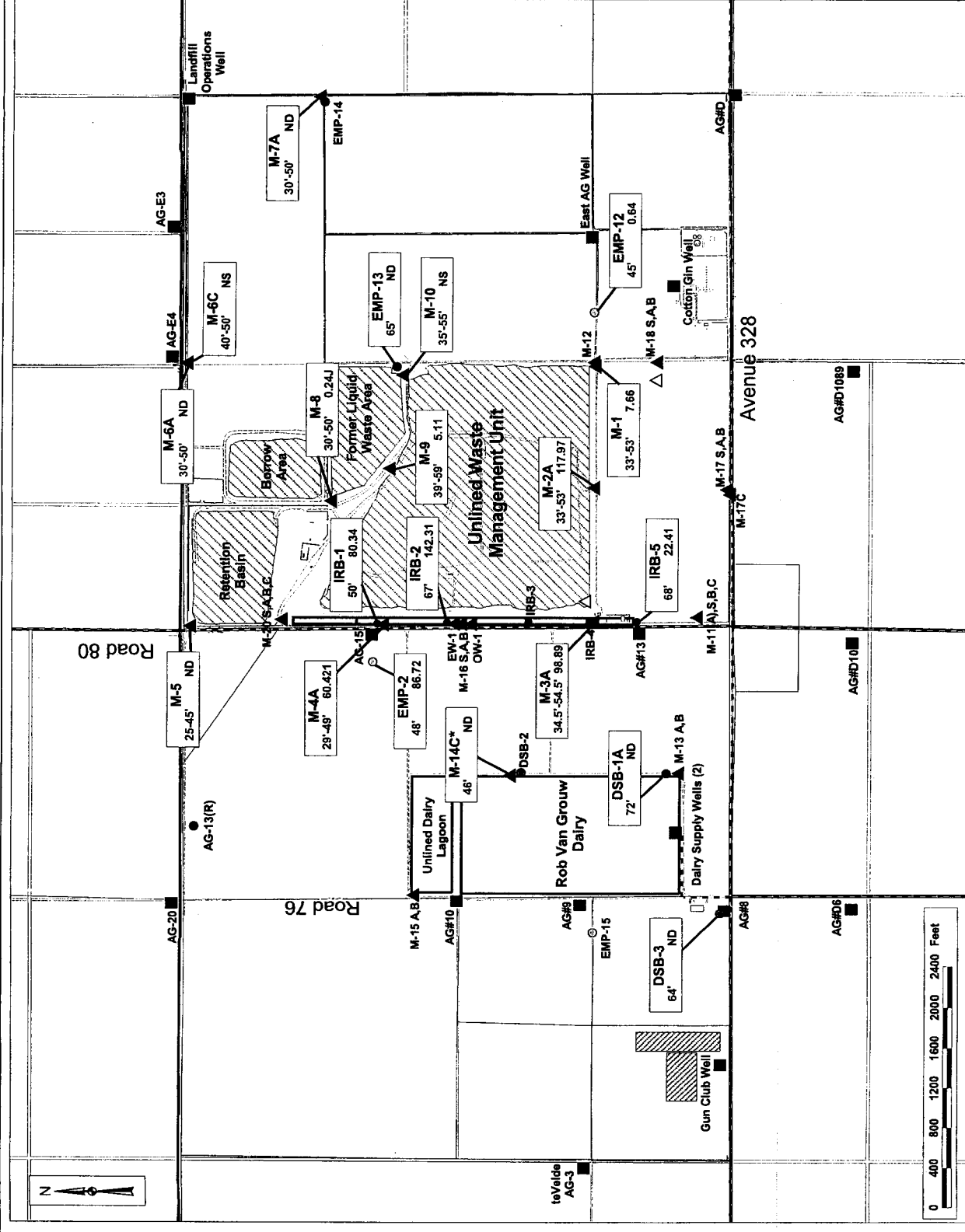
S-Zone VOC Distribution

MALCOLM
PIRRIE

Figure 4-1

DATE: 4-13-01

DRW: 2986-009-B7



Legend - Map Symbols

- Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Well
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- Abandoned Water Well
- Unlined Unit/Stormwater Pond
- IRB Boring
- Potential hydraulic barrier
- Landfill Property
- Streams and Canals

Legend - VOC Boxes

Well Name	M-2A	Sum of Chlorinated Solvents / (micrograms/L)
Sample Interval	33'-53'	117.97
	* Simulprobe Sample at Monitoring Well Location	
ND	Not Detected	
NS	Not Sampled	
	Compounds in Measurement	
	PCE TCE	
	1,1-DCE c-1,2-DCE t-1,2-DCE	
	1,1,1-TCA 1,1-DCA 1,2-DCA	
	Vinyl Chloride Chloroethane	
	Monitoring Wells Sampled	
	October and November 2000.	

EMP well designation suffix
S = Water table
A = approx. 100 ft. Deep
R = approx. 150 ft. Deep
C = approx. 230 ft. Deep
M-7D Screened = approx. 230 ft. Deep

Scale = 1 inch to 1000 feet

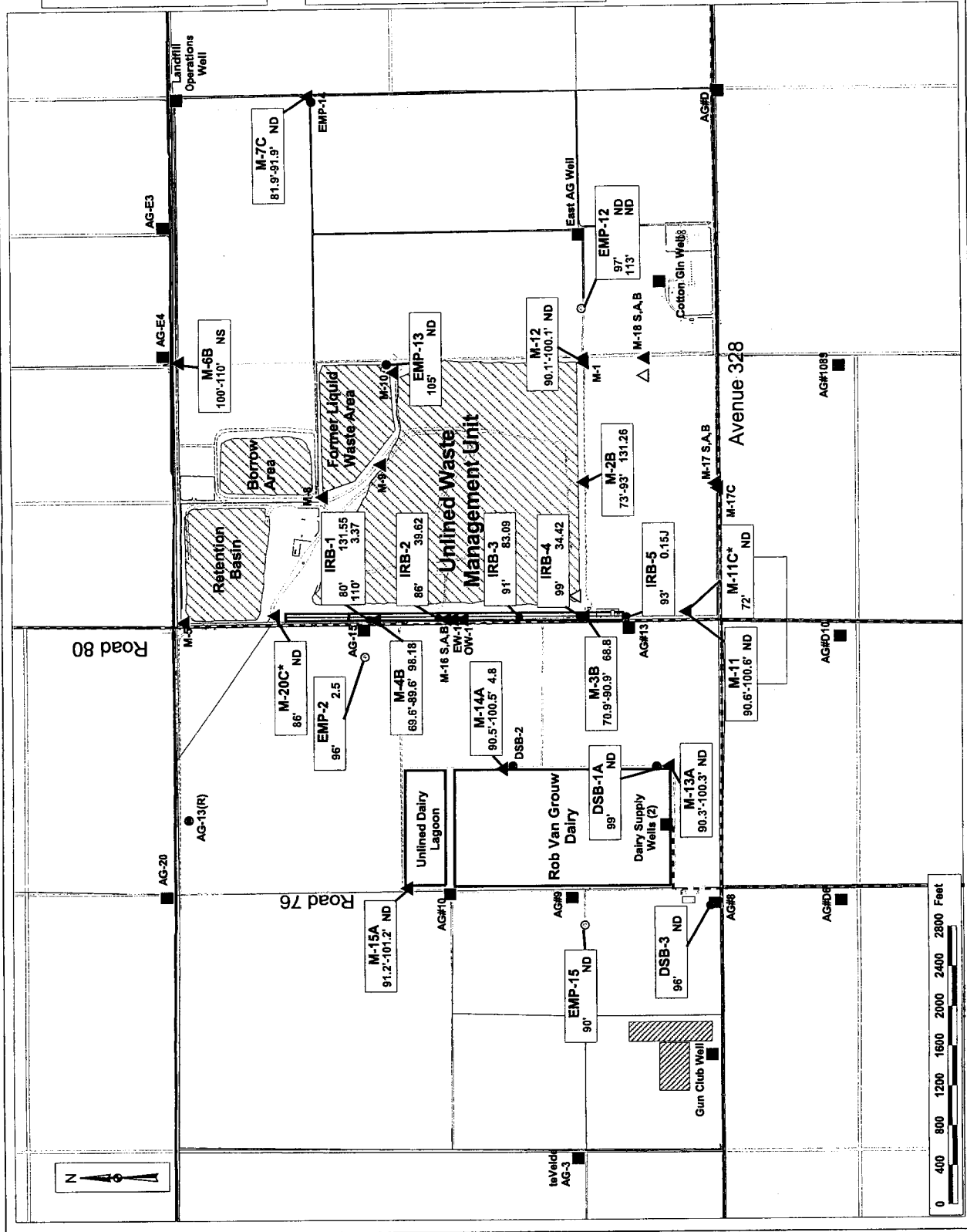
A-Zone VOC Distribution

MALCOLM
PIRNIE

Figure 4-2

DATE: 4-13-01

DRW: 2966-009-B8



Legend - Map Symbols

- Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Well
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- Abandoned Water Well
- Unlined Unit/Stormwater Pond
- IRB Boring
- Potential hydraulic barrier
- Landfill Property
- Streams and Canals

Legend - VOC Boxes

Well Name

M-2A
33'-53' 117.97

Sample Interval
Sum of Chlorinated Solvents (micrograms/L)

* Simulprobe Sample at Monitoring Well Location

ND Not Detected

NS Not Sampled

Compounds in Measurement

PCE TCE

1,1-DCE c-1,2-DCE t-1,2-DCE

1,1,1-TCA 1,1-DCA 1,2-DCA

Vinyl Chloride Chloroethane

Monitoring Wells Sampled

October and November 2000

ZMP well designation suffix	
S	Water table
A	Approx. 100 ft. Deep
B	Approx. 150 ft. Deep
C	Approx. 230 ft. Deep
M-7D	Screened = approx. 230 ft. Deep

Scale = 1 inch to 1000 feet

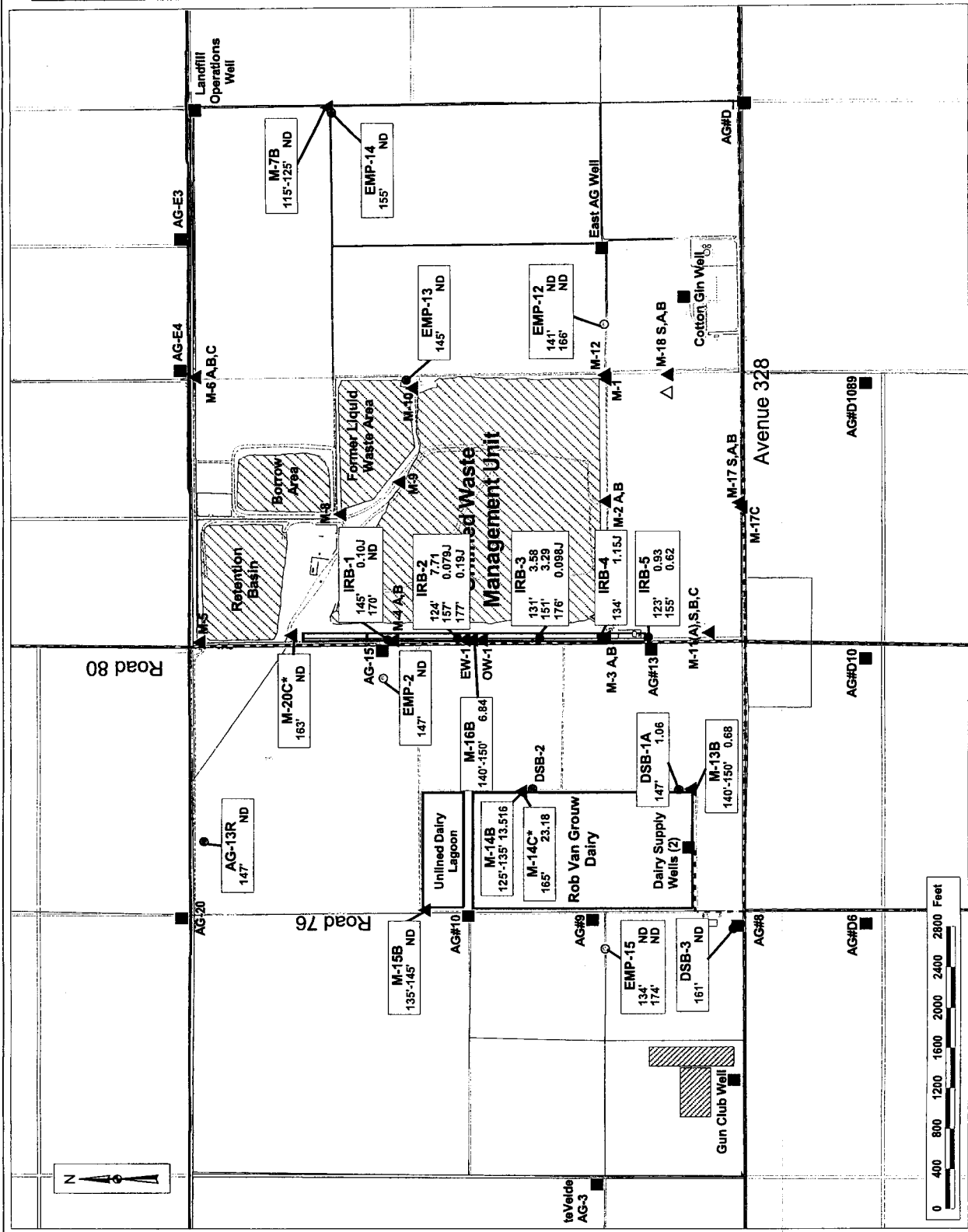
B-Zone VOC Distribution

MALCOLM
PIRNIE

Figure 4-3

DATE: 4-13-01

DRW: 2966-009-B9



Legend - Map Symbols

- ▲ Monitoring, Observation and Extraction Wells
- Agricultural/Water Supply Well
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- △ Abandoned Water Well
- ▭ Unlined Unit/Stormwater Pond
- IRB Boring
- ▨ Potential hydraulic barrier
- ▨ Landfill Property
- ▨ Streams and Canals

Legend - VOC Boxes

Well Name

M-2A
33'-53' 117.97

Sample Interval
Sum of Chlorinated Solvents / (micrograms/L)

* Simulprobe Sample at Monitoring Well Location

ND Not Detected

NS Not Sampled

RINSATE Equipment Blank

Compounds in Measurement

PCE TCE

1,1-DCE c-1,2-DCE t-1,2-DCE

1,1,1-TCA 1,1-DCA 1,2-DCA

Vinyl Chloride Chloroethane

EMP well designation suffix

S = Water Table

A = APPROX. 100 ft. Deep

C = APPROX. 330 ft. Deep

M-7D Screened = APPROX. 230 ft. Deep

Scale = 1 inch to 1000 feet

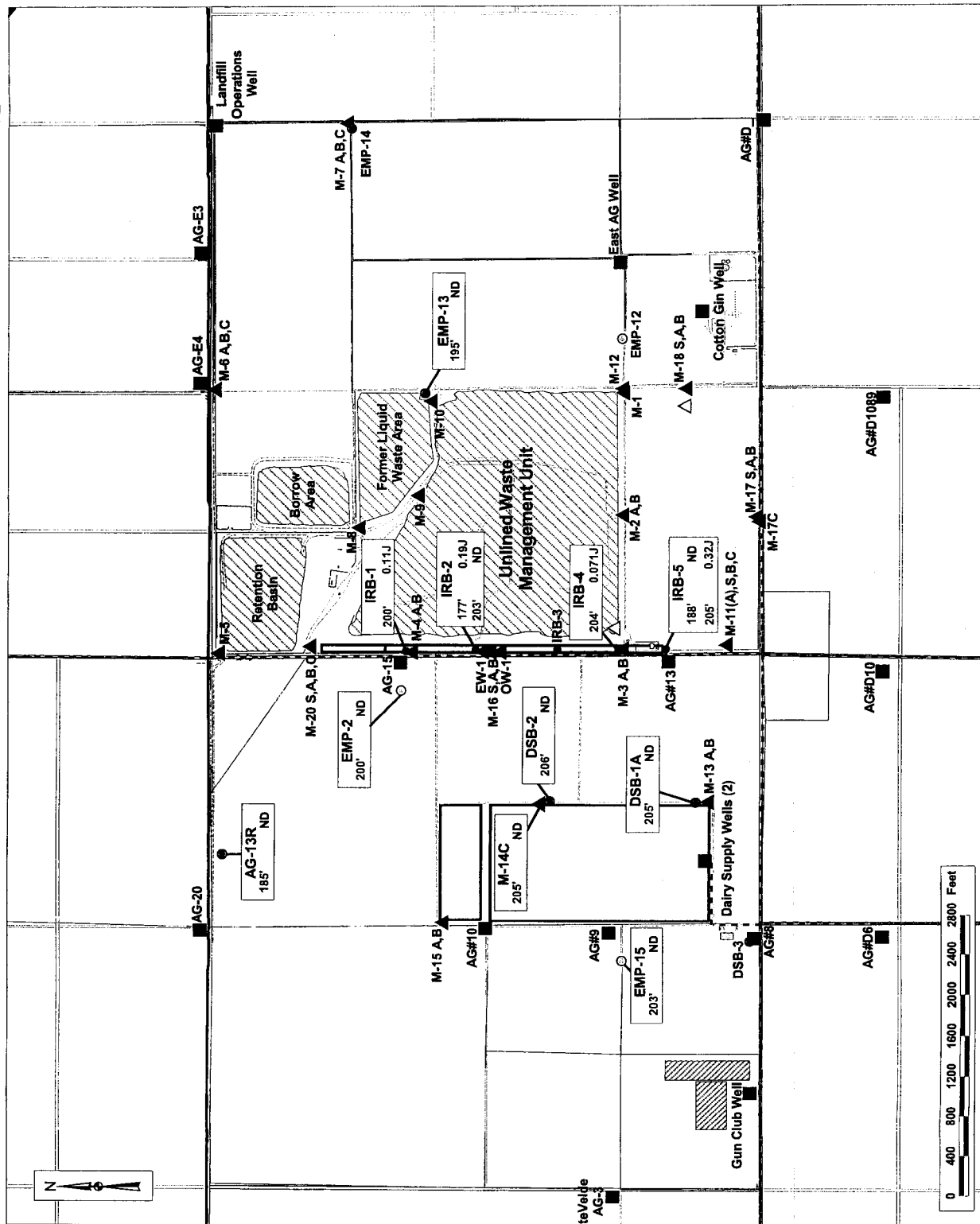
The Aquitard Zone VOC Distribution

MALCOLM
PIRNIE

Figure 4-4

DATE: 5-01-01

DRW: 2966-009-B26



Legend - Map Symbols

- ▲ Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Well
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- △ Stratigraphic Soil Boring
- △ Abandoned Water Well
- ▨ Unlined Unit/Stormwater Pond
- IRB Boring
- ▨ Potential hydraulic barrier
- ▨ Landfill Property
- ▨ Streams and Canals

Legend - VOC Boxes

Well Name	Well Name
M-2A	117.97
33'-53'	
Sample Interval	Sum of Chlorinated Solvents / (micrograms/L)
*	Simulprobe Sample at Monitoring Well Location
ND	Not Detected
NS	Not Sampled
RINSATE	Equipment Blank
	Compounds in Measurement
	PCE TCE
	1,1-DCE c-1,2-DCE t-1,2-DCE
	1,1,1-TCA 1,1-DCA 1,2-DCA
	Vinyl Chloride Chloroethane

EMP well designation suffix
S = Water table
A = approx. 100 ft. Deep
B = approx. 150 ft. Deep
C = approx. 230 ft. Deep
M-7D Screened - approx. 230 ft. Deep

Scale = 1 inch to 1000 feet

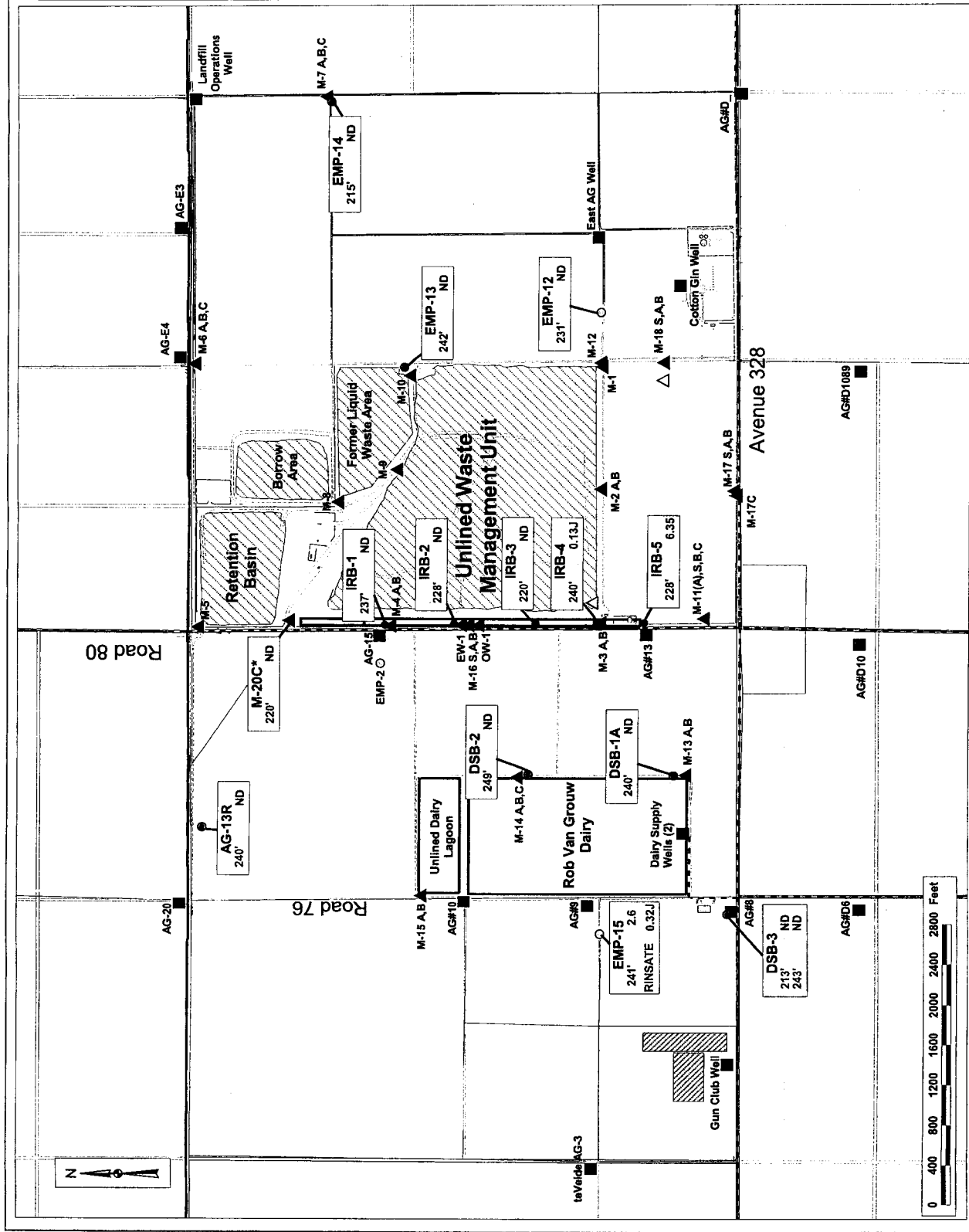
C-Zone VOC Distribution

MALCOLM
PIRNIE

Figure 4-5

DATE: 4-13-01

DRW: 2966-009-B10



Legend - Map Symbols

- Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Wells
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- Abandoned Water Well
- Unlined Unit/Stormwater Pond
- IRB Boring
- Potential hydraulic barrier
- Landfill Property
- Streams and Canals

Legend - VOC Boxes

Well Name	Well Name
M-2A	33'-53' 117.97
Sample Interval	Sum of Chlorinated Solvents / (micrograms/L)
*	Simulprobe Sample at Monitoring Well Location
ND	Not Detected
NS	Not Sampled
RINSATE	Equipment Blank
Compounds in Measurement	
PCE TCE 1,1-DCE c-1,2-DCE t-1,2-DCE	
1,1,1-TCA 1,1-DCA 1,2-DCA Vinyl Chloride Chloroethane	
EMP well designation suffix	
S =	Not detectable
A =	approx. 100 ft. Deep
B =	approx. 150 ft. Deep
C =	approx. 230 ft. Deep
M-7D	Screened = approx. 230 ft. Deep

Scale = 1 inch to 1000 feet

Deeper Zone is Greater Than Or Equal to 250 ft. Below Ground Surface

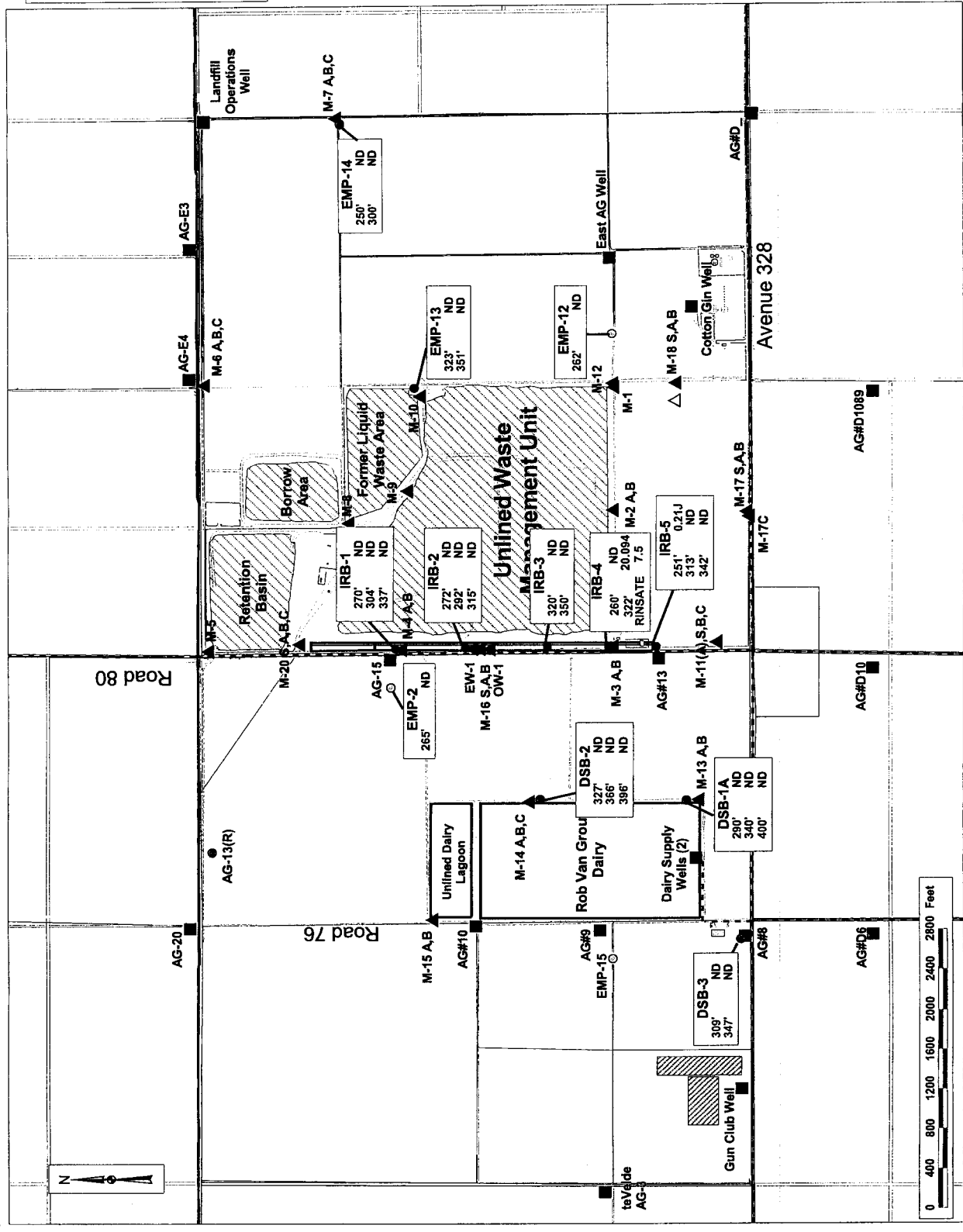
Deeper Zone VOC Distribution

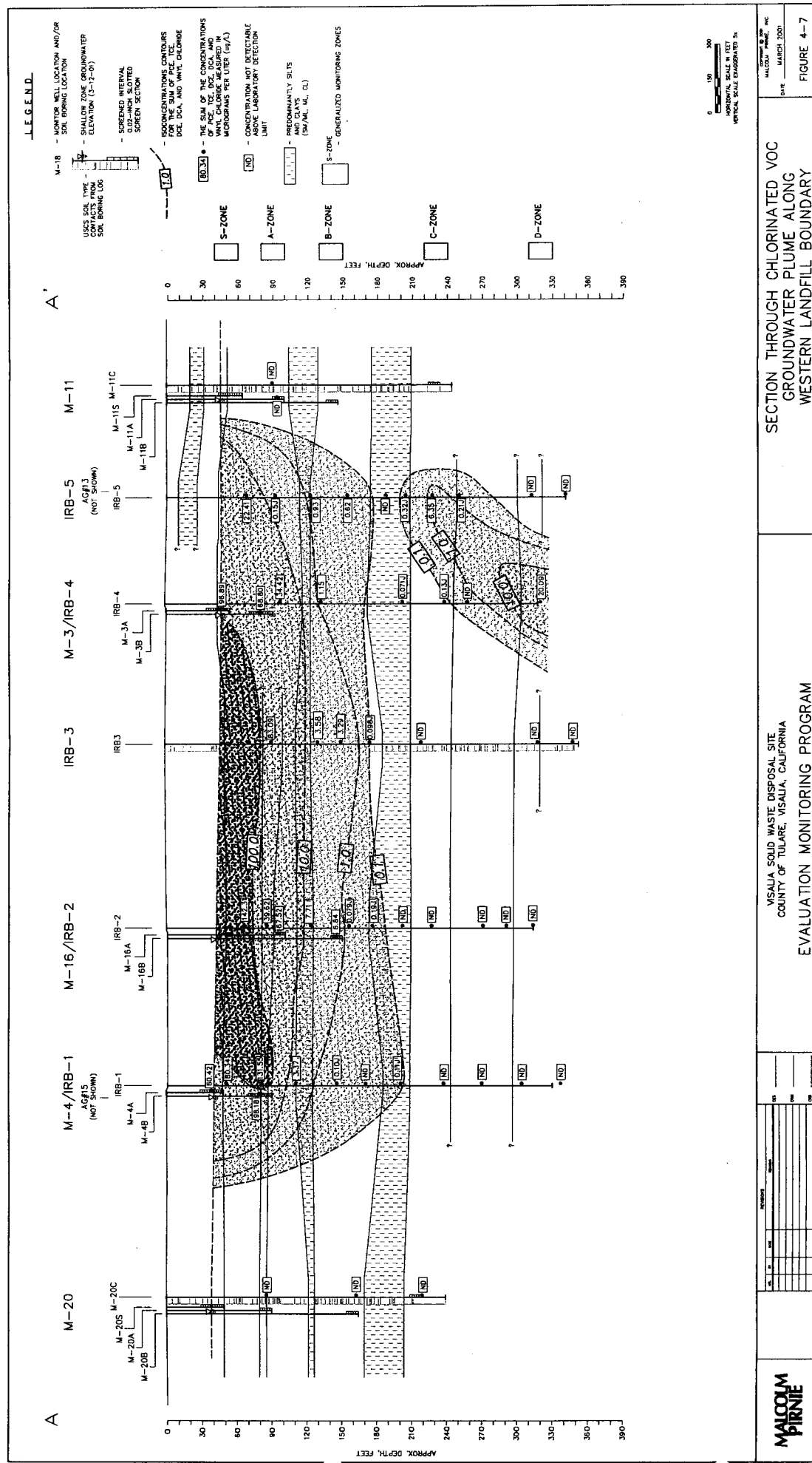
MALCOLM PIRNIE

Figure 4-6

DATE: 4-13-01

DRW: 2866-009-B11





Legend - Map Symbols

- Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Wells
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- Abandoned Water Well
- Unlined Unit/Stormwater Pond
- IRB Boring
- Potential hydraulic barrier
- Landfill Property
- Streams and Canals

Legend - VOC Boxes

Well Name Sample Date

M-2A1
PCE 117.97

Compound Concentration / (micrograms/L)

ND Not Detected

Sample Date

- 1 First Quarter 2000
- 2 First Quarter 2001
- 3 Welenco Sampling Event

EMP well designation suffix
S = Waterflood
A = approx. 100 ft. Deep
B = approx. 150 ft. Deep
C = approx. 230 ft. Deep
M-7D Screened = approx. 230 ft. Deep

Scale = 1 inch to 1500 feet

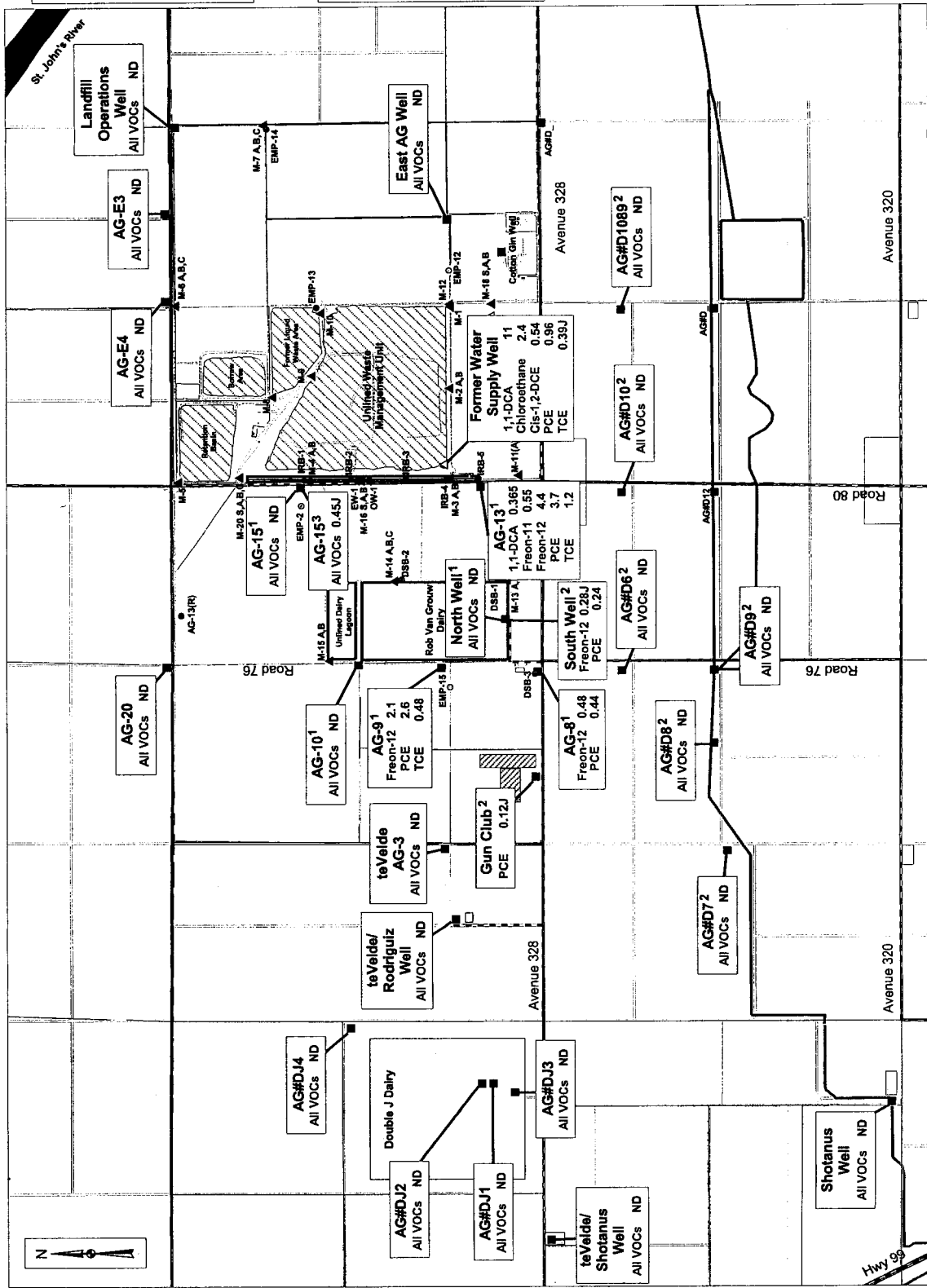
Agricultural Well VOC Distribution

MALCOLM PIRNIE

Figure 4-8

DATE: 4-13-01

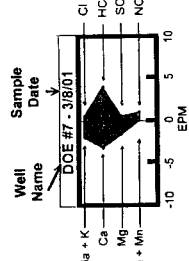
DRW: 2966-009-B12



Legend - Map Symbols

- Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Well
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- Abandoned Water Well
- Unlined Unit/Stormwater Pond
- IRB Boring
- Potential Hydraulic barrier
- Landfill Property
- Streams and Canals

Legend - Stiff Diagrams



EMP well designation suffix
S = Watertable
A = approx. 100 ft. Deep
B = approx. 150 ft. Deep
C = approx. 230 ft. Deep
M-70 Screened = approx. 230 ft. Deep

Scale = 1 inch to 1500 feet

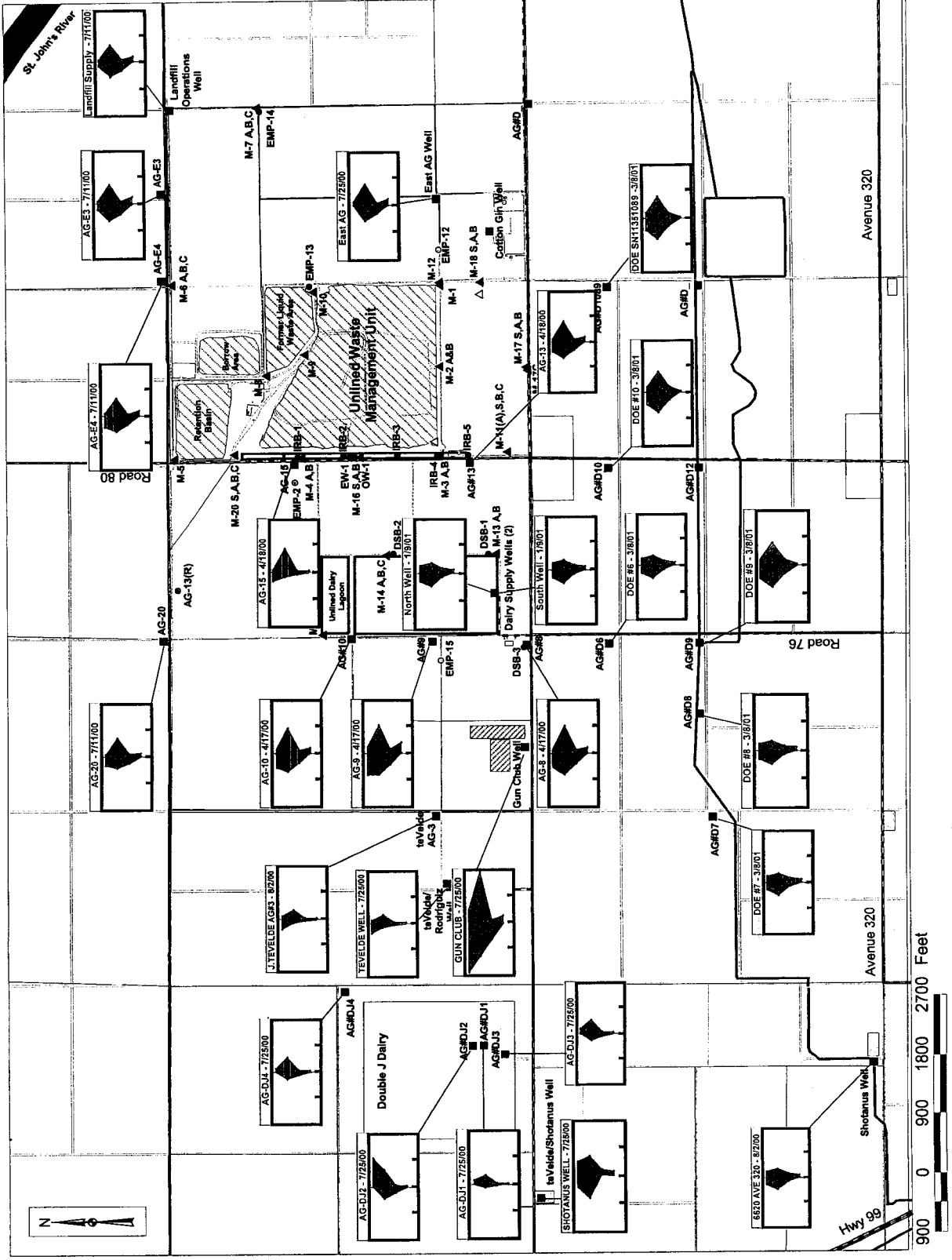
Agricultural Well Water Quality With Stiff Diagrams

MALCOLM
PIRNIE

Figure 4-9

DATE: 4-13-01

DRW: 2966-009-B13



Legend

- ▲ Monitoring, Observation, and Extraction Wells
- Agricultural/Water Supply Well
- Deep Simulprobe Boring
- Shallow Simulprobe Boring
- Stratigraphic Soil Boring
- △ Abandoned Water Well
- IRB Boring
- ▨ Unlined Unit/Stormwater Pond
- ▨ Potential hydraulic barrier
- ▨ Landfill Property
- ▨ Streams and Canals

Legend - VOC Boxes

Well Name	Carbon Disulfide (micrograms/L)
M-2A	117.97
33'-53'	
Sample Interval	
*	Simulprobe Sample at Monitoring Well Location
ND	Not Detected
NS	Not Sampled
RINSATE	Equipment Blank
E	Estimated Value

EMP well designation suffix
S = Meterable
A = approx. 100 ft. Deep
B = approx. 150 ft. Deep
C = approx. 230 ft. Deep
M-7D Screened = approx. 230 ft. Deep

Scale = 1 inch to 1000 feet

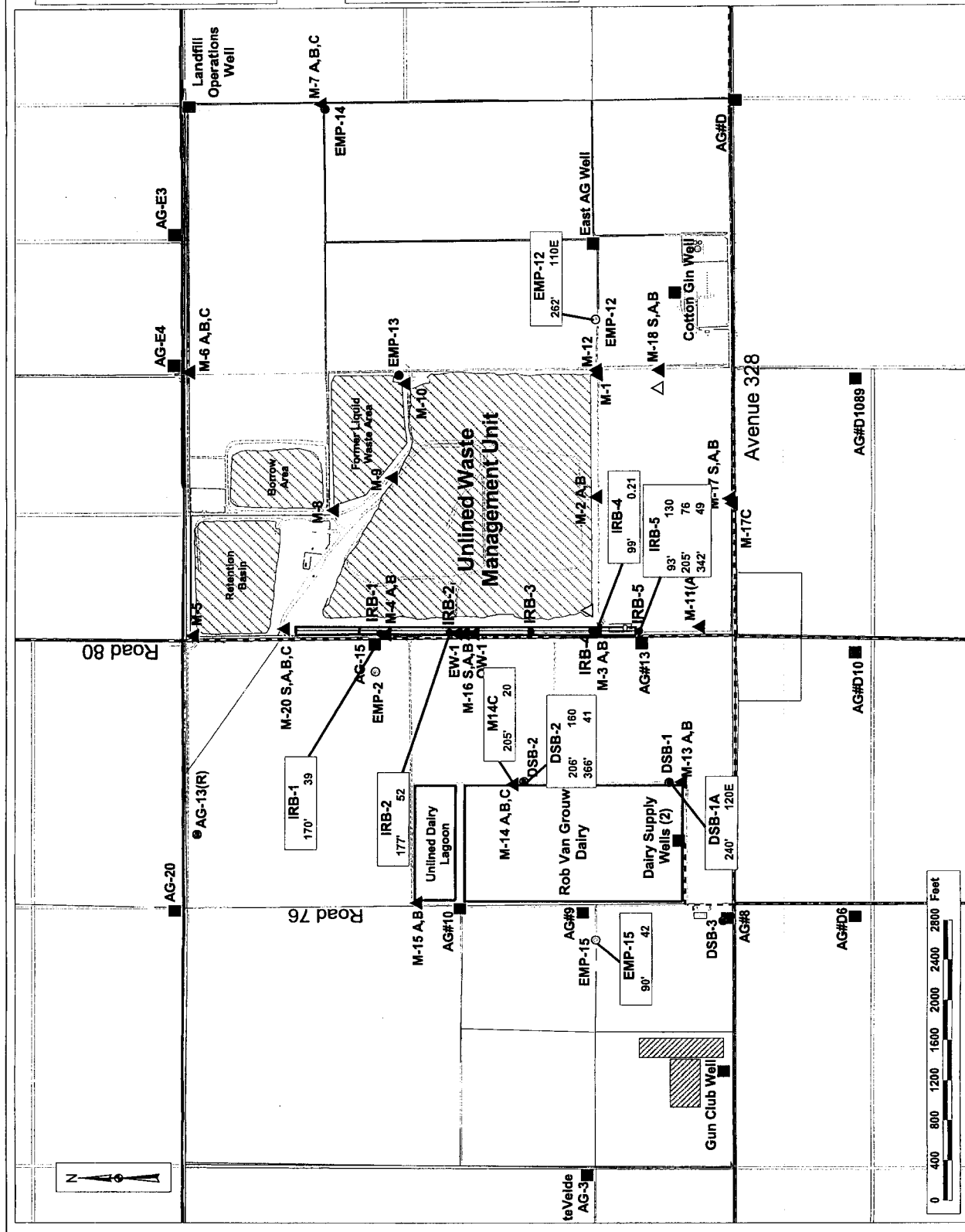
Carbon Disulfide Distribution

MALCOLM
PIRNIE

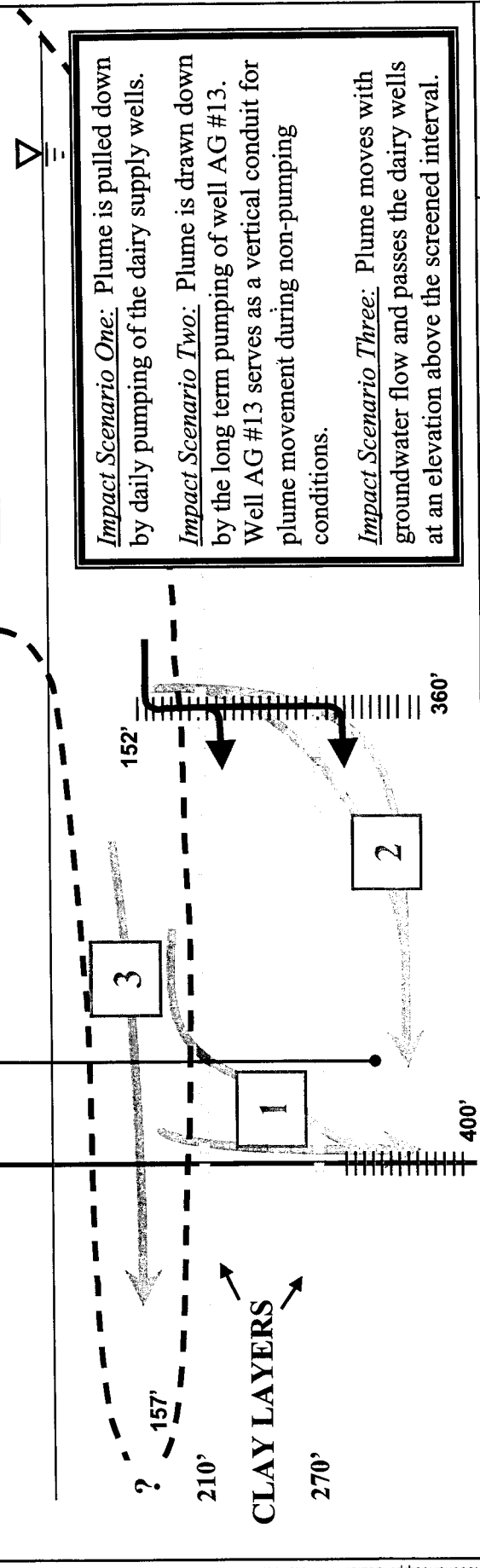
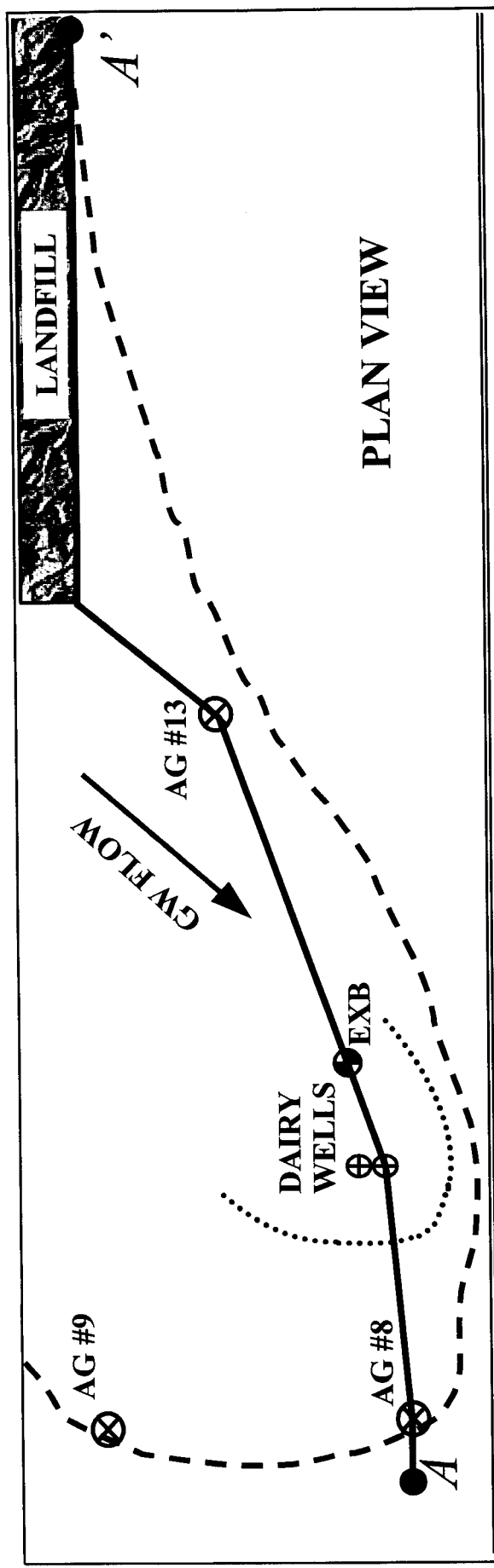
Figure 4-10

DATE: 4-17-01

DRW: 2966-009-B14



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Impact Scenario One: Plume is pulled down by daily pumping of the dairy supply wells.

Impact Scenario Two: Plume is drawn down by the long term pumping of well AG #13. Well AG #13 serves as a vertical conduit for plume movement during non-pumping conditions.

Impact Scenario Three: Plume moves with groundwater flow and passes the dairy wells at an elevation above the screened interval.

Legend

Wells

- ▲ Proposed Monitoring Well
- Proposed Soil Boring
- ▨ Unlined Unit/Stormwater Pond
- ▨ Potential hydraulic barrier
- ▨ Landfill Property
- ▨ Streams and Canals

EMP well designation suffix

- S = Watertable
- A = approx. 100 ft. Deep
- B = approx. 150 ft. Deep
- C = approx. 230 ft. Deep
- M-7D Screened = approx. 230 ft. Deep

Scale = 1 inch to 1000 feet

Proposed Soil Borings And Monitoring Well Locations

**MALCOLM
PIRNIE**

Figure 6-1

DATE: 4-13-01

DRW: 2966-009-B15

