Weber, Hayes and Associates
Hydrogeology and Environmental Engineering
120 Westgate Drive, Watsonville, CA 95076
(831) 722-3580 Fax: (831) 722-1159

RECEIVED

3:27 pm, Oct 22, 2007

Alameda County
Environmental Health

August 23, 2004

Alameda County Health Care Services Agency
Environmental Health Services, Environmental Protection
To the attention of: **Robert Schultz**
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Fuel Leak Site**: Sunol Tree Gas Station, 3004 Andrade Road, Sunol**

Investigation: **Diagnosis of MTBE-Impacted Water Production Well**
- T-Bear Ranch, 3000 Andrade Road, Sunol

BACKGROUND

Weber, Hayes and Associates (WHA) have prepared this summary report on behalf of Alameda County Environmental Health (ACEH). ACEH is managing the characterization and cleanup of this fuel release under a grant from the State Petroleum Underground Storage Tank Cleanup Fund's Emergency, Abandoned, and Recalcitrant (EAR) Account.

Gasoline contamination was initially detected in February 2003 in water collected from the T Bear Ranch drinking water well located approximately 550 feet downgradient from a documented fuel release site (Sunol Tree Gas Station, 3000 Andrade Road). The fuel release was initially discovered at the gas station property during the April 2002 closure of underground storage tanks (UST). Up to 130 parts per billion (ppb) MTBE has been detected in the T Bear domestic water supply well.

Current Scope of Work: This document provides a review of recently collected completed geophysical and discrete water quality data that was collected to assess conditions in the impacted T Bear well. Work tasks included:

- Video logging the existing well following submersible pump removal, to inspect evidence of well screen locations and well integrity (a copy of the video has been provided).

- An in-situ geophysical assessment of the well completed by Norcal Geophysical (a copy of their summary report is included as Appendix A). In-situ work tasks included:

  - Evaluation of preferential fluid entry zones for determining inflow variation over the length of the screened interval (production logging) and assessment of vertical flow (heat pulse flow meter).
  - Evaluation of different characteristics in fluid entry zones (Fluid electrical conductivity (FEC) and temperature logs).
  - Completion of a Resistivity-Gamma log to qualitatively identify potential clay, sand and gravel strata.

- Discrete water sampling was conducted under ambient conditions to assess whether increased concentrations of contaminants were entering the well at discrete intervals. A stainless steel sample tube (Solinst discrete water sampling system) was lowered to selected sampling depths based on the results of the flow meter logging. Analytical results have been tabulated in this report (Table 1) and a copy of the Lab's *Certificate of Analysis* is included as Appendix B.

DATA GATHERING

On June 29, 2004, geophysical well assessment and discrete water quality testing were completed by Norcal Geophysical Consultants (Bill Henrich, CEG, GP) and Weber, Hayes and Associates (Aaron Bierman, RG). The pumping well had been shut down for one full day prior to the start of field operations. Groundwater drawdown in the T Bear well at a normal pumping rate of about 10 gallons per minute is approximately 1.5 feet. Continuously monitored transducer data shows the well recovers very quickly following shut-down of pumping (see Figure 1, Chart of Groundwater Pumping Fluctuation).

Initial video logging and geophysical testing were completed to document construction details of the T Bear well and the presence of potential vertical gradients and more permeable saturated materials within the screened zone. Discrete water samples were subsequently obtained based on the geophysical anomalies identified. Copies of field notes, sampling and decon protocol, and collected field data are included in Appendix C.

Initial Conditions: All measurements are based on measured depth below the top of the well casing (BTOC). The 6-inch diameter well is constructed of PVC and top of casing was measured to be 0.5 feet above ground surface**:**

- Prior to pulling of the pump, static groundwater level was measured to be 7.18 feet BTOC (=6.68 feet below ground surface).
- Pump column is 2-inch diameter, flexible polyethylene tubing.
- The pump intake is at 33 feet BTOC and the bottom of the pump at 34 feet BTOC.

Video Logging: An optical televiewer was used to video log the T Bear well from ground surface to it's apparent base which was measured to be at a depth of 40 feet.

- Cloudy water was observed from 7-13 feet and some algae growth was observed between 22-26 feet BTOC.
- Two angular perforations per foot were observed on the walls of the casing from depths of approximately 3 feet BTOC to the bottom of the well. Each set of slots per foot were positioned on opposite sides of the casing and were approximately 3 to 4 inches in length. The cloudy water (7-13 feet) and algae growth (22-26 feet) partially masked the presence of the slots. There also appears to be evidence of a PVC casing joint at 22 feet BTOC.
- There is a 2-foot long metal bar (with hook) at the base of the well (apparently dropped into the well). A casing anomaly appears at 39.7 feet where there is an obvious PVC lip. This lip may be an inserted plug (base of well) or some sort of shear (damage). In either case, there is a silty mud bottom that partially covers this anomaly and the base of the well is currently considered to be at 40 feet BTOC.

Ambient (non-pumping) Flow Logging: Ambient flow logging consisted of temperature, fluid conductivity, differential fluid conductivity and heat pulse flow meter logs (see attached Norcal Geophysical plates 1 and 2, Appendix A). These logs indicate:

- The shallow (upper) water temperature was initially recorded at 18 degrees C, and dropped a little over a degree C from 16' to 22' BTOC. Temperature was consistent from 23' to the base of the well.
- A temperature anomaly was observed at 22 feet (the differential change is 0.25 degrees C).
- There was a similar drop in conductivity in the shallow groundwater (16-22' BTOC). Specifically, initial conductivity recordings of at 1,410 uS/cm dropped to 1,365 uS/cm at 22 BTOC‘ and remained consistent to bottom of the log.
- The heat-pulse flow meter data was acquired at discrete depths and held stationary while a series of measurements were taken to determine an average travel time arrival of a heated water tracer to either a lower or upper sensor. Specifically, the direction of vertical flow (up or down) was measured by observing which sensor (upper or lower) is first activated by the heat tracer. The heated slug of water travels vertically up or down depending on ambient flow direction. Additional details are provided with the Norcal Geophysical’s report (Appendix A). Preliminary review of the ambient flow data indicates:

    - Some very low flow was noted in the shallow groundwater zone, documented as minor horizontal flow (17' feet BTOC).
    - No flow was measured by the heat-pulse flow meter under ambient conditions at depths below 20 feet.

Dynamic (pumping) Flow Logging: A 2-inch diameter, submersible Grundfos pump was used to stress the shallow aquifer and a heat-pulse flow meter measured relative flow velocity entering the well, indicative of relatively higher and lower production zones. The pump was set at 10 feet BTOC and extracted groundwater at a rate of 2.8 gpm. Minor drawdown was measured immediately following pumping startup (0.37-0.42 feet of drawdown) that generally stabilized after 10 minutes of pumping. The heat pulse log is a record of flow that occurred during the

continuous pumping conditions (see "pumping conditions" graphic, Track 2, Plate 2, Appendix A). This log suggests:

- Highest horizontal flow velocity entering the well (fastest receiving time) occurred at shallow depths (highest recorded at 15 feet BTOC) and decreases with depth. Seventy percent of flow was measured at depths from 10 to 23 feet below ground surface. A portion of the flow appears to come from the basal portion of the well (twenty-three percent of flow originates from depths of 35-40 feet.
- The dynamic flow logging data indicates the majority of water flow volume (55%) enters into the T Bear well at depths of 15-23 feet. The percent of pump production graphic is presented as Track 2 of Plate 2 in Norcal's summary report (Appendix A).

Resistivity and Gamma Logging: Natural gamma and induction conductivity tools were used to interpret potential changes in lithology beyond the annulus of the PVC-cased, T Bear well. Resistivity and gamma logs are plotted on Tracks 3 and 4 of Plate 1, which also includes an interpreted strat-column that differentiates alluvium into clay and sand (Appendix A). Two sand units have been interpreted to be present from depths of approximately 15-33.8 feet and 38 feet to the bottom of the well (40 feet). Specifically:

- 0-15 feet BTOC is interpreted as interbeded sands in silts and clays (fining upward sequence)
- 15- 33.8 feet BTOC is interpreted as a clean sand or gravel with the most permeable zone appearing at a depth of 30 feet
- 33.8 - 37 feet BTOC is interpreted as a clay
- 37 feet to the bottom of well is interpreted as a sand or gravel

Recent continuous soil coring completed 20 feet from the T Bear water well has provided detailed information on subsurface conditions (PZ-2). Semi-confined to confined groundwater stabilizes at depths ranging from approximately 6-8 feet belowground surface. Soil cores revealed

- The first water-producing unit near the well is a moist, sandy-gravelly-clay that was encountered at a depth of 18-to 22 feet.
- A 2-foot thick, possibly discontinuous, damp clay separates the upper zone from a second water-producing unit.
- The second water-producing unit is a wet, upward fining sequence of gravel-to-sand-to-silt encountered from depths of 24-to-32 feet (groundwater in this unit stabilized at approximately 6 feet).
- A ten foot thick, relatively dry sandy-gravelly-clay to clay aquitard separates the two, deeper water bearing units.
- A final, confined aquifer of gravely-clay to well-graded gravels was encountered at a depth of 44 feet (groundwater in this unit stabilized at approximately 8 feet).

Discrete Sampling: On June 29, 2004 four discrete groundwater samples were collected to address geophysical anomalies identified in this 40-foot deep well. The samples were obtained

using a pre-cleaned, stainless steel sample tube (Solinst discrete water sampling unit) that was lowered to the selected sampling depth and activated to obtain a representative sample from that elevation. On July 19, 2004, an additional water sample was obtained from the groundwater interface (8' BTOC) to determine if there was any change in dissolved concentrations at the surface of the groundwater. All samples were collected during ambient conditions (non-pumping) and were tested at a State-certified laboratory for TPH-gasoline, BTEX, and fuel oxygenates including MTBE and TBA. A copy of the testing laboratory's certified results is presented in Appendix B.

Table 1
Discrete Groundwater Sample Results
(all concentrations in parts per billion)

Sampling Intervals	Anomaly	Analytical Results
8 feet BTOC	Groundwater interface sampling	MTBE detected at 15 ppb - no other detections.
15 feet BTOC	Heat Pulse flow-meter indicated relatively high flow in this zone during pumping. Cloudy groundwater observed from 7-13 feet.	Only MTBE detected at 11 ppb - no other detections.
22 feet BTOC	Differential temperatures change (anomaly). Heat Pulse flow-meter indicated relatively high flow in this zone during pumping	Only MTBE detected at 17 ppb - no other detections.
30 feet BTOC	First significant permeable zone (resistivity data), although dynamic Heat Pulse flow-meter data indicates a relative decrease in flow in this zone	Only MTBE detected at 19 ppb - no other detections.
38 feet BTOC	Second permeable zone (resistivity data), base of well at casing anomaly (potential shear/cap).	Only MTBE detected at 20 ppb - no other detections.

Notes: BTOC= below top of casing
Sample obtained from 8' BTOC sampled on 7/19/04. All other samples obtained on 6/29/04.
Recent drilling indicates saturated strata are present at depths of 18-22 feet, 24-32 feet, and 44-50 feet.

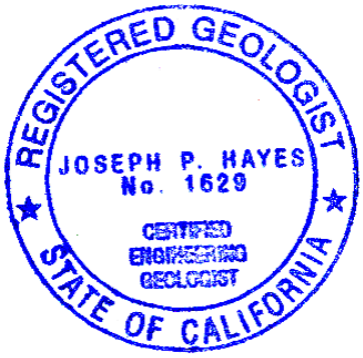
The samples were collected under ambient (non-pumping) conditions. The relatively consistent results obtained from the 5 water samples obtained at discrete elevations over a 30-foot span of well screen do not provide clear evidence of a preferential pathway (i.e. saturated soil zone containing a spike of MTBE concentrations).

LIMITATIONS: Our service consists of professional opinions and recommendations made in accordance with generally accepted geologic principles and practices. This warranty is in lieu of all others, either expressed or implied. The analysis and conclusions in this report are based on sampling and testing which are necessarily limited. Additional data from future work may lead to modifications of the options expressed herein.

All work has be conducted by and/or under the direct supervision of a geologist registered in the State of California. If you have any questions or comments regarding this workplan, please contact us at our office.

Respectfully submitted,

WEBER, HAYES AND ASSOCIATES
A California Corporation



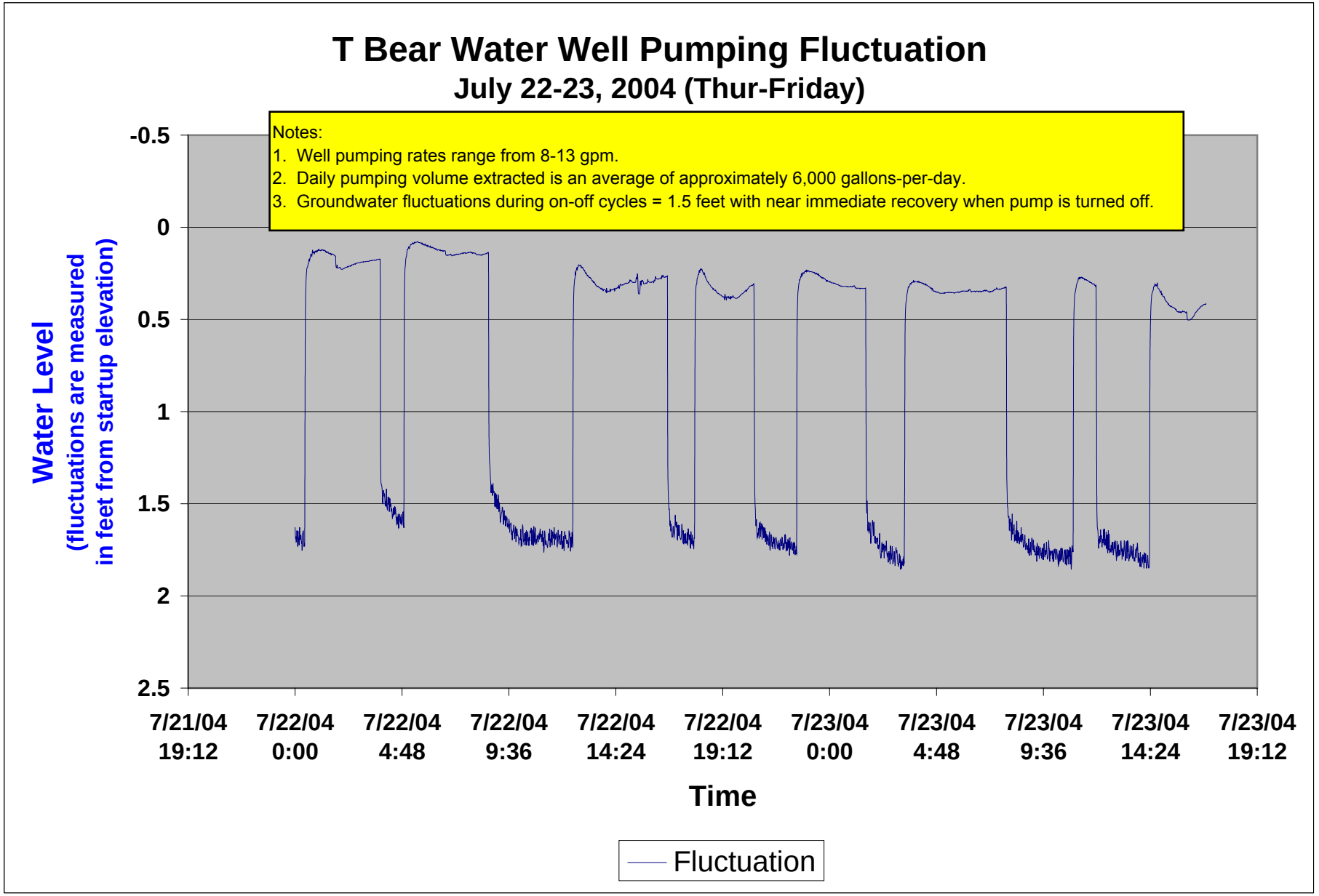
Patrick Hoban
Senior Geologist

Joseph Hayes
Certified Engineering Geologist #1629
Certified Hydrogeologist #373

Attachments:

Figure 1: Transducer Chart (T Bear pumping record)
Appendix A: Norcal Geophysical Consultants report: *Borehole Geophysical Logging Report, T-Bear Ranch Domestic Water Well*, dated August 3, 2004.
Appendix B: Entech Analytical Laboratory, *Certificate of Analysis* and Chain of Custody documentation
Appendix C: Field Logs and Protocol

Figure 1



Weber, Hayes and Associates

APPENDIX A

Norcal Geophysical Consultants report
Borehole Geophysical Logging Report, T-Bear Ranch Domestic WaterWell
dated August 3, 2004.

August 3, 2004

Mr. Pat Hoban
Project Geologist
Webber, Hayes and Associates
120 Westgate Drive
Watsonville, CA 95076

RE: Borehole Geophysical Logging Report
T-Bear Ranch Domestic Water Well
3004 Andrade Road
Sunol, California

Gentleman:

This report presents the findings of a borehole geophysical investigation performed by NORCAL Geophysical Consultants, Inc. in a domestic water at the subject site. The geophysical survey were performed on June 28, 2004 by NORCAL geophysicist William J. Henrich. Mr. Aaron Bierman of Webber, Hayes and Associates assisted with logistics and managed pumping operations.

The T-Bear domestic well was completed with a 6-inch diameter PVC casing to approximately 40 feet below top of surface casing (btoc). The well has penetrated unconsolidated alluvium. Static water level was approximately 7 feet below top of casing. The borehole geophysical logging suite consisted of color video, fluid temperature, fluid conductivity, vertical heart-pulse flowmeter, natural gamma and induction conductivity.

The purpose of the geophysical logging was as follows 1) determine the vertical extent of slotting in the casing; 2) identify key lithology components of the stratigraphic section penetrated by the well and 3) determine permeable or water producing zones.

SCOPE OF WORK

Our scope of work consisted of conducting color video, temperature-fluid conductivity and heat-pulse flowmeter, gamma and induction logs down to 40 btoc in a domestic water well on the T-Bear Ranch property. In addition, a heat-pulse flow meter log was conducted under a controlled pumping condition. The scope of work also included analyzing and interpreting all geophysical data acquired and presenting our findings this written report.

INSTRUMENTATION

The video log was conducted with a ***Laval*** downhole video logging system connected to a 3-inch diameter color camera. Other geophysical logging instrumentation (console, computer,

downhole tools and DC powered four conductor winch) consisted of a digital ***Robertson Geologging,* Ltd.** Model ***2000 Winlogger System***. This system operated the temperature-fluid conductivity, vertical heat-pulse flowmeter, natural gamma and induction conductivity logging tools.

DATA ACQUISITION

The downhole video survey was conducted at a travel rate of 3 feet per minute. The camera produces a “fish eye” or 360 degree look-down image of the casing wall. The images are recorded on a VCR tape for replay. Depth in whole units (feet) were recorded on the image.

The geophysical logging techniques in natural gamma, induction conductivity. Most of these geophysical logs were acquired in the up-going direction at speeds ranging from 5- to 6-feet-per-minute. The data sampling rate was every 0.05 feet. The combination fluid temperature-fluid conductivity measurements which were recorded in the downgoing direction at 6-feet-per minute. Differential temperature and differential conductivity values were automatically calculated by subtracting absolute temperature and fluid conductivity measurements spaced at 0.8-foot offsets.

Heat-pulse flowmeter data are acquired at discrete depths. That is, the probe is lowered to a certain depth and held stationary while a series of measurements are taken to determine an average travel time arrival of a heated water tracer to sensors mounted on either side of a heating grid. The direction of vertical flow corresponds which sensor (upper or lower) is first activated by the heat tracer. Flow velocity is therefore, simply the travel distance from heat grid to sensor divided by the average arrival time.

Heat-pulse flow meter surveys were conducted under both ambient and pumping conditions. Ambient conditions refers to a static, non stressed state of the wells fluid column. Pumping conditions refer to pumping the well at 2.8 gallons per minute (gpm) with a submersible electric pump (***Grunflos ReadyFlow***) while a series heat-pulse measurements are conducted below the elevation of the pump. In this survey we installed the pump at a depth of 10 feet btoc. Our selected heat-pulse measurement depths were -15, -17,- 20, -23, -25, -30 and -35 feet btoc.

DATA PRESENTATION AND REDUCTION

We imported raw log traces in to the computer program ***Viewlog 3*** (***Viewlog Systems***, Toronto, Canada). The continuous log traces were smoothed with a 11-point filter. Other program operations include transformation of induction conductivity (mS/m) to resistivity (RI in Ohm-meters) and reprocessing of temperature and fluid conductivity differentials. Heat-pulse measurements calculated in terms of velocity were converted to flow rate as a function of well diameter. These data were imported to the ***Viewlog*** Program to produce a irregular spaced log plot.
All logging data was merged and plotted on a series of columns (tracks) to form combined summary plots (see Plates 1 and 2). In lieu of flow rate, we have presented the heat pulse data

in terms of percent pump production (see track 2, Plate 2). This means that the pump, producing water at 2.8 gpm, was equated to100 percent water production. Heat pulse station flows below the -10 feet elevation were recalculated as a percentage according to the ratio of measured flow rate divided by the pumping rate. This plot was shaded to indicate the change in water production with depth. We have added an interpreted stratigraphic column to the right of the summary plots. The stratigraphic interpretation was based on gamma and induction resistivity log response in unconsolidated alluvial sediments (see Appendix A).

INTERPRETATION

WELL COMPLETION

Review of the video log tape indicated random “nose knife cuts” in the PVC casing from 4 to 40 feet (personal communication, Aaron Bierman, Weber Hayes and Associates). These knife nose cuts range from near vertical to vertical. These are very difficult to distinguish on the video log.

STRATIGRAPHY

The subsurface stratigraphy is shown on the “STRAT” column at the far right on each log plot (see Plates 1 and 2). This column differentiates the alluvium into clay and sand units. Two sands are interpreted to be present from -15 to -33.8 and -35 to -38 feet btoc. The coarsest, relatively most permeable subsection within the upper sand is centered at -30 feet btoc. This is based on the high resistivity (22 ohm-meters) response on the Induction Resistivity (RI) log. Furthermore, the upper sand layer represents an upper fining sequence, given the hour glass signature of the gamma and RI logs. What this means is that grain size decreases from –27 to -15 feet btoc. The upper boundary of the upper sand is gradational from sand to silt to clay and therefore not as exact as shown on the STRAT column.

FLOW UNDER AMBIENT CONDITIONS

The temperature and fluid conductivity logs show deflections at -22 feet btoc (see tracks 1 and 2, Plate 1). Nominally, this type feature indicates either inflow or outflow to the well with some vertical flow occurring above or below this depth. To measure possible vertical flow, we conducted heat-pulse flowmeter measurements above and below -22 feet btoc. The results of the heat-pulse measurements showed no flow below -22 btoc but a slight upflow (0.7gpm) above -20 feet btoc (see track 1, Plate 2).

FLOW UNDER PUMPING CONDITIONS

The production curve (track 2, Plate 2) indicates that 23 percent of total flow originates from below -35 feet btoc. This flow is probably being produced from the lower sand (See STRAT Section, Plate 2). Above -35 feet btoc, water production percentage increases slowly to 30 percent at -22.8 feet btoc depth. Above this depth, the percentage of flow increases rapidly so that by the -15 feet btoc, the flow percentage has increased to 85 percent of total flow. The

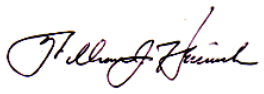
interval -22.8 to -15 feet btoc is apparently the most permeable within the well according to the flow data. Our interpretation of the subsurface geology (see STRAT Column, Plate 2) shows this interval corresponds to a sand layer but is not the most coarsest-permeable section within the sand (see Stratigraphy). Causes for this discrepancy between data sets may be related to non uniform construction of the sand pack behind casing or variations in the permeability of the slots.

8.0 STANDARD CARE AND WARRANTY

The scope of NORCAL's services for this project consisted of using the downhole geophysical techniques to measure subsurface hydraulic conditions. The accuracy of our findings is subject to specific site conditions and limitations inherent to the techniques used. We performed our services in a manner consistent with the standard of care ordinarily exercised by members of the profession currently employing similar methods. No warranty, with respect to the performance of services or products delivered under this agreement, expressed or implied, is made by NORCAL.

Thank you for the opportunity to participate in this investigation. Should you have questions please call me at your earliest convenience.

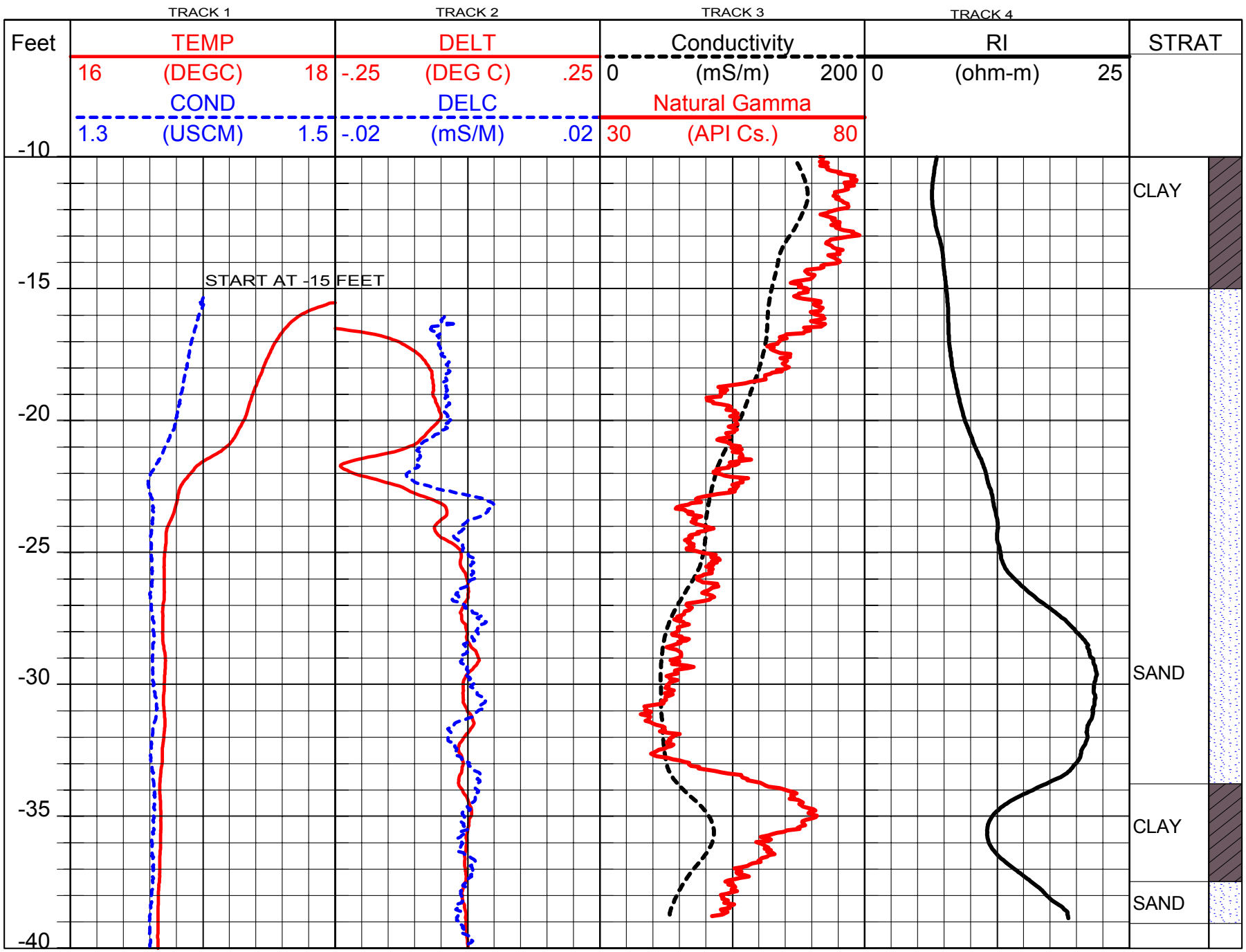
Yours very truly,



William J. Henrich, CEG, GP
Geophysicist-893

Enclosures
Plates 1-2

APPENDIX A

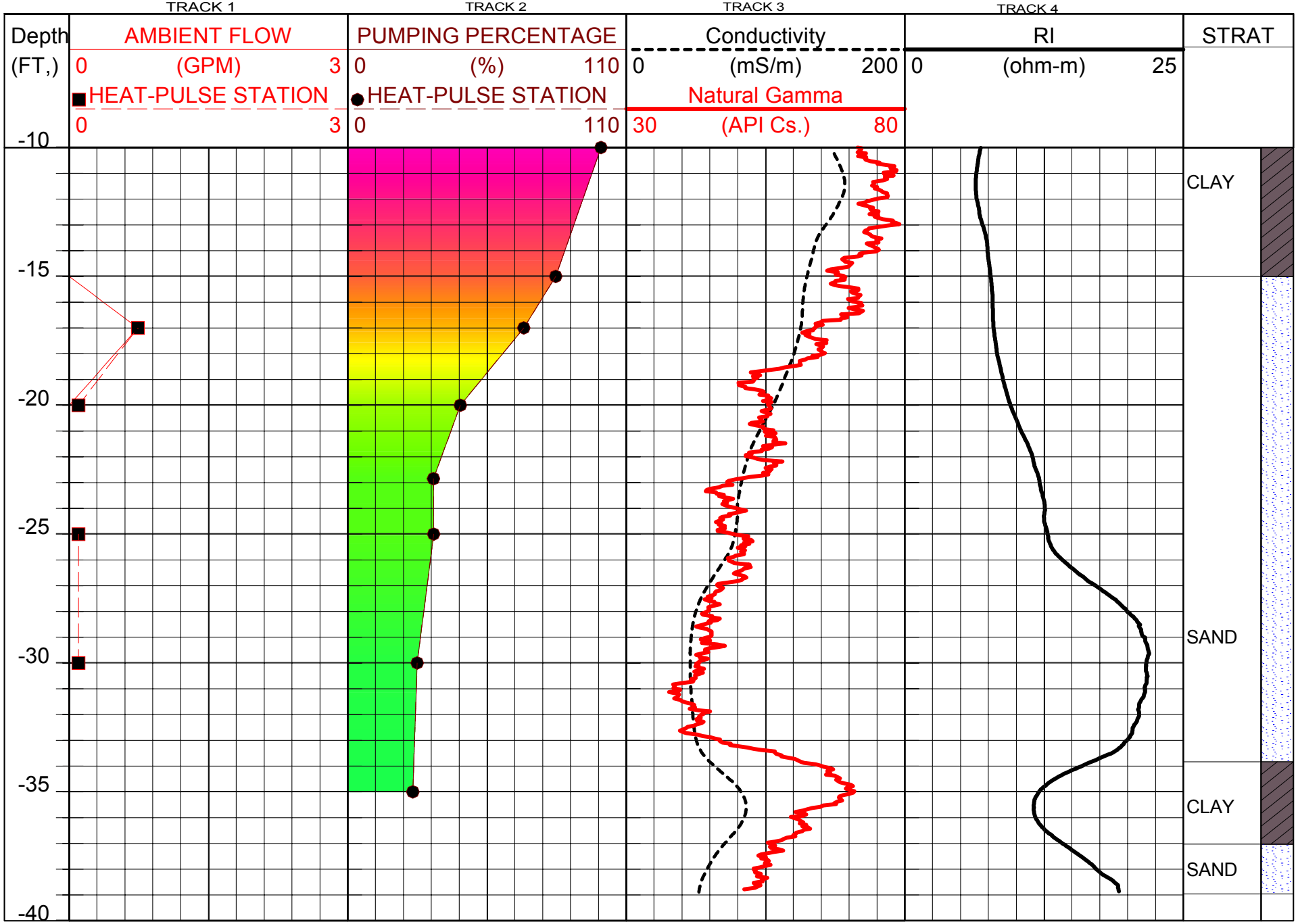


NORCAL GEOPHYSICAL CONSULTANTS, INC.

TEMP.-FLUID CONDUCTIVITY
NATURAL GAMMA and
INDUCTION LOGS

PLATE 1

Project No. 04 680-03B	Loc.T-Bear Ranch, Sunol
Drawn by. WJH	Date: Aug., 2004



NORCAL GEOPHYSICAL CONSULTANTS, INC.

HEA-PULSE FLOWMETER
GAMMA AND INDUCTION LOGS
WITH STRATIGRAPHY

PLATE 2

Project No. 04 680-03B | Loc.T-Bear Ranch, Sunol

Drawn by. WJH | Date: Aug., 2004

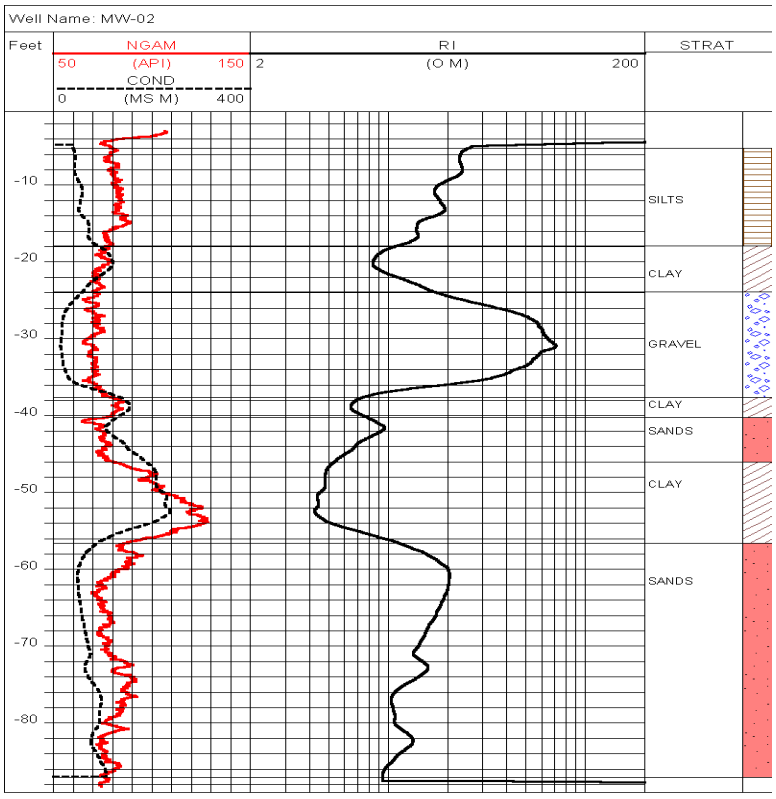
APPENDIX A GEOPHYSICAL LOGGING METHODOLOGY

Natural Gamma (GAMMA) records the amount of gamma radiation in counts per second emitted by natural occurring isotopes in the rock or sedimentary formation. These isotopes consist of primarily Potassium-40 and decay products of small concentrations of thorium and uranium. Clay bearing rocks commonly emit high gamma intensities because clay can consist of weathering products of potassium feldspar and mica. Also, water deposited clays tend to concentrate thorium and uranium ions via adsorption and ion exchange. The measurement is converted from counts-per-second to standardized American Petroleum Institute (API) units via a secondary field calibration sleeve.

Induction Resistivity/Conductivity (COND) measures the apparent conductivity in milliSiemens/meter (mS/m) of the formation using the electromagnetic induction method. The conductivity (COND) measurement is inverted by the conversion formula 1000/COND to produce a resistivity trace (RI) in ohm-meters (O-M). The induction coil spacing is 20 inches. This spacing means that formation is primarily from a radial distance 20 inches from the center axis of the probe. A major advantage of induction logging is that log data can be collected in dry, open borings or in non-metallic (e.g. PVC) cased wells.

EXAMPLE GAMMA AND INDUCTION LOG

Attached figure shows a combination gamma and induction log response in unconsolidated alluvia sediments. Note that conductivity has been inverted to resistivity (RI)



APPENDIX B

Entech Analytical Laboratory,
Certificate of Analysis and Chain of Custody documentation

Entech Analytical Labs, Inc.

3334 Victor Court • Santa Clara, CA 95054 • (408) 588-0200 • Fax (408) 588-0201

Aaron Bierman
Weber, Hayes and Associates
120 Westgate Drive
Watsonville, CA 95076

Certificate ID: 39520 - 7/2/2004 3:23:05 PM

Order: 39520
Project Name: T-Bear Ranch
Project Number: 23027

Date Collected: 6/29/2004
Date Received: 6/30/2004
P.O. Number: 23027

Certificate of Analysis - Final Report

On June 30, 2004, samples were received under chain of custody for analysis. Entech analyzes samples "as received" unless otherwise noted. The following results are included:

Matrix	Test	Method	Comments
Liquid	8260Petroleum	EPA 8260B	8260Petroleum=Btex+Oxy's ONLY. No Ethanol for all samples
	PDF	PDF	
	TPH as Gasoline - GC/MS	GC-MS	Gas by GCMS

Entech Analytical Labs, Inc. is certified for environmental analyses by the State of California (#2346).
If you have any questions regarding this report, please call me at 408-588-0200.

Sincerely,

Laurie Glantz-Murphy
Laboratory Director

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Weber, Hayes and Associates
120 Westgate Drive
Watsonville, CA 95076
Attn: Aaron Bierman

Date: 7/2/2004
Date Received: 6/30/2004
Project Name: T-Bear Ranch
Project Number: 23027
P.O. Number: 23027
Sampled By: Client

Certified Analytical Report

Laboratory ID: 39520-001 **Sample ID:** T Bear Well @ 15' **Matrix:** Liquid **Sample Date:** 6/29/2004 3:05 PM

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Analysis Date	QC Batch ID	Method
Benzene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Diisopropyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
Ethyl Benzene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Ethyl-t-butyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
Methyl-t-butyl Ether	11		1	1	1	µg/L		7/1/2004	WMS210766	EPA 8260B
tert-Amyl Methyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
tert-Butanol (TBA)	ND		1	10	10	µg/L		7/1/2004	WMS210766	EPA 8260B
Toluene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Xylenes, Total	ND		1	1	1	µg/L		7/1/2004	WMS210766	EPA 8260B

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	99.7	64 - 125
Dibromofluoromethane	96.3	23 - 172

Analyzed by: TFulton - 7/1/2004
Reviewed by: MTU - 07/02/04

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Analysis Date	QC Batch ID	Method
TPH as Gasoline	ND		1	25	25	µg/L		7/1/2004	WMS210766	GC-MS

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	99.4	64 - 125
Dibromofluoromethane	103.5	23 - 172

Analyzed by: TFulton - 7/1/2004
Reviewed by: MTU - 07/02/04

ND = Not Detected at or above the PQL
PQL = Practical Quantitation Limit (No Dilution)
DF = Dilution Factor
PQLR = Practical Quantitation Limit for Reporting (Includes Dilution)

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Weber, Hayes and Associates
120 Westgate Drive
Watsonville, CA 95076
Attn: Aaron Bierman

Date: 7/2/2004
Date Received: 6/30/2004
Project Name: T-Bear Ranch
Project Number: 23027
P.O. Number: 23027
Sampled By: Client

Certified Analytical Report

Laboratory ID: 39520-002 **Sample ID:** T Bear Well @ 22' **Matrix:** Liquid **Sample Date:** 6/29/2004 3:20 PM

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Analysis Date	QC Batch ID	Method
Benzene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Diisopropyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
Ethyl Benzene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Ethyl-t-butyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
Methyl-t-butyl Ether	17		1	1	1	µg/L		7/1/2004	WMS210766	EPA 8260B
tert-Amyl Methyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
tert-Butanol (TBA)	ND		1	10	10	µg/L		7/1/2004	WMS210766	EPA 8260B
Toluene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Xylenes, Total	ND		1	1	1	µg/L		7/1/2004	WMS210766	EPA 8260B

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	103.1	64 - 125
Dibromofluoromethane	100.0	23 - 172

Analyzed by: TFulton - 7/1/2004
Reviewed by: MTU - 07/02/04

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Analysis Date	QC Batch ID	Method
TPH as Gasoline	ND		1	25	25	µg/L		7/1/2004	WMS210766	GC-MS

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	103.0	64 - 125
Dibromofluoromethane	107.6	23 - 172

Analyzed by: TFulton - 7/1/2004
Reviewed by: MTU - 07/02/04

ND = Not Detected at or above the PQL
PQL = Practical Quantitation Limit (No Dilution)
DF = Dilution Factor
PQLR = Practical Quantitation Limit for Reporting (Includes Dilution)

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Weber, Hayes and Associates
120 Westgate Drive
Watsonville, CA 95076
Attn: Aaron Bierman

Date: 7/2/2004
Date Received: 6/30/2004
Project Name: T-Bear Ranch
Project Number: 23027
P.O. Number: 23027
Sampled By: Client

Certified Analytical Report

Laboratory ID: 39520-003 **Sample ID:** T Bear Well @ 30' **Matrix:** Liquid **Sample Date:** 6/29/2004 3:40 PM

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Analysis Date	QC Batch ID	Method
Benzene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Diisopropyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
Ethyl Benzene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Ethyl-t-butyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
Methyl-t-butyl Ether	19		1	1	1	µg/L		7/1/2004	WMS210766	EPA 8260B
tert-Amyl Methyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
tert-Butanol (TBA)	ND		1	10	10	µg/L		7/1/2004	WMS210766	EPA 8260B
Toluene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Xylenes, Total	ND		1	1	1	µg/L		7/1/2004	WMS210766	EPA 8260B

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	103.2	64 - 125
Dibromofluoromethane	101.3	23 - 172

Analyzed by: TFulton - 7/1/2004
Reviewed by: MTU - 07/02/04

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Analysis Date	QC Batch ID	Method
TPH as Gasoline	ND		1	25	25	µg/L		7/1/2004	WMS210766	GC-MS

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	102.8	64 - 125
Dibromofluoromethane	109.6	23 - 172

Analyzed by: TFulton - 7/1/2004
Reviewed by: MTU - 07/02/04

ND = Not Detected at or above the PQL
PQL = Practical Quantitation Limit (No Dilution)
DF = Dilution Factor
PQLR = Practical Quantitation Limit for Reporting (Includes Dilution)

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Weber, Hayes and Associates
120 Westgate Drive
Watsonville, CA 95076
Attn: Aaron Bierman

Date: 7/2/2004
Date Received: 6/30/2004
Project Name: T-Bear Ranch
Project Number: 23027
P.O. Number: 23027
Sampled By: Client

Certified Analytical Report

Laboratory ID: 39520-004 **Sample ID:** T Bear Well @ 38' **Matrix:** Liquid **Sample Date:** 6/29/2004 4:00 PM

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Analysis Date	QC Batch ID	Method
Benzene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Diisopropyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
Ethyl Benzene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Ethyl-t-butyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
Methyl-t-butyl Ether	20		1	1	1	µg/L		7/1/2004	WMS210766	EPA 8260B
tert-Amyl Methyl Ether	ND		1	5	5	µg/L		7/1/2004	WMS210766	EPA 8260B
tert-Butanol (TBA)	ND		1	10	10	µg/L		7/1/2004	WMS210766	EPA 8260B
Toluene	ND		1	0.5	0.5	µg/L		7/1/2004	WMS210766	EPA 8260B
Xylenes, Total	ND		1	1	1	µg/L		7/1/2004	WMS210766	EPA 8260B

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	100.7	64 - 125
Dibromofluoromethane	101.4	23 - 172

Analyzed by: TFulton - 7/1/2004
Reviewed by: MTU - 07/02/04

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Analysis Date	QC Batch ID	Method
TPH as Gasoline	ND		1	25	25	µg/L		7/1/2004	WMS210766	GC-MS

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	100.8	64 - 125
Dibromofluoromethane	109.2	23 - 172

Analyzed by: TFulton - 7/1/2004
Reviewed by: MTU - 07/02/04

ND = Not Detected at or above the PQL
PQL = Practical Quantitation Limit (No Dilution)
DF = Dilution Factor
PQLR = Practical Quantitation Limit for Reporting (Includes Dilution)

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Quality Control - Method Blank

Analyzed by: TFULTON -7/1/2004
Entered by: TFULTON - 07/02/04
Validated by: MTU - 07/02/04

QC Batch ID: WMS210766
Matrix: Liquid
Date of Analysis: 7/1/2004

Method: EPA 8260B

Parameter	Result	DF	PQL	PQLR	Units
1,2-Dibromoethane (EDB)	ND	1	0.5	0.5	µg/L
1,2-Dichloroethane	ND	1	0.5	0.5	µg/L
Benzene	ND	1	0.5	0.5	µg/L
Diisopropyl Ether	ND	1	5	5	µg/L
Ethanol	ND	1	100	100	µg/L
Ethyl Benzene	ND	1	0.5	0.5	µg/L
Ethyl-t-butyl Ether	ND	1	5	5	µg/L
Methyl-t-butyl Ether	ND	1	1	1	µg/L
tert-Amyl Methyl Ether	ND	1	5	5	µg/L
tert-Butanol (TBA)	ND	1	10	10	µg/L
Toluene	ND	1	0.5	0.5	µg/L
Xylenes, Total	ND	1	1	1	µg/L

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**103.3**	64 - 125
Dibromofluoromethane	**95.8**	23 - 172
Toluene-d8	**105.7**	70 - 134

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Quality Control - Method Blank

Analyzed by: TFULTON -7/1/2004
Entered by: TFULTON - 07/02/04
Validated by: MTU - 07/02/04

QC Batch ID: WMS210766
Matrix: Liquid
Date of Analysis: 7/1/2004

Method: GC-MS

Parameter	Result	DF	PQL	PQLR	Units
TPH as Gasoline	ND	1	25	25	µg/L

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**103.2**	64 - 125
Dibromofluoromethane	**103.8**	23 - 172
Toluene-d8	**103.6**	70 - 134

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Quality Control - Laboratory Control Spike / Duplicate Results

Analyzed by: TFULTON -7/1/2004
Reviewed by: MTU - 07/02/04

QC Batch ID: WMS210766
Date of Analysis: 7/1/2004

Method EPA 8260B — **Liquid** — **Conc. Units: µg/L**

Parameter	Blank	Spike Amt	SpikeResult	QC Type	Analysis Date	% Recovery	RPD	RPD Limits	Recovery Limits
1,1-Dichloroethene	ND	20.0	18.488	LCS	7/1/2004	**92.4**			60 - 132
Benzene	ND	20.0	19.086	LCS	7/1/2004	**95.4**			77 - 154
Chlorobenzene	ND	20.0	19.751	LCS	7/1/2004	**98.8**			66 - 141
Methyl-t-butyl Ether	ND	20.0	16.817	LCS	7/1/2004	**84.1**			58 - 127
Toluene	ND	20.0	19.931	LCS	7/1/2004	**99.7**			47 - 137
Trichloroethene	ND	20.0	18.035	LCS	7/1/2004	**90.2**			57 - 159

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**104.0**	64 - 125
Dibromofluoromethane	**97.0**	23 - 172
Toluene-d8	**103.9**	70 - 134

1,1-Dichloroethene	ND	20.0	18.851	LCSD	7/1/2004	**94.3**	**1.9**	25	60 - 132
Benzene	ND	20.0	19.608	LCSD	7/1/2004	**98.0**	**2.7**	25	77 - 154
Chlorobenzene	ND	20.0	19.885	LCSD	7/1/2004	**99.4**	**0.7**	25	66 - 141
Methyl-t-butyl Ether	ND	20.0	17.069	LCSD	7/1/2004	**85.3**	**1.5**	25	58 - 127
Toluene	ND	20.0	20.176	LCSD	7/1/2004	**100.9**	**1.2**	25	47 - 137
Trichloroethene	ND	20.0	18.348	LCSD	7/1/2004	**91.7**	**1.7**	25	57 - 159

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**101.8**	64 - 125
Dibromofluoromethane	**98.0**	23 - 172
Toluene-d8	**103.3**	70 - 134

Method GC-MS — **Liquid** — **Conc. Units: µg/L**

Parameter	Blank	Spike Amt	SpikeResult	QC Type	Analysis Date	% Recovery	RPD	RPD Limits	Recovery Limits
TPH as Gasoline	ND	250.0	240.6	LCS	7/1/2004	**96.2**			65 - 135

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**101.0**	64 - 125
Dibromofluoromethane	**98.2**	23 - 172
Toluene-d8	**105.1**	70 - 134

TPH as Gasoline	ND	250.0	246.2	LCSD	7/1/2004	**98.5**	**2.3**	25	65 - 135

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**103.0**	64 - 125
Dibromofluoromethane	**95.4**	23 - 172
Toluene-d8	**104.2**	70 - 134

Weber, Hayes & Associates
Hydrogeology and Environmental Engineering
120 Westgate Dr., Watsonville, CA 95076
(831) 722-3580 (831) 662-3100
Fax: (831) 722-1159

CHAIN -OF-CUSTODY RECORD

PROJECT NAME AND JOB #: T-Bear Ranch / 23027

SEND CERTIFIED RESULTS TO: Weber, Hayes and Associates - Attention: Aaron Bierman

ELECTRONIC DELIVERABLE FORMAT: ☐ YES ☒ NO

Sampler: Aaron Bierman AB

Date: 6.29.04

LABORATORY: Entech Analytical Laboratory

TURNAROUND TIME: (Standard Five-Day) 24hr Rush 48hr Rush 72hr Rush

GLOBAL I.D.: NA

Sample Identification	Sample Depth (Ft, TOC)	Date Sampled	Time Sampled	Matrix	SAMPLE CONTAINERS: 40 mL VOAs (preserved)	1 Liter Amber Jars	___mL Poly Bottle	Liner Acetate or Brass	REQUESTED ANALYSIS: Total Petroleum Hydrocarbons: TEPH: Diesel with Standard Silica Gel Cleanup	Total Recoverable Petroleum Hydrocarbons	TPH-gasoline & BTEX by EPA Method# 8260	Volatile Organics: 1,2-DCA by EPA Method# 8010	Solvents by EPA Method# 8010	Fuel Oxygenates EPA Method# 8260	Additional Analysis: Total Suspended Solids	Total Dissolved Solids	Metals: Al, Ar, Cd, Cr, Cu, Pb, Ni, Se, Zn, Hg, Nitrate as N
T BEAR WELL @ 15'	15'	6.29.04	305	H_2O	x4						X			X	349520-001		
T BEAR WELL @ 22'	22'	6.29.04	320	H_2O	x4						X			X			002
T BEAR WELL @ 30'	30'	6.29.04	340	H_2O	x4						X			X			003
T BEAR WELL @ 38'	38'	6.29.04	400	H_2O	x4						X			X			004

RELEASED BY:

1.) Aaron Bierman
2.)
3.)
4.)
5.)

Date & Time

6/30/04 @ 1245
6/30/04 1415

RECEIVED BY:

Date & Time

6/30/04 1245
6/30/04 1420

SAMPLE CONDITION: (circle 1)

Ambient	(Refrigerated)	Frozen
Ambient	Refrigerated	Frozen
Ambient	Refrigerated	Frozen
Ambient	Refrigerated	Frozen
Ambient	Refrigerated	Frozen

NOTES:

☐ *If MTBE is detected by EPA Method 8020, please confirm detections by EPA Method 8260 with a minimum detection limit of 5 ug/L, and report only confirmed 8260 detections.*

☐ *For MTBE-analyzed samples with non-detectable results (ND) but having elevated detection limits, please confirm by EPA Method #8260.*

☐ *Please use MDL (Minimum Detection Limit) for any diluted samples.*

-Please send certified results via *.pdf to laboratory@weber-hayes.com.

Entech Analytical Labs, Inc.

3334 Victor Court • Santa Clara, CA 95054 • (408) 588-0200 • Fax (408) 588-0201

Aaron Bierman
Weber, Hayes and Associates
120 Westgate Drive
Watsonville, CA 95076

Certificate ID: 39708 - 7/23/2004 1:08:54 PM

Order: 39708
Project Name: T-Bear Ranch
Project Number: 23027

Date Collected: 7/19/2004
Date Received: 7/19/2004
P.O. Number: 23027

Certificate of Analysis - Final Report

On July 19, 2004, sample was received under chain of custody for analysis. Entech analyzes samples "as received" unless otherwise noted. The following results are included:

Matrix	Test	Method	Comments
Liquid	8260Petroleum	EPA 8260B	8260Petroleum=Btex+Oxy's ONLY. No Ethanol
	PDF	PDF	
	TPH as Gasoline - GC/MS	GC-MS	Gas by GCMS

Entech Analytical Labs, Inc. is certified for environmental analyses by the State of California (#2346).
If you have any questions regarding this report, please call me at 408-588-0200.

Sincerely,

Laurie Glantz-Murphy
Laboratory Director

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Weber, Hayes and Associates
120 Westgate Drive
Watsonville, CA 95076
Attn: Aaron Bierman

Date: 7/23/2004
Date Received: 7/19/2004
Project Name: T-Bear Ranch
Project Number: 23027
P.O. Number: 23027
Sampled By: Client

Certified Analytical Report

Lab # : 39708-001 **Sample ID:** **T-Bear Well @ 8'** **Matrix:** Liquid **Sample Date:** 7/19/2004 2:10 PM

Method: EPA 8260B / EPA 5030B / Purge-and-trap

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Prep Batch	Analysis Date	QC Batch
Benzene	ND		1	0.5	0.5	µg/L	N/A	N/A	07/22/2004	WMS2040721
Toluene	ND		1	0.5	0.5	µg/L	N/A	N/A	07/22/2004	WMS2040721
Ethyl Benzene	ND		1	0.5	0.5	µg/L	N/A	N/A	07/22/2004	WMS2040721
Xylenes, Total	ND		1	1	1	µg/L	N/A	N/A	07/22/2004	WMS2040721
Methyl-t-butyl Ether	15		1	1	1	µg/L	N/A	N/A	07/22/2004	WMS2040721
Ethyl-t-butyl Ether	ND		1	5	5	µg/L	N/A	N/A	07/22/2004	WMS2040721
tert-Butanol (TBA)	ND		1	10	10	µg/L	N/A	N/A	07/22/2004	WMS2040721
Diisopropyl Ether	ND		1	5	5	µg/L	N/A	N/A	07/22/2004	WMS2040721
tert-Amyl Methyl Ether	ND		1	5	5	µg/L	N/A	N/A	07/22/2004	WMS2040721

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	97.2	64 - 125
Dibromofluoromethane	115.3	23 - 172
Toluene-d8	101.2	70 - 134

Analyzed by: TFulton - 07/22/2004
Reviewed by: MTU - 07/23/04

Method: GC-MS

Parameter	Result	Flag	DF	PQL	PQLR	Units	Prep Date	Prep Batch	Analysis Date	QC Batch
TPH as Gasoline	ND		1	25	25	µg/L	N/A	N/A	07/22/2004	WMS2040721

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	97.0	64 - 125
Dibromofluoromethane	124.2	23 - 172
Toluene-d8	99.1	70 - 134

Analyzed by: TFulton - 07/22/2004
Reviewed by: MTU - 07/23/04

ND = Not Detected at or above the PQL
PQL = Practical Quantitation Limit (No Dilution)
DF = Dilution Factor
PQLR = Practical Quantitation Limit for Reporting (Includes Dilution)

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Quality Control - Method Blank

Validated by: MTU - 07/22/04

QC Batch ID: WMS2040721
Matrix: Liquid
Date of Analysis: 7/21/2004

Method: EPA 8260B

Parameter	Result	DF	PQL	PQLR	Units
Benzene	ND	1	0.5	0.5	µg/L
Diisopropyl Ether	ND	1	5	5	µg/L
Ethyl Benzene	ND	1	0.5	0.5	µg/L
Ethyl-t-butyl Ether	ND	1	5	5	µg/L
Methyl-t-butyl Ether	ND	1	1	1	µg/L
tert-Amyl Methyl Ether	ND	1	5	5	µg/L
tert-Butanol (TBA)	ND	1	10	10	µg/L
Toluene	ND	1	0.5	0.5	µg/L
Xylene, m+p	ND	1	1	1	µg/L
Xylene, o	ND	1	0.5	0.5	µg/L
Xylenes, Total	ND	1	1	1	µg/L

Surrogate for Blank	% Recovery	Control Limits
4-Bromofluorobenzene	**97.6**	64 - 125
Dibromofluoromethane	**109.3**	23 - 172
Toluene-d8	**103.3**	70 - 134

Quality Control - Laboratory Control Spike / Duplicate Results

Reviewed by: MTU - 07/22/04

QC Batch ID: WMS2040721
Date of Analysis: 7/21/2004

Method EPA 8260B — **Liquid** — **Conc. Units: µg/L**

Parameter	Blank	Spike Amt	SpikeResult	QC Type	Analysis Date	% Recovery	RPD	RPD Limits	Recovery Limits
1,1-Dichloroethene	<0.5	20.0	20.878	LCS	7/21/2004	**104.4**			60 - 132
Benzene	<0.5	20.0	22.311	LCS	7/21/2004	**111.6**			77 - 154
Chlorobenzene	<0.5	20.0	20.313	LCS	7/21/2004	**101.6**			66 - 141
Methyl-t-butyl Ether	<1	20.0	22.371	LCS	7/21/2004	**111.9**			58 - 127
Toluene	<0.5	20.0	20.136	LCS	7/21/2004	**100.7**			47 - 137
Trichloroethene	<0.5	20.0	22.156	LCS	7/21/2004	**110.8**			57 - 159

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**104.0**	64 - 125
Dibromofluoromethane	**112.9**	23 - 172
Toluene-d8	**99.6**	70 - 134

1,1-Dichloroethene	<0.5	20.0	19.583	LCSD	7/21/2004	**97.9**	**6.4**	25	60 - 132
Benzene	<0.5	20.0	21.565	LCSD	7/21/2004	**107.8**	**3.4**	25	77 - 154
Chlorobenzene	<0.5	20.0	19.206	LCSD	7/21/2004	**96.0**	**5.6**	25	66 - 141
Methyl-t-butyl Ether	<1	20.0	21.622	LCSD	7/21/2004	**108.1**	**3.4**	25	58 - 127
Toluene	<0.5	20.0	19.395	LCSD	7/21/2004	**97.0**	**3.7**	25	47 - 137
Trichloroethene	<0.5	20.0	21.747	LCSD	7/21/2004	**108.7**	**1.9**	25	57 - 159

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**100.5**	64 - 125
Dibromofluoromethane	**112.6**	23 - 172
Toluene-d8	**100.5**	70 - 134

Entech Analytical Labs, Inc.

3334 Victor Court , Santa Clara, CA 95054 Phone: (408) 588-0200 Fax: (408) 588-0201

Quality Control - Method Blank

Validated by: MTU - 07/22/04

QC Batch ID: WMS2040721
Matrix: Liquid
Date of Analysis: 7/21/2004

Method: GC-MS

Parameter	Result	DF	PQL	PQLR	Units
TPH as Gasoline	ND	1	25	25	µg/L

Surrogate for Blank	% Recovery	Control Limits
4-Bromofluorobenzene	**97.7**	64 - 125
Dibromofluoromethane	**118.3**	23 - 172
Toluene-d8	**101.2**	70 - 134

Quality Control - Laboratory Control Spike / Duplicate Results

Reviewed by: MTU - 07/22/04

QC Batch ID: WMS2040721
Date of Analysis: 7/21/2004

Method GC-MS **Liquid** **Conc. Units: µg/L**

Parameter	Blank	Spike Amt	SpikeResult	QC Type	Analysis Date	% Recovery	RPD	RPD Limits	Recovery Limits
TPH as Gasoline	<25	250.0	259.6	LCS	7/21/2004	**103.8**			65 - 135

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**98.1**	64 - 125
Dibromofluoromethane	**117.4**	23 - 172
Toluene-d8	**100.8**	70 - 134

TPH as Gasoline	<25	250.0	267.8	LCSD	7/21/2004	**107.1**	**3.1**	25	65 - 135

Surrogate	% Recovery	Control Limits
4-Bromofluorobenzene	**99.0**	64 - 125
Dibromofluoromethane	**113.4**	23 - 172
Toluene-d8	**101.8**	70 - 134

Weber, Hayes & Associates
Hydrogeology and Environmental Engineering

120 Westgate Dr., Watsonville, CA 95076
(831) 722-3580 (831) 662-3100
Fax: (831) 722-1159

CHAIN -OF-CUSTODY RECORD

PROJECT NAME AND JOB #: [redacted] T. BEAR RANCH / 23027

SEND CERTIFIED RESULTS TO: Weber, Hayes and Associates - Attention: Aaron Bierman

ELECTRONIC DELIVERABLE FORMAT: [ ] YES [X] NO

LABORATORY: Entech Analytical Laboratory

TURNAROUND TIME: (Standard Five-Day) 24hr Rush 48hr Rush 72hr Rush

GLOBAL I.D.: NA

Sampler: Aaron Bierman AB

Date: 7.19.04

Field Point Name (GeoTracker)	Sample Identification	Sample Depth	Date Sampled	Time Sampled	Matrix	SAMPLE CONTAINERS: 40 mL VOAs (preserved)	1 Liter Amber Jars	___mL Poly Bottle	Liner Acetate or Brass	REQUESTED ANALYSIS: Total Petroleum Hydrocarbons: TEPH: Diesel with Standard Silica Gel Cleanup	Total Recoverable Petroleum Hydrocarbons	TPH-gasoline, BTEX & MTBE 8260 by EPA Method# ~~8015M & 8020~~	Volatile Organics: 1,2-DCA by EPA Method# 8010	Solvents by EPA Method# 8010	Fuel Oxygenates EPA Method# 8260	Additional Analysis: Total Suspended Solids	Total Dissolved Solids	Metals: Al, Ar, Cd, Cr, Cu, Pb, Ni, Se, Zn, Hg, Nitrate as N
NA	T. BEAR WELL@8'	8'	7.19.04	2''	H_2O	x5		34108-001				X			X			

	RELEASED BY:	Date & Time	RECEIVED BY:	Date & Time	SAMPLE CONDITION: (circle 1)		
1.)	Aaron Bierman			7/19/04 1705	Ambient	(Refrigerated)	Frozen
2.)					Ambient	Refrigerated	Frozen
3.)					Ambient	Refrigerated	Frozen
4.)					Ambient	Refrigerated	Frozen
5.)					Ambient	Refrigerated	Frozen

NOTES:

- [ ] *If MTBE is detected by EPA Method 8020, please confirm detections by EPA Method 8260 with a minimum detection limit of 5 ug/L, and report only confirmed 8260 detections.*
- [ ] *For MTBE-analyzed samples with non-detectable results (ND) but having elevated detection limits, please confirm by EPA Method #8260.*
- [ ] *Please use MDL (Minimum Detection Limit) for any diluted samples.*

-Please send certified results via *.pdf to laboratory@weber-hayes.com.

APPENDIX C

FIELD METHODOLOGY

Field Logs and Protocol

Field Methodologies for:

Discrete Groundwater Sampling

Weber, Hayes and Associates' field methodology for groundwater monitoring and sampling is based on procedures specified in the *LUFT Field Manual*. The first step in groundwater sampling from a well or borehole is for field personnel to measure the depth-to-groundwater to the nearest hundredth (0.01) of a foot with an electric sounder. If groundwater level is fluctuating, measurements are made until the groundwater levels stabilize, and a final depth-to-groundwater measurement is taken and recorded. All field data (depth-to-groundwater, well purge volume, physical parameters, and sampling method) are recorded on field data sheets (see attached). A Solinst, depth discrete sampler was used to collect groundwater samples for the current investigation as it is specifically designed to profile open boreholes and screened wells, and to collect samples from distinct levels or points of inflow. Information on this sampler and sampling details are attached.

After water level recovery, a groundwater sample is collected from each well/boring with a new, disposable bailer or discrete sampling tube, and decanted into the appropriate laboratory-supplied sample container(s). The sample containers at this site were 40-ml. vials. Each vial was filled until a convex meniscus formed above the vial rim, then sealed with a Teflon®-septum cap, and inverted to insure that there were no air bubbles or head space in the vial. All samples are labeled in the field and transported in insulated containers cooled with blue ice to state-certified laboratories under proper chain of custody procedures.

All purge water has been stored on site in poly tank for testing and eventual discharge (if clean) or off-site disposal by a state-licensed contractor pending laboratory analysis for fuel hydrocarbons. All field and sampling equipment is decontaminated before, between, and after measurements or sampling by washing in a Liqui-Nox and tap water solution, rinsing with tap water, and rinsing with distilled water.

Solinst® Discrete Interval Sampler

Model 425 Data Sheet

Discrete Interval Sampling

Discrete interval sampling is ideal for obtaining truly representative water samples from below floating product layers (LNAPL) and for obtaining samples of product itself (LNAPL and DNAPL). It is also used to profile open boreholes and screened wells, and to collect samples from distinct levels or points of inflow.

There is negligible disturbance as can be caused by pumping and purging. Mixing of water from different levels in the well is minimized.

Purging and disposal of purged water can be avoided. Sampling directly from a specific depth results in the collection of water which is most representative of the groundwater outside of the well at that depth.

Model 425
Discrete Interval Sampler

The Solinst Model 425 is a stainless steel sampler, with LDPE tubing mounted on the convenient Solinst reel. The reel has a pressure attachment for the high pressure hand pump, and a pressure/vent switch which is used to apply and release the pressure on the sampler. A sample release device is included with each Discrete Interval Sampler.

The sampler is pressurized using a high pressure hand pump before being lowered into the well to prevent water flowing into the sampler on the way down the well. Once the desired depth is reached, the pressure is released and hydrostatic pressure fills the sampler with water directly from the sampling zone. A floating checkball inside the 1.66" sampler prevents water from entering the tubing, thus avoiding the need to decontaminate the tubing.

When the sampler is filled, it is repressurized and raised to the surface. The sample is decanted using the sample release device, to regulate flow avoid degassing of the sample.

The sampler is ideal for groundwater sampling from below an oil/product layer on the surface of the water, as it allows a sample to be obtained which is untouched by the oil. The sampler is easily disassembled for decontamination.

Solinst also manufactures a zero-headspace sampler that can be sealed and transported directly to the laboratory in down-hole condition. the Model 425-T is described overleaf.

A disposable high density polyethylene bailer and a stainless steel Point-Source Bailers are also available from Solinst. (See Model 428 & 429 Data Sheets.)

VOC Sampling

Discrete interval samplers (DIS) are excellent for VOC sampling. There is no mixing with water from different levels in the well. The sample does not travel through a long length of tubing, risking loss of volatile organics. The sample has minimal contact with air.

For the most accurate VOA results, the Model 425T Transportable DIS can be used. It retains the volatiles at down-hole conditions with zero headspace during retrieval and transport to the laboratory. (See overleaf)

Applications

- Obtaining a representative groundwater sample from below oil/product layers
- Discrete interval sampling
- Chemical profiling of wells
- Sampling at points of inflow to well
- LNAP and DNAPL sampling

Advantages

- Sample not pumped through tubing
- No mixing of water from different levels
- Easy disassembly for decontamination
- Avoids purging and disposal of purge water
- Easy operation and transportation

Solinst®

Method of Operation

The Discrete Interval Sampler is connected to the tubing. The high pressure hand pump, or a compressed air source, is attached to the reel.

To determine the operating pressure required, use the chart at right. For other depths, the formulas may be used. Pressure is applied to the tubing and sampler, which closes the check valve in the bottom of the sampler, preventing any water from entering the sampler.

The sampler is then lowered to the chosen sampling depth while pressurized. At the chosen depth, the pressure is released. Hydrostatic pressure fills the sampler as the water rises to static level. A floating check ball prevents water from entering the tubing, eliminating the need to decontaminate the tubing between different wells or zones.

The sampler is again pressurized to close the lower check valve and prevent sample mixing loss of volatiles during retrieval. The sampler is then raised to the surface and removed from the borehole.

The sample release device is used to transfer the water to a sample bottle with a controlled flow that prevents degassing of the sample.

Discrete Interval Sampler Capacity

English Units		Metric Units	
Size	**Capacity**	**Size**	**Capacity**
1" x 2'	6 oz	25.4 mm x 610 mm	175 ml
1.66" x 2'	18 oz	42 mm x 610 mm	475 ml
2" x 2'	27 oz	50.8 mm x 610 mm	800 ml
1" x 4'	12 oz	25.4 mm x 1220 mm	365 ml
1.66" x 4'	32 oz	42 mm x 1220 mm	1000 ml
2" x 4'	61 oz	50.8 mm x 1220 mm	1800 ml

Other diameters and lengths available, on request.

Depth Capability

The Solinst Discrete Interval Sampler can sample to depths of 500 ft. (150m) below water level, regardless of total depth from surface.

Recommended Operating Pressure

Depth Feet	Pressure psi	Depth Metres	Pressure kPa
25	20	8	148
50	30	15	217
100	50	30	364
200	95	60	660
300	140	90	952
500	225	150	1,540

Operating Pressure = (Sample depth in feet x 0.43) + 10 psi
(Sample depth in m x 9.8) + 70 kPa

Model 425-T
Sampler/Transportation Vessel

This model is designed to prevent any air contact with the sample all the way to the laboratory, thus retaining all volatiles at down-hole conditions during sampling and during transportation.

The sampler uses special shut-off valves to lock the sample within the sample canister with zero head space.

The Model 425-T sampler operates in a similar manner to the standard Model 425, but when the sampler is brought under pressure to the surface, the special shut-off valves are closed before the sampler is disconnected from the tubing. Thus air contact with the sample is avoided and the sample is sealed within the sampler with zero headspace, in down-hole condition.

The sampler may then be sent to the laboratory for analysis, without discharging it. The VOCs in the sample will be held in the down-hole state until opened in the laboratory, thus ensuring the highest sample quality at the time of analysis.

Materials

The samplers are constructed of stainless steel with Viton® o-rings, Teflon® and polypropylene check balls.

The tubing most commonly used is low density polyethylene (LDPE), however, Teflon® or Teflon-lined polyethylene tubing is also available. Depth markers may be ordered for the tubing in either feet or meters, as an optional extra.

Suspension Cable may be used (stainless steel), if desired. A cable connector is welded to the top of the sampler in readiness. Generally a cable is not required, and is more cumbersome to use, but when sampling at depth, a cable should be considered.

For further information, please contact: Solinst Canada Ltd.
35 Todd Road, Georgetown, ON, Canada L7G 4R8 *E-mail: instruments@solinst.com*
TEL: (905) 873-2255 or (800) 661-2023 *FAX: +1 (905) 873-1992 or (800) 516-9081* *Web: www.solinst.com*

Solinst®