TETRA TECH, INC.

TECHNICAL MEMORANDUM

Basewide Groundwater Monitoring Program Report
Fall 2005 (Q4)
Installation Restoration Program Site 2
Vandenberg Air Force Base, California

09 March 2006

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1.0 INTRODUCTION

This report documents the activities and results of the fall 2005 groundwater monitoring at Installation Restoration Program Site 2 (Old Base Service Station, or OBSS), Operable Unit 6, Vandenberg Air Force Base (AFB), Santa Barbara County, California. Samples were collected at Site 2 by Tetra Tech, Inc. (Tetra Tech) during November 2005. The location of Site 2 is shown on Figure 1.

The groundwater monitoring is being completed in accordance with the Basewide Groundwater Monitoring Program (BGMP) Work Plan (Tetra Tech 2000a), the BGMP Health and Safety Plan Addendum (Tetra Tech 2000b), the Basewide Sampling and Analysis Plan (Tetra Tech 2003), the BGMP Quality Assurance Project Plan (QAPP) Addendum (Tetra Tech 2004a), the Vandenberg AFB Hazardous Waste Management Plan (U.S. Air Force 2002), and the Waste Management Plan Addendum (Tetra Tech 2005a). Regulatory oversight of the work is being performed by the California Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board—Central Coast Region (RWQCB).

Site background information is summarized in Section 2.0. The scope of work and methodology for groundwater monitoring are presented in Section 3.0. The results of the quarterly monitoring are presented in Section 4.0. Quality Assurance/Quality Control is discussed in Section 5.0. Recommendations for future sampling are presented in Section 6.0.

2.0 BACKGROUND

2.1 SITE DESCRIPTION AND HISTORY

Installation Restoration Program Site 2 is located in the main cantonment area, north of the intersection of Wyoming and Summersil Avenues. In early 2000, a Tee-Ball field was constructed that covers the majority of the Site (Figure 1). The Child Development Center playground is located to the northeast.

The OBSS had a service station building and three pump islands on a 200-foot by 200-foot asphalt lot. The site had four 10,000-gallon gasoline underground storage tanks (USTs), a 500-gallon aboveground waste oil tank, and an oil/water separator. The OBSS dispensed leaded and unleaded gasoline from 1941 until 1981.

All structures, tanks, and piping associated with the OBSS were removed between 1981 and 1998 (HydroGeoLogic [HGL] 2001). All four gasoline USTs, which were located at the northwest corner of the site, were removed in 1981. In 1992, Jacobs Engineering Group, Inc. (JEG) removed the concrete oil/water separator and fuel distribution piping (HGL 2001). In 1998, the 500-gallon waste oil tank was removed. During the removal of the OBSS building, the pump islands, and the pavement in 1998, monitoring wells 2-MW-2, and OS-MW-4 reportedly were destroyed and wells OS-MW-3A and OS-MW-2 were damaged (HGL 2001).

In 1999, IT Corporation, Inc. (IT) began investigations at the site. In September 1999, IT conducted a shallow soil investigation. HGL continued the investigation and, in November 1999, removed 170 cubic yards of soil below the former location of the two easternmost pump islands (along the southern portion of the site) (HGL 2001). The Tee-Ball field was built several months after completion of the excavation activities (Martinez 2001).

During the construction of the Tee-Ball field and the realignment of Wyoming Avenue and Utah Avenue, monitoring wells 2-MW-5 through 2-MW-9, OS-MW-3A, and OS-MW-4 were buried under fill material. Wells 2-MW-5 through 2-MW-9 were subsequently found and are not damaged. In September 2000,

Tetra Tech was requested to determine the condition of wells OS-MW-2, OS-MW-3A, and OS-MW-4. Well OS-MW-2 was found and was determined to be undamaged. Tetra Tech was unable to find monitoring wells OS-MW-3A and OS-MW-4 due to the amount of fill material covering them. The condition of these wells is unknown; however, it appears likely they have been destroyed. In a letter dated 6 February 2001 the Air Force recommended no further search for these wells. The RWQCB concurred with this recommendation in a letter dated 15 March 2001.

In February 2002, Tetra Tech installed a remote sampling system for wells 2-MW-5, 2-MW-7, 2-MW-8, and 2-MW-9 at Site 2. The system was designed to facilitate quarterly sampling of these wells, which are buried under the Tee-Ball field, without delaying use of the Tee-Ball field or impacting the condition of the grass on the field or surrounding grounds.

The remote sampling system was installed with watertight well caps and continuous tubing. The static water levels of these wells are measured using a pressure transducer that calculates the height of a water column above an open-ended tube suspended in the casing. The pressure transducer is zeroed to ambient pressure before the first reading is taken. Since the wells are sealed to prevent surface water intrusion, the air inside the casings is no longer at ambient pressure. For this reason the static water levels measured by the remote sampling system may be different from what is measured by the pressure transducer.

2.2 HYDROGEOLOGY

Site 2 is located on Burton Mesa, where groundwater typically occurs unpredictably in small lenses perched on low-permeability layers. At Site 2, groundwater is encountered in apparently discontinuous perched lenses in the unconsolidated sediments overlying Monterey Formation bedrock and, more importantly, in fractured cherts and porcelanites (HGL 2001). Groundwater occurring in this fractured zone within the Monterey Formation represents the groundwater monitoring network sampled under the BGMP at Site 2.

Groundwater depths range from 14 to 31 feet below ground surface. However, groundwater was encountered during drilling at approximately 10 feet below the static level measured in the monitoring wells (HGL 2001).

Groundwater levels measured in November 2005 indicate the groundwater elevation ranged from approximately 451 to 454 feet above mean sea level (Table 1). Based on data from this quarter, the interpreted direction of groundwater flow at Site 2 was to the northwest with an average hydraulic gradient of 0.01 feet per foot (Figure 1).

Monitoring wells at Site 2 are screened between 411.3 and 452.5 feet above mean sea level (Tetra Tech 2004b). According to the Supplemental RI Report completed by HGL, the deep groundwater zone occurs below lenses of relatively impermeable material. The boring logs of monitoring wells sampled as part of the BGMP show groundwater encountered at depths below laminated mudstone, silty clay, or clay layers (HGL 2001). Therefore, the groundwater sampled as part of the BGMP is from the deep groundwater zone.

3.0 SCOPE OF WORK

The work performed during fall 2005 at Site 2 included measuring groundwater elevations, collecting groundwater samples for laboratory analysis, and preparing this report.

3.1 GROUNDWATER MONITORING METHODOLOGY

Three wells were sampled at Site 2 during fall 2005. Dedicated MicroPurge pumps were used for purging and sampling groundwater from wells 2-MW-8, 2-MW-11, and 2-MW-12. Sampling was conducted in accordance with the documents cited in Section 1.0. Measured groundwater elevations are presented in Table 1, and groundwater contours are illustrated on Figure 1. Purge records are provided in Appendix A.

In general, wells were purged until a minimum of one pump and tubing volume of water was removed and water quality parameters had stabilized. Criteria for determining stabilization are three successive measurements of temperature within ±1 degree Celsius, pH within ±0.1, conductivity within ±5 percent, and a turbidity reading of less than 5 nephelometric turbidity units (NTUs). In cases where stability or a turbidity reading of less than 5 NTUs was not obtained, samples were collected after purging a minimum of five pump and tubing volumes of water.

3.1.1 MicroPurge Groundwater Sampling

MicroPurge sampling was conducted at all monitoring wells sampled at Site 2 during fall 2005. The pumping rates were calibrated for each well prior to purging to maintain a static water level (i.e., minimal drawdown). Due to high turbidity, well 2-MW-12 was sampled after purging approximately five pump and tubing volumes of water.

4.0 RESULTS

Temperature, conductivity, pH, and turbidity were measured during purging and sampling. Field parameter readings measured immediately prior to sampling are presented in Table 2. Fixed laboratory analyses were performed by EMAX Laboratories, Inc. in Torrance, California. Samples were analyzed according to the work plan (Tetra Tech 2000a) for dissolved metals by U.S. Environmental Protection Agency (EPA) method SW6010B, volatile organic compounds (VOCs) by EPA method SW8260B, semivolatile organic compounds (SVOCs) by EPA method SW8270C, and polynuclear aromatic hydrocarbons (PAHs) by EPA method SW8270C with selected ion monitoring (SIM). Laboratory analyses and data validation were conducted according to the QAPP Addendum (Tetra Tech 2004a). Data validation was performed on 100 percent of the analytical data. Analytical results are presented in Tables 3 through 5 and on Figure 2. A historical summary of key contaminants of concern (COCs) is presented in Table 6 and on Figures 3A and 3B. Figure 3A contains historical data for key COCs from December 1999 through fall 2003, and Figure 3B contains historical data for key COCs from winter 2004 to present. Hydrographs showing historical benzene concentrations in groundwater from well 2-MW-7 and benzene and naphthalene concentrations in groundwater from wells 2-MW-7 and 2-MW-8 are presented on Figure 4. Chain-of-custody records are provided in Appendix B.

4.1 METALS

Groundwater samples collected from all wells sampled at Site 2 this quarter were analyzed for dissolved metals. Dissolved metal concentrations were compared to the 95th percentile background threshold values (BTVs) for groundwater (JEG 1994) and primary maximum contaminant levels (MCLs).

Aluminum was detected above the BTV of 1,200 micrograms per liter (μg/L) and the MCL of 1,000 μg/L in groundwater from well 2-MW-8 at a concentration of 4,960 μg/L (Table 3 and Figure 2).

Beryllium was detected above the BTV of 0.3 μg/L and the primary MCL of 4 μg/L in groundwater from well 2-MW-8 at a concentration of 7.14 μg/L.

Cadmium was detected above the BTV and primary MCL of 5 μg/L in groundwater from well 2-MW-8 at a concentration of 33.9 μg/L.

Selenium was detected above the BTV of 3 μg/L in groundwater from wells 2-MW-8 and 2-MW-11 at concentrations of 36.6 and 40.8 μg/L, respectively.

Thallium was detected above the BTV of 1 μg/L and the primary MCL of 2 μg/L in groundwater collected from all three wells at concentrations ranging from 6.27 to 7.28 μg/L.

In addition, arsenic, barium, calcium, cobalt, magnesium, molybdenum, potassium, and sodium were detected at concentrations above their respective BTVs in one or more Site 2 wells, and dissolved nickel was detected above the MCL of 100 μg/L for nickel in groundwater from well 2-MW-8. The dissolved metals key COCs concentrations detected during fall 2005 were within the ranges of those previously detected (Table 6 and Figures 3A and 3B).

4.2 VOLATILE ORGANIC COMPOUNDS

The groundwater sample collected from well 2-MW-8 was analyzed for VOCs. Benzene was detected above the primary MCL of 1 μg/L at a concentration of 35 μg/L (Table 4).

Concentrations of benzene, ethylbenzene, toluene, and xylenes detected in groundwater from well 2-MW-8 increased significantly between fall 2001 and winter 2002, which coincides with the installation of the MicroPurge pump during winter 2002 (Table 6 and Figures 3A and 3B). Since winter 2002, ethylbenzene and o-xylene concentrations in well 2-MW-8 have decreased, while toluene concentrations have generally decreased steadily. Concentrations of m,p-xylenes were within the ranges of those previously detected. All of the benzene concentrations detected in groundwater from well 2-MW-8 since December 1999 have been above the MCL of 1 μg/L. The hydrograph on Figure 4 illustrates an overall trend of increasing benzene concentrations in wells 2-MW-7 and 2-MW-8. There is no apparent correlation between contaminant concentration and groundwater elevation. Benzene has not been detected in groundwater from downgradient well 2-MW-9 since December 1999, indicating the contamination is not moving downgradient. During the remedial investigation performed by HGL, BTEX were detected in deep and shallow soil samples collected from the vicinity of well 2-MW-8, and 170 cubic yards of soil were removed from the site in November 1999 (HGL 2001).

4.3 SEMIVOLATILE ORGANIC COMPOUNDS AND POLYNUCLEAR AROMATIC HYDROCARBONS

The groundwater sample collected from well 2-MW-8 was analyzed for SVOCs. This groundwater sample was also analyzed for PAHs. Naphthalene was detected at a concentration of 12 μg/L using EPA method SW8270C for SVOCs, and 10 μg/L using EPA method SW8270C with SIM for PAHs (Table 5). The compound 2-methylnaphthalene was detected at a concentration of 13 μg/L using EPA method SW8270C.

Naphthalene has been detected in groundwater collected from well 2-MW-8 since December 1999 at concentrations ranging from 1.07 μg/L (December 1999) to 28.8 μg/L (winter 2004) (Table 6). Naphthalene has been detected at concentrations above the California Department of Health Services (DHS) notification level of 17 μg/L during seven quarters since December 1999. The compound 2-methylnaphthalene has been detected in groundwater collected from well 2-MW-8 since summer 2001 at concentrations ranging from 5.7 μg/L (fall 2001) to 38.2 μg/L (winter 2004) (Appendix C). Concentrations of both compounds generally show an increasing trend until winter 2004, followed by a decreasing trend. (Figure 4 and Appendix C: Figure C-1).

Although naphthalene and 2-methylnaphthalene are not classified as carcinogens by the U.S. EPA (U.S. EPA 2005), the State of California considers naphthalene a carcinogen. However, a benzo(a)pyrene potency equivalency factor (PEF) has not yet been established by the State of California and a benzo(a)pyrene PEF is not available for either compound (DTSC 1999). Therefore, the naphthalene and 2-methylnaphthalene results for groundwater from well 2-MW-8 have not been evaluated using PEFs.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

All of the analytical data presented in this report have been validated according to the QAPP Addendum (Tetra Tech 2004a). The data validation process includes review of sample preservation, temperature, and hold times; detection and quantitation limits; instrument calibration; and equipment blank, trip blank, method blank, laboratory control sample, and matrix spike/matrix spike duplicate. Data validation qualifiers and comments are provided on the data tables to indicate the results of the data validation and to quantitatively indicate the usability of the data. In addition, field sampling records are reviewed to assess the potential for any field conditions to adversely impact the data quality.

There were no significant quality assurance/quality control discrepancies with the data presented in this report. The data quality objectives for the fall 2005 sampling at Site 2 were achieved.

6.0 RECOMMENDATIONS

In the summer 2005 Groundwater Monitoring Report for Site 2, Tetra Tech and the Air Force made the following recommendations:

1. Remove VOC analysis for well 2-MW-3, a cross-gradient well. The RWQCB and DTSC concurred with this recommendation.

2. Reduce SVOC analyses at wells 2-MW-1, 2-MW-3, 2-MW-5, 2-MW-9, OS-MW-1, and OS-MW-2 from semiannually to annually during winter quarters. The RWQCB and DTSC concurred with this recommendation.

3. Change annual VOC sampling at wells 2-MW-3, 2-MW-7, 2-MW-9, and OS-MW-2 and annual TPHg sampling at wells 2-MW-7, 2-MW-8, 2-MW-9, and OS-MW-1 from summer to winter quarters. The RWQCB and DTSC concurred with this recommendation.

Recommendations for the fall 2005 Groundwater Monitoring Report are presented below:

1. Tetra Tech and the Air Force recommend reducing the analyte list for dissolved metals at Site 2 to key BGMP COCs aluminum, beryllium, cadmium, selenium, and thallium. These key COCs have been detected in groundwater from one or more well at concentrations above the BTV and the MCL (Table 6). The Supplemental RI is Final (HGL 2001) and long-term monitoring of other metals are not warranted.

2. Tetra Tech and the Air Force recommend reducing the sampling frequency for dissolved metals from semiannually to annually during summer quarters for wells 2-MW-3, 2-MW-6, 2-MW-7, 2-MW-9, OS-MW-1, and OS-MW-2 and from quarterly to annually during winter quarters for wells 2-MW-8 and 2-MW-11. Concentrations of key metals of concern have been stable or decreasing in groundwater from these wells since winter 2003, with the exception of cadmium concentrations in groundwater from well 2-MW-9 which has been stable or decreasing since summer 2003, and thallium concentrations in groundwater from well 2-MW-11, which have been

increasing slightly since fall 2003 but have been generally stable since then (Appendix D: Figure D-1). The highest concentrations of metals were detected during winter quarters. Concentrations of one or more key COC increased recently in wells 2-MW-1, 2-MW-5, 2-MW-10, and 2-MW-12; therefore, a reduction of the metals sampling frequency is not appropriate for these wells.

3. Tetra Tech and the Air Force recommend reducing the sampling frequency for TPHg from semiannually to annually during winter quarters for well OS-MW-2. TPHg has not been detected in groundwater from this well, with the exception of one TPHg result during winter 2004 that was qualified for blank contamination and strongly suspected to be a false positive (Table 6). Other wells sampled annually for TPHg are sampled during winter quarters.

4. Tetra Tech and the Air Force recommend reducing the sampling frequency for SVOCs from semiannually to annually during winter quarters for well 2-MW-7. SVOCs have not been detected in groundwater from this well during the last 4 quarters that groundwater was analyzed for SVOCs. Tables of supporting data are provided in Appendix E. Well 2-MW-7 is currently sampled semiannually during winter and summer quarters and, therefore, was not analyzed for SVOCs during fall 2005, spring 2005, fall 2004, or spring 2004. Other wells sampled annually for SVOCs are sampled during winter quarters.

These recommendations were developed in accordance with the Air Force Center for Environmental Excellence Long-Term Monitoring Optimization Guide (U.S. Air Force 1997) and the decision tree developed by Tetra Tech for the BGMP at Vandenberg AFB (Tetra Tech 2002).

The winter 2006 sampling will be conducted according to the work plan (Tetra Tech 2000a).

7.0 REFERENCES

California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC)

1999 *Preliminary Endangerment Assessment Guidance Manual.*

HydroGeoLogic, Inc. (HGL)

2001 *Supplemental Remedial Investigation Report, Site 2-Old Base Service Station, Vandenberg AFB, California. Final.* Prepared for the Air Force Center for Environmental Excellence. December.

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Martinez, Pablo

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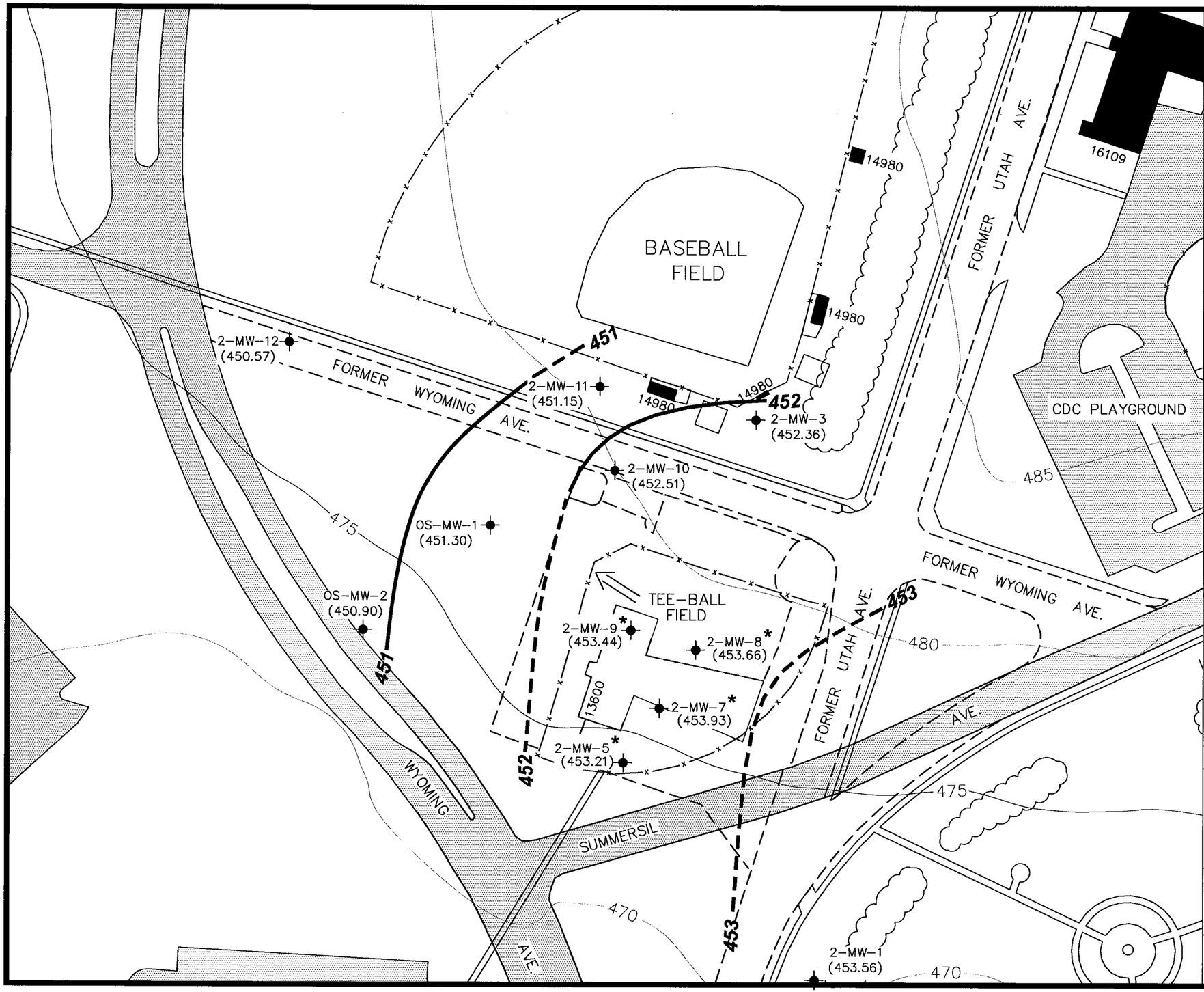


LEGEND

- CONTOUR OF GROUND SURFACE ELEVATION IN FEET ABOVE MSL (5-FOOT INTERVALS) (NAVD 1988)
- FENCE
- FORMER ROAD OR STREET
- PAVED ROAD OR STREET
- BUILDING
- DEMOLISHED BUILDING
- FORMER CONCRETE OR PAVED AREAS
- CONCRETE OR PAVED AREAS
- VEGETATION LINE
- 2-MW-11 (451.15) GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION
- 452 — 452 GROUNDWATER ELEVATION CONTOUR APPROXIMATED BY LINEAR INTERPOLATION (DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION
- TEE-BALL FIELD FENCE
- * GROUNDWATER ELEVATION NOT USED IN ESTIMATION OF CONTOURS; NON-VENTED WELLS PART OF REMOTE SAMPLING SYSTEM.

NOTE(S): GROUNDWATER ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL AS MEASURED IN NOVEMBER 2005.

N

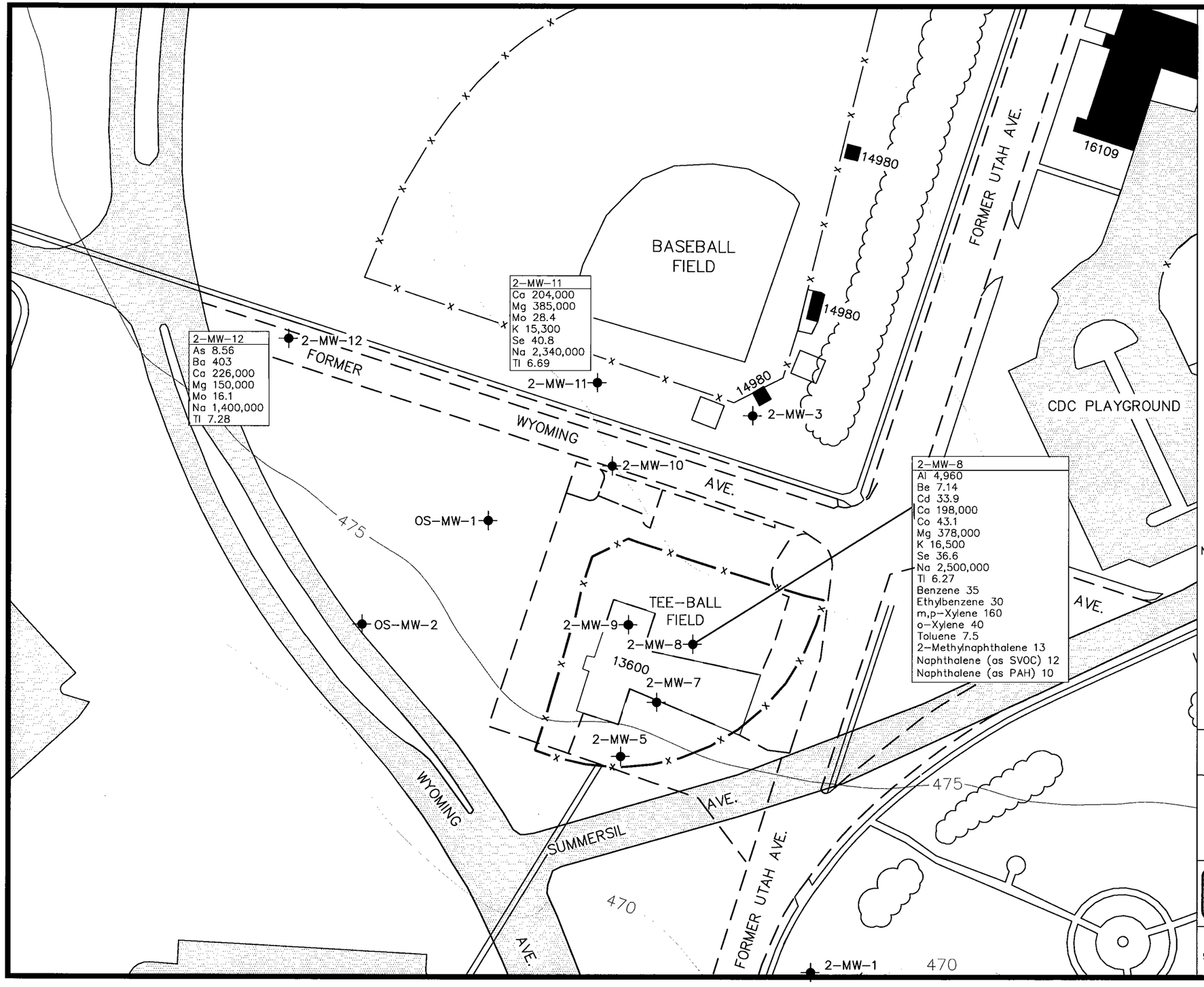
0 37.5' 75' 112.5'
SCALE

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

SITE 2
OLD BASE SERVICE STATION
SITE PLAN AND
GROUNDWATER CONTOURS
FALL 2005

TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TASK NO.	DATE	DRAWN BY	MADE FROM	DWG NO.	Figure
99105-18	1/11/06	PRICHARD	TAB21	5388	1



LEGEND

- CONTOUR OF GROUND SURFACE ELEVATIONS IN FEET ABOVE MSL (5-FOOT INTERVALS) (NAVD 1988) (480)
- FENCE
- FORMER ROAD OR STREET
- PAVED ROAD OR STREET
- BUILDING (14980)
- DEMOLISHED BUILDING (13600)
- FORMER CONCRETE OR PAVED AREAS
- CONCRETE OR PAVED AREAS
- VEGETATION LINE
- 2-MW-1 GROUNDWATER MONITORING WELL
- TEE-BALL FIELD FENCE

NOTE(S): RESULTS FOR ALL COMPOUNDS ARE IN µg/L.
METALS RESULTS ARE FOR FILTERED GROUNDWATER WITH CONCENTRATIONS ABOVE BTVs.

N

0 37.5' 75' 112.5'
SCALE

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

SITE 2
OLD BASE SERVICE STATION
ANALYTICAL RESULTS
FALL 2005

TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TASK NO.	DATE	DRAWN BY	MADE FROM	DWG NO.	Figure
99105-18	1/18/06	PRICHARD	TAB21	5415	2

2-MW-10	Benzene	Toluene	Naphthalene	Al	Be	Cd	Se	Tl
Dec-99	0.0472	ND	0.137	NA	NA	60.2	NA	NA
Fall-00	ND	ND	ND	ND	ND	80.4	23.5	ND
Win-01	ND	ND	ND	ND	ND	78.8	14.3	ND
Spr-01	ND	0.53	ND	ND	ND	76.3	20.9	ND
Sum-01	ND	ND	ND	232	ND	77.4	32.3	ND
Fall-01	ND	ND	ND	277	ND	88.1	27.4	71.1
Win-02*	ND	ND	ND	651	ND	71.8	22.6	ND
Sum-02	ND	ND	NA	341	ND	87.5	9.67	ND
Win-03	ND	ND	NA	622	ND	11.3	20.8	ND
Sum-03	ND	ND	NA	939	2.7	59.7	23.9	ND

2-MW-12	Cd	Al	Se	Se	Tl
Spr-01	36.3	ND	ND	ND	ND
Sum-01	36.1	ND	ND	ND	ND
Fall-01	31.6	ND	ND	66.1	69.7
Win-02*	ND	284	ND	ND	ND
Spr-02	12.7	186	ND	ND	ND
Sum-02	17.4	ND	ND	ND	ND
Fall-02	ND	ND	40.7	ND	ND
Win-03	8.12	ND	52.1	ND	ND
Spr-03	1.9	26.6	ND	ND	ND
Fall-03	ND	33.6	3.3	ND	ND

2-MW-11	Cd	Al	Se	Tl
Spr-01	5.87	ND	25.3	ND
Sum-01	5.39	ND	24.1	ND
Fall-01	7.18	ND	25.2	66.1
Win-02*	4.33	341	25.8	ND
Spr-02	5.11	242	55	ND
Sum-02	5.8	ND	23.7	ND
Fall-02	4.56	ND	87.5	ND
Win-03	5.74	ND	148	ND
Spr-03	5	33.2	36.3	ND
Fall-03	6.5	26.2	36.3	ND

2-MW-3	Benzene	Al	Cd	Se	Tl
Dec-99	0.0465	NA	2.32	NA	NA
Fall-00	ND	ND	12	ND	ND
Win-01	ND	ND	ND	ND	ND
Spr-01	ND	ND	4.13	ND	ND
Sum-01	ND	ND	6.6	ND	ND
Fall-01	ND	ND	2.05	ND	44.9
Win-02*	ND	ND	5.84	ND	ND
Spr-02	ND	118	7	ND	ND
Sum-02	ND	ND	5.98	ND	ND
Win-03	ND	ND	4.17	23.1	ND
Sum-03	ND	ND	ND	ND	ND

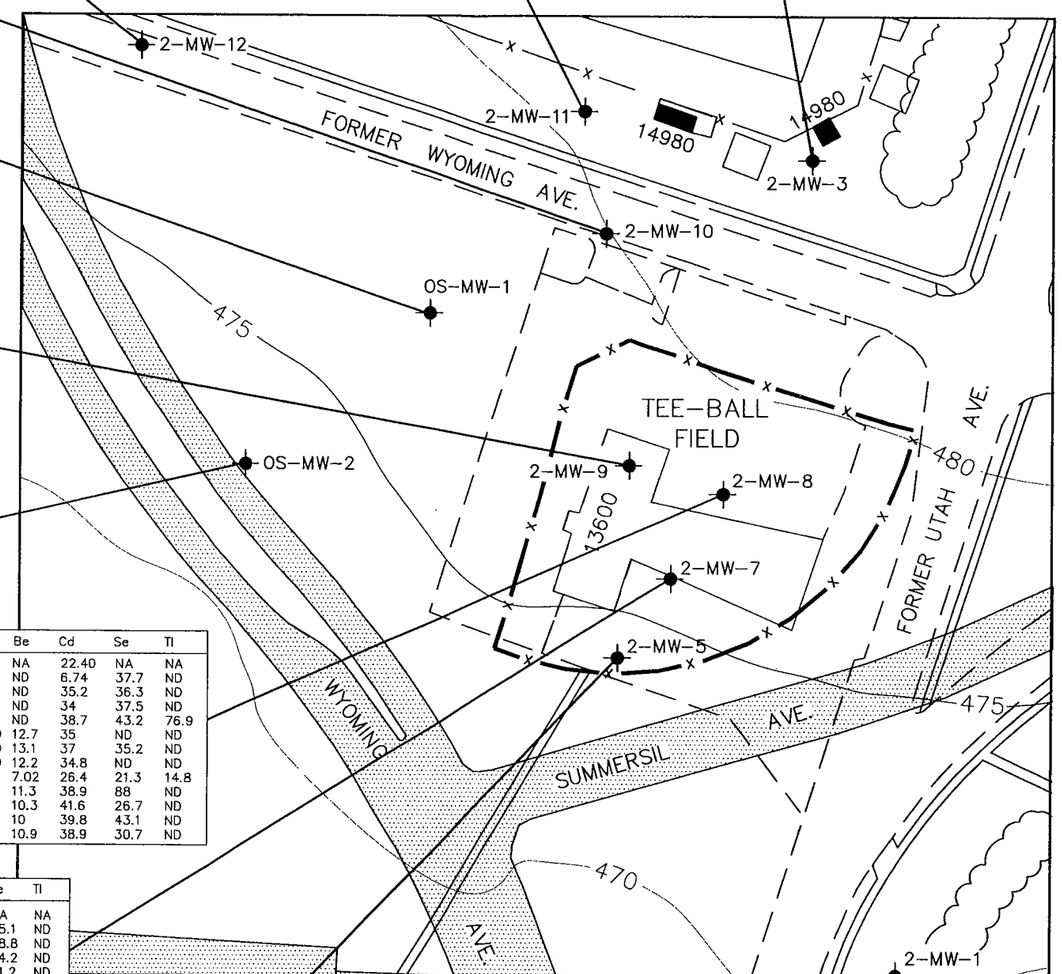
OS-MW-1	Al	Cd	Se	Tl
Dec-99	NA	38.1	NA	NA
Fall-00	ND	85.6	14.8	ND
Win-01	ND	54.7	9.11	ND
Spr-01	ND	54.5	16.3	ND
Sum-01	ND	50.8	15.8	ND
Fall-01	ND	60.5	13.6	65.2
Win-02*	313	46.6	ND	ND
Spr-02	NA	NA	NA	NA
Sum-02	ND	58.8	ND	ND
Fall-02	NA	NA	NA	NA
Win-03	ND	63.2	58.3	ND
Spr-03	NA	NA	NA	NA
Sum-03	42.8	64.7	18	ND
Fall-03	NA	NA	NA	NA

2-MW-9	Benzene	Toluene	Naphthalene	Al	Cd	Se	Tl
Dec-99	0.0485	ND	0.205	NA	42.3	NA	NA
Fall-00	ND	ND	ND	ND	34	43.4	ND
Win-01	ND	ND	ND	ND	74.5	37.5	ND
Spr-01	ND	0.59	ND	268	76.5	40.3	ND
Sum-01	ND	ND	ND	ND	81.1	42.0	ND
Fall-01	ND	ND	ND	483	96	47.8	78.4
Win-02*	ND	ND	ND	548	72.1	31.1	ND
Sum-02	ND	ND	ND	ND	73.4	31.2	ND
Win-03	ND	ND	ND	265	12.4	88.6	ND
Sum-03	ND	ND	ND	284	85.8	56.7	ND

OS-MW-2	Cd	Al	Se	Tl
Spr-01	6.82	ND	10.7	ND
Sum-01	13.9	ND	13.6	ND
Fall-01	2.56	ND	ND	38.5
Win-02*	10.9	211	ND	ND
Sum-02	10.3	ND	ND	ND
Win-03	10.4	ND	34.4	ND
Sum-03	9.8	20.1	12.3	ND

2-MW-8	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	TPHg	Naphthalene	Al	Be	Cd	Se	Tl
Dec-99	0.375	2.06	1.38	6.26	2.21	1.9	1.07	NA	NA	22.40	NA	NA
Fall-00	3.5	5.3	5.2	29	6.0	0.69	ND	1,380	ND	6.74	37.7	ND
Win-01	4.40	11	10	42	14	0.62	ND	1,260	ND	35.2	36.3	ND
Sum-01	5.1	11	8.7	37	12	0.88	5.3	1,650	ND	34	37.5	ND
Fall-01	5.3	6.4	4.9	37	10	0.64	ND	1,970	ND	38.7	43.2	76.9
Win-02*	36	64	62	250	74	4.9	21	13,500	12.7	35	ND	ND
Spr-02	7.7	12	12	61	21	1.2	10	12,700	13.1	37	35.2	ND
Sum-02	23	35	37	160	53	2.8	18	12,300	12.2	34.8	ND	ND
Fall-02	18	23	31	72	35	2.3	12	3,970	7.02	26.4	21.3	14.8
Win-03	26	37	36	180	52	3.6	16	7,410	11.3	38.9	88	ND
Spr-03	32.5	22.7	34.7	230	56.2	2.72	15.2	8,600	10.3	41.6	26.7	ND
Sum-03	22.5	12.1	32.3	125	24.7	2.12	18.5	8,320	10	39.8	43.1	ND
Fall-03	33.0	24.1	26.9	227	61.6	2.27	25.7	9,300	10.9	38.9	30.7	ND

2-MW-7	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	TPHg	Al	Be	Cd	Se	Tl
Dec-99	ND	ND	ND	ND	ND	ND	NA	NA	2.79	NA	NA
Fall-00	ND	ND	ND	4.6	ND	0.11	470	ND	4.4	35.1	ND
Win-01	ND	ND	ND	ND	ND	ND	373	ND	6.39	28.8	ND
Spr-01	ND	0.64	ND	ND	ND	ND	423	ND	6.62	34.2	ND
Sum-01	ND	ND	ND	ND	ND	ND	408	ND	6.78	31.2	ND
Fall-01	ND	ND	ND	ND	ND	ND	666	ND	29.7	46.1	59.9
Win-02*	ND	ND	ND	ND	4.9	0.27	1,180	ND	17.5	31.3	ND
Sum-02	0.69	2.2	2.4	22	8.6	0.25	200	ND	1.94	22.3	ND
Win-03	ND	1.2	1.7	17	6.4	0.15	475	ND	8.63	63.1	ND
Sum-03	0.23	0.17	0.1	7.88	2.59	0.09	519	1.5	7.6	57.5	ND



2-MW-5	Benzene	m,p-Xylenes	o-Xylene	Al	Cd	Se	Tl
Dec-99	0.0675	0.316	0.114	NA	ND	NA	NA
Fall-00	ND	ND	ND	ND	4.9	ND	ND
Win-01	ND	ND	ND	ND	298	ND	ND
Spr-01	ND	ND	ND	ND	141	14.9	ND
Sum-01	ND	ND	ND	ND	59.3	7.08	ND
Fall-01	ND	ND	ND	ND	137	10.7	90.0
Win-02*	ND	ND	ND	209	4.74	ND	ND
Sum-02	ND	ND	ND	ND	13.6	ND	ND
Win-03	ND	ND	ND	ND	6.68	47.6	ND
Sum-03	ND	ND	ND	ND	4.5	62.6	ND

2-MW-1	Naphthalene	Al	Cd	Se	Tl
Dec-99	0.124	NA	10.8	NA	NA
Fall-00	ND	238	55.4	39.8	ND
Win-01	ND	380	12.4	35.8	ND
Spr-01	ND	293	12.7	32.4	ND
Sum-01	ND	ND	10.2	37.6	ND
Fall-01	ND	464	12.4	43.8	66.6
Win-02*	ND	662	11.1	32	ND
Sum-02	ND	288	10.7	23.9	ND
Win-03	ND	ND	79.6	127	ND
Sum-03	ND	383	13.1	42.9	ND

LEGEND

- 480 — CONTOUR OF GROUND SURFACE ELEVATION IN FEET ABOVE MSL (5-FOOT INTERVALS) (NAVD 1988)
- x — FENCE
- FORMER ROAD OR STREET
- PAVED ROAD OR STREET
- 14980 — BUILDING
- 13600 — DEMOLISHED BUILDING
- FORMER CONCRETE OR PAVED AREAS
- CONCRETE OR PAVED AREAS
- VEGETATION LINE
- 2-MW-1 — GROUNDWATER MONITORING WELL
- x — TEE-BALL FIELD FENCE
- NA — NOT ANALYZED
- ND — NOT DETECTED; RESULT IS LESS THAN THE METHOD DETECTION LIMIT.
- * — INSTALLED MICROPURGE PUMP

NOTE(S): RESULTS FOR ALL COMPOUNDS EXCEPT TPHg ARE IN µg/L. TPHg RESULTS ARE IN mg/L. METALS RESULTS ARE FOR FILTERED GROUNDWATER. BTVs ARE AS FOLLOWS:
Al-1,200µg/L
Cd-5µg/L
Be-0.3µg/L
Se-3µg/L
Tl-1µg/L

N

0 37.5' 75' 112.5'
SCALE

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

SITE 2
OLD BASE SERVICE STATION
HISTORICAL ANALYTICAL RESULTS OF
BGMP KEY CONTAMINANTS OF CONCERN
DECEMBER 1999 THROUGH FALL 2003

TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TASK NO.	DATE	DRAWN BY	MADE FROM	DWG NO.	Figure
99105-18	10/10/05	PRICHARD	TAB21	5212	3A

2-MW-10	Benzene	Toluene	Al	Be	Cd	Se	Tl
Win-04	ND	ND	505	1.7	69.9	21.1	ND
Sum-04	ND	ND	213	ND	64.5	24.1	ND
Win-05	NA	NA	521	1.5	71.3	28.8	6.44
Sum-05	NA	NA	ND	ND	ND	ND	7.44

2-MW-11	Al	Cd	Se	Tl
Win-04	23	4.9	38.6	1.4
Sum-04	ND	4.59	42.8	6.17
Fall-04	ND	7.1	44.1	ND
Win-05	ND	8.21	45.7	8.56
Spr-05	ND	3.2	45.6	11.1
Sum-05	ND	7.74	46	6.03
Fall-05	ND	3.69	40.8	6.69

2-MW-3	Benzene	Al	Cd	Se	Tl
Win-04	ND	17.8	ND	ND	ND
Sum-04	ND	ND	ND	ND	6.03
Win-05	NA	ND	ND	ND	ND
Sum-05	ND	ND	ND	ND	ND

2-MW-12	Al	Cd	Se	Tl
Win-04	19	ND	ND	1.80
Sum-04	ND	ND	ND	ND
Fall-04	ND	ND	ND	ND
Win-05	ND	ND	ND	ND
Spr-05	ND	ND	ND	5.5
Sum-05	ND	2.07	ND	5.99
Fall-05	ND	ND	ND	7.28

OS-MW-1	Al	Cd	Se	Tl
Win-04	44.6	73.8	17.1	0.85
Spr-04	NA	NA	NA	NA
Sum-04	ND	64.9	15.2	ND
Fall-04	NA	NA	NA	NA
Win-05	ND	72.3	13.3	ND
Sum-05	ND	64	13.5	ND

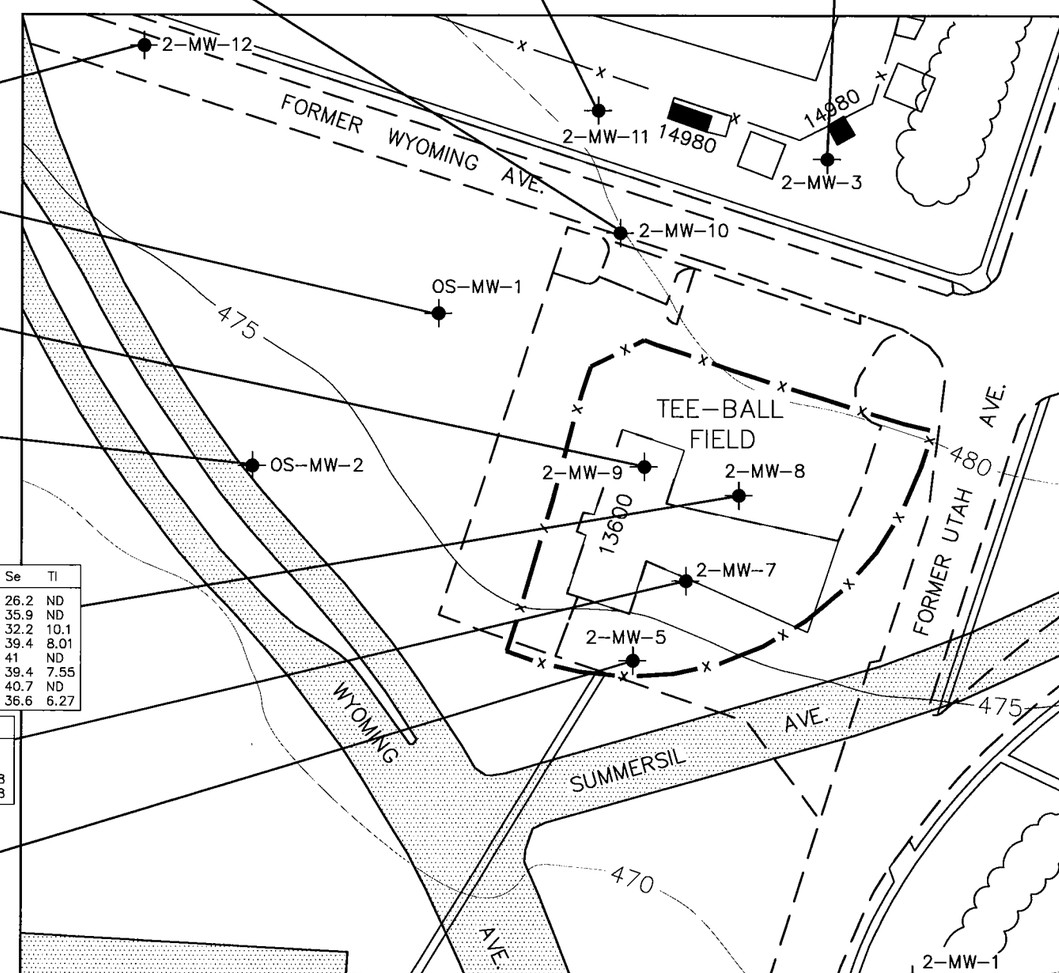
2-MW-9	Benzene	Toluene	Naphthalene	Al	Cd	Se	Tl
Win-04	ND	ND	ND	132	83.5	33.4	1.10
Sum-04	ND	ND	ND	ND	84.4	44.7	10.6
Win-05	NA	NA	ND	104	87.2	48.3	ND
Sum-05	ND	ND	ND	61.5	86.1	48.3	6.26

OS-MW-2	Al	Cd	Se	Tl
Win-04	26.9	5.2	8.3	1.30
Sum-04	ND	2.25	15.9	ND
Win-05	ND	2.52	6.56	ND
Sum-05	ND	3.84	7.79	ND

2-MW-8	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	TPHg	Naphthalene	Al	Be	Cd	Se	Tl
Win-04	33.8	9.98	34.1	218	48.7	2.55	28.8	6,880	9.8	39.6	26.2	ND
Spr-04	22	6.7	20	110	28	1.5	9.7	5,330	8.42	40.5	35.9	ND
Sum-04	21	5.5	19	90	28	1.2	9.2	5,100	8.25	40.2	32.2	10.1
Fall-04	39	8.9	34	190	48	2.3	21	5,420	7.79	39.5	39.4	8.01
Win-05	57	11	39	240	51	NA	17	5,070	7.47	39.5	41	ND
Spr-05	36	8.7	26	160	42	NA	22	5,430	7.82	36.8	39.4	7.55
Sum-05	37	7.7	22	53	41	1.4	16	5,060	6.81	37.6	40.7	ND
Fall-05	35	7.5	30	160	40	NA	12	4,960	7.14	33.9	36.6	6.27

2-MW-7	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	TPHg	Al	Be	Cd	Se	Tl
Win-04	0.32	ND	0.14	8.08	2.97	0.09a	224	ND	6.8	27.2	ND
Sum-04	0.45	ND	0.29	11	4.3	0.1	574	2.43	10.3	37.3	9.7
Win-05	NA	NA	NA	NA	NA	NA	662	1.64	7.06	37	9.98
Sum-05	1.5	0.74	1.3	31	11	0.2	543	1.71	7.63	35.8	5.48

2-MW-5	Benzene	m,p-Xylenes	o-Xylene	Al	Cd	Se	Tl
Win-04	ND	ND	ND	21.9	3.4	16.9	ND
Sum-04	ND	ND	ND	ND	14.1	17.6	5.88
Win-05	NA	NA	NA	ND	4.96	25	ND
Sum-05	NA	NA	NA	ND	5.49	24.8	7.01



2-MW-1	Naphthalene	Al	Cd	Se	Tl
Win-04	ND	464	14.1	35	1.30
Sum-04	ND	408	12	40.1	7.55
Win-05	ND	386	11	39.4	7.62
Sum-05	ND	445	14	45.7	9.77

LEGEND

- 480 — CONTOUR OF GROUND SURFACE ELEVATION IN FEET ABOVE MSL (5-FOOT INTERVALS) (NAVD 1988)
- —x— FENCE
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- CONCRETE OR PAVED AREAS
- VEGETATION LINE
- 2-MW-1 — GROUNDWATER MONITORING WELL
- —x— TEE-BALL FIELD FENCE
- NA — NOT ANALYZED
- ND — NOT DETECTED; RESULT IS LESS THAN THE METHOD DETECTION LIMIT.
- a — RESULT WAS QUALIFIED FOR BLANK CONTAMINATION (B-QUALIFIED) AND IS SUSPECTED TO BE A FALSE POSITIVE.

NOTE(S): RESULTS FOR ALL COMPOUNDS EXCEPT TPHg ARE IN µg/L. TPHg RESULTS ARE IN mg/L. METALS RESULTS ARE FOR FILTERED GROUNDWATER. BTVs ARE AS FOLLOWS:
Al-1,200µg/L
Be-0.3µg/L
Cd-5µg/L
Se-3µg/L
Tl-1µg/L

N

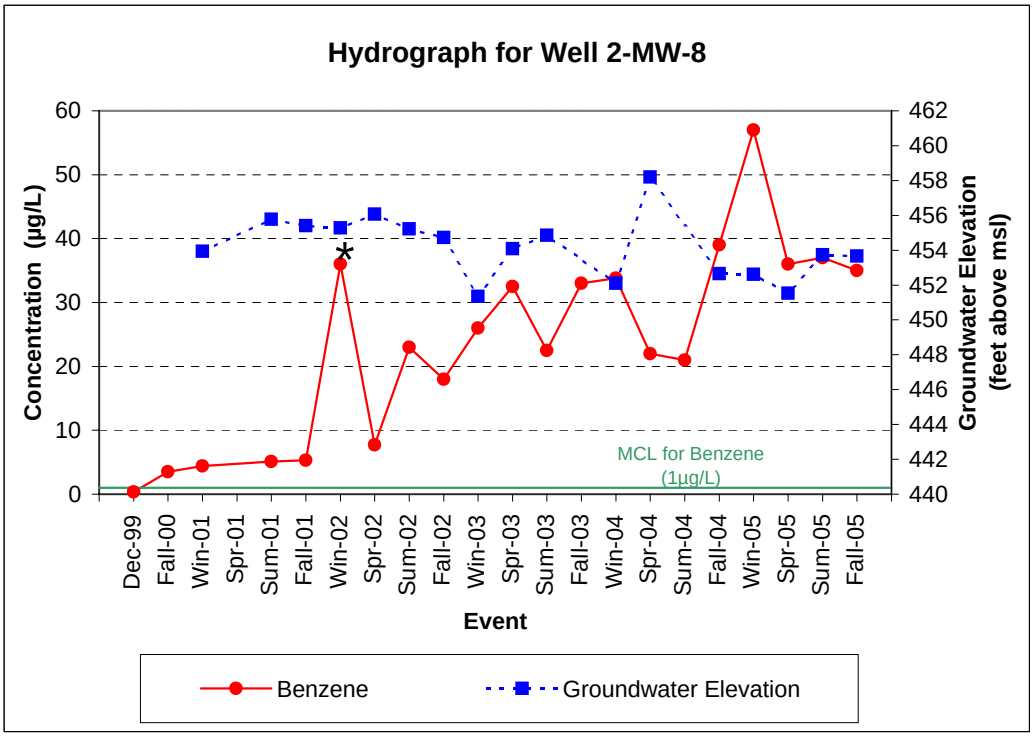
0 37.5' 75' 112.5'
SCALE

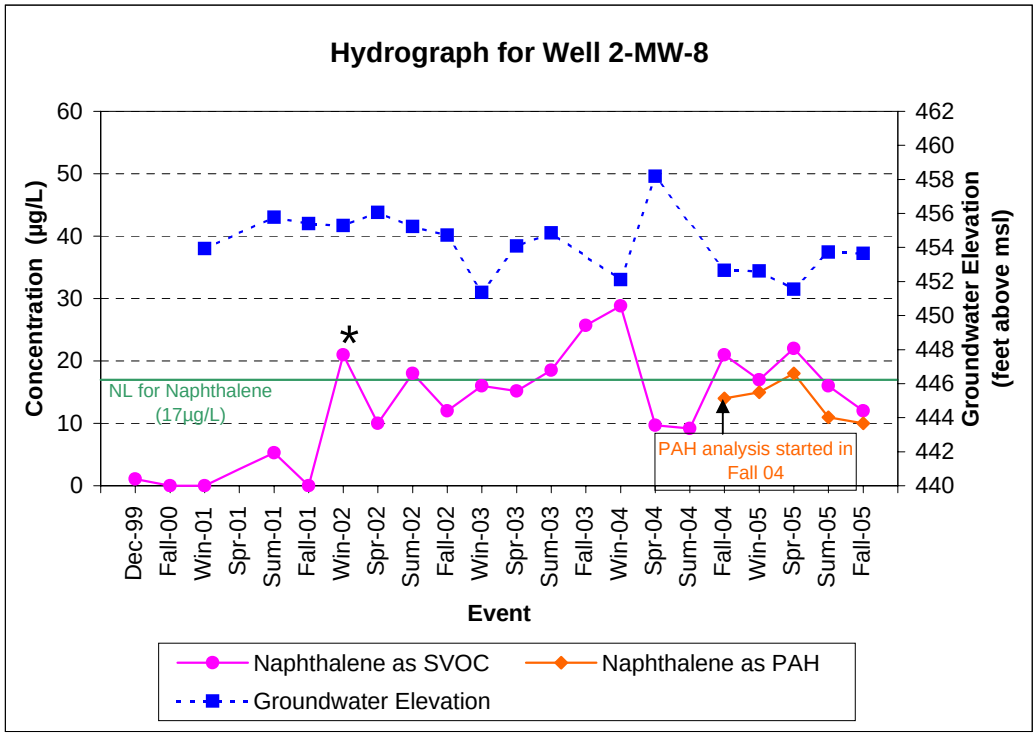
UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

SITE 2
OLD BASE SERVICE STATION
HISTORICAL ANALYTICAL RESULTS OF
BGMP KEY CONTAMINANTS OF CONCERN
WINTER 2004 THROUGH FALL 2005

TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TASK NO.	DATE	DRAWN BY	MADE FROM	DWG NO.	Figure
99105-18	2/3/06	RANDALL	TAB21	5416	3B





* - MicroPurge pump installed during winter 2002.
NL - California Department of Health Services (DHS) notification level (No MCL is available for naphthalene)

Figure 4. Groundwater Elevations and Concentrations of Benzene and Naphthalene at Site 2.

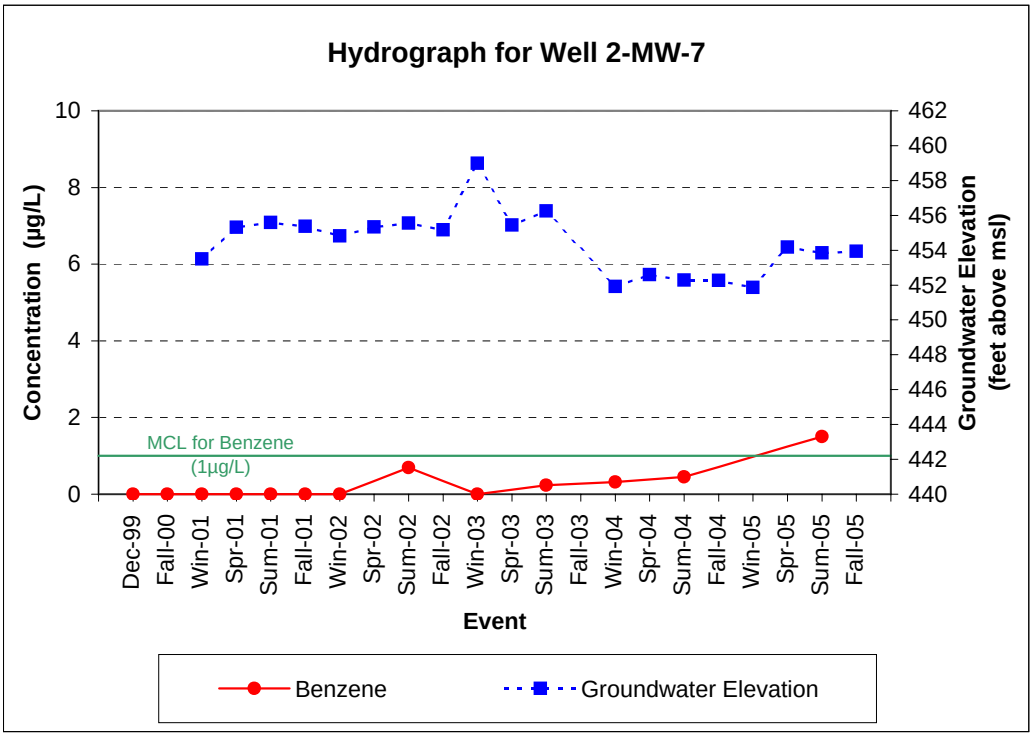


Figure 4. Groundwater Elevations and Concentrations of Benzene and Naphthalene at Site 2. Naphthalene was not detected in groundwater from well 2-MW-7.

Table 1
Groundwater Elevations
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

Monitoring Well	Top of Casing Elevation (feet above msl)	Date Measured	Groundwater Depth (feet below TOC)	Groundwater Elevation (feet above msl)			
				Fall 2005	Summer 2005	Spring 2005	Winter 2005
		Fall 2005	Fall 2005				
2-MW-1	468.26	07-Nov-05	14.70	453.56	453.89	453.69	452.91
2-MW-3	482.84	07-Nov-05	30.48	452.36	452.77	452.54	451.72
2-MW-5[a]	474.50	07-Nov-05	21.29	453.21	453.01	453.10	451.73
2-MW-7[a]	475.39	07-Nov-05	21.46	453.93	453.84	454.18	451.86
2-MW-8[a]	476.51	07-Nov-05	22.85	453.66	453.73	451.54	452.61
2-MW-9[a]	476.24	07-Nov-05	22.80	453.44	452.91	453.73	452.91
2-MW-10	479.94	07-Nov-05	27.43	452.51	452.44	452.40	451.55
2-MW-11	482.10	07-Nov-05	30.95	451.15	451.56	451.32	450.49
2-MW-12	477.77	07-Nov-05	27.20	450.57	450.67	450.39	449.37
OS-MW-1	476.28	07-Nov-05	24.98	451.30	451.76	451.49	450.63
OS-MW-2	471.50	07-Nov-05	20.60	450.90	451.28	451.04	450.25

Definition(s):

msl - mean sea level
TOC - top of well casing

Note(s):

a - Non-vented well; part of remote sampling system.

Table 2
Water Quality Parameters
Fall 2005
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

Sampling Location	**2-MW-8**	**2-MW-11**	**2-MW-12**
Sample ID	**V2MW8M**	**V2MW11F**	**V2MW12F**
Collection Date	**07-Nov-05**	**07-Nov-05**	**07-Nov-05**
Field Parameters[1]:			
Temperature (°Celsius)	17.51	17.33	18.36
Conductivity (µmhos/cm)	11,998	11,897	7,095
pH	4.44	5.54	8.08
Turbidity (NTUs)	1.50	1.47	8.66

Definition(s):

µmhos/cm - micromhos per centimeter
NTU - nephelometric turbidity unit

Note(s):

1 - field parameters measured immediately prior to sampling.

Table 3
Metals in Groundwater
Fall 2005
EPA Method SW6010B (µg/L)
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

Sample Location					**2-MW-8**			**2-MW-11**			**2-MW-12**		
Sample ID					**V2MW8F**			**V2MW11F**			**V2MW12F**		
Collection Date					**07-Nov-05**			**07-Nov-05**			**07-Nov-05**		
Dissolved Metals	**MDL[1]**	**PQL[1]**	**Primary MCL**	**BTV**									
Aluminum	15	60	1,000	1,200	**4,960**		g	60	U	g	60	U	g
Antimony[2]	40	100	6	10	40	U	g	40	U	g	40	U	g
Arsenic	4	10	10	7	5	U	g	5	U	g	8.56	J	q
Barium	1	5	1,000	276	127		g	86.6		g	403		g
Beryllium[2]	1	5	4	0.3	**7.14**		g	1	U	g	1	U	g
Cadmium	1	5	5	5	**33.9**		g	3.69	J	q	2	U	g
Calcium	22	500	N/A	197,000	198,000		g	204,000		g	226,000		g
Chromium	1	10	50	20	5	U	g	5	U	g	5	U	g
Cobalt	2	15	N/A	13	43.1		g	5	U	g	5	U	g
Copper	1	10	1,300	58	19.8		g	5	U	g	5	U	g
Iron	4	100	N/A	3,530	137		g	40	U	g	40	U	g
Lead	2	3	15	3	2	U	g	2	U	g	2	U	g
Magnesium	26	200	N/A	119,000	378,000		g	385,000		g	150,000		g
Manganese	1	5	N/A	971	154		g	32.4		g	23.5		g
Molybdenum	2	15	N/A	12	10	U	g	28.4		g	16.1		g
Nickel	5	20	100	490	**201**		g	66		g	10	J	q
Potassium	41	1,000	N/A	13,300	16,500		g	15,300		g	12,600		g
Selenium[2]	5	10	50	3	36.6		g	40.8		g	5	U	g
Silver[2]	1	10	N/A	0.2	5	U	g	5	U	g	5	U	g
Sodium	23	500	N/A	420,000	2,500,000		g	2,340,000		g	1,400,000		g
Thallium[2]	5	10	2	1	**6.27**	J	q	**6.69**	J	q	**7.28**	J	q
Vanadium	1	10	N/A	28	5	U	g	5	U	g	5	U	g
Zinc	2	20	N/A	80	66.9		g	9.68	J	q	5	U	g

Table 3
Metals in Groundwater
Fall 2005
EPA Method SW6010B (µg/L)
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

Data Validity Qualifier(s):

J - The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.
U - The analyte was not detected at or above the MDL.

Data Validity Comment(s):

g - The data met prescribed criteria as detailed in the QAPP.
q - The analyte detection was below the PQL.

Definition(s):

BTV - background threshold value
MCL - maximum contaminant level
MDL - method detection limit
µg/L - micrograms per liter
N/A - not applicable
PQL - practical quantitation limit
QAPP - Quality Assurance Project Plan

Note(s):

Bold type indicates results that were above the MCL.
Shading indicates results that were above the 95th percentile BTV.
1 - Values from QAPP Addendum (Tetra Tech 2004a).
2 - The BTV was less than the detection limit for this metal.

Table 4
VOCs in Groundwater
Fall 2005
EPA Method SW8260B (µg/L)
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

Sample Location				**2-MW-8**		
Sample ID				**V2MW8M**		
Collection Date				**07-Nov-05**		
	MDL[1]	**PQL[1]**	**Primary MCL**			
Benzene	0.07	0.4	1	**35**	J	b, c
Ethylbenzene	0.12	1.0	300	30	J	b, c
m,p-Xylenes	0.25	2.0	1,750[2]	160	J	c
o-Xylene	0.13	1.0	1,750[2]	40		g
Toluene	0.11	1.0	150	7.5	J	b
All other target analytes	N/A	N/A	N/A	ND		

Data Validity Qualifier(s):

J - The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.

Data Validity Comment(s):

b - The surrogate spike recovery was outside quality control criteria.
c - The matrix spike and/or matrix spike duplicate recoveries were outside control limits.
g - The data met prescribed criteria as detailed in the QAPP.

Definition(s):

MCL - maximum contaminant level
MDL - method detection limit
µg/L - micrograms per liter
N/A - not applicable
ND - not detected; result is less than the MDL.
PQL - practical quantitation limit
QAPP - Quality Assurance Project Plan

Note(s):

Bold type indicates results that were above the MCL.
1 - Values from QAPP Addendum (Tetra Tech 2004a).
2 - MCL of 1,750 µg/L applies to sum of *m*-xylene, *o*-xylene, and *p*-xylene.

Table 5
SVOCs and PAHs in Groundwater
Fall 2005
EPA Methods SW8270C and SW8270C SIM (µg/L)
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

			SVOCs			PAHs	
Sample Location	**Sample ID**	**Collection Date**	**2-Methylnaphthalene**	**Naphthalene**	**All Other Target Analytes**	**Naphthalene**	**All Other Target Analytes**
		MDL[1]	1.8	1.6	N/A	0.024	N/A
		PQL[1]	10	10	N/A	1.0	N/A
2-MW-8	V2MW8M	07-Nov-05	13 g	12 g	ND	10 g	ND

Data Validity Qualifier(s):

U - The analyte was not detected at or above the MDL.

Data Validity Comment(s):

g - The data met prescribed criteria as detailed in the QAPP.

Definition(s):

MDL - method detection limit
µg/L - micrograms per liter
N/A - not applicable
ND - Not detected; result is less than the MCL.
PAH - polynuclear aromatic hydrocarbon
PQL - practical quantitation limit
QAPP - Quality Assurance Project Plan
SIM - selected ion monitoring
SVOC - semivolatile organic compound

Note(s):

1 - Values from QAPP Addendum (Tetra Tech 2004a).

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Benzene (µg/L)[a]										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-3	0.0465	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
2-MW-5	0.0675	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-6	0.0445	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	ND	NA	0.69	NA	ND
2-MW-8	0.375	**3.5**	**4.4**	NA	**5.1**	**5.3**	**36**	**7.7**	**23**	**18**	**26**
2-MW-9	0.0485	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-10	0.0472	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-5	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	0.23	NA	0.32	NA	0.45	NA	NA	NA	**1.5**	NA
2-MW-8	**32.5**	**22.5**	**33**	**33.8**	**22**	**21**	**39**	**57**	**36**	**37**	**35**
2-MW-9	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-10	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-11	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
2-MW-12	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA
OS-MW-2	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Toluene (µg/L)[a]										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
2-MW-5	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-6	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA
2-MW-7	ND	ND	ND	0.64	ND	ND	ND	NA	2.2	NA	1.2
2-MW-8	2.06	5.3	11	NA	11	6.4	64	12	35	23	37
2-MW-9	ND	ND	ND	0.59	ND	ND	ND	NA	ND	NA	ND
2-MW-10	ND	ND	ND	0.53	ND	ND	ND	NA	ND	NA	ND
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-5	NA	0.44	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	0.17	NA	ND	NA	ND	NA	NA	NA	0.74	NA
2-MW-8	22.7	12.1	24.1	9.98	6.7	5.5	8.9	11	8.7	7.7	7.5
2-MW-9	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-10	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-11	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
2-MW-12	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	0.4	ND	ND	ND	ND	ND	ND	NA	ND	NA
OS-MW-2	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Ethylbenzene (µg/L)[a]										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
2-MW-5	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-6	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	ND	NA	2.4	NA	1.7
2-MW-8	1.38	5.2	10	NA	8.7	4.9	62	12	37	31	36
2-MW-9	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-10	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-5	NA	ND	NA	0.20	NA	ND	NA	NA	NA	NA	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	0.1	NA	0.14	NA	0.29	NA	NA	NA	1.3	NA
2-MW-8	34.7	32.3	26.9	34.1	20	19	34	39	26	22	30
2-MW-9	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-10	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-11	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
2-MW-12	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA
OS-MW-2	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	m,p-Xylenes (µg/L)[b]										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
2-MW-5	0.316	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-6	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA
2-MW-7	ND	4.6	ND	ND	ND	ND	ND	NA	22	NA	17
2-MW-8	6.26	29	42	NA	37	37	250	61	160	72	180
2-MW-9	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-10	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-5	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	7.88	NA	8.08	NA	11	NA	NA	NA	31	NA
2-MW-8	230	125	227	218	110	90	190	240	160	53	160
2-MW-9	NA	0.17	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-10	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-11	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
2-MW-12	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA
OS-MW-2	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	o-Xylene (µg/L)[b]										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
2-MW-5	0.114	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-6	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	4.9	NA	8.6	NA	6.4
2-MW-8	2.21	6	14	NA	12	10	74	21	53	35	52
2-MW-9	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-10	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-5	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	2.59	NA	2.97	NA	4.3	NA	NA	NA	11	NA
2-MW-8	56.2	24.7	61.6	48.7	28	28	48	51	42	41	40
2-MW-9	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA
2-MW-10	NA	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA
2-MW-11	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
2-MW-12	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA
OS-MW-2	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	TPH as gasoline (mg/L)										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-3	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA
2-MW-5	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-MW-6	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-MW-7	ND	0.11	ND	ND	ND	ND	0.27	NA	0.25	NA	0.15
2-MW-8	0.0719	0.69	0.62	NA	0.88	0.64	4.9	1.2	2.8	2.3	3.6
2-MW-9	ND	ND	ND	ND	ND	ND	NA	NA	ND	NA	ND
2-MW-10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-3	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	0.09	NA	0.09[c]	NA	0.1	NA	NA	NA	0.2	NA
2-MW-8	2.72	2.12	2.27	2.55	1.5	1.2	2.3	NA	NA	1.4	NA
2-MW-9	NA	ND	NA	0.02[c]	NA	ND	NA	NA	NA	ND	NA
2-MW-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	NA	ND	NA	0.02[c]	NA	ND	NA	NA	NA	ND	NA
OS-MW-2	NA	ND	NA	0.03[c]	NA	ND	NA	ND	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Naphthalene (µg/L)										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	0.124	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
2-MW-5	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-6	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-8	1.07	ND	ND	NA	5.3	ND	21	10	18	12	16
2-MW-9	0.205	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-10	0.137	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-5	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-8	15.2	18.5	25.7	28.8	9.7	9.2	21	17	22	16	12
2-MW-9	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
OS-MW-2	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Dissolved Aluminum (µg/L)[d]										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	NA	238	380	293	ND	464	662	NA	288	NA	ND
2-MW-3	NA	ND	ND	ND	ND	ND	ND	118	ND	NA	ND
2-MW-5	NA	ND	ND	ND	ND	ND	209	NA	ND	NA	ND
2-MW-6	NA	399	ND	ND	ND	229	678	NA	374	NA	NA
2-MW-7	NA	470	373	423	408	666	**1,180**	NA	200	NA	475
2-MW-8	NA	1,380	1,260	NA	1,650	1,970	13,500	12,700	12,300	3,970	7,410
2-MW-9	NA	ND	ND	268	ND	483	548	NA	ND	NA	265
2-MW-10	NA	ND	ND	ND	232	277	651	NA	341	NA	622
2-MW-11	NA	NA	NA	ND	ND	ND	341	242	ND	ND	ND
2-MW-12	NA	NA	NA	ND	ND	ND	284	186	ND	ND	ND
OS-MW-1	NA	ND	ND	ND	ND	ND	313	NA	ND	NA	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	211	NA	ND	NA	ND

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	383	NA	464	NA	408	NA	386	NA	445	NA
2-MW-3	NA	ND	NA	17.8	NA	ND	NA	ND	NA	ND	NA
2-MW-5	NA	ND	NA	21.9	NA	ND	NA	ND	NA	ND	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	519	NA	224	NA	574	NA	662	NA	543	NA
2-MW-8	8,600	8,320	9,300	6,880	5,330	5,100	5,420	5,070	5,430	5,060	4,960
2-MW-9	NA	284	NA	132	NA	ND	NA	104	NA	61.5	NA
2-MW-10	NA	939	NA	505	NA	213	NA	521	NA	ND	NA
2-MW-11	33.2[c]	NA	26.2	23	NA	ND	ND	ND	ND	ND	ND
2-MW-12	26.6[c]	NA	33.6	19	NA	ND	ND	ND	ND	ND	ND
OS-MW-1	NA	42.8	NA	44.6	NA	ND	NA	ND	NA	ND	NA
OS-MW-2	NA	20.1	NA	26.9	NA	ND	NA	ND	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
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Vandenberg AFB, California

	Dissolved Beryllium (µg/L)[e]										
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02[i]	Spr-02	Sum-02	Fall-02	Win-03
2-MW-1	NA	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-3	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
2-MW-5	NA	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-6	NA	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA
2-MW-7	NA	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-8	NA	ND	ND	NA	ND	ND	12.7	13.1	12.2	7.02	11.3
2-MW-9	NA	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-10	NA	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
2-MW-11	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
OS-MW-1	NA	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND
OS-MW-2	NA	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND

	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Fall-05
2-MW-1	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-5	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	1.5	NA	ND	NA	2.43	NA	1.64	NA	1.71	NA
2-MW-8	10.3	10	10.9	9.8	8.42	8.25	7.79	7.47	7.82	6.81	7.14
2-MW-9	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-10	NA	2.7	NA	1.7	NA	ND	NA	1.5	NA	ND	NA
2-MW-11	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND
2-MW-12	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND
OS-MW-1	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
OS-MW-2	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Dissolved Cadmium (µg/L)[f]										
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02[i]	Spr-02	Sum-02	Fall-02	Win-03
2-MW-1	10.8	55.4	12.4	12.7	10.2	12.4	11.1	NA	10.7	NA	79.6
2-MW-3	2.32	12	ND	4.13	6.6	2.05	5.84	7	5.98	NA	4.17
2-MW-5	ND	4.9	298	141	59.3	137	4.74	NA	13.6	NA	6.68
2-MW-6	4.31	ND	41	20.5	8.96	30.2	5.22	NA	4.66	NA	NA
2-MW-7	2.79	4.4	6.39	6.62	6.78	29.7	17.5	NA	1.94	NA	8.63
2-MW-8	22.4	6.74	35.2	NA	34	38.7	35	37	34.8	26.4	38.9
2-MW-9	42.3	34	74.5	76.5	81.1	96	72.1	NA	73.4	NA	12.4
2-MW-10	60.2	80.4	78.8	76.3	77.4	88.1	71.8	NA	87.5	NA	11.3
2-MW-11	NA	NA	NA	5.87	5.39	7.18	4.33	5.11	5.8	4.56	5.74
2-MW-12	NA	NA	NA	36.3	36.1	31.6	ND	12.7	17.4	ND	8.12
OS-MW-1	38.1	85.6	54.7	54.5	50.8	60.5	46.6	NA	58.8	NA	63.2
OS-MW-2	NA	NA	NA	6.82	13.9	2.56	10.9	NA	10.3	NA	10.4

	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Fall-05
2-MW-1	NA	13.1	NA	14.1	NA	12	NA	11	NA	14	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-5	NA	4.5	NA	3.4	NA	14.1	NA	4.96	NA	5.49	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	7.6	NA	6.8	NA	10.3	NA	7.06	NA	7.63	NA
2-MW-8	41.6	39.8	38.9	39.6	40.5	40.2	39.5	39.5	36.8	37.6	33.9
2-MW-9	NA	85.8	NA	83.5	NA	84.4	NA	87.2	NA	86.1	NA
2-MW-10	NA	59.7	NA	69.9	NA	64.5	NA	71.3	NA	ND	NA
2-MW-11	5	NA	6.5	4.9	NA	4.59	7.1	8.21	3.2	7.74	3.69
2-MW-12	1.9	NA	ND	ND	NA	ND	ND	ND	ND	2.07	ND
OS-MW-1	NA	64.7	NA	73.8	NA	64.9	NA	72.3	NA	64	NA
OS-MW-2	NA	9.8	NA	5.2	NA	2.25	NA	2.52	NA	3.84	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Dissolved Selenium (µg/L)[g]										
	Dec-99	**Fall-00**	**Win-01**	**Spr-01**	**Sum-01**	**Fall-01**	**Win-02[i]**	**Spr-02**	**Sum-02**	**Fall-02**	**Win-03**
2-MW-1	NA	39.8	35.8	32.4	37.6	43.8	32	NA	23.9	NA	**127**
2-MW-3	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	23.1
2-MW-5	NA	ND	ND	14.9	7.08	10.7	ND	NA	ND	NA	47.6
2-MW-6	NA	31.9	29.8	28.5	35.9	6.83	30.1	NA	ND	NA	NA
2-MW-7	NA	35.1	28.8	34.2	31.2	46.1	31.3	NA	22.3	NA	**63.1**
2-MW-8	NA	37.7	36.3	NA	37.5	43.2	ND	35.2	ND	21.3	**88.0**
2-MW-9	NA	43.4	37.5	40.3	42.0	47.8	31.1	NA	31.2	NA	**88.6**
2-MW-10	NA	23.5	14.3	20.9	32.3	27.4	22.6	NA	9.67	NA	20.8
2-MW-11	NA	NA	NA	25.3	24.1	25.2	25.8	**55**	23.7	**87.5**	**148**
2-MW-12	NA	NA	NA	ND	ND	ND	ND	ND	ND	40.7	**52.1**
OS-MW-1	NA	14.8	9.11	16.3	15.8	13.6	ND	NA	ND	NA	**58.3**
OS-MW-2	NA	NA	NA	10.7	13.6	ND	ND	NA	ND	NA	34.4

	Spr-03	**Sum-03**	**Fall-03**	**Win-04**	**Spr-04**	**Sum-04**	**Fall-04**	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-1	NA	42.9	NA	35	NA	40.1	NA	39.4	NA	45.7	NA
2-MW-3	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-5	NA	**62.6**	NA	16.9	NA	17.6	NA	25	NA	24.8	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	**57.5**	NA	27.2	NA	37.3	NA	37	NA	35.8	NA
2-MW-8	26.7	43.1	30.7	26.2	35.9	32.2	39.4	41	39.4	40.7	36.6
2-MW-9	NA	**56.7**	NA	33.4	NA	44.7	NA	48.3	NA	48.3	NA
2-MW-10	NA	23.9	NA	21.1	NA	24.1	NA	28.8	NA	ND	NA
2-MW-11	36.3	NA	36.3	38.6	NA	42.8	44.1	45.7	45.6	46	40.8
2-MW-12	ND	NA	3.3	ND	NA	ND	ND	ND	ND	ND	ND
OS-MW-1	NA	18	NA	17.1	NA	15.2	NA	13.3	NA	13.5	NA
OS-MW-2	NA	12.3	NA	8.3	NA	15.9	NA	6.56	NA	7.79	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Dissolved Thallium (µg/L)[h]										
	Dec-99	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02[i]	Spr-02	Sum-02	Fall-02	Win-03
2-MW-1	NA	ND	ND	ND	ND	66.6	ND	NA	ND	NA	ND
2-MW-3	NA	ND	ND	ND	ND	44.9	ND	ND	ND	NA	ND
2-MW-5	NA	ND	ND	ND	ND	90.0	ND	NA	ND	NA	ND
2-MW-6	NA	ND	ND	ND	ND	35.9	ND	NA	ND	NA	NA
2-MW-7	NA	ND	ND	ND	ND	59.9	ND	NA	ND	NA	ND
2-MW-8	NA	ND	ND	NA	ND	76.9	ND	ND	ND	14.8	ND
2-MW-9	NA	ND	ND	ND	ND	78.4	ND	NA	ND	NA	ND
2-MW-10	NA	ND	ND	ND	ND	71.1	ND	NA	ND	NA	ND
2-MW-11	NA	NA	NA	ND	ND	66.1	ND	ND	ND	ND	ND
2-MW-12	NA	NA	NA	ND	ND	69.7	ND	ND	ND	ND	ND
OS-MW-1	NA	ND	ND	ND	ND	65.2	ND	NA	ND	NA	ND
OS-MW-2	NA	NA	NA	ND	ND	38.5	ND	NA	ND	NA	ND

	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Fall-05
2-MW-1	NA	ND	NA	1.30	NA	7.55	NA	7.62	NA	9.77	NA
2-MW-3	NA	ND	NA	ND	NA	6.03	NA	ND	NA	ND	NA
2-MW-5	NA	ND	NA	ND	NA	5.88	NA	ND	NA	7.01	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	NA	ND	NA	ND	NA	9.7	NA	9.98	NA	5.48	NA
2-MW-8	ND	ND	ND	ND	ND	10.1	8.01	ND	7.55	ND	6.27
2-MW-9	NA	ND	NA	1.10	NA	10.6	NA	ND	NA	6.26	NA
2-MW-10	NA	ND	NA	ND	NA	ND	NA	6.44	NA	7.44	NA
2-MW-11	ND	NA	ND	1.40	NA	6.17	ND	8.56	11.1	6.03	6.69
2-MW-12	ND	NA	ND	1.80	NA	ND	ND	ND	5.5	5.99	7.28
OS-MW-1	NA	ND	NA	0.85	NA	ND	NA	ND	NA	ND	NA
OS-MW-2	NA	ND	NA	1.30	NA	ND	NA	ND	NA	ND	NA

Table 6
Summary of BGMP Key Contaminants of Concern
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

Definition(s):

BTV	background threshold value
MCL	maximum contaminant level
µg/L	micrograms per liter
mg/L	milligrams per liter
NA	not analyzed
ND	Not detected; result is less than the method detection limit.
TPH	total petroleum hydrocarbons

Note(s):

Bold type indicates results that were above the MCL.
Shading indicates results that were above the 95th percentile BTV.

a	The MCLs for benzene, toluene, and ethylbenzene are 1, 150, and 300 µg/L, respectively.
b	The MCL of 1,750 µg/L applies to the sum of m-xylene, o-xylene, and p-xylene.
c	The data were qualified for blank contamination during the validation process. The laboratory method blank showed the same order of magnitude as the sample results. The sample results are strongly suspected to be false positive.
d	The BTV and MCL for aluminum are 1,200 and 1,000 µg/L, respectively.
e	The BTV and MCL for beryllium are 0.3 and 4 µg/L, respectively.
f	The BTV and MCL for cadmium are both 5 µg/L.
g	The BTV and MCL for selenium are 3 and 50 µg/L, respectively.
h	The BTV and MCL for thallium are 1 and 2 µg/L, respectively.
i	Dedicated MicroPurge pumps were installed in Site 2 wells during winter 2002.

APPENDIX A PURGE RECORDS

TETRA TECH, INC.
4213 State Street, STE 100
Santa Barbara, CA 93110
Telephone (805) 681-3100
Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

DATE 11/17/05 SITE NUMBER 2 PURGING DEVICE MICROPURGE DEDICATED PUMP

PROGRAM NAME BGMP TRIP BLANK I.D. V2TB1112 SAMPLING DEVICE MICROPURGE DEDICATED PUMP

MONITORING WELL IDENTIFICATION 2-MW-8 PID READING IN CASING (ppm) (initial) - (vented to) -

SAMPLE I.D. V2MW8M DUPLICATE I.D. / COLLECTION TIME -/- PID READING IN BREATHING ZONE (ppm) (initial) - (vented to) -

STATIC WATER LEVEL (ft btoc) 22.85 TOTAL WELL DEPTH (ft btoc) 34.8

WATER COLUMN (feet) 12.0 TUBING DIAMETER (in) 3/8 SAMPLER'S SIGNATURE [signature]

PUMP & TUBING (V) (L) 1.48 5 V (L) 7.40

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump & Tubing Volumes Purged	Flow Rate (LPM)
1100	Arrived at well											
1125	Begin Purge											0.14
1135		23.19	17.93	11847	4.39	2.57	8.57	-73.0	clear	1.4	0.95	0.14
1140		23.23	17.69	11915	4.48	2.23	2.67	-150.7	clear	2.1	1.42	0.14
1145	End Purge	23.25	17.51	11998	4.44	1.50	1.90	-178.6	clear	2.8	1.89	0.14
1150	Sample											0.14
1230	Vacated well											

Fe+2 (ppm) - Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 23.29 FILTER LOT # A1053 1342

Comments: 45.23
WL is estimated due to remote system.

PARAMETERS FOR WATER QUALITY STABILIZATION

Temperature ±1 C (1.8 F)	Conductivity ±5%
pH ±0.1	Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.

Form number Tt-O-049 (9/05)

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TETRA TECH, INC.
4213 State Street, STE 100
Santa Barbara, CA 93110
Telephone (805) 681-3100
Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

DATE 11/7/05 SITE NUMBER 2 PURGING DEVICE MICROPURGE DEDICATED PUMP

PROGRAM NAME BGMP TRIP BLANK I.D. — SAMPLING DEVICE MICROPURGE DEDICATED PUMP

MONITORING WELL IDENTIFICATION 2-MW-11 PID READING IN CASING (ppm) (initial) — (vented to) —

SAMPLE I.D. V2MW11F DUPLICATE I.D. / COLLECTION TIME - / - PID READING IN BREATHING ZONE (ppm) (initial) — (vented to) —

STATIC WATER LEVEL (ft btoc) 30.95 TOTAL WELL DEPTH (ft btoc) 54.9

WATER COLUMN (feet) 24.0 TUBING DIAMETER (in) 3/8 SAMPLER'S SIGNATURE [signature]

PUMP & TUBING (V) (L) 0.87 5 V (L) 4.35

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump & Tubing Volumes Purged	Flow Rate (LPM)
1235	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1248	Begin Purge	—	—	—	—	—	—	—	—	—	—	0.20
1251		31.38	17.56	11937	5.49	—	4.62	-114.3	clear	0.6	0.69	0.20
1254		31.49	17.46	11931	5.51	1.76	4.10	-120.6	clear	1.8	1.38	0.20
1257		31.58	17.33	11897	5.54	1.47	2.97	-166.7	clear	2.4	2.07	0.20
1258	End Purge											
1300	Sample											
1307	Vacated well	—	—	—	—	—	—	—	—	—	—	—

Fe+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 31.67 FILTER LOT # A1053134 2

Comments:

PARAMETERS FOR WATER QUALITY STABILIZATION

Temperature ±1 C (1.8 F)	Conductivity ± 5%
pH ± 0.1	Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.

Form number Tt-O-049 (9/05)

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TETRA TECH, INC.
4213 State Street, STE 100
Santa Barbara, CA 93110
Telephone (805) 681-3100
Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

DATE 11/7/05 SITE NUMBER 2 PURGING DEVICE MICROPURGE DEDICATED PUMP

PROGRAM NAME BGMP TRIP BLANK I.D. ~~V2-MW~~ SAMPLING DEVICE MICROPURGE DEDICATED PUMP

MONITORING WELL IDENTIFICATION 2-MW-12 PID READING IN CASING (ppm) (initial) — (vented to) —

SAMPLE I.D. V2MW12F DUPLICATE I.D. / COLLECTION TIME — / — PID READING IN BREATHING ZONE (ppm) (initial) — (vented to) —

STATIC WATER LEVEL (ft btoc) 27.20 TOTAL WELL DEPTH (ft btoc) 67.8

WATER COLUMN (feet) 40.6 TUBING DIAMETER (in) 3/8 SAMPLER'S SIGNATURE [signature]

PUMP & TUBING (V) (L) 0.98 5 V (L) 4.9

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump & Tubing Volumes Purged	Flow Rate (LPM)
1310	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1322	Begin Purge	—	—	—	—	—	—	—	—	—	—	0.2
1326		27.59	18.57	9574	5.80	4.12	3.26	-158.9	clear	0.8	0.82	0.2
1330		27.70	18.92	8260	6.32	10.8	1.86	-222.6	clear	1.6	1.64	0.2
1334		27.86	18.92	7794	7.06	14.7	1.13	-259.4	clear	2.4	2.46	0.2
1338		27.95	18.74	7416	7.66	14.9	0.77	-271.0	clear	3.2	3.28	0.2
1342		28.10	18.25	7071	8.03	12.3	0.50	-315.1	clear	4.0	4.08	0.2
1347	End Purge	28.15	18.36	7095	8.08	8.66	0.44	-328.5	clear	5.0	5.10	0.2
1350	Sample											
1400	Vacated well	—	—	—	—	—	—	—	—	—	—	—

Fe+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 28.20 FILTER LOT # A1053142

Comments:

PARAMETERS FOR WATER QUALITY STABILIZATION

Temperature ±1 C (1.8 F)	Conductivity ±5%
pH ±0.1	Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.

Form number Tt-O-049 (9/05)

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APPENDIX B CHAIN-OF-CUSTODY RECORDS

TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, CA 93110
Phone (805) 681-3100
FAX (805) 681-3108

SHIPPED TO: EMAX Labs
1835 West 205th Street
Torrance, CA 90501

C14/VW01-20

05K063

CHAIN OF CUSTODY RECORD

SITE 2 DATE 11/7/05 PAGE 1 OF 1

CLIENT: Vandenberg, AFB
PROJECT NAME: BGMP
PROJECT MANAGER: Kevin McNamara
TC#: T99105-06
SAMPLERS (Signatures): X [signature] X [signature]

TURN-AROUND TIME: Standard

OBSERVATIONS/COMMENTS: No Hg

ANALYTICAL METHODS

	SAMPLE NO.	DATE	TIME	SW8260 Volatile Organics	SW8015 Diesel / Gasoline	SW8081 Pesticides	SW8082 PCBs	SW8270 SVOCs	SW8270 SIM PAHs	SW6010 / ~~7470 / 7471~~ Metals	E218.6 Chromium VI	E300/310.1/160.1 CL/S/ALK/TDS	E353.3/E415.1 N / TOC	RSK 175	E376.2 Sulfide	E314.0 Perchlorate	Matrix Type	Container Type	Number of Containers	Filtered Sample	Observations
1.	V2MW8M	11/7/05	1150	X				X	X								W	G	13		MS/MSD
2.	V2MW8F	↓	1155							X							W	P	1	X	
3.	V2MW11F		1300							X							W	P	1	X	
4.	V2MW12F		1350							X							W	P	1	X	
5.	V2TB1112		0910	X													W	G	2		

MW

MATRIX TYPE: S = Soil, W = Water, SD = Sediment
CONTAINER TYPE: E = Encore; G = Glass, SS = Stainless Steel, P = Plastic
PRESERVATIVES: All samples are preserved at 4° C. Water samples are preserved as indicated on the sample labels.
TEMPERATURE BLANK EACH COOLER: YES NO

RELINQUISHED BY:	SIGNATURE:		DATE:	TIME:	TOTAL NUMBER OF CONTAINERS
Brian Dow	[signature]	TETRA TECH, INC.	11/8/05	1015	18
RECEIVED BY: GEORGE LIM	SIGNATURE: [signature]	COMPANY: EMAX	DATE: 11/8/05	TIME: 10:15	METHOD OF SHIPMENT: courier
RELINQUISHED BY: GEORGE LIM	SIGNATURE: [signature]	COMPANY: EMAX	DATE: 11/8/05	TIME: 12:25	SPECIAL SHIPMENT/HANDLING/STORAGE REQUIREMENTS:
RECEIVED BY: SITNIKOV	SIGNATURE: [signature]	COMPANY: EMAX LAB.	DATE: 11.08.05	TIME: 12:25	

Cooler #1 T = 3.8°C
Cooler #2 T = 3.5°C

1001

Tt-IRP-009 (04/26/05)

DISTRIBUTION: White = Lab Canary = Client Pink = Tetra Tech, Inc.

APPENDIX C SUPPORTING TABLES AND HYDROGRAPH

Table C-1
Summary of SVOCs and PAHs
EPA Methods SW8270C and
SW8270C SIM (µg/L)
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Indeno(1,2,3-cd)pyrene (by SW8270C)										
	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02	Spr-02	Sum-02	Fall-02	Win-03	Spr-03
2-MW-1	NA	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA
2-MW-5	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-6	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-MW-9	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-11	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-MW-12	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
OS-MW-2	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND	NA

	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Fall-05
2-MW-1	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-3	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-5	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-8	ND	ND	ND	ND	ND	ND	0.27	ND	ND	ND
2-MW-9	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
OS-MW-2	ND	NA	4.27	NA	ND	NA	ND	NA	ND	NA

Table C-1
Summary of SVOCs and PAHs
EPA Methods SW8270C and
SW8270C SIM (µg/L)
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	2-Methylnaphthalene (by SW8270C)										
	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02	Spr-02	Sum-02	Fall-02	Win-03	Spr-03
2-MW-1	NA	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA
2-MW-5	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-6	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-8	ND	ND	ND	6.3	5.7	23	ND	21	ND	28	21.3
2-MW-9	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-11	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-MW-12	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
OS-MW-2	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND	NA

	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Fall-05
2-MW-1	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-3	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-5	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-8	25.1	32.0	38.2	9.5	9.7	25	21	25	18	13
2-MW-9	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
OS-MW-2	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA

Table C-1
Summary of SVOCs and PAHs
EPA Methods SW8270C and
SW8270C SIM (µg/L)
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Naphthalene [a] (by SW8270C)										
	Fall-00	Win-01	Spr-01	Sum-01	Fall-01	Win-02	Spr-02	Sum-02	Fall-02	Win-03	Spr-03
2-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-3	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA
2-MW-5	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-6	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-7	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-8	ND	ND	NA	5.3	ND	21	10	18	12	16	15.2
2-MW-9	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
2-MW-10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
2-MW-11	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-MW-12	NA	NA	ND	ND	ND	ND	ND	ND	NA	NA	NA
OS-MW-1	ND	ND	ND	ND	ND	ND	NA	ND	NA	ND	NA
OS-MW-2	NA	NA	ND	ND	ND	ND	NA	ND	NA	ND	NA

	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Fall-05
2-MW-1	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-3	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-5	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-7	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-8	18.5	25.7	28.8	9.7	9.2	21	17	22	16	12
2-MW-9	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
2-MW-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-MW-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OS-MW-1	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
OS-MW-2	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA

Table C-1
Summary of SVOCs and PAHs
EPA Methods SW8270C and
SW8270C SIM (µg/L)
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

	Naphthalene [a] (by SW8270C SIM)				
	Fall-04	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-8	14	15	18	11	10
OS-MW-2	ND	ND	NA	ND	NA

	Indeno(1,2,3-cd)pyrene (by SW8270C SIM)				
	Fall-04	**Win-05**	**Spr-05**	**Sum-05**	**Fall-05**
2-MW-8	ND	0.27	ND	ND	ND
OS-MW-2	ND	ND	NA	ND	NA

Definition(s):

µg/L - micrograms per liter
NA - not analyzed
ND - not detected; result is less than the method detection limit

Note(s):

a - The California Department of Health Services (DHS) notification level for naphthalene is 17 µg/L.

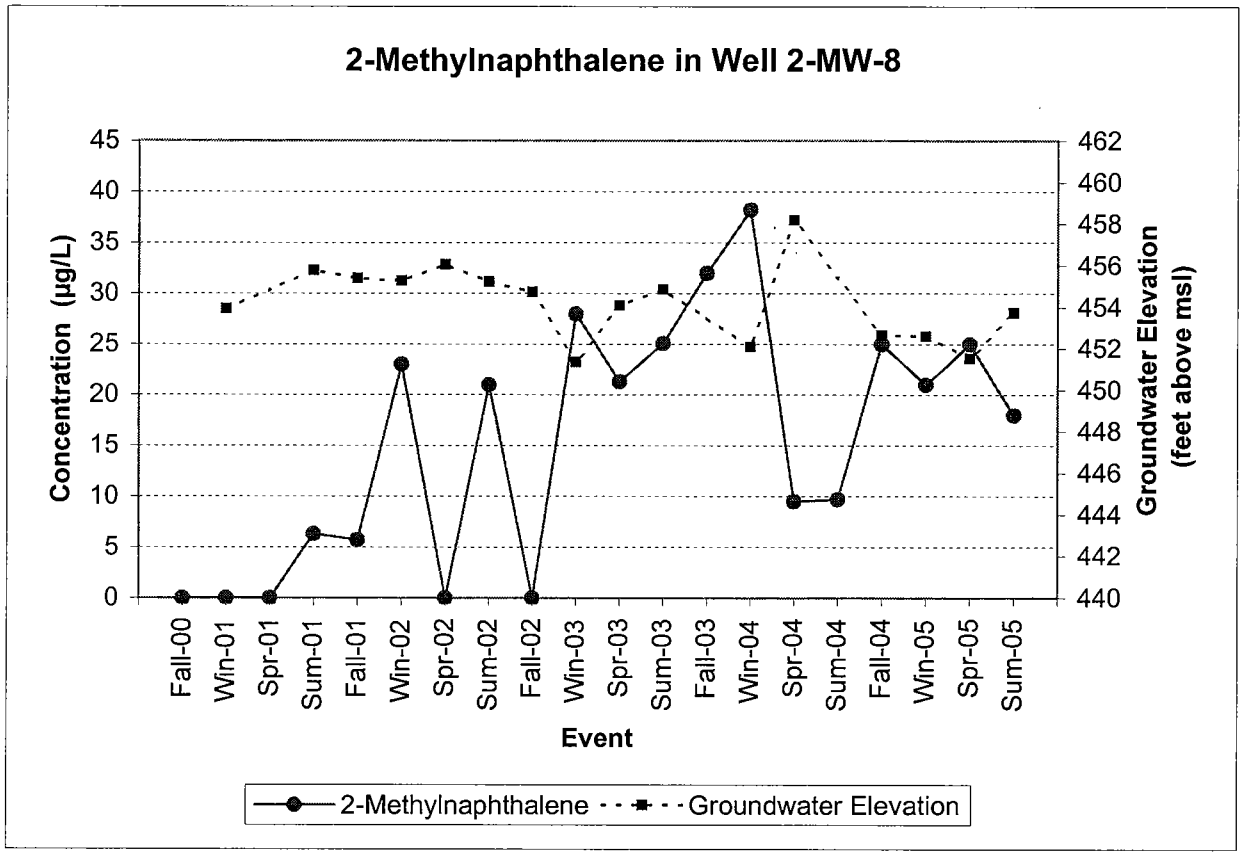
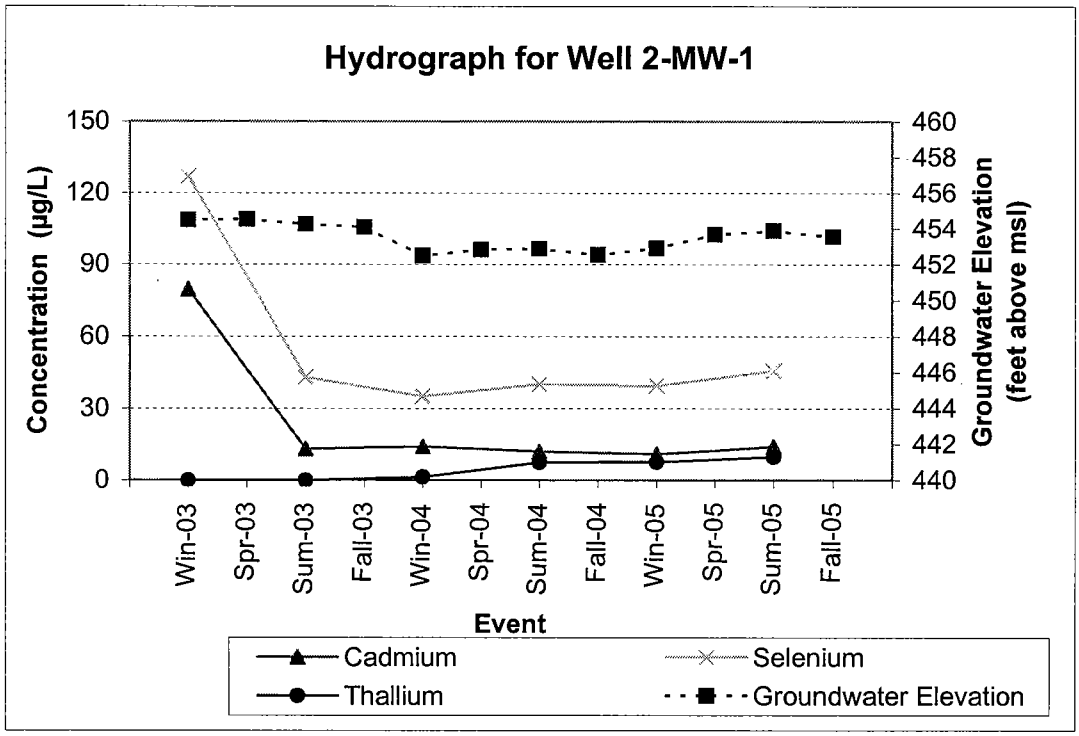


Figure C-1. Historic concentrations of 2-Methylnaphthalene in Groundwater from well 2-MW-8. The compound has only been detected in groundwater from well 2-MW-8.

APPENDIX D METALS HYDROGRAPHS



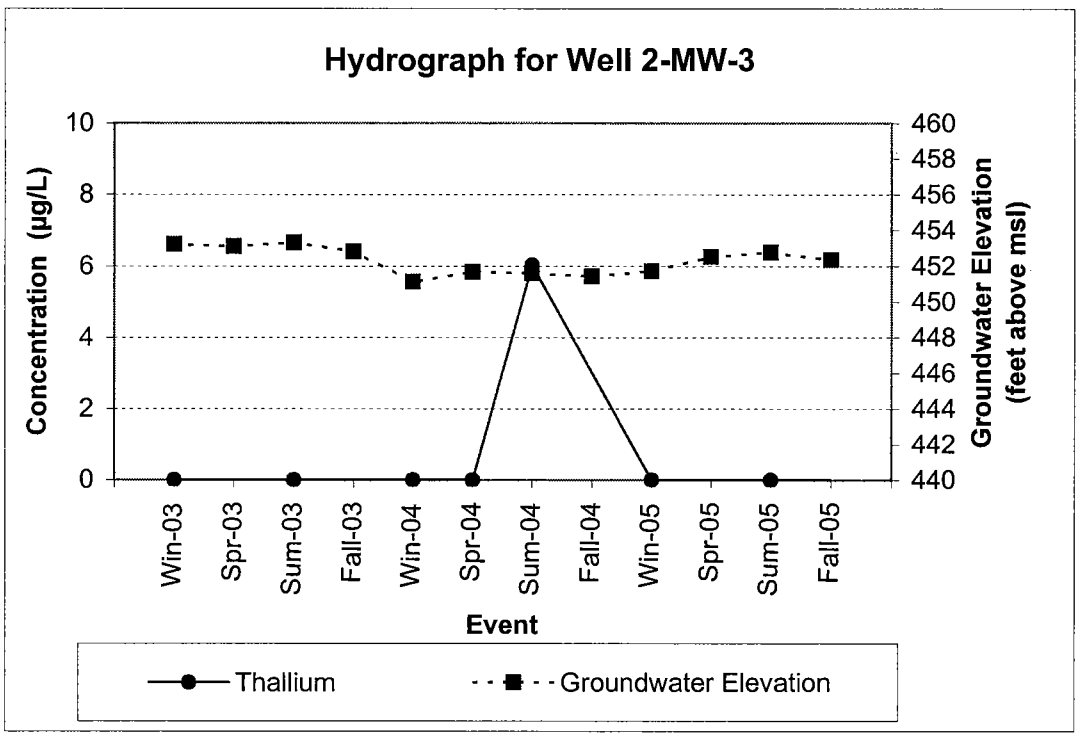
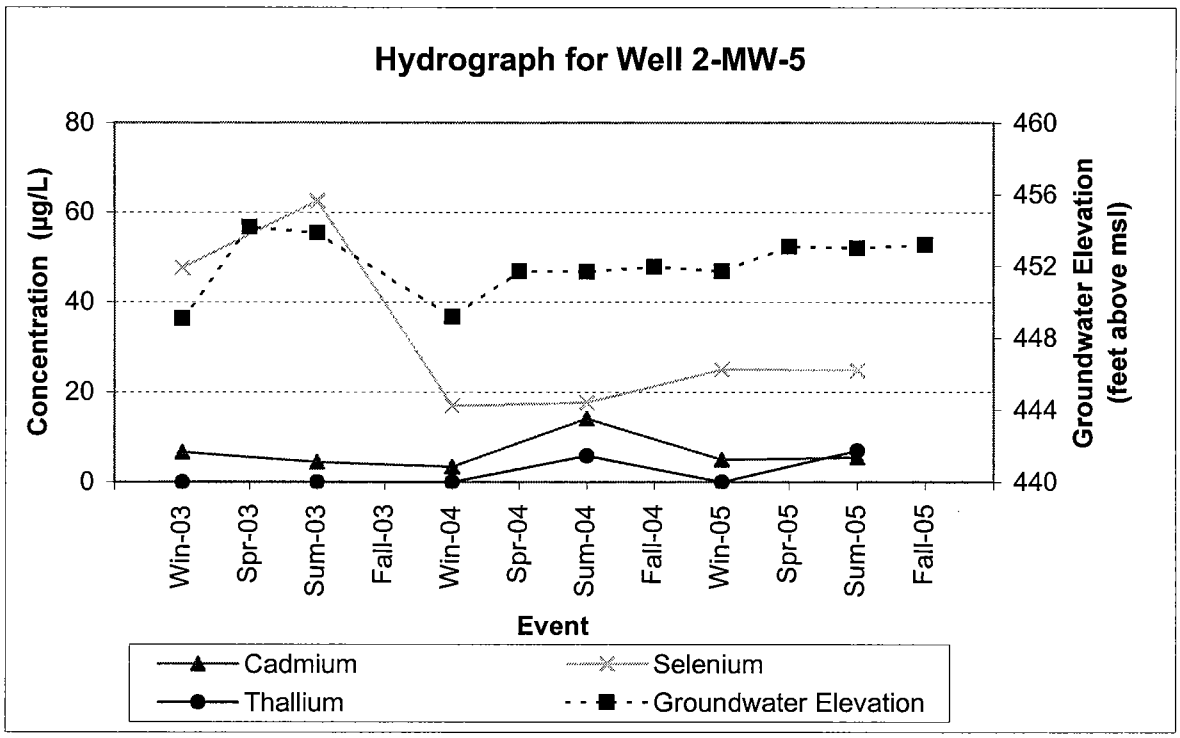


Figure D-1. Historical Concentrations of Key Metals COCs in Groundwater from all Site 2 BGMP wells.



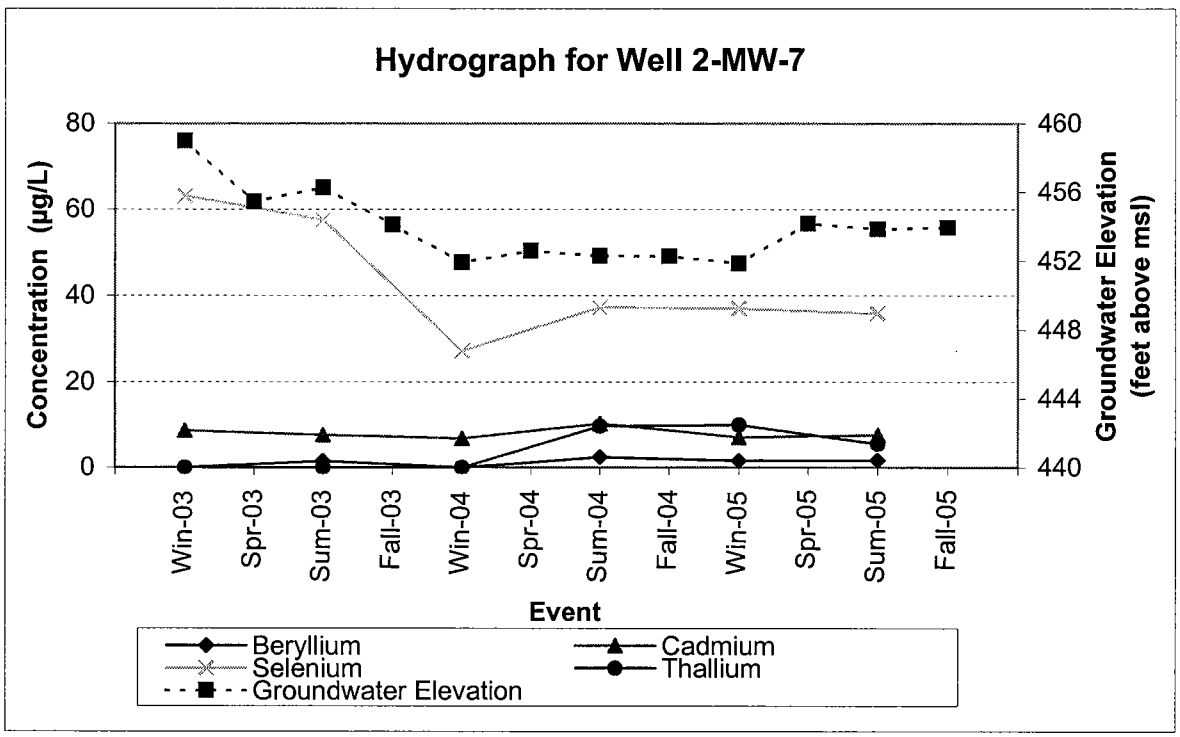


Figure D-1 (cont'd). Historical Concentrations of Key Metals COCs in Groundwater from all Site 2 BGMP wells.

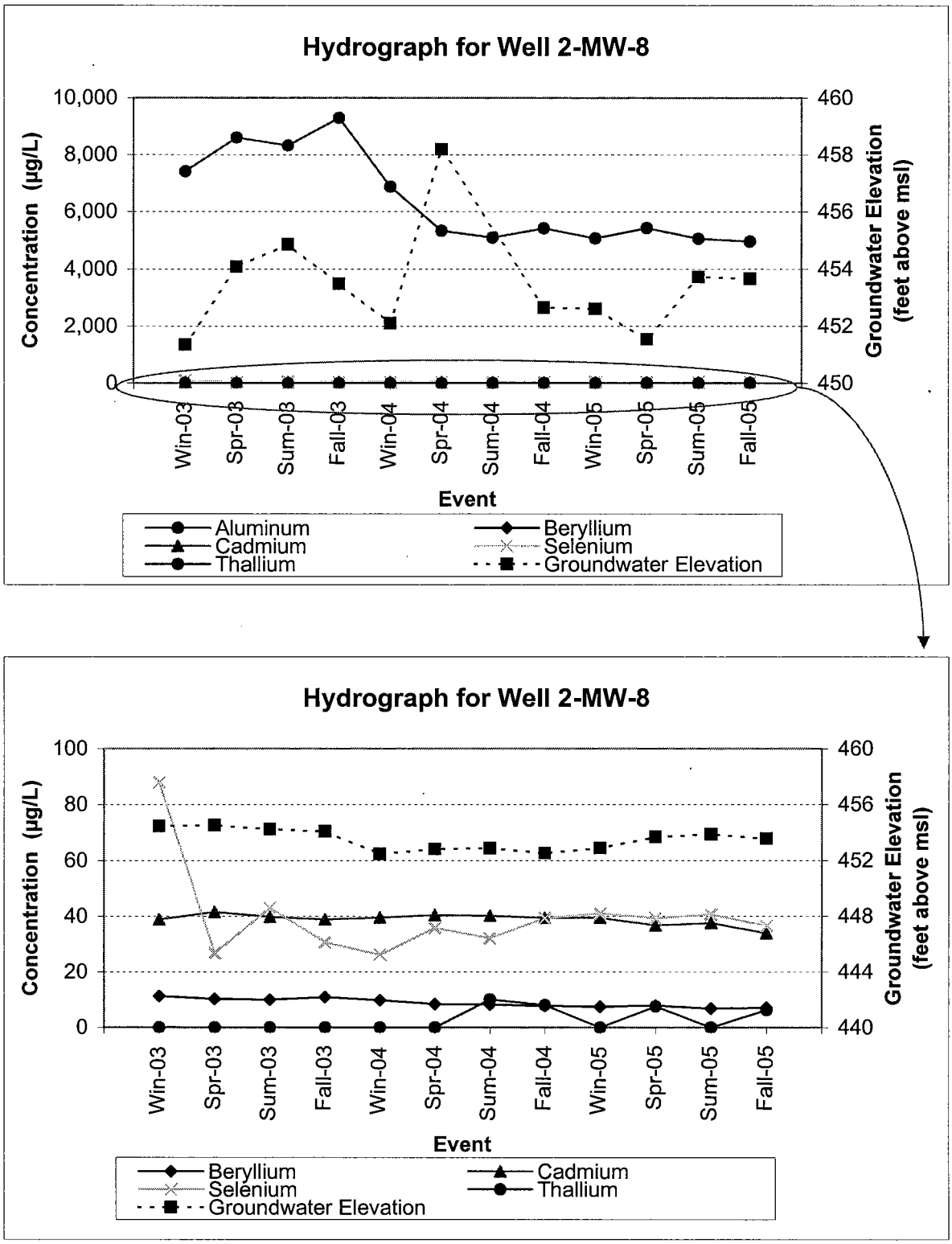
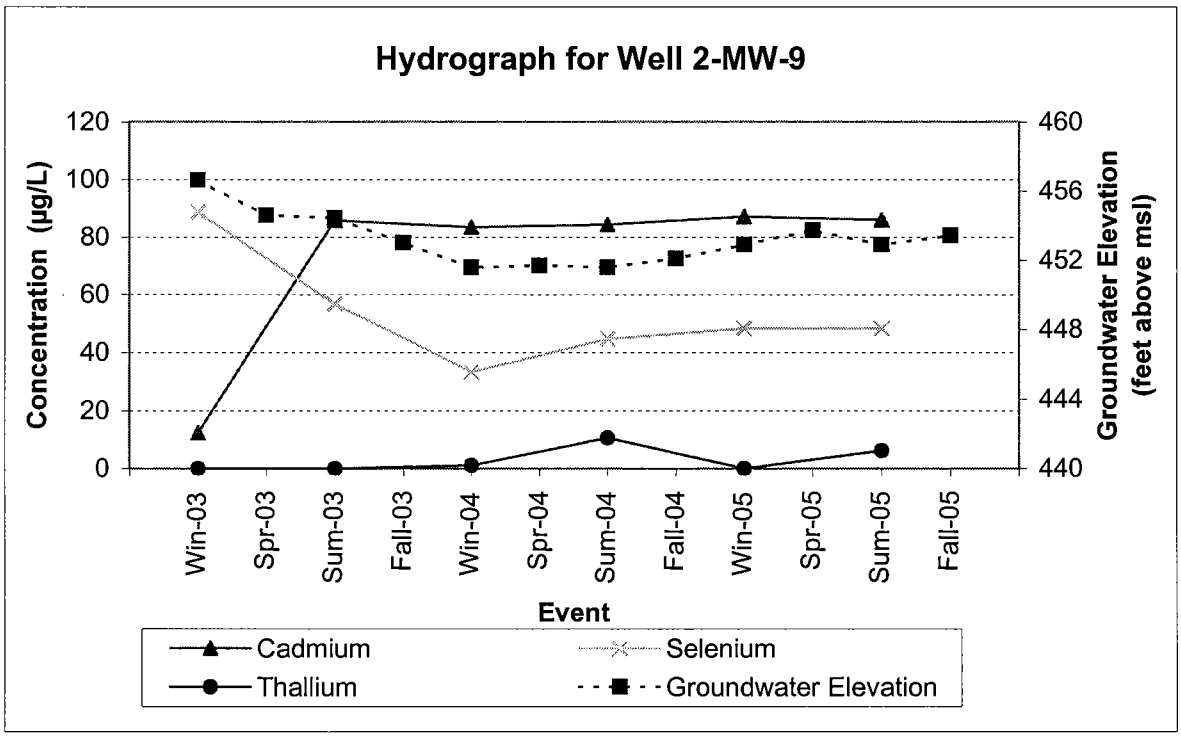


Figure D-1 (cont'd). Historical Concentrations of Key Metals COCs in Groundwater from all Site 2 BGMP wells.



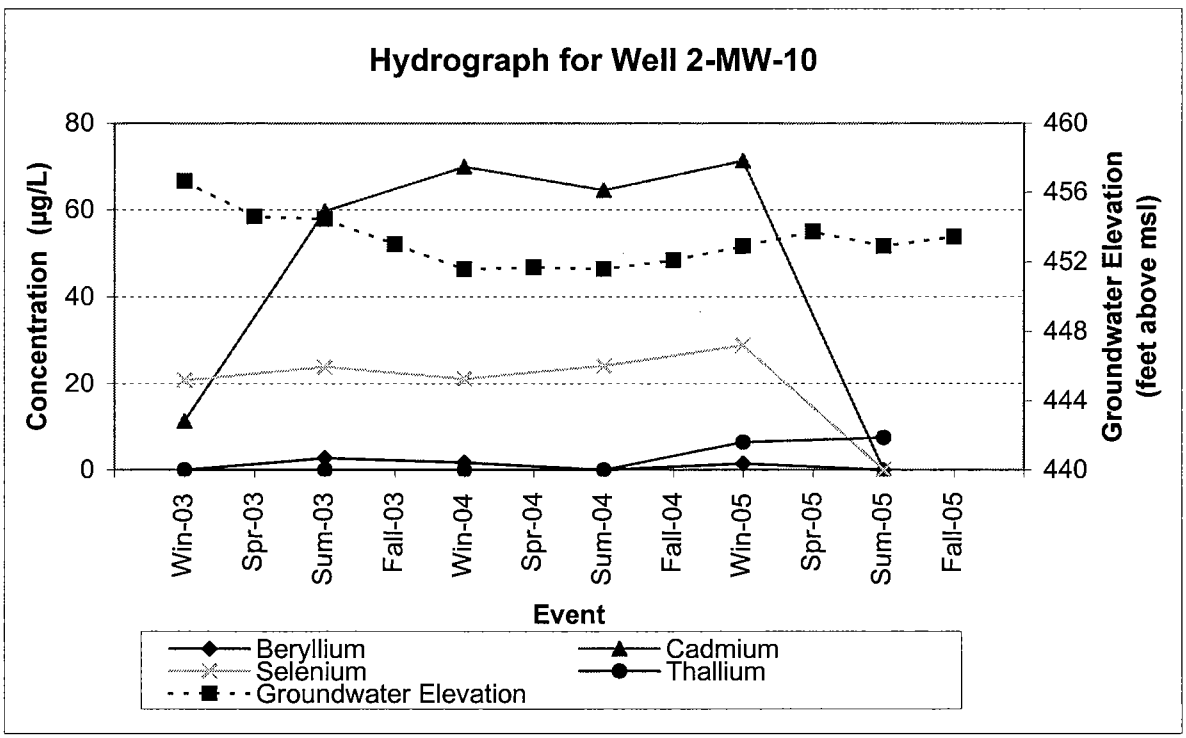
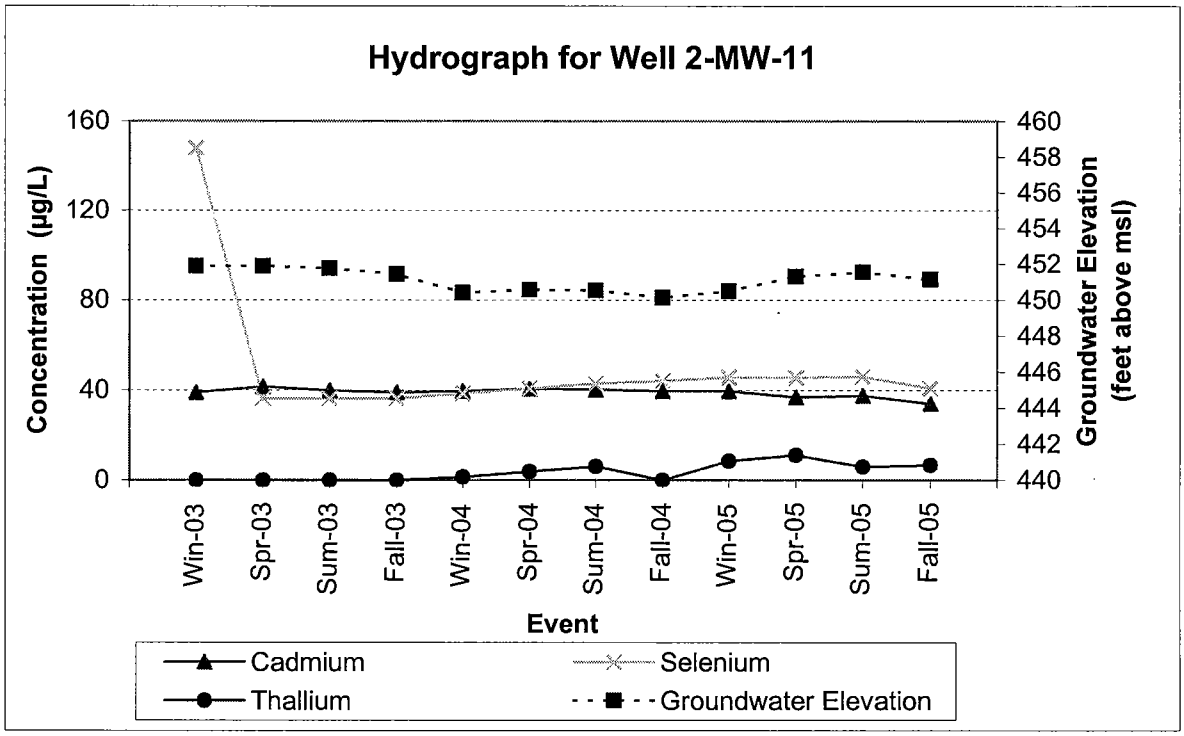


Figure D-1 (cont'd). Historical Concentrations of Key Metals COCs in Groundwater from all Site 2 BGMP wells.



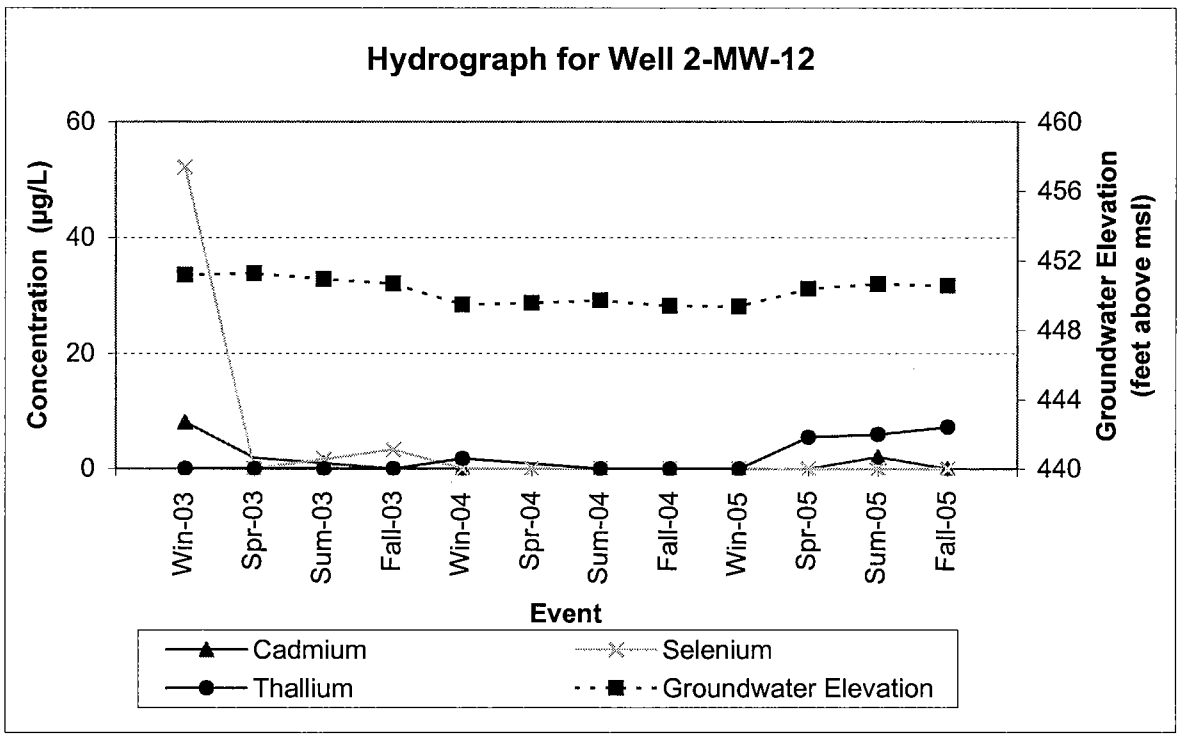
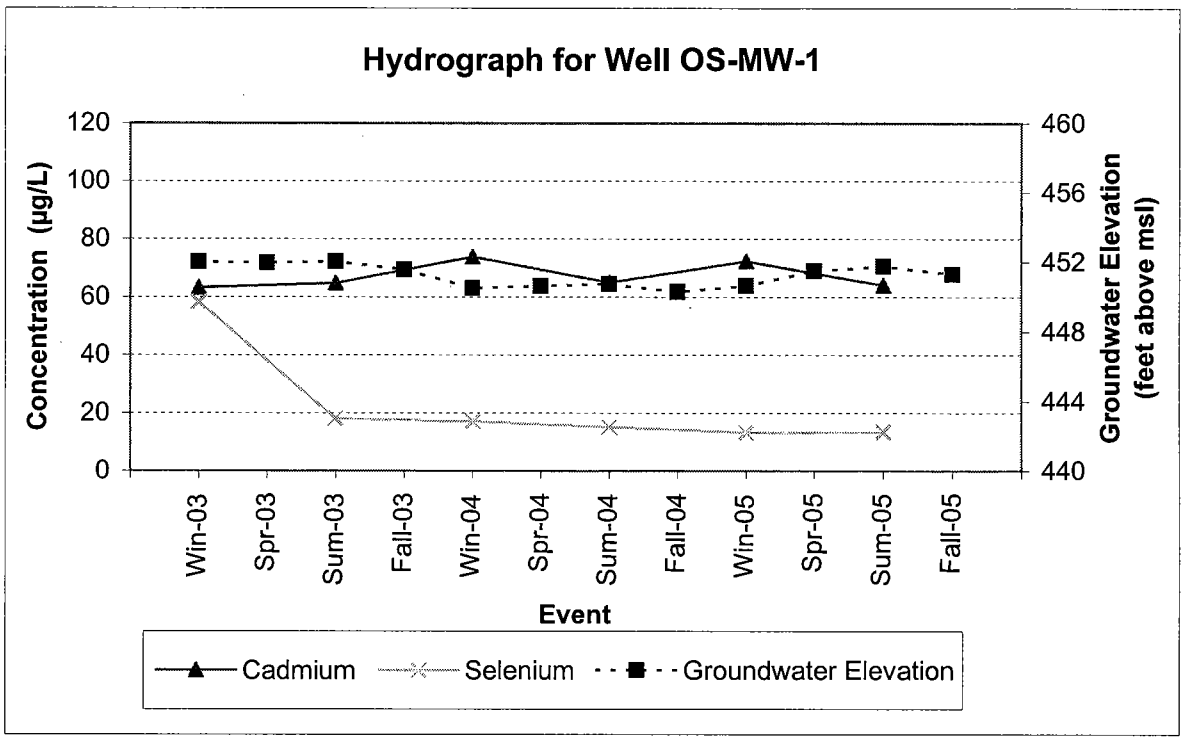


Figure D-1 (cont'd). Historical Concentrations of Key Metals COCs in Groundwater from all Site 2 BGMP wells.



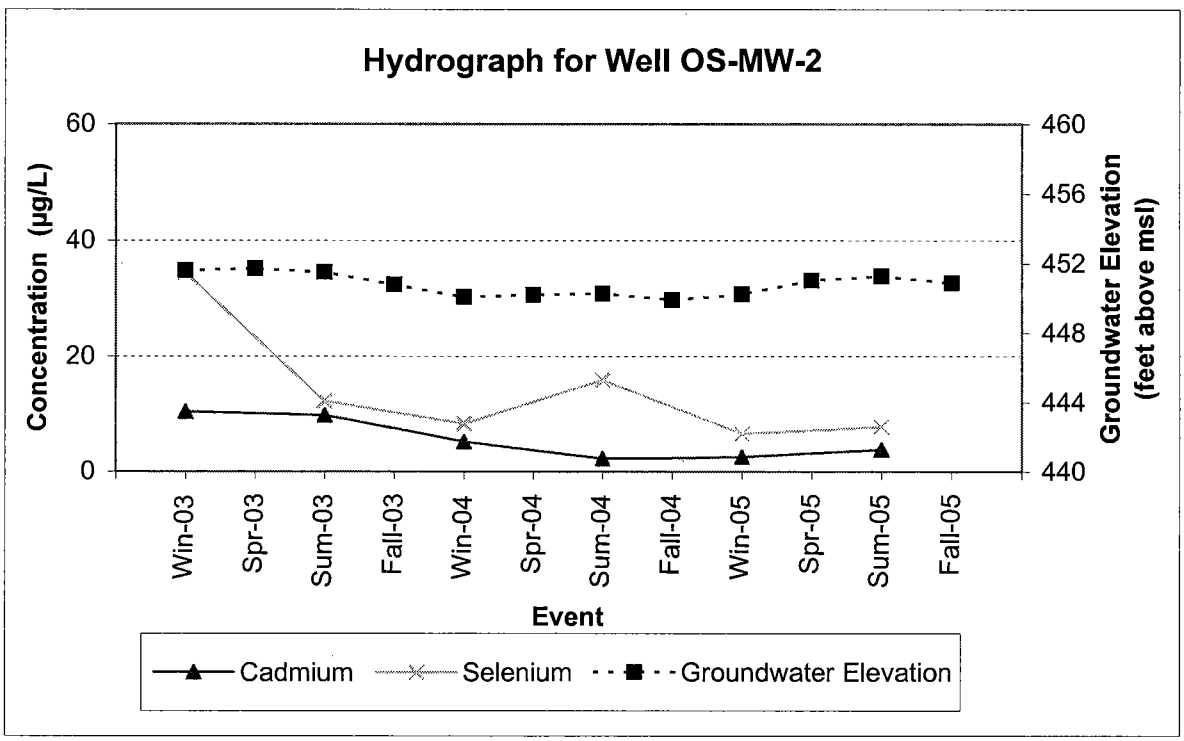


Figure D-1 (cont'd). Historical Concentrations of Key Metals COCs in Groundwater from all Site 2 BGMP wells.

APPENDIX E SUPPORTING TABLES

Table 4
TPH as Gasoline, SVOCs, and PAHs in Groundwater
Summer 2005
EPA Methods SW8015B, SW8270C, and SW8270C SIM
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

			TPH as gasoline (mg/L)	SVOCs (µg/L)				PAHs (µg/L)	
Sample Location	**Sample ID**	**Collection Date**		**bis(2-Ethylhexyl) phthalate**	**2-Methylnaphthalene**	**Naphthalene**	**All Other Target Analytes**	**Naphthalene**	**All Other Target Analytes**
		MDL[1]	0.02	2.3	1.8	1.6	N/A	0.024	N/A
		PQL[1]	0.1	10	10	10	N/A	1.0	N/A
2-MW-1	V2MW1	03-Aug-05	NA	4.8 U g	4.8 U g	4.8 U g	ND	NA	ND
2-MW-1	V99W547 (D)	03-Aug-05	NA	5 U g	5 U g	5 U g	ND	NA	ND
2-MW-3	V2MW3	01-Aug-05	NA	14 g	4.8 U g	4.8 U g	ND	NA	ND
2-MW-5	V2MW5	02-Aug-05	NA	4.9 U g	4.9 U g	4.9 U g	ND	NA	ND
2-MW-7	V2MW7	02-Aug-05	0.2 g	4.9 U g	4.9 U g	4.9 U g	ND	NA	ND
2-MW-8	V2MW8	02-Aug-05	1.4 g	4.9 U g	18 g	16 g	ND	11 g	ND
2-MW-9	V2MW9	02-Aug-05	0.02 U g	4.9 U g	4.9 U g	4.9 U g	ND	NA	ND
OS-MW-1	VOSMW1	01-Aug-05	0.02 U g	4.9 U g	4.9 U g	4.9 U g	ND	NA	ND
OS-MW-1	V99W539 (D)	01-Aug-05	0.02 U g	4.8 U g	4.8 U g	4.8 U g	ND	NA	ND
OS-MW-2	VOSMW2M	03-Aug-05	0.02 U g	4.8 U g	4.8 U g	4.8 U g	ND	0.19 U g	ND

Data Validity Qualifier(s):

U - The analyte was not detected at or above the MDL.

Data Validity Comment(s):

g - The data met prescribed criteria as detailed in the QAPP.

Definition(s):

(D) - duplicate sample
MDL - method detection limit
µg/L - micrograms per liter
mg/L - milligrams per liter
N/A - not applicable
NA - not analyzed
ND - not detected; result is less than the MCL
PAH - polynuclear aromatic hydrocarbon
PQL - practical quantitation limit
QAPP - Quality Assurance Project Plan
SIM - selected ion monitoring
SVOC - semivolatile organic compound
TPH - total petroleum hydrocarbons

Note(s):

1 - Values from QAPP Addendum (U.S. Air Force 2004a).

Table 4
TPH, SVOCs, and PAHs in Groundwater
Winter 2005
EPA Methods SW8015B, SW8270C, and SW8270C SIM
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

			TPH	SVOCs				PAHs		
Sample Location	**Sample ID**	**Collection Date**	**TPH as Gasoline (mg/L)**	**Naphthalene (µg/L)**	**2-Methylnaphthalene (µg/L)**	**bis(2-Ethylhexyl)phthalate (µg/L)**	**SVOCs All Other Target Analytes (µg/L)**	**Indeno(1,2,3-c,d) pyrene (µg/L)**	**Naphthalene (µg/L)**	**PAHs All Other Target Analytes (µg/L)**
		MDL[1]	0.02	1.6	1.8	2.3	N/A	0.014	0.024	N/A
		PQL[1]	0.1	10	10	10	N/A	0.2	1.0	N/A
2-MW-1	V2MW1	15-Feb-05	NA	4.7 U g	4.7 U g	4.7 U g	ND	NA	NA	NA
2-MW-3	V2MW3	15-Feb-05	NA	4.7 U g	4.7 U g	4.7 U g	ND	NA	NA	NA
2-MW-5	V2MW5	16-Feb-05	NA	4.7 U g	4.7 U g	4.7 U g	ND	NA	NA	NA
2-MW-7	V2MW7	16-Feb-05	NA	4.7 U g	4.7 U g	4.7 U g	ND	NA	NA	NA
2-MW-8	V2MW8	16-Feb-05	NA	17 g	21 g	4.7 U g	ND	0.27 J q	15 g	ND
2-MW-8	V99W490 (D)	16-Feb-05	NA	16 g	20 g	4.7 U g	ND	NA	NA	NA
2-MW-9	V2MW9	16-Feb-05	NA	4.7 U g	4.7 U g	4.7 U g	ND	NA	NA	NA
OS-MW-1	VOSMW1M	15-Feb-05	NA	4.7 U g	4.7 U g	4.7 U g	ND	NA	NA	NA
OS-MW-2	VOSMW2	16-Feb-05	0.02 U g	4.7 U g	4.7 U g	4.7 U g	ND	0.19 U g	0.19 U g	ND
OS-MW-2	V99W489 (D)	16-Feb-05	0.02 U g	4.7 U g	4.7 U g	7 J q	ND	NA	NA	NA

Data Validity Qualifier(s):

J - The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.
U - The analyte was not detected at or above the MDL.

Data Validity Comment(s):

g - The data met prescribed criteria as detailed in the QAPP.
q - The analyte detection was below the PQL.

Definition(s):

(D) - duplicate sample
MDL - method detection limit
µg/L - micrograms per liter
mg/L - milligrams per liter
N/A - not applicable
NA - not analyzed
ND - not detected; result is less than the MDL
PAH - polynuclear aromatic hydrocarbon
PQL - practical quantitation limit
QAPP - Quality Assurance Project Plan
SIM - selected ion monitoring
SVOC - semivolatile organic compound
TPH - total petroleum hydrocarbons

Note(s):

1 - Values from QAPP Addendum (U.S. Air Force 2004a).

Table 5
TPHg and SVOCs in Groundwater
Summer 2004
EPA Methods SW8015B and SW8270C
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

Sample Location	Sample ID	Collection Date		TPH as Gasoline (mg/L)	Naphthalene (µg/L)	2-Methylnaphthalene (µg/L)	SVOCs All Other Target Analytes (µg/L)
			MDL[1]	0.02	1.6	1.8	N/A
			PQL[1]	0.1	10	10	N/A
2-MW-1	V2MW1	10-Aug-04		NA	4.8 U g	4.8 U g	ND
2-MW-3	V2MW3	10-Aug-04		NA	4.7 U g	4.7 U g	ND
2-MW-5	V2MW5	09-Aug-04		NA	4.9 U g	4.9 U g	ND
2-MW-7	V2MW7	09-Aug-04		0.1 g	4.9 U g	4.9 U g	ND
2-MW-8	V2MW8	09-Aug-04		1.2 g	9.2 J q	9.7 g	ND
2-MW-9	V2MW9	09-Aug-04		0.02 U g	4.8 U g	4.8 U g	ND
OS-MW-1	VOSMW1M	11-Aug-04		0.02 U g	4.8 U g	4.8 U g	ND
OS-MW-2	VOSMW2	11-Aug-04		0.02 U g	4.8 U g	4.8 U g	ND
OS-MW-2	V99W412 (D)	11-Aug-04		0.02 U g	4.8 U g	4.8 U g	ND

Data Validity Qualifiers:

J - The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.
U - The analyte was not detected at or above the MDL.

Data Validity Comments:

g - The data met prescribed criteria as detailed in the QAPP.
q - The analyte detection was below the PQL.

Definitions:

(D) - duplicate sample
MDL - method detection limit
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - not analyzed
N/A - not applicable
ND - not detected; result is less than the MDL
PQL - practical quantitation limit
QAPP - Quality Assurance Project Plan
SVOC - semivolatile organic compound
TPHg - total petroleum hydrocarbons as gasoline

Note:

1 - Values from QAPP Addendum (U.S. Air Force 2004a).

Table 4
TPH and SVOCs in Groundwater
Winter 2004
EPA Methods SW8015B and SW8270C
IRP Site 2 (Old Base Service Station)
Vandenberg AFB, California

Sample Location	Sample ID	Collection Date		TPH as Gasoline (mg/L)	Naphthalene (µg/L)	2-Methylnaphthalene (µg/L)	Indeno(1,2,3-cd)pyrene (µg/L)	SVOCs All Other Target Analytes (µg/L)
			MDL[1]	0.019	1.63	1.76	2.78	N/A
			PQL[1]	0.1	10	10	10	N/A
2-MW-1	V2MW1	16-Feb-04		NA	1.64 U g	1.33 U g	2.25 U g	N/A
2-MW-3	V2MW3	16-Feb-04		NA	1.64 U g	1.33 U g	2.25 U g	N/A
2-MW-5	V2MW5	17-Feb-04		NA	1.64 U g	1.33 U g	2.25 U g	N/A
2-MW-7	V2MW7	17-Feb-04		0.09 B J a, q	1.64 U g	1.33 U g	2.25 U g	N/A
2-MW-8	V2MW8	17-Feb-04		2.55 g	28.8 g	38.2 g	2.25 U g	N/A
2-MW-9	V2MW9	17-Feb-04		0.02 B J a, q	1.64 U g	1.33 U g	2.25 U g	N/A
OS-MW-1	VOSMW1M	16-Feb-04		0.02 B J a, q	1.64 U g	1.33 U g	2.25 U g	N/A
OS-MW-1	V99W362 (D)	16-Feb-04		0.02 B J a, q	1.64 U g	1.33 U g	2.25 U g	N/A
OS-MW-2	VOSMW2	16-Feb-04		0.03 B J a, q	1.64 U g	1.33 U g	4.47 J q	N/A

Data Validity Qualifiers:

B - The sample result is less than 5 times (10 times for common organic laboratory contaminants) the blank contamination. The result is considered not to have originated from the environmental sample, because cross-contamination is suspected.
J - The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.
U - The analyte was not detected at or above the MDL.

Data Validity Comments:

a - The analyte was found in the method blank.
g - The data met prescribed criteria as detailed in the QAPP.
q - The analyte detection was below the PQL.

Definitions:

(D) - duplicate sample
MDL - method detection limit
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - not analyzed
N/A - not applicable
ND - not detected; result is less than the MDL
PQL - practical quantitation limit
QAPP - Quality Assurance Project Plan
SAP - Sampling and Analysis Plan
SVOC - semivolatile organic compound
TPH - total petroleum hydrocarbons

Note:

1 - Values from SAP Addendum (U.S. Air Force 2000a).