Semiannual Groundwater Monitoring Report
Third Quarter and Fourth Quarter 2009
Lockheed Martin Corporation
Beaumont Site 1, Beaumont, California

Prepared for:

LOCKHEED MARTIN

TETRA TECH

301 E. Vanderbilt Way, Suite 450
San Bernardino, California 92408

TC# 23521-0103 / April 2010

Lockheed Martin Corporation, Shared Services
Energy, Environment, Safety and Health
2950 North Hollywood Way, Suite 125 Burbank, CA 91505
Telephone: 818.847.0197 Facsimile: 818.847.0256

LOCKHEED MARTIN

April 27, 2010

Mr. Daniel Zogaib
Southern California Cleanup Operations
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Subject: Submittal of *Semiannual Groundwater Monitoring Report, Third Quarter and Fourth Quarter 2009, Lockheed Martin Corporation, Beaumont Site 1, Beaumont, California*

Dear Mr. Zogaib:

Please find enclosed one hard copy of the body of the report and two CDs of the report body and appendices of the *Semiannual Groundwater Monitoring Report, Third Quarter and Fourth Quarter 2009, Lockheed Martin Corporation, Beaumont Site 1, Beaumont, California* for your approval or comments.

If you have any questions regarding this submittal or the status of site activities, please contact me at 408.756.9595 or denise.kato@lmco.com.

Sincerely,

Denise Kato

Denise Kato
Remediation Analyst Senior Staff

Enclosure

Copy with Enc:
Gene Matsushita, LMC (hard copy & electronic copy)
Ian Lo, CDM (electronic copy)
Tom Villeneuve, Tetra Tech, Inc. (hard copy & electronic copy)

BUR090 Beau 1 Q3 Q4 GWMR

Semi-annual Groundwater Monitoring Report
Third Quarter and Fourth Quarter 2009
Beaumont Site 1, Beaumont, California

Prepared for:

Lockheed Martin Corporation

Prepared by:

Tetra Tech, Inc.

April 2010

Christopher Patrick
Environmental Scientist

Bill Muir, PG (6762)
Deputy Program Manager

PROFESSIONAL GEOLOGIST
WILLIAM
MUIR
No. 6762
Exp. 7/31/11
STATE OF CALIFORNIA

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

ACRONYMS

B	The result is < 5 times the blank contamination. Cross contamination is suspected.
bgs	below ground surface
BPA	burn pit area
COPC	chemical of potential concern
COV	coefficient of variation
CSM	conceptual site model
1,1 DCA	1,1 dichloroethane
1,2 DCA	1,2 dichloroethane
1,1 DCE	1,1 dichloroethene
cis 1,2-DCE	cis 1,2-dichloroethene
DO	dissolved oxygen
DWNL	California drinking water notification level
DTSC	Department of Toxic Substances Control
e	A holding time violation occurred.
EC	electrical conductivity
EPA	United States Environmental Protection Agency
f	The duplicate relative percent difference was outside the control limit.
ft/day	feet per day
GMP	Groundwater Monitoring Program
GPS	global positioning system
GR	weathered granite / boulder

HCP	Habitat Conservation Plan
IUOE	International Union of Operating Engineers
J	The analyte was positively identified, but the analyte concentration is an estimated value.
K	hydraulic conductivity
k	The analyte was found in the field blank.
LEB	equipment blank
LMC	Lockheed Martin Corporation
LPC	Lockheed Propulsion Company
LTB	trip blank
MCL	Maximum Contaminant Level
MCEA	Massacre Canyon Entrance Area
MDLs	method detection limits
MEF	Mount Eden formation
MeV	Million electronic volts
mg/L	milligrams per liter
µg/L	microgram per liter
µg/L/yr	microgram per liter per year
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
MTBE	methyl-tert butyl ether
NA	not analyzed / applicable
NPCA	Northern Potrero Creek Area
NTUs	nephelometric turbidity units
NWS	National Weather Service
ORP	oxidation-reduction potential

PQL	practical quantitation limit
q	The analyte detection was below the practical quantitation limit.
QAL	Quaternary alluvium
QA/QC	quality assurance/quality control
Radian	Radian Corporation, Inc.
Report	Supplemental Site Investigation Report
RMPA	Rocket Motor Production Area
S	Mann-Kendall statistic
SKR	Stephens' Kangaroo Rat
Tetra Tech	Tetra Tech, Inc.
TOC	top of casing
TCE	trichloroethene
TNT	2,4,6-trinitrotoluene
1,1,1 TCA	1,1,1 trichloroethane
1,1,2 – TCA	1,1,2 trichloroethane
U	The analyte was not detected above the method detection limit.
UG	upgradient
USFWS	United States Fish and Wildlife Service
VOCs	volatile organic compounds

SECTION 1 INTRODUCTION

This Semi-annual Groundwater Monitoring Report (Report) has been prepared by Tetra Tech, Inc. (Tetra Tech), on behalf of Lockheed Martin Corporation (LMC), and presents the results of the Third Quarter 2009 and Fourth Quarter 2009 water quality monitoring activities of the Beaumont Site 1 (Site) Groundwater Monitoring Program (GMP). The Site is located south of the City of Beaumont, Riverside County, California (Figure 1-1). Currently, the Site is inactive with the exception of remedial activities performed under Consent Order 88/89 034 and Operation and Maintenance Agreement (O&M Agreement) 93/94 025 with the Department of Toxic Substances Control (DTSC). The State of California owns the 9,117 acre site, and LMC maintains a conservation easement over 565 acres (Figure 1-2).

The GMP has a quarterly/semi-annual/annual/biennial monitoring frequency with both groundwater and surface water collected and sampled as part of the GMP. The annual and biennial events are larger major monitoring events, and the quarterly and semi-annual events are smaller minor events. All new wells are sampled quarterly for one year. The semi-annual wells are sampled second and fourth quarter of each year, annual wells are sampled the second quarter of each year, and the biennial wells are sampled during the second quarter of even numbered years.

The objectives of this Report are to:

- Briefly summarize the site history;
- Document water quality monitoring procedures and results; and
- Analyze and evaluate the water quality monitoring data generated.

This Report is organized into the following sections: 1) Introduction, 2) Summary of Monitoring Activities, 3) Groundwater Monitoring Results, 4) Summary and Conclusions, 5) References, and 6) Acronyms. A brief description of the previous site environmental investigations and the current conceptual site model (CSM) can be found in Appendix A.

1.1 SITE BACKGROUND

The Site is a 9,117 acre parcel located south of Beaumont, California. The Site was primarily used for ranching prior to 1960. From 1960 to 1974, the Site was used by Lockheed Propulsion Company (LPC) for solid rocket motor and ballistics testing (Tetra Tech, 2003a). Activities at the Site also included burning of process chemicals and waste rocket propellants in an area commonly referred to as the burn pit area (BPA).

Nine primary historical operational areas have been identified at the Site. A site historical operational areas and features map is presented as Figure 1-2. Historical operational areas were used for various activities associated with rocket motor assembly, testing, and propellant incineration. A brief description of each historical operational area follows:

Historical Operational Area A – Eastern Aerojet Range

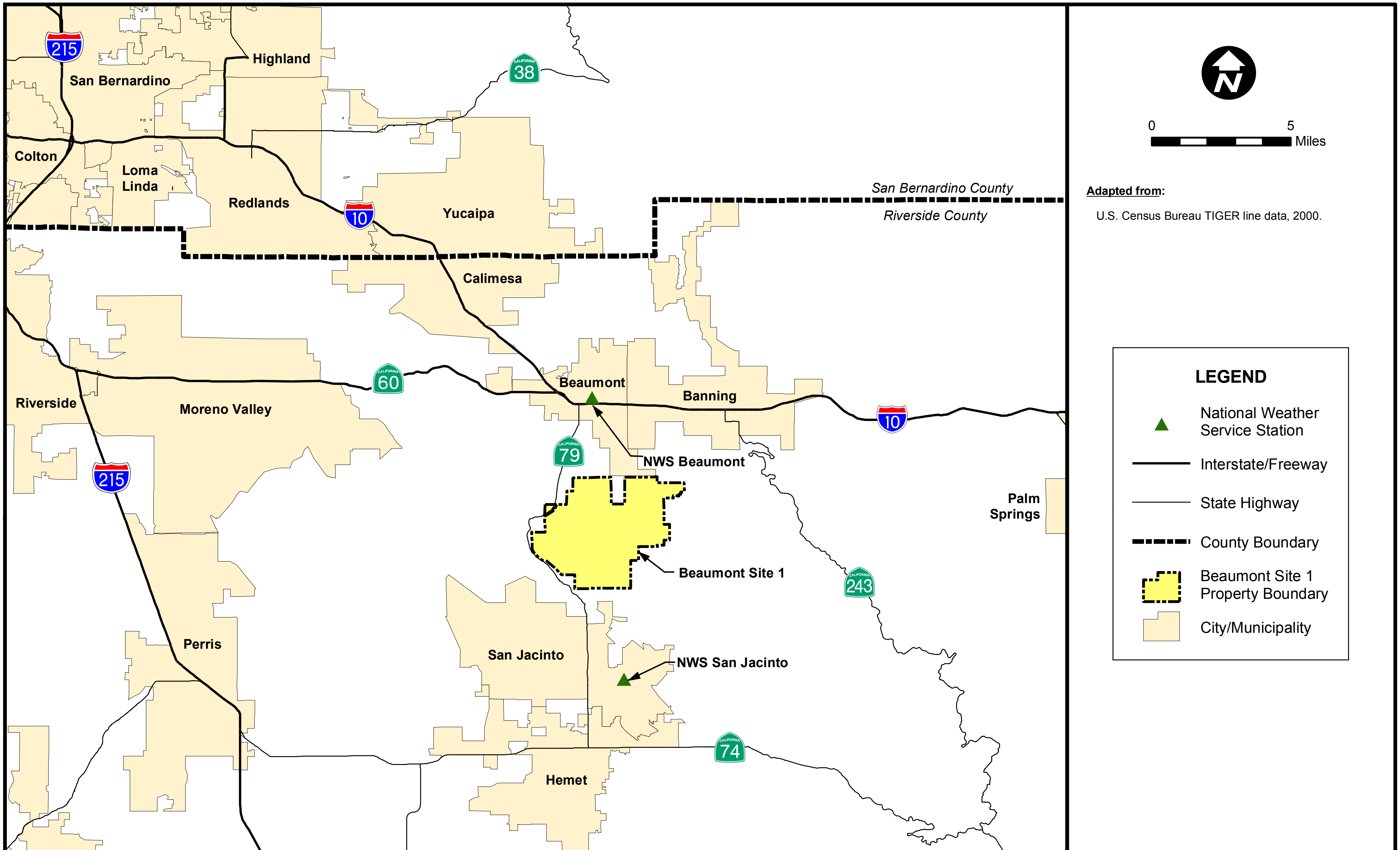
Between 1970 and 1972, Aerojet leased an area (referred to as the Eastern Aerojet Range) along the eastern portion of the Site. The Eastern Aerojet Range was used periodically for ballistics research and development experimentation on several types of 30-millimeter projectiles. Avanti, a highly classified project, utilized the land directly east of the Eastern Aerojet Range, including several U-shaped revetments for the storage of explosive materials and rocket motors. Due to its classified status, the purpose of the Avanti project and its operational procedures are unknown (Radian, 1986).

Historical Operational Area B – Rocket Motor Production Area

The Rocket Motor Production Area (RMPA), also known as the Propellant Mixing Area, was used for the processing and mixing of rocket motor solid propellants. The rocket motor production process consisted of: 1) a fuel slurry station, 2) a mixing station, and 3) a cast and curing station.

If a defect was found in the solid propellant mix, the rocket motor was scrapped. The solid propellant was removed from the casings by water jetting at the motor washout located south of the mixing station (Radian, 1986).

In 1973, an area east of the mixing station, known as the blue motor burn pit, was utilized for the destruction of four motors, which included a motor with “Maloy blue” solid propellant (Radian, 1986).



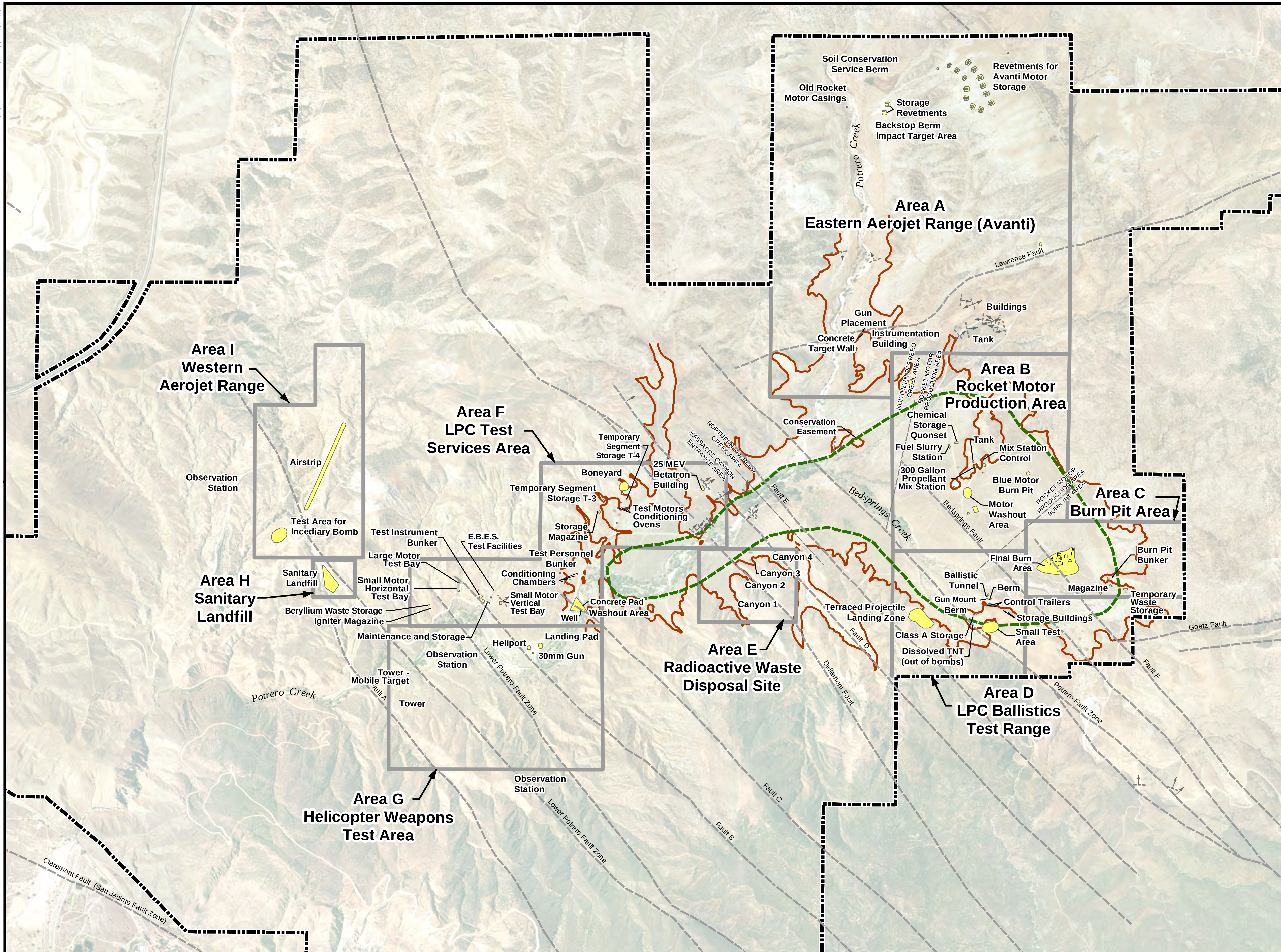
Beaumont Site 1

Figure 1-1
Regional Location of Beaumont Site 1

TETRA TECH

X:\GIS\Lockheed S1 Q3Q409\region.mxd

X:\GIS\Lockheed S1 Q3Q409\Site.mxd



N

0 1,000 2,000
Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact (Dashed where inferred)
- Historic Feature Location
- Conservation Easement Boundary
- Beaumont Site 1 Property Boundary
- Historical Operational Area Boundary

Notes: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 1-2
Historical Operational Areas, Site Features, and Conservation Easement

TETRA TECH

Historical Operational Area C – Burn Pit Area

The BPA consisted of three primary features: 1) the chemical storage area, 2) burn pits, and 3) the beryllium test stand. Hazardous waste materials generated at the Site were stored in 55-gallon drums on a concrete pad east of the burn pits at the chemical storage area until enough material was generated for a burning event. The hazardous materials burned in the pits included: ammonium perchlorate, wet propellant from motor washout, dry propellant, batches of out-of-specification propellant, various kinds of adhesives, resin curatives such as polybutadiene acrylonitrile/acrylic acid copolymer, burn rate modifiers such as ferrocene, pyrotechnic and ignition components, packaging materials (e.g., metal drums, plastic bags, and paper drums), and solvents (Radian, 1986).

On the south side of the spur, where the burn pit instrumentation bunker was located, there was a one-time firing of small beryllium research motors (Radian, 1986).

Historical Operational Area D – LPC Ballistics Test Range

The LPC Ballistics Test Range facilities included gun mounts, a ballistic tunnel, and storage buildings and trailers. Guns were tested by firing through the tunnel toward a terraced hill. Live rounds were not used although projectiles were often specially shaped and weighted to simulate actual live rounds (Radian, 1986). Another major project conducted in this area was experimentation on a rocket-assisted projectile to test penetration capability. Additional experiments included impact testing of various motors and pieces of equipment (Radian, 1986).

Class A explosives were reportedly stored in two or three 10-foot by 10-foot buildings located behind a berm. A small canyon behind the hill to the south of the former storage buildings was reportedly used as a small test area for incendiary bombs. An incendiary bomb was detonated in the center of drums containing various types of fuel (e.g., jet fuel, gasoline, and diesel) set in circles of different radii to observe shrapnel and penetration patterns. This test may have been conducted in Area I. At a small area near the bend in the road, acetone was used to dissolve 2,4,6-trinitrotoluene (TNT) out of projectiles before they were fired (Radian, 1986).

Historical Operational Area E – Radioactive Waste Disposal Site

During 1971, low-level radioactive waste was buried in one of four canyons southeast of the LPC test services area as reported by former site employees. In 1990, the radioactive waste was located and removed. The analytical results indicated that detected radiation levels were within the range of naturally occurring levels (Radian, 1990). Maps from the removal action report suggest the waste was removed from Canyon 2.

Historical Operational Area F – LPC Test Services Area

The LPC Test Services Area included the following features: 1) three bays for structural load tests, 2) a 13-foot-diameter spherical pressure vessel, 3) six temperature conditioning chambers, 4) four environmental chambers, 5) a 25-million electron volt (MeV) Betatron for X-raying large structures, 6) personnel and instrumentation protection bunkers, and 7) supporting workshops and storage areas (Radian, 1986).

If defects were identified during the integrity and environmental testing activities, the rocket motors were taken to a secondary washout area located south of the conditioning chambers adjacent to Potrero Creek (Radian, 1986).

Rocket motor structural load testing under static and captive firing conditions occurred at the LPC test bays. During several of the initial tests conducted at Bay 309, the readied motor exploded instead of firing (Radian, 1986).

Historical Operational Area G – Helicopter Weapons Test Area

The helicopter weapons test area was used to develop equipment for handling helicopter weapons systems. The facilities within this area included a hanger (Building 302), helicopter landing pad, stationary ground mounted gun platforms, and a mobile target suspended between towers. The primary project at this test area was testing of both stationary guns and guns mounted on helicopters. Experimentation also was performed on the solid propellant portion of an armor-piercing round. The majority of rounds were fired into the side of the creek wash, about 100 yards to the south of the hanger. A longer impact area labeled with distance markers was located in the canyon to the south of the wash. Projectiles were steel only; warheads were not used during tests at this facility (Tetra Tech, 2003a).

Historical Operational Area H – Sanitary Landfill

A permitted sanitary landfill was located along the western side of the Site. The permit for the landfill authorized LPC to dispose of trash such as paper, scrap metal, concrete, and wood generated during routine daily operations. Lockheed policy strictly dictated that hazardous materials were not to be disposed of at this landfill. The trenches were later covered and leveled, with only an occasional tire, metal scrap, or piece of wood remaining on the surface (Tetra Tech, 2003a).

Historical Operational Area I – Western Aerojet Range

Between 1970 and 1972, Aerojet leased an area (referred to as the Western Aerojet Range) along the western portion of the Site. LPC conducted an incendiary test with a 500-pound bomb at the southwest end of the Western Aerojet Range. This test was reportedly similar to testing performed at the LPC Ballistics Test Area. According to a historical report prepared by Radian Corporation, Inc. in 1986, the Western Aerojet Range was originally leveled to be used as an airstrip (Radian, 1986). Based on employee interviews, the airstrip may have been used only on one occasion (Tetra Tech, 2003a). During Munitions and Explosives of Concern (MEC) investigations performed in 2006 it was discovered that inert 27.5 millimeter projectiles were tested in this area.

Post LPC and Aerojet Facility Usage

LMC leased portions of the Site to several outside parties for use in various activities (Radian, 1986; Tetra Tech, 2003a). The International Union of Operating Engineers (IUOE) utilized the Site from 1971 through 1991 for surveying and heavy equipment training. The main office of the IUOE was formerly located within Bunker 304 of Historical Operational Area F (LPC Test Services Area). The IUOE earth-moving activities involved maintaining roads and reshaping various parts of the Site, primarily within Historical Operational Areas F and G.

On several occasions, General Dynamics utilized Historical Operational Area B (RMPA) for testing activities (Radian, 1986). In 1983 and 1984, General Dynamics conducted weapons testing of a Viper Bazooka and Phalanx Gatling gun.

Structural Composites used the steep terrain of the Site for vehicle rollover tests on a number of occasions. Structural Composites also conducted heat and puncture tests on pressurized fiberglass and plastic reinforced cylinders. The tests involved shooting a single 30-caliber round at the cylinders and recording the results (Radian, 1986).

SECTION 2 SUMMARY OF MONITORING ACTIVITIES

Section 2 summarizes the Third Quarter 2009 and Fourth Quarter 2009 groundwater monitoring events conducted at the Site. The results from these monitoring events are discussed in Section 3.

2.1 GROUNDWATER LEVEL MEASUREMENTS

Groundwater level measurements are collected at the Site on a quarterly basis from all available wells. The Third Quarter 2009 groundwater level measurements were collected from 172 of the Site's wells between August 11 and August 14, 2009. The Fourth Quarter 2009 groundwater level measurements were collected from 171 of the Site's wells between November 2, and November 9, 2009. Water level measurements for 172 wells were proposed for the Third Quarter 2009 and 171 wells were proposed for the Fourth Quarter 2009. Copies of field data sheets from the water quality monitoring events are presented in Appendix B. A summary of well construction details is presented in Appendix C.

In order to correlate observed changes in groundwater levels with local precipitation, precipitation data is collected from the local weather station in Beaumont. Between June 2009 (Second Quarter 2009) and September 2009 (Third Quarter 2009), the Beaumont National Weather Service (NWS) station reported approximately 0.04 inches of precipitation. Between September 2009 (Third Quarter 2009) and December 2009 (Fourth Quarter 2009), the Beaumont NWS reported approximately 2.68 inches of precipitation.

2.2 SURFACE WATER FLOW

The Site is primarily drained by Potrero Creek, an ephemeral stream which follows the valley from north to south before turning southwest to pass through Massacre Canyon toward its convergence with the San Jacinto River. Potrero Creek is fed by local tributary drainage and stormwater runoff from the city of Beaumont as well as other ephemeral streams in the southern and eastern portions of the Site. The largest of the tributary drainages is Bedsprings Creek, which is located southwest of the former RMPA and former BPA. In general, creeks are dry except during and immediately after periods of rainfall. However, springs and seeps occur in and adjacent to Potrero Creek in the western portion of the Site. Surface water flow is not continuous through most of Potrero Valley. In Massacre Canyon, while perennial surface water flow is present, during dryer periods surface water flow becomes limited to two reaches, 50 to 100 feet in length, along the western portion of the Northern Potrero Creek Area (NPCA). In general, creeks are dry except during and immediately after periods of heavy rainfall. The areas within Potrero and Bedsprings Creek where surface water was present were mapped during the Third Quarter 2009 and Fourth Quarter 2009 groundwater monitoring events. The four previously identified fixed locations were checked for flowing water and, if present, the flow rate and volume were determined through field observation and measurements.

2.3 GROUNDWATER AND SURFACE WATER SAMPLING

The frequency of groundwater monitoring is dependent on the monitoring well's classification within the network and intended purpose. Groundwater is sampled as frequently as quarterly and surface water samples are collected semi-annually. The Third Quarter 2009 monitoring event consisted of water level monitoring, the quarterly sampling of newly installed wells, and natural attenuation sampling of the Large Motor Washout Area (F-33) monitoring wells. The Fourth Quarter 2009 monitoring event consisted of water level monitoring, surface water sampling, the quarterly sampling of newly installed wells, and the semi-annual sampling of increasing contaminant trend wells and guard wells. Tables 2-1 and 2-2 lists the locations sampled during the Third Quarter 2009 and Fourth Quarter 2009 monitoring events, respectively. The tables summarize analytical methods, sampling dates, Quality Assurance/Quality Control (QA/QC) samples collected, and field notes. The surface water samples are collected from 18 fixed locations. One designated alternate location is sampled if flowing water is not encountered at the southern end of Massacre Canyon at Gilman Hot Springs Road (Figure 2-1).

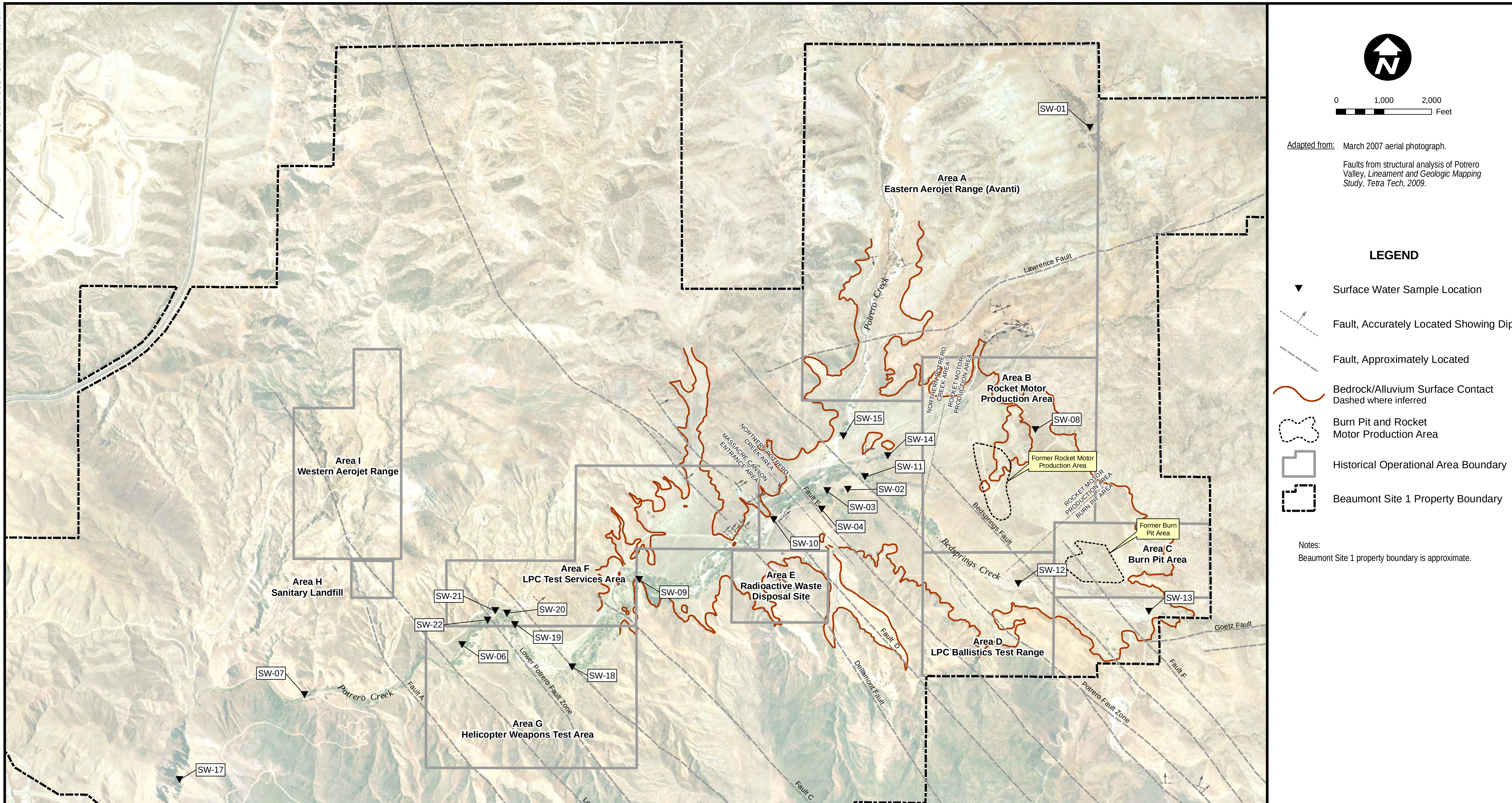
Because of the ephemeral nature of the streams on the Site, certain locations are generally sampled only during or shortly after periods of precipitation. Sampling, analytical, and QA/QC procedures for the monitoring events are described in the Revised Groundwater Sampling and Analysis Plan (Tetra Tech, 2003b).

2.3.1 Proposed and Actual Surface Water and Well Locations Sampled

A total of 30 monitoring wells as shown in Figure 2-2, were proposed and sampled for the Third Quarter 2009 monitoring event.

For the Fourth Quarter 2009 monitoring event, a total of 70 sampling locations (18 surface water, one alternate surface water, and 51 monitoring wells) were proposed for water quality monitoring. One proposed monitoring well location, P-06S, and twelve proposed surface water sample locations, SW-01, SW-05, SW-07, SW-08, SW-10, SW-11, SW-12, SW-13, SW-14, SW-15, and SW-16, were not sampled because the locations were dry. SW-17, an alternate surface water location sampled when SW-16 is dry, was also dry and was not sampled. Therefore, water quality data was collected from six surface water and 50 monitoring wells locations. Figure 2-3 presents groundwater and surface water locations sampled for the Fourth Quarter 2009 monitoring event.

X:\GIS\Lockheed S1 Q3Q409\Surf Samp Loc.mxd



Beaumont Site 1

Figure 2-1

Surface Water Sample Locations

TETRA TECH

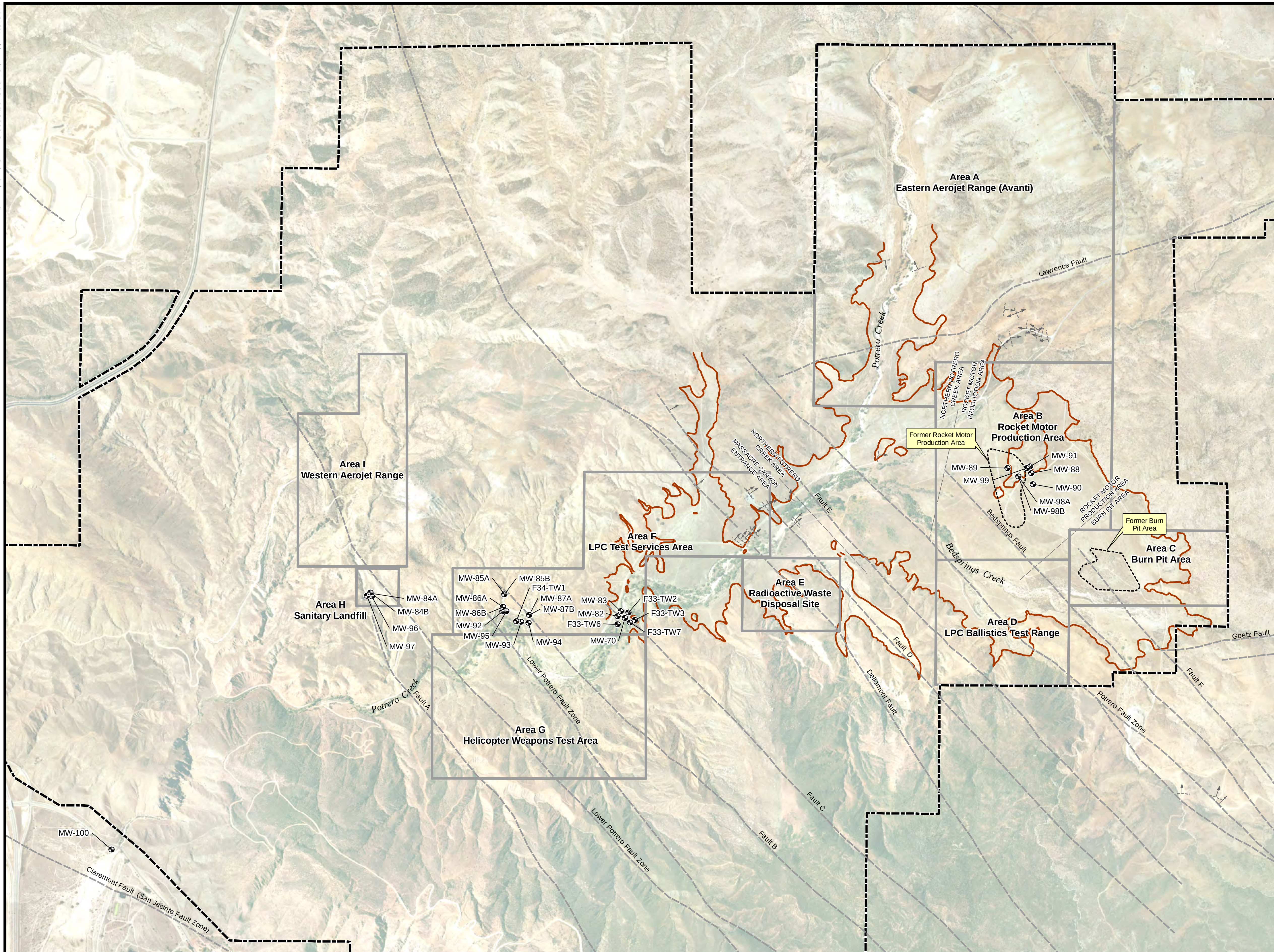
Table 2-1 Sampling Schedule - Third Quarter 2009

Monitoring Well or Surface Water Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Per chlorate (3)	Natural Attenuation Parameters (4)	Comments and QA / QC Samples
F33-TW2	08/20/09	X	X	X	X	Sample with Peristaltic Pump, MS/MSD
F33-TW3	08/20/09	X	X	X	X	Sample with Peristaltic Pump
F33-TW6	08/25/09	X	X	X	X	Sample with Peristaltic Pump
F33-TW7	08/25/09	X	X	X	X	Sample with Peristaltic Pump
F34-TW1	08/19/09	X	X	X	-	Sample with Peristaltic Pump, MS/MSD
MW-70	08/20/09	X	X	X	X	Sample with Dedicated Pump
MW-82	08/25/09	X	X	X	X	Sample with Dedicated Pump, Duplicate MW-82-Dup
MW-83	08/25/09	X	X	X	X	Sample with Dedicated Pump
MW-84A	08/18/09	X	X	X	-	Sample with Dedicated Pump
MW-84B	08/18/09	X	X	X	-	Sample with Dedicated Pump
MW-85A	08/18/09	X	X	X	-	Sample with Dedicated Pump
MW-85B	08/18/09	X	X	X	-	Sample with Dedicated Pump
MW-86A	08/17/09	X	X	X	-	Sample with Dedicated Pump
MW-86B	08/17/09	X	X	X	-	Sample with Dedicated Pump
MW-87A	08/19/09	X	X	X	-	Sample with Dedicated Pump
MW-87B	08/19/09	X	X	X	-	Sample with Dedicated Pump, Duplicate MW-87B-Dup
MW-88	08/17/09	X	X	X	-	Sample with Dedicated Pump
MW-89	08/17/09	X	X	X	-	Sample with Dedicated Pump
MW-90	08/17/09	X	X	X	-	Sample with Dedicated Pump
MW-91	08/17/09	X	X	X	-	Sample with Dedicated Pump
MW-92	08/19/09	X	X	X	-	Sample with Dedicated Pump
MW-93	08/19/09	X	X	X	-	Sample with Dedicated Pump
MW-94	08/19/09	X	X	X	-	Sample with Dedicated Pump
MW-95	08/18/09	X	X	X	-	Sample with Dedicated Pump
MW-96	08/18/09	X	X	X	-	Sample with Dedicated Pump
MW-97	08/18/09	X	X	X	-	Sample with Dedicated Pump
MW-98A	08/17/09	X	X	X	-	Sample with Dedicated Pump
MW-98B	08/17/09	X	X	X	-	Sample with Dedicated Pump, Duplicate MW-98B-Dup
MW-99	08/17/09	X	X	X	-	Sample with Dedicated Pump
MW-100	08/24/09	X	X	X	-	Sample with Dedicated Pump
Total Sample Locations:		30				
Total Samples Collected:		30				

Notes:

(1) - Volatile organic compounds (VOCs) analyzed by EPA Method 8260 B.
(2) - 1,4 - Dioxane analyzed by EPA Method 8270 C(M) isotope dilution.
(3) - Perchlorate analyzed by EPA Method 314.0.
(4) - Natural attenuation parameters by various methods
MS / MSD - Matrix Spike / Matrix Spike Duplicate.
NA - Not available.

X:\GIS\Lockheed S1 Q3Q409\Q309 Samp Schedule.mxd



0 1,000 2,000
Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

- Monitoring Well Locations
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact
  Dashed where inferred
- Historical Operational Area Boundary
- Beaumont Site 1 Property Boundary

Notes:

Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 2-2

Third Quarter (August) 2009 Sample Locations

TETRA TECH

Table 2-2 Sampling Schedule – Fourth Quarter 2009

Monitoring Well or Surface Water Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Per chlorate (3)	Natural Attenuation Parameters (4)	Comments and QA / QC Samples
SW-01	NA	-	-	-	-	Dry, no sample collected.
SW-02	11/11/09	X	X	X	-	South of OW-02, upper pond #1
SW-03	11/11/09	X	X	X	-	Upper Pond #2
SW-04	11/11/09	X	X	X	-	South of MW-43/MW-45, upper pond #3
SW-05	NA	-	-	-	-	Dry, no sample collected.
SW-06	11/10/09	X	X	X	-	Near prior S-3 in sandstone canyon
SW-07	NA	-	-	-	-	Dry, no sample collected.
SW-08	NA	-	-	-	-	Dry, no sample collected.
SW-09	11/10/09	X	X	X	-	SW of MW-15/18 (former First Surface Water)
SW-10	NA	-	-	-	-	Dry, no sample collected.
SW-11	NA	-	-	-	-	Dry, no sample collected.
SW-12	NA	-	-	-	-	Dry, no sample collected.
SW-13	NA	-	-	-	-	Dry, no sample collected.
SW-14	NA	-	-	-	-	Dry, no sample collected.
SW-15	NA	-	-	-	-	Dry, no sample collected.
SW-16	NA	-	-	-	-	Dry, no sample collected.
SW-17	NA	-	-	-	-	Dry, no sample collected.
SW-18	11/10/09	X	X	X	-	Near MW-77A/B in Potrero Creek
SW-19	NA	-	-	-	-	Dry, no sample collected.
P-06S	NA	-	-	-	-	Dry, no sample collected.
P-06D	11/24/09	X	X	X	-	Sample with Portable Bladder Pump
EW-15	11/24/09	X	X	X	-	Sample with Portable Bladder Pump
MW-68	11/24/09	X	X	X	-	Sample with Portable Bladder Pump
F33-TW2	11/17/09	X	X	X	X	Sample with Peristaltic Pump, MS/MSD
F33-TW3	11/17/09	X	X	X	X	Sample with Peristaltic Pump
F33-TW6	11/18/09	X	X	X	X	Sample with Peristaltic Pump
F33-TW7	11/17/2009, 11/18/2009	X	X	X	X	Sample with Peristaltic Pump
F34-TW1	11/18/09	X	X	X	-	Sample with Peristaltic Pump
MW-80	11/23/09	X	X	X	-	Sample with Peristaltic Pump, Duplicate MW-80-Dup
EW-13	11/23/09	X	X	X	-	Sample with Dedicated Pump
IW-04	11/19/09	X	X	X	-	Sample with Dedicated Pump
MW-15	11/16/09	X	X	X	-	Sample with Dedicated Pump
MW-18	11/16/09	X	X	X	-	Sample with Dedicated Pump
MW-28	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-31	11/23/09	X	X	X	-	Sample with Dedicated Pump
	Total Sample Locations:	70				
	Dry Sample Locations:	14				
	Total Samples Collected:	56				

Notes:

(shaded)	Well not sampled or surface water sample not collected.
(1) -	Volatile organic compounds (VOCs) analyzed by EPA Method 8260 B.
(2) -	1,4 - Dioxane analyzed by EPA Method 8270 C(M) isotope dilution.
(3) -	Perchlorate analyzed by EPA Method 331.0.
(4) -	Natural attenuation parameters by various methods
MS / MSD -	Matrix Spike / Matrix Spike Duplicate.
NA -	Not available.

Table 2-2 Sampling Schedule – Fourth Quarter 2009 (continued)

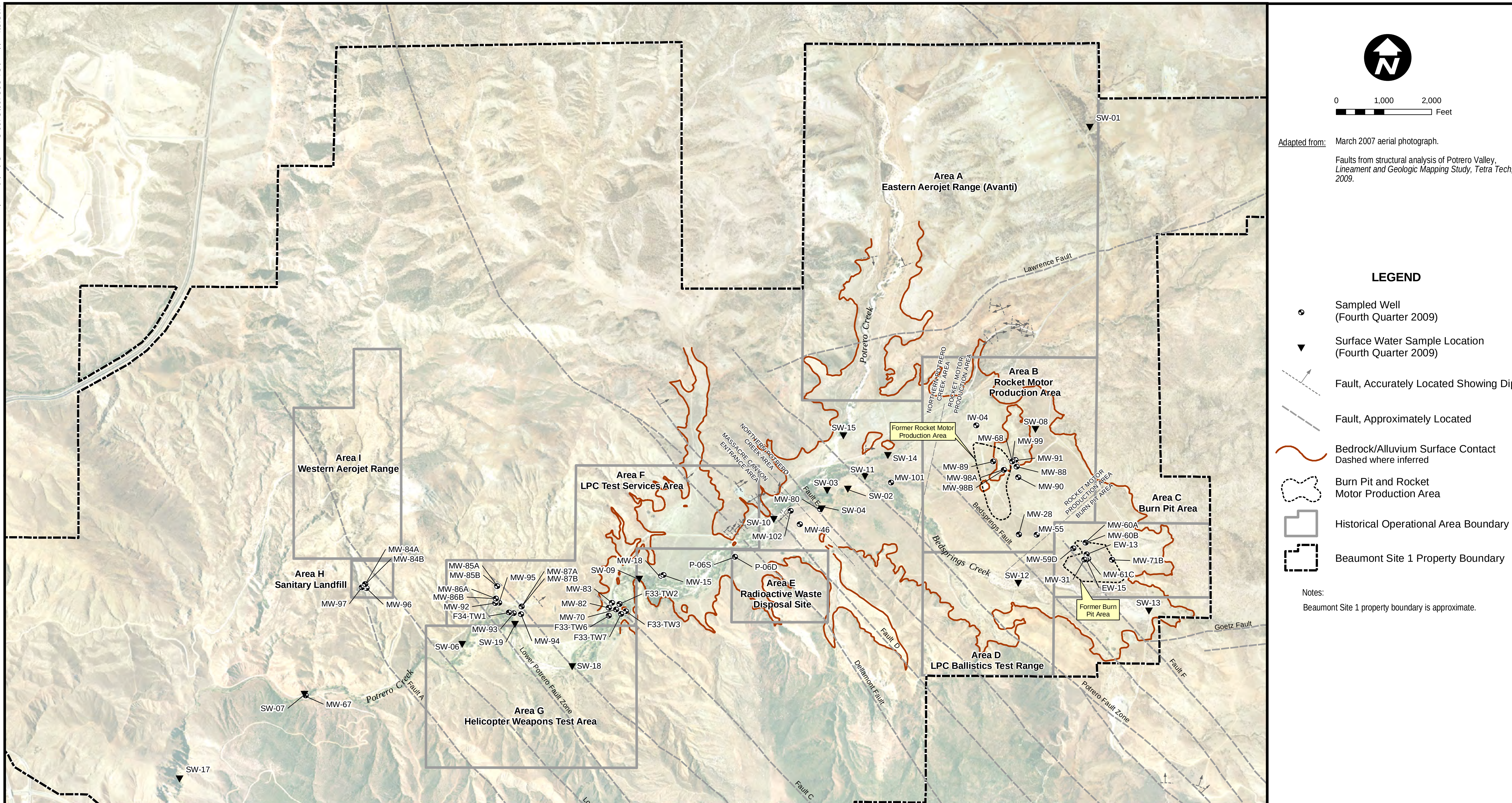
Monitoring Well or Surface Water Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Per chlorate (3)	Natural Attenuation Parameters (4)	Comments and QA / QC Samples
MW-46	11/16/09	X	X	X	-	Sample with Dedicated Pump
MW-55	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-59D	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-60A	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-60B	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-61C	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-67	11/16/09	X	X	X	-	Sample with Dedicated Pump
MW-70	11/13/09	X	X	X	X	Sample with Dedicated Pump
MW-71B	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-82	11/13/09	X	X	X	X	Sample with Dedicated Pump, Duplicate MW-82-Dup
MW-83	11/13/09	X	X	X	X	Sample with Dedicated Pump
MW-84A	11/20/09	X	X	X	-	Sample with Dedicated Pump
MW-84B	11/20/09	X	X	X	-	Sample with Dedicated Pump
MW-85A	11/20/09	X	X	X	-	Sample with Dedicated Pump, MS/MSD
MW-85B	11/18/09	X	X	X	-	Sample with Dedicated Pump
MW-86A	11/18/09	X	X	X	-	Sample with Dedicated Pump
MW-86B	11/18/09	X	X	X	-	Sample with Dedicated Pump
MW-87A	11/19/09	X	X	X	-	Sample with Dedicated Pump
MW-87B	11/19/09	X	X	X	-	Sample with Dedicated Pump, Duplicate MW-87B-Dup
MW-88	11/11/09	X	X	X	-	Sample with Dedicated Pump
MW-89	11/19/09	X	X	X	-	Sample with Dedicated Pump
MW-90	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-91	11/11/09	X	X	X	-	Sample with Dedicated Pump
MW-92	11/18/09	X	X	X	-	Sample with Dedicated Pump
MW-93	11/19/09	X	X	X	-	Sample with Dedicated Pump
MW-94	11/19/09	X	X	X	-	Sample with Dedicated Pump
MW-95	11/18/09	X	X	X	-	Sample with Dedicated Pump
MW-96	11/20/09	X	X	X	-	Sample with Dedicated Pump
MW-97	11/20/09	X	X	X	-	Sample with Dedicated Pump
MW-98A	11/11/09	X	X	X	-	Sample with Dedicated Pump
MW-98B	11/11/09	X	X	X	-	Sample with Dedicated Pump, Duplicate MW-98B-Dup
MW-99	11/12/09	X	X	X	-	Sample with Dedicated Pump
MW-100	11/16/09	X	X	X	-	Sample with Dedicated Pump
MW-101	11/23/09	X	X	X	-	Sample with Dedicated Pump
MW-102	11/19/09	X	X	X	-	Sample with Dedicated Pump

Total Sample Locations:	70
Dry Sample Locations:	14
Total Samples Collected:	56

Notes:

(grey shading)	Well not sampled or surface water sample not collected.
(1) -	Volatile organic compounds (VOCs) analyzed by EPA Method 8260 B.
(2) -	1,4 - Dioxane analyzed by EPA Method 8270 C(M) isotope dilution.
(3) -	Perchlorate analyzed by EPA Method 331.0.
(4) -	Natural attenuation parameters by various methods
MS / MSD -	Matrix Spike / Matrix Spike Duplicate.
NA -	Not available.

X:\GIS\Lockheed S1 Q3Q409\Q409 Samp Schedule.mxd



Beaumont Site 1

Figure 2-3
Fourth Quarter (November) 2009
Sample Locations

TETRA TECH

2.3.2 Field Sampling Procedures

The following water quality field parameters were measured and recorded on field data sheets (Appendix B) during well purging activities: water level, temperature, pH, electrical conductivity (EC), turbidity, oxidation reduction potential (ORP), and dissolved oxygen (DO). Groundwater samples were collected from monitoring wells by low-flow purging and sampling through dedicated double valve pumps, a portable bladder pump, or a peristaltic pump.

Collection of water quality parameters was initiated when at least one discharge hose / pump volume had been removed and purging was considered complete when the above parameters had stabilized, or the well was purged dry (evacuated). Stabilization of water quality parameters were used as an indication that representative formation water had entered the well and was being purged. The criteria for stabilization of these parameters are as follows: water level ± 0.1 foot, pH ± 0.1, EC ± 3%, turbidity < 10 nephelometric turbidity units (NTUs) (if > 10 NTUs ± 10%), DO ± 0.3 milligrams per liter (mg/L) and ORP ± 10 millivolts (mV). Sampling instruments and equipment were maintained, calibrated, and operated in accordance with the manufacturer's specifications, guidelines, and recommendations. If a well was purged dry, the well was sampled with a disposable bailer after sufficient recharge had taken place to allow sample collection.

Groundwater samples were collected in order of decreasing volatilization potential and placed in appropriate containers. A sample identification label was affixed to each sample container and sample custody was maintained by chain-of-custody record. Groundwater samples collected were chilled and transported to a state accredited analytical laboratory, via courier, thus maintaining proper temperatures and sample integrity. Trip blanks (LTBs) were collected for the monitoring events to assess cross-contamination potential of water samples while in transit. Equipment blanks (LEBs) were collected when sampling with non-dedicated equipment to assess cross-contamination potential of water samples via sampling equipment.

Surface water sampling locations were previously located using a global positioning satellite (GPS) system and marked in the field. Surface water samples were collected at previously GPS mapped locations using either a disposable bailer and transferred to the laboratory supplied water sample containers or the water sample was collected directly in the laboratory supplied water sample containers. Temperature, pH, EC, turbidity, ORP, and DO were measured and recorded on field data sheets at surface water sampling locations.

2.4 ANALYTICAL DATA QA/QC

The samples were tested using approved United States Environmental Protection Agency (EPA) methods. Since the analytical data were obtained by following EPA approved method criteria, the data were evaluated by using the EPA approved validation methods described in the National Functional Guidelines (EPA, 1999 and 2004). The National Functional Guidelines contain instructions on method required quality control parameters and on how to interpret these parameters to confer validation to environmental data results.

Quality control parameters used in validating data results include: holding times, field blanks, laboratory control samples, method blanks, duplicate environmental samples, spiked samples, and surrogate and spike recovery data.

2.5 HABITAT CONSERVATION

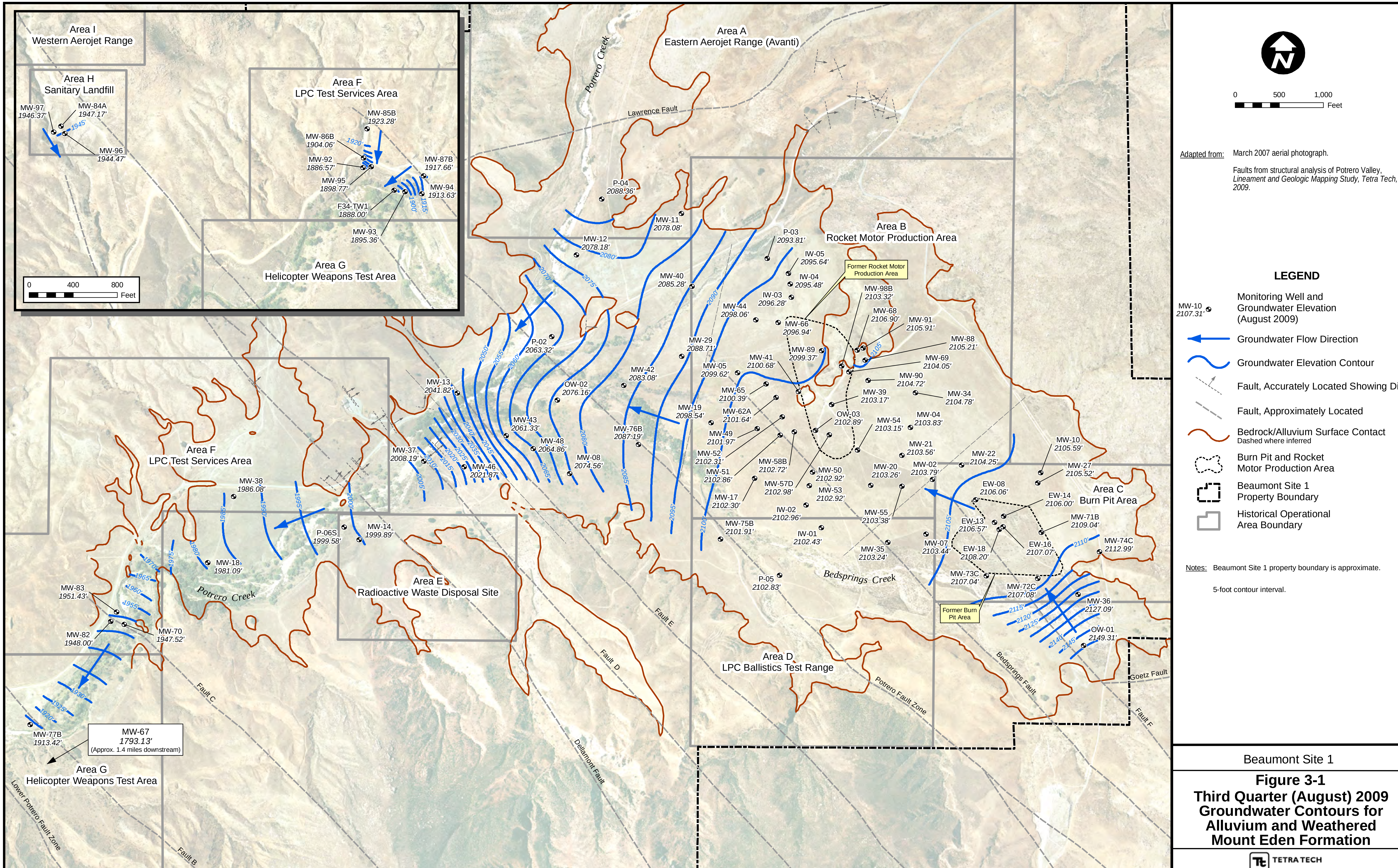
All monitoring activities were performed in accordance with the U.S. Fish and Wildlife Service approved Habitat Conservation Plan (HCP) [USFWS, 2005] and subsequent clarifications (LMC, 2006a and 2006b) of the HCP. Groundwater sampling activities were conducted with light duty vehicles and, as specified in the Low Affect HCP, do not require biological monitoring.

SECTION 3 GROUNDWATER MONITORING RESULTS

Section 3 presents the results and interpretations of the Third Quarter 2009 and Fourth Quarter 2009 groundwater monitoring events. The following subsections include tabulated summaries of groundwater elevation and water quality data contour maps, and primary COPC analyte results. Plots of groundwater elevation versus time (hydrographs) and concentration versus time (time series graphs) for primary and secondary COPC analytes are presented in Appendices D and E, respectively.

3.1 GROUNDWATER ELEVATION

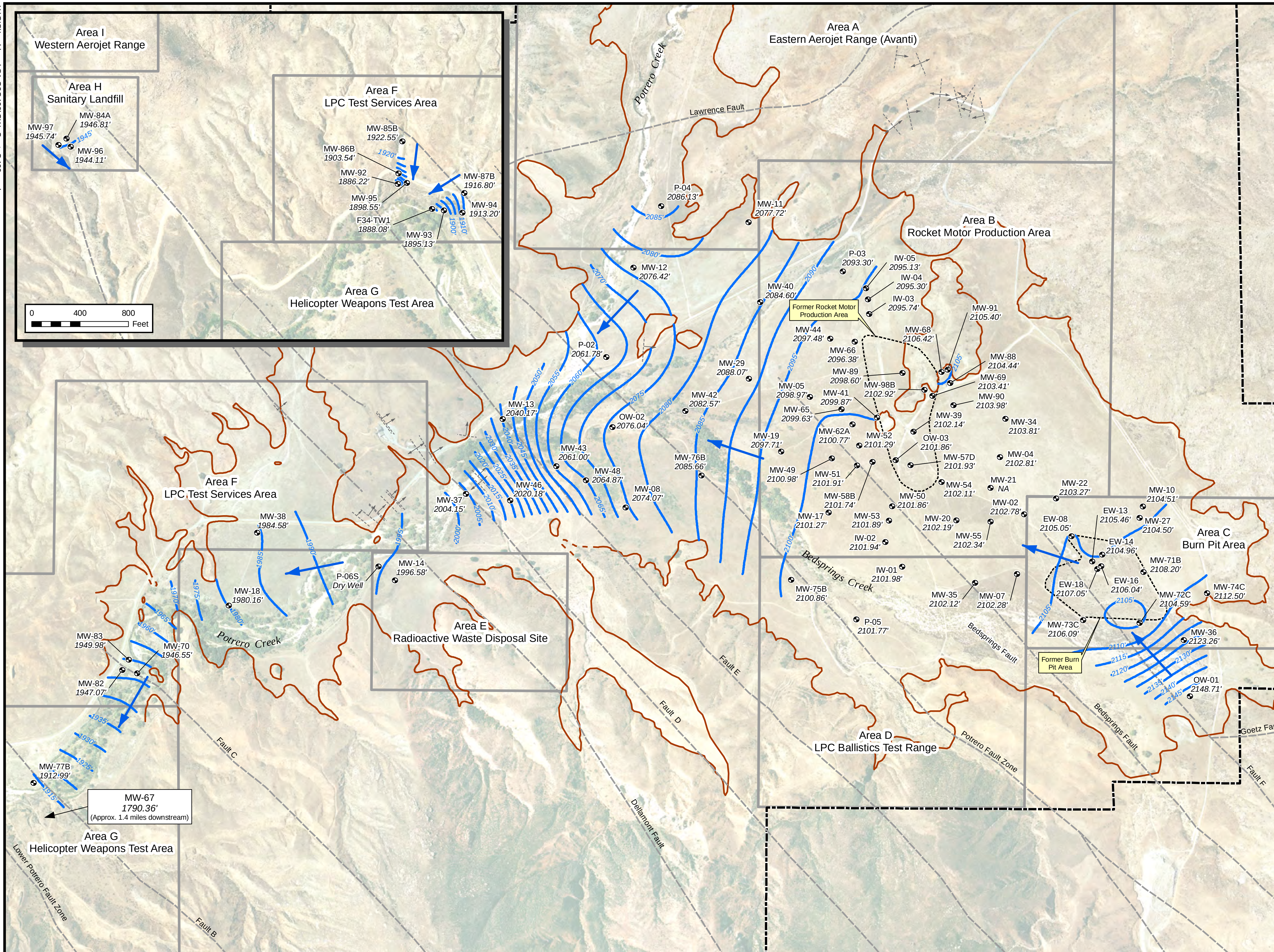
Groundwater elevations during the Third Quarter 2009 and Fourth Quarter 2009 monitoring events ranged from approximately 2,149 feet mean sea level (msl) upgradient of the former BPA to approximately 1,793 feet msl in the Massacre Canyon Entrance Area (MCEA). A total of 172 monitoring wells were identified for groundwater level measurements for the Third Quarter 2009 monitoring event and a total of 171 monitoring wells were identified for groundwater level measurements for the Fourth Quarter 2009 monitoring event. For the Third Quarter 2009 monitoring events, three wells (OW-05, OW-06, and OW-07) were dry, and measurements from two other wells could not be collected due to obstructions in their casings (EW-15 and MW-24). For the Fourth Quarter 2009 monitoring events, four wells were dry (OW-05, OW-06, OW-07 and P-06S). Monitoring wells that have previously been identified as artesian wells are fitted with pressure caps to prevent groundwater flow onto the ground surface and pressure gauges for measurement of shut-in head for calculation of static water level. During Fourth Quarter 2009, attempts were made to clean out and rehabilitate wells EW-15 and MW-24. EW-15 was successfully cleaned out and rehabilitated, but MW-24was destroyed after cleanout attempts were unsuccessful. Monitoring well destruction procedures followed the approved Site 1 Well Destruction, Rehabilitation, and Installation Work Plan (Tetra Tech 2009e). Groundwater elevations for the Third Quarter 2009 and Fourth Quarter 2009 monitoring events from wells screened in the alluvium and weathered Mount Eden formation are shown on Figures 3-1 and 3-2, respectively. A tabulated summary of groundwater elevations for all the wells measured during the Third Quarter 2009 and Fourth Quarter 2009 monitoring events are presented in Table 3-1. Hydrographs for individual wells and well groups are presented in Appendix D.



Beaumont Site 1

Figure 3-1
Third Quarter (August) 2009 Groundwater Contours for Alluvium and Weathered Mount Eden Formation

X:\GIS\Lockheed S1 Q3Q409\GW_Cont_Q409.mxd



Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

MW-10 2106.59' — Monitoring Well and Groundwater Elevation (November 2009)

Groundwater Flow Direction

Groundwater Elevation Contour

Fault, Accurately Located Showing Dip

Fault, Approximately Located

Bedrock/Alluvium Surface Contact
Dashed where inferred

Burn Pit and Rocket Motor Production Area

Historical Operational Area Boundary

Beaumont Site 1 Property Boundary

Notes: Beaumont Site 1 property boundary is approximate.
5-foot contour interval.
NA - Not available.

Beaumont Site 1

Figure 3-2
Fourth Quarter (November) 2009 Groundwater Contours for Alluvium and Weathered Mount Eden Formation

TETRA TECH

Table 3-1 Groundwater Elevation - Third Quarter and Fourth Quarter 2009

Well ID	Site Area	Formation Screened	Measuring Point Elevation (feet msl)	August 2009 Groundwater Elevation Data				November 2009 Groundwater Elevation Data			
				Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Second Quarter 2009	Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Third Quarter 2010
EW-01	RMPA	QAL	2142.62	08/13/09	39.83	2102.79	-1.09	11/06/09	40.83	2101.79	-1.00
EW-02	RMPA	QAL	2126.15	08/13/09	25.60	2100.55	-0.85	11/04/09	26.45	2099.70	-0.85
EW-08	BPA	MEF	2178.40	08/13/09	72.34	2106.06	-1.03	11/06/09	73.35	2105.05	-1.01
EW-09	BPA	MEF	2179.67	08/13/09	73.95	2105.72	-1.00	11/06/09	74.91	2104.76	-0.96
EW-10	BPA	MEF	2180.19	08/13/09	74.18	2106.01	-1.04	11/06/09	75.20	2104.99	-1.02
EW-11	BPA	MEF	2182.09	08/13/09	74.82	2107.27	-2.14	11/06/09	75.80	2106.29	-0.98
EW-12	BPA	MEF	2183.28	08/13/09	77.23	2106.05	-2.43	11/06/09	78.25	2105.03	-1.02
EW-13	BPA	MEF	2185.57	08/13/09	79.00	2106.57	-0.98	11/06/09	80.11	2105.46	-1.11
EW-14	BPA	QAL/MEF	2184.59	08/13/09	78.59	2106.00	-1.04	11/06/09	79.63	2104.96	-1.04
EW-15	BPA	MEF	2183.55	08/13/09	NA	NA	NA	11/06/09	78.19	2105.36	NA
EW-16	BPA	MEF	2185.52	08/13/09	78.45	2107.07	-2.35	11/06/09	79.48	2106.04	-1.03
EW-17	BPA	MEF	2179.15	08/13/09	74.27	2104.88	-0.96	11/06/09	75.47	2103.68	-1.20
EW-18	BPA	MEF	2184.98	08/13/09	76.78	2108.20	-2.01	11/06/09	77.93	2107.05	-1.15
EW-19	MCEA	QAL	2033.89	08/12/09	35.50	1998.39	-3.69	11/04/09	38.49	1995.40	-2.99
F33-TW2	NPCA	QAL	1959.75	08/12/09	7.03	1952.72	-2.10	11/09/09	7.47	1952.28	-0.44
F33-TW3	NPCA	QAL	1955.79	08/12/09	5.62	1950.17	-1.49	11/09/09	5.92	1949.87	-0.30
F33-TW6	NPCA	QAL	1950.62	08/12/09	6.53	1944.09	-1.92	11/09/09	7.09	1943.53	-0.56
F33-TW7	NPCA	QAL	NA	08/14/09	8.38	NA	NA	11/09/09	9.04	NA	NA
F34-TW1	MCEA	QAL	1894.08	08/13/09	6.08	1888.00	-0.87	11/09/09	6.00	1888.08	0.08
IW-01	RMPA	QAL	2160.73	08/12/09	58.30	2102.43	-1.79	11/04/09	58.75	2101.98	-0.45
IW-02	RMPA	QAL	2155.01	08/12/09	52.05	2102.96	-1.16	11/04/09	53.07	2101.94	-1.02
IW-03	NPCA	QAL	2132.86	08/11/09	36.58	2096.28	-0.57	11/09/09	37.12	2095.74	-0.54
IW-04	NPCA	QAL	2135.09	08/11/09	39.61	2095.48	-0.80	11/09/09	39.79	2095.30	-0.18
IW-05	NPCA	QAL	2136.94	08/11/09	41.30	2095.64	-0.52	11/09/09	41.81	2095.13	-0.51
MW-01	RMPA	MEF	2176.98	08/12/09	73.69	2103.29	-1.12	11/09/09	74.81	2102.17	-1.12
MW-02	RMPA	MEF	2170.10	08/13/09	66.31	2103.79	-1.07	11/06/09	67.32	2102.78	-1.01
MW-03	RMPA	MEF	2169.36	08/13/09	126.44	2042.92	-0.04	11/06/09	126.31	2043.05	0.13
MW-04	RMPA	QAL	2160.02	08/13/09	56.19	2103.83	-1.07	11/06/09	57.21	2102.81	-1.02
MW-05	RMPA	QAL	2121.40	08/12/09	21.78	2099.62	-0.81	11/06/09	22.43	2098.97	-0.65
MW-06	RMPA	QAL	2121.76	08/12/09	24.74	2097.02	-0.84	11/06/09	25.58	2096.18	-0.84
MW-07	BPA	QAL	2176.52	08/12/09	73.08	2103.44	-1.10	11/09/09	74.24	2102.28	-1.16
MW-08	NPCA	QAL	2090.53	08/12/09	15.97	2074.56	-1.21	11/04/09	16.46	2074.07	-0.49
MW-09	NPCA	QAL	2089.16	08/14/09	1.67	2087.49	-2.25	11/04/09	2.21	2086.95	-0.54
MW-10	RMPA	QAL	2179.40	08/13/09	73.81	2105.59	-1.00	11/06/09	74.89	2104.51	-1.08
MW-11	NPCA	QAL	2122.61	08/11/09	44.53	2078.08	-0.42	11/09/09	44.89	2077.72	-0.36
MW-12	NPCA	QAL	2098.49	08/11/09	20.31	2078.18	-3.29	11/09/09	22.07	2076.42	-1.76
MW-13	NPCA	QAL	2057.89	08/12/09	16.07	2041.82	-4.92	11/09/09	17.72	2040.17	-1.65
MW-14	MCEA	QAL	2029.67	08/12/09	29.78	1999.89	-3.68	11/04/09	33.09	1996.58	-3.31
MW-15	MCEA	QAL	2009.76	08/12/09	27.76	1982.00	-2.04	11/09/09	28.78	1980.98	-1.02
MW-17	RMPA	QAL	2140.40	08/12/09	38.10	2102.30	-1.15	11/06/09	39.13	2101.27	-1.03
MW-18	MCEA	QAL	2008.69	08/12/09	27.60	1981.09	-1.93	11/09/09	28.53	1980.16	-0.93
MW-19	NPCA	QAL	2118.49	08/12/09	19.95	2098.54	-1.15	11/04/09	20.78	2097.71	-0.83
MW-20	RMPA	QAL	2162.03	08/13/09	58.77	2103.26	-1.07	11/06/09	59.84	2102.19	-1.07
MW-21	RMPA	QAL	2160.73	08/13/09	57.17	2103.56	-1.08	11/06/09	NA	NA	NA
MW-22	RMPA	QAL	2173.48	08/13/09	69.23	2104.25	-1.06	11/06/09	70.21	2103.27	-0.98
MW-23	RMPA	QAL	2165.02	08/13/09	61.58	2103.44	-1.08	11/06/09	62.62	2102.40	-1.04
MW-24	BPA	MEF	2182.89	08/13/09	NA	NA	NA	11/06/09	80.61	2102.28	NA
MW-26	BPA	MEF	2183.81	08/13/09	77.71	2106.10	-0.99	11/06/09	78.95	2104.86	-1.24
MW-27	BPA	QAL	2182.73	08/13/09	77.21	2105.52	-1.00	11/06/09	78.23	2104.50	-1.02
MW-28	RMPA	QAL	2160.84	08/13/09	57.71	2103.13	-1.01	11/06/09	58.75	2102.09	-1.04
MW-29	NPCA	MEF	2115.09	08/13/09	26.38	2088.71	-0.82	11/06/09	27.02	2088.07	-0.64
MW-30	RMPA	QAL	2165.01	08/13/09	60.80	2104.21	-1.08	11/06/09	61.81	2103.20	-1.01
MW-31	BPA	Granite	2186.52	08/13/09	93.41	2093.11	-1.00	11/06/09	94.28	2092.24	-0.87
MW-32	RMPA	Granite	2176.61	08/12/09	86.85	2089.76	-1.15	11/09/09	87.65	2088.96	-0.80
MW-34	RMPA	QAL	2153.80	08/13/09	49.02	2104.78	-1.04	11/06/09	49.99	2103.81	-0.97
MW-35	RMPA	QAL	2170.98	08/12/09	67.74	2103.24	-1.13	11/09/09	68.86	2102.12	-1.12
MW-36	UG	QAL	2205.18	08/13/09	78.09	2127.09	-4.67	11/06/09	81.92	2123.26	-3.83
MW-37	MCEA	QAL	2040.97	08/12/09	32.78	2008.19	-5.40	11/02/09	36.82	2004.15	-4.04
MW-38	MCEA	MEF	2030.29	08/12/09	44.21	1986.08	-1.46	11/09/09	45.71	1984.58	-1.50
MW-39	RMPA	QAL	2144.18	08/12/09	41.01	2103.17	-1.06	11/06/09	42.04	2102.14	-1.03
MW-40	NPCA	MEF	2126.39	08/11/09	41.11	2085.28	-0.78	11/09/09	41.79	2084.60	-0.68
MW-41	RMPA	MEF	2133.95	08/11/09	33.27	2100.68	-0.95	11/06/09	34.08	2099.87	-0.81
MW-42	NPCA	QAL	2092.55	08/12/09	9.47	2083.08	-1.33	11/02/09	9.98	2082.57	-0.51
MW-43	NPCA	QAL	2068.58	08/12/09	7.25	2061.33	-2.13	11/04/09	7.58	2061.00	-0.33
MW-44	NPCA	QAL	2128.69	08/12/09	30.63	2098.06	-0.68	11/06/09	31.21	2097.48	-0.58
MW-45	MCEA	QAL	2068.18	08/12/09	Artesian 3.5 PSI	2076.26	-1.62	11/04/09	Artesian 2.5 PSI	2073.95	-2.31
MW-46	MCEA	QAL	2072.17	08/12/09	50.30	2021.87	-2.10	11/04/09	51.99	2020.18	-1.69
MW-47	NPCA	QAL	2076.67	08/12/09	Artesian 2.6 PSI	2082.67	-1.16	11/04/09	Artesian 2.2 PSI	2081.75	-0.92
MW-48	NPCA	QAL	2076.44	08/12/09	11.58	2064.86	-2.50	11/04/09	11.57	2064.87	0.01
MW-49	RMPA	QAL	2130.92	08/12/09	28.95	2101.97	-1.09	11/04/09	29.94	2100.98	-0.99
MW-50	RMPA	QAL	2151.43	08/12/09	48.51	2102.92	-1.11	11/04/09	49.57	2101.86	-1.06
MW-51	RMPA	QAL	2138.36	08/12/09	35.50	2102.86	-1.05	11/04/09	36.45	2101.91	-0.95
MW-52	RMPA	QAL	2136.18	08/12/09	33.87	2102.31	-1.07	11/04/09	34.89	2101.29	-1.02
MW-53	RMPA	QAL	2153.29	08/12/09	50.37	2102.92	-1.11	11/04/09	51.40	2101.89	-1.03
MW-54	RMPA	QAL	2153.44	08/13/09	50.29	2103.15	-1.09	11/06/09	51.33	2102.11	-1.04
MW-55	RMPA	QAL	2166.66	08/13/09	63.28	2103.38	-1.07	11/06/09	64.32	2102.34	-1.04
MW-56A	RMPA	MEF	2143.09	08/12/09	52.12	2090.97	-0.97	11/06/09	52.98	2090.11	-0.86
MW-56B	RMPA	QAL	2142.58	08/12/09	39.71	2102.87	-1.08	11/06/09	40.77	2101.81	-1.06
MW-56C	RMPA	QAL	2142.77	08/12/09	40.01	2102.76	-1.06	11/06/09	41.02	2101.75	-1.01
MW-56D	RMPA	QAL	2142.48	08/12/09	39.60	2102.88	-1.16	11/06/09	40.63	2101.85	-1.03
MW-57A	RMPA	QAL	2145.98	08/12/09	42.95	2103.03	-1.10	11/06/09	44.01	2101.97	-1.06
MW-57B	RMPA	QAL	2146.19	08/12/09	43.15	2103.04	-1.11	11/06/09	44.23	2101.96	-1.08
MW-57C	RMPA	QAL	2146.02	08/12/09	42.98	2103.04	-1.15	11/06/09	43.98	2102.04	-1.00
MW-57D	RMPA	QAL	2146.10	08/12/09	43.12	2102.98	-1.09	11/06/09	44.17	2101.93	-1.05
MW-58A	RMPA	QAL	2140.73	08/12/09	38.17	2102.56	-1.07	11/06/09	39.24	2101.49	-1.07
MW-58B	RMPA	QAL	2140.78	08/12/09	38.06	2102.72	-1.09	11/06/09	39.04	2101.74	-0.98

Notes:

BPA - Burn Pit Area.
MCEA - Massacre Canyon Entrance Area.
NPCA - Northern Potrero Creek Area.
RMPA - Rocket Motor Production Area.
UG - Upgradient
DG - Downgradient
BTOC - Below top of casing.
msl - Mean sea level.
NA - Not available.
PSI - pounds per square inch
"-" Formation screened not defined.
QAL - Quaternary alluvium.
QAL/MEF - Quaternary alluvium / Mt Eden.
MEF - Mount Eden Formation.

Table 3-1 Groundwater Elevation – Third Quarter and Fourth Quarter 2009 (continued)

Well ID	Site Area	Formation Screened	Measuring Point Elevation (feet msl)	August 2009 Groundwater Elevation Data				November 2009 Groundwater Elevation Data			
				Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Second Quarter 2009	Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Third Quarter 2010
MW-58C	RMPA	QAL	2141.02	08/12/09	38.41	2102.61	-1.07	11/06/09	39.43	2101.59	-1.02
MW-58D	RMPA	QAL	2140.94	08/12/09	38.41	2102.53	-1.10	11/06/09	39.43	2101.51	-1.02
MW-59A	BPA	MEF	2180.14	08/13/09	79.51	2100.63	-1.02	11/06/09	80.43	2099.71	-0.92
MW-59B	BPA	MEF	2180.39	08/13/09	75.06	2105.33	-1.01	11/06/09	76.00	2104.39	-0.94
MW-59C	BPA	MEF	2179.93	08/13/09	76.69	2103.24	-1.01	11/06/09	77.67	2102.26	-0.98
MW-59D	BPA	MEF	2180.53	08/13/09	76.55	2103.98	-1.01	11/06/09	77.54	2102.99	-0.99
MW-60A	BPA	MEF	2182.59	08/13/09	79.18	2103.41	-1.03	11/06/09	80.12	2102.47	-0.94
MW-60B	BPA	MEF	2182.77	08/13/09	77.68	2105.09	-1.03	11/06/09	78.68	2104.09	-1.00
MW-61A	BPA	MEF	2186.95	08/13/09	86.99	2099.96	-1.28	11/06/09	87.95	2099.00	-0.96
MW-61B	BPA	MEF	2186.77	08/13/09	79.07	2107.70	-0.98	11/06/09	80.31	2106.46	-1.24
MW-61C	BPA	MEF	2186.84	08/13/09	84.75	2102.09	-1.01	11/06/09	85.81	2101.03	-1.06
MW-61D	BPA	MEF	2186.83	08/13/09	82.15	2104.68	-1.00	11/06/09	83.27	2103.56	-1.12
MW-62A	RMPA	QAL	2131.32	08/12/09	29.68	2101.64	-1.01	11/04/09	30.55	2100.77	-0.87
MW-62B	RMPA	QAL	2131.49	08/12/09	29.84	2101.65	-1.03	11/04/09	30.86	2100.63	-1.02
MW-63	RMPA	QAL	2156.20	08/13/09	52.99	2103.21	-1.08	11/06/09	54.05	2102.15	-1.06
MW-64	RMPA	QAL	2128.41	08/12/09	27.83	2100.58	-0.89	11/04/09	28.59	2099.82	-0.76
MW-65	RMPA	QAL	2128.92	08/12/09	28.53	2100.39	-0.92	11/04/09	29.29	2099.63	-0.76
MW-66	RMPA	QAL	2130.43	08/12/09	33.49	2096.94	-0.64	11/06/09	34.05	2096.38	-0.56
MW-67	MCEA	QAL	1799.54	08/12/09	6.41	1793.13	-1.55	11/09/09	9.18	1790.36	-2.77
MW-68	RMPA	QAL	2144.69	08/11/09	37.79	2106.90	-0.51	11/06/09	38.27	2106.42	-0.48
MW-69	RMPA	QAL	2143.26	08/11/09	39.21	2104.05	-0.79	11/06/09	39.85	2103.41	-0.64
MW-70	NPCA	QAL	1976.15	08/12/09	28.63	1947.52	-2.46	11/09/09	29.60	1946.55	-0.97
MW-71A	BPA	Granite	2193.77	08/13/09	159.34	2034.43	-0.49	11/06/09	159.33	2034.44	0.01
MW-71B	BPA	QAL/MEF	2194.01	08/13/09	84.97	2109.04	-0.89	11/06/09	85.81	2108.20	-0.84
MW-71C	BPA	MEF	2193.87	08/13/09	87.39	2106.48	-0.87	11/06/09	88.25	2105.62	-0.86
MW-72A	BPA	Granite	2199.06	08/13/09	96.62	2102.44	-0.19	11/06/09	99.22	2099.84	-2.60
MW-72B	BPA	MEF	2199.22	08/13/09	92.17	2107.05	-0.96	11/06/09	94.67	2104.55	-2.50
MW-72C	BPA	QAL	2199.35	08/13/09	92.27	2107.08	-0.94	11/06/09	94.76	2104.59	-2.49
MW-73A	BPA	MEF	2189.39	08/13/09	111.84	2077.55	-0.80	11/06/09	112.41	2076.98	-0.57
MW-73B	BPA	MEF	2189.48	08/13/09	95.93	2093.55	-1.02	11/06/09	96.99	2092.49	-1.06
MW-73C	BPA	QAL	2189.65	08/13/09	82.61	2107.04	-0.29	11/06/09	83.56	2106.09	-0.95
MW-74A	UG	Granite	2199.66	08/13/09	159.70	2039.96	-0.60	11/06/09	159.27	2040.39	0.43
MW-74B	UG	Granite	2199.81	08/13/09	118.20	2081.61	-0.26	11/06/09	118.10	2081.71	0.10
MW-74C	UG	MEF	2199.96	08/13/09	86.97	2112.99	-0.52	11/06/09	87.46	2112.50	-0.49
MW-75A	RMPA	MEF	2149.44	08/12/09	56.34	2093.10	-1.05	11/04/09	57.31	2092.13	-0.97
MW-75B	RMPA	QAL	2149.51	08/12/09	47.60	2101.91	-1.29	11/04/09	48.65	2100.86	-1.05
MW-75C	RMPA	QAL	2150.02	08/12/09	48.12	2101.90	-1.13	11/04/09	49.16	2100.86	-1.04
MW-76A	NPCA	MEF	2105.91	08/12/09	23.99	2081.92	-1.15	11/04/09	24.95	2080.96	-0.96
MW-76B	NPCA	QAL	2105.40	08/12/09	18.21	2087.19	-1.93	11/04/09	19.74	2085.66	-1.53
MW-76C	NPCA	QAL	2106.29	08/12/09	9.95	2096.34	-1.08	11/04/09	10.88	2095.41	-0.93
MW-77A	MCEA	MEF	1930.62	08/13/09	13.91	1916.71	-2.12	11/09/09	14.77	1915.85	-0.86
MW-77B	MCEA	MEF	1930.88	08/13/09	17.46	1913.42	-1.14	11/09/09	17.89	1912.99	-0.43
MW-78	BPA	MEF	2182.63	08/12/09	89.34	2093.29	-1.02	11/06/09	90.18	2092.45	-0.84
MW-79A	RMPA	MEF	2142.00	08/12/09	43.23	2098.77	-1.11	11/04/09	44.23	2097.77	-1.00
MW-79C	RMPA	QAL	2142.07	08/12/09	40.21	2101.86	-1.14	11/04/09	41.25	2100.82	-1.04
MW-80	NPCA	MEF	2070.47	08/12/09	Artesian 0.5 PSI	2071.63	-1.27	11/04/09	2.92	2067.55	-4.07
MW-81	MCEA	MEF	2010.72	08/12/09	29.08	1981.64	-1.98	11/09/09	30.14	1980.58	-1.06
MW-82	NPCA	QAL	1974.17	08/12/09	26.17	1948.00	-2.47	11/09/09	27.10	1947.07	-0.93
MW-83	NPCA	QAL	1976.93	08/12/09	25.50	1951.43	-3.10	11/09/09	26.95	1949.98	-1.45
MW-84A	MCEA	MEF	2,010.02	08/13/09	62.85	1947.17	-0.33	11/09/09	63.21	1946.81	-0.36
MW-84B	MCEA	MEF	2,011.19	08/13/09	65.43	1945.76	-0.38	11/09/09	65.80	1945.39	-0.37
MW-85A	MCEA	MEF	1,929.31	08/13/09	7.50	1921.81	-1.30	11/09/09	8.16	1921.15	-0.66
MW-85B	MCEA	MEF	1,928.74	08/13/09	5.46	1923.28	-2.24	11/09/09	6.19	1922.55	-0.73
MW-86A	MCEA	MEF	1,923.21	08/13/09	16.44	1906.77	-1.01	11/09/09	16.97	1906.24	-0.53
MW-86B	MCEA	QAL/MEF	1,923.21	08/13/09	19.15	1904.06	-1.00	11/09/09	19.67	1903.54	-0.52
MW-87A	MCEA	MEF	1,938.92	08/13/09	22.32	1916.60	-1.06	11/09/09	22.97	1915.95	-0.65
MW-87B	MCEA	MEF	1,938.82	08/13/09	21.16	1917.66	-1.15	11/09/09	22.02	1916.80	-0.86
MW-88	RMPA	QAL	2,141.97	08/11/09	36.76	2105.21	-0.81	11/06/09	37.53	2104.44	-0.77
MW-89	RMPA	QAL	2,130.82	08/11/09	31.45	2099.37	-0.84	11/09/09	32.22	2098.60	-0.77
MW-90	RMPA	QAL	2,147.71	08/11/09	42.99	2104.72	-0.87	11/06/09	43.73	2103.98	-0.74
MW-91	RMPA	MEF	2,144.85	08/11/09	38.94	2105.91	-0.68	11/06/09	39.45	2105.40	-0.51
MW-92	MCEA	MEF	1,919.83	08/13/09	33.26	1886.57	-1.29	11/09/09	33.61	1886.22	-0.35
MW-93	MCEA	MEF	1,931.47	08/13/09	36.11	1895.36	-1.33	11/09/09	36.34	1895.13	-0.23
MW-94	MCEA	MEF	1,936.55	08/13/09	22.92	1913.63	-0.95	11/09/09	23.35	1913.20	-0.43
MW-95	MCEA	MEF	1,920.80	08/13/09	22.03	1898.77	-0.71	11/09/09	22.25	1898.55	-0.22
MW-96	MCEA	MEF	1998.63	08/13/09	54.16	1944.47	-0.39	11/09/09	54.52	1944.11	-0.36
MW-97	MCEA	MEF	1996.47	08/13/09	50.10	1946.37	-1.10	11/09/09	50.73	1945.74	-0.63
MW-98A	RMPA	MEF	2141.68	08/11/09	46.31	2095.37	-0.77	11/06/09	46.96	2094.72	-0.65
MW-98B	RMPA	MEF	2141.73	08/11/09	38.41	2103.32	-0.47	11/06/09	38.81	2102.92	-0.40
MW-99	RMPA	MEF	2144.63	08/11/09	56.35	2088.28	-0.58	11/06/09	56.91	2087.72	-0.56
MW-100	DG	Granite	1525.79	08/11/09	106.79	1419.00	1.78	11/09/09	107.97	1417.82	-1.18
OW-01	BPA	QAL	2204.62	08/13/09	55.31	2149.31	-0.48	11/06/09	55.91	2148.71	-0.60
OW-02	NPCA	QAL	2078.97	08/12/09	2.81	2076.16	-0.36	11/04/09	2.93	2076.04	-0.12
OW-03	RMPA	QAL	2143.65	08/12/09	40.76	2102.89	-1.07	11/06/09	41.79	2101.86	-1.03
OW-05	NPCA	QAL	2160.85	08/11/09	Dry	Dry Well	NA	11/09/09	Dry	Dry Well	NA
OW-06	MCEA	QAL	2084.67	08/12/09	Dry	Dry Well	NA	11/09/09	Dry	Dry Well	NA
OW-07	MCEA	QAL	2108.06	08/12/09	Dry	Dry Well	NA	11/09/09	Dry	Dry Well	NA
OW-08	MCEA	QAL	2036.33	08/12/09	48.71	1987.62	-0.77	11/09/09	50.39	1985.94	-1.68
P-02	NPCA	QAL	2081.15	08/12/09	17.83	2063.32	-2.64	11/09/09	19.37	2061.78	-1.54
P-03	NPCA	QAL	2140.25	08/11/09	46.44	2093.81	-0.58	11/09/09	46.95	2093.30	-0.51
P-04	NPCA	QAL	2112.63	08/11/09	24.27	2088.36	-3.22	11/09/09	26.50	2086.13	-2.23
P-05	RMPA	QAL	2162.20	08/12/09	59.37	2102.83	-1.17	11/04/09	60.43	2101.77	-1.06
P-06S	MCEA	QAL	2034.44	08/12/09	34.86	1999.58	-3.41	11/04/09	Dry	Dry Well	NA
P-06D	MCEA	QAL	2034.41	08/12/09	35.90	1998.51	-3.70	11/04/09	38.89	1995.52	-2.99
P-07	MCEA	QAL	2034.60	08/12/09	36.32	1998.28	-3.66	11/04/09	39.33	1995.27	-3.01
P-08	MCEA	QAL	2030.87	08/12/09	32.15	1998.72	-3.72	11/04/09	35.17	1995.70	-3.02

Notes:

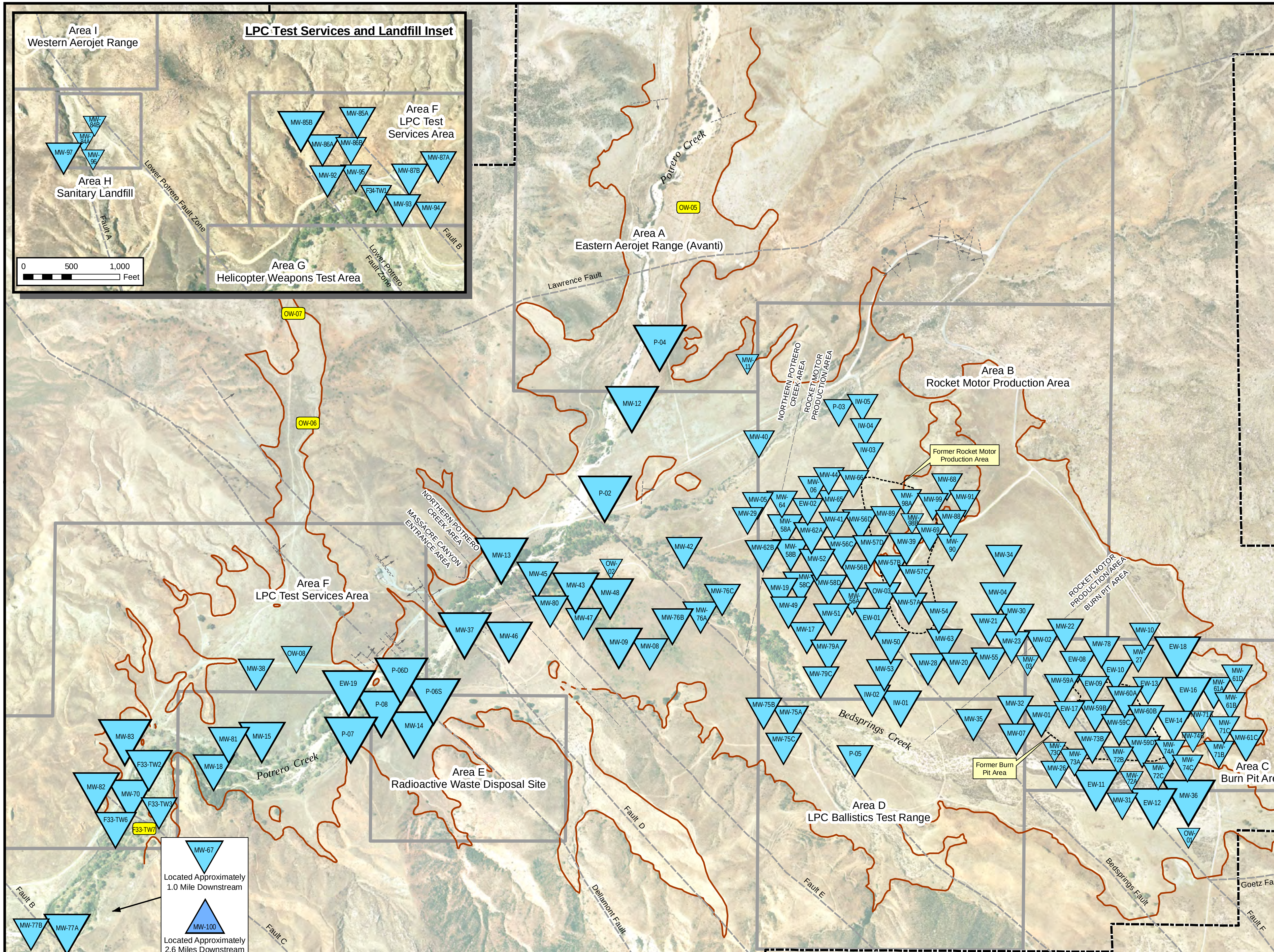
BPA -	Burn Pit Area.	DG -	Downgradient	"-"	Formation screened not defined.
MCEA -	Massacre Canyon Entrance Area.	BTOC -	Below top of casing.	QAL -	Quaternary alluvium.
NPCA -	Northern Potrero Creek Area.	msl -	Mean sea level.	QAL/MEF -	Quaternary alluvium / Mt Eden.
RMPA -	Rocket Motor Production Area.	NA -	Not available.	MEF -	Mount Eden Formation.
UG -	Upgradient	PSI -	pounds per square inch		

Between June 2009 (Second Quarter 2009) and September 2009 (Third Quarter 2009), the Beaumont NWS reported approximately 0.04 inches of precipitation, and the average site-wide groundwater elevation decreased approximately 1.03 feet. Between September 2009 (Third Quarter 2009) and December 2009 (Fourth Quarter 2008), the Beaumont NWS reported approximately 2.68 inches of precipitation and the average site-wide groundwater elevation decreased approximately 1.06 feet. Table 3-2 presents the range and average change in groundwater elevation by area. Figures 3-3 and 3-4 present elevation differences between the Second Quarter 2009 and Third Quarter 2009 and Third Quarter 2009 and Fourth Quarter 2009 groundwater monitoring events.

Table 3-2 Groundwater Elevation Change – Third Quarter 2009 and Fourth Quarter 2009

Site Area	Range of Groundwater Elevation Change - Third Quarter 2009		Average Change By Area	Range of Groundwater Elevation Change - Fourth Quarter 2009		Average Change By Area
BPA	-2.43	-0.19	-1.07	-2.60	0.01	-1.09
RMPA	-1.79	-0.04	-1.00	-1.12	0.13	-0.90
NPCA	-4.92	-0.36	-1.68	-4.07	0.01	-0.90
MCEA	-5.40	-0.33	-1.85	-7.06	0.08	-1.50

Groundwater elevations and seasonal responses to changes in recharge for select shallow and deeper wells are shown on Figures 3-5 through 3-7. The selected wells represent a groundwater flow path from upgradient of the former BPA, through the former BPA, through the former RMPA and southwestward (downgradient) through the Northern Potrero Creek Area (NPCA) and MCEA. Groundwater elevations in shallow wells (alluvium and shallow MEF) upgradient of the BPA and at the BPA show a rapid and significant response to rainfall with a more dampened response observed further out in the valley through the RMPA, NPCA, and MCEA (Figures 3-5 and 3-7). The deeper MEF and bedrock wells show a response very similar to the shallow wells during the periods of increased precipitation (Figure 3-6).



0 500 1,000 Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

Groundwater Elevation Change (compared to previous quarter groundwater elevations)

DECREASING		INCREASING
	0 to 0.50	
	0.51 to 1.00	
	1.01 to 1.50	
	1.51 to 2.00	
	2.01 to 2.50	
	> 2.51	

Groundwater Elevation Change not Available

Fault, Accurately Located Showing Dip

Fault, Approximately Located

Bedrock/Alluvium Surface Contact
Dashed where inferred

Historical Operational Area Boundary

Beaumont Site 1 Property Boundary

Notes: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

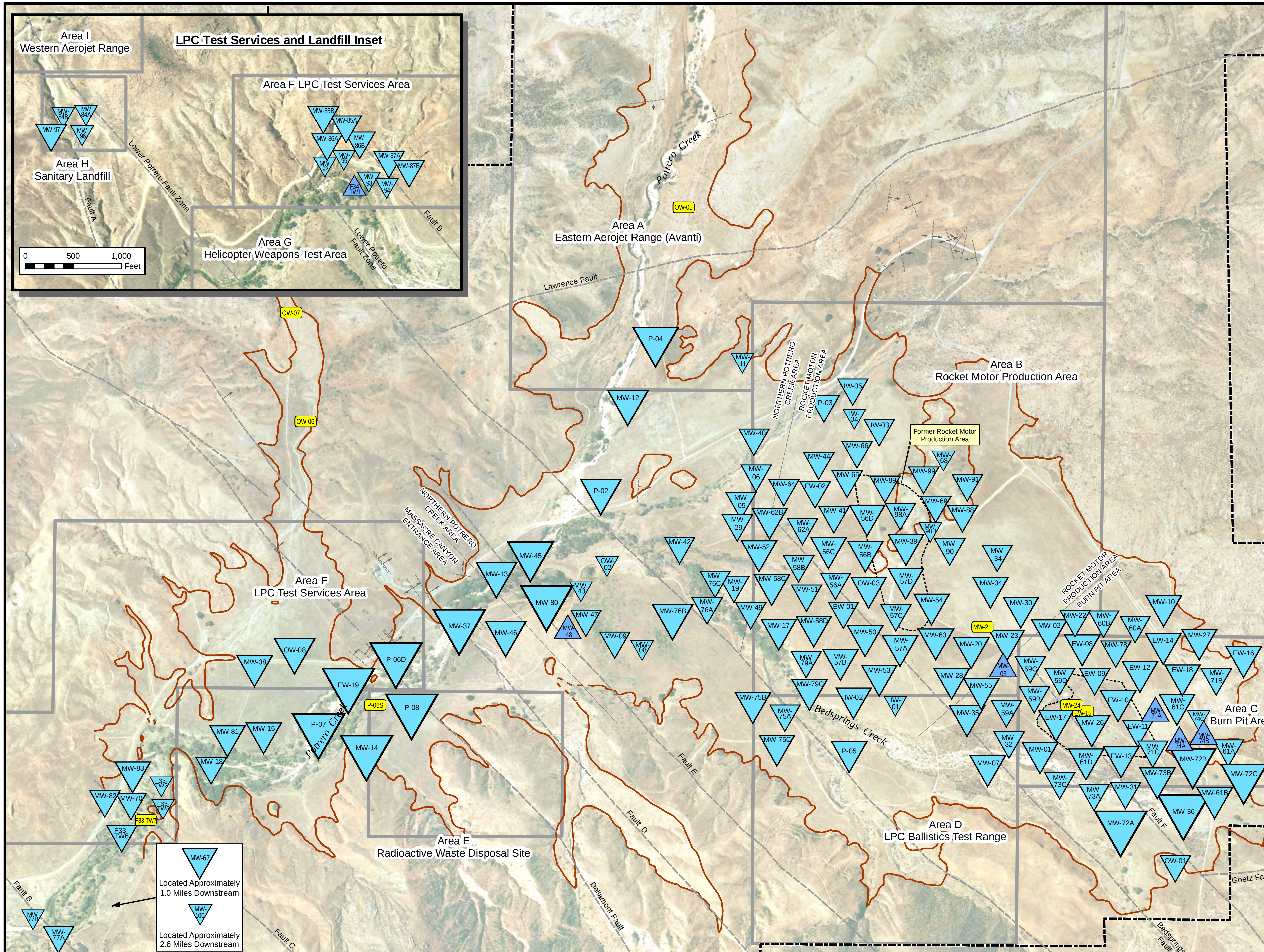
Figure 3-3

Third Quarter (August) 2009 Groundwater Elevation Change

TETRA TECH

X:\GIS\Lockheed S1 Q3Q409\GW_ElevChange Q309.mxd

X:\GIS\Lockheed S1 Q3Q409\GW_ElevChange Q409.mxd



0 500 1,000
Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

Groundwater Elevation Change
(compared to previous quarter groundwater elevations)

DECREASING		INCREASING
	0 to 0.50	
	0.51 to 1.00	
	1.01 to 1.50	
	1.51 to 2.00	
	2.01 to 2.50	
	> 2.51	

Groundwater Elevation Change not Available

Fault, Accurately Located Showing Dip

Fault, Approximately Located

Bedrock/Alluvium Surface Contact
Dashed where inferred

Beaumont Site 1 Property Boundary

Historical Operational Area Boundary

Notes: Beaumont Site 1 property boundary is approximate.

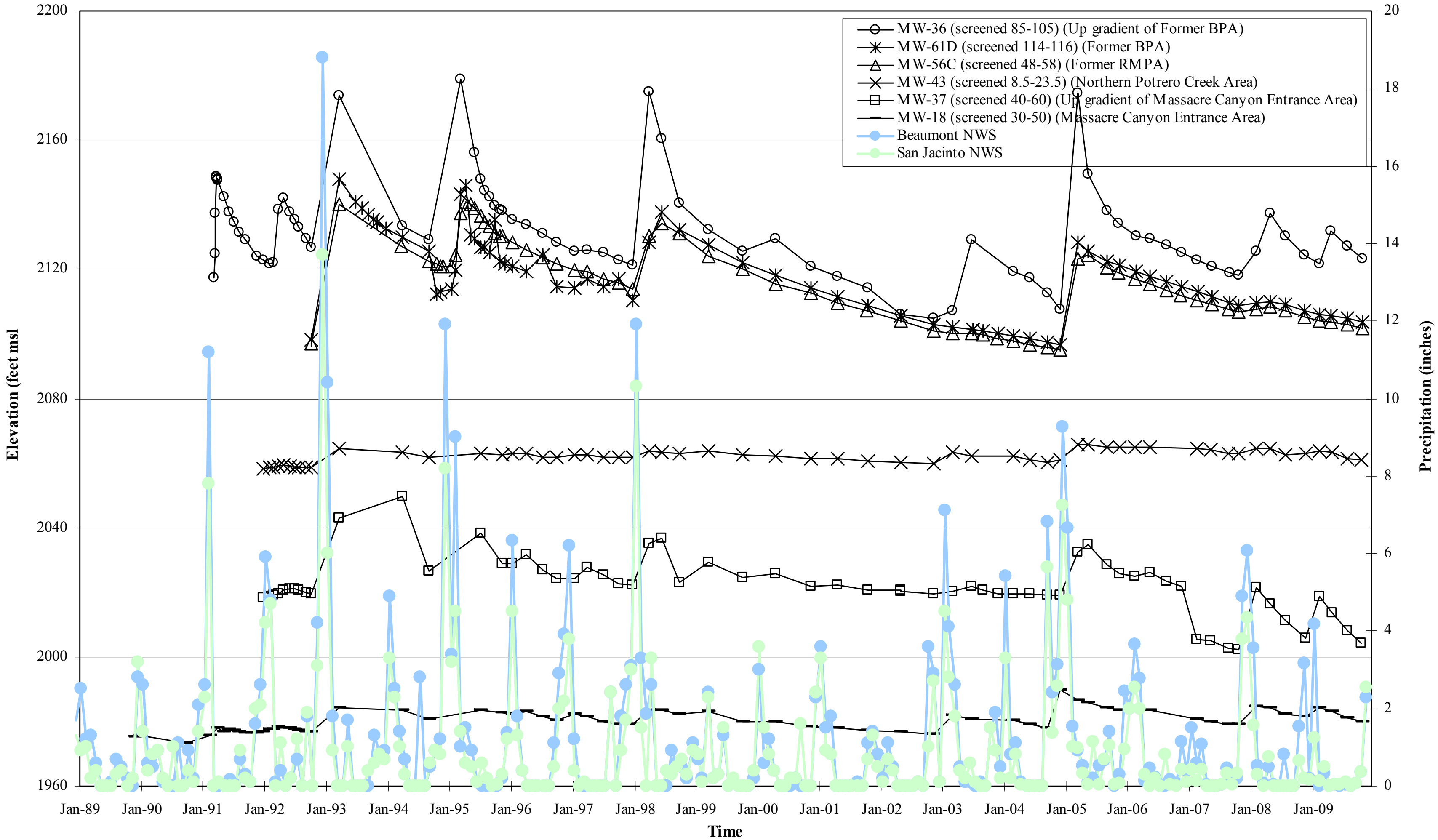
Beaumont Site 1

Figure 3-4

Fourth Quarter (November) 2009 Groundwater Elevation Change

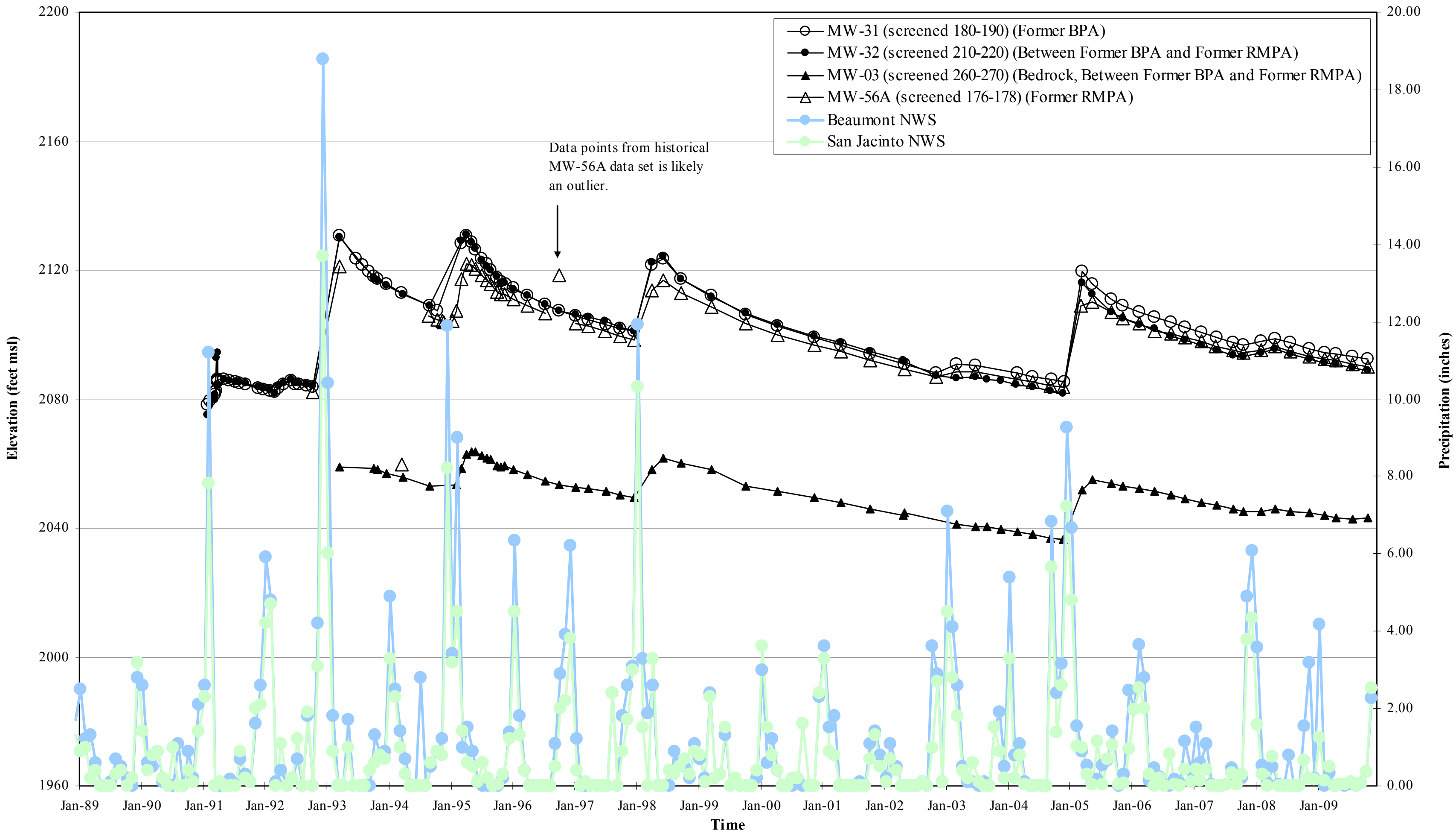
TETRA TECH

Figure 3-5 Groundwater Elevations vs. Time - Selected Alluvial and Shallow Mount Eden formation Wells



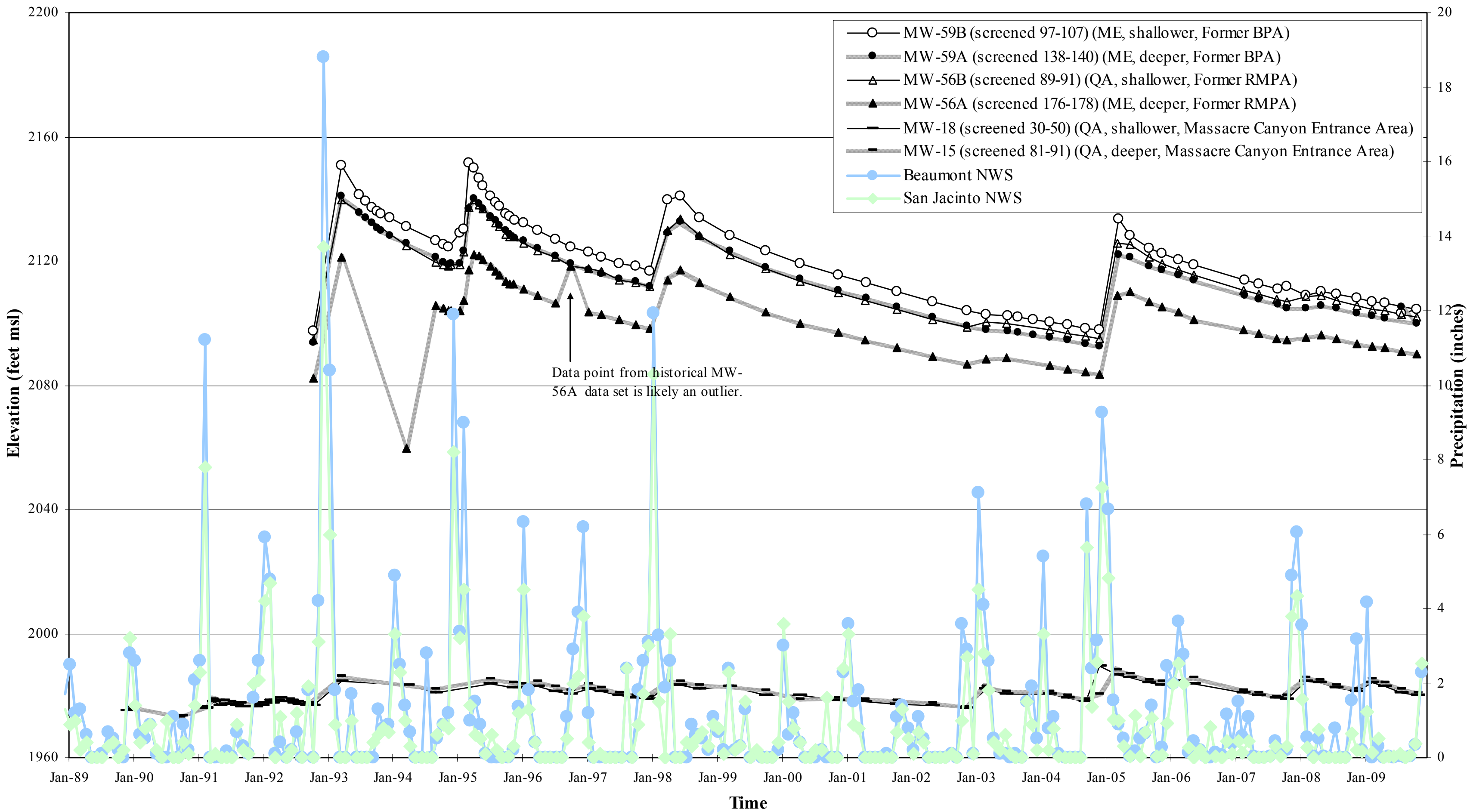
NWS - National Weather Service

Figure 3-6 Groundwater Elevations vs. Time - Deeper Mount Eden formation and Bedrock Wells



NWS - National Weather Service

Figure 3-7 Groundwater Elevations Comparison - Selected Shallower and Deeper Screened Wells in the Alluvial and Shallow Mount Eden formation



NWS - National Weather Service

3.2 SURFACE WATER FLOW

During Third Quarter 2009 and Fourth Quarter 2009, the Potrero and Bedsprings creek riparian corridors were walked to determine the presence, nature, and quantity of surface water within the creek beds. The locations where surface water was encountered were plotted and a determination was made whether the water was flowing or stagnant. Where flowing water was encountered, the flow rate was determined using a modified version of the EPA Volunteer Stream Monitoring: Methods Manual (USEPA 1997).

Four fixed stream locations, SF-1 through SF-4, were previously chosen for stream flow measurements. SF-1 is located near Gilman Hot Springs at the southeast border of the Site, SF-2 is located in the vicinity of MW-67, SF-3 is located in the vicinity of MW-15 and 18, and SF-4 is located near MW-42.

At each location a section of stream that is relatively straight for at least 20 feet was chosen for measurement. This 20 foot section was marked and width measurements were taken at various points to determine the average width. Depth measurements were collected at five points along the width of the stream to determine the average depth of the stream. The average width and depth measurements were multiplied together to obtain an average cross sectional area. Velocity was measured by releasing a float upgradient and recording the time it took to float through the 20-foot marked section.

Three velocity measurements were taken and averaged. The length of the measured section was divided by the average velocity and the answer was multiplied by a correction factor of 0.9 to correct for friction between the water and stream bed. The average cross sectional area was then multiplied by the corrected average surface velocity to obtain the average cubic feet of water per second (cfs) flowing through that section of the stream.

A summary of the surface water flow rates is presented in Table 3-3, and the measurement locations and the locations where surface water was encountered are shown on Figures 3-8 and 3-9.

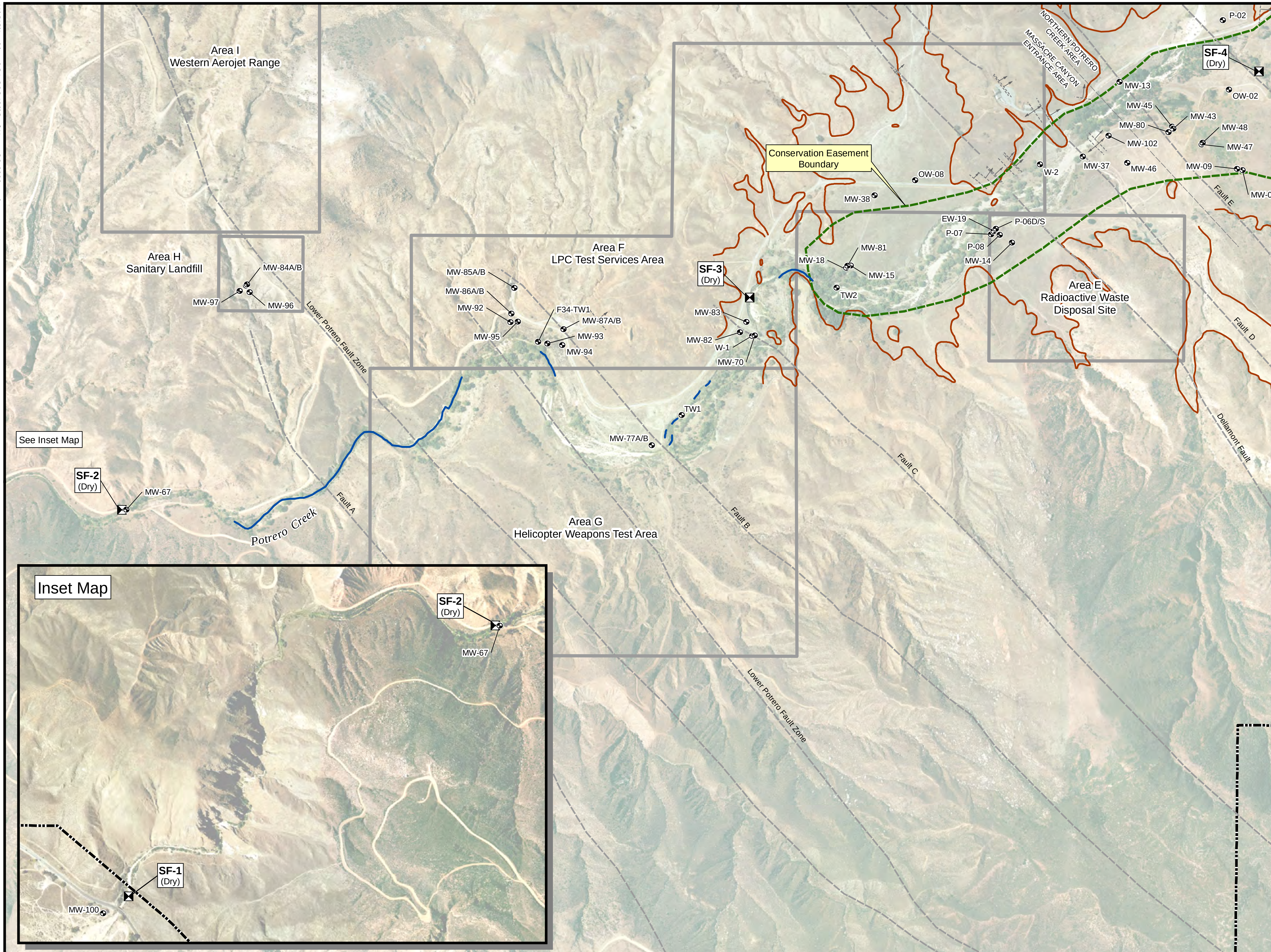
Table 3-3 Surface Water Flow Rates

Location ID	Description of Location	Date Measured	Length of Measured Section (ft)	Width of Measured Section (ft)	Depth of Measured Section (ft)	Float Travel Time (seconds)	Cross Sectional Area (ft2)	Surface Velocity (ft /sec)	Stream Flow Rate (cfs)	Site Stream Flow Rate (cfs)
Third Quarter (August) 2009										
SF-1	Near Gilman Hot Springs Road	08/07/08	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0.09
SF-2	Near MW-67	08/07/08	20	1.02	0.04	19.73	0.04	0.91	0.03	
SF-3	Near MW-15 and 18	08/07/08	20	2.67	0.05	16.66	0.13	1.08	0.14	
SF-4	Near MW-42	08/07/08	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
Fourth Quarter (November) 2009										
SF-1	Near Gilman Hot Springs Road	11/11/09	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0.00
SF-2	Near MW-67	11/11/09	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
SF-3	Near MW-15 and 18	11/11/09	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
SF-4	Near MW-42	11/11/09	Dry	Dry	Dry	Dry	Dry	Dry	Dry	

Notes: Measurements are averaged. NA - insufficient flow for measurement

cfs - cubic feet per second

X:\GIS\Lockheed S1 Q3Q409SurfWater_Q3-2009.mxd



0 500 1,000 Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

- Surface Flow Measurement Location
- Existing Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Surface Water Flow
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Conservation Easement Boundary
- Beaumont Site 1 Property Boundary
- Historical Operational Area Boundary

Notes:

Beaumont Site 1 property boundary is approximate.

cfs - Cubic feet per second.

Dry - Surface flow not significant enough for measurement.

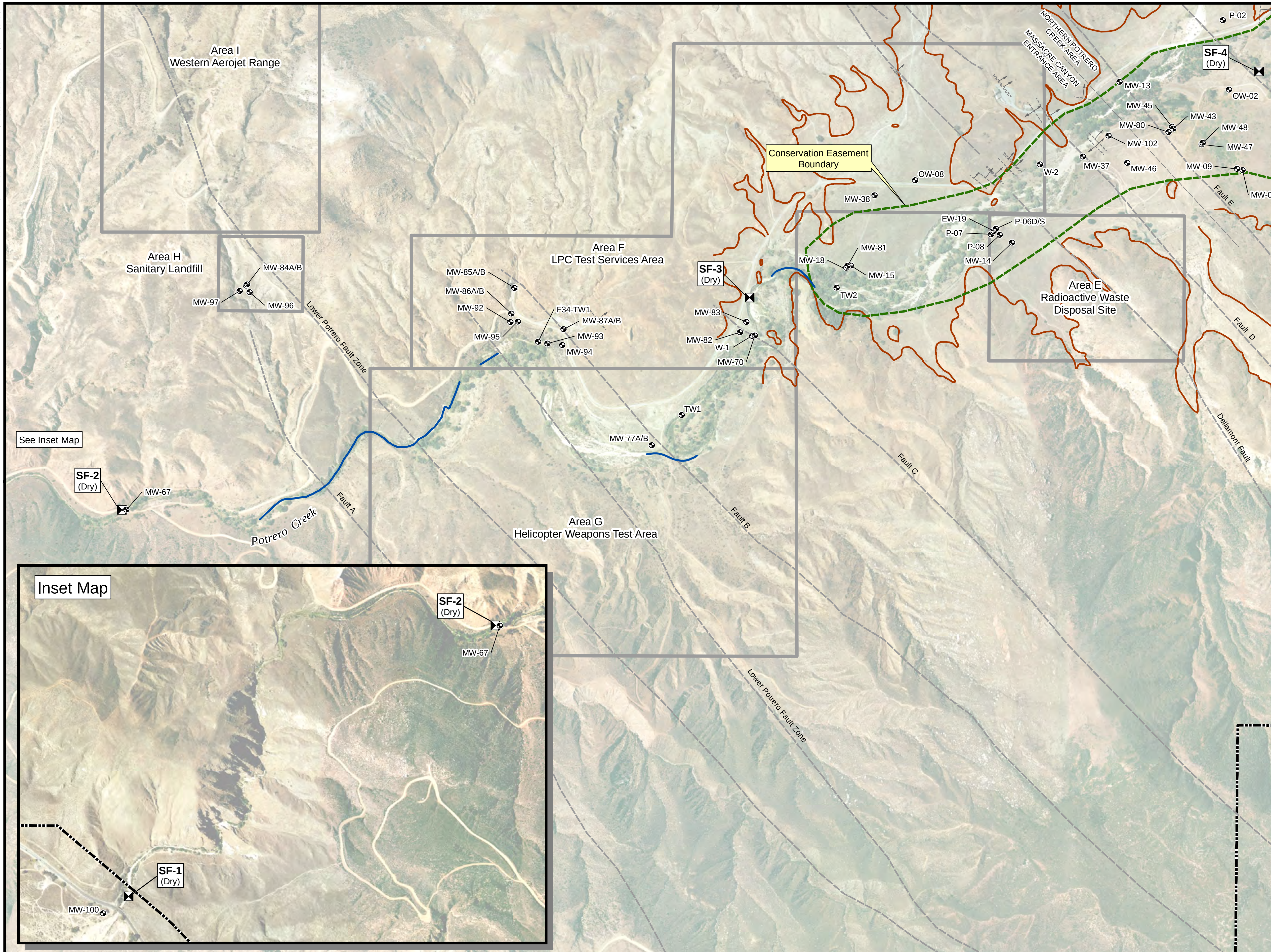
Beaumont Site 1

Figure 3-8

Third Quarter (August) 2009 Surface Water Flow Locations

TETRA TECH

X:\GIS\Lockheed S1 Q3Q409\SurfWater_Q4-2009.mxd



Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

- Surface Flow Measurement Location
- Existing Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Surface Water Flow
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Conservation Easement Boundary
- Beaumont Site 1 Property Boundary
- Historical Operational Area Boundary

Notes:

Beaumont Site 1 property boundary is approximate.

cfs - Cubic feet per second.

Dry - Surface flow not significant enough for measurement.

Beaumont Site 1

Figure 3-9
Fourth Quarter (November) 2009 Surface Water Flow Locations

TETRA TECH

3.3 GROUNDWATER FLOW

Groundwater flow directions from Third Quarter 2009 and Fourth Quarter 2009 (Figures 3-1 and 3-2 respectively) were similar to previously observed patterns for a dry period (Appendix A, Figure 2-14). Generally, groundwater flowed northwest from the southeastern limits of the valley (near the former BPA) beneath the former RMPA, towards Potrero Creek where groundwater flow then changes direction and begins heading southwest, parallel to the flow of Potrero Creek, into Massacre Canyon.

3.3.1 Horizontal and Vertical Groundwater Gradients

The overall horizontal groundwater gradient (approximating a flowline from MW-36, upgradient of the BPA, through the RMPA and NPCA to MW-18, in the MCEA) remained the same at 0.013 ft/ft between Third Quarter 2009 and Fourth Quarter 2009.

Vertical groundwater gradients are calculated from individual clusters of wells. Well clusters are used to measure the difference in static water level at different depths within the aquifer. The vertical gradient is a comparison of static water level between wells at different depths within the aquifer and is an indication of the vertical flow (downward – negative gradient; upward – positive gradient), of groundwater. The vertical groundwater gradients at the Site are generally negative in the BPA, negative in the RMPA, negative in the NPCA, and positive in the MCEA.

A summary of horizontal and vertical groundwater gradients is presented in Table 3-4. A complete listing of historical horizontal and vertical groundwater gradients and associated calculations is presented in Appendix F.

Table 3-4 Summary of Horizontal and Vertical Groundwater Gradient

Horizontal Groundwater Gradients (feet / foot), approximating a flowline from MW-36 to MW-18 and subsections					
Location:	**Overall**	**BPA**	**RMPA**	**NPCA**	**MCEA**
Date	**MW-36 to MW-18**	**MW-36 to MW-2**	**MW-2 to MW-5**	**MW-5 to MW-46**	**MW-46 to MW-18**
Previous - Second Quarter (May) 2009	0.013	0.0131	0.0019	0.021	0.013
Third Quarter (August) 2009	0.013	0.0113	0.0017	0.021	0.013
Fourth Quarter (November) 2009	0.013	0.0100	0.0016	0.022	0.013

Vertical Groundwater Gradients (feet / foot)					
Location:	**BPA**	**RMPA**	**NPCA**	**MCEA**	**MCEA**
shallow screen	**MW-59B** (MEF)	**MW-56B** (QAL	**MW-75B** (QAL)	**MW-18** (QAL)	**MW-77B** (MEF)
Date deep screen	**MW-59A** (MEF)	**MW-56A** (MEF)	**MW-75A** (MEF)	**MW-15** (QAL)	**MW-77A** (MEF)
Previous - Second Quarter (May) 2009	-0.13	-0.14	-0.07	0.02	0.05
Third Quarter (August) 2009	-0.13	-0.14	-0.07	0.02	0.04
Fourth Quarter (November) 2009	-0.13	-0.14	-0.07	0.02	0.03

Notes:

BPA - Burn Pit Area.
RMPA - Rocket Motor Production Area
NPCA - Northern Potrero Creek Area.
MCEA - Massacre Canyon Entrance Area.
QAL - Quaternary alluvium.
MEF - Mount Eden Formation.

3.4 ANALYTICAL DATA SUMMARY

Summaries of validated laboratory analytical results for organic (VOCs, 1,4-dioxane) and inorganic (perchlorate, natural attenuation parameters) analytes detected above their respective method detection limits (MDLs) from the Third Quarter 2009 and Fourth Quarter 2009 water quality monitoring events are presented in Tables 3-5 and 3-6, respectively. A complete list of analytes tested, along with validated sample results by analytical method are provided in Appendix G.

Sample results detected above the published maximum contaminant level (MCL), federal or state, whichever is lower, or the California Department of Health Services state drinking water notification level (DWNL) are bolded in Tables 3-5 and 3-6. Laboratory analytical data packages, which include environmental, field QC, and laboratory QC results, are provided in Appendix H and consolidated analytical data summary tables are presented in Appendix I. Tables 3-7 and 3-8 present summary statistics of the organic and inorganic analytes detected during the Third Quarter 2009 and Fourth Quarter 2009 monitoring events, respectively.

Table 3-5 Summary of Validated Detected Organic and Inorganic Analytes - Third Quarter 2009

Sample Location	Sample Date	Per chlorate	1,4- Dioxane	Acetone	2- Butanone	Benzene	Carbon Disulfide	Chloro form	1,1- Dichloro ethane	1,1- Dichloro ethene	c-1,2- Dichloro ethene	t-1,2- Dichloro ethene	Ethyl benzene	Methylene Chloride	Toluene	Trichloro ethene	m,p-Xylenes	o -Xylene
All results reported in µg/L unless otherwise stated																		
F33-TW2	08/20/09	<0.071	**4.5**	<5	<1.2	<0.14	<0.36	<0.17	<0.098	0.37 Jq	0.29 Jq	<0.1	<0.26	<0.15	<0.22	<0.17	<0.36	<0.41
F33-TW3	08/20/09	<0.071	**6.2**	<5	<1.2	<0.14	<0.36	<0.17	0.25 Jq	1.2	0.3 Jq	<0.1	<0.26	0.24 BJkq	<0.22	0.72	<0.36	<0.41
F33-TW6	08/25/09	<0.071	**4.2**	<5	<1.2	<0.14	<0.36	<0.17	<0.098	<0.12	<0.18	<0.1	<0.26	<0.15	<0.22	<0.17	<0.36	<0.41
F33-TW7	08/25/09	<0.071	**4.1**	<5	<1.2	<0.14	<0.36	<0.17	<0.098	<0.12	<0.18	<0.1	<0.26	<0.15	<0.22	<0.17	<0.36	<0.41
F-34-TW1	08/19/09	<0.071	**4.7**	<5.0	<1.2	<0.14	<0.36	<0.17	<0.098	0.29 Jq	<0.18	<0.10	<0.26	0.44 BJkq	<0.22	0.77	<0.36	<0.41
MW-70	08/20/09	**18**	**4.3**	<5	<1.2	<0.14	<0.36	<0.17	<0.098	<0.12	<0.18	<0.1	<0.26	<0.15	<0.22	<0.17	<0.36	<0.41
MW-82	08/25/09	<0.071	**3.6**	<5	<1.2	<0.14	<0.36	<0.17	<0.098	<0.12	<0.18	<0.1	<0.26	<0.15	<0.22	<0.17	<0.36	<0.41
MW-83	08/25/09	<0.071	**5.3**	<5	<1.2	<0.14	<0.36	<0.17	0.16 Jq	0.44 Jq	<0.18	<0.1	<0.26	<0.15	<0.22	0.24 Jq	<0.36	<0.41
MW-84A	08/18/09	<0.071	<0.10	<5.0	<1.2	<0.14	2.8	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.26 Jq	<0.22	<0.17	<0.36	<0.41
MW-84B	08/18/09	<0.071	<0.10	<5.0	<1.2	<0.14	1.6	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.35 Jq	<0.22	<0.17	<0.36	<0.41
MW-85A	08/18/09	<0.071	<0.10	<5.0	<1.2	<0.14	4.2	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.33 BJkq	<0.22	<0.17	<0.36	<0.41
MW-85B	08/18/09	<0.071	<0.10	<5.0	<1.2	<0.14	0.67	<0.17	<0.098	<0.12	<0.18	0.15 Jq	<0.26	0.37 Jq	<0.22	**22**	<0.36	<0.41
MW-86A	08/17/09	<0.071	<0.10	<5.0	<1.2	<0.14	3.3	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.26 BJkq	<0.22	<0.17	<0.36	<0.41
MW-86B	08/17/09	<0.071	0.81	<5.0	<1.2	<0.14	1.9	<0.17	<0.098	0.20 Jq	2.6	0.88	<0.26	0.38 BJkq	<0.22	**73**	<0.36	<0.41
MW-87A	08/19/09	<0.071	**5.8**	<5.0	<1.2	<0.14	1.3	<0.17	<0.098	0.28 Jq	<0.18	<0.10	<0.26	0.92 BJkq	<0.22	0.49 Jq	<0.36	<0.41
MW-87B	08/19/09	**21**	**25**	<5.0	<1.2	<0.14	<0.36	<0.17	<0.098	3.2	<0.18	<0.10	<0.26	0.20 BJkq	<0.22	**17**	<0.36	<0.41
MW-88	08/17/09	**450**	0.17 Jq	<5.0	<1.2	<0.14	<0.36	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	<0.15	<0.22	<0.17	<0.36	<0.41
MW-89	08/17/09	**2200**	**6.6**	<5.0	<1.2	<0.14	<0.36	0.81	0.21 Jq	5.4	<0.18	<0.10	<0.26	0.37 BJkq	<0.22	**8.3**	<0.36	<0.41
MW-90	08/17/09	**210**	0.26	<5.0	<1.2	<0.14	<0.36	0.23 Jq	<0.098	2.1	<0.18	<0.10	<0.26	0.18 BJkq	<0.22	2.4	<0.36	<0.41
MW-91	08/17/09	**1900**	1.6	<5.0	<1.2	<0.14	<0.36	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.23 BJkq	<0.22	<0.17	<0.36	<0.41
MW-92	08/19/09	**26**	0.19 Jq	<5.0	<1.2	<0.14	<0.36	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.25 BJkq	<0.22	**16**	<0.36	<0.41
MW-93	08/19/09	3.9	**16**	<5.0	<1.2	<0.14	0.46 Jq	<0.17	0.16 Jq	0.76	<0.18	<0.10	<0.26	0.21 BJkq	<0.22	2.3	<0.36	<0.41
MW-94	08/19/09	<0.071	**7.4**	<5.0	<1.2	<0.14	1.7	<0.17	0.35 Jq	0.42 Jq	<0.18	<0.10	<0.26	0.35 BJkq	<0.22	1.5	<0.36	<0.41
MW-95	08/18/09	0.15	0.27	<5.0	<1.2	<0.14	1.8	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.28 Jq	<0.22	**13**	<0.36	<0.41
MW-96	08/18/09	<0.071	<0.10	<5.0	<1.2	<0.14	2.8	0.19 Jq	<0.098	<0.12	<0.18	<0.10	<0.26	0.56 BJkq	<0.22	<0.17	<0.36	<0.41
MW-97	08/18/09	<0.071	<0.10	<5.0	<1.2	<0.14	0.98	0.19 Jq	<0.098	<0.12	<0.18	<0.10	<0.26	0.27 BJkq	<0.22	<0.17	<0.36	<0.41
MW-98A	08/17/09	<0.071	<0.10	<5.0	<1.2	<0.14	0.72	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.17 BJkq	<0.22	<0.17	<0.36	<0.41
MW-98B	08/17/09	**1500**	**10**	<5.0	<1.2	<0.14	<0.36	1.6	0.44 Jq	**11**	<0.18	<0.10	<0.26	0.19 BJkq	<0.22	**24**	<0.36	<0.41
MW-99	08/17/09	**1100**	2.3	16	2.4 Jq	0.19 Jq	0.38 Jq	<0.17	<0.098	2.5	<0.18	<0.10	0.36 Jq	0.34 BJkq	2.0	1.7	1.4	0.84
MW-100	08/24/09	<0.071	0.070 Jq	<5.0	<1.2	<0.14	2.8	<0.17	<0.098	<0.12	<0.18	<0.10	<0.26	0.21 Jq	<0.22	<0.17	<0.36	<0.41
MDL (µg/L)		0.071	0.10	5	1.2	0.14	0.36	0.17	0.098	0.12	0.18	0.10	0.26	0.15	0.22	0.17	0.36	0.41
MCL/DWNL (µg/L)		6	3 (1)	-	-	1	160 (1)	-	5	6	6	10	300	5	150	5	1750	1750

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.

µg/L - micrograms per liter.
MDL - Method detection limit.
MCL - California Department of Health Services Maximum Contaminant Level l.
DWNL - California Department of Public Health drinking water notification level.
(1) - DWNL
Bold - MCL or DWNL exceeded.

<# - Analyte not detected, method detection limit concentration is shown.
B - The result is < 5 times the blank contamination.
Cross contamination is suspected and the data is considered unusable
J - The analyte was positively identified, but the analyte concentration is an estimated value.
a - The analyte was found in the method blank.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 3-6 Summary of Validated Detected Organic and Inorganic Analytes - Fourth Quarter 2009

Sample Location	Sample Date	Perchlorate	1,4-Dioxane (SW8270S)	Acetone	2-Butanone	Benzene	Carbon disulfide	Chlorobenzene	Chloroethane	Carbon Tetrachloride	Chloroform	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	Cis-1,2-Dichloroethene	Trans-1,2-Dichloroethene	Methylene Chloride	Styrene	Toluene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	Tetrachloroethene	Vinyl Chloride	m,p-Xylenes	o-Xylene
All results reported in µg/L unless otherwise stated																										
SW-02	11/11/2009	**78**	**11**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	2.1	0.26 Jq	<0.10	<0.15	<0.22	0.72	<0.12	<0.31	2.2	<0.17	<0.13	<0.36	<0.41
SW-03	11/11/2009	<0.071	**13**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	1.2	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
SW-04	11/11/2009	0.46	**6.6**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	0.34 Jq	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
SW-06	11/10/2009	0.65	2.2	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
SW-09	11/10/2009	<0.071	**3.7**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	0.23 Jq	<0.18	<0.10	<0.15	0.27 Jq	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
SW-18	11/10/2009	<0.071	**4.5**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
EW-13	11/23/2009	1.9	**1,300**	<5.0	<1.2	**1.3**	0.95	<0.23	0.42 Jq	<0.15	0.84	**38**	**190**	**2,600**	**500**	1.1	1.3 BJkq	<0.22	<0.22	<0.12	**14**	**310**	1.4	**5.5**	<0.36	<0.41
EW-15	11/24/2009	**120,000**	**590**	<5.0	<1.2	**3.1**	<0.36	0.71	<0.35	**6.4**	48	**240**	**160 Jq**	**8,200**	**81**	6.1	0.84 BJkq	<0.22	<0.22	13	**29**	**2,100**	**7.9**	**1.1**	<0.36	<0.41
F33-TW2	11/17/2009	<0.071	**4.6**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	0.51	0.22 Jq	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
F33-TW3	11/17/2009	<0.071	**5**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	0.12 Jq	<0.21	0.74	0.19 Jq	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	0.48 Jq	<0.17	<0.13	<0.36	<0.41
F33-TW6	11/18/2009	<0.071	**5**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	0.39 Jq	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	0.29 Jq	<0.17	<0.13	<0.36	<0.41
F33-TW7	11/17/2009	<0.071	<0.10	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
F34-TW1	11/18/2009	<0.071	**4**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	0.28 Jq	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	0.67	<0.17	<0.13	<0.36	<0.41
IW-04	11/19/2009	<0.071	**20**	<5.0	<1.2	0.23 Jq	<0.36	<0.23	0.53	<0.15	<0.17	<0.098	0.21 Jq	**19**	2.9	0.37 Jq	0.26 Jq	<0.22	0.23 Jq	<0.12	<0.31	**16**	<0.17	**1.1**	<0.36	<0.41
MW-15	11/16/2009	<0.071	**7.7**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	0.35 Jq	<0.21	2.3	0.29 Jq	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	1.5	<0.17	<0.13	<0.36	<0.41
MW-18	11/16/2009	2.5	**5.4**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	0.24 Jq	<0.21	1.6	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	1.5	<0.17	<0.13	<0.36	<0.41
MW-28	11/12/2009	**200**	**6.4**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	0.87	1.0	**27**	<0.18	<0.10	<0.15	<0.22	<0.22	0.55	<0.31	**36**	<0.17	<0.13	<0.36	<0.41
MW-31	11/23/2009	2.7	<0.10	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-46	11/16/2009	0.52	**8.6**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	0.33 Jq	<0.21	1.6	0.65	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	0.98	<0.17	0.30 Jq	<0.36	<0.41
MW-55	11/12/2009	**1,700**	**75**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	0.16 Jq	1.2	3.0	2.7	**210**	1.1	<0.10	<0.15	<0.22	<0.22	0.99	1.1	**160**	0.37 Jq	<0.13	<0.36	<0.41
MW-59D	11/12/2009	**6,500**	**45**	<5.0	<1.2	0.31 Jq	<0.36	<0.23	<0.35	**1.1**	3.2	**15**	**24**	**860**	1.9	0.31 Jq	0.16 Jq	<0.22	<0.22	0.73	1.8	**660**	0.83	<0.13	<0.36	<0.41
MW-60A	11/12/2009	**5,700**	**130**	<5.0	<1.2	0.24 Jq	<0.36	<0.23	<0.35	**0.61**	2.9	**5.1**	**9.0**	**470**	2.2	0.18 Jq	<0.15	<0.22	<0.22	0.70	1.6	**340**	0.52	<0.13	<0.36	<0.41
MW-60B	11/12/2009	**1,200**	**9.5**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	0.56	0.45 Jq	0.67	**46**	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	**13**	<0.17	<0.13	<0.36	<0.41
MW-61C	11/12/2009	**1,900**	**6.5**	<5.0	<1.2	<0.14	0.56	<0.23	<0.35	<0.15	0.96	3.1	3.1	**120**	0.65	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	**28**	<0.17	<0.13	<0.36	<0.41
MW-67	11/16/2009	<0.071	0.89	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-68	11/24/2009	**14,000**	**12**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	0.27 Jq	1.2	0.57	**78**	0.46 BJkq	<0.10	0.21 BJkq	<0.22	<0.22	<0.12	<0.31	**34**	<0.17	<0.13	<0.36	<0.41
MW-70	11/13/2009	0.37	**4.2**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-71B	11/12/2009	**390**	<0.10	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	0.60	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	0.36 Jq	<0.17	<0.13	<0.36	<0.41
MDL (µg/L)		0.071	0.10	5	1.2	0.14	0.36	0.23	0.35	0.15	0.17	0.098	0.21	0.12	0.18	0.10	0.15	0.22	0.22	0.12	0.31	0.17	0.17	0.13	0.36	0.41
MCL/DWNL (µg/L)		6	3 (1)	-	-	1	160 (1)	-	-	0.5	-	5	5	6	6	10	5	100	150	200	5	5	5	0.5	1750	1750

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.
µg/L - micrograms per liter.
MDL - Method detection limit>
DWNL - California Department of Public Health drinking water notification level.
MCL - California Department of Health Services Maximum Contaminant Level
(1) DWNL
"-" - MCL or DWNL not available.
Bold - MCL or DWNL exceeded.
<# - Analyte not detected, method detection limit concentration is shown.
B - The result is < 5 times the blank contamination. Cross contamination is suspectedand the data is considered unusable
J - The analyte was positively identified, but the analyte concentration is an estimated value.
k - The analyte was found in a field blank.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 3-6 Summary of Validated Detected Organic and Inorganic Analytes - Fourth Quarter 2009 (continued)

Sample Location	Sample Date	Per chlorate	1,4-Dioxane (SW8270S)	Acetone	2-Butanone	Benzene	Carbon disulfide	Chloro-benzene	Chloro-ethane	Carbon Tetra-chloride	Chlor-o form	1,1-Dichloro ethane -	1,2-Dichloro-ethane	1,1-Dichloro-ethene	Cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	Methylene Chloride	Styrene	Toluene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Tetra-chloro-ethene	Vinyl Chloride	m,p-Xylenes	o-Xylene
All results reported in µg/L unless otherwise stated																										
MW-80	11/23/2009	<0.071	**7.3**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	0.42 Jq	<0.21	1.7	0.41 Jq	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	0.61	<0.17	<0.13	<0.36	<0.41
MW-82	11/13/2009	<0.071	**3.7**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-83	11/13/2009	<0.071	**5.1**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	0.15 Jq	<0.21	0.55	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	0.34 Jq	<0.17	<0.13	<0.36	<0.41
MW-84A	11/20/2009	<0.071	<0.10	<5.0	<1.2	<0.14	2.1	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-84B	11/20/2009	<0.071	<0.10	<5.0	<1.2	<0.14	1.5	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-85A	11/20/2009	<0.071	<0.10	<5.0	<1.2	<0.14	2.9	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-85B	11/18/2009	<0.071	<0.10	<5.0	<1.2	<0.14	1.1	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	**24**	<0.17	<0.13	<0.36	<0.41
MW-86A	11/18/2009	<0.071	**4.3**	<5.0	<1.2	<0.14	2.8	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-86B	11/18/2009	0.8	0.6	<5.0	<1.2	<0.14	1.1	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	0.20 Jq	1.9	0.43 Jq	<0.15	<0.22	<0.22	<0.12	<0.31	**46**	<0.17	<0.13	<0.36	<0.41
MW-87A	11/19/2009	<0.071	**4.7**	<5.0	<1.2	<0.14	1.9	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	0.29 Jq	<0.18	<0.10	0.62 Jq	<0.22	<0.22	<0.12	<0.31	0.45 Jq	<0.17	<0.13	<0.36	<0.41
MW-87B	11/19/2009	**28**	**15**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	2.9	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	**17**	<0.17	<0.13	<0.36	<0.41
MW-88	11/11/2009	**470**	0.21	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	0.44 Jq	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	0.39 Jq	<0.17	<0.13	<0.36	<0.41
MW-89	11/19/2009	**2,100**	**6.1**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	0.86	0.21 Jq	<0.21	5.8	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	**7.9**	<0.17	<0.13	<0.36	<0.41
MW-90	11/12/2009	**200**	0.3	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	0.24 Jq	<0.098	<0.21	2.0	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	2.4	<0.17	<0.13	<0.36	<0.41
MW-91	11/11/2009	**2,000**	1.7	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-92	11/18/2009	**26**	0.14 Jq	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	**17**	<0.17	<0.13	<0.36	<0.41
MW-93	11/19/2009	2.3	**13**	<5.0	<1.2	<0.14	0.49 Jq	<0.23	<0.35	<0.15	<0.17	0.16 Jq	<0.21	0.87	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	2.3	<0.17	<0.13	<0.36	<0.41
MW-94	11/19/2009	<0.071	**5.7**	<5.0	<1.2	<0.14	1.8	<0.23	<0.35	<0.15	<0.17	0.28 Jq	<0.21	0.46 Jq	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	1.6	<0.17	<0.13	<0.36	<0.41
MW-95	11/18/2009	<0.071	0.27	<5.0	<1.2	<0.14	1.4	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	**15**	<0.17	<0.13	<0.36	<0.41
MW-96	11/20/2009	<0.071	<0.10	<5.0	<1.2	<0.14	3.1	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-97	11/20/2009	<0.071	<0.10	<5.0	<1.2	<0.14	1.4	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-98A	11/11/2009	<0.071	<0.10	<5.0	<1.2	<0.14	0.60	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-98B	11/11/2009	**1,600**	**10**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	1.8	0.40 Jq	<0.21	**13**	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	**28**	<0.17	<0.13	<0.36	<0.41
MW-99	11/12/2009	**930**	1.9	11	1.5 Jq	0.15 Jq	<0.36	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	2.6	<0.18	<0.10	<0.15	<0.22	1.0	<0.12	<0.31	1.9	<0.17	<0.13	1.1	0.60
MW-100	11/16/2009	<0.071	0.060 Jq	<5.0	<1.2	<0.14	1.2	<0.23	<0.35	<0.15	<0.17	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	<0.17	<0.17	<0.13	<0.36	<0.41
MW-101	11/23/2009	<0.071	**23**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	1.8	0.56	**55**	**41**	1.6	<0.15	<0.22	<0.22	<0.12	<0.31	**48**	<0.17	**1.4**	<0.36	<0.41
MW-102	11/19/2009	<0.071	**19**	<5.0	<1.2	0.17 Jq	<0.36	<0.23	<0.35	<0.15	<0.17	1.9	0.32 Jq	**24**	**32**	2.4	<0.15	<0.22	<0.22	<0.12	<0.31	**25**	<0.17	**3.3**	<0.36	<0.41
P-06D	11/24/2009	0.22	**6.9**	<5.0	<1.2	<0.14	<0.36	<0.23	<0.35	<0.15	<0.17	0.46 Jq	<0.21	3.8 Bk	0.47 BJkq	<0.10	<0.15	<0.22	<0.22	<0.12	<0.31	2.4	<0.17	<0.13	<0.36	<0.41
MDL (µg/L)		0.071	0.10	5	1.2	0.14	0.36	0.23	0.35	0.15	0.17	0.098	0.21	0.12	0.18	0.10	0.15	0.22	0.22	0.12	0.31	0.17	0.17	0.13	0.36	0.41
MCL/DWNL (µg/L)		6	3 (1)	-	-	1	160 (1)	-	-	0.5	-	5	5	6	6	10	5	100	150	200	5	5	5	0.5	1750	1750

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.
µg/L - micrograms per liter.
MDL - Method detection limit>
DWNL - California Department of Public Health drinking water notification level.
MCL - California Department of Health Services Maximum Contaminant Level
(1) DWNL
"-" - MCL or DWNL not available.

Bold - MCL or DWNL exceeded.
<# - Analyte not detected, method detection limit concentration is shown.
B - The result is < 5 times the blank contamination. Cross contamination is suspectedand the data is considered unusable
J - The analyte was positively identified, but the analyte concentration is an estimated value.
k - The analyte was found in a field blank.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 3-7 Summary Statistics of Validated Third Quarter 2009 Organic and Inorganic Analytes Detected in Groundwater

Organic Analytes Detected	Total Number of Samples Analyzed	Total Number of Detections (1)	Number of Detections Exceeding MCL or DWNL (1)	MCL / DWNL		Minimum Concentration Detected		Maximum Concentration Detected	
1,4-Dioxane	30	22	14	3 (2)	µg/L	0.070	µg/L	25	µg/L
Acetone	30	1	0	-	µg/L	16	µg/L	16	µg/L
2- Butanone	30	1	0	-	µg/L	2.4	µg/L	2.4	µg/L
Benzene	30	1	0	1	µg/L	0.19	µg/L	0.19	µg/L
Carbon Disulfide	30	15	0	160	µg/L	0.38	µg/L	4.2	µg/L
Chloroform	30	5	0	-	µg/L	0.19	µg/L	1.6	µg/L
1,1-Dichloroethane	30	6	0	5	µg/L	0.16	µg/L	0.44	µg/L
1,1-Dichloroethene	30	13	1	6	µg/L	0.20	µg/L	11	µg/L
cis-1,2-Dichloroethene	30	3	0	6	µg/L	0.29	µg/L	2.6	µg/L
trans-1,2-Dichloroethene	30	2	0	10	µg/L	0.15	µg/L	0.88	µg/L
Ethylbenzene	30	1	0	300	µg/L	0.36	µg/L	0.36	µg/L
Methylene Chloride	30	5	0	5	µg/L	0.21	µg/L	0.37	µg/L
Toluene	30	1	0	150	µg/L	2.0	µg/L	2.0	µg/L
Trichloroethene	30	15	7	5	µg/L	0.24	µg/L	73	µg/L
m,p-Xylenes	30	1	0	1750	µg/L	1.4	µg/L	1.4	µg/L
o -Xylene	30	1	0	1750	µg/L	0.84	µg/L	0.84	µg/L
Methane	7	7	0	-	µg/L	1.2	µg/L	110	µg/L
Acetic Acid	7	7	0	-	mg/L	0.034	mg/L	0.074	mg/L
Lactic Acid and HIBA	7	1	0	-	mg/L	0.12	mg/L	0.12	mg/L
i-Pentanoic Acid	7	1	0	-	mg/L	0.63	mg/L	0.63	mg/L
Propionic Acid	7	3	0	-	mg/L	0.28	mg/L	0.28	mg/L
Total Organic Carbon	7	7	0	-	mg/L	1.9	mg/L	3.4	mg/L
Dissolved Organic Carbon	7	7	0	-	mg/L	1.3	mg/L	2.9	mg/L
Inorganic Analytes Detected	**Total Number of Samples Analyzed**	**Total Number of Detections (1)**	**Number of Detections Exceeding MCL or DWNL (1)**	**Corresponding MCL / DWNL**		**Minimum Concentration Detected**		**Maximum Concentration Detected**	
Perchlorate -ug/L	30	11	9	6	µg/L	0.15	µg/L	2,200	µg/L
Hydrogen	6	6	0	-	nM	1.4	nM	1.8	nM
Iron	7	6	3	0.3	mg/L	0.076	mg/L	0.750	mg/L
Sulfate	7	7	0	250	mg/L	43	mg/L	70	mg/L

Notes:

" - " - MCL or California Department of Health Services state drinking water notification level not established.
(1) - Number of detections exclude sample duplicates, trip blanks and equipment blanks.
(2) - DWNL.
DWNL - California Department of Health Services state drinking water notification level.
MCL - California Department of Health Services Maximum Contaminant Level
mg/L - Milligrams per liter.
µg/L - Micrograms per liter.
nM - Nanomoles

Table 3-8 Summary Statistics of Validated Fourth Quarter 2009 Organic and Inorganic Analytes Detected in Groundwater

Organic Analytes Detected	Total Number of Samples Analyzed	Total Number of Detections (1)	Number of Detections Exceeding MCL or DWNL (1)	MCL / DWNL		Minimum Concentration Detected		Maximum Concentration Detected	
1,4-Dioxane (8270S)	56	46	36	3 (2)	µg/L	0.060	µg/L	1,300	µg/L
Acetone	56	1	0	-	µg/L	11	µg/L	11	µg/L
2-Butanone	56	1	0	-	µg/L	1.5	µg/L	1.5	µg/L
Benzene	56	7	2	1	µg/L	0.15	µg/L	3.1	µg/L
Carbon disulfide	56	16	0	160 (2)	µg/L	0.49	µg/L	3.1	µg/L
Chlorobenzene	56	1	0	-	µg/L	0.71	µg/L	0.71	µg/L
Chloroethane	56	2	0	-	µg/L	0.42	µg/L	0.53	µg/L
Carbon tetrachloride	56	4	3	0.5	µg/L	0.16	µg/L	6.4	µg/L
Chloroform	56	11	0	-	µg/L	0.24	µg/L	48	µg/L
1,1-Dichloroethane	56	22	4	5	µg/L	0.12	µg/L	240	µg/L
1,2-Dichloroethane	56	12	4	5	µg/L	0.21	µg/L	190	µg/L
1,1-Dichloroethene	56	34	13	6	µg/L	0.2	µg/L	8,200	µg/L
cis-1,2-Dichloroethene	56	16	4	6	µg/L	0.19	µg/L	500	µg/L
trans-1,2-Dichloroethene	56	8	0	10	µg/L	0.18	µg/L	6.1	µg/L
Methylene Chloride	56	3	0	5	µg/L	0.16	µg/L	0.62	µg/L
Styrene	56	1	0	100	µg/L	0.27	µg/L	0.27	µg/L
Toluene	56	5	0	150	µg/L	0.23	µg/L	1.2	µg/L
1,1,1-Trichloroethane	56	5	0	200	µg/L	0.55	µg/L	13	µg/L
1,1,2-Trichloroethane	56	5	2	5	µg/L	1.1	µg/L	29	µg/L
Trichloroethene	56	34	17	5	µg/L	0.29	µg/L	2,100	µg/L
Tetrachloroethene	56	5	1	5	µg/L	0.37	µg/L	7.9	µg/L
Vinyl chloride	56	6	5	0.5	µg/L	0.3	µg/L	5.5	µg/L
m, p-Xylene	56	1	0	1750	µg/L	1.1	µg/L	1.1	µg/L
o-Xylene	56	1	0	1750	µg/L	0.60	µg/L	0.60	µg/L
Methane	7	5	0	-	µg/L	1.1	µg/L	120	µg/L
Acetic Acid	7	3	0	-	mg/L	0.035	mg/L	0.04	mg/L
Propionic Acid	7	2	0	-	mg/L	0.051	mg/L	1.2	mg/L
Total Organic Carbon	7	7	0	-	mg/L	1.7	mg/L	2.4	mg/L
Dissolved Organic Carbon	7	7	0	-	mg/L	1.9	mg/L	3.4	mg/L
Inorganic Analytes Detected	**Total Number of Samples Analyzed**	**Total Number of Detections (1)**	**Number of Detections Exceeding MCL or DWNL (1)**	**Corresponding MCL / DWNL**		**Minimum Concentration Detected**		**Maximum Concentration Detected**	
Perchlorate	56	28	19	6	µg/L	0.22	µg/L	120,000	µg/L
Hydrogen	7	7	0	-	nM	0.74	nM	1.5	nM
Iron	7	7	4	0.3	mg/L	0.0065	mg/L	0.820	mg/L
Sulfate	7	7	0	250	mg/L	46	mg/L	75	mg/L

Notes:
" - " - MCL or California Department of Health Services state drinking water notification level not established.
(1) - Number of detections exclude sample duplicates, trip blanks and equipment blanks.
(2) - DWNL.
DWNL - California Department of Health Services state drinking water notification level.
MCL - California Department of Health Services Maximum Contaminant Level
mg/L - Milligrams per liter.
µg/L - Micrograms per liter.
nM - Nanomoles

3.4.1 Data Quality Review

The quality control samples were reviewed as described in the Revised Groundwater Sampling and Analysis Plan (Tetra Tech, 2003b). The data for the groundwater sampling activities were contained in analytical data packages generated by Babcock Laboratories Inc and Microseeps Laboratories Inc. These data packages were reviewed using the latest versions of the National Functional Guidelines for Organic and Inorganic Data Review documents from the EPA (EPA 2004 and 2008).

Holding times, field blanks, laboratory control samples, (LCS) method blanks, duplicate environmental samples, spiked samples, and surrogate and spike recovery data were reviewed. Within each environmental sample the sample specific quality control spike recoveries were examined. These data examinations include comparing statistically calculated control limits to percent recoveries of all spiked analytes and duplicate spiked analytes. Relative Percent Difference (RPD) control limits are compared to actual spiked (MS/MSD) RPD results. Surrogate recoveries were examined for all organic compound analyses and compared to their control limits.

Environmental samples were analyzed by the following methods: AM23G for metabolic acids, AM20GAX for hydrogen, E300.0 for nitrate and sulfate, E332.0 for perchlorate, A5310 for total and dissolved organic carbon, RSK-175 for methane, ethane, and ethene, SW8270C SIM for 1,4-dioxane, SW6010B and E200.7 for metals, and SW8260B for VOCs. Unless discussed below, all data results met required criteria, are of known precision and accuracy, did not require any qualification, and may be used as reported.

Blank contamination caused 0.6 percent of the total SW8260B data to be qualified for blank contamination. The blank qualified data should be considered not detected.

Blank contamination caused 12.5 percent of the total RSK-175 data to be qualified for blank contamination. The blank qualified data should be considered not detected.

Blank contamination caused 11.1 percent of the total AM23G data to be qualified for blank contamination. The blank qualified data should be considered not detected.

Method AM20GAX had field duplicate errors that qualified as estimated 5.4 percent of the total AM23G data. The data qualified as estimated is usable for the intended purpose.

In addition to being detected by method SW8270C SIM, if high enough concentrations are encountered 1,4-dioxane will also be detected by Method SW8260B. Method SW8270C SIM however is a more accurate method for measuring 1,4-dioxane than method SW8260B. Therefore, the SW8270C SIM result will be used as the best and correct result for the analyte.

3.5 CHEMICALS OF POTENTIAL CONCERN

The identification of COPCs is an ongoing process that takes place annually and is reported in the First and Second Quarter Semi-annual Groundwater Monitoring Report. The purpose of identifying COPCs is to establish a list of analytes that best represents the extent and magnitude of affected groundwater and to focus more detailed analysis on those analytes. The analytes were organized and evaluated in two groups, organic and inorganic analytes, and divided into primary and secondary COPCs. Tables 3-5 and 3-6 present summaries of the organic and inorganic analytes detected during the Third Quarter 2009 and Fourth Quarter 2009 monitoring events. Data that is “B” qualified because of its association with either laboratory blank or field cross contamination is not included in the COPC evaluation.

The COPC process does not eliminate analytes from testing but reduces the number of analytes that are evaluated and discussed during reporting. The standard list of analytes for each method will continue to be tested for and screened annually to insure that the appropriate COPCs are being identified and evaluated as specified in the Revised Groundwater Sampling and Analysis Plan (Tetra Tech, 2003b).

3.5.1 Identification of Chemicals of Potential Concern

As indicated above, COPCs are evaluated annually and reported in the First and Second Quarter Semi-annual Groundwater Monitoring Report. COPCs have been selected to include compounds that consistently have been detected in groundwater samples collected from the Site at concentrations above regulatory limits and that can be used to assess the extent of affected groundwater. Primary COPCs are parent products such as TCE and 1,1,1-TCA and are always present with a secondary COPC. Secondary COPCs are breakdown products such as 1,1-DCA and

1,1-DCE and are detected at lower concentrations then their parent products. At this site 1,1-DCE, a breakdown product of 1,1,1-TCA, is detected at higher concentrations then 1,1,1-TCA so it is considered the Primary COPC, and 1,1,1-TCA is considered a secondary COPC.

An annual evaluation of COPC based on the results of the Second Quarter 2009 water quality monitoring event was presented in the First and Second Quarter 2009 Semi-annual Groundwater Monitoring Report (Tetra Tech, 2009f). Based on the results of water quality monitoring and the screening of those results against the existing COPCs, the MCLs and DWNLs, no additional COPCs were identified nor was there evidence to remove an analyte from the existing COPC list. Table 3-9 presents those groundwater analytes that have been identified as COPCs. Time-series graphs of primary and secondary COPCs are provided in Appendix E

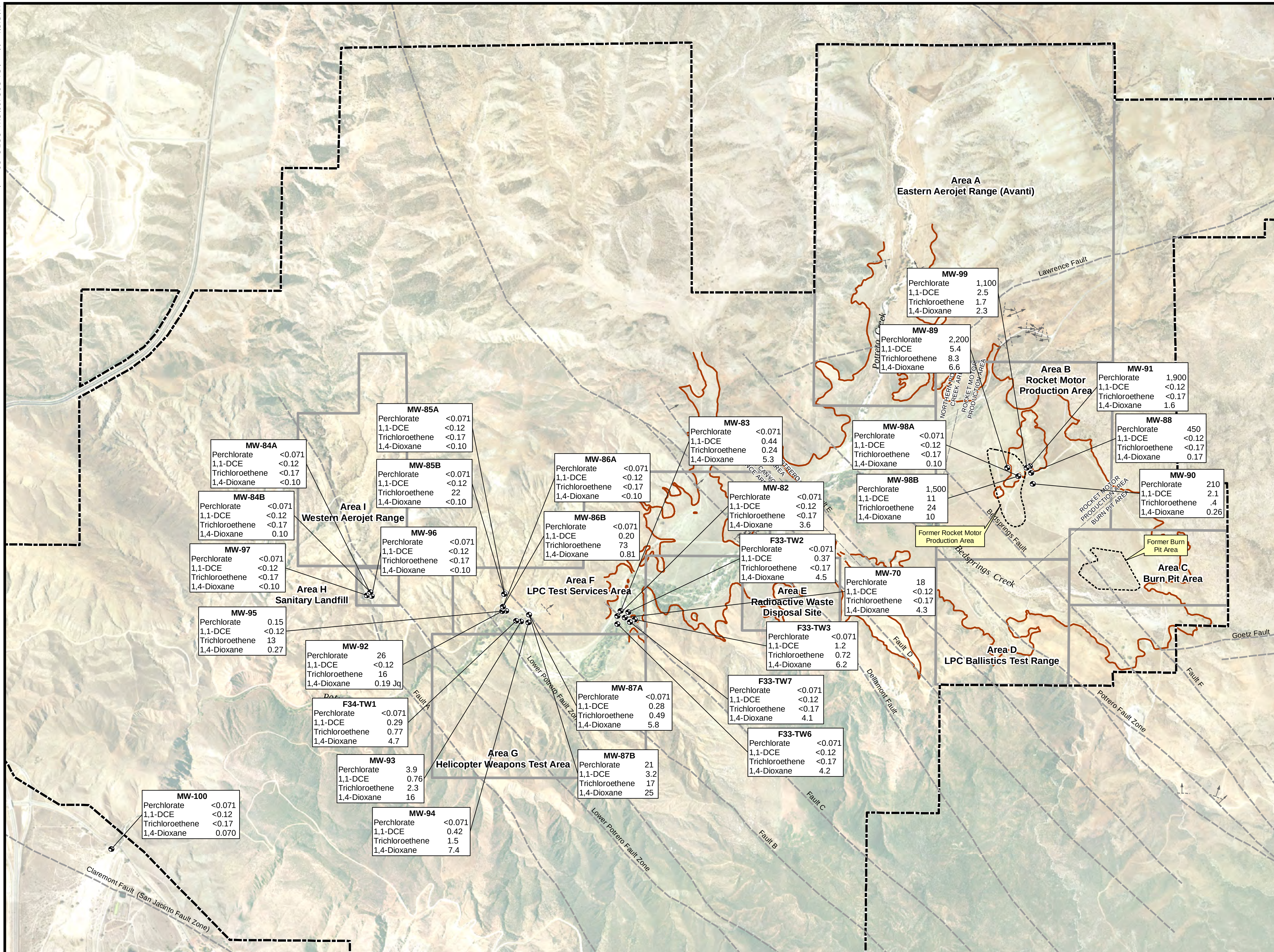
Table 3-9 Groundwater Chemicals of Potential Concern

Analyte	Classification	Comments
Perchlorate	Primary	Parent product (propellant), widely detected at Site.
1,1-Dichloroethene	Primary	Breakdown product of 1,1,1-TCA, detected at higher concentrations than 1,1,1-TCA at Site.
Trichloroethene	Primary	Parent product (solvent), widely detected at Site.
1,4-Dioxane	Primary	Stabilizer in 1,1,1-TCA, widely detected at Site.
1,1-Dichloroethane	Secondary	Breakdown product of 1,1,1-TCA.
1,2-Dichloroethane	Secondary	Breakdown product of 1,1,1-TCA.
1,1,1-Trichloroethane	Secondary	Parent product (solvent), detected at lower concentrations than breakdown product (1,1-DCE) at Site.
cis-1,2-Dichloroethene	Secondary	Breakdown product of TCE.

3.6 DISTRIBUTION OF THE PRIMARY CHEMICALS OF POTENTIAL CONCERN

The Third Quarter 2009 and Fourth Quarter 2009 monitoring events are minor events. Only guard wells, wells with increasing contaminant trends, new wells, and surface water locations are sampled and tested during these events (Tetra Tech, 2003b). Therefore, only those wells and surface water sampled and tested during this event will be discussed. Figures 3-10 and 3-11 present summaries of COPC laboratory results for groundwater samples collected for the Third Quarter 2009 and Fourth Quarter 2009 monitoring events.

X:\GIS\Lockheed S1 Q3Q409\GW_COPC_Q3.mxd



N

0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

- Monitoring Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Burn Pit and Rocket Motor Production Area
- Historical Operational Area Boundary
- Beaumont Site 1 Property Boundary

Notes:

DCE - Dichloroethene.

TCE - Trichloroethene

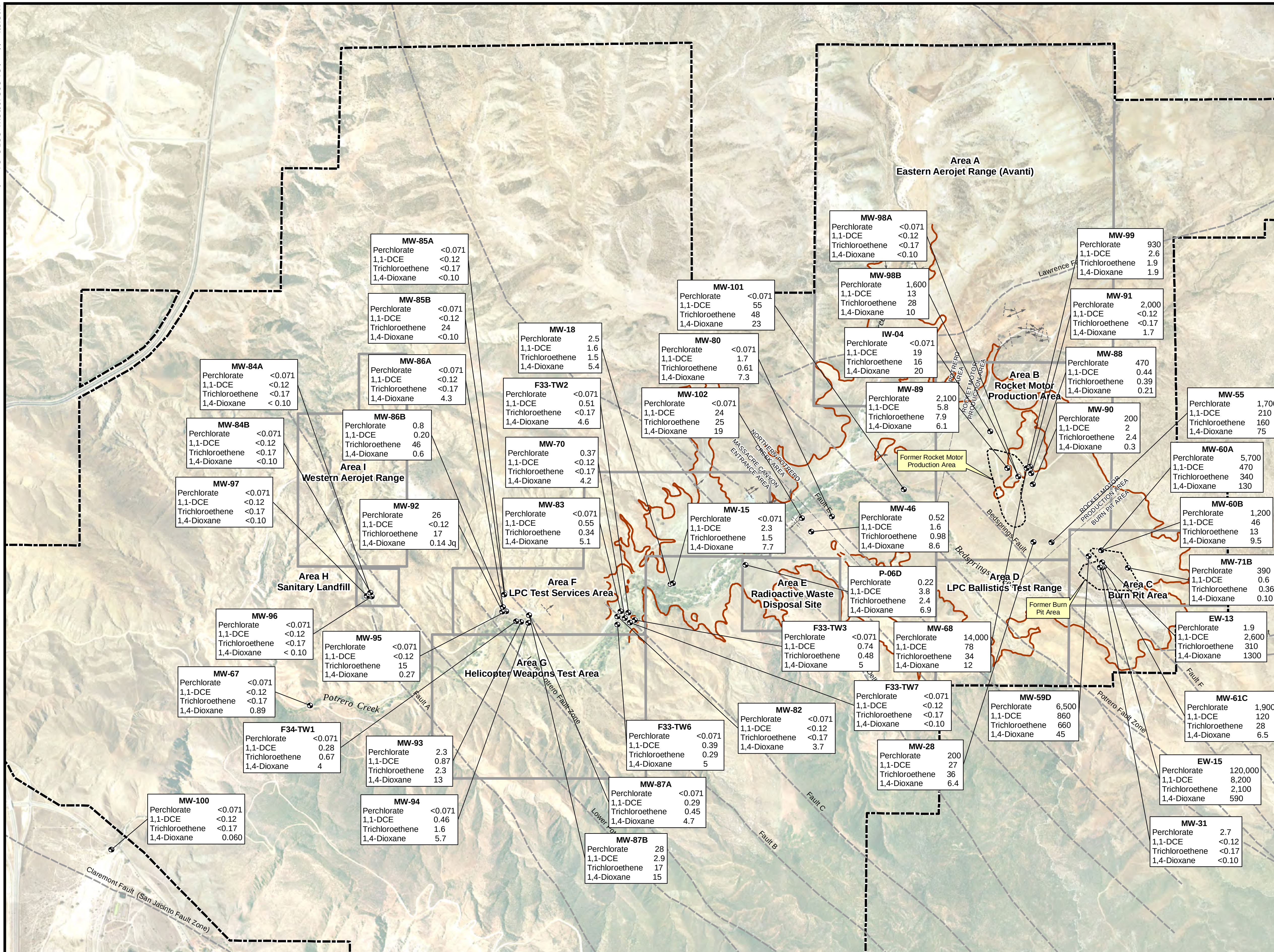
Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 3-10
Third Quarter (August) 2009 Primary COPC Sampling Results (µg/L)

TETRA TECH

X:\GIS\Lockheed S1 Q3Q409\GW_COPC_Q4.mxd



0 1,000 2,000
Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

- Monitoring Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Burn Pit and Rocket Motor Production Area
- Historical Operational Area Boundary
- Beaumont Site 1 Property Boundary

Notes:

DCE - Dichloroethene.

TCE - Trichloroethene

Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 3-11
Fourth Quarter (November) 2009 Primary COPC Sampling Results (µg/L)

TETRA TECH

3.6.1 Guard Wells

Guard wells are wells that are used as an early warning to detect contaminants for the protection of private and municipal wells. Guard wells are also used to monitor any migration of contaminants offsite.

Three monitoring wells, MW-15, MW-18, and MW-67, were designated as guard wells during the semi-annual event conducted during the second quarter of the previous year. Wells MW-15 and MW-18 are a clustered well pair. Well MW-18 is completed near the top of the alluvial aquifer and MW-15 is completed near the bottom of the alluvial aquifer. Well MW-67 is the furthest downgradient well and located approximately 0.9 miles upgradient of the southern edge of the Site. A new offsite guard well (MW-100) was installed in February 2009 as part of the Dynamic Site Investigation due to low- level detections (0.94 and 0.78 µg/l) of 1,4-dioxane in the MW-67 (Tetra Tech, 2009d). Well MW-100 was installed approximately 500 feet from the property boundary on the property just south of Gilman Springs Road near the mouth of Potrero Creek. Table 3-10 presents a summary of the detected COPCs reported in guard well samples collected from the Fourth Quarter 2009 and previous monitoring events. In general, the COPC concentrations have remained stable in the guard wells.

Table 3-10 Summary of Detected COPCs in Guard Wells

Sample Location	Site Area	Sample Date	1,4-Dioxane	1,1-Dichloro ethane	1,1-Dichloro ethene	cis-1,2-Dichloro ethene	Trichloro ethene	Perchlorate
All results reported in µg/L unless otherwise stated								
MW-15	MCEA	11/07/07	**5.3**	0.45 Jq	2.9	0.28 Jq	1.4	<0.5
MW-15	MCEA	05/30/08	**4.3**	<1	2 Jq	<1	1.1 Jq	<0.5
MW-15	MCEA	11/11/08	**4.6**	0.41 Jq	2.4	0.27 Jq	1.3	<0.5
MW-15	MCEA	06/08/09	**6.4**	0.47 Jq	2.6	<0.49	1.3	<0.071
MW-15	MCEA	11/16/09	**7.7**	0.35 Jq	2.3	0.29 Jq	1.5	<0.071
MW-18	MCEA	11/02/07	**4.7**	0.21 Jq	1.4	<0.2	1.4	**6.13**
MW-18	MCEA	05/30/08	**6.7**	<1	1.9 Jq	<1	1.6 Jq	**6.02**
MW-18	MCEA	11/11/08	**3.2**	0.27 Jq	1.8	<0.2	1.5	3.07
MW-18	MCEA	06/10/09	**6.5**	<0.37	1.5 Jd	<0.49	1.2	2.1
MW-18	MCEA	11/16/09	**5.4**	0.24 Jq	1.6	<0.18	1.5	2.5
MW-67	MCEA	11/02/07	0.78 Jq	<0.2	<0.2	<0.2	<0.2	<0.5
MW-67	MCEA	05/30/08	0.86 Jq	<1	<1	<1	<1	<0.5
MW-67	MCEA	11/11/08	<0.58	<0.2	<0.2	<0.2	<0.2	<1
MW-67	MCEA	06/10/09	1.2 Jcq	<0.37	<0.40 Rd	<0.49	<0.30	<0.071
MW-67	MCEA	11/16/09	0.9	<0.098	<0.12	<0.18	<0.17	<0.071
MW-100	Off Site	03/10/09	<2.0	<0.10	<0.10	<0.10	<0.10	<0.5
MW-100	Off Site	06/15/09	<0.40	<0.37	<0.40	<0.49	<0.30	<0.071
MW-100	Off Site	08/24/09	0.070 Jq	<0.098	<0.12	<0.18	<0.17	<0.071
MW-100	Off Site	11/16/09	0.060 Jq	<0.098	<0.12	<0.18	<0.17	<0.071
MCL/DWNL (µg/L)			3 (1)	5	6	6	5	6

Notes: Only analytes positively detected are presented in this table.
For a complete list, refer to the laboratory data package.
MCEA - Massacre Canyon Entrance Area.
MCL - California Department of Health Services Maximum Contaminant Level.
DWNL - California Department of Health Services state drinking water notification level.
(1) DWNL
µg/L - micrograms pre liter.
Bold - MCL or CA Department of Health Services state DWNL exceeded.
<# - Analyte not detected, method detection limit concentration is shown.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

3.6.2 Increasing Trend Wells

During Second Quarter 2009, (Tetra Tech, 2009e), 12 monitoring wells were designated as increasing or probably increasing trend monitoring wells: IW-04 (1,1-DCE), MW-28 (perchlorate and 1,1-DCE), MW-31 (perchlorate), MW-46 (1,1-DCE), MW-55 (perchlorate), MW-59D (perchlorate), MW-60A (1,4-dioxane and perchlorate), MW-60B (1,4-dioxane), MW-61C (1,1-DCE), MW-68 (1,4-dioxane and perchlorate), MW-71B (perchlorate), and MW-80 (TCE). The MCLs for 1,1-DCE, TCE, and perchlorate are 6 µg/L, 5 µg/L, and 6 µg/L respectively. The DWNL for 1,4-dioxane is 3 µg/L.

The concentration of 1,1-DCE in groundwater samples collected from IW-04 was 8.7 µg/L in 2007, 15 µg/L in 2008, and 19 µg/L in Second Quarter 2009. The current concentration is 19 µg/L. IW-04 is located within the RMPA which is a known source area.

The concentration of 1,1-DCE and perchlorate in groundwater samples collected from MW-28 were 8.7 µg/L and 116 µg/L in 2007, 26 µg/L and 130 µg/L in 2008, and 26 µg/L and 210 µg/L in Second Quarter 2009 respectively. The current concentrations of 1,1-DCE and perchlorate are 27 µg/L and 200 µg/L respectively. MW-28 is located within the BPA which is a known source area.

The concentration of perchlorate in groundwater samples collected from MW-31 was 2.4 µg/L in 2006, 4.33 µg/L in 2008, and 2.5 µg/L in Second Quarter 2009. The current concentration is 2.7 µg/L. MW-31 is located within the BPA, which is a known source area.

The concentration of 1,1-DCE in groundwater samples collected from MW-46 was 1.9 µg/L in 2007, 2.2 µg/L in 2008, and 2.8 µg/L in Second Quarter 2009. The current concentration of 1,1-DCE is 1.6 µg/L. MW-46 is located within the NPCA.

The concentration of perchlorate in groundwater samples collected from MW-55 was 1,370 µg/L in 2007, 1,750 µg/L in 2008, and 1,600 µg/L in Second Quarter 2009. The current concentration of perchlorate is 1,700 µg/L. MW-55 is located within the RMPA, which is a known source area.

The concentration of perchlorate in groundwater samples collected from MW-59D was 7,100 µg/L in 2007 and 5,670 µg/L in 2008, and 6,100 µg/L in Second Quarter 2009. The current concentration of perchlorate is 6,500 µg/L. MW-59D is located just downgradient of the BPA, which is a known source area.

The concentration of 1,4-dioxane and perchlorate in groundwater samples collected from MW-60A were 100 µg/L and 5100 µg/L in 2006, 110 µg/L and 5360 µg/L in 2008, and 140 µg/L and 5300 µg/L in Second Quarter 2009 respectively. The current concentrations of 1,4-dioxane and perchlorate are 130 µg/L and 5700 µg/L respectively. MW-60A is located within the BPA, which is a known source area.

The concentration of perchlorate in groundwater samples collected from MW-60B was 0.9 µg/L in 2007 and 3.7 µg/L in 2008, and 6.6 µg/L in Second Quarter 2009. The current concentration of perchlorate is 9.5 µg/L. MW-60B is located within the BPA, which is a known source area.

The concentration of 1,1-DCE in groundwater samples collected from MW-61C was 51 µg/L in 2006, 61 µg/L in 2008, and 110 µg/L in Second Quarter 2009. The current concentration of 1,1-DCE is 120 µg/L. MW-61C is located within the BPA, which is a known source area.

The concentration of 1,4-dioxane and perchlorate in groundwater samples collected from MW-68 were 2.2 µg/L and 3270 µg/L in 2007, 3.4 µg/L and 3980 µg/L in 2008, and 9.8 µg/L and 3600 µg/L in Second Quarter 2009 respectively. The current concentrations of 1,4-dioxane and perchlorate are 12 µg/L and 14,000 µg/L respectively. MW-68 is located within the RMPA, which is a known source area.

The concentration of perchlorate in groundwater samples collected from MW-71B was 242 µg/L in 2007 and 263 µg/L in 2008, and 40 µg/L in Second Quarter 2009. The current concentration of perchlorate is 390 µg/L. MW-71B is located within the BPA, which is a known source area

The concentration of TCE in groundwater samples collected from MW-80 was 0.45 µg/L in 2007, not detected above the MDL in 2008, and 1.2 µg/L in Second Quarter 2009. The current concentration of TCE is 0.61 µg/L. MW-80 is located within the NPCA.

3.6.3 New Wells

MW-37 and MW-42 were destroyed and replacement wells MW-101 and MW-102 were installed as part of the Site 1 well destruction, rehabilitation, and installation work that was completed in early November 2009. MW-101 and MW-102 were installed as replacements for MW-42 and MW-37, respectively, which were in danger of being damaged due to stream bank erosion. The new wells were designed and installed to mimic the geochemical and hydrological characteristics of MW-37 and MW-42 as closely as possible while still being located in protected areas. A complete description of the work performed will be presented in the Site 1 Well Destruction, Rehabilitation, and Installation Report currently in preparation. COPC sample results from the Fourth Quarter 2009 groundwater sampling event for MW-101 and MW-102 and historic sample results from MW-37 and MW-42 can be found in Table 3-11.

Table 3-11 New Well COPC Sample Results

Sample Location	Sample Date	Perch lorate	1,4-Dioxane	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1-Dichloro ethene	c-1,2-Dichloro ethene	1,1,1-Trichloro ethane	Trichloro ethene
All results reported in µg/L unless otherwise stated									
MW-37	06/07/06	<0.43	**8.8**	0.68 Jq	<0.22	3.9	<0.35	<0.32	1.9
MW-37	06/14/07	<0.5	**5.7**	0.77 Jq	<0.2	**7.2**	0.2 Jq	<0.2	3.3
MW-37	05/29/08	<0.5	2.6	<1	<1	1.5 Jq	<1	<1	<1
MW-37	06/11/09	<0.36	**7.2**	0.45 Jq	<0.31	2.5	<0.49	<0.45	1.4
MW-102 (1)	11/19/09	<0.071	**19**	1.9	0.32 Jq	**24**	**32**	<0.12	**25**
MW-42	06/09/06	<0.43	**32**	3.6	0.90	**89**	2.8	<0.32	**79**
MW-42	06/21/07	4.84	**22**	3.7	0.68 Jq	**48**	1.2	<0.2	**50**
MW-42	06/09/08	<0.5	**19**	4.5 Jq	<1	**75**	2.2 Jq	<1	**80**
MW-42	06/11/09	<0.36	**32**	**5.2**	0.57	**90**	2.7	<0.45	**84**
MW-101 (2)	11/23/09	<0.071	**23**	1.8	0.56	**55**	**41**	<0.12	**48**
MCL/DWNL (µg/L)		6	3 (3)	5	5	6	6	200	5

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package
MCL - California Department of Health Services Maximum Contaminant Level
DWNL - California Department of Health Services state drinking water notification level.
(1) – MW-102 is a replacement well for MW-37
(2) – MW-101 is a replacement well for MW-42
(3) -– DWNL
µg/L - micrograms pre liter.
Bold - MCL or CA Department of Health Services state DWNL exceeded.
<# - Analyte not detected, method detection limit concentration is shown.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
b - the surrogate spike recovery was outside control limits.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

3.6.4 Surface Water

Surface water samples were collected in Fourth Quarter 2009 during the routine groundwater sampling event. Table 3-12 presents concentrations of COPCs reported in surface water samples collected from this sampling event.

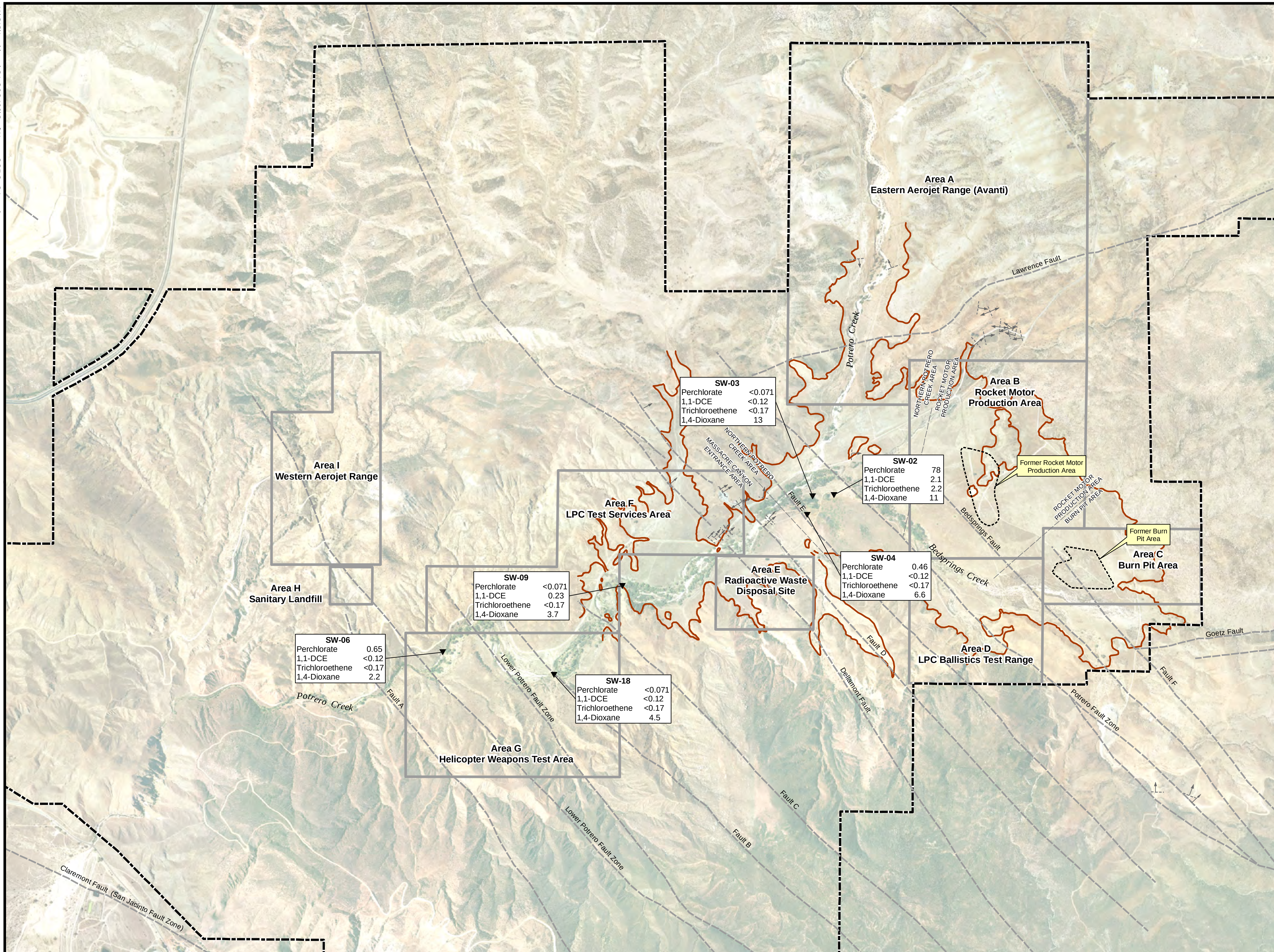
During Fourth Quarter 2009 surface water samples were collected from six locations (SW-02, SW-03, SW-04, SW-06, SW-09, and SW-18) along the Potrero and Bedsprings Creek drainages. The remaining 12 locations and the 1 alternate location were dry at the time of sampling. The four primary COPCs, 1,4-dioxane, 1,1-DCE, TCE, and perchlorate, and 1 secondary COPC, cis-1,2-DCE, were detected in surface water samples collected from locations SW-02, SW-03, and SW-04; these samples were collected from springs and or spring fed ponds located outside of the stream beds but near the intersection of Bedsprings and Potrero Creeks.

Three of the primary COPCs, 1,4-dioxane, 1,1-DCE, and perchlorate, and no secondary COPCs were detected in the surface water samples collected from locations SW-06, SW-07, and SW-18. These samples were collected from water flowing in Potrero Creek and are located topographically downgradient of the springs discussed in the previous paragraph. Figure 3-12 presents concentrations of COPCs reported in surface water samples collected from the Fourth Quarter 2009 monitoring event.

Table 3-12 Summary of Detected COPCs in Surface Water – Fourth Quarter 2009

Sample Location	Sample Date	1,4-Dioxane	1,1-Dichloroethene	c-1,2-Dichloroethene	Trichloroethene	Perchlorate
All results reported in μg/L unless otherwise stated						
SW-02	11/11/2009	**11**	2.1	0.26 Jq	2.2	**78**
SW-03	11/11/2009	**13**	<0.12	<0.18	<0.17	<0.071
SW-04	11/11/2009	**6.6**	<0.12	<0.18	<0.17	0.46
SW-06	11/10/2009	2.2	<0.12	<0.18	<0.17	0.65
SW-09	11/10/2009	**3.7**	0.23 Jq	<0.18	<0.17	<0.071
SW-18	11/10/2009	**4.5**	<0.12	<0.18	<0.17	<0.071
Method Detection Limit (μg/L)		0.60	0.20	0.18	0.20	0.5
MCL/DWNL (μg/L)		3 (1)	6	6	5	6

Notes: Only analytes positively detected are presented in this table.
For a complete list, refer to the laboratory data package.
μg/L - micrograms per liter.
MCL - California Department of Health Services Maximum Contaminant Level
DWNL - California Department of Public Health drinking water notification level.
(1) DWNL
Bold - MCL or DWNL exceeded.
<# - Analyte not detected, method detection limit concentration is shown.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).



X:\GIS\Lockheed S1 Q3Q409\SurfWater_COPC_Q4.mxd

N

0 1,000 2,000
Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

- Surface Water Sample Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact
  Dashed where inferred
- Burn Pit and Rocket Motor Production Area
- Historical Operational Area Boundary
- Beaumont Site 1 Property Boundary

Notes:

DCE - Dichloroethene.

TCE - Trichloroethene

Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 3-12
Fourth Quarter (November) 2009 Surface Water Primary COPC Sampling Results (µg/L)

TETRA TECH

3.7 F-33 MONITORED NATURAL ATTENUATION SAMPLING

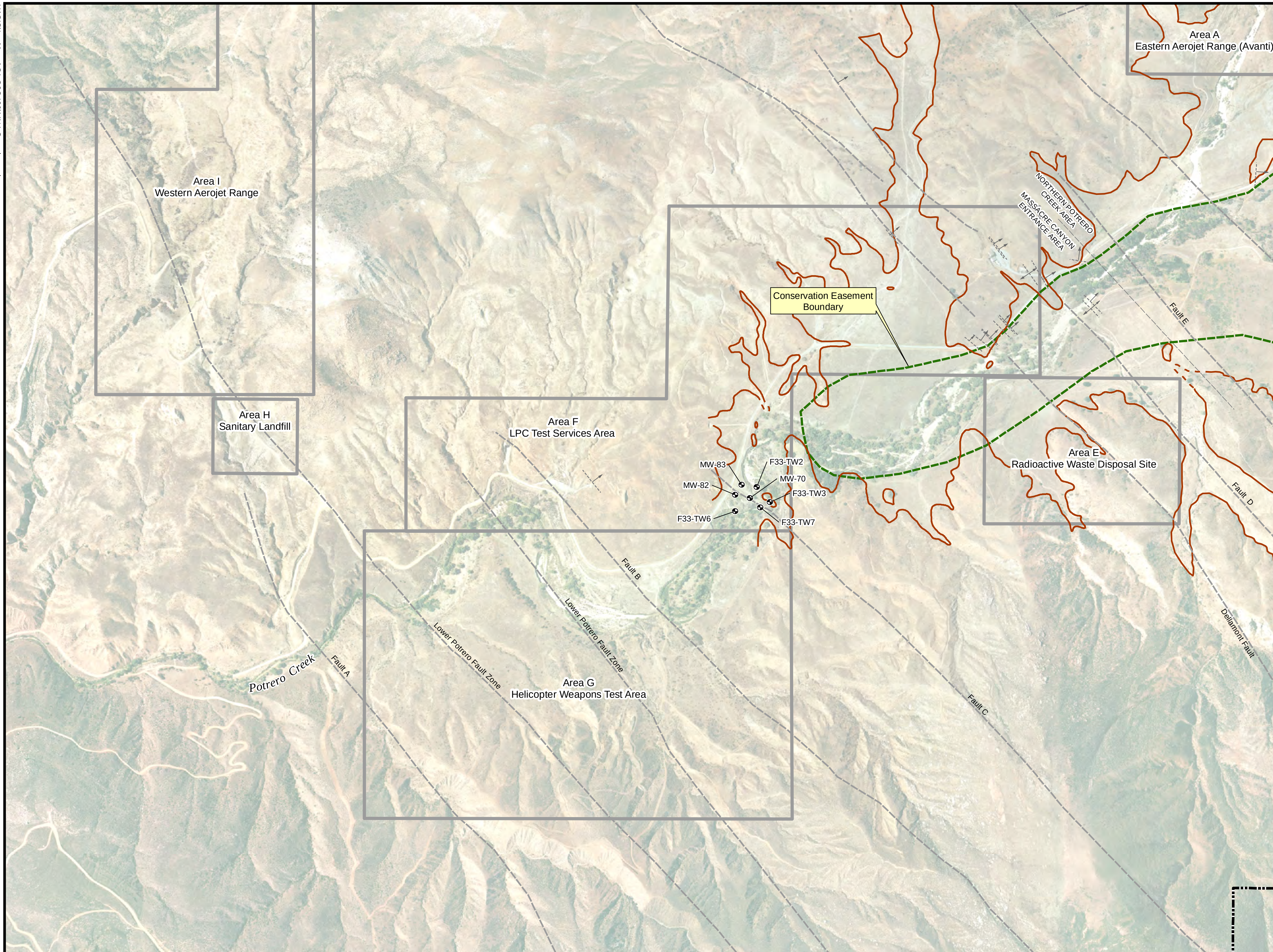
Seven monitoring wells (F33-TW2, F33-TW3, F33-TW6, F33-TW7, MW-70, MW-82, and MW-83) located in the F-33 area were sampled for monitored natural attenuation parameters (MNA) during the Third Quarter 2009 and Fourth Quarter 2009 monitoring events. Samples for laboratory analysis were collected for total organic carbon (TOC), dissolved organic carbon (DOC), total iron, ferrous iron, sulfide, sulfate, methane, hydrogen, and volatile fatty acids (VFAs). Ferrous iron and sulfide were analyzed using a field instrument during these sampling events. Additionally, DO and ORP were monitored with field instruments during purging and sampling. Figure 3-13 presents monitoring well locations sampled for MNA during the Third Quarter 2009 and Fourth Quarter 2009 monitoring events. Table 3-13 presents a summary of detected analytes and field measurements.

Perchlorate

Perchlorate concentrations have been below detection limits in all monitoring wells within the F-33 area except for MW-70 where concentrations appear to increase seasonally with increased rainfall and higher groundwater levels (Figure 3-14). During Third Quarter 2009 and Fourth Quarter 2009 perchlorate concentrations in MW-70 were 18 µg/L and 0.37 µg/L respectively. Perchlorate concentrations have ranged from below the MDL to 48.5 µg/L (First Quarter 2008). Based on the high concentrations of perchlorate in the Feature F-33 vadose zone soil and the fact that perchlorate was below the detection limit in all other area wells supports that geochemical conditions in groundwater are generally conducive to natural biodegradation.

The concentration of perchlorate in soil samples collected in the vicinity of the surrounding and downgradient wells is much lower than the perchlorate concentrations in soil samples collected adjacent to MW-70. Therefore, even though geochemical conditions appear to support natural attenuation in the entire vicinity, seasonal increases in surface water infiltration and groundwater elevation result in an increase in perchlorate concentrations in groundwater in the vicinity of MW-70. Perchlorate movement from soil into groundwater appears to be limited or halted completely by biodegradation as perchlorate is not observed in the surrounding and downgradient wells.

X:\GIS\Lockheed S1 Q3Q409\MNA Sample.mxd



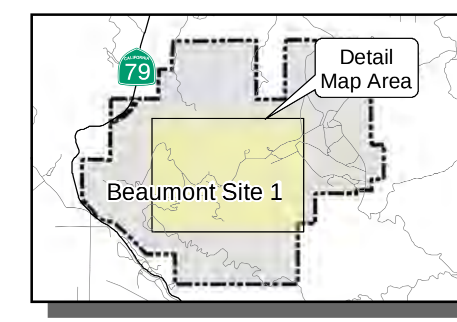
0 500 1,000
Feet

Adapted from: March 2007 aerial photograph.

Faults from structural analysis of Potrero Valley, *Lineament and Geologic Mapping Study, Tetra Tech, 2009.*

LEGEND

- Monitoring Well Location with Sampling Frequency
- Bedrock/Alluvium Surface Contact, Dashed where inferred
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Conservation Easement Boundary
- Historical Operational Area Boundary
- Beaumont Site 1 Property Boundary



Beaumont Site 1

Figure 3-13
MNA Sample Locations Third Quarter 2009 and Fourth Quarter 2009

TETRA TECH

Table 3-13 Summary of Validated Detected Natural Attenuation Analytes and Field Measurements – Third Quarter 2009 and Fourth Quarter 2009

		Field Parameters				Analytes										
Sample Location	Sample Date	DO - mg/L	ORP - mVs	Sulfide -mg/L (1)	Ferrous Iron -mg/L (1)	Per chlorate -ug/L	Acetic Acid -mg/L	Lactic Acid and HIBA -mg/L	i-Pentanoic Acid -mg/L	Propionic Acid -mg/L	Dissolved Organic Carbon -mg/L	Total Organic Carbon -mg/L	Hydrogen -nM	Methane -ug/L	Sulfate -mg/L	Iron -mg/L
F33-TW2	8/20/2009	0.34	2.5	0.00	**0.80**	<0.071	0.074	0.13 Ba	<0.032	0.28	2.4	2.1	1.6	110	53	**0.750**
F33-TW2	11/17/2009	0.56	12.6	0.01	**0.70**	<0.071	0.036 BJaq	0.12 Ba	<0.032	<0.002	2.0	2.0	1.3	120	49	**0.810**
F33-TW3	8/20/2009	0.16	-29.9	0.01	**0.49**	<0.071	0.059 Jq	0.14 Ba	0.63	0.28	1.9	1.3	1.5	33	49	**0.500**
F33-TW3	11/17/2009	0.28	-12.2	0.01	**0.84**	<0.071	0.057 BJaq	0.1 Ba	<0.032	0.034 BJaq	1.9	1.7	0.91	110	46	**0.820**
F33-TW6	8/25/2009	0.26	57.5	0.01	0.28	<0.071	0.042 Jq	<0.042	<0.032	<0.002	2.3	2.1	1.6	1.4	66	0.270
F33-TW6	11/18/2009	0.35	35.5	0.00	0.00	<0.071	0.051 BJaq	0.15 Ba	<0.032	0.051 Jq	2.4	2.1	1.4	1.1	70	**0.390**
F33-TW7	8/25/2009	0.36	18.0	0.00	0.21	<0.071	0.034 Jq	<0.042	<0.032	<0.002	3.4	2.9	-	100	43	**0.300**
F33-TW7	11/17/2009	0.75	20.8	0.00	**0.33**	<0.071	0.05 BJaq	0.13 Ba	<0.032	0.042 BJaq	2.1	2.1	1.5	76	49	**0.340**
MW-70	8/20/2009	5.54	40.2	0.02	0.04	**18**	0.044 Jq	<0.042	<0.032	0.28	2.7	2.3	1.7	1.8	45	0.150
MW-70	11/13/2009	2.13	73.0	0.01	0.06	**0.37**	0.038 Jq	0.11 Ba	<0.032	<0.002	3.4	2.4	0.92	0.14 Ba	53	0.060
MW-82	8/25/2009	0.80	41.0	0.01	0.04	<0.071	0.046 Jq	<0.042	<0.032	<0.002	2.4	1.9	1.8	1.2 Jf	65	0.076
MW-82	11/13/2009	1.08	35.6	0.00	0.08	<0.071	0.035 Jq	0.13 Ba	<0.032	<0.002	2.3	2.2	0.82	0.05 BJaq	75	0.160
MW-83	8/25/2009	1.00	78.1	0.00	0.00	<0.071	0.049 Jq	0.12	<0.032	<0.002	2	1.9	1.4	1.3	70	<0.025
MW-83	11/13/2009	0.81	53.7	0.00	0.00	<0.071	0.04 Jq	0.16 Ba	<0.032	1.2	2.1	1.7	0.74	4.6	66	0.0065 Jq
Method Detection Limit		-	-	-	-	0.5	0.07	0.10	0.07	0.07	0.5	0.5	0.6	0.6	1.25	0.04
MCL/DWNL (µg/L)		-	-	-	0.3	6	-	-	-	-	-	-	-	-	250	0.3

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.

(1) - Sulfide and ferrous iron sample analysis was performed in the field using.
a Hach DR 850 colorimeter

mg/L - milligrams per liter

µg/L - micrograms per liter.

nM -– nanomoles

MCL - California Department of Health Services Maximum Contaminant Level.

DWNL - California Department of Public Health drinking water notification level.

Bold - MCL or DWNL exceeded.

"-" - Not available.

<# - Analyte not detected, method detection limit concentration is shown.

B - The result is < 5 times the blank contamination.
Cross contamination is suspected and the data is considered unusable

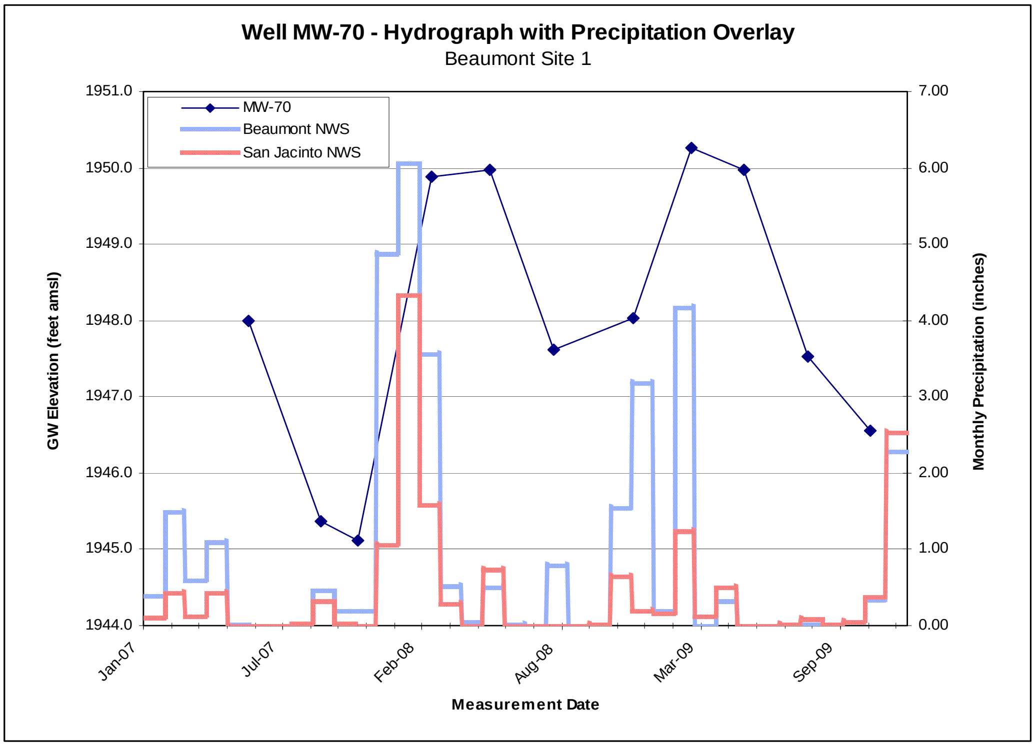
J - The analyte was positively identified, but the analyte concentration is an estimated value.

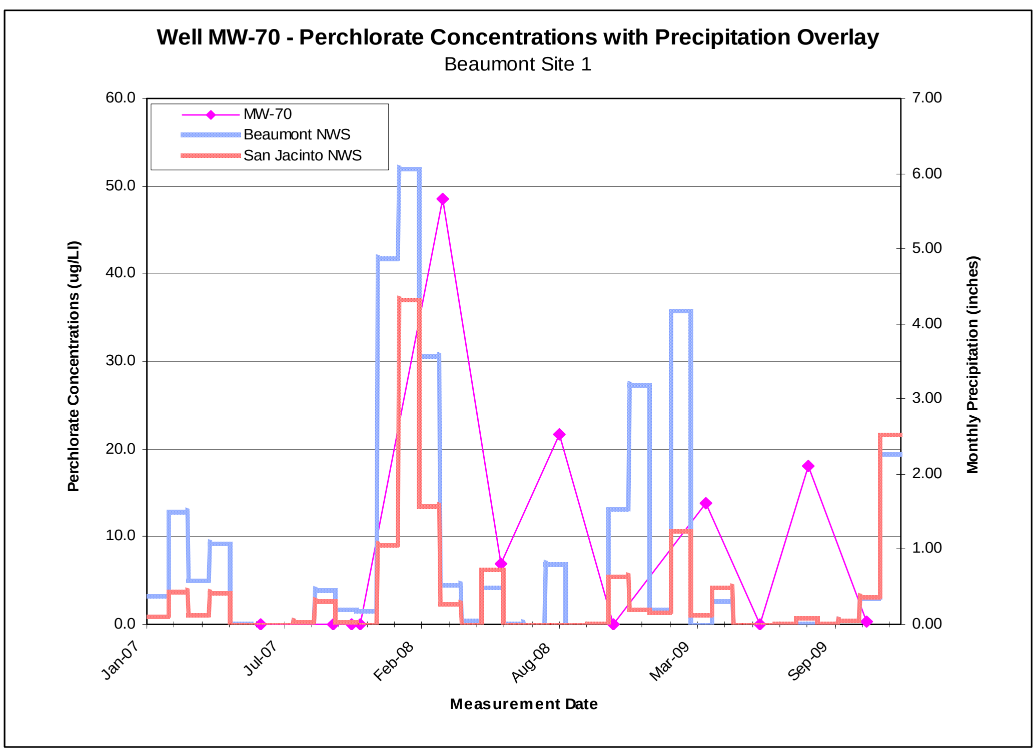
a - The analyte was found in the method blank.

f - The duplicate Relative Percent Difference was outside the control limit.

q - The analyte detection was below the Practical Quantitation Limit (PQL).

Figure 3-14 Water Level Elevation and Perchlorate Concentrations with Precipitation Overlay





NWS – National Weather Service

Nitrate

Nitrate was not detected above the MDL during the Third Quarter 2009 and Fourth Quarter 2009 monitoring events. Nitrate is often considered the most critical electron acceptor competitor to perchlorate. Its absence in the aquifer permits native groundwater microorganisms to utilize perchlorate as an electron acceptor in the respiratory process. The absence of nitrate is also significant because it means that natural organic carbon that exists in the aquifer does not get consumed for denitrification.

DO and ORP

DO measurements are used to assess whether the aquifer is aerobic or anaerobic. In F-33 monitoring wells the DO concentrations have generally been less than 1.0 mg/L, which is considered to be anaerobic and provides an environment that could sustain natural perchlorate biodegradation. However, following periods of precipitation, MW-70 has shown DO levels greater than 1.0 mg/L. This increase in DO measurements corresponds with elevated perchlorate detections.

In general, ORP values in the F-33 monitoring wells were measured below 50 mV. These results are indicative of anaerobic conditions. Therefore, the DO and the ORP values are in tandem, suggesting a redox environment that encourages natural perchlorate biodegradation.

Total Iron and Ferrous Iron

Both forms of iron were measured and were either not detected or detected at very low levels in the groundwater. Therefore, it appears that there is almost no oxidized or reduced iron in the aquifer. Oxidized iron could have consumed natural organic carbon in the process of biological iron reduction. In the vicinity of F-33 this does not appear to be the case, leaving the available organic carbon for direct consumption by native perchlorate reducing microorganisms.

Sulfate and Sulfide

During Third Quarter 2009 and Fourth Quarter 2009 sulfate was detected at concentrations up to 75 mg/L in F-33 monitoring wells, and sulfide was generally absent or detected at very low concentrations. Very little biological sulfate reduction appears to be occurring in the vicinity of F-33, primarily because redox conditions do not strongly support such an occurrence. In general, sulfate is not a major competitor for perchlorate as an electron acceptor, in comparison with nitrate. However, it is important to note that sulfate does exist at high enough concentrations where it could consume natural organic carbon that would otherwise be used for perchlorate biodegradation.

Methane

Methane concentrations ranged from below the MDL to a high of 120 µg/L (F33-TW2). Methanogenesis generally occurs when the aquifer becomes strongly anaerobic and, as a result, methane is found in the 1,000 µg/L range. Under moderately anaerobic conditions, methane may generally be greater than 500 µg/L; and under mildly methanogenic conditions, methane is generally measured at concentrations greater than 100 µg/L. These results indicate that conditions are mildly anaerobic and sufficiently reducing to support perchlorate biodegradation.

Hydrogen

Hydrogen concentrations were greater than 1.0 nanoMoles (nM) in all monitoring wells where it was analyzed during Third Quarter 2009. Hydrogen concentrations were greater than 1.0 nanoMoles (nM) in three of the seven locations where it was analyzed during Fourth Quarter 2009. Hydrogen above 1.0 nM is indicative of anaerobic conditions with the likelihood of the onset of mildly sulfate-reducing conditions. This level of hydrogen is supportive of natural perchlorate biodegradation. Hydrogen is considered a more reliable indicator of redox conditions than ORP because it is easier to measure to a high degree of accuracy and ORP measurements using field instruments can be impacted by the various redox pairs in the groundwater. In this area, redox measurements from ORP field instruments and hydrogen concentrations match fairly closely, making deductions about the geochemical environment in the aquifer more accurate. In general, hydrogen measurements in the F-33 monitoring wells point to anaerobic conditions that are reducing enough to support perchlorate biodegradation.

TOC and DOC

TOC and DOC in the F-33 monitoring wells were both generally measured at concentrations ranging from 1.3 mg/L to 3.4 mg/L. Although these levels are not suggestive of an aquifer rich in natural organic carbon, they are likely to be sufficient to sustain natural biodegradation of low levels of perchlorate. However, as seen in MW-70, perchlorate concentrations tend to increase in groundwater following periods of heavy precipitation as perchlorate from the vadose zone migrates into the aquifer. Increasing perchlorate concentrations in the groundwater do not appear to coincide with higher amounts of organic carbon, which would be required to keep perchlorate concentrations below detectable levels. Hence, we see perchlorate in MW-70 where the natural processes are not able to degrade the increased perchlorate with fluctuating groundwater levels; and a continuing absence in surrounding and downgradient wells where perchlorate degradation can still be sustained.

Therefore, the current natural biodegradation potential may not be sufficient to sustain perchlorate degradation in the immediate vicinity of MW-70 during periods of heavy precipitation or elevated groundwater levels but it is attenuated before it can migrate to other F-33 monitoring wells. This may be the case even though other electron acceptors such as iron and nitrate do not appear to be competing for organic carbon in the aquifer.

VFAs:

VFAs are a more direct indication of the carbon substrate form which is immediately available to native microorganisms involved in biodegradation. Perhaps the most important of the VFAs is acetic acid, which plays a key and direct role in metabolism and energy generation. Acetic acid, when present even in small amounts, indicates that there is an excess that is available for consumption by perchlorate reducing microorganisms. In the Feature F-33 vicinity, acetic acid concentrations generally range up to 0.74 mg/L. These concentrations appear to be sufficient to sustain natural biodegradation of perchlorate except during periods of heavy precipitation.

3.8 HABITAT CONSERVATION

Consistent with the U.S. Fish and Wildlife Service approved HCP (USFWS, 2005) and subsequent clarifications (LMC, 2006a, 2006b and 2006c) of the HCP describing activities for environmental remediation at the Site, all field activities were performed under the supervision of a USFWS approved biologist who monitored each work location. As a result, no impact to SKR occurred during the performance of the field activities related to the Third Quarter 2009 and Fourth Quarter 2009 monitoring events.

SECTION 4 SUMMARY AND CONCLUSIONS

Groundwater level measurements were collected for the Third Quarter 2009 and Fourth Quarter 2009 water quality monitoring events. A total of 172 groundwater level measurements were collected for the Third Quarter 2009 monitoring event and a total 171 groundwater level measurements were collected during the Fourth Quarter 2009 monitoring event. For the Third Quarter 2009 monitoring event, three wells were observed to be dry and measurements from two other wells could not be collected due to obstructions in their casings. For the Fourth Quarter 2009 monitoring event, four wells were observed to be dry.

For the Third Quarter 2009 monitoring event, a total of 30 sampling locations (30 well locations) were proposed and sampled for water quality monitoring.

For the Fourth Quarter 2009 monitoring event, a total of 70 sampling locations (18 surface water, 1 alternate surface water, and 51 monitoring wells) were proposed for water quality monitoring. One proposed monitoring well location, P-06S, and twelve proposed surface water sample locations, SW-01, SW-05, SW-07, SW-08, SW-10, SW-11, SW-12, SW-13, SW-14, SW-15, and SW-16, were not sampled because the locations were dry. SW-17, the alternate surface water location, was also dry and was not sampled. Therefore, water quality data was collected from six surface water and 50 monitoring wells locations.

4.1 GROUNDWATER ELEVATIONS

The Beaumont National Weather Station (NWS) reported approximately 0.04 inches of rain between June 2009 (Second Quarter 2009) and September 2009 (Third Quarter 2009) and approximately 2.68 inches of precipitation between September 2009 (Third Quarter 2009) and December 2009 (Fourth Quarter 2009). During this time period groundwater elevations generally decreased across the site. Groundwater elevation decreases were seen in wells located in all areas of the Site during Third Quarter 2009 and Fourth Quarter 2009.

Groundwater elevations during the Third Quarter 2009 monitoring event ranged from approximately 2,149 feet above mean sea level (msl) upgradient of the former BPA to approximately 1,793 feet msl in the MCEA. Groundwater elevations during the Fourth Quarter 2009 monitoring event ranged from approximately 2,149 feet msl upgradient of the former BPA to approximately 1,790 feet msl in the MCEA.

Groundwater elevation differences in all wells from quarter to quarter appear to depend on the short and long-term weather patterns. In general, the greatest differences in quarterly groundwater elevations occur during periods of seasonal precipitation. Wells located within the NPCA and the MCEA appear to respond the quickest to precipitation compared to the former BPA and RMPA, which generally show a one season lag before responding to seasonal precipitation. The response also diminishes within each area with depth and distance from the Potrero and Bedsprings Creeks. The Site has experienced overall groundwater level declines since 2005; this decline in water levels coincides with a slight elongation in the plume geometry and increase in concentrations at the Site.

4.2 SURFACE WATER FLOW

During the Third Quarter 2009 and Fourth Quarter 2009, the Potrero and Bedsprings creek riparian corridors were walked to determine the presence, nature, and quantity of surface water within the creek beds. The locations where surface water was encountered were plotted and a determination was made whether the water was flowing or stagnant. At specific locations where flowing water was encountered the flow rate was determined using a modified version of the EPA Volunteer Stream Monitoring: Methods Manual (USEPA 1997).

Four fixed stream locations, SF-1 through SF-4, were chosen for stream flow measurements, SF-1, located near Gilman Hot Springs at the southeast border of the Site, SF-2, located in the vicinity of MW-67, SF-3, located in the vicinity of MW-15 and 18, and SF-4, located near MW-42.

During Third Quarter 2009 SF-1 had insufficient flow for measurement, SF-2 had an average flow rate of 0.03 cfs, SF-3 had an average flow rate of 0.14 cfs, and SF-4 had insufficient flow for measurement. The average site flow rate for Third Quarter 2009 is 0.09 cfs.

During Fourth Quarter 2009 all locations had insufficient flow for measurement.

4.3 GROUNDWATER FLOW AND GRADIENTS

Groundwater flow directions from Third Quarter 2009 and Fourth Quarter 2009 were similar to previously observed patterns for a dry period. Generally, groundwater flowed northwest from the southeastern limits of the valley (near the former BPA) beneath the former RMPA, towards Potrero Creek where groundwater flow then changes direction and begins heading southwest, parallel to the flow of Potrero Creek, into Massacre Canyon.

Between June 2009 (Second Quarter 2009) and September 2009 (Third Quarter 2009), the overall groundwater gradient (approximating a flowline from MW-36, upgradient of the BPA, through the RMPA and NPCA to MW-18, in the MCEA) remained the same at 0.013 ft/ft. Between September 2009 (Third Quarter 2009) and December 2009 (Fourth Quarter 2008) the overall groundwater gradient through the same flow path remained the same at 0.013 ft/ft. In general the horizontal gradient is lowest between the BPA and the RMPA with a greatly increased flow through the NPCA and the MCEA. The flattening of the gradient in the BPA and RMPA appears to be attributed to the aquifer transmissivity and thickness in these areas.

Vertical groundwater gradients between shallow and deeper monitoring well pairs are generally downward (negative) in the BPA, RMPA, and the NPCA, and upward (positive) in the MCEA. The response to seasonal changes in groundwater recharge, although dampened by depth, are consistent within the different vertical well pairs installed at the Site. This suggests that there is vertical hydraulic communication within the aquifer.

4.4 WATER QUALITY

The GMP has a quarterly/semi-annual/annual/biennial frequency. Both groundwater and surface water are collected and sampled as part of the GMP. The annual and biennial events are larger major monitoring events and the quarterly and semi-annual events are smaller minor events. All new wells are sampled quarterly for one year. The semi-annual wells are sampled second and fourth quarter of each year, annual wells are sampled second quarter of each year and the biennial wells are sampled second quarter of even numbered years. The primary COPCs identified for the Site during the Second Quarter 2009 monitoring event were: perchlorate, 1,1-DCE, TCE and 1,4-dioxane. The secondary COPCs identified for the Site during the Second Quarter 2009 monitoring event were: 1,1-DCA, 1,2-DCA, cis-1,2-DCE, and 1,1,1-TCA. These are consistent with the

COPCs identified during the Second Quarter 2008 event. The results of surface and groundwater samples collected and tested during this quarterly and semi-annual event are discussed below.

4.4.1 Groundwater

Only guard wells, wells with increasing contaminant trends, new wells, and surface water locations were sampled and analyzed during Third Quarter 2009 and Fourth Quarter 2009 (Tetra Tech, 2003b).

Guard Wells

Four monitoring wells are designated as guard wells: MW-15, MW-18, MW-67, and MW-100. Wells MW-15 and MW-18 are a clustered well pair. Well MW-18 is completed near the top of the alluvial aquifer and MW-15 is completed near the bottom of the alluvial aquifer. Well MW-67, the furthest downgradient site well, is located approximately 0.9 miles upgradient of the southern site boundary and MW-100, an offsite well, is located approximately 500 feet south of the southern site boundary near the mouth of Potrero Creek. The wells are located along Potrero Creek, downgradient of the BPA and RMPA source areas. The analyte 1,4-dioxane was detected in monitoring wells MW-15, MW18, MW-67, and MW-100 at concentrations of 7.7 µg/L, 5.4 µg/L, 0.9 µg/L, and 0.060 µg/L respectively. The analyte 1,4-dioxane is the only COPC to be detected above the MCL or DWNL during the Third and Fourth Quarter sampling events. The MCLs for 1,1-DCE, TCE, and perchlorate are 6 µg/L, 5 µg/L, and 6 µg/L respectively. The DWNL for 1,4-dioxane is 3 µg/L. Sample results for the guard wells from Fourth Quarter 2009 are consistent with sample results from previous sampling events and generally display stable or decreasing COPC trends.

Increasing Trend Monitoring Wells

The number of increasing or probably increasing trend wells has increased from six wells in the 2008 temporal trend analyses to 12 wells in the 2009 temporal trend analyses. The temporal trend analyses were performed using data from Second Quarter 2002 to Second Quarter 2009. The start of this period spans the shut down of the groundwater extraction system located in the RMPA. The system was shut down in late 2002. While including data from Second Quarter (May) 2002 represents a time of active remediation, it was near the end of the active phase and is considered to represent initial concentrations at the termination of active remediation.

Possible reasons for the change in the number of increasing or probably increasing trend wells are 1) an increase in amount of data for the individual locations, the trends become more noticeable due to the ability to better define outliers, and 2) as additional time passes, potential influence from the former extraction system becomes less noticeable. In general however, the plume morphology has not changed.

The 12 wells designated as increasing or probably increasing trend wells are IW-04 (1,1-DCE), MW-28 (perchlorate and 1,1-DCE), MW-31 (perchlorate), MW-46 (1,1-DCE), MW-55 (perchlorate), MW-59D (perchlorate), MW-60A (1,4-dioxane and perchlorate), MW-60B (1,4-dioxane), MW-61C (1,1-DCE), MW-68 (1,4-dioxane and perchlorate), MW-71B (perchlorate), and MW-80 (TCE). Wells MW-28, MW-31, MW-60A, MW-60B, MW-61C, and MW-71B are located in the BPA; a known source area, well MW-59D is located just downgradient of the BPA; wells IW-04, MW-55, and MW-68 are located in the RMPA, also a known source area; and wells MW-46 and MW-80 are located in the NPCA. None of the 12 wells displaying increasing trends are guard wells. The farthest downgradient well displaying an increasing or probably increasing trend is MW-46.

New Wells

Two new wells were installed during Fourth Quarter 2009 as part of the well rehabilitation, destruction, and installation activities. MW-101 and MW-102 were installed as a replacement wells for MW-42 and MW-37 respectively. Initial sample results from MW-101 and MW-102 are generally similar to results previously obtained from MW-37 and MW-42.

Surface Water

Eighteen surface water sample locations and one alternate sample location have been identified for semi-annual sampling at the Site. Samples locations have been chosen to include springs and spring fed ponds, ephemeral ponds, and locations in the Bedsprings and Potrero Creek drainages. Due to the ongoing drought conditions and the ephemeral nature of the ponds and creeks, it is common for many of the locations to be dry at the time of sampling.

During the Fourth Quarter 2009 sampling event, surface water samples were collected from six locations. The remaining 12 locations and the one alternate location were dry at the time of sampling. The sample results from the locations sampled are consistent with previous sample results obtained at the Site and generally display stable or decreasing COPC trends.

The four primary COPCs: 1,4-dioxane, 1,1-DCE, TCE, and perchlorate; and one secondary COPC, cis-1,2-DCE, were detected in surface water samples collected from locations SW-02, SW-03, and SW-04. These samples were collected from springs and or spring fed ponds located outside of the stream beds but near the intersection of Bedsprings and Potrero Creeks. Only 1,4-dioxane and perchlorate were detected above their respective MCL or DWNL in these locations. The MCLs for 1,1-DCE, TCE, and perchlorate are 6 μg/L, 5 μg/L, and 6 μg/L respectively. The DWNL for 1,4-dioxane is 3 μg/L.

Three of the primary COPCs, 1,4-dioxane, 1,1-DCE, and perchlorate, and no secondary COPCs were detected in the surface water samples collected from locations SW-06, SW-07, and SW-18. These samples were collected from water flowing in Potrero Creek and are located topographically downgradient of the springs discussed in the previous paragraph. 1,4-dioxane is the only COPC to be detected above the MCL or DWNL.

4.5 MONITORED NATURAL ATTENUATION SAMPLING

The objective of the MNA sampling and analyses effort is to understand the geochemical characteristics that appear to be contributing to the natural attenuation of the low level perchlorate in groundwater in 2 areas: the Potrero Creek area that has migrated into the area from the BPA and the RMPA, and the area around the Large Motor Washout Area (F-33). In the F-33 area elevated perchlorate concentrations (up to 302 mg/kg at 16 feet below ground surface in F33-DP20, July 2008) have been detected in soil samples, while groundwater concentrations have fluctuated from below detection limits up to 48.5 μg/L.

The MNA sampling results confirm that the various geochemical parameters (redox conditions, the absence of electron acceptor competition, and the availability of low levels of useable organic carbon), as well as the environmental conditions in the aquifer, are within the required range to promote biodegradation of perchlorate in groundwater in the area. It appears this riparian area and its organic rich lithologic layers observed in the area are contributing to the TOC, which is in turn creating the small amounts of volatile fatty acids that provide the carbon substrate for perchlorate-reducing microorganisms. Seasonal detections of perchlorate in MW-70 may indicate that during periods of heavy rainfall, perchlorate contamination from the overlying soil is being flushed into the aquifer. However, the organic carbon in the aquifer does not appear to be sufficient to completely degrade the increased amount of perchlorate migrating from the vadose zone during periods of heavy rainfall, which results in temporary increases in perchlorate concentrations at MW-70. The concentrations of perchlorate in soil samples collected in the vicinity of the surrounding wells is much lower than in soil samples collected in the vicinity of MW-70. Therefore, even though the surrounding areas may also receive increased amounts of perchlorate migrating from the vadose zone during periods of heavy rainfall, the geochemical conditions still appear to be conducive to natural biodegradation.

It is likely that seasonal and long term changes in precipitation have an influence on the geochemical conditions observed, impacting the perchlorate reducing conditions. This is likely the reason for the fluctuation in perchlorate concentrations at MW-70. Monitoring should be continued to gain a better understanding of the geochemistry and its seasonal variations and to evaluate the long-term implications of these processes at F-33.

4.6 PROPOSED CHANGES TO THE GROUNDWATER MONITORING PROGRAM

Generally, the groundwater monitoring program is reviewed and modified as necessary during the second quarter of each year in conjunction with the annual temporal trend analyses. Due to the well rehabilitation, destruction, and installation activities completed in November 2009, quarterly sampling of -new wells MW-101 and MW-102 quarterly for four quarters is proposed; following that, the sampling frequency will be re-evaluated. Additionally, it is proposed to continue quarterly monitoring of MW-100 and to re-classify it as a guard well.

No other unusual events or observations occurred during this reporting period that requires modification of the monitoring program.

SECTION 5 REFERENCES

1. Air Force Center for Environmental Excellence (AFCEE), 2004. *Monitoring and Remediation Optimization System (MAROS) Software Version 2.1 User's Guide*, November, 2004.

2. Archer, W. L., 1996. *Industrial Solvent Handbook*. Marcel Dekker, New York, 1996.

3. Bielefeldt, A. R., Stensel, H. D., and Strand, S. E., 1995. *Cometabolic Degradation of TCE and DCE Without Intermediate Toxicity*. Journal of Environmental Engineering, November 1995.

4. California Department of Water Resources, 1981. *Water Well Standards*, State of California, Bulletin 74-81

5. California Department of Water Resources, 1990. *Water Well Standards*, State of California, Bulletin 74-90

6. California Department of Water Resources, 2008. *California Irrigation Management Information System (CIMIS). Evapotranspiration data reported for Riverside, California at the California Irrigation Management System (CIMIS) Station*, California Department of Water Resources, online at http://wwwcimis.water.ca.gov/cimis/welcome.jsp (accessed August 27, 2008)

7. Dibblee, T. W., 1981. *Geologic Map of Banning (15 minute) Quadrangle, California*, South Coast Geologic Society Map 2.

8. Domenico, P. A. and Schwartz, F. W., 1990. *Physical and Chemical Hydrogeology*. John Wiley & Sons, New York, New York, 1990.

9. United States Environmental Protection Agency (EPA), 1997. *USEPA Volunteer Stream Monitoring: A Methods Manual*, EPA 841-B-97-003, November 1997.

10. United States Environmental Protection Agency, 1999. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA-540/R-99-008 (PB99-963506), October 1999.

11. United States Environmental Protection Agency, 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, OSWER 9240.1-45, EPA-540-R-04-004, October 2004.

12. United States Environmental Protection Agency, 2008. *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*, OSWER 9240.1-48, USEPA-540-R-08-01, June 2008.

13. Harden, Deborah R., 1998. *California Geology*. Prentice Hall, Inc., Upper Saddle River, New Jersey, 1998.

14. Leighton and Associates, 1983. *Geotechnical and Water Resources Management Feasibility Study, Potrero Creek Area South of Beaumont, Riverside County, California*. March 24, 1983.

15. Leighton and Associates, 1984. *Hydrogeologic Investigation for Water Resources Development, Potrero Creek, Riverside County, California*. October 27, 1983.

16. Lewis, K., D. Hathaway, and N. Shafike, 2002. *Evapotranspiration-Driven Diurnal Fluctuations in Groundwater Levels at San Marcial, NM*, Proceedings Ground Water Surface Water Interactions: American Water Resource Association 2002 Summer Specialty Conference: Keystone, Colorado July 1-3, 2002.

17. Lockheed Martin Corporation (LMC), 2006a. *Clarification of Effects on Stephens' Kangaroo Rat from Characterization Activities at Beaumont Site 1 (Potrero Creek) and Site 2 (Laborde Canyon)*. August 3, 2006.

18. Lockheed Martin Corporation, 2006b. *Clarification Concerning Treatment of Unexploded Ordinance (UXO) Discovered During Munitions and Explosives of Concern (MEC) Characterization at Beaumont Site 1 (Potrero Creek) and at the Immediately Adjacent Metropolitan Water District (MWD) Parcel, Riverside County, California; and Analysis of Effects of Treatment Activities for the Federally-Endangered Stephens' Kangaroo Rat (SKR)*. August 3, 2006.

19. Lockheed Martin Corporation, 2006c. *Clarification of Mapping Activities Proposed under the Low-Effect Habitat Conservation Plan for the Federally-Endangered Stephens' Kangaroo Rat at Beaumont Site 1 (Potrero Creek) and Site 2 (Laborde Canyon) Riverside County, California* (mapping methodology included). December 8, 2006.

20. Mohr, Thomas K. G., 2001. *Solvent Stabilizer*, White paper, Santa Clara Valley Water District, 2001.

21. Radian, 1986. *Lockheed Propulsion Company Beaumont Test Facilities Historical Report*. September 1986.

22. Radian, 1990. *Lockheed Propulsion Company Beaumont Test Facilities Source and Hydrogeologic Investigation*. February 1990.

23. Radian, 1992. *Hydrogeologic Study, Lockheed Propulsion Company Beaumont Test Facilities*. December 1992.

24. Ransome, F. L., 1932. *Final Geologic Report on the San Jacinto Tunnel Line Colorado River Aqueduct. Prepared for the Metropolitan Water District of Southern California*. March 12, 1932.

25. Tetra Tech, Inc., 2002. *Final Supplemental Site Characterization Report, Beaumont Site, Lockheed Martin Corporation*. September 2002.

26. Tetra Tech, Inc., 2003a. *Lockheed Beaumont, Site 1 & 2, Phase I Environmental Site Assessment, Beaumont, California*. March 2003.

27. Tetra Tech, Inc., 2003b. *Revised Groundwater Sampling and Analysis Plan, Lockheed Martin Corporation, Beaumont Site 1, Beaumont, California*. May 2003.

28. Tetra Tech, Inc., 2004. *Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2004, Lockheed Martin Corporation, Beaumont Site 1*, December 2004.

29. Tetra Tech, Inc., 2006a. *Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2005, Lockheed Martin Corporation, Beaumont Site 1*. January 2006.

30. Tetra Tech, Inc., 2006b. *Groundwater Monitoring Well Installation Work Plan, Lockheed Martin Corporation, Beaumont Site 1*. November 2006.

31. Tetra Tech, Inc., 2007a. *Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2006, Lockheed Martin Corporation, Beaumont Site 1*. March 2007.

32. Tetra Tech, Inc., 2007b. *Semiannual Groundwater Monitoring Report, Third Quarter and Fourth Quarter 2006, Lockheed Martin Corporation, Beaumont Site 1*. June 2007.

33. Tetra Tech, Inc., 2008a. *Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2007, Lockheed Martin Corporation, Beaumont Site 1*. March 2008.

34. Tetra Tech, Inc., 2008b. *Groundwater Installation and Sampling Report, Lockheed Martin Corporation, Beaumont Site 1*. 2008.

35. Tetra Tech, Inc., 2008c. *Supplemental Soil Investigation Report Historical Operational Areas A, B, C, D, F, G and H, Lockheed Martin Corporation, Beaumont Site 1*. May 2008.

36. Tetra Tech, Inc., 2008d. *Dynamic Site Investigation Work Plan, Lockheed Martin Corporation, Beaumont Site 1 Beaumont, California*. May 2008.

37. Tetra Tech, Inc., 2008e. *Semiannual Groundwater Monitoring Report, Third Quarter and Fourth Quarter 2007, Lockheed Martin Corporation, Beaumont Site 1*. July 2008.

38. Tetra Tech, Inc., 2009a. *Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2008, Lockheed Martin Corporation, Beaumont Site 1*. January 2009.

39. Tetra Tech, Inc., 2009b. *Dynamic Site Investigation Former Operational Areas B, C, F, G, and H, Lockheed Martin Corporation, Beaumont Site 1*. July 2009.

40. Tetra Tech, Inc., 2009c. *Semiannual Groundwater Monitoring Report, Third Quarter and Fourth Quarter 2008, Lockheed Martin Corporation, Beaumont Site 1*. August 2009.

41. Tetra Tech, Inc., 2009d. *Dynamic Site Investigation, Former Operational Areas A, B, C, F, G, and H, Lockheed Martin Corporation, Beaumont Site 1*. September 2009.

42. Tetra Tech, Inc., 2009e. *Site 1 Well Rehabilitation, Destruction, and Well Installation Work Plan, Lockheed Martin Corporation, Beaumont Site 1 Beaumont, California*. October 2009.

43. Tetra Tech, Inc., 2009f. *Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2009, Lockheed Martin Corporation, Beaumont Site 1*. December 2009.

44. United States Fish and Wildlife Service (USFWS), 2005. *Endangered Species Act Incidental Take Permit for Potrero Creek and Laborde Canyon Properties Habitat Conservation Plan*. October 14, 2005.

45. Vogel, T. M., Criddle, C. S., and McCarty, P. L., 1987. *Transformations of Halogenated Aliphatic Compounds.* Environmental Science and Technology, Volume 21, Number 8, 1987.

46. White, W.N., 1932. *A method of estimating groundwater supplies based on discharge from plants and evaporation from the soil: Results of investigations in Escalante Valley, Utah.* United States Geological Survey Water Supply Paper 659, 1932

REPORT BODY AND APPENDICES A-I ON CD ON THIS DIVIDER