Semiannual Groundwater Monitoring Report
Third Quarter and Fourth Quarter 2012
Potrero Canyon (Lockheed Martin Beaumont Site 1)
Beaumont, California

Prepared for:

LOCKHEED MARTIN

TETRA TECH

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TC# 30079 / April 2013

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LOCKHEED MARTIN

April 23, 2013

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

Subject: Submittal of the *Semiannual Groundwater Monitoring Report, Third Quarter and Fourth Quarter 2012, Lockheed Martin Corporation, Potrero Canyon (Lockheed Martin Beaumont Site 1), Beaumont, California*

Dear Mr. Zogaib:

Please find enclosed one hard copy of the body of the report and two compact disks with the report body and appendices of the *Semiannual Groundwater Monitoring Report, Third Quarter and Fourth Quarter 2012, Lockheed Martin Corporation, Potrero Canyon (Lockheed Martin Beaumont Site 1), Beaumont, California* for your review and approval or comment.

If you have any questions regarding this submittal, please contact me at 818-847-9901 or brian.thorne@lmco.com.

Sincerely,

Brian T. Thorne
Project Lead

Enclosure: *Semiannual Groundwater Monitoring Report, Third and Fourth Quarter 2012, Lockheed Martin Corporation, Potrero Canyon (Lockheed Martin Beaumont Site 1), Beaumont, California*

Copy: Gene Matsushita, LMC (electronic and hard copy)
Barbara Melcher, CDM Smith (electronic copy)
Tom Villeneuve, Tetra Tech (electronic copy)
Alan Bick, Gibson Dunn (electronic copy)

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SEMIANNUAL GROUNDWATER MONITORING REPORT THIRD QUARTER AND FOURTH QUARTER 2012 POTRERO CANYON (LOCKHEED MARTIN BEAUMONT SITE 1) BEAUMONT, CALIFORNIA

Prepared for:

Lockheed Martin Corporation

Prepared by:

Tetra Tech, Inc.

April 2013

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ACRONYMS AND ABBREVIATIONS

BPA	Burn Pit Area
BGS	below ground surface
BTOC	below top of casing
cfs	cubic feet per second
1,1-DCA	1,1-dichloroethane
1,1 -DCE	1,1-dichloroethene
cis-1,2-DCE	cis-1,2-dichloroethene
DG	downgradient
DO	dissolved oxygen
DOC	dissolved organic carbon
DWNL	California Department of Public Health drinking water notification level
EC	electrical conductivity
GPS	global positioning system
HCP	Habitat Conservation Plan
LCS	laboratory control sample
MCL	California Department of Public Health maximum contaminant level
MCEA	Massacre Canyon Entrance Area
MDL	method detection limit
MEF	Mount Eden formation
mg/L	milligrams per liter
µg/L	micrograms per liter
µg/L/yr	micrograms per liter per year
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level

NA	not analyzed / not applicable / not available
ND	non-detect
nM	nanoMoles
NPCA	Northern Potrero Creek Area
NTU	nephelometric turbidity unit
NWS	National Weather Service
ORP	oxidation-reduction potential
PQL	practical quantitation limit
psi	pounds per square inch
QAL	Quaternary alluvium
QAL/MEF	Quaternary alluvium/Mount Eden formation
QA/QC	quality assurance/quality control
Radian	Radian Corporation, Inc.
RMPA	Rocket Motor Production Area
RPD	relative percent difference
site	Potrero Canyon (Lockheed Martin Beaumont Site 1)
1,1,1-TCA	1,1,1-trichloroethane
Tetra Tech	Tetra Tech, Inc.
TCE	trichloroethene
UG	upgradient
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VFA	volatile fatty acid
VOC	volatile organic compound

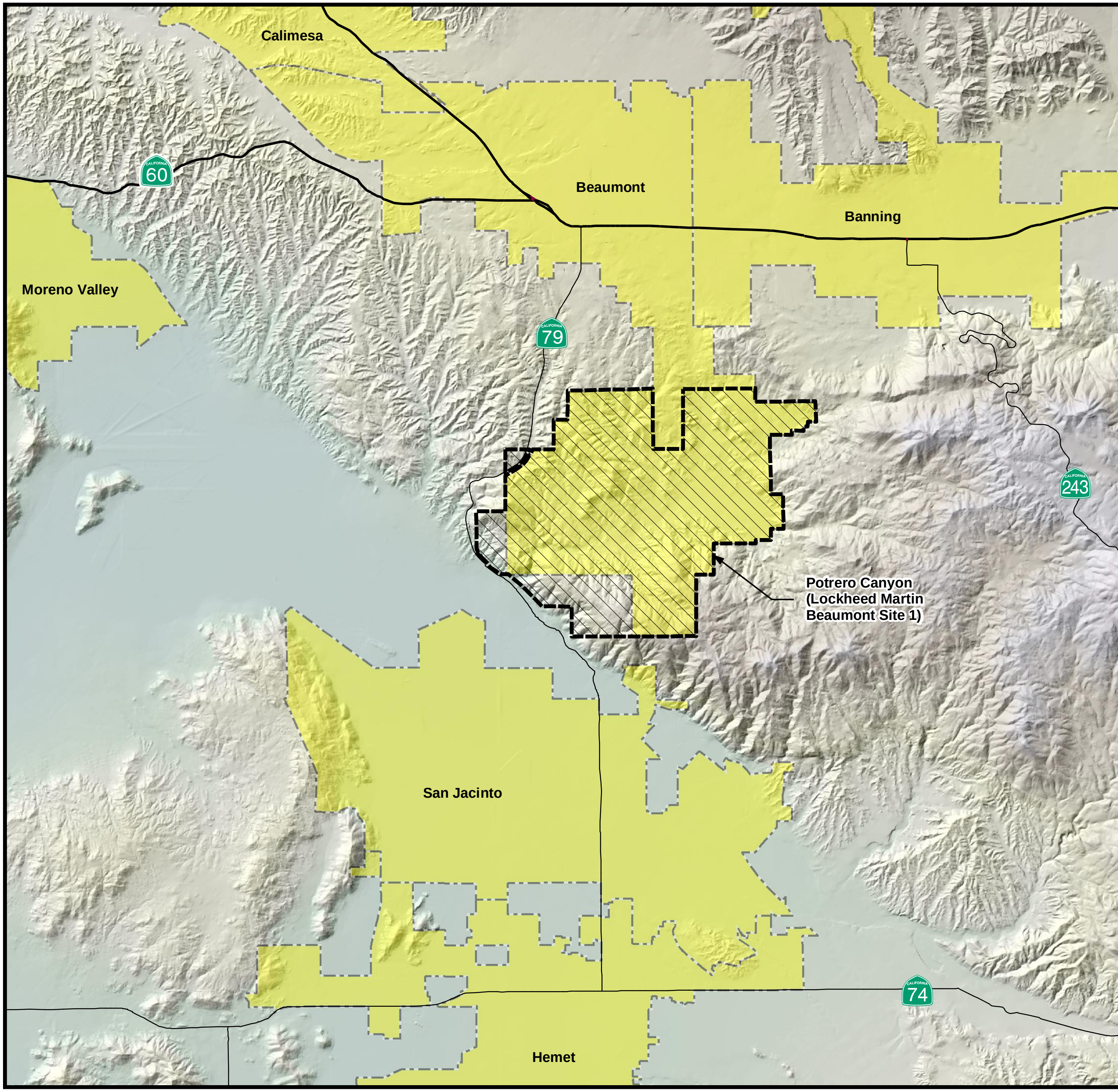
SECTION 1 INTRODUCTION

On behalf of Lockheed Martin Corporation, Tetra Tech, Inc. has prepared this Semiannual Groundwater Monitoring Report, which presents the results of the Third Quarter 2012 (1 July 2012 through 30 September 2012) and Fourth Quarter 2012 (1 October 2012 through 31 December 2012) water quality monitoring for the Potrero Canyon (Lockheed Martin Beaumont Site 1) Groundwater Monitoring Program. The site is located in an undeveloped area in the southern portion of the city of Beaumont in Riverside County, California (Figure 1-1). Currently, the site is inactive except for environmental investigations performed under Consent Order 88/89-034 and Operation and Maintenance Agreement 93/94-025 with the California Department of Toxic Substances Control. The State of California owns approximately 94% (8,552 acres) of the site. The remaining 565 acres, referred to as the conservation easement, were retained by Lockheed Martin Corporation (Figure 1-2).

The Groundwater Monitoring Program includes quarterly, semiannual, annual, and biennial monitoring tasks with both groundwater and surface water collected and sampled as shown in Appendix A, Table 1-1. The annual and biennial events are larger major monitoring events, and the quarterly and semiannual events are smaller minor events. All new wells are sampled quarterly for one year. Semiannual wells are sampled the second and fourth quarter of each year, annual wells are sampled the second quarter of each year, and biennial wells are sampled during the second quarter of even-numbered years.

The objectives of this report are to accomplish the following:

- Briefly summarize the site history
- Document water level and water quality monitoring activities and results
- Analyze and evaluate the groundwater elevation and water quality monitoring data generated



Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 1-1
Regional Location of Beaumont Site 1

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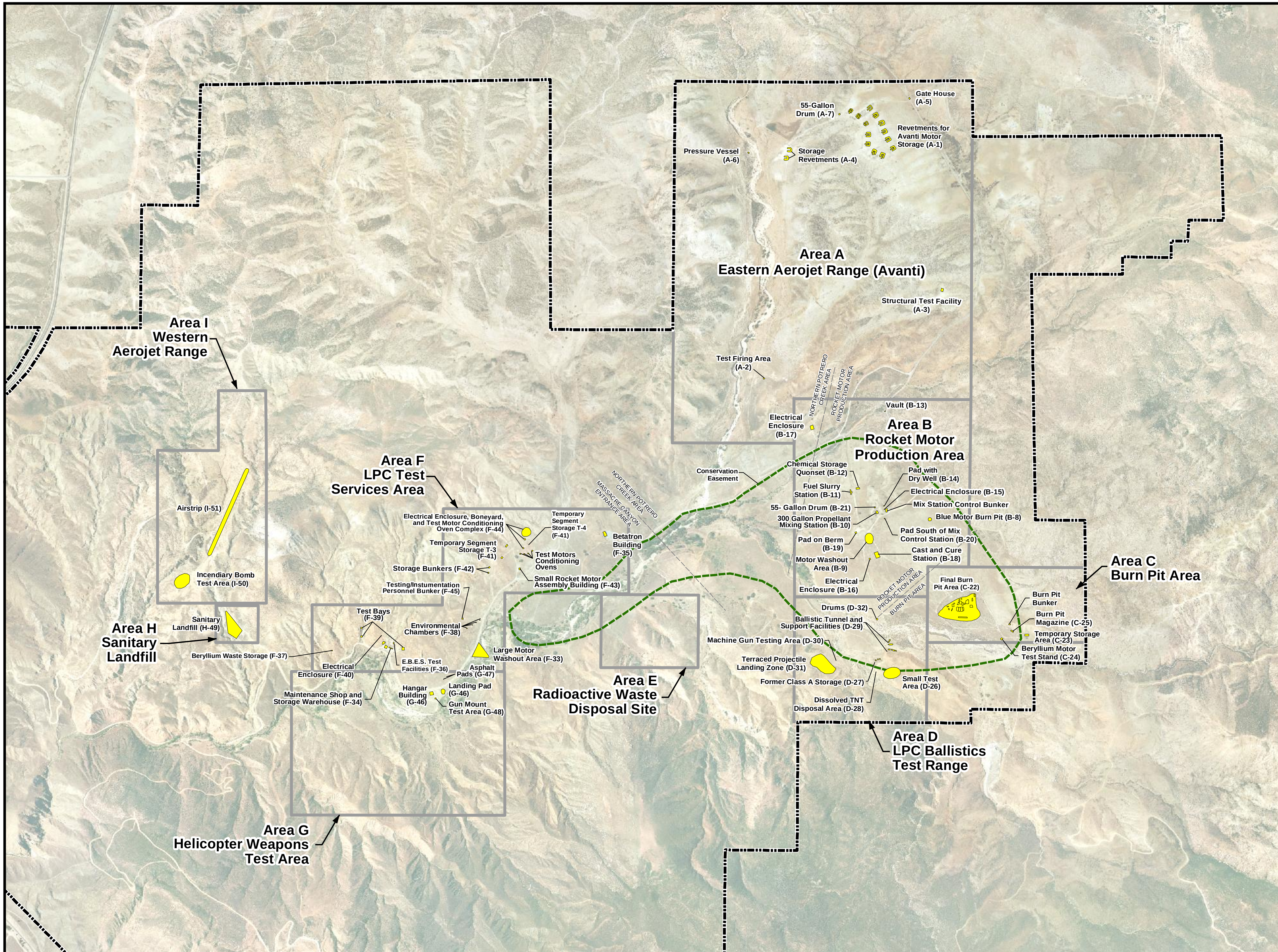

0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- Historic Feature Location
- Conservation Easement Boundary
- Historical Operational Area Boundary
- Potrero Canyon Property Boundary (Lockheed Martin Beaumont Site 1)

Note: Beaumont Site 1 property boundary is approximate.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

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

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This report is organized into the following sections: (1) Introduction, (2) Summary of Monitoring Activities, (3) Groundwater Monitoring Results, (4) Summary and Conclusions, and (5) References. Appendix A provides a brief description of the previous site environmental investigations and the current conceptual site model.

1.1 SITE BACKGROUND

The site consists of a 9,117-acre parcel located in the southern portion of Beaumont, California. The site was primarily used for ranching before 1960. From 1960 to 1974, Lockheed Propulsion Company used the site 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.

Tetra Tech identified nine primary historical operational areas at the site. A map of site historical operational areas and features 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, used the land directly east of the Eastern Aerojet Range, including several U-shaped revetments for the storage of explosive materials and rocket motors. The purpose of the Avanti project and its operational procedures are unknown, due to its classified status (Radian, 1986).

Historical Operational Area B – Rocket Motor Production Area

The Rocket Motor Production Area, 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 south of the mixing station (Radian, 1986).

In 1973, an area east of the mixing station, known as the Blue Motor Burn Pit, was used for the destruction of four motors, which included a motor with “Malloy blue” solid propellant, also referred to as milori blue or Prussian blue (Radian, 1986).

Historical Operational Area C – Burn Pit Area

The Burn Pit Area had three primary features: (1) the chemical storage area, (2) burn pits, and (3) the beryllium test stand. Hazardous wastes 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 accumulated 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 bedrock outcrop where the burn pit instrumentation bunker was located, there was a one-time firing of small beryllium research motors.

Historical Operational Area D – Lockheed Propulsion Company Ballistics Test Range

The Lockheed Propulsion Company 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 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. (Alternatively, this test may have been conducted in Historical Operational Area I.) At a small area near the bend in the road, acetone was used to dissolve 2,4,6-trinitrotoluene 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 Lockheed Propulsion Company test services area as reported by former site employees. In 1990, the radioactive waste was located and removed. Soil samples were collected after removal of the waste. 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 – Lockheed Propulsion Company Test Services Area

The Lockheed Propulsion Company 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 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 the large motor washout area 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 Lockheed Propulsion Company 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 in this area included a hangar (Building 302), helicopter landing pad, stationary ground-mounted gun platforms, and a mobile target suspended between towers. The primary project at this area was testing of both stationary guns and guns mounted on helicopters. Experimentation was also performed on the solid propellant portion of an armor-piercing round. Most rounds were fired into the side of the creek wash, about 100 yards to the south of the hangar. 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 Lockheed Propulsion Company to dispose of trash such as paper, scrap metal, concrete, and wood generated during routine daily operations. Lockheed policy strictly dictated that no hazardous materials were to have been disposed 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. Lockheed Propulsion Company 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 Lockheed Propulsion Company Ballistics Test Area. According to Radian’s historical report, 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 investigations performed in 2006 for munitions and explosives of concern (Tetra Tech, 2007), it was discovered that inert 27.5-millimeter projectiles were tested in this area.

Post Lockheed Propulsion Company and Aerojet Facility Usage

Lockheed Martin Corporation 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 used the site from 1971 through 1991 for surveying and heavy equipment training. The Union’s main office was located in Bunker 304 of Historical Operational Area F (Lockheed Propulsion Company Test Services Area). The Union's earth-moving actions involved maintaining roads and reshaping various parts of the site, primarily in Historical Operational Areas F and G.

On several occasions, General Dynamics used Historical Operational Area B (Rocket Motor Production Area) 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 2012 and Fourth Quarter 2012 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. Water level measurements were proposed for 182 wells for the Third Quarter 2012 and Fourth Quarter 2012 monitoring events. The Third Quarter 2012 groundwater level measurements were collected between 13 August and 15 August 2012. The Fourth Quarter 2012 groundwater level measurements were collected between 13 November and 14 November 2012. Appendix B provides copies of field data sheets from the water quality monitoring events, and Appendix C presents a summary of well construction details.

Precipitation data are collected from the local weather station in Beaumont to correlate observed changes in groundwater levels with local precipitation. During Third Quarter 2012, the Beaumont National Weather Service (NWS) station reported approximately 0.30 inches of precipitation. During Fourth Quarter 2012, the Beaumont NWS reported approximately 3.62 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 storm water runoff from the city of Beaumont as well as from other ephemeral streams in the southern and eastern portions of the site. The largest of the tributary drainages is Bedsprings Creek, which is southwest of the former Rocket Motor Production Area (RMPA) and former Burn Pit Area (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, although perennial surface water flow is present during most years, 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 in Potrero and Bedsprings creek where surface water was present were mapped during the Third Quarter 2012 and Fourth Quarter 2012 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 depends on the well's classification in the network and intended monitoring purpose. Groundwater is sampled as frequently as quarterly and surface water samples are collected semiannually. Sampling, analytical, and quality assurance/quality control (QA/QC) procedures for the monitoring events are described in the *Programmatic Sampling and Analysis Plan, Lockheed Martin Corporation, Beaumont Sites 1 and 2, Beaumont, California* (Tetra Tech, 2010).

The Third Quarter 2012 monitoring event consisted of water level monitoring, the quarterly sampling of newly installed wells, and storm water sampling. The Fourth Quarter 2012 monitoring event consisted of water level monitoring; surface water sampling; the quarterly sampling of newly installed wells and the semiannual sampling of increasing contaminant trend wells, guard wells, and contaminant attenuation wells. Tables 2-1 and 2-2 list the locations sampled during the Third Quarter 2012 and Fourth Quarter 2012 monitoring events, respectively. Contaminant attenuation parameters include alkalinity, chloride, dissolved organic carbon (DOC), dissolved manganese, ferrous iron, total iron, sulfide, sulfate, nitrate, methane, ethane, ethene, hydrogen, and volatile fatty acids (VFAs). The tables summarize analytical methods, sampling dates, QA/QC samples collected, and field notes.

Surface water samples are collected from up to 17 fixed locations. One designated alternate surface water location (SW-17) is sampled if flowing water is not encountered at the southern end of Massacre Canyon at Gilman Springs Road (SW-16) (Figure 2-1). Certain locations are generally sampled only during or shortly after periods of precipitation, because of the ephemeral nature of the streams on the site.

Table 2-1 Sampling Schedule - Third Quarter 2012

Sample Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	Comments and QA/QC Samples
MW-110	08/22/12	X	X	X	Sampled with Dedicated Pump, MS/MSD sample
MW-111A	08/21/12	X	X	X	Sampled with FLUTe™ System
MW-111B	08/21/12	X	X	X	Sampled with FLUTe™ System
MW-111C	08/31/12	X	X	X	Sampled with FLUTe™ System
MW-111D	08/21/12	X	X	X	Sampled with FLUTe™ System
MW-111E	08/21/12	X	X	X	Sampled with FLUTe™ System
MW-112A	08/20/12	X	X	X	Sampled with FLUTe™ System, Duplicate MW-112A-Dup
MW-112B	08/20/12	X	X	X	Sampled with FLUTe™ System
MW-112C	08/20/12	X	X	X	Sampled with FLUTe™ System
Total Sample Locations:		9			
Total Samples Collected:		9			

Notes:

(1) - Volatile organic compounds (VOCs) analyzed by EPA Method SW8260B

(2) - 1,4-Dioxane analyzed by EPA Method SW8270C SIM

(3) - Perchlorate analyzed by EPA Method E332.0

MS/MSD - Matrix Spike/Matrix Spike Duplicate

Table 2-2 Sampling Schedule - Fourth Quarter 2012

Sample Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	Contaminant Attenuation Parameters (4)	Comments and QA/QC Samples
SW-01	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-02	11/15/12	X	X	X	-	Surface Water
SW-03	11/15/12	X	X	X	-	Surface Water, Duplicate Sample SW-03-Dup
SW-04	11/15/12	X	X	X	-	Surface Water
SW-06	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-07	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-08	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-09	11/15/12	X	X	X	-	Surface Water, MS/MSD Sample
SW-10	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-11	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-12	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-13	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-14	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-15	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-16	NA	-	-	-	-	Surface Water - Dry no sample collected
SW-17	NA				-	Surface Water - Dry no sample collected
SW-18	11/15/12	X	X	X	-	Surface Water
SW-19	NA	-	-	-	-	Surface Water - Dry no sample collected
F34-TW1	11/26/12	X	X	X	-	Sampled with Peristaltic Pump
IW-04	11/19/12	X	X	X	-	Sample with Dedicated Pump
MW-05	11/28/12	X	X	X	X	Sample with Dedicated Pump
MW-08	11/26/12	X	X	X	X	Sample with Dedicated Pump
MW-13	11/26/12	X	X	X	X	Sample with Dedicated Pump, MS/MSD Sample
MW-15	11/16/12	X	X	X	-	Sample with Dedicated Pump
MW-18	11/16/12	X	X	X	-	Sample with Dedicated Pump, Duplicate Sample MW-18-Dup
MW-43	11/26/12	X	X	X	X	Sample with Dedicated Pump, Duplicate Sample MW-43-Dup
MW-48	11/28/12	X	X	X	X	Sample with Dedicated Pump
MW-60A	11/29/12	X	X	X	-	Sample with Dedicated Pump
MW-60B	11/29/12	X	X	X	-	Sample with Dedicated Pump

Notes:

(shaded) Well not sampled or surface water sample not collected.

(1) - Volatile organic compounds (VOCs) analyzed by EPA Method SW8260B

(2) - 1,4-Dioxane analyzed by EPA Method SW8270C SIM

(3) - Perchlorate analyzed by EPA Method E332.0

(4) - Contaminant attenuation parameters by various methods

NA - Not analyzed

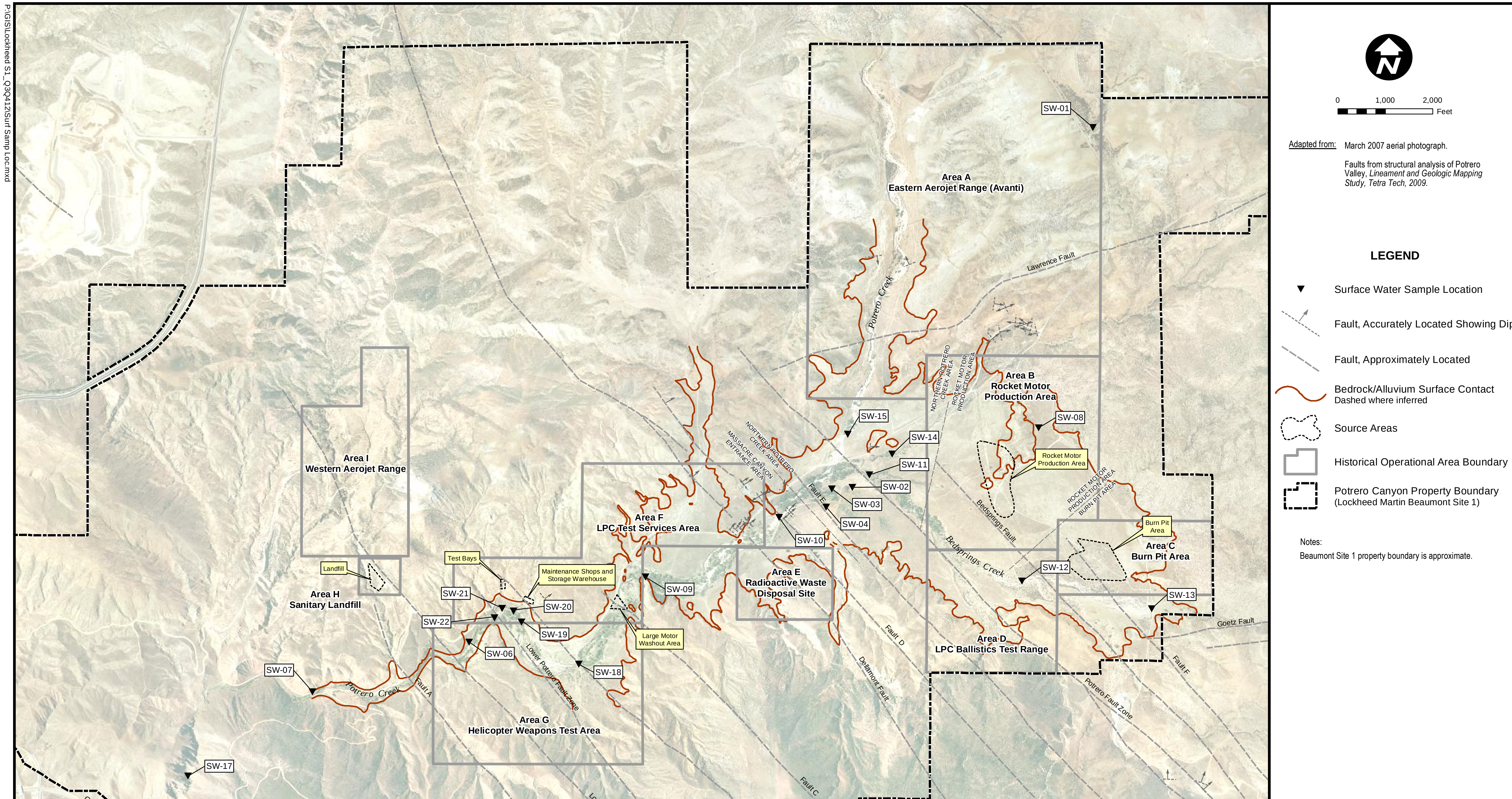
MS/MSD - Matrix Spike/Matrix Spike Duplicate

Table 2-2 Sampling Schedule - Fourth Quarter 2012 (continued)

Sample Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	Contaminant Attenuation Parameters (4)	Comments and QA/QC Samples
MW-67	11/16/12	X	X	X	-	Sample with Dedicated Pump, MS/MSD Sample
MW-68	11/28/12	X	X	X	-	Sample with Dedicated Pump
MW-70	11/16/12	X	X	X	-	Sample with Dedicated Pump
MW-76B	11/28/12	X	X	X	X	Sample with Dedicated Pump
MW-88	11/19/12	X	X	X	-	Sample with Dedicated Pump
MW-93	11/19/12	X	X	X	-	Sample with Dedicated Pump, Duplicate Sample MW-93-Dup
MW-98B	11/28/12	X	X	X	-	Sample with Dedicated Pump
OW-02	11/28/12	X	X	X	X	Sampled with Peristaltic Pump
P-02	11/26/12	X	X	X	X	Sample with Dedicated Pump
MW-100	11/16/12	X	X	X	-	Sample with Dedicated Pump
MW-101	11/28/12	X	X	X	X	Sample with Dedicated Pump
MW-102	11/28/12	X	X	X	X	Sample with Dedicated Pump
MW-103	11/27/12	X	X	X	X	Sampled with Peristaltic Pump, Duplicate Sample MW-103-Dup
MW-104	11/27/12	X	X	X	X	Sampled with Peristaltic Pump
MW-105	11/27/12	X	X	X	X	Sampled with Peristaltic Pump
MW-106	11/27/12	X	X	X	X	Sampled with Peristaltic Pump
MW-107	11/27/12	X	X	X	X	Sampled with Peristaltic Pump
MW-109	11/27/12	X	X	X	X	Sampled with Peristaltic Pump
MW-110	11/19/12	X	X	X	-	Sample with Dedicated Pump
MW-111A	11/20/12	X	X	X	-	Sampled with FLUTe™ System
MW-111B	11/20/12	X	X	X	-	Sampled with FLUTe™ System
MW-111C	NA	-	-	-	-	FLUTe™ System clogged, unable to sample
MW-111D	11/20/12	X	X	X	-	Sampled with FLUTe™ System
MW-111E	11/20/12	X	X	X	-	Sampled with FLUTe™ System
MW-112A	11/20/12	X	X	X	-	Sampled with FLUTe™ System
MW-112B	11/20/12	X	X	X	-	Sampled with FLUTe™ System
MW-112C	11/20/12	X	X	X	-	Sampled with FLUTe™ System

Total Sample Locations: 56
Total Samples Collected: 42

Notes:
(shaded) - Well not sampled or surface water sample not collected.
(1) - Volatile organic compounds (VOCs) analyzed by EPA Method SW8260B
(2) - 1,4-Dioxane analyzed by EPA Method SW8270C SIM
(3) - Perchlorate analyzed by EPA Method E332.0
(4) - Contaminant attenuation parameters by various methods
NA - Not analyzed
MS/MSD - Matrix Spike/Matrix Spike Duplicate



Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 2-1
Surface Water Sampling Locations

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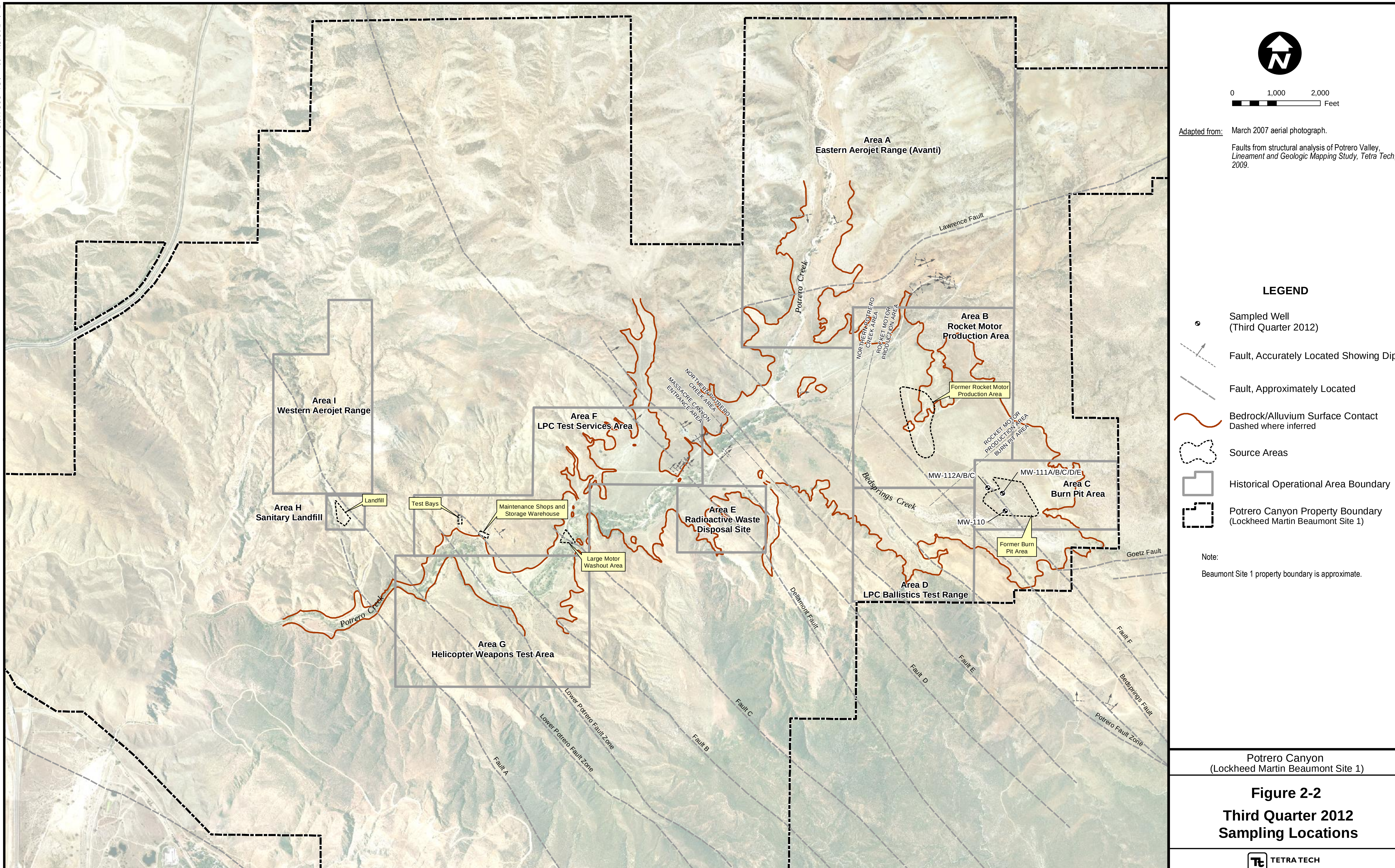
2.3.1 Proposed and Actual Surface Water and Well Locations Sampled

For the Third Quarter 2012 monitoring event, 9 monitoring wells were proposed and sampled for water quality monitoring. Figure 2-2 illustrates groundwater locations sampled for the Third Quarter 2012 monitoring event.

For the Fourth Quarter 2012 monitoring event, 56 sampling locations (17 surface water, one alternate surface water location, and 38 monitoring wells) were proposed for water quality monitoring. Twelve surface water sample locations were not sampled because the locations were dry. The alternate surface water location (SW-17) was also dry and was not sampled. Additionally one monitoring well, MW-111C, was unable to be sampled because its port in the Water FLUTe™ multilevel monitoring system was clogged with sediment. Therefore, water quality data were collected from five surface water, and 37 monitoring well locations during this event. Figure 2-3 illustrates groundwater and surface water locations sampled for the Fourth Quarter 2012 monitoring event.



Potrero Canyon (Lockheed Martin Beaumont Site 1)

Figure 2-2
Third Quarter 2012 Sampling Locations

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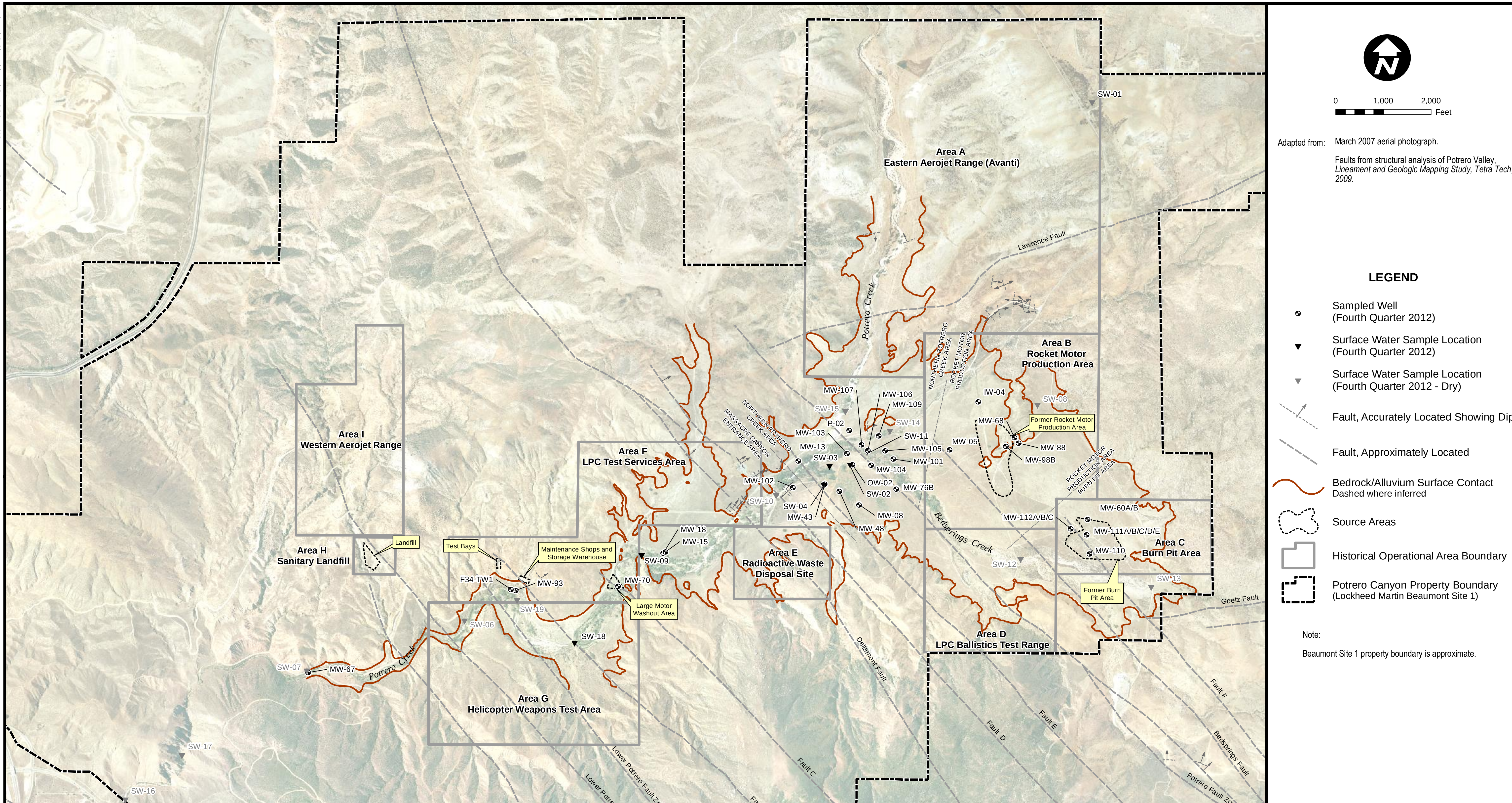

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 2-3

Fourth Quarter 2012 Sampling Locations

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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: 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 started 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 was 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 ± three percent, turbidity < 10 nephelometric turbidity units (NTUs) (if > 10 NTUs ± 10%), DO ± 0.3 milligrams per liter (mg/L), and ORP ± 10 millivolts. Sampling instruments and equipment were maintained, calibrated, and operated in accordance with the manufacturers' 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 container, and sample custody was maintained by chain-of-custody record. Samples collected were chilled and transported via courier to E.S. Babcock & Sons, a state-accredited analytical laboratory, thus maintaining proper temperatures and sample integrity. Trip blanks were collected for the monitoring events to assess cross-contamination potential of water samples while in transit. Equipment blanks 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 system (GPS) and had been marked in the field. Surface water samples were collected at these GPS-mapped locations either by using a disposable bailer with the sample transferred to the laboratory-supplied water sample containers, or by collecting the water sample directly in the laboratory-supplied water sample container. 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 (USEPA) methods. Since the analytical data were obtained by following USEPA-approved method criteria, the data were evaluated by using the USEPA-approved validation methods described in the USEPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Superfund Data Review (USEPA, 2008 and 2010). 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

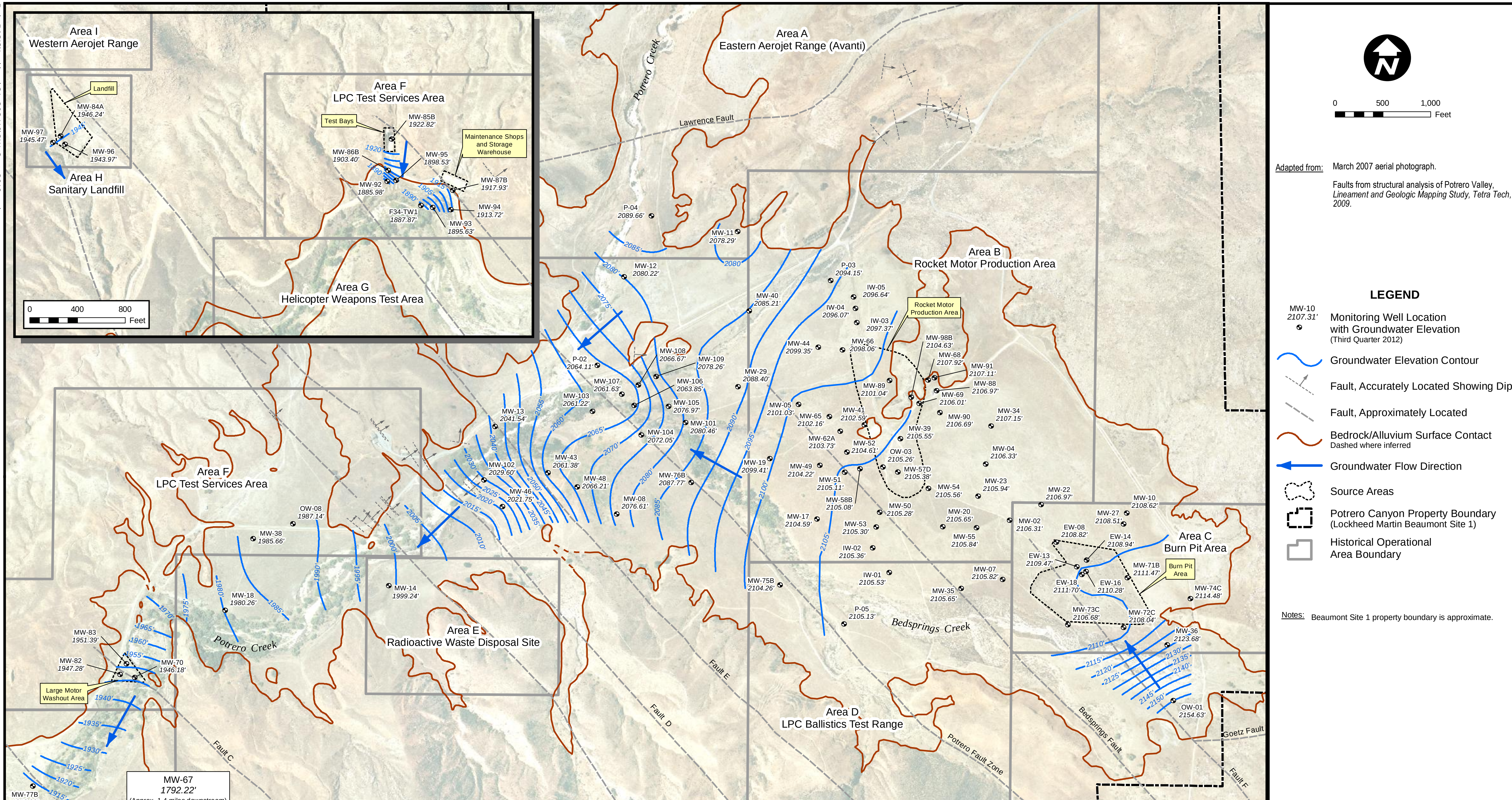
All monitoring activities were performed in accordance with the United States Fish and Wildlife Service (USFWS)-approved Habitat Conservation Plan (HCP) (USFWS, 2005) and subsequent clarifications (Lockheed Martin Corporation, 2006a, 2006b, and 2006c) of the HCP. Groundwater sampling activities were conducted with light-duty vehicles, and were supervised by a USFWS-approved biologist as specified in the Low Effect HCP.

SECTION 3 GROUNDWATER MONITORING RESULTS

Section 3 presents the results and interpretations of the Third Quarter 2012 and Fourth Quarter 2012 groundwater monitoring events. The following subsections include tabulated summaries of groundwater elevation and water quality data, contour maps, and primary chemicals of potential concern results. Plots of groundwater elevation versus time (hydrographs) and concentration versus time (time series graphs) for primary and secondary chemicals of potential concern are presented in Appendices D and E, respectively.

3.1 GROUNDWATER ELEVATION

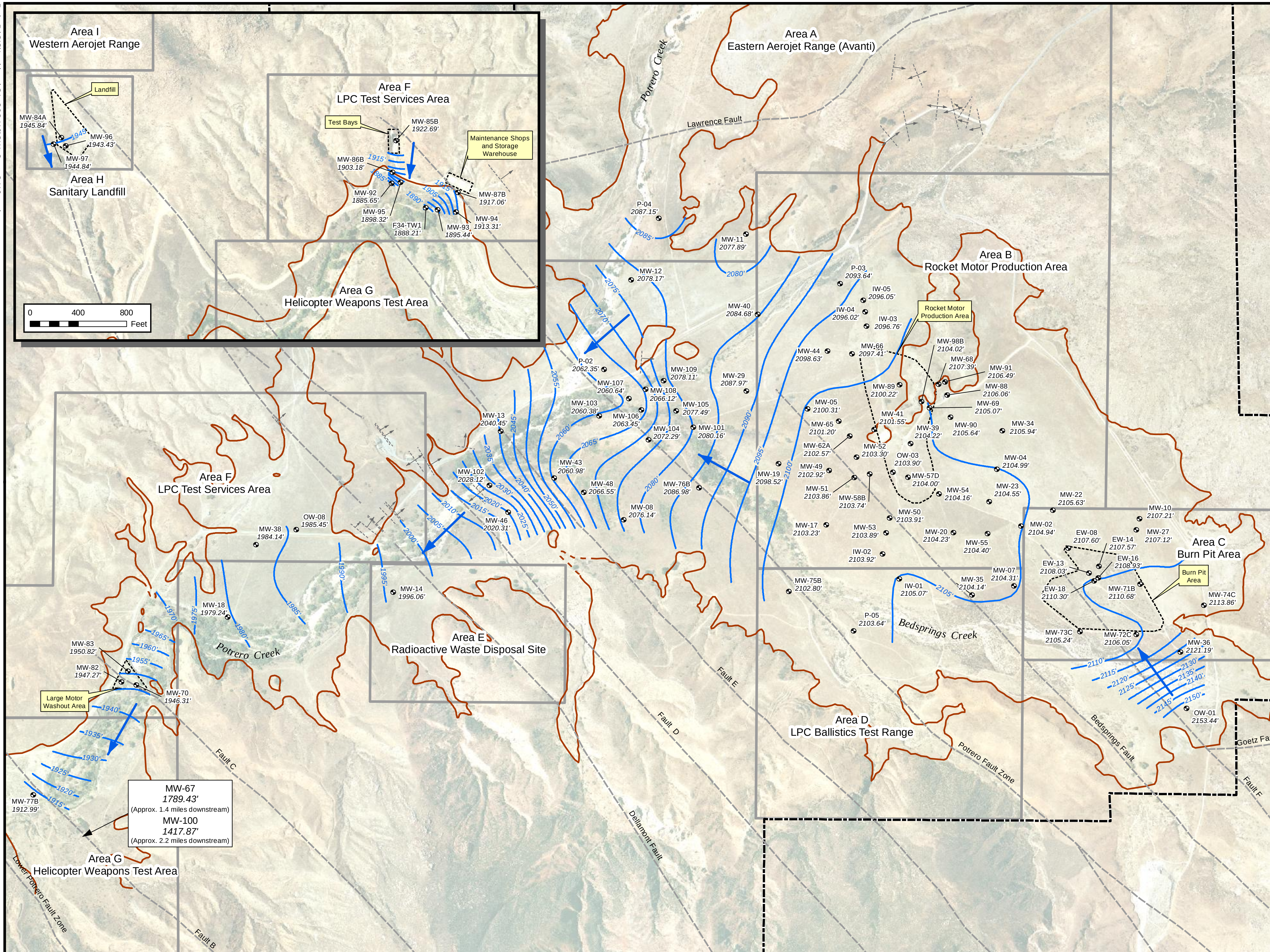
Groundwater elevations during the Third Quarter 2012 monitoring event ranged from approximately 2,155 feet mean sea level (msl) upgradient of the former Burn Pit Area to approximately 1,792 feet msl in the Massacre Canyon Entrance Area. Groundwater elevations during the Fourth Quarter 2012 monitoring event ranged from approximately 2,153 feet msl upgradient of the former Burn Pit Area to approximately 1,789 feet msl in the Massacre Canyon Entrance Area. A total of 182 monitoring wells were identified for groundwater level measurements for the Third Quarter 2012 and Fourth Quarter 2012 monitoring events. For the Third Quarter 2012 monitoring events, four wells were dry (OW-05, OW-06, OW-07, and VRW-01). For the Fourth Quarter 2012 monitoring events, five wells were dry (OW-05, OW-06, OW-07, P-06S, and VRW-01). EW-01 and EW-02 are former extraction wells with pumps and associated wiring and piping still in place. Whereas these down-hole items make water level measurements difficult, the wells may be needed for future site remediation and/or monitoring activities, and therefore Tetra Tech continues to include them in the monitoring well network. However, if water level measurements cannot be collected from either of these wells, several monitoring wells that are located in close proximity to these former extraction wells can be used for contouring and temporal trends. We will continue to monitor water level elevations from these two former extraction wells when possible. 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. Groundwater elevations for the Third Quarter 2012 and Fourth Quarter 2012 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 2012 and Fourth Quarter 2012 monitoring events is presented in Table 3-1. Hydrographs for individual wells and for well groups are presented in Appendix D.



Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-1
Groundwater Contours for Alluvium and Weathered Mount Eden Formation-Third Quarter 2012

TETRA TECH



N

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

MW-10 2107.31' Monitoring Well Location with Groundwater Elevation (Fourth Quarter 2012)

Groundwater Elevation Contour

Fault, Accurately Located Showing Dip

Fault, Approximately Located

Bedrock/Alluvium Surface Contact (Dashed where inferred)

Groundwater Flow Direction

Source Areas

Potrero Canyon Property Boundary (Lockheed Martin Beaumont Site 1)

Historical Operational Area Boundary

Notes: Beaumont Site 1 property boundary is approximate.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-2
Groundwater Contours for Alluvium and Weathered Mount Eden Formation- Fourth Quarter 2012

TETRA TECH

Table 3-1 Groundwater Elevation - Third Quarter 2012 and Fourth Quarter 2012

Well ID	Site Area	Formation Screened	Measuring Point Elevation (feet msl)	Third Quarter 2012				Fourth Quarter 2012			
				Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Second Quarter 2012	Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Third Quarter 2012
EW-01	RMPA	QAL	2142.62	08/14/12	37.45	2105.17	-1.31	11/13/12	38.81	2103.81	-1.36
EW-02	RMPA	QAL	2126.15	08/14/12	23.72	2102.43	-1.05	11/13/12	24.80	2101.35	-1.08
EW-08	BPA	MEF	2178.40	08/14/12	69.60	2108.82	-1.25	11/14/12	70.82	2107.60	-1.22
EW-09	BPA	MEF	2179.67	08/14/12	70.95	2108.72	-1.26	11/14/12	72.38	2107.29	-1.43
EW-10	BPA	MEF	2180.19	08/14/12	71.30	2108.93	-1.61	11/14/12	72.62	2107.61	-1.32
EW-11	BPA	MEF	2182.09	08/14/12	72.00	2110.00	-1.36	11/14/12	73.50	2108.50	-1.50
EW-12	BPA	MEF	2183.28	08/14/12	74.34	2108.82	-1.25	11/14/12	75.62	2107.54	-1.28
EW-13	BPA	MEF	2185.57	08/14/12	76.10	2109.47	-1.20	11/14/12	77.54	2108.03	-1.44
EW-14	BPA	QAL/MEF	2184.59	08/14/12	75.66	2108.94	-1.11	11/14/12	77.03	2107.57	-1.37
EW-15	BPA	MEF	2184.10	08/14/12	73.83	2110.00	-1.29	11/14/12	75.21	2108.62	-1.38
EW-16	BPA	MEF	2185.52	08/14/12	75.25	2110.28	-1.25	11/14/12	76.60	2108.93	-1.35
EW-17	BPA	MEF	2179.04	08/14/12	71.99	2107.05	-1.42	11/14/12	73.40	2105.64	-1.41
EW-18	BPA	MEF	2184.98	08/14/12	73.35	2111.70	-1.28	11/14/12	74.75	2110.30	-1.40
EW-19	MCEA	QAL	2033.89	08/15/12	36.21	1997.68	-3.39	11/14/12	39.10	1994.79	-2.89
EW-20	BPA	MEF	2187.45	08/14/12	75.88	2111.57	-1.45	11/14/12	77.37	2110.08	-1.49
F33-TW2	NPCA	QAL	1959.75	08/13/12	7.28	1952.47	-1.30	11/13/12	6.91	1952.84	0.37
F33-TW6	NPCA	QAL	1950.62	08/13/12	7.98	1942.64	-0.39	11/13/12	7.80	1942.82	0.18
F33-TW7	NPCA	QAL	NA	08/13/12	9.83	NA	NA	11/13/12	9.61		NA
F34-TW1	MCEA	QAL	1894.08	08/13/12	6.21	1887.87	-0.79	11/13/12	5.87	1888.21	0.34
IW-01	RMPA	QAL	2160.73	08/14/12	55.20	2105.53	-1.32	11/13/12	55.66	2105.07	-0.46
IW-02	RMPA	QAL	2155.01	08/14/12	49.65	2105.36	-1.34	11/13/12	51.09	2103.92	-1.44
IW-03	RMPA	QAL	2132.86	08/14/12	35.49	2097.37	-0.47	11/13/12	36.10	2096.76	-0.61
IW-04	RMPA	QAL	2135.09	08/14/12	39.02	2096.07	-1.16	11/13/12	39.07	2096.02	-0.05
IW-05	RMPA	QAL	2136.94	08/14/12	40.30	2096.64	-0.41	11/13/12	40.89	2096.05	-0.59
MW-01	RMPA	MEF	2176.98	08/13/12	71.29	2105.69	-1.38	11/14/12	72.81	2104.17	-1.52
MW-02	RMPA	MEF	2170.10	08/14/12	63.79	2106.31	-1.33	11/14/12	65.16	2104.94	-1.37
MW-03	RMPA	MEF	2169.36	08/14/12	124.27	2045.09	-0.82	11/14/12	125.30	2044.06	-1.03
MW-04	RMPA	QAL	2160.02	08/14/12	53.69	2106.33	-1.35	11/14/12	55.03	2104.99	-1.34
MW-05	RMPA	QAL	2121.40	08/14/12	20.37	2101.03	-0.69	11/13/12	21.09	2100.31	-0.72
MW-06	RMPA	QAL	2121.76	08/14/12	23.15	2098.61	-0.89	11/13/12	24.13	2097.63	-0.98
MW-07	BPA	QAL	2176.52	08/13/12	70.70	2105.82	-1.38	11/14/12	72.21	2104.31	-1.51
MW-08	NPCA	QAL	2090.53	08/15/12	13.92	2076.61	-0.99	11/14/12	14.39	2076.14	-0.47
MW-09	NPCA	QAL	2089.16	08/15/12	0.30	2088.86	-1.30	11/14/12	1.61	2087.55	-1.31
MW-10	RMPA	QAL	2179.40	08/13/12	70.78	2108.62	-1.08	11/14/12	72.19	2107.21	-1.41
MW-11	NPCA	QAL	2122.61	08/13/12	44.32	2078.29	-0.08	11/13/12	44.72	2077.89	-0.40
MW-12	NPCA	QAL	2098.49	08/13/12	18.27	2080.22	-4.04	11/13/12	20.32	2078.17	-2.05
MW-13	NPCA	QAL	2057.89	08/13/12	16.35	2041.54	-4.53	11/13/12	17.44	2040.45	-1.09
MW-14	MCEA	QAL	2029.67	08/15/12	30.43	1999.24	-3.36	11/14/12	33.61	1996.06	-3.18
MW-15	MCEA	QAL	2009.76	08/13/12	28.53	1981.23	-1.88	11/13/12	29.63	1980.13	-1.10
MW-17	RMPA	QAL	2140.40	08/14/12	35.81	2104.59	-1.33	11/13/12	37.17	2103.23	-1.36
MW-18	MCEA	QAL	2008.69	08/13/12	28.43	1980.26	-1.80	11/13/12	29.45	1979.24	-1.02
MW-19	NPCA	QAL	2118.49	08/14/12	19.08	2099.41	-0.94	11/13/12	19.97	2098.52	-0.89
MW-20	RMPA	QAL	2162.03	08/14/12	56.38	2105.65	-1.37	11/14/12	57.80	2104.23	-1.42
MW-22	RMPA	QAL	2173.48	08/14/12	66.51	2106.97	-1.28	11/14/12	67.85	2105.63	-1.34
MW-23	RMPA	QAL	2165.02	08/14/12	59.08	2105.94	-1.38	11/14/12	60.47	2104.55	-1.39
MW-26	BPA	MEF	2183.81	08/14/12	75.44	2108.37	-1.47	11/14/12	76.94	2106.87	-1.50
MW-27	BPA	QAL	2182.73	08/13/12	74.22	2108.51	-1.10	11/14/12	75.61	2107.12	-1.39
MW-28	RMPA	QAL	2160.84	08/14/12	55.31	2105.53	-1.36	11/14/12	56.73	2104.11	-1.42
MW-29	NPCA	MEF	2115.09	08/14/12	26.69	2088.40	-0.48	11/13/12	27.12	2087.97	-0.43
MW-30	RMPA	QAL	2165.01	08/14/12	58.22	2106.79	-1.27	11/14/12	59.56	2105.45	-1.34
MW-31	BPA	Granite	2186.52	08/14/12	90.80	2095.72	-1.21	11/14/12	92.23	2094.29	-1.43
MW-32	RMPA	Granite	2176.61	08/13/12	84.25	2092.36	-1.28	11/14/12	85.69	2090.92	-1.44
MW-34	RMPA	QAL	2153.80	08/14/12	46.65	2107.15	-1.19	11/14/12	47.86	2105.94	-1.21
MW-35	RMPA	QAL	2170.98	08/13/12	65.33	2105.65	-1.35	11/14/12	66.84	2104.14	-1.51
MW-36	UG	QAL	2205.18	08/13/12	81.50	2123.68	-2.08	11/14/12	83.99	2121.19	-2.49
MW-38	MCEA	MEF	2030.29	08/13/12	44.63	1985.66	-1.25	11/13/12	46.15	1984.14	-1.52
MW-39	RMPA	QAL	2144.18	08/14/12	38.63	2105.55	-1.36	11/14/12	39.96	2104.22	-1.33
MW-40	NPCA	MEF	2126.39	08/13/12	41.18	2085.21	-0.40	11/13/12	41.71	2084.68	-0.53
MW-41	RMPA	MEF	2133.95	08/15/12	31.36	2102.59	-1.06	11/14/12	32.40	2101.55	-1.04
MW-43	NPCA	QAL	2068.58	08/15/12	7.20	2061.38	-2.10	11/14/12	7.60	2060.98	-0.40
MW-44	NPCA	QAL	2128.69	08/14/12	29.34	2099.35	-0.64	11/13/12	30.06	2098.63	-0.72
MW-45	MCEA	QAL	2068.18	08/15/12	4.0 PSI	2077.42	-0.69	11/14/12	3.6 PSI	2076.49	-0.92
MW-46	MCEA	QAL	2072.17	08/15/12	50.42	2021.75	-1.66	11/14/12	51.86	2020.31	-1.44
MW-47	NPCA	QAL	2076.67	08/15/12	3.4 PSI	2084.52	-1.39	11/14/12	3.0 PSI	2083.60	-0.92
MW-48	NPCA	QAL	2076.44	08/15/12	10.23	2066.21	-1.87	11/14/12	9.89	2066.55	0.34
MW-49	RMPA	QAL	2130.92	08/14/12	26.70	2104.22	-1.27	11/13/12	28.00	2102.92	-1.30
MW-50	RMPA	QAL	2151.43	08/14/12	46.15	2105.28	-1.33	11/13/12	47.52	2103.91	-1.37
MW-51	RMPA	QAL	2138.36	08/14/12	33.25	2105.11	-1.21	11/13/12	34.50	2103.86	-1.25
MW-52	RMPA	QAL	2136.18	08/14/12	31.57	2104.61	-1.25	11/13/12	32.88	2103.30	-1.31
MW-53	RMPA	QAL	2153.29	08/14/12	47.99	2105.30	-1.33	11/13/12	49.40	2103.89	-1.41
MW-54	RMPA	QAL	2153.44	08/14/12	47.88	2105.56	-1.39	11/14/12	49.28	2104.16	-1.40
MW-55	RMPA	QAL	2166.66	08/14/12	60.82	2105.84	-1.33	11/14/12	62.26	2104.40	-1.44
MW-56A	RMPA	MEF	2143.09	08/14/12	49.94	2093.15	-1.20	11/13/12	51.19	2091.90	-1.25
MW-56B	RMPA	QAL	2142.58	08/14/12	37.37	2105.21	-1.34	11/13/12	38.75	2103.83	-1.38
MW-56C	RMPA	QAL	2142.77	08/14/12	37.65	2105.12	-1.29	11/13/12	39.01	2103.76	-1.36
MW-56D	RMPA	QAL	2142.48	08/14/12	37.24	2105.24	-1.34	11/13/12	38.61	2103.87	-1.37
MW-57A	RMPA	QAL	2145.98	08/14/12	40.56	2105.42	-1.31	11/13/12	41.95	2104.03	-1.39
MW-57B	RMPA	QAL	2146.19	08/14/12	40.76	2105.43	-1.31	11/13/12	42.15	2104.04	-1.39
MW-57C	RMPA	QAL	2146.02	08/14/12	40.58	2105.44	-1.32	11/13/12	41.98	2104.04	-1.40
MW-57D	RMPA	QAL	2146.10	08/14/12	40.72	2105.38	-1.31	11/13/12	42.10	2104.00	-1.38
MW-58A	RMPA	QAL	2140.73	08/14/12	35.85	2104.88	-1.30	11/13/12	37.22	2103.51	-1.37
MW-58B	RMPA	QAL	2140.78	08/14/12	35.70	2105.08	-1.29	11/13/12	37.04	2103.74	-1.34
MW-58C	RMPA	QAL	2141.02	08/14/12	36.06	2104.96	-1.27	11/13/12	37.41	2103.61	-1.35
MW-58D	RMPA	QAL	2140.94	08/14/12	36.07	2104.87	-1.31	11/13/12	37.45	2103.49	-1.38
MW-59A	BPA	MEF	2180.14	08/14/12	76.72	2103.42	-1.27	11/14/12	78.16	2101.98	-1.44
MW-59B	BPA	MEF	2180.39	08/14/12	72.11	2108.28	-1.26	11/14/12	73.55	2106.84	-1.44
MW-59C	BPA	MEF	2179.93	08/14/12	73.90	2106.03	-1.29	11/14/12	75.36	2104.57	-1.46
MW-59D	BPA	MEF	2180.53	08/14/12	73.88	2106.65	-1.41	11/14/12	75.31	2105.22	-1.43
MW-60A	BPA	MEF	2182.59	08/14/12	76.32	2106.27	-1.18	11/14/12	77.70	2104.89	-1.38
MW-60B	BPA	MEF	2182.77	08/14/12	74.85	2107.92	-1.21	11/14/12	76.21	2106.56	-1.36

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/Mount Eden formation
MEF - Mount Eden formation

Table 3-1 Groundwater Elevation - Third Quarter 2012 and Fourth Quarter 2012 (continued)

				Third Quarter 2012				Fourth Quarter 2012			
Well ID	Site Area	Formation Screened	Measuring Point Elevation (feet msl)	Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Second Quarter 2012	Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Third Quarter 2012
MW-61A	BPA	MEF	2186.95	08/14/12	84.09	2102.86	-4.14	11/14/12	85.58	2101.37	-1.49
MW-61B	BPA	MEF	2186.77	08/14/12	75.79	2110.98	-1.30	11/14/12	77.16	2109.61	-1.37
MW-61C	BPA	MEF	2186.84	08/14/12	81.76	2105.08	-1.27	11/14/12	83.23	2103.61	-1.47
MW-61D	BPA	MEF	2186.83	08/14/12	79.11	2107.72	-1.27	11/14/12	80.54	2106.29	-1.43
MW-62A	RMPA	QAL	2131.32	08/14/12	27.59	2103.73	-1.07	11/13/12	28.75	2102.57	-1.16
MW-62B	RMPA	QAL	2131.49	08/14/12	27.67	2103.82	-1.21	11/13/12	28.91	2102.58	-1.24
MW-63	RMPA	QAL	2156.20	08/14/12	50.58	2105.62	-1.38	11/14/12	52.00	2104.20	-1.42
MW-64	RMPA	QAL	2128.41	08/14/12	26.08	2102.33	-0.88	11/13/12	27.02	2101.39	-0.94
MW-65	RMPA	QAL	2128.92	08/14/12	26.76	2102.16	-0.89	11/13/12	27.72	2101.20	-0.96
MW-66	RMPA	QAL	2130.43	08/14/12	32.37	2098.06	-0.55	11/13/12	33.02	2097.41	-0.65
MW-67	MCEA	QAL	1799.54	08/13/12	7.32	1792.22	-2.57	11/13/12	10.11	1789.43	-2.79
MW-68	RMPA	QAL	2144.69	08/14/12	36.77	2107.92	-0.60	11/14/12	37.30	2107.39	-0.53
MW-69	RMPA	QAL	2143.26	08/15/12	37.25	2106.01	-0.78	11/14/12	38.19	2105.07	-0.94
MW-70	MCEA	QAL	1976.15	08/13/12	29.97	1946.18	-1.00	11/13/12	29.84	1946.31	0.13
MW-71A	BPA	Granite	2193.77	08/14/12	157.25	2036.52	-0.53	11/14/12	158.07	2035.70	-0.82
MW-71B	BPA	QAL/MEF	2194.01	08/14/12	82.54	2111.47	-0.69	11/14/12	83.33	2110.68	-0.79
MW-71C	BPA	MEF	2193.87	08/14/12	84.65	2109.22	-1.12	11/14/12	85.87	2108.00	-1.22
MW-72A	BPA	Granite	2199.06	08/13/12	96.78	2102.28	-2.18	11/14/12	98.90	2100.16	-2.12
MW-72B	BPA	MEF	2199.22	08/13/12	91.23	2107.99	-1.87	11/14/12	93.21	2106.01	-1.98
MW-72C	BPA	QAL	2199.35	08/13/12	91.31	2108.04	-1.87	11/14/12	93.30	2106.05	-1.99
MW-73A	BPA	MEF	2189.39	08/13/12	110.16	2079.23	-1.38	11/14/12	111.57	2077.82	-1.41
MW-73B	BPA	MEF	2189.48	08/13/12	94.83	2094.65	-1.43	11/14/12	96.34	2093.14	-1.51
MW-73C	BPA	QAL	2189.65	08/13/12	82.97	2106.68	-1.14	11/14/12	84.41	2105.24	-1.44
MW-74A	UG	Granite	2199.66	08/13/12	158.46	2041.20	-0.31	11/14/12	159.00	2040.66	-0.54
MW-74B	UG	Granite	2199.81	08/13/12	115.95	2083.86	-1.37	11/14/12	115.85	2083.96	0.10
MW-74C	UG	MEF	2199.96	08/13/12	85.48	2114.48	-0.54	11/14/12	86.10	2113.86	-0.62
MW-75A	RMPA	MEF	2149.44	08/15/12	54.23	2095.21	-1.28	11/14/12	55.58	2093.86	-1.35
MW-75B	RMPA	QAL	2149.51	08/15/12	45.25	2104.26	-1.37	11/14/12	46.71	2102.80	-1.46
MW-75C	RMPA	QAL	2150.02	08/15/12	45.83	2104.19	-1.34	11/14/12	47.25	2102.77	-1.42
MW-76A	NPCA	MEF	2105.91	08/15/12	22.90	2083.01	-1.32	11/14/12	24.23	2081.68	-1.33
MW-76B	NPCA	QAL	2105.40	08/15/12	17.63	2087.77	-1.71	11/14/12	18.42	2086.98	-0.79
MW-76C	NPCA	QAL	2106.29	08/15/12	8.03	2098.26	-1.27	11/14/12	9.27	2097.02	-1.24
MW-77A	MCEA	MEF	1930.62	08/13/12	14.07	1916.55	-1.82	11/13/12	14.78	1915.84	-0.71
MW-77B	MCEA	MEF	1930.88	08/13/12	17.65	1913.23	-0.74	11/13/12	17.89	1912.99	-0.24
MW-78	BPA	MEF	2182.63	08/14/12	86.43	2096.20	-1.23	11/14/12	87.84	2094.79	-1.41
MW-79A	RMPA	MEF	2142.00	08/14/12	41.03	2100.97	-1.33	11/13/12	42.37	2099.63	-1.34
MW-79C	RMPA	QAL	2142.07	08/14/12	37.93	2104.14	-1.34	11/13/12	39.30	2102.77	-1.37
MW-80	NPCA	MEF	2070.47	08/15/12	0.45 PSI	2071.51	-1.89	11/14/12	1.94	2068.53	-2.98
MW-81	MCEA	MEF	2010.72	08/13/12	29.82	1980.90	-1.85	11/13/12	30.92	1979.80	-1.10
MW-82	NPCA	QAL	1974.17	08/13/12	26.89	1947.28	-0.69	11/13/12	26.90	1947.27	-0.01
MW-83	NPCA	QAL	1976.93	08/13/12	25.54	1951.39	-1.38	11/13/12	26.11	1950.82	-0.57
MW-84A	MCEA	MEF	2,010.02	08/13/12	63.78	1946.24	-0.25	11/13/12	64.18	1945.84	-0.40
MW-84B	MCEA	MEF	2,011.19	08/13/12	65.86	1945.33	-0.18	11/13/12	66.22	1944.97	-0.36
MW-85A	MCEA	MEF	1,929.31	08/13/12	7.50	1921.81	-1.07	11/13/12	8.04	1921.27	-0.54
MW-85B	MCEA	MEF	1,928.74	08/14/12	5.92	1922.82	-2.35	11/13/12	6.05	1922.69	-0.13
MW-86A	MCEA	MEF	1,923.21	08/13/12	16.66	1906.55	-0.99	11/13/12	17.07	1906.14	-0.41
MW-86B	MCEA	QAL/MEF	1,923.21	08/13/12	19.81	1903.40	-0.72	11/13/12	20.03	1903.18	-0.22
MW-87A	MCEA	MEF	1,938.92	08/13/12	22.10	1916.82	-0.84	11/13/12	22.71	1916.21	-0.61
MW-87B	MCEA	MEF	1,938.82	08/13/12	20.89	1917.93	-0.84	11/13/12	21.76	1917.06	-0.87
MW-88	RMPA	QAL	2,141.97	08/14/12	35.00	2106.97	-0.87	11/14/12	35.91	2106.06	-0.91
MW-89	RMPA	QAL	2,130.82	08/15/12	29.78	2101.04	-0.74	11/14/12	30.60	2100.22	-0.82
MW-90	RMPA	QAL	2,147.71	08/14/12	41.02	2106.69	-1.02	11/14/12	42.07	2105.64	-1.05
MW-91	RMPA	MEF	2,144.85	08/14/12	37.74	2107.11	-0.71	11/14/12	38.36	2106.49	-0.62
MW-92	MCEA	MEF	1,919.83	08/13/12	33.85	1885.98	-1.30	11/13/12	34.18	1885.65	-0.33
MW-93	MCEA	MEF	1,931.47	08/13/12	35.84	1895.63	-0.99	11/13/12	36.03	1895.44	-0.19
MW-94	MCEA	MEF	1,936.55	08/13/12	22.83	1913.72	-0.56	11/13/12	23.24	1913.31	-0.41
MW-95	MCEA	MEF	1,920.80	08/13/12	22.27	1898.53	-0.62	11/13/12	22.48	1898.32	-0.21
MW-96	MCEA	MEF	1998.63	08/13/12	54.66	1943.97	-0.29	11/13/12	55.20	1943.43	-0.54
MW-97	MCEA	MEF	1996.47	08/13/12	51.00	1945.47	-1.02	11/13/12	51.63	1944.84	-0.63
MW-98A	RMPA	MEF	2141.68	08/15/12	44.19	2097.49	-0.96	11/14/12	45.30	2096.38	-1.11
MW-98B	RMPA	MEF	2141.73	08/15/12	37.10	2104.63	-0.67	11/14/12	37.71	2104.02	-0.61
MW-99	RMPA	MEF	2144.63	08/14/12	55.53	2089.10	-0.52	11/14/12	56.19	2088.44	-0.66
MW-100	DG	Granite	1525.79	08/14/12	103.81	1421.84	-3.43	11/13/12	107.78	1417.87	-3.97
MW-101	NPCA	QAL	2095.90	08/14/12	15.44	2080.46	-2.16	11/13/12	15.74	2080.16	-0.30
MW-102	MCEA	QAL	2067.21	08/15/12	37.61	2029.60	-3.59	11/14/12	39.09	2028.12	-1.48
MW-103	NPCA	QAL	2075.88	08/15/12	14.66	2061.22	-0.69	11/14/12	15.50	2060.38	-0.84
MW-104	NPCA	QAL	2087.47	08/15/12	15.42	2072.05	-1.57	11/14/12	15.18	2072.29	0.24
MW-105	NPCA	QAL	2092.23	08/15/12	15.26	2076.97	-1.43	11/14/12	14.74	2077.49	0.52
MW-106	NPCA	QAL	2085.25	08/15/12	21.40	2063.85	-3.38	11/14/12	21.80	2063.45	-0.40
MW-107	NPCA	QAL	2084.84	08/15/12	23.21	2061.63	-3.10	11/14/12	24.20	2060.64	-0.99
MW-108	NPCA	QA/MEF	2087.22	08/15/12	20.55	2066.67	-3.74	11/14/12	21.10	2066.12	-0.55
MW-109	NPCA	QA/MEF	2092.86	08/15/12	14.60	2078.26	-1.58	11/14/12	14.75	2078.11	-0.15
MW-110	BPA	QAL	2188.54	08/14/12	95.53	2093.01	-1.70	11/14/12	97.34	2091.20	-1.81
OW-01	BPA	QAL	2204.62	08/13/12	49.99	2154.63	-1.23	11/14/12	51.18	2153.44	-1.19
OW-02	NPCA	QAL	2078.97	08/15/12	2.54	2076.43	-0.25	11/14/12	3.13	2075.84	-0.59
OW-03	RMPA	QAL	2143.65	08/14/12	38.39	2105.26	-1.33	11/13/12	39.75	2103.90	-1.36
OW-05	NPCA	QAL	2160.85	08/13/12	Dry	Dry Well	NA	11/13/12	Dry	Dry Well	NA
OW-06	MCEA	QAL	2084.67	08/13/12	Dry	Dry Well	NA	11/13/12	Dry	Dry Well	NA
OW-07	MCEA	QAL	2108.06	08/13/12	Dry	Dry Well	NA	11/13/12	Dry	Dry Well	NA
OW-08	MCEA	QAL	2036.33	08/13/12	49.19	1987.14	-1.55	11/13/12	50.88	1985.45	-1.69
P-02	NPCA	QAL	2081.15	08/13/12	17.04	2064.11	-2.76	11/13/12	18.80	2062.35	-1.76
P-03	NPCA	QAL	2140.25	08/14/12	46.10	2094.15	-0.30	11/13/12	46.61	2093.64	-0.51
P-04	NPCA	QAL	2112.63	08/13/12	22.97	2089.66	-3.96	11/13/12	25.48	2087.15	-2.51
P-05	RMPA	QAL	2162.20	08/15/12	57.07	2105.13	-1.38	11/14/12	58.56	2103.64	-1.49
P-06S	MCEA	QAL	2034.44	08/15/12	36.53	1997.91	-4.14	11/14/12	Dry	Dry Well	NA
P-06D	MCEA	QAL	2034.41	08/15/12	35.49	1998.92	-2.30	11/14/12	39.48	1994.93	-3.99
P-07	MCEA	QAL	2034.60	08/15/12	37.11	1997.49	-3.33	11/14/12	39.99	1994.61	-2.88
P-08	MCEA	QAL	2030.87	08/15/12	32.82	1998.05	-3.37	11/14/12	35.75	1995.12	-2.93
P-09	BPA	MEF	2187.38	08/14/12	76.10	2111.28	-1.43	11/14/12	77.53	2109.85	-1.43
VRW-01	BPA	QAL	2187.35	08/14/12	Dry	Dry Well	NA	11/14/12	Dry	Dry Well	NA
VRW-02	BPA	QAL	2181.66	08/14/12	75.56	2106.10	-1.43	11/14/12	77.06	2104.60	-1.50
VRW-03	BPA	MEF	2184.32	08/14/12	70.67	2113.65	-0.91	11/14/12	71.66	2112.66	-0.99

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/Mount Eden formation
MEF - Mount Eden formation

During Third Quarter 2012, the Beaumont National Weather Service (NWS) station reported approximately 0.30 inches of precipitation, and the average site-wide groundwater elevation decreased approximately 1.39 feet. During Fourth Quarter 2012, the Beaumont NWS station reported approximately 3.62 inches of precipitation and the average site-wide groundwater elevation decreased approximately 1.15 feet. Generally the groundwater elevations in site wells show a one-season lag before responding to seasonal precipitation. Table 3-2 presents the range and average change in groundwater elevation by area. Figures 3-3 and 3-4, respectively, present elevation differences between the Second Quarter 2012 and Third Quarter 2012, and between the Third Quarter 2012 and Fourth Quarter 2012 groundwater monitoring events.

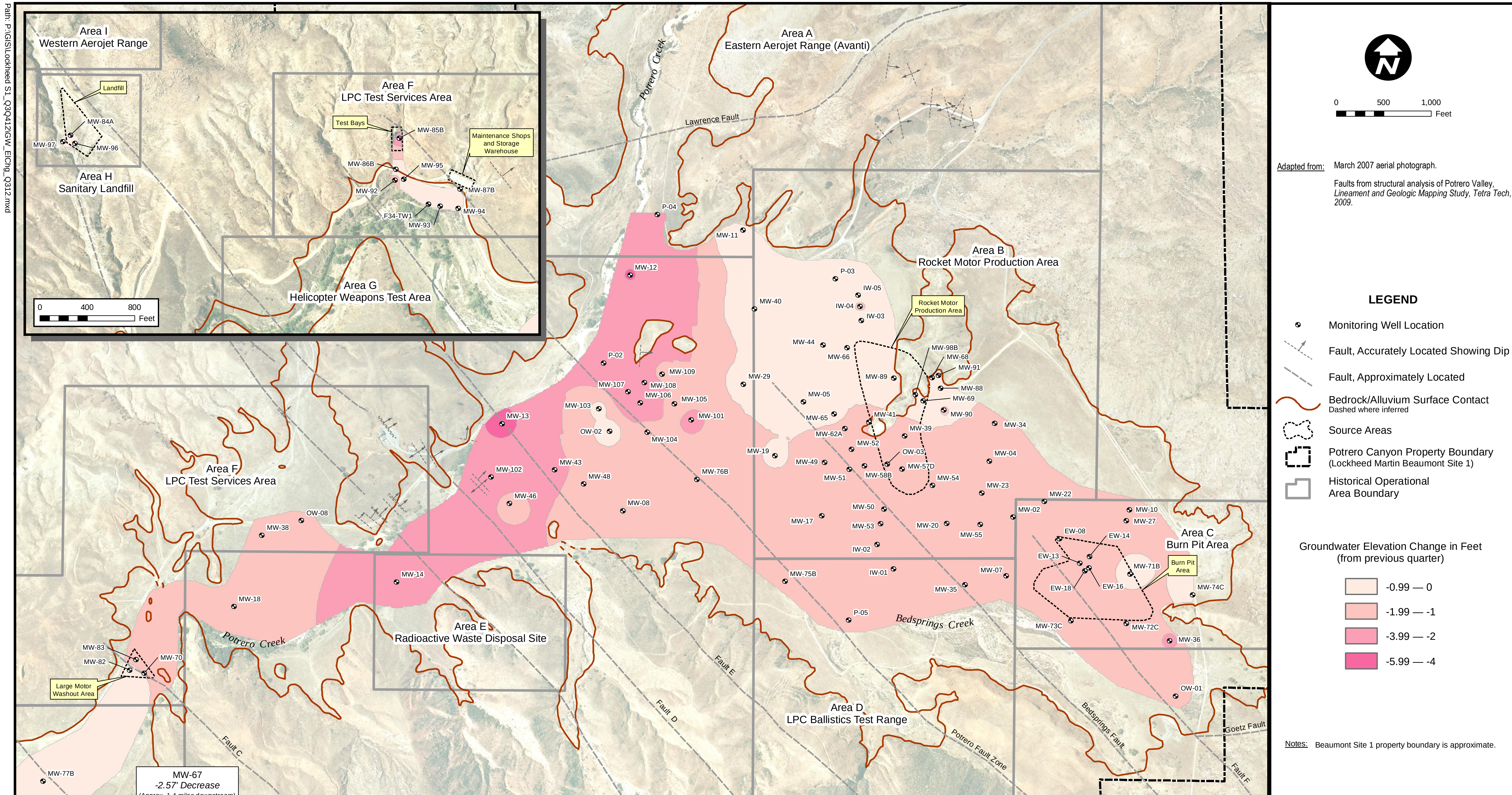
Table 3-2 Groundwater Elevation Change - Third Quarter 2012 and Fourth Quarter 2012

Site Area	Range of Groundwater Elevation Change - Third Quarter 2012 (feet)		Average Change By Area (feet)	Range of Groundwater Elevation Change - Fourth Quarter 2012 (feet)		Average Change By Area (feet)
BPA	-4.14	-0.53	-1.38	-2.12	-0.79	-1.42
MCEA	-4.14	-0.18	-1.61	-3.99	0.34	-1.10
NPCA	-4.53	-0.08	-1.67	-2.98	0.52	-0.73
RMPA	-1.39	-0.41	-1.15	-1.52	-0.05	-1.18

Notes:

BPA - Burn Pit Area
MCEA - Massacre Canyon Entrance Area
NPCA - Northern Potrero Creek Area
RMPA - Rocket Motor Production Area

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 Burn Pit Area (BPA), through the former BPA, through the former Rocket Motor Production Area (RMPA), and southwestward (downgradient) through the Northern Potrero Creek Area (NPCA) and Massacre Canyon Entrance Area (MCEA). Groundwater elevations in shallow wells (alluvium and shallow Mount Eden formation (MEF)) upgradient of the BPA and at the BPA show a rapid and significant response to rainfall, with a more dampened response observed farther out in the valley through the RMPA, NPCA, and MCEA (Figures 3-5 and 3-7). The deeper MEF and granitic/metasedimentary bedrock wells show a response very similar to the shallow wells during the periods of increased precipitation (Figure 3-6).



Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-3

Groundwater Elevation Change- Third Quarter 2012

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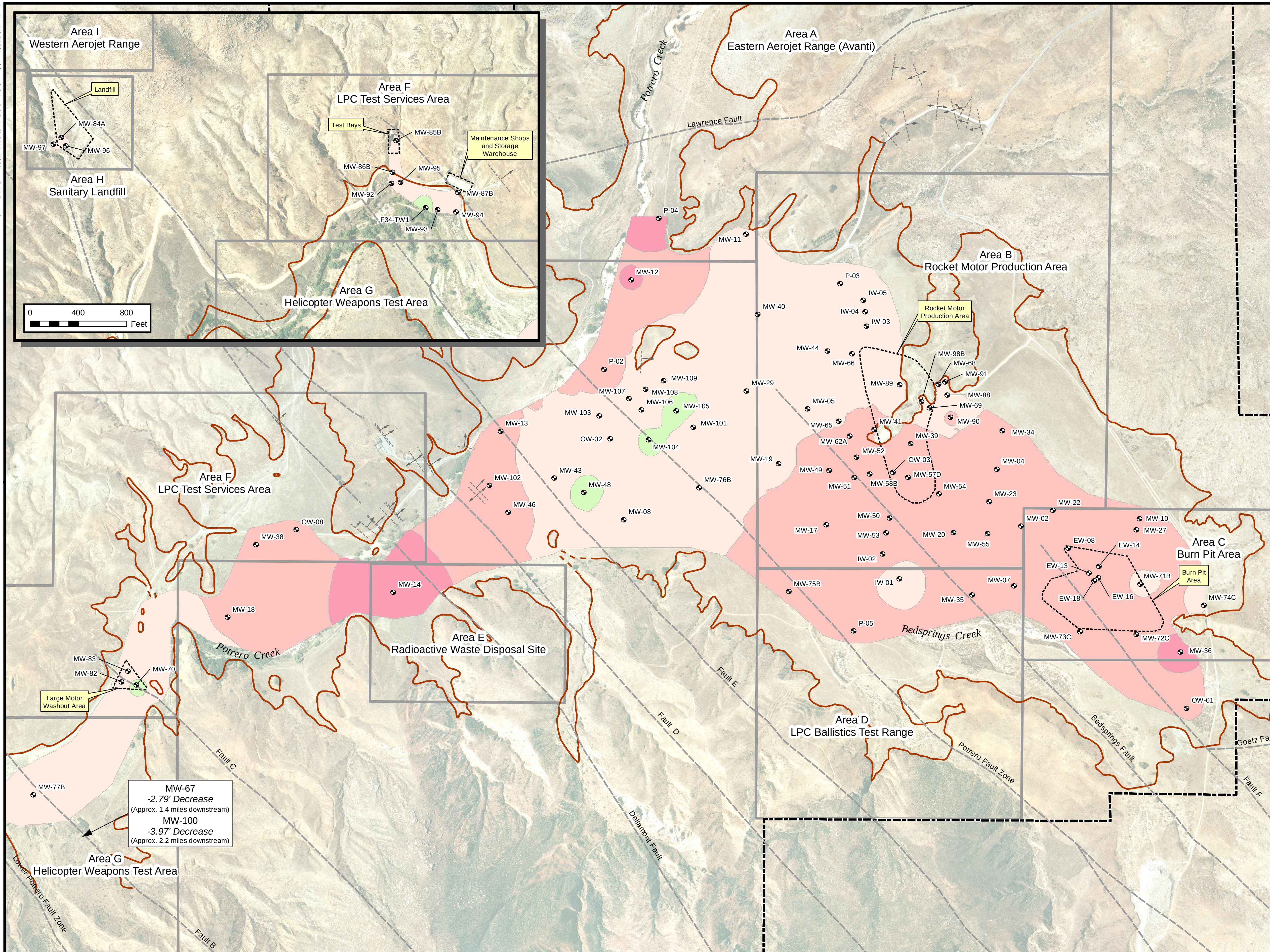
Path: P:\GIS\Lockheed S1_Q3Q412\GW_ElChg_Q412.mxd



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
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact (Dashed where inferred)
- Source Areas
- Potrero Canyon Property Boundary (Lockheed Martin Beaumont Site 1)
- Historical Operational Area Boundary

Groundwater Elevation Change in Feet (from previous quarter)

- 0 — 1
- -0.99 — 0
- -1.99 — -1
- -3.00 — -2

Notes: Beaumont Site 1 property boundary is approximate.

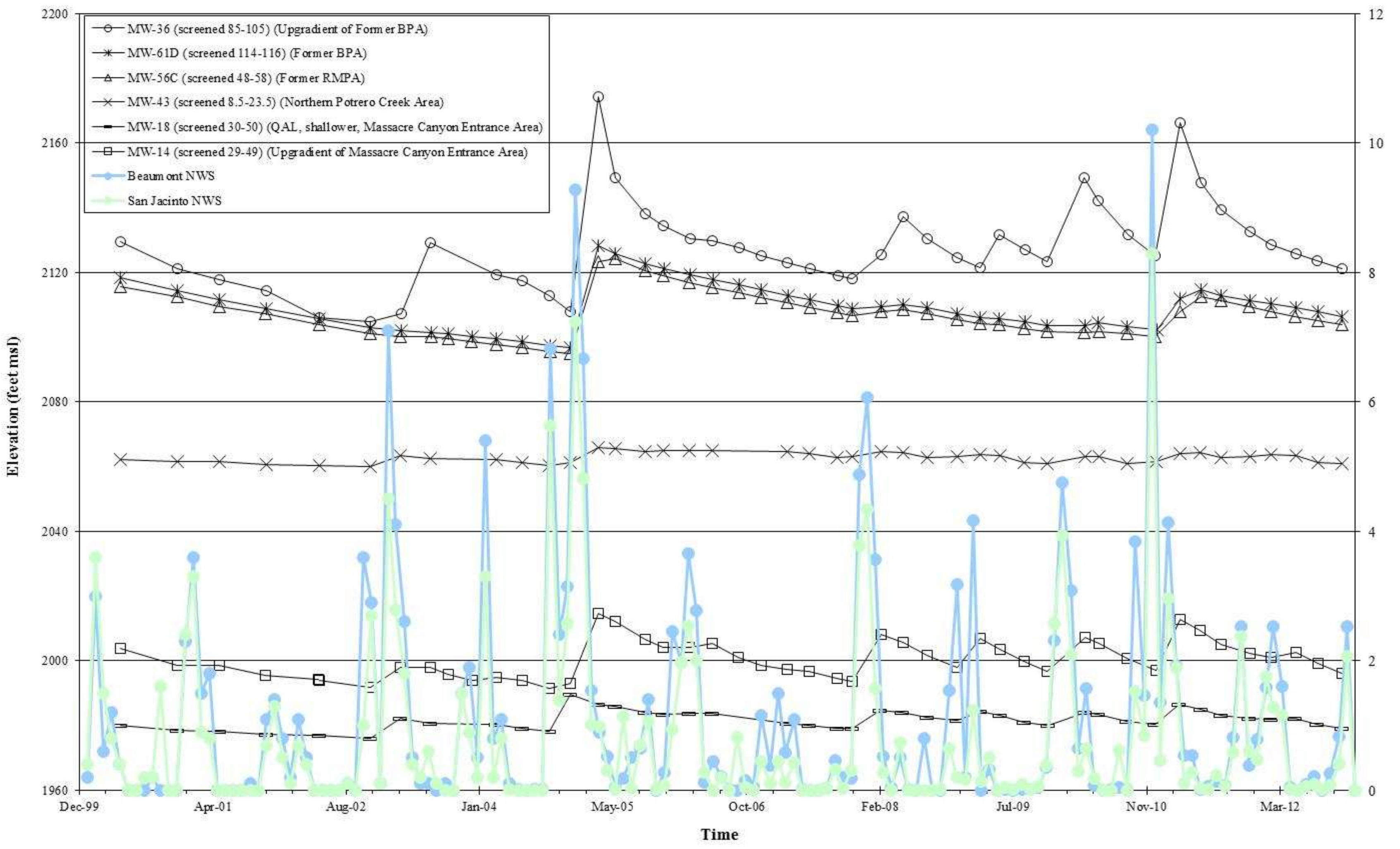
Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-4

Groundwater Elevation Change- Fourth Quarter 2012

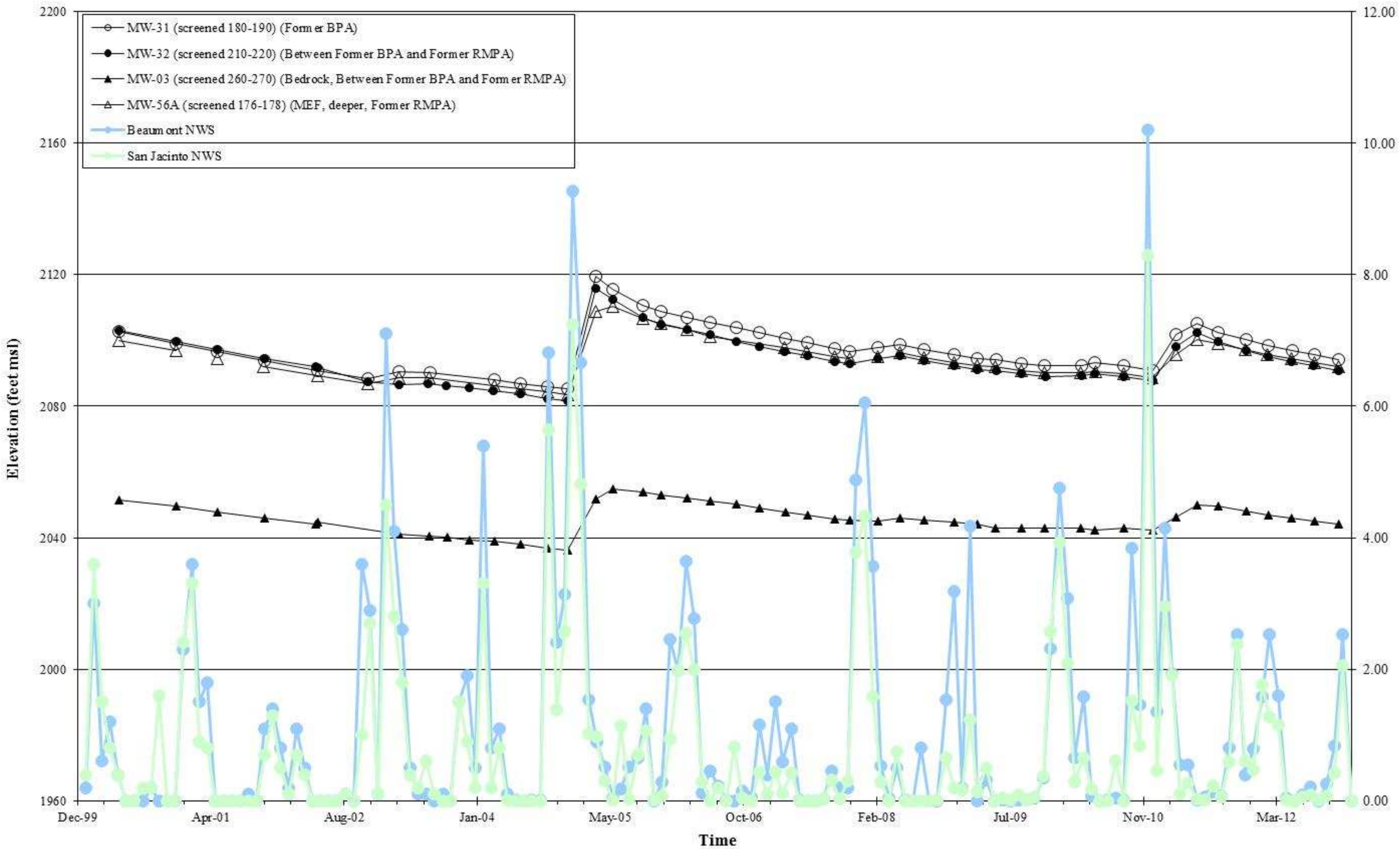
TETRA TECH

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



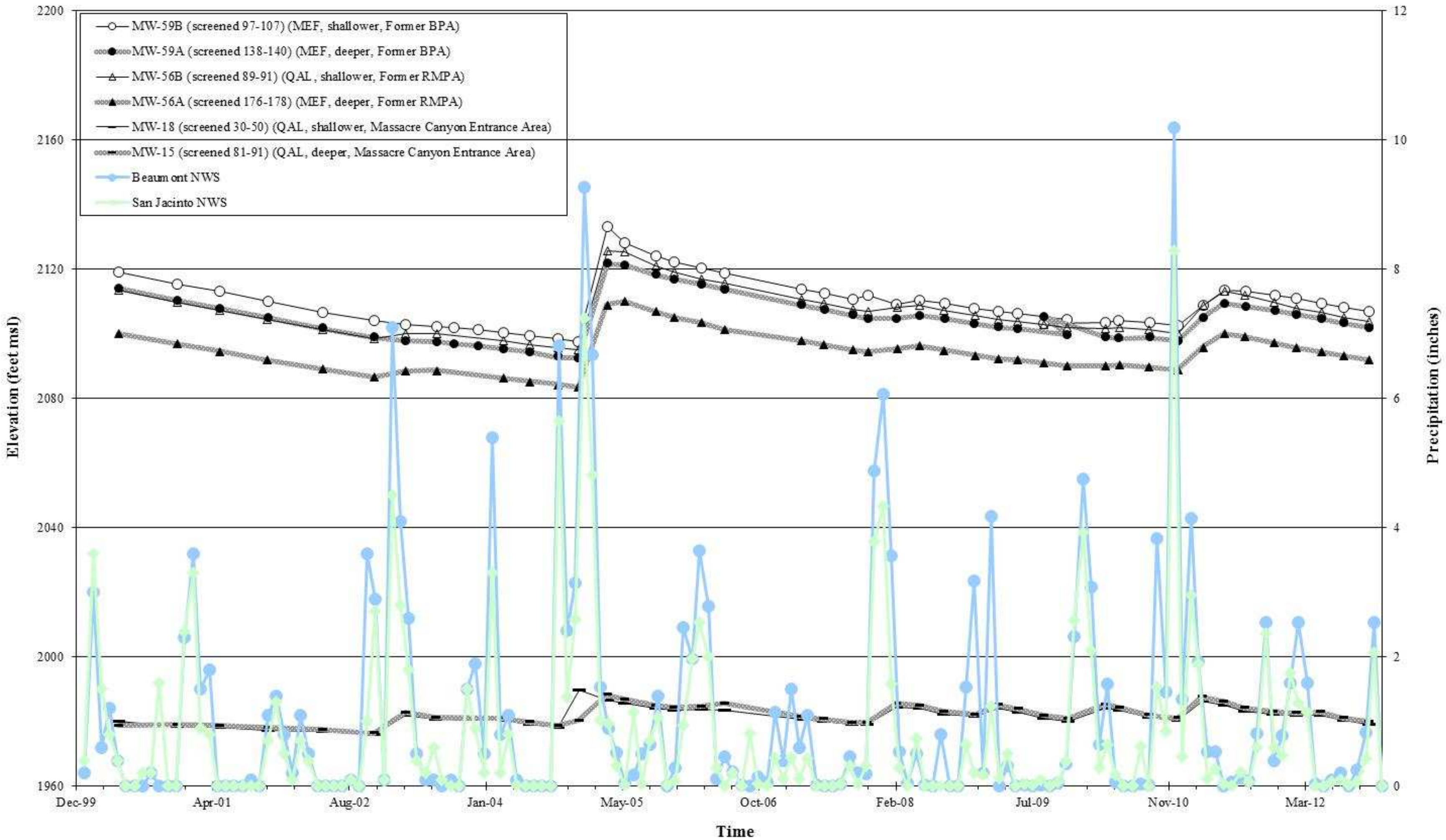
Notes: BPA – Burn Pit Area msl – mean sea level NWS - National Weather Service QAL – Quaternary alluvium RMPA – Rocket Motor Production Area

Figure 3-6 Groundwater Elevations vs. Time - Deeper Mount Eden Formation and Granitic/Metasedimentary Bedrock Wells



Notes: BPA – Burn Pit Area msl – mean sea level MEF – Mount Eden formation NWS - National Weather Service RMPA – Rocket Motor Production Area

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



Notes: BPA – Burn Pit Area msl – mean sea level MEF – Mount Eden formation NWS - National Weather Service QAL – Quaternary alluvium RMPA – Rocket Motor Production Area

3.2 SURFACE WATER FLOW

During Third Quarter 2012 and Fourth Quarter 2012, Tetra Tech personnel walked the Potrero and Bedsprings creek riparian corridors to determine the presence, nature, and quantity of surface water in 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 *United States Environmental Protection Agency Volunteer Stream Monitoring: A 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 near MW-67, SF-3 is near MW-15 and MW-18, and SF-4 is near MW-101.

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 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 per second for water flowing through that section of the stream.

A summary of the surface water flow rates is presented in Table 3-3. 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 (ft^2)	Surface Velocity (ft /sec)	Stream Flow Rate (cfs)	Site Stream Flow Rate (cfs)
Third Quarter (August) 2012										
SF-1	Near Gilman Hot Springs Road	08/17/12	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
SF-2	Near MW-67	08/17/12	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
SF-3	Near MW-15 and 18	08/17/12	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
SF-4	Near MW-42	08/17/12	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
Fourth Quarter (Nov) 2012										
SF-1	Near Gilman Hot Springs Road	11/30/12	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
SF-2	Near MW-67	11/30/12	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
SF-3	Near MW-15 and 18	11/30/12	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
SF-4	Near MW-42	11/30/12	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
Notes:	Measurements are averaged. cfs - cubic feet per second									

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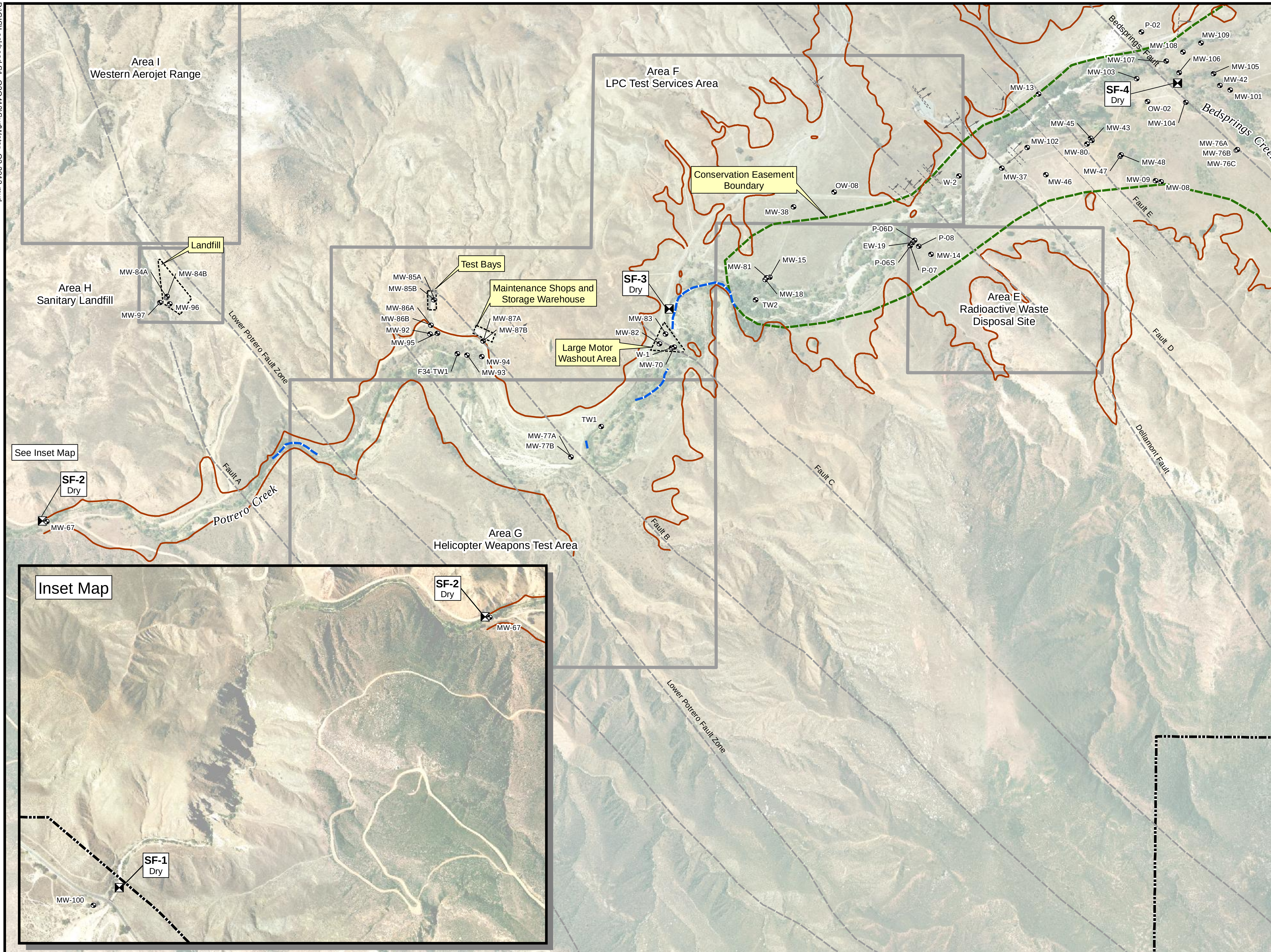

0 500 1,000
Feet

Adapted from: March 2007 aerial photograph.

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

LEGEND

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

Notes:

Beaumont Site 1 property boundary is approximate.

cfs - Cubic feet per second.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-8
Surface Water Flow Locations-
Third Quarter 2012

TETRA TECH

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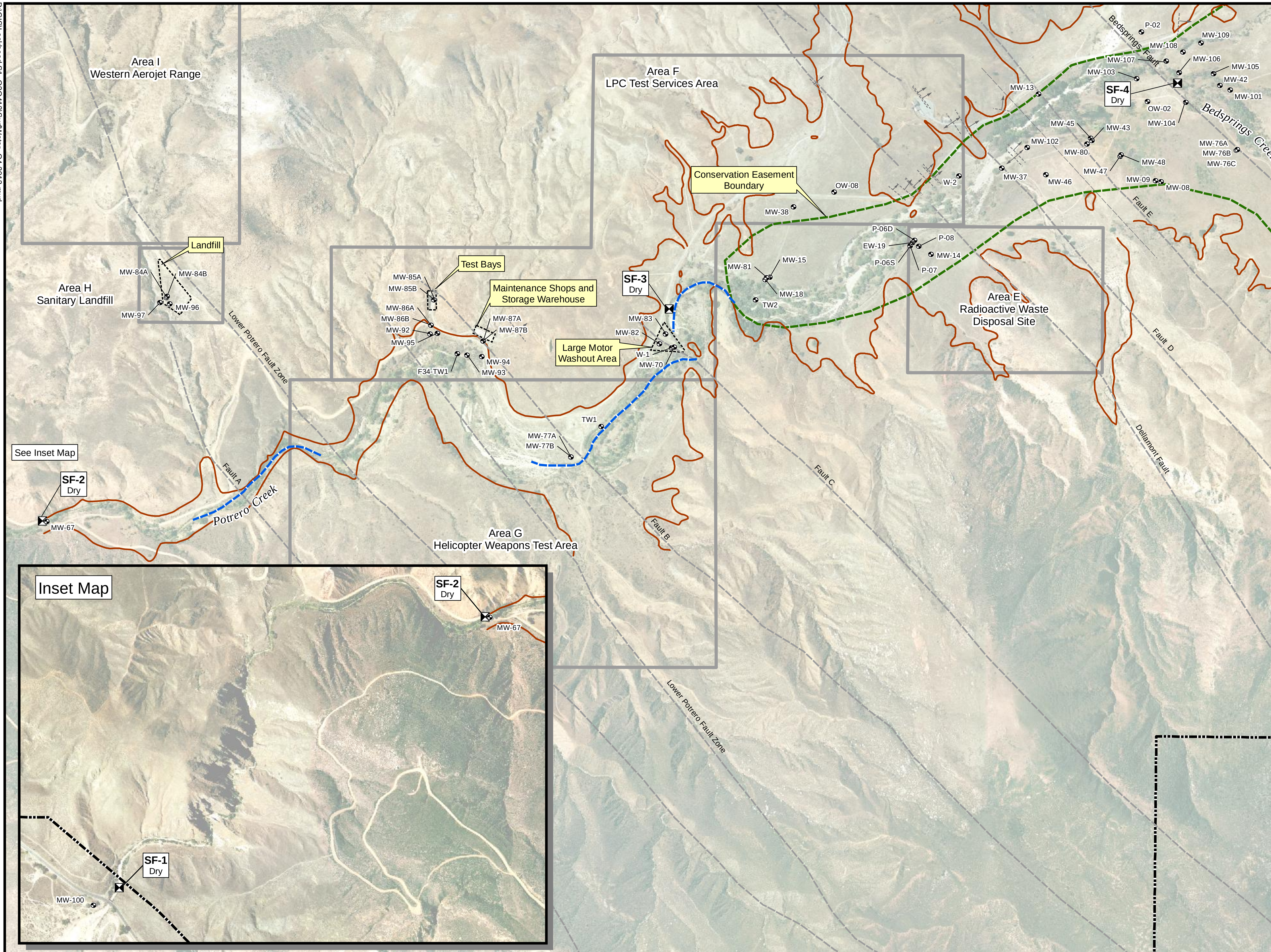

0 500 1,000 Feet

Adapted from: March 2007 aerial photograph.

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

LEGEND

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

Notes:

Beaumont Site 1 property boundary is approximate.

cfs - Cubic feet per second.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-9

**Surface Water Flow Locations-
Fourth Quarter 2012**

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3.3 GROUNDWATER FLOW

Groundwater flow directions from Third Quarter 2012 and Fourth Quarter 2012 (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, toward Potrero Creek where groundwater flow then changed direction and began heading southwest, parallel to the flow of Potrero Creek, into Massacre Canyon.

3.3.1 Horizontal and Vertical Groundwater Gradients

Horizontal groundwater gradients are calculated using a segmented path from well to well that approximates the overall site flowline. The horizontal gradient is a measure of the change in the hydraulic head over a change in distance between wells (the slope of the water table). 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 constant at 0.013 feet/foot between Third Quarter 2012 and Fourth Quarter 2012. Horizontal gradients are relatively high upgradient of the BPA where recharge from Bedsprings Creek and the adjacent mountain areas enters the main valley. The gradients significantly decrease downgradient of the BPA in the main valley, and then begin to increase again as groundwater flows from the main valley into the canyon just below the confluence of Bedsprings and Potrero creeks.

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 in the aquifer. The vertical gradient is a comparison of static water level between wells at different depths in 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, RMPA, and NPCA, indicating areas of recharge, and positive in the MCEA, indicating an area of discharge.

Table 3-4 presents a summary of horizontal and vertical groundwater gradients. Appendix F provides a complete listing of historical horizontal and vertical groundwater gradients and associated calculations.

Table 3-4 Summary of Horizontal and Vertical Groundwater Gradients

Horizontal Groundwater Gradients (feet/foot), approximating a flowline from MW-36 to MW-18 and subsections

Location: / Date	Overall MW-36 to MW-18	BPA MW-36 to MW-2	RMPA MW-2 to MW-5	NPCA MW-5 to MW-46	MCEA MW-46 to MW-18
Previous - Second Quarter (May) 2012	0.013	0.009	0.002	0.021	0.014
Third Quarter (August) 2012	0.013	0.008	0.002	0.022	0.014
Fourth Quarter (November) 2012	0.013	0.008	0.002	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) 2012	-0.13	-0.14	-0.07	0.02	0.05
Third Quarter (August) 2012	-0.13	-0.14	-0.07	0.02	0.04
Fourth Quarter (November) 2012	-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 (volatile organic compounds [VOCs] and 1,4-dioxane) and inorganic (perchlorate, natural attenuation, and general minerals parameters) analytes detected above their respective method detection limits (MDLs) are presented in Table 3-5, Third Quarter 2012 monitoring event, and Tables 3-6 and 3-7, Fourth Quarter 2012 monitoring event. Appendix G provides a complete list of analytes tested, along with validated sample results by analytical method.

Sample results detected above the published California Department of Public Health maximum contaminant level (MCL) or the California Department of Public Health drinking water notification level (DWNL) are bolded in Tables 3-5, 3-6 and 3-7. Appendix H provides laboratory analytical data packages, which include environmental, field quality control (QC), and laboratory QC results, and Appendix I contains consolidated analytical data summary tables. Tables 3-8 and 3-9 present summary statistics of the organic and inorganic analytes detected during the Third Quarter 2012 and Fourth Quarter 2012 monitoring events, respectively.

Table 3-5 Summary of Validated Detected Organic and Inorganic Analytes - Third Quarter 2012

Sample Location	Sample Date	Per-chlorate	1,4-Dioxane	Acetone	Bromo-dichloro-methane	Benzene	Chloro-ethane	Carbon Tetra-chloride	Chloro-form	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	Methyl tert-butyl ether	Methylene Chloride	Toluene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Tetrachloro-ethene	Vinyl Chloride
All results reported in µg/L unless otherwise stated																						
MW-110	8/22/2012	**7.7**	<0.10	<5.0	<0.11	<0.14	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-111A	8/21/2012	**2,500**	**2,800 Je**	<5.0	<0.11	**1.4**	<0.35	<0.15	5.6	**48**	**130**	**1,800**	**18**	0.96	<0.43	1.2 Jq	4.8	0.86	**39**	**610**	1.8	0.34 Jq
MW-111B	8/21/2012	**25,000**	**7,300 Je**	<5.0	<0.11	**5.3**	<0.35	**1.6**	35	**230**	**550**	**9,700**	**95**	4.7	<0.43	4.0	4.2	7.6	**140**	**4,800**	**17**	0.31 Jq
MW-111C	8/31/2012	**25,000**	**6,800**	<5.0	<0.11	**5.4**	<0.35	**5.6**	38	**240**	**600**	**12,000**	**100**	5.6	<0.43	3.6	3.1	7.9	**160**	**5,400**	**22**	0.27 Jq
MW-111D	8/21/2012	**23,000**	**6,600 Je**	<5.0	<0.11	**5.6**	<0.35	**5.4**	39	**230**	**560**	**10,000**	**85**	5.0	<0.43	4.0	2.8	7.9	**150**	**5,400**	**21**	0.25 Jq
MW-111E	8/21/2012	**36,000**	**6,100 Je**	<5.0	0.16 Jq	**7.1**	<0.35	**8.8**	53	**330**	**670**	**16,000**	**120 Jq**	7.3	<0.43	3.6	2.9	7.6	**160 Jq**	**7,000**	**25**	0.31 Jq
MW-112A	8/20/2012	**4,300**	**63**	<5.0	<0.11	0.29 Jq	<0.35	**0.96**	2.3	**11**	**16**	**270**	1.7	0.28 Jq	0.82 Jq	<0.15	0.23 Jq	0.23 Jq	1.9	**250**	1.0	<0.13
MW-112B	8/20/2012	**4,500**	**70**	7.4 Jq	<0.11	0.49 Jq	0.44 Jq	**1.4**	2.5	**17**	**21**	**410**	2.6	0.37 Jq	0.63 Jq	0.20 Jq	0.32 Jq	0.38 Jq	2.4	**350**	1.1	<0.13
MW-112C	8/20/2012	**3,000**	**59**	5.9 Jq	<0.11	0.67	1.0	0.16 Jq	0.81	**6.3**	**12**	**120**	1.4	0.14 Jq	0.48 Jq	0.47 Jq	0.49 Jq	<0.12	0.85	**87**	<0.23	<0.13
MDL (µg/L)		0.071	0.10	5	0.11	0.14	0.35	0.15	0.46	0.098	0.21	0.12	0.18	0.10	0.43	0.15	0.22	0.12	0.31	0.25	0.23	0.13
MCL/DWNL (µg/L)		6	1 (1)	-	-	1	-	0.5	-	5	0.5	6	6	10	13	5	150	200	5	5	5	0.5

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

µg/L - Micrograms per liter
MDL - Method detection limit
DWNL - California Department of Public Health drinking water notification level
MCL - California Department of Public Health maximum contaminant level
(1) - DWNL
"-" - MCL or DWNL not available.

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.
e - A holding time violation occurred.
q - The analyte detection was below the practical quantitation limit (PQL).

Table 3-6 Summary of Validated Detected Organic Analytes - Fourth Quarter 2012

Sample Location	Sample Date	1,4-Dioxane	Bromo-dichloro-methane	Benzene	Chloro-benzene	Chloro-ethane	Carbon Tetra-chloride	Chloro-form	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Methyl tert-butyl ether	Methylene Chloride	Toluene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Tri-chloro-ethene	Tetra-chloro-ethene	Vinyl Chloride
All results reported in µg/L unless otherwise stated																						
F34-TW1	11/26/12	**6.6**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	0.44 Jq	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	1.6	<0.23	<0.13
IW-04	11/19/12	**21**	<0.11	0.19 Jq	<0.23	<0.35	<0.15	<0.46	0.20 Jq	<0.21	**9.6**	0.93	0.40 Jq	<0.19	<0.43	0.16 Jq	<0.22	<0.12	<0.31	**14**	<0.23	0.34 Jq
MW-05	11/28/12	**34**	<0.11	<0.14	<0.23	<0.35	<0.15	3.3	3.4	**0.53**	**130**	0.49 Jq	<0.10	<0.19	<0.43	<0.15	<0.22	0.34 Jq	0.33 Jq	**150**	<0.23	<0.13
MW-08	11/26/12	<0.10	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-13	11/26/12	<0.10	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-15	11/16/12	**6.2**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.32 Jq	<0.21	1.7	0.29 Jq	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	0.93	<0.23	<0.13
MW-18	11/16/12	**4.5**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.18 Jq	<0.21	1.3	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	1.0	<0.23	<0.13
MW-43	11/26/12	**6.9**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.42 Jq	<0.21	5.0	0.19 Jq	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	4.7	<0.23	<0.13
MW-48	11/28/12	0.71	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-60A	11/29/12	**110**	<0.11	0.26 Jq	<0.23	<0.35	0.47 Jq	2.5	**5.1**	**7.0**	**420**	2.3	0.19 Jq	<0.19	<0.43	<0.15	<0.22	0.25 Jq	1.5	**330**	0.46 Jq	<0.13
MW-60B	11/29/12	**15**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.66	**0.89**	**52**	0.22 Jq	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**22**	<0.23	<0.13
MW-67	11/16/12	0.92	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-68	11/28/12	**21**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.17 Jq	<0.21	**6.3**	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-70	11/16/12	**2.9**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-76B	11/28/12	0.27	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-88	11/19/12	0.19 Jq	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-93	11/19/12	**22**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.17 Jq	<0.21	1.0	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	3.2	<0.23	<0.13
MW-98B	11/28/12	**11**	<0.11	<0.14	<0.23	<0.35	<0.15	1.4	0.33 Jq	<0.21	**11**	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**26**	<0.23	<0.13
MW-100	11/16/12	0.23	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-101	11/28/12	**21**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	1.3	0.41 Jq	**45**	**43**	1.5	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**32**	<0.23	**1.8**
MW-102	11/28/12	**18**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	1.3	<0.21	**17**	**26**	1.8	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**15**	<0.23	**2.4**
MW-103	11/27/12	**14**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.77	<0.21	3.7	4.9	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**11**	<0.23	<0.13
MW-104	11/27/12	**27**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	**5.9**	0.26 Jq	**55**	3.7	0.25 Jq	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	4.5	<0.23	**15**
MW-105	11/27/12	**30**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	4.8	**0.55**	**74**	**7.0**	1.7	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**69**	<0.23	**2.0**
MW-106	11/27/12	**28**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	2.7	0.37 Jq	**28**	2.8	1.3	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**27**	<0.23	0.31 Jq
MW-107	11/27/12	**16**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	1.1	<0.21	**10**	3.3	1.4	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**11**	<0.23	<0.13
MW-109	11/27/12	**26**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	3.0	**0.52**	**55**	2.7	0.18 Jq	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	**64**	<0.23	**0.78**
MW-110	11/19/12	<0.10	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-111A	11/20/12	**1,900**	<0.11	**1.3**	<0.23	<0.35	<0.15	5.5	<0.098	**130**	**2,000**	**19**	0.95	<0.19	<0.43	1.0 Jq	3.3	0.80	**34**	**720**	2.1	0.37 Jq
MW-111B	11/20/12	**5,800**	<0.11	**5.6**	0.24 Jq	<0.35	**0.71**	39	**240**	**590**	**10,000**	**110**	5.2	0.28 Jq	<0.43	3.5	3.8	6.4	**190**	**4,400**	**18**	0.40 Jq
MW-111D	11/20/12	**7,900**	<0.11	**6.1**	<0.23	<0.35	**5.8**	44	**310**	**680**	**14,000**	**120**	6.0	0.27 Jq	<0.43	3.4	1.9	6.8	**150**	**6,500**	**25**	0.39 Jq
MW-111E	11/20/12	**4,800**	0.14 Jq	**7.8**	<0.23	<0.35	**11**	60	**430**	**840**	**20,000**	**170**	8.5	0.35 Jq	<0.43	2.9 Jq	1.5	6.5	**170**	**9,200**	**32**	**0.51**
MW-112A	11/20/12	**64**	<0.11	0.23 Jq	<0.23	<0.35	**0.77**	2.1	**9.7**	**14**	**260**	1.5	0.23 Jq	<0.19	0.75 Jq	<0.15	<0.22	0.18 Jq	1.7	**270**	0.95	<0.13
MW-112B	11/20/12	**72**	<0.11	0.44 Jq	<0.23	0.53	**1.2**	2.5	**17**	**20**	**430**	2.8	0.39 Jq	<0.19	0.58 Jq	0.23 Jq	0.24 Jq	0.30 Jq	2.2	**420**	1.2	<0.13
MW-112C	11/20/12	**66**	<0.11	0.53	<0.23	0.98	0.28 Jq	1.2	**8.9**	**14**	**170**	2.1	0.20 Jq	<0.19	0.53 Jq	0.46 Jq	0.34 Jq	<0.12	1.1	**150**	0.27 Jq	<0.13
OW-02	11/28/12	**10**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.45 Jq	<0.21	**14**	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	0.18 Jq	<0.31	**17**	<0.23	<0.13
P-02	11/26/12	<0.10	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
SW-02	11/15/12	**10**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	0.40 Jq	<0.21	**9.8**	0.75	<0.10	<0.19	<0.43	<0.15	0.39 Jq	0.16 Jq	<0.31	**13**	<0.23	0.38 Jq
SW-03	11/15/12	**11**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	1.1	0.42 Jq	<0.10	<0.19	<0.43	<0.15	1.5	<0.12	<0.31	1.1	<0.23	<0.13
SW-04	11/15/12	**4.3**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	1.0	0.25 Jq	<0.10	<0.19	<0.43	<0.15	6.2	<0.12	<0.31	1.2	<0.23	<0.13
SW-09	11/15/12	**2.9**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
SW-18	11/15/12	**3.8**	<0.11	<0.14	<0.23	<0.35	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.19	<0.43	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MDL (µg/L)		0.10	0.11	0.14	0.23	0.35	0.15	0.46	0.098	0.21	0.12	0.18	0.10	0.19	0.43	0.15	0.22	0.12	0.31	0.25	0.23	0.13
MCL/DWNL (µg/L)		1 (1)	-	1	-	-	0.5	-	5	0.5	6	6	10	5	13	5	150	200	5	5	5	0.5

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

µg/L - Micrograms per liter
mg/L - Milligrams per liter
MDL - Method detection limit
DWNL - California Department of Public Health drinking water notification level
MCL - California Department of Public Health maximum contaminant level
(1) - DWNL

"-" - MCL or DWNL not available.
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).

Table 3-7 Summary of Validated Detected Inorganic Analytes - Fourth Quarter 2012

Sample Location	Sample Date	Per-chlorate - µg/L	Dissolved Organic Carbon - mg/L	Alkalinity, Total - mg/L	Bicarbonate -mg/L	Chloride -mg/L	Nitrate as N - mg/L	Sulfate -mg/L	Iron - ug/L	Dissolved Manganese -ug/L
F34-TW1	11/26/12	<0.071	NA	NA	NA	NA	NA	NA	NA	NA
IW-04	11/19/12	0.27	NA	NA	NA	NA	NA	NA	NA	NA
MW-05	11/28/12	**2,900**	0.36 Jq	120	150	9.5	7.9	11	<2.3	1.4 Jq
MW-08	11/26/12	<0.071	0.27 Jq	96	120	5.1	<0.11	11	**1,400**	190
MW-13	11/26/12	0.36	0.70	310	370	9.6	1.4	79	4.8 Jq	<0.24
MW-15	11/16/12	<0.071	NA	NA	NA	NA	NA	NA	NA	NA
MW-18	11/16/12	3.0	NA	NA	NA	NA	NA	NA	NA	NA
MW-43	11/26/12	**54**	0.29 Jq	83	100	5.8	0.77	8.7	96	4.5 Jq
MW-48	11/28/12	<0.071	1.1	170	210	7.9	<0.11	6.3	**1,900**	250
MW-60A	11/29/12	**6,600**	NA	NA	NA	NA	NA	NA	NA	NA
MW-60B	11/29/12	**1,800**	NA	NA	NA	NA	NA	NA	NA	NA
MW-67	11/16/12	<0.071	NA	NA	NA	NA	NA	NA	NA	NA
MW-68	11/28/12	**17,000**	NA	NA	NA	NA	NA	NA	NA	NA
MW-70	11/16/12	0.22	NA	NA	NA	NA	NA	NA	NA	NA
MW-76B	11/28/12	<0.071	0.31 Jq	97	120	5.6	<0.11	8.4	220	11
MW-88	11/19/12	**610**	NA	NA	NA	NA	NA	NA	NA	NA
MW-93	11/19/12	5.5	NA	NA	NA	NA	NA	NA	NA	NA
MW-98B	11/28/12	**1,700**	NA	NA	NA	NA	NA	NA	NA	NA
MW-100	11/16/12	<0.071	NA	NA	NA	NA	NA	NA	NA	NA
MW-101	11/28/12	<0.071	0.39 Jq	77	94	7.1	<0.11	28	**1,700**	110
MW-102	11/28/12	<0.071	0.49 Jq	120	140	6.3	<0.11	16	80	56
MW-103	11/27/12	**31**	1.1	140	180	7.5	<0.11	6.9 Jd	**2,100 Jcf**	11
MW-104	11/27/12	<0.071	0.70	97	120	7.3	<0.11	4.0	**400**	98
MW-105	11/27/12	<0.071	0.64 Jq	130	160	11	<0.11	27	120	**860**
MW-106	11/27/12	<0.071	2.7	220	260	17	<0.11	63	5.1 Jq	120
MW-107	11/27/12	**53**	1.7	250	300	14	<0.11	26	12 Jq	62
MW-109	11/27/12	**310**	0.48 Jq	120	140	9.3	1.3	23	5.8 Jq	320
MW-110	11/19/12	**14**	NA	NA	NA	NA	NA	NA	NA	NA
MW-111A	11/20/12	**2,600**	NA	NA	NA	NA	NA	NA	NA	NA
MW-111B	11/20/12	**36,000**	NA	NA	NA	NA	NA	NA	NA	NA
MW-111D	11/20/12	**38,000**	NA	NA	NA	NA	NA	NA	NA	NA
MW-111E	11/20/12	**49,000**	NA	NA	NA	NA	NA	NA	NA	NA
MW-112A	11/20/12	**5,800**	NA	NA	NA	NA	NA	NA	NA	NA
MW-112B	11/20/12	**6,800**	NA	NA	NA	NA	NA	NA	NA	NA
MW-112C	11/20/12	**4,700**	NA	NA	NA	NA	NA	NA	NA	NA
OW-02	11/28/12	**350**	0.33 Jq	71	87	7.1	3.2	7.5	6.6 Jq	0.26 Jq
P-02	11/26/12	0.32	1.3	230	280	76	0.72	**490**	**1,200**	790
SW-02	11/15/12	**100**	NA	NA	NA	NA	NA	NA	NA	NA
SW-03	11/15/12	3.0	NA	NA	NA	NA	NA	NA	NA	NA
SW-04	11/15/12	3.6	NA	NA	NA	NA	NA	NA	NA	NA
SW-09	11/15/12	<0.071	NA	NA	NA	NA	NA	NA	NA	NA
SW-18	11/15/12	<0.071	NA	NA	NA	NA	NA	NA	NA	NA
	MDL	0.071	0.36	1.7	1.7	1.7	0.11	0.37	2.3	0.24
	MCL/DWNL	6	-	-	-	250	10	250	300	500 (1)

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data packages in Appendix H.
MDL - Method detection limit
MCL - California Department of Public Health Services maximum contaminant level
DWNL - California Department of Public Health Services drinking water notification level
"-" - MCL or DWNL not available.
(1) DWNL
µg/L - Micrograms per liter
mg/L - Milligrams per liter
Bold - MCL or DWNL exceeded.
NA - not analyzed
<# - Analyte not detected; method detection limit concentration is shown.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
c - The Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) recoveries were outside control limits.
f - The duplicate Relative Percent Difference was outside the control limit.
q - The analyte detection was below the practical quantitation limit (PQL).

Table 3-8 Summary Statistics of Validated Organic and Inorganic Analytes - Third Quarter 2012

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	9	8	8	1 (2)	µg/L	59	µg/L	7,300	µg/L
Acetone	9	2	0	-	µg/L	5.9	µg/L	7.4	µg/L
Bromodichloromethane	9	1	0	-	µg/L	0.16	µg/L	0.16	µg/L
Benzene	9	8	5	1	µg/L	0.29	µg/L	7.1	µg/L
Chloroethane	9	2	0	-	µg/L	0.44	µg/L	1.0	µg/L
Carbon tetrachloride	9	7	6	0.5	µg/L	0.16	µg/L	8.8	µg/L
Chloroform	9	8	0	-	µg/L	0.81	µg/L	53	µg/L
1,1-Dichloroethane	9	8	8	5	µg/L	6.3	µg/L	330	µg/L
1,2-Dichloroethane	9	8	8	0.5	µg/L	12	µg/L	670	µg/L
1,1-Dichloroethene	9	8	8	6	µg/L	120	µg/L	16,000	µg/L
cis-1,2-Dichloroethene	9	8	5	6	µg/L	1.4	µg/L	120	µg/L
trans-1,2-Dichloroethene	9	8	0	10	µg/L	0.14	µg/L	7.3	µg/L
Methyl-tert-butyl ether	9	3	0	13	µg/L	0.48	µg/L	0.82	µg/L
Methylene Chloride	9	7	0	5	µg/L	0.20	µg/L	1.20	µg/L
Toluene	9	8	0	150	µg/L	0.23	µg/L	4.8	µg/L
1,1,1-Trichloroethane	9	7	0	200	µg/L	0.23	µg/L	7.9	µg/L
1,1,2-Trichloroethane	9	8	5	5	µg/L	0.85	µg/L	160	µg/L
Trichloroethene	9	8	8	5	µg/L	87	µg/L	7,000	µg/L
Tetrachloroethene	9	7	4	5	µg/L	1.0	µg/L	25	µg/L
Vinyl chloride	9	5	0	0.5	µg/L	0.25	µg/L	0.34	µg/L
Inorganic 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**	
Perchlorate	9	9	9	6	µg/L	7.7	µg/L	36,000	µg/L

Notes:

DWNL - California Department of Public Health drinking water notification level

MCL - California Department of Public Health maximum contaminant level

" - " - MCL or DWNL not established.

(1) - Number of detections excludes sample duplicates, trip blanks and equipment blanks

(2) - DWNL

µg/L - Micrograms per liter

Table 3-9 Summary Statistics of Validated Organic and Inorganic Analytes - Fourth Quarter 2012

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	42	38	33	1 (2)	µg/L	0.19	µg/L	7,900	µg/L
Bromodichloromethane	42	1	0	-	µg/L	0.14	µg/L	0.14	µg/L
Benzene	42	9	4	1	µg/L	0.19	µg/L	7.8	µg/L
Chlorobenzene	42	1	0	-	µg/L	0.24	µg/L	0.24	µg/L
Chloroethane	42	2	0	-	µg/L	0.53	µg/L	0.98	µg/L
Carbon tetrachloride	42	7	5	0.5	µg/L	0.28	µg/L	11	µg/L
Chloroform	42	10	0	-	µg/L	1.2	µg/L	60	µg/L
1,1-Dichloroethane	42	26	8	5	µg/L	0.17	µg/L	430	µg/L
1,2-Dichloroethane	42	15	12	0.5	µg/L	0.26	µg/L	840	µg/L
1,1-Dichloroethene	42	30	22	6	µg/L	0.26	µg/L	20,000	µg/L
cis-1,2-Dichloroethene	42	24	7	6	µg/L	0.19	µg/L	170	µg/L
trans-1,2-Dichloroethene	42	16	0	10	µg/L	0.18	µg/L	8.5	µg/L
1,2-Dichloropropane	42	3	0	5	µg/L	0.27	µg/L	0.35	µg/L
Methyl-tert-butyl ether	42	3	0	13	µg/L	0.53	µg/L	0.75	µg/L
Methylene Chloride	42	7	0	5	µg/L	0.16	µg/L	3.5	µg/L
Toluene	42	9	0	150	µg/L	0.24	µg/L	6.2	µg/L
1,1,1-Trichloroethane	42	10	0	200	µg/L	0.16	µg/L	6.8	µg/L
1,1,2-Trichloroethane	42	9	4	5	µg/L	1.10	µg/L	190	µg/L
Trichloroethene	42	29	21	5	µg/L	0.93	µg/L	9,200	µg/L
Tetrachloroethene	42	8	3	5	µg/L	0.27	µg/L	32	µg/L
Vinyl chloride	42	12	6	0.5	µg/L	0.31	µg/L	15	µg/L
Dissolved Organic Carbon	16	16	0	-	mg/L	0.27	mg/L	2.7	mg/L
Methane	16	13	0	-	µg/L	0.20	µg/L	1,700	µg/L
Acetic Acid	16	6	0	-	mg/L	0.075	mg/L	0.12	mg/L
2-Hydroxypropanoic Acid	16	1	0	-	mg/L	0.22	mg/L	0.22	mg/L
Hexanoic Acid	16	1	0	-	mg/L	0.44	mg/L	0.44	mg/L
Inorganic 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**	
Perchlorate	42	28	20	6	µg/L	0.22	µg/L	49,000	µg/L
Hydrogen	16	9	0	-	nM	0.60	nM	2.2	nM
Alkalinity, Total	16	16	0	-	mg/L	71	mg/L	310	mg/L
Bicarbonate	16	16	0	-	mg/L	87	mg/L	370	mg/L
Chloride	16	16	0	250	mg/L	5.1	mg/L	76	mg/L
Nitrate	16	6	0	10	mg/L	0.72	mg/L	7.9	mg/L
Sulfate	16	16	1	250	mg/L	4.0	mg/L	490	mg/L
Iron	16	15	6	300	µg/L	4.8	µg/L	2,100	µg/L
Dissolved Manganese	16	15	1	500	µg/L	0.26	µg/L	860	µg/L

Notes:
DWNL - California Department of Public Health drinking water notification level
MCL - California Department of Public Health maximum contaminant level
" - " - MCL or DWNL not established.
(1) - Number of detections excludes sample duplicates, trip blanks and equipment blanks.
(2) - DWNL
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 *Programmatic Sampling and Analysis Plan, Lockheed Martin Corporation, Beaumont Sites 1 and 2, Beaumont, California* (Tetra Tech, 2010). The data for the groundwater sampling activities were contained in analytical data packages generated by Microseeps Laboratories, Inc. and E.S. Babcock and Sons Laboratories, Inc. These data packages were reviewed using the latest versions of the United States Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Superfund Data Review (USEPA, 2008 and 2010).

Preservation criteria, holding times, field blanks, laboratory control samples, 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 included comparing statistically calculated control limits to percent recoveries of all spiked analytes and duplicate spiked analytes. Relative percent difference (RPD) control limits were compared to actual spiked (matrix spike/matrix spike duplicate) 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: Method ASTM 2320 for alkalinity, Method AM23GS for volatile fatty acids, Method AM20GAX for hydrogen, Method E300.0 for anions, EPA Method E332.0 for perchlorate, Method A5310B for total organic carbon, Method RSK-175 for methane, ethane, ethene, EPA Method SW8270C SIM for 1,4-dioxane, Method SW6010B for metals, and Methods E524.2 and SW8260B for VOCs.

Unless otherwise noted below, all data results met required criteria, are of known precision and accuracy, did not require qualification, and may be used as reported.

EPA Method SW8270C SIM for 1, 4-dioxane had holding time errors that caused 6.9 percent (4 samples out of 58 samples) of the total SW8270C SIM data to be qualified as estimated. The samples were extracted one day after the seven-day holding time requirement. The holding time errors are minor and the negative effect on the data is minor. The data qualified as estimated are usable for the intended purpose.

After conversations with the laboratory concerning holding time errors, the cause of the error has been determined to be the manner in which the laboratory determines the holding time.

- The laboratory consulted the EPA and determined that holding times are counted by days and not hours for methods that the holding time is stated in days. Therefore, by rounding days, it is possible to not have a holding time error for eight days out from sample receipt for EPA Method SW8270C SIM.
- Tetra Tech uses a 24-hour clock to determine holding times as the National Functional Guidelines indicate. Using a 24-clock for day determination does not allow for day rounding. Therefore, eight days out from sample receipt is a holding time error for EPA Method SW8270C SIM.

We will continue to interact with the laboratory in order to resolve this holding time situation and request that holding times be calculated using a 24 hour clock.

Method 300.0 for anions had laboratory control samples (LCS) recovery below the lower limit which resulted in 6.3 percent (2 out of 54) of the total anion data to be qualified as estimated. The LCS lower control limit is 90 percent. The recovery that leads to the qualified results was 88.8 percent. Because the LCS error is minor, the effect on the data is minor and the data may be used for the intended purpose.

Method SW6010B for metals had matrix spike recovery errors and RPD errors that qualified as estimated 5.5 percent (2 out of 36) of the total SW6010B data. The data may be used for the intended purpose.

3.5 CHEMICALS OF POTENTIAL CONCERN

The identification of chemicals of potential concern is an ongoing process that takes place annually as part of the second quarter sampling. The purposes for identifying chemicals of potential concern are to establish a list of analytes that best represents the extent and magnitude of affected groundwater, and to focus more detailed analysis on only those analytes. The analytes were organized and evaluated in two groups, organic and inorganic, and divided into primary and secondary chemicals of potential concern. Tables 3-5, 3-6, and 3-7 present summaries of the organic and inorganic analytes detected during the Third Quarter 2012 and Fourth Quarter 2012 monitoring events. Data that are “B” qualified because of their associations with either laboratory blank contamination or field cross-contamination are not included in the chemicals of potential concern evaluation.

The identification process for chemicals of potential concern does not eliminate analytes from testing, but does reduce the number of analytes that are evaluated and discussed during reporting. All of the secondary chemicals of potential concern will continue to be tested during future monitoring events, because of their association with other analytes that are listed as primary chemicals of potential concern. However, the secondary chemicals of potential concern are not discussed further because they are detected on a more limited or inconsistent basis, and/or are detected at concentrations below a regulatory threshold. The standard list of analytes for each method will continue to be tested for and screened annually to insure that the appropriate chemicals of potential concern are being identified and evaluated.

3.5.1 Identification of Chemicals of Potential Concern

Chemicals of potential concern have been selected to include compounds that are consistently detected in groundwater at concentrations above regulatory limits and that can be used to assess the extent of affected groundwater. Primary chemicals of potential concern are parent products such as trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA), and are always present with secondary chemicals of potential concern. Secondary chemicals of potential concern are breakdown products such as 1,1-dichloroethane (1,1-DCA) and 1,1-dichloroethene (1,1-DCE), and are detected at lower concentrations than their parent products. At this site 1,1-DCE, a breakdown product of 1,1,1-TCA, is detected at higher concentrations than 1,1,1-TCA, so 1,1-DCE is considered the primary chemical of potential concern, and 1,1,1-TCA is considered a secondary chemical of potential concern.

As discussed above, the chemicals of potential concern analysis is intended to streamline and focus the evaluation of the contaminant data collected during monitoring events. It is not intended to trivialize or dismiss the analytes screened out as part of the process. Therefore, to ensure that all analytes detected receive the proper attention, this chemicals of potential concern analysis is performed annually.

An annual evaluation of chemicals of potential concern based on the results of the Second Quarter 2012 water quality monitoring event was presented in the First and Second Quarter 2012 Semiannual Groundwater Monitoring Report (Tetra Tech, 2011). Based on the results of water quality monitoring and the screening of those results against the existing chemicals of potential concern, the MCLs, and DWNLs, no additional chemicals of potential concern were identified, nor was there evidence for removing an analyte from the existing chemicals of potential concern list. Table 3-10 presents those groundwater analytes that have been identified as chemicals of potential concern. Time-series graphs of primary and secondary chemicals of potential concern are provided in Appendix E.

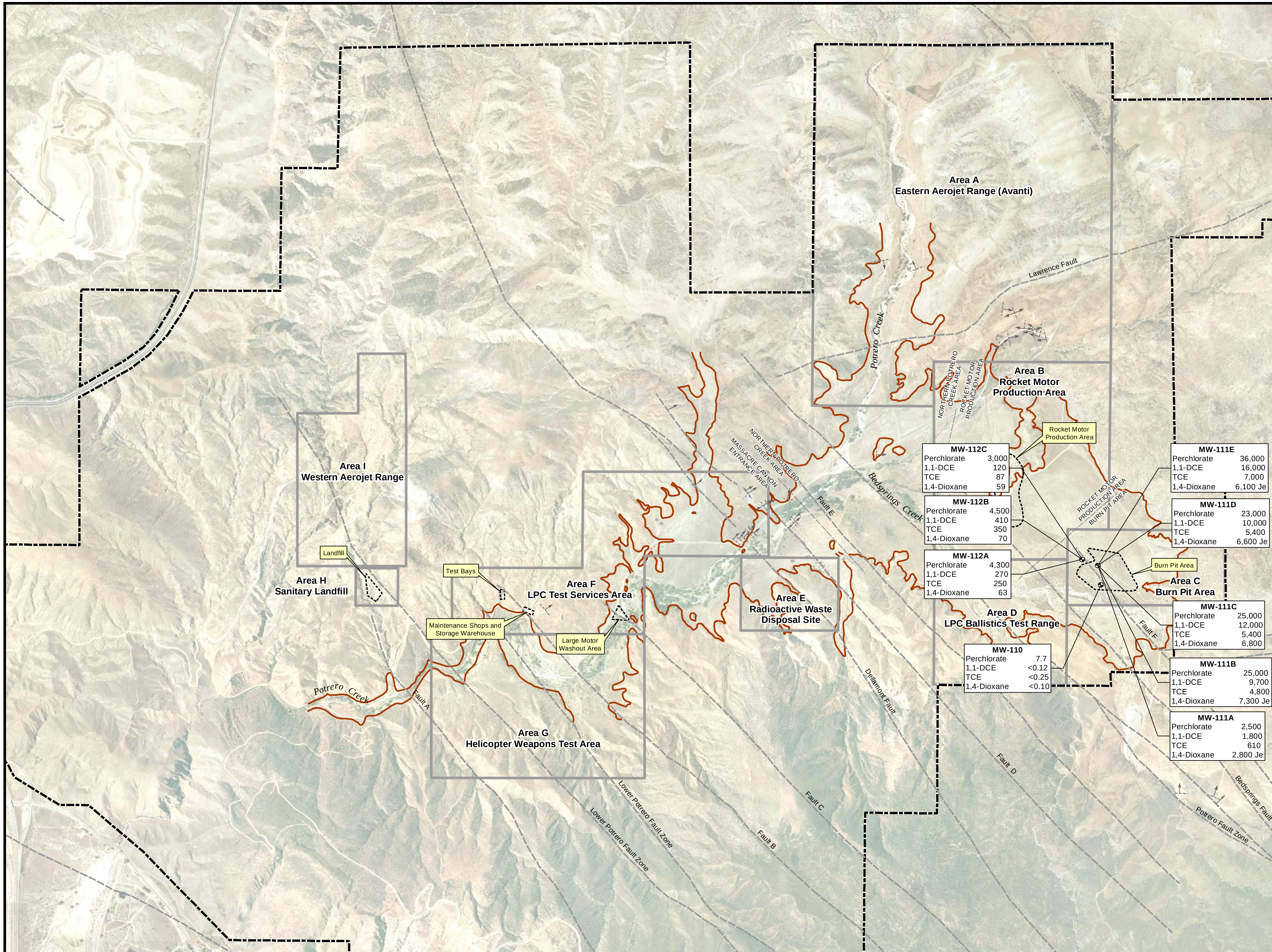
Table 3-10 Groundwater Chemicals of Potential Concern

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
1,1,2-Trichloroethane	Secondary	Isomeric impurity of 1,1,1-TCA
cis-1,2-Dichloroethene	Secondary	Breakdown product of TCE
Vinyl chloride	Secondary	Breakdown product of TCE and/or 1,1,1-TCA

3.6 DISTRIBUTION OF THE PRIMARY CHEMICALS OF POTENTIAL CONCERN

The Third Quarter 2012 and Fourth Quarter 2012 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). Only those wells and surface water locations sampled and tested during this event will be discussed. Figures 3-10 and 3-11 present the primary chemicals of potential concern sampling results for the wells sampled during the Third Quarter 2012 and Fourth Quarter 2012 monitoring events, respectively. A figure illustrating the extent of the primary chemicals of potential concern based on the recent data is presented in Figure 3-12.

P:\GIS\Lockheed S1_Q3\0412\COPC_Q312.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

- Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact
  Dashed where inferred
- Source Areas
- Potrero Canyon Property Boundary
  (Lockheed Martin Beaumont Site 1)
- Historical Operational Area Boundary

Notes:

DCE - Dichloroethene.

TCE - Trichloroethene

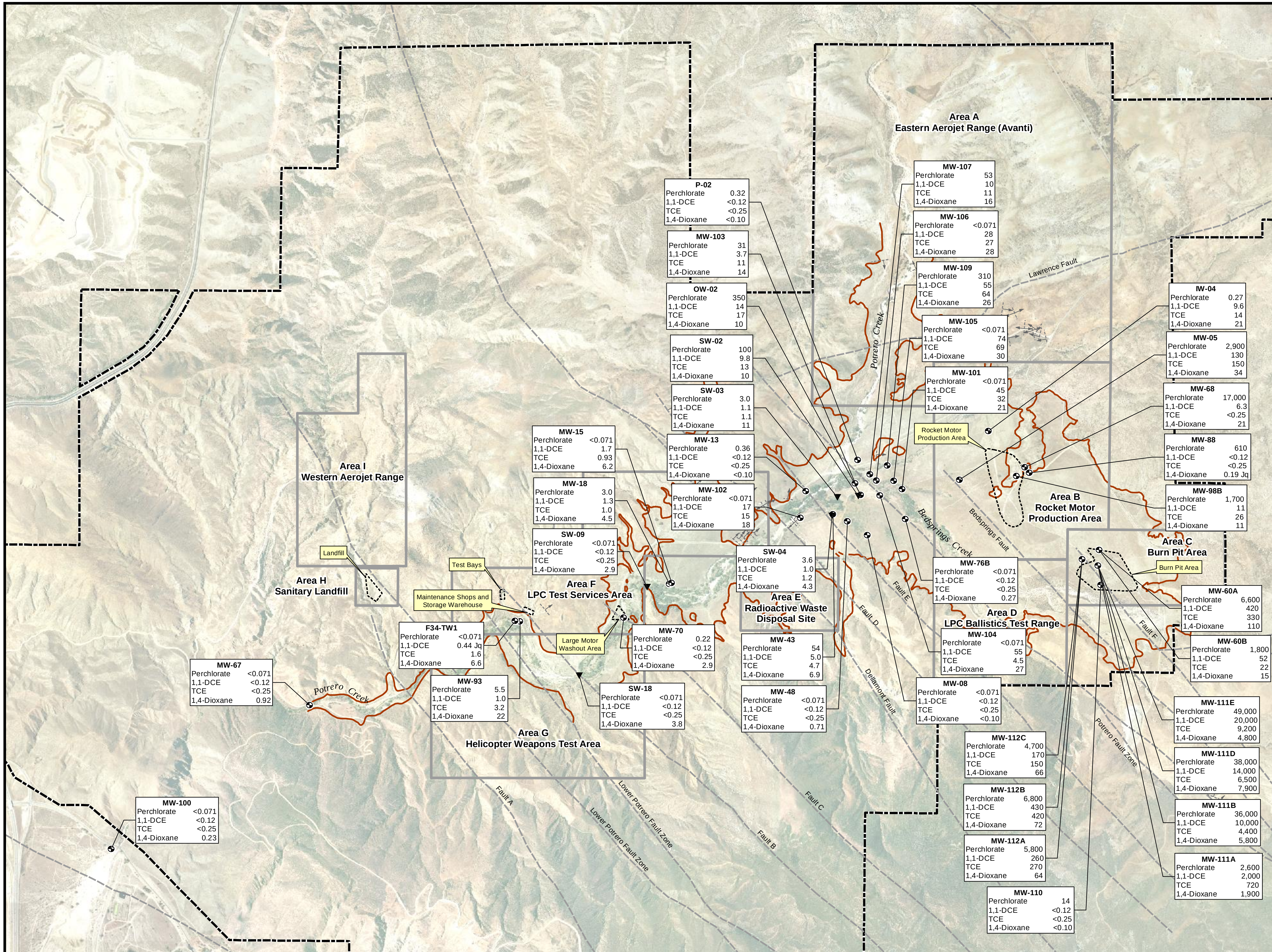
Beaumont Site 1 property boundary is approximate.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-10
Primary COPC Sampling Results (µg/L)-Third Quarter 2012

TETRA TECH

P:\GIS\Lockheed S1_Q3Q412\COPC_Q412.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 Sampling Location
- Surface Water Sampling Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact
  Dashed where inferred
- Source Areas
- Potrero Canyon Property Boundary
  (Lockheed Martin Beaumont Site 1)
- Historical Operational Area Boundary

Notes:

DCE - Dichloroethene.

TCE - Trichloroethene

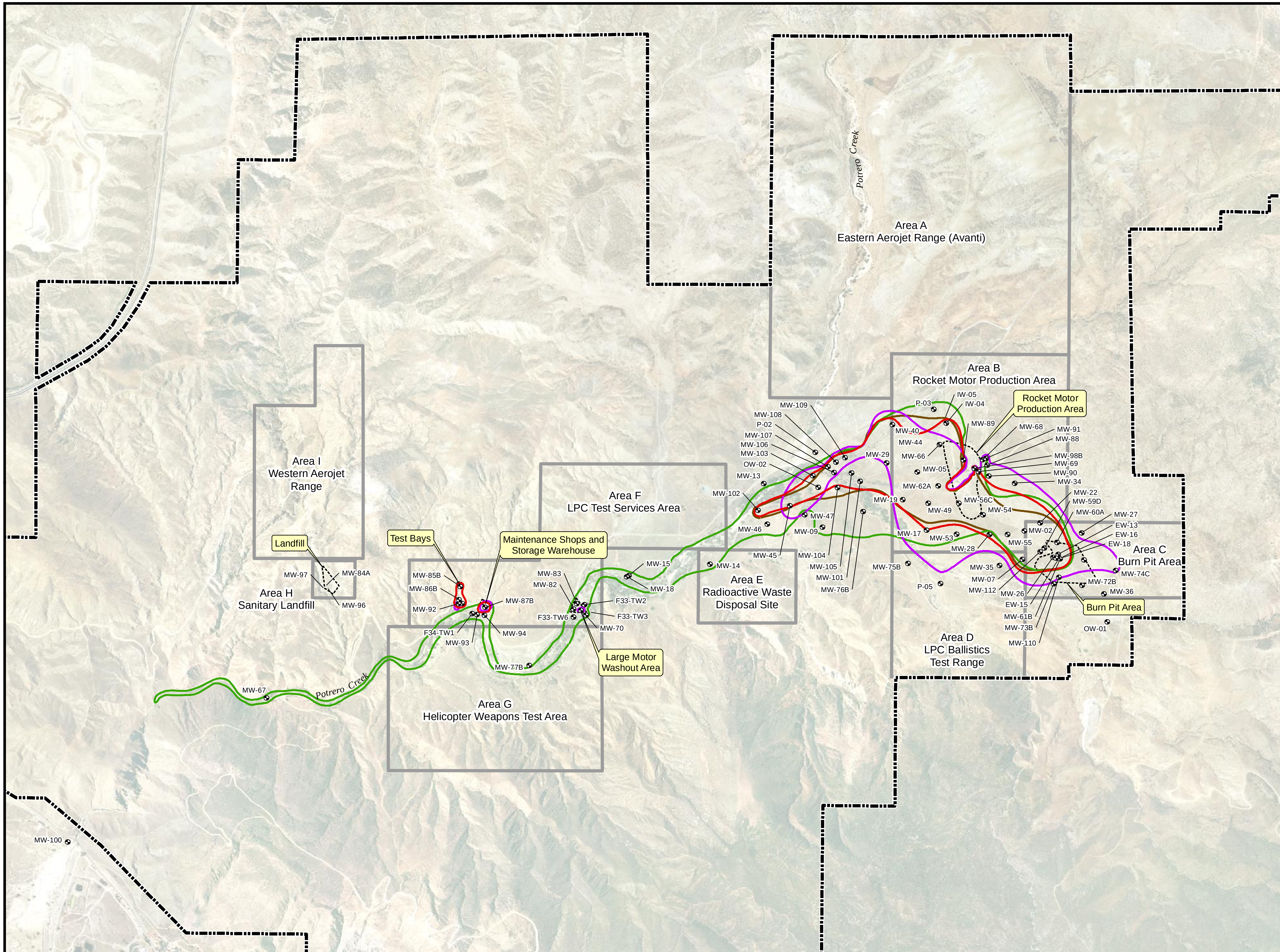
Beaumont Site 1 property boundary is approximate.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-11
Primary COPC
Sampling Results (µg/L)-
Fourth Quarter 2012

TETRA TECH

P:\GIS\Lockheed S1_Q3Q412\COPC Extents.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

Perchlorate (6.0 µg/L) - Dashed where inferred

1,4-Dioxane (1.0 µg/L) - Dashed where inferred

Tricloroethene (5.0 µg/L) - Dashed where inferred

1,1-DCE (6.0 µg/L) - Dashed where inferred

Historical Operational Area Boundary

Potrero Canyon Property Boundary (Lockheed Martin Beaumont Site 1)

Notes: Beaumont Site 1 property boundary is approximate.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-12
Primary Chemicals of Potential Concern Extents for Alluvium and Shallow Mount Eden Formation

TETRA TECH

3.6.1 Guard Wells

Guard wells are wells that are used as an early warning to protect private and municipal wells by detecting any upgradient contaminants. Guard wells are also used to monitor any migration of contaminants off-site.

Four monitoring wells, MW-15, MW-18, MW-67, and MW-100, were designated as guard wells during the semiannual event conducted during the second quarter of the 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 farthest downgradient site well, and is located approximately 0.9 miles upgradient of the southern edge of the site. MW-100 is located off-site approximately 500 feet from the southern property boundary just south of Gilman Springs Road near the mouth of Potrero Creek. Table 3-11 presents a summary of the detected chemicals of potential concern reported in guard well samples collected during Fourth Quarter 2012, and previous monitoring events. In general, the chemicals of potential concern concentrations during this reporting period have remained stable in the guard wells.

Table 3-11 Summary of Detected Chemicals of Potential Concern in Guard Wells

Sample Location	Site Area	Sample Date	Per-chlorate	1,4-Dioxane	1,1-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	Trichloro-ethene
All results reported in µg/L unless otherwise stated								
MW-15	MCEA	01/06/11	<0.071	**5.9**	0.34 Jq	2.0	0.30 Jq	1.2
		06/07/11	<0.071	**6.8**	0.30 Jq	1.9	0.29 Jq	1.1
		12/09/11	<0.071	**5.8**	0.25 Jq	1.6	0.28 Jq	1.0
		05/31/12	<0.071	**6.7**	0.34 Jq	1.8	0.26 Jq	1.1
		11/16/12	<0.071	**6.2**	0.32 Jq	1.7	0.29 Jq	0.9
MW-18	MCEA	01/06/11	1.2	**3.7**	0.15 Jq	1.0	<0.18	0.97
		06/07/11	1.3	**4.3**	0.15 Jq	0.93	<0.18	0.76
		12/09/11	0.72	**3.7**	0.14 Jq	0.88	<0.18	0.83
		05/31/12	2.1	**3.8**	0.14 Jq	1.1	<0.18	1.1
		11/16/12	3.0	**4.5**	0.18 Jq	1.3	<0.18	1.0
MW-67	MCEA	01/07/11	0.55	<0.10	<0.098	0.15 Jq	<0.18	<0.25
		06/06/11	<0.071	**1.2**	<0.098	<0.12	<0.18	<0.25
		12/08/11	<0.071	**1.1**	<0.098	<0.12	<0.18	<0.25
		05/29/12	<0.071	**1.2**	<0.098	<0.12	<0.18	<0.25
		11/16/12	<0.071	0.92	<0.098	<0.12	<0.18	<0.25
MW-100	DG	01/04/11	<0.071	0.17 Jq	<0.098	<0.12	<0.18	<0.26
		06/06/11	<0.071	0.15 Jq	<0.098	<0.12	<0.18	<0.25
		12/12/11	<0.071	0.18 Jq	<0.098	<0.12	<0.18	<0.25
		05/29/12	<0.35	0.21	<0.098	<0.12	<0.18	<0.25
		11/16/12	<0.071	0.23	<0.098	<0.12	<0.18	<0.25
MCL/DWNL (µg/L)			6	1 (1)	5	6	6	5

Notes:
MCEA - Massacre Canyon Entrance Area.
DG – Downgradient
MCL - California Department of Public Health maximum contaminant level
DWNL - California Department of Public Health drinking water notification level
(1) DWNL
µg/L - Micrograms per liter
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).

3.6.2 Increasing Trend Wells

During the Second Quarter 2011 statistical trend analyses, (Tetra Tech, 2011), 21 monitoring wells were designated as having increasing or probably increasing trends. Based on the magnitude of the trend and the wells' locations, nine of these wells were included in the Fourth Quarter 2012 semiannual sampling event. The portion of the site where these wells are located, the location identification, and the chemicals of potential concern that have the increasing trend are listed below:

Two wells are located in the BPA.

- MW-60A: perchlorate, TCE, 1,1-DCE, and 1,4-dioxane
- MW-60B: TCE and 1,4-dioxane

Four wells are located in the RMPA.

- IW-04: TCE and 1,1-DCE
- MW-68: perchlorate, 1,1-DCE,and 1,4-dioxane
- MW-88: perchlorate
- MW-98B: TCE and 1,1-DCE

One well is located in the NPCA.

- MW-103: perchlorate

Two wells are located in the MCEA.

- F34-TW1: 1,4-dioxane
- MW-93: perchlorate

These increasing trend wells were chosen based on the Second Quarter 2011 trend analyses, and may change pending approval of the First Quarter 2012 and Second Quarter 2012 Groundwater Monitoring Report (Tetra Tech 2012c). Table 3-12 presents a summary of the detected chemicals of potential concern reported in increasing trend well samples collected during Fourth Quarter 2012, and previous monitoring events.

Table 3-12 Summary of Detected Chemicals of Potential Concern in Increasing Trend Wells

Sample Location	Site Area	Sample Date	Perchlorate	1,4-Dioxane	1,1-Dichloroethene	Trichloroethene
All results reported in µg/L unless otherwise stated						
F34-TW1	MCEA	06/11/10	<0.071	**5.5**	<0.12	0.55
		06/06/11	2.1	**9.6**	0.23 Jq	0.76
		12/08/11	<0.071	**11**	0.13 Jq	0.85
		6/13/2012	<0.35	**4.1**	0.28 Jq	0.86
		11/26/2012	<0.071	**6.6**	0.44 Jq	1.6
IW-04	RMPA	01/17/11	<0.071	**23**	**25**	**18**
		06/14/11	<0.071	**25**	**35**	**23**
		12/08/11	<0.071	**21**	**17**	**23**
		6/7/2012	<0.071	**23**	**14**	**21**
		11/19/2012	0.27	**21**	**9.6**	**14**
MW-60A	BPA	01/06/11	**4,700**	**140**	**430**	**290**
		06/21/11	**4,900**	**130**	**460**	**280**
		12/12/11	**4,700**	**130**	**380**	**280**
		6/22/2012	**4,900**	**150**	**370**	**270**
		11/29/2012	**6,600**	**110**	**420**	**330**
MW-60B	BPA	01/06/11	**1,100**	**11**	**43**	**14**
		06/21/11	**1,300**	**8.8**	**41**	**12**
		12/12/11	**900**	**8.8**	**34**	**13**
		6/22/2012	**1,100**	**10**	**39**	**15**
		11/29/2012	**1,800**	**15**	**52**	**22**
MW-68	RMPA	01/19/11	**14,000**	**21**	5.7	**9.2**
		06/21/11	**13,000**	**25**	**6.1**	<0.25
		12/12/11	**6,000**	**11**	2.6	<0.25
		6/15/2012	**9,100**	**18**	4.4	<0.25
		11/28/2012	**17,000**	**21**	**6.3**	<0.25
MW-88	RMPA	06/09/10	**1,100**	0.35	<0.12	<0.17
		06/17/11	**6,100**	0.23	<0.12	<0.25
		12/12/11	**740**	0.23	<0.12	<0.25
		6/15/2012	**770**	0.20	<0.12	<0.25
		11/19/2012	**610**	0.19 Jq	<0.12	<0.25
MW-93	MCEA	06/11/10	**10 Jd**	**12**	0.28 Jq	1.1
		06/07/11	**8.4**	**4.4**	<0.12	<0.25
		12/12/11	**6.7**	**14**	0.56	1.7
		5/31/2012	4.9	**19**	1.1	3.1
		11/19/2012	5.5	**22**	1.0	3.2
MW-98B	RMPA	01/05/11	**1,400**	**13**	**23**	**39**
		06/17/11	**1,600**	**5.2**	**12**	**17**
		12/09/11	**470**	**2.2**	**9.6**	**12**
		6/5/2012	**570**	**2.0**	**11**	**12**
		11/28/2012	**1,700**	**11**	**11**	**26**
MW-103	NPCA	06/09/11	**160**	**11**	3.6	**5.9**
		08/22/11	**180**	**14**	**6.6**	**8.4**
		12/07/11	**76**	**15**	5.6	**10**
		6/12/2012	**120**	**15**	4.8	**8.6**
		11/27/2012	**31**	**14**	3.7	**11**
MCL/DWNL (µg/L)			6	1 (1)	6	5

Notes:
MCL - California Department of Public Health maximum contaminant level
DWNL - California Department of Public Health drinking water notification level.
(1) DWNL
µg/L - Micrograms per liter.
Bold - MCL or DWNL exceeded.
BPA - Burn Pit Area.
MCEA - Massacre Canyon Entrance Area.
NPCA - Northern Potrero Creek Area.
RMPA - Rocket Motor Production Area.
<# - Analyte not detected; method detection limit concentration is shown.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
d - The Laboratory Control Sample (LCS) recovery was outside control limits.
q - The analyte detection was below the practical quantitation limit (PQL).

3.6.3 New Wells

New monitoring wells MW-110, MW-111A, MW-111B, MW-111D, MW-111E, and MW-112A through MW-112C were sampled during Fourth Quarter 2012. These wells were installed in three angle boreholes in the BPA as part of the Site 1 Hydraulic Testing Investigation (Tetra Tech, 2012a). MW-110 was installed with a 2-inch diameter single completion pre-pack well across a zone of flowing sands. MW-111A through MW-111E, and MW-112A through MW-112C were installed with Water FLUTe™ multilevel monitoring systems in the MEF sandstone. MW-111C was unable to be sampled due to sediment clogging of the Water FLUTe™ port at this depth interval. Table 3-13 identifies the well designation and the screen or sampling port location. Complete well construction information appears in Appendix C.

Table 3-13 New Well Construction Information

Monitoring Port Well ID	Screen/Port Linear Depth (Feet BGS)	Screen/Port Vertical Depth (Feet BGS)
MW-110	110 to 130	95.3 to 112.6
MW-111A	180 to185	155.9 to 160.2
MW-111B	161 to 166	139.4 to 143.8
MW-111C	131 to 136	113.4 to 117.8
MW-111D	121 to 126	104.8 to 109.1
MW-111E	97 to 102	84.0 to 88.3
MW-112A	125 to 130	108.3 to 112.6
MW-112B	100 to 105	86.6 to 90.9
MW-112C	87 to 92	75.3 to 79.7

Notes:
BGS – Below ground surface

The addition of these wells helps to characterize the Mount Eden sandstone and contaminant concentrations with depth, and provides additional hydraulic data to support the evaluation of remedial alternatives at the site. It is expected to take a longer period than normal for wells MW-111A through MW-111E and wells MW-112A through MW-112C to fully equilibrate with the adjacent formation and produce representative groundwater samples, due to (1) the extremely low permeability in the BPA and (2) the fact that wells with the Water FLUTe™ system installed cannot be developed following traditional well development procedures. Additional purging cycles are being performed on the wells between sampling events to speed up the process of equilibration. A summary of the sample results from Fourth Quarter 2012 and previous sampling events appears in Table 3-14.

Table 3-14 Summary of Detected Chemicals of Potential Concern in New Wells

Sample Location	Sample Date	Per-chlorate	1,4-Dioxane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	c-1,2-Dichloro-ethene	1,1,2-Trichloro-ethane	Trichloro-ethene
All results reported in µg/L unless otherwise stated									
MW-110	02/27/12	2.0	0.24 Ba	<0.098	<0.21	<0.12	<0.18	<0.31	<0.25
	06/25/12	**7.0**	<0.10	<0.098	<0.21	<0.12	<0.18	<0.31	<0.25
	08/22/12	**7.7**	<0.10	<0.098	<0.21	<0.12	<0.18	<0.31	<0.25
	11/19/12	**14**	<0.10	<0.098	<0.21	<0.12	<0.18	<0.31	<0.25
MW-111A	02/28/12	**35,000**	**3,800**	**170**	**470**	**4,800**	**74**	**110**	**3,300**
	06/21/12	**3,300**	**2,900**	**32**	**100**	**1,300**	**13**	**32**	**510**
	08/21/12	**2500**	**2,800 Je**	**48**	**130**	**1,800**	**18**	**39**	**610**
	11/20/12	**2,600**	**1,900**	<0.098	**130**	**2,000**	**19**	**34**	**720**
MW-111B	02/28/12	**17,000**	**6,100**	**140**	**390**	**5,700**	**55**	**120**	**3,200**
	06/21/12	**20,000**	**7,000**	**170**	**440**	**7,600**	**67**	**120**	**3,500**
	08/21/12	**25,000**	**7,300 Je**	**230**	**550**	**9700**	**95**	**140**	**4,800**
	11/20/12	**36,000**	**5,800**	**240**	**590**	**10,000**	**110**	**190**	**4,400**
MW-111C	02/28/12	**18,000**	**6,400**	**120**	**370**	**4,100**	**50**	**110**	**2,500**
	06/21/12	**21,000**	**7,300**	**170**	**440**	**7,700**	**69**	**120**	**3,400**
	08/31/12	**25,000**	**6,800**	**240**	**600**	**12,000**	**100**	**160**	**5,400**
MW-111D	02/28/12	**20,000**	**6,300**	**140**	**400**	**5,200**	**55**	**120**	**2,600**
	06/21/12	**21,000**	**8,400**	**150**	**430**	**6,900**	**63**	**130**	**3,300**
	08/21/12	**23,000**	**6,600 Je**	**230**	**560**	**10,000**	**85**	**150**	**5,400**
	11/20/12	**38,000**	**7,900**	**310**	**680**	**14,000**	**120**	**150**	**6,500**
MW-111E	02/28/12	**7,700**	**4,800**	**45**	**170**	**1,400**	**20**	**57**	**670**
	06/21/12	**35,000**	**4,900**	**270**	**560**	**12,000**	**110**	**110**	**5,700**
	08/21/12	**36,000**	**6,100 Je**	**330**	**670**	**16,000**	**120 Jq**	**160 Jq**	**7,000**
	11/20/12	**49,000**	**4,800**	**430**	**840**	**20,000**	**170**	**170**	**9,200**
MW-112A	02/29/12	**1,300**	**46**	**5.8**	**9.6**	**69**	1.3	1.2	**67**
	06/21/12	**4,300**	**66**	**9.2**	**13**	**220**	1.4	1.7	**220**
	08/20/12	**4,300**	**63**	**11**	**16**	**270**	1.7	1.9	**250**
	11/20/12	**5,800**	**64**	**9.7**	**14**	**260**	1.5	1.7	**270**
MW-112B	02/29/12	**4,800**	**71**	**15**	**18**	**310 Jf**	2.4	2.4	**340 Jf**
	06/21/12	**4,900**	**66**	**16**	**18**	**370**	2.3	2.2	**340**
	08/20/12	**4,500**	**70**	**17**	**21**	**410**	2.6	2.4	**350**
	11/20/12	**6,800**	**72**	**17**	**20**	**430**	2.8	2.2	**420**
MW-112C	02/29/12	**4,300**	**59**	**10**	**14**	**210**	1.6	1.6	**230**
	06/21/12	**2,500**	**62**	**8.5**	**13**	**140**	1.5	1.0	**100**
	08/20/12	**3,000**	**59**	**6.3**	**12**	**120**	1.4	0.85	**87**
	11/20/12	**4,700**	**66**	**8.9**	**14**	**170**	2.1	1.1	**150**
MCL/DWNL (µg/L)		6	1 (1)	5	5	6	6	5	5

Notes:
MCL - California Department of Public Health maximum contaminant level
DWNL - California Department of Public Health drinking water notification level
(1) DWNL
µg/L - micrograms per liter
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 are 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.
e - A holding time violation occurred.
f - The duplicate Relative Percent Difference was outside the control limit.
q - The analyte detection was below the practical quantitation Limit (PQL).

3.6.4 Surface Water

Surface water samples were scheduled for collection from 17 locations during the Fourth Quarter 2012 groundwater sampling event. Table 3-15 presents concentrations of chemicals of potential concern reported in surface water samples collected from this sampling event.

During Fourth Quarter 2012 surface water samples were collected from five locations (SW-02, SW-03, SW-04, SW-09, and SW-18) along the Potrero and Bedsprings creek drainages. The remaining 12 locations were dry at the time of sampling. Because surface water location SW-16 was dry, an attempt was made to collect a sample from the alternate location SW-17, but it was also dry and therefore was not sampled. The four primary chemicals of potential concern (1,4-dioxane, 1,1-DCE, TCE, and perchlorate) and four secondary chemicals of potential concern (1,1-DCA, cis-1,2-dichloroethene, 1,1,1-TCA, and vinyl chloride) were detected in surface water samples collected from locations SW-02, SW-03, and SW-04. These samples were collected from springs and/or manmade surface depressions fed by nearby springs located outside of the stream beds but near the intersection of Bedsprings and Potrero creeks.

1,4-Dioxane was the only chemical of potential concern detected in the surface water samples collected from locations SW-09 and SW-18. These samples were collected from water flowing in Potrero Creek and are topographically downgradient of the springs discussed in the previous paragraph. Figure 3-11 presents concentrations of chemicals of potential concern reported in surface water samples collected from the Fourth Quarter 2012 monitoring event.

Table 3-15 Summary of Detected Chemicals of Potential Concern in Surface Water - Fourth Quarter 2012

Sample Location	Sample Date	Per-chlorate	1,4-Dioxane	1,1-Dichloro-ethane	1,1-Dichloro-ethene	c-1,2-Dichloro-ethene	1,1,1-Trichloro-ethane	Trichloro ethene	Vinyl Chloride
All results reported in µg/L unless otherwise stated									
SW-02	11/15/12	**100**	**10**	0.40 Jq	**9.8**	0.75	0.16 Jq	**13**	0.38 Jq
SW-03	11/15/12	3.0	**11**	<0.098	1.1	0.42 Jq	<0.12	1.1	<0.13
SW-04	11/15/12	3.6	**4.3**	<0.098	1.0	0.25 Jq	<0.12	1.2	<0.13
SW-09	11/15/12	<0.071	**2.9**	<0.098	<0.12	<0.18	<0.12	<0.25	<0.13
SW-18	11/15/12	<0.071	**3.8**	<0.098	<0.12	<0.18	<0.12	<0.25	<0.13
Method Detection Limit (µg/L)		0.071	0.10	0.098	0.12	0.18	0.12	0.25	0.13
MCL/DWNL (µg/L)		6	1 (1)	5	6	6	200	5	0.5

Notes:

µg/L - Micrograms per liter

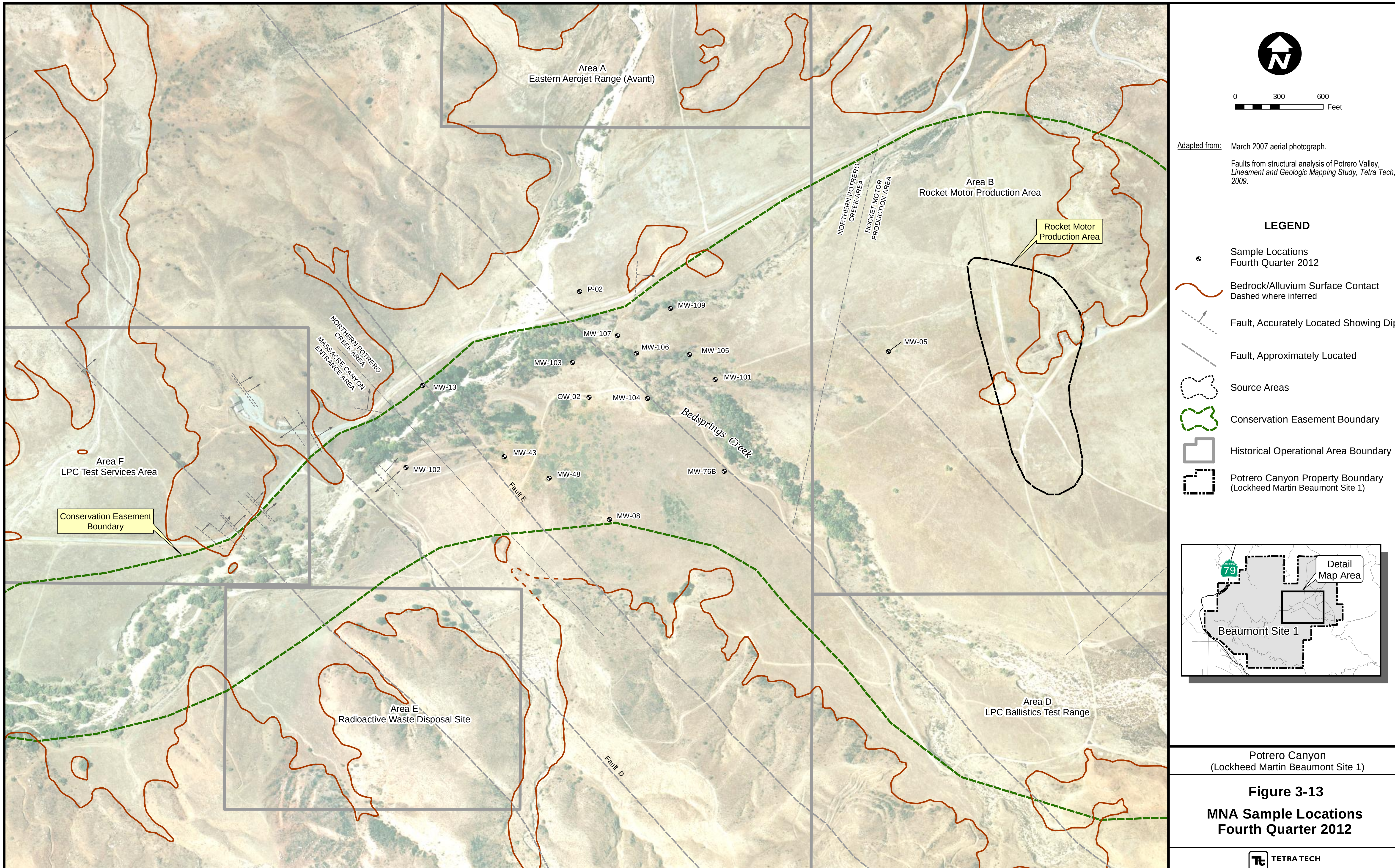
MCL - California Department of Public Health maximum contaminant level
DWNL - California Department of Public Health drinking water notification level
(1) DWNL
Bold - MCL or DWNL exceeded.
<# - Analyte not detected; method detection limit concentration is shown.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the practical quantitation limit (PQL).

3.7 CONTAMINANT ATTENUATION SAMPLING

A site-wide contaminant attenuation evaluation was completed in the Spring of 2012 (Tetra Tech, 2012b). The evaluation concluded that approximately 95% of the contaminant flux was being attenuated, and that contaminant attenuation was going to be an important component of any remedial strategy implemented at this site. The attenuation is primarily occurring in the riparian corridor located at the confluence of Bedsprings and Potrero creeks, with approximately 22% of the attenuation being due to evapotranspiration and 72% being due to biodegradation. The evaluation concluded that approximately 95% of the contaminant mass flux was being attenuated, primarily in the riparian corridor located in the NPCA and MCEA. Although the bulk of the contaminant attenuation is taking place in this area, the study also found that contaminant attenuation is also occurring at Features F-33, F-34, and F-39. The contaminant attenuation evaluation recommended the routine monitoring of the degradation processes and aquifer redox conditions in up to 22 monitoring wells. Following is a discussion of the results of the Fourth Quarter 2012 contaminant attenuation monitoring.

Monitoring wells scheduled for contaminant attenuation parameter sampling during the Fourth Quarter 2012 monitoring event included 15 monitoring wells (MW-05, MW-08, MW-13, MW-43, MW-48, MW-76B, MW-101, MW-103, MW-104, MW-105, MW-106, MW-107, MW-109, OW-02, and P-02) located in the NPCA and one monitoring well (MW-102) located in the MCEA.

Samples for laboratory analysis were collected for alkalinity, chloride, dissolved organic carbon (DOC), dissolved manganese, sulfate, nitrate, methane, ethane, ethene, hydrogen, and volatile organic compounds (VFAs). Dissolved oxygen (DO) and oxidation-reduction potential (ORP) were monitored with field instruments during purging and sampling, and ferrous iron and sulfide were analyzed using a field instrument prior to sample collection. Figure 3-13 shows the locations of the monitoring wells sampled for contaminant attenuation parameters during the Fourth Quarter 2012 monitoring event. Table 3-16 presents a summary of the field measurements and validated analytical results.



Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3-13

MNA Sample Locations Fourth Quarter 2012

Table 3-16 Summary of Validated Detected Contaminant Attenuation Analytes and Field Measurements - Fourth Quarter 2012

		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**	**2-Hydroxy-propanoic Acid - mg/L**	**Hexanoic Acid - mg/L**	**Dissolved Organic Carbon - mg/L**	**Hydrogen –nM**	**Methane -ug/L**	**Nitrate (as N) -mg/L**	**Sulfate -mg/L**	**Chloride -mg/L**	**Iron - mg/L**	**Dissolved Manganese -ug/L**
MW-05	11/28/12	0.48	-137.2	-	-	**2,900**	<0.021	<0.032	<0.039	0.36 Jq	<0.074	<0.044	7.9	11	9.5	<0.0023	1.4 Jq
MW-08	11/26/12	0.31	-154.3	0.00	**0.41**	<0.071	<0.021	<0.032	<0.039	0.27 Jq	0.66	0.29	<0.11	11	5.1	**1.4**	190
MW-13	11/26/12	2.61	-6.1	0.00	0.04	0.36	0.076	<0.032	<0.039	0.70	<0.074	<0.044	1.4	79	9.6	0.0048 Jq	<0.24
MW-43	11/26/12	0.25	-119.5	0.01	0.11	**54**	<0.021	<0.032	<0.039	0.29 Jq	2.2	210	0.77	8.7	5.8	0.096	4.5 Jq
MW-48	11/28/12	0.47	-122.3	0.01	**1.15**	<0.071	<0.021	<0.032	<0.039	1.1	<0.074	1,700	<0.11	6.3	7.9	**1.9**	250
MW-76B	11/28/12	0.40	-99.0	0.00	0.22	<0.071	<0.021	<0.032	<0.039	0.31 Jq	<0.074	4.2	<0.11	8.4	5.6	0.22	11
MW-101	11/28/12	0.31	-106.2	0.00	**0.48**	<0.071	0.076	0.22	<0.039	0.39 Jq	<0.074	0.20	<0.11	28	7.1	**1.7**	110
MW-102	11/28/12	0.65	-122.0	0.00	0.06	<0.071	<0.021	<0.032	<0.039	0.49 Jq	<0.074	17	<0.11	16	6.3	0.08	56
MW-103	11/27/12	2.81	20.4	0.00	0.01	**31**	<0.021	<0.032	<0.039	1.1	1.0	7.0	<0.11	6.9 Jd	7.5	**2.1 Jcf**	11
MW-104	11/27/12	0.70	-141.3	0.00	**0.32**	<0.071	0.098	<0.032	<0.039	0.70	0.98	1.2	<0.11	4.0	7.3	**0.4**	98
MW-105	11/27/12	0.47	-164.6	0.04	0.14	<0.071	0.12	<0.032	<0.039	0.64 Jq	0.60	10	<0.11	27	11	0.12	**860**
MW-106	11/27/12	0.79	-154.2	0.00	0.04	<0.071	0.075	<0.032	<0.039	2.7	1.1	2.4	<0.11	63	17	0.0051 Jq	120
MW-107	11/27/12	1.18	-177.5	0.01	0.02	**53**	<0.021	<0.032	<0.039	1.7	1.5	1.2	<0.11	26	14	0.012 Jq	62
MW-109	11/27/12	0.35	-153.3	0.00	0.03	**310**	<0.021	<0.032	0.44	0.48 Jq	1.4	4.4	1.3	23	9.3	0.0058 Jq	320
OW-02	11/28/12	2.97	-68.3	0.00	0.03	**350**	0.075	<0.032	<0.039	0.33 Jq	2.1	<0.044	3.2	7.5	7.1	0.0066 Jq	0.26 Jq
P-02	11/26/12	0.40	-147.6	0.00	0.02	0.32	<0.021	<0.032	<0.039	1.3	<0.074	0.37	0.72	**490**	76	**1.2**	**790**
MDL		-	-	-	-	0.071	0.021	0.032	0.039	0.16	0.074	0.044	0.11	0.37	1.0	0.0023	0.24
MCL/DWNL		-	-	-	0.3	6	-	-	-	-	-	-	10	250	250	0.3	500 (2)

Notes:

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

(1) - Sulfide and ferrous iron sample analysis was performed in the field using a Hach DR 850 colorimeter.
(2) - DWNL
MCL - California Department of Public Health Services maximum contaminant level
DWNL - California Department of Public Health Services drinking water notification level
J - The analyte was positively identified, but the analyte concentration is an estimated value.
c - The Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) recoveries were outside control limits.
f - The duplicate Relative Percent Difference was outside the control limit.
q - The analyte detection was below the practical quantitation limit (PQL).

<# - Analyte not detected, method detection limit concentration is shown.
MDL - Method detection limit
mg/L - milligrams per liter
µg/L - micrograms per liter
nM – NanoMoles
Bold - MCL or DWNL exceeded
"-" - Not available

Dissolved Oxygen and General Minerals

Software developed by the United States Geological Survey (USGS, 2009) was used to evaluate aquifer redox conditions based on dissolved oxygen, nitrate, manganese, iron, sulfate, and sulfide concentrations in the groundwater. The results of this analysis are provided in Appendix J. With the exception of monitoring wells MW-13 and OW-02, the aquifer redox category was anoxic. Wells for which redox category changed with respect to the Second Quarter 2012 conditions include

- MW-05 (changed from oxic to anoxic),
- MW-13 (changed from anoxic to oxic),
- MW-102 (changed from anoxic to mixed oxic/anoxic),
- MW-103 (changed from oxic to mixed oxic/anoxic),
- MW-104 (changed from anoxic to mixed oxic/anoxic),
- MW-105 (changed from anoxic to mixed anoxic),
- MW-107 (changed from anoxic to mixed oxic/anoxic), and
- P-02 (changed from anoxic to mixed anoxic).

It should be noted that in all of these cases, the redox classification changes are attributable to relatively small changes in the DO concentrations measured in the field.

Oxidation-Reduction Potential

Oxidation/reduction potential values are a general indicator of aquifer oxidation state. Table 3-16 shows that with the exception of monitoring well MW-103, ORP values are negative, consistent with the redox conditions necessary for perchlorate biodegradation (Lieberman and Borden, 2008).

Methane

Methane can be produced in an aquifer by a number of anaerobic biologic pathways, including fermentative breakdown of acetate to methane and carbon dioxide, and biological carbon dioxide reduction. In general, the presence of methane is indicative of highly-reduced aquifer conditions. Table 3-16 shows that methane was detected in all wells except for MW-05, MW-13, and OW-02, which is consistent with the previously observed anoxic aquifer conditions in the riparian corridor located in the NPCA and MCEA.

Dissolved Hydrogen

Dissolved hydrogen is produced in anoxic environments by fermentative microorganisms, and is consumed by nitrate-, iron-, sulfate-, and carbon dioxide-reducing microorganisms. The efficiency of hydrogen utilization varies among these microorganisms, with nitrate-reducing bacteria being the most efficient, followed by iron-, sulfate-, and carbon dioxide-reducers. Thus, steady-state hydrogen concentrations in anoxic aquifers are lowest under nitrate-reducing conditions, and become progressively higher as conditions become more reducing. Table 3-16 shows that hydrogen was detected in nine of the monitoring wells at concentrations ranging from 0.60 to 2.1 nanoMoles (nM). These findings are consistent with anoxic aquifer conditions.

Dissolved Organic Carbon

Dissolved organic carbon was detected in all of the monitoring wells, at concentrations ranging from 0.27 to 2.7 milligrams per liter (mg/L) (Table 3-16). Volatile fatty acids are organic carbon molecules that are immediately available to the microorganisms involved in contaminant biodegradation. The presence of VFAs in groundwater, even at low concentrations, indicates that there is an excess of organic carbon available for biodegrading microorganisms. Detectable concentrations of VFAs were observed in seven of the monitoring wells (Table 3-16).

Perchlorate

The trend analysis conducted during Second Quarter 2012 indicates that only one of the monitoring wells sampled for contaminant attenuation parameters (MW-103) had an increasing or probably increasing perchlorate concentration trend. This is a relatively new well, which was installed in late 2010, and has been sampled six times. As a new well, the well was sampled quarterly and then, as specified in the groundwater monitoring sampling and analysis plan (Tetra Tech, 2003b), it was reclassified as a plume monitoring well and the sampling frequency was adjusted. Review of the analytical data used for the trend analysis suggests that perchlorate concentrations fluctuate seasonally, peaking in the fall and summer, and decreasing during the winter and spring. The perchlorate concentrations from the summer 2011 and 2012 events are similar, suggesting stability rather than an increasing trend. The DO and ORP appear to fluctuate seasonally as well, most likely as a result of the influx of oxygenated water after storm events. Because the statistical analysis showed an increasing trend for perchlorate in this well, this well will be sampled semiannually. Future sampling events should provide more clarity on perchlorate trends in this well.

3.8 HABITAT CONSERVATION

Consistent with the United States Fish and Wildlife Service (USFWS)-approved Habitat Conservation Plan (HCP) (USFWS, 2005) and subsequent clarifications (Lockheed Martin Corporation, 2006a, 2006b, and 2006c) of the HCP describing activities for environmental remediation at the site, field activities were performed under the supervision of a USFWS-approved biologist. No impact to the Stephens' kangaroo rat occurred during the performance of field activities related to the Third Quarter 2012 and Fourth Quarter 2012 monitoring events.

SECTION 4 SUMMARY AND CONCLUSIONS

This section summarizes the results of the Third Quarter 2012 and Fourth Quarter 2012 groundwater monitoring events. A total of 182 groundwater level measurements were collected for the Third Quarter 2012 and Fourth Quarter 2012 water quality monitoring events. Four wells were observed to be dry during the Third Quarter and five wells were observed to be dry during the Fourth Quarter. For the Third Quarter 2012 monitoring event, 9 monitoring wells were proposed and sampled for water quality monitoring. For the Fourth Quarter 2012 monitoring event, 56 sampling locations (17 surface water, one alternate surface water location, and 38 monitoring wells) were proposed for water quality monitoring. Twelve surface water sample locations were not sampled because the locations were dry. The alternate surface water location SW-17 was also dry and was not sampled. Additionally one monitoring well, MW-111C, was unable to be sampled because this depth interval in the Water FLUTe™ system was clogged with sediment. Therefore, water quality data were collected from five surface water and 37 monitoring well locations.

4.1 GROUNDWATER ELEVATIONS

The Beaumont National Weather Service station reported approximately 0.30 inches of precipitation during Third Quarter 2012, and approximately 3.62 inches of precipitation during Fourth Quarter 2012. During this same period, groundwater elevations generally decreased approximately 2.54 feet across the site.

Groundwater elevations during the Third Quarter 2012 and Fourth Quarter 2012 monitoring events ranged from approximately 2,155 feet mean sea level (msl) upgradient of the former Burn Pit Area to approximately 1,789 feet msl in the Massacre Canyon Entrance Area.

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 in the Northern Potrero Creek Area and the Massacre Canyon Entrance Area appear to respond most quickly to precipitation compared to the former Burn Pit Area and Rocket Motor Production Area, which generally show a one-season lag before responding to seasonal precipitation. However, wells near Bedsprings Creek just south of the Burn Pit Area also show rapid responses to precipitation due to surface water infiltration and mountain front recharge. The response also diminishes in each area with depth and distance from the Potrero and Bedsprings creeks. The site has experienced overall groundwater level declines since 2005.

4.2 SURFACE WATER FLOW

During the Third Quarter 2012 and Fourth Quarter 2012, Tetra Tech personnel walked the Potrero and Bedsprings creek riparian corridors to determine the presence, nature, and quantity of surface water in 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 *United States Environmental Protection Agency Volunteer Stream Monitoring: A Methods Manual* (USEPA, 1997).

Four fixed stream locations were previously chosen for stream flow measurements: SF-1, which is near Gilman Hot Springs at the southwest border of the site; SF-2, which is near MW-67; SF-3, which is near MW-15 and MW-18; and SF-4, which is near MW-101.

During Third Quarter 2012 and Fourth Quarter 2012 the four stream flow measurement locations, (SF-1 through SF-4), were dry at the time of measurement.

4.3 GROUNDWATER FLOW AND GRADIENTS

Groundwater flow directions from Third Quarter 2012 and Fourth Quarter 2012 were similar to previously observed patterns for a dry period. Generally, groundwater flows northwest from the southeastern limits of the valley (near the former Burn Pit Area) beneath the former Rocket Motor Production Area, toward Potrero Creek where groundwater flow then changes direction and begins heading southwest, parallel to the flow of Potrero Creek, into Massacre Canyon.

Between June 2012 (Second Quarter 2012) and September 2012 (Third Quarter 2012), the overall groundwater gradient (approximating a flowline from MW-36, upgradient of the Burn Pit Area, through the Rocket Motor Production Area and Northern Potrero Creek Area to MW-18, in the Massacre Canyon Entrance Area) remained constant at 0.013 feet/foot. Between September 2012 (Third Quarter 2012) and December 2012 (Fourth Quarter 2012), the overall groundwater gradient through the same flow path remained constant at 0.013 feet/foot. In general the horizontal gradient was lowest between the Burn Pit Area and the Rocket Motor Production Area with a greatly increased flow through the Northern Potrero Creek Area and the Massacre Canyon Entrance Area. The flattening of the gradient in the Burn Pit Area and Rocket Motor Production Area appears to be attributable to the lithology, aquifer transmissivity, and aquifer thickness in these areas.

Vertical groundwater gradients between shallow and deeper monitoring well pairs are generally downward (negative) in the Burn Pit Area, Rocket Motor Production Area, and the Northern Potrero Creek Area, and upward (positive) in the Massacre Canyon Entrance Area. 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

Both groundwater and surface water are collected and sampled as part of the Groundwater Monitoring Program. The program has a quarterly/semiannual/annual/biennial sampling frequency. The annual and biennial events are larger major monitoring events, and the quarterly and semiannual events are smaller minor events. All new wells are sampled quarterly for one year. The semiannual wells are sampled second and fourth quarters of each year, the annual wells are sampled second quarter of each year, and the biennial wells are sampled second quarter of even-numbered years.

An evaluation of chemicals of potential concern is performed annually, and reported in the First and Second Quarter Semiannual Groundwater Monitoring Report. The chemicals of potential concern previously identified for the site during the 2011 evaluation, (Tetra Tech, 2011), are consistent with those identified in the 2012 evaluation (Tetra Tech, 2012c). The primary chemicals of potential concern identified for the site are perchlorate, 1,1-dichloroethene, trichloroethene, and 1,4-dioxane. The secondary chemicals of potential concern identified for the site are 1,1-dichloroethane, 1,2-dichloroethane, 1,1,1-trichloroethane, 1,1,2-trichloroethane, cis-1,2-dichloroethene, and vinyl chloride. The 2012 evaluation yielded no additions or deletions to the list of chemicals of potential concern. The results of surface and groundwater samples collected and tested during the Third and Fourth Quarter 2012 monitoring events are discussed below.

4.4.1 Surface Water

Surface water samples are collected semiannually during the second and fourth quarter sampling events, and during a storm event. Seventeen surface water sample locations and one alternate sample location have been identified for semiannual surface water sampling at the site. Sample locations have been chosen to include springs and manmade surface depressions fed by nearby springs, ephemeral ponds, and locations in the Bedsprings and Potrero creek drainages. Twelve locations in the active drainages and one ephemeral pond location have been identified for surface water sampling during a storm event. It is common for many of the locations to be dry at the time of sampling, due to the ongoing drought conditions and the ephemeral nature of the ponds and creeks.

During the Fourth Quarter 2012 sampling event, surface water samples were collected from five locations. The remaining 12 locations were dry at the time of sampling. Because surface water location SW-16 was dry, an attempt was made to collect a sample from the alternate location SW-17, but it was also dry and therefore not sampled. The sample results from the locations sampled are consistent with previous sample results obtained at the site.

The four primary chemicals of potential concern (1,4-dioxane, 1,1-dichloroethene, trichloroethene, and perchlorate) and four secondary chemicals of potential concern (1,1- dichloroethane, cis-1,2-dichloroethene, 1,1,1-trichloroethane, and vinyl chloride) were detected in surface water samples collected from locations SW-02, SW-03, and SW-04. These samples were collected from springs or surface depressions, in an area of discharging groundwater, located outside of the stream beds but near the intersection of Bedsprings and Potrero creeks, downgradient from the Rocket Motor Production Area.

Surface water sample locations SW-09 and SW-18 are in areas of flowing water in Potrero Creek, topographically downgradient of the springs and surface depressions discussed in the previous paragraph. 1,4-Dioxane was detected at concentrations exceeding the drinking water notification level (1 microgram per liter [µg/L]) in the surface water samples collected from these locations. No other chemicals of potential concern were detected in these locations during Fourth Quarter 2012.

The analyte 1,4-dioxane was detected above the drinking water notification level in all surface water samples collected during the Fourth Quarter 2012 sampling event. Additionally, perchlorate, 1,1-dichloroethene, and trichloroethene were detected above their respective maximum contaminant levels in the surface water sample collected from SW-02. Sample results for the surface water samples collected during Fourth Quarter 2012 are consistent with results from previous sampling events.

In general, the concentrations of chemicals of potential concern in surface water are highest in the area of the surface depressions, an area of discharging groundwater; the concentrations decrease rapidly to at or near the method detection limit, as one moves downgradient through the riparian zone toward the property boundary. The concentration gradient of 1,4-dioxane in surface water samples, however, is much smaller and appears to be less affected by movement through the riparian zone, since it is not biodegraded like the other chemicals of potential concern.

4.4.2 Groundwater

Groundwater monitoring wells were sampled during the third and fourth quarters. The third quarter event included the quarterly sampling of newly installed wells. The fourth quarter event included the quarterly sampling of newly installed wells and the semiannual sampling of increasing contaminant trend wells, guard wells, and contaminant attenuation wells (Tetra Tech, 2003b).

New Wells

Monitoring wells MW-110, MW-111A through MW-111E, and MW-112A through MW-112C were installed as part of the hydraulic testing in 2011 (Tetra Tech, 2012a) to help characterize the Mount Eden sandstone and contaminant concentrations with depth, and to provide additional hydraulic data to support the evaluation of remedial alternatives at the site. MW-110 was installed with a 2-inch diameter single completion pre-pack well across a zone of flowing sands. MW-111A through MW-111E, and MW-112A through MW-112C were installed with Water FLUTe™ multilevel monitoring systems. The results from MW-111A through MW-111E, and MW-112A through MW-112C are not considered representative at this time, due to (1) the extremely low permeability in the Burn Pit Area, and (2) the fact that wells with Water FLUTe™ system installed cannot be developed following traditional well development procedures.

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 upstream of the Large Motor Washout Area (Feature F-33). All guard wells are located along Potrero Creek, downgradient of the source areas (Burn Pit Area and Rocket Motor Production Area). Well MW-18 is completed near the top of the alluvial aquifer and MW-15 is completed near the bottom of the alluvial aquifer. These wells are approximately three miles from the southern site boundary and are upgradient of the secondary sources identified at F-33, F-34, and F-39. Well MW-67, is the farthest downgradient site well and is approximately 0.9 miles upgradient of the southern site boundary. MW-100, an off-site well, is approximately 500 feet south of the southern site boundary near the mouth of Potrero Creek. Both MW-67 and MW-100 are located below the secondary sources identified at F-33, F-34, and F-39. The analyte 1,4-dioxane was detected in monitoring wells MW-15, MW-18, MW-67, and MW-100 at concentrations of 6.2 µg/L, 4.5 µg/L, 0.92 µg/L, and 0.23 µg/L, respectively. The analyte 1,4-dioxane was the only chemical of potential concern to be detected above the California Department of Public Health maximum contaminant level or drinking water notification level in these guard wells during the Fourth Quarter 2012 sampling event. The drinking water notification level for 1,4-dioxane is 1 µg/L. Sample results for the guard wells from Fourth Quarter 2012 are consistent with results from previous sampling events.

Increasing Trend Monitoring Wells

The number of increasing or probably increasing trend wells decreased from 24 wells in 2010 to 21 wells in the 2011 temporal trend analyses. The temporal trend analyses have been performed using data from Second Quarter 2002 to Second Quarter 2012. This period was chosen because operation of the Rocket Motor Production Area groundwater pump and treat system was discontinued in 2002. The 2011 temporal trend analysis updates the analysis performed following completion of the Second Quarter 2010 monitoring event (Tetra Tech, 2011). The temporal trends were analyzed using Mann-Kendall and linear regression methods. A summary of the trend analysis results for the 21 increasing or probably increasing trend locations is presented in Table 4-1. The percent change that these increases represent with respect to the mean of the data used to calculate each trend is also presented in Table 4-1. Twelve of the wells had trend magnitudes with less than a 20% change. Based on the magnitude of the trend (greater than a 20% change with respect to the mean) and the wells' location, nine increasing trend wells were included in Fourth Quarter 2012 semiannual sampling event. These locations are shaded in Table 4-1.

During this time period, the number of locations identified as having either a decreasing or probably decreasing trend has increased, and the number of wells identified as having no trend has decreased. Due to the new non-detect designation, several locations that were previously identified as having a stable trend have been reclassified, thus reducing the number of wells identified as having a stable trend.

In general, the plume morphology has remained stable with only slight modifications due to new wells better defining the lateral extent of the plume. The majority of the wells and the surface water locations display a stable trend, no trend, or are non-detect.

Possible reasons for the change in the number of increasing trend wells are: (1) the number of new wells that have been installed in the last several years (60 new wells since 2006); (2) longer monitoring histories at the individual locations, trends become more noticeable due to the ability to better define outliers; and (3) as time passes, changes created by operation of the former extraction system are dissipating.

In general, the chemicals of potential concern concentrations in the sampled increasing trend wells are consistent with previous results. These wells will continue to be sampled on a semiannual basis until the magnitude of the trend is less than a 20% change, or until the well is reclassified in the annual temporal trend analysis.

Table 4-1 Summary of Increasing Chemicals of Potential Concern Trends

Analyte:	Perchlorate			1,1-Dichloroethene			Trichloroethene			1,4-Dioxane		
Sample Location	Trend	Magnitude (%/yr)	Magnitude (µg/L/yr)	Trend	Magnitude (%/yr)	Magnitude (µg/L/yr)	Trend	Magnitude (%/yr)	Magnitude (µg/L/yr)	Trend	Magnitude (%/yr)	Magnitude (µg/L/yr)
Burn Pit Area												
MW-07	No Trend			No Trend			No Trend			Increasing	6.6	0.04
MW-26	Decreasing	-2.2	-166.44	Probably Increasing	2.6	94.54	No Trend			Increasing	2.9	12.26
MW-60A	Increasing	23.7	1115.08	Increasing	4.9	17.74	Increasing	6.0	13.25	Increasing	4.9	5.42
MW-60B	Decreasing	-4.0	-56.21	Stable			Probably Increasing	1.5	0.18	Increasing	25.6	1.33
MW-61B	Stable			No Trend			No Trend			Increasing	2.7	12.59
MW-61C	No Trend			Increasing	13.0	12.96	Increasing	11.3	2.49	Increasing	4.9	0.29
MW-71B	No Trend			Probably Increasing	15.3	0.04	No Trend			Non-detect		
Rocket Motor Production Area												
IW-04	Decreasing	-67.5	-108.04	Increasing	21.9	3.29	Increasing	12.8	1.66	Stable		
MW-05	Decreasing	-5.1	-112.42	Stable			Probably Increasing	6.6	5.78	No Trend		
MW-09	Non-detect			Non-detect			Non-detect			Probably Increasing	2.6	0.13
MW-19	Stable			Probably Increasing	1.2	0.33	No Trend			Stable		
MW-28	No Trend			Probably Increasing	7.7	1.38	No Trend			No Trend		
MW-68	Increasing	21.9	1489.20	Increasing	29.2	2.83	No Trend			Increasing	34.7	3.22
MW-88	Probably Increasing	56.6	735.48	Stable			No Trend			No Trend		
MW-91	Probably Increasing	12.2	256.78	No Trend			No Trend			Increasing	15.3	0.25
MW-98B	No Trend			Increasing	20.1	2.61	Increasing	16.1	3.69	No Trend		
Northern Potrero Creek Area												
MW-76A	Non-detect			Non-detect			Non-detect			Increasing	18.1	0.38
MW-103	Increasing	346.8	221.92	Not Available			Not Available			Stable		
Massacre Canyon Entrance Area												
F34-TW1	No Trend			No Trend			No Trend			Increasing	23.7	1.16
MW-70	No Trend			Decreasing	-27.4	-0.07	Decreasing	-13.3	-0.02	Probably Increasing	5.3	0.15
MW-93	Probably Increasing	45.6	1.92	Stable			Stable			Stable		
SW-07	Stable			Non-detect			Non-detect			Increasing	4.6	0.04

Notes:

Shading indicates that based on the magnitude of the trend and the well location, the well was included in the Fourth Quarter 2012 sampling event.

µg/L/yr - Micrograms per liter per year   %/yr - Percent change per year

4.5 CONTAMINANT ATTENUATION SAMPLING

A site-wide contaminant attenuation evaluation was completed in the Spring of 2012 (Tetra Tech, 2012b). The evaluation concluded that approximately 95% of the contaminant flux was being attenuated, and that contaminant attenuation was going to be an important component of any remedial strategy implemented at this site. The attenuation is primarily occurring in the riparian corridor located at the confluence of Bedsprings and Potrero creeks, with approximately 22% of the attenuation being due to evapotranspiration and 72% being due to biodegradation. The contaminant attenuation evaluation recommended the routine monitoring of degradation progress and aquifer redox conditions in up to 22 monitoring wells. With the exception of a few minor differences, the redox conditions observed in 2012 are consistent with the conditions observed in 2011 and documented in the contaminant attenuation evaluation finalized in 2012. The redox conditions and the contaminant trends observed indicate that conditions are essentially unchanged from the 2011 baseline, and that contaminant attenuation is continuing to occur.

4.6 PROPOSED CHANGES TO THE GROUNDWATER MONITORING PROGRAM

4.6.1 Groundwater Sampling Frequency

The sampling frequency of a monitoring well is based on the well's classification (i.e., its function) (Tetra Tech, 2003b). Groundwater monitoring well classifications are based on the evaluation of the temporal trends, spatial distribution, and other qualitative criteria. There are seven different well classifications. Currently no wells are designated as remedial monitoring wells, because remedial actions are not yet in place. A summary of the sampling frequency by well classification is presented in Table 4-2.

Table 4-2 Well Classification and Sampling Frequency

Classification	Sampling Frequency
Horizontal Extent (Plume) Wells	Annual
Vertical Distribution Wells	Biennial
Increasing Trend Wells	Semiannual
Remedial Monitoring Wells	Semiannual
Guard Wells	Semiannual
Redundant Wells	Suspend
New Wells	Quarterly

4.6.2 Proposed Changes

The analytical scheme is evaluated annually during the second quarter of each year, and changes may be proposed then to accommodate expanded site knowledge or changing site conditions. The classification of the wells in the network and their corresponding sampling frequency are also evaluated annually during the second quarter of each year, and are modified as needed. No unusual events or observations occurred during this reporting period that require consideration of modifying the monitoring program.

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