Semiannual Groundwater Monitoring Report
Third Quarter and Fourth Quarter 2011
Potrero Canyon Unit (Lockheed Martin Beaumont Site 1)
Beaumont, California

Prepared for:

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Semiannual Groundwater Monitoring Report Third Quarter and Fourth Quarter 2011 Potrero Canyon Unit (Lockheed Martin Beaumont Site 1) Beaumont, California

Prepared for:

Lockheed Martin Corporation

Prepared by:

Tetra Tech, Inc.

April 2012

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ACRONYMS

BPA	burn pit area
BTOC	below top of casing
cfs	cubic feet per second
COPC	chemical of potential concern
CSM	conceptual site model
1,1-DCA	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
1,1 -DCE	1,1-dichloroethene
cis-1,2-DCE	cis-1,2-dichloroethene
DG	downgradient
DO	dissolved oxygen
DWNL	California Department of Public Health drinking water notification level
EC	electrical conductivity
EPA	United States Environmental Protection Agency
ft/ft	feet per foot
GMP	Groundwater Monitoring Program
GPS	global positioning system
HCP	Habitat Conservation Plan
IUOE	International Union of Operating Engineers
LCS	laboratory control samples
LMC	Lockheed Martin Corporation
LPC	Lockheed Propulsion Company

MCL	maximum contaminant level
MCEA	Massacre Canyon Entrance Area
MDLs	method detection limits
MEF	Mount Eden formation
mg/L	milligrams per liter
µg/L	micrograms per liter
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
MTBE	methyl tert-butyl ether
MWD	Metropolitan Water District
mV	millivolts
NA	not analyzed/not applicable/not available
ND	Non-detect
NPCA	Northern Potrero Creek Area
NTUs	nephelometric turbidity units
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.
Report	Semiannual Groundwater Monitoring Report
RMPA	Rocket Motor Production Area

RPD	relative percent difference
Site	Potrero Canyon Unit (Lockheed Martin Beaumont Site 1)
1,1,1-TCA	1,1,1-trichloroethane
1,1,2-TCA	1,1,2-trichloroethane
Tetra Tech	Tetra Tech, Inc.
TCE	trichloroethene
TNT	2,4,6-trinitrotoluene
UG	upgradient
USFWS	United States Fish and Wildlife Service
VOCs	volatile organic compounds

SECTION 1 INTRODUCTION

This Semiannual Groundwater Monitoring Report (Report) has been prepared by Tetra Tech, Inc. (Tetra Tech), on behalf of Lockheed Martin Corporation (LMC), and presents the results of the Third Quarter 2011 (1 July 2011 through 30 September 2011) and Fourth Quarter 2011 (1 October 2011 through 31 December 2011) water quality monitoring activities of the Potrero Canyon Unit (Lockheed Martin Beaumont Site 1) (Site) Groundwater Monitoring Program (GMP). The Site is located within the Beaumont City limits in an undeveloped area south of the City of Beaumont, Riverside County, California (Figure 1-1). Currently, the Site is inactive with the exception of environmental investigations performed under Consent Order 88/89-034 and Operation and Maintenance Agreement 93/94-025 with the 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, was retained by LMC (Figure 1-2).

The GMP 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 procedures and results, and
- Analyze and evaluate the groundwater elevation and water quality monitoring data generated.

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

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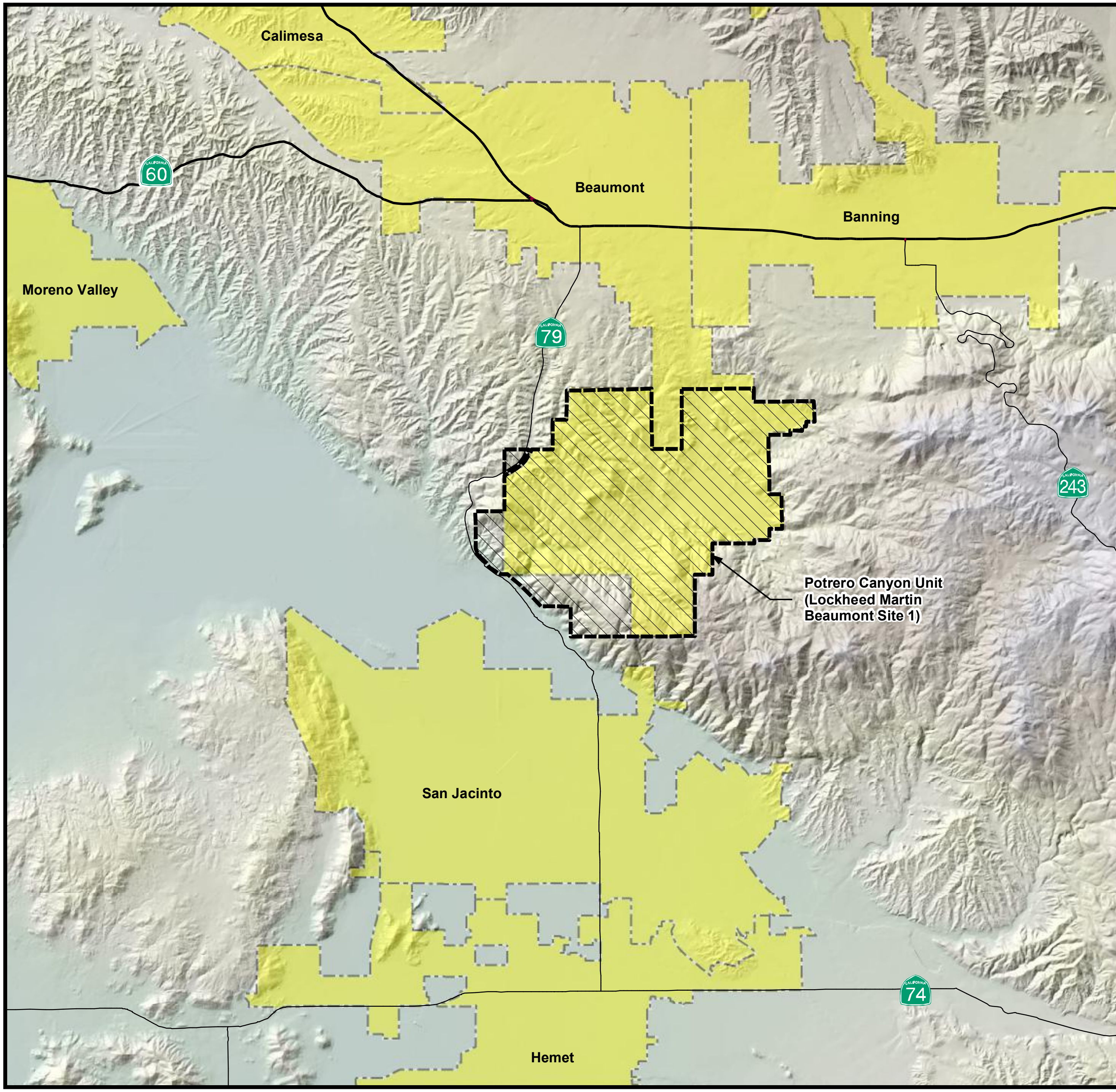

N

0 2 Miles

Adapted from:

U.S. Census Bureau TIGER line data, 2000.

LEGEND

- Interstate/Freeway
- State Highway
- County Boundary
- Potrero Canyon Unit Property Boundary
- City/Municipality

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 1-1

Regional Location of Beaumont Site 1

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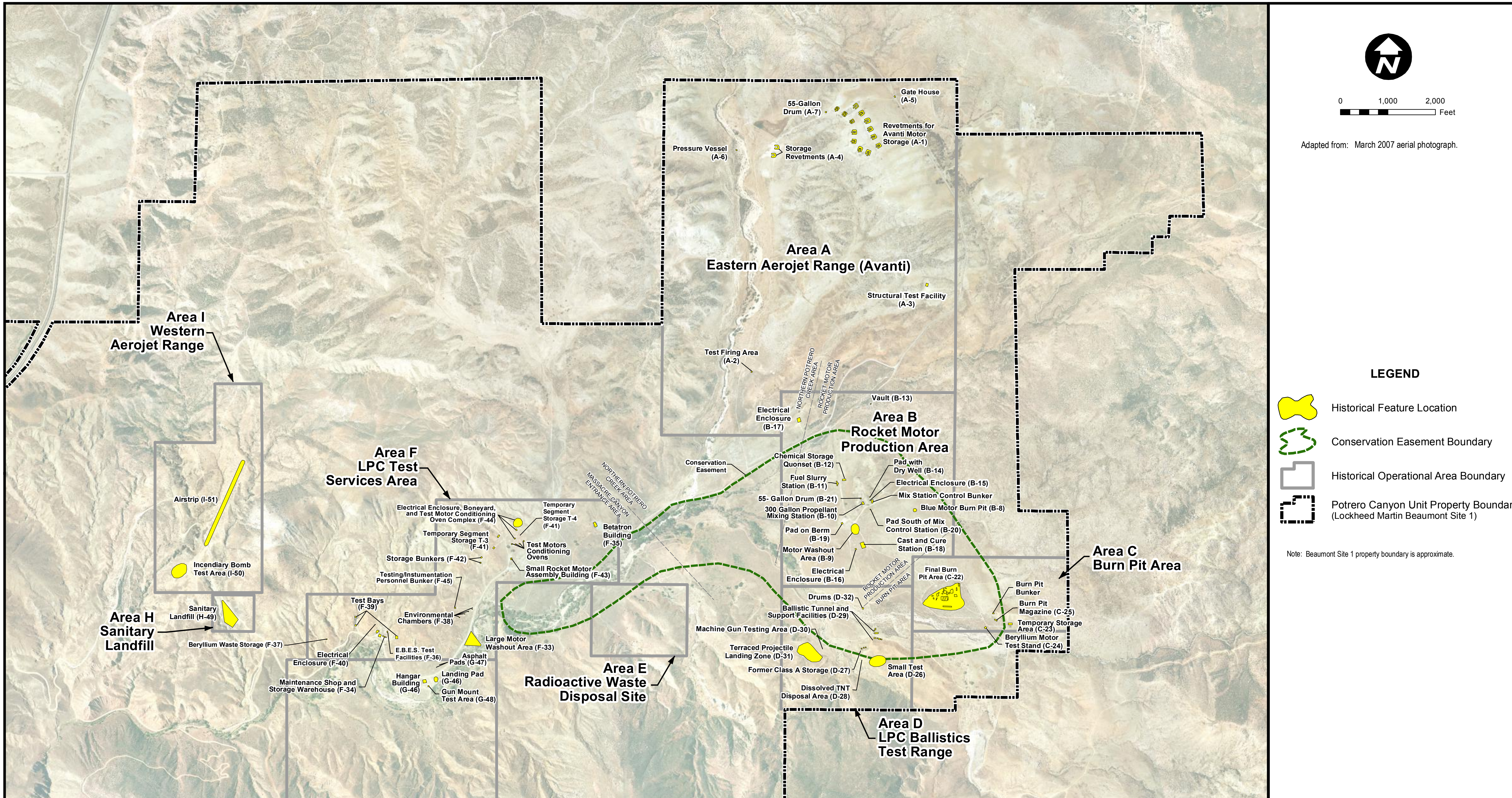

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

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

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1.1 SITE BACKGROUND

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

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

Historical Operational Area A – Eastern Aerojet Range

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

Historical Operational Area B – Rocket Motor Production Area

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

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

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

Historical Operational Area C – Burn Pit Area

The BPA consisted of three primary features: 1) the chemical storage area, 2) burn pits, and 3) the beryllium test stand. Hazardous 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 – LPC Ballistics Test Range

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

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

Historical Operational Area E – Radioactive Waste Disposal Site

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

Historical Operational Area F – LPC Test Services Area

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

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

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

Historical Operational Area G – Helicopter Weapons Test Area

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

Historical Operational Area H – Sanitary Landfill

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

Historical Operational Area I – Western Aerojet Range

Between 1970 and 1972, Aerojet leased an area (referred to as the Western Aerojet Range) along the western portion of the Site. LPC conducted an incendiary test with a 500-pound bomb at the southwest end of the Western Aerojet Range. This test was reportedly similar to testing performed at the LPC Ballistics Test Area. According to 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 Munitions and Explosives of Concern investigations performed in 2006 (Tetra Tech, 2007), it was discovered that inert 27.5-millimeter projectiles were tested in this area.

Post LPC and Aerojet Facility Usage

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

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

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

SECTION 2 SUMMARY OF MONITORING ACTIVITIES

Section 2 summarizes the Third Quarter 2011 and Fourth Quarter 2011 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 179 wells for Third Quarter 2011. Prior to Fourth Quarter 2011 water level measurements, one extraction well and one piezometer were installed at the BPA for a constant-rate aquifer test, so during Fourth Quarter 2011, water level measurements were proposed for 181 monitoring wells. The Third Quarter 2011 groundwater level measurements were collected between August 17 and August 19, 2011. The Fourth Quarter 2011 groundwater level measurements were collected between November 30 and December 5, 2011. Copies of field data sheets from the water quality monitoring events are presented in Appendix B. A summary of well construction details is presented in Appendix C.

In order to correlate observed changes in groundwater levels with local precipitation, precipitation data is collected from the local weather station in Beaumont. During Third Quarter 2011, the Beaumont National Weather Service (NWS) station reported approximately 0.27 inches of precipitation. During Fourth Quarter 2011, the Beaumont NWS reported approximately 3.73 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 located southwest of the former RMPA and former BPA. In general, creeks are dry except during and immediately after periods of rainfall. However, springs and seeps occur in and adjacent to Potrero Creek in the western portion of the Site. Surface water flow is not continuous through most of Potrero Valley. In Massacre Canyon, while perennial surface water flow is present, during dryer periods surface water flow becomes limited to two reaches, 50 to 100 feet in length, along the western portion of the Northern Potrero Creek Area (NPCA). The areas within Potrero and Bedsprings Creek where surface water was present were mapped during the Third Quarter 2011 and Fourth Quarter 2011 groundwater monitoring events. The four previously identified fixed locations were checked for flowing water and, if present, the flow rate and volume were determined through field observation and measurements.

2.3 GROUNDWATER AND SURFACE WATER SAMPLING

The frequency of groundwater monitoring is dependent on the well's classification within the network and intended monitoring purpose. Groundwater is sampled as frequently as quarterly and surface water samples are collected semiannually. The Third Quarter 2011 monitoring event consisted of water level monitoring and the quarterly sampling of newly installed wells. The Fourth Quarter 2011 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 and guard wells. Additionally, non-routine sampling was conducted in the BPA as part of the hydraulic testing study. Tables 2-1 through 2-3 list the locations sampled during the Third Quarter 2011 and Fourth Quarter 2011 monitoring events respectively. The tables summarize analytical methods, sampling dates, quality assurance/quality control (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).

Because of the ephemeral nature of the streams on the Site, certain locations are generally sampled only during or shortly after periods of precipitation. Sampling, analytical, and QA/QC procedures for the monitoring events are described in the Beaumont Sites 1 and 2, Programmatic Sampling and Analysis Plan (Tetra Tech, 2010a).

Table 2-1 Sampling Schedule - Third Quarter 2011

Sample Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	Comments and QA/QC Samples
MW-103	08/22/11	X	X	X	Sampled with Peristaltic Pump
MW-104	08/22/11	X	X	X	Sampled with Peristaltic Pump
MW-105	08/25/11	X	X	X	Sampled with Peristaltic Pump
MW-106	08/25/11	X	X	X	Sampled with Peristaltic Pump, Duplicate
MW-107	08/25/11	X	X	X	Sampled with Peristaltic Pump, MS/MSD
MW-108	08/22/11	X	X	X	Sampled with Peristaltic Pump
MW-109	08/22/11	X	X	X	Sampled with Peristaltic Pump
Total Sample Locations:		7			
Total Samples Collected:		7			

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 – Hydraulic Testing Study

Sample Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	Comments and QA/QC Samples
EW-08	08/29/11	X	X	X	Sampled with Portable Bladder Pump, Duplicate, MS/MSD
EW-09	08/29/11	X	X	X	Sampled with Portable Bladder Pump
EW-10	08/30/11	X	X	X	Sampled with Portable Bladder Pump
EW-11	08/31/11	X	X	X	Sampled with Portable Bladder Pump
EW-12	08/31/11	X	X	X	Sampled with Portable Bladder Pump
EW-14	08/30/11	X	X	X	Sampled with Portable Bladder Pump
EW-17	08/30/11	X	X	X	Sampled with Portable Bladder Pump
MW-61D	08/31/11	X	X	X	Sampled with Portable Bladder Pump
Total Sample Locations:		8			
Total Samples Collected:		8			

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 2-3 Sampling Schedule - Fourth Quarter 2011

Sample Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Per chlorate (3)	Comments and QA/QC Samples
SW-01	NA	-	-	-	Surface Water - Dry no sample collected
SW-02	12/06/11	X	X	X	Surface Water
SW-03	12/06/11	X	X	X	Surface Water
SW-04	12/06/11	X	X	X	Surface Water, Duplicate Sample SW-04-Dup
SW-06	12/07/11	X	X	X	Surface Water
SW-07	12/07/11	X	X	X	Surface Water
SW-08	NA	-	-	-	Surface Water Sample - Dry no sample collected
SW-09	12/06/11	X	X	X	Surface Water
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	12/07/11	X	X	X	Surface Water
SW-17	NA	-	-	-	Sample only if SW-16 is dry.
SW-18	12/06/11	X	X	X	Surface Water, MS/MSD Sample
SW-19	12/07/11	X	X	X	Surface Water
F34-TW1	12/08/11	X	X	X	Sampled with Peristaltic Pump
IW-04	12/08/11	X	X	X	Sampled with Dedicated Pump
MW-15	12/09/11	X	X	X	Sampled with Dedicated Pump
MW-18	12/09/11	X	X	X	Sampled with Dedicated Pump
MW-60A	12/12/11	X	X	X	Sampled with Dedicated Pump
MW-60B	12/12/11	X	X	X	Sampled with Dedicated Pump
MW-67	12/08/11	X	X	X	Sampled with Dedicated Pump, MS/MSD Sample
MW-68	12/12/11	X	X	X	Sampled with Dedicated Pump
MW-70	12/09/11	X	X	X	Sampled with Dedicated Pump
MW-88	12/12/11	X	X	X	Sampled with Dedicated Pump
MW-93	12/12/11	X	X	X	Sampled with Dedicated Pump
MW-98B	12/09/11	X	X	X	Sampled with Dedicated Pump
MW-100	12/12/11	X	X	X	Sampled with Dedicated Pump
MW-103	12/07/11	X	X	X	Sampled with Peristaltic Pump, Duplicate sample MW-103-Dup
MW-104	12/07/11	X	X	X	Sampled with Peristaltic Pump
MW-105	12/08/11	X	X	X	Sampled with Peristaltic Pump
MW-106	12/08/11	X	X	X	Sampled with Peristaltic Pump, Duplicate sample MW-106-Dup
MW-107	12/07/11	X	X	X	Sampled with Peristaltic Pump
MW-108	12/07/11	X	X	X	Sampled with Peristaltic Pump
MW-109	12/07/11	X	X	X	Sampled with Peristaltic Pump

Total Sample Locations: 38

Total Samples Collected: 29

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

NA - Not analyzed

MS/MSD - Matrix Spike/Matrix Spike Duplicate

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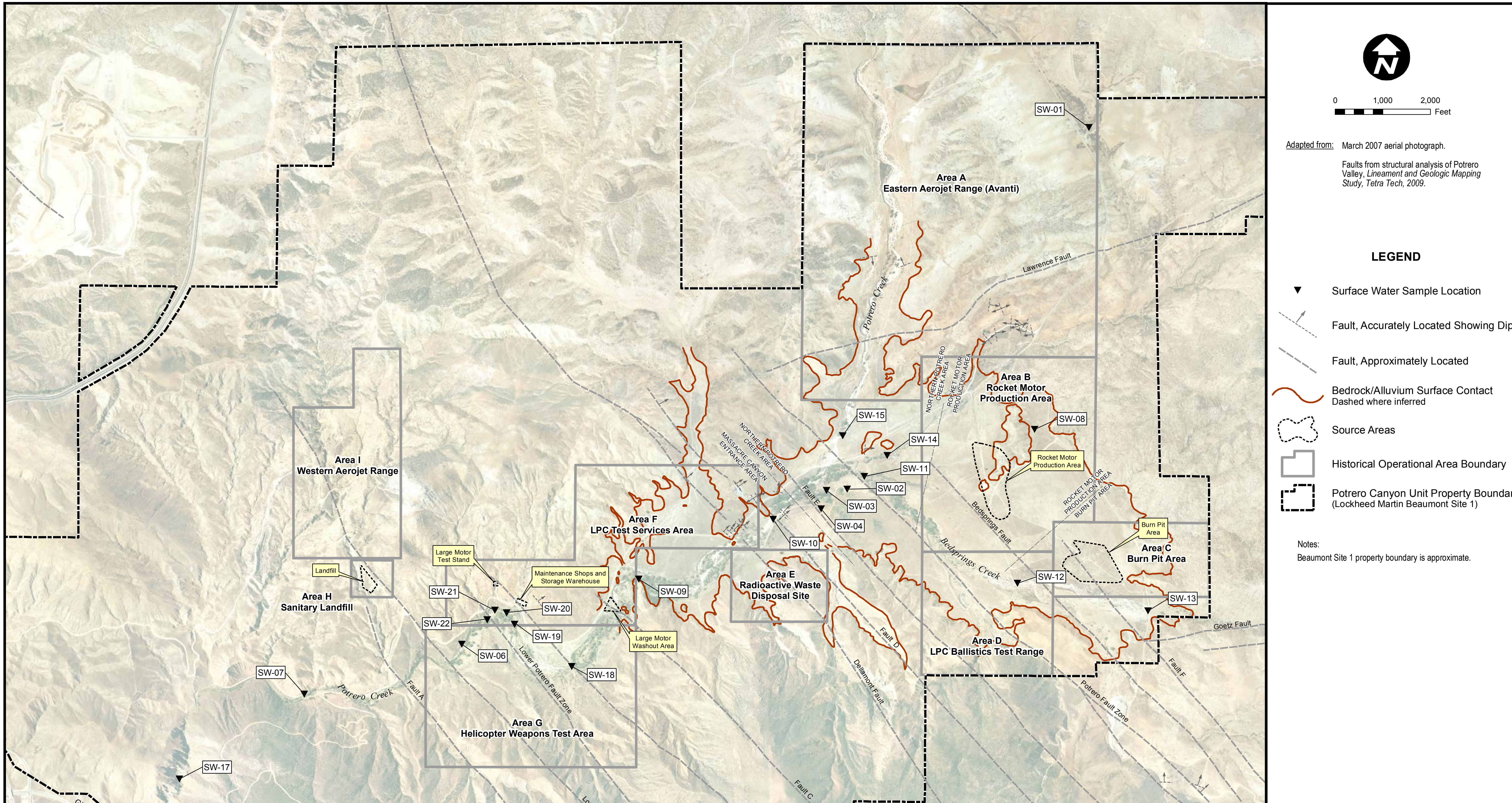

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 2-1

Surface Water Sample Locations

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2.3.1 Proposed and Actual Surface Water and Well Locations Sampled

For the Third Quarter 2011 monitoring event, a total of seven monitoring wells were proposed and sampled for water quality monitoring. Eight additional wells were sampled as part of the hydraulic testing study. Therefore, water quality data was collected from 15 monitoring well locations. Figure 2-2 presents groundwater locations sampled for the Third Quarter 2011 monitoring event.

For the Fourth Quarter 2011 monitoring event, a total of 38 sampling locations (17 surface water, one alternate surface water location, and 20 monitoring wells) were proposed for water quality monitoring. Eight surface water sample locations were not sampled because the locations were dry. Because SW-16 was sampled, SW-17, an alternate surface water location sampled when SW-16 is dry, was not sampled. Therefore, water quality data was collected from nine surface water and 20 monitoring well locations during this event. Figure 2-3 presents groundwater and surface water locations sampled for the Fourth Quarter 2011 monitoring event.

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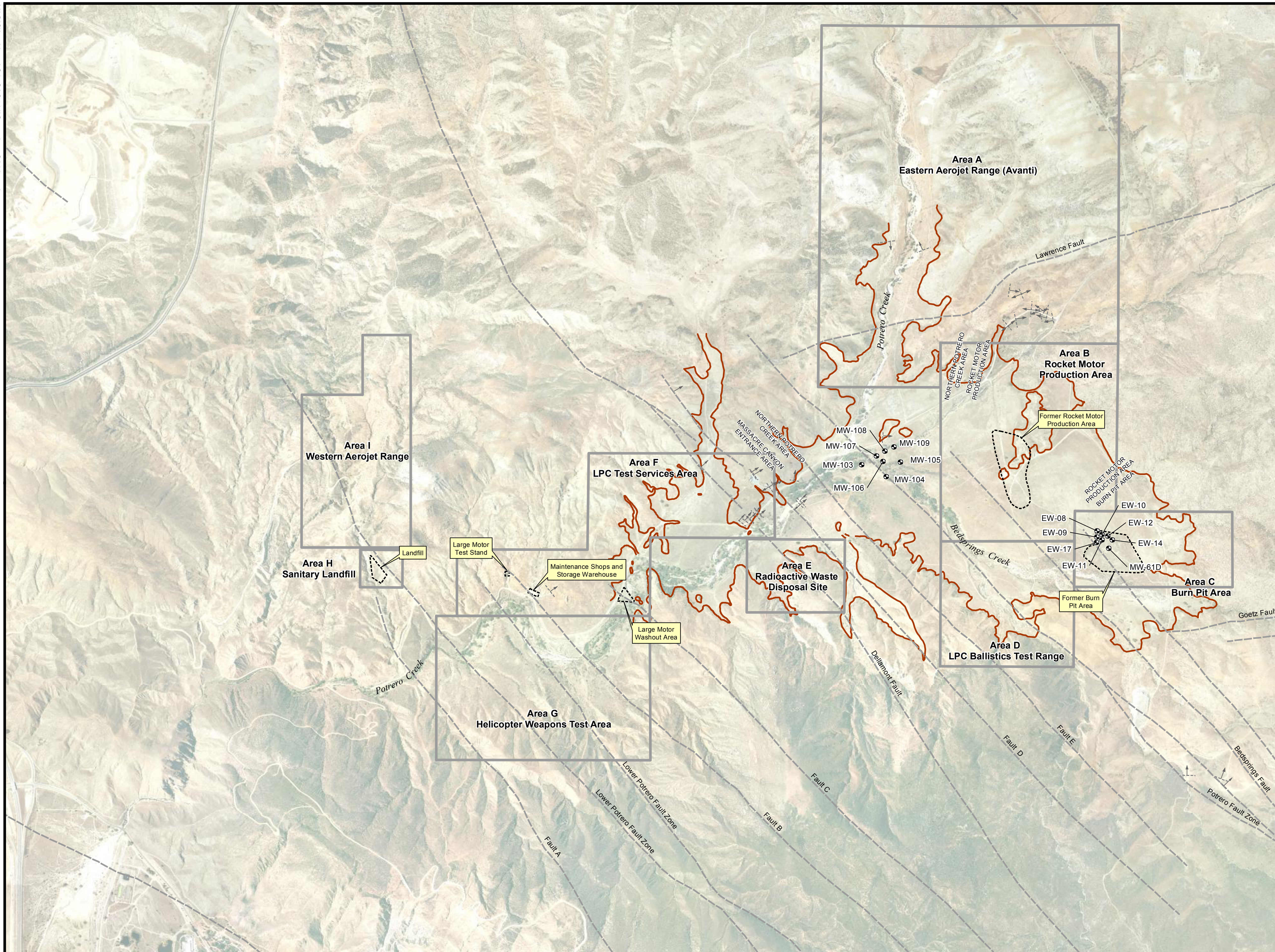

0 1,000 2,000
Feet

Adapted from: March 2007 aerial photograph.

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

LEGEND

- Sampled Well (Third Quarter 2011)
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact
  Dashed where inferred
- Source Areas
- Potrero Canyon Unit Property Boundary (Lockheed Martin Beaumont Site 1)
- Historical Operational Area Boundary

Note:

Beaumont Site 1 property boundary is approximate.

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 2-2

Sample Locations
Third Quarter 2011

TETRA TECH

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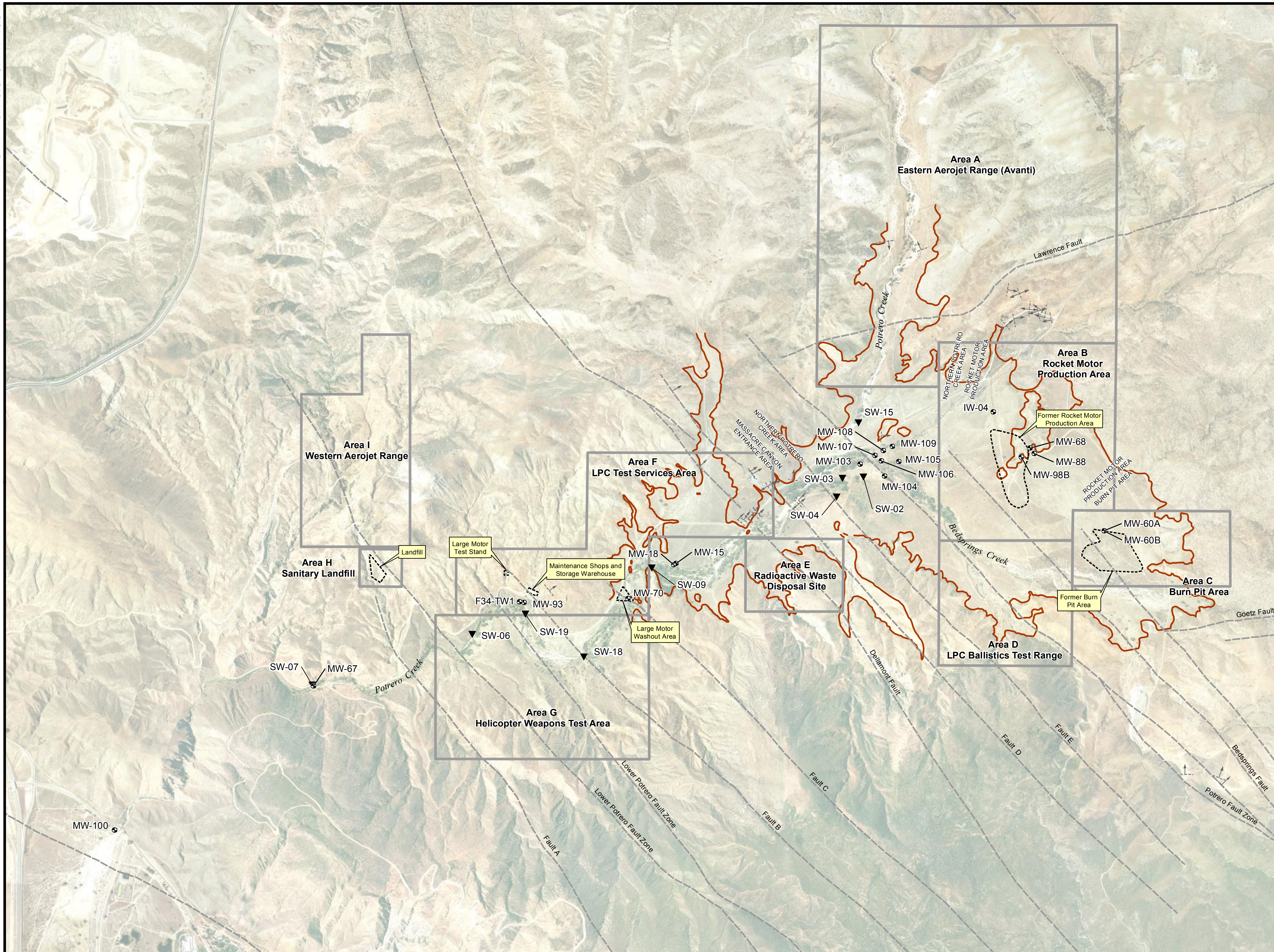

N

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

- Sampled Well (Fourth Quarter 2011)
- Surface Water Sample Location (Fourth Quarter 2011)
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact — Dashed where inferred
- Source Areas
- Potrero Canyon Unit Property Boundary (Lockheed Martin Beaumont Site 1)
- Historical Operational Area Boundary

Note:

Beaumont Site 1 property boundary is approximate.

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 2-3
Sample Locations Fourth Quarter 2011

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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 activities: water level, temperature, pH, electrical conductivity (EC), turbidity, oxidation-reduction potential (ORP), and dissolved oxygen (DO). Groundwater samples were collected from monitoring wells by low-flow purging and sampling through dedicated double-valve pumps, a portable bladder pump, or a peristaltic pump.

Collection of water quality parameters was initiated when at least one discharge hose/pump volume had been removed, and purging was considered complete when the above parameters had stabilized or the well was purged dry (evacuated). Stabilization of water quality parameters 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 foot, EC ± 3 percent, turbidity < 10 nephelometric turbidity units (NTUs) (if > 10 NTUs ± 10%), DO ± 0.3 milligrams per liter (mg/L), and ORP ± 10 millivolts (mV). Sampling instruments and equipment were maintained, calibrated, and operated in accordance with the 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 sample container and sample custody was maintained by chain-of-custody record. Groundwater samples collected were chilled and transported to a state accredited analytical laboratory, via courier, thus maintaining proper temperatures and sample integrity. Trip blanks 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 satellite (GPS) system and marked in the field. Surface water samples were collected at previously GPS-mapped locations either using a disposable bailer with the sample transferred to the laboratory supplied water sample containers, or the water sample was collected directly in the laboratory supplied water sample containers. Temperature, pH, EC, turbidity, ORP, and DO were measured and recorded on field data sheets at surface water sampling locations.

2.4 ANALYTICAL DATA QA/QC

The samples were tested using approved United States Environmental Protection Agency (EPA) methods. Since the analytical data was obtained by following EPA approved method criteria, the data was evaluated by using the EPA approved validation methods described in the National Functional Guidelines (EPA, 2008 and EPA, 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

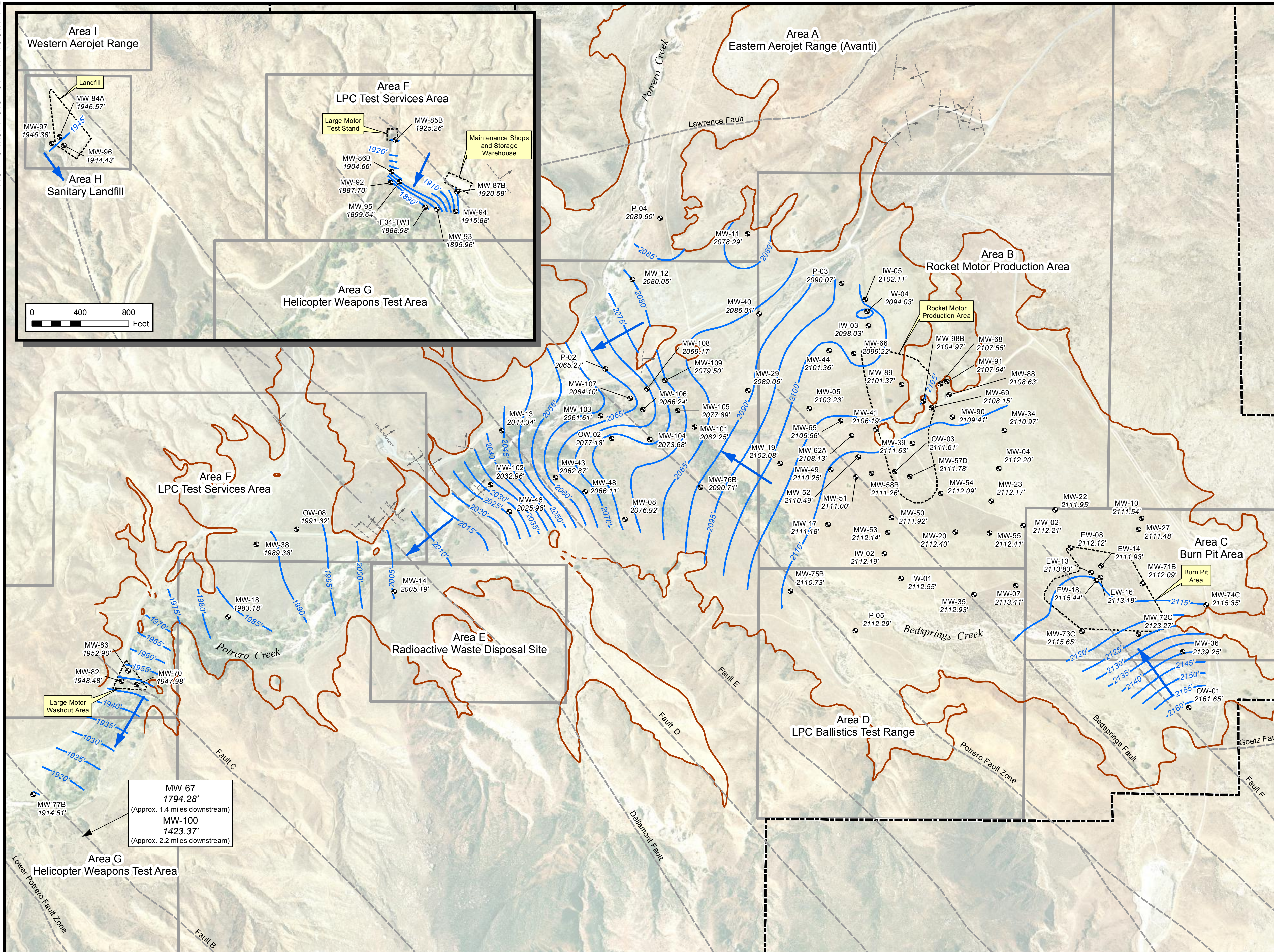
All monitoring activities were performed in accordance with the U.S. Fish and Wildlife Service approved Habitat Conservation Plan (HCP) (USFWS, 2005) and subsequent clarifications (LMC, 2006a, 2006b, and 2006c) of the HCP. Groundwater sampling activities were conducted with light duty vehicles and were supervised by a United States Fish and Wildlife Service (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 2011 and Fourth Quarter 2011 groundwater monitoring events. The following subsections include tabulated summaries of groundwater elevation and water quality data, contour maps, and primary chemicals of potential concern (COPC) results. Plots of groundwater elevation versus time (hydrographs) and concentration versus time (time series graphs) for primary and secondary COPCs are presented in Appendices D and E, respectively.

3.1 GROUNDWATER ELEVATION

Groundwater elevations during the Third Quarter 2011 and Fourth Quarter 2011 monitoring events ranged from approximately 2,158 feet mean sea level (msl) upgradient of the former BPA to approximately 1,794 feet msl in the Massacre Canyon Entrance Area (MCEA). A total of 179 monitoring wells were identified for groundwater level measurements for the Third Quarter 2011 monitoring event and 181 monitoring wells were identified for groundwater level measurements during Fourth Quarter 2011. For the Third Quarter 2011 and Fourth Quarter 2011 monitoring events, four wells were dry (OW-05, OW-06, OW-07, 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 continue to be included in the monitoring well network. However, if water level measurements cannot be collected from either of these wells, several monitoring wells are located in close proximity to these former extraction wells which can be utilized for contouring and temporal trends in their absence. Water level elevations will continue to be monitored from these two former extraction wells and recorded 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 2011 and Fourth Quarter 2011 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 2011 and Fourth Quarter 2011 monitoring events is presented in Table 3-1. Hydrographs for individual wells and for well groups are presented in Appendix D.



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

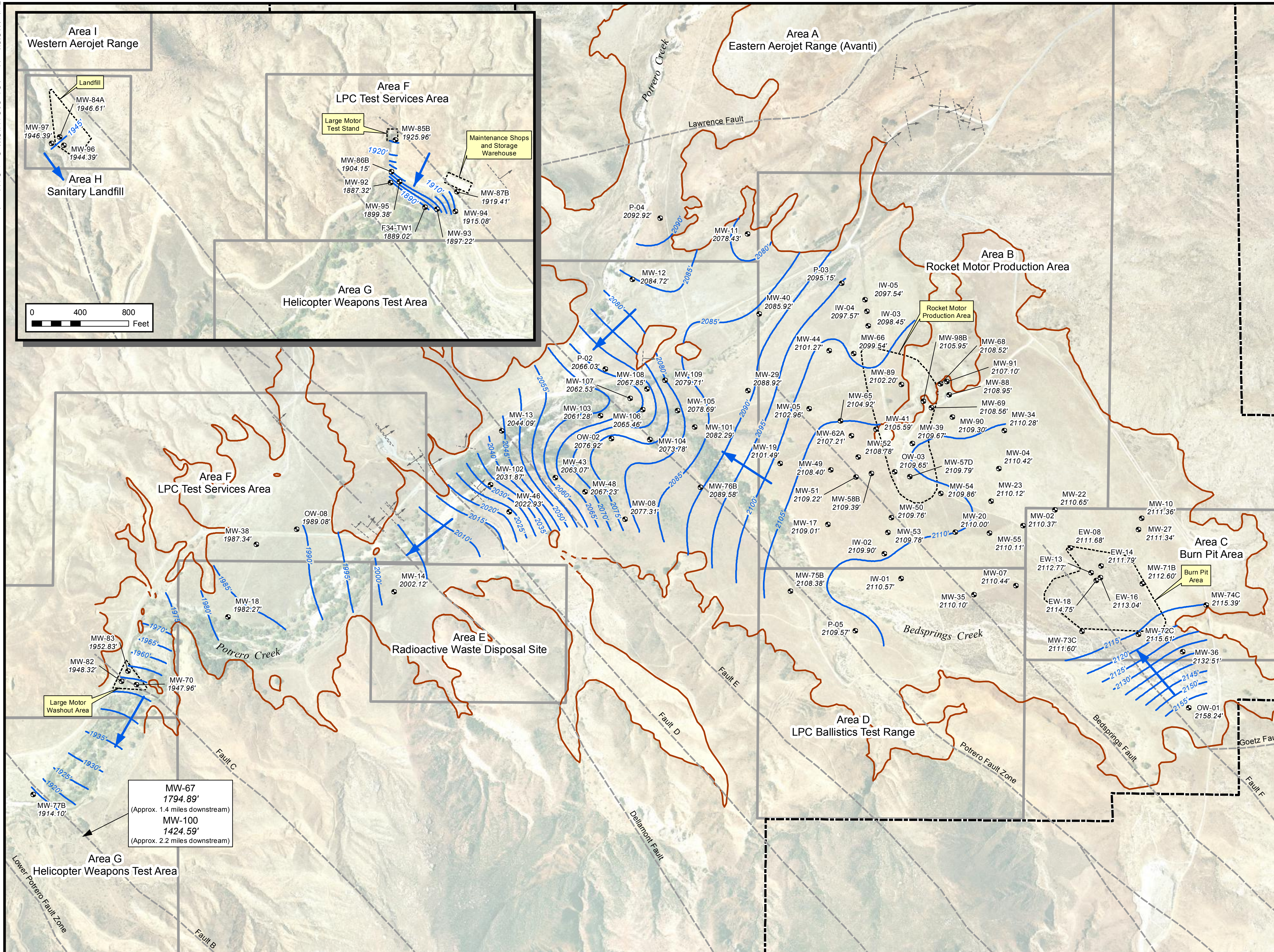
- MW-10 2107.31' — Monitoring Well Location with Groundwater Elevation (August 2011)
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Groundwater Elevation Contour
- Bedrock/Alluvium Surface Contact (Dashed where inferred)
- Groundwater Flow Direction
- Source Areas
- Potrero Canyon Unit Property Boundary (Lockheed Martin Beaumont Site 1)
- Historical Operational Area Boundary

Notes: Beaumont Site 1 property boundary is approximate.

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-1
Groundwater Contours for Alluvium and Weathered Mount Eden Formation-Third Quarter 2011

TETRA TECH



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 (December 2011)
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Groundwater Elevation Contour
- Bedrock/Alluvium Surface Contact (Dashed where inferred)
- Groundwater Flow Direction
- Source Areas
- Potrero Canyon Unit Property Boundary (Lockheed Martin Beaumont Site 1)
- Historical Operational Area Boundary

Notes: Beaumont Site 1 property boundary is approximate.

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-2
Groundwater Contours for Alluvium and Weathered Mount Eden Formation- Fourth Quarter 2011

TETRA TECH

Table 3-1 Groundwater Elevation - Third Quarter 2011 and Fourth Quarter 2011

				August 2011 Groundwater Elevation Data				December 2011 Groundwater Elevation Data			
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 2011**	**Date Measured**	**Depth to Water (feet BTOC)**	**Groundwater Elevation (feet msl)**	**Groundwater Elevation Change from Third Quarter 2011**
EW-01	RMPA	QAL	2142.62	8/18/2011	31.13	2111.49	-1.00	12/01/11	33.11	2109.51	-1.98
EW-02	RMPA	QAL	2126.15	8/18/2011	19.44	2106.71	-0.45	12/01/11	20.48	2105.67	-1.04
EW-08	BPA	MEF	2178.40	8/19/2011	66.28	2112.12	1.20	12/05/11	66.72	2111.68	-0.44
EW-09	BPA	MEF	2179.67	8/19/2011	66.42	2113.25	0.17	12/05/11	67.46	2112.21	-1.04
EW-10	BPA	MEF	2180.19	8/19/2011	65.61	2114.58	3.01	12/05/11	68.25	2111.94	-2.64
EW-11	BPA	MEF	2182.09	8/19/2011	66.49	2115.60	-0.22	12/05/11	68.89	2113.20	-2.40
EW-12	BPA	MEF	2183.28	8/19/2011	70.95	2112.33	1.26	12/05/11	71.40	2111.88	-0.45
EW-13	BPA	MEF	2185.57	8/19/2011	71.74	2113.83	0.63	12/05/11	72.80	2112.77	-1.06
EW-14	BPA	QAL/MEF	2184.59	8/19/2011	72.66	2111.93	1.43	12/05/11	72.80	2111.79	-0.14
EW-15	BPA	MEF	2184.10	8/19/2011	68.85	2114.70	-1.54	12/05/11	70.30	2113.25	-1.45
EW-16	BPA	MEF	2185.52	8/19/2011	72.34	2113.18	1.25	12/05/11	72.48	2113.04	-0.14
EW-17	BPA	MEF	2179.04	8/19/2011	64.44	2114.60	-3.35	12/05/11	67.37	2111.67	-2.93
EW-18	BPA	MEF	2184.98	8/19/2011	69.54	2115.44	0.18	12/05/11	70.23	2114.75	-0.69
EW-19	MCEA	QAL	2033.89	8/19/2011	30.41	2003.48	-4.04	12/05/11	33.16	2000.73	-2.75
EW-20	BPA	MEF	2187.45	NA	NA	NA	NA	12/05/11	72.76	2114.69	NA
F33-TW2	NPCA	QAL	1959.75	8/18/2011	5.86	1953.89	-0.52	11/30/11	5.68	1954.07	0.18
F33-TW3	NPCA	QAL	1955.79	8/18/2011	5.85	1949.94	0.02	11/30/11	5.02	1950.77	0.83
F33-TW6	NPCA	QAL	1950.62	8/18/2011	6.90	1943.72	-0.67	11/30/11	6.92	1943.70	-0.02
F33-TW7	NPCA	QAL	NA	8/18/2011	8.65	NA	NA	11/30/11	8.61	NA	NA
F34-TW1	MCEA	QAL	1894.08	8/18/2011	5.10	1888.98	-1.48	11/30/11	5.06	1889.02	0.04
IW-01	RMPA	QAL	2160.73	8/17/2011	48.18	2112.55	-2.03	12/01/11	50.16	2110.57	-1.98
IW-02	RMPA	QAL	2155.01	8/17/2011	42.82	2112.19	-1.81	12/01/11	45.11	2109.90	-2.29
IW-03	NPCA	QAL	2132.86	8/18/2011	34.41	2098.03	1.09	12/01/11	34.41	2098.45	0.42
IW-04	NPCA	QAL	2135.09	8/18/2011	41.06	2094.03	0.85	12/01/11	37.52	2097.57	3.54
IW-05	NPCA	QAL	2136.94	8/18/2011	39.87	2097.07	1.03	12/01/11	39.40	2097.54	0.47
MW-01	RMPA	MEF	2176.98	8/19/2011	63.61	2113.37	-3.16	12/05/11	66.63	2110.35	-3.02
MW-02	RMPA	MEF	2170.10	8/19/2011	57.89	2112.21	-0.76	12/05/11	59.73	2110.37	-1.84
MW-03	RMPA	MEF	2169.36	8/19/2011	119.71	2049.65	-0.38	12/05/11	121.23	2048.13	-1.52
MW-04	RMPA	QAL	2160.02	8/19/2011	47.82	2112.20	-0.49	12/05/11	49.60	2110.42	-1.78
MW-05	RMPA	QAL	2121.40	8/18/2011	18.17	2103.23	0.13	12/01/11	18.44	2102.96	-0.27
MW-06	RMPA	QAL	2121.76	8/18/2011	19.61	2102.15	-0.29	12/01/11	20.41	2101.35	-0.80
MW-07	BPA	QAL	2176.52	8/19/2011	63.11	2113.41	-3.09	12/05/11	66.08	2110.44	-2.97
MW-08	NPCA	QAL	2090.53	8/17/2011	13.61	2076.92	-0.17	12/05/11	13.22	2077.31	0.39
MW-09	NPCA	QAL	2089.16	8/17/2011	1.7 PSI	2093.09	-1.22	12/05/11	1.1 PSI	2091.70	-1.39
MW-10	RMPA	QAL	2179.40	8/19/2011	67.86	2111.54	1.59	12/05/11	68.04	2111.36	-0.18
MW-11	NPCA	QAL	2122.61	8/18/2011	44.32	2078.29	0.26	11/30/11	44.18	2078.43	0.14
MW-12	NPCA	QAL	2098.49	8/18/2011	18.44	2080.05	-3.07	11/30/11	13.77	2084.72	4.67
MW-13	NPCA	QAL	2057.89	8/18/2011	13.55	2044.34	-4.43	11/30/11	13.80	2044.09	-0.25
MW-14	MCEA	QAL	2029.67	8/17/2011	24.48	2005.19	-4.04	12/05/11	27.55	2002.12	-3.07
MW-15	MCEA	QAL	2009.76	8/18/2011	25.46	1984.30	-2.07	11/30/11	26.48	1983.28	-1.02
MW-17	RMPA	QAL	2140.40	8/17/2011	29.22	2111.18	-1.62	12/01/11	31.39	2109.01	-2.17
MW-18	MCEA	QAL	2008.69	8/18/2011	25.51	1983.18	-1.93	11/30/11	26.42	1982.27	-0.91
MW-19	NPCA	QAL	2118.49	8/17/2011	16.41	2102.08	-0.37	12/01/11	17.00	2101.49	-0.59
MW-20	RMPA	QAL	2162.03	8/19/2011	49.63	2112.40	-1.73	12/05/11	52.03	2110.00	-2.40
MW-22	RMPA	QAL	2173.48	8/19/2011	61.53	2111.95	0.11	12/05/11	62.83	2110.65	-1.30
MW-23	RMPA	QAL	2165.02	8/19/2011	52.85	2112.17	-1.06	12/05/11	54.90	2110.12	-2.05
MW-26	BPA	MEF	2183.81	8/19/2011	57.25	2126.56	5.94	12/05/11	70.52	2113.29	-13.27
MW-27	BPA	QAL	2182.73	8/19/2011	71.25	2111.48	1.58	12/05/11	71.39	2111.34	-0.14
MW-28	RMPA	QAL	2160.84	8/19/2011	48.58	2112.26	-1.77	12/05/11	50.99	2109.85	-2.41
MW-29	NPCA	MEF	2115.09	8/18/2011	26.03	2089.06	-0.13	12/01/11	26.17	2088.92	-0.14
MW-30	RMPA	QAL	2165.01	8/19/2011	53.25	2111.76	-0.18	12/05/11	54.57	2110.44	-1.32
MW-31	BPA	Granite	2186.52	8/19/2011	84.14	2102.38	-2.65	12/05/11	86.35	2100.17	-2.21
MW-32	RMPA	Granite	2176.61	8/19/2011	76.85	2099.76	-2.70	12/05/11	79.76	2096.85	-2.91
MW-34	RMPA	QAL	2153.80	8/19/2011	42.83	2110.97	0.74	12/05/11	43.52	2110.28	-0.69
MW-35	RMPA	QAL	2170.98	8/19/2011	58.05	2112.93	-2.54	12/05/11	60.88	2110.10	-2.83
MW-36	UG	QAL	2205.18	8/19/2011	65.93	2139.25	-8.46	12/05/11	72.67	2132.51	-6.74
MW-38	MCEA	MEF	2030.29	8/18/2011	40.91	1989.38	-1.46	11/30/11	42.95	1987.34	-2.04
MW-39	RMPA	QAL	2144.18	8/19/2011	32.55	2111.63	-0.72	12/05/11	34.51	2109.67	-1.96
MW-40	NPCA	MEF	2126.39	8/18/2011	40.38	2086.01	-0.03	11/30/11	40.47	2085.92	-0.09
MW-41	RMPA	MEF	2133.95	8/18/2011	27.76	2106.19	0.34	12/01/11	28.36	2105.59	-0.60
MW-43	NPCA	QAL	2068.58	8/17/2011	5.71	2062.87	-1.40	12/05/11	5.51	2063.07	0.20
MW-44	NPCA	QAL	2128.69	8/18/2011	27.33	2101.36	0.49	12/01/11	27.42	2101.27	-0.09
MW-45	MCEA	QAL	2068.18	8/17/2011	5.6 PSI	2081.11	-0.92	12/05/11	5.0 PSI	2079.73	-1.39
MW-46	MCEA	QAL	2072.17	8/17/2011	46.19	2025.98	-2.78	12/05/11	49.24	2022.93	-3.05
MW-47	NPCA	QAL	2076.67	8/17/2011	4.9 PSI	2087.99	-0.23	12/05/11	4.4 PSI	2086.83	-1.15
MW-48	NPCA	QAL	2076.44	8/17/2011	10.33	2066.11	-2.19	12/05/11	9.21	2067.23	1.12
MW-49	RMPA	QAL	2130.92	8/17/2011	20.67	2110.25	-1.11	12/05/11	22.52	2108.40	-1.85
MW-50	RMPA	QAL	2151.43	8/17/2011	39.51	2111.92	-1.47	12/01/11	41.67	2109.76	-2.16
MW-51	RMPA	QAL	2138.36	8/17/2011	27.36	2111.00	-1.10	12/01/11	29.14	2109.22	-1.78
MW-52	RMPA	QAL	2136.18	8/18/2011	25.69	2110.49	-0.92	12/01/11	27.40	2108.78	-1.71
MW-53	RMPA	QAL	2153.29	8/17/2011	41.15	2112.14	-1.22	12/01/11	43.51	2109.78	-2.36
MW-54	RMPA	QAL	2153.44	8/19/2011	41.35	2112.09	-1.25	12/05/11	43.58	2109.86	-2.23
MW-55	RMPA	QAL	2166.66	8/19/2011	54.25	2112.41	-1.59	12/05/11	56.55	2110.11	-2.30
MW-56A	RMPA	MEF	2143.09	8/18/2011	44.09	2099.00	-1.17	12/01/11	45.92	2097.17	-1.83
MW-56B	RMPA	QAL	2142.58	8/18/1350	30.74	2111.84	-1.40	12/01/11	32.91	2109.67	-2.17
MW-56C	RMPA	QAL	2142.77	8/18/2011	31.35	2111.42	-0.99	12/01/11	33.30	2109.47	-1.95
MW-56D	RMPA	QAL	2142.48	8/18/2011	30.71	2111.77	-1.30	12/01/11	32.81	2109.67	-2.10
MW-57A	RMPA	QAL	2145.98	8/19/2011	34.04	2111.94	-1.29	12/01/11	36.14	2109.84	-2.10
MW-57B	RMPA	QAL	2146.19	8/19/2011	34.18	2112.01	-1.46	12/01/11	36.32	2109.87	-2.14
MW-57C	RMPA	QAL	2146.02	8/19/2011	34.05	2111.97	-1.41	12/01/11	36.14	2109.88	-2.09
MW-57D	RMPA	QAL	2146.10	8/19/2011	34.32	2111.78	-1.01	12/01/11	36.31	2109.79	-1.99
MW-58A	RMPA	QAL	2140.73	8/18/2011	29.46	2111.27	-1.35	12/01/11	31.50	2109.23	-2.04
MW-58B	RMPA	QAL	2140.78	8/18/2011	29.52	2111.26	-1.00	12/01/11	31.39	2109.39	-1.87
MW-58C	RMPA	QAL	2141.02	8/18/2011	29.90	2111.12	-1.05	12/01/11	31.78	2109.24	-1.88
MW-58D	RMPA	QAL	2140.94	8/18/2011	29.62	2111.32	-1.41	12/01/11	31.70	2109.24	-2.08
MW-59A	BPA	MEF	2180.14	8/19/2011	71.48	2108.66	-0.80	12/05/11	72.86	2107.28	-1.38
MW-59B	BPA	MEF	2180.39	8/19/2011	67.10	2113.29	-0.37	12/05/11	68.40	2111.99	-1.30
MW-59C	BPA	MEF	2179.93	8/19/2011	68.72	2111.21	-0.82	12/05/11	70.04	2109.89	-1.32
MW-59D	BPA	MEF	2180.53	8/19/2011	68.48	2112.05	-1.14	12/05/11	69.79	2110.74	-1.31
MW-60A	BPA	MEF	2182.59	8/19/2011	72.09	2110.50	0.07	12/05/11	72.97	2109.62	-0.88
MW-60B	BPA	MEF	2182.77	8/19/2011	70.94	2111.83	0.88	12/05/11	71.64	2111.13	-0.70

Notes:

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

DG - Downgradient
BTOC - Below top of casing
msl - Mean sea level
NA - Not available
PSI - Pounds per square inch

"-" Formation screened not defined.
QAL - Quaternary alluvium
QAL/MEF - Quaternary alluvium/Mt Eden
MEF - Mount Eden formation

Table 3-1 Groundwater Elevation - Third Quarter 2011 and Fourth Quarter 2011 (continued)

				August 2011 Groundwater Elevation Data				**December 2011 Groundwater Elevation Data**			
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 2011**	**Date Measured**	**Depth to Water (feet BTOC)**	**Groundwater Elevation (feet msl)**	**Groundwater Elevation Change from Third Quarter 2011**
MW-61A	BPA	MEF	2186.95	8/19/2011	78.81	2108.14	-1.62	12/05/11	77.52	2109.43	1.29
MW-61B	BPA	MEF	2186.77	8/19/2011	71.80	2114.97	-0.21	12/05/11	72.67	2114.10	-0.87
MW-61C	BPA	MEF	2186.84	8/19/2011	76.50	2110.34	-1.60	12/05/11	77.82	2109.02	-1.32
MW-61D	BPA	MEF	2186.83	8/19/2011	73.91	2112.92	-1.78	12/05/11	75.41	2111.42	-1.50
MW-62A	RMPA	QAL	2131.32	8/18/2011	23.19	2108.13	-0.15	12/01/11	24.11	2107.21	-0.92
MW-62B	RMPA	QAL	2131.49	8/18/2011	22.11	2109.38	-0.87	12/01/11	23.71	2107.78	-1.60
MW-63	RMPA	QAL	2156.20	8/19/2011	43.95	2112.25	-1.46	12/05/11	46.21	2109.99	-2.26
MW-64	RMPA	QAL	2128.41	8/18/2011	22.86	2105.55	0.12	12/01/11	23.35	2105.06	-0.49
MW-65	RMPA	QAL	2128.92	8/18/2011	23.36	2105.56	0.00	12/01/11	24.00	2104.92	-0.64
MW-66	RMPA	QAL	2130.43	8/18/2011	31.21	2099.22	0.88	12/01/11	30.89	2099.54	0.32
MW-67	MCEA	QAL	1799.54	8/18/2011	5.26	1794.28	-0.49	11/30/11	4.65	1794.89	0.61
MW-68	RMPA	QAL	2144.69	8/18/2011	37.14	2107.55	1.42	12/05/11	36.17	2108.52	0.97
MW-69	RMPA	QAL	2143.26	8/19/2011	35.11	2108.15	1.74	12/01/11	34.70	2108.56	0.41
MW-70	NPCA	QAL	1976.15	8/18/2011	28.17	1947.98	-0.65	11/30/11	28.19	1947.96	-0.02
MW-71A	BPA	Granite	2193.77	8/19/2011	154.87	2038.90	0.09	12/05/11	155.49	2038.28	-0.62
MW-71B	BPA	QAL/MEF	2194.01	8/19/2011	81.92	2112.09	1.71	12/05/11	81.41	2112.60	0.51
MW-71C	BPA	MEF	2193.87	8/19/2011	81.92	2111.95	0.36	12/05/11	82.11	2111.76	-0.19
MW-72A	BPA	Granite	2199.06	8/19/2011	80.89	2118.17	-8.51	12/05/11	88.07	2110.99	-7.18
MW-72B	BPA	MEF	2199.22	8/19/2011	76.63	2122.59	-8.72	12/05/11	83.76	2115.46	-7.13
MW-72C	BPA	QAL	2199.35	8/19/2011	76.08	2123.27	-8.80	12/05/11	83.74	2115.61	-7.66
MW-73A	BPA	MEF	2189.39	8/19/2011	101.60	2087.79	-4.16	12/05/11	105.36	2084.03	-3.76
MW-73B	BPA	MEF	2189.48	8/19/2011	85.91	2103.57	-4.88	12/05/11	89.71	2099.77	-3.80
MW-73C	BPA	QAL	2189.65	8/19/2011	74.00	2115.65	14.96	12/05/11	78.05	2111.60	-4.05
MW-74A	UG	Granite	2199.66	8/19/2011	157.29	2042.37	-0.05	12/05/11	157.70	2041.96	-0.41
MW-74B	UG	Granite	2199.81	8/19/2011	114.52	2085.29	0.65	12/05/11	114.44	2085.37	0.08
MW-74C	UG	MEF	2199.96	8/19/2011	84.61	2115.35	-0.10	12/05/11	84.57	2115.39	0.04
MW-75A	RMPA	MEF	2149.44	8/17/2011	47.91	2101.53	-1.49	12/05/11	50.27	2099.17	-2.36
MW-75B	RMPA	QAL	2149.51	8/17/2011	38.78	2110.73	-1.59	12/05/11	41.13	2108.38	-2.35
MW-75C	RMPA	QAL	2150.02	8/17/2011	38.95	2111.07	-1.91	12/05/11	41.54	2108.48	-2.59
MW-76A	NPCA	MEF	2105.91	8/17/2011	17.80	2088.11	-1.01	12/05/11	19.65	2086.26	-1.85
MW-76B	NPCA	QAL	2105.40	8/17/2011	14.69	2090.71	-1.42	12/05/11	15.82	2089.58	-1.13
MW-76C	NPCA	QAL	2106.29	8/17/2011	2.41	2103.88	-1.29	12/05/11	4.43	2101.86	-2.02
MW-77A	MCEA	MEF	1930.62	8/18/2011	11.83	1918.79	-1.84	11/30/11	12.38	1918.24	-0.55
MW-77B	MCEA	MEF	1930.88	8/18/2011	16.37	1914.51	-1.15	11/30/11	16.78	1914.10	-0.41
MW-78	BPA	MEF	2182.63	8/19/2011	81.18	2101.45	-0.61	12/05/11	82.53	2100.10	-1.35
MW-79A	RMPA	MEF	2142.00	8/17/2011	34.46	2107.54	-1.75	11/30/11	36.65	2105.35	-2.19
MW-79C	RMPA	QAL	2142.07	8/17/2011	31.25	2110.82	-1.79	11/30/11	33.48	2108.59	-2.23
MW-80	NPCA	MEF	2070.47	8/17/2011	2.0 PSI	2075.09	-1.16	12/05/11	1.25 PSI	2073.36	-1.73
MW-81	MCEA	MEF	2010.72	8/18/2011	26.65	1984.07	-1.99	11/30/11	27.74	1982.98	-1.09
MW-82	NPCA	QAL	1974.17	8/18/2011	25.69	1948.48	-0.54	11/30/11	25.85	1948.32	-0.16
MW-83	NPCA	QAL	1976.93	8/18/2011	24.03	1952.90	-0.36	11/30/11	24.10	1952.83	-0.07
MW-84A	MCEA	MEF	2,010.02	8/18/2011	63.45	1946.57	-0.02	11/30/11	63.41	1946.61	0.04
MW-84B	MCEA	MEF	2,011.19	8/18/2011	65.68	1945.51	0.20	11/30/11	65.61	1945.58	0.07
MW-85A	MCEA	MEF	1,929.31	8/18/2011	5.39	1923.92	-0.99	11/30/11	5.80	1923.51	-0.41
MW-85B	MCEA	MEF	1,928.74	8/18/2011	3.48	1925.26	-1.78	11/30/11	2.78	1925.96	0.70
MW-86A	MCEA	MEF	1,923.21	8/18/2011	14.60	1908.61	-0.71	11/30/11	15.29	1907.92	-0.69
MW-86B	MCEA	QAL/MEF	1,923.21	8/18/2011	18.55	1904.66	-0.74	11/30/11	19.06	1904.15	-0.51
MW-87A	MCEA	MEF	1,938.92	8/18/2011	19.50	1919.42	-1.88	11/30/11	20.35	1918.57	-0.85
MW-87B	MCEA	MEF	1,938.82	8/18/2011	18.24	1920.58	-2.21	11/30/11	19.41	1919.41	-1.17
MW-88	RMPA	QAL	2,141.97	8/19/2011	33.34	2108.63	1.85	12/05/11	33.02	2108.95	0.32
MW-89	RMPA	QAL	2,130.82	8/18/2011	29.45	2101.37	1.47	12/01/11	28.62	2102.20	0.83
MW-90	RMPA	QAL	2,147.71	8/18/2011	38.30	2109.41	1.75	12/05/11	38.41	2109.30	-0.11
MW-91	RMPA	MEF	2,144.85	8/19/2011	37.21	2107.64	1.42	12/05/11	37.75	2107.10	-0.54
MW-92	MCEA	MEF	1,919.83	8/18/2011	32.13	1887.70	-0.74	11/30/11	32.51	1887.32	-0.38
MW-93	MCEA	MEF	1,931.47	8/18/2011	35.51	1895.96	-4.13	12/05/11	34.25	1897.22	1.26
MW-94	MCEA	MEF	1,936.55	8/18/2011	20.67	1915.88	-1.61	11/30/11	21.47	1915.08	-0.80
MW-95	MCEA	MEF	1,920.80	8/18/2011	21.16	1899.64	-0.65	11/30/11	21.42	1899.38	-0.26
MW-96	MCEA	MEF	1998.63	8/18/2011	54.20	1944.43	-0.04	11/30/11	54.24	1944.39	-0.04
MW-97	MCEA	MEF	1996.47	8/18/2011	50.09	1946.38	-0.78	11/30/11	50.08	1946.39	0.01
MW-98A	RMPA	MEF	2141.68	8/19/2011	40.02	2101.66	-0.13	12/01/11	41.02	2100.66	-1.00
MW-98B	RMPA	MEF	2141.73	8/19/2011	36.76	2104.97	1.45	12/01/11	35.78	2105.95	0.98
MW-99	RMPA	MEF	2144.63	8/18/2011	54.27	2090.36	0.50	12/05/11	54.44	2090.19	-0.17
MW-100	DG	Granite	1525.79	8/17/2011	102.42	1423.37	-3.26	11/30/11	101.20	1424.59	1.22
MW-101	NPCA	QAL	2095.90	8/17/2011	13.65	2082.25	-2.51	12/01/11	13.61	2082.29	0.04
MW-102	MCEA	QAL	2067.21	8/17/2011	34.25	2032.96	-1.85	12/05/11	35.34	2031.87	-1.09
MW-103	NPCA	QAL	2075.88	8/17/2011	14.27	2061.61	-1.62	12/05/11	14.60	2061.28	-0.33
MW-104	NPCA	QAL	2087.47	8/17/2011	13.79	2073.68	-1.45	12/05/11	13.69	2073.78	0.10
MW-105	NPCA	QAL	2092.23	8/18/2011	14.34	2077.89	-2.44	12/01/11	13.54	2078.69	0.80
MW-106	NPCA	QAL	2085.25	8/18/2011	19.01	2066.24	-3.86	12/01/11	19.79	2065.46	-0.78
MW-107	NPCA	QAL	2084.84	8/18/2011	20.74	2064.10	-3.82	12/01/11	22.31	2062.53	-1.57
MW-108	NPCA	QA/MEF	2087.22	8/18/2011	18.05	2069.17	-4.81	12/01/11	19.37	2067.85	-1.32
MW-109	NPCA	QA/MEF	2092.86	8/18/2011	13.36	2079.50	-1.92	12/01/11	13.15	2079.71	0.21
OW-01	BPA	QAL	2204.62	8/19/2011	42.97	2161.65	-3.89	12/05/11	46.38	2158.24	-3.41
OW-02	NPCA	QAL	2078.97	8/17/2011	1.79	2077.18	-0.58	12/05/11	2.05	2076.92	-0.26
OW-03	RMPA	QAL	2143.65	8/17/2011	32.04	2111.61	-0.91	12/01/11	34.00	2109.65	-1.96
OW-05	NPCA	QAL	2160.85	8/18/2011	Dry	Dry Well	NA	11/30/11	Dry	Dry Well	NA
OW-06	MCEA	QAL	2084.67	8/18/2011	Dry	Dry Well	NA	11/30/11	Dry	Dry Well	NA
OW-07	MCEA	QAL	2108.06	8/18/2011	Dry	Dry Well	NA	11/30/11	Dry	Dry Well	NA
OW-08	MCEA	QAL	2036.33	8/18/2011	45.01	1991.32	-1.86	11/30/11	47.25	1989.08	-2.24
P-02	NPCA	QAL	2081.15	8/18/2011	15.88	2065.27	-2.77	11/30/11	15.12	2066.03	0.76
P-03	NPCA	QAL	2140.25	8/18/2011	45.45	2094.80	0.03	12/01/11	45.10	2095.15	0.35
P-04	NPCA	QAL	2112.63	8/18/2011	23.03	2089.60	-2.94	11/30/11	19.71	2092.92	3.32
P-05	RMPA	QAL	2162.20	8/17/2011	49.91	2112.29	-2.09	12/05/11	52.63	2109.57	-2.72
P-06S	MCEA	QAL	2034.44	8/17/2011	30.70	2003.74	NA	12/05/11	32.75	2001.69	-2.05
P-06D	MCEA	QAL	2034.41	8/17/2011	29.84	2004.57	-3.18	12/05/11	33.51	2000.90	-3.67
P-07	MCEA	QAL	2034.60	8/17/2011	31.30	2003.30	-4.03	12/05/11	34.16	2000.44	-2.86
P-08	MCEA	QAL	2030.87	8/17/2011	26.97	2003.90	-4.04	12/05/11	29.81	2001.06	-2.84
P-09	BPA	MEF	2187.38	NA	NA	NA	NA	12/05/11	73.07	2114.31	NA
VRW-01	BPA	QAL	2187.35	8/19/2011	Dry	Dry Well	NA	12/05/11	Dry	Dry Well	NA
VRW-03	BPA	MEF	2184.32	8/19/2011	68.19	2116.13	1.09	12/05/11	68.54	2115.78	-0.35

Notes:

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

During Third Quarter 2011, the Beaumont NWS reported approximately 0.27 inches of precipitation, and the average site-wide groundwater elevation decreased approximately 1.04 feet. During Fourth Quarter 2011, the Beaumont NWS reported approximately 3.73 inches of precipitation and the average site-wide groundwater elevation decreased approximately 1.23 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 present elevation differences between the Second Quarter 2011 and Third Quarter 2011, and between the Third Quarter 2011 and Fourth Quarter 2011 groundwater monitoring events respectively.

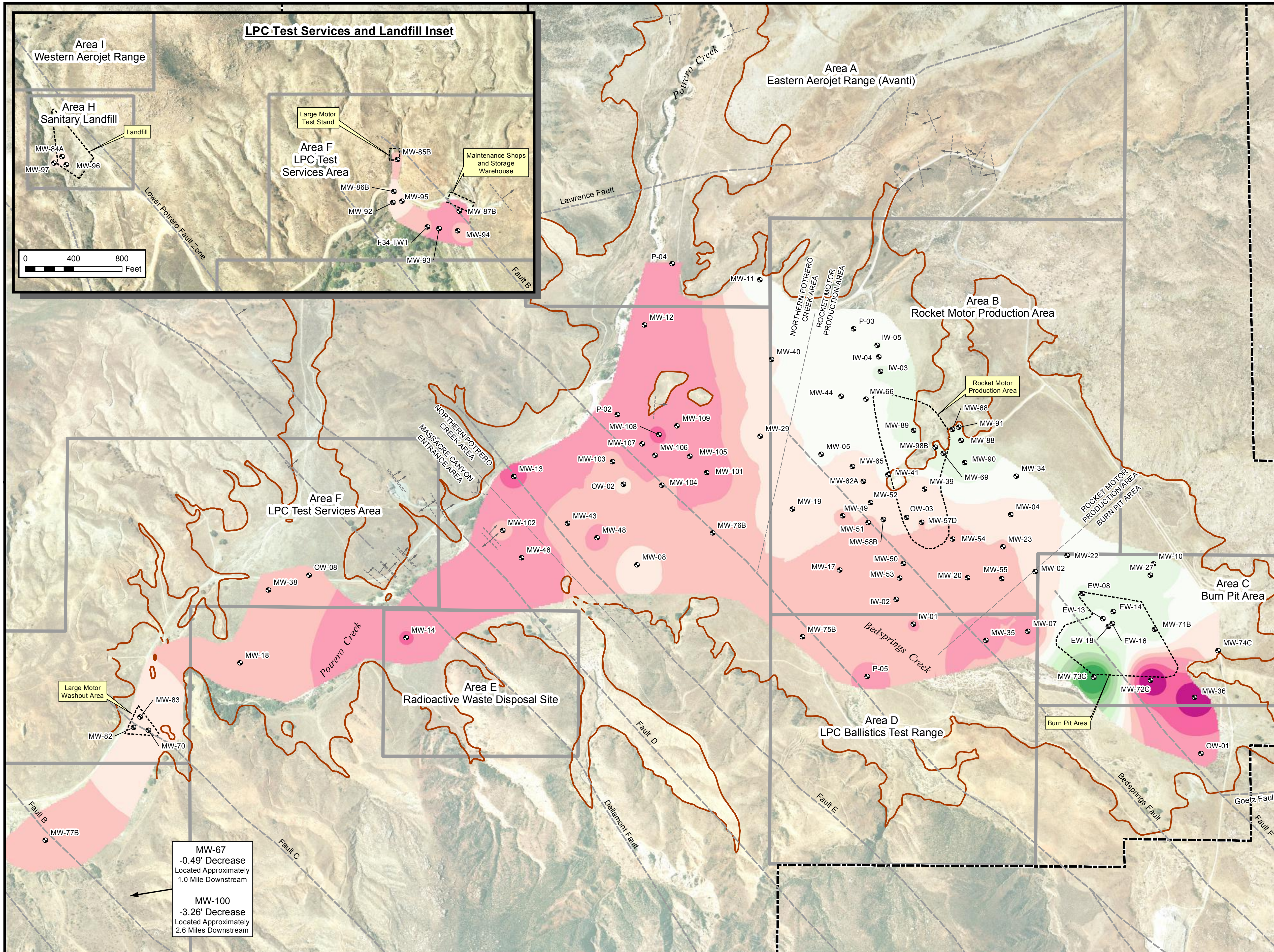
Table 3-2 Groundwater Elevation Change - Third Quarter 2011 and Fourth Quarter 2011

Site Area	Range of Groundwater Elevation Change - Third Quarter 2011 (feet)		Average Change By Area (feet)	Range of Groundwater Elevation Change - Fourth Quarter 2011 (feet)		Average Change By Area (feet)
BPA	-8.80	14.96	-0.62	-13.27	1.29	-2.17
MCEA	-4.13	0.20	-1.78	-3.67	1.26	-1.04
NPCA	-4.81	6.07	-1.24	-4.57	5.46	0.07
RMPA	-3.16	1.85	-0.71	-3.02	0.98	-1.53

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 BPA, through the former BPA, through the former RMPA, and southwestward (downgradient) through the NPCA and MCEA. Groundwater elevations in shallow wells (alluvium and shallow MEF) upgradient of the BPA and at the BPA show a rapid and significant response to rainfall, with a more dampened response observed further out in the valley through the RMPA, NPCA, and MCEA (Figures 3-5 and 3-7). The deeper MEF and granitic/metasedimentary bedrock wells show a response very similar to the shallow wells during the periods of increased precipitation (Figure 3-6).



X:\GIS\Lockheed S1_Q3Q411\GW_ElevChange Q311.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
- Historical Operational Area Boundary
- Potrero Canyon Unit Property Boundary (Lockheed Martin Beaumont Site 1)

Groundwater Elevation Change in Feet (from previous quarter)

- 10 — 15
- 8 — 10
- 6 — 8
- 4 — 6
- 2 — 4
- 1 — 2
- 0 — 1
- -1 — 0
- -2 — -1
- -4 — -2
- -6 — -4
- -8 — -6

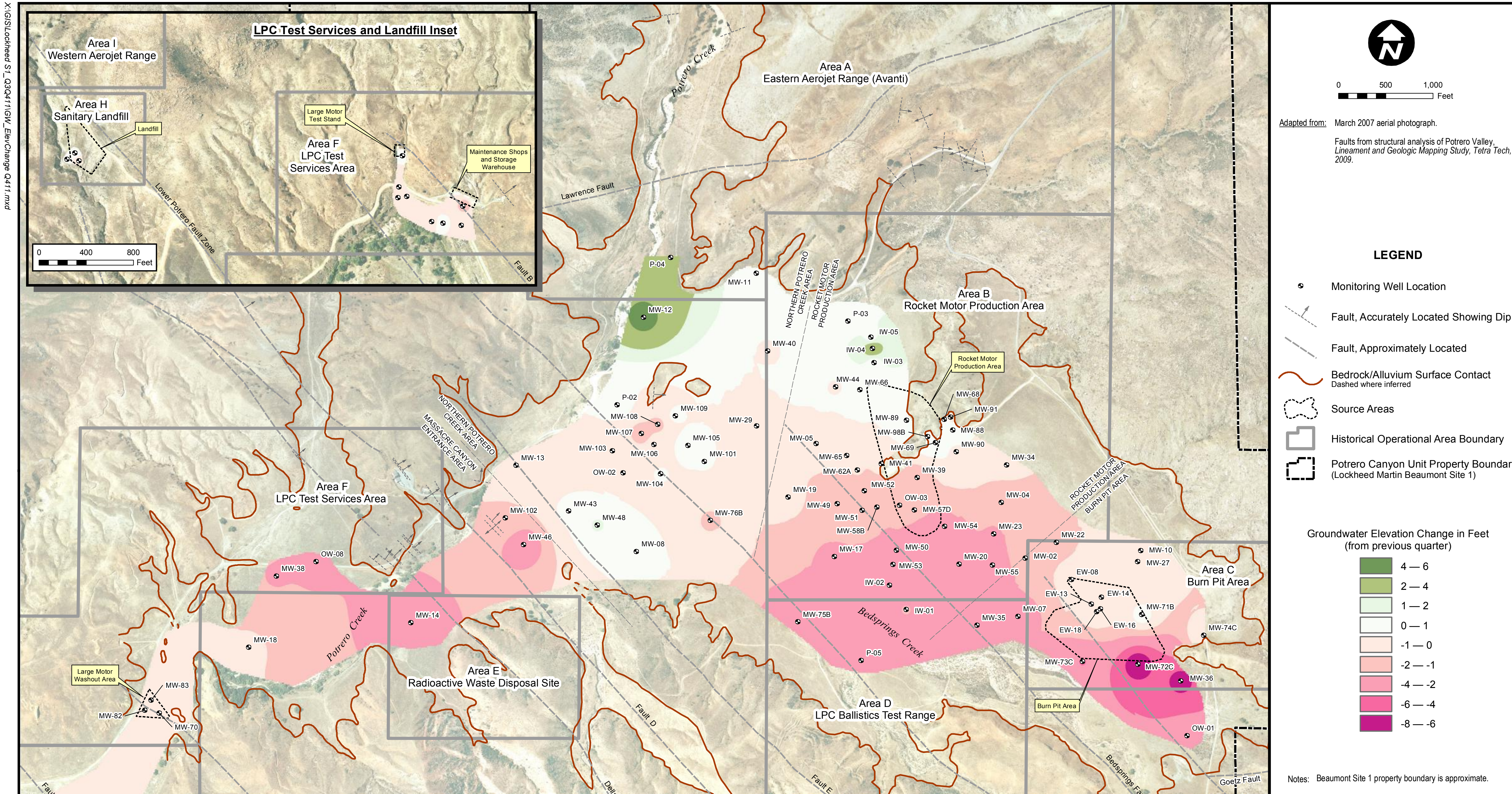
Notes: Beaumont Site 1 property boundary is approximate.

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-3

Groundwater Elevation Change-Third Quarter 2011

TETRA TECH



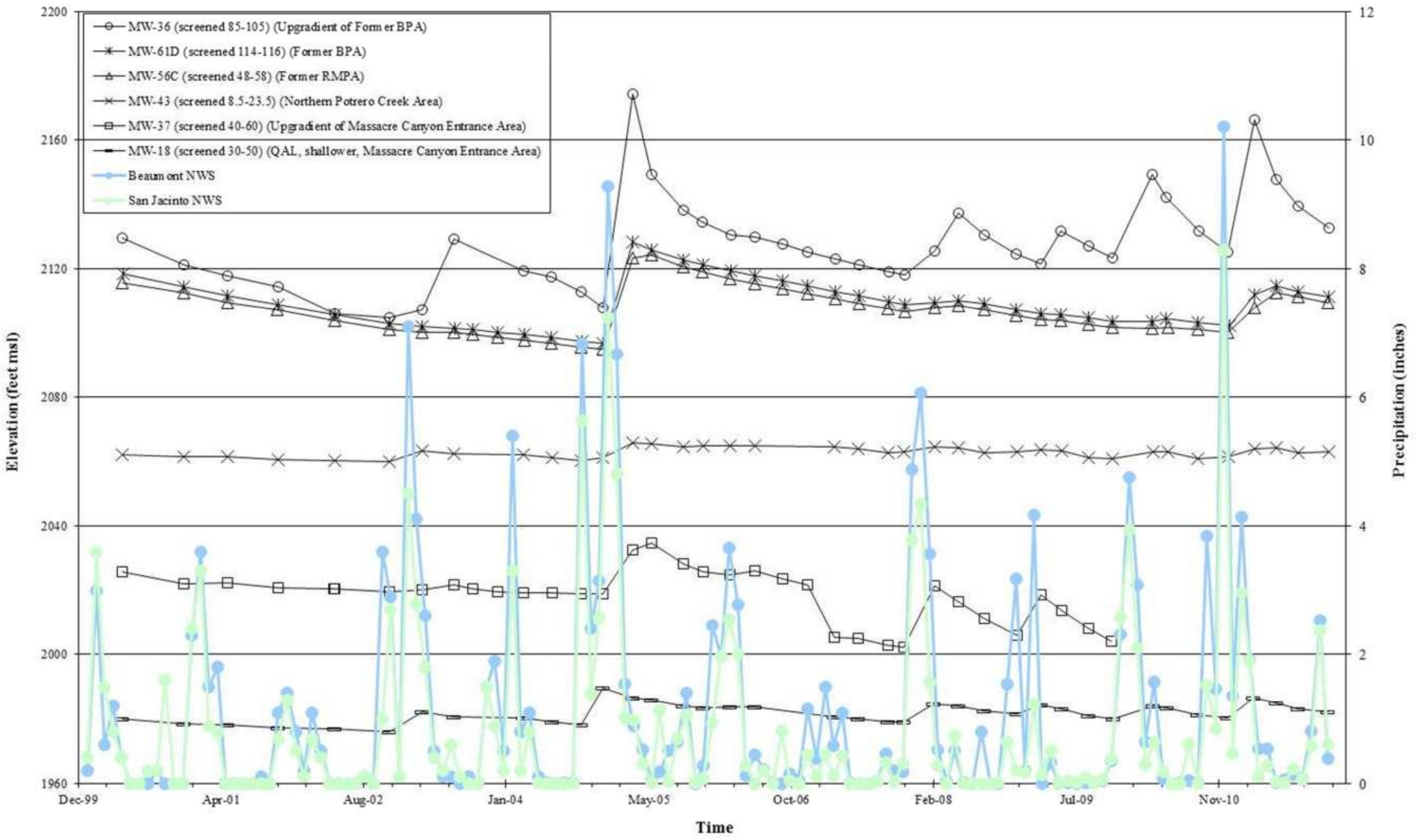
Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-4

Groundwater Elevation Change-Fourth Quarter 2011

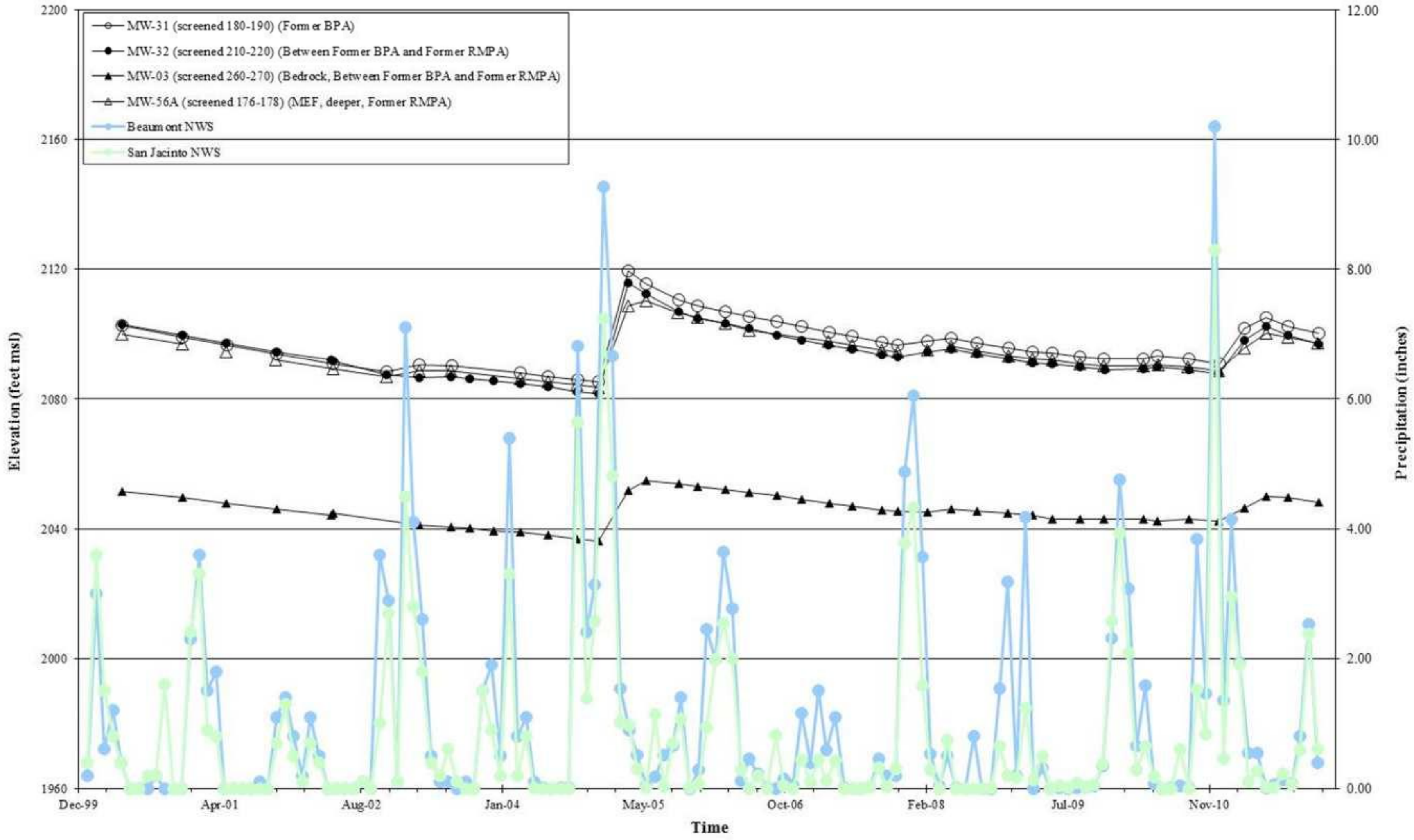
TETRA TECH

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



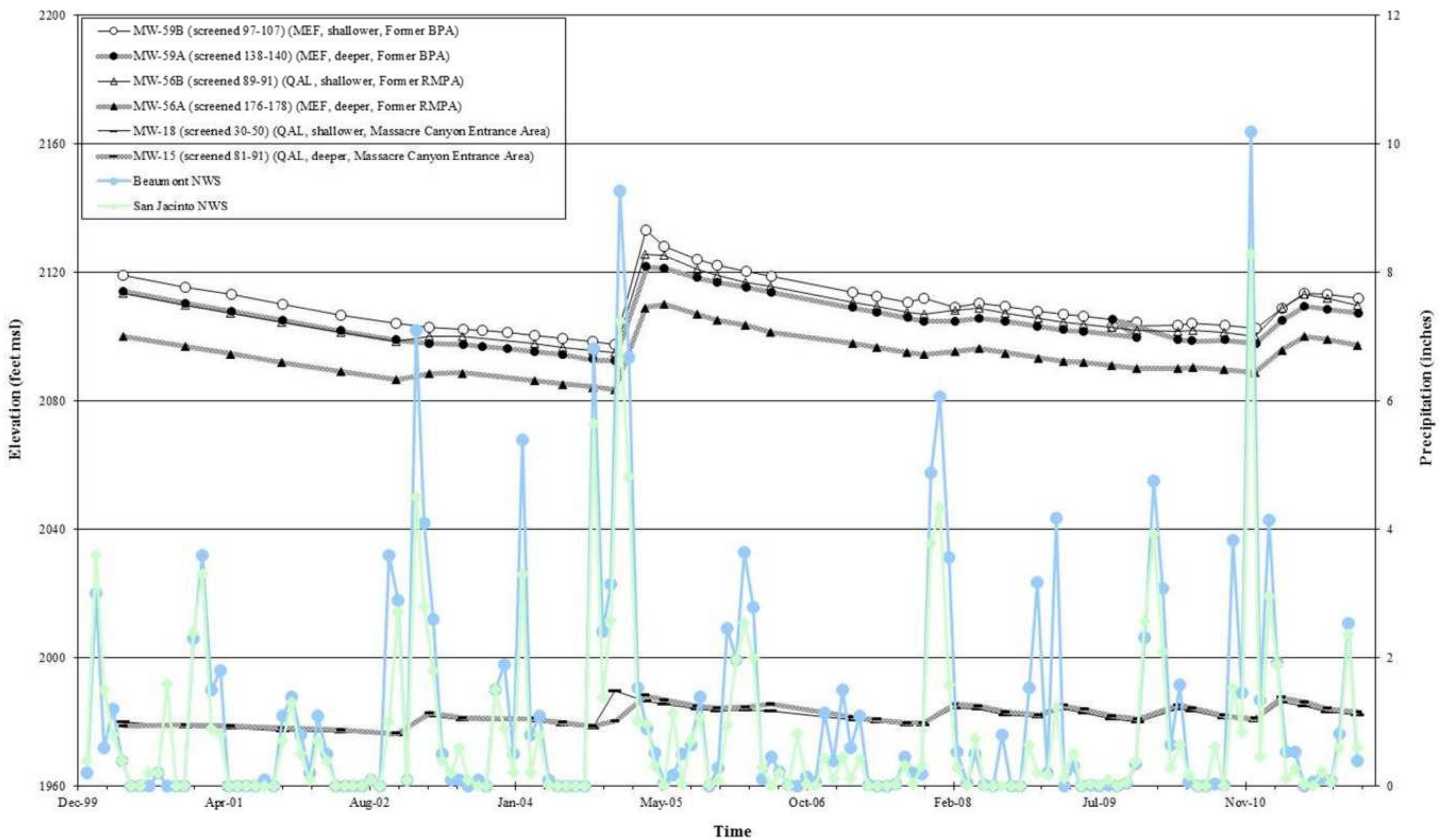
NWS - National Weather Service

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



NWS - National Weather Service

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



NWS - National Weather Service

3.2 SURFACE WATER FLOW

During Third Quarter 2011 and Fourth Quarter 2011, the Potrero and Bedsprings creek riparian corridors were walked to determine the presence, nature, and quantity of surface water within the creek beds. The locations where surface water was encountered were plotted and a determination was made whether the water was flowing or stagnant. Where flowing water was encountered, the flow rate was determined using a modified version of the EPA Volunteer Stream Monitoring: 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 located in the vicinity of MW-67, SF-3 is located in the vicinity of MW-15 and MW-18, and SF-4 is located near MW-101.

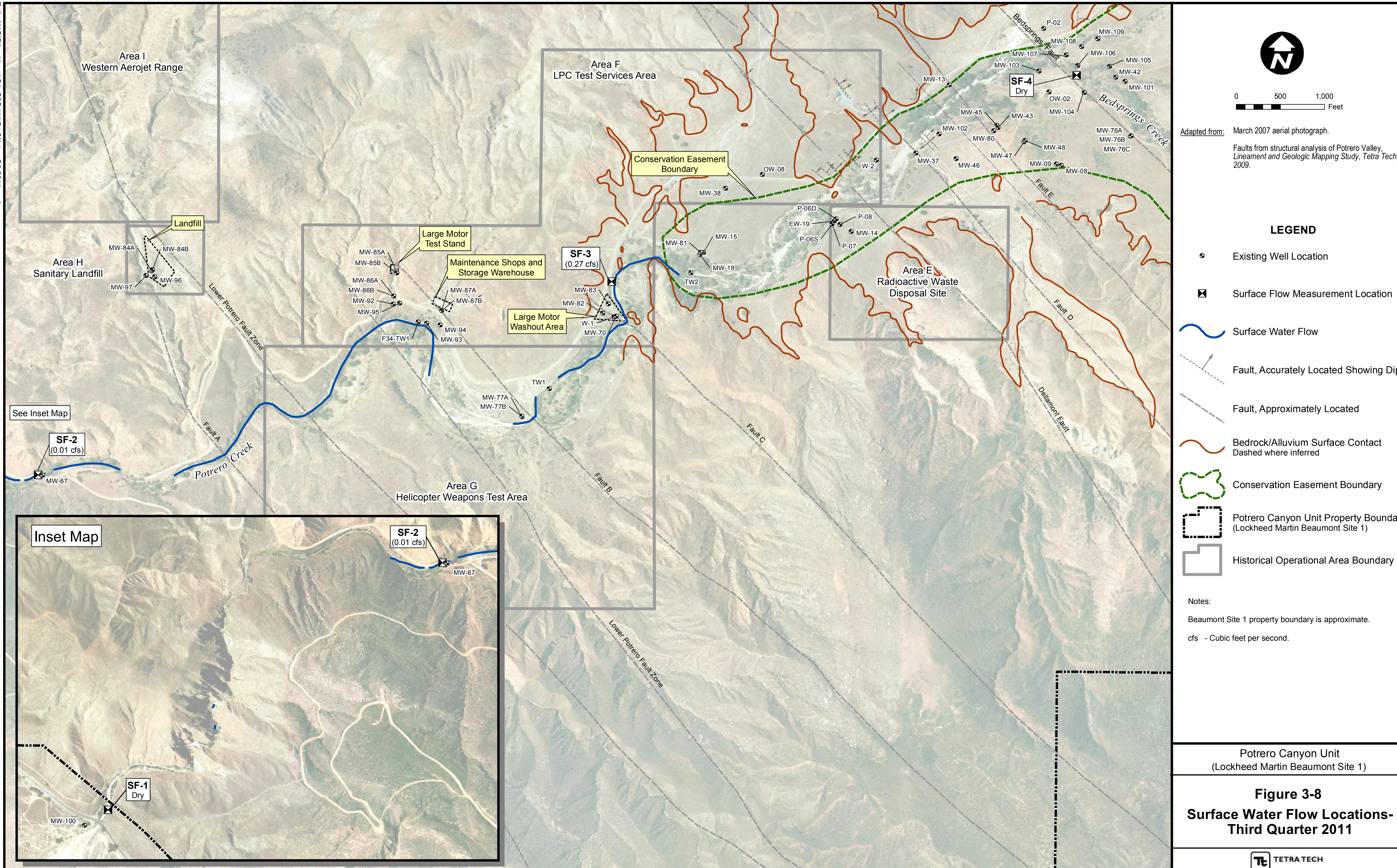
At each location a section of stream that is relatively straight for at least 20 feet was chosen for measurement. This 20-foot section was marked and width measurements were taken at various points to determine the average width. Depth measurements were collected at five points along the width of the 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 (cfs) 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) 2011										
SF-1	Near Gilman Hot Springs Road	08/23/11	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0.14
SF-2	Near MW-67	08/23/11	20	0.93	0.04	56.37	0.04	0.32	0.01	
SF-3	Near MW-15 and 18	08/23/11	20	2.23	0.09	12.54	0.19	1.44	0.27	
SF-4	Near MW-42	08/23/11	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
Fourth Quarter (December) 2011										
SF-1	Near Gilman Hot Springs Road	12/13/11	20	5.57	0.08	10.41	0.42	1.73	0.73	0.99
SF-2	Near MW-67	12/13/11	20	7.63	0.10	10.90	0.76	1.65	1.26	
SF-3	Near MW-15 and 18	12/13/11	20	2.28	0.28	11.73	0.63	1.53	0.97	
SF-4	Near MW-42	12/13/11	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
Notes:	Measurements are averaged. cfs - cubic feet per second									



Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-8
Surface Water Flow Locations-
Third Quarter 2011

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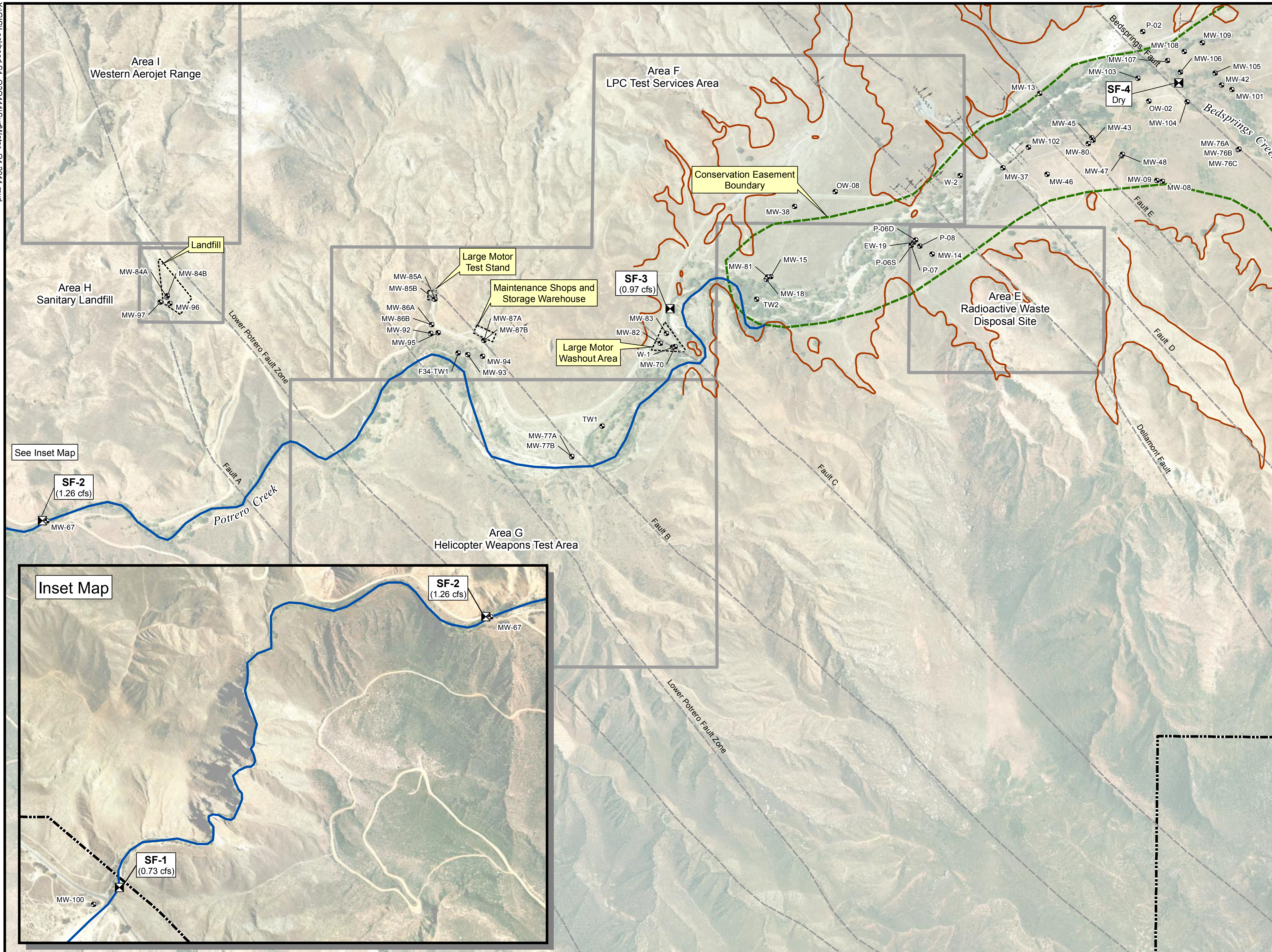


0 500 1,000 Feet

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
- Surface Water Flow
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Bedrock/Alluvium Surface Contact
  Dashed where inferred
- Conservation Easement Boundary
- Potrero Canyon Unit 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 Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-9
Surface Water Flow Locations-
Fourth Quarter 2011

TETRA TECH

3.3 GROUNDWATER FLOW

Groundwater flow directions from Third Quarter 2011 and Fourth Quarter 2011 (Figures 3-1 and 3-2 respectively) were similar to previously observed patterns for a dry period (Appendix A, Figure 2-14). Generally, groundwater flowed northwest from the southeastern limits of the valley (near the former BPA) beneath the former RMPA, towards Potrero Creek, where groundwater flow then 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) decreased to 0.013 feet/foot (ft/ft) between Third Quarter 2011 and Fourth Quarter 2011. Horizontal gradients are relatively high upgradient of the BPA where recharge from Bedsprings Creek and the adjacent mountain areas enter the main valley. The gradients significantly decrease downgradient of the BPA within 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 within the aquifer. The vertical gradient is a comparison of static water level between wells at different depths within the aquifer and is an indication of the vertical flow (downward - negative gradient; upward - positive gradient) of groundwater. The vertical groundwater gradients at the Site are generally negative in the BPA, RMPA, and NPCA, indicating areas of recharge, and positive in the MCEA, indicating an area of discharge.

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

Table 3-4 Summary of Horizontal and Vertical Groundwater Gradient

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

Location: / 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 (June) 2011	0.015	0.0169	0.0041	0.020	0.014
Third Quarter (August) 2011	0.014	0.0132	0.0037	0.021	0.014
Fourth Quarter (December) 2011	0.013	0.0108	0.0030	0.022	0.013

Vertical Groundwater Gradients (feet/foot)

Location: / shallow screen / Date deep screen	BPA **MW-59B** (MEF) **MW-59A** (MEF)	RMPA **MW-56B** (QAL) **MW-56A** (MEF)	NPCA **MW-75B** (QAL) **MW-75A** (MEF)	MCEA **MW-18** (QAL) **MW-15** (QAL)	MCEA **MW-77B** (MEF) **MW-77A** (MEF)
Previous - Second Quarter (June) 2011	-0.11	-0.15	-0.07	0.03	0.05
Third Quarter (August) 2011	-0.12	-0.15	-0.07	0.02	0.05
Fourth Quarter (December) 2011	-0.13	-0.15	-0.07	0.02	0.04

Notes:

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

3.4 ANALYTICAL DATA SUMMARY

Summaries of validated laboratory analytical results for organic (VOCs, 1,4-dioxane) and inorganic (perchlorate, natural attenuation, and general minerals parameters) analytes detected above their respective method detection limits (MDLs) from the Third Quarter 2011 and Fourth Quarter 2011 water quality monitoring events are presented in Tables 3-5 and 3-6, respectively. A complete list of analytes tested, along with validated sample results by analytical method, are provided in Appendix G.

Sample results detected above the published 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 and 3-6. Laboratory analytical data packages, which include environmental, field QC, and laboratory QC results, are provided in Appendix H, and consolidated analytical data summary tables are presented in Appendix I. Tables 3-7 and 3-8 present summary statistics of the organic and inorganic analytes detected during the Third Quarter 2011 and Fourth Quarter 2011 monitoring events, respectively.

Table 3-5 Summary of Validated Detected Organic and Inorganic Analytes - Third Quarter 2011

Sample Location	Sample Date	Per-chlorate	1,4-Dioxane	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	Methyl-tert-butyl-ether	Methylene Chloride	Styrene	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																						
EW-08	08/29/11	**210**	**16**	0.32 Jq	0.74	<0.35	<0.15	<0.46	1.1	**2.2**	**26**	0.35 Jq	<0.10	<0.43	0.22 BJkq	<0.22	0.58	<0.12	<0.31	**17**	<0.23	<0.13
EW-09	08/29/11	**62**	**43**	0.37 Jq	0.44 Jq	<0.35	<0.15	<0.46	3.3	**6.7**	**81**	1.7	0.13 Jq	0.61 Jq	0.20 BJkq	<0.22	0.40 Jq	<0.12	<0.31	**51**	<0.23	0.14 Jq
EW-10	08/30/11	**360**	**37**	0.42 Jq	<0.23	<0.35	<0.15	0.54	**6.1**	**10**	**250**	2.5	0.20 Jq	<0.43	0.29 Jq	<0.22	0.39 Jq	<0.12	0.66	**130**	0.55	0.18 Jq
EW-11	08/31/11	**47**	**5.1**	0.41 Jq	0.65	<0.35	<0.15	<0.46	1.5	**1.6**	**140**	**6.1**	0.13 Jq	<0.43	0.27 Jq	0.24 Jq	0.71	<0.12	<0.31	**55**	0.29 Jq	0.20 Jq
EW-12	08/31/11	**6,000**	**1,000 Je**	0.54	<0.23	<0.35	**0.65**	3.7	**15**	**36**	**730**	**6.8**	0.36 Jq	<0.43	0.20 Jq	<0.22	<0.22	0.65	**11**	**390**	1.6	<0.13
EW-14	08/30/11	**21**	**2,900 Je**	**2.4**	1.2	0.47 Jq	<0.15	1.4	**38**	**93**	**1,900**	**260**	0.54	<0.43	1.0 Jq	<0.22	1.4	0.96	**5.0**	**150**	0.65	**3.1**
EW-17	08/30/11	**260**	**54**	0.40 Jq	<0.23	<0.35	<0.15	<0.46	**8.2**	**14**	**220**	**54**	0.23 Jq	1.1 Jq	0.31 Jq	<0.22	0.30 Jq	<0.12	0.94	**150**	0.37 Jq	0.34 Jq
MW-61D	08/31/11	**75,000**	**320 Je**	**1.8**	1.1	<0.35	**3.0**	28	**110**	**91**	**5,000**	**40**	2.2	<0.43	0.58 Jq	<0.22	2.2	3.6	**8.3**	**1,600**	4.0	0.33 Jq
MW-103	08/22/11	**180**	**14**	<0.14	<0.23	<0.35	<0.15	<0.46	0.55	<0.21	**6.6**	3.2	<0.10	<0.43	0.17 Jq	<0.22	<0.22	<0.12	<0.31	**8.4**	<0.23	<0.13
MW-104	08/22/11	<0.071	**30**	<0.14	<0.23	<0.35	<0.15	<0.46	**5.6**	0.26 Jq	**52**	4.1	0.25 Jq	<0.43	<0.15	<0.22	<0.22	<0.12	<0.31	2.2	<0.23	**15**
MW-105	08/25/11	<0.071	**31**	<0.14	<0.23	<0.35	<0.15	<0.46	**5.0**	**0.65**	**73**	4.0	1.1	<0.43	<0.15	<0.22	<0.22	<0.12	<0.31	**62**	<0.23	**1.8**
MW-106	08/25/11	**45**	**26**	<0.14	<0.23	<0.35	<0.15	<0.46	2.6	0.40 Jq	**40**	3.8	3.3	<0.43	<0.15	<0.22	<0.22	<0.12	<0.31	**34**	<0.23	**0.55**
MW-107	08/25/11	**36**	**10**	<0.14	<0.23	<0.35	<0.15	<0.46	0.80	<0.21	**7.4**	1.8	0.77	<0.43	<0.15	<0.22	<0.22	<0.12	<0.31	**8.4**	<0.23	<0.13
MW-108	08/22/11	**79**	**31**	<0.14	<0.23	<0.35	<0.15	<0.46	4.4	**0.67**	**74**	0.74	0.15 Jq	<0.43	<0.15	<0.22	<0.22	<0.12	<0.31	**56**	<0.23	**0.53**
MW-109	08/22/11	**440**	**27**	<0.14	<0.23	<0.35	<0.15	<0.46	2.4	0.44 Jq	**45**	3.1	0.20 Jq	<0.43	<0.15	<0.22	<0.22	<0.12	<0.31	**54**	<0.23	0.23 Jq
MDL (µg/L)		0.071	0.10	0.14	0.23	0.35	0.15	0.46	0.098	0.21	0.12	0.18	0.10	0.43	0.15	0.22	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	100	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 package.

- 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.
- B - The result is < 5 times the blank contamination. Cross contamination is suspected and the data is considered unusable.
- J - The analyte was positively identified, but the analyte concentration is an estimated value.
- e - A holding time violation occurred.
- k - The analyte was found in a field blank.
- q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 3-6 Summary of Validated Detected Organic and Inorganic Analytes - Fourth Quarter 2011

Sample Location	Sample Date	Per chlorate	1,4-Dioxane	Acetone	Benzene	Carbon disulfide	Carbon Tetra chloride	Chloro form	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1-Dichloro ethene	cis-1,2-Dichloroethene	trans-1,2-Dichloro ethene	Methylene Chloride	Toluene	1,1,1-Trichloro ethane	1,1,2-Trichloro ethane	Trichloro ethene	Tetra chloro ethene	Vinyl Chloride
All results reported in µg/L unless otherwise stated																				
SW-02	12/06/11	**240**	**13**	<5.0	<0.14	<0.36	<0.15	<0.46	0.48 Jq	<0.21	**12**	0.29 Jq	<0.10	<0.15	<0.22	0.22 Jq	<0.31	**15**	<0.23	<0.13
SW-03	12/06/11	**99**	**13**	<5.0	<0.14	<0.36	<0.15	<0.46	0.13 Jq	<0.21	1.6	0.18 Jq	<0.10	<0.15	<0.22	<0.12	<0.31	2.3	<0.23	<0.13
SW-04	12/06/11	**36**	**7.1**	5.6 Jq	<0.14	0.37 Jq	<0.15	<0.46	<0.098	<0.21	0.73	<0.18	<0.10	<0.15	0.29 Jq	<0.12	<0.31	0.96	<0.23	<0.13
SW-06	12/07/11	<0.071	**1.8**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
SW-07	12/07/11	<0.071	**1.5**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
SW-09	12/06/11	<0.071	**3.1**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	0.23 Jq	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
SW-16	12/07/11	<0.071	**1.2**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
SW-18	12/06/11	<0.071	**3.3**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
SW-19	12/07/11	<0.071	**2.1**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
F34-TW1	12/08/11	<0.071	**11**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	0.13 Jq	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	0.85	<0.23	<0.13
IW-04	12/08/11	<0.071	**21**	<5.0	0.17 Jq	<0.36	<0.15	<0.46	0.56	<0.21	**17**	0.68	<0.10	0.26 BJkq	<0.22	<0.12	<0.31	**23**	<0.23	<0.13
MW-15	12/09/11	<0.071	**5.8**	<5.0	<0.14	<0.36	<0.15	<0.46	0.25 Jq	<0.21	1.6	0.28 Jq	<0.10	<0.15	<0.22	<0.12	<0.31	1.0	<0.23	<0.13
MW-18	12/09/11	0.72	**3.7**	<5.0	<0.14	0.36 Jq	<0.15	<0.46	0.14 Jq	<0.21	0.88	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	0.83	<0.23	<0.13
MW-60A	12/12/11	**4,700**	**130**	<5.0	0.25 Jq	<0.36	0.43 Jq	2.5	4.9	**7.9**	**380**	2.3	0.17 Jq	0.31 BJkq	<0.22	0.31 Jq	1.8	**280**	0.41 Jq	<0.13
MW-60B	12/12/11	**900**	**8.8**	<5.0	<0.14	<0.36	<0.15	<0.46	0.41 Jq	**0.59**	**34**	<0.18	<0.10	0.17 BJkq	<0.22	<0.12	<0.31	**13**	<0.23	<0.13
MW-67	12/08/11	<0.071	**1.1**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-68	12/12/11	**6,000**	**11**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	2.6	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-70	12/09/11	5.0	**2.7**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	0.25 BJkq	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-88	12/12/11	**740**	0.23	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	0.20 BJkq	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-93	12/12/11	**6.7**	**14**	<5.0	<0.14	<0.36	<0.15	<0.46	<0.098	<0.21	0.56	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	1.7	<0.23	<0.13
MW-98B	12/09/11	**470**	**2.2**	<5.0	<0.14	<0.36	<0.15	0.63	0.24 Jq	<0.21	**9.6**	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	**12**	<0.23	<0.13
MW-100	12/12/11	<0.071	0.18 Jq	<5.0	<0.14	0.55	<0.15	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.22	<0.12	<0.31	<0.25	<0.23	<0.13
MW-103	12/07/11	**76**	**15**	<5.0	<0.14	<0.36	<0.15	<0.46	0.67	<0.21	5.6	4.3	<0.10	0.17 BJkq	<0.22	<0.12	<0.31	**10**	<0.23	<0.13
MW-104	12/07/11	<0.071	**32**	<5.0	<0.14	<0.36	<0.15	<0.46	**5.4**	0.26 Jq	**47**	3.8	0.21 Jq	<0.15	<0.22	<0.12	<0.31	2.4	<0.23	**14**
MW-105	12/08/11	<0.071	**31**	<5.0	<0.14	<0.36	<0.15	<0.46	4.8	**0.71**	**73**	4.7	2.2	<0.15	<0.22	<0.12	<0.31	**65**	<0.23	**1.9**
MW-106	12/08/11	**7.7**	**29**	<5.0	<0.14	<0.36	<0.15	<0.46	2.8	0.38 Jq	**28**	**8.2**	4.7	<0.15	<0.22	<0.12	<0.31	**13**	<0.23	0.32 Jq
MW-107	12/07/11	**23**	**12**	<5.0	<0.14	<0.36	<0.15	<0.46	0.81	<0.21	**8.2**	1.8	0.65	<0.15	<0.22	<0.12	<0.31	**8.4**	<0.23	<0.13
MW-108	12/07/11	**79**	**32**	<5.0	<0.14	<0.36	<0.15	<0.46	4.0	**0.63**	**66**	0.73	0.17 Jq	0.17 BJkq	<0.22	<0.12	<0.31	**59**	<0.23	0.46 Jq
MW-109	12/07/11	**380**	**28**	<5.0	<0.14	<0.36	<0.15	<0.46	2.1	0.45 Jq	**40**	2.4	0.17 Jq	<0.15	<0.22	<0.12	<0.31	**54**	<0.23	0.23 Jq
MDL (µg/L)		0.071	0.10	5	0.14	0.36	0.15	0.46	0.098	0.21	0.12	0.18	0.10	0.15	0.22	0.12	0.31	0.25	0.23	0.13
MCL/DWNL (µg/L)		6	1 (1)	-	1	160 (1)	0.5	-	5	0.5	6	6	10	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 package.

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.
B - The result is < 5 times the blank contamination. Cross contamination is suspected and the data is considered unusable.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
k - The analyte was found in a field blank.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 3-7 Summary Statistics of Validated Organic and Inorganic Analytes - Third Quarter 2011

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	15	15	15	1 (2)	µg/L	2.10	µg/L	2,900	µg/L
Benzene	15	8	2	1	µg/L	0.32	µg/L	2.4	µg/L
Chlorobenzene	15	5	0	-	µg/L	0.44	µg/L	1.2	µg/L
Chloroethane	15	1	0	-	µg/L	0.47	µg/L	0.47	µg/L
Carbon tetrachloride	15	2	2	0.5	µg/L	0.65	µg/L	3.0	µg/L
Chloroform	15	4	0	-	µg/L	0.54	µg/L	28	µg/L
1,1-Dichloroethane	15	15	7	5	µg/L	0.55	µg/L	110	µg/L
1,2-Dichloroethane	15	13	10	0.5	µg/L	0.26	µg/L	93	µg/L
1,1-Dichloroethene	15	15	15	6	µg/L	6.6	µg/L	5,000	µg/L
cis-1,2-Dichloroethene	15	15	5	6	µg/L	0.35	µg/L	260	µg/L
trans-1,2-Dichloroethene	15	13	0	10	µg/L	0.13	µg/L	3.3	µg/L
Methyl-tert-butyl ether	15	2	0	13	µg/L	0.61	µg/L	1.1	µg/L
Methylene Chloride	15	7	0	5	µg/L	0.17	µg/L	1.0	µg/L
Styrene	15	1	0	100	µg/L	0.24	µg/L	0.24	µg/L
Toluene	15	7	0	150	µg/L	0.3	µg/L	2.2	µg/L
1,1,1-Trichloroethane	15	3	0	200	µg/L	0.65	µg/L	3.6	µg/L
1,1,2-Trichloroethane	15	5	3	5	µg/L	0.66	µg/L	11	µg/L
Trichloroethene	15	15	14	5	µg/L	2.2	µg/L	1,600	µg/L
Tetrachloroethene	15	6	0	5	µg/L	0.29	µg/L	4.0	µg/L
Vinyl chloride	15	11	5	0.5	µg/L	0.14	µg/L	15	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	15	13	13	6	µg/L	21	µg/L	75,000	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

mg/L - Milligrams per liter

µg/L - Micrograms per liter

Table 3-8 Summary Statistics of Validated Organic and Inorganic Analytes - Fourth Quarter 2011

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	29	29	27	1 (2)	μg/L	0.18	μg/L	130	μg/L
Acetone	29	1	0	-	μg/L	5.6	μg/L	5.6	μg/L
Benzene	29	2	0	1	μg/L	0.17	μg/L	0.25	μg/L
Carbon disulfide	29	3	0	160 (2)	μg/L	0.36	μg/L	0.55	μg/L
Carbon tetrachloride	29	1	0	0.5	μg/L	0.43	μg/L	0.43	μg/L
Chloroform	29	2	0	-	μg/L	0.63	μg/L	2.5	μg/L
1,1-Dichloroethane	29	15	1	5	μg/L	0.13	μg/L	5.4	μg/L
1,2-Dichloroethane	29	7	4	0.5	μg/L	0.26	μg/L	7.9	μg/L
1,1-Dichloroethene	29	20	11	6	μg/L	0.13	μg/L	380	μg/L
cis-1,2-Dichloroethene	29	12	1	6	μg/L	0.18	μg/L	8.2	μg/L
trans-1,2-Dichloroethene	29	7	0	10	μg/L	0.17	μg/L	4.7	μg/L
Toluene	29	1	0	150	μg/L	0.29	μg/L	0.29	μg/L
1,1,1-Trichloroethane	29	2	0	200	μg/L	0.22	μg/L	0.31	μg/L
1,1,2-Trichloroethane	29	1	0	5	μg/L	1.8	μg/L	1.8	μg/L
Trichloroethene	29	18	11	5	μg/L	0.83	μg/L	280	μg/L
Tetrachloroethene	29	1	0	5	μg/L	0.41	μg/L	0.41	μg/L
Vinyl chloride	29	5	2	0.5	μg/L	0.23	μg/L	14	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	29	16	14	6	μg/L	0.72	μg/L	6,000	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
mg/L - Milligrams per liter
μg/L - Micrograms per liter

3.4.1 Data Quality Review

The quality control samples were reviewed as described in the Programmatic Sampling and Analysis Plan (Tetra Tech, 2010a). The data for the groundwater sampling activities was contained in analytical data packages generated by E.S. Babcock and Sons Laboratories Inc. These data packages were reviewed using the latest versions of the National Functional Guidelines for Organic and Inorganic Data Review from the EPA (EPA, 2008 and EPA, 2010).

Preservation criteria, holding times, field blanks, laboratory control samples (LCS), method blanks, duplicate environmental samples, spiked samples, and surrogate and spike recovery data were reviewed. Within each environmental sample, the sample-specific quality control spike recoveries were examined. These data examinations 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 (MS/MSD) RPD results. Surrogate recoveries were examined for all organic compound analyses and compared to their control limits.

Environmental samples were analyzed by the following methods: Method E332.0 for perchlorate, Method SW8270C SIM for 1,4-dioxane, and Method SW8260B for VOCs.

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

Method SW8260B for 1,4-dioxane had calibration errors that caused five out of forty 1,4-dioxane analytes (12.5%) to be qualified as estimated. The calibration for 1,4-dioxane is based on a multi-level calibration with the lowest calibration level equal to the reporting limit. The reporting level for 1,4-dioxane by Method SW8260B is 35 ppb. 1,4-Dioxane is poorly purged from water and sometimes (as in this example) the low point in the calibration is out of control. It is for this reason the SW8260B QC method instruction states that 1,4-dioxane is better analyzed by Method SW8270C SIM. 1,4-Dioxane was also analyzed for all samples by Method SW8270C SIM and the results for these samples were not qualified. The 1,4-dioxane results from the Method SW8270C SIM analysis are more accurate and should be used in place of the qualified Method SW8260B results. The 1,4-dioxane data qualified as estimated is usable for the intended purpose.

Method SW8260B for VOCs had trip blank contamination that caused 0.4 percent (7 of the 1720 analytes) of the total SW8260B data to be qualified for blank contamination. The blank qualified results should be considered not detected at elevated detection levels.

3.5 CHEMICALS OF POTENTIAL CONCERN

The identification of COPCs is an ongoing process that takes place annually as part of the Second Quarter sampling. The purpose of identifying COPCs is to establish a list of analytes that best represents the extent and magnitude of affected groundwater and to focus more detailed analysis on only those analytes. The analytes were organized and evaluated in two groups, organic and inorganic, and divided into primary and secondary COPCs. Tables 3-5 and 3-6 present summaries of the organic and inorganic analytes detected during the Third Quarter 2011 and Fourth Quarter 2011 monitoring events. Data that is "B" qualified because of associations with either laboratory blank contamination or field cross contamination is not included in the COPC evaluation.

The COPC process does not eliminate analytes from testing but reduces the number of analytes that are evaluated and discussed during reporting. While all of the secondary COPCs will continue to be tested for in future monitoring events because of their association with other analytes that are listed as primary COPCs, these secondary COPCs are detected on a more limited or inconsistent basis, and/or their detection falls below a regulatory threshold. Therefore, the secondary COPCs will not be discussed further in the later sections of this report. Additionally, the standard list of analytes for each method will continue to be tested for and screened annually to insure that the appropriate COPCs are being identified and evaluated as specified in the Beaumont Sites 1 and 2, Programmatic Sampling and Analysis Plan (Tetra Tech, 2010a).

3.5.1 Identification of Chemicals of Potential Concern

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

An annual evaluation of COPCs based on the results of the Second Quarter 2011 water quality monitoring event was presented in the First and Second Quarter 2011 Semiannual Groundwater Monitoring Report (Tetra Tech, 2011a). Based on the results of water quality monitoring and the screening of those results against the existing COPCs, the MCLs, and DWNLs, no additional COPCs were identified, nor was there evidence to remove an analyte from the existing COPC list. Table 3-9 presents those groundwater analytes that have been identified as COPCs. Time-series graphs of primary and secondary COPCs are provided in Appendix E.

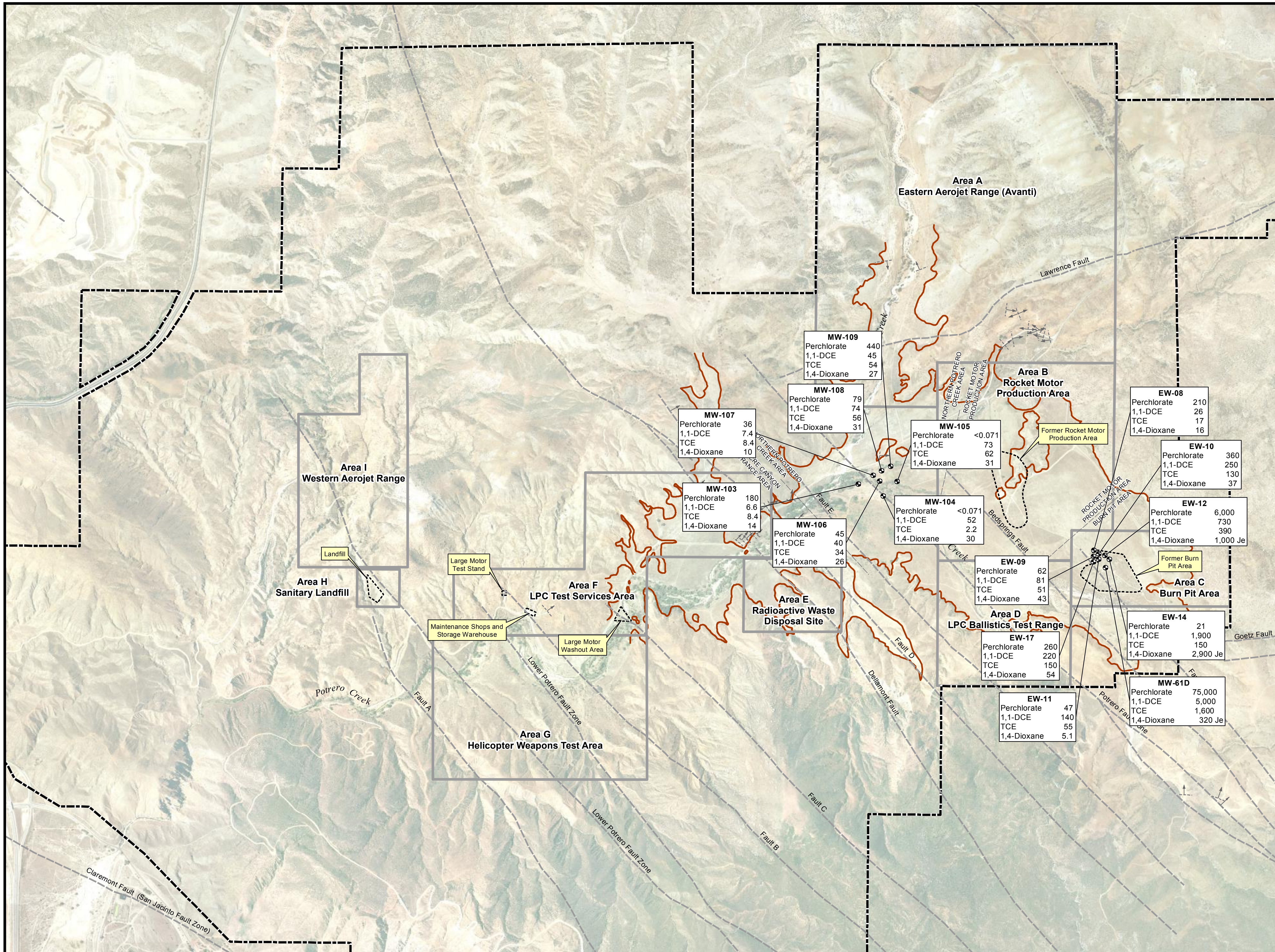
Table 3-9 Groundwater Chemicals of Potential Concern

Analyte	Classification	Comments
Perchlorate	Primary	Parent product (propellant), widely detected at Site.
1,1-Dichloroethene	Primary	Breakdown product of 1,1,1-TCA, detected at higher concentrations than 1,1,1-TCA at Site.
Trichloroethene	Primary	Parent product (solvent), widely detected at Site.
1,4-Dioxane	Primary	Stabilizer in 1,1,1-TCA, widely detected at Site.
1,1-Dichloroethane	Secondary	Breakdown product of 1,1,1-TCA
1,2-Dichloroethane	Secondary	Breakdown product of 1,1,1-TCA
1,1,1-Trichloroethane	Secondary	Parent product (solvent), detected at lower concentrations than breakdown product (1,1-DCE) at Site.
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 2011 and Fourth Quarter 2011 monitoring events are minor events. Only guard wells, wells with increasing contaminant trends, new wells, and surface water locations are sampled and tested during these events (Tetra Tech, 2003b). Therefore, only those wells and surface water sampled and tested during this event will be discussed. Interpretation of the data collected as part of the hydraulic testing study is presented in the Site 1 Hydraulic Testing Summary Report. Figures 3-10 and 3-11 present the primary COPC sampling results for the wells sampled during the Third Quarter 2011 and Fourth 2011 monitoring events, respectively. A figure illustrating the extent of the primary COPCs based on the recent data is presented in Figure 3-12.

X:\GIS\Lockheed S1_Q3Q411\COPC_Q311.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 Unit Property Boundary (Lockheed MArtin Beaumont Site 1)
- Historical Operational Area Boundary

Notes:

DCE - Dichloroethene.

TCE - Trichloroethene

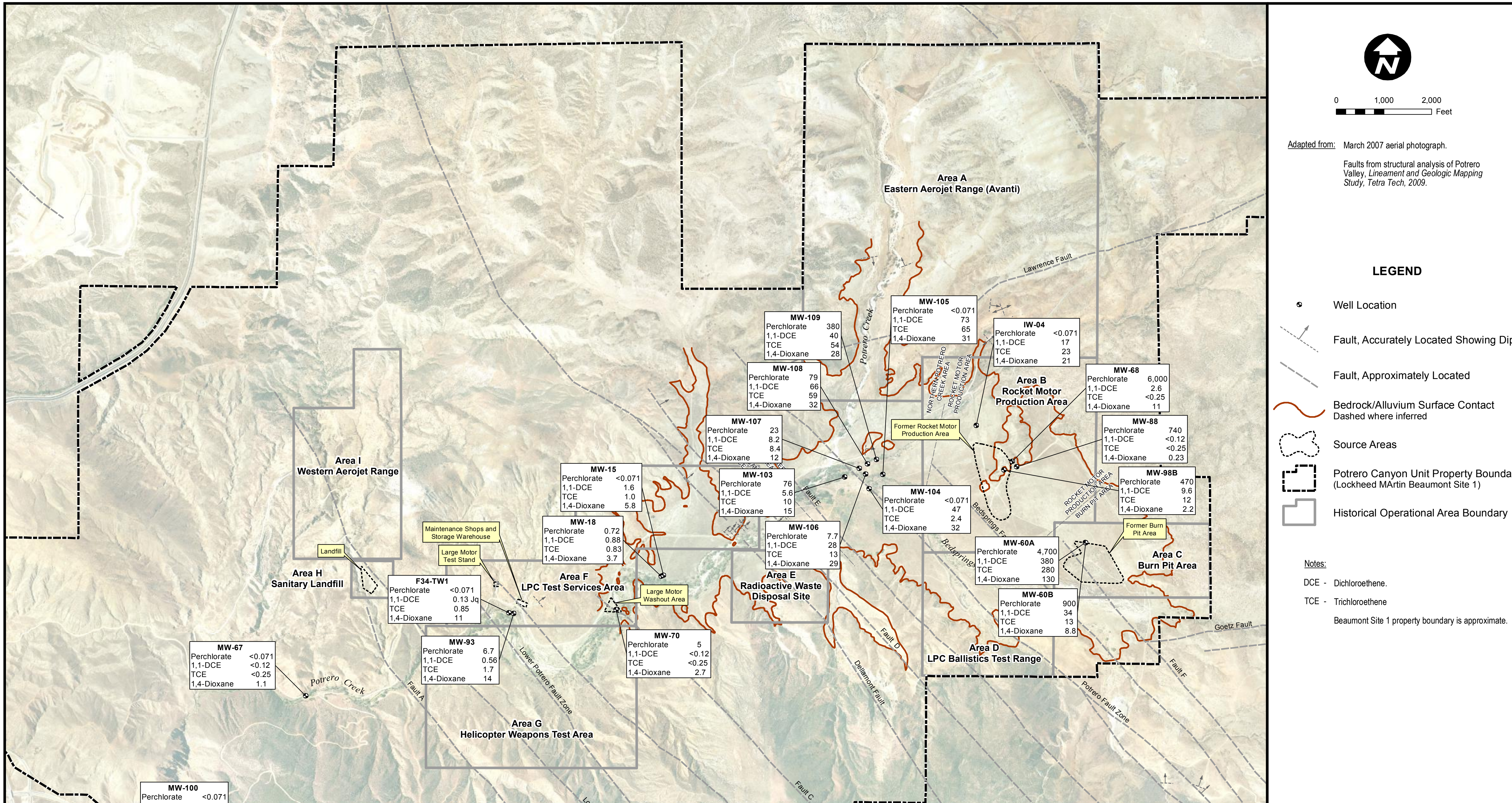
Beaumont Site 1 property boundary is approximate.

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-10
Primary COPC
Sampling Results (µg/L)-
Third Quarter 2011

TETRA TECH

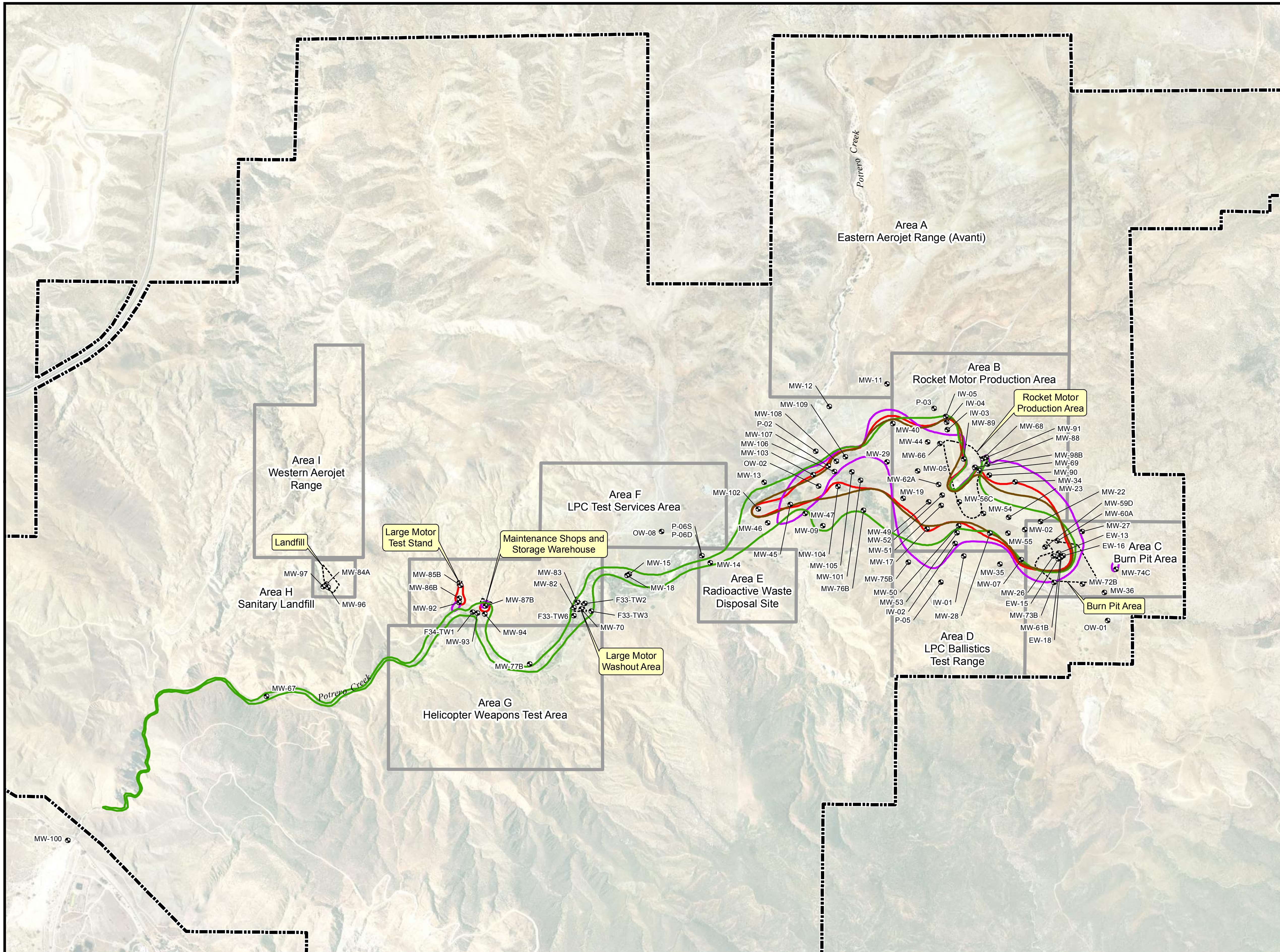
X:\GIS\Lockheed S1_Q3Q411\COPC_Q411.mxd



Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-11
Primary COPC Sampling Results (µg/L)- Fourth Quarter 2011

TETRA TECH



X:\GIS\Lockheed S1_Q3Q411\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

- Well Location
- 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
- Potrero Canyon Unit Property Boundary (Lockheed Martin Beaumont Site 1)
- Historical Operational Area Boundary

Notes: Beaumont Site 1 property boundary is approximate.

Potrero Canyon Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-12

Primary COPC 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 offsite.

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 offsite approximately 500 feet from the southern property boundary just south of Gilman Springs Road near the mouth of Potrero Creek. Table 3-10 presents a summary of the detected COPCs reported in guard well samples collected during Fourth Quarter 2011, and previous monitoring events. In general, the COPC concentrations during this reporting period have remained stable in the guard wells.

Table 3-10 Summary of Detected COPCs in Guard Wells

Sample Location	Site Area	Sample Date	Perchlorate	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	06/14/10	<0.071	**6.6**	0.43 Jq	2.7	0.33 Jq	1.2
		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
		12/09/12	<0.071	**5.8**	0.25 Jq	1.6	0.28 Jq	1.0
MW-18	MCEA	05/05/10	2.5	**5.2**	0.18 Jq	1.2	<0.18	1.0
		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
		12/09/12	0.72	**3.7**	0.14 Jq	0.88	<0.18	0.83
MW-67	MCEA	05/07/10	<0.071	**1.2**	<0.098	<0.12	<0.18	<0.17
		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
		12/08/12	<0.071	**1.1**	<0.098	<0.12	<0.18	<0.25
MW-100	DG	06/02/10	0.072 Jq	0.13 Jeq	<0.098	<0.12	<0.18	<0.17
		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
		12/12/12	<0.071	0.18 Jq	<0.098	<0.12	<0.18	<0.25
MCL/DWNL (µg/L)			6	1 (1)	5	6	6	5

Notes:
DG - Downgradient
MCEA - Massacre Canyon Entrance Area
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.
e - A holding time violation occurred.
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, 2011a), 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 2011 semiannual sampling event. The portion of the site where these wells are located, the location identification, and the COPC that has 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

Table 3-11 presents a summary of the detected COPCs reported in increasing trend well samples collected during Fourth Quarter 2011, and previous monitoring events. In general, the COPC concentrations in the increasing trend wells are consistent with previous results.

Table 3-11 Summary of Detected COPCs 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	08/19/09	<0.071	**4.7**	0.29 Jq	0.77
		11/18/09	<0.071	**4.0**	0.28 Jq	0.67
		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
IW-04	RMPA	06/09/09	<0.36	**23**	**19**	**15**
		06/14/10	0.11	**20**	**23**	**19**
		01/17/11	<0.071	**23**	**25**	**18**
		06/14/11	<0.071	**25**	**35**	**23**
		12/08/11	<0.071	**21**	**17**	**23**
MW-60A	BPA	06/09/09	**5,300**	**140**	**570**	**310**
		06/08/10	**5,400 Jd**	**150**	**550**	**360**
		01/06/11	**4,700**	**140**	**430**	**290**
		06/21/11	**4,900**	**130**	**460**	**280**
		12/12/11	**4,700**	**130**	**380**	**280**
MW-60B	BPA	06/09/09	**1,200**	**6.6**	**46**	**10**
		06/08/10	**1,100 Jd**	**10**	**52**	**14**
		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**
MW-68	RMPA	06/22/09	**3,600**	**9.8**	3.3	<0.17
		06/17/10	**9,600**	**18**	5.8	3.7
		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
MW-88	RMPA	08/17/09	**450**	0.17 Jq	<0.12	<0.17
		11/11/09	**470**	0.21	0.44 Jq	0.39 Jq
		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
MW-93	MCEA	08/19/09	3.9	**16**	0.76	2.3
		11/19/09	2.3	**13**	0.87	2.3
		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
MW-98B	RMPA	11/11/09	**1,600**	**10**	**13**	**28**
		06/07/10	**1,400 Jd**	**11**	**21**	**35**
		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**
MW-103	NPCA	12/14/10	5.6	**17**	2.8	**7.5**
		03/24/11	**56**	**12**	2.6	4.8
		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**
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-103 through MW-109, which were installed as part of the Site 1 Plant Uptake Study (Tetra Tech, 2010c), were sampled during the Third Quarter 2011 and Fourth Quarter 2011 sampling events. With the exception of perchlorate, COPC sample results for the new wells were generally consistent with results from previous sampling events. The concentration of perchlorate remained generally consistent with previous results during the third quarter but concentration decreases were seen in all wells except MW-108 during the fourth quarter. At this time there is insufficient data to determine if these decreases were due to seasonal influences. The addition of the new wells helped to better define the plume connection between the RMPA and the area downgradient (west) of the confluence of Bedsprings and Potrero creeks near the groundwater discharge ponds. A summary of the sample results from Fourth Quarter 2011 and previous sampling events can be found in Table 3-12.

Table 3-12 Summary of Detected COPCs 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	Trichloro ethene	Vinyl Chloride
All results reported in µg/L unless otherwise stated									
MW-103	12/14/10	5.6	**17**	0.69	<0.21	2.8	2.7	**7.5**	<0.13
	03/24/11	**56**	**12**	0.42 Jq	<0.21	2.6	3.2	4.8	<0.13
	06/09/11	**160**	**11**	0.38 Jq	<0.21	3.6	2.2	**5.9**	<0.13
	08/22/11	**180**	**14**	0.55	<0.21	**6.6**	3.2	**8.4**	<0.13
	12/07/11	**76**	**15**	0.67	<0.21	5.6	4.3	**10**	<0.13
MW-104	12/14/10	<0.071	**31**	**5.2**	<0.21	**60**	4.3	1.9	**15**
	03/24/11	<0.071	**34**	**5.8**	0.24 Jq	**46**	3.1	0.94	**16**
	06/09/11	<0.071	**31**	**5.6**	0.26 Jq	**56**	3.7	1.7	**14**
	08/22/11	<0.071	**30**	**5.6**	0.26 Jq	**52**	4.1	2.2	**15**
	12/07/11	<0.071	**32**	**5.4**	0.26 Jq	**47**	3.8	2.4	**14**
MW-105	12/13/10	<0.071	**32**	**5.9**	0.76	**130**	4.1	**81**	**2.4**
	03/24/11	<0.071	**33**	**5.7**	0.65	**90**	4.4	**72**	**2.2**
	06/09/11	<0.071	**34**	**5.4**	0.66	**87**	3.8	**69**	1.6
	08/25/11	<0.071	**31**	**5.0**	0.65	**73**	4.0	**62**	**1.8**
	12/08/11	<0.071	**31**	4.8	0.71	**73**	4.7	**65**	**1.9**
MW-106	12/13/10	<0.071	**27**	2.7	0.30 Jq	**24**	**10**	2.0	0.22 Jq
	03/24/11	**40**	**21**	1.6	0.26 Jq	**27**	1.8	**23**	0.38 Jq
	06/07/11	**42**	**23**	1.7	0.26 Jq	**27**	1.9	**24**	0.34 Jq
	08/25/11	**45**	**26**	2.6	0.40 Jq	**40**	3.8	**34**	**0.55**
	12/08/11	**7.7**	**29**	2.8	0.38 Jq	**28**	**8.2**	**13**	0.32 Jq
MW-107	12/14/10	**14**	**12**	0.90	<0.21	**11**	2.8	**9.6**	<0.13
	03/24/11	**12**	**12**	0.53	<0.21	4.2	1.5	**6.3**	<0.13
	06/07/11	**34**	**11**	0.60	<0.21	4.8	1.8	**7.8**	<0.13
	08/25/11	**36**	**10**	0.80	<0.21	**7.4**	1.8	**8.4**	<0.13
	12/07/11	**23**	**12**	0.81	<0.21	**8.2**	1.8	**8.4**	<0.13
MW-108	12/13/10	**75**	**30**	4.7	0.83	**100**	0.68	**64**	**0.65**
	03/24/11	**84**	**25**	3.3	0.50	**60**	1.7	**44**	0.45 Jq
	06/09/11	**84**	**20**	2.1	0.32 Jq	**36**	2.9	**28**	0.25 Jq
	08/22/11	**79**	**31**	4.4	0.67	**74**	0.74	**56**	**0.53**
	12/07/11	**79**	**32**	4.0	0.63	**66**	0.73	**59**	0.46 Jq
MW-109	12/13/10	**440**	**27**	2.7	0.58	**66**	2.8	**64**	0.34 Jq
	03/24/11	**510**	**27**	2.6	0.55	**56**	3.0	**60**	0.32 Jq
	06/09/11	**450**	**27**	2.6	0.53	**55**	2.8	**61**	0.24 Jq
	08/22/11	**440**	**27**	2.4	0.44 Jq	**45**	3.1	**54**	0.23 Jq
	12/07/11	**380**	**28**	2.1	0.45 Jq	**40**	2.4	**54**	0.23 Jq
MCL/DWNL (µg/L)		6	1 (1)	5	5	6	6	5	0.5

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.
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).

3.6.4 Surface Water

Surface water samples were collected during Fourth Quarter 2011 as part of the routine groundwater sampling event. Table 3-13 presents concentrations of COPCs reported in surface water samples collected from this sampling event.

During Fourth Quarter 2011 surface water samples were collected from nine locations (SW-02, SW-03, SW-04, SW-06, SW-07, SW-09, SW-16, SW-18, and SW-19) along the Potrero and Bedsprings creek drainages. The remaining eight locations were dry at the time of sampling. Because surface water location SW-16 was sampled, there was no need to sample the alternate location, SW-17. The four primary COPCs (1,4-dioxane, 1,1-DCE, TCE, and perchlorate) and two secondary COPCs (1,1-DCA and cis-1,2-dichloroethene) were detected in surface water samples collected from locations SW-02, SW-03, and SW-04; these samples were collected from springs and or spring-fed ponds located outside of the stream beds but near the intersection of Bedsprings and Potrero creeks.

Two of the primary COPCs (1,4-dioxane and 1,1-DCE) and no secondary COPCs were detected in the surface water samples collected from locations SW-06, SW-07, SW_09, SW-16, SW-18, and SW-19. These samples were collected from water flowing in Potrero Creek and are located topographically downgradient of the springs discussed in the previous paragraph. Figure 3-13 presents concentrations of COPCs reported in surface water samples collected from the Fourth Quarter 2011 monitoring event.

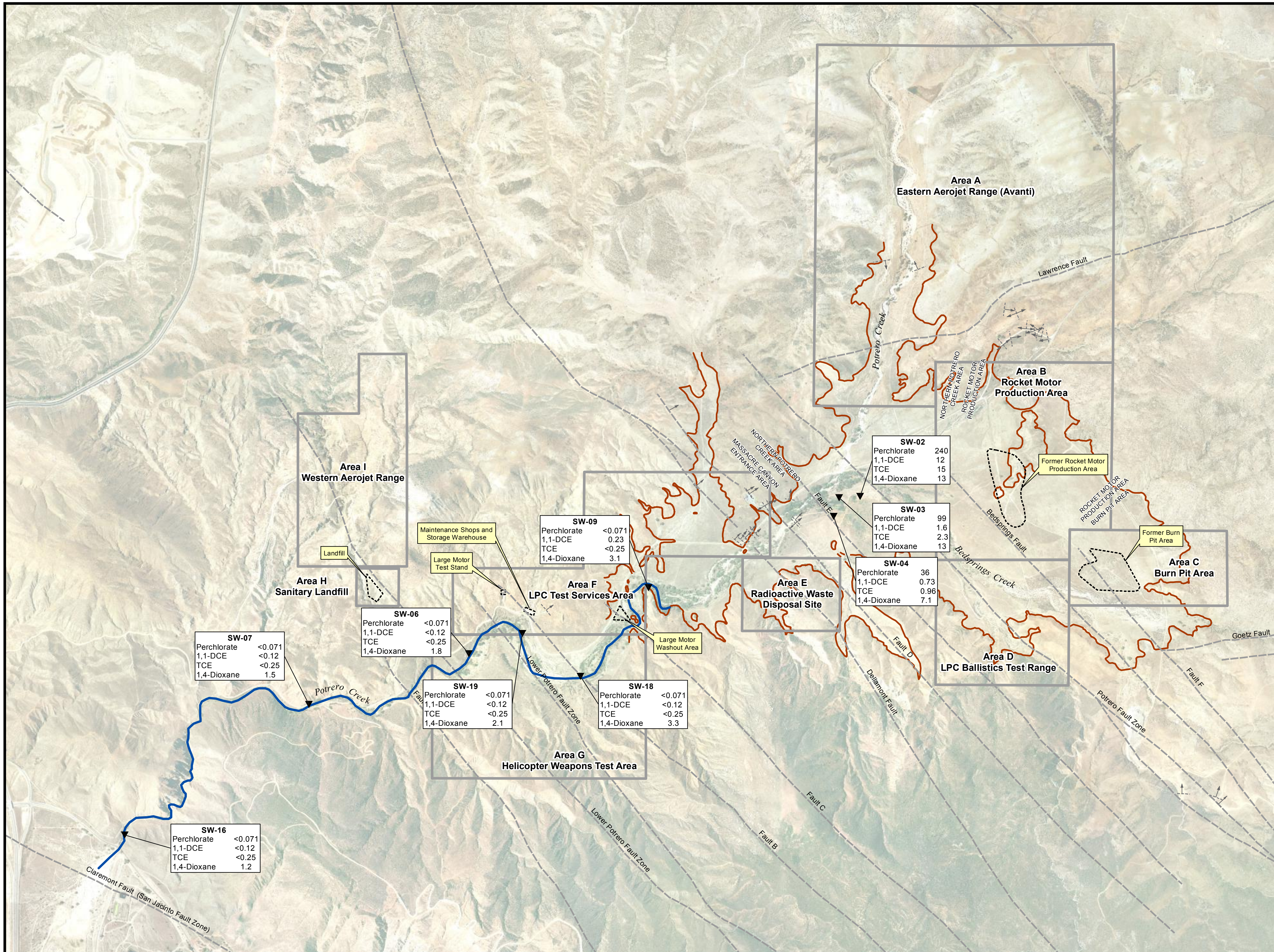
In general, the concentration of COPCs in surface water is highest in the area of the ponds, an area of discharging groundwater, and decreases rapidly to concentrations at or near the MDL as one moves downgradient through the riparian zone towards the property boundary. The concentration gradient of 1,4-dioxane in surface water samples, however, is much smaller and appears to be less affected by movement through the riparian zone.

Table 3-13 Summary of Detected COPCs in Surface Water – Fourth Quarter 2011

Sample Location	Sample Date	Per chlorate	1,4-Dioxane	1,1-Dichloroethane	1,1-Dichloro ethene	c-1,2-Dichloroethene	Trichloro ethene
All results reported in µg/L unless otherwise stated							
SW-02	12/06/11	**240**	**13**	0.48 Jq	**12**	0.29 Jq	**15**
SW-03	12/06/11	**99**	**13**	0.13 Jq	1.6	0.18 Jq	2.3
SW-04	12/06/11	**36**	**7.1**	<0.098	0.73	<0.18	0.96
SW-06	12/07/11	<0.071	**1.8**	<0.098	<0.12	<0.18	<0.25
SW-07	12/07/11	<0.071	**1.5**	<0.098	<0.12	<0.18	<0.25
SW-09	12/06/11	<0.071	**3.1**	<0.098	0.23 Jq	<0.18	<0.25
SW-16	12/07/11	<0.071	**1.2**	<0.098	<0.12	<0.18	<0.25
SW-18	12/06/11	<0.071	**3.3**	<0.098	<0.12	<0.18	<0.25
SW-19	12/07/11	<0.071	**2.1**	<0.098	<0.12	<0.18	<0.25
Method Detection Limit (µg/L)		0.071	0.10	0.098	0.12	0.18	0.20
MCL/DWNL (µg/L)		6	1 (1)	5	6	6	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).

X:\G\S\Lockheed S1_Q3Q411\SurfWater_Q311 COPC.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

- Surface Water Sample Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Surface Water Flow
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Source Areas
- Potrero Canyon Unit 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 Unit
(Lockheed Martin Beaumont Site 1)

Figure 3-13
Surface Water Primary COPC Sampling Results (µg/L)- Fourth Quarter 2011

TETRA TECH

3.7 HABITAT CONSERVATION

Consistent with the U.S. Fish and Wildlife Service approved HCP (USFWS, 2005) and subsequent clarifications (LMC, 2006a, 2006b, and 2006c) of the HCP describing activities for environmental remediation at the Site, 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 2011 and Fourth Quarter 2011 monitoring events.

SECTION 4 SUMMARY AND CONCLUSIONS

A total of 179 groundwater level measurements were collected for the Third Quarter water quality 2011 monitoring event and a total 181 groundwater level measurements were collected during the Fourth Quarter water quality 2011 monitoring event. Four wells were observed to be dry during each of the events.

For the Third Quarter 2011 monitoring event, a total of seven monitoring wells were proposed and sampled for water quality monitoring. Eight additional wells were sampled as part of the hydraulic testing study. Therefore, water quality data was collected from 15 monitoring well locations.

For the Fourth Quarter 2011 monitoring event, a total of 38 sampling locations (17 surface water, one alternate surface water location, and 20 monitoring wells) were proposed for water quality monitoring. Eight surface water sample locations were not sampled because the locations were dry. SW-16 was sampled so SW-17, an alternate surface water location sampled when SW-16 is dry, was not sampled. Therefore, water quality data was collected from nine surface water and 20 monitoring well locations.

4.1 GROUNDWATER ELEVATIONS

The Beaumont NWS reported approximately 0.27 inches of precipitation during Third Quarter 2011 and approximately 3.73 inches of precipitation during Fourth Quarter 2011. During this time period groundwater elevations generally decreased across the Site. During Third Quarter 2011, groundwater elevation decreases were seen in wells located in all areas. During Fourth Quarter 2011 groundwater elevation decreases were seen in wells located in the BPA, RMPA, and the MCEA. During this same period, groundwater elevation increases were seen in wells located in the NPCA.

Groundwater elevations during the Third Quarter 2011 monitoring event ranged from approximately 2,162 feet msl upgradient of the former BPA to approximately 1,794 feet msl in the MCEA. Groundwater elevations during the Fourth Quarter 2011 monitoring event ranged from approximately 2,158 feet msl upgradient of the former BPA to approximately 1,795 feet msl in the MCEA.

Groundwater elevation differences in all wells from quarter to quarter appear to depend on the short- and long-term weather patterns. In general, the greatest differences in quarterly groundwater elevations occur during periods of seasonal precipitation. Wells located within the NPCA and the MCEA appear to respond most quickly to precipitation compared to the former BPA and RMPA, which generally show a one-season lag before responding to seasonal precipitation. However, wells near Bedsprings Creek just south of the BPA also show rapid responses to precipitation due to surface water infiltration and mountain front recharge. The response also diminishes within each area with depth and distance from the Potrero and Bedsprings Creeks. The Site has experienced overall groundwater level declines since 2005.

4.2 SURFACE WATER FLOW

During the Third Quarter 2011 and Fourth Quarter 2011, the Potrero and Bedsprings creek riparian corridors were walked to determine the presence, nature, and quantity of surface water within the creek beds. The locations where surface water was encountered were plotted and a determination was made on whether the water was flowing or stagnant. At specific locations where flowing water was encountered, the flow rate was determined using a modified version of the EPA Volunteer Stream Monitoring: A Methods Manual (USEPA, 1997).

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

During Third Quarter 2011 SF-1 was dry, SF-2 had an average flow rate of 0.01 cfs, SF-3 had an average flow rate of 0.27 cfs, and SF-4 was dry. The average site flow rate for Third Quarter 2011 was 0.14 cfs.

During Fourth Quarter 2011 SF-1 had an average flow rate of 0.73 cfs, SF-2 had an average flow rate of 1.26 cfs, SF-3 had an average flow rate of 0.97 cfs, and SF-4 was dry. The average site flow rate for Fourth Quarter 2011 was 0.99 cfs.

4.3 GROUNDWATER FLOW AND GRADIENTS

Groundwater flow directions from Third Quarter 2011 and Fourth Quarter 2011 were similar to previously observed patterns for a dry period. Generally, groundwater flows northwest from the southeastern limits of the valley (near the former BPA) beneath the former RMPA, towards

Potrero Creek, where groundwater flow then changes direction and begins heading southwest, parallel to the flow of Potrero Creek, into Massacre Canyon.

Between June 2011 (Second Quarter 2011) and September 2011 (Third Quarter 2011), the overall groundwater gradient (approximating a flowline from MW-36, upgradient of the BPA, through the RMPA and NPCA to MW-18, in the MCEA) decreased to 0.014 ft/ft. Between September 2011 (Third Quarter 2011) and December 2011 (Fourth Quarter 2011), the overall groundwater gradient through the same flow path decreased to 0.013 ft/ft. In general the horizontal gradient was lowest between the BPA and the RMPA with a greatly increased flow through the NPCA and the MCEA. The flattening of the gradient in the BPA and RMPA appears to be attributable to the lithology, aquifer transmissivity, and aquifer thickness in these areas.

Vertical groundwater gradients between shallow and deeper monitoring well pairs were generally downward (negative) in the BPA, RMPA, and the NPCA, and upward (positive) in the MCEA. The response to seasonal changes in groundwater recharge, although dampened by depth, were 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 GMP. The GMP has a quarterly/semiannual/annual/biennial 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 quarter 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.

A COPC evaluation is performed annually, and reported in the First and Second Quarter Semiannual Groundwater Monitoring Report. The primary COPCs identified for the Site during the 2011 evaluation (Tetra Tech, 2011a) were perchlorate, 1,1-DCE, TCE and 1,4-dioxane. The secondary COPCs identified for the Site during 2010 monitoring were 1,1-DCA, 1,2-dichloroethane (1,2-DCA), 1,1,1-TCA, 1,1,2-TCA, cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride. The 2011 evaluation yielded no additions or deletions to the list of COPCs. The results of surface and groundwater samples collected and tested during the Third Quarter 2011 and Fourth Quarter 2011 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 spring-fed ponds, ephemeral ponds, and locations in the Bedsprings and Potrero creek drainages. Twelve locations within the active drainages have been identified for surface water sampling during a storm event. Due to the ongoing drought conditions and the ephemeral nature of the ponds and creeks, it is common for many of the locations to be dry at the time of sampling.

During the Fourth Quarter 2011 sampling event, surface water samples were collected from nine locations. The remaining eight locations were dry at the time of sampling. Because surface water location SW-16 was able to be sampled, the alternate location, SW-17, was not sampled. The sample results from the locations sampled are consistent with previous sample results obtained at the Site.

Surface water sample locations SW-02, SW-03, and SW-04 are collected from springs and or spring-fed ponds, an area of discharging groundwater, located outside of the stream beds but near the intersection of Bedsprings and Potrero creeks, downgradient from the RMPA. During Fourth Quarter 2011 the four primary COPCs (1,4-dioxane, 1,1-DCE, TCE, and perchlorate) and none of the secondary COPCs were detected above the MCL or DWNL in one or more samples collected from these locations.

Surface water sample locations SW-06, SW-07, SW-09, SW-10, SW-12, SW-18, and SW-19 are located in areas of flowing water in Potrero Creek, topographically downgradient of the springs and groundwater discharge ponds discussed in the previous paragraph. During Fourth Quarter 2011 1,4-dioxane was the only COPC detected above the MCL or DWNL in these locations. 1,4-Dioxane is generally detected in samples from these locations above the DWNL.

1,4-Dioxane has been intermittently detected in surface water samples collected at location SW-16 located at the mouth of Massacre Canyon and Gilman Hot Springs Road. During Fourth Quarter 2011 1,4-dioxane was detected at a concentration of 1.2 µg/L.

4.4.2 Groundwater

Only guard wells, wells with increasing contaminant trends and new wells were sampled and analyzed during Third Quarter 2011 and Fourth Quarter 2011 (Tetra Tech, 2003b).

New Wells

Monitoring wells MW-103 through MW-109 were installed as part of the Site 1 Plant Uptake Study (Tetra Tech, 2010c) to determine the relationship between the concentration of perchlorate and 1,4-dioxane found in shallow groundwater and the concentrations found in leaf tissue. During Third Quarter 2011 and Fourth Quarter 2011 perchlorate was detected in five of the seven wells at concentrations ranging from 7.7 µg/L to 440 µg/L, and 1,4-dioxane was detected in all wells ranging in concentration from 10 µg/L to 32 µg/L.

Guard Wells

Four monitoring wells are designated as guard wells: MW-15, MW-18, MW-67, and MW-100. All guard wells are located along Potrero Creek, downgradient of the BPA and RMPA source areas. Wells MW-15 and MW-18 are a clustered well pair located upstream of the Large Motor Washout Area (Feature F-33). 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 located approximately three miles from the southern site boundary and are located upgradient of the secondary sources identified at F-33, F-34, and F-39. Well MW-67, the farthest downgradient site well, is located approximately 0.9 miles upgradient of the southern site boundary, and MW-100, an offsite well, is located approximately 500 feet south of the southern site boundary near the mouth of Potrero Creek. 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 5.8 µg/L, 3.7 µg/L, 1.1 µg/L, and 0.18 µg/L, respectively. The analyte 1,4-dioxane was the only COPC to be detected above the MCL or DWNL in these guard wells during the Fourth Quarter 2011 sampling event. The MCLs for 1,1-DCE, TCE, and perchlorate are 6 µg/L, 5 µg/L, and 6 µg/L, respectively. The DWNL for 1,4-dioxane is 1 µg/L. Sample results for the guard wells from Fourth Quarter 2011 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 were performed using data from Second Quarter 2002 to Second Quarter 2011. This period was chosen because operation of the RMPA 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, 2010b). 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 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 2011 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) with 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 COPC 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 the well is reclassified in the annual temporal trend analysis.

Table 4-1 Summary of Increasing COPC Trends

Analyte:	Perchlorate			1,1-Dichloroethene			Trichloroethene			1,4-Dioxane		
Sample Location	Trend	Magnitude (%/yr)	Magnitude (µg/L/y)	Trend	Magnitude (%/yr)	Magnitude (µg/L/y)	Trend	Magnitude (%/yr)	Magnitude (µg/L/y)	Trend	Magnitude (%/yr)	Magnitude (µg/L/y)
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:

(shaded) Shading indicates that based on the magnitude of the trend and the well location it was included in the Fourth Quarter 2010 sampling event.

µg/L/yr - Microgram per liter per year

%/yr - Percent change per year

4.5 PROPOSED CHANGES TO THE GROUNDWATER MONITORING PROGRAM

4.5.1 Groundwater Sampling Frequency

The sampling frequency of a monitoring well is based on the well's classification (i.e., 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 potential well classifications. Because there are not currently any remedial actions, there are no wells designated as remedial monitoring wells. 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

4.5.2 Proposed Changes

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

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