Semiannual Groundwater Monitoring Report Fourth Quarter 2011 and First Quarter 2012 Laborde Canyon (Lockheed Martin Beaumont Site 2) Beaumont, California



Prepared for:

LOCKHEED MARTIN

Prepared by:



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June 13, 2012

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

Subject: Submittal of the Semiannual Groundwater Monitoring Report, Fourth Quarter 2011 and First Quarter 2012, Lockheed Martin Corporation, Laborde Canyon (Lockheed Martin Beaumont Site 2), Beaumont, California

Dear Mr. Zogaib:

Please find enclosed one hard copy of the body of the report and two compact disks with the report body and appendices of the Semiannual Groundwater Monitoring Report, Fourth Quarter 2011 and First Quarter 2012, Lockheed Martin Corporation, Laborde Canyon (Lockheed Martin Beaumont Site 2), Beaumont, California for your review and approval or comment.

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

Sincerely,

Brian Thorne

Bin Un

Project Lead

Enclosure: Semiannual Groundwater Monitoring Report, Fourth Quarter 2011 and First Quarter 2012, Lockheed Martin Corporation, Laborde Canyon (Lockheed Martin Beaumont Site 2), Beaumont, California

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Prepared for:

Lockheed Martin Corporation

Prepared by:

Tetra Tech, Inc.

June 2012

Christopher Patrick

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Acronyms

a This data validation qualifier means the analyte was found in the

method blank.

B This data validation qualifier means the sample result is < 5 times

the blank contamination. Cross contamination is suspected.

Babcock E.S. Babcock & Sons, Inc.

bgs below ground surface

c This data validation qualifier means the Matrix Spike (MS) and/or

Matrix Spike Duplicate (MSD) recoveries were outside control

limits.

CAM California Assessment Manual

CDHS California Department of Health Services

cfs cubic feet per second

COPCs chemical(s) of potential concern

CSM conceptual site model

1,2-DCA 1,2-dichloroethane

1,1 -DCE 1,1-dichloroethene

DO dissolved oxygen

DTSC California Department of Toxic Substances Control

DWNL California Department of Public Health drinking water notification

level

EC electrical conductivity

EPA United States Environmental Protection Agency

f This data validation qualifier means the duplicate sample's Relative

Percent Difference (RPD) was outside the control limit.

ft/ft feet per foot

ft/day feet per day

GCR Grand Central Rocket Company

GMP Groundwater Monitoring Program

HCP Habitat Conservation Plan

J This data validation qualifier means the analyte was positively

identified, but the concentration is an estimated value.

k This data validation qualifier means the analyte was found in a field

blank.

LAC Lockheed Aircraft Corporation

LC lower canyon

LCS laboratory control sample

LMC Lockheed Martin Corporation

LPC Lockheed Propulsion Company

MW monitoring well

MCL California Department of Public Health maximum contaminant level

MDLs method detection limits

MEF Mt. Eden formation

mg/L milligrams per liter

MS matrix spike

MSD matrix spike duplicate

msl mean sea level

μg/L micrograms per liter

μg/L/yr micrograms per liter per year

NA not applicable/not available/not analyzed

NTUs nephelometric turbidity units

NWS National Weather Service

ORP oxidation/reduction potential

%/yr percent change per year with respect to the sample mean

PQL practical quantitation limit

q This data validation qualifier means the analyte detected was below

the PQL.

QAL Quaternary alluvium

QA/QC quality assurance/quality control

RDX hexahydro-1,3,5-trinitro-1,3,5-triazine

Report Semiannual Groundwater Monitoring Report

RPD relative percent difference

SAP sampling and analysis plan

SKR Stephens' Kangaroo rat

STF San Timoteo formation

TCE trichloroethene

U.S. United States

USFWS United States Fish and Wildlife Service

VOCs volatile organic compounds

WDA Waste Discharge Area

wMEF weathered Mt. Eden formation

WS former Wolfskill property

wSTF weathered San Timoteo formation

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 Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring activities for the Laborde Canyon (Lockheed Martin Beaumont Site 2; the Site) Groundwater Monitoring Program (GMP). The Site is located southwest of the City of Beaumont, Riverside County, California (Figure 1-1). Currently, the Site is inactive with the exception of ongoing investigative activities performed under Consent Order HSA 88/89-034, amended January 1, 1991, with the California Department of Toxic Substances Control (DTSC).

The objectives of this Report are to:

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

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

1.1 Site Background

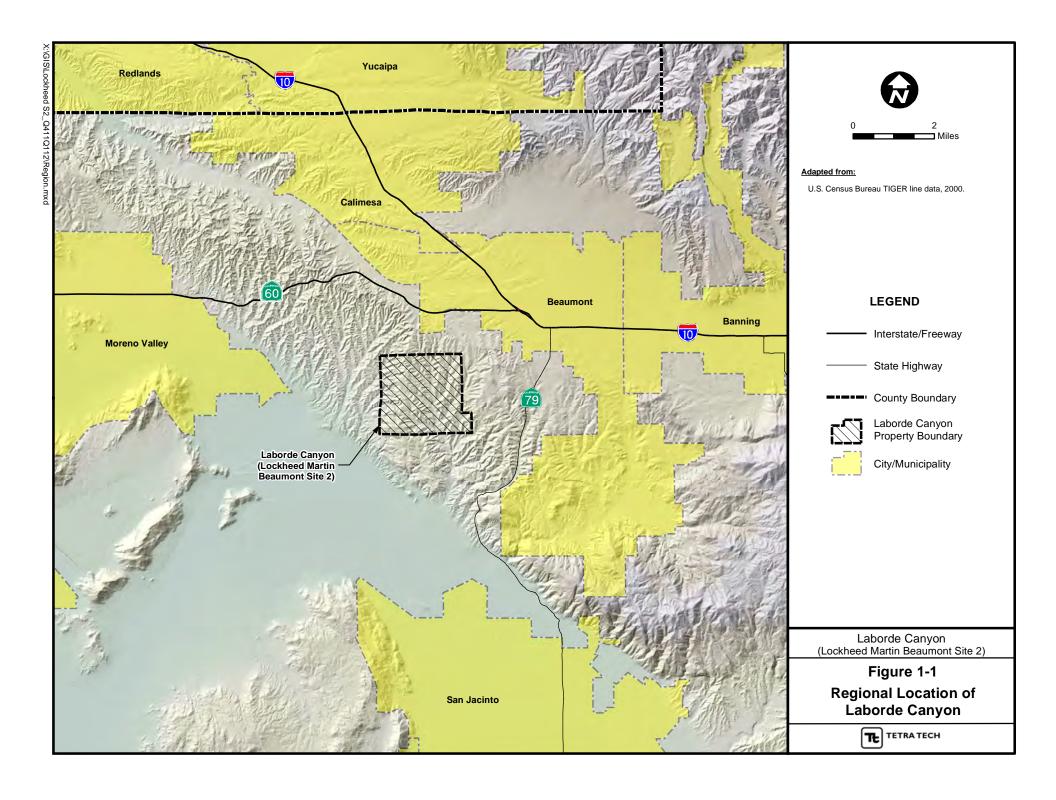
The Site is a 2,668-acre parcel located southwest of Beaumont, California. The parcels that comprise the Site were owned by individuals and the United States (U.S.) government prior to 1958. Between 1958 and 1960, portions of the Site were purchased by the Grand Central Rocket Company (GCR) and utilized as a remote test facility for early space and defense program efforts. In 1960, Lockheed Aircraft Corporation (LAC) purchased one-half interest in GCR. GCR became a wholly-owned subsidiary of LAC in 1961. The remaining parcels of land that comprise the Site were purchased from the U.S. government between 1961 and 1964. In 1963, Lockheed Propulsion Company (LPC) became an operating division of LAC and was responsible for the operation of the Site until its closure in 1974. The Site was utilized by GCR and LPC from 1958 to 1974 for

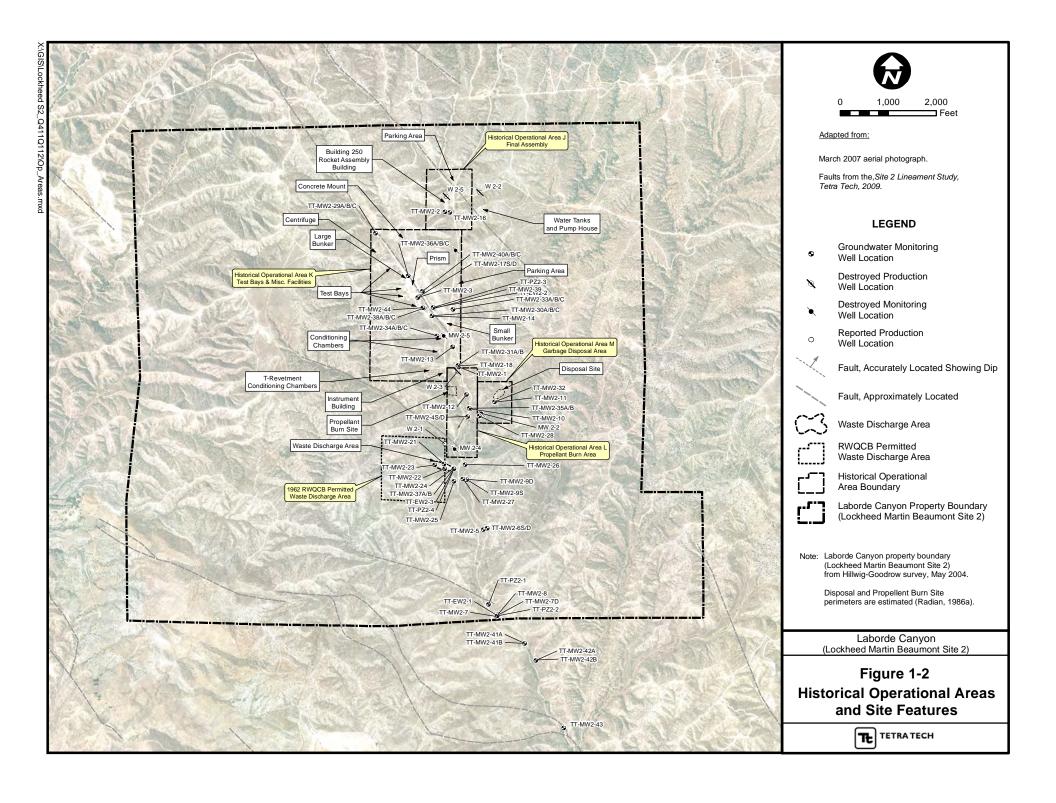
small rocket motor assembly, testing operations, propellant incineration, and minor disposal activities. Ogden Labs is known to have leased portions of the Site during the 1970s (Radian, 1986).

In 1989, the California Department of Health Services (CDHS) issued a Consent Order requiring LMC to clean up contamination at the Site related to past testing activities (CDHS, 1989). Based on investigative and cleanup activities performed at the Site, the DTSC, as a successor agency, issued a no further remedial action letter to LMC in 1993.

Based on regulatory interest in perchlorate and 1,4-dioxane, a groundwater sample was collected from an inactive groundwater production well (identified as W2-3) at the Site in January 2003. The sample was analyzed for volatile organic compounds (VOCs), perchlorate, and 1,4-dioxane to determine the potential presence and concentration of those chemicals in groundwater. The analytical results indicated that VOCs and 1,4-dioxane were not present at or above their respective method detection limits (MDLs). However, perchlorate was reported at a concentration of 4,080 micrograms per liter (μ g/L), which exceeded the then-current California Department of Public Health drinking water notification level (DWNL) of 4 μ g/L. In October 2007, the DWNL was replaced by the California Department of Public Health maximum contaminant level (MCL) of 6 μ g/L. Based on the detection of perchlorate in the groundwater sample, the DTSC reopened the Site for further assessment in August 2004.

Four primary historical operational areas have been identified at the Site (Figure 1-2). Each operational area was used for various activities associated with rocket motor assembly, testing, and propellant incineration. In addition, a fifth area (the Waste Discharge Area; WDA) was identified based on additional records discovered by LMC in 2007. A brief description of each area follows.





Historical Operational Area J (Area J) –Final Assembly

Rocket motor casings with solid propellant were transported to Building 250, where final assembly of the rocket hardware was conducted. The building was used from 1970 to 1974 for final assembly and shipment of short-range attack missile rocket motors. Rocket motor assembly operations included installation of the nozzle and headcap, pressure check of the motor, installation of electrical systems, and preparations for shipment. During plant closure in 1974, all usable parts of this facility were dismantled, taken off the Site, and sold (Radian, 1986).

<u>Historical Operational Area K (Area K) – Test Bays and Miscellaneous Facilities</u>

The primary features included a large earthen structure known as the "Prism," conditioning chambers, a centrifuge, and four test bays with two associated bunkers.

The Prism was reportedly built between 1984 and 1990, and was used to test radar by General Dynamics (Tetra Tech, 2007b). Details concerning construction of the Prism are not available, but it appears to have been constructed with soils from near the test bays.

The conditioning chambers were used to examine the effects of extreme temperatures on rocket motors and to meet specification requirements (Radian, 1986). A centrifuge was located in the northwestern portion of Area K, where rocket motors were tested in order to determine if the solid propellant would separate from its casing under increased gravitational forces.

Four test bays were present at the Site. Initially, only three test bays were known; however, a former employee reported in an interview that a fourth test bay, located north of the other three bays, was also used in Area K (Tetra Tech, 2009b). The initial testing activities had a history of explosions that destroyed complete test areas, especially during the period when GCR operated at the Site (Radian, 1986). While vestiges from three test bays are currently visible at the Site, the fourth was reportedly destroyed by such an explosion during testing. After a motor failure occurred, the area surrounding the test bay was reportedly inspected to recover any unburned propellant.

<u>Historical Operational Area L (Area L) – Propellant Burn Area</u>

Solid propellant was reportedly transported to the burn area and set directly on the ground surface for burning (Radian, 1986). No pits or trenches were dug as part of the burning process. The solid propellant was saturated with diesel fuel to initiate combustion. Reportedly, the solid propellant

would burn rapidly. No evidence or physical features identify the precise location of burning activities, and previous site investigations (Tetra Tech, 2005; Tetra Tech, 2010a) found no evidence of significant contamination in Area L, suggesting that propellant incineration may not have been conducted in this area of the Site.

<u>Historical Operational Area M (Area M) – Garbage Disposal Area</u>

A garbage disposal area was located adjacent to a small creek at the Site (Radian, 1986). Scrap metal, paper, wood, and concrete materials were disposed of at the disposal site by LPC. Hazardous materials, including explosives and propellants, were never disposed of at the disposal site by LPC, according to employee interviews. However, Ogden Labs, a company that tested valves and explosive items, reportedly used this site for disposal of hazardous waste. In 1972, a Lockheed Safety Technician was exposed to toxic vapors of unsymmetrical dimethyl hydrazine from a pressurized gas container located within the disposal site. Based on potential exposure risks to occupants, LPC's safety group required Ogden Labs to take measures to remove any potentially hazardous materials at the disposal site. Shortly thereafter, a disposal company was contracted by Ogden Labs to clean up the disposal site (Radian, 1986).

Waste Discharge Area

In 2007, LMC discovered the existence of Santa Ana River Basin Regional Water Pollution Control Board Resolution 62-24, dated September 14, 1962. Resolution 62-24 prescribed requirements for the "discharge of industrial wastes (rocket fuel residuum) to excavated pits." The discharge area was described as two shallow basins protected by two-foot berms, located in a small canyon on the western side of Laborde Canyon, in the SW quarter of the NW quarter of Section 19, Township 3 South, Range 1 West, San Bernardino Baseline and Meridian. Resolution 62-24 further described the wastes to be discharged as "residue remaining after the manufacturing refuse is burned," and indicated that the amount of material to be discharged was "approximately 5,000 gallons per year."

The exact nature of the waste proposed for discharge is not clear from Resolution 62-24. The description of the waste material suggests that the area may have been used for burning propellant; but the description of the quantity of material to be discharged suggests that the waste may have been liquid rather than solid. A 1961 aerial photograph shows the WDA as a large cleared area with roads leading to two circular structures, suggesting that the WDA was in use by 1961 (Tetra

Tech, 2009b). Investigation of this area (Tetra Tech, 2007b and 2008) found evidence for perchlorate impacts in both soil and groundwater.

Features remaining at the WDA include two roughly circular depressions surrounded by earthen berms, at the location of the circular structures identified in the 1961 aerial photograph.

Section 2 Summary of Monitoring Activities

Section 2 summarizes the Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring activities conducted at the Site. The results of 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 72 wells and four piezometers for Fourth Quarter 2011 and First Quarter 2012. During Fourth Quarter 2011, groundwater level measurements were collected from 72 monitoring wells and four piezometers between 23 November 2011 and 1 December 2011. During First Quarter 2012, groundwater level measurements were collected from 72 monitoring wells and four piezometers between 20 February 2012 and 21 February 2012. Two monitoring wells, TT-MW2-29A and TT-MW2-43, were found to be dry during both quarters. Copies of the 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 Fourth Quarter 2011, the Beaumont National Weather Service (NWS) station reported approximately 3.73 inches of precipitation. During First Quarter 2012, the Beaumont NWS station reported approximately 4.91 inches of precipitation.

2.2 Surface Water Flow and Sampling

The Site is bisected by Laborde Canyon, a major north-south oriented canyon which represents the principal drainage for the Site. Ephemeral storm water drains to the south through Laborde Canyon toward the San Jacinto Valley. The 2,821-acre watershed for the Site is dry when there is no rainfall. Consequently, no permanent streams, creeks, or other major surface water bodies, other than a spring on the former Wolfskill property, occur at the Site.

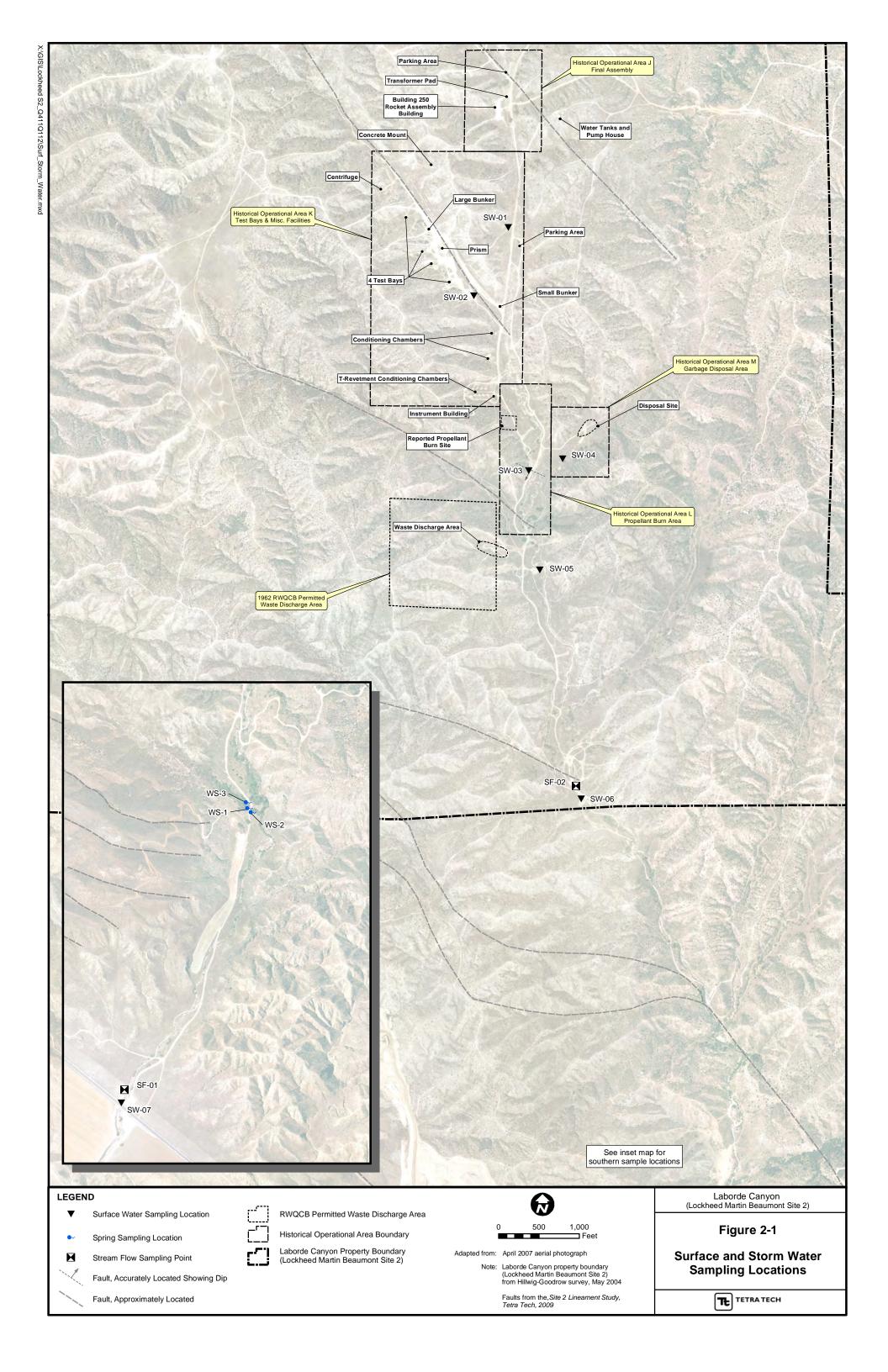
Storm water sampling locations SW-01 through SW-07 are located in ephemeral stream beds within Laborde Canyon and major side canyons. Storm water runoff drains to the stream beds during periods of heavy precipitation and flows south through the Site and the former Wolfskill property, eventually crossing beneath Gilman Hot Springs Road. Water is present in the stream beds only during periods of heavy, prolonged precipitation. Surface water sampling locations WS-1, WS-2, and WS-3 are located at a spring approximately three quarters of a mile south of the southern Site boundary on the former Wolfskill property. Surface water is generally present at one or more of these sampling locations throughout the year. Figure 2-1 shows the storm water and surface water sampling locations.

The areas within Laborde Canyon where surface water was observed were mapped during the Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring events. If surface water was present, the locations where surface water was encountered would have been plotted and a determination made whether the water was flowing or stagnant.

If flowing water was present, the stream flow was estimated at two locations (SF-1, located at Gilman Hot Springs Road; and SF-2, located at the southern boundary of the property) using a modified version of the method presented in the USEPA Volunteer Stream Monitoring: A Methods Manual (USEPA, 1997).

At each location, a section of the stream bed that is relatively straight for a distance of at least 20 feet would have been chosen for measurement. This 20-foot section would have been marked and width measurements taken at various points to determine the average width. Depth measurements would have been collected at five points along the width of the stream to determine the average depth of the stream. The average width and average depth measurements would then be multiplied together to estimate the channel cross-sectional area. Velocity would have been measured by releasing a float upstream and recording the time it took to traverse the 20-foot marked section.

At each section, three timed measurements would have been taken and averaged. The length of the measured section would be divided by the average time to obtain a velocity. This result would then be multiplied by a correction factor of 0.9 to account for friction between the water and stream bed. The average cross-sectional area would then have been multiplied by the corrected average surface velocity to obtain the average flow in cubic feet of water per second (cfs) through that section of the stream. The two stream flow measurement locations are shown on Figure 2-1.



2.3 Groundwater Sampling

The GMP has a quarterly, semiannual, and annual frequency as shown in Appendix A, Table 1-1. Both groundwater and surface water are sampled as part of the GMP. The annual event is the major monitoring event, and the quarterly and semiannual events are smaller, minor events. All new wells are sampled quarterly for one year, after which they are evaluated and reclassified. The semiannual event includes horizontal extent, vertical distribution, increasing contaminant, and guard wells, and occurs during the second and fourth quarter of each year. The annual monitoring event also includes background wells, and takes place during the second quarter of each year. The groundwater monitoring schedule is reviewed and modified as necessary annually following the second quarter groundwater monitoring event. Modifications to the sampling schedule are made in accordance with the approved Groundwater Sampling and Analysis Plan (SAP; Tetra Tech, 2007a). The Fourth Quarter 2011 and First Quarter 2012 sampling events followed the schedule proposed in the Second and Third Quarter 2011 monitoring report (Tetra Tech, 2011), which was submitted to the DTSC in December 2011, and was approved with no comments to the proposed schedule.

During the Fourth Quarter 2011 monitoring event, a total of 51 sampling locations (48 groundwater monitoring wells, and three surface water sampling locations) were proposed and sampled for water quality monitoring. Table 2-1 lists the locations monitored for the Fourth Quarter 2011 monitoring event, analytical methods, sampling dates, and quality assurance/quality control (QA/QC) samples collected. Figure 2-2 illustrates the sample locations sampled for the Fourth Quarter 2011 monitoring event.

During the First quarter 2012 monitoring event, storm water samples were scheduled to be collected from seven locations. Due to the lack of sufficient precipitation, no samples could be collected. If sufficient precipitation occurs in the upcoming quarters, the samples will be collected at that time. No other water quality samples were scheduled to be collected during the First Quarter 2012 monitoring event.

Table 2-1 Sampling Schedule and Analysis Method - Fourth Quarter 2011

Monitoring Well or			1,4-	Per	
Surface Water		VOCs	Dioxane	chlorate	Comments and QA /QC Samples
Location	Sample Date	(1)	(2)	(3)	Comments and QA/QC Samples
WS-1	12/13/2011		(2)	X	Spring Sample, MS/MSD
WS-2		-	-	X	
	12/13/2011	-			Spring Sample
WS-3	12/13/2011	-	-	X	Spring Sample
TT-MW2-1	12/14/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-4S	12/16/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-5	12/14/2011	-	X	X	Sample with Dedicated Pump
TT-MW2-6S	12/14/2011	-	X	X	Sample with Dedicated Pump
TT-MW2-6D	12/14/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-7	12/16/2011	-	X	X	Sample with Dedicated Pump
TT-MW2-7D	12/16/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-8	12/16/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-9S	12/22/2011	X	X	X	Sample with Dedicated Pump
TT-MW2-9D	12/22/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-10	12/21/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-11	12/16/2011	X	-	X	Sample with Dedicated Pump
TT-MW2-12	12/22/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-13	12/14/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-14	12/14/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-17S	12/19/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-17D	12/19/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-18	12/14/2011	-	_	X	Sample with Dedicated Pump
TT-MW-19S	12/13/2011	-	_	X	Sample with Dedicated Pump, Duplicate TT-MW2-19S-Dup
TT-MW-19D	12/13/2011	-	-	X	Sample with Dedicated Pump
TT-MW-20S	12/13/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-21	12/22/2011	X	-	X	Sample with Dedicated Pump, Duplicate TT-MW2-21-Dup
TT-MW2-22	12/22/2011	X	X	X	Sample with Dedicated Pump
TT-MW2-24	12/19/2011	X	X	X	Sample with Dedicated Pump
TT-MW2-25	12/21/2011	-	-	X	Sample with Dedicated Pump, MS/MSD
TT-MW2-26	12/21/2011	_	_	X	Sample with Dedicated, Pump, Duplicate TT-MW2-26-Dup
TT-MW2-27	12/21/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-28	12/21/2011	X	-	X	Sample with Dedicated Pump
TT-MW2-29C	12/13/2011	-	_	X	Sample with Dedicated Pump
TT-MW2-29C	12/13/2011	-		X	Sample with Dedicated Pump
	12/19/2011		-	X	Sample with Dedicated Pump
TT-MW2-30B		-	-	X	* *
TT-MW2-30C	12/19/2011	-	-		Sample with Dedicated Pump
TT-MW2-31A	12/22/2011		-	X	Sample with Dedicated Pump
TT-MW2-32	12/16/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-33A	12/22/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-34A	12/22/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-35A	12/22/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-36A	12/13/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-37A	12/15/2011	X	X	X	Sample with Dedicated Pump, MS/MSD, Duplicate TT-MW2-37A-Dup
TT-MW2-37B	12/15/2011	-	-	X	Sample with Dedicated Pump, Duplicate TT-MW2-37B-Dup
TT-MW2-38A	12/19/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-38A	1/25/2012	-	-	X	Sample with Dedicated Pump - Confirmation Sample
TT-MW2-38A	4/4/2012	-	-	X	Sample with Dedicated Pump - Confirmation Sample
TT-MW2-38B	12/19/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-38C	12/19/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-39	12/22/2011	-	-	X	Sample with Dedicated Pump, Duplicate TT-MW2-39-Dup
TT-MW2-40A	12/15/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-40B	12/15/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-41A	12/23/2011	-	-	X	Sample with Dedicated Pump
TT-MW2-42A	12/23/2011	-	-	X	Sample with Portable Bladder Pump
Total Sar	mple Locations:	53			

Total Sample Locations: Total Samples Collected:

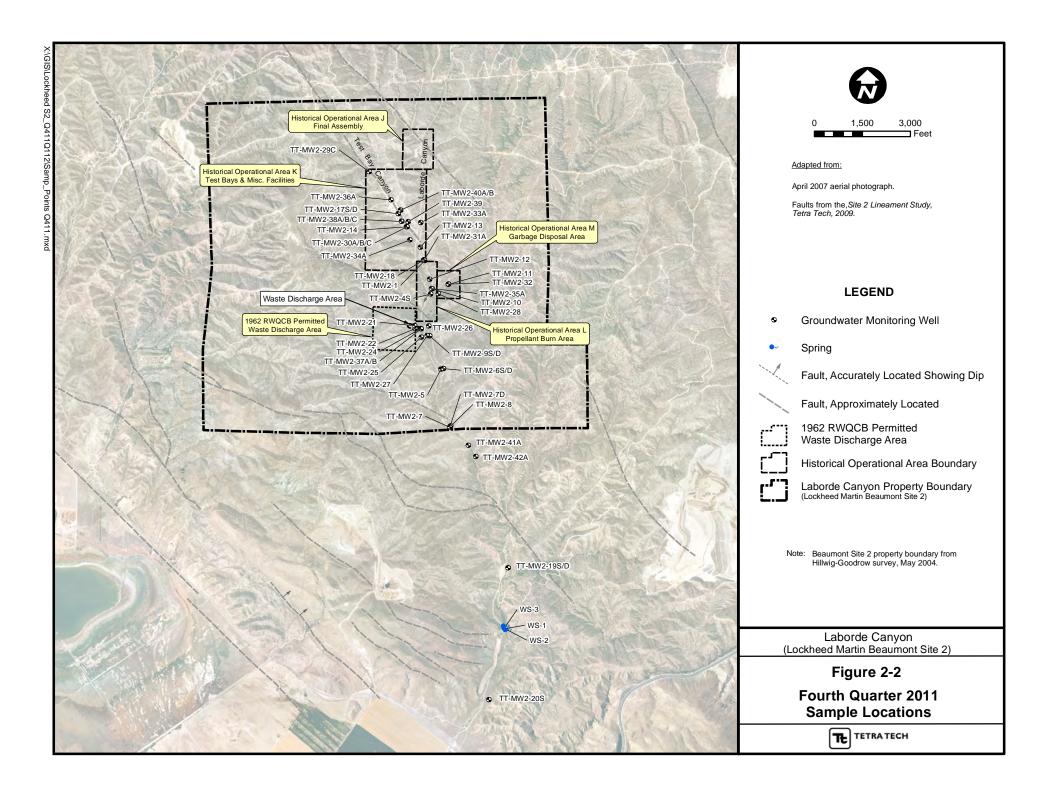
Notes:

VOCs -Volatile organic compounds

- Volatile organic compounds (VOCs) analyzed by EPA Method SW8260 B. (1) -
- (2) -1,4 - Dioxane analyzed by EPA Method SW8270C SIM
- Perchlorate analyzed by EPA Method E332.0.

(3) -Not analyzed

Matrix Spike / Matrix Spike Duplicate. MS / MSD -



The following water quality parameters were measured and recorded on field data sheets (Appendix B) during well purging activities: water level, temperature, pH, electrical conductivity (EC), turbidity, dissolved oxygen (DO) and oxidation/reduction potential (ORP). Measurement of water quality parameters was initiated after at least one discharge hose/pump volume had been removed; purging was considered complete when the above parameters had stabilized or the well was purged dry (evacuated). Stabilization of water quality parameters was used as an indication that representative formation water had entered the well and was being purged. The criteria for stabilization of these parameters are as follows: water level ± 0.1 foot, pH ± 0.1 , EC $\pm 3\%$, turbidity <10 nephelometric turbidity units (NTUs) or $\pm 10\%$ if turbidity stabilizes at >10 NTUs), DO ± 0.3 mg/L and ORP ± 10 mV. Sampling instruments and equipment were maintained, calibrated, and operated in accordance with the manufacturers' specifications, guidelines, and recommendations. Groundwater monitoring wells were purged and sampled using low-flow purging and sampling techniques with dedicated double-valve sampling pumps or a portable bladder pump.

Every effort was made to collect the groundwater samples in order of increasing perchlorate and trichloroethene (TCE) concentration. Samples were placed in appropriate United States Environmental Protection Agency (EPA) method-specified containers. A sample identification label was affixed to each sample container, and sample custody was documented on a chain-of-custody record. Groundwater samples collected during the monitoring events were chilled and transported to E. S. Babcock & Sons, Inc. (Babcock), a state-accredited analytical laboratory, via courier, thus maintaining proper temperatures and sample integrity. Trip blanks were collected on each day of the monitoring events to assess potential cross-contamination 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.

2.4 Analytical Data QA/QC

The samples were tested using approved 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 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 included: holding times, field blanks, laboratory control samples, method blanks, duplicate environmental samples, spiked samples, and surrogate and spike recovery data.

2.5 Habitat Conservation

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

Section 3 Groundwater Monitoring Results

The results of Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring events are presented in the following subsections. These subsections include tabulated summaries of the groundwater elevation and water quality data, groundwater elevation maps, and figures showing analytical results.

3.1 Groundwater Elevation and Flow

Groundwater elevations during the Fourth Quarter 2011 and First Quarter 2012 monitoring events ranged from approximately 2,076 feet above mean sea level (msl) at TT-MW2-16, located in the northern portion of the Site, to about 1,819 feet above msl at TT-MW2-8, located in the southern portion of the Site. Seventy-two monitoring wells and four piezometers were identified for groundwater level measurements during the Fourth Quarter 2011 and First Quarter 2012 monitoring event. For these monitoring events, two wells were dry (MW-29A and MW-43).

Depth to first groundwater ranged from about 119 feet below ground surface (bgs) at TT-MW2-29B to about 15 feet bgs at TT-MW2-8. A tabulated summary of groundwater depths and elevations is presented in Table 3-1. Groundwater elevation contour maps for wells screened in first groundwater for the Fourth Quarter 2011 and First Quarter 2012 are presented in Figures 3-1 and 3-2 respectively. Hydrographs for individual wells are provided in Appendix D.

Table 3-1 Groundwater Elevation Data - Fourth Quarter 2011 and First Quarter 2012

		Fourth Quarter 2011					First Quarter 2012				
	Measuring Point Elevation (feet	Date	Depth to Water (from Measuring	Groundwater Elevation	Groundwater Elevation Change from Third	Date	Depth to Water (from Measuring	Groundwater Elevation	Groundwater Elevation Change from Fourth		
Well ID	msl)	Measured	Point, feet)	(feet msl)	Quarter 2011 (feet)	Measured	Point, feet)	(feet msl)	Quarter 2011 (feet)		
TT-EW2-1	1840.24	11/23/11	21.55	1818.69	0.76	2/20/2012	21.70	1818.54	0.15		
TT-EW2-2	2079.12	11/22/11	58.78	2020.34	2.32	2/20/2012	58.96	2020.16	0.18		
TT-EW2-3	1962.82	11/23/11	53.00	1909.82	-0.06	2/20/2012	53.17	1909.65	0.17		
TT-MW2-1	2035.21	11/23/11	58.09	1977.12	-0.30	2/20/2012	58.14	1977.07	0.05		
TT-MW2-2	2137.75	11/23/11	70.84	2066.91	0.09	2/20/2012	70.94	2066.81	0.10		
TT-MW2-3	2094.66	11/22/11	69.87	2024.79	-0.25	2/20/2012	69.54	2025.12	-0.33		
TT-MW2-4S	1986.94	11/23/11	50.58	1936.36	0.23	2/20/2012	50.60	1936.34	0.02		
TT-MW2-4D	1987.17	11/23/11	58.46	1928.71	0.16	2/20/2012	58.56	1928.61	0.10		
TT-MW2-5	1911.31	11/23/11	39.80	1871.51	0.46	2/20/2012	40.20	1871.11	0.40		
TT-MW2-6S	1908.00	11/23/11	36.19	1871.81	0.56	2/20/2012	36.78	1871.22	0.59		
TT-MW2-6D	1908.07	11/23/11	37.20	1870.87	0.54	2/20/2012	37.66	1870.41	0.46		
TT-MW2-7	1839.25	11/23/11	20.25	1819.00	0.95	2/20/2012	20.62	1818.63	0.37		
TT-MW2-7D	1838.96	11/23/11	18.41	1820.55	0.47	2/20/2012	18.46	1820.50	0.05		
TT-MW2-8	1836.32	11/23/11	17.67	1818.65	0.66	2/20/2012	17.81	1818.51	0.14		
TT-MW2-9S	1938.38	11/23/11	39.88	1898.50	0.89	2/20/2012	40.24	1898.14	0.36		
TT-MW2-9D	1938.78	11/23/11	43.29	1895.49	0.42	2/20/2012	43.75	1895.03	0.46		
TT-MW2-10	2001.57	11/23/11	57.98	1943.59	0.11	2/20/2012	57.84	1943.73	-0.14		
TT-MW2-11	2004.51	11/23/11	50.15	1954.36	0.37	2/20/2012	50.13	1954.38	-0.02		
TT-MW2-12	2016.26	11/23/11	51.27	1964.99	0.01	2/20/2012	51.12	1965.14	-0.15		
TT-MW2-13	2049.39	11/23/11	64.67	1984.72	0.12	2/20/2012	65.55	1983.84	0.88		
TT-MW2-14	2074.78	11/22/11	63.86	2010.92	1.36	2/20/2012	64.58	2010.20	0.72		
TT-MW2-16	2137.20	11/23/11	61.24	2075.96	0.08	2/20/2012	61.62	2075.58	0.38		
TT-MW2-17S	2095.55	11/22/11	71.30	2024.25	0.17	2/20/2012	70.84	2024.71	-0.46		
TT-MW2-17D	2095.33	11/22/11	70.86	2024.47	-0.08	2/20/2012	70.53	2024.80	-0.33		
TT-MW2-18	2035.32	11/23/11	57.97	1977.35	-0.32	2/20/2012	58.04	1977.28	0.07		
TT-MW2-19S	1698.18	12/01/11	43.71	1654.47	-1.66	2/21/2012	44.60	1653.58	0.89		
TT-MW2-19D	1698.15	12/01/11	24.74	1673.41	0.37	2/21/2012	25.03	1673.12	0.29		
TT-MW2-20S	1587.10	12/01/11	33.16	1553.94	0.76	2/21/2012	33.94	1553.16	0.78		
TT-MW2-20D	1587.62	12/01/11	32.40	1555.22	0.76	2/21/2012	33.19	1554.43	0.79		
TT-MW2-21	1978.45	11/23/11	66.61	1911.84	0.03	2/20/2012	66.70	1911.75	0.09		
TT-MW2-22	1975.86	11/23/11	65.40	1910.46	0.03	2/20/2012	65.52	1910.34	0.12		
TT-MW2-23	1995.17	11/23/11	83.27	1911.90	0.02	2/20/2012	83.30	1911.87	0.03		
TT-MW2-24	1964.26	11/23/11	54.14	1910.12	0.05	2/20/2012	54.20	1910.06	0.06		
TT-MW2-25	1966.96	11/23/11	64.14	1902.82	0.03	2/20/2012	64.22	1902.74	0.08		
TT-MW2-26	1944.43	11/23/11	38.60	1905.83	1.02	2/20/2012	38.68	1905.75	0.08		
TT-MW2-27	1948.27	11/23/11	50.48	1897.79	0.84	2/20/2012	51.06	1897.21	0.58		
TT-MW2-28	1995.65	11/23/11	62.80	1932.85	0.91	2/20/2012	62.67	1932.98	-0.13		
TT-MW2-29A	2147.77	11/23/11	Dry	Dry	NA	2/20/2012	Dry	Dry	NA		
Notes:						_					

Notes:

NA - Not available msl - Mean sea level #.## - Denotes an increase in groundwater elevation

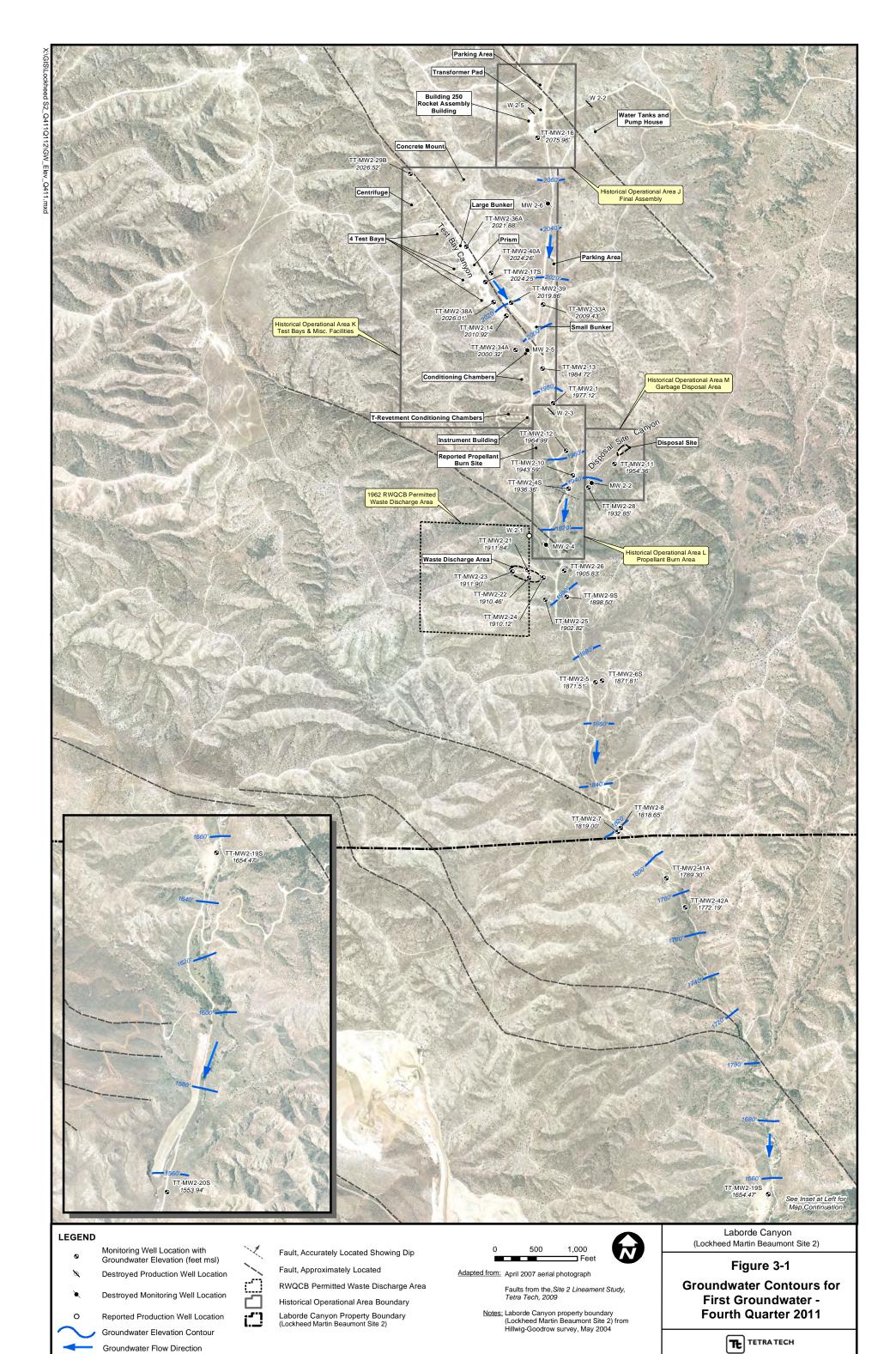
- #.## - Denotes a decrease in groundwater elevation

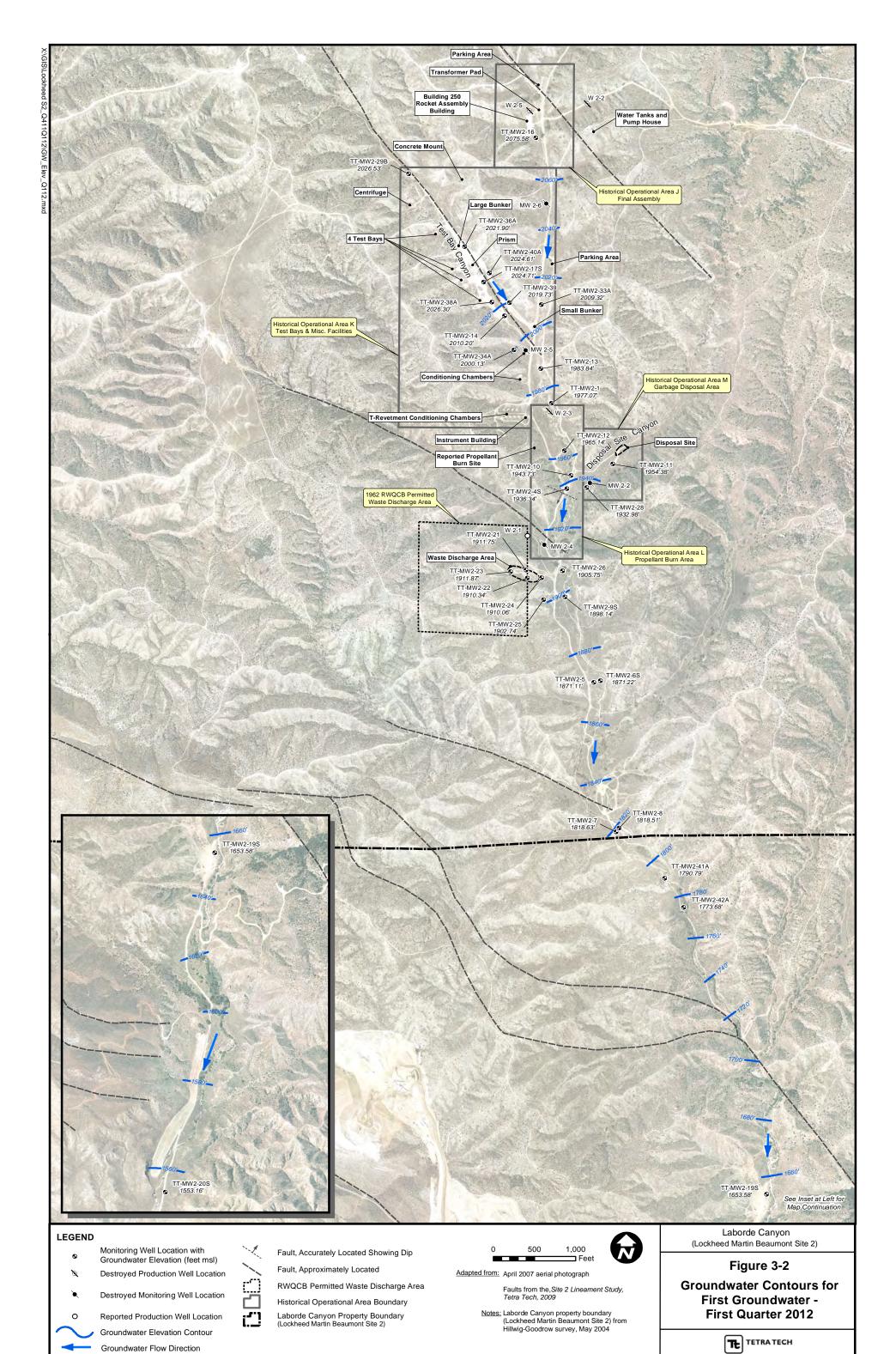
Table 3-1 Groundwater Elevation Data - Fourth Quarter 2011 and First Quarter 2012 (Continued)

			Four	th Quarter 2011		First Quarter 2012				
	Measuring	ъ.,	Depth to Water (from	Groundwater	Groundwater Elevation	ъ.	Depth to Water (from	Groundwater	Groundwater Elevation	
Well ID	Point Elevation (feet msl)	Date Measured	Measuring Point, feet)	Elevation (feet msl)	Change from Third Ouarter 2011 (feet)	Date Measured	Measuring Point, feet)	Elevation (feet msl)	Change from Fourth Ouarter 2011 (feet)	
TT-MW2-29B	2147.90	11/23/11	121.38	2026.52	0.06	2/20/2012	121.37	2026.53	-0.01	
TT-MW2-29C	2147.83	11/23/11	126.70	2021.13	-0.96	2/20/2012	127.71	2020.12	1.01	
TT-MW2-30A	2074.37	11/22/11	71.67	2002.70	0.97	2/20/2012	72.20	2002.17	0.53	
TT-MW2-30B	2074.41	11/22/11	74.21	2000.20	0.70	2/20/2012	74.68	1999.73	0.47	
TT-MW2-30C	2074.35	11/22/11	76.74	1997.61	0.45	2/20/2012	77.14	1997.21	0.40	
TT-MW2-31A	2036.11	11/23/11	59.13	1976.98	-0.29	2/20/2012	59.16	1976.95	0.03	
TT-MW2-31B	2036.15	11/23/11	67.05	1969.10	0.01	2/20/2012	67.08	1969.07	0.03	
TT-MW2-32	2004.87	11/23/11	53.64	1951.23	0.31	2/20/2012	53.71	1951.16	0.07	
TT-MW2-33A	2070.54	11/23/11	61.11	2009.43	-0.02	2/20/2012	61.22	2009.32	0.11	
TT-MW2-33B	2070.54	11/23/11	65.62	2004.92	0.19	2/20/2012	65.78	2004.76	0.16	
TT-MW2-33C	2070.54	11/23/11	63.74	2006.80	0.01	2/20/2012	63.94	2006.60	0.20	
TT-MW2-34A	2066.84	11/23/11	66.52	2000.32	0.17	2/20/2012	66.71	2000.13	0.19	
TT-MW2-34B	2066.85	11/23/11	72.65	1994.20	0.08	2/20/2012	72.89	1993.96	0.24	
TT-MW2-34C	2066.84	11/23/11	74.64	1992.20	-0.02	2/20/2012	74.80	1992.04	0.16	
TT-MW2-35A	2003.20	11/23/11	49.92	1953.28	0.10 2/20/2012 50.04		1953.16	0.12		
TT-MW2-35B	2003.20	11/23/11	54.65	1948.55	0.04	2/20/2012	54.79	1948.41	0.14	
TT-MW2-36A	2100.99	11/23/11	79.11	2021.88	0.06	2/20/2012	79.09	2021.90	-0.02	
TT-MW2-36B	2101.04	11/23/11	79.79	2021.25	0.06	2/20/2012	79.76	2021.28	-0.03	
TT-MW2-36C	2100.88	11/23/11	79.76	2021.12	0.05	2/20/2012	79.71	2021.17	-0.05	
TT-MW2-37A	1963.62	11/23/11	63.25	1900.37	0.06	2/20/2012	63.54	1900.08	0.29	
TT-MW2-37B	1963.67	11/23/11	71.33	1892.34	0.11	2/20/2012	71.61	1892.06	0.28	
TT-MW2-38A	2084.56	11/22/11	58.55	2026.01	0.30	2/20/2012	58.26	2026.30	-0.29	
TT-MW2-38B	2084.42	11/22/11	80.29	2004.13	0.80	2/20/2012	80.75	2003.67	0.46	
TT-MW2-38C	2084.63	11/22/11	88.53	1996.10	1.59	2/20/2012	87.87	1996.76	-0.66	
TT-MW2-39	2079.53	11/22/11	59.67	2019.86	0.80	2/20/2012	59.80	2019.73	0.13	
TT-MW2-40A	2096.28	11/22/11	72.02	2024.26	0.03	2/20/2012	71.67	2024.61	-0.35	
TT-MW2-40B	2096.24	11/22/11	83.12	2013.12	0.39	2/20/2012	83.27	2012.97	0.15	
TT-MW2-40C	2096.28	11/22/11	88.26	2008.02	0.33	2/20/2012	88.45	2007.83	0.19	
Tt-MW2-41A	1812.47	11/23/11	23.17	1789.30	1.07	2/20/2012	21.68	1790.79	-1.49	
Tt-MW2-41B	1812.22	11/23/11	19.54	1792.68	0.54	2/20/2012	18.39	1793.83	-1.15	
Tt-MW2-42A	1799.06	11/23/11	26.87	1772.19	0.79	2/20/2012	25.38	1773.68	-1.49	
Tt-MW2-42B	1799.07	11/23/11	24.60	1774.47	0.79	2/20/2012	23.66	1775.41	-0.94	
Tt-MW2-43	1771.44	11/23/11	Dry	Dry	NA	2/20/2012	Dry	Dry	NA	
Tt-MW2-44	2085.22	11/23/11	58.25	2026.97	NA	2/20/2012	58.61	2026.61	0.36	
TT-PZ2-1	1847.06	11/23/11	19.44	1827.62	0.99	2/20/2012	19.39	1827.67	-0.05	
TT-PZ2-2	1840.76	11/23/11	21.54	1819.22	0.79	2/20/2012	21.73	1819.03	0.19	
TT-PZ2-3	2079.89	11/23/11	57.69	2022.20	1.35	2/20/2012	57.79	2022.10	0.10	
TT-PZ2-4	1961.49	11/23/11	51.99	1909.50	-0.13	2/20/2012	52.07	1909.42	0.08	
Notes:		•								

Notes:

NA - Not applicable msl - Mean sea level #.## - Denotes an increase in groundwater elevation - #.## - Denotes a decrease in groundwater elevation





During Fourth Quarter 2011, the Beaumont NWS reported approximately 3.73 inches of precipitation, and the average site-wide groundwater elevation increased approximately 0.35 foot. During First Quarter 2012, the Beaumont NWS reported approximately 4.91 inches of precipitation and the average site-wide groundwater elevation increased approximately 0.10 feet. Table 3-2 presents the range and average change in groundwater elevation by area. Figures 3-3 and 3-4 present elevation differences between the Third Quarter 2011 and Fourth Quarter 2011, and between the Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring events, respectively.

Table 3-2 Groundwater Elevation Change - Fourth Quarter 2011 and First Quarter 2012

Site Area	Range of Groundwater Elevation Change - Fourth Quarter 2011 (feet)		Change - Fourth Quarter 2011 By Area Change - First		ndwater Elevation at Quarter 2012 eet)	Average Change By Area (feet)
J	0.08	0.09	0.09	0.10	0.38	0.24
K	-0.96	2.32	0.32	-0.66	1.01	0.13
L	0.01	0.23	0.11	-0.15	0.14	0.01
M	0.31	0.91	0.53	-0.13	0.07	-0.03
WDA	-0.13	0.11	0.01	0.03	0.29	0.14
LC	0.03	1.07	0.70	-1.49	0.59	-0.07
WS	-1.66	0.76	0.06	0.29	0.89	0.69

Notes:

J - Final Assembly Area

K - Test Bays and Miscellaneous Facilities

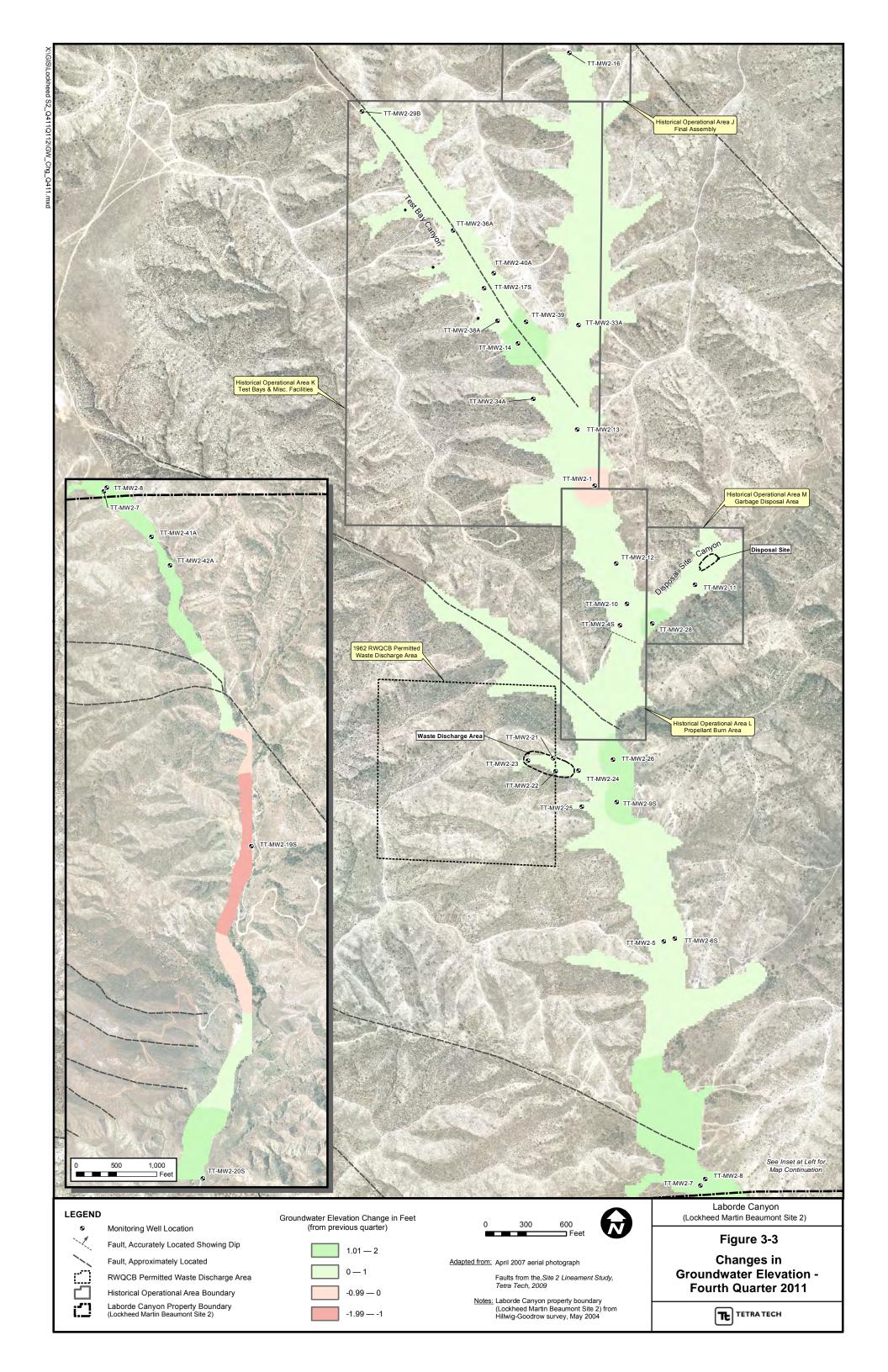
L - Propellant Burn Area

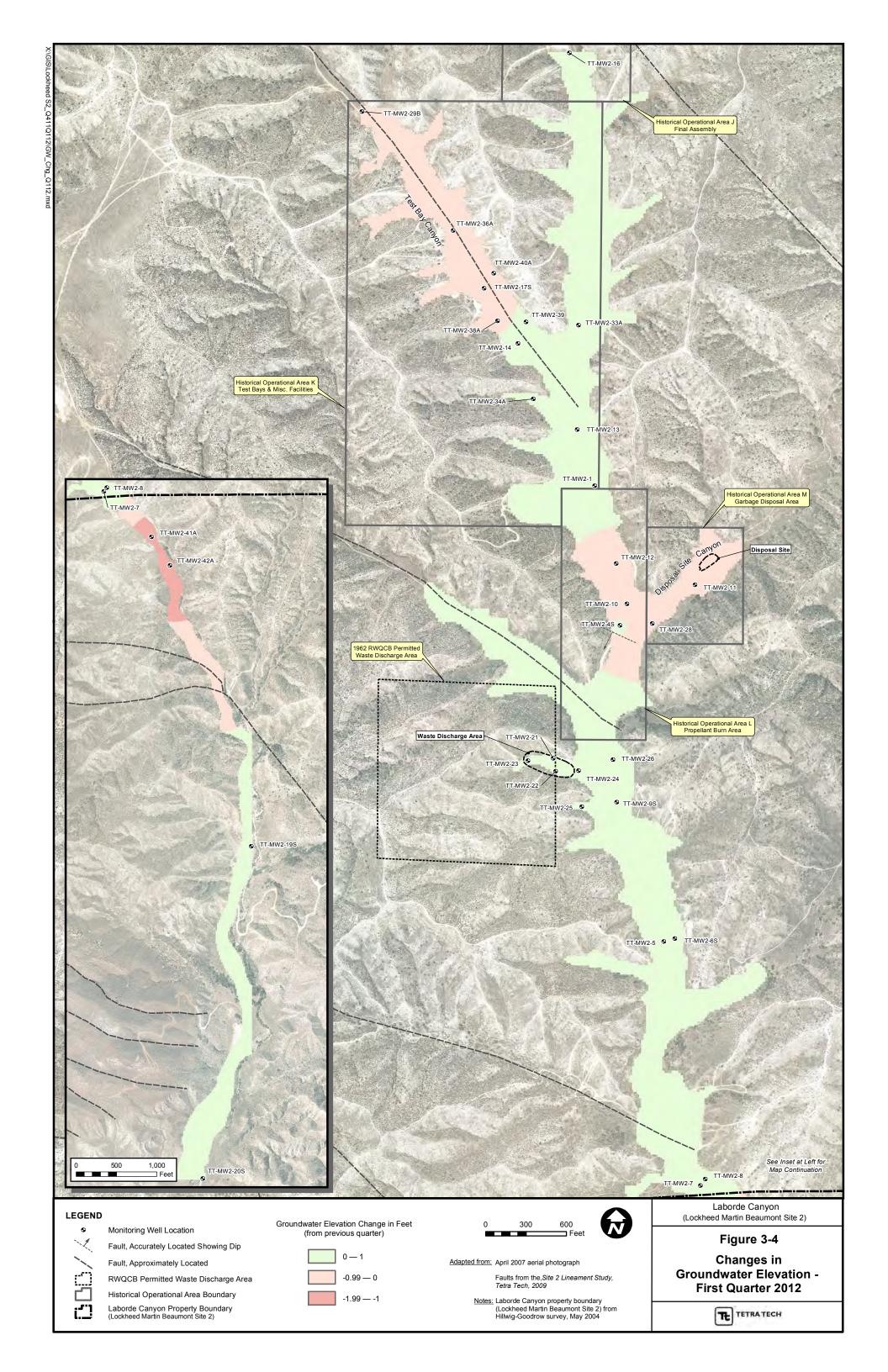
M - Garbage Disposal Area

WDA - Waste Discharge Area

LC - Lower Canyon

WS - Former Wolfskill property





3.2 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 divided by the distance between wells (i.e., the slope of the water table). The average horizontal groundwater gradient calculated between TT-MW2-16 and TT-MW2-6S from the Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring events for the shallow wells screened in the weathered San Timoteo formation (wSTF) was 0.030 feet per foot (ft/ft). The horizontal groundwater gradient calculated between TT-MW2-2 and TT-MW2-6D for deeper wells screened in the San Timoteo formation (STF) was 0.029 feet/foot during the Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring events.

Vertical groundwater gradients are calculated from individual clusters of wells. Well clusters are used to measure the differences 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 head difference (downward - negative gradient, upward - positive gradient) of groundwater. Vertical groundwater gradients at the Site are generally downward. The vertical gradients range from -0.31 feet/foot at well cluster TT-MW2-4S and -4D located in Area L, to +0.18 feet/foot at well cluster TT-MW2-19S and -19D located on the former Wolfskill property. A summary of calculated horizontal and vertical groundwater gradients is presented in Table 3-3. A complete listing of historical horizontal and vertical groundwater gradients and associated calculations is presented in Appendix E.

Table 3-3 Summary of Horizontal and Vertical Groundwater Gradients

Horizontal Groundwater Gradients (feet / foot), approximating a flowline perpendicular to groundwater contours							
_	Overall	Overall					
_	STF	QAL/WSTF					
_	TT-MW2-2	TT-MW2-16					
	to	to					
	TT-MW2-6D	TT-MW2-6S					
Previous Quarter (August 2011)	0.029	0.030					
Fourth Quarter (November 2011)	0.029	0.030					
Third Quarter (March 2011)	0.029	0.030					

$\underline{Vertical\ Groundwater\ Gradients}\ \ (feet\ /\ foot)$

-								Southern portion of Site		
_		Area J	Area K	Area K	Area L	Southern portion of Site 2	Southern portion of Site 2	2	Former Wolfskill Property	Former Wolfskill Property
										1
	deep screen	TT-MW2-2 (STF)	TT-MW2-17D (wSTF)	TT-MW2-18 (STF)	TT-MW2-4D (STF)	TT-MW2-9D (STF)	TT-MW2-6D (STF)	TT-MW2-7D (STF)	TT-MW2-19D (MEF)	TT-MW2-20D (MEF)
	shallow screen	TT-MW2-16 (wSTF)	TT-MW2-17S (wSTF)	TT-MW2-1 (wSTF)	TT-MW2-4S (STF)	TT-MW2-9S (wSTF)	TT-MW2-6S (wSTF)	TT-MW2-7 (wSTF)	TT-MW2-19S (wMEF)	TT-MW2-20S (wMEF)
Previous Quarter (August 2011)		-0.19	0.00	0.01	-0.31	-0.13	-0.05	0.03	0.19	0.01
Fourth Quarter (November 2011)		-0.19	0.01	0.01	-0.31	-0.12	-0.05	0.04	0.17	0.03
Third Quarter (March 2011)		-0.19	0.00	0.01	-0.31	-0.12	-0.04	0.05	0.18	0.01

Notes:

QAL - Quaternary alluvium

STF - San Timoteo formation

MEF - Mt. Eden formation

wSTF - Weathered San Timoteo formation

wMEF - Weathered Mt. Eden formation

3.3 Surface Water Flow

During the Fourth Quarter 2011 and First Quarter 2012, the Laborde Canyon drainage channel was walked to determine the presence, nature, and quantity of surface water within the creek bed. Surface water was not present within the creek bed during the Fourth Quarter 2011 and First Quarter 2012 monitoring events, so stream flow measurements were not taken.

3.4 Analytical Data Summary

Groundwater and surface water samples collected during the Fourth Quarter 2011 monitoring event were analyzed for perchlorate. Select wells were also sampled for VOCs and 1,4-dioxane. Storm water samples were scheduled to be collected during the First Quarter 2012 monitoring event but could not be collected due to the lack of sufficient precipitation. No other samples were scheduled to be collected during the First Quarter 2012 monitoring event.

A summary of validated laboratory analytical results for analytes detected above their respective MDLs during the Fourth Quarter 2011 monitoring event is presented in Table 3-4. Analytes with sample results above the MCL or DWNL are indicated by bold type in Table 3-4. Table 3-5 presents summary statistics for validated organic and inorganic analytes detected during the monitoring event. A complete list of the analytes tested, along with validated sample results by analytical method, is provided in Appendix F. Laboratory analytical data packages, which include all environmental, field QC, and laboratory QC results, are provided in Appendix G. A consolidated laboratory data summary table is presented in Appendix H.

Table 3-4 Summary of Validated Detected Organic and Inorganic Analytes - Fourth Quarter 2011

Sample	Sample	Per chlorat	1,4- Dioxan	Aceton	2- Butanon	Benzen	Chlor	1,1- Dichlor	1,2- Dichlor	1,1- Dichlor	c-1,2- Dichlor	t-1,2- Dichlor	Methylen e	Toluen	1,1,2- Trichlor	Trichlor
Location	Date	e	e	e	e	e ^ 11 1	o form	o ethane	o ethane	o ethene	o ethene	o ethene	Chloride	e	o ethane	o ethene
TT-MW2-1	12/14/11	5,900	NA	NA	NA	NA NA	NA	in µg/L unle	NA NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-4S	12/14/11	0.63	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
TT-MW2-5	12/14/11	760	0.75	NA NA	NA NA	NA NA	NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
TT-MW2-6D	12/14/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-6S	12/14/11	130	<0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-7	12/16/11	330	0.15 Jq	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-7D	12/16/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-8	12/16/11	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-9D	12/22/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-9S	12/22/11	11,000	17	< 5.0	<1.2	< 0.14	< 0.46	< 0.098	< 0.21	< 0.12	< 0.18	< 0.10	< 0.15	< 0.22	< 0.31	1.8
TT-MW2-10	12/21/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-11	12/16/11	180	NA	<5.0	<1.2	< 0.14	< 0.46	< 0.098	< 0.21	< 0.12	< 0.18	< 0.10	< 0.15	< 0.22	< 0.31	6.8
TT-MW2-12	12/22/11	0.090 Jq	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-13	12/14/11	5,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-14	12/14/11	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-17D	12/19/11	55,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-17S	12/19/11	1,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-18	12/14/11	12,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-19D	12/13/11	<0.071	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
TT-MW2-19S TT-MW2-20S	12/13/11 12/13/11	<0.071	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
TT-MW2-20S	12/13/11	20	NA NA	<5.0	<1.2	<0.14	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	6.5	<0.22	<0.31	5.5
TT-MW2-22	12/22/11	< 0.071	57	<5.0	<1.2	0.76	<0.46	2.9	0.88	17	3.1	0.57	3.3	<0.22	<0.31	460
TT-MW2-24	12/19/11	96,000	210	<5.0	<1.2	0.17 Jq	2.3	0.58	0.41 Jq	2.2	<0.18	<0.10	0.43 BJkq	<0.22	0.36 Jq	84
TT-MW2-25	12/21/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-26	12/21/11	87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-27	12/21/11	240	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-28	12/21/11	0.83	NA	< 5.0	<1.2	< 0.14	< 0.46	< 0.098	< 0.21	< 0.12	< 0.18	< 0.10	< 0.15	< 0.22	< 0.31	< 0.25
TT-MW2-29C	12/13/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-30A	12/19/11	8,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-30B	12/19/11	2,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-30C	12/19/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-31A	12/22/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-32	12/16/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-33A	12/22/11	0.27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-34A	12/22/11	5.2	NA	NA	NA	NA	NA	NA NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-35A	12/22/11	<0.071	NA NA	NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
TT-MW2-36A TT-MW2-37A	12/13/11 12/16/11	<0.071 12,000	NA 14	NA 56	9.5	NA 0.47 Jq	NA <0.46	NA <0.098	NA <0.21	0.23 Jq	NA <0.18	NA <0.10	NA <0.15	NA 0.39 Jq	NA <0.31	NA 4.9 Jc
TT-MW2-37B	12/16/11	39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-37B	12/19/11	410	NA NA	NA NA	NA NA	NA NA	NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
TT-MW2-38A	1/25/12	23,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-38A	4/4/12	80,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-38B	12/19/11	7,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-38C	12/19/11	87,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-39	12/22/11	75,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-40A	12/16/11	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-40B	12/16/11	0.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-41A	12/23/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-42A	12/23/11	0.43 Bk	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS-1	12/13/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS-2	12/13/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS-3	12/13/11	< 0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Method Dete		0.071	0.10	5.0	1.2	0.14	0.46	0.098	0.21	0.12	0.18	0.10	0.15	0.22	0.31	0.25
MCL (uni	less noted) / DWNL	6	1 (1)	-	-	1	-	5	0.5	6	6	10	5	150	5	5
Notes: Only analytes positively detected in samples are presented in this table. For a complete list of constituents analyzed, refer to the laboratory data package.																

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

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

" - " MCL/DWNL not established.

Bold - MCL or DWNL exceeded.

< # - Method detection limit concentration is shown.

NA - Not analyzed

B - The sample result was less than 5 times blank contamination. Cross contamination is suspected.

 $\mbox{\it J}$ - $\mbox{\it }$ The analyte was positively identified, but the concentration is an estimated value.

c - The Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) recoveries were outside control limits.

k - The analyte was found in a field blank.

 ${\bf q}$ - $\;\;$ The analyte detection was below the Practical Quantitation Limit (PQL).

Table 3-5 Summary Statistics for Validated Detected 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	7	6	4	1(2)	μg/L	0.15	μg/L	210	μg/L	
Acetone	7	1	-	-	μg/L	56	μg/L	56	μg/L	
2-Butanone	7	1	=	-	μg/L	9.5	μg/L	9.5	μg/L	
Benzene	7	3	0	1	μg/L	0.17	μg/L	0.76	μg/L	
Chloroform	7	1	=	-	μg/L	2.3	μg/L	2.3	μg/L	
1, 1-Dichloroethane	7	2	0	5	μg/L	0.58	μg/L	2.9	μg/L	
1, 2-Dichloroethane	7	2	1	0.5	μg/L	0.41	μg/L	0.88	μg/L	
1, 1-Dichloroethene	7	3	1	6	μg/L	0.23	μg/L	17	μg/L	
cis-1, 2-Dichloroethene	7	1	0	6	μg/L	3.1.	μg/L	3.1	μg/L	
trans-1, 2-Dichloroethene	7	1	0	10	μg/L	0.57	μg/L	0.57	μg/L	
Methylene Chloride	7	2	1	5	μg/L	3.3	μg/L	6.5	μg/L	
Toluene	7	1	0	150	μg/L	0.39	μg/L	0.39	μg/L	
1, 1, 2-Trichloroethane	7	1	0	5	μg/L	0.36	μg/L	0.36	μg/L	
Trichloroethene	7	6	4	5	μg/L	1.8	μg/L	460	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	Concer	imum ntration ected	Maxir Concent Detec	ration	
Perchlorate	51	32	25	6	μg/L	0.09	μg/L	96,000	μg/L	
Notes:	Only analytes positively detected in groundwater or surface water samples are presented in this table.									
	For a complete list of constituents analyzed, refer to the laboratory data packages (Appendix G).									
(1) -	Number of detections exclude sample duplicates, trip blanks, and equipment blanks.									
(2) - California Department of Public Health state drinking water notification level										
MCL -	California Department of Public Health Maximum Contaminant Level									
DWNL -	California Department of Public Health Drinking Water Notification Level									

3.4.1 Data Quality Review

" - " MCL/DWNL not established.

μg/L - Micrograms per liter

The quality control samples were reviewed as described in the Beaumont Sites 1 and 2, Programmatic Sampling and Analysis Plan (Tetra Tech, 2010b). 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 documents from the EPA (EPA, 2008 and 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, Methods 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 VOCs had one matrix spike recovery error that qualified as estimated, which constituted 0.3 percent of the total SW8260B data. The data qualified as estimated are usable for the intended purpose. Trip blank contamination caused 0.3 percent (one sample) of the total SW8260B data to be qualified for blank contamination. The batch-associated analyte with a positive detection is designated with a "B" qualifier. This data may be used if re-qualified to "U" ("not detected"), and if the detection level is increased to the level of the positive detection in the environmental sample. All other blank results were within method requirements.

Equipment blank contamination caused 1.8 percent (one sample) of the total E332.0 data to be qualified for blank contamination. The batch-associated analyte with a positive detection is designated with a "B" qualifier. This data may be used if re-qualified to "U" ("not detected"), and if the detection level is increased to the level of the positive detection in the environmental sample. All other blank results were within method requirements.

3.5 Chemicals of Potential Concern (COPCs)

The identification of chemicals of potential concern (COPCs) is an ongoing process that takes place annually as part of the second quarter sampling event and is reported in the Second and Third Quarter Semiannual Groundwater Monitoring Report. The purpose of identifying COPCs is to establish a list of analytes that best represents the extent and magnitude of affected groundwater and to focus more detailed analysis on those analytes. The analytes were organized and evaluated in two groups, organic and inorganic, and divided into primary and secondary COPCs. Table 3-4 presents a summary of the validated organic and inorganic analytes detected during the Fourth Quarter 2011 monitoring event. Data that is "B" qualified because of its association with either laboratory blank or field cross contamination is not included in the COPC evaluation.

The COPC identification process does not eliminate analytes from testing, but does reduce the number of analytes that are evaluated and discussed during reporting. While all of the secondary COPCs will continue to be tested during future monitoring events because of their association with other analytes that are listed as primary COPCs, they are not discussed further because they are detected on a more limited or inconsistent basis, and/or are detected at concentrations below a regulatory threshold. The standard list of analytes for each method will continue to be tested for and screened annually to insure that the appropriate COPCs are being identified and evaluated. Table 3-6 presents a summary of the Laborde Canyon COPCs. Time-series graphs of perchlorate and TCE concentrations are provided in Appendix I.

Table 3-6 Groundwater Chemicals of Potential Concern

Analyte	Classification				
Perchlorate	Primary				
Trichloroethene	Primary				
1,4-Dioxane	Primary				
Benzene	Secondary				
Methylene Chloride	Secondary				
1, 2-Dichloroethane	Secondary				
1, 1-Dichloroethene	Secondary				
RDX	Secondary				
Notes:					
RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine					

3.5.1 Organic Analytes

Five organic analytes (1,4-dioxane, 1,2-dichloroethane [1,2-DCA], 1,1-dichloroethene [1,1-DCE], methylene chloride, and TCE) were detected above their respective MCL or DWNL during the Fourth Quarter 2011 monitoring event. Table 3-4 presents a summary of validated organic analyte concentrations reported in groundwater samples collected during the Fourth Quarter 2011 groundwater monitoring event.

1,4-Dioxane was reported in groundwater samples collected from six monitoring wells (TT-MW2-5, TT-MW2-7, TT-MW2-9S, TT-MW2-22, TT-MW2-24, and TT-MW2-37A,) during the Fourth Quarter 2011 monitoring event at concentrations ranging from 0.15 μ g/L to 210 μ g/L. All wells are located within or just downgradient from the former WDA. The DWNL for 1,4-dioxane is 1 μ g/L.

1,2-DCA was reported in groundwater samples collected from two monitoring wells (TT-MW2-22 and TT-MW2-24) located in the former WDA during the Fourth Quarter 2011 monitoring event at concentrations of 0.88 μ g/L and 0.41 μ g/L respectively. The MCL for 1,2-DCA is 0.5 μ g/L.

1,1-DCE was reported in groundwater samples collected from two monitoring wells (TT-MW2-22 and TT-MW2-24) located in the former WDA during the Fourth Quarter 2011monitoring event at concentrations of 17 μ g/L and 2.2 μ g/L respectively. The MCL for 1,1-DCE is 6 μ g/L.

Methylene chloride was reported in groundwater samples collected from two monitoring wells, TT-MW2-21 and TT-MW2-22, located in the WDA at concentrations of 6.5 μ g/L and 3.3 μ g/L respectively during the Fourth Quarter 2011 monitoring event. Previously, methylene chloride has been detected as high as 220 μ g/L in monitoring well TT-MW2-21. The MCL for methylene chloride is 5 μ g/L.

TCE was reported in groundwater samples collected from five monitoring wells (TT-MW2-9S, TT-MW2-21, TT-MW2-22, TT-MW2-24, and TT-MW2-37A) located within or just downgradient from the former WDA during the Fourth Quarter 2011 monitoring event at concentrations ranging from 1.8 μ g/L to 460 μ g/L. TCE was also detected in monitoring well TT-MW2-11, located in Area M, at a concentration of 6.8 μ g/L. The MCL for TCE is 5 μ g/L. Timeseries graphs of TCE are provided in Appendix I.

Benzene, a secondary COPC, was reported below the MCL in groundwater samples collected from three monitoring wells (TT-MW2-22, TT-MW2-24, and TT-MW2-37A) located in the former WDA at concentrations ranging from 0.17 μ g/L to 0.76 μ g/L during the Fourth Quarter 2011 monitoring event. The MCL for benzene is 1 μ g/L.

Other organic analytes detected at low levels during the Fourth Quarter 2011 groundwater monitoring event were acetone, 2-butanone, chloroform, 1,1-dichloroethane, cis-1,2-dichloroethene, trans-1,2-dichloroethene, toluene, and 1,1,2-trichloroethane. None of these compounds exceeded their MCL or DWNL, and generally they are not detected consistently from event to event.

3.5.2 Organic COPCs

Based on the analysis above and the concentrations detected during previous groundwater monitoring events, TCE and 1,4-dioxane are identified as primary organic COPCs, and benzene, 1,2-DCA, 1,1-DCE, methylene chloride, and RDX are identified as secondary COPCs at the Site. The remaining 6 organic analytes were either detected below their respective MCL or DWNL or at relatively low concentrations. Their distribution and concentrations in groundwater will continue to be monitored and the results evaluated. Figure 3-5 presents a summary of organic COPC laboratory results for groundwater samples collected for the Fourth Quarter 2011.

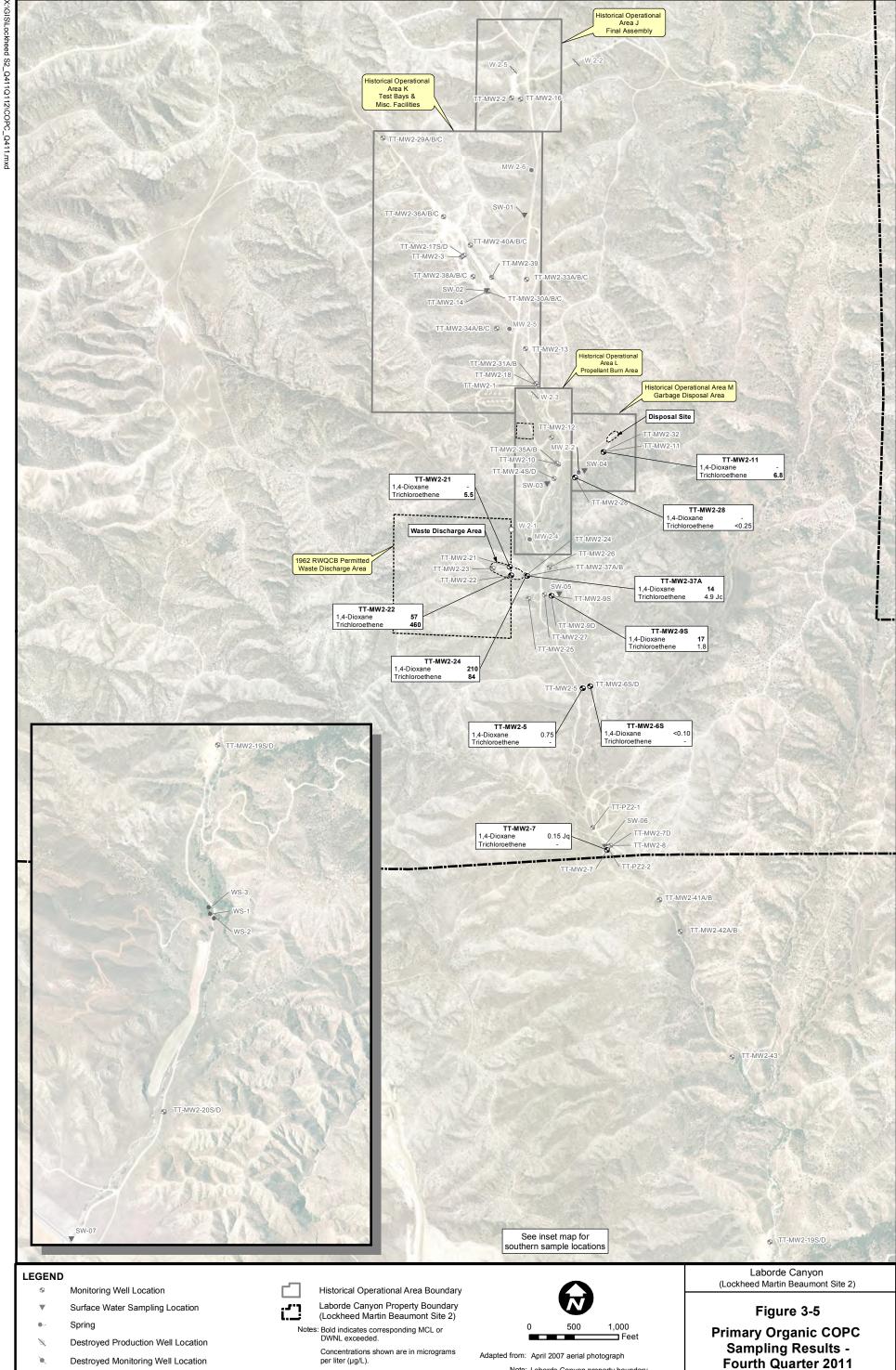
3.5.3 Inorganic Analytes

One inorganic analyte (perchlorate) was detected in groundwater above a published MCL or DWNL. Table 3-4 presents a summary of validated inorganic analyte concentrations reported in groundwater samples collected during the Fourth Quarter 2011 groundwater monitoring event.

Perchlorate was reported in groundwater samples collected from 32 of 51 locations sampled during the Fourth Quarter 2011 groundwater monitoring event at concentrations up to 96,000 μ g/L. The California MCL for perchlorate is 6 μ g/L. Time-series graphs of perchlorate are provided in Appendix I.

3.5.4 Inorganic COPCs

Based on the analysis above and the concentrations detected during previous groundwater monitoring events, perchlorate is the only inorganic COPC identified at the Site. No secondary COPCs were identified. Figure 3-6 presents a perchlorate isoconcentration map for groundwater samples collected for the Fourth Quarter 2011.



- O Reported Production Well Location
 - . 1962 RWQCB Permitted Waste Discharge Area

MCL - Maximum Contaminant Level

DWNL - Drinking Water Notification Limit

Gray symbols indicate sample not available.

Note: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004



3.6 Surface Water and Storm Water Sampling Results

Surface water samples were collected for perchlorate at three locations, WS-1, WS-2 and WS-3,

from a spring on the former Wolfskill property during the Fourth Quarter 2011 (Figure 2-2).

Perchlorate was not detected in any surface water samples collected during the Fourth Quarter

2011 sampling event. No other surface water samples were collected during this reporting period.

3.7 Increasing Trend Wells

During the Second Quarter 2011 statistical trend analysis (Tetra Tech, 2011), 16 monitoring wells

were designated as having increasing or probably increasing concentration trends. Based on trend

magnitude and well location, ten of these wells were included in the Fourth Quarter 2011

semiannual sampling event. The portion of the site where the increasing trend wells are located,

the well or location identification, and the COPC that has the increasing trend are listed below:

Six wells located in Area K:

• TT-MW2-1: perchlorate

• TT-MW2-17S: TCE

• TT-MW2-17D: perchlorate

• TT-MW2-34A: perchlorate

• TT-MW2-38A: perchlorate

TT-MW2-38C: perchlorate

One well located in Area L:

• TT-MW2-4S: perchlorate

One well located in Area M:

• TT-MW2-11: TCE

Four wells located in the former WDA:

• TT-MW2-21: perchlorate, TCE, and methylene chloride

• TT-MW2-22: TCE

- TT-MW2-24: perchlorate
- TT-MW2-37A: 1,4-dioxane, and TCE

Three wells located just downgradient and crossgradient, respectively, of the former WDA:

- TT-MW2-9S: 1,4-dioxane, perchlorate, and TCE
- TT-MW2-26: perchlorate
- TT-MW2-27: perchlorate

One well located on the former Wolfskill property:

• TT-MW2-19S: perchlorate

Table 3-7 presents a summary of the detected COPCs in the increasing trend well samples collected during the Fourth Quarter 2011 and previous monitoring events. In general, the COPC concentrations in the increasing trend wells are consistent with previous results.

Table 3-7 Summary of Detected COPCs in Increasing Trend Wells

Sample Location	Sample Date	1,4-Dioxane	Perchlorate	Benzene	Methylene Chloride	Trichloroethene	RDX
			All results reported in µg/	L unless otherwise stated			
TT-MW2-1	07/15/10	NA	5,100	< 0.14	< 0.15	< 0.17	NA
TT-MW2-1	02/01/11	NA	8,100	NA	NA	NA	NA
TT-MW2-1	06/27/11	NA NA	6,500	NA NA	NA NA	NA NA	NA NA
TT-MW2-1 TT-MW2-4S	12/14/11 06/28/10	NA NA	5,900 0.61	NA <0.14	NA <0.15	NA <0.17	NA NA
TT-MW2-4S	01/24/11	NA NA	0.46	NA	<0.13 NA	NA	NA NA
TT-MW2-4S	06/30/11	NA NA	0.62	NA NA	NA NA	NA NA	NA NA
TT-MW2-4S	12/16/11	NA	0.63	NA	NA NA	NA NA	NA
TT-MW2-9S	06/25/10	8.5	6,600	<0.14	<0.15	0.92	NA
TT-MW2-9S	01/31/11	13	10,000	NA	NA	NA	NA
TT-MW2-9S	06/28/11	15	9,200	< 0.14	< 0.15	1.6	NA
TT-MW2-9S	12/22/11	17	11,000	< 0.14	< 0.15	1.8	NA
TT-MW2-11	06/28/10	NA	230	< 0.14	< 0.15	11	NA
TT-MW2-11	01/24/11	NA	220	<0.14	< 0.15	6.9	NA
TT-MW2-11	06/24/11	NA	210	<0.14	< 0.15	5.9	NA
TT-MW2-11	12/16/11	NA	180	<0.14	<0.15	6.8	NA
TT-MW2-17S	07/01/10	NA NA	3,100	<0.14	<0.15	0.35 Jq	NA NA
TT-MW2-17S	01/24/11	NA NA	55,000	NA -0.14	NA -0.15	NA 0.25 Jan	NA NA
TT-MW2-17S TT-MW2-17S	06/24/11 12/19/11	NA NA	1,300 1,600	<0.14 NA	<0.15 NA	0.35 Jq NA	NA NA
TT-MW2-17D	07/01/10	NA NA	57000	<0.14	<0.15	2.6	NA NA
TT-MW2-17D	01/31/11	NA NA	59000	NA	NA	NA	NA NA
TT-MW2-17D	06/23/11	NA	90000	<0.14	<0.15	6.0	NA
TT-MW2-17D	12/19/11	NA	55,000	NA	NA	NA	NA
TT-MW2-19S	09/08/10	NA	4.8	NA	NA	NA	NA
TT-MW2-19S	01/28/11	NA	5.0	NA	NA	NA	NA
TT-MW2-19S	06/22/11	NA	4.7	NA	NA	NA	NA
TT-MW2-19S	12/13/11	NA	4.7	NA	NA	NA	NA
TT-MW2-21	06/25/10	< 0.10	5.0	<0.14	2.5 Jq	3.4	NA
TT-MW2-21	01/28/11	NA 0.10	12	<0.14	4.8	4.0	NA
TT-MW2-21	06/27/11	<0.10	17	<0.14	5.2	4.3	NA NA
TT-MW2-21 TT-MW2-22	12/22/11 06/25/10	NA 22 I c	20 <0.071	<0.14 0.86	6.5 4.5	5.5 470	NA NA
TT-MW2-22	01/25/11	33 Jq 48	<0.071	0.82	5.0	420	NA NA
TT-MW2-22	06/27/11	53	<0.071	0.83	3.6	420	NA NA
TT-MW2-22	12/22/11	57	< 0.071	0.76	3.3	460	NA
TT-MW2-24	07/15/10	250	140,000 Jf	0.20 Jq	0.85 BJaq	97	NA
TT-MW2-24	02/01/11	280	160,000	0.18 Jq	0.64 BJkq	83	NA
TT-MW2-24	06/27/11	320	160,000	0.19 Jq	0.58 Jq	92	2.1
TT-MW2-24	12/19/11	210	96,000	0.17 Jq	0.43 BJkq	84	NA
TT-MW2-26	06/30/10	< 0.10	100	< 0.14	< 0.15	< 0.17	NA
TT-MW2-26	01/28/11	NA	93	NA	NA	NA	NA
TT-MW2-26	06/27/11	<0.10	100	<0.14	<0.15	<0.25	NA
TT-MW2-26	12/21/11	NA NA	87	NA O 14	NA 10.15	NA	NA NA
TT-MW2-27 TT-MW2-27	06/25/10 01/28/11	NA NA	240 370	<0.14 NA	<0.15 NA	<0.17 NA	NA NA
TT-MW2-27	06/28/11	0.66	260	<0.14	<0.15	<0.25	NA NA
TT-MW2-27	12/21/11	NA	240	NA	NA NA	NA	NA
TT-MW2-34A	06/29/10	NA NA	<0.071	<0.14	0.21 Jq	<0.17	NA NA
TT-MW2-34A	01/26/11	NA	3.5	NA	NA NA	NA	NA NA
TT-MW2-34A	06/30/11	NA	5.0	NA	NA	NA NA	NA
TT-MW2-34A	12/22/11	NA	5.2	NA	NA	NA	NA
TT-MW2-37A	06/30/10	13	7,500	0.52	< 0.15	2.0	NA
TT-MW2-37A	01/31/11	NA	12,000	NA	NA	NA	NA
TT-MW2-37A	06/29/11	18	1.2	0.48 Jq	< 0.15	3.5	NA
TT-MW2-37A	12/16/11	14	12,000	0.47 Jq	<0.15	4.9 Jc	NA
TT-MW2-38A	06/23/10	NA	200,000	<0.14	<0.15	<0.17	NA
TT-MW2-38A	02/01/11	NA NA	210,000	NA NA	NA NA	NA NA	NA NA
TT-MW2-38A	06/23/11	NA NA	250,000	NA NA	NA NA	NA NA	NA NA
TT-MW2-38A TT-MW2-38A	12/19/11 01/25/12	NA NA	410 23,000	NA NA	NA NA	NA NA	NA NA
TT-MW2-38A	04/04/12	NA NA	80,000	NA NA	NA NA	NA NA	NA NA
TT-MW2-38C	07/01/10	NA NA	61,000	<0.14	<0.15	<0.17	NA NA
TT-MW2-38C	01/31/11	NA NA	37,000	NA	NA	NA	NA NA
TT-MW2-38C	06/23/11	NA	160,000	NA	NA	NA NA	NA
	12/19/11	NA	87,000	NA	NA	NA	NA
TT-MW2-38C	12/1//11						
TT-MW2-38C	Method Detection Limit	0.043	0.071	0.14	0.15	0.17	0.2

Notes: Only analytes positively detected in samples are presented in this table.

For a complete list of constituents analyzed, refer to the laboratory data package.

RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine

 $\mu g/L - \quad \ Micrograms \ per \ liter$

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.

< # - Method detection limit concentration is shown.

NA - Not analyzed

- B The sample result was less than 5 times blank contamination. Cross contamination is suspected.
- $\label{eq:J-main} \textbf{J-} \quad \text{ The analyte was positively identified, but the concentration is an estimated value.}$
- a The analyte was found in the method blank.
- c The Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) recoveries were outside control limits.
- $f-\quad \ \ The \ duplicate \ sample's \ Relative \ Percent \ Difference \ (RPD) \ was \ outside \ the \ control \ limit.$
- k The analyte was found in a field blank.
- q The analyte detected was below the Practical Quantitation Limit (PQL).

3.8 Habitat Conservation

Consistent with the U.S. Fish and Wildlife Service approved HCP (USFWS, 2005) and subsequent clarifications (LMC, 2006a and 2006b) to 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 Stephens' Kangaroo rat (SKR) occurred during the performance of field activities related to the Fourth Quarter 2011 and First Quarter 2012 monitoring events.

Section 4 Summary and Conclusions

This section summarizes the results of the Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring events. During the Fourth Quarter 2011 monitoring event, 72 monitoring well locations and four piezometers were measured for groundwater levels, and 48 monitoring wells and three surface water locations were sampled for groundwater quality. Two monitoring wells, TT-MW2-29A and TT-MW2-43, were dry during the Fourth Quarter 2011 monitoring event. During the First Quarter 2012 monitoring event, 72 monitoring well locations and four piezometers were measured for groundwater levels. Storm water samples were scheduled to be collected during the First Quarter 2012 monitoring event, but due to the lack of sufficient precipitation, no samples were collected. No other samples were scheduled to be collected during the First Quarter 2012 monitoring wells, TT-MW2-29A and TT-MW2-43, were found to be dry during the First Quarter 2012 monitoring event.

4.1 Groundwater Elevation and Flow

The Beaumont National Weather Station reported approximately 3.73 inches of rain during Fourth Quarter 2011 and approximately 4.91inches of precipitation during First Quarter 2012. During these time periods, groundwater elevations generally increased across the Site. During Fourth Quarter 2011, groundwater elevation increases were seen in all areas of the site. During First Quarter 2012, groundwater elevation increases were seen in the northern and central portions of the Site, and elevation decreases were seen in the southern portion of the Site.

Groundwater elevations during the Fourth Quarter 2011 monitoring event ranged from approximately 2,076 feet above msl in the northern portion of the Site, to about 1,819 feet above msl in the southern portion of the Site. Depth to groundwater ranged from about 119 feet bgs to about 15 feet bgs. Groundwater elevations during the First Quarter 2012 monitoring event ranged from approximately 2,076 feet above msl in the northern portion of the Site, to about 1,819 feet above msl in the southern portion of the Site. Depth to groundwater ranged from about 121 feet bgs to about 18 feet bgs.

Based on the measured groundwater elevations, the current CSM, and the southward sloping topography at the Site, groundwater flow appears to be to the south, generally following the topography of Laborde Canyon. The overall groundwater elevation at the Site has decreased four to six feet since fourth quarter 2005 with the greatest decrease over time seen in monitoring well TT-MW2-1 (5.5 feet). Limited seasonal fluctuations can be seen to varying degrees following periods of precipitation.

Generally, the seasonal fluctuations in the northern portion of the Site are less pronounced and have a three- to four-month delay before a change in groundwater elevation is noticeable. The wells in Test Bay Canyon, however, appear to respond faster and have a greater change in elevation compared with wells in the main portion of Laborde Canyon.

In the southern portion of the Site between the WDA and the southern Site boundary, seasonal fluctuations tend to be more pronounced and have a shorter response time. This is most noticeable in the shallow wells located near the southern property boundary and in the riparian area just south of the property boundary.

On the former Wolfskill property, groundwater elevations have remained relatively stable with noticeable seasonal fluctuations.

Although the data are limited in many of the newer wells, the overall long-term decreasing trend in groundwater elevation appears to generally correspond to long-term precipitation patterns.

4.1.1 Groundwater Gradients

Horizontal groundwater gradients across the Site are relatively constant. The horizontal groundwater gradients calculated between TT-MW2-16 and TT-MW2-6S from the Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring events for the wSTF-screened wells averaged 0.030 feet/foot. The horizontal groundwater gradients calculated between TT-MW2-2 and TT-MW2-6D for the Fourth Quarter 2011 and First Quarter 2012 groundwater monitoring events for the deeper STF-screened wells averaged 0.029 feet/foot.

Generally the vertical gradients are downward on-site and upward from the Site boundary south. The vertical gradients range from -0.31 feet/foot to +0.18 feet/foot. A summary of calculated horizontal and vertical groundwater gradients is presented in Table 3-3 and in Appendix E.

4.2 Surface Water Flow

During the Fourth Quarter 2011 and First Quarter 2012, the Laborde Canyon drainage channel was walked to determine the presence, nature, and quantity of surface water within the creek beds. Surface water was not present in the creek beds during the Fourth Quarter 2011 and First Quarter 2012 monitoring events, so stream flow measurements were not taken.

4.3 Water Quality Monitoring

Both groundwater and surface water samples are collected as part of the GMP. The GMP has a quarterly/semiannual/annual frequency. The annual 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, and the annual wells are sampled second quarter of each year.

Groundwater samples collected during the Fourth Quarter 2011 monitoring event were analyzed for perchlorate. Select locations were also analyzed for VOCs and 1,4-dioxane. Based on the historical operations at the Site and groundwater monitoring results, perchlorate, TCE, and 1,4-dioxane were identified as primary COPCs. Benzene, 1,2-DCA, 1,1-DCE, methylene chloride, and RDX were identified as secondary COPCs.

4.3.1 Surface Water and Storm Water

Surface water samples are collected from seven storm water sample locations within the Laborde Canyon stream bed, and at three locations at a spring located on the former Wolfskill property. Water is generally present in the Laborde Canyon creek bed only during periods of heavy, prolonged precipitation.

During the Fourth Quarter 2011 sampling event, surface water samples were collected from the three spring locations. The samples were analyzed for perchlorate. The remaining seven storm water sampling locations in Laborde Canyon were dry at the time of sampling. Perchlorate was detected in samples during the Fourth Quarter 2011 monitoring event. No other surface water samples were collected during this reporting period.

4.3.2 Groundwater

$Area\ J-Final\ Assembly$

Area J wells were not scheduled to be sampled during the Fourth Quarter 2011. Site COPCs have not previously been detected above their respective MCLs or DWNLs in Area J.

Area K – Test Bays and Miscellaneous Facilities

Perchlorate, TCE, and RDX have been detected in Area K. Previously, perchlorate has been detected as high as 250,000 μ g/L in Area K. During Fourth Quarter 2011, perchlorate was detected at concentrations ranging from below the MDL to 87,000 μ g/L. Area K has been identified as a source of perchlorate in groundwater.

VOCs and RDX samples were not scheduled to be collected in Area K during the Fourth Quarter 2011.

<u>Area L – Propellant Burn Area</u>

Perchlorate is the only Site COPC to be detected in Area L. Area L is located downgradient of Area K, a known perchlorate source area. Previously, perchlorate was detected at concentrations up to 9.98 μ g/L. During Fourth Quarter 2011, perchlorate was detected in monitoring wells TT-MW2-4S and TT-MW2-12 at concentrations of 0.63 μ g/L and 0.09 μ g/L, respectively. There is currently no indication that a perchlorate source is present in Area L; the perchlorate detected in Area L groundwater appears to have originated upgradient in Area K.

Area M - Garbage Disposal Area

Perchlorate and TCE have been detected in Area M. Previously, perchlorate was detected at concentrations up to 469 μ g/L in well TT-MW2-11. During the Fourth Quarter 2011, perchlorate was detected at concentrations ranging from below the MDL to 180 μ g/L. Area M has been identified as a source of perchlorate in groundwater.

TCE has been consistently detected in groundwater samples collected from monitoring well TT-MW2-11 at concentrations up to 9.2 μ g/L. During the Fourth Quarter 2011, TCE was detected at a concentration of 6.8 μ g/L. TCE has not been detected in other wells in Area M.

Waste Discharge Area

Perchlorate, TCE, 1,4-dioxane, and RDX have been detected in the WDA. The WDA is located downgradient of operational areas J, K, L, and M, but they do not appear to be contributing to the impacts observed in at the WDA in a material way.

Previously, perchlorate was detected at concentrations as high as 190,000 μ g/L. Perchlorate was detected in groundwater at concentrations ranging from below the MDL to 96,000 μ g/L during the Fourth Quarter 2011. The former WDA has been identified as a source of perchlorate in groundwater.

Previously, TCE was detected at concentrations as high as $460 \,\mu\text{g/L}$ in monitoring wells located in the WDA. During the Fourth Quarter 2011, TCE was detected in groundwater at concentrations ranging from below the MDL to $460 \,\mu\text{g/L}$. The WDA has been identified as a source of TCE in groundwater. TCE has not been detected consistently, or above the MCL, in monitoring wells downgradient of the WDA.

Previously, 1,4-dioxane was detected as high as 420 μ g/L in monitoring wells located in the former WDA. 1,4-Dioxane was detected in groundwater at concentrations ranging from below the MDL to 210 μ g/L during the Fourth Quarter 2011. The WDA has been identified as a source of 1,4-dioxane in groundwater, and this constituent has been detected in downgradient monitoring wells. The 1,4-dioxane DWNL is 1 μ g/L.

RDX samples were not scheduled to be collected in Area K during Fourth Quarter 2011.

Lower Canyon and Riparian Corridor

Perchlorate, TCE, and 1,4-dioxane have been detected in the lower portion of Laborde Canyon downgradient from the WDA. Perchlorate has also been detected in the riparian corridor south of the property boundary. In the lower section of Laborde Canyon, perchlorate was detected at concentrations as high as $10,000~\mu g/L$, up to $519~\mu g/L$ at the southern Site boundary, and up to $0.18~\mu g/L$ in the riparian corridor south of the southern Site boundary. During the Fourth Quarter 2011, perchlorate was detected in groundwater at concentrations ranging from $11,000~\mu g/L$ in the northern portion of the lower Laborde Canyon to below the MDL in the riparian corridor. No source of perchlorate has been identified in the lower canyon or at the southern Site boundary. The perchlorate appears to have originated in the former WDA.

TCE was detected in monitoring well TT-MW2-9S located in the northern portion of the lower Laborde Canyon at a concentration of $1.8 \,\mu\text{g/L}$ during the Fourth Quarter 2011 monitoring event. TCE has not been detected in other wells located in the lower canyon or riparian corridor area. The source of the TCE appears to be the WDA.

During the Fourth Quarter 2011 monitoring event, 1,4-dioxane was detected in groundwater at concentrations ranging from 17 μ g/L in the northern portion of the lower Laborde Canyon to below the MDL in the riparian corridor. No source of 1,4-dioxane has been identified in the lower canyon or at the southern Site boundary. The 1,4-dioxane appears to have originated in the former WDA.

Former Wolfskill Property

On the former Wolfskill property, south of the southern Site boundary, perchlorate was detected in TT-MW1-19S during Fourth Quarter 2011 at a concentration of 4.7 μ g/L. These results are consistent with historic results. Perchlorate has not been detected in monitoring well TT-MW2-20S or TT-MW2-20D, located approximately one half mile south of TT-MW2-19S.

Summary

Based on the data available at this time, the TCE and RDX plumes in groundwater appear to be small and isolated. These plumes do not extend off-site. The 1,4-dioxane plume is limited to the WDA and lower Laborde Canyon, and does not appear to extend off-site. The perchlorate plume does appear to extend off-site, but terminates in the riparian corridor south of the southern Site boundary. The perchlorate detected in monitoring well TT-MW2-19S located on the former Wolfskill property appears to be an isolated impacted area which may have resulted from preferential flow in higher-conductivity alluvium during a prolonged period of heavy precipitation in the past.

4.4 Groundwater Monitoring Program and the Groundwater Quality Monitoring Network

Quarterly groundwater monitoring has been conducted at the Site since the September 2004 well installation activities. Groundwater samples have been routinely analyzed for VOCs and perchlorate. Selected testing for CAM 17 Metals, general minerals, 1,4-dioxane, RDX, N-nitrosodimethylamine, 1,2,3-trichloropropane, and hexavalent chromium has also been performed. A groundwater monitoring SAP was prepared to optimize and better define the GMP at the Site

(Tetra Tech, 2007a). In concurrence with DTSC, groundwater monitoring will continue to be performed in accordance with the SAP.

4.4.1 Groundwater Sampling Frequency

The primary criterion utilized in determining the sampling frequency of a monitoring well is the well classification (i.e., function of each well) (Tetra Tech, 2007a). Groundwater monitoring-well classifications are based on the evaluation of the temporal trends, spatial distribution analyses, and other qualitative criteria. During the previous reporting period, horizontal extent wells, vertical distribution wells, increasing contaminant trend wells, background wells, guard wells, and new wells were sampled. Table 4-1 presents a summary of the frequency of groundwater sampling by well classification.

Table 4-1 Well Classification and Sampling Frequency

Well Classification	Frequency				
Horizontal Extent Wells	Semiannual				
Vertical Distribution Wells	Semiannual				
Increasing Contaminant Trend Wells	Semiannual				
Background Wells	Annual				
Remedial Monitoring Wells	Varies, based on remedial action proposed				
Guard Wells	Semiannual				
New Wells	4 quarters then reclassify				
Redundant Wells	Suspend (no sampling)				

4.4.2 Proposed Changes

Methylene chloride was previously identified as a secondary COPC based on the high concentrations detected in samples collected in monitoring wells TT-MW2-14 and TT-MW2-22, (380 μ g/L and 220 μ g/L, respectively) shortly after well installation. The concentration of methylene chloride in samples collected from these wells has dropped to concentrations at or below the MCL over the last three years. For this reason, it is proposed to eliminate methylene chloride as a secondary COPC.

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