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LOCKHEED MARTIN

November 6, 2017

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

Subject: *Well Installation and Destruction Report, Potrero Canyon (Lockheed Martin Beaumont Site 1), Beaumont, California*

Dear Mr. Zogaib:

Please find enclosed one hardcopy of the body of the work plan and two compact discs with the report body and appendices of the *Well Installation and Destruction Report, Potrero Canyon (Lockheed Martin Beaumont Site 1), Beaumont, California* for your review and approval or comment.

If you have any questions regarding this submittal, please contact me at 301-548-2184 or jeff.thomas@lmco.com.

Sincerely,

Jeff Thomas, Project Lead

Enclosure: *Well Installation and Destruction Report, Potrero Canyon (Lockheed Martin Beaumont Site 1), Beaumont, California*

Copy: Barbara Melcher, CDM (electronic copy)
Ben Weink, Tetra Tech (electronic copy)
Jeff Thomas, LMC (electronic copy)

Well Installation and Destruction Report
Potrero Canyon
(Lockheed Martin Corporation Beaumont Site 1)
Beaumont, California

Prepared for:

LOCKHEED MARTIN

TETRA TECH

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

November 2017

WELL INSTALLATION AND DESTRUCTION REPORT
POTRERO CANYON
(LOCKHEED MARTIN BEAUMONT SITE 1)
BEAUMONT, CALIFORNIA

Prepared for:

Lockheed Martin Corporation

Prepared by:

Tetra Tech, Inc.

November 2017

Vanessa Calder
Associate Geologist

Benjamin M. Weink, P.G. (8037)
Project Manager

TABLE OF CONTENTS

Section **Page**

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ACRONYMS

1,1-DCE	1,1-dichloroethene
cis-1,2-DCE	*cis*-1,2-dichloroethene
bgs	below ground surface
DO	dissolved oxygen
DOC	dissolved organic carbon
DWNL	State Water Resources Control Board Division of Drinking Water drinking water notification level
DWR	California Department of Water Resources
DKR	Dulzura kangaroo rat
EC	electrical conductivity
gpm	gallons per minute
HCP	Habitat Conservation Plan
HSA	hollow-stem auger
IDW	investigation-derived waste
ISB	*in situ* bioflushing
LCS	laboratory control sample
Lockheed Martin	Lockheed Martin Corporation
MCL	California State Water Resources Control Board Division of Drinking Water maximum contaminant level
MDL	method detection limit
mg/L	milligrams per liter
µg/L	micrograms per liter
MNA	monitored natural attenuation
MPCA	Middle Potrero Creek Area
MS/MSD	matrix spike/matrix spike duplicate
mV	millivolts

NAD	North American Datum
NAVD	North American Vertical Datum
NTU	nephelometric turbidity unit
ORP	oxidation-reduction potential
PCAA	Primary Contaminant Attenuation Area
PVC	polyvinyl chloride
QC	quality control
RDST	Results Data Summary Table
RPD	relative percent difference
SIM	Selected Ion Monitoring
SKR	Stephens' kangaroo rat
TCE	trichloroethene
Tetra Tech	Tetra Tech, Inc.
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound

Section 1 Introduction

On behalf of Lockheed Martin Corporation (Lockheed Martin), Tetra Tech, Inc. (Tetra Tech) has prepared this Well Installation and Destruction Report, which documents the replacement of one monitoring well (OW-02) and the installation of three groundwater wells, three extraction wells, and six piezometers in support of the Potrero Canyon Remedial Action. Four locations (MPC-PZ06, F34-TW2, F34-TW3, and F34-TW4) within the streambed were not installed as part of this field effort but will be installed after the approved United Stated Army Corps of Engineers and Regional Water Quality Control permits have been received. Potrero Canyon (Lockheed Martin Beaumont Site 1) is a 9,117-acre parcel located in the southern portion of Beaumont, California (Figure 1).

1.1 PURPOSE AND OBJECTIVES

Additional groundwater wells and piezometers were installed at Potrero Canyon as part of approved remedial actions and contingency measures described in the *Final Remedial Action Plan (Lockheed Martin Beaumont Site 1), Beaumont, California* (Tetra Tech, 2016a). The objective for proposed monitoring well and piezometer locations were outlined in the *Well Installation and Destruction Work Plan, Potrero Canyon (Lockheed Martin Beaumont Site 1) Beaumont, California* (Tetra Tech, 2017c), herein referred to as the Work Plan. This report summarizes the field activities performed and results, including tabular summaries of the data collected, location maps, figures, data interpretations, graphical data presentations, and laboratory analytical data.

1.2 REFERENCE DOCUMENTS

The field procedures for well installation, aquifer testing, sampling, well destruction, and management and disposal of investigation-derived waste (IDW), in addition to health and safety, were conducted in accordance with the documents listed below.

- *Endangered Species Act Incidental Take Permit for Potrero Creek and Laborde Canyon Properties Habitat Conservation Plan,* United States Fish and Wildlife Service (USFWS), 2005 and subsequent clarifications (Lockheed Martin, 2006a, 2006b, and 2006c)

- California Department of Water Resources (CDWR), 2002. *California Well Standards, Water Well Standards*, (Bulletins 74-81 and 74-90 combined), June.
- *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure),* ASTM International, Designation D2488-06 (2006)
- *Well Installation and Destruction Work Plan, Potrero Canyon (Lockheed Martin Beaumont Site 1), Beaumont, California* (Tetra Tech, 2017c)
- *Beaumont Programmatic Sampling and Analysis Plan Update, Lockheed Martin Corporation Potrero Canyon (Beaumont Site 1) and Laborde Canyon (Beaumont Site 2), Beaumont, California.* (Tetra Tech, 2016b)
- *Beaumont Programmatic Sampling and Analysis Plan Addendum, Lockheed Martin Corporation Potrero Canyon (Beaumont Site 1) and Laborde Canyon (Beaumont Site 2), Beaumont, California. (*Tetra Tech, 2017b)
- *Final Beaumont Site 1 and Site 2 Health and Safety Plan, Revision Number 2.4.* (Tetra Tech, 2017a)

Section 2 Methodology

Section 2 summarizes the methodology for pre-field activities, extraction and monitoring well installation activities, and data collection/analytical methods utilized within the Middle Potrero Creek Area (MPCA), Primary Contaminant Attenuation Area (PCAA), Maintenance Shops and Warehouse (Feature F-34), and Large Motor Washout Area (Feature F-33). Work was performed in conformance with the procedures and methodologies detailed in the Work Plan (Tetra Tech, 2017c). All field work was performed under the direct supervision of a California-licensed Professional Geologist.

2.1 SITE PREPARATION ACTIVITES

Pre-drilling activities that were part of this investigation include well installation permitting, underground utility clearance, and biological monitoring.

2.1.1 Permitting and Utility Clearance

Prior to commencement of field activities, monitoring well permits were filed with the County of Riverside Department of Public Health. Copies of the permits are provided in Appendix A. Underground Service Alert was contacted prior to starting fieldwork, and one Dig Alert ticket was issued for each well feature location. Copies of Dig Alert tickets are included in Appendix B.

Twenty-one locations (10 piezometers, five monitoring wells, three temporary monitoring wells, and three extraction wells) were staked in the field prior to conducting the geophysical survey (Figures 2 through 5). Using geophysical surveying techniques, 12 well locations were cleared for underground utilities and other obstructions by a third-party private utility locator on 12 June 2017. Each boring location was delineated with a 400 square foot perimeter (20 feet by 20 feet). Clustered well locations (MPC-PZ01S/D, MPC-PZ02S/D, MPC-PZ05S/D, MW-109I/D, and OW-02RS/RI) were delineated within the same 400 square foot perimeter. On July 31, 2017, a geophysical survey was performed at F33-EW02 and MPC-PZ02. While location MPC-PZ02 was cleared on 12 June 2017, the location was moved approximately 50 feet northwest during drilling activities to be closer to the axis of the drainage based on the depth to bedrock on the north side of the channel and thick

sequence of alluvium at EW-19 and MW-46. A technical memorandum documenting the geophysical survey is provided in Appendix C.

For the four future well locations (MPC-PZ06, F34-TW2, F34-TW3, and F34-TW4) in the streambed, utility clearance will not be required as they are in a designated streambed, and these wells will be installed via hand auger method without any mechanical equipment.

Prior to initializing soil boring activities, each boring was hand augered to approximately 5 feet below ground surface (bgs) to ensure clearance of any shallow subsurface utilities or other obstructions.

2.1.2 Biological Survey

All drilling activities were performed in accordance with the United States Fish and Wildlife Service (USFWS)-approved *Habitat Conservation Plan* (HCP) (USFWS, 2005) and subsequent clarifications (Lockheed Martin, 2006a, 2006b, and 2006c) of the HCP. A biological survey of the surrounding area of each proposed groundwater monitoring well location was performed by a Section 10A permitted or subpermitted biologist to evaluate the potential for impacts during field activities to sensitive species/habitats (e.g., the endangered Stephens' kangaroo rat [SKR]).

Nesting Birds

A nesting bird survey was conducted on 10 July and 11 July 2017. The proposed groundwater monitoring well locations had been completely burnt in a recent wildfire. Additionally, the riparian area adjacent to the groundwater monitoring well locations was partially burnt. There were no active bird nests observed in the survey area, and therefore no buffers were proposed for any groundwater monitoring well locations during drilling and well installation activities.

Stephens' Kangaroo Rat

As part of the biological survey, the biologist identified and marked potential or suspected SKR burrows that were located in the vicinity of proposed well locations to avoid the "take" (i.e., harm, harassment, death, and/or disturbance of habitat) of SKRs. The biologist clearly marked the ingress and egress routes to each proposed well location in an effort to minimize the overall footprint of field activities and impacts to SKR habitat. The biological monitor implemented load spreading measures to protect suspected SKR burrows in the vicinity of the work area. Further, as specified,

the biologist remained on site during field activities to implement requirements of the "Low Effect" agreement. However, takes of the Dulzura kangaroo rat (DKR) and SKR did not occur during field activities. Findings of the pre-survey and post-surveys will be documented in the 2018 Annual SKR Report to be submitted to the United States Fish and Wildlife.

2.1.3 Secondary Containment Staging Area

A secondary containment staging area for the temporary storage of soil and water drums was constructed in an area centrally located to the proposed well and piezometer locations. The containment area was constructed on asphalt and consisted of six mil poly sheeting to cover the ground surface with large straw wattles laid out in a large rectangular perimeter under the sheeting. The raised borders provided spill containment. Wattles located on the west side of the containment area were laid in a way to provide for easy movement to the side during drum-loading activities.

2.2 EXTRACTION WELL, MONITORING WELL, AND PIEZOMETER INSTALLATIONS

The installation of six piezometers, three groundwater extraction wells, and three monitoring wells was performed between 19 July and 30 August 2017 (see Figures 2 through 4). All wells were installed in accordance with the approved Work Plan. Deviations from the Work Plan are stated in Sections 2.2.1 and 2.2.2. The groundwater piezometers, extraction wells, and monitoring wells were installed using a hollow-stem auger (HSA) drill rig operated by ABC Liovin Drilling, Inc. located in Signal Hill, California. Four locations (MPC-PZ06, F34-TW2, F34-TW3, and F34-TW4) within the streambed were not installed as part of this field effort but will be installed after the approved United Stated Army Corps of Engineers and Regional Water Quality Control permits have been received (Figures 3 and 5).

Field procedures used for drilling, lithologic logging, and borehole abandonment are described in the *Beaumont Programmatic Sampling and Analysis Plan Update* (Tetra Tech, 2016b). Copies of the soil boring logs and well completion diagrams are provided in Appendix D. Summarized construction details for each well are presented in Table 1. Details of installations of piezometers, groundwater extraction wells, and monitoring wells, and well destruction activities by feature are included in the subsections below.

2.2.1 Middle Potrero Creek Area

Six piezometers (MPC-PZ01, MPC-PZ02S, MPC-PZ02D, MPC-PZ04, MPC-PZ05, and MPC-PZ07) were installed using HSA at depths to 115 feet bgs (Figure 3). The piezometers were installed in order to demonstrate hydraulic containment of contaminated groundwater in the MPCA and to monitor the cone of depression over time to assess potential impacts on groundwater-dependent riparian vegetation after the pump-and-treat system has been installed and is operating. Well construction material for the piezometers consisted of 2-inch schedule 40 polyvinyl chloride (PVC) blank casing, screened sections constructed of 0.020-inch slotted PVC or stainless steel wire-wrapped screen with a 0.020-inch gap size, and #2/12 filter pack sand (Table 1). Deviations from the Work Plan (Tetra Tech, 2017c) for piezometer locations MPC-PZ01, MPC-PZ01D, MPC-PZ03, MPC-PZ05 and MPC-PZ05D were as follows:

- At MPC-PZ01, bedrock was encountered at 46.5 feet with first water observed at 33 feet. Bedrock was much shallower than anticipated, therefore only one piezometer (MPC-PZ01) was installed.
- At MPC-PZ03, bedrock was encountered at 33 feet and no groundwater was observed; therefore the hole was grouted up and no piezometer was installed at this location. This piezometer was not moved to a new location as piezometers MPC-PZ01 and MPC-PZ05 will provide sufficient information for monitoring water levels and drawdown due to extraction given the shallow Mount Eden formation and the absence of groundwater observed at MPC-PZ03.
- At MPC-PZ05, bedrock was encountered at 53.75 feet with first water observed at 38.5 feet. Bedrock was much shallower than anticipated, therefore only one piezometer (MPC-PZ05) was installed.

2.2.2 Primary Contaminant Attenuation Area

Three monitoring wells (MW-109D, OW-02R, MW-46D) were installed with HSA at depths to about 122 feet bgs in the PCAA to better delineate and monitor the vertical extent of groundwater impacts and the ongoing natural contaminant attenuation processes which currently remove a substantial portion of the plume contaminant mass flux and play an important role in the overall cleanup strategy for the site (Figure 2). It should be noted that two proposed well clusters (MW-109 and OW-02R) were installed as single-completion wells due to the depth at which bedrock was

encountered. Well construction material for the three monitoring wells MW-109D, OW-02R, and MW-46D consist of 2-inch schedule 40 PVC blank casing, stainless steel wire-wrapped screen with a 0.020-inch gap size, and #2/12 filter pack sand (Table 1). There was a deviation from the Work Plan (Tetra Tech, 2017c) for proposed locations MW-109I and MW-109D. At MW-109, bedrock was encountered at 30 feet with first water observed at 19 feet. Bedrock was much shallower than anticipated, therefore only one monitoring well (MW-109D) was installed.

2.2.2.1 Well Destruction and Reinstallation

Well OW-02, identified as a performance monitoring well for the monitored natural attenuation (MNA) remedy in the PCAA, was destroyed in accordance with the Work Plan (Tetra Tech, 2017c) and *California Well Standards*. Well OW-02 was removed by overdrilling with HSA using 8-inch augers to a depth of 48 feet bgs, where competent bedrock was encountered and the augers encountered refusal, and backfilling with cement/bentonite grout as specified in the Work Plan. There was a deviation from the Work Plan (Tetra Tech, 2017c) for proposed locations OW-02R and OW-02RS. At OW-02, bedrock was encountered at 45 feet with first water observed at 31 feet. Bedrock was much shallower than anticipated, therefore only one monitoring well (OW-02R) was installed (Figure 2 and Table 1).

2.2.2.2 Depth Discrete Groundwater Sampling and Analysis

Groundwater grab samples were collected at wells MW-46D and OW-02R. Depth discrete groundwater samples were collected at approximately 10-foot intervals in MW46D from about 60 to 120 feet bgs. One groundwater sample was collected in OW-02R at a depth of approximately 37.5 feet bgs. Groundwater sample collection was attempted at MW-109D but a true wetted zone was not encountered. A moistened zone was located between about 18 to 22 feet bgs, but there was insufficient water for sample collection. Samples were collected using a Hydropunch® when there was enough recharge to enable adequate sample collection. This approach entailed driving the sampler beyond the auger bit into undisturbed soil with a 2-inch diameter drive pipe, opening a temporary screened section, lowering a disposable bailer into the borehole through the inside of the drive pipe, and transferring the groundwater from the bailer into the appropriate sample containers.

Water quality parameters including temperature, electrical conductivity (EC), pH, turbidity, dissolved oxygen (DO) and oxidation-reduction potential (ORP) were collected concurrently with groundwater grab samples. Purged groundwater was collected via a disposable bailer, poured into a

container, and secured air-tight to a multi-parameter meter probe. Due to depth to groundwater, high turbidity levels, and the limited inner diameter of the drive pipe, water parameters collected via a flow-through cell were not feasible. Purge parameters collected with each groundwater grab sample are summarized in Table 2.

All samples were placed in a chilled cooler and delivered under chain-of-custody via courier to Eurofins Calscience, Inc., a California-certified fixed laboratory in Garden Grove, California. Samples were analyzed for volatile organic compounds (VOCs) using Unites States Environmental Protection Agency (USEPA) Method SW8260B, for perchlorate using USEPA Method SW6850, and for 1,4-dioxane using USEPA Method SW8270C-Selected Ion Monitoring (SIM).

2.2.3 Large Motor Washout Area (Feature F-33)

Three extraction wells were installed using HSA at depths to 75 feet bgs (Figure 4). F33-EW01 was installed, developed and tested to determine the well yield. The well yield in F33-EW01 was greater than 2.0 gallons per minute (gpm), therefore, extraction wells F33-EW02 and F33-EW03 were installed at the Large Motor Washout Area. Extraction wells were used for well yield testing to evaluate the feasibility of implementing the *in situ* bioflushing (ISB) contingency remedy identified in the *Final Remedial Action Plan* (Tetra Tech, 2016a). Extraction wells F33-EW1, F33-EW2, and F33-EW3 were constructed using nominal 4-inch diameter PVC blank casing and 4-inch diameter, stainless steel wire-wrapped screen with a 0.020-inch gap size, and #3 or #2/12 filter pack sand (Table 1).

2.3 WELL DEVELOPMENT

Wells and piezometers were developed with a combination of surging, bailing, and pumping techniques following the procedures outlined in Section 2.5.6 of the *Beaumont Programmatic Sampling and Analysis Plan Update* (Tetra Tech, 2016b) at least 24 hours after well installations had been completed. During development, water quality parameters were collected, including DO, ORP, EC, pH, turbidity, and water level drawdown. Development was considered complete when turbidity was at or below 5 nephelometric turbidity units (NTUs), or stable (±10% within three consecutive readings at 3-5 minute intervals). Well development field sheets are provided in Appendix E.

2.3.1 Extraction Well Yield Testing

Step drawdown tests of the extraction wells (F33-EW01, F33-EW02, and F33-EW03) were performed on 24 July and 13-16 August 2017. The purpose of the step drawdown tests was to estimate short-term sustainable pumping rates to determine the feasibility of using the wells as a water source for bioflushing. Well yield information will be used to help determine the type, size and operational parameters of infiltration galleries for a detailed conceptual design of the ISM contingency remedy. Electronic pressure transducers were initially placed in these wells and in the surrounding extraction/monitoring wells (Figure 4) to monitor the barometric and diurnal effects on static water levels and to ensure stable conditions prior to the start of the step drawdown tests.

The step drawdown test was conducted on each well by pumping the well at three pumping rates. Pumping continued at each pumping rate for a minimum of 5 to 10 minutes after water levels stabilized. Drawdown in the extraction wells was measured as pumping tests took place. Pre- and post-water level measurements were collected to adequately document groundwater levels in the surrounding wells. All water level measurements were recorded within 0.01-foot precision. Water level measurements were taken manually and electronically using pressure transducers. Additional test data recorded during the step drawdown test included the start and stop time, pumping rate, cumulative flow, and drawdown at each pumping rate.

2.4 MONITORING WELL SAMPLING AND ANALYSIS

Initial groundwater sampling followed well development and well purging activities by a minimum of 72 hours to allow for the monitoring wells to stabilize after the agitation and aeration caused by development activities. Groundwater samples were collected from monitoring wells by low-flow purging and sampling methods using a submersible bladder pump. Copies of the field data sheets are included in Appendix E.

All samples were placed in a chilled cooler and delivered under chain-of-custody via courier to Eurofins Calscience. These samples were analyzed according to Table 3 for the following constituents:

- VOCs using USEPA Method SW8260B
- perchlorate using USEPA Method SW6850

- 1,4-dioxane using USEPA Method SW8270C-SIM
- nitrate using USEPA Method E300.0
- dissolved organic carbon using USEPA Method SM5310B

Copies of the laboratory analytical reports and chain-of-custody documentation are in Appendix F.

2.5 MONITORING WELL SURVEYING

Monitoring well surveying for the twelve newly installed wells and three existing well locations (MW-15, MW-45 and MW-106) was needed to confirm accurate surveying results for the newly installed wells. The surveying was performed by Hillwig Goodrow, LLC, a professional land surveying company, on 28-29 August 2017. The field survey work was performed using static GPS receivers. Prior to each use, the receivers are set up on existing control points at the site. Once it was determined that the receivers were functioning properly and the coordinate values obtained were within the project limits, the GPS equipment was used to survey the monitoring stations at the project. Each monitor station was independently surveyed two times to reduce any possible random or systematic errors.

2.6 INVESTIGATION-DERIVED WASTE MANAGEMENT AND DISPOSAL

Investigation-derived waste (IDW) generated from the field activities included soil cuttings from drilling, decontamination water, and purge water from well development and sampling activities. IDW was placed in labeled 55-gallon DOT-approved drums and temporarily stored in an area with secondary containment. A total of 57 drums of soil and 67 drums of water were generated as part the above activities. Samples were collected to characterize and properly dispose of the waste. Copies of the analytical data, and IDW profiles are included in Appendix G.

Section 3 Results

Section 3 summarizes the results of the monitoring well installation activities within the Middle Potrero Creek Area (MPCA), Primary Contaminant Attenuation Area (PCAA), and Large Motor Washout Area (Feature F-33).

3.1 GEOLOGY

A total of 13 boreholes were drilled in three areas at Potrero Canyon. Three groundwater extraction wells (F33-EW01, F33-EW02 and F33-EW03) were installed at the Large Motor Washout Area; three monitoring wells (MW-46D, MW-109D and OW-02R) were installed within the PCAA (including the replacement of one monitoring well, OW-02); and six piezometers (MPC-PZ01, MPC-PZ02S, MPC-PZ02D, MPC-PZ04, MPC-PZ05 and MPC-PZ07) were installed in the MPCA.

The subsurface geology observed in the three borings drilled for installation of extraction wells at the Large Motor Washout Area is consistent with the previous findings of alluvial and fluvial sediment derived from local sources. Alluvial sediment from the north adjacent and underlying Mount Eden formation sandstone and fluvial sediments from the south adjacent Potrero Creek have deposited predominantly silty sand that displays a general coarsening with depth. Competent Mount Eden formation was encountered at depths ranging from approximately 70 to 78 feet below ground surface (bgs). Lenses of sandy silt, particularly above 25 feet bgs, were observed in borings for extraction wells F33-EW02 and F33-EW03; whereas sandy silt was absent in the boring for F33-EW01, which consisted entirely of silty sand. This is consistent with the topographical location for the extraction wells. Both F33-EW02 and F33-EW03 are located farther away from the end of the bluff, towards the hillside, while F33-EW01 is located near the end of the bluff in which the tip intersects Potrero Creek. Decomposed Mount Eden formation approximately 3-feet thick was encountered in F33-EW01 only; whereas the decomposed Mount Eden formation material was absent from F33-EW02 and F33-EW03.

Borings for all three monitoring wells installed within the PCAA displayed varying subsurface geology. Competent Mount Eden formation was encountered at approximately 30 feet bgs in the boring associated with monitoring well MW-109D. The subsurface geology at this location varied

between silty sand and sandy silt with the observed sand being predominantly fine-grained. Competent Mount Eden formation was encountered in the boring for replacement well OW-02R at approximately 45 feet bgs. A thin layer of decomposed Mount Eden formation was encountered roughly six inches prior to refusal of augers. Subsurface geology within the boring for OW-02R was dominant in fine-grained material, alternating between sandy silts, elastic silts, and lean clays containing varying fine-grained sand content.

MW-46D is the deepest well drilled during this project; reaching a total depth of roughly 125 feet bgs to competent Mount Eden formation. As with OW-02R, a thin layer, roughly a few inches thick, of decomposed Mount Eden formation was observed prior to encountering competent Mount Eden formation. Subsurface geology at location MW-46D is predominantly silty sand to poorly- and well-graded sand that displays a general coarsening with depth. All three monitoring wells exhibited groundwater under positive pressure.

Six piezometers were installed on either side of Potrero Creek. Two piezometers (MPC-PZ01 and MPC-PZ05) were installed on the north side of the creek and four piezometers (MPC-02S, MPC-02D, MPC-PZ04, and MPC-PZ07) were installed on the south side of the creek within the MPCA (Figure 3). One proposed piezometer, MPC-PZ03, was not installed since bedrock was encountered prior to reaching groundwater. Depth to competent Mount Eden formation varied from 33 feet bgs at MPC-PZ03 to 115 feet bgs at MPC-PZ02D; bedrock was not encountered within the boring for MPC-PZ07. (The location for MPC-PZ07 had been selected to only monitor shallow groundwater near the manmade depressions.) Decomposed Mount Eden formation was encountered in all borings along the north side of Potrero Creek and varied in thickness from approximately 3.5-feet thick at MPC-PZ05 to 13-feet thick at MPC-PZ03.

Decomposed Mount Eden formation was not encountered within any of the borings along the south side of Potrero Creek. All piezometer borings were located within 300 feet of the active channel for Potrero Creek and exhibit subsurface geology consistent with a predominantly fluvial and somewhat alluvial depositional environment. All piezometer boreholes display an alternating pattern of sandy silts, poorly-graded sands to silty sands, and lean clays with sand to sandy lean clays with the exception of MPC-PZ01, the borehole for which is entirely silty sand. This correlates well to the topographical location of MPC-PZ01, the closest piezometer location to Potrero Creek. The majority of sand encountered in the piezometer borings is fine-grained to medium-grained with the exception

of MPC-PZ02D/S, which displayed mostly medium-grained sand throughout the borehole. All piezometers exhibited groundwater under positive pressure. The difference between the depth to groundwater observed during drilling to the equilibrated static water level within the constructed piezometers ranged from approximately 1.5 foot at MPC-PZ04 to 8 feet at both MPC-PZ01 and MPC-PZ07.

3.2 SURVEYING RESULTS

Well surveying was performed at the top of each well casing and at the ground surface at the northern side of each well. Newly installed piezometers, monitoring wells, extraction wells and the three existing locations (MW-15, MW-45, and MW-106) were surveyed to the nearest 0.01 foot for vertical elevations in the North American Vertical Datum (NAVD) 1988 and 0.1 foot for horizontal coordinates in the North American Datum (NAD) 1983. Surveying coordinates are included in Table 4.

3.3 DATA QUALITY REVIEW

All groundwater sample collection, analysis, and data validation were performed in accordance with USEPA protocols, as specified in the project-specific Quality Assurance Project Plan, included as Section 3.8 of the *Beaumont Programmatic Sampling and Analysis Plan Update* (Tetra Tech, 2016b). The results from batch quality control (QC) samples were evaluated against control limits to determine criteria compliance. Holding times, sample preservation, field duplicates, and field blanks were also evaluated. The Results Data Summary Table (RDST), summarizing the validated data, is included in Appendix H.

Environmental samples were analyzed by the following methods: USEPA Method SW8260B for VOCs, USEPA Method SW6850 for Perchlorate, USEPA Method SW8270C-SIM for 1,4-dioxane, USEPA Method E300.0 for nitrate and USEPA Method SM5310B for Dissolved Organic Carbon (DOC). Unless otherwise noted below, all data results met required criteria, are of known precision and accuracy, did not require qualification, and may be used as reported.

Method SW8260B: Method SW8260B for volatile organic compounds (VOCs) had analytes qualified as estimated for laboratory control sample (LCS) and matrix spike recovery outside control limits. One acetone result was qualified for blank contamination. The sample names and analytes qualified are identified in the RDST. These qualified data are usable for their intended purpose.

Method SW6850: Method SW6850 for perchlorate had one result qualified as estimated for matrix spike recovery outside control limits. The sample is identified in the RDST and the result is usable for the intended purpose.

Method SW8270C-SIM: Method SW8270C-SIM for 1,4-dioxane had two results qualified for surrogate recovery and two results qualified for LCS recovery. The results were qualified as estimated and the samples affected are listed in the RDST. The data are usable as estimated values.

3.4 GROUNDWATER SAMPLING RESULTS

A tabulated summary of groundwater elevations for the twelve wells measured during sampling after well installations in August 2017 is presented in Table 5. Summaries of validated laboratory analytical results for organic (VOCs and 1,4-dioxane) and inorganic (perchlorate, nitrate, and DOC) analytes detected above their respective method detection limits (MDLs) are presented in Table 6 for depth discrete samples collected during drilling and Table 7 for samples collected from monitoring wells. Appendix H provides a complete list of analytes tested, along with validated sample results by analytical method.

3.4.1 Depth Discrete Samples

Depth discrete samples were collected at well locations OW-02R and MW-46D from the following depth intervals:

- OW-02R: 37-38.5 feet bgs
- MW-46D: 60-62, 70-71, 80-81, 110-111, and 120-121 feet bgs

Water quality parameters were collected using a Hydropunch® from the above depth intervals during drilling. The dissolved oxygen (DO) concentrations measured were above 1 milligram per liter (mg/L) (Table 2). The DO concentration in OW-02R was 1.62 mg/L, while the DO concentrations in MW-46D ranged from 2.72 mg/L to 6.74 mg/L. The oxidation-reduction potential (ORP) value in OW-02R was -24.1 millivolts (mV) while the ORP values in MW-46D ranged from 44.1 mV to 198.6 mV.

The analytical data indicate that of the nine compounds detected (seven VOCs, 1,4-dioxane, and perchlorate), only four compounds (perchlorate, 1,4-dioxane, 1,1-dichloroethene (1,1-DCE), and *cis*-1,2-dichloroethene (*cis*-1,2-DCE,) were detected at concentrations which exceeded their

respective screening level (i.e., maximum contaminant level [MCL] or drinking water notification level [DWNL]) in at least one sample. A summary of the four compounds detected above their screening levels is provided below.

- Perchlorate was detected in all samples at concentrations from 1.0 to 24 micrograms per liter (µg/L), with the highest detection in OW-02R.
- 1,4-Dioxane was detected in four samples at concentrations from 1.4 to 4.7 µg/L with the highest detection in OW-02R.
- 1,1-DCE was detected in three samples at concentrations from 1.1 to 6.2 µg/L, with the highest detection in OW-02R.
- *Cis*-1,2-DCE was detected in a single sample collected from OW-02R at a concentration of 6.5 µg/L.

The results show that perchlorate, 1,4-dioxane, 1,1-DCE and TCE attenuate with depth in well MW-46D.

3.4.2 Groundwater Monitoring Well Samples

Groundwater samples were collected from the 12 newly installed wells in August 2017. The data indicate that of the 11 compounds detected (8 VOCs, 1,4-dioxane, perchlorate, nitrate, and dissolved organic carbon), only five compounds (1,1-DCE, trichloroethene [TCE], vinyl chloride, 1,4-dioxane, and perchlorate) were detected at concentrations which exceeded their respective screening level in at least one of the wells sampled. A summary of the highest concentration of these five analytes detected in groundwater is provided below.

- Perchlorate was detected above its MCL of 6.0 µg/L in 4 of the 12 samples analyzed for this compound. The highest concentration was detected in well OW-02R (330 µg/L).
- 1,4-Dioxane was detected above its DWNL of 1.0 µg/L in 10 of the 12 samples analyzed for this compound. The highest concentration was detected in piezometer MPC-PZ07 (18-J-b µg/L).
- 1,1-DCE was detected above its MCL of 6.0 µg/L in 3 of the 12 samples analyzed for this compound. The highest concentration was detected in well MW-109D (32 µg/L).
- TCE was detected above its MCL of 5.0 µg/L in 2 of the 12 samples analyzed for this compound. The highest concentration was detected in well MW-109D (41 µg/L).

- Vinyl chloride was detected above its MCL of 0.5 µg/L in 1 of the 12 samples analyzed for this compound. The only concentration was detected in well MPC-PZ07 (2.1 µg/L).

The results are generally consistent when compared to contaminant concentrations in nearby monitoring wells, as shown on Figures 6, 7, 8, and 9. Three PCAA wells were analyzed for DOC and nitrate. DOC was detected in samples collected from wells OW-02R (0.94 mg/L) and MW-46D (1.0 mg/L) and nitrate was detected in wells OW-02R (3.1 mg/L) and MW-109D (3.0 mg/L). In the absence of other electron acceptors, DOC appears to be conducive to perchlorate degradation. The general absence of nitrate in OW-02R in the aquifer permits native groundwater microorganisms to use perchlorate as an electron acceptor in the respiratory process. The absence of nitrate is also significant because it means that natural organic carbon that exists in the aquifer does not get consumed for denitrification.

Samples for laboratory analysis were collected for DOC and nitrate. DO and ORP were monitored with field instruments during purging and sampling. DO concentrations ranged from 0.22 mg/L to 8.36 mg/L, with 8 of the 12 locations having a DO concentration below 1 mg/L (Table 7). DO concentrations greater than 1 mg/L occurred in piezometers MPC-PZ01, MPC-PZ02S, MPC-PZ04, and MPC-PZ05. Generally DO concentrations less than 1 mg/L are expected to be more favorable for natural attenuation of perchlorate (Lieberman and Borden, 2008).

ORP values are a general indicator of aquifer oxidation state. Table 7 shows ORP values range between -152.9 mV and 140.5 mV with six wells exhibiting ORP values below 50 mV. ORP values between zero and negative 100 are generally favorable for perchlorate biodegradation (Lieberman and Borden, 2008). Wells exhibiting ORP values within this range were observed in select wells located in the MPCA and Large Motor Washout Area.

3.5 HYDRAULIC TESTING RESULTS

This section summarizes the results of the hydraulic testing activities conducted. Step drawdown tests were performed in three extraction wells (F33-EW01, F33-EW02, and F33-EW03). As stated in Section 2.3.1, water level measurements during the step test were recorded electronically using pressure transducers in the extraction wells and in nearby wells. Manual water level measurements were recorded using a water level meter in the extractions wells. Graphs showing changes in water levels during the step tests are presented in Appendix I.

3.5.1 Feature F-33, Large Motor Washout Area

The step test was conducted on F33-EW01 by pumping at four pumping rates: 1.0, 2.0, 3.5, and 4.0 gpm. Water levels were recorded in F33-EW01 and nearby monitoring wells MW-70 and MW-83 during the step drawdown tests. Total measured drawdowns in extraction well F33-EW01 were 0.24 (1.0 gpm), 1.03 (2.0 gpm), 4.98 (3.5 gpm), and 5.06 feet (4.0 gpm). Overall drawdown in MW-70 (75 feet from F33-EW01) during the step drawdown test at F33-EW01 was less than 0.01 feet, and the water levels in MW-83 (95 feet from F33-EW01) actually increased 0.05 feet.

The step drawdown test was conducted on F33-EW02 by pumping the well at three pumping rates: 2.5, 4.0, and 8.0 gpm, with water level drawdown recorded in monitoring wells MW-70 and MW-82. Measured drawdowns in the extraction well were 6.59 (2.5 gpm), 14.67 (4.0 gpm), and 35.63 feet (8.0 gpm). Overall drawdown in MW-70 (10 feet from F33-EW02) during the step drawdown test at F33-EW02 was 0.06 feet and the water level in MW-82 (147 feet from F33-EW02) decreased 0.08 feet.

The step drawdown test was conducted on F33-EW03 at four pumping rates: 3.0, 6.5, 8.0, and 14 gpm, with water level drawdown also recorded in monitoring wells MW-70 and MW-83. Measured drawdowns in the extraction well were 0.61 (3.0 gpm), 1.95 (6.5 gpm), 2.98 (8.0 gpm), and 12.12 feet (14 gpm). Drawdown in MW-70 (100 feet from F33-EW03) during the step drawdown test at F33-EW03 was 0.02 feet, and the water level in MW-83 (125 feet from F33-EW03) actually increased 0.04 feet.

Section 4 CONCLUSIONS

On behalf of Lockheed Martin, Tetra Tech completed the installation of three groundwater monitoring wells (including one replacement), three extraction wells, and six piezometers in support of the Potrero Canyon Remedial Action. All twelve locations were sampled subsequent to development and were analyzed for perchlorate, volatile organic compounds, 1,4-dioxane, nitrate and/or dissolved organic carbon. The results for perchlorate, 1,1-dichloroethene, 1,4-dioxane and trichloroethene are generally consistent when compared to contaminant concentrations in nearby monitoring wells. Well yield tests were performed at three extraction wells installed at the Large Motor Washout Area to estimate short-term sustainable pumping rates, in order to determine the feasibility of using the wells as a water source for bioflushing. The results of these tests showed that a long-term pumping rate of up to 4-5 gallons per minute/well could probably be sustained depending on boundary conditions in this relatively small alluvial aquifer system beneath Potrero Creek.

Four locations (MPC-PZ06, F34-TW2, F34-TW3, and F34-TW4) within the streambed will be installed and sampled upon receipt of the approved United Stated Army Corps of Engineers and Regional Water Quality Control permits. An addendum to this report will be issued to document the well installation, development, and groundwater sampling activities for the four wells.

It is recommended that water levels be collected from all wells installed on a quarterly basis beginning in Fourth Quarter 2017. Quarterly monitoring of the new wells OW-02R, MW-46D, and MW-109D will begin in the first quarter of 2018, and continue for three additional quarters. Piezometers will be monitored for one more quarter in the first quarter of 2018. Samples will be analyzed for the standard suite of analytes in the groundwater monitoring program.

Section 5 REFERENCES

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TABLES

Table 1
Monitoring Well Construction Data
Potrero Canyon (Beaumont Site 1)

Area	Well ID	Date Completed	Top of Casing Elevation (TOC) (feet MSL)	Ground Surface Elevation (feet MSL)	Screen Elevation (TOS) (feet MSL)	Screen Elevation (BOS) (feet MSL)	Screen Interval (feet bgs)	Screen Length (feet)	Depth of Well (feet bgs)	Borehole Diameter (inches)	Casing Diameter (inches) & material	Screen Slot Size (inches) & material	Filter Pack Grain Size	Northing Coordinate (y)	Easting Coordinate (x)
PCAA	**MW-46D**	8/2/2017	2073.56	2070.65	1961.65	1946.65	109-124	15	124	8	2 PVC	0.020 SS	#2/12 Sand	2257782.11	6349269.58
	MW-109D	8/7/2017	2093.39	2090.62	2069.62	2064.62	21-26	5	26	8	2 PVC	0.020 SS	#2/12 Sand	2259147.26	6350896.89
	OW-02R	7/27/2017	2079.92	2077.08	2038.08	2033.08	39-44	5	44	8	2 PVC	0.020 SS	#2/12 Sand	2258551.22	6350344.25
MPCA	**MPC-PZ01**	7/25/2017	2038.10	2035.77	2009.77	1989.77	26-46	20	46	8	2 PVC	0.020 PVC	#2/12 Sand	2257923.70	6348309.77
	MPC-PZ02S	8/4/2017	2067.36	2064.62	2009.62	1989.62	55-75	20	75	8	2 PVC	0.020 SS	#2/12 Sand	2257377.54	6348790.07
	MPC-PZ02D	8/4/2017	2067.08	2064.10	1974.10	1954.10	90-110	20	110	8	2 PVC	0.020 SS	#2/12 Sand	2257369.51	6348782.49
	MPC-PZ04	8/4/2017	2033.79	2030.74	1990.74	1970.74	40-60	20	60	8	2 PVC	0.020 SS	#2/12 Sand	2256841.63	6347782.75
	MPC-PZ05	7/21/2017	2027.14	2025.14	1992.14	1972.14	33-53	20	53	8	2 PVC	0.020 PVC	#2/12 Sand	2257155.23	6347223.80
	MPC-PZ07	7/25/2017	2072.65	2069.73	2054.73	2044.73	15-25	10	25	8	2 PVC	0.020 PVC	#2/12 Sand	2258437.65	6349968.72
LMWA	**F33-EW01**	7/20/2017	1975.93	1972.88	1949.88	1899.88	23-73	50	73	10	4 PVC	0.020 SS	#3 Sand	2255993.19	6345417.81
	F33-EW02	8/10/2017	1974.33	1971.58	1949.08	1899.08	22.5-72.5	50	72.5	10	4 PVC	0.020 SS	#2/12 Sand	2256014.64	6345323.73
	F33-EW03	8/10/2017	1977.67	1973.98	1956.48	1906.48	17.5-67.5	50	67.5	10	4 PVC	0.020 SS	#2/12 Sand	2256076.91	6345411.01

Notes: Survey coordinates (x and y) are in State Plane Coordinates, California 0405, Zone V (NAD83, US Survey feet)

Vertical coordinates (z) are in North American Vertical Datum 1988 (NAVD88, US Survey feet).

BOS - Bottom of Screen

BTOC - below top of casing

LMWA - Large Motor Washout Area (Feature F-33)

MPCA - Middle Potrero Creek Area

MSL - Mean Sea Level

PCAA - Primary Containment Attenuation Area

PVC - poly-vinyl chloride

SS - stainless steel wire-wrap

TOC - Top of Casing

TOS - Top of Screen

Table 2
Hydropunch Purge Water Quality Parameters
Primary Contaminant Attenuation Area

Well/ Boring	Assoicated Groundwater Sample ID	Date	Time	Temp (°C)	EC (mS/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Color
OW-02R	OW-02R-N-37-38.5	7/26/2017	1052	25.9	0.263	7.06	+ 1,000	1.62	-24.1	Dark Gray
MW-46D	MW-46D-N-62-60 MW-46D-FD-62-60	7/27/2017	1254	26.5	0.339	8.89	+ 1,000	2.72	198.6	Grayish Brown
MW-46D	MW-46D-N-71-70	7/27/2017	1347	26.9	0.49	10.42	+ 1,000	3.77	44.1	Grayish Brown
MW-46D	MW-46D-N-81-80	7/27/2017	1449	27.0	0.411	10.36	+ 1,000	6.74	47.4	Gray
MW-46D	MW-46D-N-111-110 +MS/MSD	7/28/2017	1100	27.1	0.53	8.34	+ 1,000	6.40	140.0	Gray
MW-46D	MW-46D-N-121-120	7/31/2017	1044	29.3	0.48	7.63	+ 1,000	5.60	155.8	Dark Gray

Notes

°C - degrees celcius

µg/L - Micrograms per liter

mg/L - milligrams per liter

mS/cm - milli-Siemens per cm

mV - millivolts

NTU - nephelometric turbidity unit

Table 3
Monitoring Wells Sampling Plan
Potrero Canyon (Beaumont Site 1)
Beaumont, California

Well Location	Number of Groundwater Samples and Field Sampling Method	Analytical Methods
Primary Contaminant Attenuation Area Monitoring Wells		
MW-109D	1 - DV	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), 1,4-dioxane (USEPA Method SW8270C-SIM), nitrate (USEPA Method 300.0), and dissolved organic carbon (USEPA Method SM5310B)
OW-02R	1 - H	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
	1 - DV	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), 1,4-dioxane (USEPA Method SW8270C-SIM), nitrate (USEPA Method 300.0), and dissolved organic carbon (USEPA Method SM5310B)
MW-46D	5 - H	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
	1 - DV	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), 1,4-dioxane (USEPA Method SW8270C-SIM), nitrate (USEPA Method 300.0), and dissolved organic carbon (USEPA Method SM5310B)
Middle Potrero Creek Area Piezometers		
MPC-PZ1	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
MPC-PZ2 S	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
MPC-PZ2 D	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
MPC-PZ4	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
MPC-PZ5	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
MPC-PZ7	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
Large Motor Washout Area (F-33) Extraction Wells		
F33-EW1	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
F33-EW2	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)
F33-EW3	1 - B	perchlorate (USEPA Method SW6850), VOCs (USEPA Method SW8260B), and 1,4-dioxane (USEPA Method SW8270C-SIM)

Abbreviations and Acronyms:

B − bladder pump
D − deep well/piezometer
DV − dual-valve stainless steel dedicated pump
EPA − U.S. Environmental Protection Agency
EW − extraction well
H − Hydropunch™ sampling system
MPC − Middle Potrero Creek
MW − monitoring well
PZ − piezometer
S − shallow well/piezometer
VOC − volatile organic compound

Table 4
Monitoring Well Survey Data
Potrero Canyon (Beaumont Site 1)

NEW WELLS - GRID			
WELL	NORTHING	EASTING	ELEVATION
F33-EW1	2255993.193	6345417.808	1975.93
F33-EW2	2256014.642	6345323.727	1974.33
F33-EW3	2256076.907	6345411.014	1977.67
MPC-PZ01	2257923.70	6348309.765	2038.10
MPC-PZ02D	2257369.513	6348782.488	2067.08
MPC-PZ02S	2257377.535	6348790.068	2067.36
MPC-PZ04	2256841.633	6347782.751	2033.79
MPC-PZ05	2257155.231	6347223.80	2027.14
MPC-PZ07	2258437.651	6349968.718	2072.65
MW46D	2257782.114	6349269.575	2073.56
MW109D	2259147.261	6350896.894	2093.39
OW-02R	2258551.217	6350344.252	2079.92

NEW WELLS - GROUND			
NORTHING	EASTING	ELEVATION	DESCRIPTION
2255992.99	6345417.55	1975.93	4" PVC W/ NOTCH ON NORTH SIDE
2256014.44	6345323.46	1974.33	4" PVC W/ NOTCH ON NORTH SIDE
2256076.71	6345410.76	1977.67	4" PVC W/ NOTCH ON NORTH SIDE
2257923.69	6348309.79	2038.10	2" PVC W/ NOTCH ON NORTH SIDE
2257369.44	6348782.56	2067.08	2" PVC W/ NOTCH ON NORTH SIDE
2257377.47	6348790.14	2067.36	2" PVC W/ NOTCH ON NORTH SIDE
2256841.51	6347782.72	2033.79	2" PVC W/ NOTCH ON NORTH SIDE
2257155.14	6347223.72	2027.14	2" PVC W/ NOTCH ON NORTH SIDE
2258437.68	6349968.90	2072.65	2" PVC W/ NOTCH ON NORTH SIDE
2257782.08	6349269.69	2073.56	2" PVC W/ NOTCH ON NORTH SIDE
2259147.36	6350897.17	2093.39	2" PVC W/ NOTCH ON NORTH SIDE
2258551.26	6350344.47	2079.92	2" PVC W/ NOTCH ON NORTH SIDE

RESURVEYED WELLS - GRID			
MW-15	2256727.74	6346418.388	2009.78
MW-45	2258164.879	6349744.177	2068.04
MW-106	2258848.164	6350660.756	2085.32

RESURVEYED WELLS - GROUND			
2256727.61	6346418.23	2007.87	4" PVC W/ NOTCH ON NORTH SIDE
2258164.89	6349744.34	2064.51	4" PVC W/ CAP. MEASURED TO THREADED SCREW
2258848.24	6350661.01	2083.30	2" PVC W/ NOTCH ON NORTH SIDE

Table 5
Groundwater Elevations
Potrero Canyon (Beaumont Site 1)
Beaumont, California

Well ID	TOC Elevation (feet msl)	August 2017		
		Date Measured	Depth to Water (feet BTOC)	Groundwater Elevation (feet msl)
F33-EW1	1975.93	08/23/17	29.72	1946.21
F33-EW2	1974.33	08/23/17	28.88	1945.45
F33-EW3	1977.67	08/23/17	27.94	1949.73
MPC-PZ01	2038.10	08/16/17	27.28	2010.82
MPC-PZ02S	2067.36	08/16/17	57.02	2010.34
MPC-PZ02D	2067.08	08/16/17	57.92	2009.16
MPC-PZ04	2033.79	08/23/17	35.56	1998.23
MPC-PZ05	2027.14	08/15/17	35.38	1991.76
MPC-PZ07	2072.65	08/15/17	11.98	2060.67
MW46D	2073.56	08/16/17	47.76	2025.80
MW109D	2093.39	08/23/17	17.55	2075.84
OW-02R	2079.92	08/15/17	6.61	2073.31

Notes

BTOC: below top of well casing

msl - Mean sea level

TOC: top of well casing

Table 6
Summary of Detected Analytes in Hydropunch Samples
Primary Contaminant Attenuation Area
Potrero Canyon (Beaumont Site 1)
Beaumont, California

Location	Sample	Sample Depth (feet bgs)	Date	Perchlorate (ug/L)	1,4-Dioxane (ug/L)	Acetone (ug/L)	Dibromochloromethane (ug/L)	1,1-Dichloroethene (ug/L)	cis-1,2-Dichloroethene (ug/L)	Styrene (ug/L)	Toluene (ug/L)	Trichloroethene (TCE) (ug/L)
OW-02R	OW-02R-N-37-38.5	37-38.5	7/26/2017	24	12	69 Jq	<1.2	6.2 J+d	6.5	<0.86	<1.2	3.8 Jq
MW-46D	MW-46D-N-62-60	60-62	7/27/2017	22	4.7	<10	<0.25	1.3	<0.48	<0.17	<0.24	0.96 Jf, q
MW-46D	MW-46D-N-71-70	70-71	7/27/2017	21	3.0	<10	<0.25	1.1	<0.48	0.46 Jq	<0.24	1.4
MW-46D	MW-46D-N-81-80	80-81	7/27/2017	18	1.4	10 Jq	<0.25	<0.43	<0.48	<0.17	<0.24	0.63 Jq
MW-46D	MW-46D-N-111-110	110-111	7/28/2017	1.5	<0.16	<10	0.30 Jq	<0.43 UJc, f	<0.48	<0.17	0.35	<0.37 UJc
MW-46D	MW-46D-N-121-120	120-21	7/31/2017	1.0	<0.16	<15 Uk	<0.25	<0.43	<0.48	<0.17	<0.24	<0.37
			MCL / DWNL	6	6	-	-	6	6	100	150	5

Notes

bgs - below ground surface

MCL - State Water Resources Control Board Division of Drinking Water maximum contaminant level

DWNL - State Water Resources Control Board Division of Drinking Water drinking water notification level

µg/L - Micrograms per liter

Yellow - 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

U - Not detected. Analyses were performed for the compound or analyte, but it was not detected and associated blank at less than the PQL.

c - The matrix spike and/or matrix spike duplicate recoveries were outside control limits.

d - The laboratory control sample recovery was outside control limits.

f - The duplicate samples RPD was outside the control limit.

k - The analyte was found in a field blank.

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

Table 7
Summary of Detected Analytes in Monitoring Wells, Extraction Wells and Piezometers Potrero Canyon (Beaumont Site 1)

				Detected Analytes										Field Parameters					
Area	Location	Screen Interval (feet bgs)	Date	Perchlorate (ug/L)	Carbon, Dissolved Organic (mg/L)	Nitrogen, Nitrate (as N) (mg/L)	1,4-Dioxane (ug/L)	1,1-Dichloroethane (ug/L)	1,2-Dichloroethane (ug/L)	1,1-Dichloroethene (ug/L)	cis-1,2-Dichloroethene (ug/L)	Tetrachloroethene (PCE) (ug/L)	Trichloroethene (TCE) (ug/L)	Vinyl Chloride (ug/L)	Temperature (°C)	Electrical Conductivity (mS/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)
PCAA	MW-109D	21-26	8/23/2017	68 J+c	<0.24	3.0	26	1.9	0.34 Jq	32	4.2	<0.39	41	<0.30	21.3	0.313	7.06	12.3	0.28	134.5
	OW-02R	39-44	8/15/2017	330	0.94	3.1	13 J-b	0.66 Jq	<0.24	19	<0.48	<0.39	18	<0.30	21.3	0.264	7.45	+1000	0.26	107.7
	MW-46D	107-122	8/16/2017	<0.025	1.0	<0.053	11 J-b	<0.28	<0.24	0.98 Jq	<0.48	<0.39	<0.37	<0.30	21.3	0.256	8.42	85.9	0.37	-134.0
MPCA	MPC-PZ01	26-46	8/16/2017	8.7	--	--	<0.16	<0.28	<0.24	<0.43	<0.48	1.7	<0.37	<0.30	22.5	0.72	8.37	920	2.94	64.1
	MPC-PZ02S	55-75	8/16/2017	7.3	--	--	0.50	<0.28	<0.24	<0.43	<0.48	0.65 Jq	<0.37	<0.30	22.9	0.461	7.28	+1000	8.36	118.5
	MPC-PZ02D	92-112	8/16/2017	0.17 Jq	--	--	5.1 J-b	<0.28	<0.24	1.2	<0.48	<0.39	<0.37	<0.30	23.6	0.314	8.00	+1000	0.38	-37.1
	MPC-PZ04	40-60	8/23/2017	2.4	--	--	1.5	<0.28	<0.24	<0.43	<0.48	<0.39	0.44 Jq	<0.30	21.3	0.528	6.87	+1000	4.59	140.5
	MPC-PZ05	33-53	8/15/2017	0.14 Jq	--	--	5.8	0.36 Jq	<0.24	2.4	<0.48	<0.39	1.7	<0.30	21.8	0.68	7.71	88	2.57	41.0
	MPC-PZ07	15-25	8/15/2017	<0.025	--	--	18 J-b	1.5	<0.24	10	2.0	<0.39	1.7	2.1	20.8	0.230	6.85	+1000	0.22	-152.9
LMWA	F33-EW01	25-75	8/23/2017	0.98	--	--	3.1	<0.28	<0.24	<0.43	<0.48	<0.39	<0.37	<0.30	20.79	0.83	7.14	7.71	0.48	-11.2
	F33-EW02	22.5-72.5	8/23/2017	<0.025	--	--	2.5	<0.28	<0.24	<0.43	<0.48	<0.39	<0.37	<0.30	20.4	0.72	7.24	32.4	0.35	57.3
	F33-EW03	19-69	8/23/2017	0.53	--	--	2.3	<0.28	<0.24	<0.43	<0.48	<0.39	<0.37	<0.30	21.1	0.81	7.07	22.5	0.39	-26.8
			MCL / DWNL	6	-	10	1	5	0.5	6	6	5	5	0.5	-	-	-	-	-	-

Notes

MCL - State Water Resources Control Board Division of Drinking Water maximum contaminant level

DWNL - State Water Resources Control Board Division of Drinking Water drinking water notification level

LMWA - Large Motor Washout Area (Feature F-33)

MPCA - Middle Potrero Creek Area

PCAA - Primary Containment Attenuation Area

°C - degrees celcius

µg/L - Micrograms per liter

mg/L - milligrams per liter

mS/cm - milli-Siemens per cm

mV - millivolts

NTU - nephelometric turbidity unit

Yellow - 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)

b- The surrogate spike recovery was outside control limits.

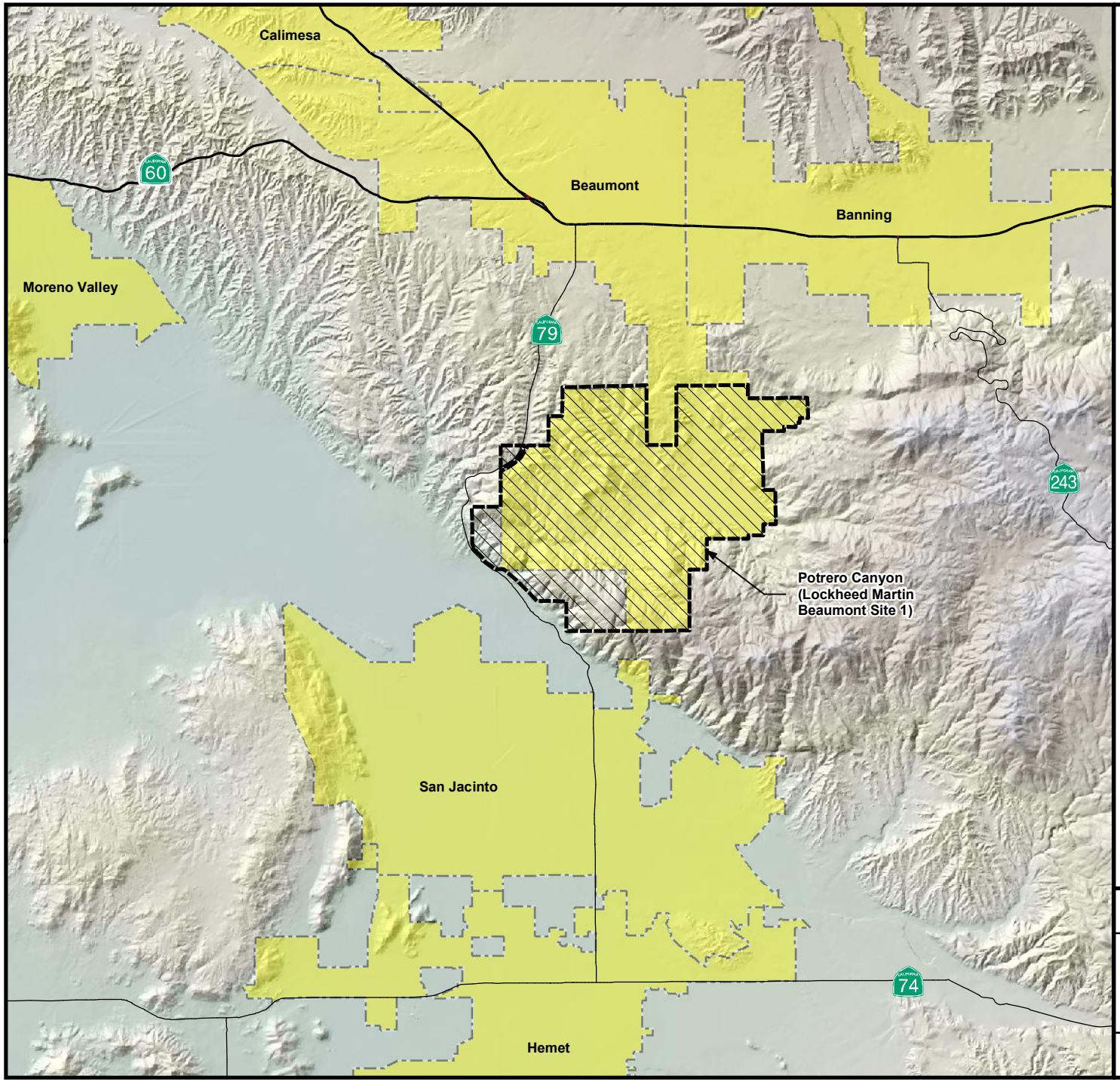
c - The matrix spike and/or matrix spike duplicate recoveries were outside control limits.

"--" - Not Analyzed.

"-" - MCL or DWNL not available.

FIGURES

P:\GIS\Lockheed_37616 Remedial_Const\Region.mxd



0 2 Miles

Adapted from:

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

LEGEND

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

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 1

Regional Location of Potrero Canyon Site

TETRA TECH

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Area A
Eastern Aerojet Range (Avanti)

Area B
Rocket Motor Production Area

Area D
LPC Ballistics Test Range

Area E
Radioactive Waste Disposal Site

Area F
LPC Test Services Area

Area G
Helicopter Weapons Test Area

Potrero Creek

Bedsprings Creek

NORTHERN POTRERO CREEK AREA

MASSACRE CANYON ENTRANCE AREA

ROCKET MOTOR PRODUCTION AREA

ROCKET MOTOR PRODUCTION AREA BURN PIT AREA

Former Rocket Motor Production Area

Former Burn Pit Area

Large Motor Washout Area (F-33)

MPC Hydraulic Containment System

MW-11
MW-12
MW109D
MW-108
MW-109
P-02
MW-103
OW-02 *
OW-02R
MPC-PZ07
MW-107
MW-105
MW-106
MW-104
MW-101
MW-13
MW-45
MW-43
MW-102
MW-80
MW-48
MW46D
MW-46
MW-47
MW-09
MW-08
MW-76A
MW-76C
MW-76B
MPC-PZ01
MPC-PZ02S
MPC-PZ02D
P-06S
P-06D
P-08
MW-14
EW-19
P-07
MPC-PZ05
MPC-PZ04
MW-15
MW-18
MPC-PZ6
MW-81
MW-83
F33-EW03
F33-TW02
F33-EW01
MW-82
F33-EW02
F33-TW06
MW-70
F33-TW-07
MW-77A
MW-77B
OW-08
P-03
MW-40
IW-04
MW-66
MW-29
MW-06
MW-05
MW-62A
MW-19
MW-49
MW-56A
MW-56B
MW-56C
MW-17
MW-79A
MW-79C
MW-53
MW-28
MW-55
MW-01
MW-32
MW-35
MW-75A
MW-75B
MW-75C
P-05
MW-07
MW-99
MW-68
MW-91
MW-88
MW-89
MW-98A
MW-98B
MW-90
MW-69
MW-34
MW-54
MW-23
MW-03
MW-02
MW-22
MW-78
MW-60A
MW-60B
EW-13
MW-61A
MW-61B
MW-61C
MW-112A
MW-112B
MW-71A
MW-71B
MW-71C
MW-26
MW-111A
MW-110
MW-74A
MW-74B
MW-74C
MW-72A
MW-72B
MW-36
MW-111B
MW-111D
MW-111E
MW-31
MW-73A
MW-73B
MW-73C
MW-59A
MW-59B
MW-59D
OW-01

0 500 1,000 Feet

Adapted from: July 2014 aerial photograph.

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

- Monitoring Well Installed in 2017
- Extraction Well Installed in 2017
- Observation Well Installed in 2017
- Piezometer Installed in 2017
- Well ID — MNA Monitoring Well
- Well ID — Proposed Piezometer Location
- Monitoring Well
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Perchlorate Concentration Contour (µg/L) - Dashed where inferred
- MCL Contour (6.0 µg/L) - Dashed where inferred
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Source Areas
- Primary Contaminant Attenuation Area (phytoextraction and degradation)
- Historical Operational Area Boundary
- Potrero Canyon Property Boundary (Lockheed Martin Beaumont Site 1)

Notes:

Well ID - Well installed in 2017.

MCL - Maximum Contaminant Level. Concentrations shown are in microgram per liter (µg/L)

Highest concentration shown is contoured for clustered or nested well locations.

Bold perchlorate result indicates MCL value exceeded.

Beaumont Site 1 property boundary is approximate.

*Well OW-02 destroyed and replaced with OW-02R.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 2

Primary Contaminant Attenuation Area Monitoring Well Locations

TETRA TECH

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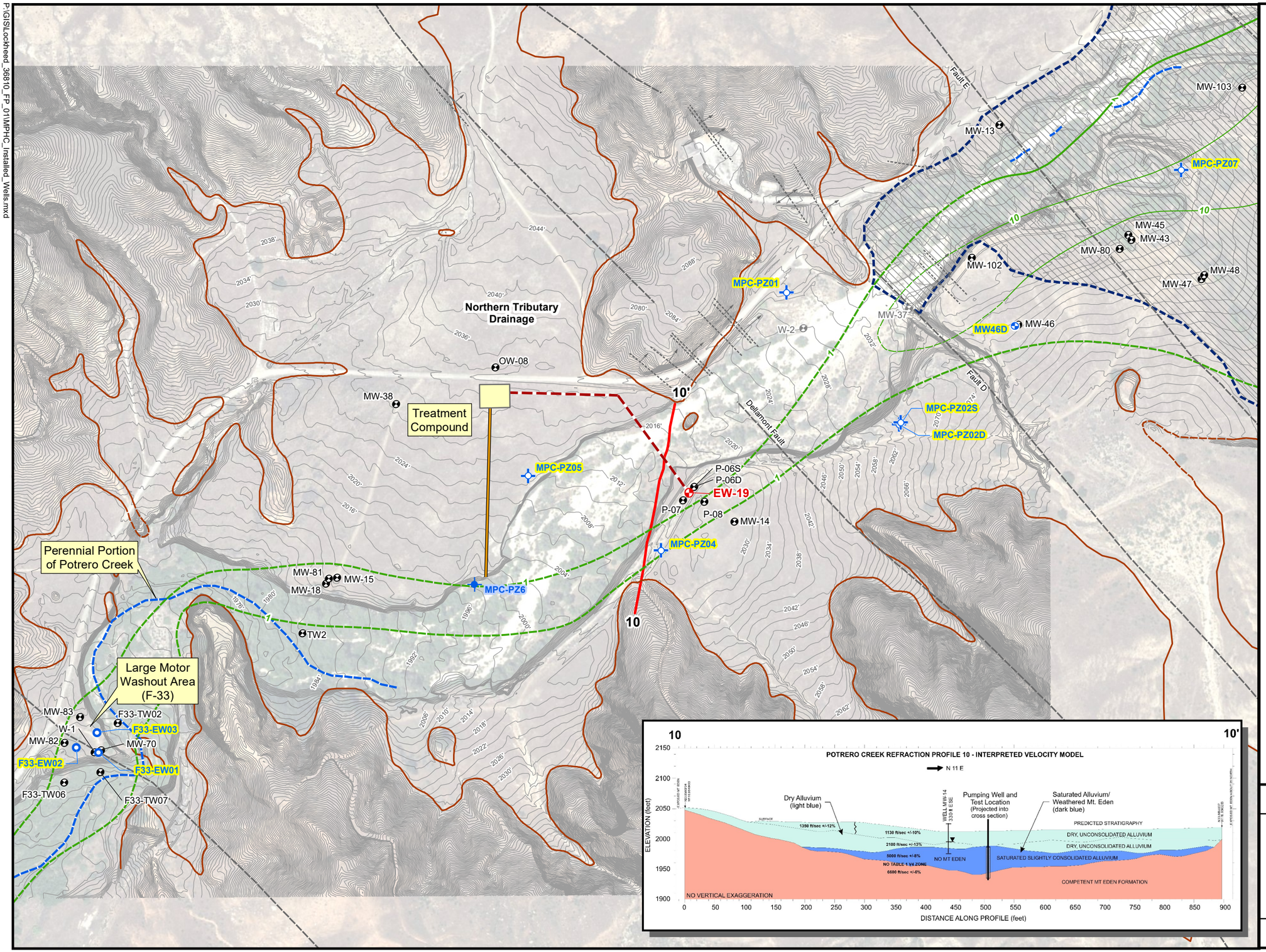

0 200 400 Feet

Adapted from: May 2016 aerial photograph.

- Monitoring Well Installed in 2017
- Extraction Well Installed in 2017
- Piezometer Installed in 2017
- Proposed Piezometer Location
- Extraction Well Location
- Destroyed Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Extraction Piping
- Streambed Discharge Piping
- Perennial Portion of Potrero Creek (First Quarter 2017)
- 1,4-Dioxane in Groundwater Concentration Contour (µg/L) - Dashed where inferred
- DWNL Contour (1.0 µg/L) - Dashed where inferred
- Bedrock/Alluvium Contact
- Inferred Bedrock/Alluvium Contact
- Geophysical Suvey Line
- Topographic Contour (feet MSL) (2-foot interval)
- Primary Contaminant Attenuation Area (phytoextraction and degradation)
- Potrero Canyon Site Boundary

Notes:

Well ID Well installed in 2017.

µg/L - Micrograms per liter.

2-foot contour interval.

Topographic contours from Hillwig-Goodrow survey May 2008.

Potero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 3

Remedial Performance Monitoring Locations

TETRA TECH

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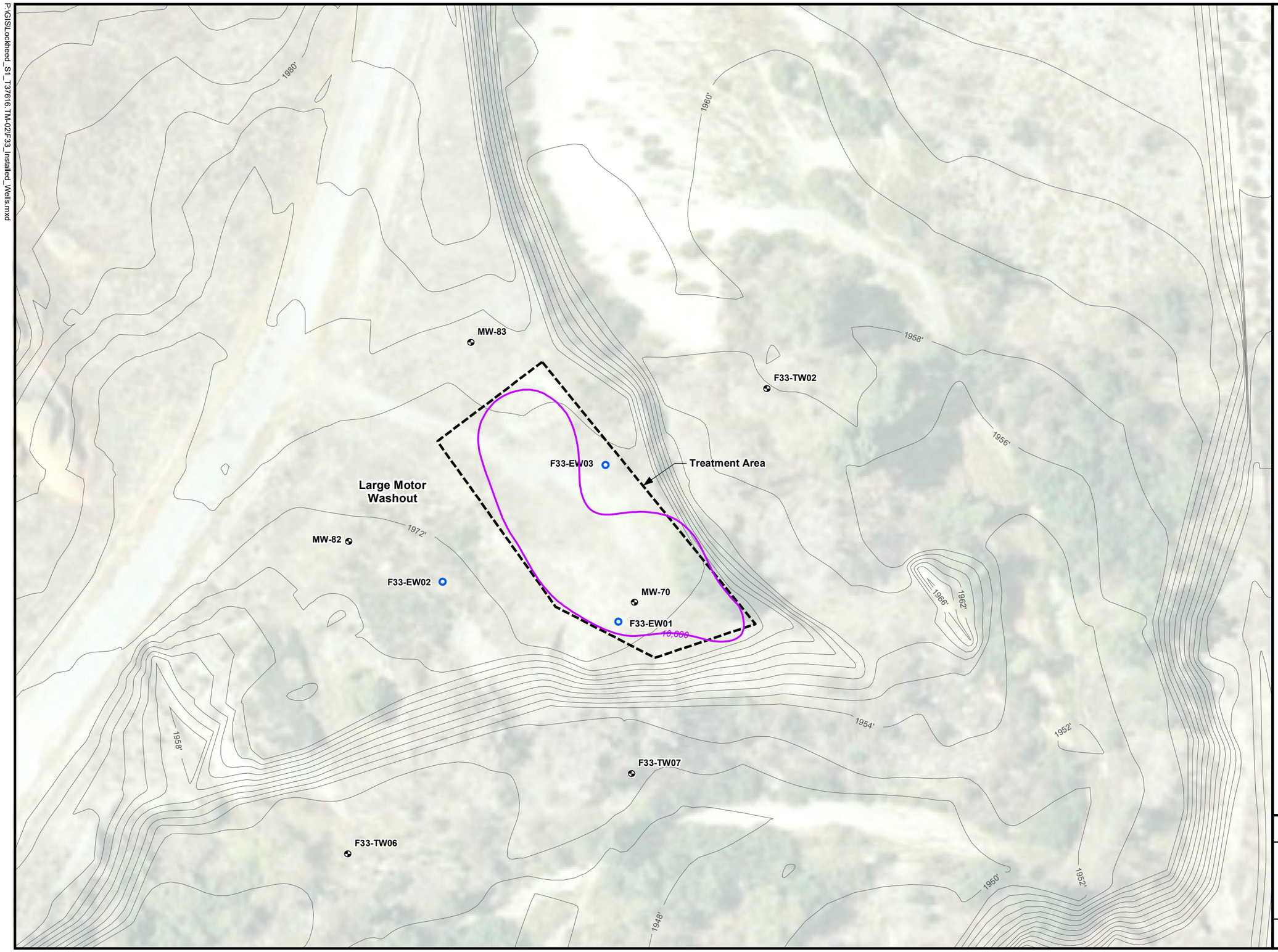
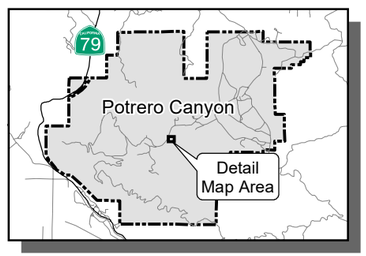


0 25 50 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- Extraction Well
- Monitoring Well
- Perchlorate Isoconcentration Contour (mg/kg)
- Treatment Area Boundary
- Topographic Elevation Contour (feet mean sea level)



Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 4

Large Motor Washout Area
Feature F-33
Area F

TETRA TECH

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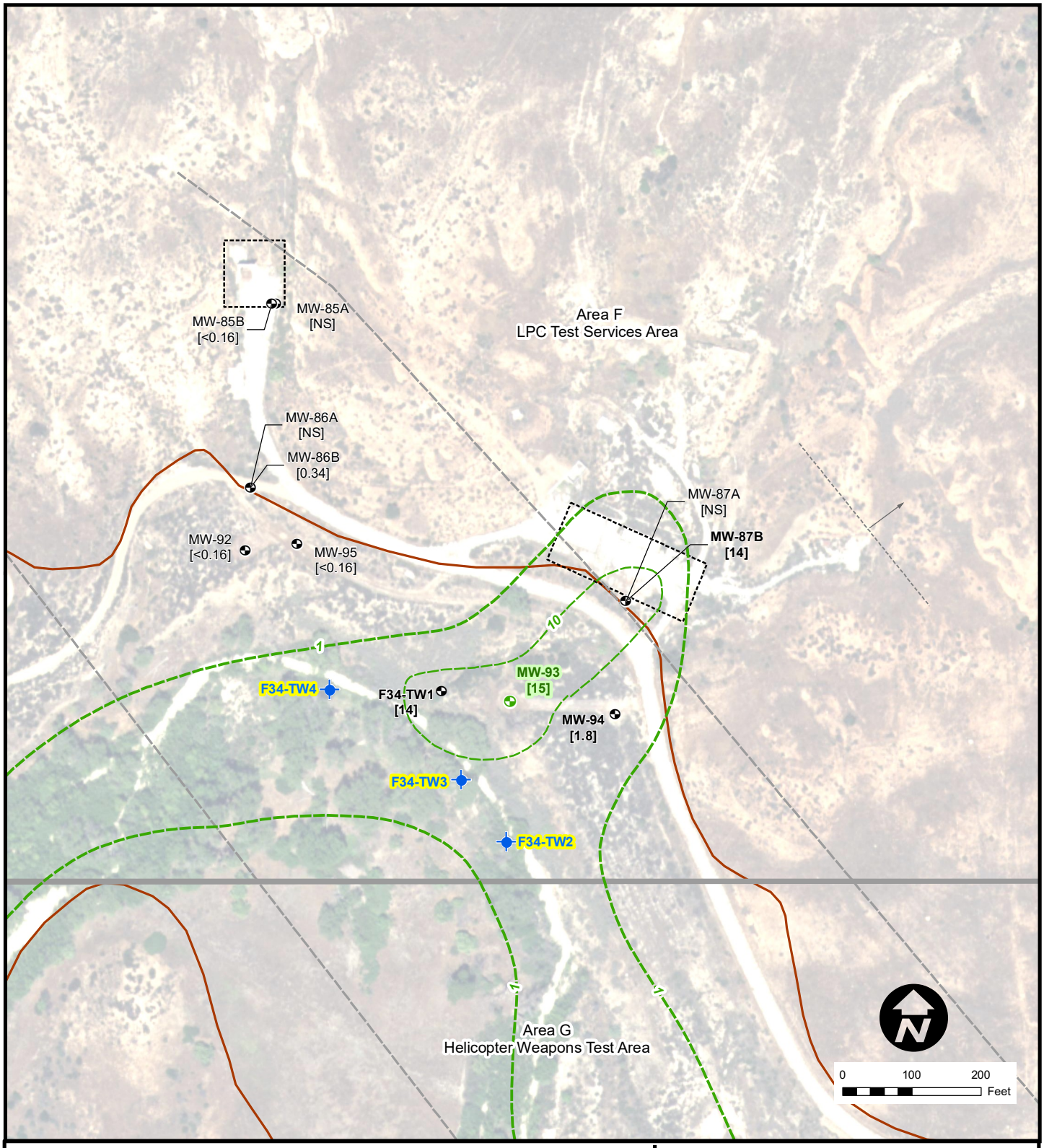

F34-TW2 Proposed Monitoring Well

MW-93 [15] MNA Monitoing Well [1,4-dioxane concentration]

Monitoring Well

Fault, Accurately Located Showing Dip

Fault, Approximately Located

1,4-Dioxane in Groundwater Concentration Contour (µg/L) - Dashed where inferred

DWNL Contour (1.0 µg/L) - Dashed where inferred

Bedrock/Alluvium Surface Contact Dashed where inferred

Source Areas

Historical Operational Area Boundary

Notes:

DWNL - Drinking Water Notification Level

NS - Not sampled

Concentrations shown are in microgram per liter (µg/L)

Highest concentration shown is contoured for clustered or nested well locations.

Bold indicates DWNL value exceeded.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 5

Maintenance Shops and Storage Warehouse (F-34) Monitoring Well Locations (Proposed and Existing)

TETRA TECH

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Area I
Western Aerojet Range

Area H
Landfill

Landfill

Fault A

Lower Potrero Fault Zone

Area F
LPC Test Services Area

Test Bays

Maintenance Shops and Storage Warehouse

MW-85B [0.049]
MW-86B [0.92]
MW-95 [0.23]
MW-92 [9.2]
SW-21 [0.16]
SW-22 [0.17]
SW-20 [0.17]
F34-TW01 [5.8]
SW-06 [<0.050]
SW-19 [0.085]
MW-94 [0.07]
MW-87B [41]
MW-93 [4.1]

Fault B

6
10
6

0 500 1,000 Feet

Area A
Eastern Aerojet Range (Avanti)

Potrero Creek

Area B
Rocket Motor Production Area

NORTHERN POTRERO CREEK AREA

ROCKET MOTOR PRODUCTION AREA

P-03 [0.039]
IW-04 [0.13]
MW-40 [260]

MW-109 [180]
MW109D [68]

Rocket Motor Production Area

MW-66 [730]
MW-91 [1800]
MW-88 [1500]
MW-90 [140]
MW-34 [29]

6
10
100
1000

ROCKET MOTOR PRODUCTION AREA BURN PIT AREA

P-02 [0.27]
MW-108 [52]
MW-103 [5.9]
MW-107 [8.2]
MW-29 [30]
MW-05 [2100]
MW-105 [<0.025]
MW-101 [0.11]
MW-106 [120]
MW-19 [43]
MW-56C [890]
MW-54 [920]
MW-22 [340]
MW-59B [3400]
MW-60B [2100]
EW-13 [0.24]
MW-61B [71000]
MW-112A [4000]
MW-07 [2200]
MW-26 [4800]
MW-35 [5.1]
MW-111A [1000]
MW-110 [150]
MW-36 [3.9]
MW-111B [17000]
Burn Pit Area
10000
1000

NORTHERN POTRERO CREEK AREA

MASSACRE CANYON ENTRANCE AREA

MPC-PZ07 [<0.025]
MW-13 [<0.025]
SW-03 [120]
MW-45 [120]
MW-104 [0.13]
OW-02 [460]
MW-17 [350]
MW-53 [150]
MW-28 [43]

Bedsprings Creek

MW-102 [0.043]
MW-43 [33]
MW-46 [0.36]
MW46D [<0.025]
MW-48 [<0.025]
OW-02R [330]
MW-76B [<0.025]
MW-09 [<0.025]
MW-08 [<0.025]

MPC-PZ01 [8.7]

Area F
LPC Test Services Area

MPC-PZ05 [0.14]
EW-19 [0.23]
MW-14 [2.6]
MPC-PZ02S [7.3]
MPC-PZ02D [0.17]
MPC-PZ04 [2.4]

Potrero Creek

F33-EW03 [0.53]
MW-83 [0.16]
MW-15 [<0.025]
MW-18 [1.2]
SW-09 [<0.025]

Large Motor Washout Area

F33-TW02 [<0.025]
MW-70 [7.3]
MW-82 [0.077]
F33-EW02 [<0.025]
F33-EW01 [0.98]
F33-TW06 [<0.025]
F33-TW07 [0.028]

Area E
Radioactive Waste Disposal Site

Area G
Helicopter Weapons Test Area

MW-77B [0.09]
SW-18 [0.17]

MW-67 [0.29] Located Approximately 1 Mile Downstream

MW-100 [<0.05] Located Approximately 2.6 Miles Downstream

Area D
LPC Ballistics Test Range

0 500 1,000 Feet

Adapted from: July 2016 aerial photograph.

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

LEGEND

- MW-46D [<0.02] — Monitoring Well Installed in 2017 [Perchlorate concentration]
- F33-EW01 [0.98] — Extraction Well Installed in 2017 [Perchlorate concentration]
- OW-02R [330] — Observation Well Installed in 2017 [Perchlorate concentration]
- MPC-PZ01 [8.7] — Piezometer Well Installed in 2017 [Perchlorate concentration]
- MW-107 [8.2] — MNA Monitoring Well [Perchlorate concentration]
- MW-22 [340] — Well ID [Perchlorate concentration]
- SW-07 [23] — Surface Water Sample Location [Perchlorate concentration]
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Perchlorate Concentration Contour (µg/L) - Dashed where inferred
- MCL Contour (6.0 µg/L) - Dashed where inferred
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Source Areas
- Primary Contaminant Attenuation Area (phytoextraction and degradation)
- Potrero Canyon Site Boundary
- Historical Operational Area Boundary

Notes:

MCL - Maximum Contaminant Level. Concentrations shown are in microgram per liter (µg/L)

Highest concentration shown is contoured for clustered or nested well locations.

Bold indicates MCL value exceeded.

Beaumont Site 1 property boundary is approximate.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 6

Perchlorate Isoconcentration Map (µg/L) for Alluvium and Shallow Mount Eden Formation

TETRA TECH

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Area F
LPC Test Services Area

Area G
Helicopter Weapons Test Area

Area H
Sanitary Landfill

Area E
Radioactive Waste Disposal Site

Area B
Rocket Motor Production Area

Area D
LPC Ballistics Test Range

Potrero Creek

Bedsprings Creek

Lower Potrero Fault Zone

Fault A

Fault B

NORTHERN POTRERO CREEK AREA

MASSACRE CANYON ENTRANCE AREA

ROCKET MOTOR PRODUCTION AREA

ROCKET MOTOR PRODUCTION AREA BURN PIT AREA

Rocket Motor Production Area

Burn Pit Area

Large Motor Washout Area

Landfill

Test Bays

MW109D [26]
MW-108 [27]
MW-109 [13]
P-02 [<0.16]
MW-107 [12]
MW-106 [24]
MW-105 [30]
MW-103 [4.0]
MW-101 [16]
MW-104 [6.6]
MW-102 [13]
MW-13 [<0.16]
SW-03 [9.5]
MW-45 [7.1]
MW-43 [6.6]
MW-48 [2.2]
MW-46 [8.5]
MW-08 [<0.16]
MW-09 [6.9]
MW-76B [<0.16]
OW-02 [15]
OW-02R [13]
MW46D [11]
MPC-PZ07 [18]
MPC-PZ01 [<0.16]
MPC-PZ05 [5.8]
MPC-PZ02S [0.5]
MPC-PZ02D [5.1]
MPC-PZ04 [1.5]
EW-19 [<0.16]
MW-14 [0.76]
MW-18 [2.6]
SW-09 [1.8]
MW-15 [5.4]
F33-EW03 [2.3]
F33-TW02 [2.8]
MW-83 [2.3]
MW-70 [1.8]
MW-82 [1.3]
F33-EW01 [3.1]
F33-EW02 [2.5]
F33-TW07 [2.1]
F33-TW06 [2.1]
MW-77B [<0.16]
SW-18 [2.2]
P-03 [3.0]
IW-04 [24]
MW-40 [13]
MW-66 [26]
MW-29 [23]
MW-05 [39]
MW-19 [49]
MW-91 [2.1]
MW-88 [1.6]
MW-90 [<0.16]
MW-34 [<0.16]
MW-56C [22]
MW-54 [13]
MW-17 [5.1]
MW-53 [3.4]
MW-28 [1.2]
MW-22 [15]
MW-59B [71]
MW-60B [73]
EW-13 [590]
MW-112A [72]
MW-61B [400]
MW-07 [29]
MW-35 [<0.16]
MW-26 [150]
MW-111A [610]
MW-110 [<0.16]
MW-111B [3500]
MW-36 [<0.16]
MW-85B [<0.16]
MW-86B [0.34]
MW-92 [<0.16]
MW-95 [<0.16]
SW-06 [1.2]
SW-22 [1.2]
SW-21 [0.99]
SW-20 [1.3]
MW-87B [14]
MW-94 [1.8]
MW-93 [15]
SW-19 [1.1]
F34-TW01 [14]
MW-77B [<0.16]
SW-18 [2.2]
SW-07 [0.54]
MW-67 [0.60]
MW-100 [0.35]
SW-16 [<0.16]
SW-16B [<0.16]

1
10
100
1000

Map Continued on Inset Below

0 500 1,000 Feet

0 1,000 2,000 Feet

Adapted from: July 2016 aerial photograph.

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

MW-46D [11] — Monitoring Well Installed in 2017 [1,4-Dioxane concentration]

F33-EW01 [3.1] — Extraction Well Installed in 2017 [1,4-Dioxane concentration]

OW-02R [19] — Observation Well Installed in 2017 [1,4-Dioxane concentration]

MPC-PZ01 [<0.16] — Piezometer Installed in 2017 [1,4-Dioxane concentration]

MW-22 [340] — Well ID [1-4-Dioxane concentration]

SW-07 [23] — Surface Wtaer Sample Location [1,4-Dioxane concentration]

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

DWNL Contour (1.0 µg/L) - Dashed where inferred

Bedrock/Alluvium Surface Contact
Dashed where inferred

Fault, Accurately Located Showing Dip

Fault, Approximately Located

Primary Contaminant Attenuation Area (phytoextraction and degradation)

Source Areas

Historical Operational Area Boundary

Potrero Canyon Site Boundary

Notes:

DWNL - Drinking water notification level.
Concentrations shown are in microgram per liter (µg/L)

Highest concentration shown is contoured for clustered or nested well locations.

Bold indicates DWNL value exceeded.

Beaumont Site 1 property boundary is approximate.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 7
1,4-Dioxane Isoconcentration Map (µg/L) for Alluvium and Shallow Mount Eden Formation

TETRA TECH

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Area I
Western Aerojet Range

Landfill

Area H
Landfill

Fault A

Lower Potrero Fault Zone

0 500 1,000 Feet

Area F
LPC Test Services Area

Test Bays

Maintenance Shops and Storage Warehouse

MW-86B [60]
MW-92 [29]
MW-85B [<1.8]
MW-95 [8.4]
SW-21 [<0.37]
SW-22 [<0.37]
SW-20 [<0.37]
SW-06 [<0.37]
F34-TW01 [0.97]
SW-19 [<0.37]
MW-93 [3.1]
MW-94 [0.56]
MW-87B [14]

Fault B

Area A
Eastern Aerojet Range (Avanti)

Area B
Rocket Motor Production Area

NORTHERN POTRERO CREEK AREA
ROCKET MOTOR PRODUCTION AREA

Rocket Motor Production Area

MW-40 [9.5]
P-03 [<0.37]
IW-04 [7.2]
MW109D [41]
MW-108 [50]
MW-109 [18]
P-02 [<0.37]
MW-66 [76]
MW-91 [1.1]
MW-88 [1.4]
MW-107 [15]
MW-106 [38]
MW-29 [44]
MW-103 [0.57]
MW-105 [6.2]
MW-05 [100]
MW-90 [0.94]
MW-34 [1.2]
MPC-PZ07 [1.7]
SW-03 [<0.37]
MW-13 [<0.37]
MW-101 [8.9]
MW-104 [0.67]
MW-19 [19]
MW-56C [50]
MW-54 [36]
MW-22 [18]
OW-02 [23]
OW-02R [18]
MW-76B [<0.37]
MW-45 [4.8]
MW-102 [1.7]
MW-43 [4.5]
MW-48 [<0.37]
MW-46 [0.71]
MW-53 [12]
MW-17 [0.59]
MW-28 [11]
MW-59B [150]
MW-60B [77]
EW-13 [570]
MW-112A [88]
MW-61B [1700]
MW-07 [280]
MW-35 [<0.37]
MW-26 [1800]
MW-111A [2500]
MW-110 [8.9]
MW-36 [<0.37]
MW-111B [3900]
MW-08 [<0.37]
MW-09 [<0.37]

NORTHERN POTRERO CREEK AREA
MASSACRE CANYON ENTRANCE AREA
ROCKET MOTOR PRODUCTION AREA BURN PIT AREA

Bedsprings Creek

Burn Pit Area

MPC-PZ01 [<0.37]
MW46D [<0.37]
MPC-PZ02S [<0.37]
MPC-PZ02D [<0.37]
MPC-PZ05 [1.7]
MPC-PZ04 [0.44]
EW-19 [<0.37]
MW-14 [<0.37]
MW-15 [0.77]
MW-18 [0.67]
SW-09 [<0.37]

Area E
Radioactive Waste Disposal Site

Large Motor Washout Area

F33-EW03 [<0.37]
F33-EW02 [<0.37]
F33-EW01 [<0.37]
MW-83 [<0.37]
MW-82 [<0.37]
F33-TW02 [<0.37]
MW-70 [<0.37]
F33-TW06 [<0.37]
F33-TW07 [<0.37]

Area G
Helicopter Weapons Test Area

MW-77B [<0.37]
SW-18 [<0.37]

MW-67 [<0.37] Located Approximately 1 Mile Downstream

MW-100 [<0.18] Located Approximately 2.6 Miles Downstream

Area D
LPC Ballistics Test Range

0 500 1,000 Feet

Adapted from: July 2016 aerial photograph.

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

- MW-46D [NS] — Monitoring Well Installed in 2017 [TCE concentration]
- F33-EW01 [NS] — Extraction Well Installed in 2017 [TCE concentration]
- MW-109D [41] — Observation Well Installed in 2017 [TCE concentration]
- OW-02R [18] — Piezometer Well Installed in 2017 [TCE concentration]
- MW-22 [340] — Well ID [TCE concentration]
- SW-07 [24] — Surface Water Sample Location [TCE concentration]
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- TCE Concentration Contour (µg/L) - Dashed where inferred
- MCL Contour (5.0 µg/L) - Dashed where inferred
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Primary Contaminant Attenuation Area (phytoextraction and degradation)
- Source Areas
- Potrero Canyon Site Boundary
- Historical Operational Area Boundary

Notes:

MCL - Maximum Contaminant Level. Concentrations shown are in microgram per liter (µg/L)

TCE - Trichloroethene.

Highest concentration shown is contoured for clustered or nested well locations.

Bold indicates MCL value exceeded.

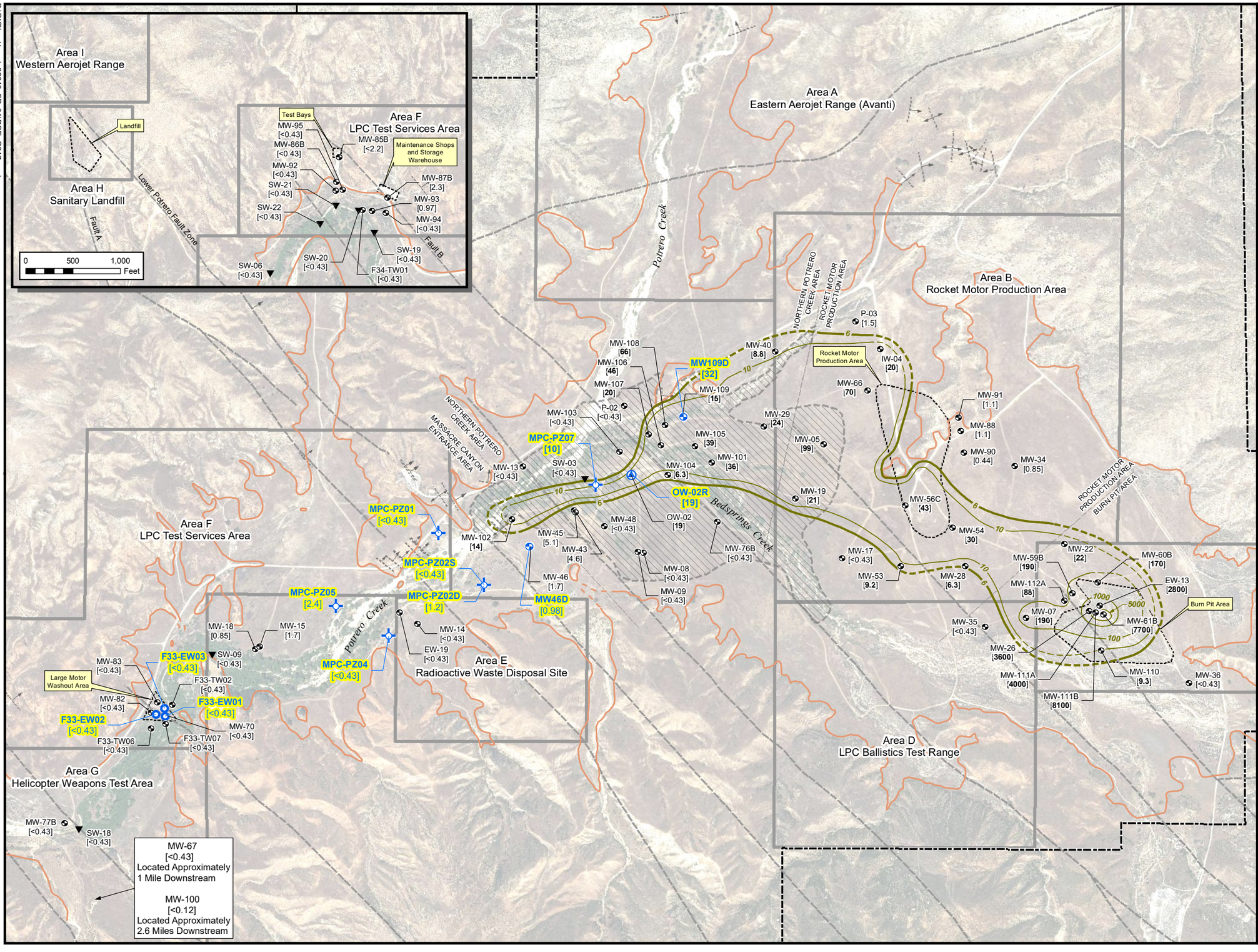
Beaumont Site 1 property boundary is approximate.

Portero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 8
TCE Isoconcentration Map (µg/L) for Alluvium and Shallow Mount Eden Formation

TETRA TECH

P:\GIS\Lockheed_36810_FP_011DCE_Q217.mxd



N

0 500 1,000 Feet

Adapted from: July 2016 aerial photograph.

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

- MW-46D [0.98] — Monitoring Well Installed in 2017 [1,2-DCE concentration]
- F33-EW01 [<0.43] — Extraction Well Installed in 2017 [1,2-DCE concentration]
- OW-02R [19] — Observation Well Installed in 2017 [1,2-DCE concentration]
- MPC-PZ01 [0.43] — Piezometer Well Installed in 2017 [1,2-DCE concentration]
- MW-22 [340] — Well ID [1,1-DCE concentration]
- SW-07 [23] — Surface Water Sample Location [1,1-DCE concentration]
- Fault, Approximately Located
- Fault, Accurately Located Showing Dip
- 1,1-DCE Concentration Contour (µg/L) - Dashed where inferred
- MCL Contour (6.0 µg/L) - Dashed where inferred
- Bedrock/Alluvium Surface Contact Dashed where inferred
- Primary Contaminant Attenuation Area (phytoextraction and degradation)
- Source Areas
- Potrero Canyon Site Boundary
- Historical Operational Area Boundary

Notes:

MCL - Maximum Contaminant Level. Concentrations shown are in microgram per liter (µg/L)

1,1-DCE - 1,1-Dichloroethene.

Highest concentration shown is contoured for clustered or nested well locations.

Bold indicates MCL value exceeded.

Beaumont Site 1 property boundary is approximate.

Potrero Canyon
(Lockheed Martin Beaumont Site 1)

Figure 9
1,1-DCE Isoconcentration Map (µg/L) for Alluvium and Shallow Mount Eden Formation

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APPENDICES

(provided on CD)

Appendix A	County of Riverside Department of Public Health Well Permits
Appendix B	Underground Service Alert Dig Alert Tickets
Appendix C	Technical Memorandum Documenting the Geophysical Survey
Appendix D	Soil Boring Logs and Well Completion Diagrams
Appendix E	Well Development and Sampling Field Sheets
Appendix F	Laboratory Analytical Data Packages
Appendix G	Investigative-Derived Waste Profiles and Analytical Data
Appendix H	Packages Validated Analytical Results by Method
Appendix I	Pump Test Results