REVISED
SUMMARY REPORT

FOLLOW-ON MUNITIONS AND EXPLOSIVES OF CONCERN (MEC) EVALUATION

Lockheed Martin Corporation
Former Beaumont Site No. 2
Beaumont, California

LOCKHEED MARTIN
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Prepared by:

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July 2010

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LOCKHEED MARTIN

July 30, 2010

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

Re: Beaumont Site 2, Final MEC Evaluation Report

Dear Mr. Zogaib:

Please find enclosed one hard copy and one electronic copy on compact disk of the final *Summary Report, Follow-on Munitions and Explosives of Concern (MEC) Evaluation, Lockheed Martin Corporation, Former Beaumont Site No. 2, Beaumont, California*. This report addresses the DTSC comments received on January 29, 2010; responses to those comments were approved by DTSC on June 23, 2010 and are included as Appendix D in the report.

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

Sincerely,

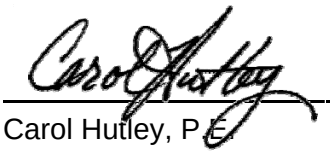
Denise Kato
Remediation Analyst Senior Staff

Enclosure

Copy with Enc:
Gene Matsushita, LMC (electronic & hard copy)
Ian Lo, CDM (electronic copy)
Tom Villeneuve, Tetra Tech, Inc. (hard copy)
Hans Kernkamp, Riverside County (electronic copy)
Carol Hutley, Tetra Tech, Inc. (electronic copy and hard copy)

This Report documents the Follow-On Munitions and Explosives of Concern (MEC) Evaluation at Beaumont Site 2. It contains a description of the procedures implemented and the areas where MEC evaluation was conducted. The report also contains a summary of the results of the MEC evaluation and conclusions regarding the potential need for future assessment or mitigation actions. By their signatures, the undersigned certify this report has been reviewed and accurately reflects the work performed in accordance with the work plan and industry standards.

APPROVALS:



07/29/10

Carol Hutley, P.E. Date
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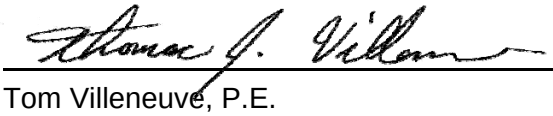

07/29/10

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Lockheed Program Manager for Tetra Tech
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FOREWORD

A number of the ordnance-related terms are included in the text of this report. The terms typically used to classify various types of ordnance based on the composition, use, and condition of that ordnance vary greatly among the different military services. In this document, the terms munitions and explosives of concern (MEC), unexploded ordnance (UXO), and munitions components (MC) are used extensively. As the definition of the acronym MEC implies, this term encompasses a broad range of different types of ordnance in various conditions including high explosive (HE) and target practice (TP) ordnance that may be fuzed or unfuzed, armed or unarmed, and fired or unfired, as well as bulk explosives. UXO is a subset of MEC including ordnance items that have been prepared (fuzed, armed, etc.) and fired, but have failed to function (detonate, burn, etc.) in the intended manner. The term UXO is primarily used in this report in relation to the qualified private-sector technicians who perform ordnance-related services. These individuals are commonly referred to in this industry as UXO technicians (not MEC technicians).

The acronym MEC was used for this project, and in this report, to refer only to items containing energetic materials. MC was used to refer to ordnance-related items that were non-explosive either by design or because they had been fired and functioned as intended destroying the energetic materials contained in the item. MC, as used for this report, would include metal scrap associated with munitions, but not ordinary metal waste such as cans, wire, or piping. Government agencies use this same acronym (MC) to represent the term “munitions constituents.” The munitions constituents category of items includes a broader range of items than those being referred to in this report as MC, including some which may contain explosive residues, and the two terms are not interchangeable. Site-specific terms and definitions were used for this project to allow a clear understanding of the different level of hazard represented by different items which could potentially have been present at this site.

EXECUTIVE SUMMARY

Beaumont Site 2 (Site 2) was historically used as a remote testing facility to support early space and defense programs. In 1974, the facility was closed and the property became surplus. LMC initially sold a 160-acre segment of the property to a private entity. This property known as the Gateway Property is adjacent to State Highway 60 and is separated from the main portion of the historical facility (Main Parcel) by a narrow strip of property owned by others. LMC sold the main 2,688 acre property in 2007 (See Figure ES-1).

In 2006, LMC began an initial evaluation of Site 2 to determine, based upon historical information available, the need for munitions and explosives of concern (MEC) evaluation at this site. No specific direct evidence of past MEC use was found during this initial evaluation; however, there were indications that lessees or other site users may have had the right to conduct testing of explosive ordnance components, subsystems, and systems. Supplemental data obtained after Site 2 was sold in 2007 also suggested that some additional evaluation was warranted to resolve the issue of potential MEC use at Site 2. In particular, it was determined that munitions testing was conducted at the site (reportedly inert sabot rounds) by Aerojet Corporation, whose testing was the source of 30mm projectiles found at Beaumont Site 1. In addition, low levels of the high explosive (HE) Cyclotrimethylenetrinitramine (RDX) have been found in groundwater samples from two monitoring wells on site. This explosive was historically known as “Royal Demolition Explosive”, thus the acronym RDX. The Follow-On MEC Evaluation documented in this report was designed to yield field data that will improve the level of confidence that there are no significant MEC issues associated with this site.

There are four historical Operational Areas at Site 2:

- Area J – Final Assembly (assembly building for SRAM rocket motors)
- Area K – Test Bays and Miscellaneous Facilities (areas for conditioning & testing rocket motors)
- Area L – Waste Propellant Burn Area
- Area M – Garbage Disposal Site

In addition, the Gateway Property is considered an area of interest for evaluation based upon historical information that a small ammunition storage building was constructed somewhere on this property in the late 1960s. These five general areas were evaluated using historical records available to identify the most likely locations where MEC could potentially have been stored, used, or disposed of in the past. Because there is no direct evidence of MEC use at Site 2, decisions regarding appropriate locations for MEC field evaluation were based upon factors such as proximity to historical operations buildings, accessibility of areas for disposal and

general location information for facilities or test areas operated by lessees at Site 2 (including Aerojet Corporation, General Dynamics, Ogden and Wiley Laboratories).

Eighteen individual sites were initially selected for field evaluation. This included two general areas on the Gateway Property that were potentially the location of the ammunition storage building reportedly built on that property. This building was reportedly quite small (120 square feet) and the location information provided in historical documents was limited to the Section, Township, and Range where the structure was supposedly built. The field crew was instructed to check the two general locations as well as other likely areas observed on the property. During field operations one additional site in Operational Area K was added for informal evaluation bringing the total to 19 sites. In addition, the shape and size of several areas were changed during the field evaluation to reflect topography or better meet the data needs for the project (i.e. steep slopes were excluded, areas were made larger to reflect the intent of the search in each area, etc.). One evaluation site (L-1) was also relocated to more accurately reflect historical data. Figure ES-1 shows the locations of the final evaluation sites.

In all, about 15 acres were evaluated across the 19 sites. Two hundred and thirty-five (235) of three hundred sixty-one (361) anomalies detected at 16 of the initial evaluation sites were randomly selected for excavation. This resulted in excavation of approximately 65% of the detected anomalies overall; ranging from about 37% to 100% among the 16 sites. The 17th and 18th sites (the potential ammunition storage building areas on the Gateway Property) did not meet the threshold criteria for intrusive evaluation (i.e., either no evidence of the building was found [foundation, etc.] or evidence found was identified by long-time residents as remnants a former home). In addition, no anomalies were identified at the 19th (informal) evaluation site (K-9) that was added during the evaluation. This site was just up-gradient of the monitoring well on site containing the highest concentration of RDX.

No MEC or related items were found during the evaluation. One suspect piece of jagged, ferrous metal was found; however, based on the size, shape, and configuration, as well as the fact that no similar items were located nearby, it was determined by the Senior Unexploded Ordnance Supervisor on site not to be munitions-related fragmentation (frag). The results of the MEC Evaluation divided by operational area and evaluation site are presented in Table ES-1.

X:\GIS\Lockheed 22289-070\TES_MEC Eval Areas.mxd

GP-2
GP-1
Gateway Property
J-1
J-2
Parking Area
Historical Operational Area J
Final Assembly
Building 250
Rocket Assembly
Building
Transformer Pad
J-5
J-3
J-4
TT-MW2-2
TT-MW2-16
Water Tanks and
Pump House
Concrete Mount
K-1
K-2
K-3
Centrifuge
Large Bunker
Historical Operational Area K
Test Bays & Misc. Facilities
Prism
TT-MW2-17S/D
TT-MW2-3
4 Test Bays
K-4
Parking Area
K-5
TT-MW2-14
Small Bunker
K-6
K-9
Conditioning Chambers
TT-MW2-13
K-7
TT-MW2-18
TT-MW2-1
T-Revetment Conditioning Chambers
K-8
Instrument Building
L-1
M-1
Reported Propellant
Burn Site
TT-MW2-12
Disposal Site
TT-MW2-11
TT-MW2-10
TT-MW2-4S
TT-MW2-4D
L-2
Historical Operational Area M
Garbage Disposal Area
1962 RWQCB Permitted
Discharge Area
Historical Operational Area L
Propellant Burn Area
Liquid Waste
Discharge Ponds
TT-MW-23
TT-MW-21
TT-MW-24
TT-MW-22
TT-MW2-9D
TT-MW2-9S

LEGEND

- Monitoring Well Location
- MEC Evaluation Area
- Historical Operational Unit Boundary
- Gateway Property Boundary
- Beaumont Site 2 Property Boundary

0 500 1,000 Feet

Adapted from: April 2007 aerial photograph.

Beaumont Site 2

Figure ES-1

Final Evaluation Sites for Follow-on MEC Evaluation

TETRA TECH

Table ES-1. Summary of MEC Evaluation Findings					
Operational Area	Site No.	No. of Anomalies Detected	No. of Anomalies Dug	% Dug	Description of Anomalies
J	J-1	4	4	100	Metal waste and expended 9mm bullets
	J-2	7	7	100	Metal waste including chain-link fence and metal signs
	J-3	25	60	42	Metal waste including an expended 9mm bullet
	J-4	25	40	62.5	Metal waste including a large vent cover
	J-5	19	19	100	Metal waste
K	K-1	21	21	100	Metal waste including several cans
	K-2	8	8	100	Metal waste (mostly beer and soda cans)
	K-3	6	6	100	Metal waste (cans and lids only)
	K-4	15	15	100	Metal waste; one dig with metal slag
	K-5	20	20	100	Metal waste
	K-6	11	11	100	Metal waste; three large anomalies including a cable and piping running through the site and a concrete slab
	K-7	9	9	100	Metal waste including expended .22 and .45 caliber casings
	K-8	15	15	100	Metal waste including a large electrical box with wiring and shell casings and a conduit
	K-9	0	--	--	No anomalies found
L	L-1	25	67	37	Metal waste including expended small arms casings
	L-2	25	59	42	Metal waste including expended small arms casings
M	M-1	0	--	--	Surface metal found at several locations; no MEC related items noted on the surface.
Gateway Property	GP-1	0	--	--	No anomalies found
	GP-2	0	--	--	No anomalies found

TABLE OF CONTENTS

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

PAGE

LIST OF TABLES

PAGE

ABBREVIATIONS AND ACRONYMS

DGPS	Differential Global Positioning System
EMI	electro-magnetic induction
frag	fragmentation
GCRC	Grand Central Rocket Company
HE	high explosives
LAC	Lockheed Aircraft Corporation
LMC	Lockheed Martin Corporation
LPC	Lockheed Propulsion Company
MC	munitions components
MEC	munitions and explosives of concern
MSL	mean sea level
Ogden	Ogden Technology Laboratories
QA	quality assurance
QC	quality control
RDX	Cyclotrimethylenetrinitramine (historically Royal Demolition Explosive)
SKR	Stephens' Kangaroo Rat
SRAM	short range attack missile
SUXOS	Senior UXO Supervisor
Tetra Tech	Tetra Tech, Incorporated
Site 2	Former Lockheed Beaumont Site No. 2
UXO	unexploded ordnance
UXOQC	UXO Quality Control Specialist
UXOSO	UXO Safety Officer

1.0 INTRODUCTION

Lockheed Martin Corporation's (LMC's) Beaumont Site 2, also known as Jack Rabbit Trail, Laborde Canyon and the Beaumont Proving Ground, was historically used as a remote testing facility to support early space and defense programs. In 1974, the facility was closed and the property became surplus. LMC initially sold a 160-acre segment of the property to a private entity. This property known as the Gateway Property is adjacent to Highway 60 and is separated from the main portion of the historical facility (Main Parcel) by a strip of property owned by others. LMC sold the main 2,688 acre surplus property to Riverside County in 2007 for use as recreational area (with use restrictions).

During 2005, small amounts of target practice ammunition and unexploded ordnance (UXO) were discovered at the former Beaumont Site 1, a companion test facility approximately 1 mile southeast of Beaumont Site 2 (Site 2). In 2006, in response to the ammunition discovery at Site 1, LMC began an initial evaluation of Site 2 to determine, based upon historical information available, the need for munitions and explosives of concern (MEC) evaluation at this site. No specific evidence of past MEC use was found during this initial evaluation; however, there were indications that lessees or other site users may have had the right to conduct testing of explosive ordnance components, subsystems and systems. Supplemental data obtained after Site 2 was sold in 2007 also suggested that some additional evaluation was warranted to resolve the issue of potential MEC use at Site 2.

Limited direct and indirect evidence of MEC or inert munitions testing at Site 2 has been uncovered. Indirect evidence of potential MEC testing was uncovered during the historical research initiated in 2006 (Tetra Tech 2008). Building permits and lease agreements reviewed for this historical research indicated that storage and/or testing of explosives or explosively operated devices could have taken place at Site 2. A 2007 interview with a former employee of a historical Site 2 tenant (Aerojet Corporation) revealed that this company utilized a location in the test bay canyon (Operational Area K) at Site 2 to conduct tests reportedly utilizing inert, large caliber, munitions. More direct evidence of potential MEC issues was obtained in 2008 when low levels of Cyclotri-methylene Trinitramine (RDX) were detected in groundwater samples from two monitoring wells located on site. This explosive was historically known as "Royal Demolition Explosive" (thus the acronym RDX) and is typically used as a component in high-explosive (HE) fillers for projectiles, mortars and rocket warheads. There is no known use of RDX associated with the rocket motor assembly or testing that was reportedly the focus of work at Site 2 and there is no evidence to indicate that rocket warheads were ever produced, stored or used at the site. Based upon the available evidence, LMC determined it would be prudent to further evaluate the potential for MEC or related materials to be present at Site 2. This report documents the methods and procedures used for that evaluation, as well as the findings of the evaluation.

1.1 PURPOSE AND SCOPE

The objectives of the Follow-On MEC Evaluation documented in this report were to:

- Locate more accurately (if possible) historical potential munitions/explosives use areas on site
- Improve the understanding of historical operations at Site 2
- Increase the level of confidence that significant residual ordnance-related contamination is not present at Site 2.

The tasks performed during the Follow-On MEC Evaluation included:

- Preparation of work plans;
- Site preparation (staking and vegetation mowing);
- Intrusive investigation of selected subsurface metallic anomalies;
- Geophysical evaluation of the former garbage disposal site location; and,
- Preparation of this report.

Note: Staking was accomplished by the UXO team using a Leica differential global positioning system (DGPS) to navigate to staking coordinates. Coordinates were established on a graphic information system (GIS) using existing bench marks on the site.

1.2 SUMMARY OF TECHNICAL APPROACH

The project was intended to provide supplemental data with which to evaluate the potential for MEC issues to exist at Site 2 as a result of historical operations. Because Site 2 has relatively rugged terrain, even in areas that appear conducive to MEC testing or disposal, the evaluation was conducted using highly portable hand-held metal detectors and manual intrusive methods (i.e. shovels). This approach allowed the unexploded ordnance (UXO) Technicians greater access to potential areas of concern and more flexibility to modify the shape, size or location of areas as appropriate to the intended purpose of the evaluation and with respect to actual terrain and vegetation conditions encountered. All-metals detectors were used for the evaluation since the rocket motors assembled and tested on site contained components fashioned from non-ferrous metals. Geophysical mapping of the former garbage disposal site was also conducted to ensure that previous removal activities had resulted in substantial removal of buried metal debris at this site that could potentially be MEC.

A small number of anomalies (typically 25 to 30 if available) at each evaluation site were randomly selected for intrusive investigation to obtain data regarding the general nature of subsurface debris. Provisions were included to increase the number of anomalies investigated in specific areas if evidence of MEC disposal or testing was found (e.g., apparent burn pits, trash pits, potential targets or craters). Because there was little direct or indirect evidence of

MEC use at Site 2, decisions regarding appropriate locations for MEC field evaluation were based upon factors such as proximity to historical operations buildings, accessibility of areas for disposal and general location information for facilities or test areas operated by lessees at Site 2 (including Aerojet Corporation, General Dynamics, Ogden Technology Laboratories, and Wiley Laboratories).

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2.0 SITE DESCRIPTION

2.1 SITE LOCATION

Site 2 is located in Riverside County south of the City of Beaumont, California, approximately 70 miles east of the City of Los Angeles, California, as shown in Figure 2-1.

2.2 SITE HISTORY AND OPERATIONS

According to historical data available (Radian, 1986), the 2,668 acre Site 2 was purchased in the 1950s by Grand Central Rocket Company (GCRC). Prior to being purchased, Site 2 was used primarily for ranching. There were ranch houses and other related structures on site and most level areas of Site 2 were under cultivation. GCRC developed Site 2 as a remote test facility supporting early space and defense programs. Lockheed Aircraft Corporation (LAC) purchased a one-half interest in GCRC, including Site 2, in 1960. GCRC became a wholly-owned subsidiary of LAC in 1961. In 1963, Lockheed Propulsion Company (LPC) became an operating division of LAC and became responsible for operations at Site 2. LAC later became LMC.

LPC used Site 2 primarily for assembly of rocket motors. Motor testing and propellant incineration were reportedly also conducted on a smaller scale. Site 2 supported work on a number of projects including the Large Solid Motor Program, the Apollo Launch Escape Motor, the Short Range Attack Missile (SRAM) motor, the Hydac and Javelin sounding rocket motors, and various satellite maneuvering systems.

In 1970, LPC began offering test services to outside parties. They also leased unused portions of Site 2 to outside parties. Ogden Technologies Laboratory (Ogden) leased a portion of Site 2 for testing. The lease included a list of activities that could be conducted on the property. The list included provisions for testing “explosive ordnance components, subsystems, and systems”.

LPC ceased operations at Site 2 in 1974. Most of the structures were dismantled and concrete foundations are all that remain of many of the buildings once present on site. In 1986, Wylie Laboratories planned to use Site 2 for testing an unspecified Class B explosive device. According to Wylie’s records, the equipment for the test was set up but the test was never conducted (Radian, 1986).

Four operational areas were identified for Site 2 during previous environmental evaluations or projects. These areas include:

1. Area J – Final Assembly;
2. Area K – Test Bays and Miscellaneous Facilities;
3. Area L – Propellant Burn Area; and
4. Area M – Garbage Disposal Site.

The four operational areas are shown on Figure 2-2. The historical activities conducted in each area, as summarized from available historical data (Radian, 1986), are briefly described in the following sections.

2.2.1 Area J – Final Assembly

Area J is located in upper Laborde Canyon near the northern boundary of Site 2. Building 250 in this area was used for final assembly of SRAM rocket motors. Assembly included installation of the nozzle and head cap; pressure checks of the motor; installation of the electrical system; and, preparation for shipping.

2.2.2 Area K – Test Bays and Miscellaneous Facilities

Southwest of the assembly building in an adjoining canyon, there were four test bays where the assembled rocket motors were tested. In the early years, especially during the period GCRC operated Site 2, there was a history of explosions during motor testing that destroyed entire test areas. As the technology and testing procedures advanced, motor failures occurred less frequently. Following any motor failures, LPC staff reportedly inspected the surrounding hillsides and removed unburned propellant.

Conditioning chambers and an associated bunker were located southeast of the test bays near the intersection of Laborde Canyon and the adjacent canyon housing the test bays. The conditioning chambers were used to evaluate the impacts of temperature extremes and other environmental factors on rocket motors. Reportedly, there were two sets of indoor conditioning chambers housed within two large buildings and a third set of chambers constructed outdoors in a series of small bays surrounded by earthen berms on three sides. The berms surrounding the outdoor test bays are still present at the site.

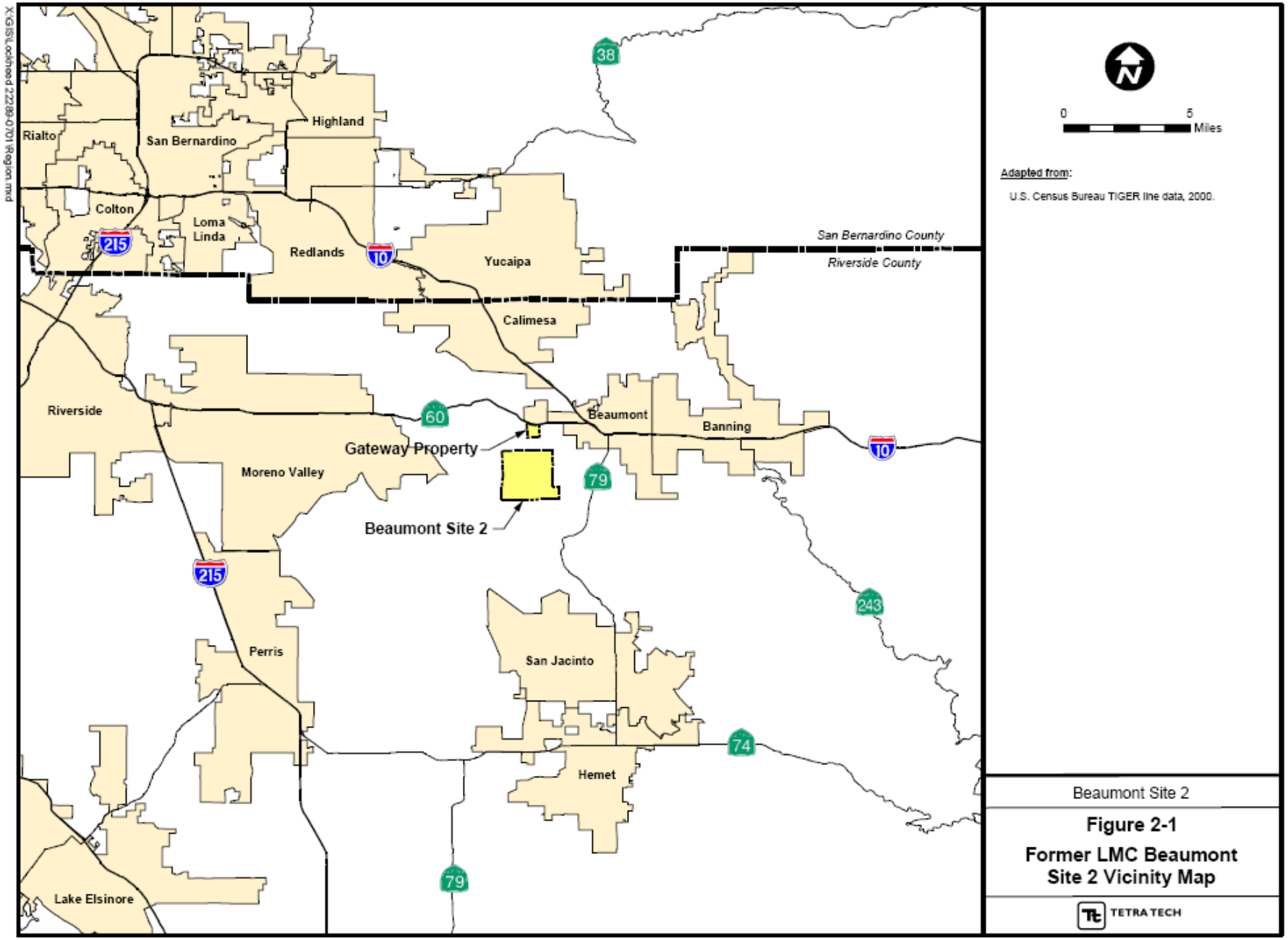
2.2.3 Area L - Propellant Burn Area

Excess propellant was reportedly burned at Site 2 at the entrance to a small side canyon adjoining (and west of) the main facility access road south of Area K. Large slabs of propellant were reportedly trucked to this location and set directly on the ground. Diesel fuel was poured on the propellant and used to initiate combustion.

2.2.4 Area M - Garbage Disposal Site

Non-hazardous wastes generated on site were disposed of in a small (about 2.1 acres) garbage disposal site located in a small side canyon adjoining (from the east) Laborde Canyon south of the assembly building. This site is almost directly east of the reported propellant burn area.

In the early 1970 an LPC safety technician was exposed to toxic vapors of unsymmetrical dimethyl hydrazine from the valve of a pressurized gas container placed in the garbage disposal site by Ogden. Shortly thereafter, Ogden was required to remove any potentially hazardous materials from the garbage disposal site. They contracted this work to a specialized disposal company.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38
Highland
Rialto
San Bernardino
Colton
Loma Linda
215
Redlands
10
Yucaipa
San Bernardino County
Riverside County
Calimesa
Riverside
60
Beaumont
Banning
Gateway Property
10
Moreno Valley
79
Beaumont Site 2
215
243
Perris
San Jacinto
74
Hemet
79
Lake Elsinore
0
5
Miles
Adapted from:
U.S. Census Bureau TIGER line data, 2000.
Beaumont Site 2
Figure 2-1
Former LMC Beaumont Site 2 Vicinity Map
TETRA TECH

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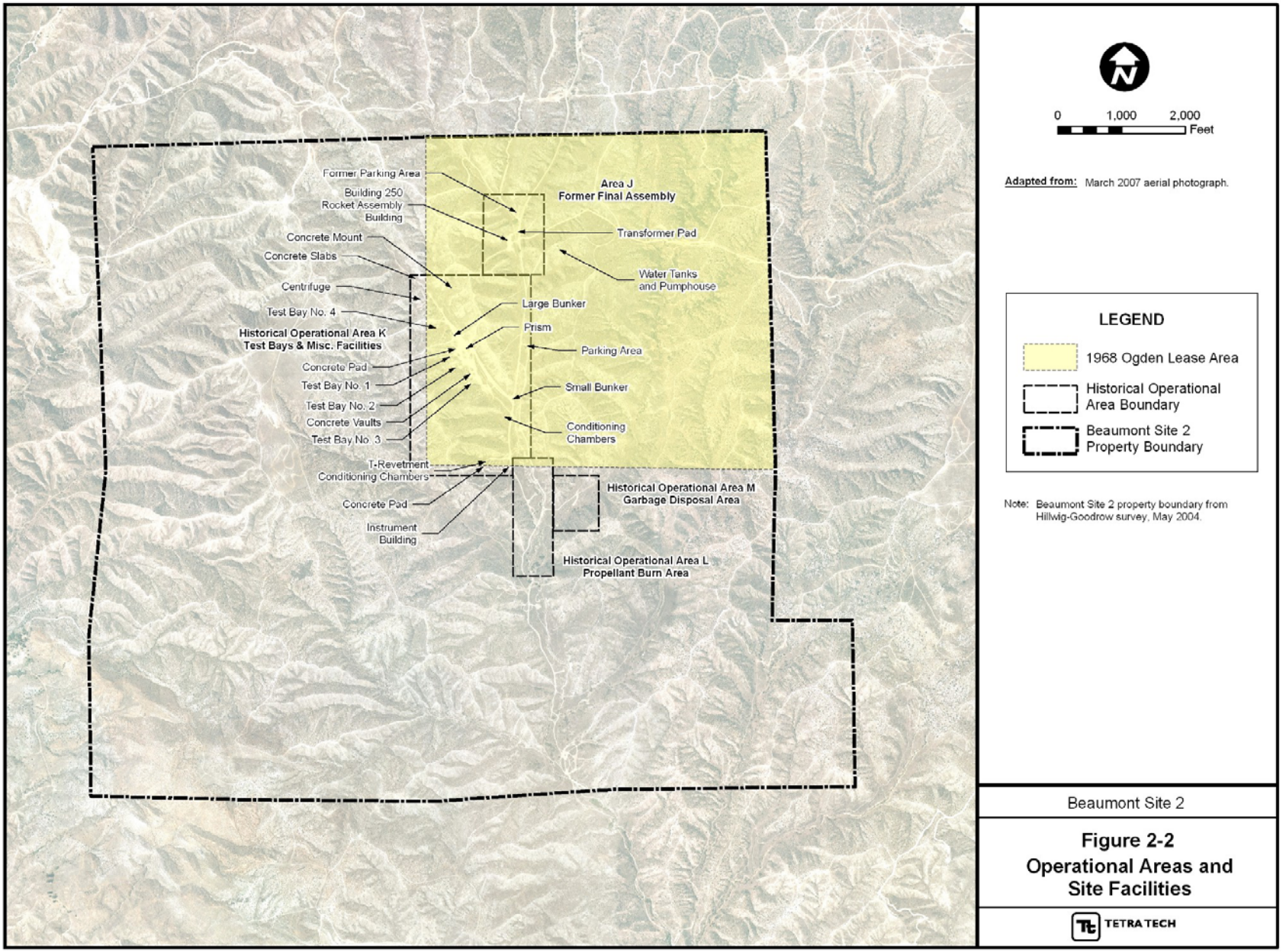
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Former Parking Area
Building 250
Rocket Assembly
Building
Concrete Mount
Concrete Slabs
Centrifuge
Test Bay No. 4
Historical Operational Area K
Test Bays & Misc. Facilities
Concrete Pad
Test Bay No. 1
Test Bay No. 2
Concrete Vaults
Test Bay No. 3
T-Revetment
Conditioning Chambers
Concrete Pad
Instrument
Building
Area J
Former Final Assembly
Transformer Pad
Water Tanks
and Pumphouse
Large Bunker
Prism
Parking Area
Small Bunker
Conditioning
Chambers
Historical Operational Area M
Garbage Disposal Area
Historical Operational Area L
Propellant Burn Area
N
0
1,000
2,000
Feet
Adapted from: March 2007 aerial photograph.
LEGEND
1968 Ogden Lease Area
Historical Operational
Area Boundary
Beaumont Site 2
Property Boundary
Note: Beaumont Site 2 property boundary from
Hillwig-Goodrow survey, May 2004.
Beaumont Site 2
Figure 2-2
Operational Areas and
Site Facilities
TETRA TECH

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2.2.5 Gateway Property History

The Gateway Property, purchased in January 1960 by GCRC, was used for ranching until the 1950s. A Phase I Environmental Site Assessment performed in 2001 stated that aerial photographs from 1953, 1967, and 1994 showed no development of the parcel except for roads (Douglas Wood & Associates, 2001). A building permit found during the 2006 historical research effort (Tetra Tech, 2008) indicates that a very small ammunition storage building was constructed somewhere on the Gateway Property in the late 1960s. The exact location is not specified in the permit.

2.3 PHYSICAL AND ENVIRONMENTAL FEATURES

Site 2 lies within a transition zone between the western foothills of the San Jacinto Mountains to the southeast and an area known as the badlands to the northwest. The site terrain consists of gently rolling hills intermixed with rugged mountains. Laborde Canyon bisects the Main Parcel from north to south and is the principle drainage at the Site; however, because of the hilly, undulating terrain, not all areas of the site drain directly toward Laborde Canyon. Many small side canyons collect runoff during periods of heavy rainfall, conveying it to the ephemeral stream at the center of Laborde Canyon. Elevations on the Main Parcel range from about 2,500 feet above mean sea level (MSL) on the hills at the north end of Laborde Canyon to approximately 1,800 feet at the mouth of the canyon to the south. The Gateway property is located north of the Main Parcel and just north of the head of Laborde Canyon. It slopes generally toward the northwest and is bounded by rolling hills to the east and west. The Site is bounded on the north by Highway 60. Elevations at the Gateway Property range from 2,530 feet above MSL in the west to about 2,320 feet above MSL in the northern portion of the parcel.

The climate of the Site region is semiarid. Rainfall averages from 11 to 14 inches per year. Annually, temperatures at the site generally range between the upper 30s and upper 90s (degrees Fahrenheit) depending on season. The hills at the Site are composed primarily of tertiary sedimentary deposits consisting of sandstone and clay. Minor outcroppings of granitic and metasedimentary rocks of the Mesozoic age are present along the southwestern and eastern boundaries of the Site. Alluvial sand and gravel deposits are present along the floor of Laborde Canyon and in the adjoining canyons on site.

Vegetation at the Site consists primarily of native stands of chaparral mixed with dense, low-growing sagebrush. There are small stands of trees/shrubs including mule's fat, willow, and scrub oak near the streambeds/arroyos. Indigenous animals include two species of rattlesnake (the Western Diamondback and the Red Rattler), cougars, the endangered Stephens' Kangaroo Rat (SKR) and several endangered bird species.

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3.0 SITES FOR MEC EVALUATION

There was little direct evidence regarding MEC use at Site 2 with which to identify appropriate sites for MEC field evaluation. Most of the individual sites included in the Follow-On MEC Evaluation were selected based upon indirect evidence or factors such as proximity to historical operations buildings, accessibility for disposal purposes (e.g., proximity to roads, flat terrain) and general location information for facilities or test areas operated by lessees at Site 2. Areas such as these could be attractive for disposal purposes (burial or burning) since they are conveniently located and easy to reach. Portions of the Gateway Property were considered areas of interest for evaluation based upon direct historical information (a building permit) indicating that a small ammunition storage building was constructed somewhere on this property in the late 1960s. However, even though the permit was direct evidence, it did not contain any specific location information. The only other evaluation site selected based on direct evidence was the location of historical testing by Aerojet Corporation, which was identified during a site walk with a former Aerojet employee. Other locations were selected based on the factors discussed above.

Eighteen individual sites were initially selected for field evaluation. This included two general areas on the Gateway Property that were potentially the location of the ammunition storage building reportedly built on that property. This building was reportedly quite small (120 square feet) and the location information provided in historical documents amounted to the Section, Township and Range where the structure was supposedly built. Two potential areas were identified from historical aerial photography; however, the field staff was instructed to search other possible locations identified during the field work, as well as the areas surrounding the two pre-determined evaluation sites. During field operations one additional site (K-9) in Operational Area K was added for informal evaluation bringing the total to 19 sites. In addition, the shape, size and specific location of several areas were changed slightly during the field evaluation to better reflect the intent of the search in each area (e.g., steep slopes were excluded from potential disposal sites, areas were made larger or smaller to conform to the shape of a box canyon, etc.). One evaluation site (L-1) was also relocated to more accurately reflect historical data regarding this site.

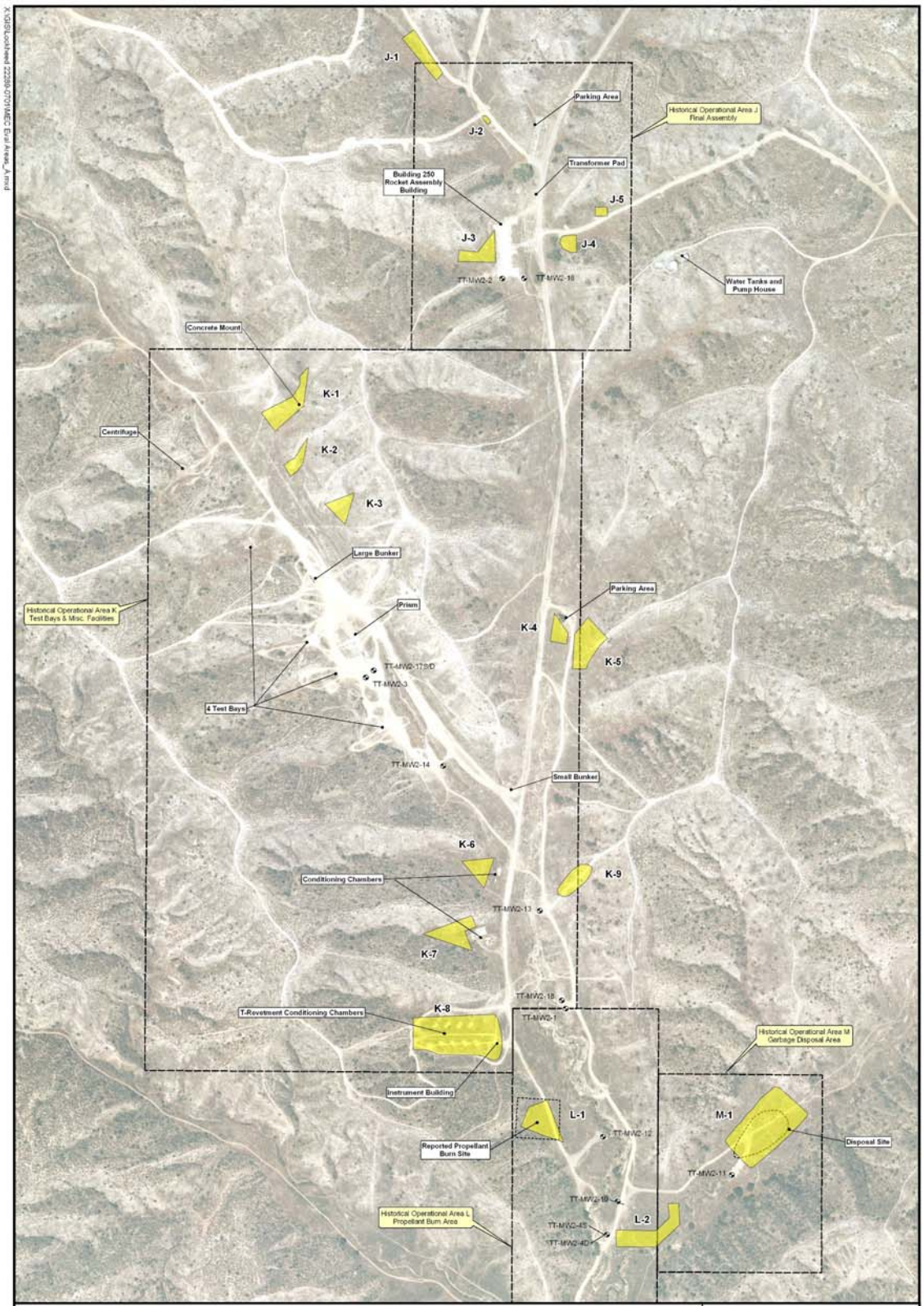
Figures 3-1a and b show the final evaluation sites for the Follow-On MEC Evaluation. Table 3-1 lists the individual evaluation sites and summarizes the rationale for their inclusion in the evaluation. The following subsections of the summary report contain a description of the evaluation sites and the rationale for selecting each site for evaluation. Although many locations at Site 2 could potentially have had MEC-related uses, the sites selected for evaluation were those considered most likely to have had this type of use based on the information available.

Table 3-1. Follow-On MEC Evaluation Sites at Beaumont Site 2

Operational Area	Evaluation Site	Rationale for Inclusion in Follow-On MEC Evaluation
J	J-1	Open area along access road; potential convenient disposal site
	J-2	Open area along access road; potential convenient disposal site
	J-3	Area just behind the former rocket motor assembly building; potential convenient area for scrap/waste disposal
	J-4	Open area along access road near former assembly building and ancillary structures
	J-5	Open area along access road near former assembly building and ancillary structures
K	K-1	Identified as inert projectile test site used by Aerojet Corporation
	K-2	Small box canyon near Aerojet test site; natural shielding for potential munitions tests
	K-3	Small box canyon near Aerojet test site; natural shielding for potential munitions tests
	K-4	Area behind south leg of "L-shaped" building potentially used by Ogden Labs; potential convenient disposal site
	K-5	Area behind east leg of "L-shaped" building potentially used by Ogden Labs; potential convenient disposal site
	K-6	Area behind former staging area; potential convenient disposal site
	K-7	Area behind former indoor conditioning chambers; potential convenient disposal site
	K-8	Former outdoor conditioning chambers; potential convenient disposal site
	K-9	Informal investigation site; small box canyon up-gradient of wells containing RDX
L	L-1	Former supposed waste propellant burn area; potential disposal site for MEC
	L-2	Area behind a former staging area with multiple buildings; potential disposal site
M	M-1	Former garbage disposal site; potential for residual scrap or MEC related items if historical removal actions were not comprehensive.
Gateway Property	GP-1	Area beside the access road through the Gateway Property where disturbance was seen in historical aerial photographs; potential location of ammo storage building
		Small clearing near the northwest corner of the property that is visible on historical photography; potential location of ammo storage building.

3.1 OPERATIONAL AREA J

There was one general area of interest in Operational Area J (See Figure 3-2) with respect to potential MEC issues. This area encompasses the entire northeastern portion of the operational area contained in Section 18, Township 3 South, Range 1 West. This area was historically leased to Ogden which according to its lease had the right to conduct testing of explosive ordnance components, subsystems and systems in this area. No specific facilities constructed or used by Ogden have been identified in this area during past evaluations. Since Ogden could have utilized any of the property specified in its lease, five sites in Operational Area J (J-1 through J-5) were selected for evaluation based upon proximity to roads and relatively flat terrain that could potentially have made them attractive sites for disposal purposes.


J-1
J-2
J-3
J-4
J-5
Parking Area
Historical Operational Area J Final Assembly
Transformer Pad
Building 250 Rocket Assembly Building
TT-MW2-2
TT-MW2-16
Water Tanks and Pump House
Concrete Mount
K-1
K-2
K-3
Centrifuge
Large Bunker
Historical Operational Area K Test Bays & Misc. Facilities
Prism
Parking Area
K-4
K-5
TT-MW2-17S/D
TT-MW2-3
4 Test Bays
TT-MW2-14
Small Bunker
K-6
K-9
Conditioning Chambers
TT-MW2-13
K-7
TT-MW2-18
TT-MW2-1
T-Revetment Conditioning Chambers
K-8
Historical Operational Area M Garbage Disposal Area
Instrument Building
L-1
M-1
Disposal Site
Reported Propellant Burn Site
TT-MW2-12
TT-MW2-11
TT-MW2-19
Historical Operational Area L Propellant Burn Area
TT-MW2-4S
TT-MW2-4D
L-2
LEGEND
Monitoring Well Location
MEC Evaluation Area
Historical Operational Unit Boundary
0
200
400
Feet
Beaumont Site 2
Figure 3-1a
Final Evaluation Sites for Follow-on MEC Evaluation
TETRA TECH

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LEGEND

MEC Evaluation Area

Gateway Property Boundary

0 200 400 Feet

Beaumont Site 2

Figure 3-1b

Final Evaluation Sites for Follow-on MEC Evaluation

TETRA TECH

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The five evaluation sites for Operational Area J are shown on Figure 3-2. The figure shows both the proposed evaluation sites and the final evaluation sites. The locations and boundaries of the sites were adjusted as appropriate in the field to accommodate actual terrain features and to ensure that the intent of the evaluation was preserved (e.g., disposal generally does not take place on steep slopes).

3.2 OPERATIONAL AREA K

There were five general areas of interest in Operational Area K (See Figure 3-3):

- A small box canyon where Aerojet conducted penetrator testing and other small canyons feeding into the test bay canyon (K-1, K-2 and K-3);
- A former L-shaped building on the east side of Laborde Canyon that was located up gradient of two groundwater monitoring wells where RDX was detected in 2007 (K-4 and K-5);
- Two former warehouse-like buildings located south of the test bay canyon which reportedly housed in-door rocket motor conditioning chambers (K-6 and K-7);
- A former outdoor rocket motor conditioning chamber area (K-8); and,
- The vicinity of two groundwater wells found to contain low levels of RDX (K-9).

The small box canyon where Aerojet reportedly conducted testing with inert sabot projectiles (K-1) was selected for evaluation to ensure that debris/scrap present is consistent with the reported use of inert munitions. Since these types of small box canyons provide natural shielding for munitions testing (i.e., enclosed on three sides by steep earthen walls) two other small canyons (K-2 and K-3) which are readily accessible from the test bay canyon were also selected for evaluation.

The area where the former L-shaped building was located could contain sites where disposal by burial could have occurred. This building appeared on aerial photographs just after Ogden signed a lease for northeast portion of Site 2 which allowed the company to test explosive ordnance components, subsystems, and systems. It is not known whether Ogden built or utilized this structure; however, it is located just up-gradient of the two wells on the site that contain RDX. For this reason, areas behind the former building that could have been attractive for disposal of waste explosives were included as evaluation sites (K-4 and K-5).

The areas behind the two former conditioning chamber buildings (K-6 and K-7) were selected for evaluation since these were attractive sites for potential disposal of scrap or waste. It was historically common for small amounts of excess material to be disposed of via burial or dumping near the facilities where they were utilized.

The outdoor conditioning chamber area (K-8) contains a number of small bays surrounded on three sides by earthen berms/revetments. These bays formerly housed conditioning chambers used to heat, cool, pressurize or otherwise environmentally expose rocket motors prior to testing. Review of historical aerial photographs revealed that the chambers were removed

piecemeal over the years and that many of the chamber bays were then used for storage. These former chamber bays would have been attractive locations for disposal of waste materials. Based upon this information the area was selected as an evaluation site.

The final area of interest is the vicinity of the two groundwater wells containing RDX (K-9). Since there are no known work or test areas near these wells, this area was initially excluded from the evaluation (i.e., it was not possible to determine where to look for a localized source of RDX). During the field work, a small box canyon was observed just northeast of the wells. Since small canyons can be an attractive site for testing due to the natural shielding, this area was added as an informal evaluation site.

The nine evaluation sites for Operational Area K (K-1 through K-9) are shown on Figure 3-3. The figure shows both the proposed evaluation sites and the final evaluation sites. The locations and boundaries of the sites were adjusted as appropriate in the field to accommodate actual terrain features and to ensure that the intent of the evaluation was preserved (e.g., disposal generally does not take place on steep slopes).

3.3 OPERATIONAL AREA L

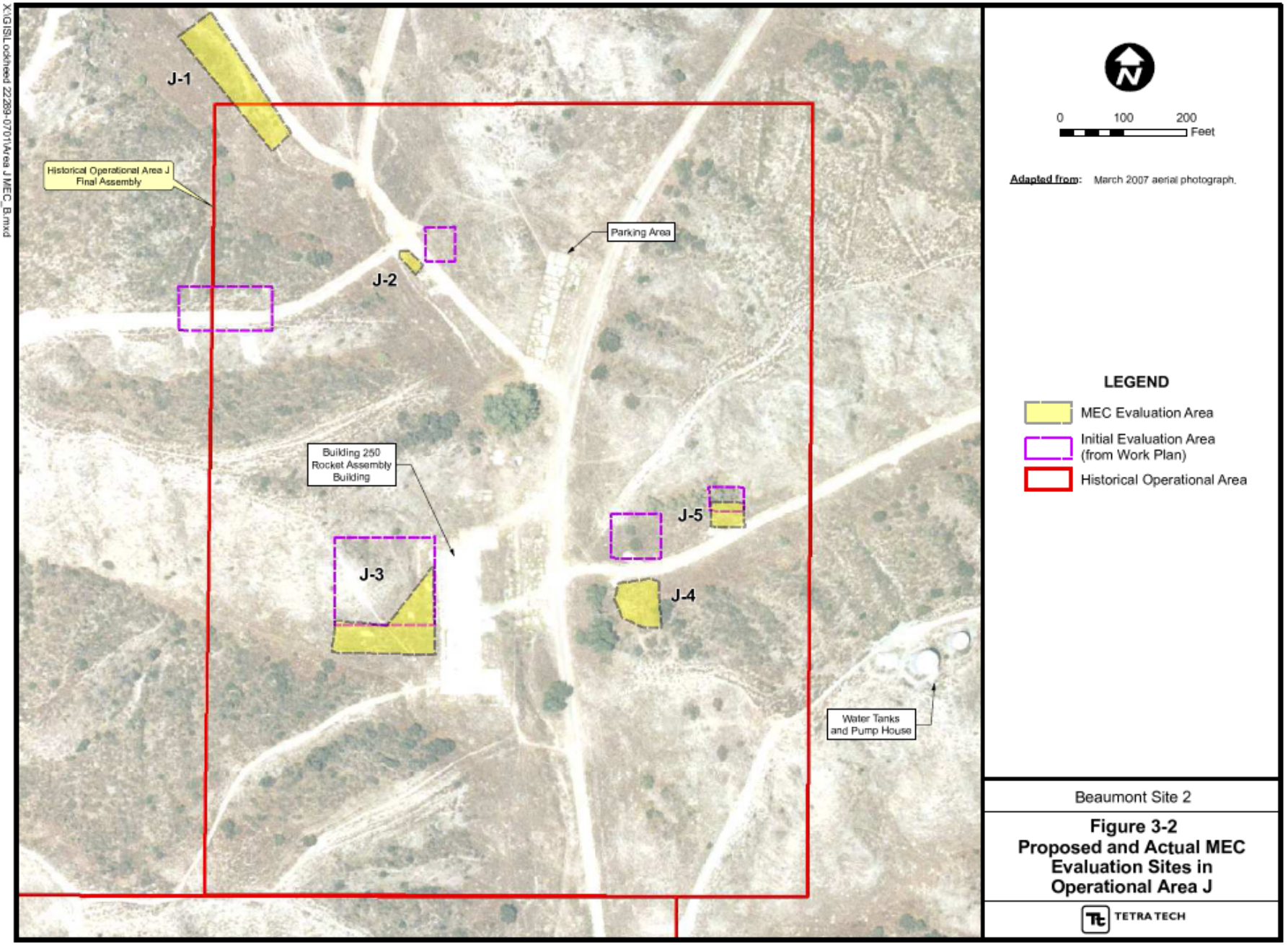
There were two areas of general interest in Operational Area L (See Figure 3-4):

- A former pasture area dating from the 1940s with a large depression at either end (north and south) (L-1); and,
- A large cleared area near the mouth of the canyon housing the former garbage disposal site (L-2).

The former pasture area (L-1) was selected as an evaluation site since the man-made depressions present could have been used for burning propellant or disposal of waste materials. During a site walk in 2006 it was noted that the area also contains piping and concrete debris, although no structure is known to have ever been located here. This evaluation site was re-located during the field activities to coincide with a historical description of the propellant burning area that placed the area in a box canyon west of the pasture area.

The large cleared area west of the garbage disposal site (L-2) could have been used as a staging or storage area during the life of the facility. The outer portions of this site which were located behind structures observed on historical aerial photographs were selected as an evaluation site to determine whether disposal could have taken place in this vicinity. It should be noted that although a portion of this evaluation site is actually located in Operational Area M, the site as a whole was included in the evaluation strategy for Operational Area L for simplicity.

The two evaluation sites for Operational Area L (L-1 and L-2) are shown on Figure 3-4. The figure shows both the proposed evaluation sites and the final evaluation sites. The locations and boundaries of the sites were adjusted as appropriate in the field to accommodate actual terrain features and to ensure that the intent of the evaluation was preserved (e.g., disposal generally does not take place on steep slopes).


X:\GIS\Lockheed 22289-0701\Area J MEC_B.mxd
J-1
Historical Operational Area J
Final Assembly
J-2
Parking Area
Building 250
Rocket Assembly
Building
J-3
J-5
J-4
Water Tanks
and Pump House
0
100
200
Feet
Adapted from: March 2007 aerial photograph.
LEGEND
MEC Evaluation Area
Initial Evaluation Area
(from Work Plan)
Historical Operational Area
Beaumont Site 2
Figure 3-2
Proposed and Actual MEC
Evaluation Sites in
Operational Area J
TETRA TECH

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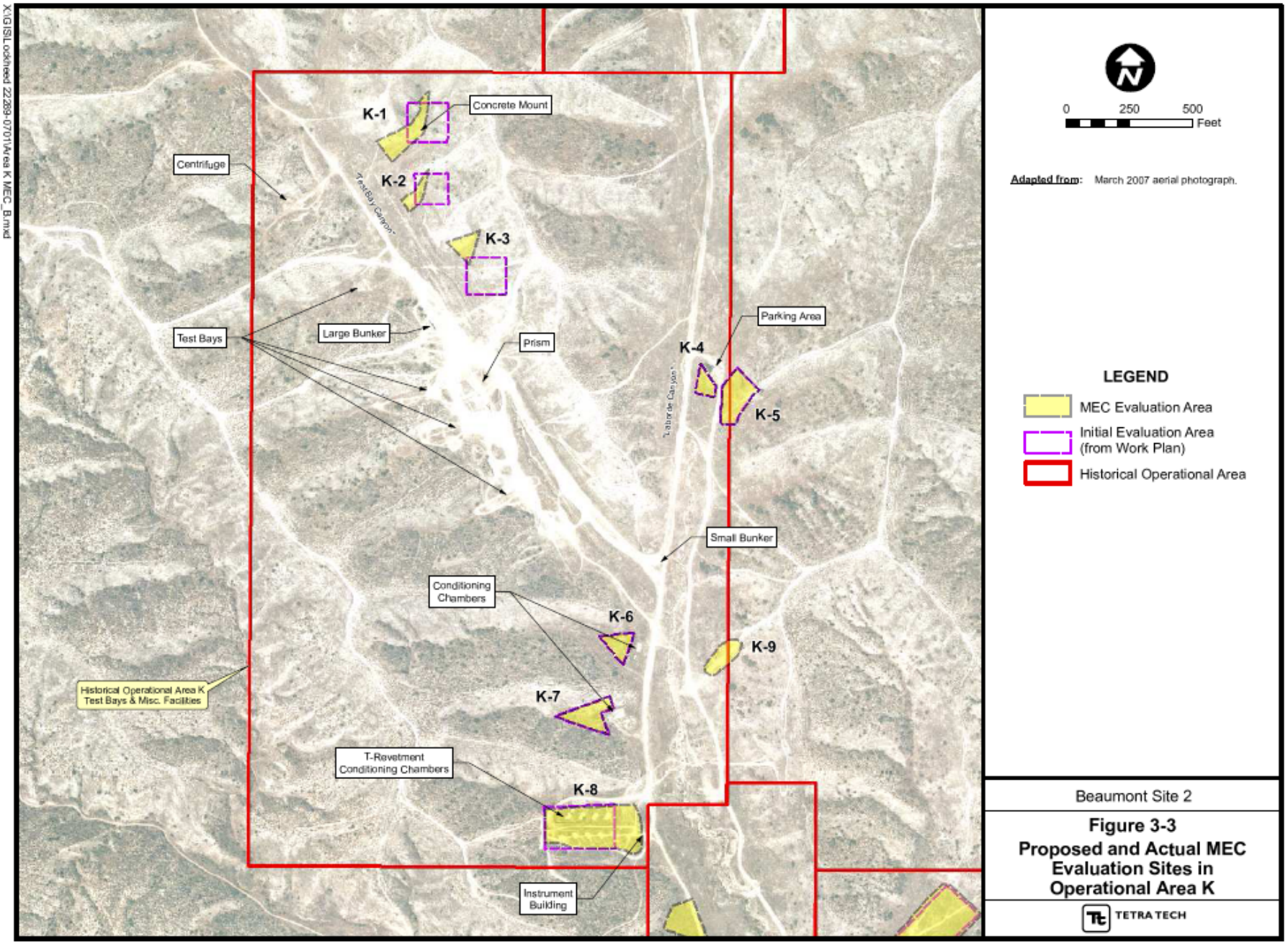
X:\GIS\Locklheed 22289-07011\Area K MEC_B.mxd
K-1
Concrete Mount
Centrifuge
K-2
K-3
Test Bays
Large Bunker
Prism
Parking Area
K-4
K-5
Small Bunker
Conditioning Chambers
K-6
K-9
Historical Operational Area K Test Bays & Misc. Facilities
K-7
T-Revetment Conditioning Chambers
K-8
Instrument Building
0
250
500
Feet
Adapted from: March 2007 aerial photograph.
LEGEND
MEC Evaluation Area
Initial Evaluation Area (from Work Plan)
Historical Operational Area
Beaumont Site 2
Figure 3-3
Proposed and Actual MEC Evaluation Sites in Operational Area K
TETRA TECH

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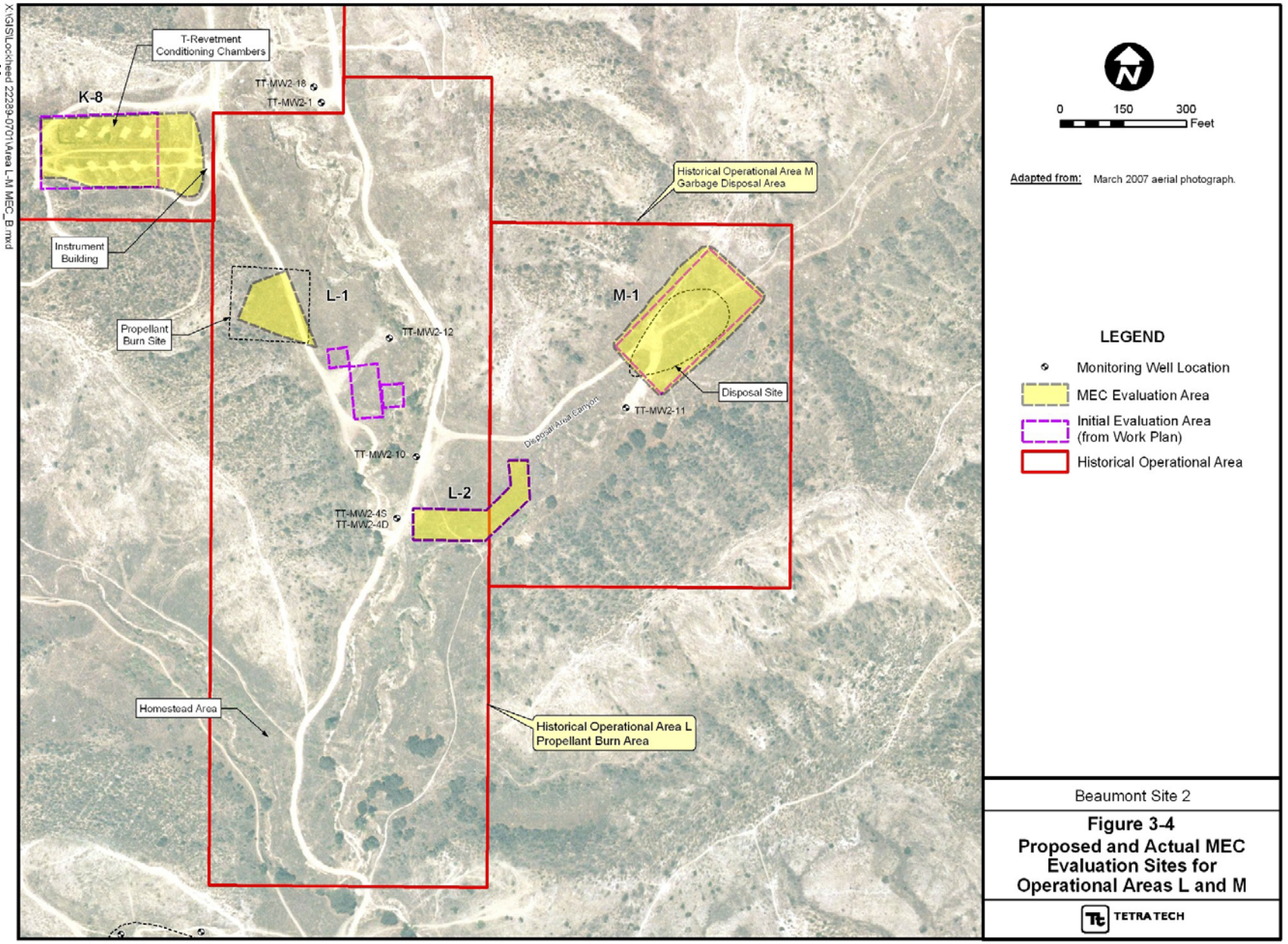
X:\GIS\Lockheed 22289-07011\Area L-M MEC_B.mxd
T-Revetment Conditioning Chambers
K-8
TT-MW2-18
TT-MW2-1
Historical Operational Area M Garbage Disposal Area
Instrument Building
L-1
M-1
Propellant Burn Site
TT-MW2-12
Disposal Site
TT-MW2-11
Disposal Area Canyon
TT-MW2-10
L-2
TT-MW2-4S
TT-MW2-4D
Homestead Area
Historical Operational Area L Propellant Burn Area
0
150
300
Feet
Adapted from: March 2007 aerial photograph.
LEGEND
Monitoring Well Location
MEC Evaluation Area
Initial Evaluation Area (from Work Plan)
Historical Operational Area
Beaumont Site 2
Figure 3-4
Proposed and Actual MEC Evaluation Sites for Operational Areas L and M
TETRA TECH

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3.4 OPERATIONAL AREA M

There was a single area of interest in Operational Area M (See Figure 3-4)::

- The former garbage disposal site for Site 2 (M-1).

Reportedly, the former garbage disposal site (M-1) was evaluated and the refuse was been removed. It is known that at one time Ogden buried hazardous waste at this site. Although there is no evidence to support this theory, the company could potentially have also buried some of the explosively operated devices that were reportedly tested at Site 2. For this reason, the former garbage disposal site was included as an evaluation site to determine whether the refuse has been substantially removed per the closure report (Radian, 1993). The former garbage disposal site is shown on Figure 3-4.

3.5 GATEWAY PROPERTY

There were two general areas of interest on the Gateway Property (See Figure 3-5):

- A long rectangular area beside the access road through the property (GP-1)
- A small clearing in the northwest portion of the property (GP-2)

The historical records search conducted for Site 2 yielded a building permit for the construction of an ammunition bunker somewhere within an area that includes the Gateway property. No obvious structure was noted during the aerial photo review or has been observed from the roadways during previous site visits, but this structure was very small. Since any material stored in this structure could potentially have been disposed of via burial near the structure, two general areas on the Gateway Property near roadways were identified for visual evaluation (GP-1 and GP-2). The field team was also instructed to evaluate any other potential or likely areas noted while traversing the roads on this property. The two evaluation sites on the Gateway Property are shown on Figure 3-5.

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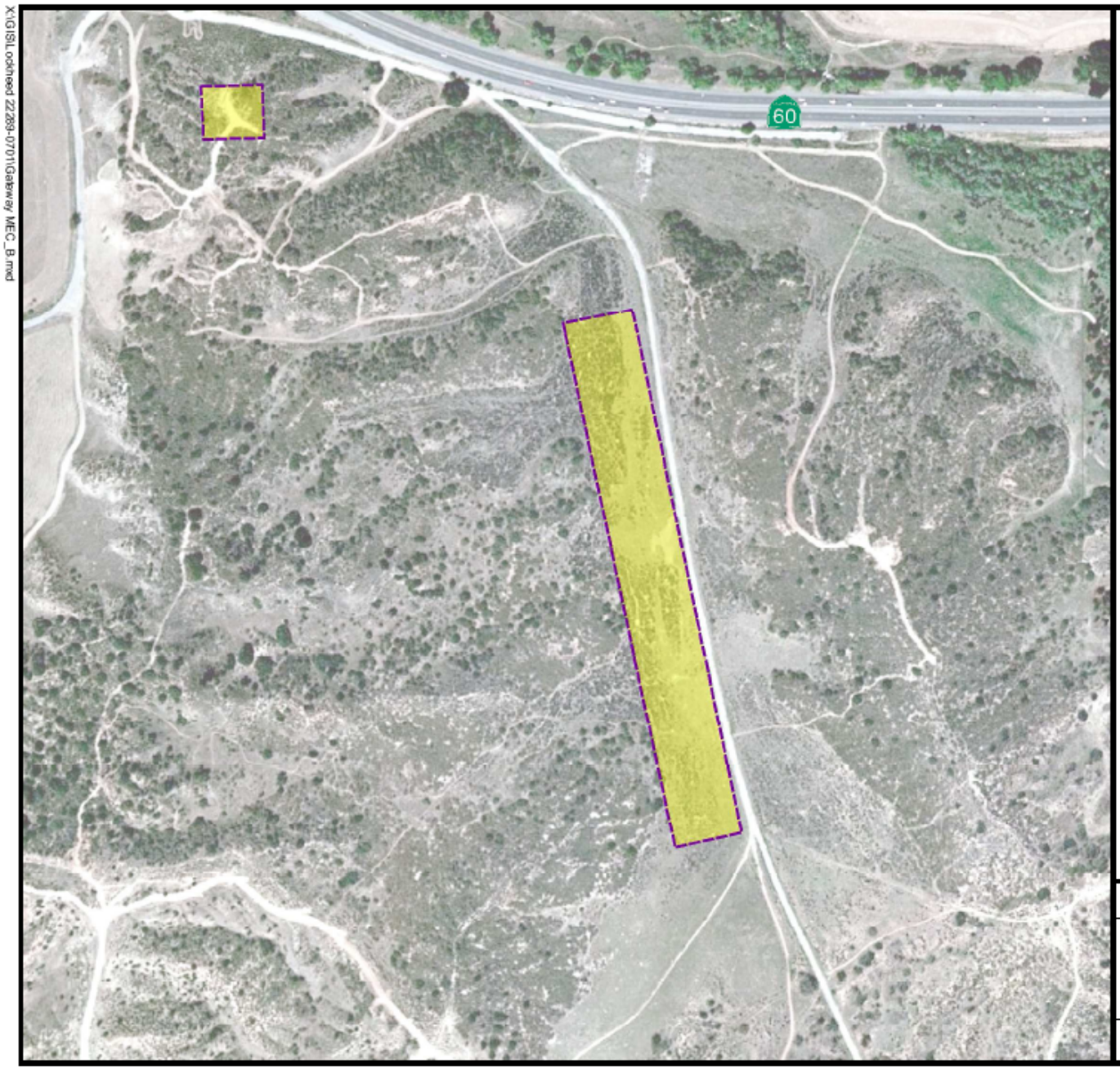

0 200 400 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- MEC Evaluation Area
- Initial Evaluation Area (from Work Plan)
- Historical Operational Area

Add labels on GP-1 and GP-2

Beaumont Site 2

Figure 3-5
Proposed and Actual MEC Evaluation Sites for the Gateway Property

TETRA TECH

X:\GIS\Lockheed 22269-07011\Gateway MEC_B.mxd

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4.0 FIELD METHODS

4.1 MAG, FLAG AND DIG EVALUATION

Mag, Flag and Dig was the primary technique used during this MEC evaluation. This technique was applied at all evaluation sites except the former garbage disposal site in Operational Area M. The geophysical evaluation used for the garbage disposal site is discussed in Section 4.2. The Mag, Flag and Dig procedure was conducted using Vallon VMH electromagnetic pulse induction all-mine/all-metal detectors. The Vallon search head continuously emits electromagnetic pulses as the operator sweeps the head close to the ground surface. Between each magnetic pulse is a short pause. During these pauses, the electro- magnetic reaction created in sub-surface metal objects by the Vallon pulses is detected by the search head. The reaction time is dependant on the size of the metallic objects and their distance from the search head. The detector's receiver processes the response from the subsurface metal object and converts it to an acoustic signal which the operator uses to pinpoint the location of the item. The Vallon VMH is capable of detecting objects the size of a 20mm projectile to depths of approximately 6 to 8 inches depending in the orientation of the item and the level of background interference from magnetic soils, cultural debris or other factors.

Mag, Flag and Dig was conducted in accordance with the procedures in the approved work plan. This entailed setting up 5-foot wide survey lanes in the various evaluation sites and then sweeping the area within those lanes using a Vallon all-metal detector to locate subsurface metal anomalies. Each detected anomaly was marked with a pin flag for reference (flagged). When all anomalies within each evaluation site were flagged, the SUXOS randomly selected 20 to 30 anomalies for intrusive evaluation. At some sites, less than 25 anomalies were detected. In these instances, all flagged anomalies were intrusively evaluated. In addition, if any potential signs of MEC-related uses such as trash pits, burn pits or MEC-related scrap were found provisions were included in the methodology to allow the SUXOS to concentrate intrusive efforts in suspect areas or to excavate additional anomalies for evaluation. This flexibility was intended to ensure that sufficient and appropriate data were obtained. The location of all anomalies selected for evaluation was recorded using a Leica differential global positioning system (DGPS) to accurately place the anomalies within Site 2. The depth of the items was recorded along with a description and any other information considered pertinent by the SUXOS.

After intrusive evaluation and quality control activities were complete, the excavations were back-filled with the material removed. The recovered anomalies were consolidated in a pile at each evaluation site. The results of the Mag, Flag and Dig are presented in Section 5.1.

4.2 GEOPHYSICAL EVALUATION

The former garbage disposal site at Site 2 was evaluated using a Geonics EM-31 MKI ground conductivity meter. The EM31 MKI is a frequency domain electromagnetic instrument that has the ability to detect metallic and non-metallic debris. The EM31 operates as a frequency

domain electromagnetic induction (EMI) methodology, whereby a primary magnetic field is generated beneath the ground surface by a current in the transmitter coil. This primary magnetic field induces current to flow within the ground (i.e., eddy currents), which produce a secondary magnetic field that is detected along with the primary field at the receiver coil. The ratio of the secondary field to the primary field is linearly related to terrain conductivity under certain constraints. Two components of the secondary magnetic field are digitally measured; the quadrature phase (terrain conductivity) as millimhos per meter (mmhos/m), and the in-phase component expressed in parts per thousand of the primary signal (a measure of signal amplitude). The in-phase component of the signal recorded by the instrument is particularly sensitive to ferrous and non ferrous metallic material.

EMI surveys are used to detect both contrasts in ground conductivity and the presence of metallic (ferrous and nonferrous) materials. Conductivity contrasts in the earth can be caused by natural phenomena, such as variations in lithology or moisture content, or manmade phenomena such as disturbed ground, buried metal, and in certain cases contaminants in the soil and groundwater. The depth of investigation is related to the separation between the transmitter and receiver coils, the operational frequency, and the coil orientation(s). In general, the EM31 MKI used in the vertical dipole mode (as it was for this project) is sensitive to conductivity variations at depths up to 5 to 6 meters. A Juniper Allegro coupled to the EM31 was used to collect and store the digital data at a rate of approximately 10 times per second, which translates into a measurement every 3-5 inches along the ground surface at a walking pace of approximately 3-4 ft per second. Data was acquired over the garbage disposal site along adjacent transects separated by approximately 20 ft. The long axis (i.e., “boom”) of the EM31 was oriented perpendicular to the direction of the data acquisition lines. This spatial sample density is sufficient to detect aggregates of larger metal items, as well as expansive areas of non-metallic waste disposal anticipated to be present if the garbage disposal site removal previously conducted was incomplete. Positioning of the EM31 MKI instrument was accomplished by using the same high-resolution DGPS used for the Mag, Flag and Dig operations.

At the end of the garbage disposal site survey the EM31 MKI and position data were processed with software developed by TtEC geophysicists. The processed data were uploaded to Geosoft Oasis Montaj, and color-coded images of the sensor intensity were generated. These color-coded images provided information regarding subsurface conditions. The results of the evaluation are discussed in Section 5.2.

4.3 QUALITY CONTROL

The QC program for this evaluation project consisted of process control. Process QC is concerned with improving the efficiency and effectiveness of the processes. This can be considered a preventative approach to QC as it aims to detect problems early and improve processes before the final product is produced. The quality of the work was ensured by strict

adherence to the standard procedures in the work plan, including those regarding function testing for detection equipment. Effective identification of MEC relies heavily on properly functioning detection equipment.

The process QC for the Follow-On MEC Evaluation was conducted using a three-phase control system. The system included preparatory, initial, and follow-up inspections (surveillance) to ensure use of adequate controls and to ensure that opportunities for improving processes were captured and implemented.

A preparatory phase inspection was performed before the beginning of field activities. The purpose of this inspection was to review applicable specifications and verify that the necessary resources, conditions, and controls were in place and compliant. In short, this inspection answered the question, "Are we ready to do the work?" The UXO Quality Control Specialist (UXOQC) performing the preparatory phase inspection verified that the appropriate plans were available, the required training had been performed, the required preparation work had been completed, the necessary equipment was available, had been calibrated and was properly functioning, and the level of quality expected was understood by the field personnel.

An initial phase inspection was also performed during the first occurrence of field work. This inspection was conducted to check preliminary work for compliance with procedures and work plan specifications. Other objectives include establishing the acceptable level of workmanship, checking safety compliance, checking for omissions, and resolving differences in interpretation of procedures and plans, if any. The UXOQC performing the initial phase inspection verified that any deficiencies identified during the preparatory phase had been corrected and that requirements for the quality of workmanship were established. This individual also verified the adequacy of the work.

The follow-up phase inspections were performed continuously, since the UXOQC for this 3-week long project also served as the safety officer observing field operations daily. The UXOQC monitored the practices and operations taking place and verified continued compliance with the specifications and requirements of work plan. The reports documenting the three-phase inspection activities are included in Appendix A.

4.3.1 Process Checks and Inspections

Process quality control was applied to Mag, Flag and Dig operations at Site 2 by performing a percentage-based inspection of the areas subjected to MEC evaluation. In areas where Mag, Flag and Dig was performed, 90 to 95 percent of the excavations were re-checked by the UXOQC to ensure that all anomalies of interest (those producing clear, audible signals) were detected and investigated. Daily equipment checks were also made to ensure the necessary equipment was available, had been calibrated and was properly functioning.

Process quality control was exercised during geophysical mapping of the garbage disposal site by performing the manufacturer - recommended instrument function tests specified in the EM31

operation manual, data checks (e.g., precision of DGPS positions, EM31 instrument "noise", lag", and response to surface metal items),, and review of the data by a senior California registered geophysicist.

4.3.2 Equipment Function Checks and Calibration

Equipment function testing and calibration were the major elements in the process QC for this project. Effective identification of MEC relies heavily on properly functioning and properly operated detection equipment. All MEC detection equipment was function tested daily utilizing metal items placed on the ground to ensure that the objects were generating an appropriate response (audible signal) from the detectors. The EM31 instrument used to evaluate the former garbage disposal site is calibrated at the factory, so no absolute calibration was performed during field investigations. However, several functional checks designated in the EM31 operational manual were performed prior to the field data collection to ensure the instrument was operating as per the manufacturer guidelines.

4.4 SAFETY

The Follow-On MEC Evaluation activities were performed in accordance with the approved Environmental Health and Safety Plan approved for the project (Tetra Tech, 2005). This plan was prepared for a large scale MEC evaluation at Beaumont Site 1 and was amended as necessary for this project to accommodate specific conditions.

One safety issue was noted during the field operations. Smoke was noted on the horizon and since this site is located in a canyon with only one ingress/egress route (other than hiking overland), the UXO Safety Officer for the project evacuated the crew from the site for approximately 2 hours. Since wildfires are of great concern in the Beaumont (Site 2) region, the staff did not re-enter the site until it was confirmed that the smoke was un-related to a brush fire.

5.0 SUMMARY OF FINDINGS

The following sections include a summary of the results of various components of the Follow-On MEC Evaluation and conclusions based on the data collected.

5.1 RESULTS OF MAG, FLAG AND DIG MEC EVALUATION

Approximately 12.6 acres of land were intrusively evaluated in 15 of the 19 final evaluation sites using Mag, Flag and Dig techniques. At two additional sites (the general areas on the Gateway Property [GP-1 and GP-2]), approximately 8.35 acres were visually evaluated but no evidence was found with which to determine appropriate locations for Mag, Flag and Dig operations. At a third site (K-9), approximately .26 acres were evaluated visually and with metal detectors but no anomalies were identified for excavation. The final site was the former garbage disposal site in Area M (M-1). This 1.48 acre site was evaluated using geophysical mapping with an EM-31. The findings for this work are presented in Section 5.2.

No MEC or related items were found at any of the evaluation sites. Although one suspect item was found at site L-2, further investigation did not support the identification of the item as MEC related.

Table 5-1 presents a summary of the field results for the MEC evaluation by operational area and site. The specific results for evaluation at each of the sites are discussed in Sections 5.1.1 through 5.3.3. Completed dig sheets for each area, as appropriate, are included in Appendix B and photographs showing items of interest from the MEC evaluation are presented in the photo log in Appendix C.

5.1.1 Operational Area J

Five sites were successfully evaluated in Area J. The boundaries for the areas were adjusted slightly in most cases to account for local topography. Two sites (J-2 and J-4) were moved relatively significant distances to remove them from steep hillsides and place them in flat areas that appeared consistent with conditions suitable for potential disposal. Sites J-3 and J-5 were also slightly shifted for the same reason. These sites were originally placed using aerial photography and it was difficult to clearly discern the terrain in that manner. No MEC was found in the Operational Area J sites during the MEC evaluation. Three expended 9mm bullets were found at two of the sites (2 at one site and one at another), but these are not likely related to historical operations. Note that the term “bullet” is used in this report to describe the expended projectile portion of a small arms round or cartridge, exclusive of the casing. This is consistent with the common definition of this term. The specific items found at each Area J site are described briefly in the following sections.

5.1.1.1 Site J-1

This site is located in a remote area near the western boundary of Area J along a dirt access road. It consists of a flat area beside the road that appeared consistent with conditions suitable

for disposal. All four (4) of the anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of a metal band, some metal flakes and two expended 9mm "Wad Cutter" bullets. These bullets were likely deposited during modern era target practice which is reportedly wide-spread on Site 2 due to the remote location and numerous small box canyons. Figure 5-1 shows the locations of metal items discovered during the evaluation at Site J-1.

Table 5-1. Summary of MEC Evaluation Findings

Operational Area	Site No.	No. of Anomalies Detected	No. of Anomalies Dug	% Dug	Description of Anomalies
J	J-1	4	4	100	Metal waste including expended 9mm bullets
	J-2	7	7	100	Metal waste including chain-link fence and metal signs
	J-3	25	60	42	Metal waste including an expended 9mm bullet
	J-4	25	40	62.5	Metal waste including a large vent cover
	J-5	19	19	100	Metal waste
K	K-1	21	21	100	Metal waste including several cans
	K-2	8	8	100	Metal waste (mostly beer and soda cans)
	K-3	6	6	100	Metal waste (cans and lids only)
	K-4	15	15	100	Metal waste; one dig with metal slag
	K-5	20	20	100	Metal waste
	K-6	11	11	100	Metal waste; three large anomalies including a cable and piping running through the site and a concrete slab
	K-7	9	9	100	Metal waste including expended .22 and .45 caliber casings
	K-8	15	15	100	Metal waste including a large electrical box with wiring and shell casings and a conduit
	K-9	0	--	--	No anomalies found
L	L-1	25	67	37	Metal waste including expended small arms casings
	L-2	25	59	42	Metal waste including expended small arms casings
M	M-1	0	--	--	Surface metal (piping, fence posts, etc.) found at several locations; no MEC related items noted on the surface.
Gateway Property	GP-1	0	--	--	No anomalies found
	GP-2	0	--	--	No anomalies found

5.1.1.2 Site J-2

This site is located in a remote area west of the historical rocket motor assembly building along a dirt access road. It consists of a flat area beside the road that appeared consistent with conditions suitable for disposal. All seven (7) of the anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of a thin metal disk, two short metal rods, wire and a nail. Figure 5-2 shows the revised area and the locations of metal items discovered during the evaluation at Site J-2.

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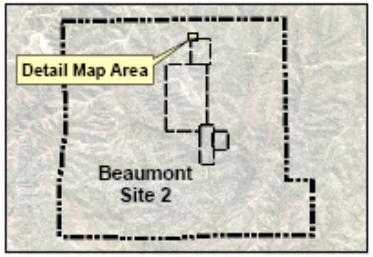
0 25 50
Feet

Adapted from:
April 2007 aerial photograph.

LEGEND

Contact Location

MEC Evaluation Area



Beaumont Site 2

Figure 5-1
Evaluation Summary
Results for J-1

TETRA TECH

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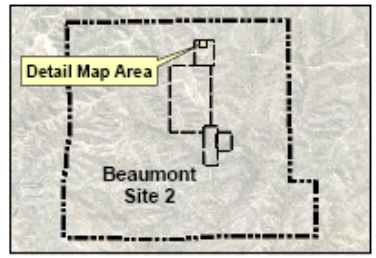
N

0 20 40 Feet

Adapted from:
April 2007 aerial photograph.

LEGEND

- Contact Location
- MEC Evaluation Area
- Initial Evaluation Area (from Work Plan)



Beaumont Site 2

Figure 5-2
Evaluation Summary Results for J-2

TETRA TECH

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5.1.1.3 Site J-3

This site is located directly behind the former rocket motor assembly building. The proposed evaluation area was rectangular; however, the area for evaluation was modified to exclude steep terrain. Twenty-five (25) of the 60 anomalies identified at this site were randomly selected and excavated for evaluation. Those anomalies evaluated consisted of two metals signs, a small diameter gas cylinder, a 3-foot piece of chain-link fence, a 2.5-foot length of pipe, beer cans, a single expended 9mm bullet, and assorted small metal scrap. Figure 5-3 shows the revised area and the locations of metal items discovered during the evaluation at Site J-3.

5.1.1.4 Site J-4

This site is located directly east of the former rocket motor assembly building along a former service road branching from the main access road. The proposed evaluation area was rectangular; however, the area for evaluation was modified slightly to exclude steep terrain. Twenty-five (25) of the 40 anomalies identified at this site were randomly selected and excavated for evaluation. Those anomalies evaluated consisted of a large vent cover, 8 short metal rods, sheet metal, nails, wire, metal flakes and a few other pieces of miscellaneous metal scrap. Figure 5-4 shows the revised area and the locations of metal items discovered during the evaluation at Site J-4.

5.1.1.5 Site J-5

This site is located east of J-4 along the same former service road. All nineteen (19) anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of ten nails, some metal banding, a key, a beer can, a bottle cap and a few pieces of miscellaneous metal scrap. Figure 5-5 shows the revised area and the locations of metal items discovered during the investigation at Site J-5.

5.1.2 Operational Area K

Nine sites were successfully evaluated in Area K. The boundaries for the areas were adjusted slightly in some cases to account for local topography; however, no significant modifications were made. No MEC was found in the Operational Area K sites during the MEC evaluation. Twenty-four (24) expended .22 caliber casings and one expended .44 caliber casing were found at one site (K-7) and two expended 9mm casings and one expended .44 caliber casing were found at another site (K-8). These casing are not likely related to historical operations. One other site contained concrete debris along with long runs of pipe and cable indicating that this evaluation site may contain a portion of the footprint of a historical structure. The items found at each Area K site are described briefly in the following sections.

5.1.2.1 Site K-1

This site is located near the northern end of the former rocket motor test bay canyon at Site 2. It consists of a small box canyon which branches northeast from the main canyon. This canyon

was utilized by Aerojet Corporation for testing of reportedly inert projectiles. The proposed evaluation area was rectangular; however, the area was modified to fit the configuration of the canyon. The final evaluation area included the entire canyon floor, accessible wall areas and the area just in front of the mouth of the canyon. All twenty-one (21) anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of two thick metal disks (1 inch thick and 5 inches in diameter), two large hex-head nuts, a piece of rebar, two pieces of thick metal, and a small lead slug (penny size) along with beer and soda cans, wire, and a paint can. Figure 5-6 shows the revised area and the locations of metal items discovered during the evaluation at Site K-1.

5.1.2.2 Site K-2

This site is a small box canyon near the northern end of the former rocket motor test bay canyon at Site 2. The site is located southeast of K-1 and is slightly smaller in size. The proposed evaluation area was rectangular; however, the area was modified to fit the configuration of the canyon. The final evaluation area included the entire canyon floor, accessible wall areas and the area just in front of the mouth of the canyon. All eight (8) anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of a 3-foot long piece of small diameter pipe, four beer cans, a soda can, a small miscellaneous can and a can lid. Figure 5-7 shows the revised area and the locations of metal items discovered during the evaluation at Site K-2.

5.1.2.3 Site K-3

This site is located southeast of K-2, near the northern end of the former rocket motor test bay canyon at Site 2. It consists of a small, broad-mouthed box canyon which branches northeast from the main canyon. The proposed evaluation area was rectangular; however, the area was modified to fit the configuration of the canyon and shifted northwest to conform to the field verified location of the canyon. All six (6) anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of three soda cans, two coffee cans, and a single paint can lid. Figure 5-8 shows the revised area and the locations of metal items discovered during the evaluation at Site K-3.

5.1.2.4 Site K-4

This site is located on the east side of Laborde Canyon near the historical site of an L-shaped building. This irregularly-shaped site constitutes the area which would have been behind the east-west leg of the building. All of the proposed area was accessible for evaluation. All fifteen (15) anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of a ten-foot length of telephone pole tensioning wire, a ten-inch piece of angle iron, miscellaneous metal scrap and a 3-foot diameter area containing a large piece of thick metal plate and numerous pieces of metal slag. Figure 5-9 shows the locations of metal items discovered during the evaluation at Site K-4.

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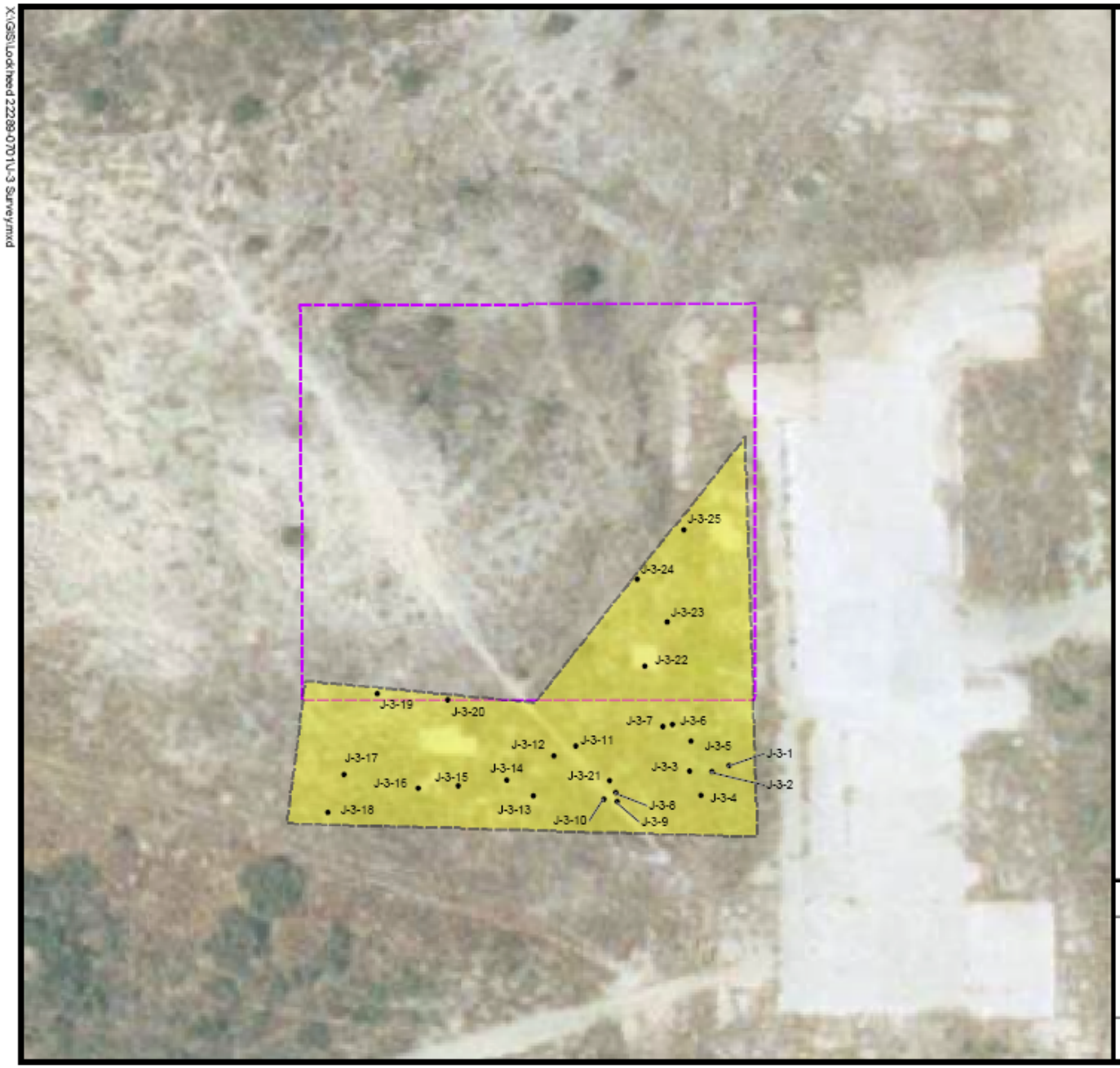

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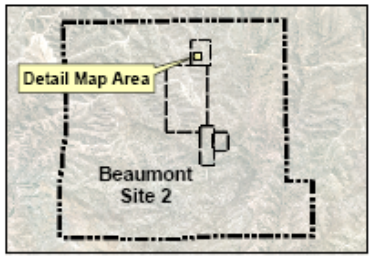
Adapted from:
April 2007 aerial photograph.

LEGEND

- Contact Location
- MEC Evaluation Area
- Initial Evaluation Area (from Work Plan)



Beaumont Site 2

Figure 5-3
Evaluation Summary Results for J-3

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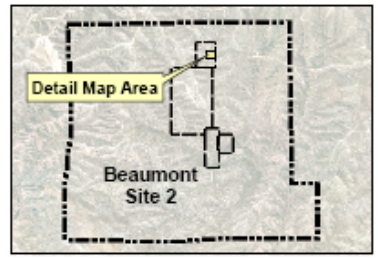
0 25 50 Feet

Adapted from:
April 2007 aerial photograph.

LEGEND

- Contact Location
- MEC Evaluation Area
- Initial Evaluation Area (from Work Plan)



Beaumont Site 2

Figure 5-4
Evaluation Summary Results for J-4

TETRA TECH

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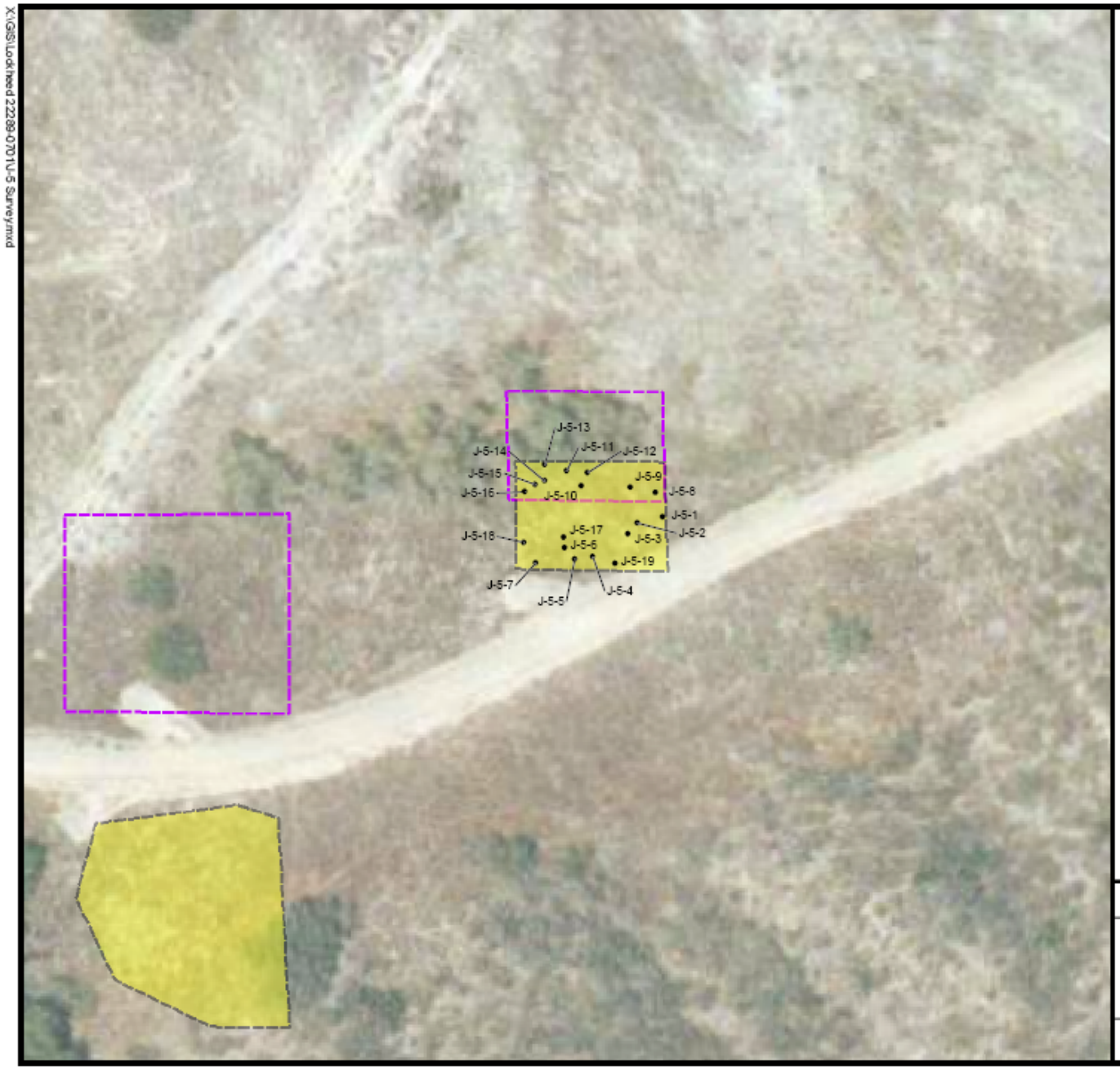


X:\GIS\Lockheed 22289-0701\J-5 Survey.mxd

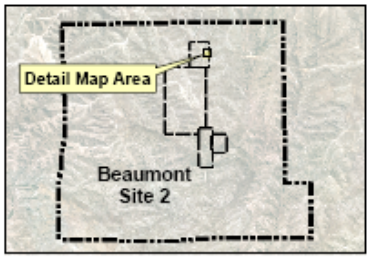
N

0 25 50
Feet

Adapted from:
April 2007 aerial photograph.

LEGEND

- Contact Location
- MEC Evaluation Area
- Initial Evaluation Area (from Work Plan)



Beaumont Site 2

Figure 5-5
Evaluation Summary Results for J-5

TETRA TECH

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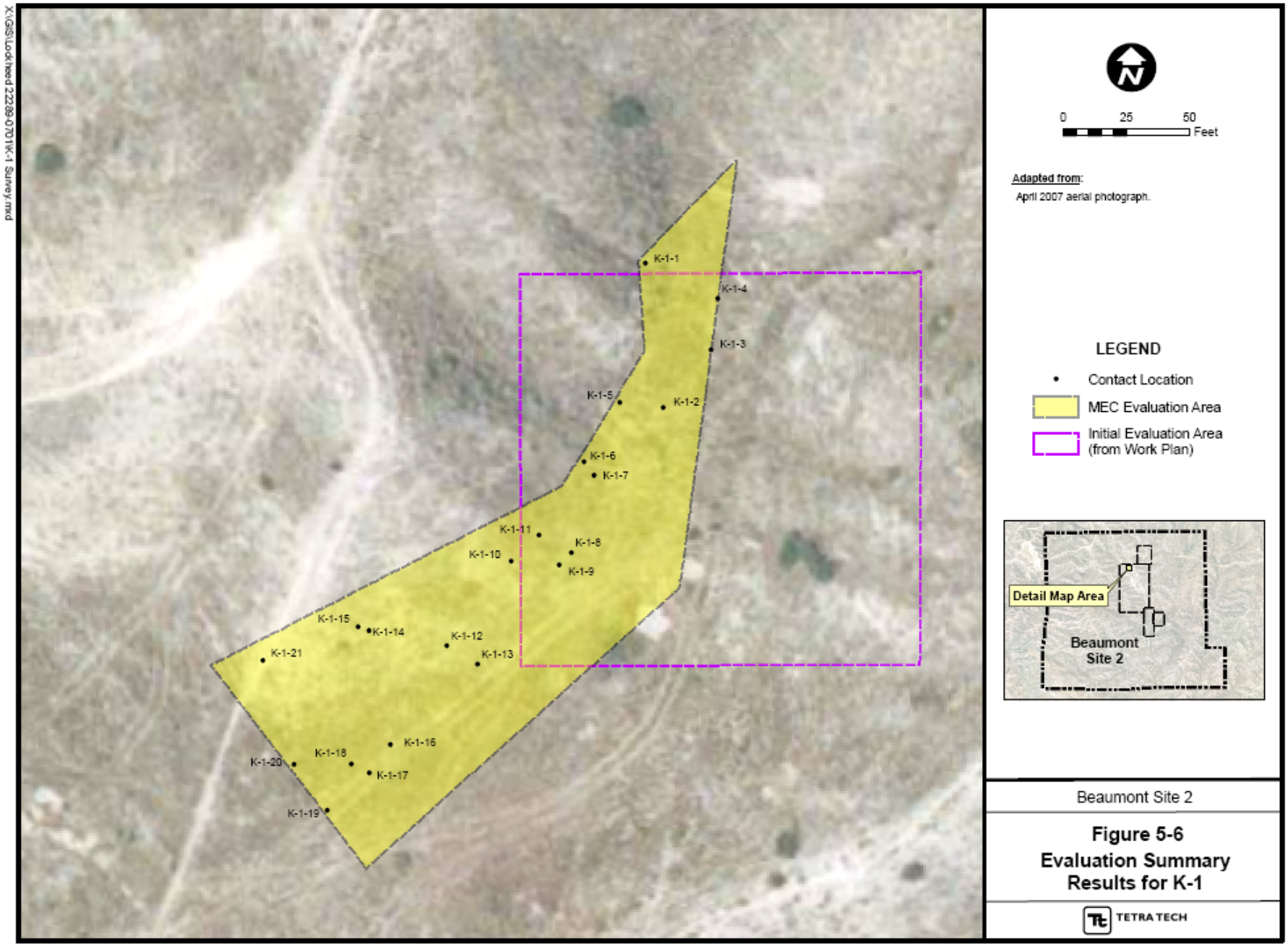
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K-1-9
K-1-15
K-1-14
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K-1-21
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K-1-16
K-1-18
K-1-20
K-1-17
K-1-19
0
25
50
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
Contact Location
MEC Evaluation Area
Initial Evaluation Area (from Work Plan)
Detail Map Area
Beaumont Site 2
Beaumont Site 2
Figure 5-6
Evaluation Summary Results for K-1
TETRA TECH

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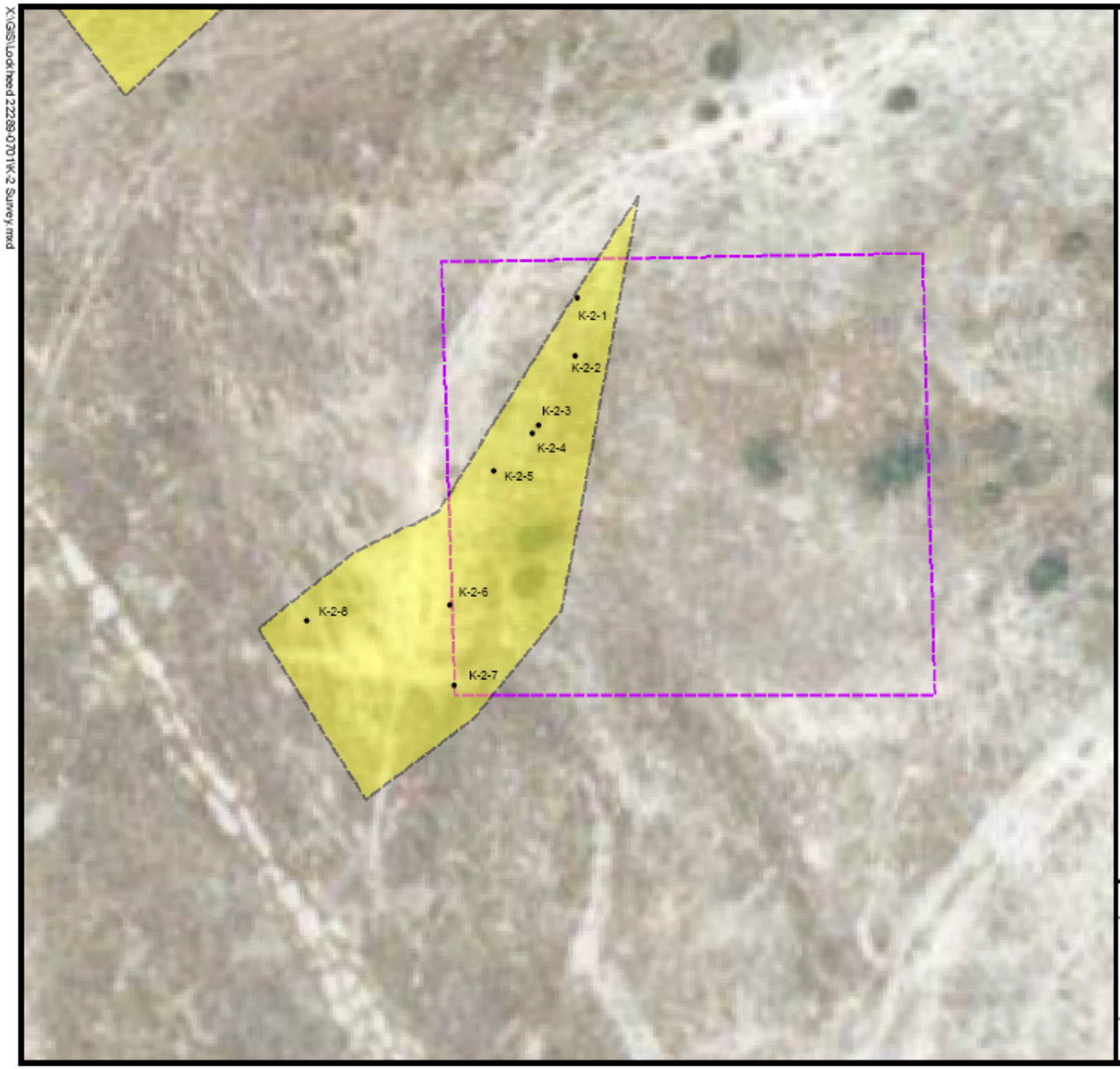
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K-2-1
K-2-2
K-2-3
K-2-4
K-2-5
K-2-6
K-2-7
K-2-8
0
20
40
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
Contact Location
MEC Evaluation Area
Initial Evaluation Area
(from Work Plan)
Detail Map Area
Beaumont
Site 2
Beaumont Site 2
Figure 5-7
Evaluation Summary
Results for K-2
TETRA TECH

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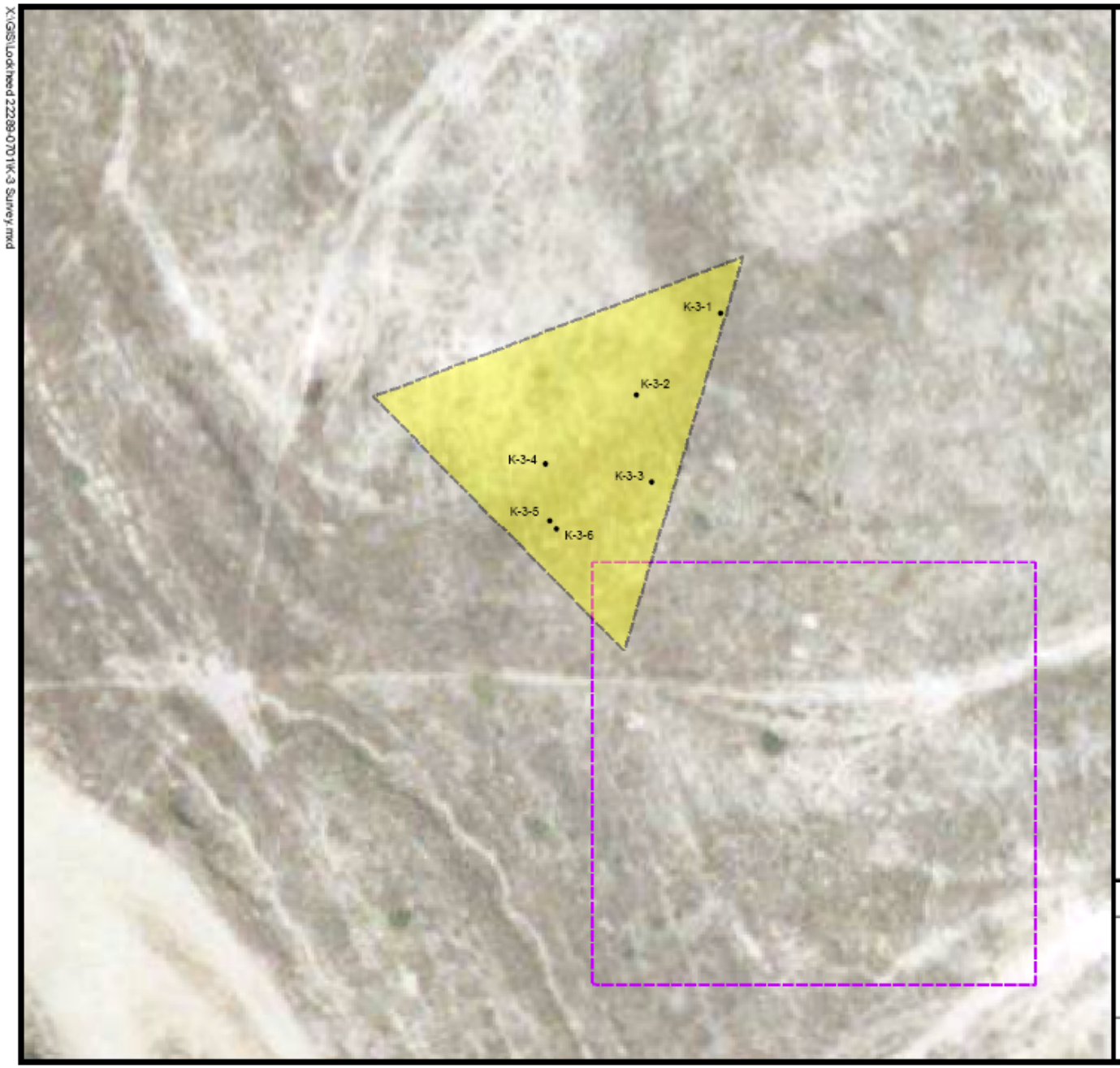

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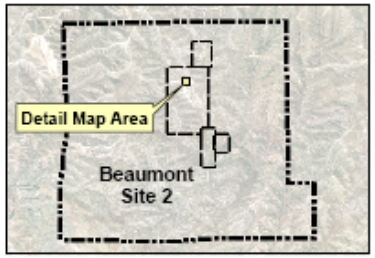
0 25 50 Feet

Adapted from:
April 2007 aerial photograph.

LEGEND
- Contact Location
- MEC Evaluation Area
- Initial Evaluation Area (from Work Plan)



Beaumont Site 2

Figure 5-8
Evaluation Summary Results for K-3

TETRA TECH

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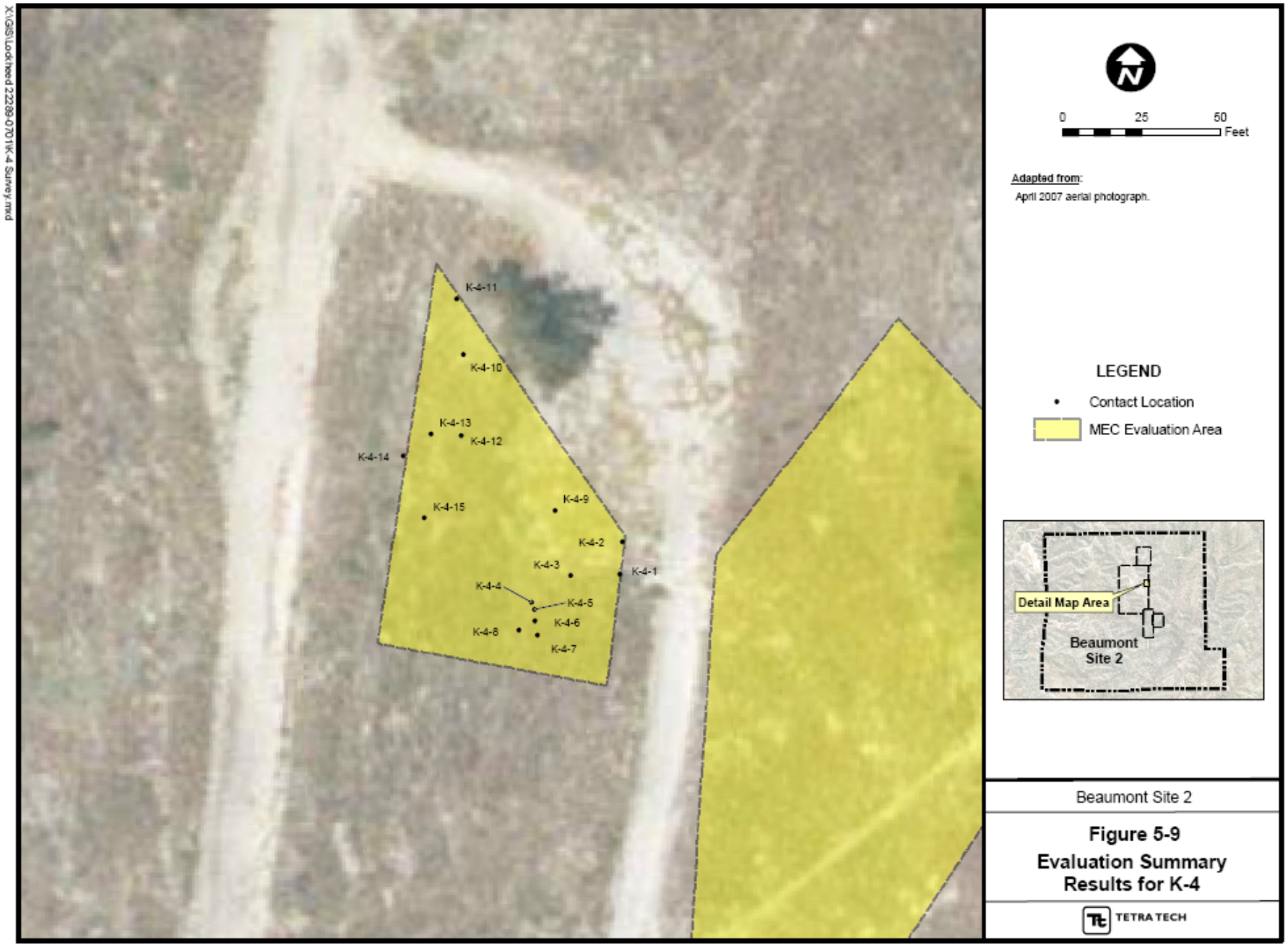
X:\GIS\Lockheed 22289-0701\K-4 Survey.mxd
K-4-11
K-4-10
K-4-13
K-4-12
K-4-14
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K-4-4
K-4-5
K-4-6
K-4-8
K-4-7
N
0
25
50
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
Contact Location
MEC Evaluation Area
Detail Map Area
Beaumont
Site 2
Beaumont Site 2
Figure 5-9
Evaluation Summary
Results for K-4
TETRA TECH

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5.1.2.5 Site K-5

This site is located on the east side of Laborde Canyon near the historical site of an L-shaped building. This irregularly-shaped site constitutes the area which would have been behind the north-south leg of the building. All of the proposed area was accessible for evaluation. All twenty (20) anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of two pieces of thick metal plating/debris, three pieces of flat metal debris, two 1/2-inch diameter wires anchored in the ground, a trash can lid, cans (beer, soda, fruit) and other miscellaneous metal debris. Figure 5-10 shows the locations of metal items discovered during the evaluation at Site K-5

5.1.2.6 Site K-6

This site is located on the west side of Laborde Canyon, south of the junction with the test bay canyon. This irregularly-shaped site constitutes the area behind a former site structure reportedly containing indoor rocket motor conditioning chambers. All of the proposed area was accessible for evaluation. All eleven (11) anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of two long, linear features (one cable and one conduit) running through multiple target points, a concrete slab, an oil can lid and miscellaneous pieces of metal waste such as nuts, bolts and nails. Figure 5-11 shows the locations of metal items discovered during the evaluation at Site K-6.

5.1.2.7 Site K-7

This site is located on the west side of Laborde Canyon, south of K-6. This irregularly-shaped site constitutes the area behind a former site structure reportedly containing indoor rocket motor conditioning chamber. All of the proposed area was accessible for evaluation. All nine (9) anomalies identified at this site were excavated for evaluation. Those anomalies evaluated consisted of a 4-foot piece of small diameter pipe, 24 expended .22 caliber casings, one expended .44 caliber casing, and other miscellaneous debris. Figure 5-12 shows the locations of metal items discovered during the evaluation at Site K-7.

5.1.2.8 Site K-8

This site is located on the west side of Laborde Canyon, south of K-7. This roughly rectangular site was the location of 10 historical outdoor rocket motor conditioning chambers. Each chamber was set in a small bay surrounded on three sides by earthen berms. There was also a large berm shielding the front of the area. The initial evaluation area was expanded to include this berm. Evaluation was limited to the bays and some adjacent berm areas. All proposed area was accessible for evaluation. All fifteen (15) anomalies identified at this site were excavated for evaluation. Those anomalies consisted of a long piece of conduit, 2 9mm casings, one .44 caliber casing, one .357 caliber casing (all expended), a 4-foot square electrical box with wiring, 3 long pieces of angle iron (~3 ft.) and miscellaneous wiring, conduit

and cans. Figure 5-13 shows the revised area and the locations of metal items discovered during the evaluation at Site K-8.

5.1.2.9 Site K-9

This site is located on the east side of Laborde Canyon northeast of Monitoring Well 13. This is the well found to contain the highest levels of RDX during water sampling conducted in 2008. The site consists of a small box canyon and is the only apparent natural or man-made feature near the well. No anomalies were located in the canyon during an instrument-aided sweep of the general area. Since no anomalies were found, there is no figure showing the results of the evaluation at this site.

5.1.3 Operational Area L

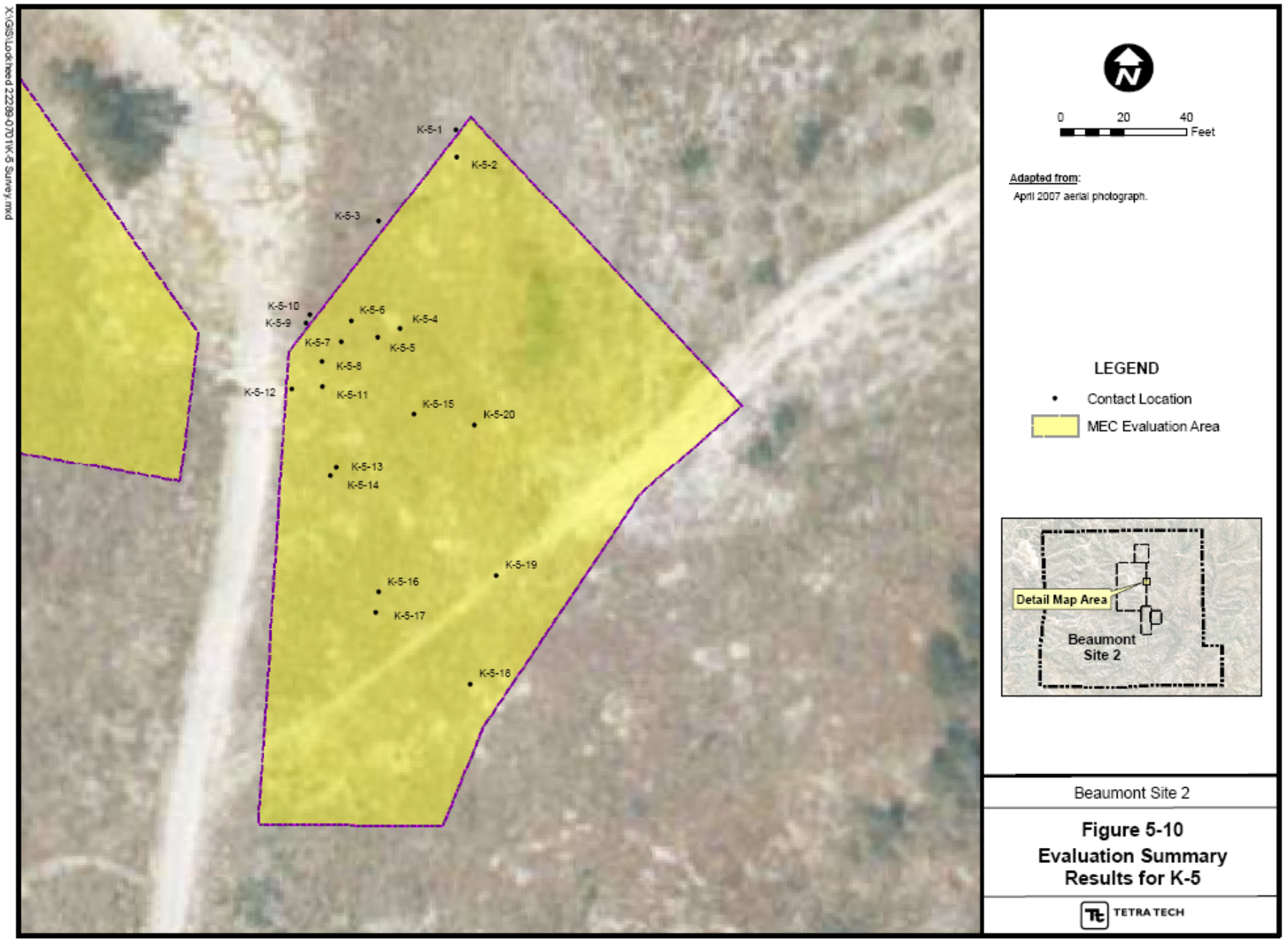
Two sites were successfully evaluated in Area L. One site (L-1) was re-located during field activities to more accurately reflect the location of the site based upon historical data. No MEC was found in the Operational Area L sites during the MEC evaluation. One site (L-2) contained a piece of metal scrap similar in nature to munitions frag; however, after careful evaluation, the SUXOS leading the field team determined that the item was not frag. The items found at each Area L site are described briefly in the following sections.

5.1.3.1 Site L-1

The final location of this site is on the eastern side of Laborde canyon across the canyon from the entrance to the former garbage disposal site at Site 2. It consists of a small box canyon which branches west from the main canyon. According to historical data this site was used to burn waste rocket propellant. The final evaluation site conformed to the shape of the box canyon and included the entire floor of the canyon as well as the area just in front of the mouth of the canyon. Twenty-five (25) of the sixty-seven (67) anomalies identified at this site were randomly selected and excavated for evaluation. Those anomalies evaluated consisted of assorted metal waste (sheet metal, wire, cans, nails), along with an shotgun shell, a 9mm casing and a .357 caliber casing (all expended). Figure 5-14 shows the revised area and the locations of metal items discovered during the evaluation at Site L-1.

5.1.3.2 Site L-2

This site consisted of a large “L”-shaped area that was historically located behind structures in a staging area at the entrance to the canyon housing the former garbage disposal site. Twenty-five (25) of the fifty-nine (59) anomalies identified at this site were randomly selected and excavated for evaluation. Those anomalies evaluated consisted of assorted metal waste (wire, cans, nails, a metal bracket) along with two shotgun shells, a 9mm casing and two .45 caliber casing (all expended). A single piece of metal scrap was found in this area that resembled munitions frag. The item was twisted making it appear jagged like munitions frag. Based upon this potential, all anomalies near this item were excavated to obtain more data regarding the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K-5-18
0
20
40
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
Contact Location
MEC Evaluation Area
Detail Map Area
Beaumont
Site 2
Beaumont Site 2
Figure 5-10
Evaluation Summary
Results for K-5
TETRA TECH

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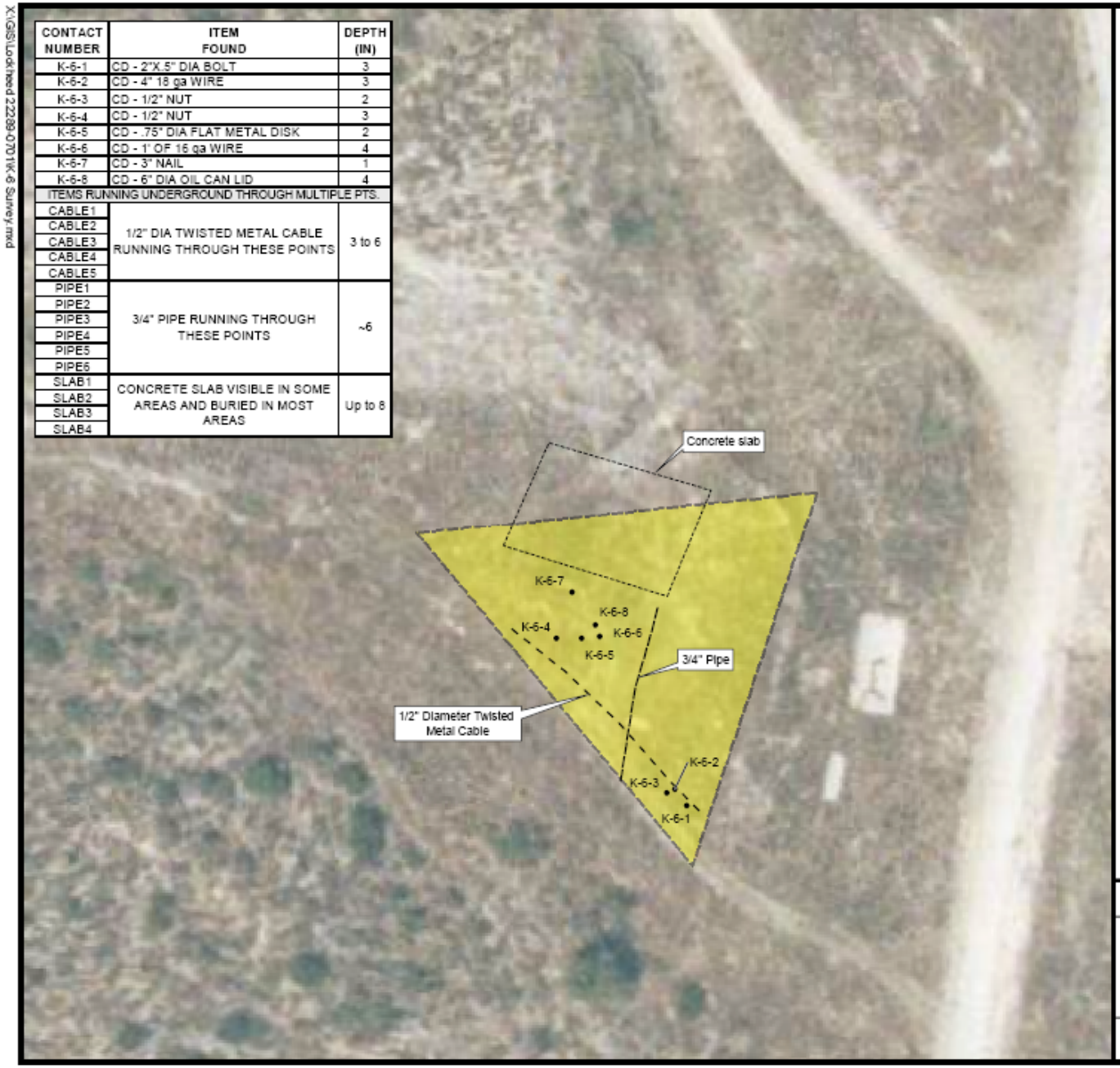
X:\GIS\Lockheed 22289-070\K-6 Survey.mxd

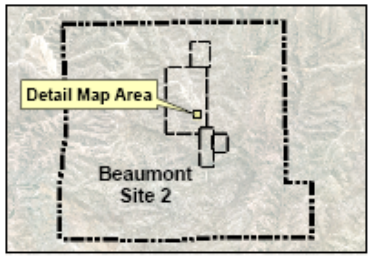
CONTACT NUMBER	ITEM FOUND	DEPTH (IN)
K-6-1	CD - 2"X.5" DIA BOLT	3
K-6-2	CD - 4" 18 ga WIRE	3
K-6-3	CD - 1/2" NUT	2
K-6-4	CD - 1/2" NUT	3
K-6-5	CD - .75" DIA FLAT METAL DISK	2
K-6-6	CD - 1" OF 16 ga WIRE	4
K-6-7	CD - 3" NAIL	1
K-6-8	CD - 6" DIA OIL CAN LID	4
ITEMS RUNNING UNDERGROUND THROUGH MULTIPLE PTS.		
CABLE1	1/2" DIA TWISTED METAL CABLE RUNNING THROUGH THESE POINTS	3 to 6
CABLE2		
CABLE3		
CABLE4		
CABLE5		
PIPE1	3/4" PIPE RUNNING THROUGH THESE POINTS	~6
PIPE2		
PIPE3		
PIPE4		
PIPE5		
PIPE6		
SLAB1	CONCRETE SLAB VISIBLE IN SOME AREAS AND BURIED IN MOST AREAS	Up to 6
SLAB2		
SLAB3		
SLAB4		



0 25 50 Feet

Adapted from:
April 2007 aerial photograph.

LEGEND
- Contact Location
- MEC Evaluation Area



Beaumont Site 2

Figure 5-11
Evaluation Summary Results for K-6

TETRA TECH

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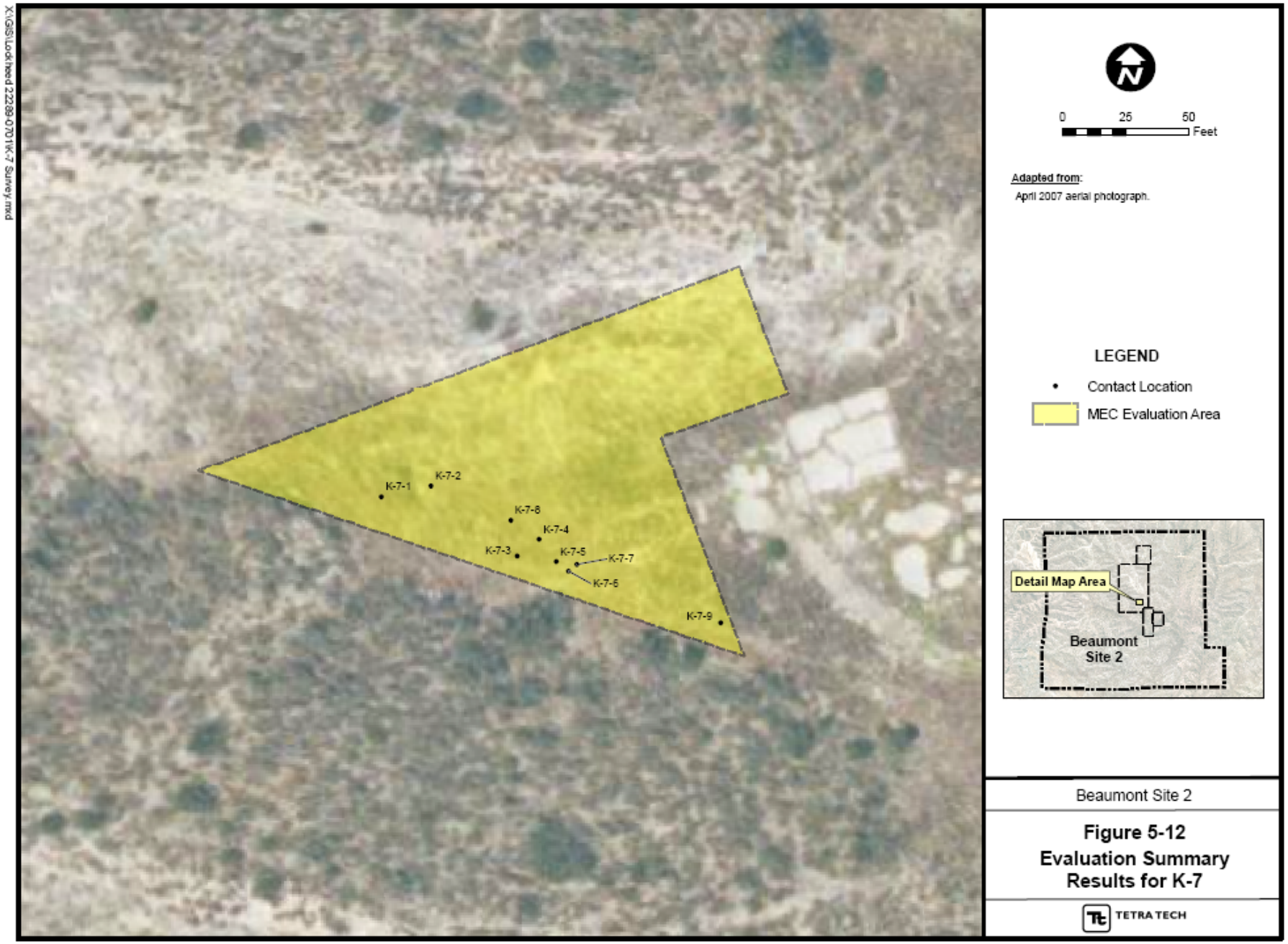
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K-7-7
K-7-6
K-7-9
0
25
50
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
Contact Location
MEC Evaluation Area
Detail Map Area
Beaumont
Site 2
Beaumont Site 2
Figure 5-12
Evaluation Summary
Results for K-7
TETRA TECH

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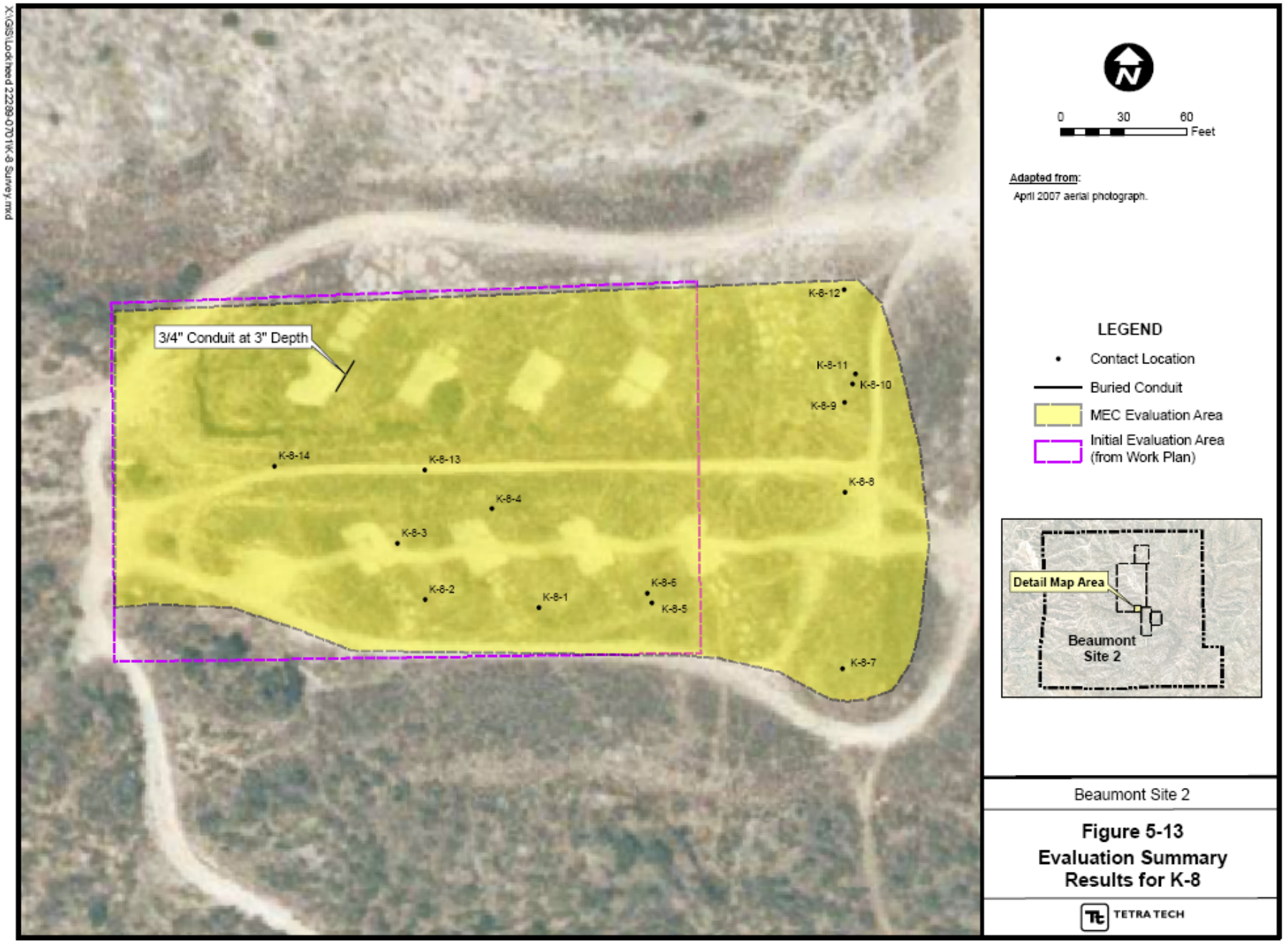
X:\GIS\Lockheed 22289-07011K-8 Survey.mxd
3/4" Conduit at 3" Depth
K-8-12
K-8-11
K-8-10
K-8-9
K-8-14
K-8-13
K-8-4
K-8-8
K-8-3
K-8-2
K-8-1
K-8-6
K-8-5
K-8-7
N
0
30
60
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
Contact Location
Buried Conduit
MEC Evaluation Area
Initial Evaluation Area
(from Work Plan)
Detail Map Area
Beaumont
Site 2
Beaumont Site 2
Figure 5-13
Evaluation Summary
Results for K-8
TETRA TECH

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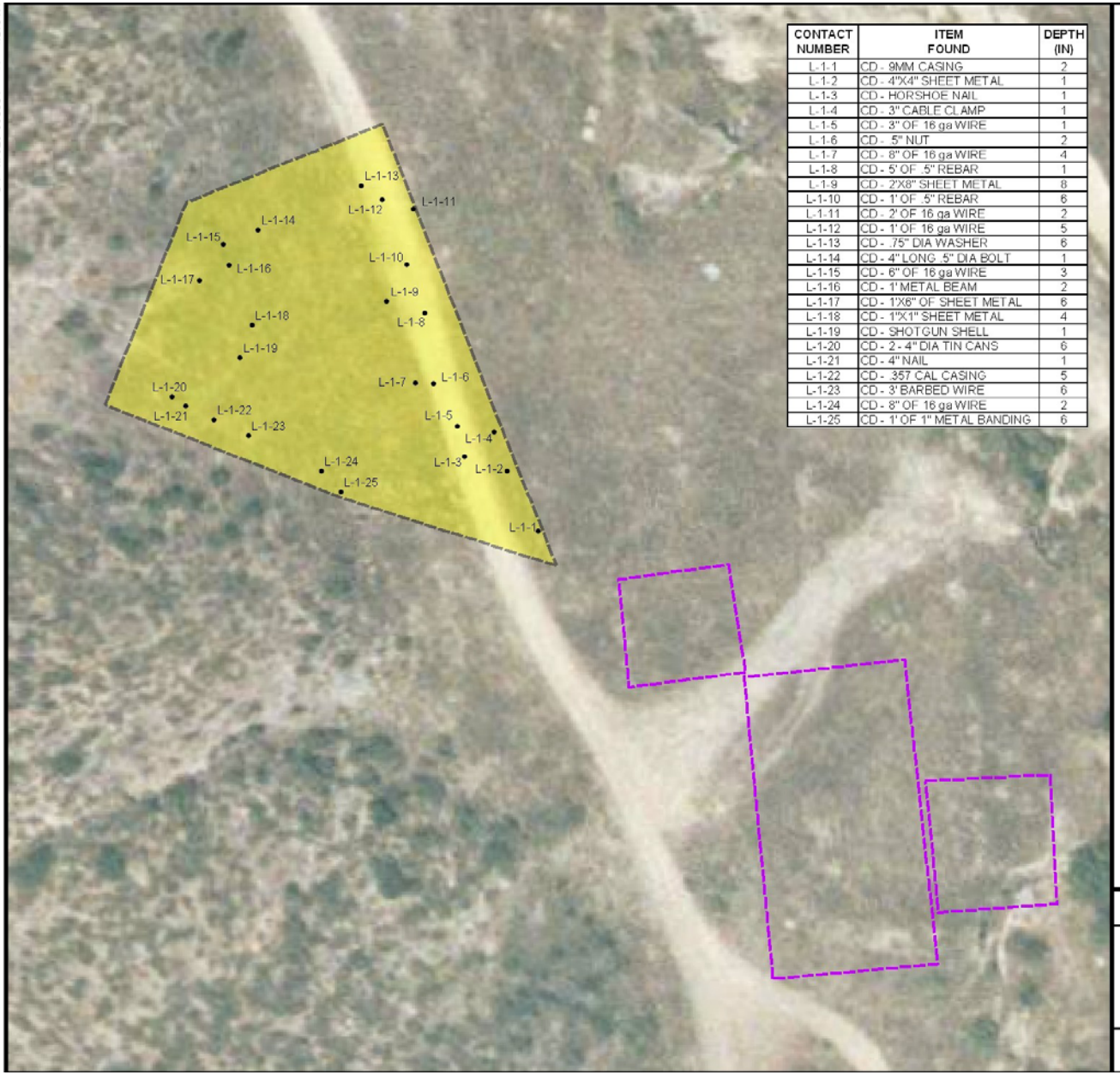
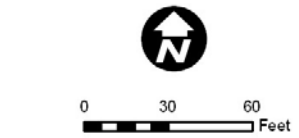


CONTACT NUMBER	ITEM FOUND	DEPTH (IN)
L-1-1	CD - 9MM CASING	2
L-1-2	CD - 4"X4" SHEET METAL	1
L-1-3	CD - HORSHOE NAIL	1
L-1-4	CD - 3" CABLE CLAMP	1
L-1-5	CD - 3" OF 16 ga WIRE	1
L-1-6	CD - .5" NUT	2
L-1-7	CD - 8" OF 16 ga WIRE	4
L-1-8	CD - 5' OF .5" REBAR	1
L-1-9	CD - 2'X8" SHEET METAL	8
L-1-10	CD - 1' OF .5" REBAR	6
L-1-11	CD - 2' OF 16 ga WIRE	2
L-1-12	CD - 1' OF 16 ga WIRE	5
L-1-13	CD - .75" DIA WASHER	6
L-1-14	CD - 4" LONG .5" DIA BOLT	1
L-1-15	CD - 6" OF 16 ga WIRE	3
L-1-16	CD - 1' METAL BEAM	2
L-1-17	CD - 1'X6" OF SHEET METAL	6
L-1-18	CD - 1"X1" SHEET METAL	4
L-1-19	CD - SHOTGUN SHELL	1
L-1-20	CD - 2 - 4" DIA TIN CANS	6
L-1-21	CD - 4" NAIL	1
L-1-22	CD - .357 CAL CASING	5
L-1-23	CD - 3' BARBED WIRE	6
L-1-24	CD - 8" OF 16 ga WIRE	2
L-1-25	CD - 1' OF 1" METAL BANDING	6

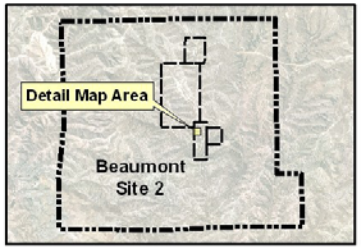


Adapted from:

April 2007 aerial photograph.

LEGEND

- Contact Location
- MEC Evaluation Area
- Initial Evaluation Area (from Work Plan)



Beaumont Site 2

Figure 5-14
Evaluation Summary Results for L-1

TETRA TECH

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nature of subsurface waste in this vicinity. No similar items were found. After careful examination of the item, and based upon the information available, knowledge and his past experience, the SUXOS directing field activities concluded the item was not munitions frag. Although it was twisted, one side was flat and the twisting was quite uniform as might be expected if the item were purposefully manufactured with a twist. In addition, if a munitions item had been detonated in this vicinity multiple pieces of frag would be normally be present. Figure 5-15 shows the locations of metal items discovered during the evaluation at Site L-2.

5.2 RESULTS OF GEOPHYSICAL EVALUATION

During the geophysical evaluation of the former garbage disposal site at Site 2 (evaluation site M-1), evidence of residual metal waste was found at the surface. No subsurface metallic anomalies were identified for intrusive evaluation and there was no indication of substantial trenches or other potential concentrations of non-metallic waste.

The track path walked during the evaluation is shown on Figure 5-16, and the In-Phase geophysical map (signal amplitude) and the Quadrature Phase geophysical map (ground conductivity) are shown in Figures 5-17 and 5-18. The quadrature phase conductivity highs directly south of the access road and in the northeast area of the site in Figure 5-18 correlate with an elevated mound of vegetated dirt and large increase in elevation at those locales, respectively. The other significant anomalies at the site apparent in Figures 5-17 and 5-18 correspond with surface metal identified during the geophysical survey including pipe and metal fence stakes.

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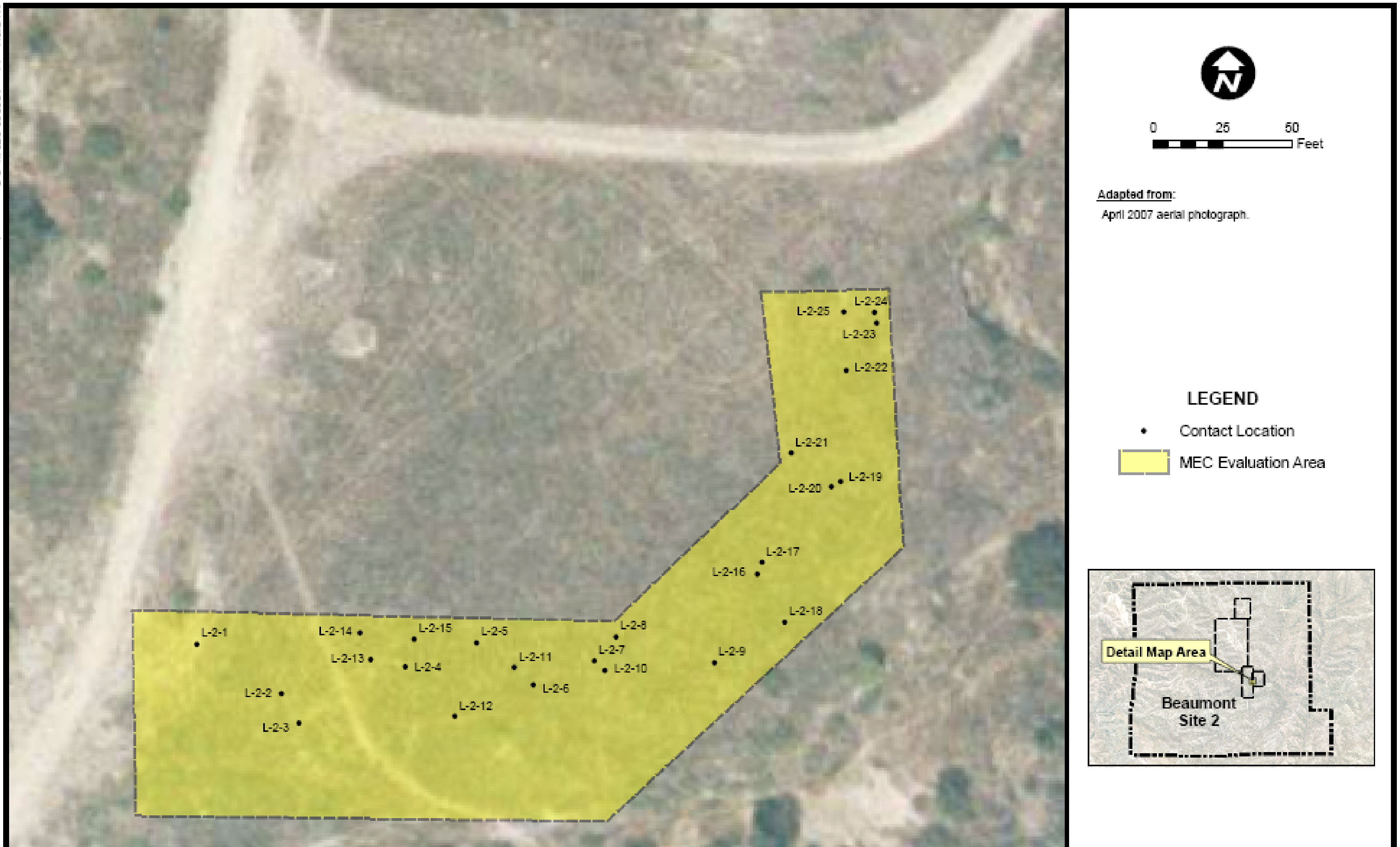
X:\GIS\Lockheed 22289-0701\L-2 Survey.mxd



Beaumont Site 2

Figure 5-15
Evaluation Summary Results for L-2

TETRA TECH

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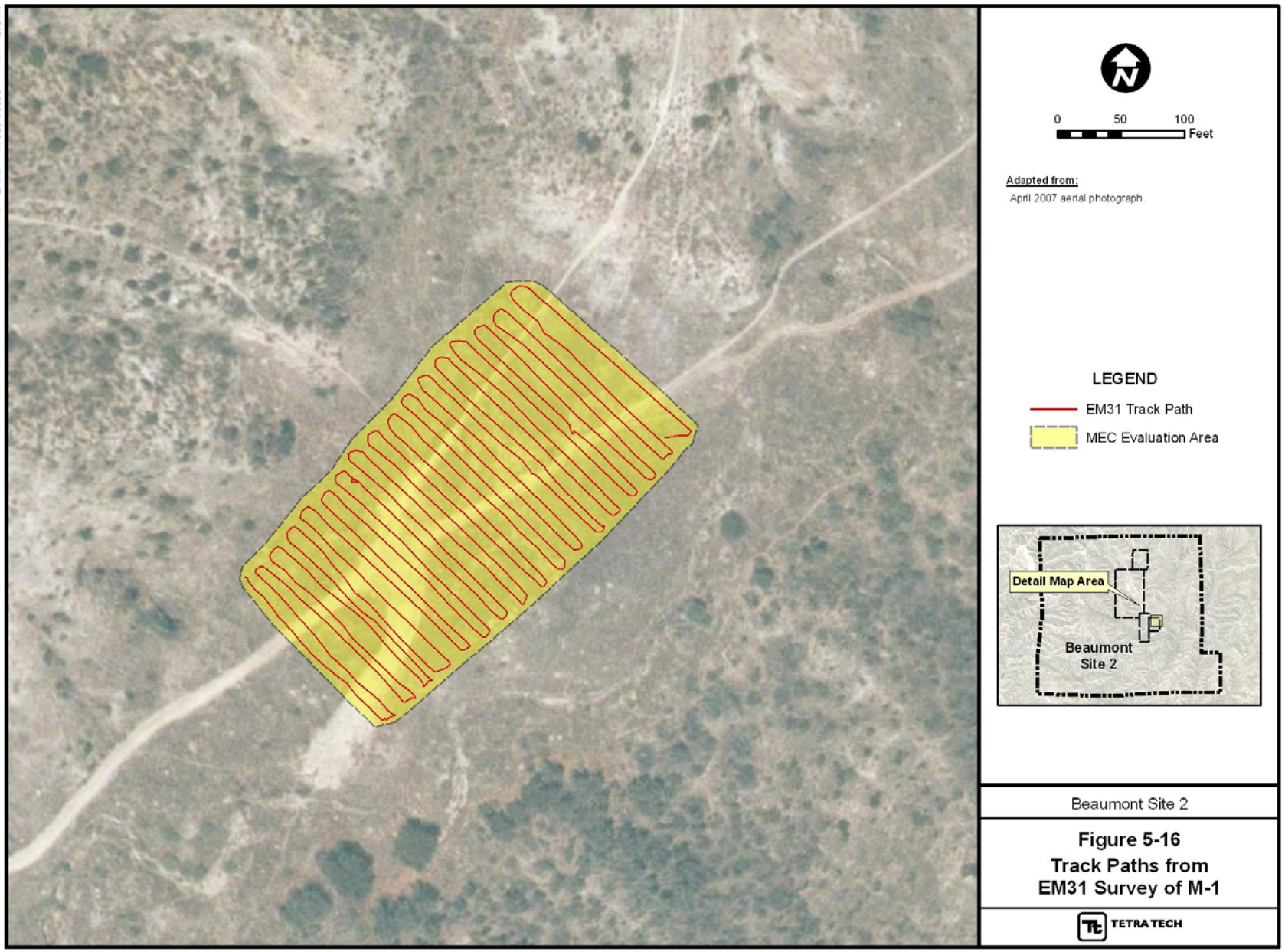
X:\GIS\Lockheed 22289-070\Landfill_Tracks.mxd
0
50
100
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
EM31 Track Path
MEC Evaluation Area
Detail Map Area
Beaumont
Site 2
Beaumont Site 2
Figure 5-16
Track Paths from
EM31 Survey of M-1
TETRA TECH

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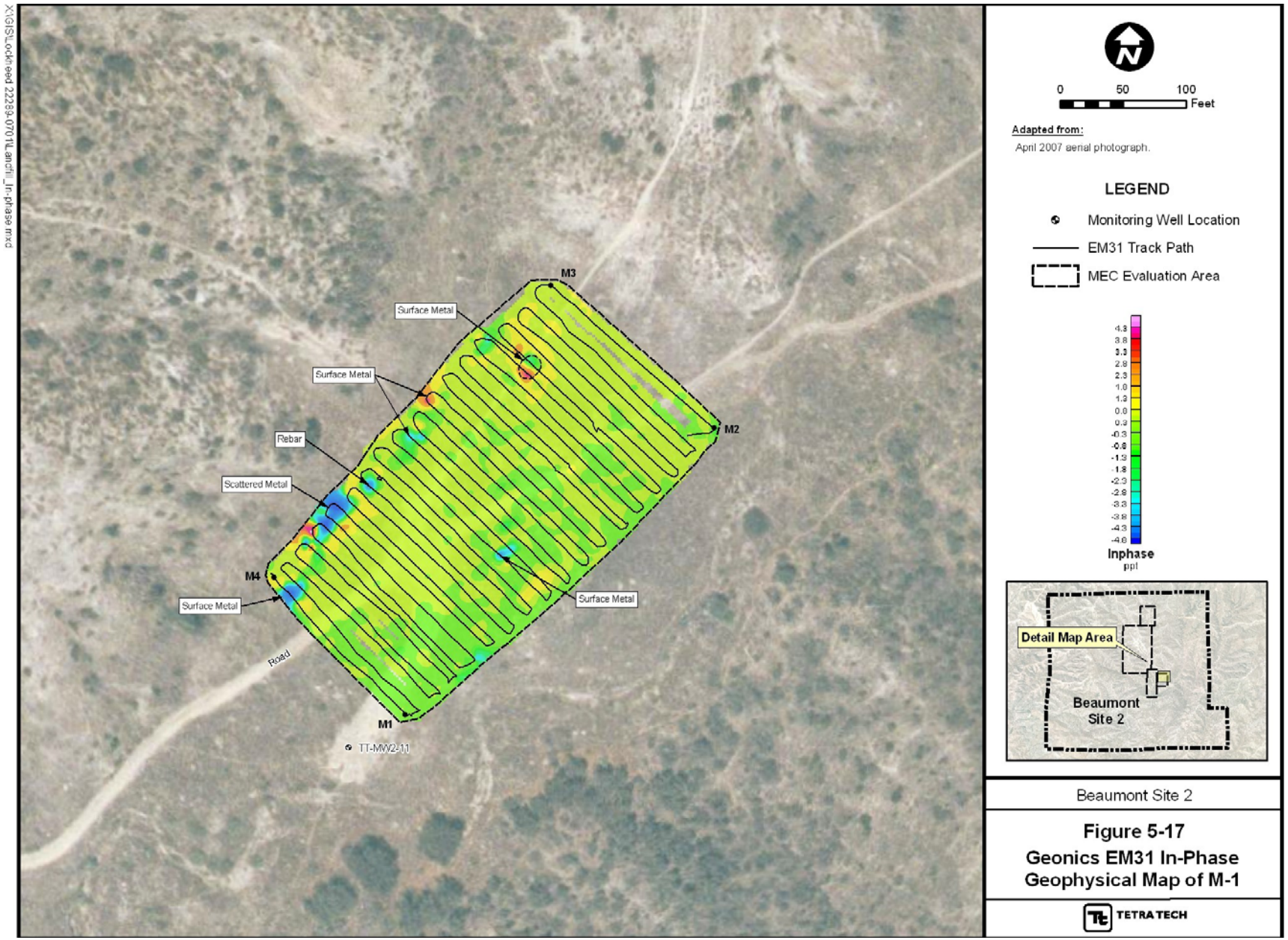
X:\GIS\Lockheed 22289-070\Landfill_In-phase.mxd
M3
Surface Metal
Surface Metal
M2
Rebar
Scattered Metal
M4
Surface Metal
Surface Metal
Road
M1
TT-MW2-11
0
50
100
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
Monitoring Well Location
EM31 Track Path
MEC Evaluation Area
4.3
3.8
3.3
2.8
2.3
1.8
1.3
0.8
0.3
-0.3
-0.8
-1.3
-1.8
-2.3
-2.8
-3.3
-3.8
-4.3
-4.8
Inphase
ppt
Detail Map Area
Beaumont
Site 2
Beaumont Site 2
Figure 5-17
Geonics EM31 In-Phase
Geophysical Map of M-1
TETRA TECH

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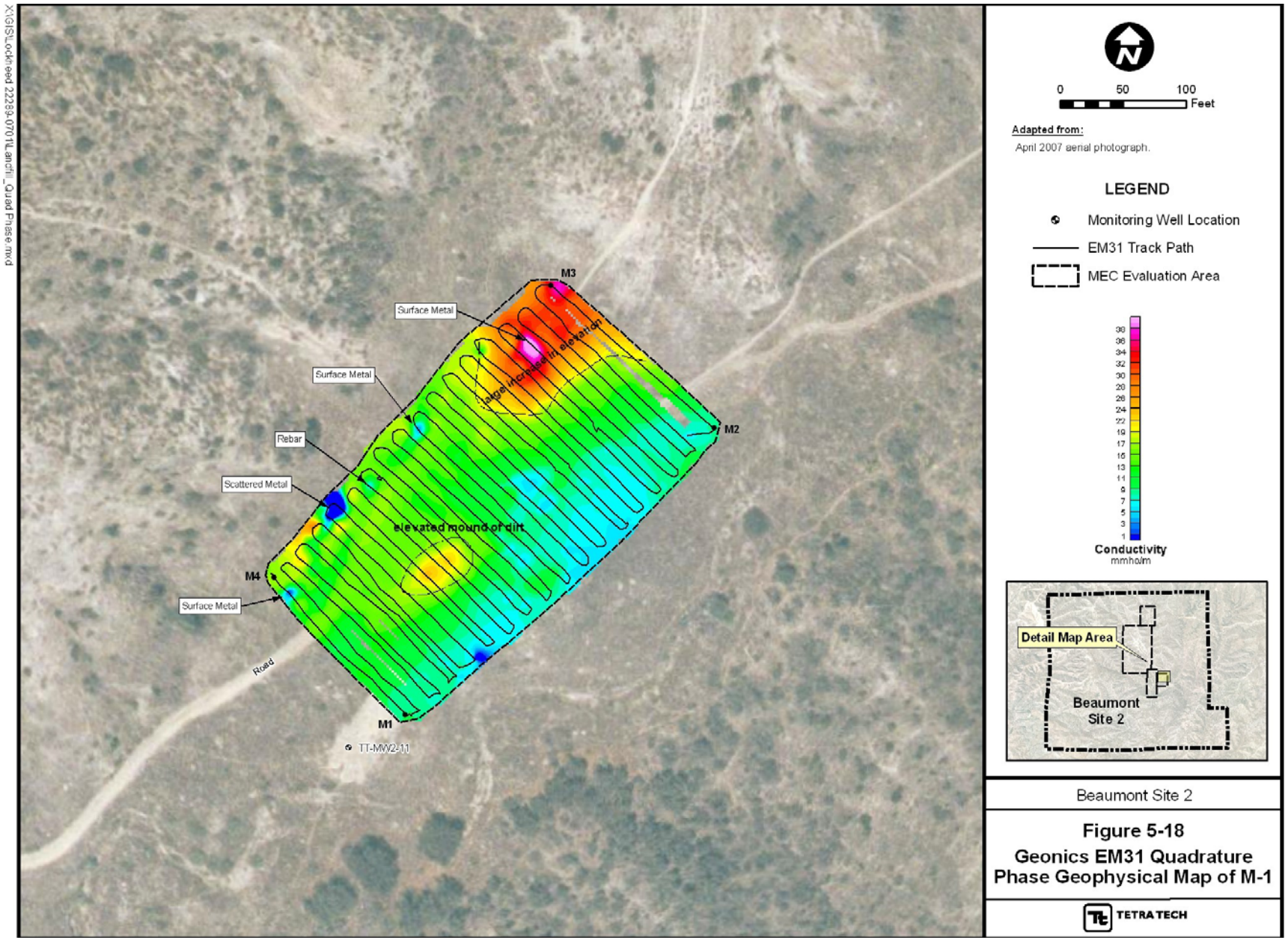
M3
Surface Metal
Surface Metal
Rebar
Scattered Metal
M2
elevated mound of dirt
M4
Surface Metal
Road
M1
TT-MW2-11
0
50
100
Feet
Adapted from:
April 2007 aerial photograph.
LEGEND
Monitoring Well Location
EM31 Track Path
MEC Evaluation Area
Conductivity
mmho/m
Detail Map Area
Beaumont
Site 2
Beaumont Site 2
Figure 5-18
Geonics EM31 Quadrature
Phase Geophysical Map of M-1
TETRA TECH

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6.0 CONCLUSIONS AND RECOMMENDATIONS

Analysis of data from the Follow-On MEC Evaluation at Site 2 did not reveal any residual evidence of MEC storage or use at the site. Most of the metal anomalies found were domestic-type waste, construction/demolition related debris or remnants of the former facilities (conduit, cables, electrical boxes, etc.). Although not all anomalies detected were excavated for evaluation, the number prosecuted was substantial (average 67%) and these anomalies were randomly selected throughout the evaluation sites to provide a representative sampling.

Two potential MEC-related issues were not completely resolved during the Follow-On MEC evaluation: 1) the location of the small ammunition storage building supposedly built on the Gateway Property was not identified; and, 2) the source for the RDX in Monitoring Wells TT-MW2-13 and TT-MW2-1 was not found.

There are several plausible scenarios for why the former location of the ammunition storage building was not found. First, it is possible that this structure was not actually built on the Gateway Property. There is a small bunker annotated on the historical site maps near the entrance to the test bay canyon on the Main Parcel. This could actually be the building referenced on the permit even though it is not located in the Section, Township and Range specified on the permit. This building was inspected during the 2003 Phase I Site Assessment and no visible signs of contamination or hazards were found (Tetra Tech, 2003). It is also possible that there is no significant remaining evidence of the building and as such, the historical location will not be found. Finally, it is also possible that the building was never constructed. Although individuals familiar with the building permit process in Riverside County have indicated that building permits receive final sign-off at the time of final inspection, this may not have been the customary practice in the early 1960s when this structure was permitted.

With respect to the probable source of the RDX detected in monitoring wells TTMW2-1 and 13, there are again several possibilities. The source could be buried, breached MEC that contains RDX; buried bulk RDX; or, rinsate containing RDX that was somehow released. Ogden's lease allowed them to test explosive ordnance, systems, subsystems, or components. If Ogden did do this sort of testing, their work may have resulted in the creation of one of these types of sources. Although no areas were identified as former MEC/explosive test or research areas in the historical data or aerial photographs available for the Site, the groundwater quality data can be used to bracket the location of the RDX release. Groundwater in this area is located approximately 60 feet below ground surface. Assuming the release would have taken place upgradient of the plume detected in the groundwater and downgradient of monitoring wells where RDX was not detected, the possible source of the RDX could be in the area (approximately 10 acres) between TT-MW2-13 and the up gradient wells where RDX was not detected. The concentrations of RDX detected were relatively small and, although mobile, RDX is not very soluble in water. RDX is, however, soluble in chemical solvents. It is not known at this time if the conditions at this Site are appropriate for all three possible scenarios to result in

the plume observed and chemical testing and the evaluation of chemical fate and transport is not part of the scope of this investigation.

Although there appear to be no records indicating MEC was actually tested on the Site, if the source of the RDX is buried MEC, it is likely outside of the areas searched during this investigation. The former operational features within the approximately 10 acre area discussed above were investigated and no buried MEC were found. If buried MEC are the source of the RDX, they were not likely to have been buried elsewhere within the 10 acre area. For chemical transport to have resulted in a groundwater plume the munitions would need to have been of sufficient mass, have been corroded or have been breached in some fashion allowing the RDX to be exposed to surface water infiltration. In addition, the infiltration conditions would need to have been appropriate for transport of the RDX through the vadose zone to the groundwater. The obvious locations within the 10 acre area were surveyed during this investigation and nothing was found. If MEC were buried within the 10 acre area, additional geophysics could be performed to try and locate a burial site. However, the terrain in the area is somewhat rugged and irregular and could impact the completeness of the additional surveys.

Although there appear to be no records indicating bulk RDX was used on the Site, if bulk RDX were disposed of by burial the disposal site would likely have been located in the same 10 acre area previously discussed. Again, for chemical transport to have resulted in a groundwater plume the bulk RDX would have to have been of sufficient mass and exposed to surface water infiltration. Additionally, the infiltration conditions would need to have been appropriate for transport of the RDX through the vadose zone to the groundwater. Unless this bulk explosive was containerized in metal containers, most geophysical instrumentation will not detect it. Some instruments such as the EM-31 used to map the former garbage disposal site are capable of detecting aberrations in the conductivity of subsurface soils which could potentially be caused by past disturbance by excavation; however, the size of the area disturbed would need to be large enough to cause a significant anomaly in the data and these anomalies can also be caused by differences in soil types and soil moisture, as well as other aspects of the site geology. Consequently, there are no reliable methods for locating bulk explosive buried without containers.

Again, although there are no records indicating there were any activities on site involving the removal or washing of RDX from munitions or related devices during testing, if rinsate containing RDX was released it would likely have been discharged in the same 10 acre area previously discussed.. The first place to look would be in proximity to physical operational features located within the 10 acre area. If this yields no indications of a source for the RDX the investigation could be expanded but, without an indication of where to look, a release of this nature would be hard to find. If it were a large release, systematic, grid-based sampling could be used to try and find the release location. If the release were small the grids would have to be prohibitively dense (small) in order to find the location.

As discussed above, although RDX sorbs weakly to soil particles and thus can move vertically through the vadose zone, it is not very soluble in water. If a chemical solvent were used in a potential washout process instead of water it could dissolve more of the RDX. And if that solvent were discharged to the ground surface, it could carry the RDX vertically along with it as it migrated though the vadose zone. Acetone was used to dissolve explosives out of several large Navy projectiles at Site 1 when the propellant was scavenged for testing.

Since the Follow-on MEC Evaluation at Site 2 was completed, RDX has been found in the groundwater below the former waste discharge area near the south end of the site. The wells located between those containing RDX and the former discharge ponds do not contain detectable RDX and the RDX levels at the discharge area are an order of magnitude higher than those in wells MW2-13 and TT-MW2-1. This new information suggests that the most likely source of the RDX in groundwater was some type of washout process. Capture and transport of the majority of the washout liquid to the discharge ponds would account for the higher levels of RDX at this location. Smaller amounts of washout liquid not captured during the washout could have carried RDX via percolation down through the soil to groundwater in the vicinity of the washout activities.

There is no clear path forward to determine whether the small ammunition storage building was ever constructed on the Gateway Property. Additional evaluation could be performed, by either screening any relatively flat areas or geophysically mapping areas near roadways and fire trails. It may also be possible to walk transects across the entire property at a relatively narrow spacing to search for the historical location of the building. The fact that no one has reported seeing this structure, it was not observed on the aerial photographs that reviewed, and none of the site maps show its location suggests that it may never have been built and expending additional resources to verify this conclusion may not be warranted.

There is also no concise path forward to determine the source of the RDX in groundwater wells at the site. However, because the available information suggests that the RDX is most likely to be related to a washout process, additional evaluation of the site to locate potential MEC use areas does not appear warranted.

7.0 REFERENCES

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APPENDIX A

QUALITY CONTROL REPORTS

APPENDIX B

COMPLETED DIG SHEETS

APPENDIX C

PHOTOLOG

APPENDIX D

DTSC COMMENTS AND RESPONSES TO COMMENTS