TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (continued)

Section **Page**

LIST OF FIGURES

TABLE OF CONTINUED

Page

LIST OF TABLES

TABLE OF CONTENTS (continued)

LIST OF APPENDICES

SECTION 4.0
TECHNICAL APPROACH

4.1 PRE-DRILLING ACTIVITIES

Prior to the start of field activities, Tetra Tech personnel reviewed the areas of investigation for potential obstructions and/or drilling issues as described in the workplan. Following a pre-drilling reconnaissance of the Site, it was determined that a hollow-stem auger rig would be necessary to complete the majority of the borings. This determination was made by the Tetra Tech project geologist based on the presence of the San Timoteo Formation observed throughout the study area. Due to the coarse-grained nature and the relatively high degree of induration (cementation and compaction) intrinsic to portions of the San Timoteo Formation, it was determined that use of the hollow-stem auger rig would expedite the completion of the proposed boreholes and minimize the potential for refusal during the drilling process.

4.1.1 Health and Safety

The Site Specific Health and Safety Plan (HASP) was maintained onsite throughout the field activities. Prior to the initial startup of field activities, the HASP was reviewed by all project personnel. Safety issues including hazards that may be encountered during the project, preventive health and safety measures, and emergency procedures (including the hospital route) were conveyed by the Site Safety Officer to all personnel prior to starting any of the field activities.

In addition, a daily tailgate safety meeting was held each day, prior to the initiation of the field activities for that day. These daily tailgate meetings were used to discuss any new hazards that may be encountered due to changing field conditions and to reinforce safety considerations overall. Additionally, the biological monitor supervising the field activities utilized the daily tailgate safety meetings to provide work crews with information on what measures were to be employed to avoid active Stephens' Kangaroo Rat burrows when driving, parking, staging materials and working on the Site. Copies of the daily tailgate safety meetings are provided in Appendix A.

4.1.2 Underground Utility Clearance

Prior to conducting subsurface drilling, surface geophysical surveys consisting of ground penetrating radar (GPR) and electromagnetometry (EM) screening methods were conducted at all boring locations.

4.1.3 Biological Clearance

Prior to conducting subsurface drilling and surface geophysical clearance surveys, a biological monitor under the supervision of a Section 10 (a) permitted biologist screened all boring locations for the presence of the federally endangered and state-listed Stephens' kangaroo rat (SKR).

A total of 52 soil boring locations were surveyed for SKR. Of the 52 locations, 42 were cleared as being at least 15 feet from an active SKR burrow and 10 were moved up to 10-15 feet in order to maintain a 15 foot separation, following conference between the biological monitor and the Tetra Tech project manager. Active SKR burrows in the vicinity of the proposed boring locations were marked with red pin flags, and access routes were surveyed and the path that avoided the most SKR burrows was marked with green pin flags. Existing paved or dirt roads were used as access routes to the maximum extent possible, and all off-road access routes were selected so as to avoid as many SKR burrows as possible.

4.1.4 Concrete Coring

Concrete pads were present in several of the locations identified in the Workplan where borings were to be completed. In order to drill at these locations, concrete coring was performed by a concrete coring specialist using a portable electric coring device similar to a large stand-up drill press. The portable drill was wheeled to the sampling locations, anchored to the concrete slab with an anchor bolt, and connected to a power source. Prior to powering up the device, a 10-inch diameter diamond bit core tube was attached to the rotating shaft and a water coolant line was turned on to protect the drill bit and cuttings. Coring and extraction of the concrete core waste commenced immediately after the introduction of water.

4.2 SOIL MATRIX SAMPLING

Intrinsic to this soil investigation was the collection of depth dependant soil samples. These soil samples were used to determine if any chemicals of potential concern (COPC) are present within the soil matrix at the Site. By collecting soil samples at pre-established depths, the vertical distribution of COPC concentrations can be determined.

4.2.1 Sample Collection

Depth-dependant soil samples were collected through one of the two following methods:

1.) *Truck-mounted Hollow Stem Auger (HSA) rig* – using a 2 inch diameter split spoon, and

2.) *Hand Auger (HA)* – using a 2 inch open core barrel.

Individual samples were collected from the abovementioned methods in the following manner:

- From the 2 inch diameter split spoon (common to the truck-mounted HSA samples) – 2 individual 3-inch long stainless steel sampling rings and 2 individual 6-inch long stainless steel sampling rings were fitted in the following manner starting from the shoe and progressing upwards (3 inch ring, 6 inch ring, 3 inch ring, 6 inch ring). The first ring (3 inch) was used for the collection of lithological typing data. The second ring (6 inch) was sealed with Teflon™ sheeting and plastic end caps for analytical laboratory analysis. The third ring (3 inch) was used for the collection of the Encore™ samples. The fourth and final ring was used if any additional sample was needed for any of the earlier described samples.
- From the 3¼ inch diameter open core barrel (common to HA samples) – 2 individual (6-inch long) stainless steel sampling rings were manually pushed into the retrieved core barrel. The first ring was used for collection of Encore™ samples, headspace data, and lithological typing data. The second ring was sealed with Teflon™ sheeting and plastic end caps for analytical laboratory analysis.

At each sampling location, a five foot sampling interval was used to the total depth of the given boring. This sampling interval was used throughout the soil investigation. Upon being retrieved from the sampler barrel, subsamples for VOC analysis were collected as described in the following subsection. The remaining sample rings and their entire contents were then capped immediately at both ends, labeled, sealed in a Ziploc® bag, placed into a cooler with ice, and transported to Calscience for chemical analyses following standard chain of custody protocols.

4.2.2 Encore™ Sampling

Pursuant to EPA Method 5035, VOC sub-samples were collected from a 3 or 6-inch sample ring (dependant upon method of sample recovery) utilizing three Encore™ samplers with a T-bar handle. Each Encore™ sampler was inserted manually into the soil core to retrieve approximately 5 grams of soil. The three Encore™ sub-samples were then sealed in aluminum bags, labeled, and placed into a Ziploc® bag for delivery to the state-certified analytical laboratory, Calscience Environmental Laboratories, Inc., (Calscience).

Upon completion of VOC sampling, the remaining 3 or 6-inch long sample ring was capped at both ends with Teflon™ sheeting and plastic end caps, labeled, and stored in a Ziploc® bag for chemical analyses. All

samples were placed into a cooler with ice and delivered to Calscience following standard chain-of-custody (COC) protocols. A copy of the COCs are presented in Appendix A.

4.3 LITHOLOGICAL LOGGING

Using the soils in the samplers not designated for chemical analyses, all of the recovered soil samples were examined, described, and characterized by the field geologist. Each sample was initially examined for odors, apparent soil discoloration, or other signs of contamination upon collection. The geologist had discretion to collect additional soil samples if contamination was observed by discoloration, odor, or elevated VOC readings obtained by an organic vapor analyzer (OVA). All observations and descriptions were recorded on boring log forms.

The soil grain size, gradation, grain angularity/roundness, percentage of soil fractions (i.e., clay, silt, sand, gravel, cobbles), cohesiveness (i.e., firm, loose, plastic, etc), and moisture content were also evaluated and recorded on the logs in accordance with the Unified Soil Classification System (USCS). Soil color was determined using typical color descriptive terminology and recorded on the logs. Excess soil from the liners was containerized in DOT approved 55-gallon drums pending disposal. Copies of the boring logs are provided in Appendix B.

Since the presence of VOCs in the soil samples can be qualitatively determined by measuring the headspace VOC concentrations in a sample container, field screening tests were conducted using an OVA equipped with a photo-ionization detector (PID) as described below:

- Placing of a portion of the soil sample in a Ziploc® plastic bag;
- Disaggregating the soil samples with the plastic bag sealed;
- Allowing the soil sample within the bag to set for 10 to 15 minutes with minimum disturbance; and
- Inserting the OVA probe into the headspace of the Ziploc® bag and obtaining a stabilized VOC reading. The VOC readings obtained in parts per million by volume (ppmv) were recorded on the boring logs by the field geologist.

4.4 BORING ABANDONMENT

In all situations where completed borings were not converted into soil gas probe sampling sites, the borings were properly abandoned by backfilling the annular space with chipped bentonite for the entire depth.

4.5 TEMPORARY SOIL GAS PROBE INSTALLATION AND SAMPLING

Soil gas probes were installed in soil borings after the completion of soil sampling. Soil gas probes were installed to collect soil gas samples at pre-established depth intervals. A schematic diagram of a typical soil gas probe is provided in Figure 4-1. The soil gas probes consisted of ¼-inch Nylaflow™ slotted tubing and a sample collection port at the surface end. Once the boring was created by one of the previously described drilling methods, the soil gas sampling probes were constructed using the following steps:

1.) Backfilling the annular space below the targeted depth with chipped bentonite (hydrating the chips at regular intervals).
2.) Installing a six (6) inch transition of granular bentonite interval and then hydrating.
3.) Installing a six (6) inch transition of #30 grained sized sand interval.
4.) Installing the deepest ¼ inch Nylaflow™ soil gas probe to the targeted sampling depth.
5.) Setting the probe within a 2-foot-thick filter pack comprised of #3 sand.
6.) Installing a six (6) inch transition of #30 grained sized sand interval.
7.) Installing a six (6) inch transition of granular bentonite interval and then hydrating.
8.) Then, completing the soil gas probe boring with chipped bentonite and hydrating at the surface, or repeating the steps described above at the next targeted sampling depth.

The soil gas probes were sampled using the following steps:

1.) The tubing exiting the surface of the ground was connected to a glass sampling bulb fitted with Teflon™ stopcocks and a viton rubber sampling port.
2.) The bulb is connected in turn to a vacuum gauge, flowmeter, and portable sampling pump.
3.) The ends of the bulb are opened and a flow of 150 ml/min is maintained for seven to 10 purge volumes.
4.) For sampling, the flow rate was increased to 500 ml/min and a vacuum test was performed to ensure that the increase flow rate had no effect on absence of vacuum.
5.) The stopcocks were then closed (pump end first), and the sample retained in the container.
6.) The bulbs were then delivered to the off-site laboratory for analysis.

Figure 4-1 – Sample Soil Gas Probe

4.6 SAMPLE LOCATION SURVEY

A global positioning survey (GPS) was conducted at each sampling location to ensure the points could be re-located. The survey used the North American Datum (NAD) 83 Zone 6 as coordinate system for northing and easting and mean sea level is used as the base for elevations. The data are presented in Table 4-1.

Table 4-1 Summary of Global Positioning Survey for Sampling Locations

Sample Location	NORTHING	EASTING	ELEVATION (feet mean sea level)
J-53-DP1	2277359.41	6325279.19	2149.06
J-53-DP2	2277216.17	6325241.06	2145.74
J-53-DP3	2277104.01	6325149.95	2141.37
J-53-DP4	2277040.54	6325163.23	2139.91
J-53-DP6	2276894.54	6325162.39	2135.62
J-53-DP7	2276773.81	6325066.65	2135.72
J-53-DP8	2276838.92	6325051.39	2135.75
J-53-DP9	2276761.91	6325162.56	2135.64
J-53-DP10	2276767.34	6325230.61	2133.20
J-53-HA1	2277399.14	6325314.04	2152.04
J-53-HA2	2277059.68	6325194.83	2135.18
K-54-DP1	2275114.47	6325389.10	2084.11
K-54-DP2	2275041.78	6325371.60	2083.06
K-54-DP3	2276212.10	6323632.12	2145.09
K-54-DP5	2276017.46	6323741.91	2139.68
K-54-DP6	2275505.01	6323948.01	2132.29
K-54-DP8	2275335.82	6324266.52	2110.20
K-54-DP10	2275044.10	6324235.11	2107.52
K-54-DP11	2275139.06	6324302.74	2097.99
K-54-DP12	2274901.36	6324376.95	2094.49
K-54-DP14	2274764.88	6324560.87	2086.06
K-54-DP15	2274652.48	6324550.37	2084.01
K-54-DP16	2274695.91	6324606.17	2083.86
K-54-DP17	2274364.60	6325109.28	2062.78
K-54-DP18	2275790.48	6323695.36	2147.00
K-54-DP19	2275163.06	6324422.55	2096.49
K-54-DP20	2275008.46	6324528.76	2094.07
K-55-DP21	2274007.68	6325079.20	2055.37
K-55-DP22	2273708.11	6325022.18	2057.19
K-55-DP23	2273320.08	6325107.53	2049.74
K-55-DP24	2273335.01	6324791.03	2062.47
K-54-HA1	2275166.89	6324267.31	2107.41
K-54-HA2	2273299.85	6324713.70	2087.68
K-54-HA3	2276080.99	6324221.64	2158.94
K-54-HA4	2273451.85	6325184.03	2039.97
L-56-DP1	2273300.28	6325191.48	2037.50
L-56-DP2	2273261.66	6325288.85	2030.71
L-56-DP3	2273215.25	6325386.38	2020.32
L-56-DP4	2273178.64	6325247.10	2031.88
L-56-DP6	2272937.77	6325459.47	2020.62

Table 4-1 Summary of Global Positioning Survey for Sampling Locations (Cont.)

Sample Location	NORTHING	EASTING	ELEVATION (feet mean sea level)
L-56-DP7	2272888.39	6325394.06	2020.59
L-56-DP8	2272808.47	6325444.11	2015.94
L-56-DP9	2272845.08	6325541.72	2012.62
L-56-DP10	2272760.00	6325559.89	2009.05
L-56-DP11	2272763.08	6325500.66	2007.42
L-56-DP12	2272698.49	6325514.77	2006.29
L-56-HA1	2272363.09	6325645.16	1989.82
L-56-HA2	2272980.05	6325410.78	2015.63
L-56-HA3	2272983.45	6325445.88	2015.61
M-58-DP1	2273018.46	6326271.36	2022.32
M-58-DP2	2272976.95	6326249.55	2019.86
M-58-DP3	2272907.46	6326206.27	2009.96

SECTION 5.0
INVESTIGATION RESULTS

5.1 SOIL MATRIX SAMPLING RESULTS

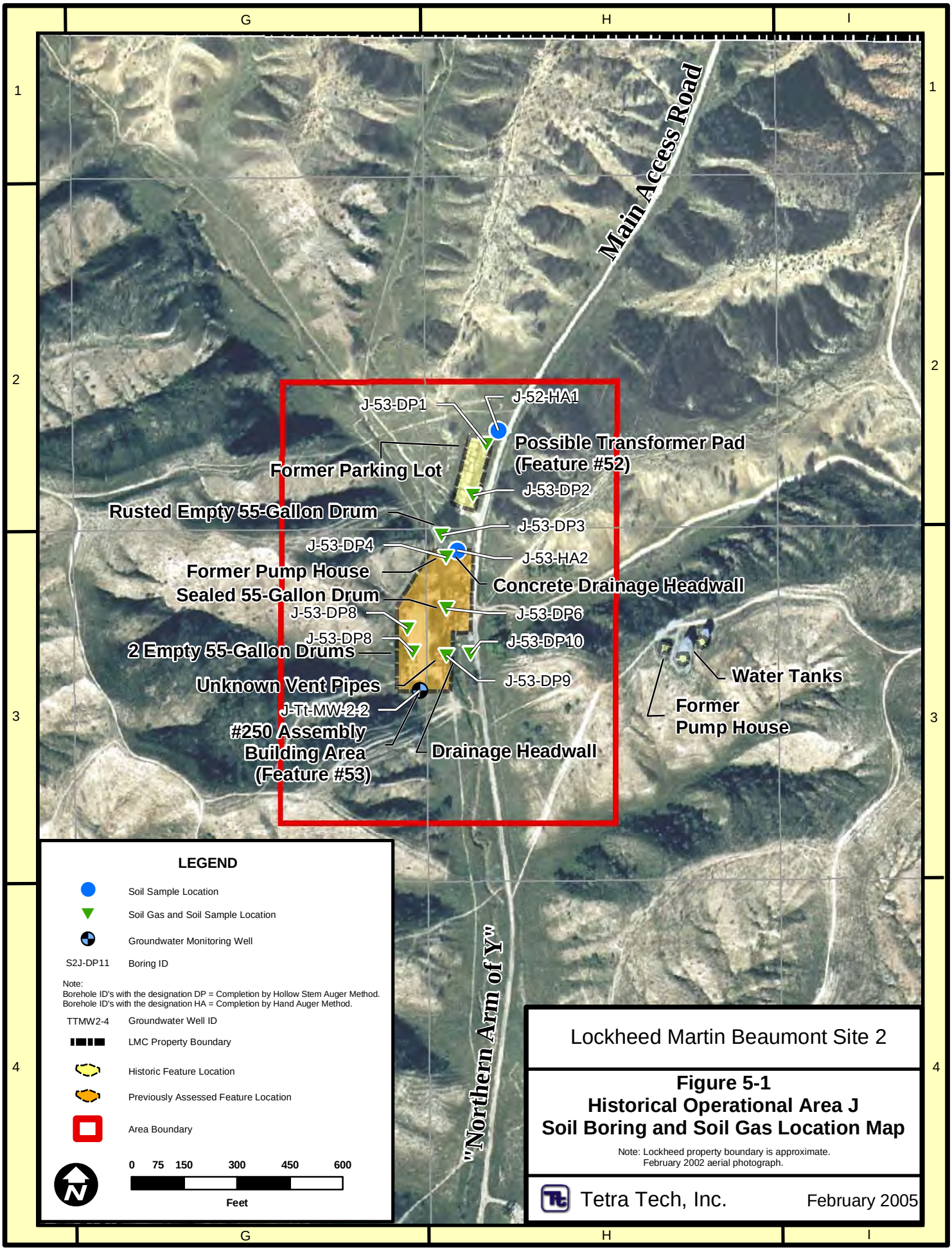
Tetra Tech drilled a total of 52 boreholes at the Site from September 6 through 20, 2004. A total of 268 soil samples were collected from the borings and 251 of the samples were analyzed for one or more of the following constituents, using the indicated test method: VOCs – 8260B, semi-volatile organic compounds (SVOCs) – 8270C, 1,4-dioxane – 8270SIM, perchlorate – 314.6, metals – 6010/7000, polychlorinated biphenyls (PCBs) - 8082, and total petroleum hydrocarbons (TPH) – 8015M. The 17 samples that were not analyzed for chemical constituents were utilized for lithologic logging purposes and archived. Copies of the soil matrix laboratory reports are presented in Appendix C. The soil matrix investigation results are presented in the following subsections.

5.1.1 Historical Operational Area J

5.1.1.1 Investigation Approach and Deviations

A total of nine (9) Class 1 soil borings were completed for Historical Operational Area J. These boring locations are identified as J-53-DP1 through J-53-DP4, and J-53-DP6 through J-53-DP10 in Figure 5-1. Soil gas probes were installed to 10 feet bgs at the nine Class 1 boring locations. The features that were assessed by these Class 1 soil borings are:

Feature No. 53 Assembly Building Area, located in the central portion of Historical Operational Area J – see Figure 2-4. The building and associated support structures were utilized for the general assembly and shipment of short range attack missile (SRAM) rocket motors, which may have utilized Maloy Blue propellant. Electrical systems were also assembled. Solvents, ammonium perchlorate, and ferrocene were used or present during the assembly activities and PCBs may have been present at the transformer locations. The remains of the former building consisted of a large concrete pad with work area divisions. A concrete pad is present that formerly supported multiple transformers. Another concrete pad is present where a possible guard shack and entry gate existed. An electric powered gate may have been used at this entrance to the parking lot of Site 2. Based on the historical data and Site


G
H
I
1
2
3
4
Main Access Road
J-53-DP1
J-52-HA1
Possible Transformer Pad
(Feature #52)
Former Parking Lot
J-53-DP2
Rusted Empty 55-Gallon Drum
J-53-DP3
J-53-DP4
J-53-HA2
Former Pump House
Concrete Drainage Headwall
Sealed 55-Gallon Drum
J-53-DP8
J-53-DP6
J-53-DP8
J-53-DP10
2 Empty 55-Gallon Drums
Unknown Vent Pipes
J-53-DP9
Water Tanks
Former
Pump House
J-Tt-MW-2-2
#250 Assembly
Building Area
(Feature #53)
Drainage Headwall
"Northern Arm of Y"
LEGEND
Soil Sample Location
Soil Gas and Soil Sample Location
Groundwater Monitoring Well
S2J-DP11
Boring ID
Note:
Borehole ID's with the designation DP = Completion by Hollow Stem Auger Method.
Borehole ID's with the designation HA = Completion by Hand Auger Method.
TTMW2-4
Groundwater Well ID
LMC Property Boundary
Historic Feature Location
Previously Assessed Feature Location
Area Boundary
0 75 150 300 450 600
Feet
N
Lockheed Martin Beaumont Site 2
Figure 5-1
Historical Operational Area J
Soil Boring and Soil Gas Location Map
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

inspection information soil samples collected at this feature were analyzed for VOCs, SVOCs, perchlorate, 1,4-dioxane, Title 22 metals, PCBs, and TPH. A limited soil gas survey was also performed for VOCs.

Two (2) additional Class 1 soil borings were originally planned for Feature No. 53. The first of these was planned for installation near the Water Tanks and Former Pump House located directly east of the Assembly Building Area (Figure 5-1). However, these features are located atop a relatively steep ridge that can only be accessed from an undeveloped dirt track. The conditions of the dirt track at the time of the soil investigation had deteriorated to such an extent as to preclude all vehicle access and therefore a soil boring was not installed at that location.

The other change involves a Class 1 boring that was originally planned for the Concrete Drainage Head, located at the northern margin of the Assembly Building Area. This boring was originally designated J-53-DP5 and was to be drilled by HSA. However, based on a review of the Site by the Tetra Tech project geologist, the actual location of the boring was moved into the actual drainage area to collect a more representative sample for that feature. As such, the location was converted to a Class 2 soil boring as it could not be drilled using the HSA rig. This boring is indicated on Figure 5-1 as J-53-HA2.

One (1) Class 2 soil boring was originally planned for Historical Operational Area J. This boring is indicated as J-52-HA1 on Figure 5-1. The feature assessed by this Class 2 soil boring is:

Feature No. 52 — *Possible Transformer Location*, located at the north end of a former parking lot and approximately 400 feet north of the former Assembly Building Area in the north-central portion of Historical Operational Area J – *see Figure 2-4*. This feature was likely utilized for activities associated with the rocket motor assembly area. PCBs are the chemicals of concern at this feature. Soil samples collected at this feature were therefore analyzed for PCBs.

5.1.1.2 Analytical Results

Feature No. 52 – Possible Transformer Pad

The soil samples collected at Feature No. 52 were only analyzed for PCBs. There were no detections of PCBs above its reporting limit.

Feature No. 53 – Assembly Building Area

The soil samples collected at Feature No. 53 were analyzed for VOCs, SVOCs, perchlorate, 1,4-dioxane, Title 22 metals, PCBs, and TPH. Perchlorate, SVOCs, 1,4-dioxane, and PCBs were not detected at concentrations above their respective reporting limits. Several heavy metals and low levels of TPH and VOCs (i.e., BTEX) were detected at various locations throughout the feature. The TPH concentrations ranged from 5.2 to 77 mg/kg and total BTEX concentrations ranged from 1.1 to 20.5 µg/kg. The reported concentrations of heavy metals are discussed in Section 6.2.1. A summary of the analyte detections above reporting limits is presented in Table 5-1.

Table 5-1 Summary of Detected Compounds in Soils at Historical Operational Area J

Area	Feature #	Feature Description	Soil Boring ID	Depth	Sample Date	TPH	PERCHLORATE	METALS														VOCs						
						TPH as Diesel (mg/kg)	Perchlorate (ug/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Total Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	1,1-Dichloroethene (ug/kg)	Acetone (ug/kg)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	o-Xylene (ug/kg)	p/m-Xylene (ug/kg)	Toluene (ug/kg)
J	53	Assembly Building Area	J-53-DP1-0.5	0.5	9/17/2004	ND	ND	ND	ND	104	0.487	ND	20.6	11.5	17.8	4.40	ND	17.0	ND	ND	40.2	48.7	ND	ND	1.7	ND	ND	ND	1.8
J	53	Assembly Building Area	J-53-DP1-5	5	9/17/2004	ND	ND	ND	ND	90.6	0.445	ND	18.6	9.98	15.7	4.27	ND	14.7	ND	ND	36.4	43.0	ND	ND	2.5	ND	ND	ND	1.9
J	53	Assembly Building Area	J-53-DP2-0.5	0.5	9/16/2004	ND	ND	ND	**0.831**	77.7	0.376	ND	15.2	7.61	13.5	4.59	ND	11.5	ND	ND	28.3	32.7	ND	ND	ND	ND	ND	ND	ND
J	53	Assembly Building Area	J-53-DP2-5	5	9/16/2004	ND	ND	ND	**1.01**	92.5	0.449	ND	20.4	10.6	16.0	4.80	ND	15.3	ND	ND	41.4	42.6	ND	ND	ND	ND	ND	ND	ND
J	53	Assembly Building Area	J-53-DP2-20	20	9/16/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1
J	53	Assembly Building Area	J-53-DP3-0.5	0.5	9/16/2004	ND	ND	ND	**1.42**	94.4	0.426	ND	19.4	9.74	18.8	5.24	ND	15.2	ND	ND	37.1	42.6	ND	ND	ND	ND	ND	ND	1.3
J	53	Assembly Building Area	J-53-DP3-5	5	9/16/2004	ND	ND	ND	ND	53.0	ND	ND	10.9	5.89	7.68	3.06	ND	7.57	ND	ND	27.3	21.5	ND	ND	3.6	1.2	ND	ND	5.6
J	53	Assembly Building Area	J-53-DP4-0.5	0.5	9/16/2004	5.3	ND	ND	**1.38**	96.0	0.525	ND	25.9	12.1	20.3	4.70	ND	21.4	ND	ND	42.9	56.0	ND	ND	1.3	ND	ND	ND	1.4
J	53	Assembly Building Area	J-53-DP4-5	5	9/16/2004	ND	ND	ND	**1.26**	119	0.537	ND	24.4	12.2	23.1	5.63	ND	18.8	ND	ND	45.5	56.0	ND	ND	ND	ND	ND	ND	ND
J	53	Assembly Building Area	J-53-DP4-10	10	9/16/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4
J	53	Assembly Building Area	J-53-DP6-0.5	0.5	9/16/2004	ND	ND	ND	**1.73**	85.8	0.394	0.571	23.1	10.6	22.7	15.8	ND	18.3	ND	ND	38.0	91.8	ND	ND	1.2	ND	ND	ND	1.5
J	53	Assembly Building Area	J-53-DP6-5	5	9/16/2004	ND	ND	ND	ND	66.8	0.312	ND	13.1	6.94	11.0	3.51	ND	10.4	ND	ND	25.0	30.8	ND	ND	1.5	ND	ND	ND	1.5
J	53	Assembly Building Area	J-53-DP7-0.5	0.5	9/16/2004	ND	ND	ND	**1.02**	107	0.495	ND	21.1	10.8	19.3	4.88	ND	17.2	ND	ND	38.1	50.4	ND	ND	0.95	ND	ND	ND	0.91
J	53	Assembly Building Area	J-53-DP7-5	5	9/16/2004	ND	ND	ND	**1.24**	114	0.518	ND	24.3	11.9	23.1	6.26	ND	18.5	ND	ND	44.1	55.5	ND	ND	ND	ND	ND	ND	ND
J	53	Assembly Building Area	J-53-DP8-0.5	0.5	9/16/2004	77	ND	ND	**2.33**	114	0.584	1.09	26.9	13.1	31.7	6.53	ND	21.7	ND	ND	48.1	215	ND	ND	1.2	ND	ND	ND	1.4
J	53	Assembly Building Area	J-53-DP8-5	5	9/16/2004	ND	ND	ND	**3.66**	144	0.653	0.600	26.9	15.2	33.3	6.24	ND	24.4	ND	ND	56.7	74.3	ND	ND	ND	ND	ND	ND	ND
J	53	Assembly Building Area	J-53-DP8-20	20	9/16/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND	1.2
J	53	Assembly Building Area	J-53-DP9-0.5	0.5	9/16/2004	ND	ND	ND	**2.90**	98.8	0.585	0.502	27.4	12.7	24.9	5.81	ND	22.3	0.820	ND	48.0	58.7	ND	ND	0.99	ND	ND	ND	1.2
J	53	Assembly Building Area	J-53-DP9-5	5	9/16/2004	ND	ND	ND	**2.02**	101	0.498	0.510	23.0	11.0	21.2	5.33	ND	18.2	ND	0.263	42.3	52.2	ND	ND	ND	ND	ND	ND	ND
J	53	Assembly Building Area	J-53-DP9-10	10	9/16/2004	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
J	53	Assembly Building Area	J-53-DP9-20	20	9/16/2004	9.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1
J	53	Assembly Building Area	J-53-DP10-0.5	0.5	9/16/2004	5.2	ND	ND	ND	118	0.590	ND	24.0	12.1	21.8	6.20	ND	18.7	ND	ND	44.5	83.5	ND	ND	1.3	ND	ND	ND	1.2
J	53	Assembly Building Area	J-53-DP10-5	5	9/16/2004	ND	ND	ND	ND	47.9	0.253	ND	11.9	5.84	7.58	2.54	ND	8.08	ND	ND	23.8	23.3	ND	ND	ND	ND	ND	ND	1.6
J	53	Assembly Building Area	J-53-DP10-20	20	9/16/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1
J	53	Assembly Building Area	J-53-HA2-0.5	0.5	9/20/2004	ND	ND	ND	ND	61.7	0.274	ND	12.3	6.37	10.9	5.31	ND	9.76	ND	ND	24.0	29.9	ND	ND	4.0	2.4	1.5	3.3	9.3
J	53	Assembly Building Area	J-53-HA2-5	5	9/20/2004	ND	ND	ND	**1.06**	46.3	ND	ND	9.83	5.22	7.97	2.41	ND	7.51	ND	ND	21.7	22.5	ND	ND	ND	ND	ND	ND	ND
					Residential PRGs	**none**	**7,800**	**31**	**0.39**	**5,400**	**150**	**1.70**	**210**	**900**	**3,100**	**150**	**390**	**1,600**	**390**	**390**	**550**	**23,000**	**120,000**	**1,600,000**	**600**	**8,900**	**270,000**	**270,000**	**520,000**
					Industrial PRGs	**none**	**100,000**	**410**	**1.6**	**67,000**	**1,900**	**7.40**	**450**	**1,900**	**41,000**	**750**	**5,100**	**20,000**	**5,100**	**5,100**	**7,200**	**100,000**	**410,000**	**6,000,000**	**1,300**	**20,000**	**420,000**	**420,000**	**520,000**

Notes:

TPH - total petroleum hydrocarbons

VOCs - volatile organic compounds

mg/kg - milligrams per kilogram

µg/kg - micrograms per kilogram

PRGs - 2002 Region IX United States Environmental Protection Agency Preliminary Remediation Goals

ND - Not detected above reporting limit

Bolding and shading indicate the concentration is above residential PRGs for the respective compound

5.1.2 Historical Operational Area K

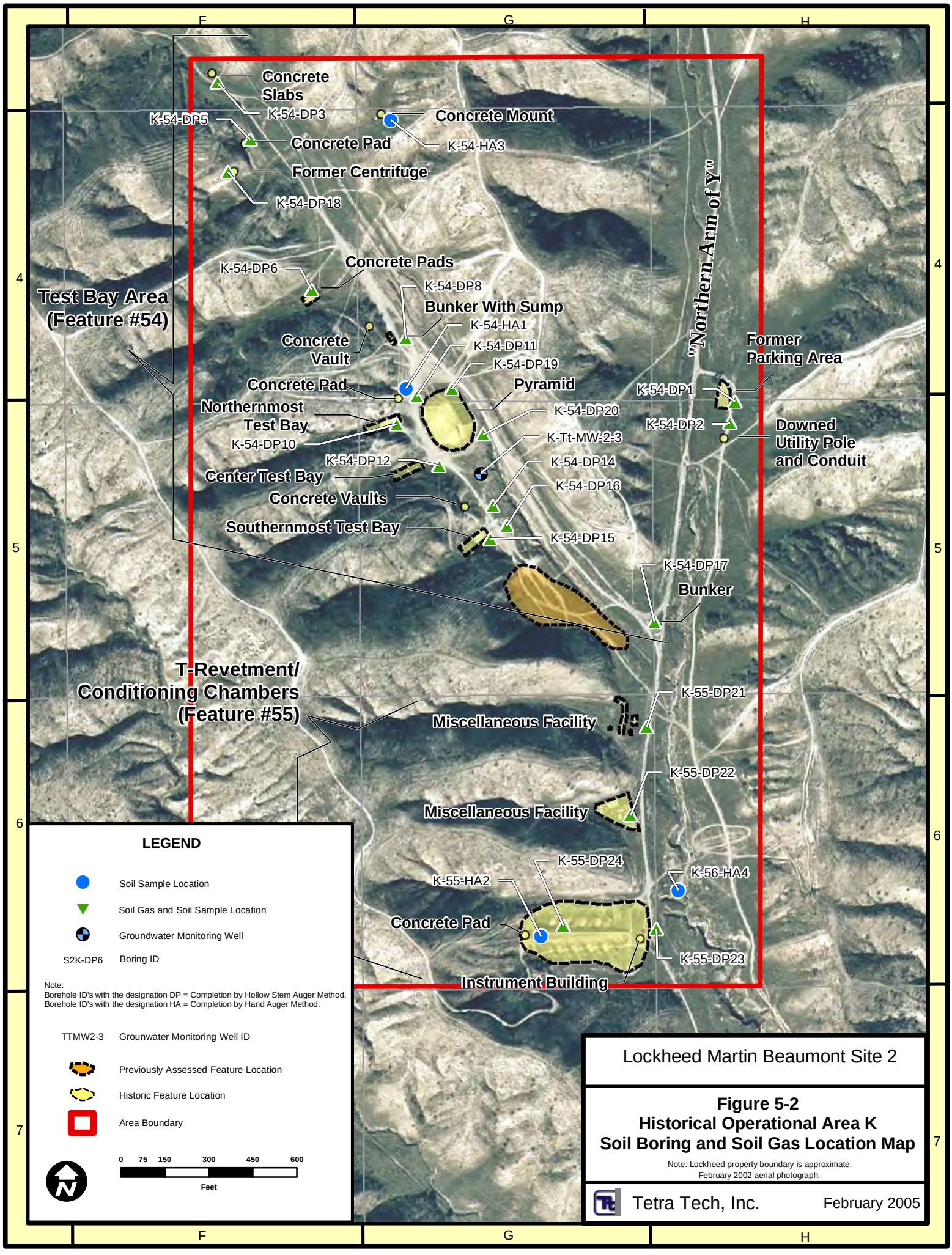
5.1.2.1 Investigation Approach and Deviations

A total of 20 Class 1 soil borings were completed for Historical Operational Area K. These boring locations are designated as K-54-DP1 through K-54-DP3, K-54-DP5, K-54-DP6, K-54-DP8, K-54-DP10 through K-DP12, K-54-DP14 through K-54-DP20, and K-55-DP21 through K-55-DP24 on Figure 5-2. Soil gas probes were installed to 10 feet bgs at the 20 Class 1 boring locations. The features that were assessed by these Class 1 soil borings are:

Feature No. 54 *Test Bays and Miscellaneous Facilities Area*, located in the northern portion of Historical Operational Area K – *see Figure 2-6*. Other miscellaneous structures were selected as potential areas of concern due to their possible involvement in the testing processes. There are three former areas within the northern portion of Historical Operational Area K that were assessed. In these areas, a limited soil gas survey was performed for VOCs.

Test Bay Area, located in the central portion of Historical Operational Area K – *see Figure 2-6*. The test bays and nearby bunkers and concrete pads were utilized for SRAM motor testing activities. The test bays were built at the foot of the hillsides, oriented perpendicular to the valley and the access road. Initial testing had a history of explosions, which destroyed complete test areas especially during the period when Grand Central Rocket operated the facility. Reportedly after motor failure, the area was checked to recover unburned propellant. Perchlorate was used in test motors and solvents were used for cleaning motors. Therefore, the analytical scheme included perchlorate, VOCs, SVOCs, 1,4-dioxane, and Title 22 metals.

A centrifuge was located northwest of the test bays where, historically, rocket motors were tested to see if the propellant would separate from its casing. Propellant, resins, and/or solvent chemicals may be present in this area. Therefore, the analytical scheme included perchlorate, VOCs, SVOCs and 1,4-dioxane.


F
G
H
4
5
6
7
Concrete Slabs
K-54-DP5
K-54-DP3
Concrete Mount
K-54-HA3
Concrete Pad
Former Centrifuge
K-54-DP18
"Northern Arm of Y"
K-54-DP6
Concrete Pads
K-54-DP8
Test Bay Area (Feature #54)
Bunker With Sump
K-54-HA1
Concrete Vault
K-54-DP11
K-54-DP19
Former Parking Area
Concrete Pad
Pyramid
K-54-DP1
Northernmost Test Bay
K-54-DP20
K-54-DP2
Downed Utility Pole and Conduit
K-54-DP10
K-Tt-MW-2-3
K-54-DP12
K-54-DP14
Center Test Bay
K-54-DP16
Concrete Vaults
Southernmost Test Bay
K-54-DP15
K-54-DP17
Bunker
T-Revetment/ Conditioning Chambers (Feature #55)
K-55-DP21
Miscellaneous Facility
K-55-DP22
Miscellaneous Facility
K-55-DP24
K-56-HA4
K-55-HA2
Concrete Pad
K-55-DP23
Instrument Building
LEGEND
Soil Sample Location
Soil Gas and Soil Sample Location
Groundwater Monitoring Well
S2K-DP6 Boring ID
Note:
Borehole ID's with the designation DP = Completion by Hollow Stem Auger Method.
Borehole ID's with the designation HA = Completion by Hand Auger Method.
TTMW2-3 Grounwater Monitoring Well ID
Previously Assessed Feature Location
Historic Feature Location
Area Boundary
0 75 150 300 450 600
Feet
N
Lockheed Martin Beaumont Site 2
Figure 5-2
Historical Operational Area K
Soil Boring and Soil Gas Location Map
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

Approximately 1,000 feet southeast of the centrifuge, adjacent to the main access road, is a large concrete bunker with a sump. It is unknown what type of storage or use of hazardous substances occurred at the bunker. A large earthen pyramid is present directly east of the northernmost test bay and was reportedly used as a visual marker during aerial flyover sighting exercises. The analytical scheme included perchlorate, VOCs, SVOCs, and 1,4-dioxane.

Feature No. 55 — *Environmental Conditioning Chambers and Miscellaneous Facilities*, located in the south central portion of Historical Operational Area K – *see Figure 2-6*. The environmental conditioning chambers were designed to examine the effects of extreme temperatures on rocket motors. Three former areas to be assessed are within the southern portion of Historical Operational Area K. A limited soil gas survey was performed for VOCs at each of the three former areas.

Approximately 250 feet south of the "Y" intersection an L-shaped berm is present with several concrete pads. A sawed off utility pole was present which may have been connected to transformers. Historically this area has been referred to as the northernmost conditioning chamber area. Ammonium perchlorate, ferrocene and possibly cleaning solvents may be potential contaminants of concern; therefore, the planned analytical scheme will include perchlorate, VOCs, SVOCs, 1,4-dioxane, Title 22 metals, PCBs, and TPH.

A second area further south of the "Y" intersection appears to have been used primarily as an asphalt and concrete pad parking lot. The exact usage of this area is unknown; therefore, soil samples were tested for VOCs, TPH, perchlorate, PCBs, and Title 22 metals.

The southernmost facilities in Feature No. 55 are the conditioning chambers arranged in a T-shaped layout. Based on the fact that historical operations conducted in this area are unknown, the soil samples collected at this feature were analyzed for SVOCs, perchlorate, TPH, VOCs, metals, PCBs, and 1,4-dioxane.

Four (4) additional Class 1 soil borings were originally planned for Feature No. 54. Two (2) of these boring locations were determined redundant by the Tetra Tech project geologist based on his field review of the Site. These include the borings originally designated as K-54-DP7 and K-54-DP13, located adjacent to the Concrete Vaults directly north of the Bunker and the Center Test Bay, respectively. At both of these locations, access by the HSA rig was precluded by either difficult or sloping terrain. After a review of these locations, it was determined by the Tetra Tech project geologist that these two borings would not be

converted to Class 2 boring as the proximity of other, successful boring locations would provide adequate coverage for the areas within Feature 54 that K-54-DP7 and K-54-DP13 were intended to serve.

The other two (2) boring locations were converted to Class 2 borings due to access issues. The boring originally designated as K-54-DP9 was located on top of a steep slope that could not be accessed by the HSA rig and was therefore sampled by hand-augering as a Class 2 boring. This boring is indicated as K-54-HA1 on Figure 5-2. The Concrete Mount located in the northern portion of Feature No. 54 (formerly designated as K-54-DP4) was also inaccessible to the HSA rig and was completed by hand-augering as a Class 2 boring. This location is indicated as K-54-HA3 on Figure 5-2. Samples collected from the converted soil borings were submitted for the same chemical analyses as originally planned for those particular locations.

In addition, two (2) more unplanned Class 2 soil boring were installed at Feature No. 55 based on a review of conditions observed in the field. One boring, K-55-HA2 was installed next to the Concrete Pad located atop of a small ridge along the revetments in the southern portion of Feature No. 55 (Figure 5-2). Another boring, K-55-HA4 was installed at the base of a large drainage tunnel that feeds into the main channel of Laborde Canyon, near the southeast margin of Area K. Samples from these two borings were submitted for the same chemical analyses as the other samples collected at Feature No. 55.

5.1.2.2 Analytical Results

Feature No. 54 – Test Bays and Miscellaneous Facilities Area

The soil samples collected at Feature No. 54 were analyzed for VOC, SVOCs, perchlorate, Title 22 metals, 1,4-dioxane, TPH, and PCBs. SVOCs, 1,4-dioxane, TPH, and PCBs were not detected at concentrations above the reporting limits. Several heavy metals and low levels of VOCs (i.e., 1,1-dichloroethene [1,1-DCE], acetone, benzene, and toluene) and perchlorate were detected at various locations throughout the feature. The total VOC concentrations ranged from 1.0 to 99.4 µg/kg and the perchlorate concentrations ranged from 0.02 to 4.51 mg/kg. The reported concentrations of heavy metals and the presence of perchlorate at the feature are discussed in Section 6.2.2. A summary of the detections above reporting limits is presented in Table 5-2.

Table 5-2 Summary of Detected Compounds in Soils at Historical Operational Area K

Area	Feature #	Feature Description	Soil Boring ID	Depth	Sample Date	TPH	PERCHLORATE	METALS														VOCs						
						TPH as Diesel (mg/kg)	Perchlorate (ug/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Total Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	1,1-Dichloroethene (ug/kg)	Acetone (ug/kg)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	o-Xylene (ug/kg)	p/m-Xylene (ug/kg)	Toluene (ug/kg)
K	54	Former Parking Area	K-54-DP1-0.5	0.5	9/15/2004	ND	ND	ND	**1.40**	99.9	0.361	ND	17.0	8.36	15.9	4.03	ND	13.5	ND	ND	30.1	39.5	ND	ND	1.7	ND	ND	ND	2.0
K	54	Former Parking Area	K-54-DP1-5	5	9/15/2004	ND	ND	ND	ND	64.1	0.321	ND	14.5	7.31	11.7	3.29	ND	11.1	ND	ND	27.4	32.4	ND	ND	3.4	ND	ND	ND	2.9
K	54	Former Parking Area	K-54-DP1-10	10	9/15/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5	ND	2.3	ND	ND	ND	2.1
K	54	Former Parking Area	K-54-DP1-20	20	9/15/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4
K	54	Former Parking Area	K-54-DP2-0.5	0.5	9/15/2004	ND	ND	ND	**1.34**	111	0.477	ND	23.5	11.5	21.9	5.12	ND	17.7	ND	ND	42.7	52.2	ND	ND	2.2	ND	ND	ND	1.8
K	54	Former Parking Area	K-54-DP2-5	5	9/15/2004	ND	ND	ND	**2.35**	120	0.474	ND	23.3	11.2	21.2	4.94	ND	17.7	ND	ND	41.1	51.8	ND	ND	5.2	ND	ND	ND	4.1
K	54	Former Parking Area	K-54-DP2-10	10	9/15/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5	ND	ND	ND	1.3
K	54	Former Parking Area	K-54-DP2-20	20	9/15/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2
K	54	Centrifuge Area	K-54-DP3-0.5	0.5	9/15/2004	ND	ND	ND	**1.36**	88.0	0.435	ND	19.5	9.66	18.2	6.33	ND	14.9	ND	ND	36.7	46.2	ND	ND	3.9	ND	ND	ND	3.6
K	54	Centrifuge Area	K-54-DP3-5	5	9/15/2004	ND	ND	ND	**1.63**	69.0	0.309	ND	13.7	6.66	12.0	3.39	ND	10.5	ND	ND	26.7	30.2	ND	ND	ND	ND	ND	ND	1.1
K	54	Centrifuge Area	K-54-DP3-10	10	9/15/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	1.4
K	54	Centrifuge Area	K-54-DP5-0.5	0.5	9/15/2004	ND	ND	ND	ND	73.6	0.265	ND	12.1	7.47	12.9	3.32	ND	11.4	ND	ND	23.2	33.1	ND	ND	ND	ND	ND	ND	ND
K	54	Centrifuge Area	K-54-DP5-20	20	9/15/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1	ND	ND	ND	2.7
K	54	Centrifuge Area	K-54-DP6-0.5	0.5	9/15/2004	ND	33.7	ND	**3.36**	167	0.596	ND	28.4	13.6	32.5	7.11	ND	21.9	ND	ND	49.9	67.9	ND	ND	ND	ND	ND	ND	ND
K	54	Centrifuge Area	K-54-DP6-5	5	9/15/2004	ND	ND	1.03	**0.889**	473	ND	ND	9.92	7.25	10.2	2.79	0.448	9.22	ND	0.545	24.2	24.2	ND	ND	2.1	ND	ND	ND	1.9
K	54	Centrifuge Area	K-54-DP6-20	20	9/15/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
K	54	Earthen Pyramid	K-54-DP8-0.5	0.5	9/15/2004	ND	48.9	ND	**3.32**	167	0.503	ND	26.6	12.7	23.1	5.50	ND	21.4	ND	0.279	46.3	57.5	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP8-5	5	9/15/2004	ND	85.5	0.918	**3.08**	99.7	0.307	ND	14.4	8.72	16.3	3.04	ND	13.5	ND	ND	35.5	40.2	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP8-10	10	9/15/2004	ND	324	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Test Bay Area	K-54-DP10-5	5	9/14/2004	ND	680	ND	**2.70**	116	0.455	ND	22.4	11.0	20.2	5.06	ND	17.5	ND	ND	36.7	51.1	ND	ND	ND	ND	ND	ND	ND
K	54	Test Bay Area	K-54-DP10-10	10	9/14/2004	ND	256	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Test Bay Area	K-54-DP10-20	20	9/14/2004	ND	110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP11-0.5	0.5	9/14/2004	ND	ND	ND	**4.50**	177	0.655	ND	28.8	14.4	37.5	7.77	ND	23.1	ND	0.397	41.9	159	ND	28	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP11-5	5	9/14/2004	ND	48.4	ND	**6.52**	227	0.470	ND	17.0	10.1	31.0	3.01	ND	13.3	ND	0.911	22.9	70.3	ND	ND	ND	ND	ND	ND	1.1
K	54	Earthen Pyramid	K-54-DP11-10	10	9/14/2004	ND	28.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP11-20	20	9/14/2004	ND	36.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Test Bay Area	K-54-DP12-0.5	0.5	9/14/2004	ND	ND	ND	**2.53**	103	0.488	ND	22.6	10.8	20.3	5.11	ND	17.4	ND	ND	36.7	51.5	ND	ND	1.4	ND	ND	ND	1.0
K	54	Test Bay Area	K-54-DP12-5	5	9/14/2004	ND	ND	ND	**2.97**	109	0.511	ND	23.8	11.4	21.2	5.67	ND	18.8	ND	ND	39.6	60.3	ND	ND	ND	ND	ND	ND	ND
K	54	Test Bay Area	K-54-DP12-20	20	9/14/2004	ND	66.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP14-0.5	0.5	9/14/2004	ND	129	ND	**3.08**	122	0.535	ND	26.5	11.8	22.8	6.27	ND	20.3	ND	ND	41.8	58.7	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP14-5	5	9/14/2004	ND	64.9	ND	**2.95**	120	0.527	ND	24.2	11.3	22.4	5.13	ND	19.0	ND	ND	39.9	54.6	ND	ND	1.4	ND	ND	ND	1.2
K	54	Earthen Pyramid	K-54-DP14-10	10	9/14/2004	ND	310	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP14-20	20	9/14/2004	ND	462	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Test Bay Area	K-54-DP15-0.5	0.5	9/13/2004	ND	347	ND	**2.93**	108	0.525	ND	21.7	11.0	21.9	5.22	ND	17.7	ND	ND	37.9	54.9	ND	ND	2.6	ND	ND	ND	2.0
K	54	Test Bay Area	K-54-DP15-5	5	9/13/2004	ND	357	ND	**4.95**	126	0.591	ND	25.0	12.6	26.3	5.89	ND	20.9	ND	0.260	44.7	62.5	ND	ND	1.9	ND	ND	ND	1.6
K	54	Test Bay Area	K-54-DP15-10	10	9/13/2004	ND	3760	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Test Bay Area	K-54-DP15-20	20	9/13/2004	ND	4510	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
					Residential PRGs	**none**	**7,800**	**31**	**0.39**	**5,400**	**150**	**1.70**	**210**	**900**	**3,100**	**150**	**390**	**1,600**	**390**	**390**	**550**	**23,000**	**120,000**	**1,600,000**	**600**	**8,900**	**270,000**	**270,000**	**520,000**
					Industrial PRGs	**none**	**10,000**	**410**	**1.6**	**67,000**	**1,900**	**7.40**	**450**	**1,900**	**41,000**	**750**	**5,100**	**20,000**	**5,100**	**5,100**	**7,200**	**100,000**	**410,000**	**6,000,000**	**1,300**	**20,000**	**420,000**	**420,000**	**520,000**

Notes:

TPH - total petroleum hydrocarbons

VOCs - volatile organic compounds

mg/kg - milligrams per kilogram

µg/kg - micrograms per kilogram

PRGs - 2002 Region IX United States Environmental Protection Agency Preliminary Remediation Goals

ND - Not detected above reporting limit

Bolding and shading indicate the concentration is above residential PRGs for the respective compound

Table 5-2 Summary of Detected Compounds in Soils at Historical Operational Area K (contd.)

Area	Feature #	Feature Description	Soil Boring ID	Depth	Sample Date	TPH	PERCHLORATE	METALS														VOCs						
						TPH as Diesel (mg/kg)	Perchlorate (ug/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Total Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	1,1-Dichloroethene (ug/kg)	Acetone (ug/kg)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	o-Xylene (ug/kg)	p/m-Xylene (ug/kg)	Toluene (ug/kg)
K	54	Earthen Pyramid	K-54-DP16-0.5	0.5	9/13/2004	ND	ND	ND	**4.74**	108	0.544	ND	24.1	14.1	25.2	6.17	ND	20.5	ND	ND	42.3	59.6	ND	ND	1.2	ND	ND	ND	1.2
K	54	Earthen Pyramid	K-54-DP16-5	5	9/13/2004	ND	ND	ND	**2.31**	97.0	0.457	ND	19.1	9.92	19.0	4.67	ND	15.8	ND	ND	34.2	46.9	ND	ND	1.2	ND	ND	ND	ND
K	54	Centrifuge Area	K-54-DP18-0.5	0.5	9/15/2004	ND	96.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	95	2.1	ND	ND	ND	2.3
K	54	Centrifuge Area	K-54-DP18-5	5	9/15/2004	ND	368	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	38	4.2	ND	ND	ND	3.9
K	54	Centrifuge Area	K-54-DP18-20	20	9/15/2004	ND	35.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	1.5
K	54	Earthen Pyramid	K-54-DP19-0.5	0.5	9/14/2004	ND	40.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP19-5	5	9/14/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	51	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP19-10	10	9/14/2004	ND	67.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP19-20	20	9/14/2004	ND	49.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP20-10	10	9/14/2004	ND	504	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
K	54	Earthen Pyramid	K-54-DP20-20	20	9/14/2004	ND	161	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND	1.3
K	54	Earthen Pyramid	K-54-HA1-0.5	0.5	9/20/2004	ND	ND	ND	**1.55**	117	0.469	ND	22.7	11.1	23.8	14.3	ND	17.3	ND	ND	38.4	70.7	ND	ND	1.4	ND	ND	ND	1.7
K	54	Earthen Pyramid	K-54-HA1-5	5	9/20/2004	ND	ND	ND	**1.81**	105	0.437	ND	19.8	9.89	19.0	4.51	ND	15.6	ND	ND	35.6	46.7	ND	ND	ND	ND	ND	ND	ND
K	54	Centrifuge Area	K-54-HA3-0.5	0.5	9/20/2004	ND	ND	ND	**1.73**	86.3	0.440	ND	18.1	9.44	17.4	5.35	ND	15.2	ND	ND	34.5	44.8	ND	ND	ND	ND	ND	ND	ND
K	54	Centrifuge Area	K-54-HA3-5	5	9/20/2004	ND	ND	ND	**1.36**	94.8	0.464	ND	21.0	10.4	19.1	4.62	ND	17.8	ND	ND	34.9	47.2	ND	ND	1.2	ND	ND	ND	ND
K	55	Northernmost Conditioning Chamber Area	K-55-DP21-0.5	0.5	9/13/2004	96	ND	ND	**1.30**	630	0.449	ND	18.3	9.25	20.1	8.51	ND	15.6	ND	ND	33.0	55.4	ND	ND	1.6	ND	ND	ND	1.3
K	55	Northernmost Conditioning Chamber Area	K-55-DP21-5	5	9/13/2004	ND	ND	ND	**1.77**	108	0.505	ND	19.8	11.0	20.9	5.14	ND	16.8	ND	ND	37.0	52.7	ND	ND	1.3	ND	ND	ND	0.99
K	55	Asphalt and Concrete Pad Parking Lot/Miscellaneous Facility	K-55-DP22-0.5	0.5	9/13/2004	ND	ND	ND	**1.43**	136	0.433	ND	16.4	9.02	18.4	4.56	ND	14.4	ND	ND	33.0	44.1	ND	46	1.7	ND	ND	ND	1.5
K	55	Asphalt and Concrete Pad Parking Lot/Miscellaneous Facility	K-55-DP22-5	5	9/13/2004	ND	ND	ND	**1.22**	149	0.461	ND	18.8	9.46	19.7	5.02	ND	15.1	ND	ND	35.3	45.1	ND	19	2.6	ND	ND	ND	2.3
K	55	Asphalt and Concrete Pad Parking Lot/Miscellaneous Facility	K-55-DP22-10	10	9/13/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND	1.2
K	55	Asphalt and Concrete Pad Parking Lot/Miscellaneous Facility	K-55-DP22-20	20	9/13/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.8	ND	ND	ND	1.7
K	55	Conditioning Chambers/Instrument Building	K-55-DP23-0.5	0.5	9/10/2004	300	ND	ND	**1.30**	151	0.458	ND	18.1	9.35	20.4	13.1	ND	15.3	ND	ND	37.0	77.9	ND	37	ND	ND	ND	ND	ND
K	55	Conditioning Chambers/Instrument Building	K-55-DP23-5	5	9/10/2004	27	ND	ND	**1.91**	147	0.483	ND	18.2	9.51	20.2	5.13	ND	15.4	ND	ND	37.5	44.6	ND	24	ND	ND	ND	ND	ND
K	55	Conditioning Chambers/Instrument Building	K-55-DP23-10	10	9/10/2004	44	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	1.7
K	55	Conditioning Chambers/Instrument Building	K-55-DP24-0.5	0.5	9/13/2004	120	ND	ND	**1.66**	140	0.464	**2.42**	20.9	9.54	45.7	42.4	ND	15.9	ND	ND	35.3	203	ND	ND	ND	ND	ND	ND	ND
K	55	Conditioning Chambers/Instrument Building	K-55-DP24-5	5	9/13/2004	19	ND	ND	**1.36**	114	0.379	0.605	16.8	7.71	23.6	20.9	ND	12.2	ND	ND	29.5	82.9	ND	ND	ND	ND	ND	ND	ND
					Residential PRGs	**none**	**7,800**	**31**	**0.39**	**5,400**	**150**	**1.70**	**210**	**900**	**3,100**	**150**	**390**	**1,600**	**390**	**390**	**550**	**23,000**	**120,000**	**1,600,000**	**600**	**8,900**	**270,000**	**270,000**	**520,000**
					Industrial PRGs	**none**	**10,000**	**410**	**1.6**	**67,000**	**1,900**	**7.40**	**450**	**1,900**	**41,000**	**750**	**5,100**	**20,000**	**5,100**	**5,100**	**7,200**	**100,000**	**410,000**	**6,000,000**	**1,300**	**20,000**	**420,000**	**420,000**	**520,000**

Notes:

TPH - total petroleum hydrocarbons

VOCs - volatile organic compounds

mg/kg - milligrams per kilogram

µg/kg - micrograms per kilogram

PRGs - 2002 Region IX United States Environmental Protection Agency Preliminary Remediation Goals

ND - Not detected above reporting limit

Bolding and shading indicate the concentration is above residential PRGs for the respective compound

Table 5-2 Summary of Detected Compounds in Soils at Historical Operational Area K (contd.)

Area	Feature #	Feature Description	Soil Boring ID	Depth	Sample Date	TPH	PERCHLORATE	METALS														VOCs						
						TPH as Diesel (mg/kg)	Perchlorate (ug/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Total Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	1,1-Dichloroethene (ug/kg)	Acetone (ug/kg)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	o-Xylene (ug/kg)	p/m-Xylene (ug/kg)	Toluene (ug/kg)
K	55	Conditioning Chambers/Instrument Building	K-55-HA2-0.5	0.5	9/20/2004	5.3	ND	ND	ND	245	0.497	ND	21.6	9.89	21.4	7.26	ND	15.3	ND	0.297	40.5	58.5	ND	ND	ND	ND	ND	ND	ND
K	55	Conditioning Chambers/Instrument Building	K-55-HA2-5	5	9/20/2004	ND	ND	ND	ND	164	0.499	ND	20.1	10.0	21.6	5.08	ND	15.5	ND	ND	39.9	48.7	ND	ND	ND	ND	ND	ND	ND
K	56	Burn Area	K-56-HA4-0.5	0.5	9/20/2004	89	ND	ND	**0.989**	164	0.441	ND	18.6	9.25	20.0	11.6	ND	14.5	ND	0.258	37.0	308	ND	ND	ND	ND	ND	ND	ND
K	56	Burn Area	K-56-HA4-5	5	9/20/2004	ND	ND	ND	**0.776**	91.0	0.394	ND	16.0	8.47	15.0	3.74	ND	13.1	ND	ND	31.1	40.4	ND	ND	1.7	ND	ND	ND	1.6
					Residential PRGs	**none**	**7,800**	**31**	**0.39**	**5,400**	**150**	**1.70**	**210**	**900**	**3,100**	**150**	**390**	**1,600**	**390**	**390**	**550**	**23,000**	**120,000**	**1,600,000**	**600**	**8,900**	**270,000**	**270,000**	**520,000**
					Industrial PRGs	**none**	**10,000**	**410**	**1.6**	**67,000**	**1,900**	**7.40**	**450**	**1,900**	**41,000**	**750**	**5,100**	**20,000**	**5,100**	**5,100**	**7,200**	**100,000**	**410,000**	**6,000,000**	**1,300**	**20,000**	**420,000**	**420,000**	**520,000**

Notes:

TPH - total petroleum hydrocarbons

VOCs - volatile organic compounds

mg/kg - milligrams per kilogram

µg/kg - micrograms per kilogram

PRGs - 2002 Region IX United States Environmental Protection Agency Preliminary Remediation Goals

ND - Not detected above reporting limit

Bolding and shading indicate the concentration is above residential PRGs for the respective compound

Feature No. 55 – Environmental Conditioning Chambers and Miscellaneous Facilities

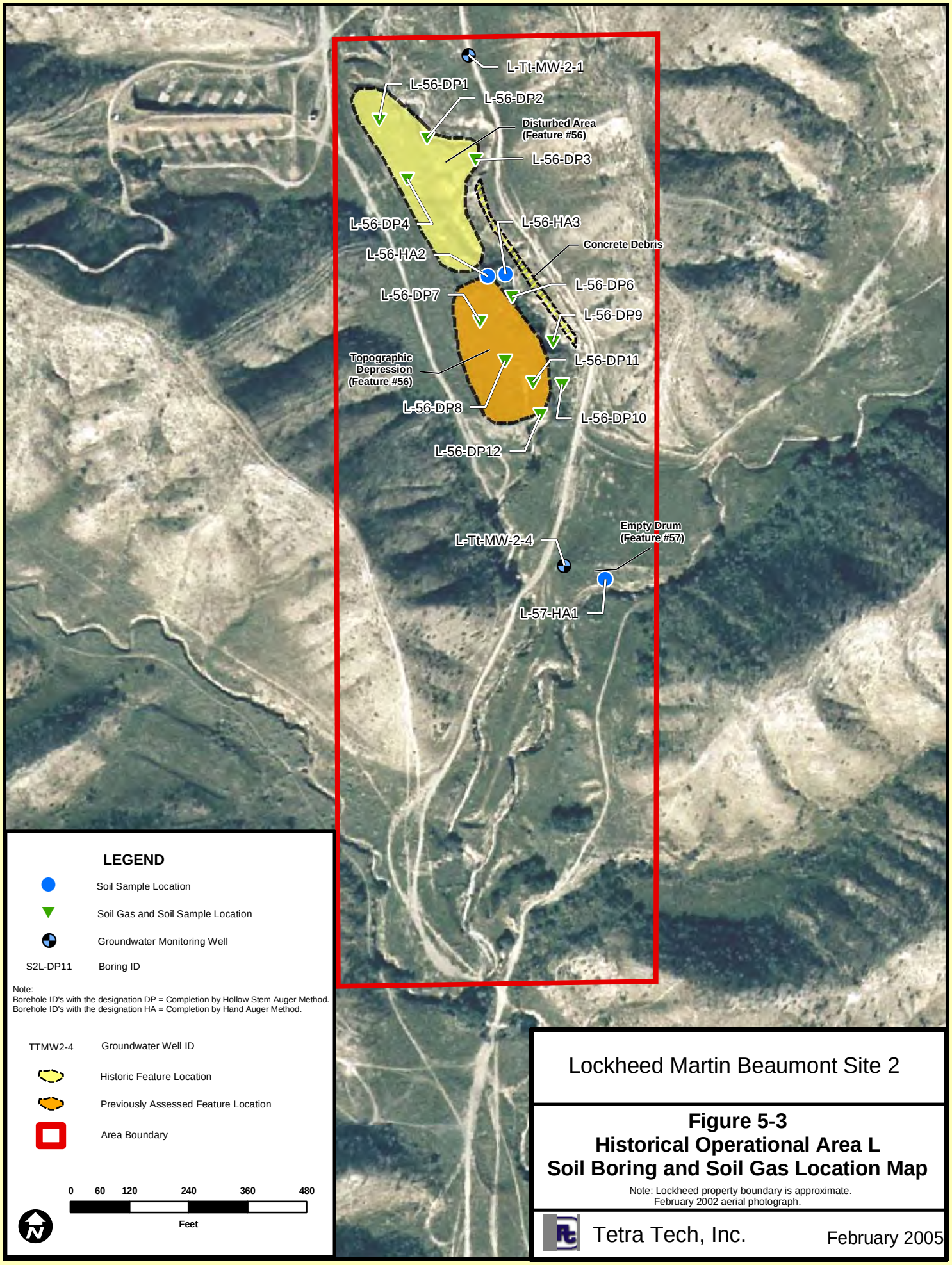
The soil samples collected at Feature No. 55 were analyzed for VOC, SVOCs, perchlorate, Title 22 metals, 1,4-dioxane, TPH, and PCBs. Perchlorate, SVOCs, 1,4-dioxane, and PCBs were not detected at concentrations above the reporting limits. Several heavy metals and low levels of TPH and VOCs (i.e., acetone, benzene, and toluene) were detected at various locations throughout the feature. The TPH concentrations ranged from 5.3 to 300 mg/kg and total VOC concentrations ranged from 2.29 to 49.2 µg/kg. The reported concentrations of heavy metals at the feature are discussed in Section 6.2.2. A summary of the analyte detections above reporting limits is presented in Table 5-2.

5.1.3 Historical Operational Area L

5.1.3.1 Investigation Approach and Deviations

A total of 11 Class 1 soil borings were installed at Historical Operational Area L. These boring locations are designated as L-56-DP1 through L-56-DP4 and L-56-DP6 through L-56-DP12 on Figure 5-3. Soil gas probes were installed at 10 and 20 feet bgs in the 11 Class 1 borings at Area L. The feature that was assessed by the Class 1 soil borings is:

Feature No. 56 — *Disturbed Area and Topographic Depression*, comprising the central portion of Historical Operational Area L – *see Figure 2-7*. Large slabs of propellant were transported to Beaumont Site 2 and set directly on the ground surface for burning. The solid propellant was saturated with diesel fuel to initiate combustion. The precise location of the burn area is unknown. Materials either used or produced through the burning of the solid propellant include ammonium perchlorate, diesel fuel, resins, solvents, SVOCs, metals, and PAHs. Soil samples collected at this feature were analyzed for VOCs, SVOCs, perchlorate, Title 22 metals, and TPH. A limited soil gas survey was also performed for VOCs at 10 and 20 bgs.


L-Tt-MW-2-1
L-56-DP1
L-56-DP2
Disturbed Area
(Feature #56)
L-56-DP3
L-56-DP4
L-56-HA3
Concrete Debris
L-56-HA2
L-56-DP6
L-56-DP7
L-56-DP9
Topographic
Depression
(Feature #56)
L-56-DP11
L-56-DP8
L-56-DP10
L-56-DP12
Empty Drum
(Feature #57)
L-Tt-MW-2-4
L-57-HA1
LEGEND
Soil Sample Location
Soil Gas and Soil Sample Location
Groundwater Monitoring Well
S2L-DP11
Boring ID
Note:
Borehole ID's with the designation DP = Completion by Hollow Stem Auger Method.
Borehole ID's with the designation HA = Completion by Hand Auger Method.
TTMW2-4
Groundwater Well ID
Historic Feature Location
Previously Assessed Feature Location
Area Boundary
0 60 120 240 360 480
Feet
Lockheed Martin Beaumont Site 2
Figure 5-3
Historical Operational Area L
Soil Boring and Soil Gas Location Map
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

In addition, one (1) Class 2 soil boring was installed based on the workplan. This boring is designated as L-57-HA1 on Figure 5-3 and was installed to investigate the following feature:

Feature No. 57 *Empty Drum*, located south of the actual burn area of Historical Operational Area L – *see Figure 2-7.* A rusted empty drum of unknown use and origin was once identified in this small area. Soil samples collected at this feature were analyzed for VOCs, SVOCs, 1,4-dioxane, perchlorate, Title 22 metals, and TPH.

One (1) Class 1 soil boring, originally designated as L-56-DP5, was converted into two (2) Class 2 borings due to access issues. This boring was located along the edge of an unstable slope that would not permit access for a HSA rig and was therefore completed as 2 separate hand-auger borings without installing soil gas probes. These borings are indicated as L-56-HA2 and L-56-HA3 on Figure 2-6.

5.1.3.2 Analytical Results

Feature No. 56 – Disturbed Area and Topographic Depression

The soil samples collected at Feature No. 56 were analyzed for VOCs, SVOCs, perchlorate, Title 22 metals, and TPH. SVOCs, 1,4-dioxane, and PCBs were not detected at concentrations above their respective reporting limits. Several Title 22 metals and low levels of TPH, VOCs (i.e., 1,1-DCE, acetone, benzene, and toluene),and perchlorate were detected at various locations throughout the feature. The TPH concentrations were 30 and 89 mg/kg and the total VOC concentrations ranged from 3.3 to 76.6 µg/kg. The detected perchlorate concentrations ranged from 0.0223 to 0.111 mg/kg. The reported concentrations of heavy metals and the presence of perchlorate in Area L are discussed in Section 6.2.3. A summary of the analyte detections above reporting limits is presented in Table 5-3.

Feature No. 57 – Empty Drum

The soil samples collected at Feature No. 57 were analyzed for VOCs, SVOCs, 1,4-dioxane, perchlorate, Title 22 metals, and TPH. The analytes were not detected at concentrations above their respective reporting limits.

Table 5-3 Summary of Detected Compounds in Soils at Historical Operational Area L

Area	Feature #	Feature Description	Soil Boring ID	Depth	Sample Date	TPH	PERCHLORATE	METALS														VOCs						
						TPH as Diesel (mg/kg)	Perchlorate (ug/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Total Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	1,1-Dichloroethene (ug/kg)	Acetone (ug/kg)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	o-Xylene (ug/kg)	p/m-Xylene (ug/kg)	Toluene (ug/kg)
L	56	Burn Area	L-56-DP1-0.5	0.5	9/10/2004	ND	ND	ND	**1.86**	160	0.495	ND	20.3	10.3	24.9	5.43	ND	16.0	ND	ND	38.7	50.6	ND	ND	1.4	ND	ND	ND	1.2
L	56	Burn Area	L-56-DP1-5	5	9/10/2004	ND	ND	ND	**1.49**	135	0.508	ND	17.4	8.63	18.7	9.40	ND	14.6	ND	ND	32.2	46.6	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP2-0.5	0.5	9/9/2004	ND	ND	ND	**0.775**	121	0.466	ND	20.5	10.5	19.7	11.6	ND	16.8	ND	ND	35.1	50.7	ND	76	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP2-5	5	9/9/2004	ND	ND	ND	**0.973**	94.4	0.397	ND	17.1	9.09	16.2	4.08	ND	13.7	ND	ND	31.0	39.9	ND	26	1.8	ND	ND	ND	1.3
L	56	Burn Area	L-56-DP2-40	40	9/9/2004	30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	26	1.5	ND	ND	ND	1.8
L	56	Burn Area	L-56-DP3-0.5	0.5	9/17/2004	ND	ND	ND	**0.950**	85.2	0.349	ND	15.1	7.77	13.7	4.73	ND	12.2	ND	ND	29.3	36.9	ND	ND	ND	ND	ND	ND	1.2
L	56	Burn Area	L-56-DP3-5	5	9/17/2004	ND	ND	ND	ND	120	0.456	ND	19.3	10.1	17.0	4.46	ND	15.9	ND	ND	38.0	46.2	ND	ND	1.3	ND	ND	ND	1.5
L	56	Burn Area	L-56-DP3-10	10	9/17/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
L	56	Burn Area	L-56-DP3-20	20	9/17/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND	1.7
L	56	Burn Area	L-56-DP3-30	30	9/17/2004	ND	23.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.98
L	56	Burn Area	L-56-DP3-40	40	9/17/2004	ND	357	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP4-0.5	0.5	9/9/2004	ND	ND	ND	**1.15**	145	0.481	ND	19.6	10.2	19.9	5.07	ND	15.8	ND	ND	34.8	47.7	ND	31	4.3	ND	ND	ND	3.0
L	56	Burn Area	L-56-DP4-5	5	9/9/2004	ND	ND	ND	ND	146	0.462	ND	19.3	9.51	20.2	8.09	ND	15.1	ND	ND	33.5	48.4	ND	32	1.5	ND	ND	ND	1.3
L	56	Burn Area	L-56-DP4-10	10	9/9/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND	1.3
L	56	Burn Area	L-56-DP4-30	30	9/9/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3
L	56	Burn Area	L-56-DP6-0.5	0.5	9/9/2004	ND	ND	ND	**1.58**	72.5	0.254	ND	19.3	9.02	11.6	5.17	1.15	14.6	ND	ND	27.5	45.0	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP6-5	5	9/9/2004	ND	ND	ND	**2.23**	109	0.447	ND	22.9	11.2	19.7	15.1	1.41	18.0	ND	ND	35.2	69.0	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP6-30	30	9/9/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.96	ND	ND	ND	1.1
L	56	Burn Area	L-56-DP6-40	40	9/9/2004	ND	111	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.3	ND	ND	ND	3.3
L	56	Burn Area	L-56-DP7-0.5	0.5	9/9/2004	ND	ND	ND	**1.36**	150	0.551	ND	21.9	10.9	23.4	12.3	ND	17.6	ND	ND	38.8	60.7	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP7-5	5	9/9/2004	ND	ND	ND	**1.18**	147	0.554	ND	22.6	11.1	22.4	10.7	ND	18.0	ND	ND	37.5	61.0	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP7-30	30	9/9/2004	ND	22.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7
					Residential PRGs	**none**	**7,800**	**31**	**0.39**	**5,400**	**150**	**1.70**	**210**	**900**	**3,100**	**150**	**390**	**1,600**	**390**	**390**	**550**	**23,000**	**120,000**	**1,600,000**	**600**	**8,900**	**270,000**	**270,000**	**520,000**
					Industrial PRGs	**none**	**10,000**	**410**	**1.6**	**67,000**	**1,900**	**7.40**	**450**	**1,900**	**41,000**	**750**	**5,100**	**20,000**	**5,100**	**5,100**	**7,200**	**100,000**	**410,000**	**6,000,000**	**1,300**	**20,000**	**420,000**	**420,000**	**520,000**

Notes:

TPH - total petroleum hydrocarbons

VOCs - volatile organic compounds

mg/kg - milligrams per kilogram

µg/kg - micrograms per kilogram

PRGs - 2002 Region IX United States Environmental Protection Agency Preliminary Remediation Goals

ND - Not detected above reporting limit

Bolding and shading indicate the concentration is above residential PRGs for the respective compound

Table 5-3 Summary of Detected Compounds in Soils at Historical Operational Area L

Area	Feature #	Feature Description	Soil Boring ID	Depth	Sample Date	TPH	PERCHLORATE	METALS														VOCs						
						TPH as Diesel (mg/kg)	Perchlorate (ug/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Total Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	1,1-Dichloroethene (ug/kg)	Acetone (ug/kg)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	o-Xylene (ug/kg)	p/m-Xylene (ug/kg)	Toluene (ug/kg)
L	56	Burn Area	L-56-DP8-0.5	0.5	9/8/2004	ND	ND	ND	**2.77**	136	0.512	ND	26.1	13.1	17.7	6.41	0.774	20.2	ND	ND	35.1	66.7	ND	75	1.6	ND	ND	ND	ND
L	56	Burn Area	L-56-DP8-5	5	9/8/2004	ND	ND	ND	**1.32**	73.0	0.325	ND	20.0	10.4	13.9	5.07	ND	15.6	ND	ND	29.8	46.8	ND	29	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP9-0.5	0.5	9/8/2004	ND	ND	ND	**1.73**	101	0.462	ND	19.6	10.8	18.7	4.66	ND	16.5	ND	ND	33.7	50.1	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP9-5	5	9/8/2004	ND	ND	ND	**2.09**	123	0.676	ND	27.8	15.7	21.0	6.30	0.457	21.6	ND	ND	48.7	60.6	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP9-10	10	9/8/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP9-40	40	9/8/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP10-0.5	0.5	9/8/2004	ND	ND	ND	**1.35**	92.5	0.526	ND	22.2	11.8	17.2	5.54	ND	16.1	ND	ND	39.9	48.1	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP10-5.0	5	9/8/2004	ND	ND	ND	**4.06**	130	0.688	ND	29.8	15.5	31.0	6.79	ND	25.4	ND	ND	49.8	71.9	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP10-30	30	9/8/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7	ND	ND	ND	2.4
L	56	Burn Area	L-56-DP11-0.5	0.5	9/6/2004	ND	ND	ND	**1.09**	113	0.592	ND	26.6	14.5	22.7	6.42	ND	20.9	ND	ND	46.3	60.6	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP11-5.0	5	9/6/2004	ND	ND	ND	**0.903**	88.8	0.525	ND	21.3	12.0	20.4	5.65	ND	16.7	ND	ND	49.8	47.1	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP12-0.5	0.5	9/6/2004	ND	ND	ND	**2.82**	83.3	0.433	ND	22.2	10.9	16.6	5.33	ND	16.1	ND	ND	36.6	46.5	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-DP12-5.0	5	9/6/2004	ND	ND	ND	**5.04**	74.2	0.439	ND	20.6	14.1	16.3	6.31	ND	15.9	ND	ND	38.1	44.7	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-HA2-0.5	0.5	9/20/2004	ND	ND	ND	**1.30**	91.2	0.385	ND	18.7	11.3	16.9	4.86	ND	16.6	ND	ND	29.8	49.6	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-HA2-5	5	9/20/2004	ND	ND	ND	ND	37.2	ND	ND	10.5	6.53	8.21	1.80	ND	9.57	ND	ND	16.1	27.0	ND	ND	ND	ND	ND	ND	ND
L	56	Burn Area	L-56-HA3-0.5	0.5	9/20/2004	ND	ND	ND	**2.13**	98.4	0.455	ND	21.1	11.4	19.5	6.75	ND	17.1	ND	ND	35.8	55.3	ND	ND	2.1	ND	ND	ND	ND
L	56	Burn Area	L-56-HA3-5	5	9/20/2004	ND	ND	ND	**0.917**	33.0	ND	ND	8.99	5.11	6.74	1.98	ND	7.65	ND	ND	14.4	21.6	ND	ND	ND	ND	ND	ND	ND
					Residential PRGs	**none**	**7,800**	**31**	**0.39**	**5,400**	**150**	**1.70**	**210**	**900**	**3,100**	**150**	**390**	**1,600**	**390**	**390**	**550**	**23,000**	**120,000**	**1,600,000**	**600**	**8,900**	**270,000**	**270,000**	**520,000**
					Industrial PRGs	**none**	**10,000**	**410**	**1.6**	**67,000**	**1,900**	**7.40**	**450**	**1,900**	**41,000**	**750**	**5,100**	**20,000**	**5,100**	**5,100**	**7,200**	**100,000**	**410,000**	**6,000,000**	**1,300**	**20,000**	**420,000**	**420,000**	**520,000**

Notes:

TPH - total petroleum hydrocarbons

VOCs - volatile organic compounds

mg/kg - milligrams per kilogram

µg/kg - micrograms per kilogram

PRGs - 2002 Region IX United States Environmental Protection Agency Preliminary Remediation Goals

ND - Not detected above reporting limit

Bolding and shading indicate the concentration is above residential PRGs for the respective compound

5.1.4 Historical Operational Area M

5.1.4.1 Investigation Approach and Deviations

A total of three (3) Class 1 soil borings were installed at Historical Operational Area M. These boring are identified as M-58-DP1 through M-58-DP3 in Figure 5-4. The feature that was assessed by the Class 1 soil borings was:

Feature No. 58 — *Dump Site (a.k.a. Garbage Disposal Site)*, located in the central portion of Historical Operational Area M – *see Figure 2-9.* The dump site had been used for disposal of scrap metal, paper, wood, and concrete materials by Lockheed propulsion Company (LPC). The disposal site was later leased to Ogden Labs for waste disposal. Ogden Labs was not selective in its waste segregation and disposal practices. LMC requested Ogden Labs to remove hazardous waste within the garbage disposal area. Shortly after 1973, Ogden Labs removed the hazardous waste within the garbage disposal area; however, no records of confirmation soil samples were found. In 1993, Radian performed removal activities of the remaining debris within the garbage disposal area. Three confirmation soil samples were collected from the perimeter of the excavation and analyzed for VOCs, SVOCs, and metals. All results were below their respective guidelines. The excavation activities were performed under the supervision of DTSC. DTSC provided a Report of Completion of Removal Action dated May 4, 1993. Soil samples collected at this feature were analyzed for VOCs, SVOCs, perchlorate, 1,4-dioxane, Title 22 metals, and TPH. A limited soil gas survey was also performed for VOCs.

5.1.4.2 Analytical Results

The soil samples collected at Feature No. 58 were analyzed for VOCs, SVOCs, perchlorate, 1,4-dioxane, Title 22 metals, and TPH. SVOCs, 1,4-dioxane, and TPH were not detected at concentrations above their respective reporting limits. Several heavy metals and low levels of VOCs (i.e., BTEX) and perchlorate were detected in samples collected from the feature. The total BTEX concentrations ranged from 1.5 to 17 µg/kg and the perchlorate concentrations ranged from 0.022 to 2.22 mg/kg. The reported concentrations of Title 22 metals and the presence of perchlorate in Area M are discussed in Section 6.2.1. A summary of the analyte detections above reporting limits is presented in Table 5-4.

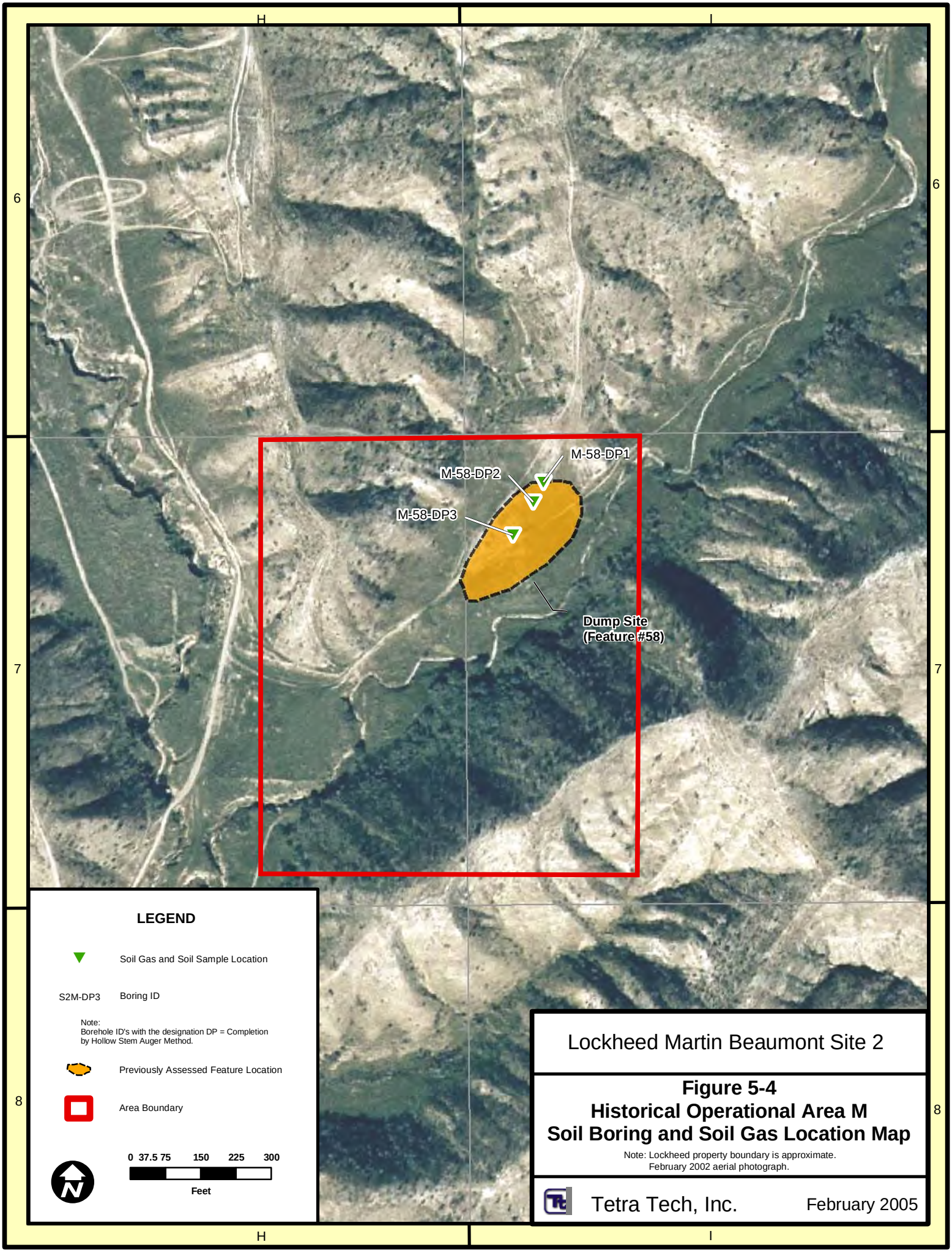

H
I
6
7
8
M-58-DP1
M-58-DP2
M-58-DP3
Dump Site
(Feature #58)
LEGEND
Soil Gas and Soil Sample Location
S2M-DP3
Boring ID
Note:
Borehole ID's with the designation DP = Completion
by Hollow Stem Auger Method.
Previously Assessed Feature Location
Area Boundary
0 37.5 75 150 225 300
Feet
Lockheed Martin Beaumont Site 2
Figure 5-4
Historical Operational Area M
Soil Boring and Soil Gas Location Map
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

Table 5-4 Summary of Detected Compounds in Soils at Historical Operational Area K

Area	Feature #	Feature Description	Soil Boring ID	Depth	Sample Date	TPH	PERCHLORATE	METALS														VOCs						
						TPH as Diesel (mg/kg)	Perchlorate (ug/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Total Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	1,1-Dichloroethene (ug/kg)	Acetone (ug/kg)	Benzene (ug/kg)	Ethylbenzene (ug/kg)	o-Xylene (ug/kg)	p/m-Xylene (ug/kg)	Toluene (ug/kg)
M	58	Garbage Landfill	M-58-DP1-0.5	0.5	9/17/2004	ND	22.4	ND	**1.32**	143	0.491	ND	20.2	10.3	20.2	4.89	ND	16.4	ND	ND	40.1	49.8	ND	ND	6.3	1.4	ND	ND	6.9
M	58	Garbage Landfill	M-58-DP1-5	5	9/17/2004	ND	ND	ND	**1.37**	154	0.476	ND	20.3	10.3	20.9	4.97	ND	16.8	ND	ND	39.7	50.1	ND	ND	ND	ND	ND	ND	ND
M	58	Garbage Landfill	M-58-DP1-10	10	9/17/2004	ND	2220	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.6	ND	ND	ND	2.9
M	58	Garbage Landfill	M-58-DP1-20	20	9/17/2004	ND	55.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M	58	Garbage Landfill	M-58-DP2-0.5	0.5	9/17/2004	ND	ND	ND	**1.26**	127	0.495	ND	21.5	10.8	19.8	5.07	ND	16.9	ND	ND	39.2	50.0	ND	ND	ND	ND	ND	ND	ND
M	58	Garbage Landfill	M-58-DP2-5	5	9/17/2004	ND	23.7	ND	**1.42**	164	0.454	ND	19.2	9.39	19.0	4.91	ND	15.3	ND	ND	37.4	45.3	ND	ND	ND	ND	ND	ND	ND
M	58	Garbage Landfill	M-58-DP2-20	20	9/17/2004	ND	32.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.2	2.0	ND	2.3	7.5
M	58	Garbage Landfill	M-58-DP3-0.5	0.5	9/17/2004	ND	ND	ND	**1.37**	116	0.464	ND	20.4	10.4	19.1	4.62	ND	16.7	ND	ND	38.1	48.3	ND	ND	1.4	ND	ND	ND	1.3
M	58	Garbage Landfill	M-58-DP3-5	5	9/17/2004	ND	ND	ND	ND	48.3	ND	ND	10.9	5.08	8.61	2.54	ND	7.77	ND	ND	19.7	23.8	ND	ND	ND	ND	ND	ND	ND
M	58	Garbage Landfill	M-58-DP3-10	10	9/17/2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5
Residential PRGs		**none**				**7,800**		**31**	**0.39**	**5,400**	**150**	**1.70**	**210**	**900**	**3,100**	**150**	**390**	**1,600**	**390**	**390**	**550**	**23,000**	**120,000**	**1,600,000**	**600**	**8,900**	**270,000**	**270,000**	**520,000**
Industrial PRGs		**none**				**10,000**		**410**	**1.6**	**67,000**	**1,900**	**7.40**	**450**	**1,900**	**41,000**	**750**	**5,100**	**20,000**	**5,100**	**5,100**	**7,200**	**100,000**	**410,000**	**6,000,000**	**1,300**	**20,000**	**420,000**	**420,000**	**520,000**

Notes:

TPH - total petroleum hydrocarbons

VOCs - volatile organic compounds

mg/kg - milligrams per kilogram

µg/kg - micrograms per kilogram

PRGs - 2002 Region IX United States Environmental Protection Agency Preliminary Remediation Goals

ND - Not detected above reporting limit

Bolding and shading indicate the concentration is above residential PRGs for the respective compound

5.2 SOIL GAS INVESTIGATION RESULTS

A total of 54 soil gas probes, 43 at 10 feet bgs and 11 at 20 feet bgs, were installed at 43 of the boring locations and sampled to determine if VOCs were present in the vadose zone of the Site. All 54 soil gas probes were sampled and analyzed for VOCs using EPA modified method 8260B. A copy of the soil gas laboratory report is presented in Appendix D. The soil gas investigation results are presented in the following subsections.

5.2.1 Historical Operational Area J

There were no detections of soil gas reported above reporting limits.

5.2.2 Historical Operational Area K

Hydrocarbon at a concentration of 11 µg/L was detected in the soil gas sample collected from 10 feet bgs at boring S2K-DP12, located at the Center Test Bay. There were no other detections of soil gas above reporting limits.

5.2.3 Historical Operational Area L

There were no detections of soil gas reported above detection limits.

5.2.4 Historical Operational Area M

There were no detections of soil gas reported above detection limits.

SECTION 6.0
DATA VALIDATION, DATA EVALUATION, AND CONCLUSIONS

6.1 DATA VALIDATION

6.1.1 Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements developed by data users to specify the quality of data from field and laboratory data collection activities. These DQOs must be carefully designed to support specific decisions or regulatory actions. The DQOs describe which data are needed, why the data are needed, and how the data will be used to address the problem being investigated. DQOs also establish numeric limits for the data to allow the data user to determine whether the data collected are of sufficient quality for use in their intended application.

The usability of the data collected during this investigation depends on its quality. A number of factors relate to the quality of data, and sample collection methods are as important to consider as methods used for sample analysis. Following standard operating procedures for both sample collection and analysis reduces sampling and analytical error. Complete chain-of-custody documentation and adherence to required sample preservation techniques, holding times and proper shipment methods ensure sample integrity. Obtaining valid and comparable data also requires adequate QA/QC procedures and documentation, as well as established detection and control limits.

Quantitation limits are based on the extent to which the field equipment, laboratory equipment, or analytical process can provide accurate measurements of consistent quality for specific constituents in field samples. The quantitation limit for a given analysis will vary depending on instrument sensitivity and matrix effects.

The effectiveness of a QA program is measured by the quality of data generated by the laboratory. Data quality is judged in terms of its precision, accuracy, completeness, and comparability.

1. Precision is expressed in RPD values. Spiked (MS/MSD) and unspiked duplicate field samples are analyzed in order to determine precision.

2. Accuracy is expressed as a percentage of the data outside the QC entity's control limits. The percent recoveries from laboratory control sample spikes, matrix spikes and surrogate spikes are used to determine accuracy.

3. The DQO compliance will be evaluated and stated as a percentage for each method.

The samples for this investigation were examined to determine compliance with the DQOs. The results are listed below and the validated sample data by analytical method is presented in Appendix E.

6.1.2 Precision and Accuracy

The following methods analyzed samples with no QC errors and resulted in usable data of known precision and accuracy. The data can be used as stated and did not require any qualification.

Method E314.0 for Perchlorate
Method E1624 for low level 1,4-Dioxane
Method E1625C for low level N-Nitrosodimethylamine
Method SW7470A/SW7471A for Mercury
Method SW8015B for Gasoline and Diesel Range Organics
Method SW8082 for Polychlorinated Biphenyls
Method SW8260B for Volatile Organic Compounds
Method SW8270C for Semi-Volatile Organic Compounds.

Method SW6010B for Metals had four (4) antimony results (0.3%) qualified as estimated (J flagged) for low spike recovery. The estimated data is usable for its intended purpose.

6.1.3 Completeness and Comparability

The completeness of this data set was above the DQO criterion of 90 percent. The DQO was satisfied.

6.1.4 Data Gaps

All data are usable for their intended purpose. No data gaps exist.

6.1.5 Holding Times Compliance

All holding times were within criteria.

6.1.6 Blank Contamination

None to report.

6.1.7 Other QC Problems

None to report.

6.2 DATA EVALUATION AND CONCLUSIONS

The preliminary soil investigations of the Site focused on LMC's historical operation areas, which were separated into the following four functional areas: Area J – Final Assembly, Area K – Test Bays and Miscellaneous Facilities, Area L – Propellant Burn Area, and Area M – Garbage Disposal Site. The subsurface soil investigation was conducted at the historical features associated with the operations within each functional area. A total of seven (7) historical features were identified and investigated as part of this soil investigation. A discussion of the analytical data for each feature and conclusions based on the data are presented in the following subsections.

6.2.1 Historical Operational Area J

Feature No. 52 – Possible Transformer Pad

PCBs were the chemicals of potential concern at this feature. Given that there were no detections above reporting limits, this feature has no identified chemicals of potential concern.

Feature No. 53 – Assembly Building Area

VOCs, SVOCs, perchlorate, 1,4-dioxane, Title 22 metals, PCBs, and TPH were the chemicals of potential concern at this feature. SVOCs, perchlorate, 1,4-dioxane, and PCBs were not detected at concentrations above their respective reporting limits and are not identified chemical of potential concern for this feature. The TPH concentrations detected in samples from the feature ranged from 5.2 to 77 mg/kg and total BTEX concentrations ranged from 1.1 to 20.5 µg/kg. The detected concentrations are low with respect to the 2002 United States Environmental Protection Agency (USEPA) Region IX Preliminary Remediation Goals (PRGs).

Heavy metals are naturally occurring at the Site and the detection of metals in samples collected throughout the feature is expected. The concentrations of the detected metals, with the exception of arsenic, were below their respective PRG values. Arsenic concentrations ranged from 0.83 to 3.66 mg/kg and exceeded

the residential and industrial PRG values of 0.39 and 1.6 mg/kg, respectively. The detected metal concentrations were also less than 20 x the respective soluble threshold limit concentration (STLC) using the toxicity characteristic leaching procedure (TCLP) as an indication of the leaching potential of the detected metals.

Arsenic was detected in samples from both the 0.5- and 5-foot depth intervals at eight (8) locations – *see Figure 6-1*. There was a slight, increasing trend in half of the locations (J-53-DP2, J-53-DP7, J-53-DP8, and J-53-HA2), which are spread throughout the feature. Given the indiscriminate distribution and narrow range of the arsenic detections and absence of historical operations at the feature that utilized arsenic, the elevated concentrations of arsenic in Feature No. 53 do not appear to be anthropogenic. To verify this assertion, further assessment is necessary to determine the naturally occurring concentrations of arsenic at the Site.

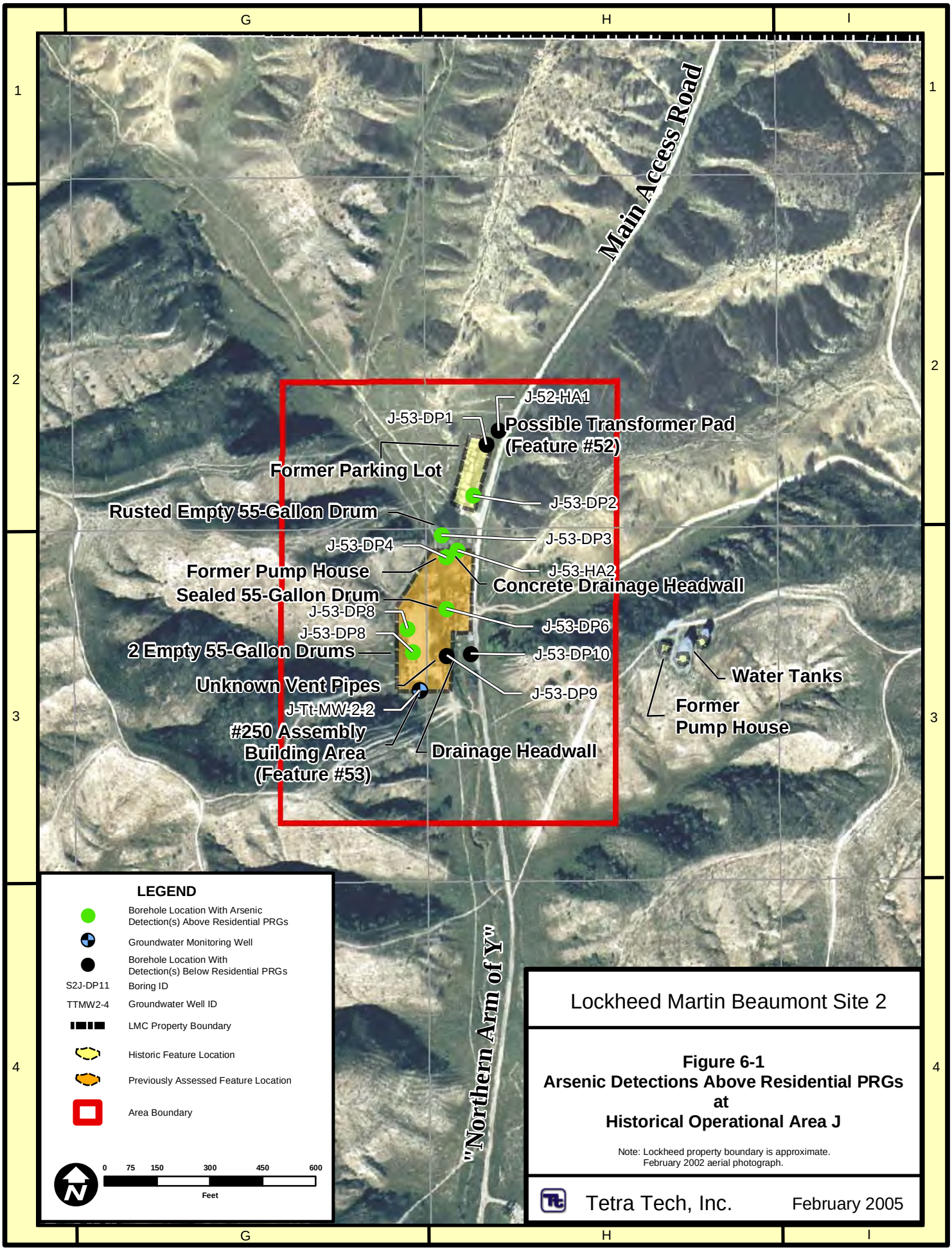
For Historic Operational Area J, a human health and ecological risk assessment will be performed. The risk assessment will determine if metals exceed background, identify chemicals of potential concern, evaluate exposures to potential receptors, assess the toxicity of the chemicals of potential concern, and characterize the risk. For the human health risk assessment, the exposure evaluation will be based on low impact recreational land use.

6.2.2 Historical Operational Area K

Feature No. 54 – Test Bays and Miscellaneous Facilities Area

VOC, SVOCs, perchlorate, Title 22 metals, 1,4-dioxane, TPH, and PCBs were the chemicals of potential concern at this feature. SVOCs, 1,4-dioxane, TPH, and PCBs were not detected at concentrations above their respective reporting limits and are not identified chemicals of potential concern at this feature. The total VOC (i.e., 1,1-DCE, acetone, benzene, and toluene) concentrations ranged from 1.0 to 99.4 µg/kg. The detected concentrations are low with respect to PRGs.

Perchlorate was only detected above reporting limits in samples collected from 10 of the borings sampled at the southernmost test bay, northernmost test bay, centrifuge area, and south of the pyramid. The

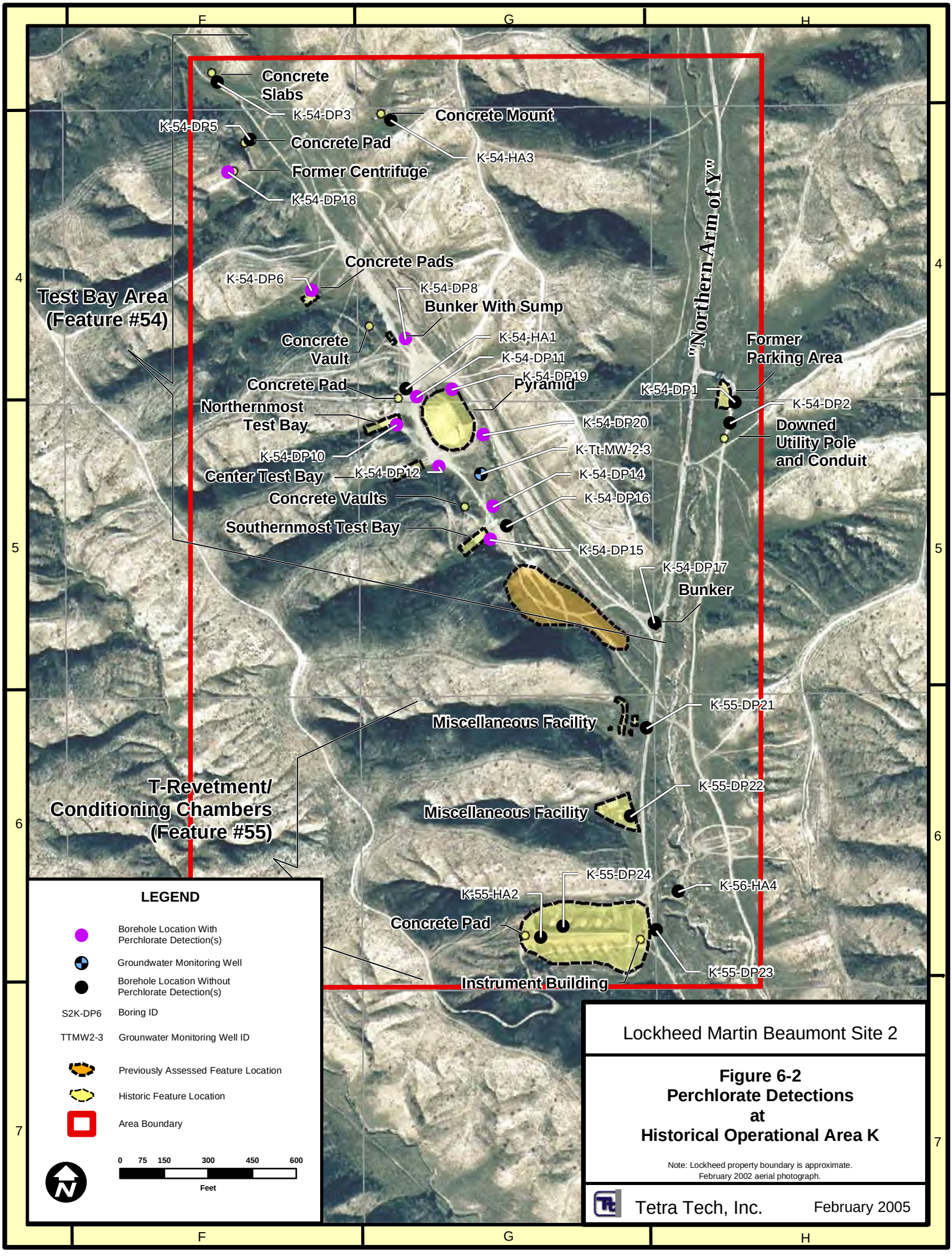

G
H
I
1
2
3
4
Main Access Road
"Northern Arm of Y"
J-52-HA1
J-53-DP1
Possible Transformer Pad
(Feature #52)
Former Parking Lot
J-53-DP2
Rusted Empty 55-Gallon Drum
J-53-DP4
J-53-DP3
Former Pump House
J-53-HA2
Concrete Drainage Headwall
Sealed 55-Gallon Drum
J-53-DP8
J-53-DP6
J-53-DP8
2 Empty 55-Gallon Drums
J-53-DP10
Water Tanks
Unknown Vent Pipes
J-53-DP9
Former
Pump House
J-Tt-MW-2-2
#250 Assembly
Building Area
(Feature #53)
Drainage Headwall
LEGEND
Borehole Location With Arsenic Detection(s) Above Residential PRGs
Groundwater Monitoring Well
Borehole Location With Detection(s) Below Residential PRGs
S2J-DP11 Boring ID
TTMW2-4 Groundwater Well ID
LMC Property Boundary
Historic Feature Location
Previously Assessed Feature Location
Area Boundary
0 75 150 300 450 600
Feet
Lockheed Martin Beaumont Site 2
Figure 6-1
Arsenic Detections Above Residential PRGs
at
Historical Operational Area J
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

detected concentrations ranged from 0.02 to 4.51 mg/kg and were present across all depth intervals (0.5 to 20 feet bgs). The highest concentrations were primarily detected in the 10 and 20 foot depth intervals at the southernmost test bay, northernmost test bay, and southeast corner of the earthen pyramid. Concentrations of perchlorate increased with depth in the vicinity of the southernmost test bay (K-54-DP15 and K-54-DP14) and at the bunker with a sump (K-54-DP8). There were pockets of detected perchlorate at K-54-DP12 (20 ft bgs only) and K-54-DP20 (10 and 20 ft bgs only). The detected concentrations reported for the remaining five borings either decreased with depth (K-54-DP6, K-54-DP10, K-54-DP11) or was highest at an intermediate depth interval (K-54-DP18 [highest at 5 ft bgs] and K-54-DP19 [highest at 10 ft bgs]).

Perchlorate was detected in 10 of the borings sampled at the southernmost test bay, northernmost test bay, centrifuge area, and south of the pyramid – *see Figure 6-2*. The detected perchlorate concentrations ranged 0.02 to 4.51 mg/kg and were present across all depth intervals (0.5 to 20 feet bgs). The reported concentrations are below the residential and industrial PRGs of 7.8 mg/kg and 100 mg/kg, respectively. The highest concentrations were primarily detected in the 10 and 20-foot depth intervals at the southernmost test bay, northernmost test bay, and southeast corner of the earthen pyramid. Concentrations of perchlorate increased with depth in the vicinity of the southernmost test bay (K-54-DP15 and K-54-DP14) and at the bunker with a sump (K-54-DP8). There were pockets of detected perchlorate at K-54-DP12 (20 ft bgs only) and K-54-DP20 (10 and 20 ft bgs only). The detected concentrations reported for the remaining five borings either decreased with depth (K-54-DP6, K-54-DP10, K-54-DP11) or were highest at an intermediate depth interval (K-54-DP18 [highest at 5 ft bgs] and K-54-DP19 [highest at 10 ft bgs]).

Given the adequate coverage of the sampling locations, the data indicates that perchlorate is present at the feature in low concentrations and is primarily limited to the vicinity of the test bays. The perchlorate is most likely a result of historical operations (e.g., motor explosions) at the feature. The reported concentrations of perchlorate do not exceed PRGs.

Heavy metals are naturally occurring at the Site and the detection of metals in samples collected throughout the feature is expected. The concentrations of the detected metals, with the exception of arsenic, were below their respective PRG values. Arsenic concentrations ranged from 0.889 to 6.52 mg/kg and exceeded the residential and industrial PRG values of 0.39 and 1.6 mg/kg, respectively. The detected


F
G
H
4
5
6
7
Concrete Slabs
K-54-DP3
Concrete Mount
K-54-DP5
Concrete Pad
K-54-HA3
Former Centrifuge
K-54-DP18
"Northern Arm of Y"
Concrete Pads
K-54-DP6
K-54-DP8
Bunker With Sump
Test Bay Area (Feature #54)
Concrete Vault
K-54-HA1
K-54-DP11
K-54-DP19
Pyramid
Concrete Pad
Northernmost Test Bay
K-54-DP20
K-54-DP10
K-Tt-MW-2-3
Center Test Bay
K-54-DP12
K-54-DP14
Concrete Vaults
K-54-DP16
Southernmost Test Bay
K-54-DP15
K-54-DP17
Bunker
Former Parking Area
K-54-DP1
K-54-DP2
Downed Utility Pole and Conduit
Miscellaneous Facility
K-55-DP21
T-Revetment/ Conditioning Chambers (Feature #55)
Miscellaneous Facility
K-55-DP22
K-55-DP24
K-56-HA4
K-55-HA2
Concrete Pad
K-55-DP23
Instrument Building
LEGEND
Borehole Location With Perchlorate Detection(s)
Groundwater Monitoring Well
Borehole Location Without Perchlorate Detection(s)
S2K-DP6
Boring ID
TTMW2-3
Grounwater Monitoring Well ID
Previously Assessed Feature Location
Historic Feature Location
Area Boundary
0 75 150 300 450 600
Feet
N
Lockheed Martin Beaumont Site 2
Figure 6-2
Perchlorate Detections
at
Historical Operational Area K
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

metal concentrations were also less than 20 x the respective STLC using the TCLP as an indication of the leaching potential of the detected metals.

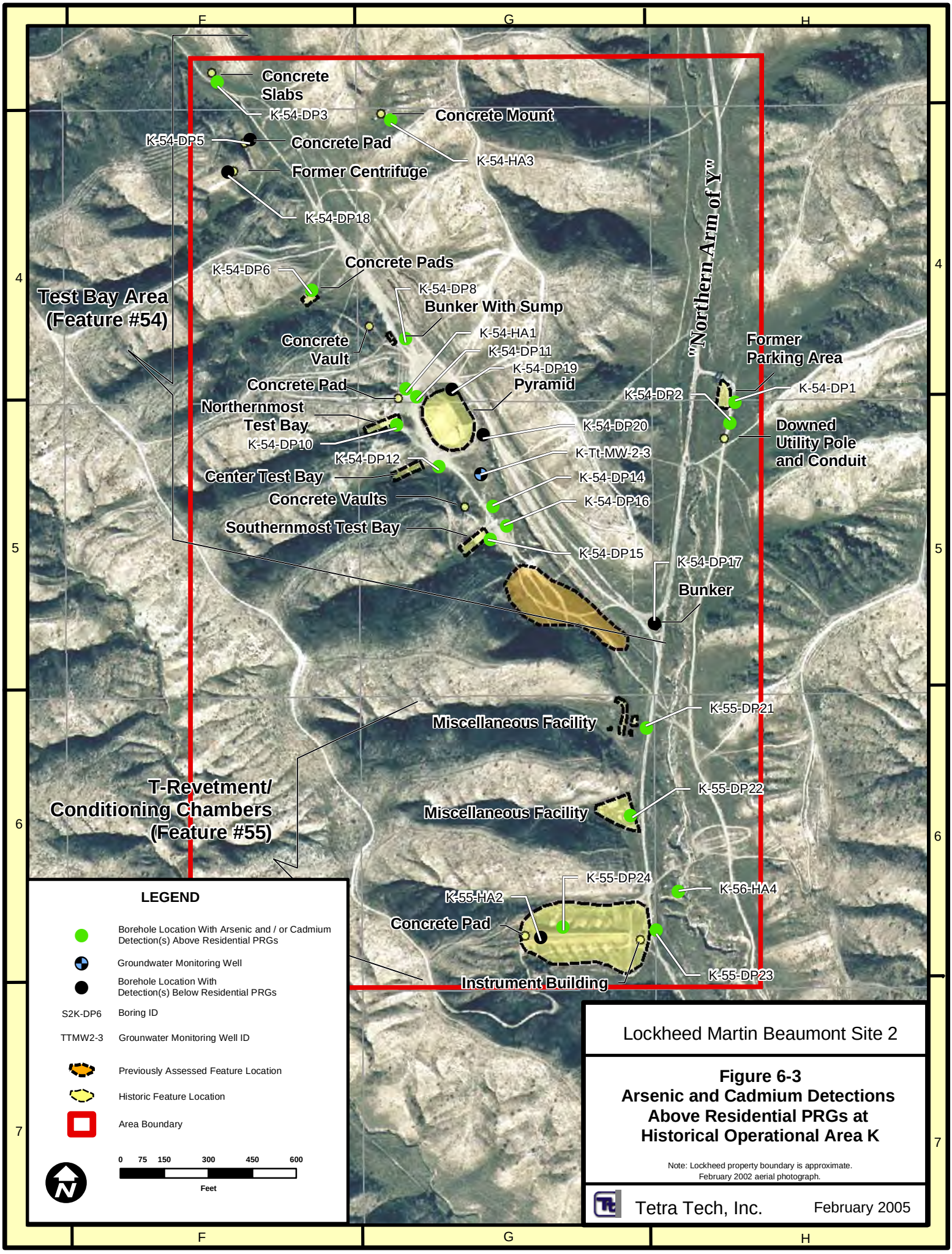
Arsenic was detected in samples from both the 0.5- and 5-foot depth intervals at 12 locations – *see Figure 6-3*. There was a slight, increasing trend in half of the locations (K-54-HA1, K-54-DP2, K-54-DP3, K-54-DP11, K-54-DP12, and K-54-DP15), which are spread throughout the feature. Given the indiscriminate distribution and relatively narrow range of the arsenic detections and absence of historical operations at the feature that utilized arsenic, the elevated concentrations of arsenic in Feature No. 54 do not appear to be anthropogenic. To verify this assertion, further assessment is necessary to determine the naturally occurring concentrations of arsenic at the Site.

Feature No. 55 – Environmental Conditioning Chambers and Miscellaneous Facilities

VOC, SVOCs, perchlorate, Title 22 metals, 1,4-dioxane, TPH, and PCBs were the chemicals of potential concern at this feature. Perchlorate, SVOCs, 1,4-dioxane, and PCBs were not detected at concentrations above their respective reporting limits and are not identified chemicals of potential concern at this feature. The TPH concentrations ranged from 5.3 to 300 mg/kg and total VOC (i.e., acetone, benzene, and toluene) concentrations ranged from 2.29 to 49.2 µg/kg. The detected concentrations are low with respect to PRGs.

Heavy metals are naturally occurring at the Site and the detection of metals in samples collected throughout the feature is expected. The concentrations of the detected metals, with the exception of arsenic and cadmium, were below their respective PRG values. Arsenic concentrations ranged from 01.22 to 1.91 mg/kg and exceeded the residential and industrial PRG values of 0.39 and 1.6 mg/kg, respectively. Cadmium was reported at a concentration of 2.42 mg/kg in the sample collected from a depth of 0.5 feet bgs at the T-Revetment / Conditioning Chamber area. The residential PRG for cadmium is 1.7 mg/kg. The detected metal concentrations were also less than 20 x the respective STLC using the TCLP as an indication of the leaching potential of the detected metals.

Arsenic was detected in samples from both the 0.5- and 5-foot depth intervals at four (4) locations – *see Figure 6-3*. There was a slight, increasing trend in half of the locations (K-55-DP21 and K-55-DP23). Given the indiscriminate distribution and relatively narrow range of the arsenic detections and absence of historical operations at the feature that utilized arsenic, the elevated concentrations of arsenic in Feature No. 55 do not appear to be anthropogenic. Additionally, the single, elevated detection of cadmium in an


F
G
H
4
5
6
7
Concrete Slabs
K-54-DP3
Concrete Mount
K-54-DP5
Concrete Pad
K-54-HA3
Former Centrifuge
K-54-DP18
"Northern Arm of Y"
Concrete Pads
K-54-DP6
K-54-DP8
Bunker With Sump
Test Bay Area (Feature #54)
Concrete Vault
K-54-HA1
K-54-DP11
K-54-DP19
Pyramid
Former Parking Area
Concrete Pad
K-54-DP2
K-54-DP1
Northernmost Test Bay
K-54-DP20
Downed Utility Pole and Conduit
K-54-DP10
K-54-DP12
K-Tt-MW-2-3
Center Test Bay
K-54-DP14
Concrete Vaults
K-54-DP16
Southernmost Test Bay
K-54-DP15
K-54-DP17
Bunker
Miscellaneous Facility
K-55-DP21
T-Revetment/ Conditioning Chambers (Feature #55)
K-55-DP22
Miscellaneous Facility
K-55-DP24
K-56-HA4
K-55-HA2
Concrete Pad
Instrument Building
K-55-DP23
LEGEND
Borehole Location With Arsenic and / or Cadmium Detection(s) Above Residential PRGs
Groundwater Monitoring Well
Borehole Location With Detection(s) Below Residential PRGs
S2K-DP6 Boring ID
TTMW2-3 Grounwater Monitoring Well ID
Previously Assessed Feature Location
Historic Feature Location
Area Boundary
0 75 150 300 450 600
Feet
N
Lockheed Martin Beaumont Site 2
Figure 6-3
Arsenic and Cadmium Detections Above Residential PRGs at Historical Operational Area K
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

area that did not have historical operations utilizing cadmium indicates that it is an anomaly. To verify these assertions, further assessment is necessary to determine the naturally occurring concentrations of arsenic and cadmium at the Site.

For Historic Operational Area K, a human health and ecological risk assessment will be performed. The risk assessment will determine if metals exceed background, identify chemicals of potential concern, evaluate exposures to potential receptors, assess the toxicity of the chemicals of potential concern, and characterize the risk. For the human health risk assessment, the exposure evaluation will be based on low impact recreational land use.

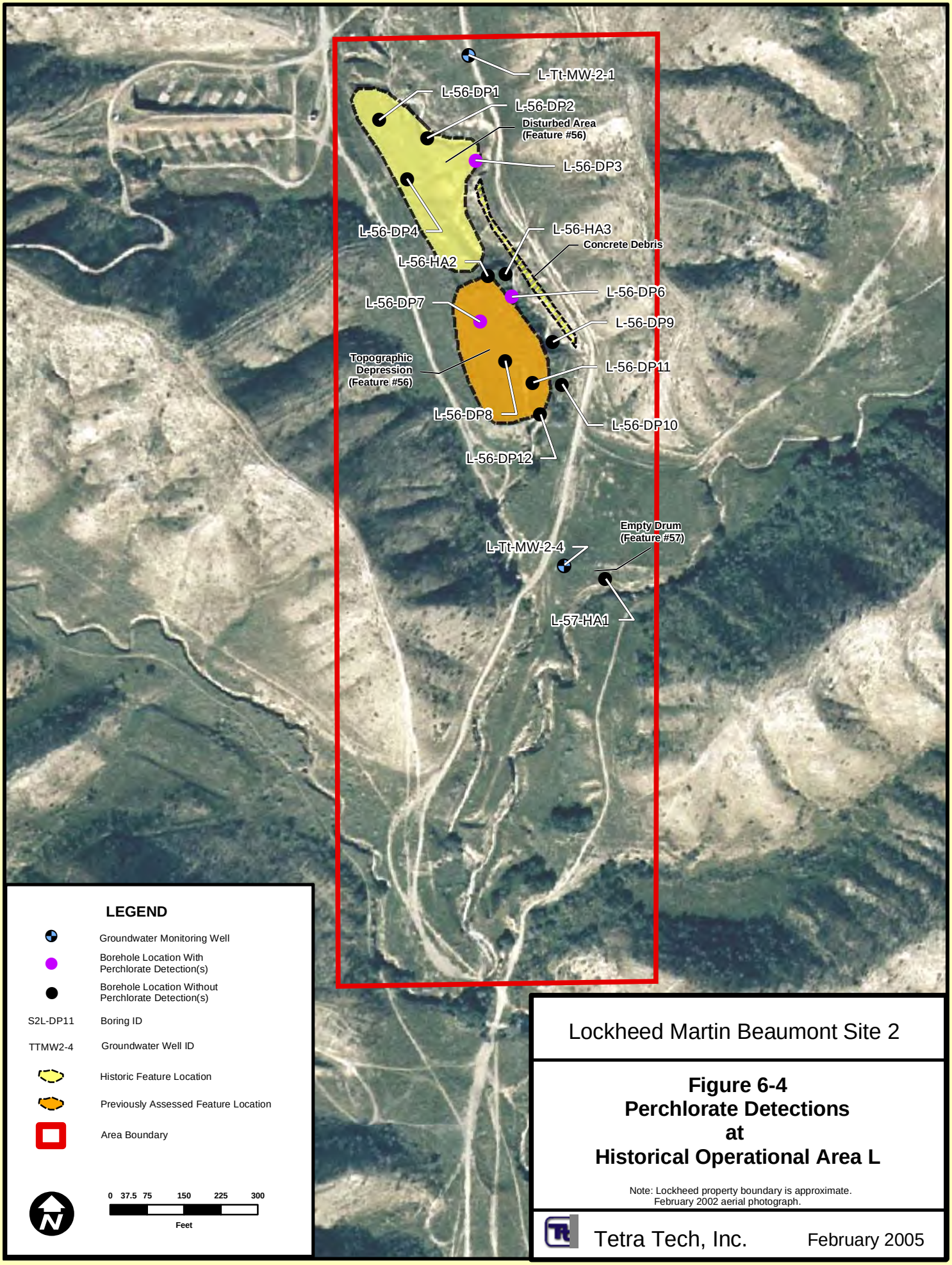
6.2.3 Historical Operational Area L

Feature No. 56 – Disturbed Area and Topographic Depression

VOCs, SVOCs, perchlorate, Title 22 metals, and TPH were the chemicals of potential concern at this feature. SVOCs, and 1,4-dioxane were not detected at concentrations above their respective reporting limits and are not identified chemicals of potential concern at this feature. The TPH concentrations detected in samples from the feature were 30 and 89 mg/kg and the total VOC concentrations ranged from 3.3 to 76.6 µg/kg. The detected concentrations are low with respect to PRGs.

Perchlorate was detected in samples collected from the east-central boundary of the Disturbed Area (L-56-DP3) and in the northeastern boundary (L-56-DP6) and north-central portion (L-56-DP7) of the Topographic Depression– *see Figure 6-4*. The detected concentrations were in samples from the 30- and 40-foot depth intervals and ranged from 0.0223 to 0.111 mg/kg. The detected values are below the residential and industrial PRGs of 7.8 mg/kg and 100 mg/kg, respectively. Given the adequate coverage of the sampling locations, the data indicates that perchlorate is present at the feature in low concentrations and is limited to the deep subsurface of the east-central portion of the Disturbed Area and northern portion of the Topographic Depression. The reported concentrations of perchlorate do not exceed PRGs.

Heavy metals are naturally occurring at the Site and the detection of metals in samples collected throughout the feature is expected. The concentrations of the detected metals, with the exception of arsenic, were below their respective PRG values. Arsenic concentrations ranged from 0.775 to 5.04 mg/kg and exceeded the residential and industrial PRG values of 0.39 and 1.6 mg/kg, respectively. The detected



Lockheed Martin Beaumont Site 2

Figure 6-4
Perchlorate Detections
at
Historical Operational Area L

Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.

Tetra Tech, Inc. February 2005

metal concentrations were also less than 20 x the respective STLC using the TCLP as an indication of the leaching potential of the detected metals.

Arsenic was detected in samples from both depth intervals at 13 locations – *see Figure 6-5*. There was a slight, increasing trend in five (5) of the locations (L-56-DP2, L-56-DP6, L-56-DP9, L-56-DP10, and L-56-DP12). Given the indiscriminate distribution and narrow range of arsenic detections and absence of historical operations at the feature that involved arsenic, the elevated concentrations of arsenic in Feature No. 56 do not appear to be anthropogenic. To verify this assertion, further assessment is necessary to determine the naturally occurring concentrations of arsenic at the Site.

Feature No. 57 – Empty Drum

VOCs, SVOCs, 1,4-dioxane, perchlorate, Title 22 metals, and TPH were the chemicals of potential concern at this feature. Given that there were no detections above reporting limits, there are no identified chemicals of potential concern at this feature.

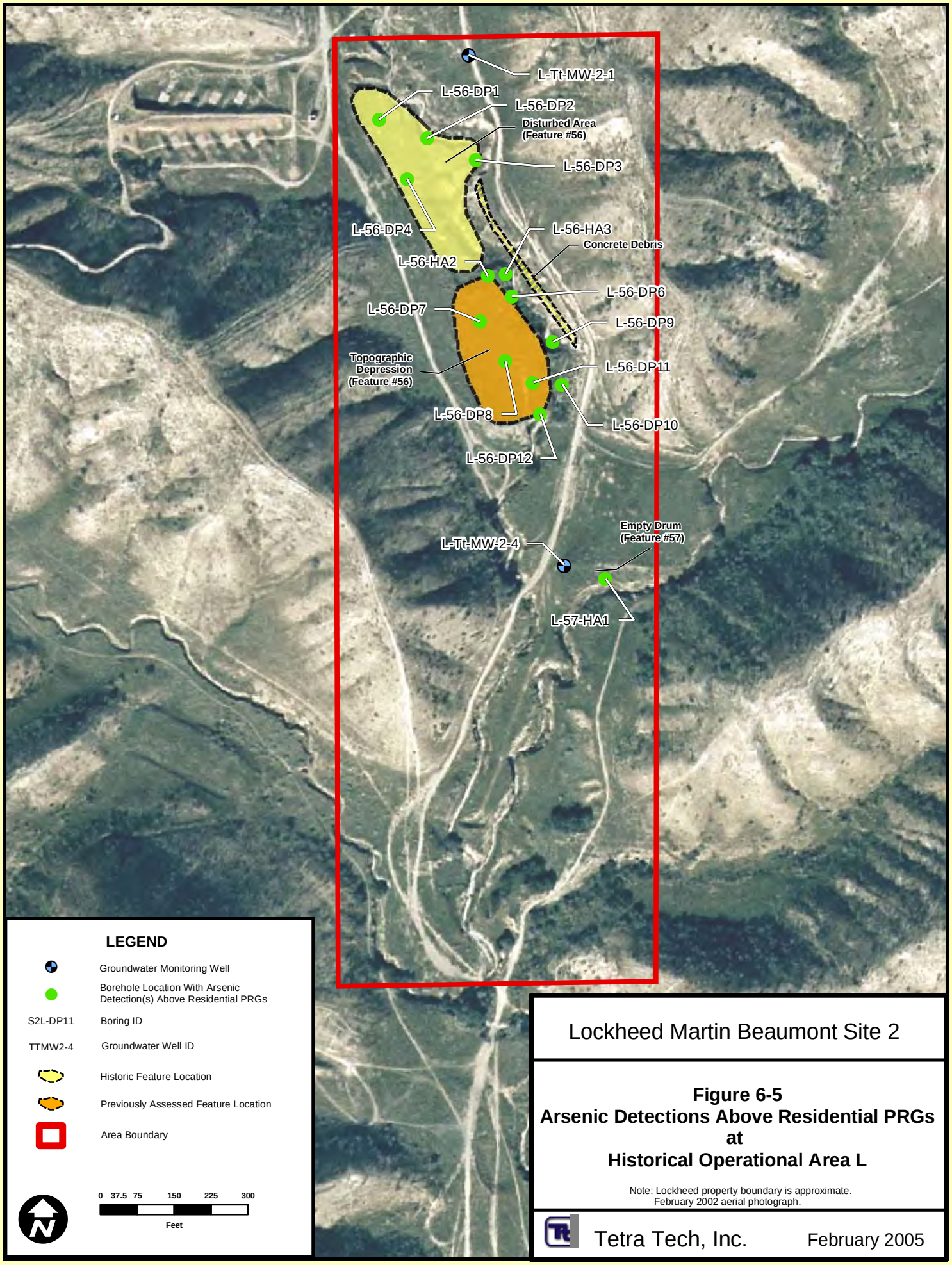
For Historic Operational Area L, a human health and ecological risk assessment will be performed. The risk assessment will determine if metals exceed background, identify chemicals of potential concern, evaluate exposures to potential receptors, assess the toxicity of the chemicals of potential concern, and characterize the risk. For the human health risk assessment, the exposure evaluation will be based on low impact recreational land use.

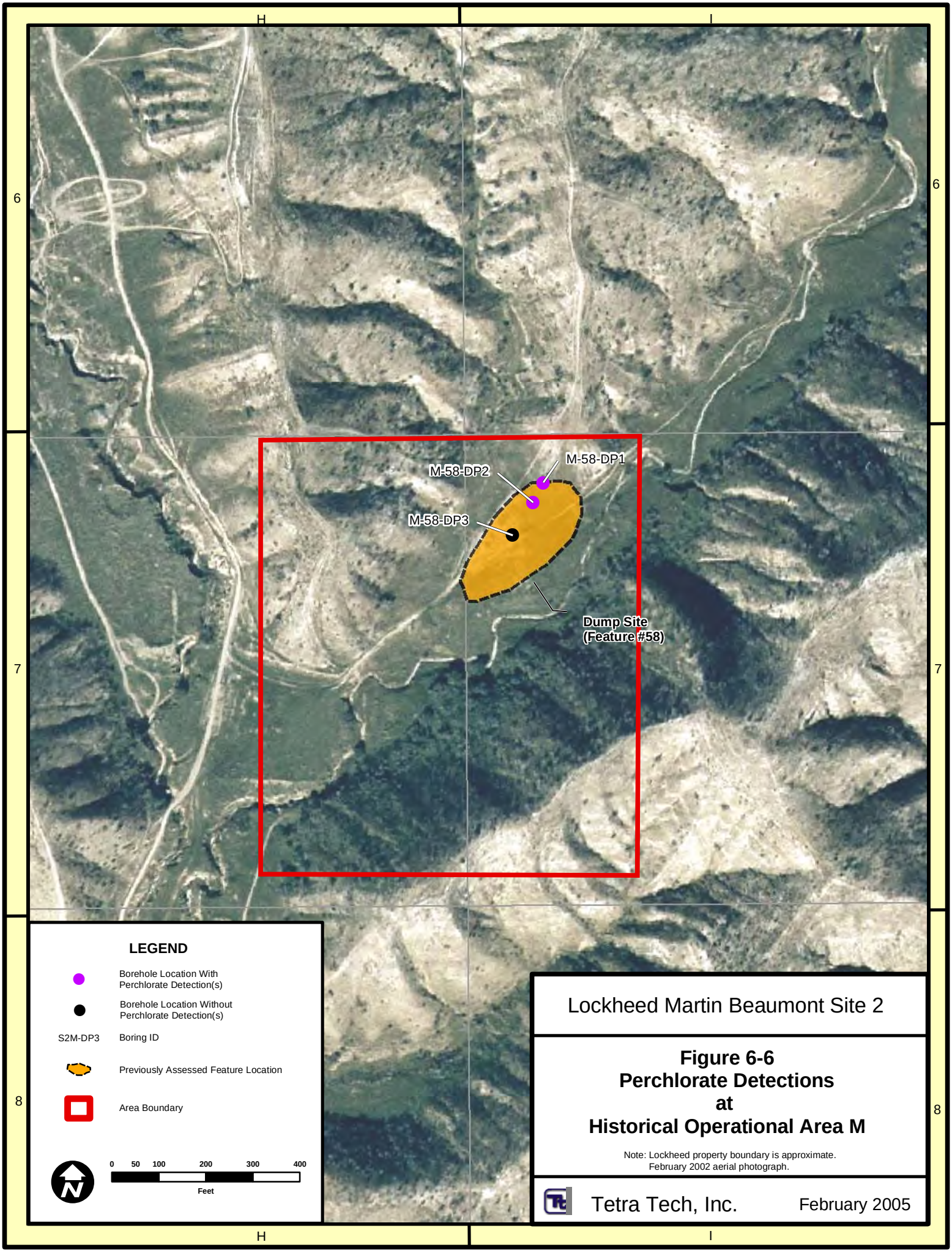
6.2.4 Historical Operational Area M

Feature No. 58 – Dump Site

VOCs, SVOCs, perchlorate, 1,4-dioxane, Title 22 metals, and TPH were the chemicals of potential concern at this feature. SVOCs, 1,4-dioxane, TPH, and PCBs were not detected at concentrations above their respective reporting limits and are not identified chemicals of potential concern at this feature. The total BTEX concentrations detected in samples from the feature ranged from 1.5 to 17 µg/kg. The detected concentrations are low with respect to PRGs.

Perchlorate was detected in samples collected from the central and northern portions of Area M – *see Figure 6-6*. The detected perchlorate concentrations ranged from 0.022 to 2.22 mg/kg and are below the


L-Tt-MW-2-1
L-56-DP1
L-56-DP2
Disturbed Area
(Feature #56)
L-56-DP3
L-56-DP4
L-56-HA3
Concrete Debris
L-56-HA2
L-56-DP6
L-56-DP7
L-56-DP9
Topographic
Depression
(Feature #56)
L-56-DP11
L-56-DP8
L-56-DP10
L-56-DP12
Empty Drum
(Feature #57)
L-Tt-MW-2-4
L-57-HA1
LEGEND
Groundwater Monitoring Well
Borehole Location With Arsenic
Detection(s) Above Residential PRGs
S2L-DP11
Boring ID
TTMW2-4
Groundwater Well ID
Historic Feature Location
Previously Assessed Feature Location
Area Boundary
0 37.5 75 150 225 300
Feet
Lockheed Martin Beaumont Site 2
Figure 6-5
Arsenic Detections Above Residential PRGs
at
Historical Operational Area L
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

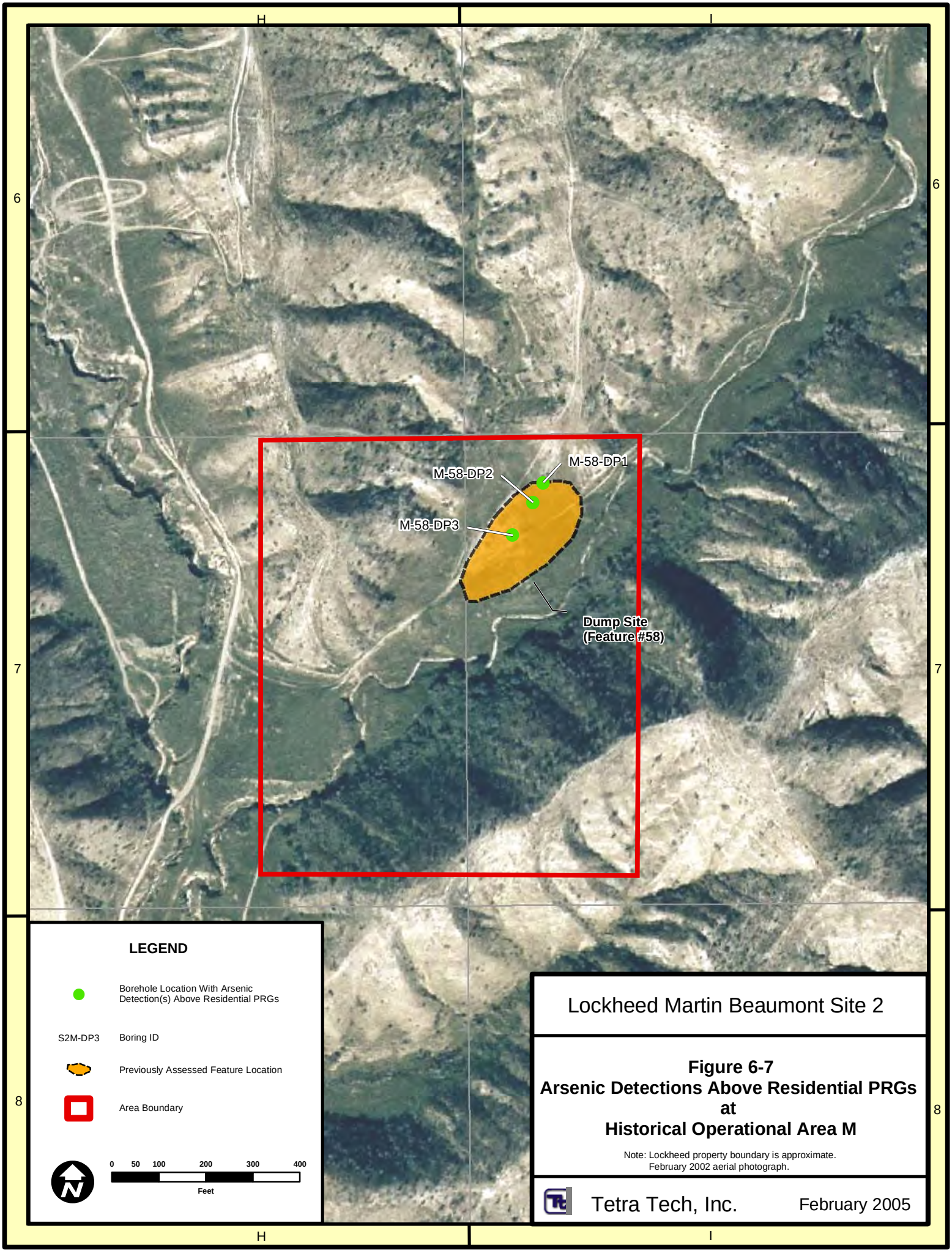

H
I
6
7
8
M-58-DP1
M-58-DP2
M-58-DP3
Dump Site
(Feature #58)
LEGEND
Borehole Location With Perchlorate Detection(s)
Borehole Location Without Perchlorate Detection(s)
S2M-DP3
Boring ID
Previously Assessed Feature Location
Area Boundary
0 50 100 200 300 400
Feet
Lockheed Martin Beaumont Site 2
Figure 6-6
Perchlorate Detections
at
Historical Operational Area M
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

residential and industrial PRGs of 7.8 mg/kg and 100 mg/kg, respectively. The highest concentration (2.22 mg/kg) was detected in the sample collected from a depth of 10 feet bgs in the northern portion of Area M (M-58-DP1). The concentration of perchlorate in the subsequent depth interval (20 feet bgs) was significantly less (0.557 mg/kg). The perchlorate concentrations detected in the samples from the central portion of the feature (0.0237 mg/kg at 5 feet bgs and 0.0322 mg/kg at 20 feet bgs) were significantly less than in the northern portion. Based on the data, it appears that perchlorate or perchlorate-containing material may have been deposited in the northern portion of Area M. The reported concentrations of perchlorate do not exceed PRGs.

Heavy metals are naturally occurring at the Site and the detection of metals in samples collected throughout the feature is expected. The concentrations of the detected metals, with the exception of arsenic, were below their respective PRG values. Arsenic concentrations ranged from 1.26 to 1.42 mg/kg and exceeded the residential and industrial PRG values of 0.39 and 1.6 mg/kg, respectively. The detected metal concentrations were also less than 20 x the respective STLC using the TCLP as an indication of the leaching potential of the detected metals.

Arsenic was detected in samples from the three borings at Area M – *see Figure 6-7*. There was a slight, increasing trend in samples from M-58-DP1 and M-58-DP2. Given the distribution and narrow range of the arsenic detections and absence of historical operations at the feature that involved arsenic, the elevated concentrations of arsenic in Feature No. 58 do not appear to be anthropogenic. To verify this assertion, further assessment is necessary to determine the naturally occurring concentrations of arsenic at the Site.

For Historic Operational Area M, a human health and ecological risk assessment will be performed. The risk assessment will determine if metals exceed background, identify chemicals of potential concern, evaluate exposures to potential receptors, assess the toxicity of the chemicals of potential concern, and characterize the risk. For the human health risk assessment, the exposure evaluation will be based on low impact recreational land use.


H
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7
8
M-58-DP1
M-58-DP2
M-58-DP3
Dump Site
(Feature #58)
LEGEND
Borehole Location With Arsenic Detection(s) Above Residential PRGs
S2M-DP3
Boring ID
Previously Assessed Feature Location
Area Boundary
0 50 100 200 300 400
Feet
Lockheed Martin Beaumont Site 2
Figure 6-7
Arsenic Detections Above Residential PRGs at Historical Operational Area M
Note: Lockheed property boundary is approximate.
February 2002 aerial photograph.
Tetra Tech, Inc.
February 2005

Based on the detected concentrations in soil at Site 2, perchlorate may not be a soil dermal/inhalation risk in the areas of concern. However, it may be a source for groundwater contamination. Perchlorate will be investigated as part of the groundwater characterization.