FINAL FIELD SAMPLING PLAN FOR CONDUCTING TRENCHING, SOIL SAMPLING, SURFACE WATER SAMPLING, UNEXPLODED ORDNANCE (UXO) SCREENING, FIELD SCREENING, AND SURVEYING AT THE McCORMICK RANCH HIGH EXPLOSIVES TEST SITE KIRTLAND AFB, NM

Prepared for:

Safety and Environmental Quality Division
Phillips Laboratory
Kirtland Air Force Base
Albuquerque, New Mexico

Phase II Environmental Baseline Survey
Contract # F29601-93-0219

Prepared by:

GRAM, Inc.
in association with
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August 1994

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LATA

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1.0 BACKGROUND INFORMATION

The investigations at McCormick Ranch are being conducted to determine if any explosives residues, detonation products, decomposition products, or other related high explosives (HE) test materials are present in the soil or surface waters in quantities that are considered hazardous according to state and/or federal regulations. The types of field investigations will include:

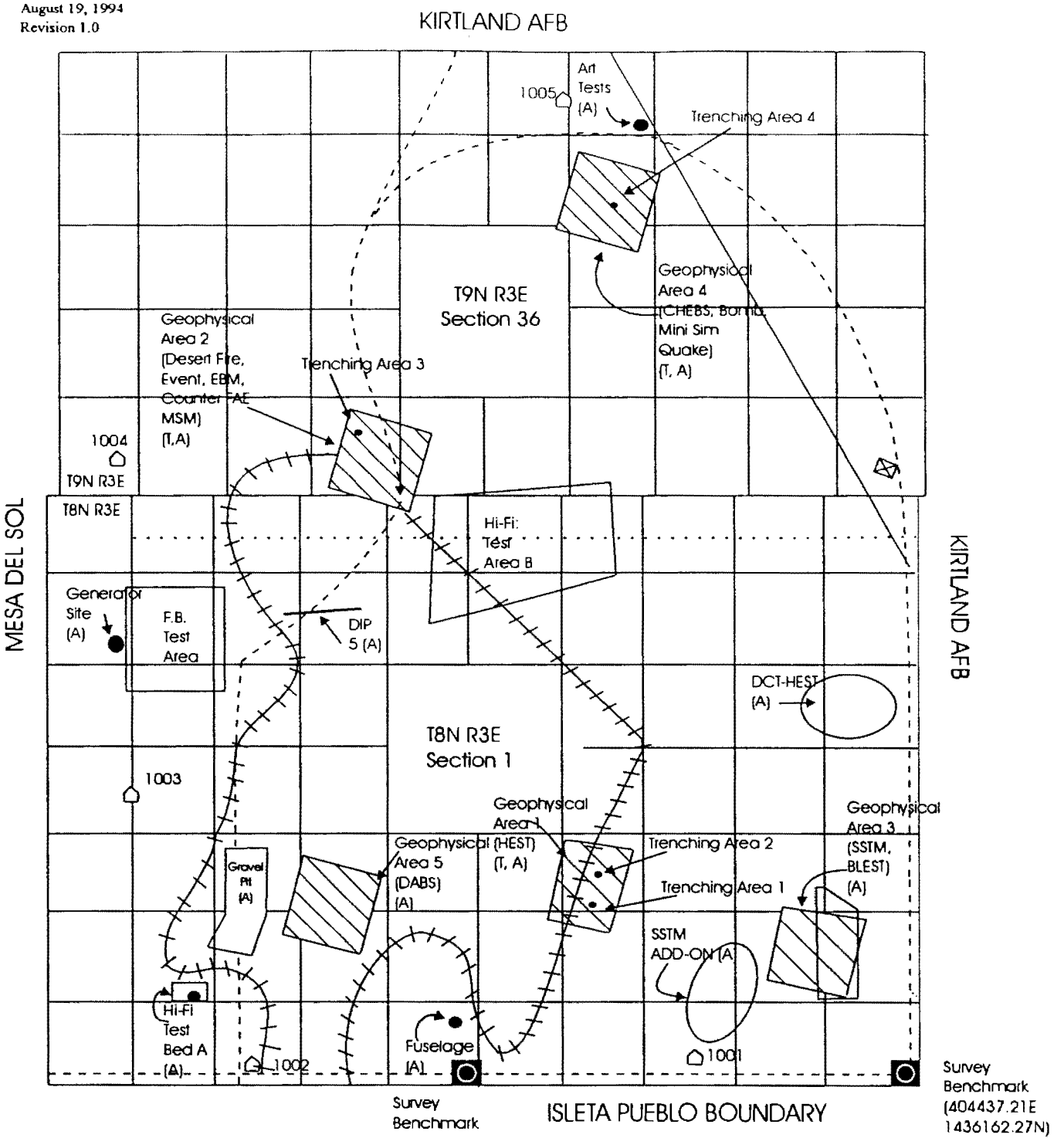
- Trenching (including soil sampling)
- Hand Augering (including soil sampling)
- Unexploded Ordnance (UXO) Screening
- Field screening of soil samples
- Surface water sampling (playa lake) [if water is present during sampling activities]
- Surveying

Figure 1.1 identifies the trenching, hand augering, and surface water sampling locations. Additionally, it identifies the benchmark to be used during the surveying task.

These investigations are being conducted to document the presence or absence of hazardous materials at selected HE test areas determined to have the highest potential for containing contaminants of concern in the soil. HE test areas were selected to be sampled after evaluating the following information:

- Written documentation of test activities and materials summarized in the Phase I EBS Report (LATA, 1993), and the Addendum to the Phase I EBS Report (GRAM, 1994a)
- Geophysical surveys conducted as part of the Phase II EBS investigations (GRAM, 1994b)
- Interviews with personnel associated with testing at the site
- Site reconnaissance

A detailed discussion of the selection process can be found in Section 3.0 of the Work Plan.



NOTE: This map is based upon the NMERI coordinate system for McCormick Ranch, and is not related to the USAF Crash Grid Map coordinates.

0 500 1000
Scale (feet)

Legend

- Geophysical Survey Area
- Playa Lake Outline (from USGS, 1974)
- USGS Well
- Survey Benchmark (with State Plane Coordinates
- Unpaved Road (Approximate Location)
- A = Hand Augering
- T = Trenching

Figure 1.1. Approximate Location of Proposed Sampling Areas

2.0 TRENCHING

2.1 INTRODUCTION

As part of this investigation trenches will be excavated in four areas at McCormick Ranch. Each trenching area will consist of two 3-foot wide by 15-foot long trenches excavated to depths of up to 15 feet that will intersect to form a single continuous L-shaped trench (Figure 2.1). This chapter will identify and describe the following:

- The locations of the four trenching areas
- How trenching will be conducted (including decision trees to be followed if trenching is halted due to either unexploded ordnance or excessive debris)
- Where the soil samples will be collected in the trenches
- What samples will be collected for field screening and laboratory analysis
- What sample numbers will be used for samples in each trenching area

2.2 TRENCHING AREA LOCATIONS AND DESCRIPTIONS

The four trenching areas to be excavated for this work effort will be located as follows (Figures 1.1, 2.2 2.3, and 2.4):

Trenching Area Number	Geophysical Survey Area	Trench Location
1	1	(1) Start at approximately 355E, 115N in Area 1 (2) Trench east 15 feet to approximately 370E, 115N or until debris filled trench is encountered and halts trenching (3) Trench north 15 feet to approximately 370E, 130N
2	1	(1) Start at approximately 70E, 265N in Area 1 (2) Trench north 15 feet to approximately 70E, 280N or until debris halts trenching (3) Trench west 15 feet to approximately 55E, 280N

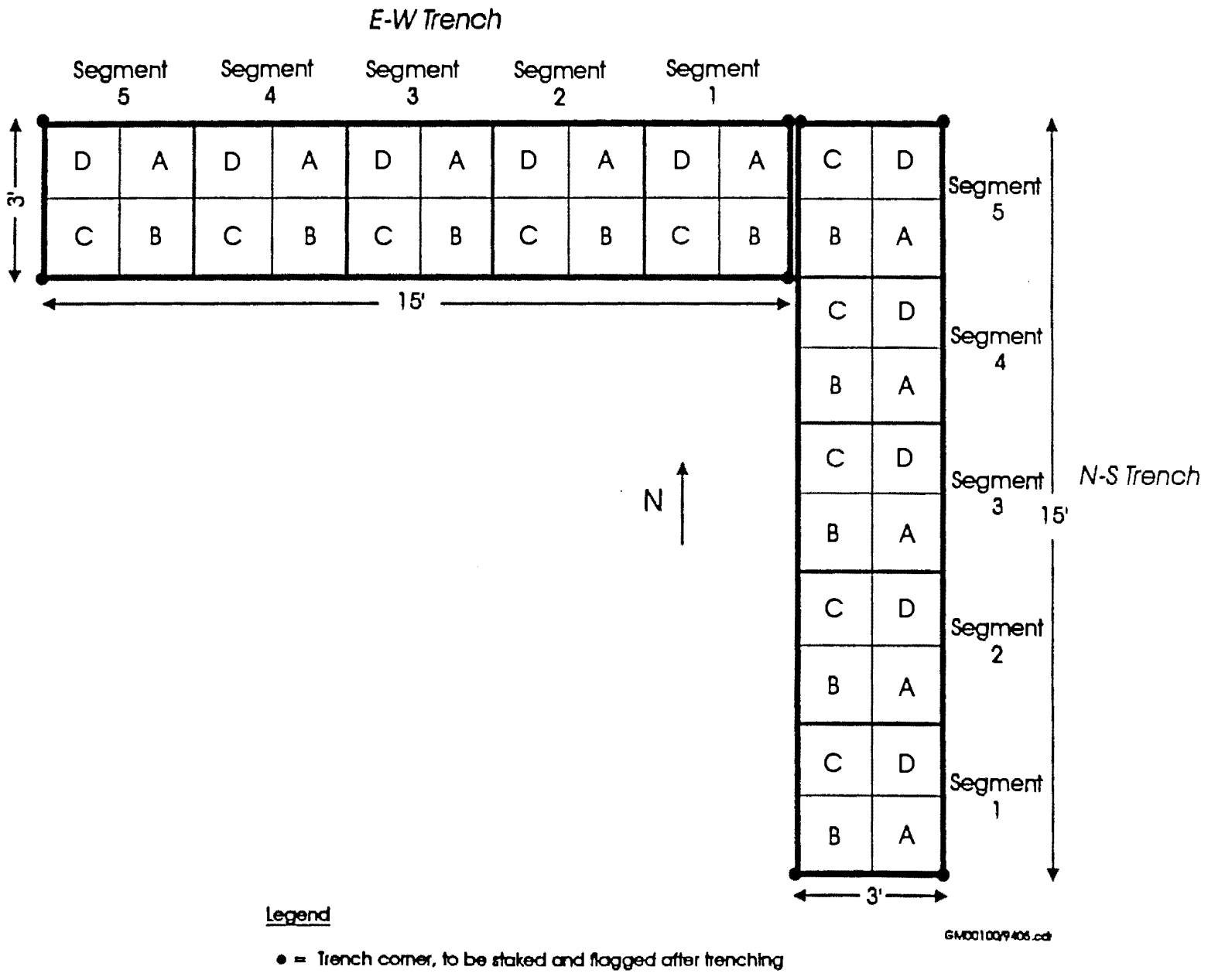


Figure 2.1. General Trenching Configuration

LOCATION OF TRENCHING AREAS 1 AND 2

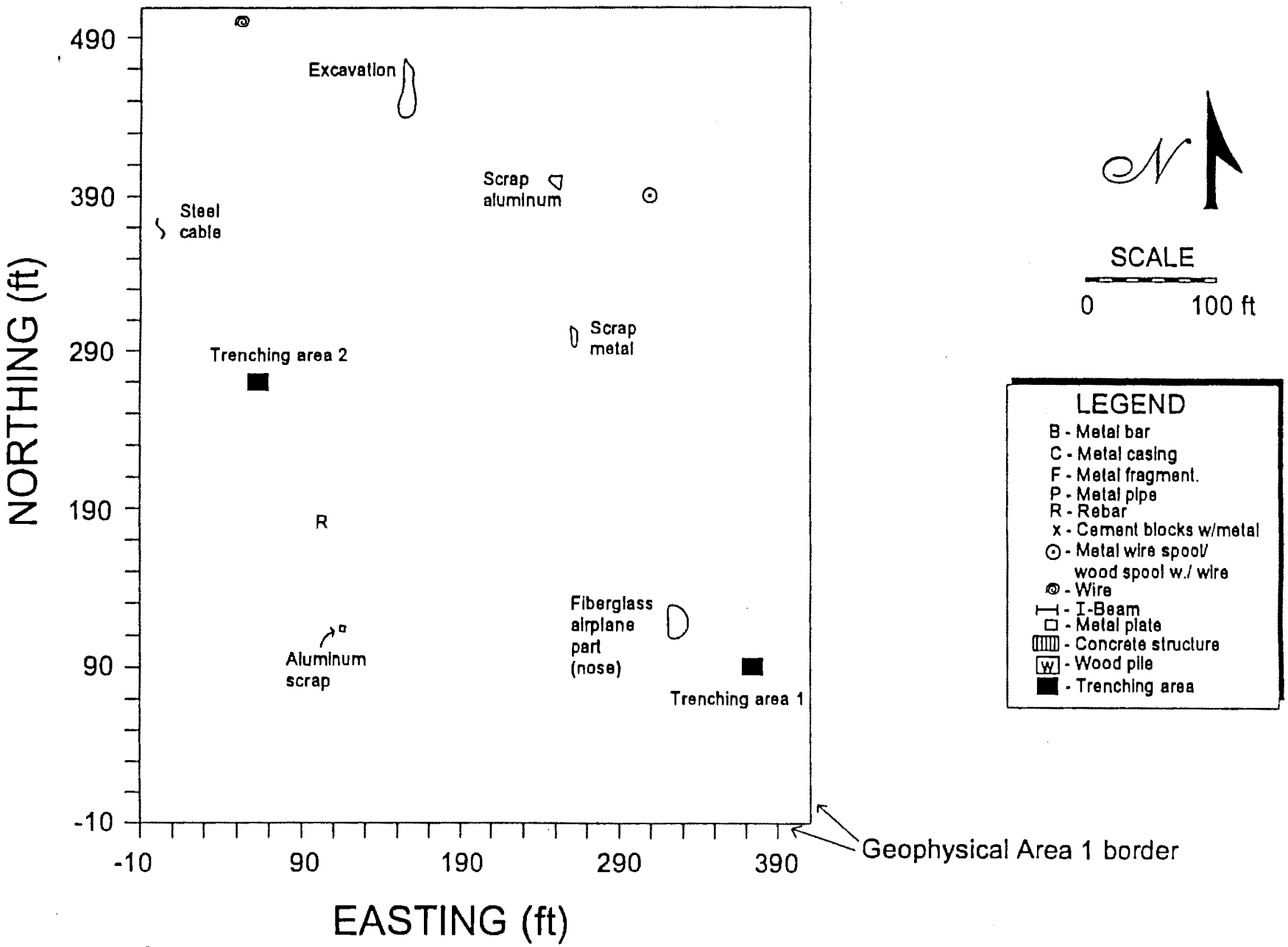


Figure 2.2

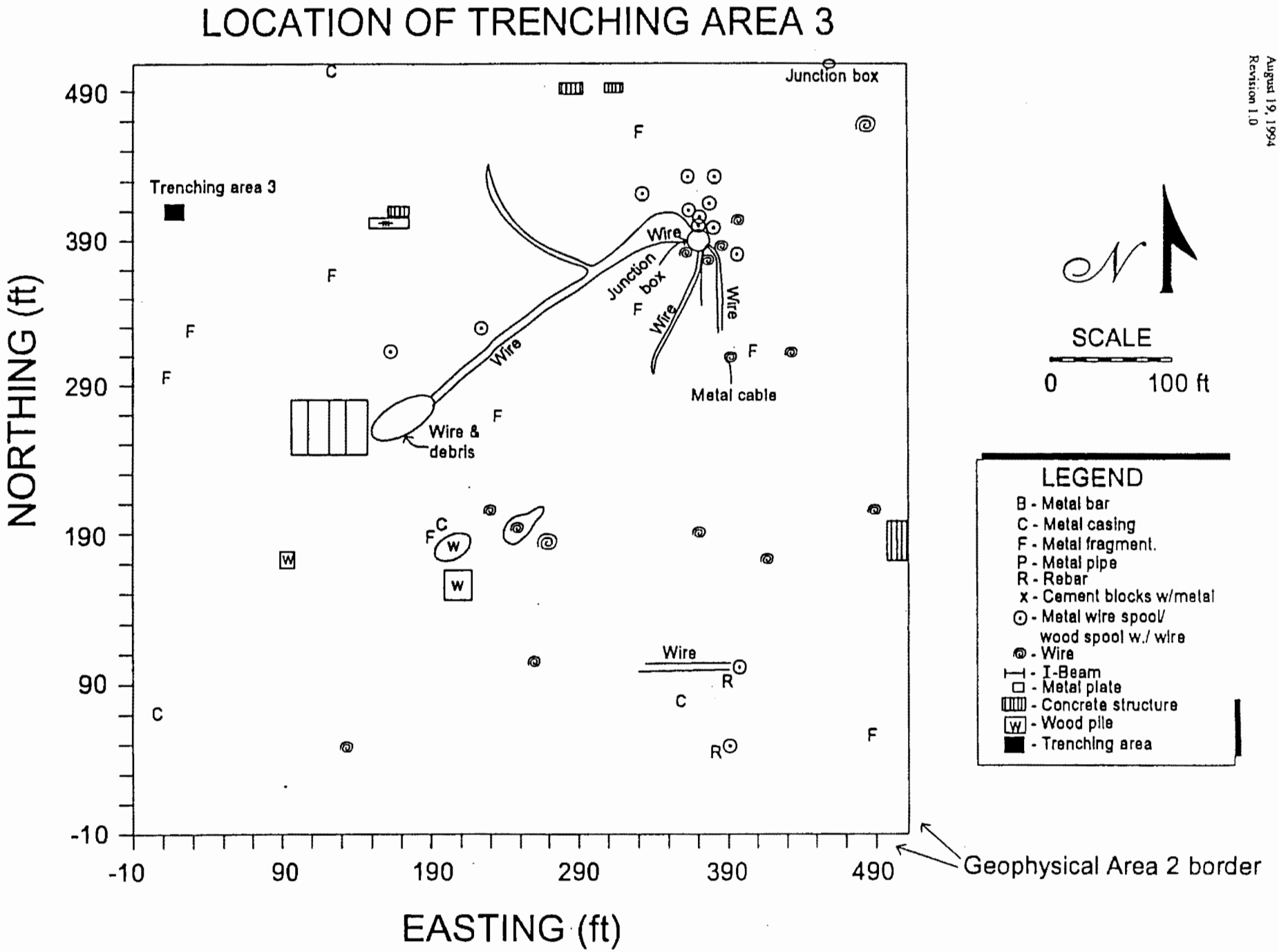

LOCATION OF TRENCHING AREA 3
NORTHING (ft)
EASTING (ft)
490
390
290
190
90
-10
-10
90
190
290
390
490
Junction box
Trenching area 3
Wire
Junction box
Wire
Wire
Wire
Metal cable
Wire & debris
Wire
SCALE
0
100 ft
LEGEND
B - Metal bar
C - Metal casing
F - Metal fragment.
P - Metal pipe
R - Rebar
x - Cement blocks w/metal
⊙ - Metal wire spool/ wood spool w./ wire
@ - Wire
I-Beam
□ - Metal plate
▥ - Concrete structure
W - Wood pile
■ - Trenching area
Geophysical Area 2 border

Figure 2.3

LOCATION OF TRENCHING AREA 4

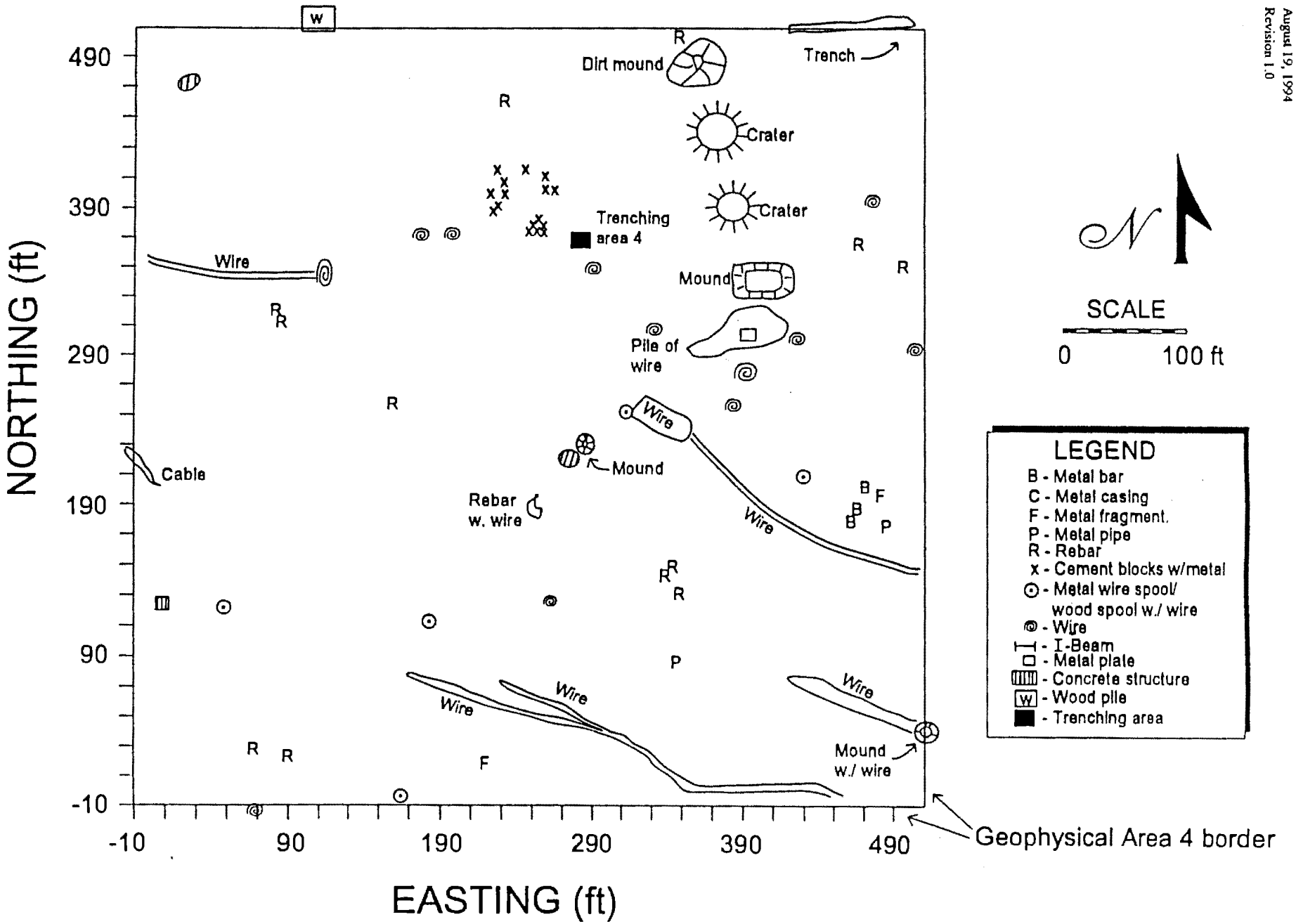


Figure 2.4

Trenching Area Number	Geophysical Survey Area	Trench Location
3	2	(1) Start at approximately 20E, 410N in Area 2 (2) Trench north 15 feet to approximately 20E, 425N or until debris halts trenching (3) Trench west 15 feet to approximately 5E, 425N
4	4	(1) Start at approximately 330E, 315N in Area 4 (2) Trench south 15 feet to approximately 330E, 300N or until debris halts trenching (3) Trench west 15 feet to approximately 315E, 300N

Trenching areas 1 and 2 are located in the High Explosives Simulation Technique (HEST) testing area (included in geophysical survey area 1). Up to 20,000 pounds of explosives were detonated in the subsurface during these tests. Surface expression of the HEST tests can be seen upon visual inspection by radial cracks and surface depressions. Test materials included PETN, ammonium nitrate, steel, wiring, and cables. Concrete and wood may also be present.

Trenching area 3 is located in geophysical survey area 2, where numerous HE tests were conducted on the surface and in the subsurface. The exact nature of the test which was conducted at the trenching area is unknown. Surface expression of testing at the trenching area can be seen as a slight depression. Vegetation at the trenching area is abundant, and may be a result of greater moisture in the depression and anomalous soil properties. Test materials known to have been used in the general vicinity of the trenching area include: PETN, TNT, RDX, propylene oxide, sodium/potassium nitrate, ammonium nitrate fuel oil (ANFO), aluminum, steel, wiring, and cables.

Trenching area 4 is located in geophysical survey area 4, where testing using bombs was conducted on the surface and potentially in the subsurface. TNT bombs (500 and 1000 lb) are known to have been detonated in the area. Geophysical surveys showed soil disturbance at depth, indicating that the Conventional High Explosives Blast Simulation (CHEBS) test may have been conducted at this location. The trenching area is also located approximately 300 feet east of the Mini Sim Quake test, where large quantities of fuel oils were used in testing. Test materials known to have been used in the vicinity include: PETN, TNT, RDX, motor oil, aluminum, steel, wiring, and cables. Concrete and wood may also be present.

2.3 TRENCHING PROCEDURES

2.3.1 Excavation

Excavation in each trenching area will create two 15 foot long trenches that will intersect to form a single continuous L-shaped trench (Figure 2.1). As indicated in Section 2.2, trenching will begin at one end of each trenching area, continue for approximately 15 feet, and then turn 90 degrees and continue for approximately another 15 feet. The initial 15-foot portion of each trench will be excavated to its total depth, and then the second 15-foot portion of the trench will be excavated. A backhoe will be used to excavate the trenches to a maximum depth of 15 feet. If native undisturbed soils are confirmed prior to reaching a depth of 15 feet on either portion of a trenching location, trenching on that portion will be stopped after an additional 3 ft of excavation (see SOP 10.0, Trenching).

Trenches will be excavated in three foot lifts, and will be approximately three feet in width. As a trench becomes deeper, it may be necessary to widen the upper portion of the trench to maintain a 3-foot width of the trench at depth. Shoring procedures (OSHA approved) will be used to maintain a safe excavation that may be entered by trenching personnel or the Kirtland AFB Explosive Ordnance Disposal (EOD) team. Air monitoring instruments (combustible gas/oxygen indicator [CGI/O_2] and photoionization detector [PID]) will be used to monitor for oxygen levels, potentially explosive conditions, and volatile organic vapors in the trench (see SOPs 3.0 and 4.0).

Prior to initiating any three foot lift, the EOD team will clear the area to be trenched with a metal detection device that is capable of clearing to at least five feet below ground surface. If the EOD team detects debris in the materials to be trenched, the nature of the debris will have to be verified by EOD before trenching can occur (Figure 2.5). Based on discussions with EOD personnel, it is likely that any unexploded ordnance found in a trench could be removed or destroyed with only minimal impact upon trench stability. See Section 4.0, SOP 16.0, and the Health and Safety Plan (HASP) for further details on EOD clearance procedures.

If test debris in the subsurface makes it impossible or unsafe for further trenching to occur at a particular location (a field decision to be made by the on-site supervising geologist), a decision will be made to (1) abandon the 15 foot portion of the trench being excavated, move to a nearby location within 20 feet, and re-trench the 15 foot portion that was abandoned, or (2) stop trenching and analyze the samples already collected. Figure 2.6 provides the information needed to make this decision. Only one alternative trench will be excavated per portion of trench being investigated. If the alternative trench is halted due to obstructions/debris, Figure 2.6 provides the information needed to determine whether to analyze samples from the initial trench or the alternative trench.

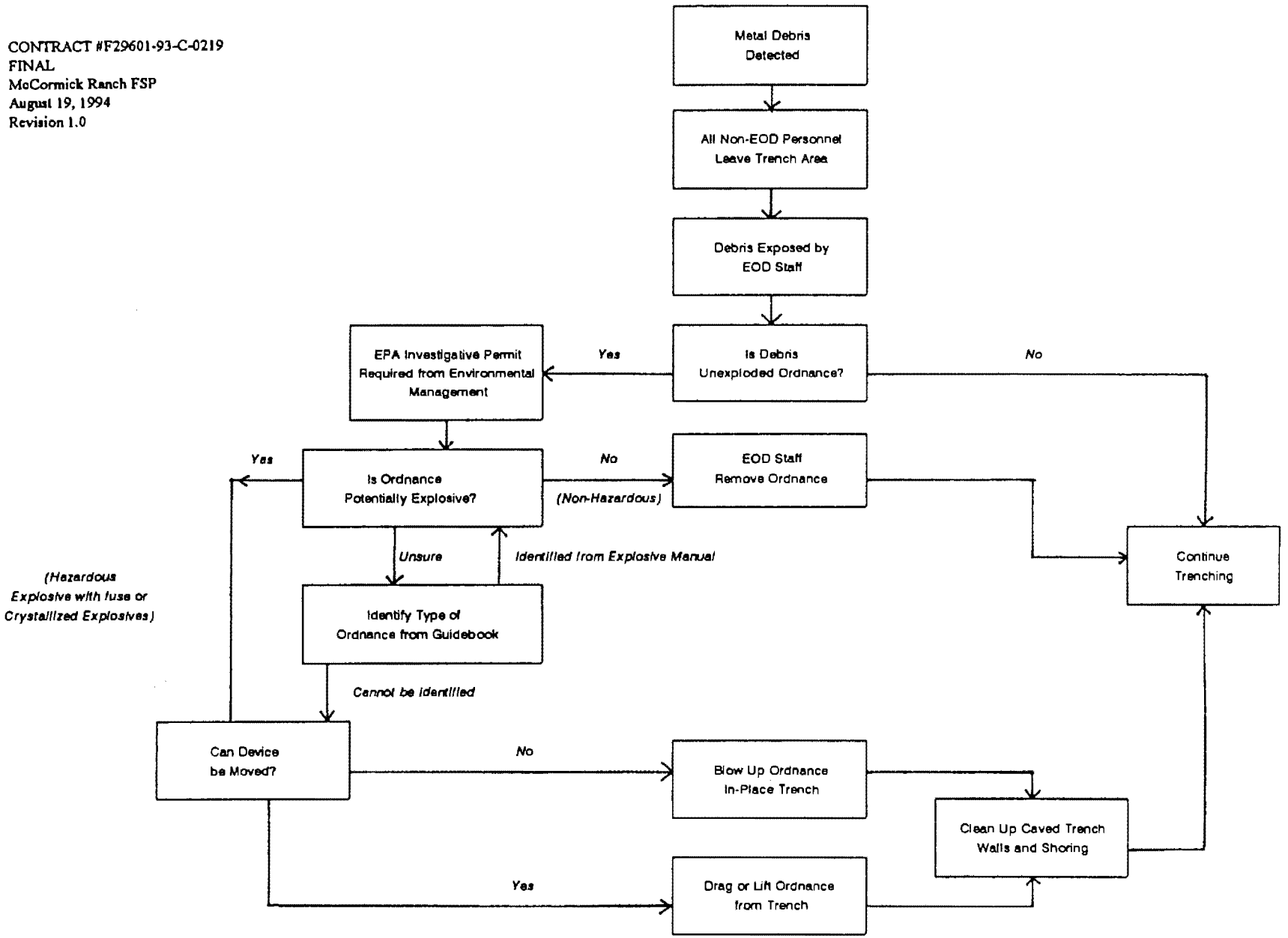


Figure 2.5 EOD Clearance Scenarios

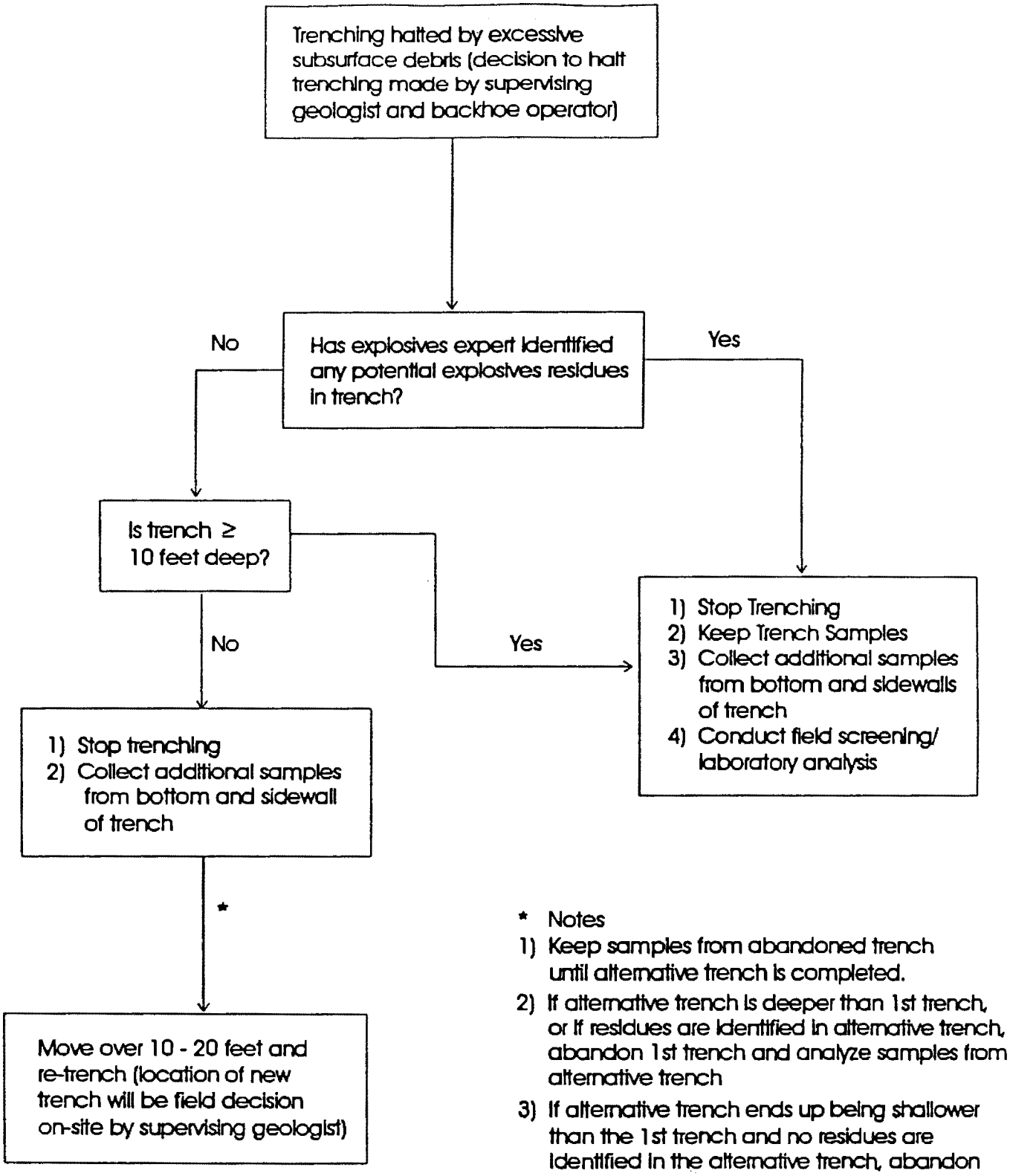


Figure 2.6. Decision Tree for Trenches Halted by Subsurface Debris

GM00100/9404.cdr

Upon completion of each trench in a trenching area, excavated materials will be placed back in the trench using the backhoe prior to any further excavations in the trenching area. The corners of the trench (Figure 2.1) will then be marked using wooden stakes and flagging so that the trench can be located and surveyed in at the end of the field program.

2.3.2 Sampling

If explosive residues are identified during excavation, soil samples will be collected from the excavated materials, the trench bottom, and/or the trench sidewalls depending upon where residues are present. If residues are not identified during excavation or if an excavation is halted before reaching the desired depth, soil samples will be collected at the end of each lift from the trench bottom. Samples will be collected using pre-cleaned scoops, containerized, placed on ice in coolers, and sent to the field laboratory for storage and field screening. See SOP 9.0, Surface Soil Sampling, for details on the sampling procedures. Table 2.1 identifies the number of soil samples to be collected from each trench for field screening, and identifies the total number of samples from each trench that will be sent to the laboratory for analysis. Table 9.1 shows the sample volume requirements for each field screening analysis and for each laboratory analysis.

2.3.2.1 Samples for PETN, TNT, Nitrate, and Hydrocarbon Field Screening

A total of 40 soil samples will be collected from each trenching area (20 from the N-S trench, and 20 from the E-W trench) for preliminary field screening analysis for PETN, TNT, nitrates, and hydrocarbons. As shown in Figure 2.1, the N-S and E-W trenches are divided into five segments, each of which is subdivided into four quadrants. If no explosive residues or hydrocarbons are found in a particular lift, the following sampling strategy will be used:

Lift	Segment/Quadrant to be Sampled
3 ft	1A, 2B, 3C, 4D, 5A
6 ft	1B, 2C, 3D, 4A, 5B
9 ft	1C, 2D, 3A, 4B, 5C
12 ft	1D, 2A, 3B, 4C, 5D
15 ft	1A, 2B, 3C, 4D, 5A

If suspected residues or hydrocarbons are found in a lift, the above sampling strategy will be abandoned and samples will be collected where the suspected residues or hydrocarbons are found. However, to document the location of samples collected around residues or hydrocarbons, the trench grid system shown in Figure 2.1 will still be used.

TABLE 2.1. Field Screening and Laboratory Analyte List (Trenching Activity)

TRENCHING AREA NUMBER	SAMPLE NUMBERS	FIELD SCREEN EXPLOSIVES	LABORATORY EXPLOSIVES	FIELD SCREEN NITRATE	LABORATORY NITRATE/NITRITE	FIELD SCREEN HYDROCARBONS	LABORATORY SVOCs	LABORATORY METALS	LABORATORY CYANIDE
1	KRTLDXX-0001 TO KRTLDXX-0040	40	4	40	4	40	0	4	4
2	KRTLDXX-0041 TO KRTLDXX-0080	40	4	40	4	40	0	4	4
3	KRTLDXX-0091 TO KRTLDXX-0130	40	4	40	4	40	1	4	4
4	KRTLDXX-0166 TO KRTLDXX-0205	40	4	40	4	40	2	4	4
	TOTAL	160	16	160	16	160	3	16	16

This sampling strategy will result in the collection of 25 samples per each trench portion (50 samples for a complete trench) if the trench reaches a depth of 15 feet. Because only 20 samples are needed per trench portion, the following samples will be disposed of prior to field screening in the event that the trench reaches a depth of 15 feet:

Lift	Segment From Which Samples will be Disposed of
3 ft	1A
6 ft	2C
9 ft	3A
12 ft	4C
15 ft	5A

If any of the five samples to be disposed are determined to have potential to contain contaminants (based on soil type, stratigraphic setting, residues, or hydrocarbon indications), a sample from the next quadrant in the lift will be selected for disposal (e.g., if the supervising geologist or explosives expert elect to keep the sample from segment 1, dispose of sample from segment 2 in the 0-3 ft lift).

If trenching is stopped before the trench reaches 15 feet, collect samples from the bottom of the trench at the total depth. If less than 20 soil samples are collected from a portion of a trench because the trench is not excavated to a depth of at least 12 feet, collect additional samples from the sidewalls, at the direction of the explosive expert or supervising geologist, until 20 samples are collected.

2.3.2.2 Samples for Laboratory Analysis of Explosives, Nitrate + Nitrite, SVOCs, Metals, and Cyanide

After field screening is completed for each trenching area (see Chapter 5.0 for field screening procedures), the following samples from each trench area will be sent to the laboratory for analysis:

Analyte	Number/Location of Samples
Explosives	4 from the sampling locations with the highest PETN and/or TNT concentrations found in field screening (see Table 2.2 for laboratory sample selection matrix for PETN and TNT). If samples are found in field screening to be contaminated with explosives residues but neither PETN or TNT, samples to be sent to the analytical laboratory will be determined by the supervising geologist.

TABLE 2.2. Laboratory Analyses for Explosives Based Upon Field Screening of Samples From Trenches

RESULTS			ACTION*
TNT HITS	PETN HITS	BOTH	
NONE	NONE	NONE	SEND FIVE SAMPLES WITH THE HIGHEST NITRATE CONCENTRATIONS, OR AT DISCRETION OF SUPERVISING GEOLOGIST
5 OR MORE	NONE	NONE	SEND FIVE TNT SAMPLES TO LABORATORY
NONE	5 OR MORE	NONE	SEND FIVE PETN SAMPLES TO LABORATORY
LESS THAN 5	NONE	NONE	SEND TNT HITS AND ADDITIONAL SAMPLES WITH THE HIGHEST NITRATE CONCENTRATIONS, OR AT DISCRETION OF SUPERVISING GEOLOGIST TO TOTAL 5
NONE	LESS THAN 5	NONE	SEND PETN HITS AND ADDITIONAL SAMPLES WITH THE HIGHEST NITRATE CONCENTRATION, OR AT DISCRETION OF SUPERVISING GEOLOGIST TO TOTAL 5
5 OR MORE	LESS THAN 5	NONE	SEND 3 >TNT AND 2 PETN. IF ONLY ONE PETN, SEND 4 >TNT AND 1 PETN
LESS THAN 5	5 OR MORE	NONE	SEND 2 >TNT AND 3 PETN. IF ONLY ONE TNT, SEND 1 TNT AND 4 PETN
LESS THAN 5	LESS THAN 5	LESS THAN 5	SEND ALL SAMPLES WITH HITS FOR BOTH AND, IF POSSIBLE, AT LEAST ONE SAMPLE EACH CONTAINING PETN AND TNT ONLY. SEND ADDITIONAL SAMPLES WITH THE HIGHEST NITRATE CONCENTRATIONS OR AT THE DISCRETION OF THE SUPERVISING GEOLOGIST TO TOTAL 5
LESS THAN 5	5 OR MORE	LESS THAN 5	SEND ALL SAMPLES WITH HITS FOR BOTH, AT LEAST 1 TNT IF POSSIBLE, AND THE REMAINDER PETN
5 OR MORE	LESS THAN 5	LESS THAN 5	SEND ALL SAMPLES WITH HITS FOR BOTH, AT LEAST 1 PETN IF POSSIBLE, AND THE REMAINDER TNT
5 OR MORE	5 OR MORE	5 OR MORE	SEND 5 SAMPLES CONTAINING BOTH PETN AND GREATEST CONCENTRATIONS OF TNT
5 OR MORE	5 OR MORE	LESS THAN 5	SEND ALL SAMPLES WITH BOTH, AND AT LEAST ONE SAMPLE EACH CONTAINING PETN AND TNT ONLY
5 OR MORE	5 OR MORE	NONE	SEND 2 >TNT AND 2 PETN. FIFTH SAMPLE AT DISCRETION OF SUPERVISING GEOLOGIST

*ALL SAMPLES ANALYZED FOR EXPLOSIVES AT THE LABORATORY WILL ALSO BE ANALYZED FOR CYANIDE

Nitrate + Nitrite	4 from the sampling locations with the highest nitrate concentrations found in field screening. If no nitrates are found in field screening (i.e., below detection limits), then nitrate samples will be sent from the same sampling locations from which explosives samples were sent to the laboratory.
SVOCs	1 (from trenching area 3) and 2 (from trenching area 4) from the sampling locations with the highest hydrocarbon concentrations found in field screening. If field screening identifies the presence of hydrocarbons at trenching areas 1 or 2 (where preliminary analysis has indicated that no hydrocarbons should be present), samples may be analyzed for SVOCs at the discretion of the supervising geologist.
Metals	4 at the same sampling locations from which explosives samples were sent to the laboratory.
Cyanide	4 from the same sampling locations from which explosives samples were sent to the laboratory.

If field screening identifies fewer potentially contaminated samples than are to be sent to the laboratory for analysis (for explosives, nitrate + nitrite, and SVOCs), the supervising geologist on-site will select any additional samples to be sent to the laboratory after reviewing field notes.

2.4 SAMPLE LOCATION IDENTIFICATION NUMBERS

The following sample location IDs will be used for the trench samples to be collected:

Trenching Area Number	Trench Portion	Sample Location IDs
1	E-W trench	KRTLD154-0001 through KRTLD154-0020
	N-S trench	KRTLD154-0021 through KRTLD154-0040
2	N-S trench	KRTLD154-0041 through KRTLD154-0060
	E-W trench	KRTLD154-0061 through KRTLD154-0080
3	N-S trench	KRTLD154-0091 through KRTLD154-0110
	E-W trench	KRTLD154-0111 through KRTLD154-0130
4	N-S trench	KRTLD154-0166 through KRTLD154-0185
	E-W trench	KRTLD154-0186 through KRTLD154-0205

3.0 HAND AUGERING

3.1 INTRODUCTION

To further investigate for soil contamination in the shallow subsurface at the McCormick Ranch site, soil samples will be collected using hand augers at known HE test locations. This activity will investigate HE test sites across a broader area of McCormick Ranch than would be accomplished by trenching alone. This chapter will identify and describe the following:

- The locations of the hand augering areas, and specific sampling locations in each area
- How sampling will be conducted
- What samples will be collected for field screening and laboratory analysis
- Sample identifiers that will be used in each hand augering area

3.2 HAND AUGERING LOCATIONS AND DESCRIPTIONS

Hand augered samples will be collected from the following 13 locations at the McCormick Ranch site (Figure 1.1):

- Geophysical Survey Area 1
- Geophysical Survey Area 2
- Geophysical Survey Area 3
- Geophysical Survey Area 4
- Geophysical Survey Area 5
- Gravel Pit
- Dip 5 Test
- Generator Site
- Fuselage
- Art Tests
- Hi Fi Test Bed A
- DCT Hest
- SSTM Add-On

The following sections describe the locations where the hand augered samples will be collected in hand augering area. However, because 150 hand augered samples are to be collected in 13 hand auger sampling areas that cover an extensive portion of the McCormick Ranch site, the exact location of each sample will be determined at the time of sampling by the supervising geologist in the field.

3.2.1 Geophysical Survey Area 1

Geophysical survey area 1 encompasses the HEST tests, where up to 20,000 pounds of explosives were detonated in the subsurface. Surface expression of the HEST tests can be seen upon visual inspection by radial cracks and surface depressions. Test materials included PETN, ammonium nitrate, steel, wiring, and cables. Concrete and wood may also be present. Samples will be collected at the following locations in geophysical survey area 1:

- Surface depressions around trenching areas 1 and 2
- South of trenching area 1 in the SE corner of the area
- Geophysical anomalies located at 280N, 160E and 220N, 210E.

3.2.2 Geophysical Survey Area 2

Geophysical survey area 2 encompasses numerous HE tests that were conducted on the surface and in the subsurface. Test materials known to have been used in the area include: PETN, TNT, RDX, propylene oxide, sodium/potassium nitrate, ANFO, aluminum, steel, wiring and cables. Samples will be collected at the following locations in geophysical survey area 2:

- Craters (bottoms, sides, and just outside) located in the eastern portion of the area
- Desert Fire well casings in the SW corner of the area
- Craters (bottoms, sides, and just outside) and around the Desert Fire well casings located approximately 200 ft southwest of the area (outside of area boundaries)
- Debris pile located at 270N, 170E

3.2.3 Geophysical Survey Area 3

Geophysical survey area 3 encompasses the SSTM and BLEST tests that were conducted on the surface and in the subsurface. Test materials known to have been used in the area include: PETN, ANFO, sodium nitrate, ammonium nitrate, fuel oil, aluminum, steel, wiring, and cables. Samples will be collected from the following locations in geophysical survey area 3:

- Craters (bottoms, sides, and just outside)
- Any other areas of disturbed soils

3.2.4 Geophysical Survey Area 4

Geophysical survey area 4 encompasses the CHEBS, Mini Sim Quake, and Bomb tests that were conducted on the surface and in the subsurface. Surface expression of the Mini Sim Quake can be seen as a depression in the NW corner of the area. Craters in the eastern portion of the site may be associated with the CHEBS test. Test materials known to have been used in the area include: PETN, TNT, RDX, motor oil, aluminum, steel, wiring, and cables. Concrete and wood may also be present. Samples will be collected from the following locations in geophysical area 4:

- Surface depression in the NW corner of the site (centered at 470N, 10E)
- Semicircular geophysical anomaly area from 300N, 230E to 300N, 350E
- Debris in area north of semicircular geophysical anomaly (debris centered at 370N, 280E)
- Craters/disturbed soils areas located approximately 100-400 ft NE of the area (outside of area boundaries)

3.2.5 Geophysical Survey Area 5

Geophysical survey area 5 encompasses the DABS tests that were conducted in the subsurface. The locations of some DABS tests are marked with a 1 inch pipe with the test number on a cap. All tests were conducted in trenches starting at the markers and proceeding to the west. Test materials known to have been used in the area include: PETN, RDX, ANFO sodium nitrate, ammonium nitrate, fuel oil, aluminum, steel, wiring, and cables. Samples will be collected from the following locations in geophysical area 5:

- Geophysical anomalies at 250N, 190E; 350N, 170E; and 450N, 40E
- DABS test locations identified by pipe markers (both in area and outside of area boundaries)
- Crater (bottom, sides, and just outside) located approximately 100 ft north of the area (outside of area boundaries)

3.2.6 Gravel Pit

The gravel pit was used for test debris disposal, and is known to contain buried metal. Other debris present may include concrete, wood, wiring, and cables. Samples will be collected from the geophysical anomaly area approximately 50 ft SW of the existing gravel pit.

3.2.7 DIP 5 Test

Preliminary placement of explosives into the 16, approximately 300-ft deep, boreholes to be used for the DIP 5 test was unsuccessful, and the approximately 15,000 pounds of the explosives were flushed onto the ground surface. Test materials known to have been used or flushed onto the ground surface include: TNT, ammonium nitrate, sodium nitrate, fuel oil, and aluminum. The locations of the boreholes can be identified by the depressions around each borehole resulting from trenching that took place subsequent to the test. Samples will be collected in a linear arrangement starting at borehole #1 in the east and proceeding west past at least 3 of the other boreholes. Samples will also be collected in topographic lows where flushed explosives may later have been concentrated.

3.2.8 Generator Site

Surface testing at the generator site was conducted in a very localized (approximately 100 ft^2) area surrounded by concrete blocks and recording devices. Materials used in testing at the site included: PETN, TNT, RDX, fuel oil, aluminum, steel, and copper. Soil samples will be collected from the test bed.

3.2.9 Fuselage

Testing of the fuselage involved setting the fuselage on fire with fuel oils and extinguishing the fire with various compounds (unknown, except for halon). The testing took place at the existing site of the fuselage, and also approximately 100 ft north of the existing site at an area identifiable by various small burned aircraft parts and melded (fused) aluminum. Samples will be collected from within 10 feet of the existing fuselage location and from the vicinity of the previous fuselage location.

3.2.10 ART Tests

The Art tests were small (10 pounds each) surface tests that consisted of detonating PETN, TNT, RDX, and fuels on concrete pads. Samples will be collected from the following locations in the area:

- Test materials remaining on the concrete pads
- Soils around the concrete pads
- Areas in the approximate blast radius of the tests

3.2.11 Hi Fi Test Bed A

At least two surface tests were conducted at the Hi Fi Test Bed A, and craters from the two tests are visible. Test materials included PETN, ammonium nitrate, sodium nitrate, fuel oil, and aluminum. Samples will be collected from the following locations in the area:

- Test materials remaining in the craters
- Craters (bottoms, sides, and just outside)

3.2.12 DCT HEST

The DCT HEST tests were surface tests using approximately 3080 lb of PETN and fuel oil per test. Other test materials included ammonium nitrate, sodium nitrate, and aluminum. The tests were located in the east-central portion of the McCormick Ranch site, but surface expression of the tests is not present. Samples will be collected from areas of disturbed soils or debris that may identify testing locations.

3.2.13 SSTM Add-On

Additional SSTM tests were conducted to the southwest of geophysical area 3. Selected craters from these tests will be sampled (samples from crater bottoms, sides, and just outside).

3.3 HAND AUGERING PROCEDURES

3.3.1 Hand Augering

After hand augering locations are identified (based upon information provided in Section 3.2), samples will be collected using hand augers. Samples will be collected from the subsurface rather than from the ground surface, because subsurface samples will be less affected by oxidation/degradation processes. A PID monitoring instrument will be used to monitor for volatile organic vapors in each augered borehole, and will be used to guide sampling for semi-VOCs when possible. The hand auger, with a 2 1/2 inch diameter auger bit and a regular hollow auger head, will be used first to auger to 3 feet below ground surface. Before the sampling team breaks the ground surface with the hand auger, the EOD team will clear the area to be augered by using a metal detection device that is capable of clearing to at least five feet below ground surface. After reaching a depth of three feet with the hand auger, the EOD team will lower the metal detection device into the borehole and clear the borehole an additional five feet. A 2 1/2 inch diameter auger bit is needed, because the EOD metal detection device is approximately 2 inches in diameter and must fit down the borehole. Section 4.0, SOP 16.0, and the Health and

Safety Plan (HASP) provide additional detail on EOD clearance procedures. All soil collected from the first 3 feet will be piled next to the borehole. The hole will then be augered to 6 feet, and all soil in the auger from 3 to 6 feet will be collected for the required analyses. If during augering of the 0 to 3 foot interval explosives residues are encountered or elevated PID readings are registered, samples will be collected from those soils. Drive tube samples or coring devices are not needed, because all analyses can be performed using disturbed soil samples. If sufficient soil volume can not be obtained from one borehole, an additional borehole(s) will be augered directly adjacent (within one foot, if possible) to the first borehole. If debris is encountered when attempting to auger, making it impossible to auger to 6 feet and/or collect sufficient sample volume, the hole will be abandoned and an alternate borehole will be augered within a reasonable distance such that the HE test targeted by the sample location is still sampled (a field decision to be determined by the supervising geologist). See SOP 11.0, Manual (Hand) Augering and Sampling, for details on field procedures.

Because this field program is designed to identify the presence or absence of contamination at selected HE test site, the hand auger will only be decontaminated between each point sampling location. It will not be necessary to decontaminate the auger between the 0-3 foot and 3-6 foot depths, or between additional or alternative boreholes at the same point sampling location. See SOP 2.0, Equipment Decontamination/Waste Management for further details on decontamination procedures.

Upon completion of a borehole, augered soil materials not collected for analysis will be placed back in the borehole using a shovel. The borehole location will then be marked using a wooden stake and flagging so that the borehole can be located and surveyed in at the end of the field program.

3.3.2 Sampling

Samples from the 3-6 foot interval of each augered borehole will be placed in a stainless steel bowl, mixed together using a stainless steel scoop, containerized, placed on ice in a cooler, and sent to the field laboratory for storage and field screening. See SOP 11.0, Manual (Hand) Augering and Sampling for details on sampling procedures. Soil samples not sent to the laboratory after field screening will be returned to the McCormick Ranch site and placed back in the boreholes from which they were collected. Table 3.1 identifies the number of soil samples to be collected from each hand augering area, and identifies the total number of samples from each hand augering area that will be sent to the laboratory for analysis. Table 9.1 shows the sample volume requirements for each field screening analysis and for each laboratory analysis.

3.3.2.1 Samples for PETN, TNT, Nitrate, and Hydrocarbon Field Screening

Table 3.1 identifies the number of hand auger samples from each hand augering area that will be analyzed during the field screening activity. All areas will have at least some field screening, except for the gravel pit area which will only have laboratory analysis for metals.

3.3.2.2. Samples for Laboratory Analysis of Explosives, Nitrate + Nitrite, SVOCs, Metals, and Cyanide.

After field screening is completed, selected soil samples will be sent from each hand auger area to the laboratory for analysis. Table 3.1 identifies the number of samples from each hand augering area to be sent to the laboratory for analysis. The following procedures will be used to determine which samples from each general area are sent to the laboratory for analysis:

Analyte	Samples to be Sent
Explosives	Samples with the highest PETN and/or TNT concentrations found in field screening for the area. If possible, send samples from sampling locations which have both TNT and PETN hits. If possible, send at least one sample with a PETN hit and one sample with a TNT hit. If samples are found in field screening to be contaminated with explosives residues but neither PETN or TNT, samples to be sent to the analytical laboratory will be determined by the supervising geologist. If no explosive hits are found in an area, send samples from sampling locations with the highest nitrate concentrations or at the discretion of the supervising geologist.
Nitrate + Nitrite	Samples with the highest nitrate concentrations found in field screening for the area. If no nitrates are found in field screening for the area (i.e., below detection limits), then nitrate samples will be sent from the same sampling locations from which explosives samples were sent to the laboratory.
SVOCs	Samples with the highest hydrocarbon concentrations found in field screening for the area. If no hydrocarbons are found, then SVOC samples will be sent from the same sampling locations from which explosives samples were sent to the laboratory. If field screening identifies the presence of hydrocarbons at geophysical area 1 or the Art Test area (where preliminary analysis has indicated that no hydrocarbons were used in testing), samples may be analyzed for SVOCs at the discretion of the supervising geologist.

TABLE 3.1. Field Screening and Laboratory Analyte List (Hand Auger Samples)

AREA	SAMPLE NUMBERS	FIELD SCREEN EXPLOSIVES	LABORATORY EXPLOSIVES	FIELD SCREEN NITRATE	LABORATORY NITRATE/NITRITE	FIELD SCREEN HYDROCARBONS	LABORATORY SVOCs	LABORATORY METALS	LABORATORY CYANIDE
GEOPHYSICAL AREA 1	KRTLDXX-0081 TO KRTLDXX-0090	10	2	10	2	10	0	2	2
GEOPHYSICAL AREA 2	KRTLDXX-0131 TO KRTLDXX-0150	20	2	20	2	20	2	2	2
GEOPHYSICAL AREA 3	KRTLDXX-0151 TO KRTLDXX-0165	15	5	15	5	15	2	0	5
GEOPHYSICAL AREA 4	KRTLDXX-0206 TO KRTLDXX-0225	20	2	20	2	20	2	2	2
GEOPHYSICAL AREA 5	KRTLDXX-0226 TO KRTLDXX-0245	20	2	20	2	20	2	2	2
GRAVEL PIT	KRTLDXX-0246 TO KRTLDXX-0250	0	0	0	0	0	0	5	0
DIP 5	KRTLDXX-0251 TO KRTLDXX-0265	15	3	15	3	15	3	3	3
GENERATOR SITE	KRTLDXX-0266 TO KRTLDXX-0270	5	1	5	1	5	1	1	1
FUSELAGE	KRTLDXX-0271 TO KRTLDXX-0275	0	0	0	0	5	2	0	0
ART TESTS	KRTLDXX-0276 TO KRTLDXX-0285	10	2	10	2	10	0	2	2
HI FI TEST BED A	KRTLDXX-0286 TO KRTLDXX-0295	10	2	10	2	10	1	2	2
DCT HEST	KRTLDXX-0296 TO KRTLDXX-0300	5	1	5	1	5	1	1	1
SSTM ADD-ON	KRTLDXX-0301 TO KRTLDXX-0310	10	2	10	2	10	1	2	2
	TOTAL	140	24	140	24	145	17	24	24

Metals — Samples to be sent from the same locations from which explosives samples were sent to the laboratory, with the following exceptions: (1) No metal samples will be sent from geophysical area 3 even though five explosives samples will be sent, and (2) Five metal samples will be sent from the gravel pit area even though no explosives samples will be sent.

Cyanide — Samples to be sent from the same locations from which explosives samples were sent to the laboratory.

If field screening identifies fewer potentially contaminated samples than are to be sent to the laboratory for analysis (for explosives, nitrate + nitrite, and SVOCs), the supervising geologist on-site will select any additional samples to be sent to the laboratory after reviewing field notes.

3.4 SAMPLE LOCATION IDENTIFICATION NUMBERS

The following sample location IDs will be used for the hand auger samples to be collected:

Sample Location Area	Sample Location IDs
Geophysical Area 1	KRTLD154-0081 through KRTLD154-0090
Geophysical Area 2	KRTLD154-0131 through KRTLD154-0150
Geophysical Area 3	KRTLD154-0151 through KRTLD154-0165
Geophysical Area 4	KRTLD154-0206 through KRTLD154-0225
Geophysical Area 5	KRTLD154-0226 through KRTLD154-0245
Gravel Pit	KRTLD154-0246 through KRTLD154-0250
DIP 5 Test	KRTLD154-0251 through KRTLD154-0265
Generator Site	KRTLD154-0266 through KRTLD154-0270
Fuselage	KRTLD154-0271 through KRTLD154-0275
Art Tests	KRTLD154-0276 through KRTLD154-0285
Hi Fi Test Bed A	KRTLD154-0286 through KRTLD154-0295
DCT HEST	KRTLD154-0296 through KRTLD154-0300
SSTM Add-On	KRTLD154-0301 through KRTLD154-0310

4.0 UNEXPLODED ORDNANCE (UXO) SCREENING

Screening of UXOs will be conducted to ensure the health and safety of all personnel working at the trenching and hand augering sites. UXO screening will also document the type and size of any test debris encountered during the trenching and hand augering activities. Kirtland AFB EOD personnel, guided by the supervising geologist on-site, will clear the following:

- All access routes to trenching areas that are off of established roadways
- The general vicinity of each trenching area where heavy equipment will be operating
- The area to be trenched prior to excavating each 3-foot lift at each trenching area
- The location to be augered at each hand auger borehole site prior to augering

The EOD personnel will use a calibrated metal detection device (Forester Mark 26 Ordnance Locator) capable of clearing an area to a depth of at least 5 feet below ground surface. No trenching or hand augering activities will be allowed to proceed without screening for UXOs. UXO screening and documentation procedures are detailed in SOP 16.0, Screening for Unexploded Ordnance with a Forester Mark 26 Ordnance Locator.

5.0 FIELD SCREENING

Field screening of soil samples from the McCormick Ranch site will be performed to increase the cost effectiveness of the program and provide greater sample density (i.e., site coverage) than would be possible through laboratory analyses alone. This process will less expensively identify soil samples with the highest probability of containing contaminants, and limit requirements for more expensive analytical laboratory analyses. Specifically, soil samples will be screened for TNT and TNT degradation products, PETN, nitrate, and hydrocarbons. Proposed field screening methods and the number of analyses recommended are presented in Table 5.1.

TABLE 5.1. Proposed Field Screening Methods and Number of Samples

ANALYTE	FIELD SCREENING METHOD	LABORATORY METHOD*	NUMBER OF SAMPLES
TNT	IMMUNOASSAY	SW8330	300
PETN	THIN LAYER CHROMATOGRAPHY	SW8331	300
NITRATE	COLORIMETRIC	E353.2**	300
HYDROCARBONS	THIN LAYER CHROMATOGRAPHY	SW8270	100

* EPA, 1986, Test Method for Evaluating Solid Waste Laboratory Manual Physical/Chemical Methods, SW-346, Third Edition.

* EPA, 1983, Methods for Chemical Analysis of Water and Wastes, EPA-6001, 4-79-020.

5.1 TNT FIELD SCREENING

Field screening for TNT and TNT degradation products will be performed with a commercially available immunoassay test kit manufactured by Ensys, Incorporated, that provides a quantitative, colorimetric analysis. The test kit conforms to EPA SW846 draft Method 8515 for

quantitative field analysis of TNT, and will detect TNT in soil down to 1 ppm concentration. The method will also detect other nitroaromatic TNT degradation products. Compounds detected and detection limits are listed in Table 5.2.

TABLE 5.2. TNT Soil Test Sensitivity to Explosive Compounds.

COMPOUND	MINIMUM SENSITIVITY (PPM)*
2,4,6-trinitrotoluene (TNT)	1
2,4-dinitrotoluene	1.1
2,6-dinitrotoluene	0.6
2-nitrotoluene	>100
3-nitrotoluene	>100
4-nitrotoluene	>100
4-amino-2,6-dinitrotoluene	>100
1,3,5-trinitrobenzene	1
nitrobenzene	>100

* The lowest concentration at which the analyte is distinguishable from a matrix blank by two standard deviations.

Field screening will provide a semi-quantitative result, but TNT can not be distinguished from TNT degradation products and interferences may affect the accuracy of the results.

A total of 300 soil samples will be field screened for TNT using this procedure. From these 40 samples will be sent to the analytical laboratory for quantitative analysis and compound identification by method SW8330. Procedures for selecting the samples to send to the laboratory are described in Section 5.6.

Samples will be received at the field screening laboratory along with a field screening chain of custody form. Samples will be homogenized in the field during sampling as described in SOP 9.0, Surface Soil Sampling. Prior to analysis, approximately 20 grams of soil sample will be removed from the sample container and air dried until the sample crumbles rather than compacts

when pressure is applied. This sample volume is sufficient to perform the TNT field screening procedure twice, and will allow for replicate analyses as required. Dried and homogenized samples will then be analyzed according to the procedures in SOP 12.0, TNT Field Screening. Required QA/QC samples and procedures are described in Section 5.5, and in SOP 12.0.

5.2 PETN FIELD SCREENING

Field screening for PETN will be performed using thin layer chromatography (TLC). The TLC method can be used to screen for semi- and non-volatile organic contaminants. This includes contaminants such as PETN, gasoline residues, oil, grease, mineral oil, PCB, phthalates, pesticides, and herbicides. The method is used to screen samples, and to limit the use of more expensive analytical laboratory procedures. In this application, the TLC method is used to determine if PETN is present in samples. Selected samples testing positive will be sent to the laboratory for confirmation and quantitation.

Thin layer chromatography is a solid-liquid chromatographic procedure, meaning that there are two phases. The liquid phase (solvent) is used to carry the analyte (solute) through the solid medium (in this case silica gel). The analytes are carried through the porous solid by the liquid, which moves at a relatively constant rate. As the analytes move up the slide, they partition between the solid and liquid phases. Analytes strongly attracted to the solid phase will remain on the solid longer, and move more slowly along the slide than analytes that are less strongly attracted. When the chromatography is stopped, the distance the analyte has moved relative to the distance the solvent has moved is used to determine the R_f value. The analytes are visualized on the plate using ultraviolet light, and the R_f value can be used to tentatively identify the compound(s).

The TLC procedure for PETN will be performed using a PETN standard, obtained from the Army Environmental Center (AEC), along with sample extracts on each TLC plate. This will allow direct comparison between the sample results and a positive result for PETN. The method will detect if PETN is present above the method quantitation limit, but will not be used to quantify the PETN in the samples

A total of 300 soil samples will be screened for PETN using the TLC method. From these, 40 samples will be sent to the analytical laboratory for quantitative analysis by SW8330-ADD-1. The method for selecting samples to send to the analytical laboratory is discussed in Section 5.6.

Samples will be received at the field screening laboratory along with a field screening chain of custody form. Samples will be homogenized in the field during sampling as described in SOP 9.0, Surface Soil Sampling. Prior to analysis, approximately 10 grams of soil sample will be removed from the sample container. This sample volume is sufficient to perform the TLC field

screening procedure twice, and will allow for replicate analyses as required. Dried and homogenized samples will then be analyzed according to the procedures in SOP 13.0, PETN Field Screening. Required QA/QC samples and procedures are described in Section 5.5, and in SOP 13.0.

5.3 HYDROCARBON FIELD SCREENING

Hydrocarbon field screening will be performed using the TLC method described above. However, samples will be tested in conjunction with diesel standards, rather than PETN standards. Diesel was selected as the standard because it was widely used at the site, and is readily available. The intent of testing the diesel standard is to verify that the procedure is performed properly, and to provide a spot for comparison with sample extracts. Although some of the SVOC's that may be present at the site are not components of diesel, their presence will be identified by the method.

A total of 305 samples will be screened for hydrocarbons using the TLC method. From these, 20 samples will be selected for laboratory analysis for SVOC's by method SW8270. Procedures for selecting samples to send to the laboratory are discussed in Section 5.6

Samples will be received at the field screening laboratory along with a field screening chain of custody form. Samples will be homogenized in the field during sampling as described in SOP 9.0, Surface Soil Sampling. Prior to analysis, approximately 10 grams of soil sample will be removed from the sample container. This sample volume is sufficient to perform the hydrocarbon field screening procedure twice, and will allow for replicate analyses as required. Dried and homogenized samples will then be analyzed according to the procedures in SOP 15.0, Hydrocarbon Field Screening. Required QA/QC samples and procedures are described in Section 5.5, and in SOP 15.0.

5.4 NITRATE FIELD SCREENING

Field screening for nitrate will be performed with the N-Trak soil test kit, manufactured by Hach, Incorporated, that provides a quantitative, colorimetric analysis. The test kit will detect nitrate in soil down to 1 ppm concentration. The method is accurate to +/- 2 ppm in the range of 10 to 30 ppm concentration, and somewhat less accurate outside this range. The soil nitrate field screening is intended to provide a semi-quantitative evaluation of nitrate in soil samples, and will be followed by quantitative laboratory analysis for nitrate+nitrite in selected samples.

A total of 300 soil samples will be analyzed for nitrate concentration using the N-Trak test kit.

From these, 40 samples will be sent to the analytical laboratory for quantitative analysis by method E353.2. Procedures for selecting samples to send to the laboratory are discussed in Section 5.6.

Samples will be received at the field screening laboratory along with a field screening chain of custody form. Samples will be homogenized in the field during sampling as described in SOP 9.0, Surface Soil Sampling. Prior to analysis, approximately 250 mL of soil sample will be removed from the sample container and air dried until the sample crumbles rather than compacts when pressure is applied. This sample volume is sufficient to perform the nitrate field screening procedure twice, and will allow for replicate analyses as required. Dried and homogenized samples will then be analyzed according to the procedures in SOP 14.0, Nitrate Field Screening. Required QA/QC samples and procedures are described in Section 5.5, and in SOP 14.0.

5.5 QUALITY ASSURANCE/QUALITY CONTROL

Rigorous quality assurance/quality control (QA/QC) procedures will be followed for all field screening performed. Required QA/QC includes documentation, procedures, and QA/QC samples.

5.5.1 Documentation

Field sampling/screening forms will accompany each batch of samples collected. The laboratory technician performing the field screening will record results of the analyses on the field sampling/screening forms. Analysis of the samples will be recorded using the unique sample identifiers for each sample. The laboratory technician will sign the forms upon receipt of the samples and upon completion of sample screening.

Each step of the screening procedure will be recorded in the laboratory logbook, along with other pertinent information. Field screening steps that will be recorded include standard preparation, sample preparation, sample spotting, equipment cleaning, TLC plate preparation, and sample analysis. Pertinent information includes date, time, sample numbers, analytical results, and any unusual incidents or circumstances (e.g., accidental spill). The laboratory technician will sign or initial all pages of the laboratory logbook.

Upon completion of field screening, some samples will be sent to the laboratory, and some will be returned to the site for disposal in their place of origin (i.e., trench or borehole). The disposition of the sample will be recorded on the field sampling/screening form, and the laboratory technician will sign the completed form. The field geologist will again sign the field sampling/screening form upon receipt of samples for disposal. For samples sent to the

laboratory, a chain of custody form will be initiated. The procedures for preparing samples for laboratory analysis is presented in Section 8 of this FSP, the procedure for filling out the chain of custody forms is presented SOP 1.0, Sample Control and Documentation, and the procedures for determining sample ID's for QA samples is presented in Section 7 of the FSP.

5.5.2 Samples

Table 5.3 lists the QA/QC samples required and sample frequency for each field screening method. The TNT and nitrate test kits contain standards that are analyzed along with each batch of samples and at the beginning of the day, respectively. Hydrocarbons and PETN will be screened with the TLC method, and standards will be prepared as described in the SOP's for these methods.

Method blanks will be tested for one in twenty samples for all field screening procedures, to detect false positive results. Matrix spike samples will be tested for every 20 samples analyzed by the TLC method (PETN and hydrocarbons) to detect false negatives. The potential for false negatives will be evaluated for the nitrate and TNT kits by testing standards with every batch of samples (not to exceed 10). Replicate samples will be tested for every 20 samples tested for all field screening procedures, to assess the repeatability of the analyses. Soil blanks will be analyzed for TNT and PETN field screening at a frequency of 1 in 40 samples. Soil blanks will be collected in an area containing similar soils to those sampled, where no explosive testing has occurred. The soil blank samples will be collected in the open area to the west of the McCormick Ranch site, at least 1/2 mile from any known testing activities. The purpose of the soil blanks is to detect false positive results that may occur because of interferences related to soil composition (e.g., presence of humic materials). Spike blanks will be tested for every 20 samples tested for PETN and hydrocarbon screening to ensure that the method is detecting contamination in the absence of any interference from soil materials.

TABLE 5.3. Field Screening QA/QC Samples.

SAMPLE TYPE	TNT	PETN	NITRATES	HYDROCARBONS
SOIL BLANK	1/40	1/40	NA*	NA
METHOD BLANK	1/20	1/20	1/20	1/20
MATRIX SPIKE	NA	1/20	NA	1/20
REPLICATE	1/20	1/20	1/20	1/20
STANDARD	1/BATCH	AT LEAST 2/BATCH	3/DAY**	AT LEAST 2/BATCH

* NA - not applicable
** Three standards at beginning of day

5.6 SELECTION OF SAMPLES FOR LABORATORY ANALYSIS

The procedures to follow in selecting samples for laboratory analysis are described in Section 2.3.2.3 (trench samples) and 3.3.2.2 (hand auger samples) of this FSP. Table 2.3 provides a sample selection matrix for explosives analysis (PETN and TNT). Table 2.1 lists the type and number of field screening analyses and laboratory analyses for samples from the trenches, and Table 3.1 lists the type and number of field screening analyses and laboratory analyses for hand auger samples. If no contaminants are detected through field screening, selection of samples for analysis will be at the discretion of the supervising geologist.

6.0 SURFACE WATER SAMPLING

6.1 INTRODUCTION

Surface water sampling will be conducted to determine if any existing soil contamination at the McCormick Ranch site is mobilized in surface waters after a precipitation event. This activity will investigate surface waters both on-site within the playa lake boundaries, and in an upgradient area off-site. The surface water sampling activity will require a rainfall event where sufficient ponded water is present to collect water samples for analysis. If the required rainfall event does not occur, then no sampling will be conducted. This chapter will identify and describe the following:

- Where the surface water samples will be collected
- How surface water sampling will be conducted
- What samples will be collected for analysis
- What sample identifiers will be used for each sampling location

6.2 SURFACE WATER SAMPLING LOCATIONS

Surface water will be collected from four sampling locations within the boundaries of the playa lake in the south central portion of the McCormick Ranch site, and from two locations upgradient and to the east of the McCormick Ranch site (Figure 1.1). Exact sampling locations will be determined within one hour after a significant rainfall event, if sufficient ponding occurs to collect the required sample volumes. Depressions associated with pathways may collect the most water and allow for the easiest collection of samples.

6.3 SURFACE WATER SAMPLING PROCEDURES

After identifying sampling locations, surface water samples will be collected within one hour of the rainfall event by using a peristaltic pump to pump ponded water through a .45 micron filter into sample bottles (see SOP 7.0, Surface Water Sampling with a Peristaltic Pump).

Because the objective of surface water sampling is to determine if soil contaminants are mobilized into surface waters after significant precipitation events, surface water samples will be analyzed for the same contaminants potentially present in the soils. Surface water samples will be analyzed for explosives, nitrate + nitrite, SVOCs, metals, cyanide, and selected field parameters (pH, specific conductivity, and alkalinity). Table 9.2 identifies the water sample volume required for each analysis.

6.4 SAMPLE IDENTIFICATION NUMBERS

The following sample IDs will be used for the surface water samples:

Sample Location	Sample Location IDs
On-site samples (playa lake)	KRTLD154-311 through KRTLD154-314
Off-site samples (upgradient/east)	KRTLD154-315 through KRTLD154-316

7.0 SURVEYING

Upon completion of all field trenching and sampling activities, survey equipment will be used to map the locations of the following:

- Trench corners (8x4)
- Soil point samples (150)
- Surface water samples (6)
- Corners of geophysical survey areas (5x4)
- USGS wells (5)
- Significant landmarks/road intersections, as appropriate (20)

All points will be surveyed in state-plane coordinates, and will be tied into the benchmark located in the southeast corner of the McCormick Ranch site (Figure 1.1). All points will be surveyed to 0.01 ft accuracy in the horizontal direction and 0.1 ft in the vertical direction. Surveying will be conducted by a licensed New Mexico surveyor. The supervising geologist will assist the surveying team in locating all surveying points.

All trench and sample locations will have been previously marked with wooden stakes and flagging, with each stake clearly labeled in indelible ink with the trench number or sample location number. All locations will also have been previously documented on a sketched map on each soil sampling field form.

8.0 SAMPLE DESIGNATION

The following sample designations will be used when sampling:

Site ID#

KRTLD154

Location ID

Predetermined location numbers as shown in sections 2.4, 3.4, and 5.4

Sample ID#s (For either soil or surface water samples)

Normal Field Sample - 0001
Duplicate Sample - 0002 (i.e., the field duplicate)
Equipment Blank - 1001
Ambient Blank - 2001
Matrix Spike/Matrix Spike Duplicate (MS/MSD) - 0001 (MS/MSD)

Example

If a point soil sample is collected in the DIP 5 area at Location ID 255, its sample designation would be: KRTLD154-0255-0001.

If a duplicate point soil sample is sent to the analytic laboratory from the same location, its sample designation would be: KRTLD154-0255-0002.

If a point soil sample for MS/MSD analysis is collected in the DIP 5 area at Location ID 255, its sample designation would be: KRTLD154-0255-0001 (MS/MSD).

If an equipment blank is collected from the decontaminated auger prior to sampling at in the Fuselage area at Location 272, its sample designation would be KRTLD154-0272-1001.

If an ambient blank is collected at the same time at Location 272, its sample designation would be KRTLD154-0272-2001.

9.0 SAMPLE CONTAINERS, VOLUMES, AND PRESERVATION

Table 9.1 provides analytes, sample containers, volumes, preservation methods, and holding times required for soil samples to be collected for laboratory analysis. Because soil samples will first be sent to the field laboratory for field screening, they will first be collected in the field in one gallon zip-lock freezer bags. This will allow for sufficient sample for duplicates at any sampling location. Once the samples are screened in the field laboratory, samples from selected locations will be re-packaged in the proper containers required by the analytical laboratory.

Table 9.2 provides analytes, sample containers, volumes, preservation methods, and holding times required for water samples to be collected for laboratory analysis.

TABLE 9.1. Sample Methods, Containers, Volumes, Preservation Methods, and Holding Times for Soil Samples

ANALYTE	LABORATORY METHOD	NUMBER OF CONTAINERS	WEIGHT PER ANALYSES	TYPE OF CONTAINER	PRESERVATION METHOD	MAXIMUM HOLDING TIME
Explosives	SW8330 SW8330-ADD-1 SW8330-ADD-2	1	50g	amber glass	4C	14 days extraction 40 days analysis
Nitrate + Nitrite	E353.2	1	50g	clear glass	4C	28 days
Semi-VOCs	SW8270	1	50g	amber glass	4C	14 days extraction 40 days analysis
ICP Metals	SW6010	1	10g	clear glass	4C	180 days
Mercury	SW7471	1	10g	clear glass	4C	28 days
Lead Arsenic Selenium	SW7421 SW7060 SW7740	1	10g	clear glass	4C	180 days
Cyanide	SW9010A	1	50g	clear glass	4C	14 days

NOTE: (1) For each sample collected, one 16-oz glass jar will be filled to provide sufficient sample weight for all required analysis.
(2) Sample bottles will be certified pre-cleaned to meet EPA requirements, and will be provided by the analytical laboratory.

TABLE 9.2. Sample Methods, Containers, Volumes, Preservation Methods, and Holding Times for Water Samples

ANALYTE	LABORATORY METHOD	NUMBER OF CONTAINERS	VOLUME PER CONTAINER	TYPE OF CONTAINER	PRESERVATION METHOD	MAXIMUM HOLDING TIME
Explosives	SW8330 SW8330-ADD-1 SW8330-ADD-2	2	1000 ml	amber glass	4C	7 days extraction 40 days analysis
Nitrate + Nitrite	E353.2	1	250 ml	polyethylene	4C, H2SO4 to pH<2	28 days
Semi-VOCs	SW8270	2	1000 ml	amber glass	4C	7 days extraction 40 days analysis
ICP Metals	SW6010	1	500 ml	polyethylene	4C, HNO3 to pH<2	180 days
Mercury	SW7471	1	250 ml	amber glass	4C, HNO3 to pH<2	28 days
Lead Arsenic Selenium	SW7421 SW7060 SW7740	1	500 ml	polyethylene	4C, HNO3 to pH<2	180 days
Cyanide	SW9010A	1	500 ml	polyethylene	4C, NaOH to pH<12	14 days

NOTE: Sample bottles will be certified pre-cleaned to meet EPA requirements, and will be provided by the analytical laboratory.

10.0 FIELD QA/QC SAMPLES

10.1 SOIL SAMPLING

10.1.1 Field Duplicates

Field duplicates will be collected at a frequency of 1 per 10 samples sent to the laboratory for analysis. Because 40 samples will be sent to the laboratory for analysis, 4 field duplicates will be collected. However, until field screening is completed it can not be known which samples will be sent to the laboratory for analysis. As a result, sufficient soil will be collected at each sampling location to allow for duplicate laboratory analysis.

Each field duplicate will be collected by splitting the soil sample that was collected and then homogenized in a stainless steel bowl. This will be performed at the field screening laboratory.

10.1.2 Equipment Blanks

Equipment blanks will be collected at a frequency of 1 per 10 samples sent to the laboratory for analysis. Because 40 samples will be sent to the laboratory for analysis, 4 equipment blanks will be collected. Equipment blanks will be collected from the following:

- Backhoe bucket
- Hand auger bit
- Soil scoop (for trench samples)
- Stainless steel bowl

Equipment blanks will be collected by pouring organic-free ASTM Type II water over a decontaminated piece of sampling equipment and then into sample containers, and will be non-filtered.

10.1.3 Ambient Blanks

One ambient blank will be collected to analyze the purity of the organic-free ASTM Type II water. The water will be poured directly from the water container into sample containers. The water will not be filtered.

10.1.4 Matrix Spike/Matrix Spike Duplicates (MS/MSD)

Samples for MS/MSD analysis will be collected at a frequency of 1 per 20 samples sent to the laboratory. Each MS/MSD will be collected by splitting the soil sample that was collected and then homogenized in a stainless steel bowl. This will be performed at the field screening laboratory. Because 40 samples will be sent to the laboratory for analysis, 2 MS/MSDs will be collected

10.2 WATER SAMPLING

10.2.1 Field Duplicates

Field duplicates will be collected at a frequency of 1 per 10 samples sent to the laboratory for analysis. Because 6 samples will be sent to the laboratory for analysis, 1 field duplicate will be collected. The field duplicate will be collected from an on-site area with sufficient water volume.

10.2.2 Equipment Blanks

Equipment blanks will be collected at a frequency of 1 per 10 samples sent to the laboratory for analysis. Because 6 samples will be sent to the laboratory for analysis, 1 equipment blank will be collected. The equipment blank will be collected by pumping organic-free ASTM Type II water through the decontaminated tubing of the peristaltic pump and into sample bottles. The equipment blank will be non-filtered.

10.2.3 Ambient Blanks

One ambient blank will be collected to analyze the purity of the organic-free ASTM Type II water. The water will be poured directly from the water container into sample containers. The water will not be filtered.

10.2.4 Matrix Spike/Matrix Spike Duplicates

Samples for MS/MSD analysis will be collected at a frequency of 1 per 20 samples sent to the laboratory. Because 6 samples will be sent to the laboratory for analysis, 1 MS/MSD will be collected.

11.0 DECONTAMINATION/WASTE HANDLING

Prior to initiating any field work, the Kirtland AFB Environmental Management Compliance group (Marsha Carra, 846-5027) will be contacted to coordinate the handling and disposal of Investigation Derived Wastes.

11.1 WASTE FROM DECONTAMINATION

11.1.1 Heavy Equipment Decontamination

Heavy equipment (backhoe) decontamination will take place at the decontamination pad that was constructed adjacent to the former mercury spill site, approximately 5 miles northeast of McCormick Ranch (see SOP 2.0, Equipment Decontamination/Waste Management). Water from the steam cleaner and soils from the backhoe in the collection trench on the north side of the decontamination pad will be transferred to 55-gallon plastic drums. The drums will be labeled "Investigation Derived Wastes (Water, Soil), McCormick Ranch Site, DATE". Upon completion of field studies, the wastes will be transferred to the Kirtland AFB Environmental Management (EM) Department for handling and disposal.

11.1.2 Soil Sampling Equipment Decontamination

Decontamination of hand augers, sampling scoops and spatulas, stainless steel bowls, and any other sampling equipment will take place at a central decontamination station just north of geophysical area 1 (HEST) in the south central portion of the McCormick Ranch site (Figure 1.1). Decontamination will be in an assembly line-like fashion, with separate tubs used for initial rinsing, soap scrubbing, final rinsing, and drying (see SOP 2.0, Equipment Decontamination/Waste Management). Water and decontamination solutions from each tub will be emptied into either 5-gallon or 55-gallon plastic drums, when necessary. The drums will be labeled "Investigation Derived Wastes (Water, Soil, Detergent, Nitric Acid, Methanol, Hexane), McCormick Ranch Site, DATE". Methanol and nitric acid wastes will be collected in separate drums from other wastes to minimize hazardous waste produced. Gloves, plastic sheeting, and another other solid decontamination debris will also be collected. Unless the materials are obviously contaminated, the materials will be placed in plastic bags and disposed of as solid non-hazardous waste. If the materials are potentially contaminated, they will be placed in steel drums labeled "Investigation Derived Wastes (Gloves, Plastic Sheeting, etc.), McCormick Ranch Site, DATE". Upon completion of field studies, the wastes will be transferred to the Kirtland AFB EM Department for handling and disposal.

11.1.3 Peristaltic Pump Decontamination

Decontamination of the water sampling equipment will take place at the central decontamination station (see SOP 2.0, Equipment Decontamination/Waste Management). Water and detergent used in the decontamination process will be disposed in a 55-gallon plastic drum. The drum will be labeled "Investigation Derived Wastes (Water, Soil, Detergent), McCormick Ranch Site, DATE". Gloves, plastic sheeting, and any other solid decontamination debris will also be collected. Unless the materials are obviously contaminated, the materials will be placed in plastic bags and disposed of as solid non-hazardous waste. If the materials are potentially contaminated, they will be placed in steel drums labeled "Investigation Derived Wastes (Gloves, Plastic Sheeting, etc.), McCormick Ranch Site, DATE". Upon completion of field studies, the wastes will be transferred to the Kirtland AFB EM Department for handling and disposal.

11.2 WASTE FROM FIELD SCREENING

11.1.1 Laboratory Chemicals

As a result of field screening procedures, small quantities of wash water, detergent, acetone, methanol, hexane, diesel, and methylene chloride wastes will be created. These wastes will be stored in a small plastic drum in the laboratory which will be labeled "Investigative-Derived Wastes (Laboratory Field Screening Wastes - Soil, Water, Detergent, Acetone, Methanol, Methylene Chloride, etc.), McCormick Ranch Site, DATE". Upon completion of field studies, the wastes will be transferred to the Kirtland AFB EM Department for handling and disposal.

11.1.2 Soils

Small quantities of soils used during the field screening procedures will require disposal as wastes. The soil wastes will be placed in the same drum as the laboratory chemical wastes.
The drum will be labeled "Investigative-Derived Wastes (Laboratory Field Screening Wastes - Soil, Water, Detergent, Acetone, Methanol, Methylene Chloride, etc.), McCormick Ranch Site, DATE". Upon completion of field studies, the wastes will be transferred to the Kirtland AFB EM Department for handling and disposal.

11.3 WASTE FROM SAMPLING

11.3.1 Trenched Materials

During trenching activities, all trenched materials will be piled adjacent to the trench (with the exception of the materials collected for field screening and laboratory analysis). Upon completion of each trench, the trenched materials will be placed back into the open trench. Any scrap metal unearthed during the field activities will be left at the sampling sites. If EOD personnel are required to blow up any materials, residues will require treatment and removal by a separate contractor. Any trench samples that are not sent to the laboratory (as determined from the field screening analysis) will be returned from the field laboratory to the site and also placed back in the trench. As a result, the trenched materials will not add to the waste generated during field activities.

11.3.2 Augered Soils

During point soil sampling activities, all augered materials will be piled adjacent each augered borehole (with the exception of the materials collected for field screening and laboratory analysis). Upon completion of each borehole, the augered materials will be placed back into the open borehole. Any scrap metal unearthed during the field activities will be left at the sampling sites. If EOD personnel are required to blow up any materials, residues will require treatment and removal by a separate contractor. Any point soil samples that are not sent to the laboratory (as determined from the field screening analysis) will be returned from the field laboratory to the site and also placed back in the borehole. As a result, the augered materials will not add to the waste generated during field activities.

11.3.3 Materials Waste

Materials associated with sampling, such as paper towels and disposable gloves, will be bagged and disposed of as solid non-hazardous waste unless the materials are obviously contaminated. If the materials are potentially contaminated, they will be placed in steel drums labeled "Investigation Derived Wastes (Gloves, Plastic Sheeting, etc.), McCormick Ranch Site, DATE". Upon completion of field studies, the wastes will be transferred to the Kirtland AFB EM Department for handling and disposal.

12.0 REFERENCES

EPA, 1983. Methods for Chemical Analysis of Water and Wastes, EPA-6001, 4-79-020.

EPA, 1986. Test Method for Evaluating Solid Waste Laboratory Manual Physical/Chemical Methods, SW-346, Third Edition.

GRAM, 1994a. Addendum to the McCormick Ranch Phase I EBS Report, prepared for Phillips Laboratory, PL/SEE, Kirtland AFB, New Mexico, February 9, 1994.

GRAM, 1994b. Technical Memorandum: Preliminary Data Report on the Geophysical Surveys at McCormick Ranch, Revision 0, March 3, 1994.

Los Alamos Technical Associates (LATA), 1993. Phase I Environmental Baseline Survey of McCormick Ranch, prepared for the Research Facility Engineering Division, Phillips Laboratory, Kirtland AFB, New Mexico, June 1993.