Closed Castner Firing Range Remedial Investigation

Technical Project Planning (TPP) Meeting #3

19 January 2017

9:00 AM – 1:00 PM

Meeting Agenda

- Meeting Goals
- Remedial Investigation (RI) Project Objectives
- Review of Technical Project Planning (TPP) Meeting #2
- RI Status
  - Munitions and Explosives of Concern (MEC) Investigation
    - Work Completed
    - Results
  - Munitions Constituents (MC) Investigation
    - Work Performed to Date
    - Results
    - Phase 2 Activities
- RI Report
- Schedule
- Questions and Follow-Up Items

Safety Moment

Meeting Goals

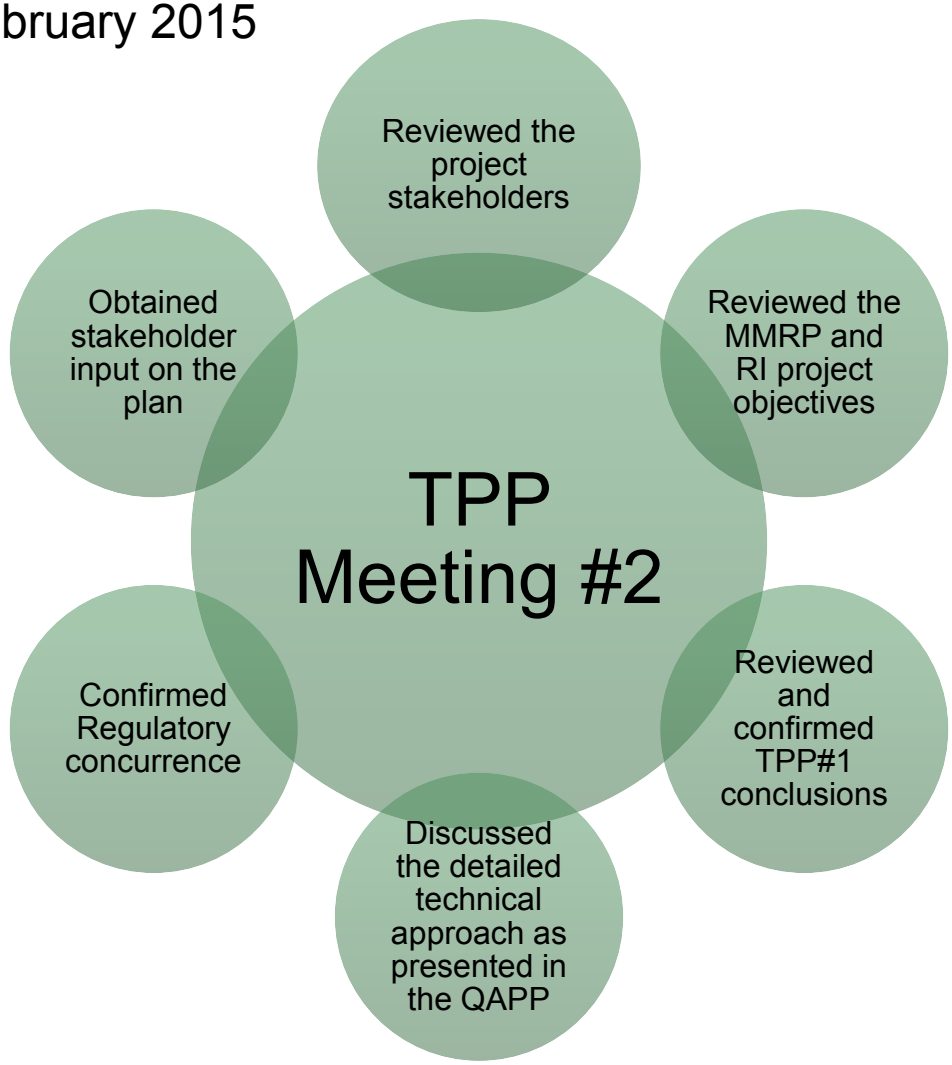
- Review TPP Meeting #2 conclusions
- Present summary of field work performed to date and preliminary results:
  - MEC Investigation
  - MC Investigation
- Discuss remaining field work
- Discuss RI Report
- Review remaining schedule

RI Project Objectives

- Overall Goal:
  - Gather sufficient information to determine the nature and extent of MEC / MC and assess potential risks / hazards at the Closed Castner Firing Range MRS
- RI Objectives:
  - Conduct RI field investigation to characterize the Closed Castner Firing Range
    - Determine the type (nature), density and distribution (extent) of MEC
    - Determine the concentrations and extent of MC
  - Assess potential risks/hazards to human health, safety and the environment
  - Ensure sufficient data collected to develop remedial alternatives for Feasibility Study phase

Review of TPP Meeting #2

Meeting held 11 February 2015



Actions Completed Since TPP 2

- Finalized QAPP
- Conducted Public Meeting
- Finalized Explosives Site Plan
- Completed MEC Investigation
- Completed Phase I of the MC Investigation

Castner Range RI Tasks

Implement TPP Process	
TPP Meeting #1 & 2	Complete
TPP Meeting #3	Today
TPP Meeting #4	~ April 2017
Develop Planning Documents	Complete
QAPP	March 2015
ESP	March 2016
Community Relations Support	
Public Meeting 1	May 2015
Public Meeting 2	~ July 2017
RAB Meetings	~ April 2017
RI Report	Currently Working

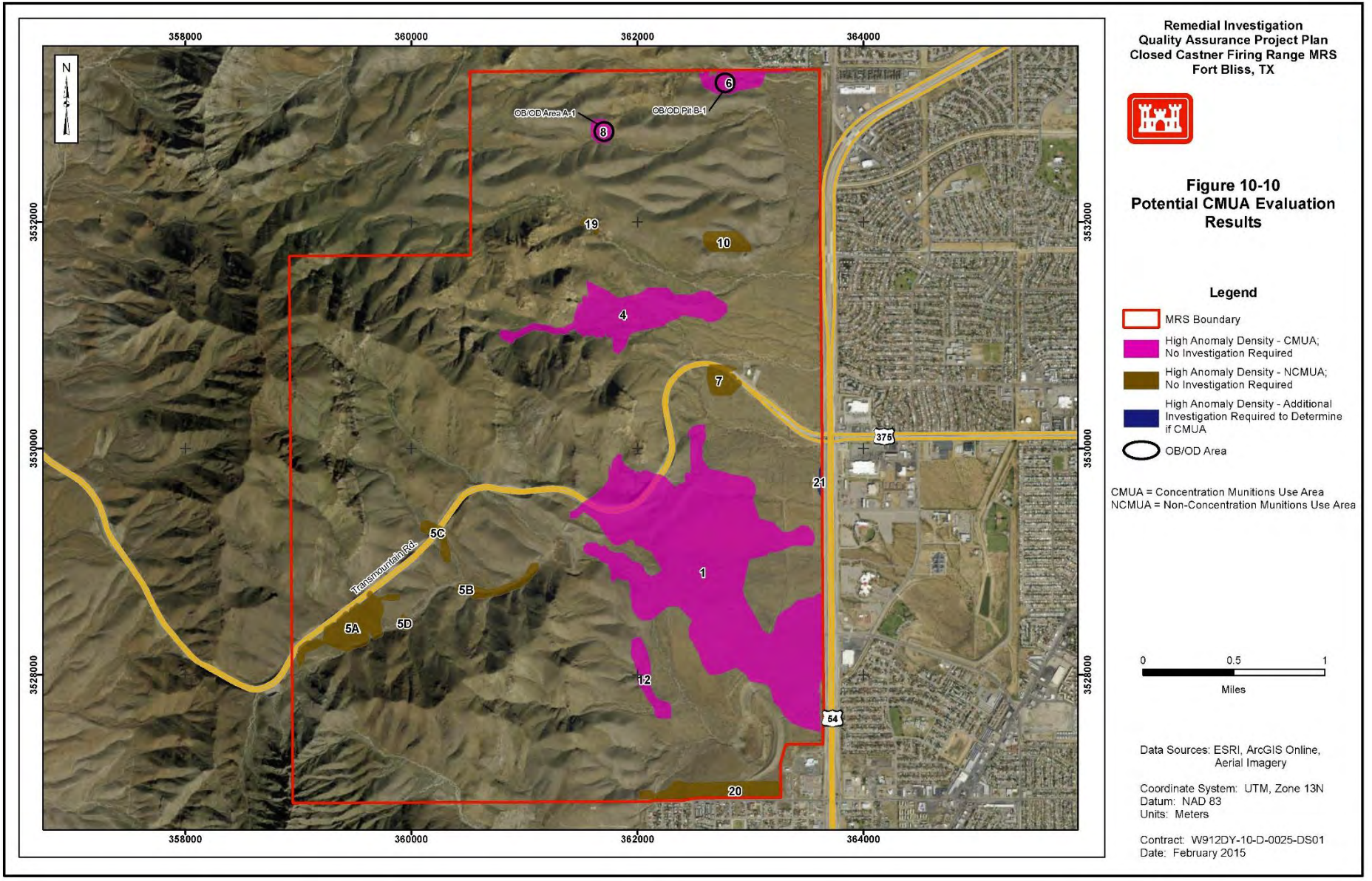
General RI Approach / Data Gaps

- Includes MEC and MC investigation
- Evaluate and utilize previous work, especially:
  - 2012 WAA Field Demonstration Report
  - 2013 ISM Field Demonstration Report
- Collect additional MEC and MC data to fill data gaps:
  - Vertical and horizontal extent of MEC and MC
  - MEC density outside identified CMUA
  - Identify additional CMUAs in high slopes, if present
  - Transportation potential of MEC and MC from high to low elevations

RI Technical Approach - MEC

- Sufficient existing data to:
  - Define boundary CMUAs (*i.e.,* potential target areas) in eastern side of MRS
  - Show that CMUAs were delineated to an accuracy of +/- 250 ft
  - Characterize nature and extent of MEC within CMUAs
- Phased field investigation will close remaining data gaps:
  - Define boundary of CMUAs, if any, in steep areas within western side of MRS
  - Verify that MEC density throughout MRS outside of CMUAs is < 0.1 MEC/acre to a 95% confidence level
  - Migration potential of MEC (and MC) from higher to lower elevation areas

Delineated CMUAs



RI Technical Approach – MEC

- MEC approach uses UXO Estimator to determine statistically valid approaches
- In areas with slopes < 30%:
  - Investigate approximately 25 acres, using three methods:
    - Reacquisition and intrusive investigation of WAA anomalies (~16 acres)
    - Collection of new DGM data, processing, and intrusive investigation (~5 acres)
    - Analog ("mag and dig") transect surveys (~ 4 acres)
- In areas with slopes > 30%:
  - 70 acres via Instrument-assisted visual survey
  - Analog (i.e., "mag and dig") investigation if potential CMUA identified

RI Technical Approach – MEC

- **MEC Phase 1: Instrument Assisted Visual Surveys (areas with slopes > 30%)**
  - Meandering path surveys
  - Handheld GPS and EMI sensor
  - No intrusive investigation
- **MEC Phase 2 (areas with slopes < 30%):**
  - **Phase 2a: Investigation of WAA anomalies**
    - 1750 100-ft transect segments selected
    - Reacquire anomalies with GPS and hand-held EMI sensor (*e.g,.* White's all metals detector)
    - Intrusively investigate with hand tools
    - Record results in tablet PC

Handheld EMI Sensor

RI Technical Approach – MEC

- **MEC Phase 2 (areas with slopes < 30%):**
  - **Phase 2b: DGM Grids**
    - 22 100’ x 100’ grids (areas with <18% slope)
    - Designed in UXO Estimator
    - EM61-MK2 surveys with RTK DGPS positioning
    - Investigate all anomalies meeting selection criteria with hand tools
    - Record results in tablet PC
  - **Phase 2c: Analog (“mag and dig”) transects**
    - 1,002 randomly placed100-ft transect segments (18% < slopes < 30%)
    - Use hand-held EMI sensor to identify anomalies
    - Intrusively investigate with hand tools
    - Record results in tablet and GPS anomalies

EM61-MK2

RI Technical Approach – MEC

- **MEC Phase 3 (areas with slopes > 30%)**
  - Analog (“mag and dig” transects) in IAVS areas with anomaly density greater than 300 anomalies/acre
  - Analog transects to determine the nature and extent of MEC within potential CMUA

Analog “mag and dig”

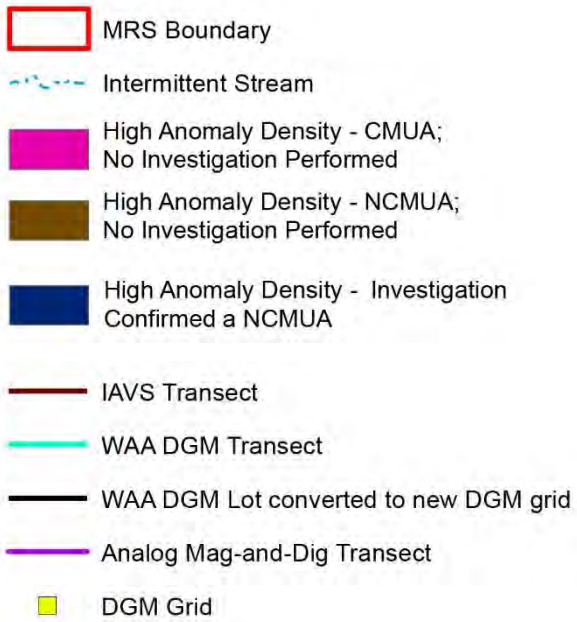
Handheld EMI Sensor

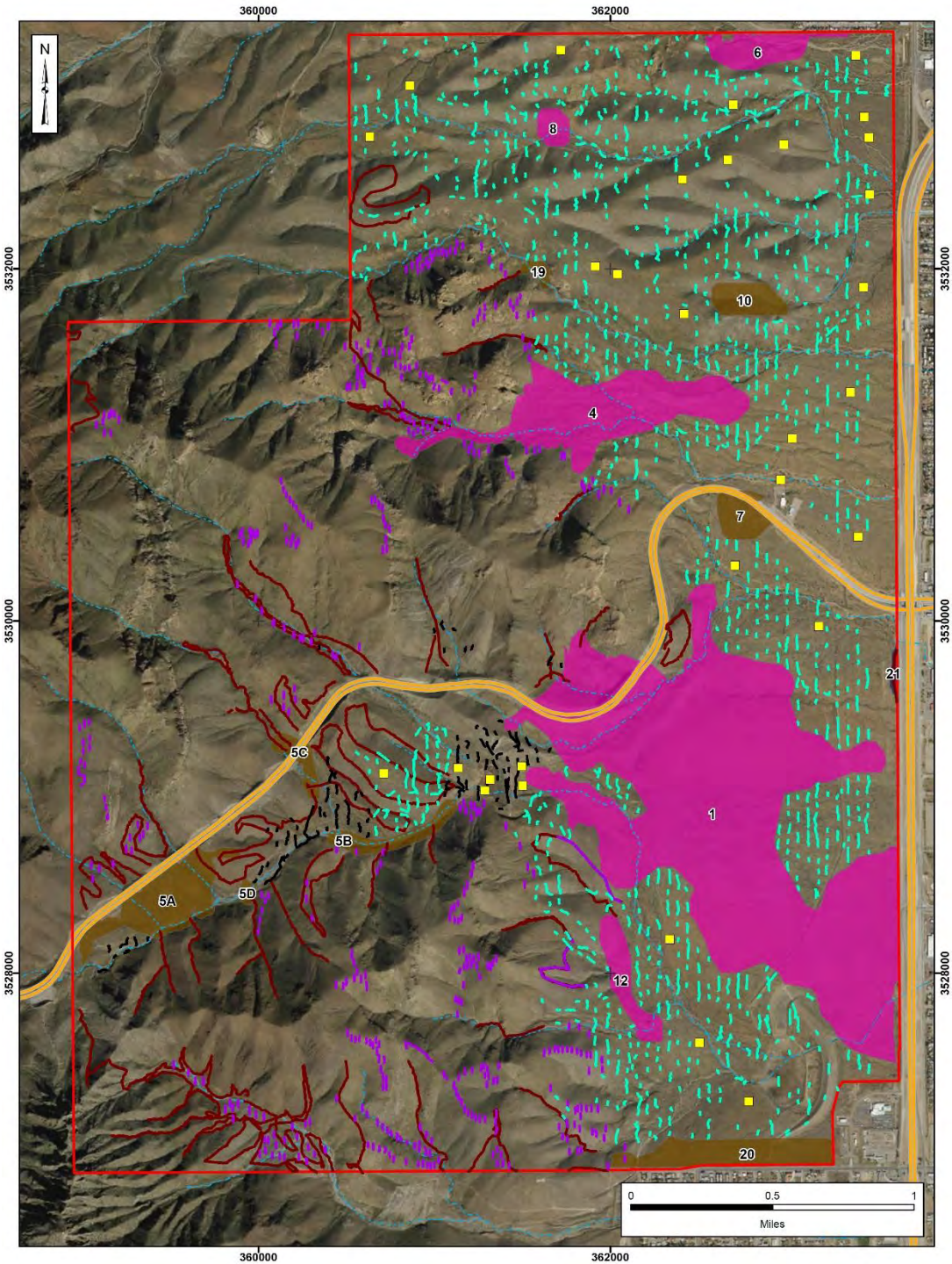
MEC Sampling Design

Decision Unit	Area (acres)[1]	Sampling Design			Required Investigation (acres)		Actual Investigation (acres)
		MEC/ Acre	Conf. Level	MEC Range	Investigation Type	Area (acres)	
Areas outside NCMUA	5977	< 0.1	95%	0-600	Total Required	29.8	29.8
					Conducted in WAA	4.6	4.6
					Analog Transects	4.3	6.3
					RI WAA DGM Transect Investigation	16.1	16.1
					RI DGM Grid	4.9	6.7
					RI Total Investigation:	29.8	33.6

Note:
1 – Acreage represents 6,803 acres of Castner Range (from GIS files) minus the known concentrated munitions use areas.
2 – Requires that no UXO are found to confirm hypothesis

RI Approach - MEC





IAVS Results

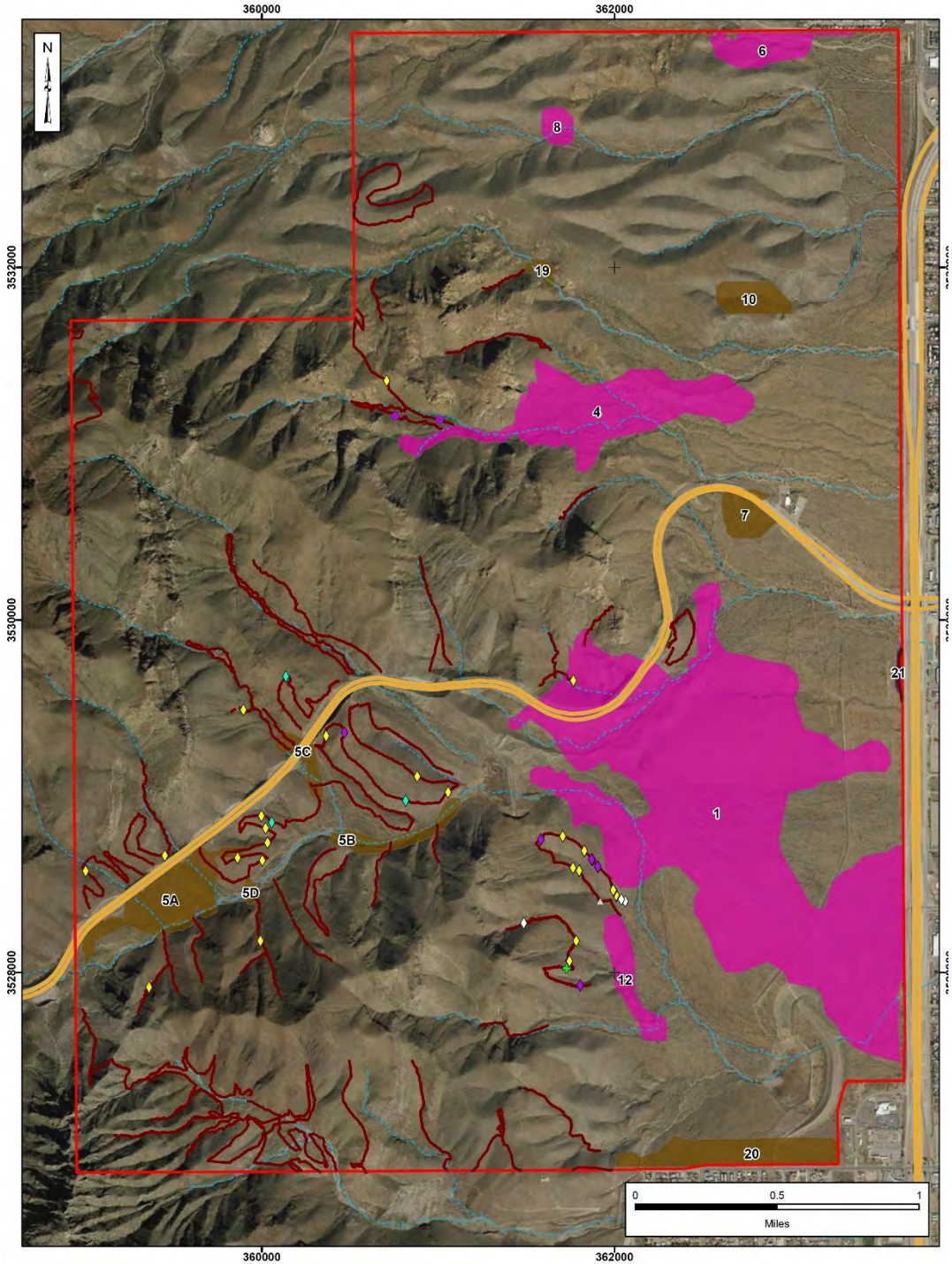
- MRS Boundary
- Intermittent Stream
- High Anomaly Density - CMUA; No Investigation Performed
- High Anomaly Density - NCMUA; No Investigation Performed
- High Anomaly Density - Investigation Confirmed a NCMUA
- IAVS Transect

MD - Projectiles

- 37mm Projectile
- 40mm Projectile
- 75mm Projectile
- Projectile frag

Other Munitions Debris

- Fragment
- Fuzes
- Grenade



Analog Transect Results

- MRS Boundary
- Intermittent Stream
- High Anomaly Density - CMUA; No Investigation Performed
- High Anomaly Density - NCMUA; No Investigation Performed
- High Anomaly Density - Investigation Confirmed a NCMUA
- Analog Mag-and-Dig Transect

MD - Projectiles

- 37mm Projectile
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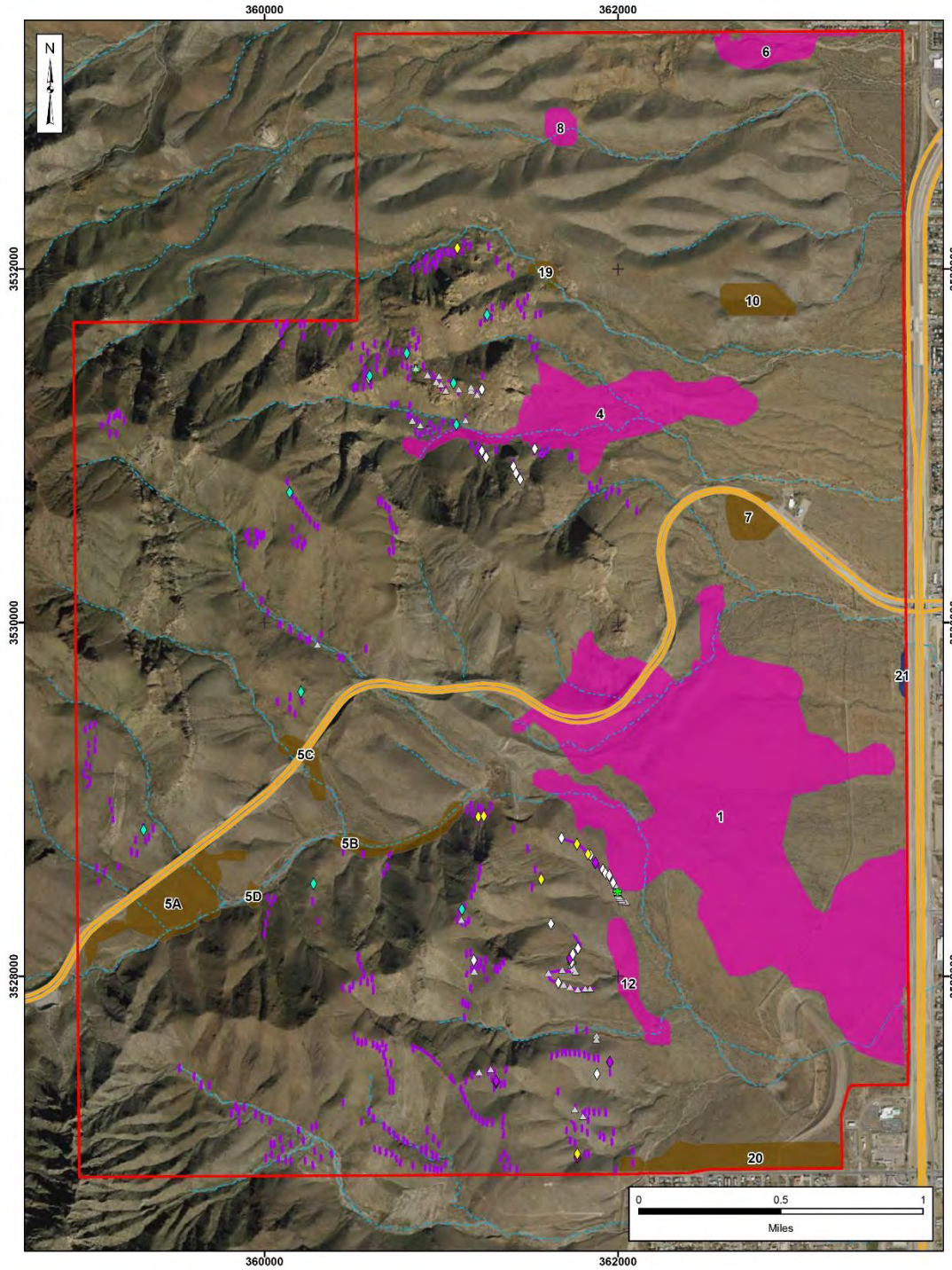
- Projectile frag

Other Munitions Debris

- Fragment
- Fuzes
- Grenade
- Mortar



New DGM Grids

MRS Boundary

Intermittent Stream

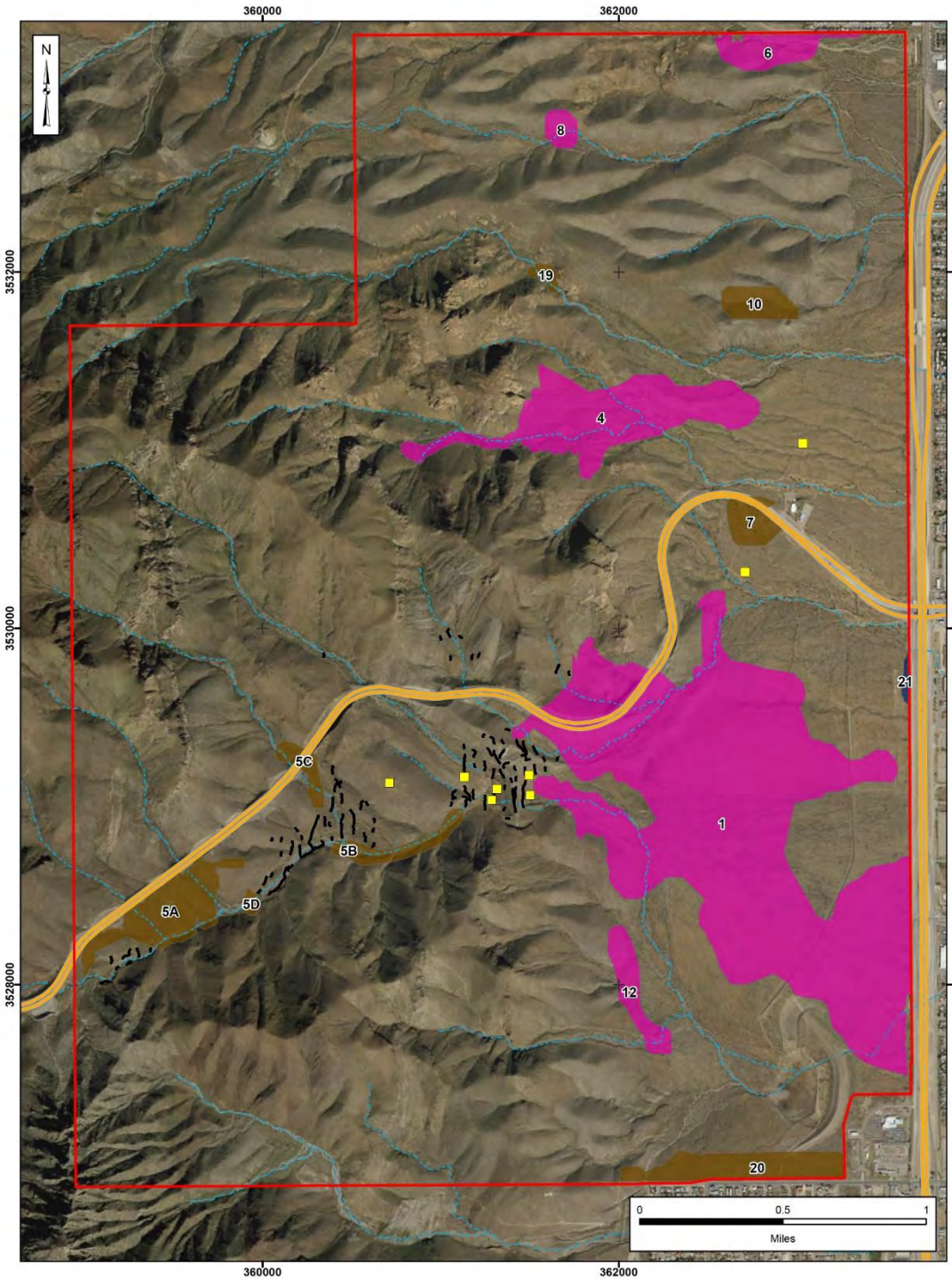
High Anomaly Density - CMUA; No Investigation Performed

High Anomaly Density - NCMUA; No Investigation Performed

High Anomaly Density - Investigation Confirmed a NCMUA

WAA DGM Lot converted to new DGM grid

New DGM Grid



RI MEC Finds

Target ID	Location	MEC Found	MEC Type
NA - Surface	Grid 20	37mm High Explosive (HE) Projectile	Projectile
WAA-1441	Lot 8	M19A1 Rifle Grenade, White Phosphorus (WP)	Grenades
WAA-1735	Lot 9	40mm M81 Projectile still in cartridge	Projectile
WAA-0284	Lot 2	37mm HE Projectile	Projectile
WAA-0391	Lot 2	MK27 Point Detonating (PD) fuze	Fuze
G24-0003	Grid 24	60mm Mortar fuzed	Mortar

MEC Finds


Grid 20 on surface
MOTOROLA
SUXOS


WAA-0284
FLS 284
37MM FUZED
0284

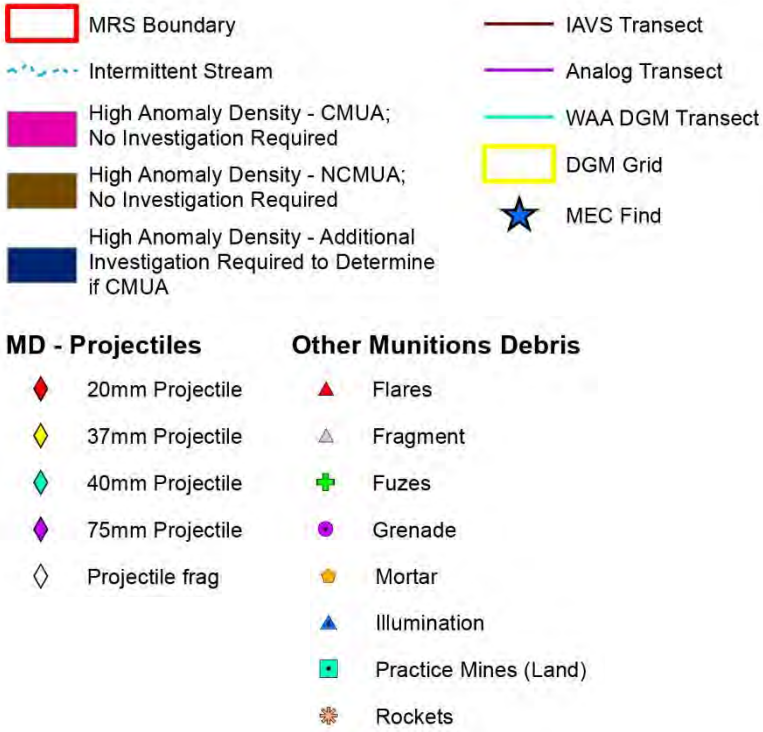

Target G24-0003
60mm M49 SERIES

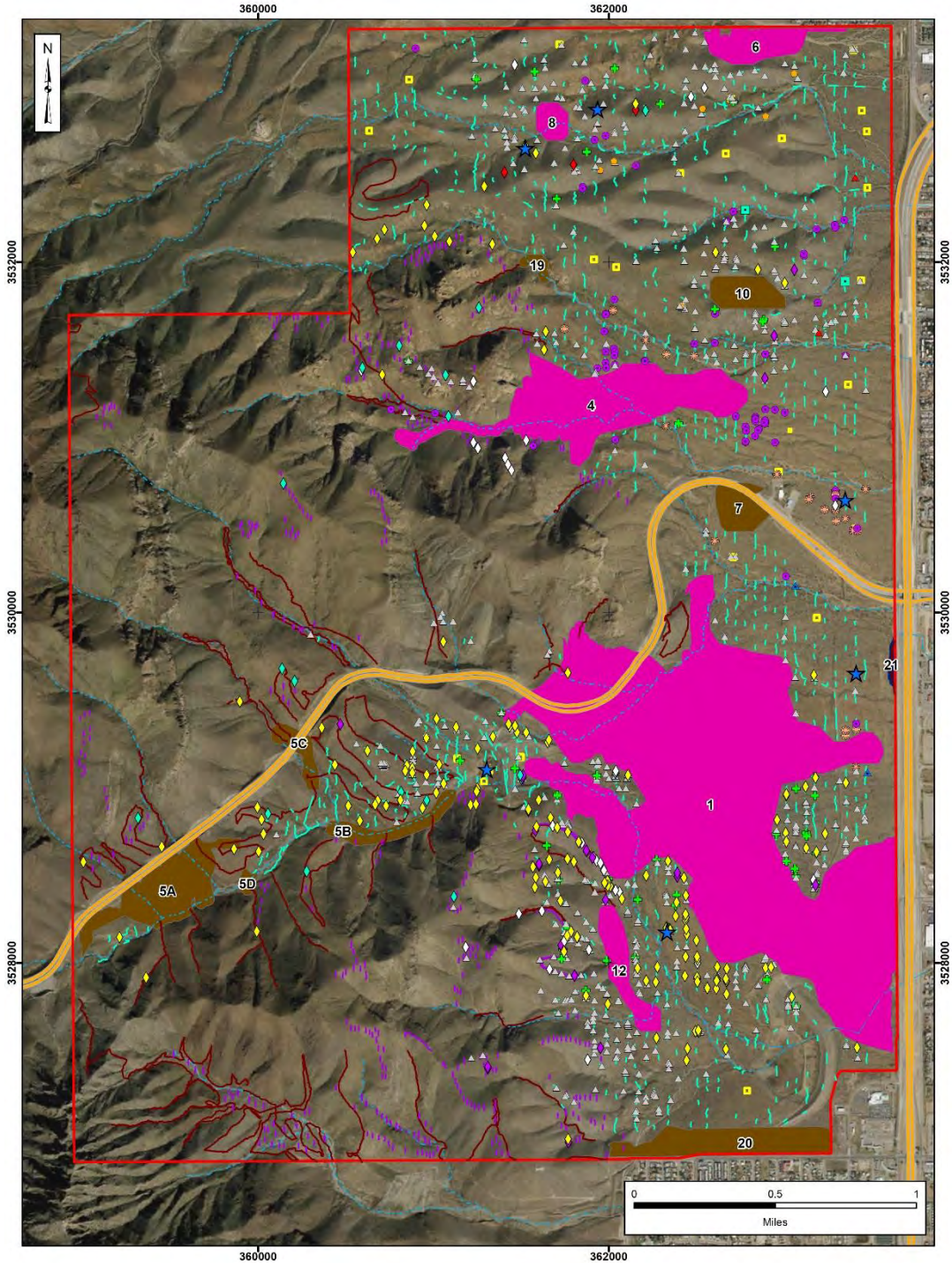

WAA-0391
TEAM 2B - LOT 02
TARGET: 0391
MEC: Mk 27 PD Fuze
w/ Booster cup


WAA-1735
5 April 16
TEAM 2B
Lot 9 - Target 1735
DMM: 37mm APT

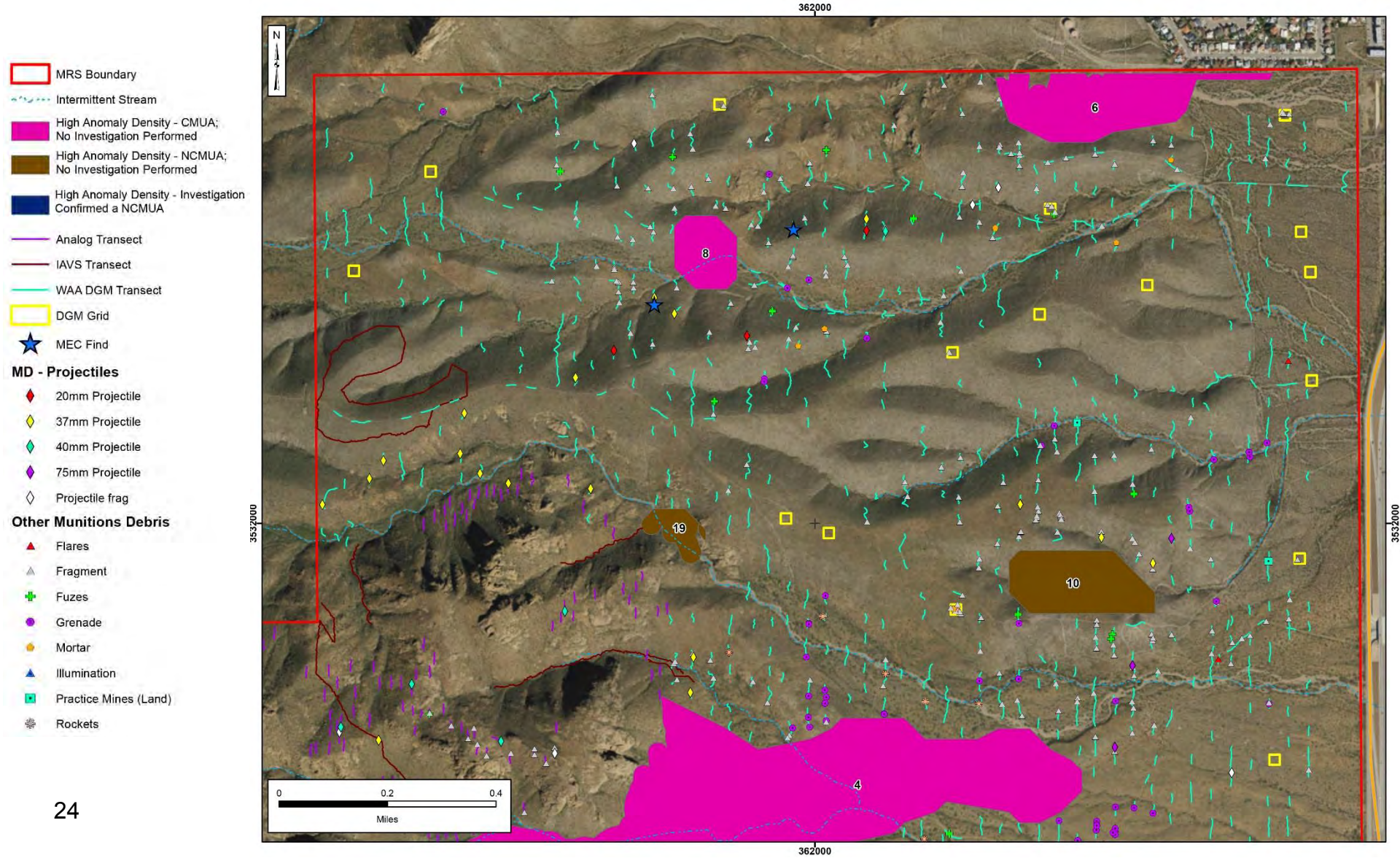

Target WAA-1441
M9 RIFLE GRENADE
WAS 1441 LOT 8
Inches 2 3 4 5 6 7 8 9

RI Dig Results

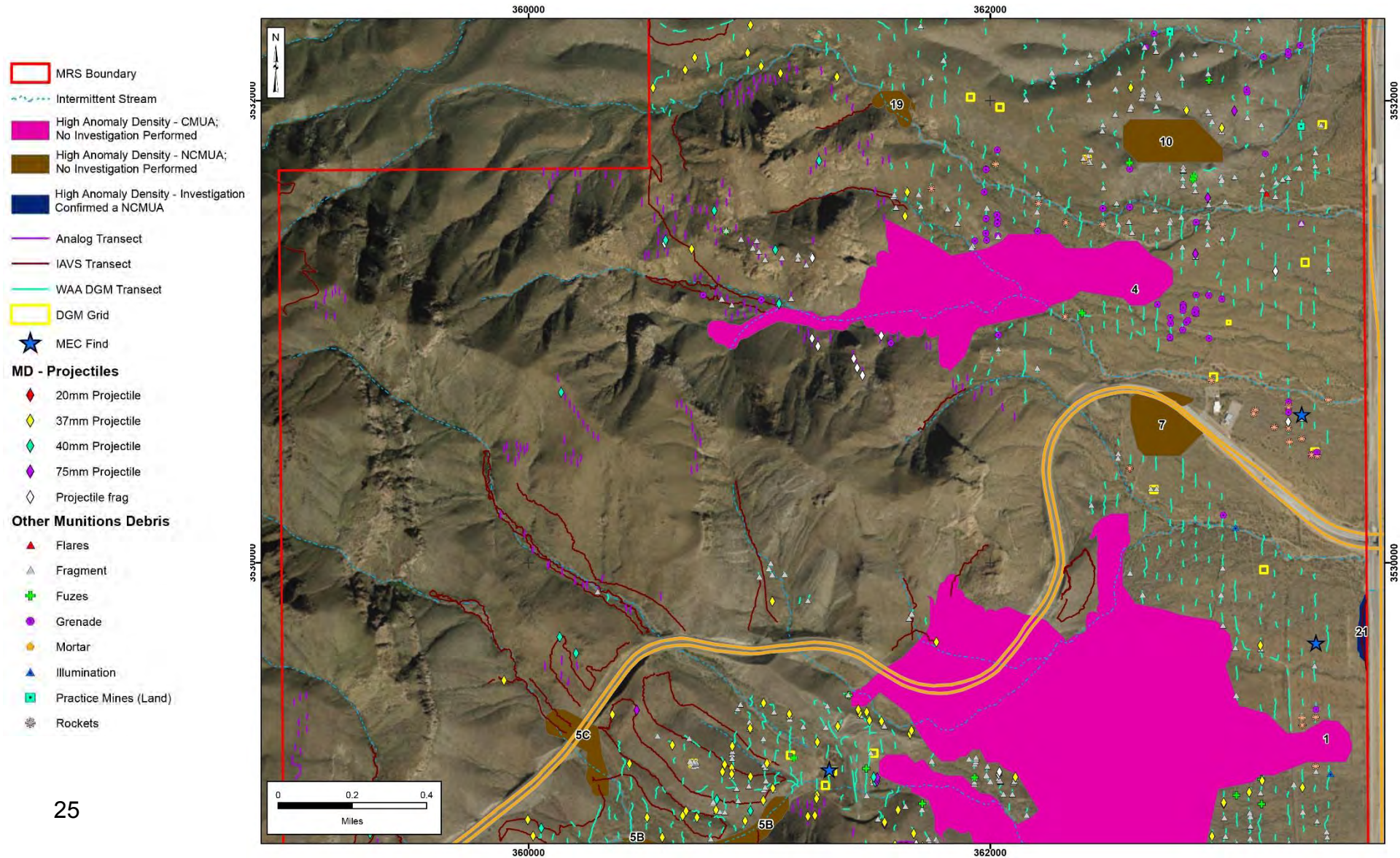




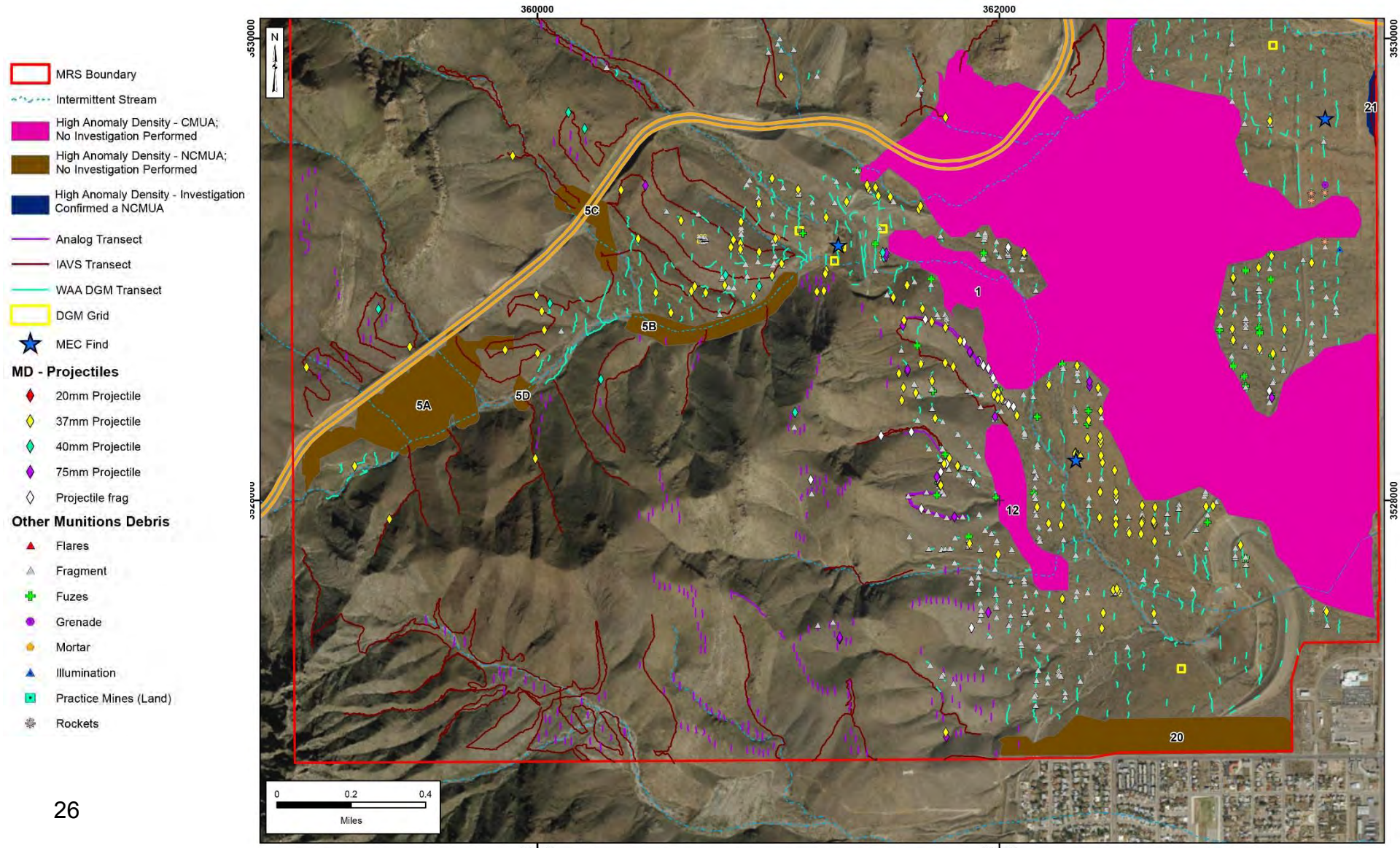
RI Dig Results - North



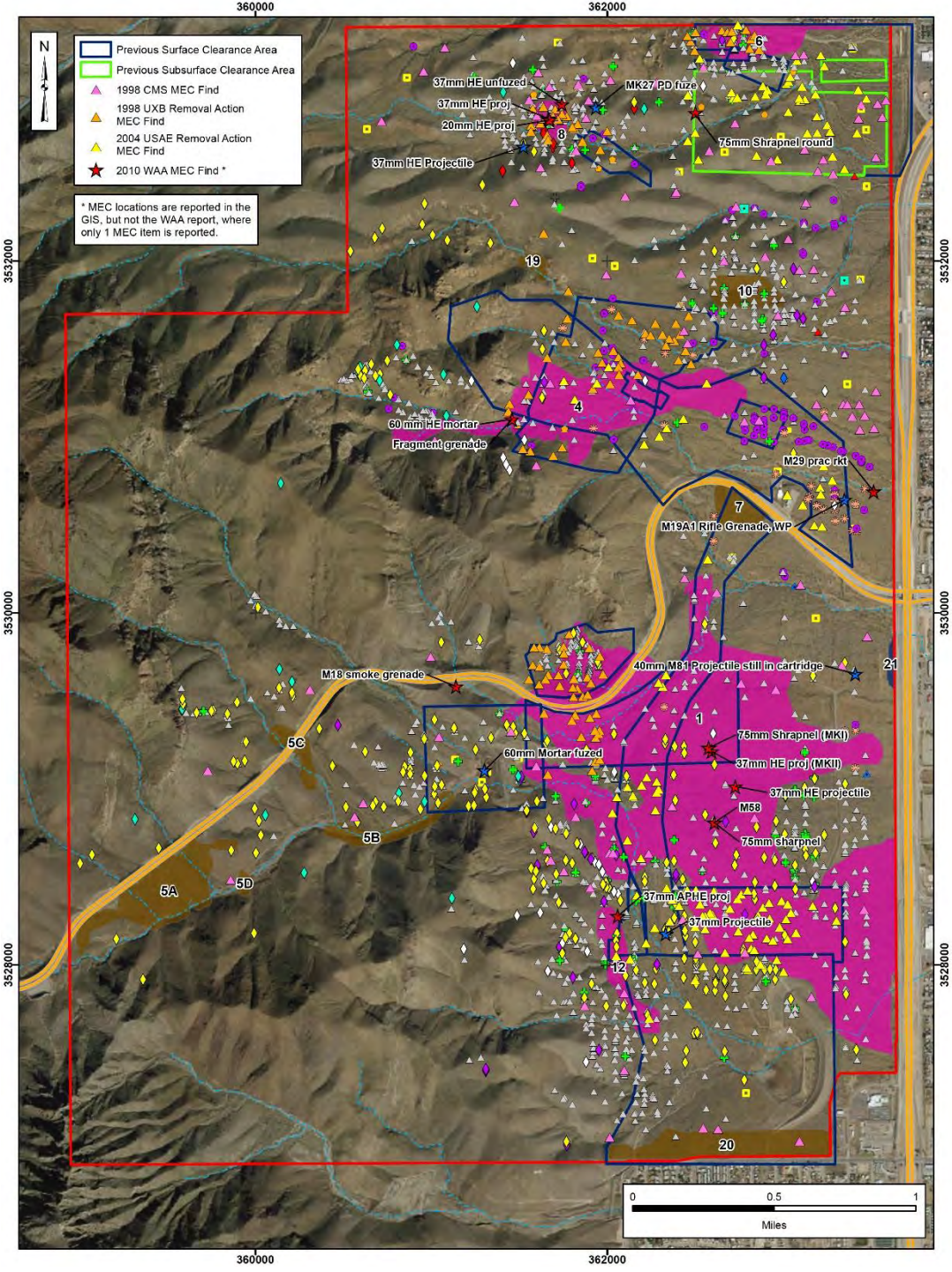
RI Dig Results - Central



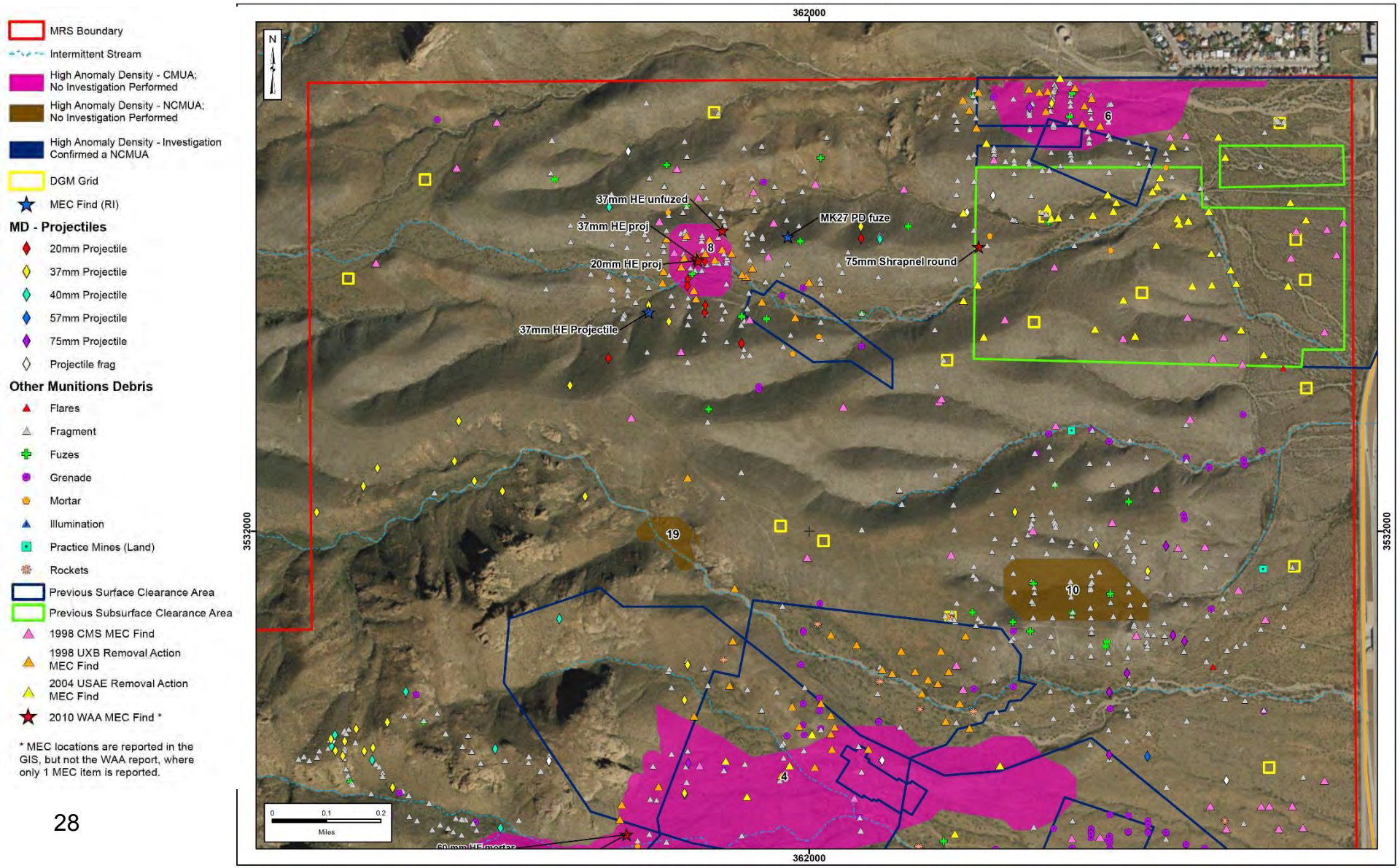
RI Dig Results - South



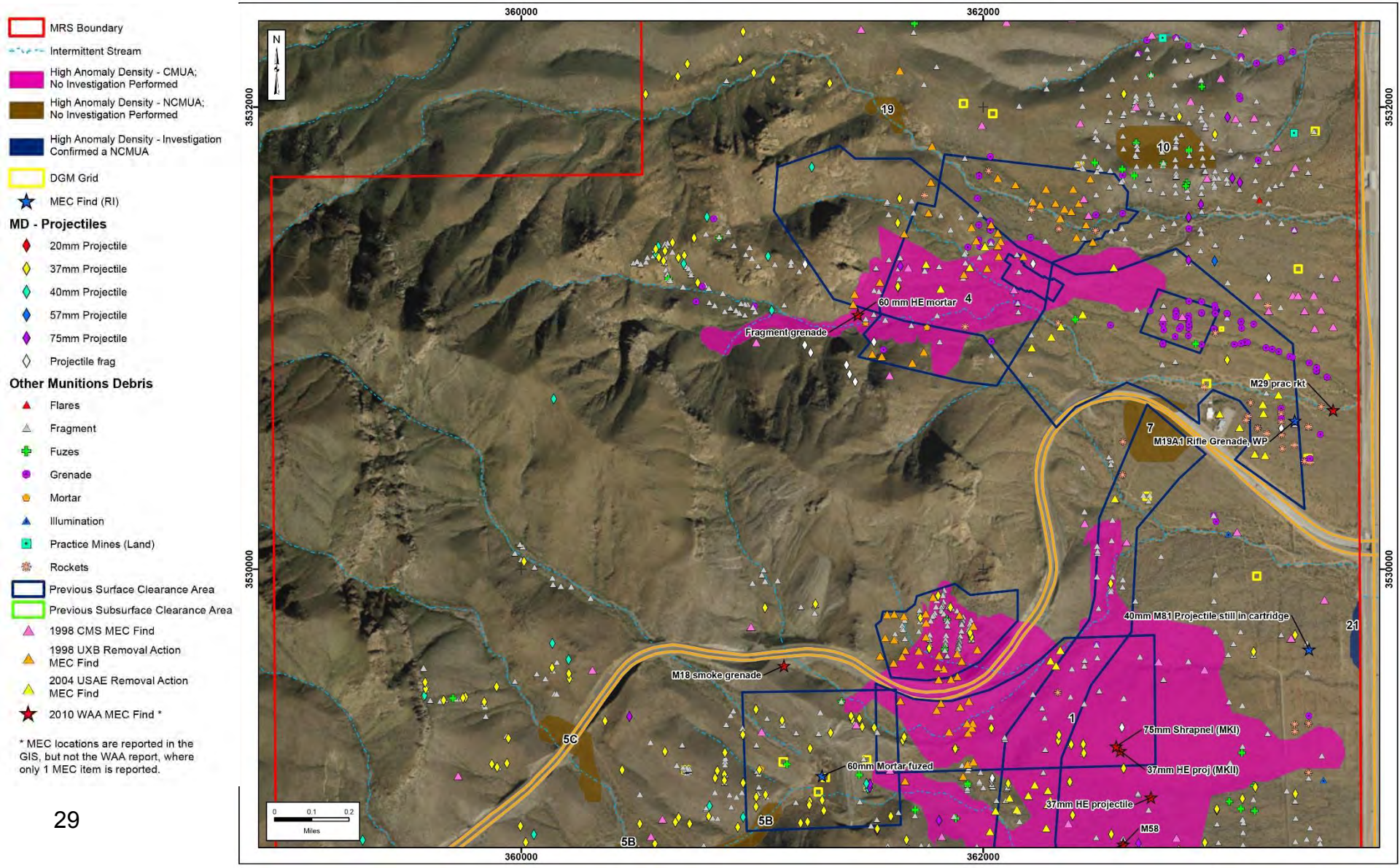
RI and Historical MEC Finds



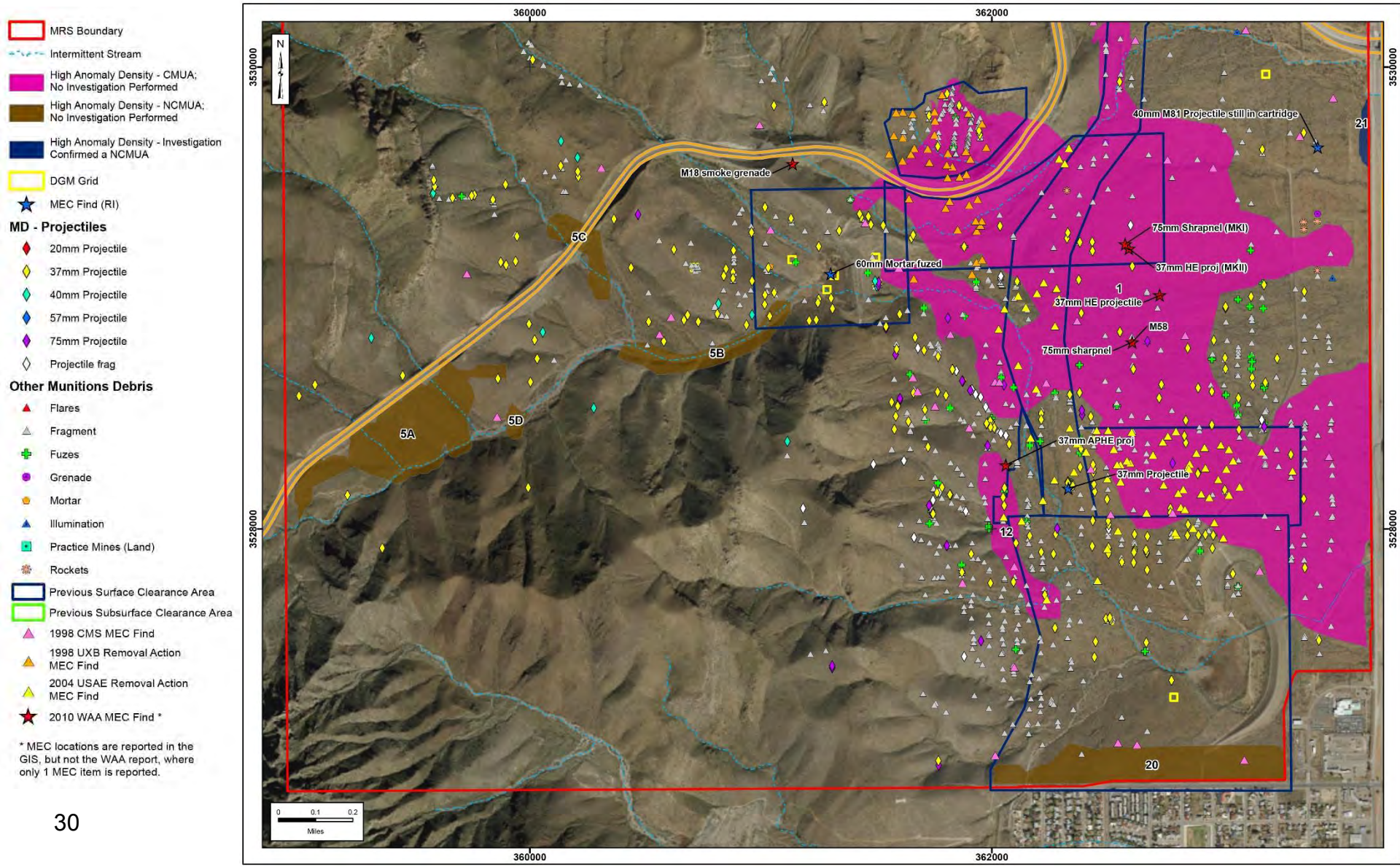
RI and Historical MEC Finds - North



RI and Historical MEC Finds - Central



RI and Historical MEC Finds - South



Munitions Density Estimate

MRS Boundary

Intermittent Stream

High Anomaly Density - CMUA; No Investigation Performed

High Anomaly Density - NCMUA; No Investigation Performed

High Anomaly Density - Investigation Confirmed a NCMUA

Proposed CMUA Expansion

DGM Grid

MEC Find (RI)

MD - Projectiles

- 20mm Projectile
- 37mm Projectile
- 40mm Projectile
- 57mm Projectile
- 75mm Projectile
- Projectile frag

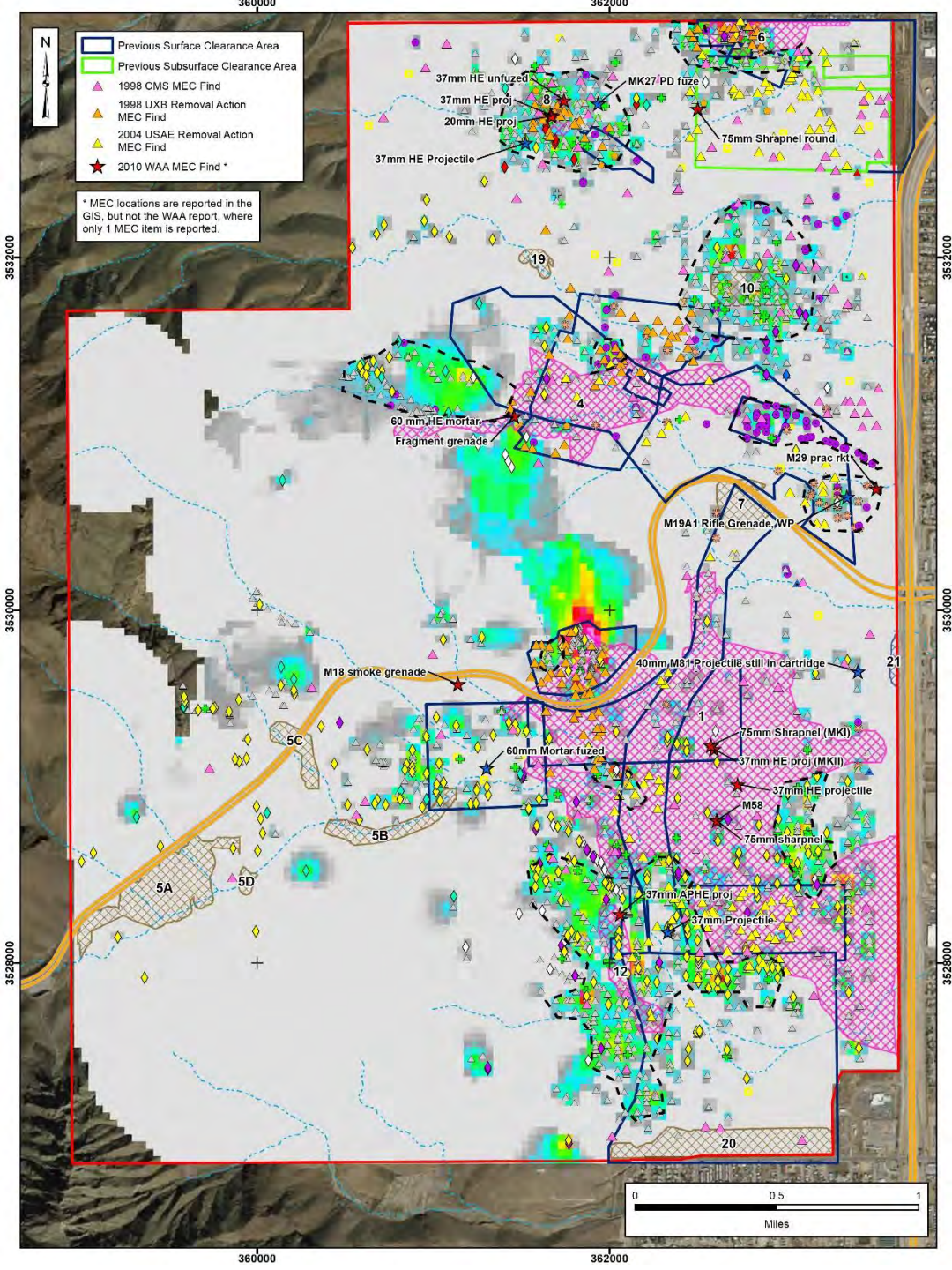
Other Munitions Debris

- Flares
- Fragment
- Fuzes
- Grenade
- Mortar
- Illumination
- Practice Mines (Land)
- Rockets

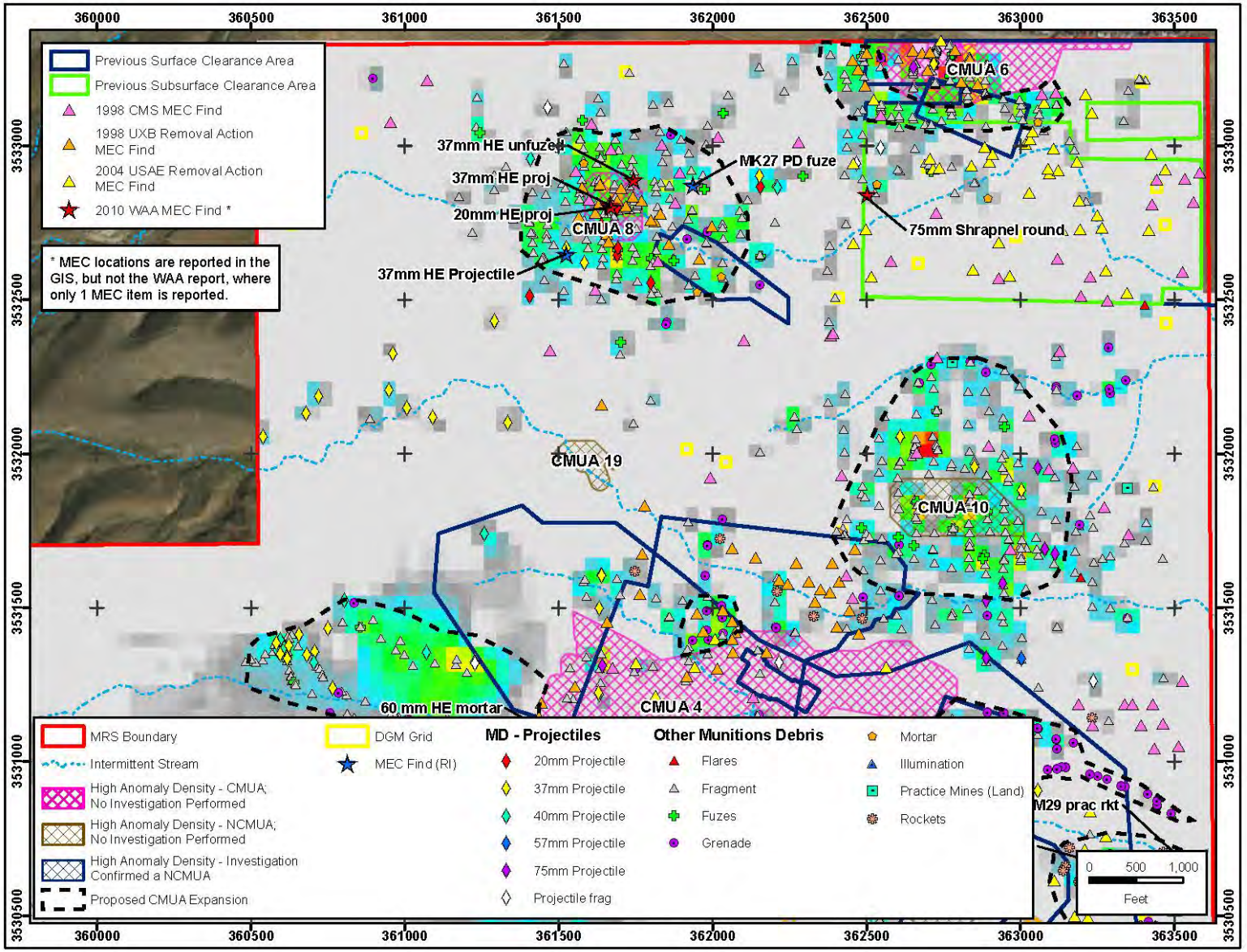
Munitions Density

High: 1167

Low: 0



Munitions Density Estimate - North

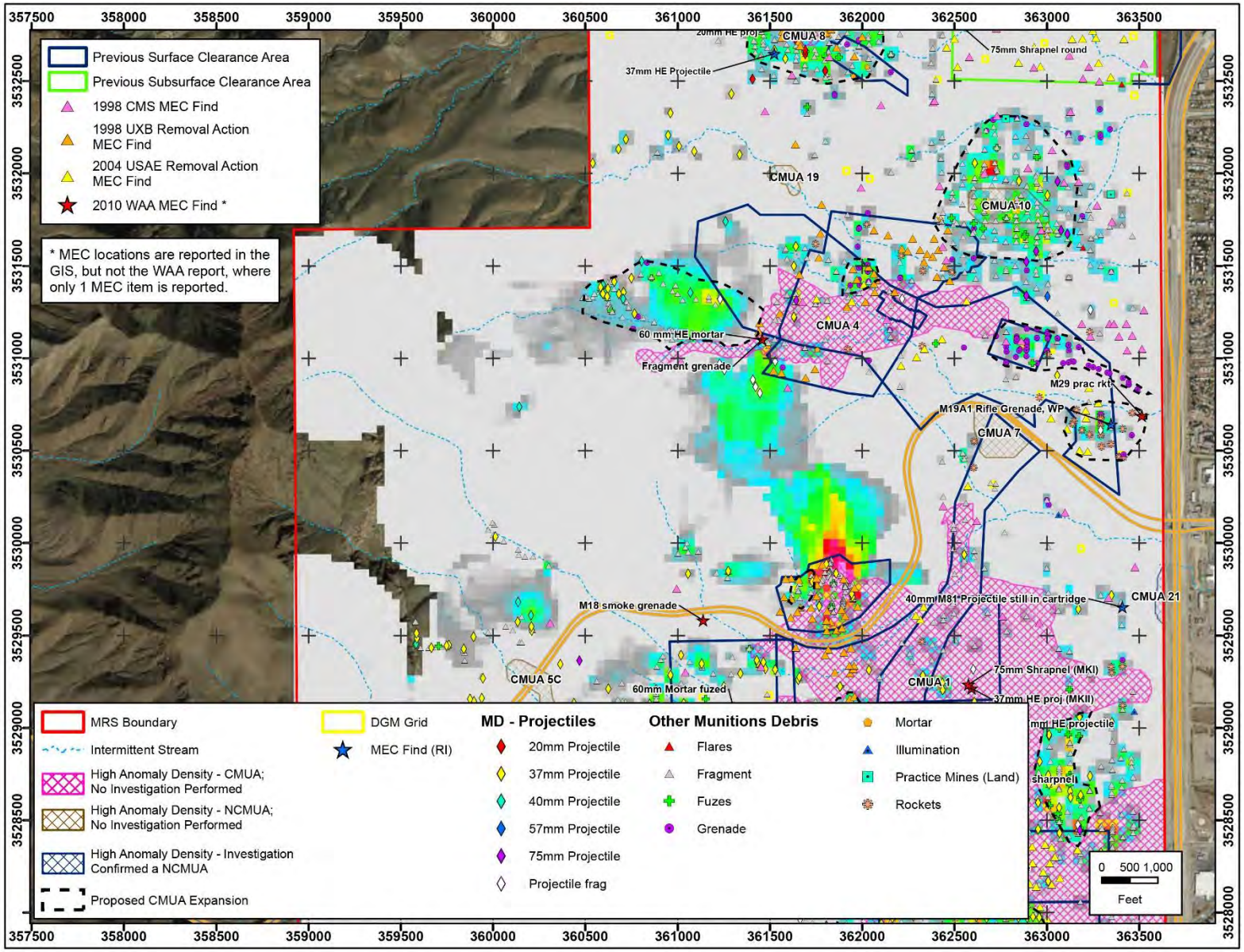


Munitions Density

High: 1167

Low: 0

Munitions Density Estimate - Central

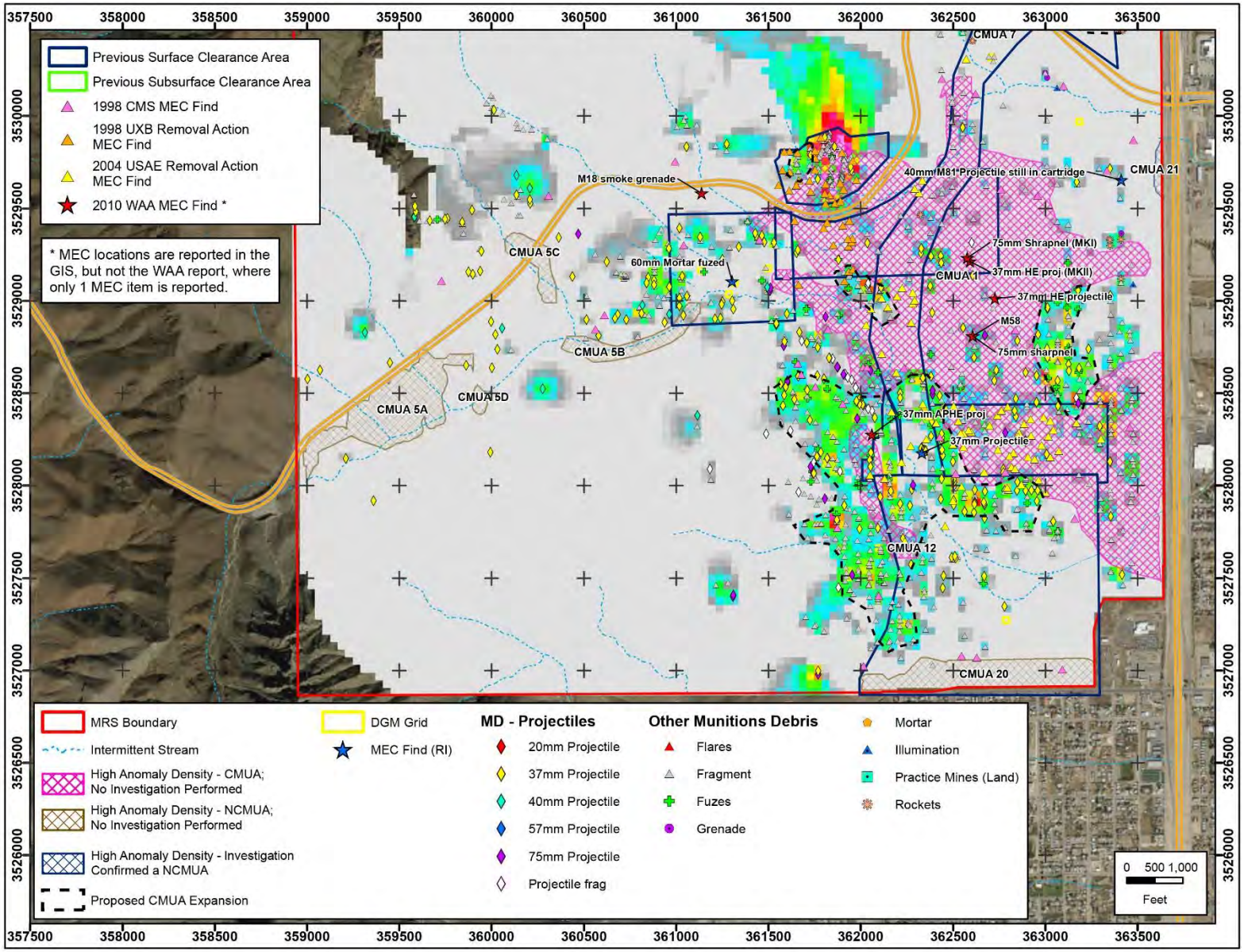


Munitions Density

High: 1167

Low: 0

Munitions Density Estimate - South

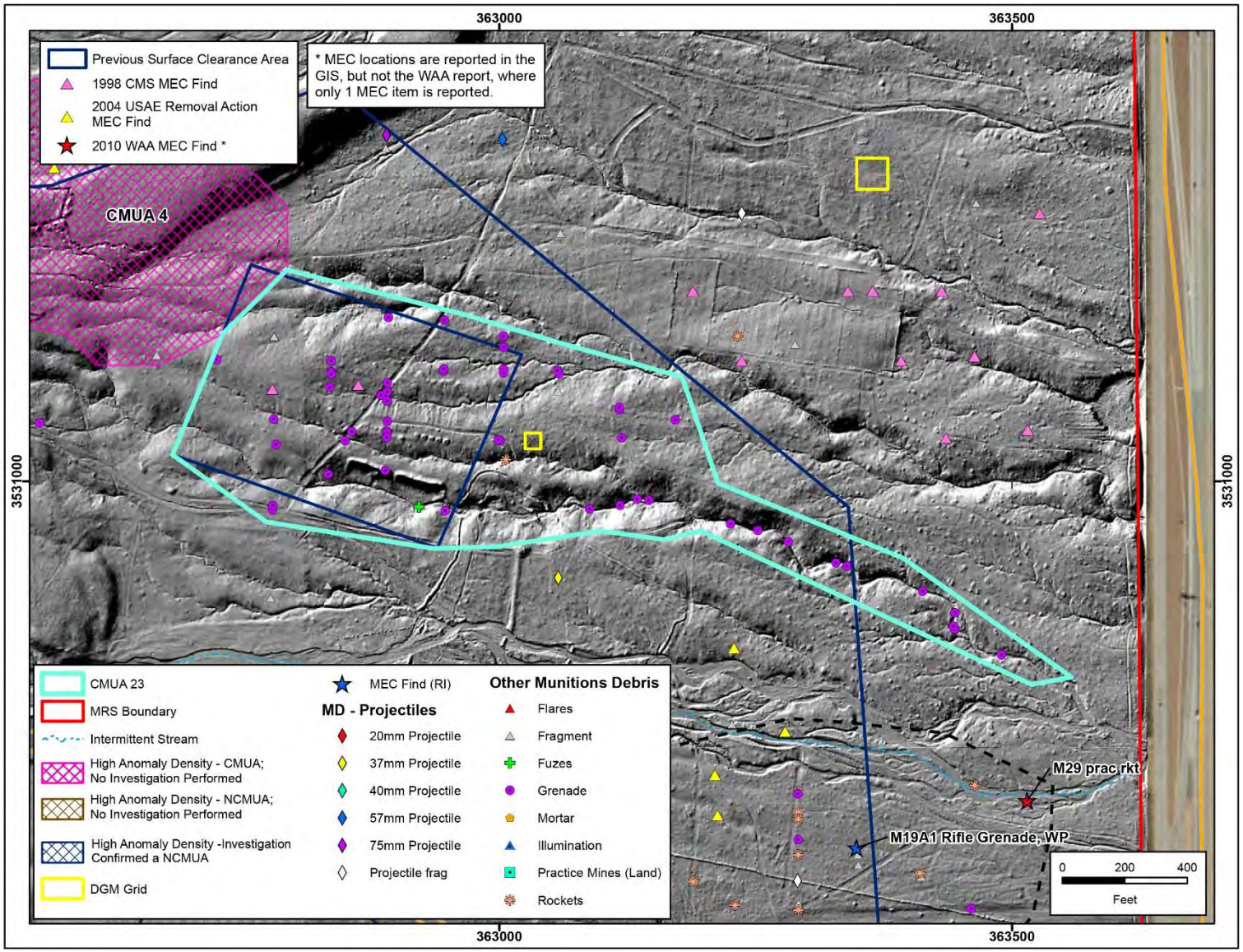


Munitions Density

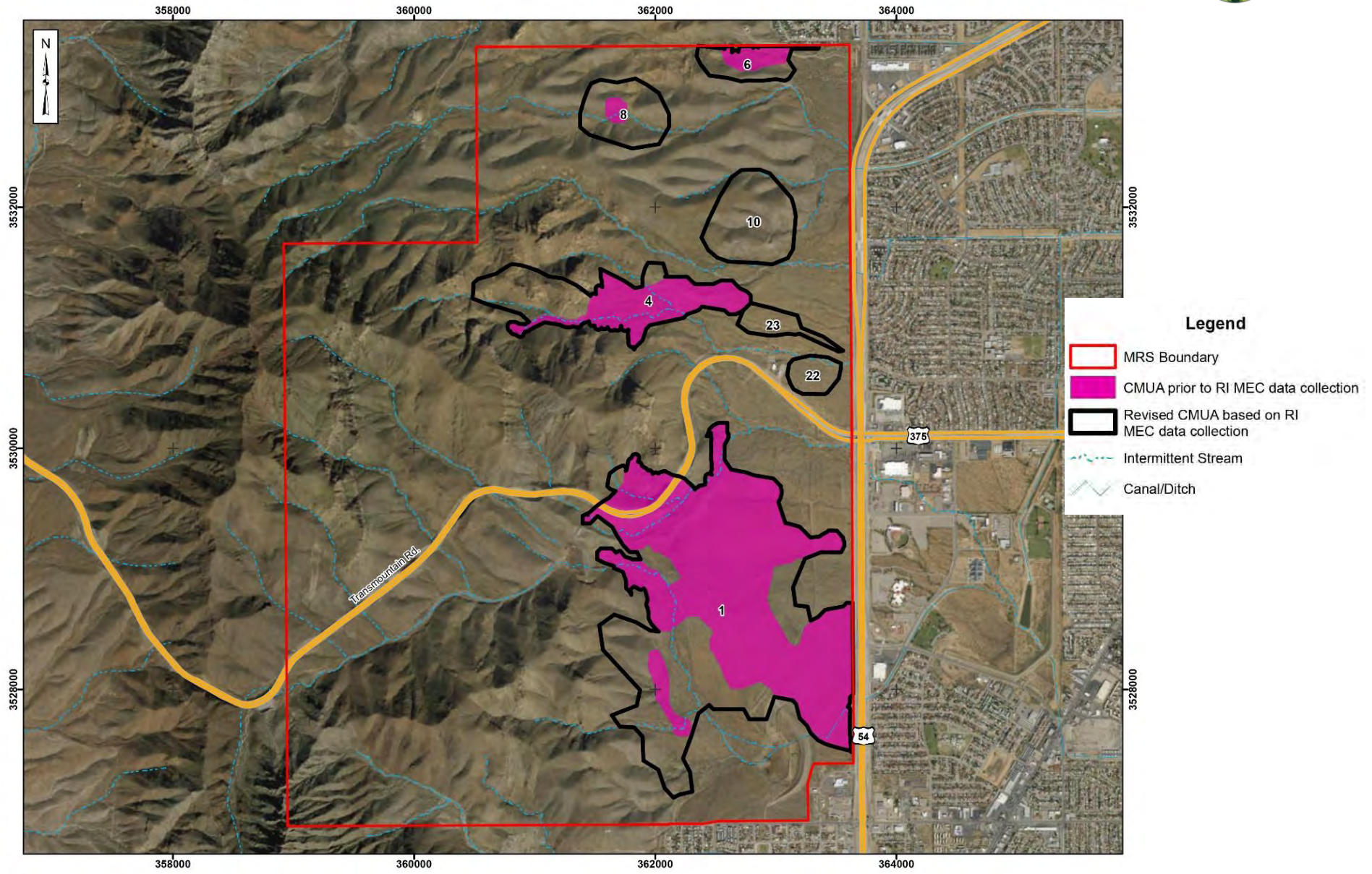
High: 1167

Low: 0

CMUA 23


363000
363500
3531000
Previous Surface Clearance Area
1998 CMS MEC Find
2004 USAE Removal Action MEC Find
2010 WAA MEC Find *
* MEC locations are reported in the GIS, but not the WAA report, where only 1 MEC item is reported.
CMUA 4
CMUA 23
MRS Boundary
Intermittent Stream
High Anomaly Density - CMUA; No Investigation Performed
High Anomaly Density - NCMUA; No Investigation Performed
High Anomaly Density -Investigation Confirmed a NCMUA
DGM Grid
MEC Find (RI)
MD - Projectiles
20mm Projectile
37mm Projectile
40mm Projectile
57mm Projectile
75mm Projectile
Projectile frag
Other Munitions Debris
Flares
Fragment
Fuzes
Grenade
Mortar
Illumination
Practice Mines (Land)
Rockets
M29 prac rkt
M19A1 Rifle Grenade, WP
0
200
400
Feet

Revised CMUAs



Revised CMUAs

CMUA Location	Original Size (acres)	CMUA Expansion Size (acres)	Revised Size (acres)	Comments
1	632.4	288.41	920.81	Four expansion areas and merged with CMUA12
4	119.6	81.07	200.67	Two expansion areas
6	24.5	26.0	50.5	One expansion area
8	8.8	73.7	82.5	One expansion area
10	17.5	97.5	115	Was not considered a CMUA in the QAPP based solely on WAA dig results.
12	23.2	-23.2	0.0	Now included in CMUA 1
22	0.0	28.37	28.37	New CMUA identified during RI
23	0.0	29.48	29.48	New CMUA identified during RI
Sub-total:	**826**	**601.33**	**1427.33**	
NCMUA	5977.3	-601.33	5375.97	
Total:	**6803.3**	**0**	**6803.3**	

MEC Recommendations

- CMUAs
  - Incorporate area of CMUA expansion boundaries
- NCMUA
  - Re-calculate the MEC density
  - Additional investigation not recommended; original hypotheses likely impossible to prove given large number of MEC found.
  - Recommend also including historical data to qualitatively determine residual MEC hazard.
- Revise CSM

Break

MC RI Program Elements

- Elements include:
  - Incremental Sampling Methodology (ISM)
  - Discrete sampling (soil, surface water, sediment)
  - Sampling associated with MEC
- Phased approach to meet TCEQ delineation requirements
- Based on ISM Demonstration Report
  - Lead, copper, zinc primary MC
  - Ecological receptors will likely drive assessment level

MC

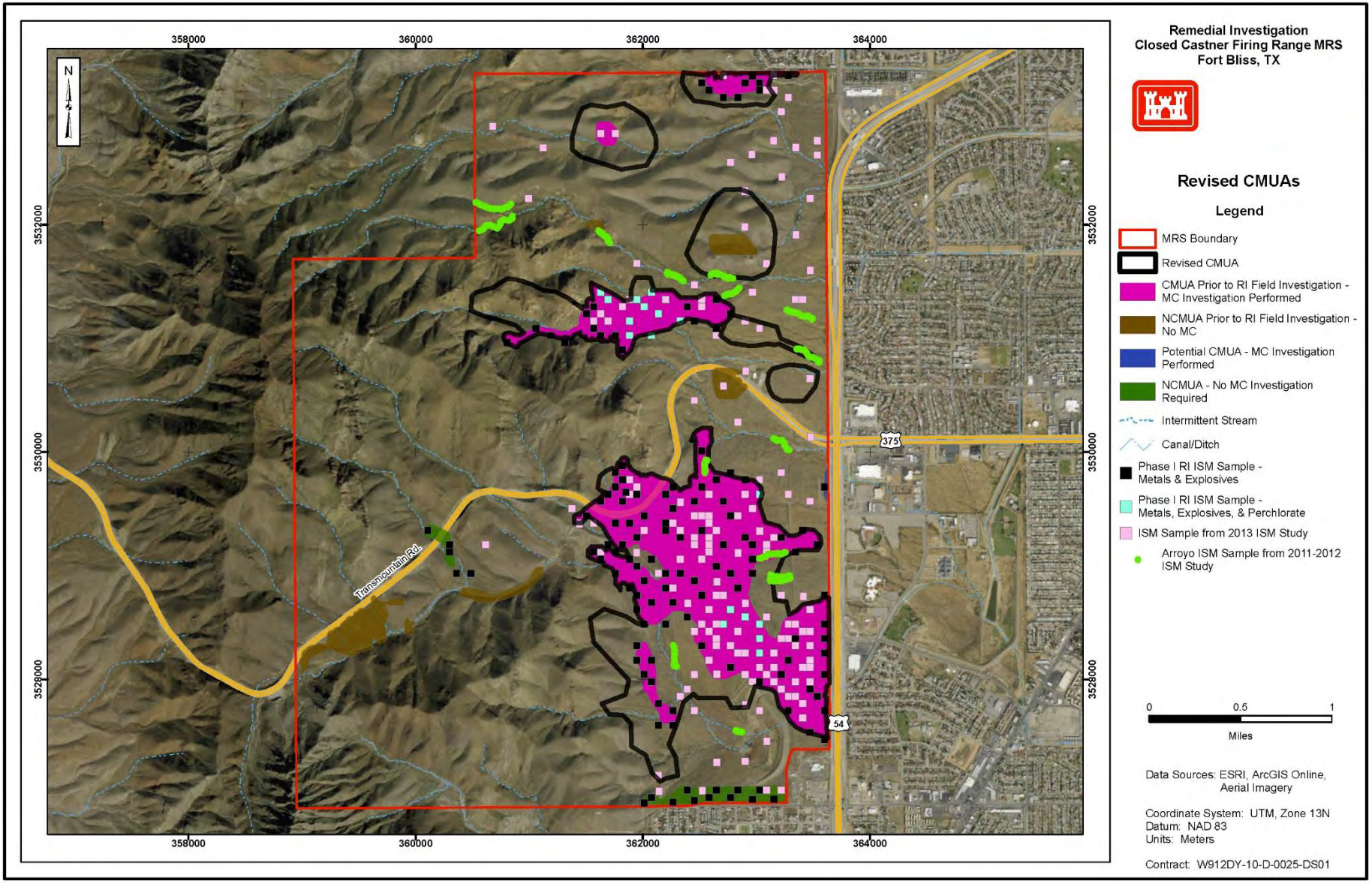
- Explosives (USEPA Method 8330B)
  - Materials inside munitions
  - 16 separate constituents including TNT, RDX
- Metals (USEPA Method 6010B)
  - Small arms ammunition, munition casings
  - antimony, arsenic, beryllium, copper, lead, nickel, zinc
- Perchlorate (USEPA Method 6850)
  - Propellant used in rockets

Example of MC deposition

ISM Delineation – Phase I

- 149 Area-Wide Sample Locations
  - Within CMUAs identified prior to RI MEC data collection
  - 1-acre decision units
  - Separate mobilization to resample DU locations with laboratory QC issues for explosives
- Laboratory Analysis
  - Explosives, metals – all samples
  - Perchlorate – only samples collected near former rocket ranges

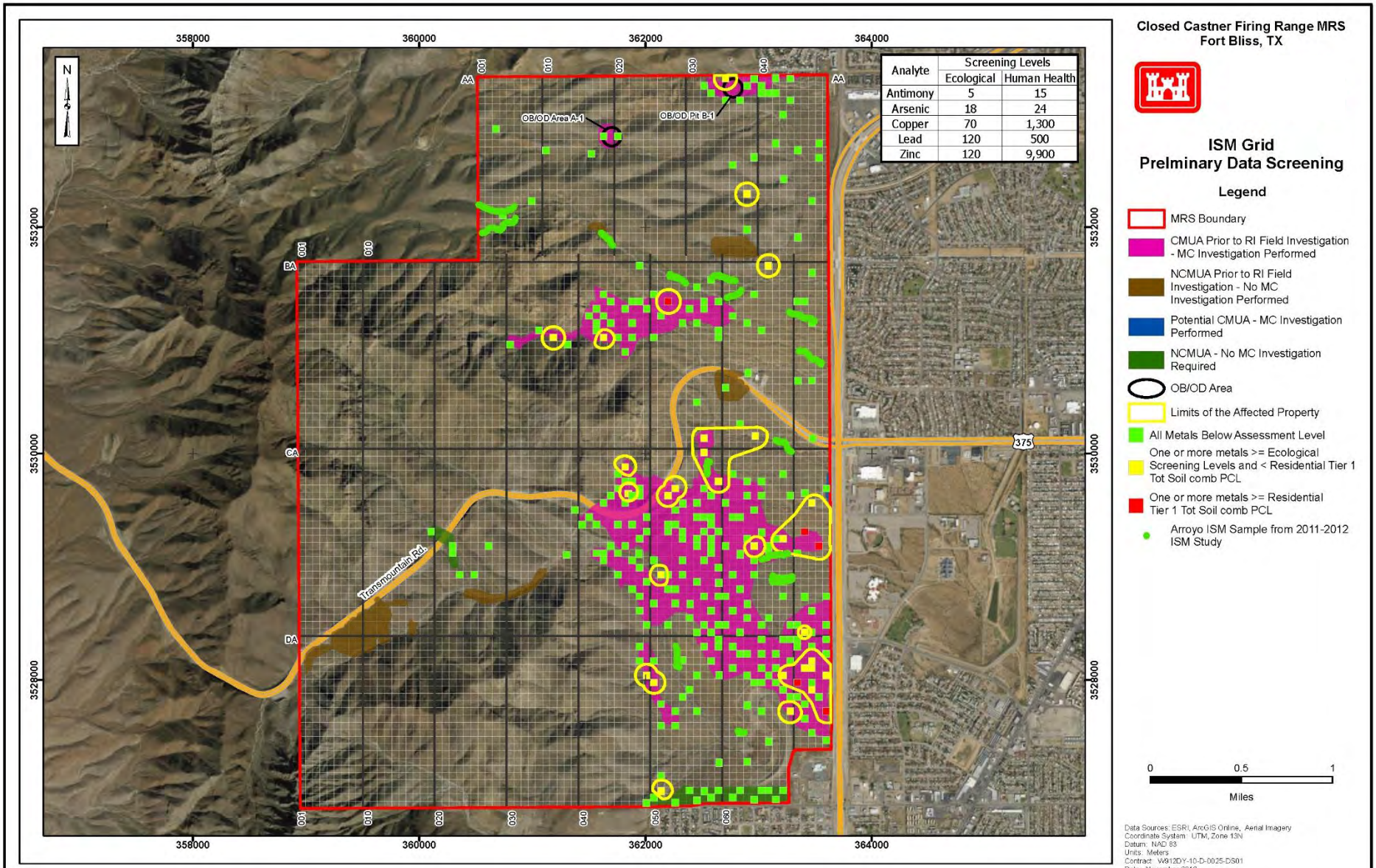
Phase 1 ISM Locations



ISM Results & Affected Property

- Plotted results of 2011/2012 Study and 2016 RI
  - Screened against:
    - Ecological benchmarks
    - Human Health Tier 1 PCLs ($^{Tot}Soil_{comb}$)
    - Assumes ^{GW}Soil pathway will be closed during Phase II
- Estimated Affected Property Areas
  - Results >Residential Assessment Level
    - Driven by ecological benchmarks
    - Some human health exceedances ($^{Tot}Soil_{comb}$)

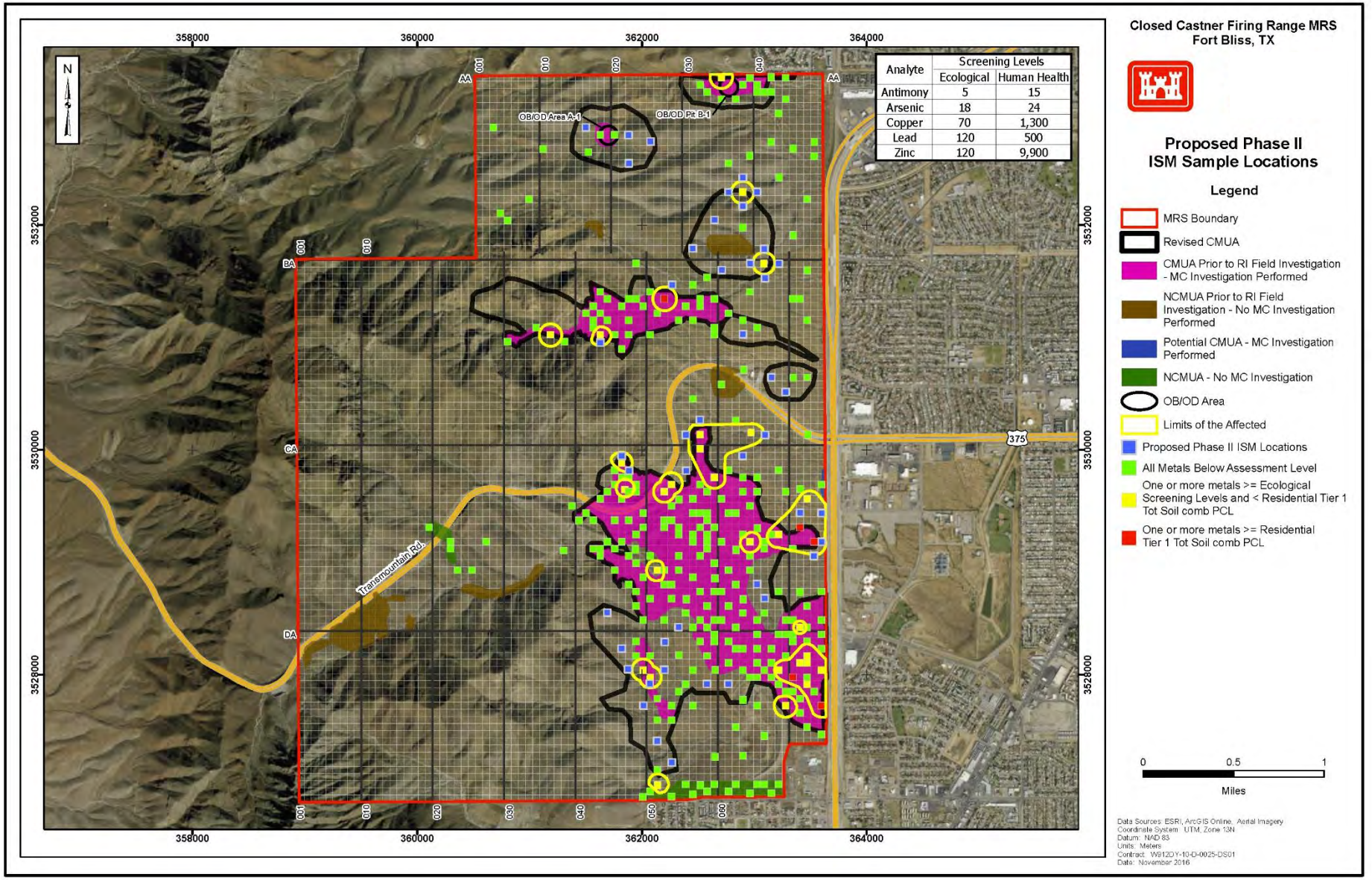
ISM Results - Metals



Phase II ISM Locations

- Identified Phase II Step Out Locations
  - Within newly identified CMUAs
  - To complete delineation of Affected Property Areas
- Phase II Locations Limited by:
  - Steep terrain in some areas
  - Range boundary to the north (separate RI planned)
  - Range boundary to the east (Highway 54 boundary)

Phase II ISM Locations



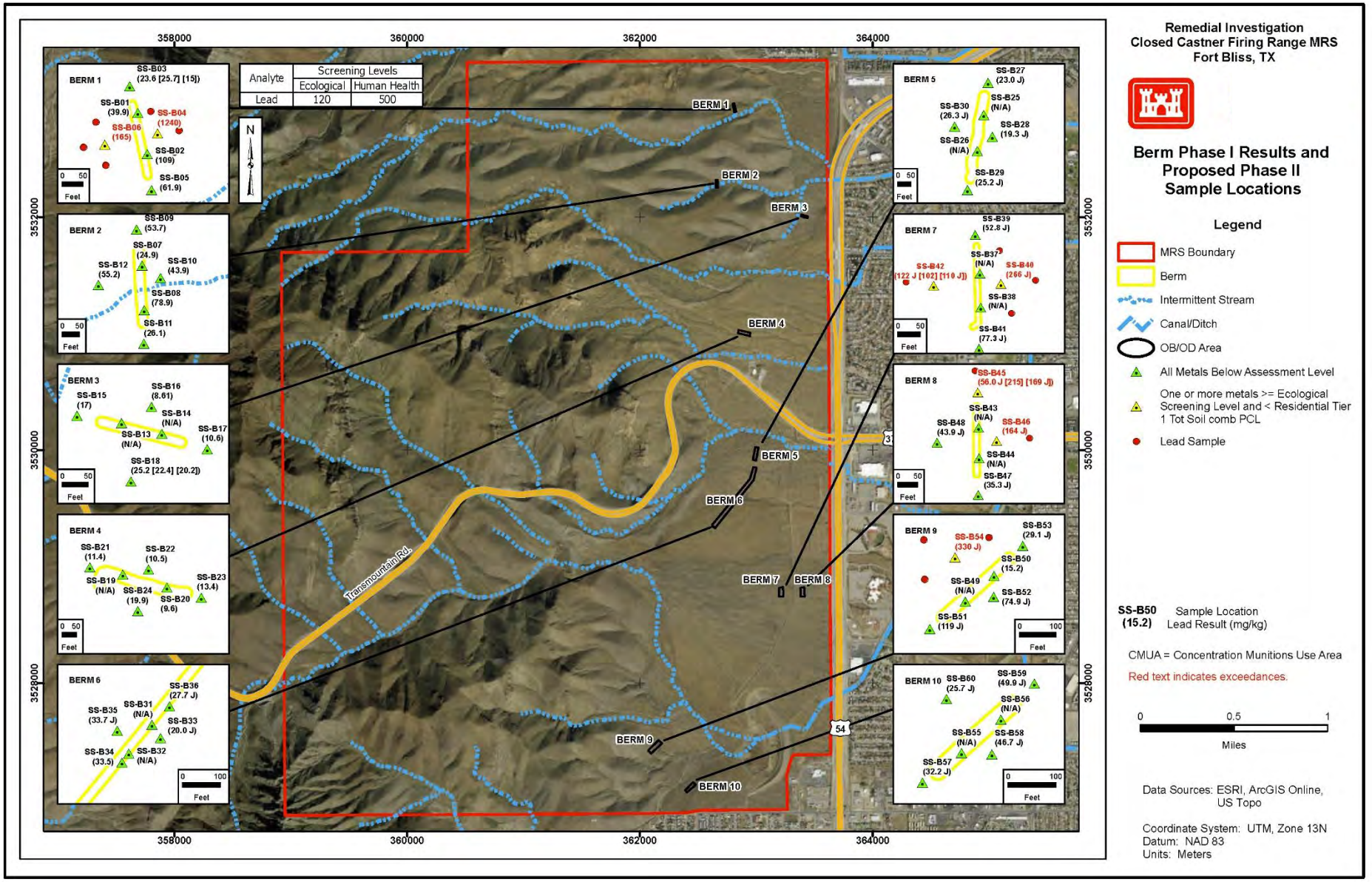
Backstop Berms- Phase I

- 10 Berms Identified using LIDAR Data
- Discrete Soil Sampling
  - 2 samples per berm, three depth intervals (0-1', 1-2', 2-3')
  - 4 samples at base of berm
  - Laboratory analysis for metals

Phase I Berm Results & Phase II Locations

- Four berms had sample results above assessment level
- Lead was the only metal exceeding
- One lead result (Berm 1) exceeded human health $^{Tot}Soil_{comb}$ PCL
- Phase II sampling will be performed to:
  - Delineate lead
  - Have a sufficient number of results to perform statistical comparisons to the PCL

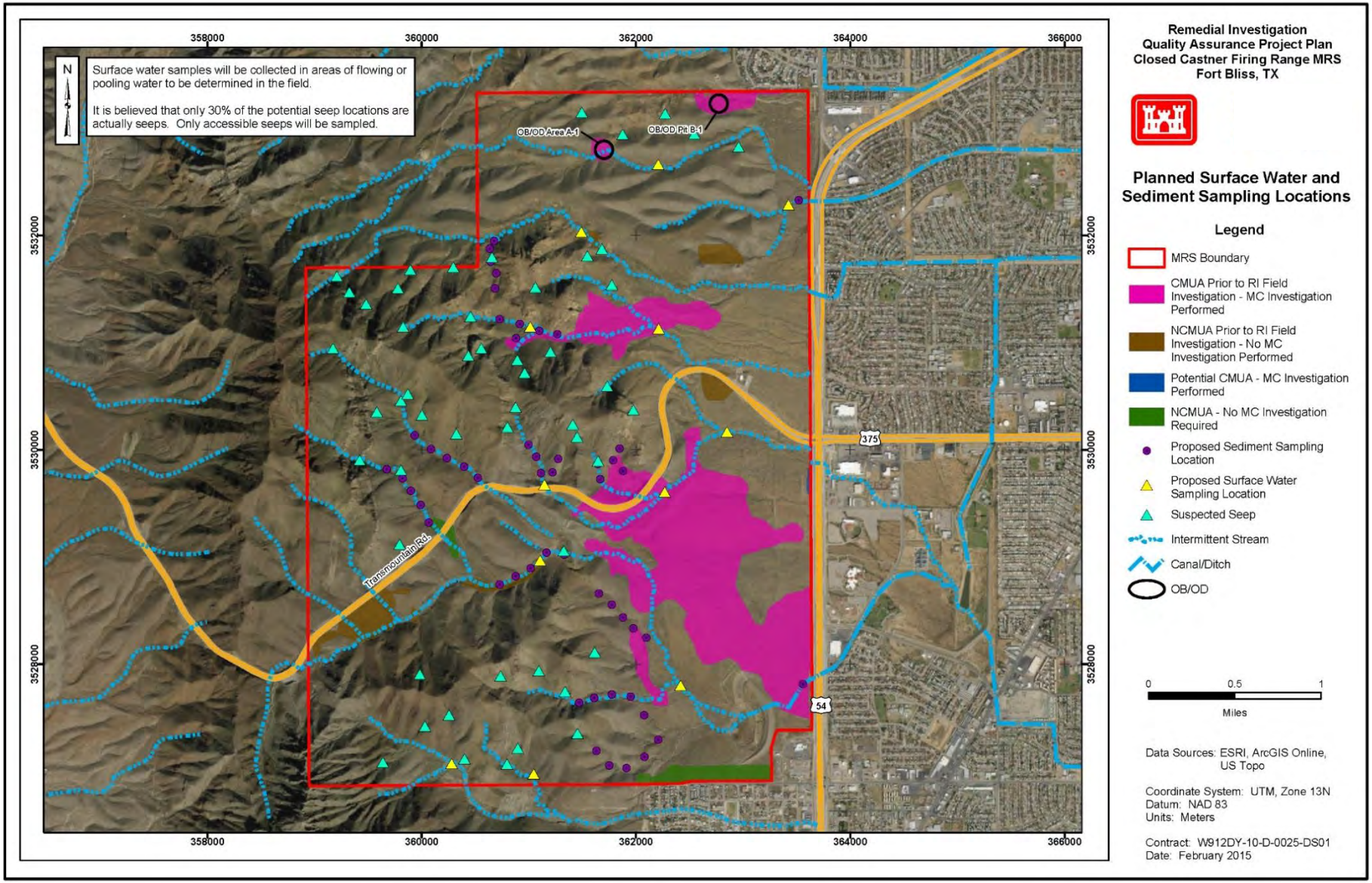
Berm Results and Phase II Locations



Arroyo Sampling - Phase I

- Arroyo Soil Delineation
  - Provides information on MC transport from steep areas
  - 52 discrete sediment sample locations in depositional areas
    - Samples collected from 0-6” in depth
    - If located in CMUA, samples collected at 0-6” and 12-18”
    - Analyzed for metals
- Surface Water Samples
  - Two events: dry weather and wet weather performed in Phase I
  - Seep sampling
    - 18 locations targeted; 4 locations contained water
    - Samples analyzed for metals
  - Arroyo surface water samples – 6 locations targeted
    - Dry event and 48 hours after rain event: No water present in arroyos

Planned Surface Water and Sediment Sampling Locations



Surface Water Sampling Types

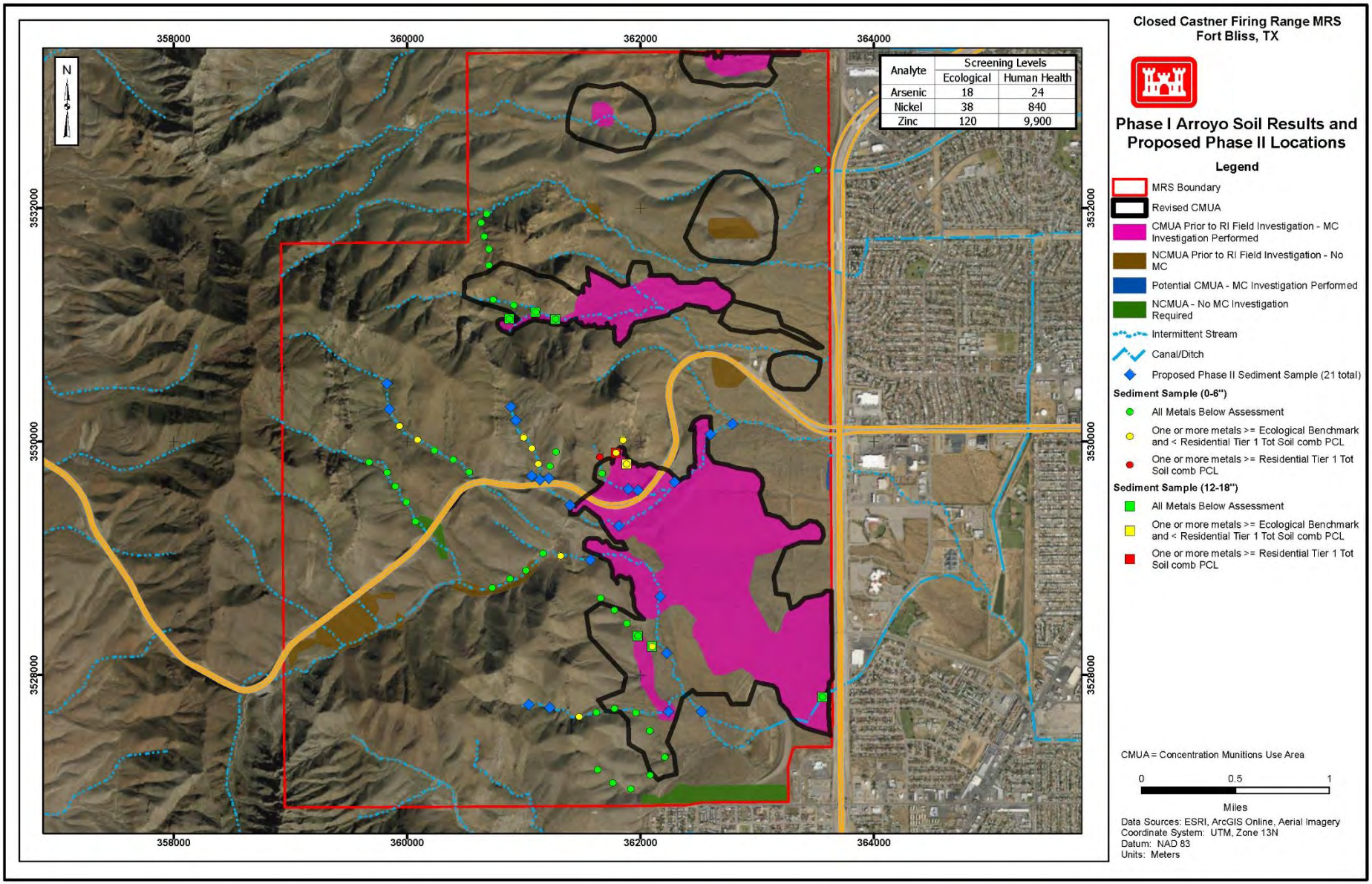
Arroyo Sampling Location (dry)

Seep Sampling Location

Phase I Sediment Results

- Arsenic, Nickel, and Zinc exceeded Ecological Screening Levels ("benchmarks")
- Arsenic exceeded human health $^{Tot}Soil_{comb}$ at two locations
- Results for the two locations at the downgradient Range boundaries were less than screening levels
- Phase II sampling will be performed for Zinc and Arsenic

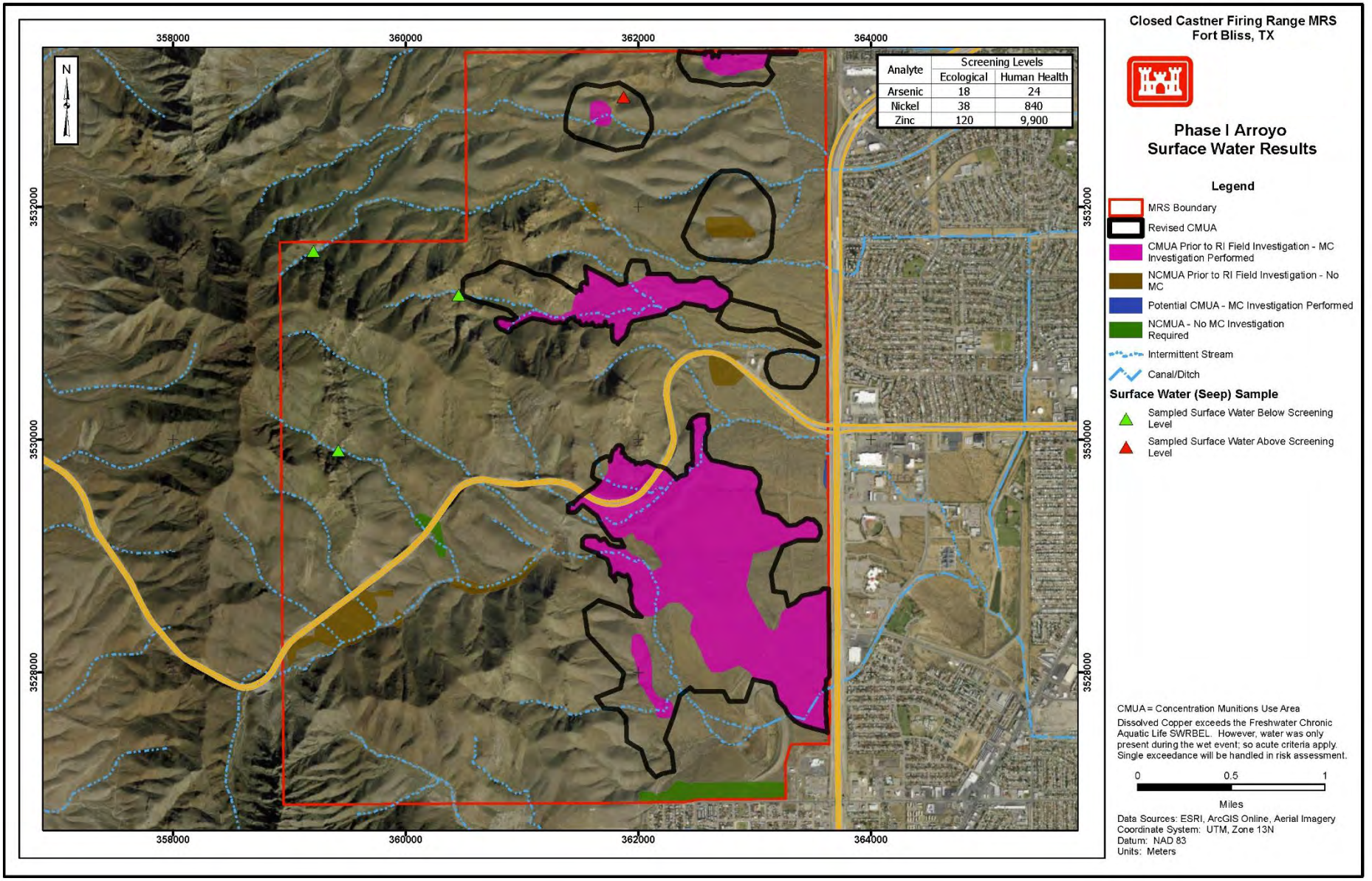
Phase I Sediment Results & Phase II Locations



Surface Water Results

- No water was present in the arroyos during the dry sampling event or 48 hours after the rain event
- Of the potential seep locations, four contained sufficient water for sampling
- Metals results compared to Freshwater ^{SW}RBELs
- Only one sample had a result above the screening level
  - Dissolved copper exceeded Freshwater Chronic Aquatic Life ^{SW}RBEL
  - Water was only present at this location during the wet event; so acute criteria apply. The single exceedance will be handled in the risk assessment.

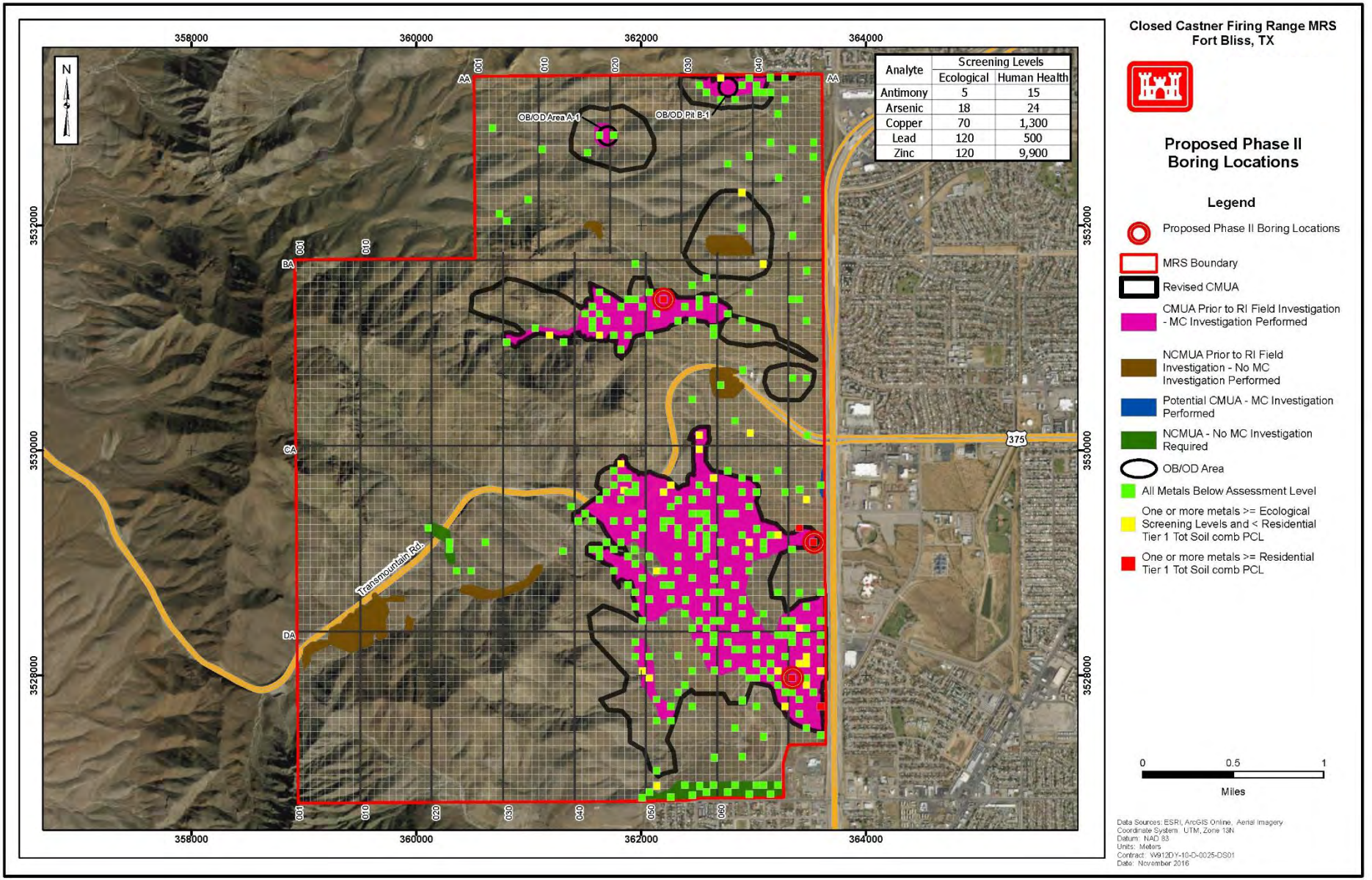
Phase I Seep Results



Soil to Groundwater Pathway - Phase II

- Vertical delineation
  - Discrete borings in 3 DUs with highest lead concentration
    - BF052 (lead 1,520 mg/kg)
    - CN073 (lead 1,320 mg/kg)
    - DG070 (lead 5,030 mg/kg)
  - 3 Borings per DU to depth of 20 feet
    - Locations determined based on field screening for lead with XRF
    - 3 depth intervals sampled (0-0.5 inches bgs, interval with the highest XRF results, and the bottom of the boring)
    - If XRF result from bottom of boring exceed background, boring will be advanced an additional 10 feet

Phase II Boring Locations



Soil to Groundwater Pathway - Phase II

- ^{GW}Soil PCL Determination
  - Collect samples for remaining Tier 2 parameters during Phase II
    - pH collected during Phase I
    - SPLP analyses performed on Phase I samples
- Groundwater Assessment
  - Groundwater Assessment performed only if necessary based on vertical delineation results
  - Groundwater Assessment, if necessary, performed in Phase III
  - If refusal encountered in Phase II borings, ^{GW}Soil Pathway will be considered incomplete

RI Report

- Document and evaluate data (both MEC and MC findings)
- Update CSM
- Report on nature and extent of MEC and MC
- Prepare HHRA and SLERA
- Prepare MEC Hazard Assessment
- Update MRSPP

Conclusions of the RI Report provide the foundation to develop remedial alternatives during a future Feasibility Study

Upcoming Project Schedule

- Phase 2 MC Field Work — January / February 2017
- RAB Meeting: — ~ April 2017
- TPP Meeting #4: — ~ April 2017
- Draft RI Report: — ~ May 2017
- Draft Final RI Report: — ~ August 2017
- Public Meeting: — ~ July / August 2017

TPP Comments

Sylvia A. Waggoner
Chief, Compliance Branch
Directorate of Public Works
Fort Bliss, TX 79916
915-568-7031

Questions?