

APPENDIX A4
GEOPHYSICAL ANOMALY TRENCHING REPORT
MWH, 2011B

Prepared for:

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NORTHEAST CHURCH ROCK MINE

GEOPHYSICAL ANOMALY TRENCHING REPORT

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TABLE OF CONTENTS

<u>SECTION NO.</u>	<u>PAGE NO.</u>
1.0 INTRODUCTION	1-1
2.0 METHODS	2-1
2.1 GEOPHYSICAL SURVEY.....	2-1
2.2 GEOTECHNICAL SURVEY.....	2-1
2.3 FIELD METHODS.....	2-2
3.0 RESULTS	3-1
3.1 BONEYARD.....	3-1
3.2 FUEL OIL STORAGE.....	3-1
3.3 MAGAZINE.....	3-1
3.4 NECR-1.....	3-1
3.5 NECR-2.....	3-2
3.6 NECR DRAINAGE.....	3-2
3.7 NEMSA.....	3-2
3.8 POND 1.....	3-2
3.9 POND 3.....	3-2
3.10 SEDIMENT PAD.....	3-2
3.11 TRAILER PARK.....	3-3
3.12 VENTHOLES 3 AND 8.....	3-3
4.0 CONCLUSION AND RECOMMENDATIONS	4-1
5.0 REFERENCES	5-1

FIGURES

<u>Figure No.</u>	<u>Description</u>
1	Geophysical Trenching Locations
2	Geotechnical Trenching Locations

LIST OF APPENDICES

<u>Appendix</u>	<u>Description</u>
A	Trench Photographs
B	Test Trench Field Logs

1.0 INTRODUCTION

Excavation of test trenches was conducted at the Northeast Church Rock (NECR) mine site between April 26 and 29, 2011 as a Supplemental Removal Site Evaluation (SRSE). The objective of this SRSE was to conduct a visual survey of material that caused geophysical anomaly signals observed during a geophysical survey of the site in 2006 (MWH, 2007) as well as to characterize the types of materials from the areas that will be included as part of the removal action. This document presents the results of the field survey. In addition, MWH excavated test trenches to collect representative soils for geotechnical evaluation. The geotechnical evaluation is being performed by Dr. Stephen Dwyer and will be presented in a separate report.

2.0 METHODS

2.1 GEOPHYSICAL SURVEY

A geophysical survey was conducted at the NECR mine site in 2006 (MWH, 2007) using two surface geophysical techniques: magnetic and electromagnetic induction (EM). The magnetic and EM surveys were conducted to provide rapid reconnaissance coverage to detect the presence of shallow, electrically-conductive material (metallic), and ferrous metallic material associated with historic septic systems installed in the 1940's. The calibration tests showed the expected responses to various types of metallic objects, and helped to differentiate scrap metal from potentially more substantial objects, such as metallic containers. Overall, the EM method provided the best characterization and delineation of suspected buried metallic objects. The magnetic results augmented the EM interpretation and in some instances provided additional locations for possible buried metallic objects. The results of that investigation were described in the technical memorandum *Results of Geophysical Survey, Northeast Church Rock Mine Site*, which was submitted to the U.S. Environmental Protection Agency (U.S. EPA) dated June 11, 2007 (MWH). The results showed 57 point locations of magnetic anomalies. Of these 57 point locations, approximately two locations per area were selected to be representative of the anomalies observed, based on the strength, size and location of the chosen anomalies, for a total of 16 test trenches, as shown on Figure 1, *Geophysical Trenching Locations*.

In addition to the information developed from the geophysical survey, a site reconnaissance survey was conducted with a former mine site worker (Scotty Begay) on October 5, 2010. Mr. Begay provided anecdotal information as to the possible location of additional buried material. Mr. Begay pointed out several locations where he recalled debris had been buried, as well as locations where underground heater and utility galleries were supposedly located. Based on this reconnaissance survey, two additional test trenches were added for inspection: (1) at the Trailer Park, downgradient of the NEMSA where materials were reportedly burned; and (2) at Vents 3 & 8, where diesel fuel was reportedly stored and used at Vents 3 and 8 to power ventilation systems (see Figure 1).

The locations were subsequently located using a GPS and marked with a wooden stake. At each of the 18 locations, two trenches were dug in a cross-pattern, typically with east-west and north-south orientations, to provide a comprehensive investigation of each point location. The locations of these trenches are shown on Figure 1, *Geophysical Trenching*.

2.2 GEOTECHNICAL SURVEY

In addition to the survey of geophysical anomalies described above, samples of subsurface soils were collected at eleven locations. These samples were submitted to a geotechnical laboratory and analyzed for geotechnical parameters in order to collect data representative of the soils at each of the chosen locations. The soil profile was also described. Approximately 10 gallons of material was collected at each location using

plastic five gallon buckets and a backhoe. The sample locations are shown on Figure 2, *Geotechnical Trenching Locations*. Some of the sample locations were co-located with the geophysical test trenches. The results of the geotechnical sampling and analysis will be provided in a separate report.

2.3 FIELD METHODS

Test trenches were excavated using a John Deere 310SC backhoe. Material at each location was scanned using a Ludlum 19 meter, measuring gamma radiation in $\mu\text{R/hr}$, in accordance with the Site Health and Safety Plan (MWH, 2011). Excavations were conducted at 24 locations throughout the site, in the following thirteen areas with the number of test trench locations following in parenthesis:

- Boneyard (1)
- Fuel Oil Storage Area (2)
- Magazine (2)
- NECR-1 (3)
- NECR-2 (1)
- NECR Drainage (2)
- Non-Economic Material Storage Area (3)
- Pond 1 (2)
- Pond 3 (1)
- Sediment Pad (1)
- Trailer Park (3)
- Vent Hole 3 (1)
- Vent Hole 8 (2)

Each of the 24 test trenches were logged with the findings in each trench, including the trench dimensions, an illustration of the trench profile, soil color and texture, the date and time of the test trench excavation, orientation of each trench and of the face logged, and a general summary of the excavation. Field procedures consisting of soil sampling, sample description, and sample handling, were conducted in accordance with the *Standard Operating Procedures* (SOPs) included in the *Removal Site Evaluation Work Plan* (MWH, 2006). Samples collected for geotechnical analysis, the results of which will be presented in a separate report, were collected in accordance with SOP-16, Geotechnical Sample Collections and Analysis. SOP-16 was submitted to EPA in an e-mail dated April 16, 2011. Each test trench was backfilled upon completion with the underlying material backfilled first, followed by the surface material. Trench locations are shown on Figures 1 and 2.

3.0 RESULTS

The dimensions of the test trenches were typically two to three feet wide by 10-12 feet deep by 15-20 feet in length. Soil observed in the test trenches ranged from sandy silt to coarse sand, consisting primarily of yellowish brown silty fine sand with some gravel. Cobbles and boulders up to two feet in diameter were observed in only two test trenches. In other trenches, where gravel was observed, the gravel was generally only present as a small percent (less than 10%) of the overall soil type.

In some locations, , gray and occasionally black material was found that differed in texture by either having higher clay content or a higher coarse sand content, such as in the NEMSA and Pond 1. A brief summary of the findings from each area, including photographs, is provided in the following sections. Trench Locations are shown on Figure 1. Representative photographs for each area are included Appendix A and test trench field logs are shown in Appendix B.

3.1 BONEYARD

One test trench located in the Boneyard (TT-224) revealed significant metallic items or materials that were buried at this location. Hoist cables, a fire extinguisher, a rusted empty barrel, wire mesh, rusted empty one gallon refrigerant cans, and braddis cloth were the prominent items excavated at this location, as shown on Plate 1 (Appendix A).

3.2 FUEL OIL STORAGE

Two geophysical test trenches were located in the fuel oil storage area. TT-222 revealed a ground cable approximately 3/4" in diameter while no metallic items were found in the excavation of TT-221. The area surrounding TT-222 had several circular concrete rings, 10 feet in diameter. These made test trench excavation relatively difficult. Bedrock was encountered at approximately 4 feet at these locations, as shown on Plate 2. No staining, odors or other evidence of the use of, or impacts from, petroleum products were observed in the test trenches.

3.3 MAGAZINE

Two geophysical test trenches were located in the magazine area, approximately 100 feet apart (TT-207 and TT-208). The geophysical anomaly for these locations was likely a 4" iron pipe with a black coating that ran in a northwest – southeast direction, found in each test trench. In addition, two copper electrical cables were found in TT-207, as shown on Plate 3. A portion of the iron pipe was also found on the ground surface near TT-208.

3.4 NECR-1

Three geotechnical test trench locations were located in NECR-1: TT-223, TT-216, and TT-217. This area consisted of waste rock with a cover of varying thickness. Cover

material was sampled at TT-223 and TT-216, while the underlying waste rock material was the primary material sampled in TT-217, as shown on Plate 4.

3.5 NECR-2

One geotechnical test trench was located in NECR-2, TT-204. Samples were collected and although this location was not marked for geophysical anomalies, several metal pieces were found, as shown on Plate 5.

3.6 NECR DRAINAGE

Two geophysical test trenches were located in the NECR Drainage area (TT-205 and TT-206). TT-205 was also a geotechnical test trench. Some miscellaneous metallic items were found at these locations, including wire mesh, rusted cable, and rusted pipe, as shown on Plate 6. An effort was made to follow the same east-west and north-south “cross” pattern for the test trenches but the topography of this area made this relatively difficult.

3.7 NEMSA

Two test trenches were located within the NEMSA area, TT-201 (geophysical and geotechnical) and TT-202 (geophysical), and one geophysical test trench was located just outside of the NEMSA area, TT-203. The two test trenches within the NEMSA area generally revealed a coarser sandy material, grayish in color, found from approximately 1 foot to 5 feet in depth. Metal cables were the most likely material that caused the geophysical anomalies previously observed in these locations, as shown on Plate 7.

3.8 POND 1

The two test trenches located in Pond 1, TT-214 and TT-215, were both geophysical test trenches and TT-215 was also a geotechnical trench. Gray and black clayey material was observed. The majority of the metallic findings came from TT-215, and consisted primarily of hoist cables, wire mesh, and rusted barrels, as shown on Plate 8.

3.9 POND 3

One test trench was located in Pond 3, TT-213, and used for geotechnical data collection. A single north-south test trench was excavated at this location and a sample was collected, as shown on Plate Figure 9.

3.10 SEDIMENT PAD

There was one geotechnical test trench located in the Sediment Pad, TT-209. Gray material was found from approximately 1.5 feet to 6 feet below the ground. This material was coarser than what was typically found in the NECR test trenches, as sluffing and caving was common during excavation, as shown on Plate 10.

3.11 TRAILER PARK

All three of the Trailer Park test trenches (TT-218, TT-219, and TT-220) were geophysical test trenches with one, TT-219, also being a geotechnical test trench. The significant metal pieces observed in these locations were an 18" culvert in TT-220 and a large metal box in TT-218 (see Plate 11). The box in TT-218 contained mostly garbage, one rusted empty barrel, and scrap metal. TT-219 seemed to be in an area of an old road, as there was a layer of asphalt near the surface at this location.

3.12 VENT HOLES 3 AND 8

Two geophysical test trenches were located in the Vent Hole 3 area, TT-210 and TT-211. A third test trench was located in the Vent Hole 8 area, and was both a geophysical and geotechnical location, TT-212. Each of these locations had relatively shallow bedrock (up to 5 feet below ground surface) and no metallic material was observed (see Plate 12). No staining, odors or other evidence of the use of, or impacts from, petroleum products were observed in the test trenches.

4.0 CONCLUSION AND RECOMMENDATIONS

During the investigation of geophysical anomalies that was conducted at the NECR Mine Site, no containers were found that contained any liquid waste of any kind and no odors came from the trenches or material piles that indicated the presence of any contamination in the liquid or vapor phase. Additionally, no staining, odors or other evidence of the use of, or impacts from, petroleum products were observed in any of the test trenches, including the fuel storage area and Vent Holes 3 and 8. Based on these findings, there were no indications that the anomalies observed during the 2006 geophysical survey (MWH, 2007) are or were potential sources of constituents of concern. Therefore, MWH does not recommend further investigation, removal of materials, or treatment of soils related to the geophysical anomalies.

The test trenches were all located in areas that will be included in the removal action and the field information, as well as the follow up geotechnical evaluation, will be used for in the design process. Key findings include:

- Soil observed in the test trenches were generally uniform and ranged from sandy silt to coarse sand, typically consisting of yellowish brown silty fine sand with some gravel. Some gray and occasionally black material was found in the NEMSA and Pond 1 that differed in texture by either having a higher clay content or a higher coarse sand content. Overall this type of material makes up only a small fraction of the overall material.
- Cobbles and boulders up to two feet in diameter were observed in only two test trenches in NECR-2 (TT-204) and the NECR Drainage (TT-206) just downstream of NECR-2. In other trenches, where gravel was observed, the gravel was only present as a small percent (less than 10%) of the overall soil type.
- Some type of metallic material was observed in most areas in at least one trench in each area, with the exception of Vent Holes 3 and 8, where no metallic objects were observed.
- The Boneyard contained a large quantity of metallic material, as it was used for storage of scrap materials for the mine site. The metallic material in the Boneyard typically consisted of hoist cables, empty fire extinguishers, a rusted empty barrel, wire mesh, rusted empty one-gallon refrigerant cans, and braddis cloth.
- In other areas, metallic objects were more often single isolated objects, or a few small objects together, consisting of hoist cable, electrical cable, iron pipe, wire mesh, rusted barrels, a culvert (Trailer Park), a large metal box (Trailer Park) filled with garbage, and scrap metal.
- The quantity and size of these materials within each area was generally small, and so can be properly managed on-site.

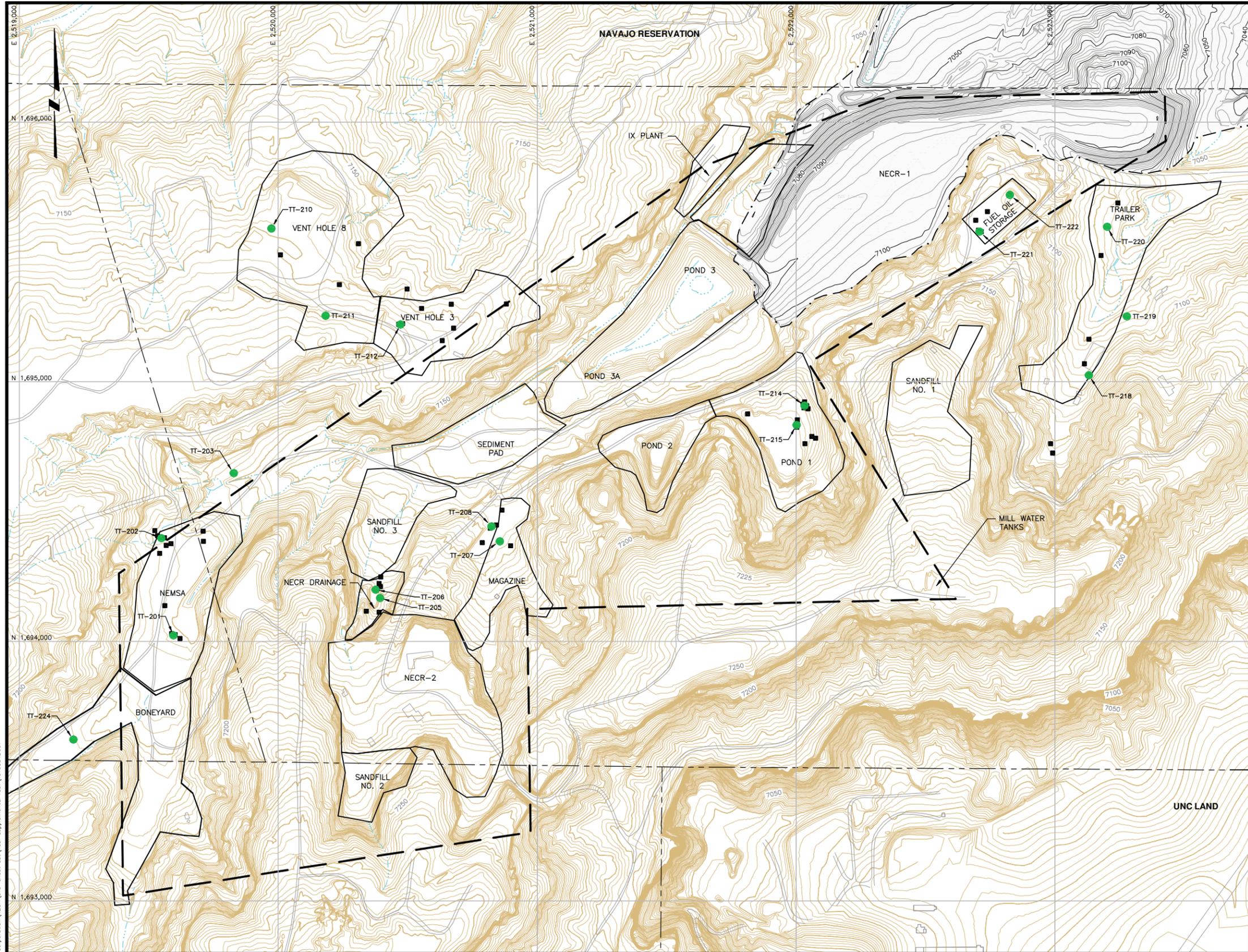
5.0 REFERENCES

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MWH, 2007. *Results of Geophysical Survey*, Northeast Church Rock Mine Site, Technical Memorandum, United Nuclear Corporation. June.

MWH, 2006. *Removal Site Evaluation Work Plan*, Northeast Church Rock Mine Site, August.

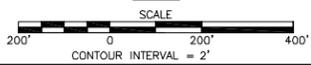
FIGURES



LEGEND:

- 7040 PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- 7040 IRA REGRADE GROUND SURFACE CONTOUR & ELEVATION, FEET
- LIMIT OF 2010 TOPOGRAPHIC SURVEY
- NECR MINE PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE NAVAJO RESERVATION BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- GEOPHYSICAL TRENCH LOCATION
- SUBSURFACE GEOPHYSICAL ANOMALY

PLAN



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0	FINAL	CHF	LF	09/06/11

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2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY, 2010.
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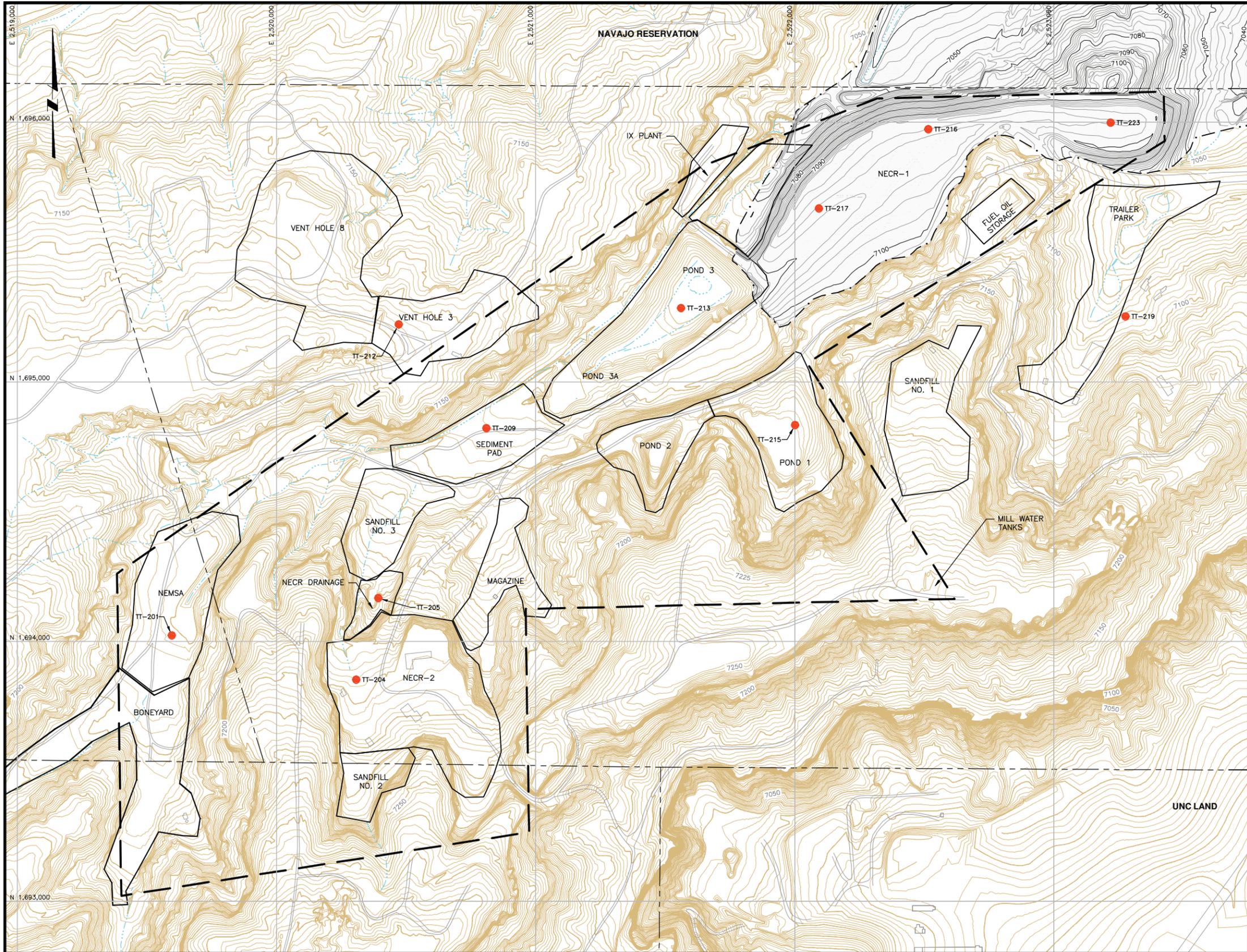
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ZONE:
NEW MEXICO WEST
DATUM:
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DRAWN BY	C FOWLER	09/06/11
CHECKED BY	L FUHRIG	09/06/11
APPROVED BY	T LEESON	09/06/11
PROJECT MANAGER	T LEESON	09/06/11
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PROJECT LOCATION	NORTHEAST CHURCH ROCK MINE	
PROJECT	SUPPLEMENTAL REMOVAL SITE EVALUATION	
TITLE	GEOPHYSICAL TRENCHING LOCATIONS	
FIGURE	1	REVISION 0
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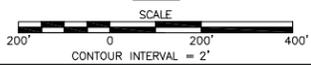




LEGEND:

- 7040 PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
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- APPROXIMATE NAVAJO RESERVATION BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- GEOTECHNICAL TRENCH LOCATION

PLAN



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APPROVED BY	T LEESON	09/06/11
PROJECT MANAGER	T LEESON	09/06/11
CLIENT APPROVAL		
CLIENT REFERENCE NO.		



PROJECT LOCATION	NORTHEAST CHURCH ROCK MINE	
PROJECT	SUPPLEMENTAL REMOVAL SITE EVALUATION	
TITLE	GEOTECHNICAL TRENCHING LOCATIONS	
FIGURE	2	REVISION 0
FILE NAME	1010334D008	



APPENDIX A
TRENCH PHOTOGRAPHS

Plate 1: Boneyard



Plate 2: Fuel Oil Storage



Plate 3: Magazine



Plate 4: NECR-1



Plate 5: NECR-2

