

# Remediation Summary Report North Benson Queen Unit Tank Battery Produced Water Spill

Prepared By:

A handwritten signature in black ink, appearing to read "Fred Holmes".

Fred Holmes  
Project Manager  
Etech Environmental & Safety Solutions, Inc.

Reviewed By:

A handwritten signature in black ink, appearing to read "Shane Estep".

Shane Estep  
Senior Environmental Scientist  
Etech Environmental & Safety Solutions, Inc.

**Prepared By:** Etech Environmental & Safety Solutions, Inc.  
**Date Prepared:** June 21, 2010  
**Project Number:** 094-1749-000

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## Executive Summary

On August 3, 2008, a produced water release occurred at the Arena Resources, Inc. (Arena) NBQU Tank Battery facility located in Lea County, New Mexico. Before cleanup of the spills, a second release occurred on August 28, 2008 at the NBQU Tank Battery.

Arena Resources, Inc. (Arena) contracted Etech Environmental and Safety Solutions, Inc. (Etech) to; 1. Prepare and submit a corrective action plan (CAP) to the State of New Mexico, Oil Conservation Division (OCD) and, 2. Implement the CAP once approved. The approved CAP called for the construction of an on-site soil washing system to remove the chlorides from the soils. Once the soils reached a threshold level of 500 mg/kg or less of chlorides, the soils would be removed and the process repeated until all soils associated with the above releases had been mitigated. On October of 2008 Etech began excavation of the impacted soils and construction of the washing unit. Soils washing operations started in December of 2008 and were concluded in May of 2010. It should be noted that the unit was also used to wash chloride impacted soils from a flowline leak which had occurred at the NBQU Well # 16. A remediation report for that section was prepared and submitted to the OCD. The site was considered mitigated in August of 2009 and consequently is not part of this report

A three-tiered sampling and analysis plan was utilized to field screen and laboratory validate that the soils were remediated to the proper levels. All samples analyzed by Etech and by the third party laboratory confirmed the soils were cleaned to the objective levels of the corrective action plan.

Following the completion of the remediation of all of the excavated soils, the geotextile membrane and majority of the filter rock were removed from the treatment cell. As per approval from the OCD, the polyethylene liners were left in place. The cell was backfilled in 6-12 inch lifts and tire compacted to surface. The final surface area was contoured so that any water or spills would flow back towards the center of the site.

After completion of all of the activities, and the results of the analyses, the impacted soils from the two spills at the NBQU tank battery site have been successfully remediated.

## Introduction

On August 3, 2008, a produced water release occurred at the Arena Resources, Inc. (Arena) NBQU Tank Battery facility located in Lea County, New Mexico. Before cleanup of the spills, a second release occurred on August 28, 2008 at the NBQU Tank Battery. Particulars on each spill are as follows:

Site: ..... NBQU Tank Battery

Unit No: ..... NMNM70993X

Latitude: ..... N32° 42' 57.100"

Longitude: ..... W103° 58' 17.900"

Quantity Released: ..... 580 BBLs.

Cause:           Electrical storm shut down power to the facility. Sand tanks continued to send water to the water tank causing it to run over.

Site: ..... NBQU Tank Battery

Unit No: ..... NMNM70993X

Latitude: ..... N32° 42' 57.100"

Longitude: ..... W103° 58' 17.900"

Quantity Released: ..... 120 BBLs.

Cause:           Lightning struck the north tank. A fire ensued causing the tank adjacent to the south to explode.

Arena Resources, Inc. (Arena) contracted Etech Environmental and Safety Solutions, Inc. (Etech) to; 1. Prepare and submit a corrective action plan (CAP) to the State of New Mexico, Oil Conservation Division and, 2. Implement the CAP once approved. The approved CAP called for the construction of an on-site soil washing system to remove the chlorides from the soils. Once the soils reached a threshold level of 500 mg/kg or less of chlorides, the soils would be removed and the process repeated until all soils associated with the above releases had been mitigated. On October of 2008 Etech began excavation of the impacted soils and construction of the washing unit. Soils washing operations started in December of 2008 and were concluded in May of 2010. It should be noted that the unit was also used to wash chloride impacted soils from a flowline leak which had occurred at the NBQU Well # 16. A remediation report for that section was prepared and submitted to the OCD. The site was considered mitigated in August of 2009 and consequently is not part of this report. A site location map is provided in Attachment A. A copy of the final NM C-141 Spill Reports is provided in Attachment B.

## Remediation Summary

The process involved using freshwater as a solvent to remove the chlorides from the soil. Once the soil and water were added to the treatment cell, they were agitated to promote a uniform mixture then allowed to filter through a rock sieve covered with a geotextile membrane and flow to a separate collection area. The wash water was then transferred to a produced water tank at the facility and disposed of along with produced water from production operations at the fields produced water injection well. Photographs of the construction and cell operation are provided in Photos 1-6 on the following pages.



**Photo 1: View of the cell following excavation.**



**Photo 2: View of the cell following the installation of the primary, 40 mil polyethylene liner.**



**Photo 3: View of the completed divider wall to allow washing and the collection of rinsate.**



**Photo 4: View with secondary 40 mil polyethylene liner, filter rock, and geotextile membrane in place. Cell is ready to wash soil.**



Photo 5 : Soil and water are being added to the washing side of the treatment cell.



Photo 6: View of water entering the collection area from the other side of the wash area. Pump (middle right) is used to transfer water to the produced water tank for disposal.

## **Validation Procedures and Analyses**

Samples were collected daily by Etech's operations technician. A 25 gram aliquot of soil was placed in a sample jar along with 100 ml of distilled water and 1/8 of a tsp of calcium sulfate. The sample was agitated for 1-2 minutes then allowed to settle. Once settled, the clear phase of the liquid was extracted and placed in a clean sample vial and a HACH Quantab ® low-range titrator was inserted into the liquid. When the titrator indicated it had reached its end point, the value was read on the titrator and the result recorded. When the titrator indicated the sample was near 100 mg/kg, the soil was removed and stockpiled. Otherwise, the soil was washed again until it reached the targeted results. A copy of the field analysis sheets is provided in Attachment C.

Samples were collected from the stockpiles and tested monthly at Etech using Standard Method 4500 CIB which is identical to the sample procedure used by third party laboratories for the analysis of chlorides. If the analytical results determined the washed soil it was within the CAP objectives of 500 mg/kg or less the stockpiled material was staged to a clean area. A copy of the in-house analytical results is provided in Attachment D.

Etech also periodically collected samples from the stockpiles and sent them to Cardinal laboratories in Hobbs, NM for validation analyses. A portion of these sampling events were also witnessed by a representative of the OCD. A copy of the results of all laboratory validation analyses are provided in Attachment E.

All samples analyzed by Etech and by the third party laboratory confirmed the soils were cleaned to the objective levels of the corrective action plan.

## **Closure**

Following the completion of the remediation of all of the excavated soils, the geotextile membrane and majority of the filter rock were removed from the treatment cell. As per approval from the OCD, the polyethylene liners were left in place. However a two-foot deep trench was excavated around the perimeter of the soil-washing unit. The primary and secondary liners were trimmed and folded into this trench then backfilled. The rationale for this approach was that Arena had plans in place to potentially construct and install a produced water tank battery over this area. It was decided that it would be technically a sound idea to leave the liners in place in the event another major upset of this type occurred again, that there would be a lower level of containment underneath the tanks.

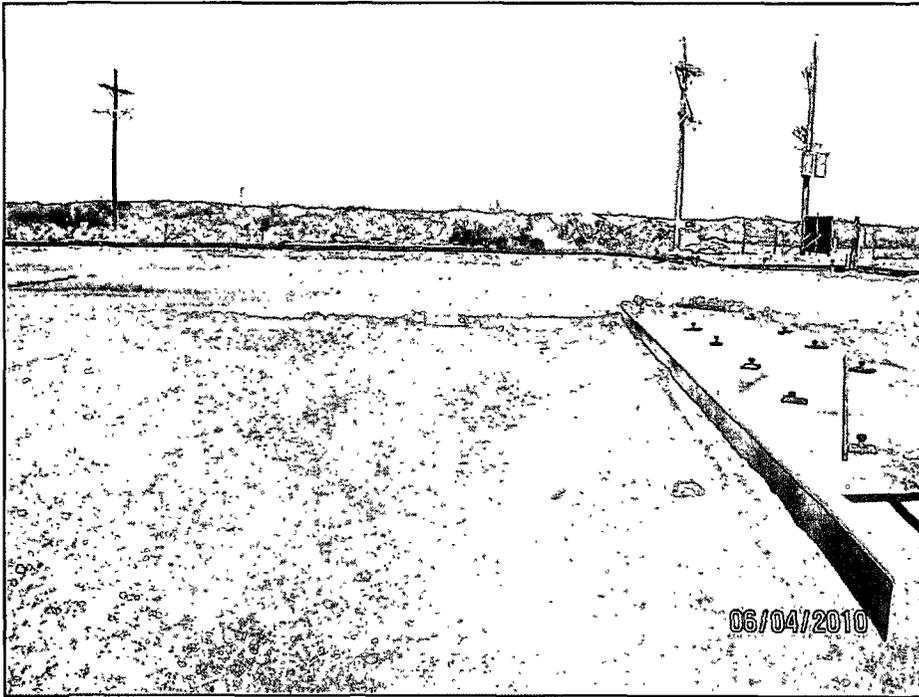
Once this was completed, the cell was backfilled in 6-12 inch lifts and tire compacted to surface. The final surface area was contoured so that any water or spills would flow back towards the center of the site. Photographs of the closure process are presented on the following pages.



**Photo 7: View of the removal of the geotextile fabric in progress.**



**Photo 8: View of the trench for folding back the near surface sections of the primary and secondary liners. Note the near completion of the filling of the cell.**



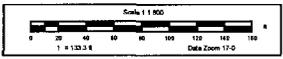
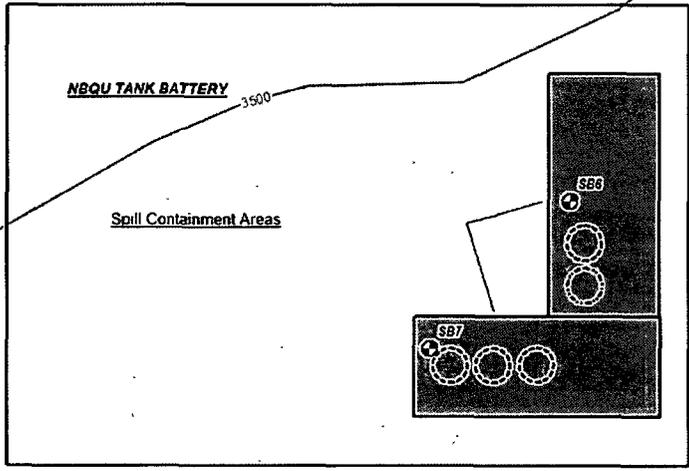
**Photo 9: View looking east of the area where the treatment cell was located after completion of closure.**

## **Conclusion**

After completion of all of the activities, and the results of the analyses, the impacted soils from the two spills at the NBQU tank battery site have been successfully remediated and complete.

**Attachment A**  
**Site Map**

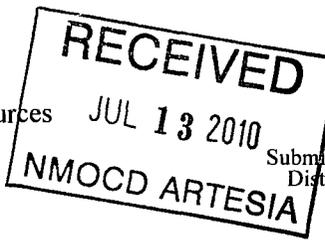
Site Map



**Attachment B**  
**Finalized C-141 Report**

District I  
1625 N French Dr , Hobbs, NM 88240  
District II  
1301 W Grand Avenue, Artesia, NM 88210  
District III  
000 Rio Brazos Road, Aztec, NM 87410  
District IV  
1220 S St Francis Dr , Santa Fe, NM 87505

State of New Mexico  
Energy Minerals and Natural Resources  
Oil Conservation Division  
1220 South St. Francis Dr.  
Santa Fe, NM 87505



Form C-141  
Revised October 10, 2003  
Submit 2 Copies to appropriate District Office in accordance with Rule 116 on back side of form

**Release Notification and Corrective Action**

**OPERATOR**

Initial Report  Final Report

Name of Company: Arena Resources, Inc.	Contact: Fred Holmes
Address: 2130 W. Bender Blvd.	Telephone No.: 575-738-1739/432-563-2200
Facility Name: North Benson Queen Battery	Facility Type: Oil and Produced Water Tank Battery

Surface Owner: BLM	Mineral Owner: BLM	Lease No.: 33129
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**LOCATION OF RELEASE**

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
J	28	18S	30E	1743	FSL	784	FEL	Lea

Latitude: N32 43' 03.1" Longitude: W103 58' 24.4"

**NATURE OF RELEASE**

Type of Release: Produced Water & Oil	Volume of Release: 700	Volume Recovered: 0
Source of Release: Power Failure and Lightning Strike	Date and Hour of Occurrence: 08/28/2008 0100 hrs	Date and Hour of Discovery: 08/29/08 0700 hrs
Was Immediate Notice Given? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required	If YES, To Whom? Sherry Bonham, OCD/ James Amos, BLM	
By Whom? Fred Holmes - Consultant	Date and Hour 08/29/08 0800	
Was a Watercourse Reached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.\*:

Describe Cause of Problem and Remedial Action Taken.\*: Battery wash involved in two spills, one from a backflow when an electrical storm shut power down to the system causing the tanks to overflow and a a second where lightning struck the tank battery produced water tanks setting a portion of them on fire.

Describe Area Affected and Cleanup Action Taken.\* : Affected area measured 200' x 100' x 6' vertical. Soil was excavated and a soil washing system conducted in the excavated area. The cleaned soil was then used to backfill the site once remediation was completed.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: <i>Colleen Robinson</i>	<b>OIL CONSERVATION DIVISION</b>		
Printed Name: Colleen Robinson	Approved by District Supervisor:		
Title: Regulatory Affairs Liason	Approval Date:	Expiration Date:	
E-mail Address: crobinson@arenaresourcesinc.com	Conditions of Approval:		Attached <input type="checkbox"/>
Date: 06/21/10	Phone: 575-738-1739		

\* Attach Additional Sheets If Necessary

**Attachment C**  
**Field Analysis Results**

## Quantab Chloride Test Strip Analysis Sheet

Date: 12/4/2008 Client: Arena Resources, Inc

Site: N Benson Queen Unit

Project Number: 094-1749 & 1748 - 000

Technician: Latta

Strip Lot Number(s): A9167

Sample ID	Titration Range	Dilution	Test Strip Result (ppm)	Final Result (ppm)	Notations
12/04/08	A	4	76.0	304.00	Move to clean area- Sample to Lab
12/05/08	A	4	94.0	376.00	Move to clean area
12/08/08	A	4	60.0	240.00	Move to clean area
12/09/08	A	4	104.0	416.00	Move to clean area
12/11/08	A	4	68.0	272.00	Move to clean area
12/12/08	A	4	94.0	376.00	Move to clean area
12/15/08	A	4	34.0	136.00	Move to clean area
12/16/08	A	4	94.0	376.00	Move to clean area
12/17/08	A	4	94.0	376.00	Pump Frozen - Left in Cell
12/19/08	A	4	34.0	136.00	Move to clean area
12/23/08	A	4	46.0	184.00	Move to clean area
12/24/08	A	4	68.0	272.00	Move to clean area - SD for Holiday
12/31/08	A	4	29.0	116.00	Move to clean area
01/05/09	A	4	34.0	136.00	Move to clean area
01/06/09	A	4	150.0	600.00	Rewash Soil
01/07/09	A	4	104.0	416.00	Move to clean area
01/08/09	A	4	178.0	712.00	Rewash Soil
01/09/09	A	4	94.0	376.00	Move to clean area
01/13/09	A	4	60.0	240.00	Move to clean area
01/14/09	A	4	94.0	376.00	Move to clean area
01/15/09	A	4	68.0	272.00	Move to clean area
01/16/09	A	4	104.0	416.00	Move to clean area
01/19/09	A	4	60.0	240.00	Move to clean area
01/20/09	A	4	60.0	240.00	Move to clean area
01/21/09	A	4	178.0	712.00	Rewash Soil
01/22/09	A	4	94.0	376.00	Move to clean area
01/23/09	A	4	60.0	240.00	Move to clean area
01/26/09	A	4	34.0	136.00	Move to clean area
01/28/09	A	4	40.0	160.00	Move to clean area
01/29/09	A	4	60.0	240.00	Move to clean area
01/30/09	A	4	68.0	272.00	Move to clean area
02/02/09	A	4	94.0	376.00	Move to clean area
02/03/09	A	4	104.0	416.00	Move to clean area

Titration Range: A= 30-600 B=300-6000 ppm

Soil Sample Volume: 25 Grams

Distilled Water Volume = 100 ml

## Quantab Chloride Test Strip Analysis Sheet

Date: 2/4/2009 Client: Arena Resources, Inc

Site: N. Benson Queen Unit

Project Number: 094-1749 & 1748 - 000

Technician: Latta

Strip Lot Number(s): A9167

Sample ID	Titrator Range	Dilution	Test Strip Result (ppm)	Final Result (ppm)	Notations
02/04/09	A	4	193.0	772.00	Rewash Soil
02/05/09	A	4	178.0	712.00	Rewash Soil-Clean Filtration Area
02/06/09	A	4	164.0	656.00	Rewash Soil
02/09/09	A	4	53.0	212.00	Move to clean area
02/10/09	A	4	104.0	416.00	Move to clean area
02/12/09	A	4	68.0	272.00	Move to clean area
02/13/09	A	4	126.0	504.00	Rewash Soil
02/16/09	A	4	68.0	272.00	Move to clean area
02/17/09	A	4	85.0	340.00	Move to clean area
02/18/09	A	4	76.0	304.00	Move to clean area
02/19/09	A	4	94.0	376.00	Move to clean area
02/23/09	A	4			Prod. water pump leaked and sprayed on some of the stacks on the south side containment. Removed soils for rewashing.
03/02/09	A	4	138.0	552.00	Rewashing Soil
03/03/09	A	4	94.0	376.00	Rewashing Soil - Move to clean area
03/04/09	A	4	68.0	272.00	Rewashing Soil - Move to clean area
03/05/09	A	4	76.0	304.00	Rewashing Soil - Move to clean area
03/09/09	A	4	53.0	212.00	Move to clean area
03/25/09	A	4	94.0	376.00	Move to clean area
03/26/09	A	4	126.0	504.00	Rewash Soil
03/27/09	A	4	60.0	240.00	Move to clean area
03/30/09	A	4	193.0	772.00	Rewash Soil
03/31/09	A	4	126.0	504.00	Rewash Soil - Lg amount of silt
04/01/09	A	4	76.0	304.00	Move to clean area
04/02/09	A	4	68.0	272.00	Move to clean area
04/09/09	A	4	76.0	304.00	Move to clean area
04/13/09	A	4	126.0	504.00	Rewash Soil
04/15/09	A	4	76.0	304.00	Move to clean area
04/20/09	A	4	29.0	116.00	Move to clean area
04/21/09	A	4	126.0	504.00	Rewash Soil
04/22/09	A	4	209.0	836.00	Rewash Soil
04/23/09	A	4	138.0	552.00	Rewash Soil - Lg amount of silts
04/28/09	A	4	104.0	416.00	Rewash Soil - Clear Drain Area
04/29/09	A	4	53.0	212.00	Move to clean area

Titrator Range: A= 30-600 B=300-6000 ppm

Soil Sample Volume: 25 Grams

Distilled Water Volume = 100 ml

## Quantab Chloride Test Strip Analysis Sheet

Date: 4/30/2009 Client: Arena Resources, Inc.

Site: N. Benson Queen Unit

Project Number: 094-1749 & 1748 - 000

Technician: Latta

Strip Lot Number(s): A9167

Sample ID	Titration Range	Dilution	Test Strip Result (ppm)	Final Result (ppm)	Notations
04/30/09	A	4	46.0	184.00	Move to clean area
05/01/09	A	4	68.0	272.00	Move to clean area - SD to move to reclaim area
06/10/09	A	4	34.0	136.00	Move to clean area
06/11/09	A	4	68.0	272.00	Move to clean area
06/15/09	A	4	85.0	340.00	Move to clean area
06/16/09	A	4	85.0	340.00	Move to clean area
06/29/09	A	4	40.0	160.00	Rewash soil
06/30/09	A	4	29.0	116.00	Move to clean area
07/01/09	A	4	65.0	260.00	Rewash soil
07/07/09	A	4	76.0	304.00	Rewash soil
07/08/09	A	4	60.0	240.00	Rewash soil
07/09/09	A	4	76.0	304.00	Rewash soil
07/10/09	A	4	245.0	980.00	Rewash soil
07/10/09	A	4	94.0	376.00	Took sample to lab
07/13/09	A	4	164.0	656.00	Rewash soil
07/14/09	A	4	76.0	304.00	Rewash soil
07/20/09	A	4	60.0	240.00	Rewash soil
08/05/09	A	4	29.0	116.00	Move to clean area
08/06/09	A	4	46.0	184.00	Cleaning out wash pit
08/18/09	A	4	29.0	116.00	Move to clean area
08/19/09	A	4	60.0	240.00	Rewash soil
08/20/09	A	4	29.0	116.00	Move to clean area
08/21/09	A	4	34.0	136.00	Rewash soil
08/24/09	A	4	29.0	116.00	Move to clean area
08/25/09	A	4	40.0	160.00	Move to clean area
08/26/09	A	4	40.0	160.00	Move to clean area
08/27/09	A	4	245.0	980.00	Rewash soil
08/28/09	A	4	126.0	504.00	Rewash soil
09/01/09	A	4	53.0	212.00	Rewash soil
09/03/09	A	4	34.0	136.00	Move to clean area
09/08/09	A	4	138.0	552.00	Rewash soil
09/09/09	A	4	104.0	416.00	Rewash soil
09/10/09	A	4	85.0	340.00	Rewash soil

Titration Range: A= 30-600 B=300-6000 ppm

Soil Sample Volume: 25 Grams

Distilled Water Volume = 100 ml

## Quantab Chloride Test Strip Analysis Sheet

**Date:** 9/11/2009      **Client:** Arena Resources, Inc.  
**Site:** N. Benson Queen Unit      **Project Number:** 094-1749 & 1748 - 000  
**Technican:** Latta      **Strip Lot Number(s):** A9167

Sample ID	Titratior Range	Dilution	Test Strip Result (ppm)	Final Result (ppm)	Notations
09/11/09	A	4	60.0	240.00	Rewash soil
09/14/09	A	4	29.0	116.00	Rewash soil
09/15/09	A	4	411.0	1644.00	Rewash soil
09/16/09	A	4	193.0	772.00	Rewash soil
09/22/09	A	4	138.0	552.00	Rewash soil
09/23/09	A	4	68.0	272.00	Rewash soil
09/24/09	A	4	40.0	160.00	Move to clean area
09/29/09	A	4	115.0	460.00	Rewash soil
10/05/09	A	4	104.0	416.00	Rewash soil
10/07/09	A	4	85.0	340.00	Rewash soil
10/12/09	A	4	60.0	240.00	Rewash soil
10/14/09	A	4	34.0	136.00	Move to clean area
10/20/09	A	4	60.0	240.00	Rewash soil
10/26/09	A	4	29.0	116.00	Rewash soil
10/27/09	A	4	85.0	340.00	Rewash soil
10/28/09	A	4	60.0	240.00	Rewash soil
10/29/09	A	4	46.0	184.00	Move to clean area
11/03/09	A	4	29.0	116.00	Move to clean area
11/09/09	A	4	126.0	504.00	Rewash soil
11/10/09	A	4	104.0	416.00	Rewash soil
11/12/09	A	4	46.0	184.00	Move to clean area
11/16/09	A	4	355.0	1420.00	Rewash soil
11/17/09	A	4	104.0	416.00	Rewash soil
11/18/09	A	4			Washed soil down and worked on pump
11/19/09	A	4	85.0	340.00	Rewash soil
11/20/09	A	4	53.0	212.00	Rewash soil
11/23/09	A	4	53.0	212.00	Rewash soil
11/24/09	A	4	34.0	136.00	Move to clean area
11/25/09	A	4	193.0	772.00	Rewash soil
11/30/09	A	4	245.0	980.00	Rewash soil
12/08/09	A	4	53.0	212.00	Rewash soil
12/10/09	A	4	53.0	212.00	Rewash soil
12/11/09	A	4	53.0	212.00	Rewash soil

Titratior Range: A= 30-600 B=300-6000 ppm  
 Soil Sample Volume: 25 Grams  
 Distilled Water Volume = 100 ml



## Quantab Chloride Test Strip Analysis Sheet

Date: 1/4/2010 Client: Arena Resources, Inc.

Site: N. Benson Queen Unit

Project Number: 094-1749 & 1748 - 000

Technician: Latta

Strip Lot Number(s): A9167

Sample ID	Titration Range	Dilution	Test Strip Result (ppm)	Final Result (ppm)	Notations
01/04/10	A	4	60.0	240.00	Rewash soil
01/05/10	A	4	29.0	116.00	Move to clean area
01/06/10	A	4	34.0	136.00	Rewash soil
01/11/10	A	4	60.0	240.00	Rewash soil
01/12/10	A	4	53.0	212.00	Rewash soil
01/13/10	A	4	46.0	184.00	Rewash soil
01/14/10	A	4	85.0	340.00	Rewash soil
01/18/10	A	4	138.0	552.00	Rewash soil
01/19/10	A	4	60.0	240.00	Rewash soil
01/20/10	A	4	53.0	212.00	Rewash soil
01/22/10	A	4	60.0	240.00	Rewash soil
02/02/10	A	4	29.0	116.00	Move to clean area
02/05/10	A	4	178.0	712.00	Rewash soil
02/08/10	A	4	164.0	656.00	Rewash soil
02/10/10	A	4	85.0	340.00	Rewash soil
02/11/10	A	4	60.0	240.00	Rewash soil
02/12/10	A	4	104.0	416.00	Rewash soil
02/15/10	A	4	76.0	304.00	Rewash soil
02/18/10	A	4	76.0	304.00	Rewash soil
02/19/10	A	4	60.0	240.00	Rewash soil
02/22/10	A	4	29.0	116.00	Move to clean area
02/25/10	A	4	307.0	1228.00	Rewash soil
03/01/10	A	4	60.0	240.00	Rewash soil
03/02/10	A	4	53.0	212.00	Rewash soil
03/03/10	A	4	53.0	212.00	Rewash soil
03/04/10	A	4	40.0	160.00	Move to clean area
03/05/10	A	4	126.0	504.00	Rewash soil
03/06/10	A	4	76.0	304.00	Rewash soil
03/08/10	A	4	104.0	416.00	Rewash soil
03/09/10	A	4	60.0	240.00	Rewash soil
03/10/10	A	4	85.0	340.00	Rewash soil
03/11/10	A	4	53.0	212.00	Rewash soil
03/12/10	A	4	46.0	184.00	Rewash soil

Titration Range: A= 30-600 B=300-6000 ppm

Soil Sample Volume: 25 Grams

Distilled Water Volume = 100 ml

## Quantab Chloride Test Strip Analysis Sheet

Date: 3/13/2010 Client: Arena Resources, Inc.

Site: N. Benson Queen Unit

Project Number: 094-1749 & 1748 - 000

Technician: Latta

Strip Lot Number(s): A9167

Sample ID	Titration Range	Dilution	Test Strip Result (ppm)	Final Result (ppm)	Notations
03/13/10	A	4	33.0	132.00	Move to clean area
03/15/10	A	4	115.0	460.00	Rewash soil
03/16/10	A	4	245.0	980.00	Rewash soil
03/17/10	A	4	85.0	340.00	Rewash soil
03/18/10	A	4	46.0	184.00	Rewash soil
03/19/10	A	4	60.0	240.00	Rewash soil
03/20/10	A	4	40.0	160.00	Rewash soil
03/22/10	A	4	126.0	504.00	Rewash soil
03/23/10	A	4	85.0	340.00	Rewash soil
03/24/10	A	4	46.0	184.00	Rewash soil
03/25/10	A	4	71.0	284.00	Rewash soil
03/26/10	A	4	40.0	160.00	Move to clean area
03/29/10	A	4	214.0	856.00	Rewash soil
03/30/10	A	4	109.0	436.00	Rewash soil
03/31/10	A	4	109.0	436.00	Rewash soil
04/01/10	A	4	60.0	240.00	Rewash soil
04/02/10	A	4	109.0	436.00	Rewash soil
04/03/10	A	4	46.0	184.00	Move to clean area
04/05/10	A	4	606.0	2424.00	Rewash soil
04/06/10	A	4	214.0	856.00	Rewash soil
04/08/10	A	4	156.0	624.00	Rewash soil
04/09/10	A	4	63.0	252.00	Rewash soil
04/10/10	A	4	99.0	396.00	Rewash soil
04/12/10	A	4	63.0	252.00	Rewash soil
04/13/10	A	4	63.0	252.00	Rewash soil
04/14/10	A	4	53.0	212.00	Rewash soil
04/15/10	A	4	40.0	160.00	Move to clean area
04/19/10	A	4	231.0	924.00	Rewash soil
04/20/10	A	4	169.0	676.00	Rewash soil
04/21/10	A	4	109.0	436.00	Rewash soil
04/22/10	A	4	89.0	356.00	Move to clean area
04/23/10	A	4			No Sample - Changed out pump
04/24/10	A	4	99.0	396.00	Rewash soil

Titration Range: A= 30-600 B=300-6000 ppm

Soil Sample Volume: 25 Grams

Distilled Water Volume = 100 ml

## Quantab Chloride Test Strip Analysis Sheet

**Date:** 4/26/2010    **Client:** Arena Resources, Inc.  
**Site:** N Benson Queen Unit    **Project Number:** 094-1749 & 1748 - 000  
**Technican:** Latta    **Strip Lot Number(s):** A9167

Sample ID	Titrator Range	Dilution	Test Strip Result (ppm)	Final Result (ppm)	Notations
04/26/10	A	4	63.0	252.00	Rewash soil
04/27/10	A	4			No Sample - cleaned sump
04/28/10	A	4			No Sample - cleaned sump
04/29/10	A	4			No Sample - cleaned sump
04/30/10	A	4	71.0	284.00	Rewash soil
05/01/10	A	4	33.0	132.00	Move to clean area
05/03/10	A	4			No Sample - washing new batch
05/04/10	A	4	416.0	1664.00	Rewash soil
05/05/10	A	4	214.0	856.00	Rewash soil
05/07/10	A	4	289.0	1156.00	Rewash soil
05/08/10	A	4	214.0	856.00	Rewash soil
05/10/10	A	4	214.0	856.00	Rewash soil
05/10/10	A	4	126.0	504.00	Afternoon test
05/11/10	A	4	169.0	676.00	Rewash soil
05/12/10	A	4	99.0	396.00	Rewash soil
05/14/10	A	4	120.0	480.00	Rewash soil
05/17/10	A	4	89.0	356.00	Rewash soil
05/18/10	A	4	63.0	252.00	Rewash soil
05/19/10	A	4	33.0	132.00	Rewash soil
05/20/10	A	4	249.0	996.00	Rewash soil
05/21/10	A	4	335.0	1340.00	Rewash soil
05/22/10	A	4	180.0	720.00	Rewash soil
05/23/10	A	4	71.0	284.00	Move to clean area

Titrator Range: A= 30-600 B=300-6000 ppm  
 Soil Sample Volume: 25 Grams  
 Distilled Water Volume = 100 ml

**Attachment D**  
**In-House Analytical Data**

### In-House Sample Analysis Sheet

**Date:** 5/24/2010                      **Client:** Arena Resources, Inc.  
**Site:** NBQU Soil Washing                      **Project Number:** 094-1748 & 1749  
**Pro. Mgr.:** Fred Holmes                      **Contaminant:** Chlorides  
**Method:** Standard Method 4500-CIB                      **QA/QC Standard:** 500 mg/kg

Treated Sample Lot (Date)	Milliliters of Sample Used	Dilution	AgNO3 0.028(N)	Result (mg/kg)	Lab Result (mg/kg)	Notations
12/4/2008	10	4	0.700	277.928	272	Sample to Lab for Verification
1/5/2009	10	4	0.600	238.224	N/A	Treated pile spot check. Passed
1/14/2009	10	4	0.450	178.668	160	Treated pile monthly composite, sample to lab for verification
2/3/2009	10	4	0.550	218.372	N/A	Treated pile spot check. Passed
2/16/2009	10	4	1.200	476.448	432	Treated pile monthly composite, sample to lab for verification
3/9/2009	10	4	0.500	198.52	160	Treated pile monthly composite, sample to lab for verification
4/6/2009	10	4	0.600	238.224	N/A	Treated pile spot check. Passed
4/29/2009	10	4	0.650	258.076	224	Treated pile monthly composite, sample to lab for verification
6/1/2009	10	4	0.550	218.372	N/A	Treated pile spot check. Passed
6/15/2009	10	4	0.250	99.26	96	Treated pile monthly composite, sample to lab for verification
8/20/2009	10	4	0.500	198.52	160	Treated pile monthly composite, sample to lab for verification
9/6/2009	10	4	0.450	178.668	144	Treated pile monthly composite, sample to lab for verification
10/28/2009	10	4	0.400	158.816	144	Treated pile monthly composite, sample to lab for verification
12/14/2009	10	4	0.600	238.224	256	Treated pile monthly composite, sample to lab for verification
1/11/2010	10	4	0.700	277.928	256	Treated pile monthly composite, sample to lab for verification
3/1/2010	10	4	0.600	238.224	208	Treated pile monthly composite, sample to lab for verification
3/25/2010	10	4	0.800	317.632	272	Treated pile monthly composite, sample to lab for verification
4/29/2010	10	4	0.900	357.336	368	Treated pile monthly composite, sample to lab for verification
Clearance Sampling For Pooled Areas	Milliliters of Sample Used	Dilution	AgNO3 0.028(N)	Result (mg/kg)	Lab Results (mg/kg)	Notations
N. Pool Area Clearance	10	4	1.150	456.596	480	Clearance sample, split to lab
W. Pool Area Clearance	10	4	0.400	158.816	144	Clearance sample, split to lab
Storm Water Drainage Clearance	10	4	0.450	178.668	176	Clearance sample, split to lab

$F = (ml \text{ AgNO}_3)(N)(35450)/ml. \text{ sample used}$   
 Soil Sample Volume: 25 Grams  
 Deionized Water Volume = 100 ml

**Attachment E**  
**Third Party Laboratory Analyses Data**

**Project Sample Analysis  
Lab Validation Sheet**

**Date:** 5/24/2010 **Client:** Arena Resources, Inc.  
**Site:** NBQU Soil Washing **Project Number:** 094-1748 & 1749  
**Pro. Mgr.** Fred Holmes **Contaminant:** Chlorides  
**Method:** Standard Method 4500-CIB **QA/QC Standard:** 500 mg/kg

Treated Sample Lot (Date)	Milliliters of Sample Used	Dilution	AgNO3 0.028(N)	Result (mg/kg)	Lab Result (mg/kg)	Notations
1/14/2009					160	Batch complete, moved to staging
2/16/2009					432	Batch complete, moved to staging
3/9/2009					160	Batch complete, moved to staging
4/29/2009					224	Batch complete, moved to staging
6/15/2009					192	Batch complete, moved to staging
6/17/2009					144	Batch complete, moved to staging
8/21/2009					1,120	Nonwashed soil
8/21/2009					96	Batch complete, moved to staging
8/25/2009					160	Batch complete, moved to staging
9/9/2009					144	Batch complete, moved to staging
10/30/2009					144	Batch complete, moved to staging
12/16/2009					256	Batch complete, moved to staging
1/13/2010					256	Batch complete, moved to staging
3/4/2010					208	Batch complete, moved to staging
3/29/2010					272	Batch complete, moved to staging
5/4/2010					368	Batch complete, moved to staging

F = (ml AgNO<sub>3</sub>(N)(35450)/ml. sample used

Soil Sample Volume: 25 Grams

Deionized Water Volume = 100 ml



**ARDINAL  
LABORATORIES**

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

May 5, 2010

Fred Holmes  
ETECH Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQIF

Enclosed are the results of analyses for sample number H19816, received by the laboratory on 05/04/10 at 3:45 pm.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.2	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.







**ARDINAL  
LABORATORIES**

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---

April 1, 2010

Fred Holmes  
ETECH Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQIF (094 001749-000)

Enclosed are the results of analyses for sample number H19570, received by the laboratory on 03/2910 at 4:20 pm.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accredited though the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.2	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.



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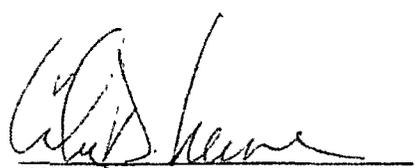
ANALYTICAL RESULTS FOR  
 ETECH ENVIRONMENTAL & SAFETY SOLUTIONS, INC.  
 ATTN: FRED HOLMES  
 P.O. BOX 8469  
 MIDLAND, TX 79708  
 FAX TO: (432) 563-2213

Receiving Date: 03/29/10  
 Reporting Date: 03/30/10  
 Project Number: 094 001749-000 (ARENA)  
 Project Name: NBQIF  
 Project Location: CARLSBAD, NM

Analysis Date: 03/30/10  
 Sampling Date: 03/29/10  
 Sample Type: SOIL  
 Sample Condition: COOL & INTACT @ 4°C  
 Sample Received By: JH  
 Analyzed By: HM

LAB NO.	SAMPLE ID	Cl <sup>-</sup> (mg/kg)
H19570-1	WASHED SOIL 094001749000	272
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent Difference		< 0.1

METHOD: Standard Methods      4500-Cl<sup>-</sup>B  
 Note: Analysis performed on a 1:4 w:v aqueous extract.

  
 Chemist

04/01/10  
 Date

H19570 Etech

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise. Results relate only to the samples identified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories.



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 101 East Marland, Hobbs, NM 88240  
 (575) 393-2326 Fax (575) 393-2476

Company Name: <i>F-tech Environmental</i>				<b>BILL TO</b>				<b>ANALYSIS REQUEST</b>																			
Project Manager: <i>Fred Holmes</i>				P.O. #:																							
Address:				Company:																							
City: <i>Midland</i> State: <i>Tx</i> Zip: <i>79705</i>				Attn:																							
Phone #: <i>432-631-3757</i> Fax #:				Address:																							
Project #: <i>094001749-000</i> Project Owner: <i>Arma</i>				City:																							
Project Name: <i>NBQIE</i>				State: Zip:																							
Project Location: <i>Carlsbad, NM</i>				Phone #:																							
Sampler Name: <i>Ray Letta</i>				Fax #:																							
FOR LAB USE ONLY												<i>Carlsbad</i>															
Lab I.D.		Sample I.D.		IGRAB OR (C)OMP.	# CONTAINERS	MATRIX			PRESERV															SAMPLING			
						GROUNDWATER	WASTEWATER	SOIL	SLUDGE	OTHER:	ACID/BASE													ICE/COOL	OTHER:	DATE	TIME
<i>H19570-1</i>		<i>washed soil 094001749000</i>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>																			<i>3-29-10</i>	<i>3:20pm</i>	

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Sampler Relinquished By: <i>[Signature]</i>		Date: <i>3-24-10</i>	Received By:	Phone Result: <input type="checkbox"/> No	Add'l Phone #:
Relinquished By:		Time: <i>4:16 pm</i>	Date: <i>3/29/10</i>	Fax Result: <input type="checkbox"/> No	Add'l Fax #:
"Delivered By: (Circle One)		Time: <i>4:20</i>	Received By: <i>[Signature]</i>	REMARKS:	
Sampler - UPS - Bus - Other:		Temp: <i>4°C</i>	Sample Condition: <input checked="" type="checkbox"/> Intact		
			<input type="checkbox"/> Yes <input type="checkbox"/> No		
			<input type="checkbox"/> No <input type="checkbox"/> No		
			CHECKED BY: <i>[Signature]</i>		

† Cardinal cannot accept verbal changes. Please fax written changes to 575-393-2476.

*#26*



**ARDINAL  
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---

March 8, 2010

Fred Holmes  
ETECH Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: 094-001749-000 (Arena)

Enclosed are the results of analyses for sample number H19376, received by the laboratory on 03/04/10 at 3:35 pm.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

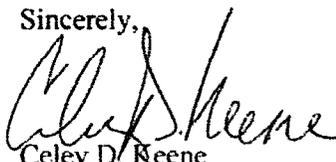
Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.2	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

  
Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.





# CARDINAL LABORATORIES

101 East Martand, Hobbs, NM 88240  
(575) 393-2326 Fax (575) 393-2476

Company Name: <u>E-Tech</u>		<b>BILL TO</b>		<b>ANALYSIS REQUEST</b>											
Project Manager: <u>Fred Holmes</u>		P.O. #:													
Address:		Company:													
City: <u>Midland</u>	State: <u>Tx</u>	Zip: <u>79708</u>	Attn:												
Phone #:	Fax #:	Address:													
Project #: <u>094-00749-000</u>	Project Owner: <u>Arona</u>		City:												
Project Name: <u>NBOEF</u>	State: _____ Zip: _____		Phone #:												
Project Location: <u>Carlsbad NM</u>	Fax #:														
Sampler Name: <u>Jay Latta</u>															

FOR LAB USE ONLY		# CONTAINERS	MATRIX					PRESERV.		SAMPLING		DATE	TIME
Lab I.D.	Sample I.D.		GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER	ACID/BASE	ICE / COOL	OTHER		
<u>HR376-1</u>	<u>Washed Soil</u>										<u>3-9-12</u>	<u>3:00 PM</u>	<u>Chlorides</u>

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Sampler Relinquished By: <u>Jay Latta</u>	Date: <u>3-9-12</u>	Time: <u>3:35 PM</u>	Received By: _____	Phone Result: <input type="checkbox"/> No	Add'l Phone #: _____
Relinquished By: _____	Date: _____	Time: _____	Received By: <u>Jodi Benson</u>	Fax Result: <input type="checkbox"/> No	Add'l Fax #: _____
Delivered By: (Circle One)	Temp. <u>24°C</u>	Sample Condition	CHECKED BY: <u>JH</u>	REMARKS:	
Sampler - UPS - Bus - Other.	Cool Intact	<input type="checkbox"/> Yes <input type="checkbox"/> No	(Initials)		

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**ARDINAL  
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---

July 1, 2009

Fred Holmes  
Etech Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQU Injection – Soil Washing

Enclosed are the results of analyses for sample number H17718, received by the laboratory on 06/30/09 at 9:29 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.



PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR  
 ETECH ENVIRONMENTAL & SAFETY SOLUTIONS, INC.  
 ATTN: FRED HOLMES  
 P.O. BOX 8469  
 MIDLAND, TX 79708  
 FAX TO: (432) 563-2213

Receiving Date: 06/30/09  
 Reporting Date: 06/30/09  
 Project Number: 094-1749  
 Project Name: NBQU INJECTION-SOIL WASHING  
 Project Location: EDDY COUNTY, NM

Analysis Date: 06/30/09  
 Sampling Date: 01/14/09  
 Sample Type: SOIL  
 Sample Condition: INTACT @ 24°C  
 Sample Received By: ML  
 Analyzed By: HM

LAB NO.	SAMPLE ID	Cl <sup>-</sup> (mg/kg)
H17718-1	01-14-2009	160
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent Difference		<0.1

METHOD: Standard Methods 4500-ClB

Note: Analysis performed on a 1:4 w:v aqueous extract. Analyzed outside EPA recommended hold time, however sample results should not be affected.

Alfred Keene  
 Chemist

07/01/09  
 Date

H17718 Etech

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise. Results relate only to the samples identified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories.









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---

August 28, 2009

Fred Holmes  
ETECH Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQU Injection – Soil Washing

Enclosed are the results of analyses for sample number H18112, received by the laboratory on 08/28/09 at 7:25 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.2	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.







**ARDINAL  
LABORATORIES**

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September 14, 2009

Fred Holmes  
ETECH Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQU Injection – Soil Washing

Enclosed are the results of analyses for sample number H18227, received by the laboratory on 09/11/09 at 8:00 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.2	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

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This report conforms with NELAP requirements.







**ARDINAL  
LABORATORIES**

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

August 25, 2009

Fred Holmes  
ETECH Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: North Benson Queen Injection Facility

Enclosed are the results of analyses for sample number H18061, received by the laboratory on 08/24/09 at 8:30 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.2	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.







PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR  
 ETECH ENVIRONMENTAL & SAFETY SOLUTIONS, INC.  
 ATTN: FRED HOLMES  
 P.O. BOX 8469  
 MIDLAND, TX 79708  
 FAX TO: (432) 563-2213

Receiving Date: 06/17/09  
 Reporting Date: 06/18/09  
 Project Number: 094-1749-000  
 Project Name: NBQU INJ.  
 Project Location: NOT GIVEN

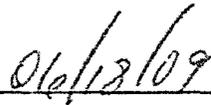
Analysis Date: 06/18/09  
 Sampling Date: 06/17/09  
 Sample Type: SOIL  
 Sample Condition: INTACT @ 33°C  
 Sample Received By: ML  
 Analyzed By: AB

LAB NO.	SAMPLE ID	Cl <sup>-</sup> (mg/kg)
H17644-1	TREATED 0617	144
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent Difference		<0.1

METHOD: Standard Methods      4500-Cl<sup>-</sup>B

Note: Analysis performed on a 1:4 w:v aqueous extract.

  
 Chemist

  
 Date

H17644 Etech

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise. Results relate only to the samples identified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories





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July 1, 2009

Fred Holmes  
Etech Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQU Injection – Soil Washing

Enclosed are the results of analyses for sample number H17722, received by the laboratory on 06/30/09 at 9:30 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.



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ANALYTICAL RESULTS FOR  
 ETECH ENVIRONMENTAL & SAFETY SOLUTIONS, INC.  
 ATTN: FRED HOLMES  
 P.O. BOX 8469  
 MIDLAND, TX 79708  
 FAX TO: (432) 563-2213

Receiving Date: 06/30/09  
 Reporting Date: 06/30/09  
 Project Number: 094-1749  
 Project Name: NBQU INJECTION-SOIL WASHING  
 Project Location: EDDY COUNTY, NM

Analysis Date: 06/30/09  
 Sampling Date: 06/15/09  
 Sample Type: SOIL  
 Sample Condition: INTACT @ 24°C  
 Sample Received By: ML  
 Analyzed By: HM

LAB NO.	SAMPLE ID	Cl <sup>-</sup> (mg/kg)
H17722-1	06-15-2009	192
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent Difference		<0.1

METHOD: Standard Methods      4500-Cl<sup>-</sup>B  
 Note: Analysis performed on a 1:4 w:v aqueous extract.

Clay S. Keene  
 Chemist

07/01/09  
 Date

H17722 Etech

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---

July 1, 2009

Fred Holmes  
Etech Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQU Injection – Soil Washing

Enclosed are the results of analyses for sample number H17721, received by the laboratory on 06/30/09 at 9:30 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.



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ANALYTICAL RESULTS FOR  
 ETECH ENVIRONMENTAL & SAFETY SOLUTIONS, INC.  
 ATTN: FRED HOLMES  
 P.O. BOX 8469  
 MIDLAND, TX 79708  
 FAX TO: (432) 563-2213

Receiving Date: 06/30/09  
 Reporting Date: 06/30/09  
 Project Number: 094-1749  
 Project Name: NBQU INJECTION-SOIL WASHING  
 Project Location: EDDY COUNTY, NM

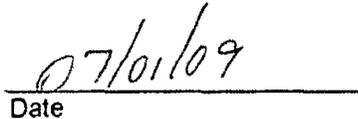
Analysis Date: 06/30/09  
 Sampling Date: 04/29/09  
 Sample Type: SOIL  
 Sample Condition: INTACT @ 24°C  
 Sample Received By: ML  
 Analyzed By: HM

LAB NO.	SAMPLE ID	Cl <sup>-</sup> (mg/kg)
H17721-1	04-29-2009	224
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent Difference		<0.1

METHOD: Standard Methods 4500-Cl<sup>-</sup>B

Note: Analysis performed on a 1:4 w:v aqueous extract. Analyzed outside EPA recommended hold time, however sample results should not be affected.

  
 Chemist

  
 Date

H17721 Etech

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---

July 1, 2009

Fred Holmes  
Etech Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQU Injection – Soil Washing

Enclosed are the results of analyses for sample number H17720, received by the laboratory on 06/30/09 at 9:30 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

---

This report conforms with NELAP requirements.







**ARDINAL  
LABORATORIES**

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

---

July 1, 2009

Fred Holmes  
Etech Environmental & Safety Solutions, Inc.  
P.O. Box 8469  
Midland, TX 79708

Re: NBQU Injection – Soil Washing

Enclosed are the results of analyses for sample number H17719, received by the laboratory on 06/30/09 at 9:29 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene  
Laboratory Director

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This report conforms with NELAP requirements.







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**ANALYTICAL RESULTS FOR**  
**ETECH ENVIRONMENTAL & SAFETY SOLUTIONS, INC.**  
**ATTN: FRED HOLMES**  
**P.O. BOX 8469**  
**MIDLAND, TX 79708**  
**FAX TO: (432) 563-2213**

Receiving Date: 12/16/08  
 Reporting Date: 12/17/08  
 Project Number: 094-1749-000  
 Project Name: NBQU  
 Project Location: CARLSBAD, NM

Analysis Date: 12/17/08  
 Sampling Date: 12/15/08  
 Sample Type: SOIL  
 Sample Condition: COOL & INTACT  
 Sample Received By: ML  
 Analyzed By: TR

LAB NO.	SAMPLE ID	Cl <sup>-</sup> (mg/kg)
H16534-1	BATCH 12-15	240
Quality Control		490
True Value QC		500
% Recovery		98.0
Relative Percent Difference		<0.1

METHOD: Standard Methods	4500-ClB
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Note: Analysis performed on a 1:4 w:v aqueous extract.

*[Signature]*  
 Chemist

12-17-08  
 Date

H16534 Etech

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# ARDINAL LABORATORIES

101 East Marland, Hobbs, NM 88240  
(575) 393-2326 Fax (575) 393-2476

Company Name: <b>ETECH Environmental</b>			<b>BILL TO</b>			<b>ANALYSIS REQUEST</b>																								
Project Manager: <b>Fred</b>			P.O. #:																											
Address:			Company:																											
City: State: Zip:			Attn:																											
Phone #: Fax #:			Address:																											
Project #: Project Owner:			City:																											
Project Name: <b>North Benson Queen Injection Facility</b>			State: Zip:																											
Project Location:			Phone #:																											
Sampler Name:			Fax #:																											
FOR LAB USE ONLY																														
Lab I.D.		Sample I.D.		IGIRAB OR (C)COMP	# CONTAINERS	MATRIX			PRESERV.			SAMPLING			C1-															
						GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	ACID/BASE:	ICE/COOL	OTHER:													DATE		TIME	
H16470-1		Post Sample #1				X																					12/4/08		10:40a	
-2		PRE SAMPLE				X																					↓		10:50a	

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Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% per annum from the original date of invoice, and all costs of collections, including attorney's fees.

Sampler Relinquished: <i>[Signature]</i>		Date: <b>12/04/08</b>	Received By: <i>[Signature]</i>	Phone Result: <input type="checkbox"/> No	Add'l Phone #:
Relinquished By: <i>[Signature]</i>		Time: <b>11:20a</b>	Received By: <i>[Signature]</i>	Fax Result: <input type="checkbox"/> No	Add'l Fax #:
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		Temp.:	Sample Condition: Cool Intact <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	REMARKS: <b>Call w/ Results Jay 432-634-9050</b>	
			CHECKED BY: <i>[Signature]</i> (Initials)		

† Cardinal cannot accept verbal changes. Please fax written changes to 575-393-2476.