

Report

Truckers Number 2 Brine Station Subsurface Investigation

> Prepared For: Key Energy Services, Inc. 6 Desta Drive, Suite 4400 Midland, TX 79705



Issue Date: November 17, 2004 Project Number: 035-387-M

facility FFACO610028545 P.O. Box 8469 Midland • TX • 79708-8469 • Tel: 432-563-2200 • Fax: 432-563-2213 app-pPAC Ole 10028646

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Summary

On November 8, 2004 Etech Environmental & Safety Solutions, Inc. (Etech) performed a subsurface investigation at the Truckers Number 2 Brine Station in Hobbs, New Mexico. The purpose of the investigation was to determine the vertical extent of chloride contamination in a drainage collection area located to the west of the brine pit.

The investigation involved the advancement of two (2) soil borings to a depth of thirty-two (32) feet below ground surface (bgs), sampling and field screening of soils and laboratory analyses of selected samples.

Following completion of the field activities and laboratory analyses, it has been determined that the majority of the vertical extent of the chloride contamination appears to be confined within the upper 6-10 feet of soils. However, soils contaminated with chlorides are slightly above the regulatory level of 250 mg/kg were found to a depth of 15 feet.

A review of the soil samples taken during the soil borings found the majority of the subsurface soils to be caliche. A tight, well-cemented sandstone formation was noted at approximately twenty to twenty-two (20-22) feet.

Introduction

On November 8, 2004 Etech Environmental & Safety Solutions, Inc. (Etech) performed a subsurface investigation at the Truckers Number 2 Brine Station in Hobbs, New Mexico. The site is operated by Key Energy Services, Inc. The purpose of the investigation was to determine the vertical extent of chloride contamination in a drainage collection area located to the west of the brine pit.

The scope of the investigation involved the following:

- Advance soil borings to a maximum depth of sixty (60) feet.
- Perform on-site screening of soil samples for chlorides
- Send selected samples for laboratory analyses for chlorides

The following summarizes the on-site activities and the results of the laboratory analyses.

Soil Borings

Two (2) soil borings sites were selected and labeled SB-4 and SB-5. This was done to keep the borings sequential with other borings performed in previous investigations. Each soil boring was advanced using air-rotary drilling rig. The sampling program called for split spoon samples to be taken every five (5) feet for the first twenty (20) feet then every ten (10) feet until total depth was reached. Grab samples of the drill cuttings were to be taken in two (2) foot intervals between split spoon samples.

SB-4 is located 33 feet west of the brine pit towards the southern quarter of the drainage collection area. The latitude and longitude of the boring is as follows:

Latitude: N32-42.071 Longitude: W103.09.340

SB-5 is located 27 feet west of the brine pit towards the northern quarter of the drainage collection area. The latitude and longitude of the boring is as follows:

Latitude: N32 42.082 Longitude: W103 09.342

A diagram showing the location of each boring is provided for review in Attachment A.

SB-4 was advanced to thirty (30) feet bgs. SB-5 was advanced to thirty-two (32) feet bgs. Soil borings were terminated at these depths when field screening indicated the chloride levels were below the 250 mg/kg objective for a sustained ten (10) foot interval. Once the borings were completed, they were backfilled to surface using bentonite chips.

The lithology of each boring was uniform. The soils throughout each boring were largely caliche. At twenty to twenty-two (20-22) feet bgs, a tight, well cemented, sandstone was encountered. This formation did slow the advancement of each boring and resulted in a reduced amount of sample recovery in the split spoon sample taken at that depth.

Field Screening & Analyses

Samples were screened on-site for chlorides. A portion of each sample was taken and a liquid extract created. The extract was then titrated for chlorides. The field screening indicated there were elevated levels of chlorides to approximately five to six (5-6) feet. At this point, the chloride levels significantly reduce until fifteen to seventeen (15-17) feet when they reach a point below the target level of 250 mg/kg. A copy of the field screening sheet is provided for review in Attachment B.

Based upon the data from the field screening, select samples were taken and analyzed for chlorides via EPA Method 300. The results of the analyses are listed in Table 1, presented below:

	Table 1 Laboratory Analyses for Chlorides	
Boring	Depth (Feet)	Chlorides (mg/kg)
Background	(Surface)	74.7
SB-4	6-7	1460
SB-4	10-11	382
SB-4	17-20	159
SB-5	5'	2770
SB-5	14-15	484
SB-5	24-25	116

The five (5) foot sample from SB-5 was subjected to additional analyses for cations and anions. This was done to give an overall picture of the soils general chemistry. The results of the analyses indicate there is a very high level of calcium (159,000) mg/kg. This would be expected given the nature of the soil. The exact amount of free calcium, or readily soluble calcium, is unknown. However, this information may be useful when selecting a method of mitigation. Copies of the analytical results are provided for review in Attachment C.

Quality Assurance & Quality Control

Field samples were individually bagged and labeled immediately after sampling. All sampling equipment used to take samples was decontaminated between each use. All samples subjected to field screening were placed in certified clean glass bottles prior to field screening. All equipment used for field screening was either single-use or decontaminated between each use. The drilling string was decontaminated between each boring.

Conclusion

Following completion of the field activities and laboratory analyses, it appears the majority of the vertical extent of the chloride contamination appears to be confined within the upper 6-10 feet of soils. Chloride levels above the regulatory level of 250 mg/kg were found to depths of at least 11 feet in one boring and 15 feet in the other boring.

Prepared By:

Aul Holnex

Fred Holmes B.Sc. Etech Environmental & Safety Solutions, Inc.

Truckers No. 2 Subsurface Investigation

November 17, 2004

Attachment A Site Diagram



December 29, 2004

Mr. Wayne Price New Mexico Oil Conservation District 1220 South St. Francis Drive Santa Fe, New Mexico 87505

Re: Hobbs Trucker's Number 2 Brine Station Subsurface Investigation Report

Dear Mr. Price:

Enclosed for your review you will find the Hobbs Trucker's Number 2 Brine Station Subsurface Investigation Report.

Please contact me after you have reviewed the report to discuss future site activities.

Sincerely,

Jason Henry Corporate Environmental Specialist

Enclosure

cc: Mr. Paul Sheeley
 New Mexico Oil Conservation District
 1625 N. French Drive
 Hobbs, New Mexico 88240

Mr. Pete Turner Key Energy Services, Inc. 418 S. Grimes Hobbs, New Mexico 88240



File: NM-7020



Truckers No. 2 Subsurface Investigation

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November 17, 2004

Attachment B Field Screening Log

Field Analysis Sheet

Date:	11/9/2004	Client:	Key Energy	Services		
Site: Ho	bbs Truckers #2		<u> </u>	Proj	ect Number:	035-387
Technican: Jai	ime Craig			C	ontaminant:	Chlorides
Sample ID	Mil Sa	lliliters of ample Used	Dilution	AgNO3 0.028(N)	Result (mg/kg)	Notations
SB4 6-7'		1	2	0.580	575.708	Sent to lab for Chlorides 300.0 Method
SB4 7-8'		- 1	2	0.500	496.3	
SB4 9-10'		1	2	0.510	506.226	
SB4 10-11'	• ••	1	2	0.300	297.78	Sent to lab for Chlorides 300.0 Method
SB4 12-13'		1	2	0.350	347.41	
SB4 14-15'		1	2	0.300	297.78	
SB4 15-17'		1	2	0.200	198.52	
SB4 17-18'		1	2	0.200	198.52	
SB4 17-20'		1	2	0.200	198.52	Sent to lab for Chlorides 300.0 Method
SB4 21-22'		1	2	0.200	198.52	
SB4 24-25'		1	2	0.100	99.26	
SB4 26-27'		. 1	2	0.150	148.89	
SB4 28-29'		1	2	0.100	99.26	
SB4 30'		1	2	0.100	99.26	
SB5 5'		1	2	1,200	1191.12	Sent to lab for Chlorides 300 0 Method
SB5 7-8'		1	2	0.900	893.34	
SB5 9-10'		1	2	0.700	694.82	
SB5 10-12'		1	2	0.600	595.56	
SB5 12-13'		1	2	0.500	496.3	
SB5 14-15'		1	2	0.400	397.04	Sent to lab for Chlorides 300.0 Method
SB5 15-17'		1	2	0.300	297.78	
SB5 17-18'		1	2	0.300	297.78	
SB5 19-20'		1	2	0.200	198.52	
SB5 22'		1	2	0.200	198.52	
SB5 24-25'		1	2	0.200	198.52	Sent to lab for Chlorides 300.0 Method
SB5 26-27'		1	2	0.200	198.52	
SB5 28-29'		1	2	0.200	198.52	
SB5 30-32'		1	2	0.100	99.26	
BACKGROUN	D	1	2	0.200	198.52	Sent to lab for Chlorides 300.0 Method
					,,,	<u> </u>

F = (ml AgNO₃)(N)(35450)/ml. sample used

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Truckers No. 2 Subsurface Investigation

November 17, 2004

Attachment C Analytical Results

Analytical Report

Prepared for:

Shane Estep E Tech Environmental & Safety Solutions, Inc. P.O. Box 8469 Midland, TX 79708-8469

Project: Hobbs Truckers #2 Brine Station Project Number: 035-387 Location: None Given

Lab Order Number: 4K10003

Report Date: 11/15/04

Project: Hobbs Truckers #2 Brine Station Project Number: 035-387 Project Manager: Shane Estep

Fax: 563-2213
Reported:
11/15/04 15:08

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BG	4K10003-01	Soil	11/08/04 00:00	11/09/04 17:10
SB4 6-7'	4K10003-02	Soil	11/08/04 00:00	11/09/04 17:10
SB4 10-11'	4K10003-03	Soil	11/08/04 00:00	11/09/04 17:10
SB4 17-20'	4K10003-04	Soil	11/08/04 00:00	11/09/04 17:10
SB5 5'	4K10003-05	Soil	11/08/04 00:00	11/09/04 17:10
SB5 14-15'	4K10003-06	Soil	11/08/04 00:00	11/09/04 1 7 :10
SB5 24-25'	4K10003-07	Soil	11/08/04 00:00	11/09/04 17:10

Project: Hobbs Truckers #2 Brine Station Project Number: 035-387 Project Manager: Shane Estep

Fax: 563-2213 Reported:

11/15/04 15:08

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB5 5' (4K10003-05) Soil									
Carbonate Alkalinity	8.00	0.100	mg/kg	1	EK41102	11/10/04	11/10/04	EPA 310.2M	
Bicarbonate Alkalinity	52.0	2.00	"		"	"	11	"	
Hydroxide Alkalinity	ND	0.100	"	"		"			
% Moisture	18.0		%	"	EK41201	11/11/04	11/12/04	% calculation	
Sulfate	557	5.00	mg/kg	10	EK41207	11/10/04	11/11/04	EPA 9038	

Environmental Lab of Texas

Project: Hobbs Truckers #2 Brine Station Project Number: 035-387 Project Manager: Shane Estep Fax: 563-2213

Reported: 11/15/04 15:08

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB5 5' (4K10003-05) Soil									
Calcium	159000	1000	mg/kg dry	100000	EK41011	11/10/04	11/10/04	EPA 6010B	
Magnesium	1940	1.00		1000	"	11		•	
Potassium	207	5.00	"	100		14	"		
Sodium	2980	10.0	"	1000	"	u			

Environmental Lab of Texas

E Tech Environmental & Safety Solutions, Inc. P.O. Box 8469		P Project Nu	roject: Ha imber: 03		Fax: 56. Repo	3-2213			
Midland TX, 79708-8469		Project Ma	nager: Sł	hane Estep				11/15/04 15:08	
		Anions by	EPA N	Method 3	00.0				
		Environn	nental]	Lab of Te	exas				
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BG (4K10003-01) Soil									
Chloride	74.7	10.0	mg/kg	1	EK41213	11/11/04	11/11/04	EPA 300.0	
SB4 6-7' (4K10003-02) Soil					-				
Chloride	1460	500	mg/kg	50	EK41213	11/11/04	11/11/04	EPA 300.0	
SB4 10-11' (4K10003-03) Soil	<u>.</u>								
Chloride	382	100	mg/kg	10	EK41213	11/11/04	11/11/04	EPA 300.0	
SB4 17-20' (4K10003-04) Soil									
Chloride	159	20.0	mg/kg	2	EK41213	11/11/04	11/11/04	EPA 300.0	
SB5 5' (4K10003-05) Soil				_		_			
Chloride	2770	500	mg/kg	50	EK41213	11/11/04	11/11/04	EPA 300.0	
SB5 14-15' (4K10003-06) Soil									
Chloride	484	200	mg/kg	20	EK41213	11/11/04	11/11/04	EPA 300.0	
SB5 24-25' (4K10003-07) Soil									
Chloride	116	10.0	mg/kg	1	EK41213	11/11/04	11/11/04	EPA 300.0	

Environmental Lab of Texas

E Tech Environmental & Safety Solutions, Inc.	Project:	Hobbs Truckers #2 Brine Station	Fax: 563-2213
P.O. Box 8469	Project Number:	035-387	Reported:
Midland TX, 79708-8469	Project Manager:	Shane Estep	11/15/04 15:08

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EK41102 - Water Extraction										
Blank (EK41102-BLK1)				Prepared &	2 Analyzed:	11/10/04				
Carbonate Alkalinity	ND	0.100	mg/kg				<u></u>	•		
Bicarbonate Alkalinity	ND	2.00	"							
Hydroxide Alkalinity	ND	0.100	"							
Duplicate (EK41102-DUP1)	Sou	rce: 4K10003	-05	Prepared &	2 Analyzed:	11/10/04				
Carbonate Alkalinity	8.00	0.100	mg/kg		8.00			0.00	20	
Bicarbonate Alkalinity	52.0	2,00			52.0			0.00	20	
Hydroxide Alkalinity	0.00	0.100	"		0.00				20	
Reference (EK41102-SRM1)				Prepared &	ک Analyzed	: 11/10/04				
Carbonate Alkalinity	0.0500		mg/kg	0.0500		100	80-120			
Batch EK41201 - General Preparation (F	'rep)									
Blank (EK41201-BLK1)				Prepared:	11/11/04 A	nalyzed: 11	/12/04			
% Moisture	0.0		%			<u>.</u>				
Duplicate (EK41201-DUP1)	Sou	rce: 4K11002	-01	Prepared:	11/11/04 A	nalyzed: 11	/12/04			
% Moisture	15.0		%		15.0		<u></u>	0.00	20	
Batch EK41207 - Water Extraction	<u></u>							<u></u>		
Blank (EK41207-BLK1)				Prepared:	11/10/04 A	nalyzed: 11	1/11/04			
Sulfate	ND	2.50	mg/kg							
Calibration Check (EK41207-CCV1)				Prepared 8	¿ Analyzed:	: 11/11/04				
Sulfate	48.1		mg/kg	50.0		96.2	80-120			

Environmental Lab of Texas

E Tech Environmental & Safety Solutions, Inc.	Project:	Hobbs Truckers #2 Brine Station	Fax: 563-2213
P.O. Box 8469	Project Number:	035-387	Reported:
Midland TX, 79708-8469	Project Manager:	Shane Estep	11/15/04 15:08

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EK41207 - Water Extraction								-		
Duplicate (EK41207-DUP1)	Sou	rce: 4K10003-	-05	Prepared:	11/10/04 A	nalyzed: 11	/11/04			
Sulfate	565	5.00	mg/kg		557			1.43	20	

Environmental Lab of Texas

Project: Hobbs Truckers #2 Brine Station Project Number: 035-387 Project Manager: Shane Estep

Fax: 563-2213
Reported:

11/15/04 15:08

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

		Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

Batch EK41011 - 6010B/No Digestion

Blank (EK41011-BLK1)				Prepared & Ana	lyzed: 11/10/04				
Calcium	ND	0.0100	mg/kg wet						
Magnesium	ND	0.00100	"						
Potassium	ND	0.0500	"						
Sodium	ND	0.0100	"						
Calibration Check (EK41011-CCV1)				Prepared & Ana	lyzed: 11/10/04				
Calcium	2.00		mg/kg	2.00	100	85-115			
Magnesium	2.17		"	2.00	108	85-115			
Potassium	1.76		"	2.00	88.0	85-115			
Sodium	1.76		"	2.00	88.0	85-115			
Duplicate (EK41011-DUP1)	Sour	rce: 4K10003	3-05	Prepared & Ana	lyzed: 11/10/04				
Calcium	161000	1000	mg/kg dry	159	9000		1.25	20	
Magnesium	1970	1.00	n	19	940		1.53	20	
Potassium	210	5.00		2	07		1.44	20	
Sodium	3050	10.0	"	29	980		2.32	20	
Duplicate (EK41011-DUP2)	Sour	rce: 4K09013	3-0 1	Prepared & Ana	lyzed: 11/10/04				
Calcium	18600	100	mg/kg wet	17	100		8.40	20	
Magnesium	390	0.100	"	3	83		1.81	20	
Sodium	853	10.0		7	85		8.30	20	

Environmental Lab of Texas

E Tech Environmental & Safety Solutions, Inc.	Project:	Hobbs Truckers #2 Brine Station	Fax: 563-2213
P.O. Box 8469	Project Number:	035-387	Reported:
Midland TX, 79708-8469	Project Manager:	Shane Estep	11/15/04 15:08

Anions by EPA Method 300.0 - Quality Control

Environmental Lab of Texas

		Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes
Batch EK41213 - General Preparation (Subcontract)									
Blank (EK41213-BLK1)				Prepared &	Analyzed:	11/11/04				
Chloride	ND	10.0	mg/kg							
LCS (EK41213-BS1)				Prepared &	Analyzed:	11/11/04				
Chloride	31.8		mg/L	30.0		106	90-110			
Matrix Spike (EK41213-MS1)	Sour	ce: 4K10003	-01	Prepared &	Analyzed:	: 11/11/04				
Chloride	97.1		mg/L	30.0	74.7	74.7	80-120			S-08
Matrix Spike Dup (EK41213-MSD1)	Sour	ce: 4K10003	-01	Prepared &	Analyzed:	: 11/11/04				
Chloride	106		mg/L	30.0	74.7	104	80-120	8.76	20	

Environmental Lab of Texas

E Tech Environmental & Safety Solutions, Inc. P.O. Box 8469 Midland TX, 79708-8469		Project: Project Number: Project Manager:	Hobbs Truckers #2 Brine Station 035-387 Shane Estep	Fax: 563-2213 Reported: 11/15/04 15:08		
	· · · · · · · · · · · · · · · · · · ·	Notes and De	finitions			
S-08	Value outside Laboratory historical or meth	ood prescribed QC limits.				
DET	Analyte DETECTED					
ND	Analyte NOT DETECTED at or above the report	ing limit				
NR	Not Reported					
dry	Sample results reported on a dry weight basis					

- RPD Relative Percent Difference
- LCS Laboratory Control Spike
- MS Matrix Spike
- Dup Duplicate

Report Approved By:

Raland K troub Date: 11/15/04

Raland K. Tuttle, Lab Manager Celey D. Keene, Lab Director, Org. Tech Director Peggy Allen, QA Officer Jeanne Mc Murrey, Inorg. Tech Director James L. Hawkins, Chemist/Geologist Sandra Sanchez, Lab Tech.

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas

Environmental Lab of Texas Variance / Corrective Action Report – Sample Log-In

A	5 m .		مست	
(lient		Imin	long in	
Cilcinc.				

Date/Time: 11-10-04@ 0850

Order #: _____K10003

Initials: JMM

Sample Receipt Checklist

· · ·

Temperature of container/cooler?	Yes	No	21.S C]
Shipping container/cooler in good condition?	Yes	No	NA	
Custody Seals intact on shipping container/cooler?	Yes	No	Not present N/A	
Custody Seals intact on sample bottles?	Yes	No	Not present>	
Chain of custody present?	(Yes)	No		
Sample Instructions complete on Chain of Custody?	(Yes)	No		
Chain of Custody signed when relinquished and received?	(Yes)	No]
Chain of custody agrees with sample label(s)	Yes	No	NoLabet written or	bag
Container labels legible and intact?	Yes	No	No Label - Writtenon	bag
Sample Matrix and properties same as on chain of custody?	Tes	No		}
Samples in proper container/bottle?	Ves	No		
Samples properly preserved?	Yes	(NO)	SOUTAIK Show	d be @ 4"C
Sample bottles intact?	(es)	No		
Preservations documented on Chain of Custody?	(Ves)	No		
Containers documented on Chain of Custody?	(es)	No]
Sufficient sample amount for indicated test?	Yes	No]
All samples received within sufficient hold time?	Yes	No]
VOC samples have zero headspace?	Yes	No	Not Applicable	Ь

Other observations:

Variance Documentation:

Contact Person: -	Fred Holmes Date/Time: 11-10-04@0930 Contacted by: Reland Tuttle
Regarding:	CO3/HCO3
ter	operature tor SOy + Alkalinity in soil
	÷
Corrective Action	Taken: Cos/HCon
Info	rmed Client Soy + Alkalinity in soil should be & 4'C
Clier	of wishes to controve with analysis
* Jea	me snoke with Fred 11-10-04@0830 to confirm
met	not for chloride on SBS @ 5' is 300.0
Free	I said to run 300.0 on chloride and the rest of anions
Per	requiar anion analytical methods