Uranerz Energy Corporation
(an Energy Fuels Company)
1701 East "E" Street
Casper, WY 82605
307-265-8900
www.energyfuels.com

July 25, 2016

UIC Program Supervisor
DEQ – Water Quality Division
Herschler Building
4W, 122 West 25th Street
Cheyenne, WY 82002

Re: 2nd Quarter 2016 Report, Uranerz Energy Corporation, UIC Class I Permit #10-392

To Whom It May Concern,

WDEQ-WQD UIC Permit #10-392 Section K, *Records and Reports,* requires Uranerz Energy Corporation (Uranerz) to submit quarterly reports to WDEQ-WQD for the UIC Class I wells. Uranerz operated two installed UIC wells, NICH-DW-1 and NICH-DW-4 during the quarter.

Attached, please find the 2nd Quarter 2016 Report.

If you have any questions regarding the provided information, please contact me at 307-232-6680 or by email at bbonifas@energyfuels.com.

Sincerely,

William P. Goranson
Executive Vice President ISR Operations
Uranerz Energy Corporation (an Energy Fuels company)

WG/th

Attachments: 2nd Quarter 2016 Report
Strata Technologies, Inc. Report

cc: Ursula Williams, WDEQ-WQD, District 3

Uranerz Energy Corporation
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UIC Class I Permit 10-392
2nd Quarter 2016 Report

Introduction

Uranerz Energy Corporation (Uranerz) received approval on October 22, 2012 of Class I UIC permit 10-392. Two UIC wells were installed, NICH-DW-1 and NICH-DW-4. NICH-DW-1 was approved for injection on December 5, 2013. NICH-DW-4 was approved for injection on December 20, 2013. The following quarterly reporting requirements are derived from Section K.6 of the UIC permit.

1. Injection Rates

Report the minimum, volume-weighted average and maximum instantaneous injection rate for each well each month of the quarter. The page showing the maximum injection rates shall also show the maximum permitted injection rates for comparison.

Table 1 below is a tabulation of the monthly instantaneous injection rate data for the period.

Table 1: Monthly Instantaneous Injection Rates

Well ID	Month	Minimum Injection (gpm)	Volume-weighted average Injection (gpm)	Maximum Injection (gpm)	Maximum Permitted Injection Rate (gpm)
NICH-DW-1	April	0.2	23.8	56.5	150
	May	0.2	20.0	56.0	
	June	0.2	16.3	59.5	
NICH-DW-4	April	0.2	24.4	64.2	
	May	0.3	21.1	60.4	
	June	0.2	16.1	58.3	

2. Injection Pressures

Report the minimum, average and maximum daily injection pressures for each well for each month of the quarter. Any pressures that activate alarms or kill switches are discussed in Section 7.

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Table 2 below is a tabulation of the daily injection pressure data for each well, each month of the reporting period.

Table 2: Monthly Injection Pressure

Well ID	Month	Minimum Injection (psi)	Average Injection (psi)	Maximum Injection (psi)	Maximum Permitted Injection Pressure (LSIP psi)
NICH-DW-1	April	663.2	987.3	1075.4	1112
	May	826.1	1049.4	1100.4	
	June	916.7	1063.0	1138.6 *	
NICH-DW-4	April	876.3	1019.1	1094.9	1199
	May	898.4	1054.9	1119.9	
	June	922.8	1071.7	1126.7	

* Please refer to Sections 6 and 7 below for a discussion of exceedances

3. Injection Volume

Report the total injection volume in barrels for each month of the quarter, the total for the quarter, and the total cumulative volume of waste injected to date.

Table 3 below is a tabulation of the injection volume data for the period.

Table 3: Total Injection Volumes

Well ID	Month	Total Injection Volume (bbl)	Total Quarterly Volume (bbl)	Total Quarterly Volume (bbl)	Total Cumulative Volume (bbl to date)
NICH-DW-1	April	13761.8	48514.8	102425.0	758840.6
	May	18013.2			
	June	16739.8			
NICH-DW-4	April	17774.3	53910.2		
	May	18175.7			
	June	17960.3			

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4. Annulus Pressure

Report the maximum and minimum annulus pressures for each well, each month of the quarter. Any pressures that activate alarms or kill switches are discussed in section 7.

Table 4 below is a tabulation of the monthly annulus pressure data for the period.

Table 4: Monthly Annulus Pressure

Well ID	Month	Minimum Annulus Pressure (psi)	Maximum Annulus Pressure (psi)	Permitted Annulus Pressure Range (psig)
NICH-DW-1	April	0.1 *	724.6	200-800
	May	384.0	731.0	
	June	224.7	716.4	
NICH-DW-4	April	449.7	484.3	
	May	429.1	493.6	
	June	436.6	475.5	

* Please refer to Sections 6 and 7 below for a discussion of exceedances

5. Analytical Results

Report any quarterly analytical results required by Section I of this permit. Sample collection dates should allow ample time to receive analytical results prior to reporting deadlines.

The Injectate sample was collected on May 25, 2016 and submitted to a third party laboratory for analysis. A copy of the analytical results is attached. NICH-DW-1 and NICH-DW-4 receive waste from the same pipe exiting the plant. Per Section I of the permit, if any group of wells receives waste from the same pipe exiting the plant, a single sample may be collected for that group rather than at the individual well.

6. Permit Exceedances

Report any permit exceedances within the quarter.

Date	Well	Explanation of Exceedance
4/11/2016	NICH-DW-1	Scheduled Maintenance
6/30/2016	NICH-DW-1	Scheduled Shut-down

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7. Events That Triggered Alarms or Shutdowns

Report any events that triggered alarms or shutdowns and the responses taken during the quarter shall be fully described.

There were no unplanned shutdowns during the quarter for either NICH-DW-1 or NICH-DW-4.

On April 11, 2016, there appeared to be a loss of Annulus Pressure at NICH-DW-1 during a scheduled maintenance activity, to repair a small leak on the well's annulus feed line. The well head and annulus were isolated from the rest of the system and the portion of line to be fixed was bled down to 0 psi. Since the well was isolated prior to bleeding the line down, the actual annulus pressure did not go below the permitted 400 psi, however, the pressure transmitter was below 400 psi for approximately 14 minutes. After the repairs were made, the isolation valve for the well's annulus was opened and the pressure transmitter returned to the normal operating value of 434.8 psi.

On June 30, 2016 at approximately 10:32pm a spike of the injection tubing pressure occurred at Deep Disposal Well #1. The recorded injection pressure hit a maximum of 1139 psi at the wellhead's pressure transmitter and the high-high alarm was set off. At this time the deep well injection pump was already shut down due to a command from the plant operator, however the alarm did alert the plant operator and would have automatically shut the injection pump down immediately, had it not already been turned off.

Before the plant operator shut the injection pump down, the well was injecting water at approximately 16 gpm and 1080 psi. As the injection pressure increased above 1080 psi the operator shut the pump off and the wellfield operator went to the disposal well building to bleed off injection pressure from the line and restart the injection pump. Immediately after the wellfield operator began to relieve pressure on the injection line, the check valve at the well head was able to seat completely. It is believed that until the pressure was relieved upstream of the check valve, the differential pressure across the check valve did not allow it to completely close or prevent back flow from the well to the injection pump. The sudden close of the check valve produced a water hammer effect on the fluid between the check valve on the well head, and the well's completion zone. When this water hammer reached the pressure transmitter it recorded a higher than normal, very sudden, pressure spike in the injection tubing at the well's surface.

Previously, water hammer events that produce a pressure spike have occurred during a shutdown of the deep disposal wells. In January 2016, a third party engineer was brought on to investigate the reason behind, and to provide any recommendations to alleviate, the wellhead pressure spikes. The attached report confirms that it is a water hammer event that is occurring when valves are shut too quickly after injecting at a high pressure into the tubing. Please see the attached report from Strata Technologies, Inc.

A few corrective actions have been implemented, such as extending the time in which the injection pump ramps down during a shut down period, and decreasing the high-high pressure value at the injection tubing, to allow for a pressure spike from water hammer without exceeding the permitted conditions. Additional corrective actions, such as a different type of check valve or possibly adding an actuated valve that can be closed slowly, are being investigated and will be tested in the future.

8. Well Tests

Any well tests conducted more than 30 days before the end of the quarter (e.g. mechanical integrity, pressure fall-off, or step rate injection) and reports of well workovers.

There were no well tests or workovers conducted during the quarter.

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Date: 6/13/2016

CLIENT: Energy Fuels (Uranerz Energy Corp)
Project: Nichols Ranch
Lab Order: S1605493

CASE NARRATIVE

Report ID: S1605493001

Samples DDW Injectate, DDW Injectate DUP, and Trip Blank were received on May 26, 2016.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Reviewed by:
Wade Nieuwsma, Assistant Laboratory Manager

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

Company: Energy Fuels (Uranerz Energy Corp)
1701 East "E" Street
Casper, WY 82605

Date Reported 6/13/2016
Report ID S1605493001

ProjectName: Nichols Ranch
Lab ID: S1605493-001
ClientSample ID: DDW Injectate
COC: 165051

WorkOrder: S1605493
CollectionDate: 5/25/2016 1:35:00 PM
DateReceived: 5/26/2016 12:17:00 PM
FieldSampler: CP
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Anions/Cations							
Alkalinity, Total (As CaCO3)	725	mg/L		5	SM 2320B	05/31/2016 1753	IBS
Alkalinity, Bicarbonate as HCO3	885	mg/L		5	SM 2320B	05/31/2016 1753	IBS
Alkalinity, Carbonate as CO3	ND	mg/L		5	SM 2320B	05/31/2016 1753	IBS
Chloride	2190	mg/L		1	EPA 300.0	05/31/2016 1443	AB
Sulfate	513	mg/L		5	EPA 300.0	05/27/2016 1905	AB
General Parameters							
pH	8.0	s.u.		0.1	SM 4500 H B	05/31/2016 1753	IBS
Electrical Conductivity	8330	µmhos/cm		5	SM 2510B	05/31/2016 1753	IBS
Total Dissolved Solids (180)	5100	mg/L		10	SM 2540	05/27/2016 1108	NLG
Specific Gravity	1.00	20℃/4℃		0.01	ASTM D1429-08	05/26/2016 1438	KB
Sulfide as H2S	ND	mg/L		0.01	HACH 8131	05/27/2016 809	KB
Metals - Total							
Arsenic	0.027	mg/L		0.001	EPA 200.8	06/02/2016 1720	MS
Selenium	2.34	mg/L		0.001	EPA 200.8	06/02/2016 1720	MS
Uranium	1.21	mg/L		0.0003	EPA 200.8	06/02/2016 1720	MS
Vanadium	1.43	mg/L		0.005	EPA 200.8	06/02/2016 1720	MS
Radionuclides - Dissolved							
Radium 226	387	pCi/L		0.2	SM 7500 Ra-B	06/06/2016 1703	MB
Radium 226 Precision (±)	2.5	pCi/L			SM 7500 Ra-B	06/06/2016 1703	MB

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL or is less than LCL
O	Outside the Range of Dilutions
X	Matrix Effect
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

Reviewed by:
Wade Nieuwsma, Assistant Laboratory Manager

Sample Analysis Report

Company: Energy Fuels (Uranerz Energy Corp)
1701 East "E" Street
Casper, WY 82605

Date Reported 6/13/2016
Report ID S1605493001

ProjectName: Nichols Ranch
Lab ID: S1605493-002
ClientSample ID: DDW Injectate DUP
COC: 165051

WorkOrder: S1605493
CollectionDate: 5/25/2016 1:35:00 PM
DateReceived: 5/26/2016 12:17:00 PM
FieldSampler: CP
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Anions/Cations							
Alkalinity, Total (As CaCO3)	705	mg/L		5	SM 2320B	05/31/2016 1802	IBS
Alkalinity, Bicarbonate as HCO3	860	mg/L		5	SM 2320B	05/31/2016 1802	IBS
Alkalinity, Carbonate as CO3	ND	mg/L		5	SM 2320B	05/31/2016 1802	IBS
Chloride	2180	mg/L		1	EPA 300.0	05/31/2016 1457	AB
Sulfate	500	mg/L		5	EPA 300.0	05/27/2016 1920	AB
General Parameters							
pH	8.0	s.u.		0.1	SM 4500 H B	05/31/2016 1802	IBS
Electrical Conductivity	8370	µmhos/cm		5	SM 2510B	05/31/2016 1802	IBS
Total Dissolved Solids (180)	5070	mg/L		10	SM 2540	05/27/2016 1109	NLG
Specific Gravity	1.00	20℃/4℃		0.01	ASTM D1429-08	05/26/2016 1439	KB
Sulfide as H2S	ND	mg/L		0.01	HACH 8131	05/27/2016 811	KB
Metals - Total							
Arsenic	0.028	mg/L		0.001	EPA 200.8	06/02/2016 1736	MS
Selenium	2.28	mg/L		0.001	EPA 200.8	06/02/2016 1736	MS
Uranium	1.12	mg/L		0.0003	EPA 200.8	06/02/2016 1736	MS
Vanadium	1.36	mg/L		0.005	EPA 200.8	06/02/2016 1736	MS
Radionuclides - Dissolved							
Radium 226	423	pCi/L		0.2	SM 7500 Ra-B	06/06/2016 1703	MB
Radium 226 Precision (±)	2.6	pCi/L			SM 7500 Ra-B	06/06/2016 1703	MB

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

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- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- X Matrix Effect
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits

Reviewed by:
Wade Nieuwsma, Assistant Laboratory Manager

Sample Analysis Report

Company: Energy Fuels (Uranerz Energy Corp)
1701 East "E" Street
Casper, WY 82605

Date Reported 6/13/2016
Report ID S1605493001

ProjectName: Nichols Ranch
Lab ID: S1605493-003
ClientSample ID: Trip Blank
COC: 165051

WorkOrder: S1605493
CollectionDate: 5/25/2016 1:35:00 PM
DateReceived: 5/26/2016 12:17:00 PM
FieldSampler: CP
Matrix: Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Anions/Cations							
Alkalinity, Total (As CaCO3)	ND	mg/L		5	SM 2320B	05/31/2016 1810	IBS
Alkalinity, Bicarbonate as HCO3	ND	mg/L		5	SM 2320B	05/31/2016 1810	IBS
Alkalinity, Carbonate as CO3	ND	mg/L		5	SM 2320B	05/31/2016 1810	IBS
Chloride	ND	mg/L		1	EPA 300.0	05/27/2016 1934	AB
Sulfate	ND	mg/L		5	EPA 300.0	05/27/2016 1934	AB
General Parameters							
pH	6.4	s.u.		0.1	SM 4500 H B	05/31/2016 1810	IBS
Electrical Conductivity	ND	µmhos/cm		5	SM 2510B	05/31/2016 1810	IBS
Total Dissolved Solids (180)	ND	mg/L		10	SM 2540	05/27/2016 1110	NLG
Specific Gravity	1.00	20℃/4℃		0.01	ASTM D1429-08	05/26/2016 1440	KB
Sulfide as H2S	ND	mg/L		0.01	HACH 8131	05/27/2016 813	KB
Metals - Total							
Arsenic	ND	mg/L		0.001	EPA 200.8	06/02/2016 1741	MS
Selenium	ND	mg/L		0.001	EPA 200.8	06/02/2016 1741	MS
Uranium	ND	mg/L		0.0003	EPA 200.8	06/02/2016 1741	MS
Vanadium	ND	mg/L		0.005	EPA 200.8	06/02/2016 1741	MS
Radionuclides - Dissolved							
Radium 226	0.3	pCi/L		0.2	SM 7500 Ra-B	06/06/2016 1703	MB
Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	06/06/2016 1703	MB

These results apply only to the samples tested.

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- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- X Matrix Effect
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits

Reviewed by: _____
Wade Nieuwsma, Assistant Laboratory Manager

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ANALYTICAL QC SUMMARY REPORT

CLIENT: Energy Fuels (Uranerz Energy Corp)
Work Order: S1605493
Project: Nichols Ranch

Date: 6/13/2016
Report ID: S1605493001

Alkalinity Sample Type **MBLK** Units: mg/L

BLANK (05/31/16 17:12) Analyte	RunNo: 134676 Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Alkalinity, Total (As CaCO3)	ND	5					

Alkalinity Sample Type **LCS** Units: mg/L

ATQC (05/31/16 17:02) Analyte	RunNo: 134676 Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Alkalinity, Total (As CaCO3)	609	5	595		102	90 - 110	

Alkalinity Sample Type **DUP** Units: mg/L

S1605509-002AD (05/31/16 20:45) Analyte	RunNo: 134676 Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
Alkalinity, Bicarbonate as HCO3	619	5	540	13.6		20	
Alkalinity, Carbonate as CO3	31	5	32	0.422		20	
Alkalinity, Total (As CaCO3)	559	5	495	12.2		20	

Conductivity Sample Type **MBLK** Units: µmhos/cm

BLANK (05/31/16 17:12) Analyte	RunNo: 134676 Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Electrical Conductivity	ND	5					

Conductivity Sample Type **LCS** Units: µmhos/cm

ATQC (05/31/16 17:02) Analyte	RunNo: 134676 Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Electrical Conductivity	1030	5	1060		96.7	90 - 110	

Conductivity Sample Type **DUP** Units: µmhos/cm

S1605498-001AD (05/31/16 18:57) Analyte	RunNo: 134676 Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
Electrical Conductivity	2200	5	2220	0.905		20	

Qualifiers:

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H	Holding times for preparation or analysis exceeded
L	Analyzed by another laboratory
O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits
E	Value above quantitation range
J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
X	Matrix Effect

ANALYTICAL QC SUMMARY REPORT

CLIENT: Energy Fuels (Uranerz Energy Corp)
Work Order: S1605493
Project: Nichols Ranch

Date: 6/13/2016
Report ID: S1605493001

Anions by ION Chromatography Sample Type **MBLK** Units: mg/L

BLK (05/26/16 09:18)	RunNo: 134525						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Chloride	ND	1					
Sulfate	ND	1					

Anions by ION Chromatography Sample Type **LCS** Units: mg/L

DIONEX (05/26/16 09:34)	RunNo: 134525						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Chloride	30	1	30		101	90 - 110	
Sulfate	146	1	150		97.5	90 - 110	

Anions by ION Chromatography Sample Type **MS** Units: mg/L

S1605334-005ASPK (05/27/16 21:33)	RunNo: 134525						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Chloride	998	1	918	22	106	80 - 120	
Sulfate	12400	1	6890	4520	114	80 - 120	

Anions by ION Chromatography Sample Type **MSD** Units: mg/L

S1605334-005ASPKD (05/27/16 21:48)	RunNo: 134525						
Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
Chloride	1000	1	998	0.625	107	20	
Sulfate	12300	1	12400	0.685	113	20	

Radium 226 in Water - Dissolved Sample Type **MBLK** Units: pCi/L

MB-1611 (06/06/16 14:49)	RunNo: 134912	PrepDate: 06/01/16 0:00			BatchID: 11845		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Radium 226 (Dissolved)	ND	0.2					

Radium 226 in Water - Dissolved Sample Type **LCS** Units: pCi/L

LCS-1611 (06/06/16 14:49)	RunNo: 134912	PrepDate: 06/01/16 0:00			BatchID: 11845		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Radium 226 (Dissolved)	5.3	0.2	5.54		96.1	67.1 - 122	

Radium 226 in Water - Dissolved Sample Type **LCSD** Units: pCi/L

LCSD-1611 (06/06/16 14:49)	RunNo: 134912	PrepDate: 06/01/16 0:00			BatchID: 11845		
Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
Radium 226 (Dissolved)	5.9	0.2	5.3	10.8	107	20	

Radium 226 in Water - Dissolved Sample Type **MS** Units: pCi/L

S1605512-003E MS (06/06/16 17:03)	RunNo: 134912	PrepDate: 06/01/16 0:00			BatchID: 11845		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Radium 226 (Dissolved)	17.2	0.2	5.54	10.9	113	65 - 131	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by another laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits	X	Matrix Effect

ANALYTICAL QC SUMMARY REPORT

CLIENT: Energy Fuels (Uranerz Energy Corp)
Work Order: S1605493
Project: Nichols Ranch

Date: 6/13/2016
Report ID: S1605493001

Solids By SM 2540 Sample Type **MBLK** Units: mg/L

DI (05/27/16 10:39)	RunNo: 134789						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Total Dissolved Solids (180)	ND	10					

Solids By SM 2540 Sample Type **LCS** Units: mg/L

CONTROL (05/27/16 10:40)	RunNo: 134789						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Total Dissolved Solids (180)	220	10	226		99.1	90 - 110	

Solids By SM 2540 Sample Type **DUP** Units: mg/L

S1605482-008A (05/27/16 10:51)	RunNo: 134789						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
Total Dissolved Solids (180)	8480	10	8460	0.236		20	

Sulfide by HACH 8131 Sample Type **MBLK** Units: mg/L

BLANK (05/27/16 08:05)	RunNo: 134514						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Sulfide as H2S	ND	0.01					

Sulfide by HACH 8131 Sample Type **LCS** Units: mg/L

QC (05/27/16 08:07)	RunNo: 134514						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Sulfide as H2S	0.38	0.01	0.452		84.4	80 - 120	

Sulfide by HACH 8131 Sample Type **MS** Units: mg/L

S1605493-003E (05/27/16 08:15)	RunNo: 134514						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Sulfide as H2S	0.39	0.01	0.452	ND	87.2	70 - 130	

Sulfide by HACH 8131 Sample Type **MSD** Units: mg/L

S1605493-003E (05/27/16 08:17)	RunNo: 134514						
Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
Sulfide as H2S	0.40	0.01	0.39	1.07	88.2	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by another laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits	X	Matrix Effect

ANALYTICAL QC SUMMARY REPORT

CLIENT: Energy Fuels (Uranerz Energy Corp)
Work Order: S1605493
Project: Nichols Ranch

Date: 6/13/2016
Report ID: S1605493001

Total (200.2) Metals by EPA 200.8 - Water Sample Type **MBLK** Units: mg/L

MB-11819 (06/02/16 16:59)	RunNo: 134778	PrepDate: 05/31/16 7:20			BatchID: 11819		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Arsenic	ND	0.005					
Selenium	ND	0.005					
Uranium	ND	0.0003					
Vanadium	ND	0.02					

Total (200.2) Metals by EPA 200.8 - Water Sample Type **LCS** Units: mg/L

LCS-11819 (06/02/16 17:04)	RunNo: 134778	PrepDate: 05/31/16 7:20			BatchID: 11819		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Arsenic	0.203	0.005	0.2		102	85 - 115	
Selenium	0.398	0.005	0.4		99.4	85 - 115	
Uranium	0.197	0.0003	0.2		98.3	85 - 115	
Vanadium	0.19	0.02	0.2		93.3	85 - 115	

Total (200.2) Metals by EPA 200.8 - Water Sample Type **MS** Units: mg/L

S1605512-001DS (06/02/16 18:14)	RunNo: 134778	PrepDate: 05/31/16 7:20			BatchID: 11819		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Arsenic	0.200	0.005	0.2	ND	97.5	70 - 130	
Selenium	0.409	0.001	0.4	ND	102	70 - 130	
Uranium	0.237	0.0003	0.2	0.0151	111	70 - 130	
Vanadium	0.22	0.02	0.2	ND	110	70 - 130	

Total (200.2) Metals by EPA 200.8 - Water Sample Type **MSD** Units: mg/L

S1605512-001DMSD (06/02/16 18:19)	RunNo: 134778	PrepDate: 05/31/16 7:20			BatchID: 11819		
Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
Arsenic	0.199	0.005	0.200	0.258	97.3	20	
Selenium	0.410	0.001	0.409	0.400	103	20	
Uranium	0.240	0.0003	0.237	1.20	113	20	
Vanadium	0.22	0.02	0.22	0.794	109	20	

pH Water Sample Type **LCS** Units: s.u.

ATQC (05/31/16 17:02)	RunNo: 134676						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
pH	8.9	0.1	8.6		104	90 - 110	

pH Water Sample Type **DUP** Units: s.u.

S1605509-002AD (05/31/16 20:45)	RunNo: 134676					
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
pH	8.8	0.1	8.8	0.0584		20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by another laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits	X	Matrix Effect

Inter-Mountain Labs
Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

Page of

All shaded fields must be completed.
This is a legal document: any misrepresentation may be construed as fraud.

165051

Client Name	Project Identification	Sampler (Signature/Attestation of Authenticity)	Telephone #
URANERZ (ENERGY FUELS)	NICHOLS RANCH		

Report Address	Contact Name
1701 EAST E. STREET CASPER, WY 82601	CHUCK PATTERSON Email CPATTERSON@ENERGYFUELS.COM Phone 307-232-6625

Invoice Address	Purchase Order #	Quote #
SAME AS ABOVE		

ANALYSES / PARAMETERS

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	SEE ATTACHED	REMARKS
1	1516054982-001	5-25-16	1335	DDW INJECTATE	WT	1	X	
2	002	5-25-16	1335	DDW INJECTATE DUP	WT	1	X	
3	003	5-25-16	1335	TRIP BLANK	WT	1	X	
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)	DATE	TIME
5.4°	CHUCK PATTERSON	5-25-16	1836	Kathy Boop	5.26.16	12:17

SHIPPING INFO	MATRIX CODES		TURNAROUND TIMES	COMPLIANCE INFORMATION		ADDITIONAL REMARKS
☐ UPS	Water	WT	Check desired service	Compliance Monitoring?	Y / N	
☐ Fed Express	Soil	SL	☐ Standard turnaround	Program (SDWA, NPDES,...)		
☐ US Mail	Solid	SD	☐ RUSH - 5 Working Days	PWSID / Permit #		
☐ Hand Carried	Filter	FT	☐ URGENT - < 2 Working Days	Chlorinated?	Y / N	
☐ Other _____	Other	OT	*Rush & Urgent Surcharges will be applied*	Sample Disposal: Lab	Client	

WDEQ : 501-461-4485

DDW Injectate

Table 9. Analyte and Parameter List for Quarterly Analyses of Injectate

EPA Analytical Method	Analyte or Parameter	CAS Number
SM2550 B	Temperature	None
120.1 or SM2510 B	Specific Conductance at 25 C	None
SM4500-H+ B	pH	None
none listed	Specific Gravity	None
160.1 or SM2540 C	Total Dissolved Solids	None
SM2320 B	Bicarbonate	71-52-3
SM2320 B	Carbonate	3812-32-6
300.0 or 300.1	Chloride, Total	16887-00-6
300.0, 300.1, or 375.2	Sulfate, Total	14808-79-8
SM4500-S2-D, SM4500-S2-G	Hydrogen Sulfide	7783-06-4
206.5, 200.7, or 200.8	Arsenic, Total	7440-38-2
200.7 or 200.8	Selenium, Total	7782-49-2
200.7 or 200.8	Vanadium, Total	7440-62-2
908.1 or 200.8	Uranium, Total	7440-61-1
903.1	^{226}Radium (picoCuries/liter)	7440-14-4

500 raw

125 mL (lab to prese

250 nitric

1 L

Note: Methods preceded by "SM" are standard methods.

Limiting Concentrations of Injectate - Analyte and parameter limits for this permit are listed in **Table 10**. The upper and lower control limits and concentrations of pH must remain within the range indicated in **Table 10**. Exceedances of these values are a violation of this permit and require notification under Section K of this permit.

Table 10. Control Limits for Injected Waste

Analyte or Parameter	Upper Control Limit
pH	2.0 < pH < 11 s.u.

J. Sampling and Test Procedures

The following units are to be used where applicable: pounds (mass) per square inch for pressure with gage or absolute pressure noted (psig or psia); standard oil field barrels (bbl, equivalent to 42 gallons) for fluid volume; standard oil field barrels per day (bbl/day) for fluid flow rates; milligrams per liter (mg/L) for analyte concentrations, except for pH, which is to be reported in standard units (s.u.) and except for radium, radioactive strontium isotopes, and gross alpha particle radioactivity, which are to be reported in picoCuries per liter (pCi/L). The permittee may report equivalent quantities in other units in addition to those above.

Procedures and methods for sample collection and analyses shall be implemented by the permittee to ensure that the samples are representative of the groundwater, water, or waste being sampled (Chapter 13, Section I-(a))

Strata Technologies, llc

Christine Schlagenhaufer
Uranerz Energy Corporation
485 Red Springs Rd.
Lynch, WY 82640

January 19, 2016

Re: Observations Pertaining to Deep Well #1

Dear Ms. Schlagenhaufer:

I have given consideration to some of the operational records for the facility Deep Well No. 1 (DW-1) Class I injection well, and have several observations and conclusions. These observations and conclusions are based on 25 years' experience with injection well systems of all classification, as well as academic research. I received information from your company pertaining to certain aspects of the well, and I have used this information in my analysis.

Analysis Information and Goals

Specifically, you asked me for an opinion regarding two events where the measured wellhead injection tubing pressure appeared to have "spiked" following a shutdown of the injection pump in DW-1. Additionally, you asked for recommendations to alleviate the increased pump suction pressure after injection into the well is ceased.

Methodology, Results and Recommendations

I have employed the flow rate and pressure trend charts covering the events in question on November 26 and November 29, 2015. Additionally, I have used information off of the wellbore diagram (tubing diameter, depths and materials). These are indicated on the injection well trend charts as the pressure "spikes" on November 27 and November 29, 2015 when the injection pump was shut down, as shown in Figure 1 (attached).

The pressure spike analysis employs basic principles of fluid mechanics, specifically fluid and material deformation resulting from water hammer phenomena as applied to DW-1. The increased pump suction piping events are indicated on Figure 1, and are evident during periods when the injection pump is shut down and the injection flowline is statically balanced with the well shut-in pressure (exerted from formation backpressure). The analysis and observations regarding this suction line pressure buildup are based on my own experience with injection well systems including: the suction feed line, filtration equipment, charge pump, injection pump, flowline, valving, flow and pressure control and drive motor.

Pressure Spikes

In short, the brief injection tubing pressure "spikes" on November 26 and November 29 are a result of water hammer which occurred after the injection pump motor was shut down and the injection flowrate rapidly decreased from approximately 18 gallons per minute to zero. This is clearly evidenced on the injection well trends which show that the pressure spike occurred when the injection pump was shut down.

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Water hammer can be created whenever the momentum of a fluid moving through a conduit is changed, such as what would occur in an injection well when the flow rate is suddenly decreased (or increased). In the case of DW-1, water is being injected into the well at a certain rate, and then the flow is suddenly interrupted when the pump is shut down. This change in momentum propagates a wave through the water column and injection tubing, down to the bottom of the well, and back up to the surface. This reflected wave is what has been recorded on the injection pressure gauge. The water hammer pressure spike is not observed on all of the shutdown events, probably due to the sampling rate of the pressure instrumentation and recording device. Furthermore, the water hammer pressure spike is greater at higher flow rate changes, and in situations when the preceding injection pressure is high. I have included a detailed discussion of water hammer phenomena and how it applies in this case in Attachment A. In this analysis, I calculate a pressure increase due to water hammer of 76 psi, which appears to be slightly over the 60 psi increase obtained from the chart, but nonetheless close to what the injection pressure trend on the chart indicates. The actual pressure spike would be expected to be less due to system dampening from open perforations and pipe diameter changes.

Water hammer can be alleviated by the installation of a pulsation dampener in the flowline on the discharge side of the pump. However, the pressure spike in DW-1 is relatively low, therefore the effectiveness of a dampener to reduce the pressure spike is not certain. The use of a pulsation dampener would require consultation with the pump supplier to ensure an optimal solution, and to avoid possible damage to the pump. In injection well systems equipped with a variable frequency drive (VFD), the injection rate can be "stepped down" and thereby lessen the magnitude of the water hammer significantly.

Pressure Increases at Injection Pump Suction

As for increased pressure on the injection pump suction side, this appears to be a combination of injection line pressure at the time that injection is shut down, and the locations of the check valves in the flowline. It is my understanding that there is one check valve in the flowline between the pump discharge and the well, and one check valve in the pump suction line between the filtration equipment and pump. When the well is operating under pressure (as opposed to vacuum conditions), the line pressure on either side of the flowline check valve is essentially equal, and it is precisely equal just after injection into the well is ceased. Trapped pressure between the check valve and pump discharge can bleed back through the pump and into the suction line. It appears further that the check valve in the pump suction line is functioning properly, otherwise this pressure could propagate back into the filtration equipment, which I understand is not rated for the pressures recorded in the pump suction line. One remedy would be to install a pressure relief valve (PRV) in the pump suction line. The PRV would be set at some pressure above the maximum operating suction line pressure, and well below the shut-in buildup pressures that have been observed. If the check valve in the flowline downstream of the pump is functioning properly, the pressure would be relieved

immediately. If this check valve is leaking, the pressure would continue to bleed into the PRV. In most cases, the PRV has attached piping that routes excess water to a sump. Alternatively, a needle valve could be installed in the suction line and pressure could be manually relieved, however, this would require prompt attention by the well operator to be standing by when the pump is shut down.

It is my pleasure to assist you in your injection well system analysis, and I look forward to working with you again. I hope that this analysis provides some value to you and your organization in your evaluation of the injection well system. Please call me with any questions or comments at (512) 914-8590.

Sincerely

Mike Johnson
Technical Manager
Strata Technologies, LLC

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Uranerz Energy Corporation
DW-4

Water Hammer Analysis

I) Water Hammer Analysis

Water hammer is a term used to describe, among other things, the effects which may occur whenever there is a change in the displacement rate (momentum) of a fluid moving within a conduit. In general, water hammer effects arise from incremental stresses imparted on a fluid when it is deformed. Consider the case where flow is suddenly stopped at the end of a pipe while fluid is moving through its length. For a brief time, fluid at the other end of the pipe continues to move forward even though the flow has stopped at the other end, resulting in the fluid deformation. The net result is that a pressure wave is propagated back through the fluid at some speed. In general, the wave moves at the speed of sound within a specified fluid contained within a specified conduit. This wave speed has several uses and can be used to calculate the pressure increase from the deformation of the fluid. In some cases, the results of the propagated pressure wave can result in a catastrophic failure of the conduit through a material yield (burst pipe or shattered fittings, for example).

Water hammer phenomena can be derived using the basic fluid mechanics principles of continuity (conservation of mass) and momentum (Newton's second law of motion). The resulting governing equations can then be used to determine the pressure increase arising from a water hammer within a pipe. A water hammer "pressure wave" propagates within a specified pipe and fluid at the speed of sound within the pipe, which is almost always much greater than the speed of the fluid moving within the pipe, just before flow is interrupted. Here, the speed of sound will be referred to as the wave celerity, and will be specified for both the fluid medium (water) and pipe material (steel).

A) Methodolgy

There are several methods available for calculating pressure increases due to water hammer. The method employed here is derived from the basic fluid mechanical principles of continuity and momentum.[1,2] There are no empirical constants or rules of thumb, i.e., the result can be calculated purely through thermodynamic and materials properties using continuity and momentum. The dimension for each parameter is defined below. The equations require that a consistent set of units be specified to ensure a correct result.

Wave Celerity

The wave celerity for water is calculated through the following equation:

$$C_W = \sqrt{\frac{E_W}{\rho_W}} \qquad \ldots (i)$$

Where,

Cw = wave celerity in water (speed of sound in water); {Length per Time};
Ew = bulk modulus of elasticity for water; {Force per Length^2}
= 313,000 psi = 4.5072 x 10^7 lb/ft^2 (for water)
ρw = density of water; {Mass per L^3}
= 1.94 slugs/ft^3 (for water at standard conditions)

In the case of a non-rigid, elastic, deformable pipe material (which is almost always the case), the wave celerity in the steel pipe is a function of the wave celerity for water (as calculated above) and the properties of the fluid and steel. The wave celerity in steel is given by:

$$Cp = \frac{Cw}{\sqrt{1 + \frac{EwD}{Ep\tau}}} \qquad \ldots (ii)$$

Where,

Cp = wave celerity in the steel pipe (speed of sound in pipe); {Length per Time};
Ew = bulk modulus of elasticity for water; {Force per Length^2}
= 313,000 psi = 4.5072 x 10^7 lb/ft^2
Ep = bulk modulus of elasticity for steel; (psi)
= 30,000,000 psi = 4.322 x 10^9 lb/ft^2
D = inside diameter of pipe; {Length}
τ = wall thickness of pipe; {Length}

Cycle Time

Expressions (*i*) and (*ii*) defined above can be used to calculate the speed of the pressure wave for a specified fluid moving through a specified pipe. The magnitude of a water hammer, in terms of pressure increase, is a strong function of the time duration for which the flow is interrupted (valve closure time). The terms "rapid" and "slow" closure are quantitative, and depend on the length of the pipe and its own wave celerity. The term "cycle time" is used to determine the whether a valve closure time is "rapid" or "slow", and is given through the equation:

$$Tcycle = \frac{2L}{Cp} \qquad \ldots (iii)$$

Where,

$Tcycle$ = closure cycle time {Time};
L = length ; {Length}
Cp = wave celerity in the steel pipe (speed of sound in pipe); {Length per Time}

Pressure Increase Due to Water Hammer

Using the wave celerities, and an evaluation of the valve closure time and cycle time in equations (*i*), (*ii*) and (*iii*) above, the pressure increase due to water hammer can be determined. It is important to evaluate whether the closure is "rapid" or "slow" because this determines the methodology used to calculate the pressure increase. In this analysis, it is assumed that closure is "rapid"; that the time used to shut down injection is less than the cycle time for a given situation. In doing this, the pressure increase due to water hammer is maximized, regardless of the closure time, and can be determined by:

$$\Delta P = \rho V Cp \qquad \ldots (iv)$$

Where,

ΔP = pressure increase {Force per Length^2};
ρ = fluid density; {Mass per Length^3}
V = fluid velocity {Length/Time}
Cp = wave celerity in the steel pipe (speed of sound in pipe); {Length per Time}

Summary

Using equations (*i*) – (*iv*) above, and assuming that the valve closure is "rapid" the pressure increase due to water hammer can be determined for any specified fluid (modulus of elasticity, density), through a specified piping conduit (modulus of elasticity, diameter, and wall thickness), and for any specified flow rate.

B) Water Hammer Analysis Uranerz Energy Corporation DW-4

The methodology developed above can be applied to virtually any situation, including the Uranerz Energy Corporation DW-4, provided the various fluid and materials properties are known. In this case, the valve closure is assumed to occur at the point of interest within the well (bottom of well), as well as within the injection pump at the surface. An example of sudden valve closure at the pump could be shutting down the pump by turning off power to the pump, thereby stopping flow in the downstream direction.

Any assumptions made below will be justified or presented as worst-case, in order to provide the maximum pressure increase due to a water hammer. It is stipulated that the water hammer exerted from the Hornet packer at 7,508 feet and the injection well at the surface (at the check valve flowline).

From information provided by you or otherwise assumed:

Well Depth	=	8,870 feet
Tubing size	=	2.875" (OD), 6.5 lb/ft, steel tubing
Tubing ID	=	2.441 in. [3]
Wall thickness	=	0.217 in. [3]
Injection Fluid	=	fresh water (assumed)

Injection Rate = 18 gallons per minute (injection rate just before the two events)
= 0.0421 cubic feet per second

Note: 1 slug = 1 lb_f–sec^2/ft

The fluid velocity inside the tubing (just before the flow "shuts off") is required to complete the analysis:

V= Injection Rate / Cross-Sectional Area of Tubing (ID)
= 0.0402 / ((π*ID^2/4)/144 in^2/ft^2) (ft^3/sec) / ft^2)
= 1.24 ft/sec

Under equations (*i*) – (*iii*) above and inserting the parameters as appropriate:

Cw = wave celerity in water
= 4,820 feet/sec.

Cp = wave celerity in the tubing
= 4,560 feet/sec.

Tcycle = 3.9 sec (rapid closure condition is probably correct)

Therefore, the pressure increase due to water hammer at the packer can now be calculated using equation (*iv*):

ΔP = pressure increase = 76 psi

This pressure change is added to the instantaneous shut-in pressure (ISIP) just before the water hammer. As an example, if the ISIP is 1,050 psig, then the pressure at the observation point combined with the water hammer would be 1,026 psig. It can be noted that the injection well system contains "dampeners" which reduce the magnitude of the water hammer pressure increase. Changes in tubing diameter, presence of perforations, entrained vapor (air or natural gas) all tend to reduce the actual water hammer pressure increase.