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LOST CREEK ISR, LLC

December 5, 2017

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington D.C. 20555-0001

Re: Response to NRC RAIs 20-26 on LC East and KM Amendments
Lost Creek ISR Project License SUA-1598: Docket 040-09068

To Whom It May Concern,

Lost Creek ISR, LLC received a letter from NRC dated October 30, 3017 that included a third subset Request for Additional Information (RAI) comprised of RAI 20-26 associated with the KM Horizon and Lost Creek East and Amendment Application. This submittal and enclosure are in reply to the request and provides responses and, in some cases, revised pages to the original Amendment Application.

Let me know if you have any questions regarding this submittal.

Sincerely,

Michael D. Gaither
Manager EHS and Regulatory Affairs
Ur-Energy USA, Inc.

Cc: Deputy Director, Division of Decommissioning
Uranium Recovery and Waste Programs
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
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NM5501

Request for Additional Information
Lost Creek KM Horizon and Lost Creek East Amendment Application
RAIs 20-26

RAI-20 Explanation of Water Levels at and in the Vicinity of Well M-N3

Description of Deficiency

Page 27 of Section D6 of the LCEAA lists well M-N3 well as an "N" Horizon well. Table D6.2-1 lists well M-N3 as an "M/N" completion. The Well Completion Report for well M-N3 depicts/lists the completion interval as the M Horizon. Page 30 of Section D6 of the LCEAA lists well M-N3 as a background sampling well for the "N" Horizon well but further states that the water quality results from wells M-N3 and M-N5a are not considered representative because of inadequate purging and future sampling will be conducted. Page 17 of Section D6 of the LCEAA as well as Page 7 of Attachment D6-4 states that head in the KM Horizon is 6 to 135 feet higher than that in the underlying N Horizon; however, Table 2.1 of Attachment D6-4 lists a maximum of 111.45 feet difference between wells M-KM9 and M-N4. If well M-N3 were to be included in Table 2-1, the difference in head between well M-KM7 and M-N3 would be 135 feet, consistent with the maximum listed in the text.

Table 2.7-6 of the LMA lists well M-N3 as an "N" completion horizon. Table 2.7-6 lists the water elevation at this well at 6765.83 feet above mean sea level (ft-amsl) on February 8, 2012 and 6711.33 on March 10, 2014. The KMA lists the depth to water at this well below 6711.33 for measurements between November 5, 2013 and March 10, 2014 though most measurements were taken in one month (November 2013) (page 246 of 576 of ADAMS Volume 4). In addition water levels at well LC27M appear higher that in the past (6820.9 ft-amsl in 2014(?) versus 6796.23 ft-amsl in 2008). Consistent with that expected for confined conditions without any induced stresses, the fluctuations at most other wells are less than a few feet.

Basis for RAI

NUREG-1569 Section 2.7.2 provides guidance on the following areas of review:
"At a minimum, the reviewer should evaluate whether the applicant has developed an acceptable conceptual model of the site hydrology and whether the conceptual model is adequately supported by the data presented in the site characterization. To this end, the reviewer should: 3) Evaluate the site hydrogeologic conceptual model for ground-water flow in potentially affected aquifers. Review available data from well logs and hydrologic tests and measurements to obtain confidence that sufficient data have been collected and that the data support the applicant's hydrologic conceptual model for groundwater flow within and around the permit boundary. The applicant's interpretation of ground-water hydraulic gradients (used to infer flow direction), horizontal · hydraulic conductivity, and the thickness, areal extent, and vertical hydraulic conductivity of confining formations should be evaluated. Examine pumping tests, analyses, and/or other measurement techniques used to determine the hydrologic properties of the local aquifers and aquitards that affect or may be affected by the proposed in

situ leach activities. Also examine pumping tests that are used to investigate vertical confinement or hydraulic isolation between the ore production zone and upper and lower aquifers."

Formation of RAI

a) Please correct the narrative and tables as to the finding of whether well M-N3 is an "M", "M/N" or "N" well. If well M-N3 is an "M" well, then the text, tables and figures need to be revised accordingly.

b) Please provide a historic summary of water fluctuations at all wells and LCI's explanation for any abnormal behavior.

RESPONSE:

a) The well M-N3 is actually completed in the "M" Horizon. The horizon information was corrected on the following text pages or tables:
   i. App D6 pages 16, 27, 30
   ii. Table D6.2-1
   iii. Table D6.2-2
   iv. Attachment D6-4 Text page 7
   v. Att D6-4 Table 3-1
   vi. Att D6-4 Tables Table 6-2

b) Table 2.7-6 data was reviewed, errors were corrected, and some additional data was added.

   Some entries on the table were in error and have been corrected and some outliers were removed likely due to field measurement error. The measurements for M-N3 varied widely, most of which have been rejected, and warrant new measurement for establishment of baseline. A recent measurement was taken at M-N3 in November 2017 to verify the validity of previous measurements. Additional measurements will be obtained until sufficient data has been collected to establish ambient water levels. Additional historical data for several of the wells was added to the table to provide a more complete history of the water level behavior.

   The groundwater elevation in 2008 for LC27M was an apparent error based on an incorrect measuring point elevation as revealed by more recent survey data and the contour interval on the map. Only LC27M was affected and the groundwater elevation has been corrected. However, the correction of the groundwater elevation has also affected the groundwater elevation contouring on Figure 2.7-10.5 which was corrected and a replacement provided. With the corrections made to the table, therefore, there are no significant fluctuations (i.e. on the order of approximately 10 to 20 feet) in water levels of note.

RAI-21 Extraneous Heading in Table 2.7-4

Description of Deficiency

On page 2 of Table 2.7-4 of the KMA, a heading is listed for "Major Ions-Dissolved" but the lines after that are obscured. It appears to be a carry-over from Page 1 of Table 2.7-4.

Basis for RAI

Section 10 CFR 40.9 states: "Information provided to the Commission by an applicant shall be complete and accurate in all material respects.

Formation of RAI

Please confirm that the table does not obscure information.

RESPONSE:
The table reviewed and determined that no information was obscured. However, a replacement table (Table 2.7-4) was produced.

RAI-22 Used of the Term "ND" in Table 2.7-4

Description of Deficiency

Table 2.7-4 of the KMA lists "ND" as the concentration below the laboratory detection limit. A value should be included for the reader to understand the quantifiable levels.

Basis for RAI

Section 10 CFR 40.9 states: "Information provided to the Commission by an applicant shall be complete and accurate in all material respects.

Formation of RAI

Please add the detection limits for the reported ND's.

RESPONSE:

There seems to be an error in the reference. There were no NDs on Table 2.7-4. However, there were no detection limits included for the "ND" entries on Table 2.7-14. The entries were revised and a replacement table (Table 2.7-14) was produced.

RAI-23 Representative Water Quality at BLM Well 4451

Description of Deficiency

Table 2.7-15 lists water quality results of BLM well 4451 as an "N" well. However, in 2013 LCI investigation demonstrated that the well was block or was originally screened at a shallow depth (240 feet) inconsistent with the reported 900-foot depth. In any event, the water quality from a well that may have caved in over 700 feet may not be indicative of the water quality at depth even if the well was originally 900 feet deep.

Basis for RAI

Section 10 CFR 40.9 states: "Information provided to the Commission by an applicant shall be complete and accurate in all material respects.

Formation of RAI

Please provide justification for listing BLM Well 4451 as an "N" well when LCI's information indicate possible inconsistencies.

RESPONSE:

The horizon for the data set will be designated as "unknown" until such time that an investigation can reveal the actual aquifer horizon that groundwater collected represents. A corrected Table 2.7-15 is provided.

RAI-24 lack of Current Seismological Information

Description of Deficiency

Seismology of the area is discussed in Section 2.6.3 of the KMA. However, the section only includes discussions of documents dated in 2002 and a figure from the original application with data up to 2007. The discussion includes no information on the current seismic activity.

Basis for RAI

Section 10 CFR 40.9 states: "Information provided to the Commission by an applicant shall be complete and accurate in all material respects.

Formation of RAI

Please provide a discussion of the current seismological data.

RESPONSE:

The history of earthquakes in Wyoming since 2007 were researched and an update section has been added to TR 2.6.3.

RAI-25 Discrepancy in Thickness of KM Unit in Analyses

Description of Deficiency

KM Amendment Volume 1, electronic Attachment 2.7-2, contains a pdf of LOST CREEK HYDROLOGIC TEST COMPOSITE KLM HORIZON PUMP TESTS KPW-2 AND KPW-1A JUNE-JULY 2009. The Theis curve fitting plot for KPW-1A {pdf page 87 of 97) indicates a KM aquifer thickness of 90 feet. This thickness is used to calculate the hydraulic conductivity of the tested formation. On the other hand, Table 7-2, and other curve fitting plots, within this report indicates that the analyses were based on a KM thickness of 115 feet.

Basis for RAI

Section 10 CFR 40.9 states: "Information provided to the Commission by an applicant shall be complete and accurate in all material respects.

Formation of RAI

Please resolve this discrepancy throughout the attachment and main body of the application as necessary.

RESPONSE:

Petrotek was consulted and the entry of 90 ft on the aquifer thickness for KPW-01A on the Theis curve (pdf page 87 of 97) was found to be in error as well as the hydrologic conductivity value for KPW-1A on Table 7-2. The errors were corrected and the replacement pages provided. The error did not affect the conclusions of the report.

RAI-26 Reclamation and Decommissioning of Processing and Support Facilities

Description of the Deficiency

The reclamation and decommissioning plan for the LCEAA, as provided in section RP 4.0, "Reclamation and Decommissioning of Processing and Support Facilities," in volume 3 of the LC East Amendment Technical Report (January 2017), incorporates by reference section 6.4, "Post Reclamation and Decommissioning Radiological Surveys" of the approved Technical Report for the Lost Creek site. However, the approved soil cleanup criteria were not based on section 6.4 but on a revised reclamation and decommissioning plan as approved by License Amendment No. 1 (ML 13016A069). The supporting Safety Evaluation Report (ML 13038A325) to Amendment No. 1 documented an approved interim soil cleanup criteria for natural uranium of 240 pCi/g for spills of thickener and yellowcake, and 90 pCi/g for spills of pregnant lixiviant and loaded resin. The soil cleanup criterion for radium-226 was 1.8 pCi/g for spills or pregnant lixiviant and loaded resin. The approved interim criteria are not included in Section 6.4, but are listed in Table 4.2-2, "Summary of Initial Soil Cleanup Criteria," of the approved technical report for the cleanup of spills on soils.

It is the NRC staff's assumption that LCI does not propose to revise the existing RESRAD model or interim soil cleanup criteria that were approved in License Amendment No. 1. If correct, then the reference to section 6.4 of the Technical Report is incomplete.

Basis for Request

NUREG-1569 Acceptance Criterion 6.4.3(1) states that cleanup criteria for radium in soils are met as provided in 10 CFR Part 40, Appendix A, Criterion 6(6).

NUREG-1569 Acceptance Criterion 6.4.3(3) states that cleanup criteria for uranium in soil, such as those in Appendix E of this standard review plan (the radium benchmark dose approach of 10 CFR Part 40, Appendix A, Criterion 6(6)) are acceptable.

NUREG-1569 Acceptance Criterion 6.4.3(4) states that, for areas that already meet the radium cleanup criteria but that still have elevated thorium levels, the applicant should propose an acceptable cleanup criterion for thorium-230. One acceptable criterion is a concentration that, combined with the residual concentration of radium-226, would result in the radium concentration (residual and from thorium decay) that would be present in 1,000 years meeting the radium cleanup standard.

Request for Additional Information

a) Please confirm that the approved interim soil cleanup criteria for natural uranium and radium will be applied to spills during operations at the Lost Creek East expansion area.

b) In addition, please confirm that you will develop soil cleanup criteria for the final decommissioning plan that accounts for all radionuclides of interest (e.g., uranium, thorium-230, and radium-226) as required by the above acceptance criteria in NUREG-1569.

RESPONSE:

a) LCI will review background soil data for LCE after it has been collected and analyzed to determine if a new RESRAD model will be needed to establish interim cleanup criteria. A RESRAD model will be used to determine interim cleanup criteria.

b) LCI commits to evaluating Th-230, Ra-226, uranium, and any other radionuclides of interest pursuant to NUREG-1569 6.4.3(4) to establish cleanup criteria for decommissioning as will be detailed in the final decommissioning plan.

Summary of Page Changes Associated with
Request for Additional Information 20-26
Lost Creek KM Horizon and
Lost Creek East Amendment Application

RAI	Document	Revised Document	Comments
20a	LCE TR Appendix D6	Appendix D6 Text pages 16, 27, 30	Replace pages
		Table D6.2-1	Replace table
		Table D6.2-2	Replace table
		Attachment D6-4 text page 7	Replace page
		Attachment D6-4 Table 3-1	Replace entire table
		Attachment D6-4 Table 6-2	Replace entire table
20b	KMA Section 2.7	Table 2.7-6	Replace table
		Figure 2.7-10.5	Replace figure
21	KMA Section 2.7	Table 2.7-4	Replace table
22	KMA Section 2.7	Table 2.7-14	Replace entire table
23	KMA Section 2.7	Table 2.7-15	Replace table pages 5-8
24	KMA Section 2.6	Section 2.6 Table of Contents and pages 20-24	Replace pages. Added earthquake update.
25	KMA Section 2.7	Attachment 2.7-2 Theis curve plot for KPW-1A	Replace plot
		Table 7-2	Replace table
26	N/A	N/A	

from 0.005 ft/ft to 0.015 ft/ft (29 to 79 ft/mile) in the Project Area (**Attachment D6-4, Figure 2-6**).

KM Horizon

Based on potentiometric surface elevations, the direction of groundwater flow within the KM Horizon is predominantly to the west-southwest. Calculated hydraulic gradients range from 0.009 ft/ft to 0.018 ft/ft (49 to 95 ft/mile) in the Project Area (**Attachment D6-4, Figure 2-7**).

L Horizon

Based on potentiometric surface contours shown on **Plate 2-1** in **Attachment D6-5**, the direction of groundwater flow within the L Horizon is predominantly to the south-southwest. The calculated hydraulic gradient ranges from approximately 0.016 ft/ft to 0.020 ft/ft (87 to 105 ft/mile) across the project area. Note that the groundwater gradient and flow direction are based on only three data points spread over three miles and bisected by numerous faults. Accordingly, the resulting gradient appears excessively large and the direction of flow does not conform to the regional conceptual model. As additional L Horizon monitor wells are installed in conjunction with the construction of mine units, the gradient and flow direction will likely change. Hence, **Plate 2-1** should be considered conceptual at best.

N Horizon

There are five N Horizon monitoring wells located in LCE. During the compilation of this report, it was discovered that monitor wells M-N2 and M-N3 are completed in both the M and N Horizons or M Horizon (**Attachment D6-2, Well Completion Reports**). Therefore, the static water elevation in these two wells is not believed to be representative. However, the MN Shale that typically separates the two Horizons is not well defined at these well locations; thus, the M and N Horizons are likely in hydraulic communication. Nevertheless, the static water level in monitor well M-N3 does not fit the regional trend and was therefore not used in constructing the potentiometric surface map (**Attachment D6-4, Figure 2-8**). Subsequent hydrologic investigations will attempt to resolve the water level anomaly and better define the N Horizon potentiometric surface.

Vertical Hydraulic Gradients

Vertical hydraulic gradients were determined by measuring water levels in closely grouped wells completed in different hydrostratigraphic units. **Figure D6.2-1** shows the location of the well groups used for the assessment of vertical hydraulic gradients Vertical hydraulic gradient from the FG to the HJ Horizon were evaluated at four locations where there were FG Horizon well completions, gradients from the HJ to the KM Horizon were evaluated at eight locations and at five locations for the KM to N Horizon calculation. **Table 2-1, Attachment D6-4** summarizes the calculated vertical gradients between the FG, HJ, KM

D6.4.2.2 Groundwater Quality Sampling Results

Background Sampling 2012/2013

LC ISR, LLC began background sampling in December 2012 at the following 20 locations:

- FG Horizon Monitor Wells: M-FG1 and M-FG2;
- HJ Horizon Monitor Wells: M-HJ1, M-HJ2A, M-HJ3, M-HJ4, M-HJ5, M-HJ6, and M-HJ7D;
- KM Horizon Monitor Wells: M-KM4A, M-KM5A, M-KM6, M-KM7, M-KM8, M-KM9 and M-KM10; and
- N Horizon Monitor Wells: M-N2, M-N4 and M-N5A.

Following the 2013 monitor well installations, sampling commenced in December 2013 at these four wells:

- FG Horizon Monitor Well: M-FG5;
- HJ Horizon Monitor Well: M-HJ8;
- KM Horizon Monitor Well: M-KM11A; and
- N Horizon Monitor Well: M-N6.

Background Sampling 2016

Following the 2016 monitor well installations, sampling commenced in September 2016 at the following three wells:

- L Horizon Monitor Wells: M-L7, M-L9, and M-L11A.

Only one round of sampling was completed in 2016; however, additional quarterly sampling will continue into 2017.

Results of the LC ISR, LLC background monitoring program are summarized in **Table D6.4-1**. The raw laboratory data was downloaded to the CD disk found in **Attachment D6-3**. In **Table D6.4-1**, those parameters that exceed specific WDEQ-WQD standards or EPA MCL criteria are shown in bold and color coded to the specific WQD or EPA criteria they exceed. **Table D6.4-2** presents the state Class-of-Use and federal Drinking Water Criteria for specific groundwater parameters.

A summary of water quality analytical results for each hydrostratigraphic Horizon of interest (FG, HJ, KM, L and N Horizons) is presented below.

N Horizon Water Quality

Four wells completed in the N Horizon were included in the background sampling program (M-N2, M-N4, M-N5A and M-N6). Sample analytical results from background monitor wells are presented in **Table D6.4-1**. Analytical results from baseline monitor well M-N5A is not considered representative due to inadequate well purging prior to sample collection. Accordingly, the results are excluded from the following discussion. In future sampling events, the submersible sampling pumps in this well will be lowered to increase submergence thus allowing for more purge time.

Background sampling results indicate that the N Horizon monitor wells are calcium-bicarbonate to calcium-sulfate type water. The chloride levels in all wells are low; less than 5 mg/L. With the exception of four pH sample results and one iron sample result, none of the remaining inorganic parameters exceeded the WDEQ or EPA criteria.

None of the background water sample results exceeded the Gross Alpha WDEQ Class I Standard or EPA MCL criteria of 15.0 pCi/L. Only one water sample from monitor well M-N6 exceeded the uranium EPA MCL criteria (0.03 mg/L). All three N Horizon monitor well water samples exceeded the WDEQ Class I Standard (5.0 pCi/L) for radium 226+228.

Summary of Site Groundwater Quality

The Piper diagram shown on **Figure D6.4-1** presents the average background groundwater quality for all quarterly sampling events from the FG, HJ, KM and N Horizon monitor wells. The Piper diagram compares the average water quality between the individual Horizons. The Piper diagram shown on **Figure D6.4-2** presents the average water quality for the L, M, MN and N Horizons. The plots show that there isn't much difference in groundwater geochemistry between the various Horizons. Groundwater contained in the shallow Battle Spring aquifers that underlie the Permit Amendment Area is a calcium-sulfate to calcium-bicarbonate type water. There is some variability in water chemistry when the wells are compared individually, but those differences don't change the overall groundwater character type.

In summary, the concentration of trace constituents, boron, cadmium, chromium, copper, mercury, molybdenum, nickel, and vanadium were at or less than the detection limits for all samples analyzed. TDS, iron and sulfate values are relatively low, with occasional exceedances of WDEQ Class I Standards. Twenty-three out of 25 wells reported TDS and sulfate concentrations less than their respective Class I Standards. Iron exceeded the WDEQ Class I Standard and EPA MCL in two FG monitor wells (M-FG1 and M-FG5), two KM monitor wells (M-KM8 and M-KM9), one L Horizon well (M-L11A), and one N monitor well (M-N6). Selenium was elevated in excess of state and federal standards in three different Horizon monitor wells.

Table D6.2-1 Well Completion Information (Page 1 of 2)

Well ID	Well Type	Completion Horizon	NAD 83 Northing	NAD 83 Easting	Distance from Pumping Well (ft)	Ground Elevation (ft amsl)	MP Elev. (ft amsl)	Depth To SWL[1] (ft TOC)	SWL Elev. (ft amsl)	Screened Interval (ft bgs)	Total Screen Length (ft)
Northern Cluster Monitor Wells											
M-KM9	Pumping Well	KM	604,036.79	2,229,994.86	0	7092.31	7,094.98	144.32	6,950.66	285-370	85
M-HJ6	Overlying Obs. Well	HJ	604,051.04	2,230,244.38	250	7,094.37	7,097.16	141.35	6,955.81	153-240	87
M-N4	Underlying Obs. Well	N	604,174.64	2,230,126.67	191	7,095.74	7,098.83	259.62	6,839.21	615-650	35
M-KM10	Observation Well	KM	608,598.34	2,229,803.58	4,566	7,148.44	7,150.80	164.14	6,986.66	220-285	65
M-N5A	Underlying Obs. Well	N	608,449.31	2,229,938.28	4,413	7,150.57	7,153.29	253.42	6,899.87	550-580	30
M-HJ5	Overlying Obs. Well	HJ	601,893.94	2,226,868.24	3,790	7,045.52	7,047.52	135.75	6,911.77	220-300	80
M-KM8	Observation Well	KM	601,980.87	2,226,775.70	3,820	7,045.45	7,047.95	159.36	6,888.59	340-420	80
M-FG2	Overlying Obs. Well	FG	598,179.70	2,225,723.62	7,249	7,004.00	7,004.42	109.80	6,894.62	180-210	30
M-HJ4	Overlying Obs. Well	HJ	598,329.96	2,225,724.97	7,127	7,006.34	7,006.89	127.55	6,879.34	245-340	95
M-KM7	Observation Well	KM	598,334.23	2,225,536.77	7,238	6,998.43	6,999.20	152.60	6,846.60	380-460	80
M-N3	Underlying Obs. Well	M	598,178.32	2,225,539.26	7,360	7,001.02	7,003.33	292.00	6,711.33	660-700	40
LC27M	Observation Well	KM	599,720.80	2,221,566.14	9,469	7,009.95	7,012.32	191.38	6,820.94	433-456	23
Center Cluster Monitor Wells											
M-KM7	Pumping Well	KM	598,334.23	2,225,536.77	0	6,998.43	6,999.20	152.6	6846.60	380-460	80
M-FG2	Overlying Obs. Well	FG	598,179.70	2,225,723.62	242	7,004.00	7,004.42	109.80	6,894.62	180-210	30
M-HJ4	Overlying Obs. Well	HJ	598,329.96	2,225,724.97	188	7,006.34	7,006.89	127.55	6,879.34	245-340	95
M-N3	Underlying Obs. Well	M	598,178.32	2,225,539.26	156	7,001.02	7,003.33	292.00	6,711.33	660-700	40
M-HJ5	Overlying Obs. Well	HJ	601,893.94	2,226,868.24	3,801	7,045.52	7,047.52	135.75	6,911.77	220-300	80
M-KM8	Observation Well	KM	601,980.87	2,226,775.70	3,851	7,045.45	7,047.95	159.36	6,888.59	340-420	80
MB-08	Overlying Obs. Well	FG	599,682.73	2,221,637.15	4,126	7,008.94	7,010.40	171.85	6,838.55	230-260	30
MB-09	Overlying Obs. Well	HJ	599,729.08	2,221,601.97	4,175	7,010.34	7,012.19	184.44	6,827.75	340-370	30
LC27M	Observation Well	KM	599,720.80	2,221,566.14	4,206	7,009.95	7,012.32	191.38	6,820.94	433-456	23
South Cluster Monitor Wells											
M-KM4A	Pumping Well	KM	591,042.42	2,217,802.71	0	6,896.27	6,897.94	161.20	6,736.74	365-450	85
M-FG1	Overlying Obs. Well	FG	590,915.99	2,217,934.64	183	6,899.01	6,901.90	124.10	6,777.80	150-190	40
M-HJ1	Overlying Obs. Well	HJ	590,917.89	2,217,809.69	125	6,895.97	6,897.55	149.82	6,747.73	220-340	120
M-N2	Underlying Obs. Well	M/N	591,019.25	2,217,935.84	135	6,901.42	6,904.27	173.94	6,730.33	659-720	61
M-HJ2A	Overlying Obs. Well	HJ	590,894.76	2,218,596.42	807	6,902.03	6,904.25	155.62	6,748.63	213-340	127
M-KM5A	Observation Well	KM	591,006.21	2,218,600.20	798	6,904.56	6,906.91	170.37	6,736.54	370-470	100
M-HJ3	Overlying Obs. Well	HJ	590,830.74	2,214,766.97	3,043	6,893.52	6,895.47	157.66	6,737.81	250-370	120
M-KM6	Observation Well	KM	590,941.64	2,214,767.41	3,037	6,891.63	6,894.09	163.58	6,730.51	400-500	100
M-FG5	Overlying Obs. Well	FG	593,787.33	2,218,219.75	2,776	6,928.59	6,930.05	133.64	6,796.41	268-300	32
M-HJ8	Overlying Obs. Well	HJ	593,693.99	2,218,207.02	2,682	6,926.92	6,929.86	166.15	6,763.71	327-430	103
M-KM11A	Observation Well	KM	593,775.19	2,218,048.35	2,744	6,927.20	6,930.39	175.17	6,755.22	475-585	110
M-N6	Underlying Obs. Well	N	593,682.11	2,218,050.04	2,651	6,926.19	6,928.58	190.27	6,738.31	790-865	75

Table D6.2-1 Well Completion Information (Page 2 of 2)

Well ID	Well Type	Completion Horizon	NAD 83 Northing	NAD 83 Easting	Distance from Pumping Well (ft)	Ground Elevation (ft amsl)	MP Elev. (ft amsl)	Depth To SWL[1] (ft TOC)	SWL Elev. (ft amsl)	Screened Interval (ft bgs)	Total Screen Length (ft)
Center Cluster Monitor Wells											
M-HJ4	Pumping Well	HJ	598,329.96	2,225,724.97	0	7,006.34	7,006.89	127.55	6,879.34	245-340	95
M-FG2	Overlying Obs. Well	FG	598,179.70	2,225,723.64	150	7,004.00	7,004.42	109.80	6,894.62	180-210	30
M-KM7	Underlying Obs. Well	KM	598,334.23	2,225,536.77	188	6,998.43	6,999.20	152.60	6,846.60	380-460	80
M-N3	Underlying Obs. Well	M	598,178.32	2,225,539.26	240	7,001.02	7,003.33	292.00	6,711.33	660-700	40
M-HJ5	Observation Well	HJ	601,893.94	2,226,868.24	3,743	7,045.52	7,047.52	135.75	6,911.77	220-300	80
M-KM8	Underlying Obs. Well	KM	601,980.87	2,226,775.70	3,799	7,045.45	7,047.95	159.36	6,888.59	340-420	80
MB-08	Overlying Obs. Well	FG	599,682.73	2,221,637.15	4,306	7,008.94	7,010.40	171.85	6,838.55	230-260	30
MB-09	Observation Well	HJ	599,729.08	2,221,601.97	4,354	7,010.34	7,012.19	184.44	6,827.75	340-370	30
LC27M	Underlying Obs. Well	KM	599,720.80	2,221,566.14	4,385	7,009.95	7,012.32	191.38	6,820.94	433-456	23
South Cluster Monitor Wells											
M-HJ1	Pumping Well	HJ	590,917.89	2,217,809.69	0	6,895.97	6,897.55	149.82	6,747.73	220-340	120
M-FG1	Overlying Obs. Well	FG	590,915.99	2,217,934.64	125	6,899.01	6,901.90	124.10	6,777.80	150-190	40
M-KM4A	Underlying Obs. Well	KM	591,042.42	2,217,802.71	125	6,896.27	6,897.94	161.2	6,736.74	365-450	85
M-N2	Underlying Obs. Well	M/N	591,019.25	2,217,935.84	162	6,901.42	6,904.27	173.94	6,730.33	659-720	61
M-HJ2A	Observation Well	HJ	590,894.76	2,218,596.42	787	6,902.03	6,904.25	155.62	6,748.63	213-340	127
M-KM5A	Underlying Obs. Well	KM	591,006.21	2,218,600.20	795	6,904.56	6,906.91	170.37	6,736.54	370-470	100
M-HJ3	Observation Well	HJ	590,830.74	2,214,766.97	3,044	6,893.52	6,895.47	157.66	6,737.81	250-370	120
M-KM6	Underlying Obs. Well	KM	590,941.64	2,214,767.41	3,042	6,891.63	6,894.09	163.58	6,730.51	400-500	100
M-FG5	Overlying Obs. Well	FG	593,787.33	2,218,219.75	2,899	6,928.59	6,930.05	133.64	6,796.41	268-300	32
M-HJ8	Observation Well	HJ	593,693.99	2,218,207.02	2,804	6,926.92	6,929.86	166.15	6,763.71	327-430	103
M-KM11A	Underlying Obs. Well	KM	593,775.19	2,218,048.35	2,867	6,927.20	6,930.39	175.17	6,755.22	475-585	110
M-N6	Underlying Obs. Well	N	593,682.11	2,218,050.04	2,775	6,926.19	6,928.58	190.27	6,738.31	790-865	75

Notes:
amsl = above mean sea level
bgs = below ground surface
ft = feet
NAD = North American Datum
MP = Measurement Point
[1] = Measurements 3/10/2014

Table D6.2-2 - Well Completion Information By Cluster - L Horizon Tests (2016)

Well ID	Well Type	Completion Horizon	NAD 83 Northing	NAD 83 Easting	Distance from Pumping Well (ft)	Ground Elevation (ft amsl)	MP Elev. (ft amsl)	Depth To SWL[1] (ft MP)	SWL[1] Elev. (ft amsl)	Screened Interval (ft bgs)	Total Screen Length (ft)
Northern Cluster Monitor Wells											
M-L7	Pumped Well	L	603,999.5	2,230,186.3	0	7,088.68	7,090.18	154.97	6,935.21	400-500	100
M-KM9	Overlying Obs. Well	KM	604,036.8	2,229,994.9	195	7,092.31	7,094.98	142.25	6,952.73	285-370	85
M-L6	Observation Well	L	604,040.0	2,230,042.8	149	7,087.86	7,089.81	158.04	6,931.77	433-443	10
M-N4	Underlying Obs. Well	N	604,174.6	2,230,126.7	185	7,095.74	7,098.83	258.85	6,839.98	615-650	35
Center Cluster Monitor Wells											
M-L9	Pumped Well	L	598,363.2	2,225,592.7	0	7,000.26	7,001.86	173.39	6,828.47	510-570	60
M-KM7	Overlying Obs. Well	KM	598,334.2	2,225,536.8	63	6,998.43	6,999.20	153.74	6,845.46	380-460	80
M-KM8	Overlying Obs. Well	KM	601,980.9	2,226,775.7	3,806	7,045.45	7,047.95	158.35	6,889.60	340-420	80
LC27M	Overlying Obs. Well	KM	599,720.8	2,221,566.1	4,249	7,009.95	7,012.32	191.95	6,820.37	433-456	23
MB11	Observation Well	L	599,739.4	2,221,626.9	4,198	7,010.38	7,012.60	202.00	6,810.60	560-590	30
M-L8	Observation Well	L	598,293.8	2,225,494.7	120	6,997.10	6,998.12	174.57	6,823.55	535-555	20
M-N3	Underlying Obs. Well	M	598,178.3	2,225,539.3	192	7,001.02	7,003.33	271.75	6,731.58	660-700	40
South Cluster Monitor Wells											
M-L11A	Pumped Well	L	591,077.01	2,218,613.1	0	6,906.85	6,909.13	173.28	6,735.85	505-565	60
M-KM4A	Overlying Obs. Well	KM	591,042.4	2,217,802.7	811	6,896.27	6,897.94	162.45	6,735.49	365-450	85
M-KM5A	Overlying Obs. Well	KM	591,006.2	2,218,600.2	72	6,904.56	6,906.91	169.97	6,736.94	370-470	100
M-L10	Observation Well	L	591,183.4	2,217,999.1	623	6,904.06	6,906.21	172.22	6,733.99	520-540	20
M-N2	Underlying Obs. Well	N	591,019.3	2,217,935.8	680	6,901.42	6,904.27	172.88	6,731.39	659-720	61

[1]SWL = Static Water Level

[1]TOC = Top of Casing

MP = Measuring Point

amsl = Above Mean Sea Level

bgs = Below Ground Surface

2.3.3 KM Horizon

Based on potentiometric surface elevations, the direction of groundwater flow within the KM Horizon is predominantly to the west-southwest. Calculated hydraulic gradients range from approximately 0.009 ft/ft to 0.018 ft/ft (49 to 95 ft/mile) in the project area (**Figure 2-7**).

2.3.4 N Horizon

There are only four N Horizon monitoring wells located in LCE. During the compilation of this report, it was discovered that monitor wells M-N2 and M-N3 are completed in both the M and N Horizons or M Horizon (Well Completion Logs, Appendix A). Therefore, the static water elevation in these two wells is not believed to be representative. However, the MN Shale that typically separates the two Horizons is not well defined at these well locations; thus the M and N Horizons are likely in hydraulic communication (Petrotek, 2013). Nevertheless, the static water level in monitor well M-N3 does not fit the regional trend and was therefore not used in constructing the potentiometric surface map (**Figure 2-8**). Subsequent hydrologic investigations will attempt to resolve the water level anomaly and better define the N Horizon potentiometric surface.

2.4 VERTICAL HYDRAULIC GRADIENT

Vertical hydraulic gradient between the FG, HJ, KM and N Horizons were calculated at various locations across the property; the results of which are summarized in **Table 2-1**. Vertical hydraulic gradient from the FG to the HJ Horizon were evaluated at four locations where there were FG Horizon well completions. Gradients from the HJ to the KM Horizon were evaluated at eight locations. Five locations were evaluated for the KM to N Horizon calculation. The following summarizes the general head differentials observed in all LCE monitored Horizons.

- Head in the FG Horizon is approximately 10 to 32 feet higher than in the underlying HJ Horizon;
- Head in the HJ Horizon is from 5 to 33 feet higher than in the underlying KM Horizon; and
- Head in the KM Horizon is from 6 to 111 feet higher than in the underlying N Horizon.

Results are consistent with the regional conceptual model of decreasing heads with depth indicating proximity to areas of recharge in this portion of the Battle Spring Formation.

Table 3-1 Well Completion Information (Page 1 of 2)

Well ID	Well Type	Completion Horizon	NAD 83 Northing	NAD 83 Easting	Distance from Pumping Well (ft)	Ground Elevation (ft amsl)	MP Elev. (ft amsl)	Depth To SWL[1] (ft TOC)	SWL Elev. (ft amsl)	Screened Interval (ft bgs)	Total Screen Length (ft)
Northern Cluster Monitor Wells											
M-KM9	Pumping Well	KM	604,036.79	2,229,994.86	0	7092.31	7,094.98	144.32	6,950.66	285-370	85
M-HJ6	Overlying Obs. Well	HJ	604,051.04	2,230,244.38	250	7,094.37	7,097.16	141.35	6,955.81	153-240	87
M-N4	Underlying Obs. Well	N	604,174.64	2,230,126.67	191	7,095.74	7,098.83	259.62	6,839.21	615-650	35
M-KM10	Observation Well	KM	608,598.34	2,229,803.58	4,566	7,148.44	7,150.80	164.14	6,986.66	220-285	65
M-N5A	Underlying Obs. Well	N	608,449.31	2,229,938.28	4,413	7,150.57	7,153.29	253.42	6,899.87	550-580	30
M-HJ5	Overlying Obs. Well	HJ	601,893.94	2,226,868.24	3,790	7,045.52	7,047.52	135.75	6,911.77	220-300	80
M-KM8	Observation Well	KM	601,980.87	2,226,775.70	3,820	7,045.45	7,047.95	159.36	6,888.59	340-420	80
M-FG2	Overlying Obs. Well	FG	598,179.70	2,225,723.62	7,249	7,004.00	7,004.42	109.80	6,894.62	180-210	30
M-HJ4	Overlying Obs. Well	HJ	598,329.96	2,225,724.97	7,127	7,006.34	7,006.89	127.55	6,879.34	245-340	95
M-KM7	Observation Well	KM	598,334.23	2,225,536.77	7,238	6,998.43	6,999.20	152.60	6,846.60	380-460	80
M-N3	Underlying Obs. Well	M	598,178.32	2,225,539.26	7,360	7,001.02	7,003.33	292.00	6,711.33	660-700	40
LC27M	Observation Well	KM	599,720.80	2,221,566.14	9,469	7,009.95	7,012.32	191.38	6,820.94	433-456	23
Center Cluster Monitor Wells											
M-KM7	Pumping Well	KM	598,334.23	2,225,536.77	0	6,998.43	6,999.20	152.6	6846.60	380-460	80
M-FG2	Overlying Obs. Well	FG	598,179.70	2,225,723.62	242	7,004.00	7,004.42	109.80	6,894.62	180-210	30
M-HJ4	Overlying Obs. Well	HJ	598,329.96	2,225,724.97	188	7,006.34	7,006.89	127.55	6,879.34	245-340	95
M-N3	Underlying Obs. Well	M	598,178.32	2,225,539.26	156	7,001.02	7,003.33	292.00	6,711.33	660-700	40
M-HJ5	Overlying Obs. Well	HJ	601,893.94	2,226,868.24	3,801	7,045.52	7,047.52	135.75	6,911.77	220-300	80
M-KM8	Observation Well	KM	601,980.87	2,226,775.70	3,851	7,045.45	7,047.95	159.36	6,888.59	340-420	80
MB-08	Overlying Obs. Well	FG	599,682.73	2,221,637.15	4,126	7,008.94	7,010.40	171.85	6,838.55	230-260	30
MB-09	Overlying Obs. Well	HJ	599,729.08	2,221,601.97	4,175	7,010.34	7,012.19	184.44	6,827.75	340-370	30
LC27M	Observation Well	KM	599,720.80	2,221,566.14	4,206	7,009.95	7,012.32	191.38	6,820.94	433-456	23
South Cluster Monitor Wells											
M-KM4A	Pumping Well	KM	591,042.42	2,217,802.71	0	6,896.27	6,897.94	161.20	6,736.74	365-450	85
M-FG1	Overlying Obs. Well	FG	590,915.99	2,217,934.64	183	6,899.01	6,901.90	124.10	6,777.80	150-190	40
M-HJ1	Overlying Obs. Well	HJ	590,917.89	2,217,809.69	125	6,895.97	6,897.55	149.82	6,747.73	220-340	120
M-N2	Underlying Obs. Well	M/N	591,019.25	2,217,935.84	135	6,901.42	6,904.27	173.94	6,730.33	659-720	61
M-HJ2A	Overlying Obs. Well	HJ	590,894.76	2,218,596.42	807	6,902.03	6,904.25	155.62	6,748.63	213-340	127
M-KM5A	Observation Well	KM	591,006.21	2,218,600.20	798	6,904.56	6,906.91	170.37	6,736.54	370-470	100
M-HJ3	Overlying Obs. Well	HJ	590,830.74	2,214,766.97	3,043	6,893.52	6,895.47	157.66	6,737.81	250-370	120
M-KM6	Observation Well	KM	590,941.64	2,214,767.41	3,037	6,891.63	6,894.09	163.58	6,730.51	400-500	100
M-FG5	Overlying Obs. Well	FG	593,787.33	2,218,219.75	2,776	6,928.59	6,930.05	133.64	6,796.41	268-300	32
M-HJ8	Overlying Obs. Well	HJ	593,693.99	2,218,207.02	2,682	6,926.92	6,929.86	166.15	6,763.71	327-430	103
M-KM11A	Observation Well	KM	593,775.19	2,218,048.35	2,744	6,927.20	6,930.39	175.17	6,755.22	475-585	110
M-N6	Underlying Obs. Well	N	593,682.11	2,218,050.04	2,651	6,926.19	6,928.58	190.27	6,738.31	790-865	75

Table 3-1 Well Completion Information (Page 2 of 2)

Well ID	Well Type	Completion Horizon	NAD 83 Northing	NAD 83 Easting	Distance from Pumping Well (ft)	Ground Elevation (ft amsl)	MP Elev. (ft amsl)	Depth To SWL[1] (ft TOC)	SWL Elev. (ft amsl)	Screened Interval (ft bgs)	Total Screen Length (ft)
Center Cluster Monitor Wells											
M-HJ4	Pumping Well	HJ	598,329.96	2,225,724.97	0	7,006.34	7,006.89	127.55	6,879.34	245-340	95
M-FG2	Overlying Obs. Well	FG	598,179.70	2,225,723.64	150	7,004.00	7,004.42	109.80	6,894.62	180-210	30
M-KM7	Underlying Obs. Well	KM	598,334.23	2,225,536.77	188	6,998.43	6,999.20	152.60	6,846.60	380-460	80
M-N3	Underlying Obs. Well	M	598,178.32	2,225,539.26	240	7,001.02	7,003.33	292.00	6,711.33	660-700	40
M-HJ5	Observation Well	HJ	601,893.94	2,226,868.24	3,743	7,045.52	7,047.52	135.75	6,911.77	220-300	80
M-KM8	Underlying Obs. Well	KM	601,980.87	2,226,775.70	3,799	7,045.45	7,047.95	159.36	6,888.59	340-420	80
MB-08	Overlying Obs. Well	FG	599,682.73	2,221,637.15	4,306	7,008.94	7,010.40	171.85	6,838.55	230-260	30
MB-09	Observation Well	HJ	599,729.08	2,221,601.97	4,354	7,010.34	7,012.19	184.44	6,827.75	340-370	30
LC27M	Underlying Obs. Well	KM	599,720.80	2,221,566.14	4,385	7,009.95	7,012.32	191.38	6,820.94	433-456	23
South Cluster Monitor Wells											
M-HJ1	Pumping Well	HJ	590,917.89	2,217,809.69	0	6,895.97	6,897.55	149.82	6,747.73	220-340	120
M-FG1	Overlying Obs. Well	FG	590,915.99	2,217,934.64	125	6,899.01	6,901.90	124.10	6,777.80	150-190	40
M-KM4A	Underlying Obs. Well	KM	591,042.42	2,217,802.71	125	6,896.27	6,897.94	161.2	6,736.74	365-450	85
M-N2	Underlying Obs. Well	M/N	591,019.25	2,217,935.84	162	6,901.42	6,904.27	173.94	6,730.33	659-720	61
M-HJ2A	Observation Well	HJ	590,894.76	2,218,596.42	787	6,902.03	6,904.25	155.62	6,748.63	213-340	127
M-KM5A	Underlying Obs. Well	KM	591,006.21	2,218,600.20	795	6,904.56	6,906.91	170.37	6,736.54	370-470	100
M-HJ3	Observation Well	HJ	590,830.74	2,214,766.97	3,044	6,893.52	6,895.47	157.66	6,737.81	250-370	120
M-KM6	Underlying Obs. Well	KM	590,941.64	2,214,767.41	3,042	6,891.63	6,894.09	163.58	6,730.51	400-500	100
M-FG5	Overlying Obs. Well	FG	593,787.33	2,218,219.75	2,899	6,928.59	6,930.05	133.64	6,796.41	268-300	32
M-HJ8	Observation Well	HJ	593,693.99	2,218,207.02	2,804	6,926.92	6,929.86	166.15	6,763.71	327-430	103
M-KM11A	Underlying Obs. Well	KM	593,775.19	2,218,048.35	2,867	6,927.20	6,930.39	175.17	6,755.22	475-585	110
M-N6	Underlying Obs. Well	N	593,682.11	2,218,050.04	2,775	6,926.19	6,928.58	190.27	6,738.31	790-865	75

Notes:
amsl = above mean sea level
bgs = below ground surface
ft = feet
NAD = North American Datum
MP = Measurement Point
[1] = Measurements 3/10/2014

Table 6-2 - Observed Drawdown (Page 1 of 3)

KM Horizon Test

Well ID	Well Type	Completion Horizon	Distance from Pumping Well (ft)	Maximum Drawdown* (ft)
M-KM9	Pumping Well	KM	0	94.9
Northern Cluster Monitor Wells				
M-HJ6	Overlying Obs. Well	HJ	249	0
M-N4	Underlying Obs. Well	N	180	-0.35
M-KM10	Observation Well	KM	4,551	0
M-N5A	Underlying Obs. Well	N	4,451	0
M-HJ5	Overlying Obs. Well	HJ	3,799	0
M-KM8	Observation Well	KM	3,828	1.65
M-FG2	Overlying Obs. Well	FG	7,261	0
M-HJ4	Overlying Obs. Well	HJ	7,139	0
M-KM7	Observation Well	KM	7,250	0
LC27M	Observation Well	KM	9,474	0

KM Horizon Test

Well ID	Well Type	Completion Horizon	Distance from Pumping Well (ft)	Maximum Drawdown* (ft)
M-KM7	Pumping Well	KM	0	87.80
Center Cluster Monitor Wells				
M-FG2	Overlying Obs. Well	FG	243	0.48
M-HJ4	Overlying Obs. Well	HJ	188	0.46
M-N3	Underlying Obs. Well	M	156	0
M-KM8	Observation Well	KM	3,851	2.58
LC27M	Observation Well	KM	4,206	6.56

Note:

* = Barometrically uncorrected drawdown
Negative sign = water level rise
ft = feet

Table 6-2 - Observed Drawdown (Page 2 of 3)

KM Horizon Test

Well ID	Well Type	Completion Horizon	Distance from Pumping Well (ft)	Maximum Drawdown* (ft)
M-KM4A	Pumping Well	KM	0	26.33
South Cluster Monitor Wells				
M-FG1	Overlying Obs. Well	FG	183	0.47
M-HJ1	Overlying Obs. Well	HJ	125	0
M-N2	Underlying Obs. Well	M/N	135	0.27
M-HJ2A	Overlying Obs. Well	HJ	807	0.3
M-KM5A	Observation Well	KM	799	10.28
M-HJ3	Overlying Obs. Well	HJ	3,043	0
M-KM6	Observation Well	KM	3,037	4.33
M-FG5	Overlying Obs. Well	FG	2,776	0.22
M-HJ8	Overlying Obs. Well	HJ	2,682	0.81
M-KM11A	Observation Well	KM	2,744	1.27
M-N6	Underlying Obs. Well	N	2,651	0.44

Note:
* = Barometric uncorrected drawdown
ft = feet

Table 6-2 - Observed Drawdown (Page 3 of 3)

HJ Horizon Test

Well ID	Well Type	Completion Horizon	Distance from Pumping Well (ft)	Maximum Drawdown* (ft)
M-HJ4	Pumping Well	HJ	0	63.90
Center Cluster Monitor Wells				
M-FG2	Overlying Obs. Well	FG	151	0.72
M-KM7	Underlying Obs. Well	KM	188	-0.72
M-N3	Underlying Obs. Well	N	240	0
M-HJ5	Observation Well	HJ	3,743	1.31†
M-KM8	Underlying Obs. Well	KM	3,799	0
MB-08	Overlying Obs. Well	FG	4,307	0
MB-09	Observation Well	HJ	4,355	1.06
LC27M	Underlying Obs. Well	KM	4,389	0

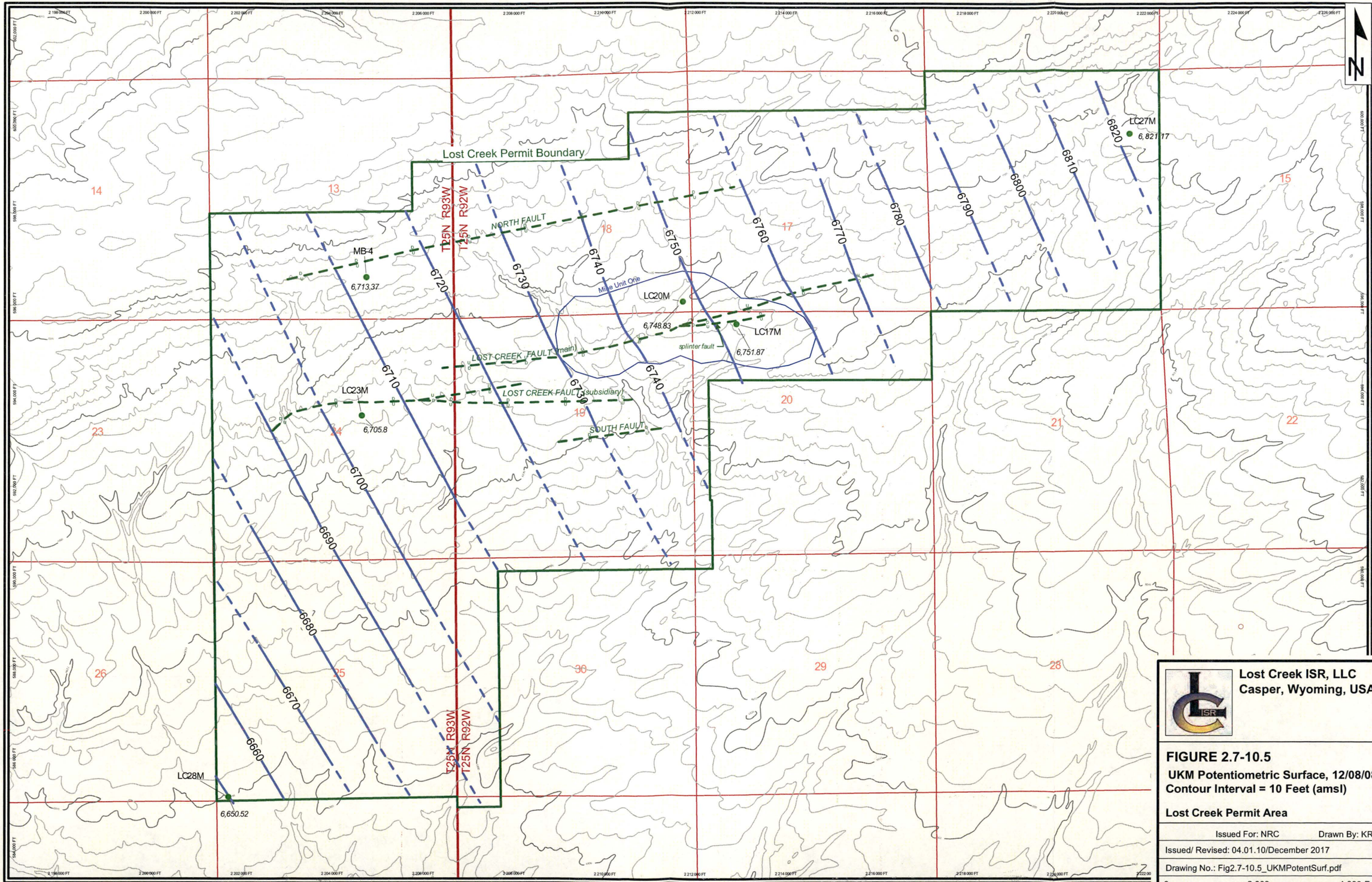
HJ Horizon Test

Well ID	Well Type	Completion Horizon	Distance from Pumping Well (ft)	Maximum Drawdown* (ft)
M-HJ1	Pumping Well	HJ	0	16.00
South Cluster Monitor Wells				
M-FG1	Overlying Obs. Well	FG	125	0.73
M-KM4A	Underlying Obs. Well	KM	125	0.03
M-N2	Underlying Obs. Well	M/N	162	0.12
M-HJ2A	Observation Well	HJ	787	6.91
M-KM5A	Underlying Obs. Well	KM	795	0.02
M-HJ3	Observation Well	HJ	3,044	2.28
M-KM6	Underlying Obs. Well	KM	3,042	0.01
M-FG5	Overlying Obs. Well	FG	2,899	0
M-HJ8	Observation Well	HJ	2,804	0.72
M-KM11A	Underlying Obs. Well	KM	2,867	0.14
M-N6	Underlying Obs. Well	N	2,775	0.15

Note:
* = Barometric uncorrected drawdown
† = Water level still dropping at cessation of monitoring period
Negative sign = water level rise
ft = feet

Table 2.7-6 Water Level Data

Well Name	Completion Horizon	MEASURE	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation	Date	Depth to Water	Water Elevation
		(ft amsl)		(ft bgs)	(ft amsl)		(ft bmp)	(ft amsl)		(ft bgs)	(ft amsl)		(ft bgs)	(ft amsl)		(ft bgs)	(ft amsl)		(ft bgs)	(ft amsl)		(ft bgs)	(ft amsl)		(ft bgs)	(ft amsl)		(ft bgs)	(ft amsl)		(ft bgs)	(ft amsl)		(ft bgs)	(ft amsl)
LC17M	KM	6,936.90	12/8/2008	185.03	6,751.87	---	---	---	---	---	---	11/8/2010	185.60	6,751.30	---	---	---	7/26/2012	188.87	6,749.34	---	---	---	9/30/2013	188.86	6,748.04	5/9/2014	186.25	6,750.65	11/5/2015	193.88	6,743.02	---	---	---
LC20M	KM	6,950.52	12/8/2008	201.69	6,748.83	---	---	---	---	---	---	11/8/2010	201.69	6,748.82	---	---	---	7/24/2012	204.50	6,746.01	---	---	---	9/30/2013	207.19	6,743.33	5/9/2014	206.49	6,744.03	11/5/2015	208.30	6,742.22	---	---	---
LC23M	KM	6,926.80	12/8/2008	221.00	6,705.80	---	---	---	---	---	---	11/8/2010	221.11	6,656.90	---	---	---	7/24/2012	221.25	6,656.76	---	---	---	9/30/2013	220.84	6,705.96	5/5/2014	220.53	6,706.27	11/5/2015	221.56	6,705.24	---	---	---
LC27M	KM	7,012.32	12/8/2008	191.15	6,821.17	---	---	---	---	---	---	11/8/2010	190.66	6,796.72	---	---	---	---	---	---	---	---	---	9/30/2013	191.88	6,820.44	5/9/2014	191.24	6,821.08	11/5/2015	191.38	6,820.94	---	---	---
LC28M	KM	6,805.56	12/8/2008	155.04	6,650.52	---	---	---	---	---	---	11/8/2010	154.83	6,650.73	---	---	---	7/25/2012	155.10	6,650.46	---	---	---	9/30/2013	155.29	6,650.27	5/9/2014	156.40	6,649.16	11/5/2015	155.80	6,649.76	---	---	---
KMU-1	KM	6,947.35	---	---	---	6/16/2009	193.05	6,750.64	8/26/2009	193.80	6,750.81	7/6/2010	198.20	6,749.15	10/21/2011	195.99	6,751.35	---	---	---	3/15/2013	194.77	6,752.58	---	---	---	---	---	---	---	---	---	---	---	---
KMU-2	KM	6,952.99	---	---	---	6/16/2009	195.19	6,755.81	8/26/2009	196.36	6,755.95	7/6/2010	197.00	6,755.99	10/21/2011	198.04	6,754.95	---	---	---	3/15/2013	197.04	6,755.95	---	---	---	---	---	---	---	---	---	---	---	---
KMU-3	KM	6,965.36	---	---	---	6/16/2009	206.98	6,755.33	8/27/2009	206.95	6,757.22	7/6/2010	209.50	6,755.86	10/21/2011	207.79	6,757.56	---	---	---	3/15/2013	207.53	6,757.83	---	---	---	---	---	---	---	---	---	---	---	---
KMU-4	KM	6,943.22	---	---	---	6/16/2009	198.43	6,740.99	8/27/2009	198.20	6,744.74	7/6/2010	202.20	6,741.02	10/21/2011	200.26	6,742.96	---	---	---	3/15/2013	199.72	6,743.50	---	---	---	---	---	---	---	---	---	---	---	---
MB-4	KM	6,987.27	12/8/2008	273.90	6,713.37	8/31/2009	274.95	6,712.32	12/14/2009	273.54	6,713.73	11/8/2010	274.36	6,712.91	---	---	---	7/25/2012	277.34	6,709.93	---	---	---	9/30/2013	276.87	6,710.40	5/5/2014	276.96	6,710.31	11/5/2015	277.36	6,709.91	---	---	---
M-KM4A	KM	6,897.94	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/8/2013	161.60	6,736.34	10/3/2013	162.67	6,735.27	3/10/2014	161.20	6,736.74	11/5/2015	161.20	6,736.74	---	---	---
M-KM5A	KM	6,906.91	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/8/2013	168.64	6,738.27	9/18/2013	169.61	6,737.30	3/10/2014	170.37	6,736.54	11/5/2015	170.37	6,736.54	---	---	---
M-KM6	KM	6,894.09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/8/2013	161.68	6,732.41	9/19/2013	161.86	6,732.23	3/10/2014	163.58	6,730.51	11/5/2015	163.58	6,730.51	---	---	---
M-KM7	KM	6,999.20	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/8/2013	155.74	6,843.46	9/18/2013	152.13	6,847.07	3/10/2014	152.60	6,846.60	11/5/2015	152.60	6,846.60	---	---	---
M-KM8	KM	7,047.95	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/8/2013	157.95	6,890.00	10/10/2013	159.68	6,888.27	3/10/2014	159.36	6,888.59	11/5/2015	159.36	6,888.59	---	---	---
M-KM9	KM	7,094.98	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/8/2013	144.19	6,950.79	10/10/2013	145.59	6,949.39	3/10/2014	144.32	6,950.66	11/5/2015	144.32	6,950.66	---	---	---
M-KM10	KM	7,150.80	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/8/2013	162.62	6,988.18	9/19/2013	152.85	6,997.95	3/10/2014	164.14	6,986.66	11/5/2015	164.14	6,986.66	---	---	---
M-KM11A	KM	6,930.39	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	10/9/2013	174.94	6,755.45	3/10/2014	175.17	6,755.22	11/5/2015	175.17	6,755.22	---	---	---
MU-101	KM	6,941.10	12/8/2008	186.65	6,753.72	6/4/2009	189.24	6,751.86	---	---	---	---	---	---	---	---	---	8/29/2012	190.26	6,750.84	---	---	---	9/26/2013	191.24	6,562.48	5/9/2014	190.99	6,750.11	11/5/2015	196.97	6,744.13	---	---	---
MU-102	KM	6,941.90	12/8/2008	187.66	6,752.77	6/4/2009	189.45	6,752.45	---	---	---	---	---	---	---	---	---	7/24/2012	190.10	6,751.80	---	---	---	9/26/2013	192.52	6,560.25	5/9/2014	191.98	6,749.92	11/5/2015	198.70	6,743.20	---	---	---
MU-103	KM	6,935.80	12/8/2008	182.91	6,752.44	6/4/2009	186.85	6,748.95	---	---	---	---	---	---	---	---	---	8/2/2012	185.85	6,749.95	---	---	---	9/26/2013	186.69	6,565.75	5/9/2014	186.91	6,748.89	11/5/2015	194.83	6,740.97	---	---	---
MU-104	KM	6,939.80	12/8/2008	191.71	6,746.17	6/3/2009	192.30	6,747.50	---	---	---	---	---	---	---	---	---	7/20/2012	193.67	6,746.13	---	---	---	9/26/2013	196.36	6,549.81	5/9/2014	196.27	6,743.53	11/5/2015	198.69	6,741.11	---	---	---
MU-105	KM	6,950.10	12/8/2008	201.21	6,748.87	6/4/2009	202.91	6,747.19	---	---	---	---	---	---	---	---	---	7/20/2012	203.60	6,746.50	---	---	---	9/25/2013	206.26	6,542.61	5/9/2014	206.03	6,744.07	11/5/2015	204.53	6,745.57	---	---	---
MU-106	KM	6,941.75	12/8/2008	193.94	6,747.81	---	---	---	---	---	---	---	---	---	---	---	---	8/2/2012	197.70	6,745.37	---	---	---	9/16/2013	201.60	6,546.21	5/9/2014	199.81	6,741.94	11/5/2015	198.00	6,743.75	---	---	---
MU-107	KM	6,937.50	12/8/2008	191.68	6,744.38	6/3/2009	194.23	6,743.27	---	---	---	---	---	---	---	---	---	8/1/2012	194.05	6,743.45	---	---	---	9/26/2013	199.54	6,544.84	5/8/2014	198.32	6,739.18	11/5/2015	197.42	6,740.08	---	---	---
MU-109	KM	6,934.30	12/8/2008	191.02	6,741.76	6/3/2009	192.98	6,741.32	---	---	---	---	---	---	---	---	---	8/2/2012	193.15	6,741.15	---	---	---	9/26/2013	195.74	6,546.02	5/8/2014	200.71	6,733.59	11/5/2015	216.41	6,717.89	---	---	---
MU-110	KM	6,941.00	12/8/2008	199.62	6,739.61	6/2/2009	202.59	6,738.41	---	---	---	---	---	---	---	---	---	7/23/2012	202.10	6,738.90	---	---	---	9/24/2013	208.55	6,531.06	5/8/2014	201.74	6,739.26	11/5/2015	203.89	6,737.11	---	---	---
MU-111	KM	6,937.00	12/8/2008	198.17	6,738.88	6/2/2009	201.82	6,735.18	---	---	---	---	---	---	---	---	---	7/24/2012	200.34	6,736.66	---	---	---	9/24/2013	206.37	6,532.51	5/8/2014	204.06	6,732.94	11/5/2015	201.32	6,735.68	---	---	---
MU-112	KM	6,938.30	12/8/2008	198.42	6,738.33	6/2/2009	200.00	6,738.30	---	---	---	---	---	---	---	---	---	8/1/2012	200.45	6,737.85	---	---	---	9/24/2013	204.55	6,533.78	5/8/2014	203.51	6,734.79	11/5/2015	202.89	6,735.41	---	---	---
MU-113	KM	6,925.40	12/8/2008	186.13	6,737.62	6/2/2009	188.75	6,736.65	---	---	---	---	---	---	---	---	---	7/24/2012	188.34	6,737.06	---	---	---	9/24/2013	191.42	6,546.20	5/8/2014	193.06	6,732.34	11/5/2015	191.99	6,733.41	---	---	---
MB-11	L	7,011.14	---	---	---	8/27/2009	199.22	6,811.92	12/15/2009	199.38	6,811.76	7/6/2010	203.40	6,807.74	---	---	---	---	---	---	3/15/2013	200.68	6,810.46	---	---	---	---	---	---	---	---	---	---	---	---
MB-12A	L	6,987.19	---	---	---	8/27/2009	277.67	6,709.52	12/14/2009	277.10	6,710.09	7/7/2010	277.55	6,709.64	---	---	---	---	---	---	3/15/2013	276.37	6,710.82	---	---	---	---	---	---	---	---	---	---	---	---
MB-13	L	6,805.66	---	---	---	8/27/2009	159.10	6,646.56	12/14/2009	159.00	6,646.66	7/7/2010	161.00	6,644.66	---	---	---	2/8/2012	159.20	6,646.46	3/15/2013	157.75	6,647.91	---	---	---	---	---	---	---	---	---	---	---	---
MB-14	L	6,924.13	---	---	---	8/31/2009	223.30	6,700.83	12/15/2009	223.00	6,701.13	7/6/2010	226.10	6,698.03	---	---	---	---	---	---	3/15/2013	221.87	6,702.26	---	---	---	---	---	---	---	---	---	---	---	---
M-L1	L	6,941.45	---	---	---	---	---	---	---	---	---	4/20/2010	191.50	6,749.95	10/21/2011	191.51	6,749.94	---	---	---	3/15/2013	190.79	6,750.66	---	---	---	---	---	---	---	---	---	---	---	---
M-L2	L	6,946.59	---	---	---	---	---	---	---	---	---	3/31/2010	198.00	6,748.59	10/21/2011	194.29	6,752.31	---	---	---	3/15/2013	196.49	6,750.10	---	---	---	---	---	---	---	---	---	---	---	---
M-L3	L	6,934.90	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	189.20	6,745.71	---	---	---	3/15/2013	189.61	6,745.29	---	---	---	---	---	---	---	---	---	---	---	---
M-L4	L	6,944.86	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	196.67	6,748.19	---	---	---	3/15/2013	195.78	6,749.08	---	---	---	---	---	---	---	---	---	---	---	---
M-L5	L	6,945.26	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	200.50	6,744.77	---	---	---	3/15/2013	201.59	6,743.67	---	---	---	---	---	---	---	---	---	---	---	---
LC606W	M	6,808.59	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/8/2012	149.65	6,658.94	3/15/2013	148.35	6,660.24	---	---	---	---	---	---	---	---	---	---	---	---
M-M1	M	6,947.34	---	---	---	---	---	---	---	---	---	4/1/2010	208.00	6,739.34	10/21/2011	204.46	6,742.87	---	---	---	3/15/2013	203.65	6,743.69	---	---	---	---	---	---	---	---	---	---	---	---
M-M2	M	6,941.97	---	---	---	---	---	---	---	---	---	4/1/2010	196.00	6,745.97	10/21/2011	199.33	6,742.64	2/8/2012	198.32	6,743.65	3/15/2013	199.36	6,742.61	---	---	---	---	---	---	---	---	---	---	---	---
M-M3	M	6,947.75	---	---	---	---	---	---	---	---	---	3/31/2010	202.20	6,745.55	10/21/2011	199.50	6,748.25	---	---	---	3/15/2013	198.68	6,749.07	---	---	---	---	---	---	---	---	---	---	---	---
M-M4	M	6,945.79	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	203.17	6,742.63	---	---	---	3/15/2013	201.97	6,743.82	---	---	---	---	---	---	---	---	---	---	---	---
M-M5	M	6,952.97	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	204.33	6,748.64	---	---	---	3/15/2013	204.87	6,748.10	---	---	---	---	---	---	---	---	---	---	---	---
M-M6A	M	6,964.46	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	209.08	6,755.38	---	---	---	3/15/2013	209.41	6,755.05	---	---	---	---	---	---	---	---	---	---	---	---
M-M7	M	6,933.45	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	194.86	6,738.60	---	---	---	3/15/2013	195.43	6,738.02	---	---	---	---	---	---	---	---	---	---	---	---
M-M8	M	6,947.71	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	202.92	6,744.79	---	---	---	3/15/2013	203.78	6,743.93	---	---	---	---	---	---	---	---	---	---	---	---
M-N3	M	7,003.33	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12/28/2012	276.94	6,726.39	---	---	---	---	---	---	---	---	---	---	---	---	---	11/30/2017	266.33	6,737.00
5S-N1	N	6,947.66	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	209.98	6,737.69	---	---	---	3/15/2013	209.14	6,738.52	---	---	---	---	---	---	---	---	---	---	---	---
LC33W	N	6,941.49	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2/9/2012	203.21	6,738.28	2/8/2013	237.50	6,765.83	---	---	---	---	---	---	---	---	---	---	---	---
LC229W	N	6,977.82	---	---	---	6/10/2009	253.40	6,724.42	---	---	---	4/21/2010	246.25	6,731.57	---	---	---	2/9/2012	246.56	6,731.26	3/15/2013	247.03	6,730.79	---	---	---	---	---	---	---	---	---	---	---	---
M-N1	N	6,942.42	---	---	---	---	---	---	---	---	---	---	---	---	10/21/2011	204.92	6,737.50	---	---	---	3/15/2013	204.22	6,738.20	---	---	---	---	---	---	---	---	---	---	---	---
M-N2	N	6,904.27	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12/11/2012	172.57	6,731.70	2/8/2013	171.20	6,733.07	9/18/2013	172.99	6,731.28	3/10/2014	173.94	6,730.33	---	---	---	---	---	---
M-N4	N	7,098.83	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12/9/2012	258.63	6,840.20	2/8/2013	257.89	6,840.94	9/19/2013	259.42	6,839.41	3/10/2014	259.62	6,839.21	---	---	---	---	---	---
M-N5A	N	7,153.29	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12/19/2012	251.75	6,901.54	2/8/2013	252.50	6,900.79	9/19/2013	252.15	6,901.14	3/10/2014	253.42	6,899.87	---	---	---	---	---	---
M-N6	N	6,928.58	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	10/9/2013	189.62	6,738.96	3/10/2014	190.27	6,738.31	---	---	---	---	---	---



Lost Creek ISR, LLC
Casper, Wyoming, USA

FIGURE 2.7-10.5

UKM Potentiometric Surface, 12/08/08
Contour Interval = 10 Feet (amsl)

Lost Creek Permit Area

Issued For: NRC	Drawn By: KRS
Issued/ Revised: 04.01.10/December 2017	
Drawing No.: Fig2.7-10.5_UKMPotentSurf.pdf	

0 2,000 4,000 Feet

S:\GIS\LC_East\Figure2.7-10.5_UKM_PotentSurf\Fig2.7-10.5_UKM_PotentSurf.pdf

Table 2.7-4 Water Quality Results for Seven Storm Water/Spring Snowmelt Samples Collected on 17 April 2007

Laboratory Analysis Report - UR Energy Project				Sample ID:	LC1	LC2	LC4	LC5	LC10	LC11	LC12
				Lab ID:	C07040912-001	C07040912-002	C07040912-003	C07040912-004	C07040912-005	C07040912-006	C07040912-007
				Sample Matrix:	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater
				Sample Date:	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007
				Report Date:	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007
Major Ions-Dissolved		Units	Detection Limit		Results	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0		2.8	5.6	3.3	5.5	3.3	5.2	7.4
Magnesium	Mg	mg/L	1.0		0.9	1.5	0.9	1.6	0.6	1.3	1
Sodium	Na	mg/L	1.0		1.1	1.1	0.8	1.2	1.4	1	1
Patassium	K	mg/L	1.0		4.1	6.2	5	7.8	8.4	9.4	3.4
Carbonate	CO_3	mg/L	1.0		<1	<1	<1	<1	<1	<1	<1
Bicarbonate	HCO_3	mg/L	1.0		12	27	17	30	29	15	24
Sulfate	SO_4	mg/L	1.0		3	3	3	5	13	6	6
Chloride	CL	mg/L	1.0		2	1	1	2	1	2	<1
Ammonia as N	NH_3	mg/L	0.05		0.46	0.6	0.55	1.11	8.7	0.86	0.41
Nitrite as N	NO_2	mg/L	0.10		<0.1	<0.1	<0.1	<0.1	0.3	0.2	<0.1
Nitrite + Nitrate as N	NO_2+NO_3	mg/L	0.10		0.3	0.3	0.3	<0.1	0.7	0.6	0.9
Fluoride	F	mg/L	0.10		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Silica	SiO_2	mg/L	1.0		6.9	9.9	7.1	14.5	0.9	1.1	3.9
Trace Metals-Dissolved											
Aluminum	Al	mg/L	0.10		0.3	0.7	0.6	0.6	<0.1	0.2	0.7
Arsenic	As	mg/L	0.001		0.002	0.003	0.002	0.006	0.002	0.002	0.001
Barium	Ba	mg/L	0.10		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	B	mg/L	0.10		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	Cd	mg/L	0.005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	Cr	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Copper	Cu	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	Fe	mg/L	0.05		0.66	0.76	0.66	1.26	0.04	0.17	0.35
Lead	Pb	mg/L	0.001		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese	Mn	mg/L	0.01		0.03	0.01	0.07	0.4	0.07	0.13	0.04
Mercury	Hg	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	mg/L	0.10		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	Ni	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	Se	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.001
Silver	Ag	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	V	mg/L	0.10		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	Zn	mg/L	0.01		0.07	0.04	0.05	0.03	0.22	0.13	0.08

Table 2.7-4 Water Quality Results for Seven Storm Water/Spring Snowmelt Samples Collected on 17 April 2007

Laboratory Analysis Report - UR Energy Project				Sample ID:	LC1	LC2	LC4	LC5	LC10	LC11	LC12
				Lab ID:	C07040912-001	C07040912-002	C07040912-003	C07040912-004	C07040912-005	C07040912-006	C07040912-007
				Sample Matrix:	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater
				Sample Date:	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007
				Report Date:	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007
Trace Metals-Total											
Aluminum	Al	mg/L	0.10		0.5	1.4	1.6	2.7	0.1	0.3	0.8
Arsenic	As	mg/L	0.001		0.001	0.002	<0.001	0.004	<0.001	<0.001	<0.001
Barium	Ba	mg/L	0.10		<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1
Boron	B	mg/L	0.10		0.6	1	0.8	0.4	0.7	0.8	1.2
Cadmium	Cd	mg/L	0.005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	Cr	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Copper	Cu	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	Fe	mg/L	0.05		0.24	0.54	0.29	1.83	0.06	0.21	0.17
Lead	Pb	mg/L	0.001		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese	Mn	mg/L	0.01		0.04	0.13	0.08	1.45	0.06	0.13	0.03
Mercury	Hg	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	mg/L	0.10		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	Ni	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	Se	mg/L	0.001		0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Silver	Ag	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	V	mg/L	0.10		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	Zn	mg/L	0.01		0.06	0.03	0.05	0.08	0.22	0.13	0.09

Table 2.7-4 Water Quality Results for Seven Storm Water/Spring Snowmelt Samples Collected on 17 April 2007

Laboratory Analysis Report - UR Energy Project				Sample ID:	LC1	LC2	LC4	LC5	LC10	LC11	LC12
				Lab ID:	C07040912-001	C07040912-002	C07040912-003	C07040912-004	C07040912-005	C07040912-006	C07040912-007
				Sample Matrix:	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater	Stormwater
				Sample Date:	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007	4/17/2007
				Report Date:	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007	6/5/2007
Radiometric-Dissolved											
Uranium	NatU	mg/L	0.0003		<0.0003	0.0004	<0.0003	0.0003	<0.0003	<0.0004	<0.0003
Lead 210	Pb	pCi/L	2.2		<2.4	<2.2	<2.2	<2.5	<2.2	<2.3	<2.2
Polonium 210	Po	pCi/L	2.2		<2.4	<2.2	<2.2	<2.5	<2.2	<2.3	<2.2
Thorium230	Th	pCi/L	0.4		<0.5	<0.4	<0.4	<0.5	<0.4	<0.5	<0.4
Radiometric-Suspended											
Uranium	NatU	mg/L	0.0003		<0.0003	0.0005	<0.0003	0.0006	<0.0003	<0.0003	<0.0003
Lead 210	Pb	pCi/L	1		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Polonium 210	Po	pCi/L	1		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Thorium230	Th	pCi/L	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
226Radium	226Ra	pCi/L	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Radiometric-Total											
Uranium	NatU	mg/L	0.0003		0.0003	0.0008	0.0003	0.0009	<0.0003	<0.0003	<0.0003
226Radium	NatU	pCi/L	0.2		<0.2	0.5	<0.2	<0.2	<0.2	<0.2	<0.2
228Radium	NatU	pCi/L	1		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Gross Alpha minus Rn & U	226Ra	pCi/L	1		1.3	3.6	1.4	2.6	1.2	<1.0	1.1
Gross Beta	a	pCi/L	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Quality Assurance Data			Target Range								
Anion	-	meq/L			0.355	0.571	0.377	0.655	0.823	0.486	0.609
Cation	-	meq/L			0.462	0.766	0.537	0.881	1.12	0.748	0.698
WYDEQ A/C Balance	-	%	-5 to +5		13	14.6	17.4	14.7	15.2	21.3	6.82
Calc TDS	-	mg/L			29	43	30	52	46	37	40
Non-Metals											
pH	S.U.	std. units	0.01		7.1	6.86	6.66	6.83	7.12	6.41	6.39
Conductivity	Cond.	µmho/cm	1.0		36.4	57.3	40.5	64.5	100	66.4	62.6
Total Suspended Solids @ 105°C	TSS	mg/L	1.0		36	422	24	5280	4	14	9
Alkalinity as CaCO3	Alk.	mg/L	1.0		10	22	14	25	24	12	20

Table 2.7-14 KM Horizon Background Water Quality Results

Major Cations and Anions												
Well ID	Completion Zone	Sample Date	Na (mg/L)	K (mg/L)	Ca (mg/L)	Mg (mg/L)	Cl (mg/L)	HCO_3 (mg/L)	CO_3 (mg/L)	SO_4 (mg/L)	SiO_2 (mg/L)	NO_3+NO_2 (mg/L)
LC17M	UKM	9/12/06	27.0	4.0	55.0	2.0	4.0	107.0	4.0	107.0	15.2	<1
LC17M	UKM	11/26/06	27.0	2.0	55.0	2.0	5.0	120.0	<1	94.0	15.1	<1
LC17M	UKM	3/1/07	29.0	2.0	62.0	3.0	5.0	124.0	<1	105.0	16.8	<1
LC17M	UKM	5/4/07	27.0	2.0	61.0	3.0	4.0	142.0	<1	108.0	15.9	<1
LC20M	UKM	9/21/06	32.0	3.0	56.0	2.0	6.0	113.0	2.0	102.0	17.2	<1
LC20M	UKM	11/22/06	32.0	5.0	38.0	<1	6.0	63.0	3.0	80.0	12.7	<1
LC20M	UKM	3/1/07	36.0	11.0	15.0	<1	5.0	39.0	<1	95.0	14.6	<1
LC20M	UKM	5/4/07	35.0	11.0	12.0	<1	6.0	34.0	2.0	91.0	14.1	<1
LC23M	UKM	9/21/06	44.0	8.0	58.0	<1	5.0	83.0	6.0	165.0	13.9	<1
LC23M	UKM	11/26/06	41.0	7.0	50.0	2.0	3.0	85.0	<1	150.0	14.1	<1
LC23M	UKM	3/1/07	64.0	48.0	52.0	<1	15.0	7.0	137.0	146.0	10.7	<1
LC23M	UKM	5/3/07	63.0	52.0	86.0	<1	5.0	4.0	66.0	126.0	9.4	<1
LC24M	UKM	9/21/06	32.0	3.0	68.0	4.0	5.0	109.0	<1	138.0	16.1	<1
LC24M	UKM	11/26/06	29.0	2.0	66.0	3.0	4.0	126.0	2.0	121.0	14.7	<1
LC24M	UKM	3/1/07	31.0	7.0	43.0	3.0	5.0	73.0	<1	126.0	14.8	<1
LC24M	UKM	5/4/07	31.0	7.0	48.0	3.0	5.0	85.0	<1	126.0	14.6	<1
LC27M	UKM	9/26/06	19.5	4.1	29.5	0.6	4.0	93.0	1.0	29.0	15.3	<1
LC27M	UKM	11/16/06	21.0	4.0	27.0	<1	6.0	82.0	2.0	29.0	15.5	<1
LC27M	UKM	3/1/07	21.0	5.0	11.0	<1	4.0	38.0	<1	39.0	16.4	<1
LC27M	UKM	5/3/07	22.0	5.0	7.0	<1	4.0	33.0	5.0	32.0	17.8	<1
LC28M	UKM	9/21/06	27.0	3.0	60.0	3.0	6.0	125.0	<1	101.0	16.1	<1
LC28M	UKM	11/26/06	24.0	2.0	58.0	3.0	4.0	127.0	<1	88.0	15.7	<1
LC28M	UKM	2/28/07	25.0	2.0	59.0	3.0	6.0	127.0	<1	95.0	16.9	<1
LC28M	UKM	5/3/07	25.0	2.0	62.0	3.0	6.0	130.0	<1	96.0	15.0	<1
MB-4	UKM	8/31/09	32.0	8.0	32.0	<1	10.0	<5	23.0	61.0	19.5	0.5
MB-4	UKM	12/14/09	33.0	8.0	19.0	<1	32.0	15.0	10.0	66.0	14.0	0.7
MB-4	UKM	3/30/10	32.0	5.0	21.0	<1	7.0	23.0	16.0	73.0	17.4	0.9
MB-4	UKM	7/7/10	29.0	3.0	19.0	<1	6.0	35.0	10.0	72.0	16.0	<0.1

ND - Concentration was below the laboratory detection limit.

Blank - Sample not analyzed for this parameter.

Blank and duplicate samples were ommitted from this table.

WQD and EPA criteria listed in Table 2.7-16.

Highlight for concentration exceeding WQD criteria is based on the lowest criteria exceeded. If EPA concentration also exceeded, both highlight and

Bold Concentration exceeds WQD Domestic Class-of-Use (Class I).

Bold Concentration exceeds WQD Agricuture Class-of-Use (Class II).

Bold Concentration exceeds WQD Livestock Class-of-Use (Class III).

Bold Concentration exceeds EPA criteria.

Table 2.7-14 KM Horizon Background Water Quality Results

			General Water Quality				Radionuclides					
Well ID	Completion Zone	Sample Date	TDS (mg/L)	Specific Conductiv	Lab pH (SU)	Alkalinity (mg/L)	Gross Alpha	Gross Beta	Ra-226 (pCi/L)	Ra-228 (pCi/L)	Ra-226 + Ra-228	Uranium (mg/L)
LC17M	UKM	9/12/06	262.0	---	---	---	**28.4**	13.7	10.6	1.1	**11.7**	0.0135
LC17M	UKM	11/26/06	262.0	436.0	8.02	98.0	**29.0**	15.5	8.8	12.9	**21.7**	0.010
LC17M	UKM	3/1/07	284.0	433.0	7.88	---	**26.8**	11.5	5.5	<1.0	**5.5**	0.011
LC17M	UKM	5/4/07	291.0	467.0	8.11	---	**17.3**	9.1	7.2	1.5	**8.7**	0.009
LC20M	UKM	9/21/06	274.0	388.0	**8.56**	96.0	**44.4**	24.0	9.6	3.9	**13.5**	**0.036**
LC20M	UKM	11/22/06	216.0	362.0	**8.91**	56.0	**38.7**	19.5	9.3	3.4	**12.7**	0.025
LC20M	UKM	3/1/07	197.0	305.0	7.66	---	**65.3**	23.9	47.8	<1.0	**47.8**	0.024
LC20M	UKM	5/4/07	188.0	322.0	**9.04**	---	**31.9**	23.6	9.2	2.6	**11.8**	0.025
LC23M	UKM	9/21/06	341.0	451.0	**8.87**	76.0	**32.8**	17.5	3.3	<1.0	3.3	0.023
LC23M	UKM	11/26/06	303.0	498.0	7.97	70.0	**35.0**	14.9	4.7	6.7	**11.4**	0.019
LC23M	UKM	3/1/07	452.0	1180.0	**11.60**	---	5.3	34.8	1.9	1.0	2.9	0.002
LC23M	UKM	5/3/07	**526.0**	1720.0	**11.60**	---	**15.1**	44.7	4.7	1.5	**6.2**	0.002
LC24M	UKM	9/21/06	321.0	455.0	8.30	91.0	**107.0**	43.2	6.5	1.5	**8.0**	**0.134**
LC24M	UKM	11/26/06	302.0	500.0	8.33	105.0	**86.8**	27.6	5.9	5.8	**11.7**	**0.100**
LC24M	UKM	3/1/07	266.0	410.0	7.99	---	**48.6**	22.6	1.8	2.0	3.8	**0.062**
LC24M	UKM	5/4/07	277.0	452.0	8.08	---	**49.1**	23.8	8.9	1.5	**10.4**	**0.052**
LC27M	UKM	9/26/06	136.0	---	---	---	10.7	9.7	1.1	0.4	1.5	0.0026
LC27M	UKM	11/16/06	145.0	243.0	**8.66**	---	6.8	9.4	1.1	3.6	4.7	0.002
LC27M	UKM	3/1/07	117.0	171.0	**8.74**	---	**77.7**	4.1	26.6	<1.0	**26.6**	0.001
LC27M	UKM	5/3/07	111.0	178.0	**9.51**	---	2.9	3.9	0.4	<1.0	0.4	0.002
LC28M	UKM	9/21/06	276.0	394.0	8.14	103.0	**30.7**	19.4	8.1	3.4	**11.5**	0.017
LC28M	UKM	11/26/06	259.0	435.0	8.00	104.0	**18.1**	14.4	8.4	4.2	**12.6**	0.006
LC28M	UKM	2/28/07	269.0	400.0	8.15	---	**27.0**	13.0	7.7	2.1	**9.8**	0.007
LC28M	UKM	5/3/07	273.0	440.0	8.01	---	**19.4**	11.2	7.1	3.7	**10.8**	0.023
MB-4	UKM	8/31/09	209.0	474.0	**11.10**	---	**49.8**	22.4	0.5	1.7	2.2	0.017
MB-4	UKM	12/14/09	183.0	329.0	**9.65**	---	**59.2**	23.0	0.9	1.2	2.1	**0.065**
MB-4	UKM	3/30/10	198.0	285.0	**9.91**	45.0	**58.6**	13.2	<0.19	<1.1	<1.3	**0.037**
MB-4	UKM	7/7/10	182.0	259.0	**9.36**	45.0	**70.5**	20.5	0.2	0.3	0.5	**0.044**

Table 2.7-14 KM Horizon Background Water Quality Results

Trace Parameters (Dissolved unless otherwise noted.)											
Well ID	Completion Zone	Sample Date	Al (mg/L)	NH_3-N (mg/L)	As (mg/L)	Ba (mg/L)	B (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	F (mg/L)
LC17M	UKM	9/12/06	<0.1	<0.05	0.006	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC17M	UKM	11/26/06	<0.1	<0.05	0.003	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC17M	UKM	3/1/07	<0.1	0.06	0.002	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC17M	UKM	5/4/07	<0.1	<0.05	0.002	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC20M	UKM	9/21/06	<0.1	<0.05	0.012	<0.1	<0.1	<0.005	<0.05	<0.01	<0.03
LC20M	UKM	11/22/06	<0.1	<0.05	0.012	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC20M	UKM	3/1/07	<0.1	<0.05	0.012	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC20M	UKM	5/4/07	<0.1	<0.05	0.011	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC23M	UKM	9/21/06	<0.1	<0.05	0.009	<0.1	<0.1	<0.005	<0.05	<0.01	<0.03
LC23M	UKM	11/26/06	<0.1	<0.05	0.004	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC23M	UKM	3/1/07	<0.1	0.86	0.003	0.30	<0.1	<0.005	<0.05	<0.01	0.40
LC23M	UKM	5/3/07	0.20	0.75	0.002	0.30	<0.1	<0.005	<0.05	<0.01	0.20
LC24M	UKM	9/21/06	<0.1	0.13	0.003	<0.1	<0.1	<0.005	<0.05	<0.01	<0.03
LC24M	UKM	11/26/06	<0.1	0.08	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC24M	UKM	3/1/07	<0.1	0.08	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	<0.03
LC24M	UKM	5/4/07	<0.1	<0.05	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC27M	UKM	9/26/06	<0.1	<0.05	0.009	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC27M	UKM	11/16/06	<0.1	<0.05	0.006	<0.1	<0.1	<0.005	<0.05	<0.01	0.30
LC27M	UKM	3/1/07	<0.1	<0.05	0.007	<0.1	<0.1	<0.005	<0.05	<0.01	0.30
LC27M	UKM	5/3/07	<0.1	<0.05	0.005	<0.1	<0.1	<0.005	<0.05	<0.01	0.30
LC28M	UKM	9/21/06	<0.1	<0.05	0.005	<0.1	<0.1	<0.005	<0.05	<0.01	<0.03
LC28M	UKM	11/26/06	<0.1	<0.05	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC28M	UKM	2/28/07	<0.1	<0.05	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
LC28M	UKM	5/3/07	<0.1	<0.05	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.20
MB-4	UKM	8/31/09	0.30	0.07	0.00	<0.1	<0.1	<0.005	<0.05	<0.01	<0.03
MB-4	UKM	12/14/09	<0.1	<0.05	0.01	<0.1	<0.1	<0.005	<0.05	<0.01	0.30
MB-4	UKM	3/30/10	<0.1	<0.05	0.01	<0.1	<0.1	<0.005	<0.05	<0.01	<0.03
MB-4	UKM	7/7/10	<0.1	<0.05	0.01	<0.1	<0.1	<0.005	<0.05	<0.01	<0.03

Table 2.7-14 KM Horizon Background Water Quality Results

Trace Parameters (Dissolved unless otherwise noted.)													
Well ID	Completion Zone	Sample Date	Fe (mg/L)		Hg (mg/L)	Mn (mg/L)		Mo (mg/L)	Ni (mg/L)	Pb (mg/L)	Se (mg/L)	V (mg/L)	Zn (mg/L)
			Dissolved	Total		Dissolved	Total						
LC17M	UKM	9/12/06	0.03	0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC17M	UKM	11/26/06	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC17M	UKM	3/1/07	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC17M	UKM	5/4/07	0.05	0.05	<0.001	<0.01	0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC20M	UKM	9/21/06	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC20M	UKM	11/22/06	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC20M	UKM	3/1/07	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC20M	UKM	5/4/07	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC23M	UKM	9/21/06	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	0.002	<0.1	<0.01
LC23M	UKM	11/26/06	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	0.002	<0.1	<0.01
LC23M	UKM	3/1/07	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC23M	UKM	5/3/07	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	0.002	0.005	<0.1	<0.01
LC24M	UKM	9/21/06	**0.32**	**0.32**	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	0.002	<0.1	<0.01
LC24M	UKM	11/26/06	0.16	0.16	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	0.002	<0.1	<0.01
LC24M	UKM	3/1/07	0.06	0.06	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC24M	UKM	5/4/07	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC27M	UKM	9/26/06	0.15	0.15	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC27M	UKM	11/16/06	0.08	0.08	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC27M	UKM	3/1/07	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC27M	UKM	5/3/07	0.04	0.04	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC28M	UKM	9/21/06	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC28M	UKM	11/26/06	0.04	0.04	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC28M	UKM	2/28/07	<0.03	<0.03	<0.001	<0.01	0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC28M	UKM	5/3/07	0.05	0.05	<0.001	<0.01	0.01	<0.1	<0.05	<0.001	0.002	<0.1	<0.01
MB-4	UKM	8/31/09	0.30	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	0.016	<0.1	<0.01
MB-4	UKM	12/14/09	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	0.014	<0.1	<0.01
MB-4	UKM	3/30/10	<0.03	0.12	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	0.015	<0.1	<0.01
MB-4	UKM	7/7/10	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	0.02	<0.1	<0.01

Table 2.7-15 L, M, and N Horizon Background Water Quality Results (Page 5 of 8)

Major Cations and Anions												
Well ID	Completion Zone	Sample Date	Na (mg/L)	K (mg/L)	Ca (mg/L)	Mg (mg/L)	Cl (mg/L)	HCO_3 (mg/L)	CO_3 (mg/L)	SO_4 (mg/L)	SiO_2 (mg/L)	NO_3+NO_2 (mg/L)
LC229W	MN	6/10/2009	48	2	33	1	3	98	<1	119	13.1	<0.05
LC229W	MN	2/9/2012	51	2	39	1	3	99	<5	123	13.2	<0.1
LC606W	M	2/8/2012	60	<1	10	<1	3	109	<5	63	11.7	<0.1
M-M1	M	4/1/2010	31	7	36	<1	8	101	<5	68	16.0	<0.1
M-M2	M	4/1/2010	30	3	41	<1	5	134	<5	66	18.0	<0.1
M-M2	M	2/9/2012	31	3	46	2	7	120	<5	77	16.4	<0.1
M-M2	M	7/26/2012	28	3	45	1	8	122	<5	78	16.7	<0.1
M-M2	M	12/27/2012	30	2	49	2	7	123	<5	78	18.2	<0.1
M-M3	M	3/31/2010	29	3	49	1	7	131	<5	82	13.5	<0.1
BLM (4451)	Unk	8/27/2009	30	3	167	8	7	206	<5	**340**	--	<0.05
BLM (4451)	Unk	6/29/2010	31	3	170	8	7	200	<5	**353**	16.5	<0.1
BLM (4451)	Unk	7/25/2012	33	3	172	8	7	201	<5	**336**	16.5	<0.1
BLM (4451)	Unk	7/26/2012					5					
LC33W	N	2/9/2012	28	2	55	2	5	126	<5	94	16.3	<0.1
LC33W	N	7/26/2012					7					

Table 2.7-15 L, M, and N Horizon Background Water Quality Results (Page 6 of 8)

			General Water Quality				Radionuclides					
Well ID	Completion Zone	Sample Date	TDS (mg/L)	Specific Conductivity	Lab pH (SU)	Alkalinity (mg/L)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Ra-226 (pCi/L)	Ra-228 (pCi/L)	Ra-226 + Ra-228 (pCi/L)	Uranium (mg/L)
LC229W	MN	6/10/2009	322	432	8.32	80	**37.0**	9.1	1.8	2.0	3.8	0.0138
LC229W	MN	2/9/2012	302	443	7.83	81	**34.5**	10.8	1.7	1.2	2.9	0.0186
LC606W	M	2/8/2012	191	269	8.40	89	5.1	3.3	0.7	0.8	1.5	0.0006
M-M1	M	4/1/2010	239	340	**9.02**	90	**108.0**	47.0	39.0	5.6	**44.4**	0.0179
M-M2	M	4/1/2010	200	342	**8.55**	110	**40.9**	20.9	4.2	5.3	**9.5**	0.0124
M-M2	M	2/9/2012	259	382	8.09	98	14.2	10.0	4.5	4.2	**8.9**	0.0019
M-M2	M	7/26/2012	245	369	8.11	<5	13.3	7.0	4.6	4.1	**8.7**	0.0017
M-M2	M	12/27/2012	271	380	8.13	101	**16.2**	10.9	5.1	4.0	**9.1**	0.0022
M-M3	M	3/31/2010	259	390	8.40	111	**47.2**	19.1	16.0	4.6	**20.6**	0.0089
BLM (4451)	Unk	8/27/2009	**698**	929	7.94	--	**1230**	313.0	11.0	8.0	**19.0**	**0.911**
BLM (4451)	Unk	6/29/2010	**694**	948	7.67	164	**1190**	249.0	7.9	5.4	**13.3**	**1.100**
BLM (4451)	Unk	7/25/2012	**709**	995	7.61	165	**816**	291.0	6.1	6.6	**12.7**	**1.030**
BLM (4451)	Unk	7/26/2012				133						
LC33W	N	2/9/2012	258	418	7.97	103	10.5	9.8	4.0	5.0	**9.0**	0.0014
LC33W	N	7/26/2012				113						

Table 2.7-15 L, M, and N Horizon Background Water Quality Results (Page 7 of 8)

Trace Parameters (Dissolved unless otherwise noted.)											
Well ID	Completion Zone	Sample Date	Al (mg/L)	NH_3-N (mg/L)	As (mg/L)	Ba (mg/L)	B (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	F (mg/L)
LC229W	MN	6/10/2009	<0.1	<0.05	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.1
LC229W	MN	2/9/2012	<0.1	<0.05	0.002	<0.1	<0.1	<0.005	<0.05	<0.01	0.2
LC606W	M	2/8/2012	<0.1	<0.05	0.002	<0.1	<0.1	<0.005	<0.05	<0.01	0.1
M-M1	M	4/1/2010	<0.1	<0.05	0.004	<0.1	<0.1	<0.005	<0.05	<0.01	0.2
M-M2	M	4/1/2010	<0.1	<0.05	0.002	<0.1	<0.1	<0.005	<0.05	<0.01	0.1
M-M2	M	2/9/2012	<0.1	<0.05	0.002	0.1	<0.1	<0.005	<0.05	<0.01	0.2
M-M2	M	7/26/2012	<0.1	<0.05	0.002	<0.1	<0.1	<0.005	<0.05	<0.01	0.1
M-M2	M	12/27/2012	<0.1	<0.05	0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.2
M-M3	M	3/31/2010	<0.1	0.07	0.002	<0.1	<0.1	<0.005	<0.05	<0.01	0.2
BLM (4451)	Unk	8/27/2009	<0.1	<0.05	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.1
BLM (4451)	Unk	6/29/2010	<0.1	<0.05	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	<0.1
BLM (4451)	Unk	7/25/2012	<0.1	<0.05	<0.001	<0.1	<0.1	<0.005	<0.05	<0.01	<0.1
BLM (4451)	Unk	7/26/2012				<0.1	<0.1				
LC33W	N	2/9/2012	<0.1	<0.05	0.001	<0.1	<0.1	<0.005	<0.05	<0.01	0.2
LC33W	N	7/26/2012									

Table 2.7-15 L, M, and N Horizon Background Water Quality Results (Page 8 of 8)

Trace Parameters (Dissolved unless otherwise noted.)													
Well ID	Completion Zone	Sample Date	Fe (mg/L)		Hg (mg/L)	Mn (mg/L)		Mo (mg/L)	Ni (mg/L)	Pb (mg/L)	Se (mg/L)	V (mg/L)	Zn (mg/L)
			Dissolved	Total		Dissolved	Total						
LC229W	MN	6/10/2009	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC229W	MN	2/9/2012	<0.03	<0.03	<0.001	0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
LC606W	M	2/8/2012	<0.03	0.25	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
M-M1	M	4/1/2010	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
M-M2	M	4/1/2010	<0.03	0.10	<0.001	<0.01	<0.01	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
M-M2	M	2/9/2012	<0.03	0.28	<0.001	0.02	0.02	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
M-M2	M	7/26/2012	<0.03	0.23	<0.001	0.01	0.02	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
M-M2	M	12/27/2012	<0.03	0.26	<0.001	<0.01	0.02	<0.1	<0.05	<0.001	<0.001	<0.1	<0.01
M-M3	M	3/31/2010	<0.03	<0.03	<0.001	<0.01	<0.01	<0.1	<0.05	0.003	0.001	<0.1	<0.01
BLM (4451)	Unk	8/27/2009	<0.03	0.11	<0.001	0.02	0.02	<0.1	<0.05	<0.001	0.015	<0.1	0.02
BLM (4451)	Unk	6/29/2010	<0.03	0.11	<0.001	0.01	0.01	<0.1	<0.05	<0.001	0.025	<0.1	0.03
BLM (4451)	Unk	7/25/2012	<0.03	0.11	<0.001	0.01	0.01	<0.1	<0.05	<0.001	0.025	<0.1	0.01
BLM (4451)	Unk	7/26/2012	<0.03	0.08	<0.001	0.01	0.01	<0.1	<0.05	<0.001	0.038	<0.1	0.03
LC33W	N	2/9/2012	<0.03	0.19	<0.001	0.02	0.02	<0.1	<0.05	<0.001	<0.001	<0.1	0.25
LC33W	N	7/26/2012											

ND - Concentration was below the laboratory detection limit.

Blank - Sample not analyzed for this parameter.

Unk - Completion zone unknown

WQD and EPA criteria listed in Table D6-15c.

Bold Concentration exceeds WQD Domestic Class-of-Use (Class I).

Bold Concentration exceeds WQD Agricuture Class-of-Use (Class II).

Bold Concentration exceeds WQD Livestock Class-of-Use (Class III).

Bold Concentration exceeds EPA criteria.

Highlight for concentration exceeding WQD criteria is based on the lowest criteria exceeded. If EPA concentration also exceeded, both highlight and pattern are shown. Pattern for concentration exceeding EPA criteria is based on lowest criteria exceeded. For pH, narrowest range is used.

Blank and duplicate samples were ommitted from this table and are presented in Attachment D6-4

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There were a series of earthquakes in the Lander area in the 1950s that caused little damage. On August 17, 1950, there was an intensity IV earthquake that caused loose objects to rattle and buildings to creak. On January 12, 1954, there was an intensity II event; and on December 13, 1955, there was an intensity IV event near Lander, with no damage reported. On June 14, 1973, a small earthquake was reported about eight miles east-northeast of Lander. The earthquake has been recently interpreted as a probable explosion. On January 31, 1992, a non-damaging magnitude 2.8 earthquake occurred approximately 20 miles northwest of Lander. This event was followed, on October 10, 1992, by a magnitude 4.0, intensity III earthquake centered approximately 22 miles east of Lander.

City of Casper Area

Casper is located about 90 miles northeast of the Permit Area. Two of the earliest recorded earthquakes in Wyoming occurred near Casper. The first was on June 25, 1894, and had an estimated intensity of V. In residences on Casper Mountain, dishes rattled and fell on the floor and people were thrown from their beds. Water in the Platte River changed from fairly clear to reddish, and became thick with mud, due to the river banks slumping into the river during the earthquake. On November 14, 1897, an even larger event was felt. An intensity VI to VII earthquake, one of the largest recorded in central and eastern Wyoming, caused considerable damage to a few buildings. As a result of the earthquake, a portion of the Grand Central Hotel was cracked from the first to the third story. Some of the ceilings in the Grand Central Hotel were also severely damaged.

On October 25, 1922, an intensity IV earthquake was reported in the Casper area. The event was felt in Casper; at Salt Creek, 50 miles north of Casper; and at Bucknum, 22 miles west of Casper. Dishes were rattled and hanging pictures were tilted near Salt Creek. No significant damage was reported in Casper (Casper Daily Tribune, 1922). On December 11, 1942, an intensity IV earthquake was recorded north of Casper. Although no damage was reported, the event was felt in Casper, Salt Creek, and Glenrock (Casper Tribune-Herald, 1941). On August 2, 1948, another intensity IV earthquake was reported in the Casper area. No damage was reported (Casper Tribune-Herald, 1948). In the 1950s, two earthquakes caused some concern among Casper residents. On January 24, 1954, an intensity IV earthquake near Alcova did not result in any reported damage (Casper Tribune-Herald, 1954). On August 19, 1959, an intensity IV earthquake was felt in Casper. Most recently, on October 19, 1996, a magnitude 4.2 earthquake was recorded approximately 15 miles north-northeast of Casper. No damage was reported.

Update – Post 2007

Earthquakes after 2007 near the project site:

Location	Date	Magnitude
28km SSE of Casper, Wyoming	8/22/2016	3.2
50km N of Casper, Wyoming	11/30/2015	3.1
50km SW of Lander, Wyoming	10/27/2015	2.8
36km NNW of Jeffrey City, Wyoming	12/14/2014	2.9
32km ESE of Rock Springs, Wyoming	7/8/2014	3.0
32km ESE of Rock Springs, Wyoming	7/5/2014	2.6
46km NNE of Rawlins, Wyoming	3/29/2014	2.5
35km ENE of Lander, Wyoming	9/21/2013	3.0
35km ENE of Lander, Wyoming	9/21/2013	4.8
40km ENE of Rock Springs, Wyoming	8/14/2013	2.7
51km SE of Rock Springs, Wyoming	7/19/2013	2.9
12km SSE of Lander, Wyoming	4/22/2013	3.1
36km W of Jeffrey City, Wyoming	3/6/2013	2.9
40km W of Jeffrey City, Wyoming	1/29/2012	3.2
30km W of Jeffrey City, Wyoming	2/1/2011	3.1
2km N of Bairoil, Wyoming	11/11/2010	3.5
60km NE of Rawlins, Wyoming	10/8/2009	3.4
25km SSE of Rawlins, Wyoming	7/3/2009	3.2
20km W of Jeffrey City, Wyoming	5/17/2009	3.7

The largest earthquake on the list was magnitude 4.8 with an intensity of IV which signifies no damage and only slight perceived shaking.

2.6.3.1 Uniform Building Code

With safety in mind, the UBC provides Seismic Zone Maps to help identify which building design factors are critical to specific areas of the country. Five UBC seismic zones are recognized, ranging from Zone 0 to Zone 4. These seismic zones are, in part, defined by the probability of having a certain level of ground shaking (horizontal acceleration) in 50 years. The criteria used for defining boundaries on the Seismic Zone Map were established by the Seismology Committee of the Structural Engineers Association of California (SEAOC, 1986). The criteria they developed are as follows:

- Zone 4: ≥ 30 percent gravity (g) effective peak acceleration;
- Zone 3: 20 to ≤ 30 percent g effective peak acceleration;
- Zone 2: 10 to ≤ 20 percent g effective peak acceleration;
- Zone 1: 5 to ≤ 10 percent g effective peak acceleration; and
- Zone 0: ≤ 5 percent g effective peak acceleration.

The Seismology Committee of the Structural Engineers Association of California assumed that there was a 90 percent probability that the above values would not be exceeded in 50 years, or a 100 percent probability that the values would be exceeded in 475 years.

Figure 2.6-4 shows the delineation of UBC seismic zones in Wyoming. The Permit Area is located in Seismic Zone 1. Since effective peak accelerations (90 percent chance of non-exceedance in 50 years) can range from five to ten percent g in Zone 1, it may be reasonable to assume that an average peak acceleration of 7.5 percent g could be applied to the design of a non-critical facility located near the center of Zone 1.

2.6.3.2 Deterministic Analysis of Active Fault Systems

There are two active fault systems in the vicinity of the Permit Area, the Chicken Springs Fault System and the South Granite Mountain Fault System (**Figure 2.6-5**).

The Chicken Springs Fault System, located six miles east of the Permit Area, is composed of a series of east-west trending segments. In 1996, the Wyoming State Geological Survey investigated this fault system, and determined that the most recent activity on the system appears to be Holocene in age. Reconnaissance-level studies indicated that the fault system is capable of generating a magnitude 6.5 earthquake (Case et al., 2002a). A magnitude 6.5 earthquake on the Chicken Springs Fault System would generate peak horizontal accelerations of approximately 4.8 percent g at Rawlins (Case et al., 2002a). These accelerations would be roughly equivalent to an intensity V earthquake, which may cause some light damage. Bairoil, however, would be subjected to a peak horizontal acceleration of approximately 23 percent g, or an intensity VII earthquake (Case et al., 2002a). Intensity VII events have the potential to cause moderate damage.

The South Granite Mountain Fault System is located about 14 miles northeast of the Permit Area. This fault system is composed of several northwest-southeast trending normal and thrust faults in southeastern Fremont County and northwestern Carbon County. The active segments of the system have been assigned a maximum magnitude of 6.75, which could generate peak horizontal accelerations of approximately 20 percent g at Bairoil and 6.1 percent g at the Rawlins (Case et al., 2002a). These accelerations would be roughly equivalent to an intensity VII earthquake at the Bairoil and an intensity V earthquake at Rawlins. Bairoil could sustain moderate damage; whereas minor or no damage could occur at Rawlins.

2.6.3.3 Maximum Tectonic Province Earthquake "Floating Earthquake" Seismogenic Source

Tectonic provinces are regions with a uniform potential for the occurrence of earthquakes that are tied to buried faults with no surface expression. Within a tectonic province,

earthquakes associated with buried faults are assumed to occur randomly, and, as a result, can theoretically occur anywhere within that area of uniform earthquake potential. In reality, that random distribution may not be the case, as most earthquakes are associated with specific faults. If all buried faults have not been identified, however, the distribution has to be considered random. "Floating earthquakes" are earthquakes that are considered to occur randomly in a tectonic province.

The US Geological Survey (USGS) identified tectonic provinces in a report titled "Probabilistic Estimates of Maximum Acceleration and Velocity in Rock in the Contiguous United States" (Algermissen et al., 1982). In that report, Sweetwater County was classified as being in a tectonic province with a "floating earthquake" maximum magnitude of 6.1. Geomatrix (1988) suggested using a more extensive regional tectonic province, called the "Wyoming Foreland Structural Province," which is approximately defined by the Idaho-Wyoming Thrust Belt on the west, 104 degrees West longitude on the east, 40 degrees North latitude on the south, and 45 degrees North latitude on the north. Geomatrix (1988) estimated that the largest "floating earthquake" in the "Wyoming Foreland Structural Province" would have a magnitude in the 6.0 to 6.5 range, with an average value of magnitude 6.25.

2.6.3.4 Short-Term Probabilistic Seismic Hazard Analysis

The USGS publishes probabilistic acceleration maps for 500-; 1,000-; and 2,500-year time frames. The maps show what accelerations may be met or exceeded in those time frames by expressing the probability that the accelerations will be met or exceeded in a shorter time frame. For example, a ten percent probability that acceleration may be met or exceeded in 50 years is roughly equivalent to a 100 percent probability of exceedance in 500 years.

The 500-year map provides accelerations that are comparable to those derived from the UBC and from the deterministic analysis on the Green Mountain Segment of the South Granite Mountain Fault System. It was often used for planning purposes for average structures. Based on the 500-year map (ten percent probability of exceedance in 50 years), the estimated peak horizontal acceleration in the Permit Area is approximately 6.5 percent g, which is comparable to the acceleration expected in Seismic Zone 1 of the UBC (**Figure 2.6-6**). These accelerations (3.9 – 9.2 percent g) are roughly comparable to intensity V earthquakes which can result in cracked plaster and broken dishes, but minor or no construction damages (Case, 2002). All facilities, including the processing plant, pipelines and well structures, at Lost Creek will be designed and constructed to sustain an intensity V earthquake. In addition, the observations of injection, production, and pipeline pressures and associated monitor well measurements, necessary for the in situ operation, will provide short-term information about any unanticipated seismic impacts. The estimated

acceleration in the Permit Area is 20 percent g on the 2,500-year map.

2.6.4 References

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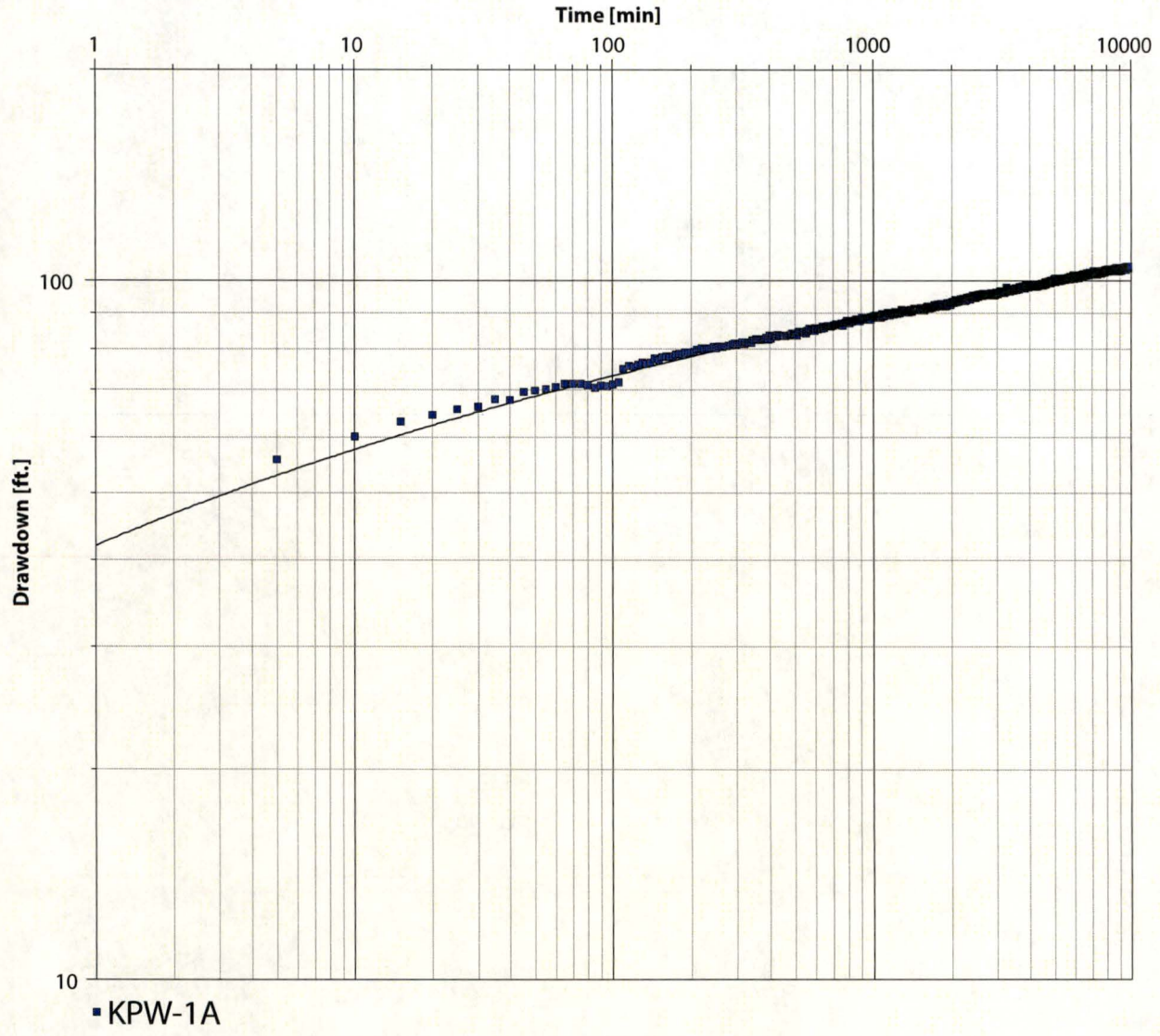
Petrotek Engineering Corporation 10288 W Chatfield Ave, Suite 201 Littleton, CO 80127 (303) 290-9414 www.petrotek.com	Pumping Test Analysis Report
	Project: Lost Creek ISR, KM Horizon Hydrologic Testing
	Number:
	Client: UR Energy, Inc.

Location: Lost Creek Project Area	Pumping Test: KPW-1A South Pump Test	Pumping Well: KPW-1A
Test Conducted by: AP		Test Date: 6/29/2009
Analysis Performed by: AP	KPW-1A Theis Drawdown	Analysis Date: 9/11/2009
Aquifer Thickness: 115.00 ft	Discharge Rate: 63 [U.S. gal/min]	
Analysis: Theis Drawdown		



Calculation after Theis

Observation Well	Transmissivity [ft²/d]	Hydraulic Conductivity [ft/d]	Storage coefficient	Radial Distance to PW [ft]	
KPW-1A	1.42×10^{2}	1.23×10^{0}	2.96×10^{-2}	0.13	

Table 7-2. Analytical Results
South Test, Pumping Well KPW-1A
Lost Creek ISR, LLC

Well Name	Distance from Pumping Well (ft)	Side of Fault	Theis Drawdown			Theis Recovery		
			T (ft^2/d)	K (ft/d)	S	T (ft^2/d)	K (ft/d)	S
KPW-1A	0	South	142.0	1.23	--	169.0	1.47	--
MU-101*	367	South	124.0	1.08	1.2E-04	--	--	--
MU-102	660	South	120.0	1.04	4.1E-05	107.0	0.93	--
MU-109	2,998	South	224.0	1.95	2.1E-04	--	--	--
KMP-1	3,219	South	128.0	1.11	6.4E-05	--	--	--
KMP-5	4,135	South	199.0	1.73	1.1E-04	--	--	--
		Maximum	**224.0**	**1.95**	**2.1E-04**	**169.0**	**1.47**	**--**
		Minimum	**120.0**	**1.04**	**4.1E-05**	**107.0**	**0.93**	**--**
		Average	**156.2**	**1.36**	**1.1E-04**	**138.0**	**1.20**	**--**
		Std. Deviation	**44.2**	**0.38**	**6.3E-05**	**43.8**	**0.38**	**--**

Notes:
T - Transmissivity
K - Hydraulic conductivity; calculated based on 115 ft aquifer thickness.
S - Storativity
* - Analysis of MU-101 utilizes time-drawdown data prior to transducer being exposed. Recovery analysis not possible.