



Department of Environmental Quality



To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

January 30, 2009

Mr. Wayne Heili
Lost Creek ISR, LLC
5880 Enterprise Drive, Suite 200
Casper, WY 82609

RE: Lost Creek ISR, LLC, In-Situ Recovery (ISR) Permit Application, **Technical Review**, TFN 4 6/268

Dear Mr. Heili:

The Land Quality Division (LQD) Staff have reviewed the above named Uranium In-Situ Recovery (ISR) Permit Application for Lost Creek ISR, LLC, also referred to as "The Lost Creek Project". The application was deemed complete on May 20, 2008, after which Lost Creek ISR published the first public notice.

After completeness was achieved, Ms. Amy Boyle (LQD - Lander) and Mr. Matthew Kunz (LQD - Cheyenne) provided Lost Creek ISR with partial technical comments on the application. Ms. Boyle's technical comments were summarized in a memorandum dated August 26, 2008 and addressed Appendices D-5 and D-6 (the Geology and Hydrology appendices). Ms. Boyle's comments were sent to your office via electronic mail in late August 2008. Mr. Kunze's technical comments were summarized in a memorandum dated August 8, 2008 and addressed the formatting of various datasets within Appendix D-6. Mr. Kunze's comments were also sent to your office via electronic mail in late August 2008. Hard copies of

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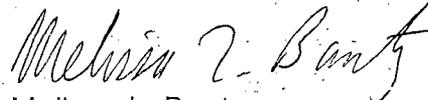


Technical Completeness comments - TFN 4 6/268
Lost Creek ISR, LLC
January 30, 2009 - ML Bautz
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Ms. Boyle's and Mr. Kunze's reviews were sent to your office under cover letter dated September 26, 2008.

Ms. Boyle's and Mr. Kunz's comments in addition to the comments listed within the attached memorandum comprise the LQD's **technical comments** on the Lost Creek ISR Permit application. Please identify TFN number 4 6/268 on your responses to the comments presented in all three memoranda.

Sincerely,



Melissa L. Bautz
District 2, Environmental Scientist 2
Land Quality Division

Enclosures January 30, 2009 memorandum, Technical Review Comments

Ec: Mr. John Cash, Lost Creek ISR, Cash, John.Cash@ur-energyusa.com
Mr. Mark Newman, BLM, Mark.Newman@blm.gov
Mr. Ronald Burrows, NRC, Ronald.Burrows@nrc.gov
Mr. Alan Bjornesen, NRC, Alan.Bjornesen@nrc.gov

Cc: Mr. John Cash, Ur-Energy-USA, 5880-Enterprise Drive, Suite 200, Casper, WY 82609. (w/encl)
Mr. Harold Backer, Ur-Energy USA, 10758 W. Centennial Rd. Suite 200, Littleton, CO 80127 (w/encl)
Mark Newman - BLM Rawlins, P. O. Box 2407, Rawlins, WY 82301 (w/encl)
Ronald A. Burrows, U.S. Nuclear Regulatory Commission, Federal and State Materials and Environmental Management Programs Uranium Recovery Licensing Branch, Mail Stop T-8F5, Washington, D.C. 20555-0001 (w/encl)
Alan Bjornesen, U.S. Nuclear Regulatory Commission, Environmental Project Manager, Office of Federal and State Materials and Environmental Management Programs, Mail Stop T-8F5, Washington D.C. 20555-0001 (w/encl)
Don Mckenzie/Matthew Kunz, Cheyenne WDEQ/LQD → TFN 4 6/268 Lost Creek ISR File (w/encl)
Mark Moxley - Lander WDEQ/LQD → TFN 4 6/268 Lost Creek ISR File (w/encl)
Melissa Bautz - Chron (w/encl)

Memorandum

File: Lost Creek ISR, LLC Uranium Project, Permit Application, TFN 4 2/628
From: Melissa L. Bautz – WDEQ/LQD
Date: January 30, 2009 *MLB*
Subject: Technical Review comments on Lost Creek ISR Application, TFN 4 2/628

This memorandum contains the WDEQ Land Quality Division's (LQD's) technical comments on the aforementioned ISR uranium application submitted by Lost Creek ISR, LLC on December 20, 2007. Several LQD staff contributed to this review including myself, Amy Boyle, Mark Moxley, Steve Platt, Craig Smith, and Brian Wood. Each reviewer's comments are identified with "MLB", "AB", "MM", "SP", "CS", or "BRW", respectively.

The comments below, combined with comments in two separate memoranda from Ms. Amy Boyle dated August 26, 2008, Mr. Matthew Kunz dated August 8, 2008 comprise the technical review of the application.

Volume 1 (Adjudication):

- 1) The Appendix E map (Plate E-1) must show all lands to be affected by the operation, including all proposed or potential well fields. The permit boundary should be reflective of the extent of proposed mining. The permit area should encompass all lands that are proposed to be affected and some reasonable buffer around the affected lands. Conversely, if an area is not going to be affected by the proposed operation then it shouldn't be in the permit area. Based on Figure OP-2a, there are large portions of the permit area (entire sections or half sections) where no proposed operations are shown. Unless there are reserves that are proposed to be mined in these areas, then these lands should not be included in the permit area. The "additional resources known to exist within the permit area", mentioned on page OP-6, must be shown in some fashion order to justify the size of the permit area. (MM)
- 2) The Appendix E map (Plate E-1) as well as all of the maps that are presented on a USGS quad map base, should be presented at a standard USGS scale of 1"=2,000' so that they are easily comparable. (MM)

Volume 2 (Appendices D-1 through D-5):

Appendix D-5 (Geology)

- 1) Section D5.2.4, "Historic Uranium Exploration Activities", Page D5-6: The last paragraph states that historic and current uranium explorations exist in "other" areas of the Basin. There is no mention of the adjacent Sweetwater Uranium project in this section. Due to that project's proximity to the Lost Creek project, it must be discussed here. (MLB)
- 2) Attachment D5-2, Plates AD5-2a,b,c: These maps need to include section lines, township and range lines, topography, roads, and other ground features. During the meeting among LQD and Lost Creek personnel held in at the Lander WDEQ/LQD office on September 22, 2008, an example of the type of base map features that

should appear on all plates/maps in the Permit was demonstrated and discussed.
(MLB)

Volume 3 (Hydrology Appendix D-6):

- 1) Section D6-1: The purpose of this section is to characterize the baseline hydrology of the proposed permit area. The information provided concerning the surface water portion is not acceptable for the following reasons:
 - a. A map was not provided that delineates the three drainage basins as described in the text on page D6-1. Figure D6-1, the drainage basin map provided, is a gross illustration of regional drainage basins. Please provide a drainage basin map that describes the three primary drainage basins within the permit area.
 - b. Please provide the total areal extent within each drainage basin and within the permit area for the three basins described.
 - c. Please provide runoff estimates for various events for the three drainage basins.
(BRW)
- 2) Section D6-2: Figure D6-2 is a longitudinal profile of North Battle Spring Draw. Please illustrate the location on a map of the longitudinal profile; mark the two end points as A and A' or use similar notation. Please also state how the profile was generated (e.g., actual survey or using USGS topographic mapping). (BRW)
- 3) Section D6-3: The text indicates that any runoff quickly infiltrates and is either lost to ground water recharge or evapotranspiration. The text in Appendices D6 and D7 has not provided any information regarding the hydrologic characteristics of the soils present within the proposed permit area. Please provide information to support the text (e.g., provide a relationship based on texture to hydrologic soil group, infiltration rates, etc.). (BRW)
- 4) Section D6-4: The text indicates that the shallow aquifer is typically 150 to 200 feet below ground surface. The BLM well (WSEO Permit 3 P55113W) located in Township 25N, Range 92W, Section 30 is completed to a depth of approximately 220 and screened from 185 to 215 feet. Between 128 and 134 feet there is a layer of gray shale and the static water level at the time of completion was reported to be 109 feet. It appears that at a minimum semi-confined conditions exist rather than unconfined as portrayed in the text. Please explain the disparity. (BRW)
- 5) Section D6-5: Section D6.1.2 contains a discussion of the Robinson Reservoir. I have searched the WSEO database believe it was a typo based on other information presented; the true location of this reservoir being in Township 25N, Range 72W, Section 26. Please remove the discussion concerning this reservoir and revise the water rights table accordingly. (BRW)
- 6) Section D6-6: Please indicate what type of sampler was used to collect water quality samples. (BRW)

- 7) Section D6-7: Please indicate if discharge measurements were taken and/or can be estimated for each sample procured. (BRW)

Volume 4 (Appendices D-7 through D-11):

Appendix D-7, Soils:

- 1) Lands to be affected by the operation (plant site, ponds, roads, well fields, etc.) must be outlined on the soils map. (MM)
- 2) The soils map should be presented at a normal engineering scale (i.e. 1"=400' or 1"=500'). The township, range and county should be clearly noted on the map. (MM)
- 3) The soils on lands to be affected must be mapped at an Order 1-2 level. (MM)
- 4) A map must be presented to show topsoil suitability/stripping depths. (MM)
- 5) Coarse fragments is one of the criteria in LQD Guideline No. 1 for establishing soil suitability. However, where soils resources are limited and marginal in quality LQD recommends that coarse fragments not be used as the determining factor for soil suitability. (MM)
- 6) The volumes of soil to be salvaged and stockpiled from the various major affected areas (plant site, ponds, roads, etc.) should be listed. (MM)
- 7) The person(s) who conducted the soils study should be identified. (MM)

Appendix D- 8, Vegetation

- 1) Lands to be affected by the operation must be outlined on the vegetation map. (MM)
- 2) The vegetation map should be presented at a normal engineering scale (i.e. 1"=400' or 1"=500'). (MM)
- 3) On page D8-6, section D8.4.1.2, the third sentence refers to **Upland** Big Sagebrush Shrubland. It appears that the correct reference would be **Lowland** Big Sagebrush Shrubland. (MM)
- 4) Sample site/transect locations should be identified by number on the map. (MM)
- 5) Appendix D8.2, Description of Study Area: Precipitation data references appendix 4. Also reference the weather station as per Chapter 2, Section 2(a)(i)(C) and (D) of the DEQ non-coal rules. (CS)
- 6) Appendix D8.3.3, Sampling Design: It is stated that "no control areas or reference areas were established. The design described is referred to as an "Extended Reference Area" in DEQ/LQD Guideline 2 Section 3 (B). It can be referred to as such in the permit application. (CS)
- 7) Appendix D8.3.5, Collection and Analysis of Vegetation Cover Data: A parenthetical comment is included explaining what constitutes a "hit". The remarks are unclear and should be reworded to better explain what data was recorded. Please explain

which hits were used in calculating total vegetation cover, just first hits or all hits recorded. (CS)

- 8) Appendix D8.4.1.1, Upland Big Sagebrush Shrubland Type: The total number of acres disturbed is not provided. The Operations Plan is referenced; however the number of acres to be affected needs to be provided as per DEQ/LQD Guideline 2 Section 1 (D). (CS)
- 9) Appendix D8.4.1.2, Lowland Big Sagebrush Shrubland Type: The total number of acres disturbed is not provided. The Operations Plan is referenced; however the number of acres to be affected needs to be provided as per DEQ/LQD Guideline 2 Section 1 (D). (CS)
- 10) Appendix D8.4.1.2, Lowland Big Sagebrush Shrubland Type: In the first paragraph fourth sentence there is a reference to Upland Big Sagebrush Shrubland. The reference should read Lowland Big Sagebrush Shrubland. (CS)
- 11) Appendix D8.4.1.2, Lowland Big Sagebrush Shrubland Type: The first paragraph includes a discussion of the differences between the sagebrush growing in the upland and lowland big sagebrush shrubland types. These differences could be a sub-species variation in Big sagebrush (*Artemisia tridentata* spp. *tridentata* vs. *Artemisia tridentata* spp. *wyomingensis*). If applicable add discussion about Big sagebrush subspecies. (CS)
- 12) Appendix D8.4.3, Weeds, Selenium Indicators, Endangered or Threatened Species: It is stated that "the permit area has very few weeds". This statement should be defined quantitatively. For example it could be defined in terms of percent cover, number of individual encountered or some other measureable way. (CS)
- 13) Appendix D8.4.3, Weeds, Selenium Indicators, Endangered or Threatened Species: It is stated that Tansy mustard is a "listed noxious weed species". Tansy mustard is a restricted noxious weed. Please update to reflect the correct status of Tansy mustard. (CS)
- 14) Appendix D8.6, Conclusions: There is no discussion of vegetative cover in the conclusions section. Please add a general statement addressing vegetative cover. (CS)
- 15) Figure D8-1, Vegetation Map: The scale of this map is approximately 1"=1760'. The scale of the vegetation map must be greater than 1"=1000' as per DEQ/LQD Guideline 2 Section 1 (A). Please reconstruct map at a scale of 1"=1000" or greater. (CS)
- 16) Table D8-5, List of Vegetation Species Observed: The cool season perennial grasses and grass like plants section contains many perennial forbs. Please separate out the perennial forbs into their own section. This would be constant with the other vegetation tables. (CS)
- 17) Table D8-9, Evaluation of Sample Adequacy: The variance entries are incorrect. It appears these entries are variance². Please correct the entries of the row title. (CS)

Appendix D-9 – Wildlife

- 1) Section D9 3.6, Wildlife: The sage thrasher (ST) is listed in both the third and fourth paragraphs. In the first instance, ST was not documented on the study area and in the second instance, it is know to breed on the study area. Please correct. (SP)
- 2) Attachment D9-2, Wildlife: On page 2 of the attachment, the table of contents should contain the page numbers of the identified sections. Please correct. (SP)
- 3) Figure D9-6, Sage Grouse Lek Map: Oral and written communication between Melissa Bautz (LQD) and Ms. Carrie Dobey (WGFD – Lander) on January 15 and 16, 2009 revealed that the Crooked Well sage grouse lek in UTM Zone 13 E 267113 N 4669158 (NAD 1983) at the eastern end of the proposed Permit Boundary is considered active by the WGFD. On Figure D9-6, the Crooked Well lek is designated as “unoccupied”. The WGFD considers this lek to be “occupied”. This is because the WGFD considers a lek to be “unoccupied” only after 10 years of inactivity at the lek. Figure D9-6 must depict the Crooked Well lek as “occupied” given the WGFD’s criteria. Please revise the map accordingly. (MLB)

Wetlands, Appendix D-11

- 1) The person(s) who conducted the wetlands study should be identified. (MM)
- 2) Section D11-1: The text on page D11-1 states that “wetland delineation is based on the presence and abundance of obligate wetland plants....” Wetland delineation is based on three basic site characteristics: (1) vegetation, as noted in the text, (2) presence or absence of hydric soils, and (3) hydrology. Please revise the text accordingly. (BRW)
- 3) Section D11-2: The text appears to indicate that wetland hydrology does not exist at the site. Assuming the average growing season for the area is 100 days, according to the 1987 ACOE Wetlands Manual, if the area is inundated for a period of five days (5% of the growing season) annually, the potential for wetland hydrology exists. I understand that runoff occurs infrequently in this area, however, given the fact all three wetland areas are identified under the National Wetlands Inventory (NWI) program appear to be depressional and over time the bottom of these features should seal through the deposition of silts, it is certainly plausible that these areas could hold water for five day minimum period. Therefore, hydrology does not appear to a limiting factor in a wetland determination; please revise the text accordingly. (BRW)
- 4) Section D11-3: No photos were provided for the two other NWI mapped wetland areas in Township 25N, Range 93W, Section 24 and Township 25N, Range 92W, Section 21. Please provide. (BRW)
- 5) Section D11-4: From on-site inspections during exploration, etc., I would agree that no wetlands exist within the proposed permit area, however the documentation provided to render this decision is lacking as alluded to in the first three comments. Please re-write this section to better support the supposition that no wetlands exist within the proposed permit area. (BRW)

- 6) On Figure D11-1, the legend shows the symbol for the plant site but it does not appear that the plant site is actually shown on the map. Also, some of the potential wetland locations are obscured by the cross hatch symbol used to show the mine units. (MM)

Volume 5 – (Operations Plan and Reclamation Plan):

Operations Plan (OP)

- 1) All maps must be presented at a standard engineering scale which should be stated on the map, in addition to the bar scale. Odd scales such as 1"=110' (Fig. OP-7c), 1"=1,760' (Fig. OP-2a), 1"=1,540' (Plate E-1), 1"=1,620' (Plate C-1), 1"=16' (Plate OP-1) or 1"=1,700' (Figure RP-2) are not acceptable. Typical map scales used in mine permit applications are 1"=2,000' and/or 1"=500'. It is helpful to present all maps in the application at a few consistent scales to facilitate comparison of maps or overlaying them on a light table. (MM)
- 2) The LQD Administrator has determined that an ISL mine permit application must, at a minimum, include a detailed plan for the first well field. (MM)
- 3) Section OP 1.0, Overview of Proposed Operation: In the first paragraph it states that "the surface area to be affected by the ISR operation will total 285 acres". However, this figure is inconsistent with Table OP-2 which indicates 58 acres will be affected by the operation. It should be noted that all of the site's roads (including so-called "tertiary" roads or two-tracks) must be included in the total affected acreage. Refer to Mark Moxley's comment number 6 below for more suggestions on how to address this. (MLB)
- 4) Section OP 1.1, Site Facilities Layout: should include a detailed facilities site plan map presented on a topographic base at a scale of 1"=100' with a 2' contour interval. All facilities and structures should be shown, including lay-down yards, parking areas, site drainage control features, ponds and topsoil stockpiles. (MM)
- 5) Figure OP-2a (and Plate E1): All roads to be improved or constructed, including primary, main and secondary, should be clearly identified and shown on the maps (e.g. Plate E-1 and Fig. Op-2a) and should be included in the permit area. Roads that provide access to the site from a formally designated public road (e.g., name and road number) and where maintenance will be incumbent on Lost Creek must be made part of the permit. Please provide a ROW agreement and revise the permit area boundary to include all access roads. Legal descriptions should be provided for the primary access roads from that point that they leave the county roads (i.e. the Baroil Road, the Minerals Ex Road and the Wamsutter Road). (BRW and MM)
- 6) Section OP 1.0, Overview of Proposed Operation (Page OP-1) and Section OP 2.3, Land Use (Page OP-7): These sections state that the operation will affect approximately 285 acres. Form 1 also lists 285 acres. Does this figure include all affected lands such as roads? On page OP-3 it is stated that each well field will cover about 50 acres. Six well fields @ 50 acres would total 300 acres. Table OP-2 only lists 58 acres to be affected, which is inconsistent and unrealistic. Table OP-2

should be removed. Table OP-4 contains a better accounting of affected areas (285 acres). Well fields should be considered to be affected and should be accounted as such (the monitor well ring is a reasonable affected area boundary). An accurate estimate of affected lands for the life of the mine, within the proposed permit boundary, is required. **(MM)**

- 7) Section OP 1.0, Overview of Proposed Operation: The text indicates that the proposed permit area encompasses 4,220 acres and the disturbance area will encompass approximately 285 acres. The application goes on to state that each well field will consist of a reserve block of approximately 50 acres and there are six proposed well fields. This later figure does not include the disturbance associated with the facilities area. None of the above figures account for the access road. Needless to say, all of the above is contradictory. While it is understood that there will be some need for ancillary areas, Lost Creek has not demonstrated by the permit area must be 10 times greater than the proposed disturbance. Please address the above. **(BRW)**
- 8) Plate OP-1: The proximity of the pond directly adjacent to the processing facilities raises concerns regarding the following: ability to monitor the pond or conduct any potential future corrective action with little to no room on the west side; the inability to expand the processing building to the east; the inability to use sprayers for enhanced evaporative effect, due to the proximity to the building; the limited use of noise deterrents to prevent waterfowl from landing on the pond, due to its proximity to the plant. **(AB)**
- 9) Plate OP-1: The pond designs are unacceptable for several reasons including, but not limited to the following:
 - No location map was provided; Plate OP 1 is not considered a location map as it is of unacceptable scale and is not tied to any coordinate system;
 - No contour interval is provided on schematics;
 - No description or detail as to what part of the pond is above and below existing grade;
 - No details concerning the piping system for the supply of water to the ponds and transfer of water between ponds;
 - No specifications concerning seaming of the liner system and QA/QC procedures to be employed to evaluate the seaming; and
 - Pond sizing calculations to address evaporative loss, inflows, etc. under a variety of conditions to demonstrate that adequate redundancy in disposal exists.Please present a complete set of designs and specifications for the two proposed ponds. **(BRW)**
- 10) Figures OP-2a and OP-2b show the powerline and pipeline layout along with the ore body. Please include the location of the Lost Creek fault(s) on these figures as well, as its location is a factor in the mine's operations. **(AB)**
- 11) Figure OP-2a Site Layout: A much more detailed Mine Plan map will need to be included in the permit. It should indicate all roads, fencing, topsoil pile locations, stormwater diversion structures, chemical storage areas, lay down yards, easements, utilities, pipelines, monitor well locations, air and weather monitoring

stations; etc. There should be one comprehensive map that indicates where any surface disturbance or feature is planned. (AB)

- 12) Section OP1.1 Site Facility Layout: The underground power lines should be in conduit, as opposed to direct burial. This should be specified in the plan. (AB)
- 13) Section OP 2.1 Project Schedule: How is the amount of time for mine unit development, production, ground water sweep, reverse osmosis etc. determined. Calculations should be presented which indicate the time it will take to perform each step, based on the hydrologic conditions of the ore body. (AB)
- 14) Section OP 2.1 Project Schedule: What are the criteria to move from production into restoration, and restoration to stability monitoring? This should be specified. (AB)
- 15) Section OP 2.1, Project Schedule: should demonstrate that reclamation will be contemporaneous with mining operations. Since the schedule presented in Figure OP-4a is considered to be somewhat conceptual and subject to change, definitive commitments such as the following should be provided, for example:
 - a. seamless transition from production to restoration with no well field down time
 - b. no inactive well fields for periods exceeding 30 days
 - c. specified minimum restoration flow rates
 - d. no more than two well fields in production at any given time
 - e. complete restoration of the first well field, through stabilization, before initiating production from the 5th well field (MM)
- 16) Section OP 2.1, Project Schedule, Page OP-5: The use of ground water sweep with direct disposal of the produced water, is no longer considered to be BPT due to excessive consumption of ground water and resultant impacts to ground water resources. This section (as well as section RP 2.3.1), should be revised to clarify that ground water sweep will only be employed when the produced water can be treated and re-injected. (MLB)
- 17) Page OP-5 (and RP-1), the statement is made that an updated schedule will be supplied with the annual report if the operation or restoration schedule varies from that shown in Figure OP-4a (and Figure RP-1). Lost Creek ISR should understand that they are obligated to follow the approved mine and reclamation schedule (refer to W.S. 35-11-415). If Lost Creek ISR plans to revise the approved schedule then it must be submitted as a permit revision for review and approval by LQD. An updated schedule submitted with an annual report would be informational, (and would probably trigger a request for a permit revision from LQD) but would not replace the schedule in the approved permit. Please revise these sections to reflect this understanding. (MM)
- 18) Figures OP-5a-e. These water balance flow charts should include the average and minimum evapotranspiration rates of the evaporation ponds to show the full water balance of the ponds, and that the ponds are up to capacity requirements. (AB)
- 19) Section OP 2.2, Additional Regulatory Requirements. Reference is made to the SWPPP, yet a complete hydrologic control plan for the facilities area and associated appurtenances as well as the first mine unit must be included in the Operations Plan.

Will water from the facilities area be diverted to a lined site containment pond. The hydrologic control plan for the remaining well fields maybe submitted with the individual well field packages. **(BRW and AB)**

- 20) Table OP-2 and the text on Page OP-7: Section "OP 2.3 – Land Use" states that a total of approximately 285 acres will be affected throughout the project. However, Table OP-2 only indicates 58 acres as being affected. This inconsistency should be clarified. It should be noted that Table OP-2 should include all disturbed areas throughout the life of the mine including all "tertiary roads". **(MLB)**
- 21) Section OP 2.4, Cultural Resources Mitigation Program, Page OP-8: In the middle of line 7 in the first paragraph, after the sentence ending in the word "excavations", another sentence should be added. The new sentence must make a commitment to add via permit revision any/all archaeological restrictions and protocol in to the permit document. **(MLB)**
- 22) Section OP 2.5, Topsoil Management, Page OP-8: The second paragraph of this section reiterates that only 58 acres will be affected. However, this value disagrees with the previously stated value of 285 acres (in the Land Use section of the Operations Plan, Page OP-7). Please clarify which value is accurate: 58 acres or 285 acres. **(MLB)**
- 23) Section OP 2.5, Topsoil Management, Page OP-8: The text on page OP-8 states that detailed soil surveys will be conducted at the plant site as well as each mine unit to provide specific information for topsoil protection and management. Given that the first well field package must be included with the application, this is not acceptable. The detailed soil survey(s) necessary for topsoil management decisions and commitments at the first mine unit must be included in the Permit Application. **(BRW and MLB)**
- 24) Section OP 2.5, Topsoil Management: should include a plan for well field layout and installation to accompany Figure OP-7c. **(MM)**
- 25) Section OP 2.5, Topsoil Management, Page OP-8: The third paragraph of this section states that "Per WDEQ-LQD requirements, topsoil will not be stripped from areas where there is minor disturbance, such as light-use-roads, monitoring stations, fences, and drill sites (except for the mud pits);". Given the definition of "minor disturbance" as maintaining 50% of the native land remaining undisturbed, it has been the experience of this reviewer that in practice, it is not feasible to assume that the well fields will witness only minor disturbance. That is, based on this reviewers observations of the disturbance levels associated with delineation drilling at the Lost Creek Project, it is expected that greater than 50% of the native vegetation will be adversely affected during the construction of the mine units. In light of that, the LQD will require that mine units and the roads leading to them be completely stripped of topsoil. **(MLB)**
- 26) Section OP 2.5.2 Long Term Topsoil Protection, Section OP2.6 Roads, Figure OP-2c: Topsoil stripping of roads has not been mentioned but is required for topsoil protection. The text should commit to topsoil stripping for roads and Figure OP-2c should also indicate that topsoil will be stripped. The amount of topsoil to be stripped

should be specified and the height, dimensions, and locations of topsoil piles should be detailed. In addition, the seed mixture for the topsoil piles should be specified. (AB)

- 27) Section OP 2.5, Topsoil Management. Paragraph 3 states that topsoil will not be stripped from light use roads. It is stated that roads to monitoring wells will not be upgraded. Given that the monitoring wells will need to have year round access, if snow removal is necessary to access an area, then the road should be upgraded, and the topsoil should be stripped. (AB)
- 28) Section OP 2.5.2, Long Term Topsoil Protection: should specify that all topsoil stockpiles will be sloped on all sides to 3:1 or flatter and will be promptly drill-seeded with the permanent seed mix, minus the shrub species. (MM)
- 29) Section OP 2.6, Roads, Page OP-10 and Figure OP-2a: The first paragraph of Section OP 2.6 as well as Figure OP-2a neglect to acknowledge and/or depict the roads that will be needed to access monitoring wells (sometimes referred to as "tertiary" roads). These roads must be discussed in the text and must be depicted on Figure OP-2a. Tertiary roads must also be depicted on any other figures depicting the project's roads. (MLB)
- 30) Section OP 2.6, Roads, Page OP-11: The fourth paragraph acknowledges that tertiary (two-track) roads will be needed and used to access the monitoring wells and header houses at the project. The text indicates that some pre-existing two tracks can and will be used for these purposes. However, the text also refers to the routes that will be taken to some monitoring wells and header houses as "travel routes". The inference of this reviewer is that these are paths beaten through the sage brush where there is no preexisting two-track. Travel routes will quickly become two-tracks which will, in turn, require reclamation at the end of the project. All of the site's roads, two-tracks, and travel routes must be accounted for in the text as well as site maps. (MLB)
- 31) Section OP 2.6, Roads: discusses the primary access road to the plant and secondary access roads to the mine units. Figure OP-2c illustrates the main access road with a 20' wide surface and secondary access road with a 12' surface. Figure OP-7b is somewhat inconsistent. It shows a "main road" with a 20' surface accessing the well field and a 15' wide secondary road in the well field. Table OP-4 lists main access road, main roads and secondary roads. Clarification is needed relative to road classifications and widths. (MM)
- 32) Section OP 2.7, Vegetation Protection and Weed Control, Page OP-11: The second paragraph in this section end with an ending quote, with no preceding quotation mark. This appears to merely a typographical error. (MLB)
- 33) Sections OP 2.8.1.2 and OP 2.8.1.5 should discuss speed limits on the various roads, including signage, employee training and enforcement policies, specifically in regards to minimizing vehicle collisions with wildlife and livestock. (MM)
- 34) Section 2.8.1.4, Transmission Line: discusses power transmission lines. Raptors perching on power poles are a threat to sage grouse. Power lines should either be

buried or raptor perch guards should be provided to deter raptor perching, in addition to minimizing the risk of electrocution. (MM)

- 35) Section OP 2.8.1.3, Fencing and Screening. Fencing design and specifications should be presented in the Operations Plan. Wildlife fencing, mud pit fencing and security fencing should each be specified. (AB)
- 36) Section OP 2.8.1.3, Fencing and Screening. As water in the ponds becomes concentrated over time, it is likely that screening will be required. US Fish and Wildlife Service (USFWS) and Wyoming Game and Fish (WG&F) should be consulted regarding the ponds and their requirements. Pond sampling schedule, the type of analysis to be performed, and screen design should all be presented in the Operations Plan. (AB)
- 37) Section OP 2.8.2, Wildlife Monitoring, Page OP-13: A separate table summarizing the annual wildlife monitoring schedule should be created and referenced in this section. This table must include a commitment to survey the two mile radius around the permit boundary every year for new sage grouse leks. (MLB)
- 38) Section OP 2.8.1, Wildlife Monitoring: This section indicates that "...additional [protection] measures will be implemented as on-site activities..." but they are not specified. Please correct. (SP)
- 39) Section OP 2.8.1.3, Wildlife Monitoring: This section indicates that "...Mine units will be fenced..." however, wildlife friendly fences identified in LQD Guideline #10 should be used for the perimeter fence. This would mean that **all** mud pits would need to be fenced as pronghorn antelope and other wildlife are capable of penetrating the perimeter fence. Please correct. (SP)
- 40) Section OP 2.8.1.3, Wildlife Monitoring: Fences should not be removed until vegetation is well established. Please correct. (MM)
- 41) Section OP 2.8.1.3, Wildlife Monitoring: By only committing to net or use other deterrence only IF fluid storage ponds are determined "to be harmful" to birds, LC ISL is proposing to wait until a violation of the Migratory Bird Treaty Act (1971) occurs. Before a "taking" occurs, LC ISL should take preventative measures. Netting or other measures should be put in place immediately upon construction of any fluid holding structure larger than a mud pit. Please correct. (SP)
- 42) Section OP 2.8.1.5, Wildlife Monitoring: This section should commit to a speed limit of no more than 30 mph to minimize vehicle collisions with wildlife. Please correct. (SP)
- 43) Section OP 2.8.1.6, Wildlife Monitoring: This section identifies "...wildlife enhancements in the Permit Area or nearby areas not proposed for disturbance...". Do "nearby areas" include only lands within the permit area or are those outside the permit area included as well? Affecting areas outside the permit boundary may represent an LQD Regulatory conflict. Although interagency coordination may relieve LQD concerns. Please correct. (SP)

- 44) Section OP 2.8 Wildlife Monitoring. Only monitoring of raptors and sage grouse is listed, yet vertebrates are also required to be monitored. (AB)
- 45) Section OP 2.8.1.4, Transmission Line: Raptor deterrents designs on the transmission lines should be presented in the Operations Plan, and also approved by USFWS and WG&F.I (AB)
- 46) Section OP 2.8.2, Wildlife Monitoring: This section indicates that the annual report will be formatted to "...meet BLM requirements...". The LQD requires an annual report written to the format specification of the WQED-LQD (see Required Annual Report Information – For Large Mine Operations, rev. 10/93 on the LQD website: <http://deq.state.wy.us/lqd/>). BLM can receive a copy of the annual report to the LQD. Please correct. (SP)
- 47) Section OP 2.8.2.1 Raptors. It is stated that monitoring will be conducted between April and July, and also states that it will be scheduled as late in the nesting season as possible. Given known nesting seasons for the likely raptors to be present, the months to conduct the monitoring should be specified. (AB)
- 48) Section OP 2.8.2.1 Raptors. The potential need for wildlife mitigation measures should be outlined in the Operations Plan. Approval from USFWS and WGF will be required for taking a nest, or any raptor deterrence plan. (AB)
- 49) Section OP 2.8.2, Wildlife Monitoring: Annual wildlife monitoring reports also need to be included in the LQD Annual Report. This should be added to the text in paragraph one. (AB)
- 50) Section OP 2.8.2, Wildlife Monitoring: Once the mine permit is approved the wildlife monitoring plan will be clearly defined in the permit and it should not be necessary to coordinate with the BLM and WGFD "annually" prior to commencing or during monitoring unless unusual circumstances occur. Annual consultation with USFWS is generally not necessary unless a T&E species is seen or if a nesting raptor is found in spring within 1 mile of current operations or if planned expansion of the operation area is to occur within 1 mile that season. Please correct. (SP)
- 51) Section OP 2.8.2, Wildlife Monitoring: On page OP-13 it is indicated that LC ISL will "...document [the] circumstances..." of each wildlife incident with the operation and will included the information in the LQD annual report. LC ISR should commit to recording all incidences in a log book kept at the mine site and available for LQD inspection. Please correct. (SP)
- 52) Section OP 2.8.2.1, Wildlife Monitoring: All available nesting habitat for raptors on the permit area and within a 1 mile perimeter should be checked for new nests every year (i.e., when the first survey of each nesting season is conducted). The volume of suitable nesting habitat is relatively small; therefore, it is not a huge task. Please correct. (SP)
- 53) Section OP 2.8.2.2, Wildlife Monitoring: "Standard protocol" in both instances should be changed to cite methods in the baseline study and if different, the method should be clearly stated here. Please correct. (SP)

- 54) Section OP 2.8.2.2, Sage Grouse, Page OP-15: Written documentation from the Wyoming Game & Fish and U.S. Fish and Wildlife Service which addresses any specific permitting requirements that they wish to impose based on the wildlife survey results, needs to be included in the permit document. Oral and written communication between Melissa Bautz (LQD-Lander) and Ms. Carrie Dobey (WGFD-Lander) reveal that the WGFD consider in situ uranium activities to have a similar effect on sage grouse and sage grouse habitat as does oil and gas activities.

Specifically, WGFD's "*Stipulations for Development in Core Sage Grouse Population Areas*" (dated July 31, 2008) states the following regarding in-situ uranium: "*There is no published research on specific impacts on sage grouse. Since development scenarios (well density, roads, activity) are similar to oil and gas, assume impacts are similar to oil and gas development. Use same stipulations used for oil and gas. In-situ uranium permitting should include a requirement to acquire data on sage grouse response to development and operation.*" In light of these concerns LQD will require that a section be added to the Wildlife Monitoring portion of the Operations Plan that addresses acquisition of data on sage grouse response to development and operation. Attached is a copy of the above-referenced document from the WGFD entitled "*Stipulations for Development in Core Sage Grouse Population Areas*". The stipulations on oil and gas development can be found at the beginning of that document. (MLB)

- 55) Section OP 2.8.2.2, Sage Grouse: discusses monitoring for sage grouse. It should be noted that the project is within the WG&F designated sage grouse Core Area. Please revise this section to include annual surveys for new leks on the permit area and a one mile perimeter. Also please reference WG&F approved survey methods which are described in Appendix B of LQD Coal Rules. (MM)
- 56) Section OP 2.9, Prevention and Remediation of Accidental Releases: In the second paragraph of this section, the commitment to contact the WDEQ/LQD and WDEQ/WQD within 24 hours of a release must specify that the contact will be verbal (not merely via e-mail or voice mail). (MLB)
- 57) Section OP 2.9, Prevention and Remediation of Accidental Releases: This section needs significantly more detail. What is the specific training that will be provided all employees? What is the frequency of the training? What is the frequency of the inspections to be conducted? How will the inspections be documented? The detailed procedures to be outlined in the Environmental Management Programs should be presented as part of the mine permit. Surface and pipeline spills have been a common occurrence at ISL facilities in the past. The Division is requiring that detailed, documented, training and inspections be clearly outlined in the Operations Plan. (MLB)
- 58) Section OP 2.9, Prevention and Remediation of Accidental Releases: This section must include a discussion of how contaminated soils resulting from a spill are to be delineated horizontally and vertically. Gamma ray and SAR must be included in the parameters measured in the soil. Specifics on how the depth of contamination will be determined and mapped must be provided. Treatment protocol must also be addressed in this section. Additionally, the permit must contain a commitment to

report and track annual releases from the site via a map in the WDEQ/LQD Annual report: The map should be a cumulative map indicating the footprint of the recent years spills in addition to any previous spills. This map should be accompanied by a table outlining the history of each release, including the estimated amount (gallons) of the release, footprint of contamination, depth of contamination, initial contamination levels, their sample locations, and any history of remediation efforts. **(MLB and AB)**

- 59) Section OP 2.9.1, Pipelines, Fittings, Valves and Tanks, Page OP-15: In the second paragraph, the depth at which pipes will be buried as well as the depth to which freezing occurs at the site should be discussed. **(MLB)**
- 60) Section OP 2.9.1, Pipelines, Fittings, Valves and Tanks Page OP-16: In the first paragraph, more detail on how the flow through pipelines will be monitored must be provided. Specifically, there should be as commitment to having a central control room where monitoring of pressure and flow of individual wells and pipelines and system balance on a mine wide and unit basis is automated. It is expected that there will be alarms requiring a response by a human being and documentation that the alarm was answered and by whom it was answered, etc. It is the reviewers' belief that a human being should not have to occupy a header house to monitor what is occurring in that particular sector of a given well field. A central control room will also minimize traffic across the site, a stated goal of the project. Other items to be addressed include how the alarm system will be tested to verify its integrity, use of tolerance limits to account for nominal deviations in flow and pressure, who/how the entire system will be monitored, whether the system will be monitored 24 hours per day and seven days per week by a human. Will the system have redundancy? In the earliest meetings among LQD and Lost Creek ISR personnel (along with AATA personnel), a central control room style of monitoring was explained (by AATA to LQD) to be an integral part of this project's design. **(MLB and BRW)**
- 61) Section OP 2.9.1 Pipelines, Fittings, Valves and Tanks. Preventive maintenance procedures should then be described. Visual inspection of pipelines, fittings and valves should be conducted to detect seeps or deteriorating conditions. Preventive maintenance schedule for replacement of pumps or valves, should also be discussed. **(AB)**
- 62) Section OP 2.9.1 Pipelines, Fittings, Valves, and Tanks. What will be considered a significant change in flow rate or pressure to activate the alarm? Which will actually be monitored – flow rates or pressures? **(AB)**
- 63) Section OP 2.9.3 Buildings. Header house and pumphouse details should be presented which indicate the inclusion of a sump and fluid detection sensors. **(AB)**
- 64) Section OP 2.9.3 Buildings. The height of the concrete curbing, the capacity and location of the sumps in the buildings, and the sloped curb at the overhead doors should all be described in greater detail. What will the storage capacity be of the building acting as a secondary containment should there be a leak, spill, or tank failure. i.e. how many tank failures can the storage capacity accommodate? **(AB)**

- 65) Section OP 2.9.4, Storage Ponds, Page OP-16: In the first paragraph of this section it is stated that pond capacity will be designed to accommodate two weeks of plant operation. However, the sixth paragraph of this section (on Page OP-17) states that the ponds will be kept full at all times to maintain the integrity of the liner (due to exposure of the elements including UV from sunlight). It appears, then, that at any given time the pond will actually have no capacity if it is full all the time. Please explain. Additionally, actual pond design plans must be provided. The schematic view of the ponds provided in Plate OP-1 are not sufficient. **(MLB)**
- 66) Section OP 2.9.4 Storage Ponds. The ponds are said to be designed to store two weeks of plant operations at a rate of 60 gpm, yet according to the water balance on Figure OP-5c, the maximum capacity should be based on 115 gpm of flow during maximum operations. **(AB)**
- 67) Figures OP-5a, b, c, Water Balance Diagrams: According to water balance diagrams presented, the deep disposal well(s) must have a minimum capacity of roughly 100 gpm. No information has been provided regarding the viability of a deep disposal well(s) and whether the characteristics of the intended formation would be sufficient to meet the project demand stated above. Prior to WDEQ/LQD permit approval, plans and specifications and approval for a deep disposal well(s) must be secured from the appropriate regulatory authority. Permits for such wells must be included in the WyDEQ/LQD permit application. This comment can be cross referenced with comment number 115 below which addresses "Section 5.2.3.2, UIC Class I Wells". Please provide. **(BRW)**
- 68) Section OP 2.9.4 Storage Ponds: What consideration has been given to the ponds freezing over. With only four feet of fluid capacity it is possible that the materials in the ponds could freeze solid. Does this have any implications to the liner strength and integrity. **(AB)**
- 69) Attachment OP-2, Figure titled Embankment Details: If the excavated material at the pond site is not suitable for embankment material, it states that material will be removed from a borrow area. Given the amount of drilling that has taken place within the permit area, has a source for embankment material been identified? The proposed borrow area should be identified, and its size, depth of excavation, and reclamation requirements should be outlined in the attachment. **(AB)**
- 70) Attachment OP-2, Figure titled Embankment Details: Although the text says fluid height will be four feet and freeboard 3, please indicate on the figure that the embankment height is 7.0 feet. Also there appears to be a typo on the Embankment Detail typ. Cross section, with a number three (3) in large font. **(AB)**
- 71) Plate OP-1, Plant Site Plan: This plate must be upgraded to an actual design including a conventional scale (the current scale is 1" = 16') and the location of the Plant Site must be depicted on a topographic map with township, range, and section lines as well as roads and other pertinent landmarks. **(MLB)**
- 72) Section OP 2.9.2, Fuel Storage Areas: More detail is needed in this section. Specifically, secondary containment must be addressed and explained. Additionally,

the weekly inspection criteria should be stated here. If an inspection checklist is to be used, the items on the checklist should also be listed. (MLB)

- 73) Section OP 2.9.5 Fuel Storage areas. How much fuel will be on-site? The Plant Site Plan (Plate OP-1) shows a gasoline and diesel tank. Is there enough fuel to qualify for Spill Prevention Control and Countermeasure Plan requirements under the Clean Water Act? If the volumes are less than the threshold, good management practices would dictate that there should be secondary containment for the tanks, capable of holding the capacity of the largest of the two tanks. (AB)
- 74) Section OP 2.10, Air Monitoring: Please indicate the source and quantity of water expected to be used for dust suppression, potable water supply, etc. for the proposed mine activity. (BRW)
- 75) Section OP 2.11.1, On-Site Wells, Page OP-18: Is the reference to "17 wells used to establish baseline" now outdated in light of the new wells installed at the site in late 2008? Please update if necessary. (MLB)
- 76) Section OP 2.11.2 Off-Site Wells. The BLM stock wells are said to be analyzed quarterly at a minimum for natural uranium and radium-226, yet if the mine operations are going to impact these off-site wells there are other parameters that would be early detectors of a problem that should be analyzed. Quarterly analysis should also include Cl, sulfate, bicarb, TDS, and pH. If these elements are showing trends, then action will be required, similar to the monitoring well ring. Please revise the text accordingly. (AB)
- 77) Section OP 2.11.2 Off-Site Wells Section OP 3.6.4.1 Mine Unit Baseline Water Quality and Upper Control Limits. These sections reference Lost Creek's Environmental Manual, and states that it discusses the sampling protocols. What is and where is this document? Sampling protocols need to be outlined in the permit document, as stated in Comment 28 from my August 26, 2008 comments on Appendix D-5 and D-6. (AB)
- 78) Section OP 3.2, Mine Unit Design: LQD Chapter 11, Section 6(d), states that casing requirements must be specified to prevent casing collapse during installation; convey liquid at the predicted injection / recovery rate and pressure; and allow for sampling. (AB)
- 79) Section OP 3.2, Excursions: A section specifying the corrective action that will be taken in the event of an excursion must be added to this section. A concrete commitment describing the handling of an excursion must be provided. Specifically, if an excursion is not in control within 60 days the [LQD] Administrator, with concurrence of the Director of the DEQ, has the authority to terminate the mining operation and revoke the permit (Chapter 11, Section 12(d)(ii)). Additionally, this reviewer would like to see text in this section regarding the steps Lost Creek plans to take in the event of an excursion. A discussion of the cessation of injection into the area under question, prior to 60 days into the corrective action process may be warranted. (MLB)

- 80) Figures OP-8a, 8b, and 8c. How far is the sand trap and base of the well bore expected to extend into the lower aquitard? With the Sage Brush shale pinching out to five feet in some locations, this aquitard should not be intersected if its integrity could be questioned. **(AB)**
- 81) Section OP 3.2 Mine Unit Design. Mine Unit 1's well field package will need to be submitted for review and approval prior to approval of the ISL Permit application. **(AB)**
- 82) Section OP 3.2 Mine Unit Design. Mine Unit 1's monitoring wells will require at least four sampling events to establish the upper control limits for the indicator constituents. The process to develop the UCL's, the number and spacing of the samples required should be outlined in the Operations Plan. **(AB)**
- 83) Section OP 3.2 Mine Unit Design. The details for the Hydrologic Test Report for the first wellfield package should include a refined water balance based on the hydrologic information for the wellfield. Minimum, maximum and average pumping rates, as well as the capacity of the ion exchange units, injection well(s) and evaporation pond(s) should be included. **(AB)**
- 84) Section OP 3.2 Mine Unit Design. The last paragraph of this section states that the operator has made an effort to properly abandon historic drill holes or wells. As noted earlier regarding Section D5.2.4 Historic Uranium Exploration Activities, all historic drill holes must be located and a determination made if they were properly abandoned. If they were not, then they must be re-entered and grouted from the bottom up to the surface. All of this effort must be clearly documented in the permit, on a hole by hole basis. **(AB)**
- 85) Section 3.2.1 Injection and Production Well Patterns: The text on page OP-22 indicates that each sand within the HJ horizon will be mined separately beginning from the bottom and progressing up. Restoration will begin with the upper most sand and progress downward. It is conceded that there is communication between the three sands. However, following the schematic in Figure OP-9a when mining the upper sand, the screens in the middle and lower sands are to be sealed off. Monitoring wells are to be screened in all three sands. Given that pumps will be set in the production zone only, please explain how stability will be maintained in the middle and lower sands until restoration occurs. Furthermore, given the above scenario and the fact that monitoring wells are screened in all three sands; if an excursion occurs, how can the source sand from which the excursion is associated be detected? Alternately, there is the potential that an excursion will not be detected due to dilution. Please address. **(BRW)**
- 86) Section 3.2.2 Monitor Well Locations. Paragraph one states that monitor wells will be completed in ore-bearing sands to be mined and in the overlying and underlying horizons. Depending on the hydraulic connectivity between multiple ore-bearing sands, multiple monitoring wells may be required in each sand unit within the HJ horizon. **(AB)**

- 87) Section 3.2.2 Monitor Well Locations. Section OP 3.6.3.3 states that mining of the overlying FG and underlying KM sands is anticipated in the future. Baseline conditions for the aquifer underlying the KM sands, should be conducted prior to any mining at the site. Regional monitoring wells of this lower aquifer will need to be installed prior to mining the HJ horizon. (AB)
- 88) Section OP 3.2.2.4 Overlying and Underlying Monitor Wells. Paragraph 2 states that operational controls, such as higher production rates may be used to control fluid migration when vertical confining layers are thin or absent. How would higher production rates control fluid migration? Would a higher bleed rate be required? How would a higher bleed rate affect the water balance and facility capacity projections. (AB)
- 89) Section OP 3.2.2.4, Overlying and Underlying Monitoring Wells: Given the discussion that ensued in the September 22, 2008 meeting at the LQD Lander office among your staff and LQD staff regarding Ms. Boyle's preliminary technical comments, the third paragraph of this section may need to be reevaluated/reworded. The third paragraph of this section discusses the shallowest water table at the site. Specifically, LQD staff understands that in the fall of 2008 Lost Creek ISR installed several new monitoring wells closer to the extents of the permit boundary in order to generate a potentiometric surface across the entire permit boundary. Some wells were installed at a relatively shallow depth of approximately 50 feet below ground surface (bgs) in order to assess the presence/absence of an aquifer at that depth. The results of the fall 2008 well installation activities are not reflected in the version of the application reviewed here. This reviewer requests that Lost Creek ISR provide documentation regarding the presence/absence of water at depths shallower than 150' bgs in Section OP 3.2.2.4. Some of your staff may recall that during the summer 2006 drilling, one of Lost Creek ISR's field staff (Dawn Schippe) contacted Ms. Bautz at the LQD Lander office via telephone explaining that a shallow (potential) aquifer had been encountered during drilling at approximately 50' bgs. (MLB)
- 90) Section OP3.3 Well Completion. The burst pressure and collapse pressure of the SDR 17 pipe to be used is presented. Please also provide information on the pressures to be experienced with the well depths in the ore zone, i.e. at what depth and/or pressures will the SDR 17 be unsuitable for use. (AB)
- 91) Section OP 3.3 Well Completion. The last paragraph states that well completion information will be submitted to the WDEQ. In addition, a boring log indicating the stratigraphy of each hole should also be included. (AB)
- 92) Section OP 3.4 Well Integrity Testing. Paragraph 2 states that the pressure in the sealed casing is then increased to a specified test pressure. Please indicate what that test pressure will be, e.g. 125% of operating pressure (AB)
- 93) Section OP 3.4, Well Integrity Testing: should describe protocols for investigating, evaluating and tracking MIT failures and also determining the impacts of the casing failure and any resulting leakage from the well. (MM)

- 94) Section OP 3.5, Mine Unit Piping and Instrumentation: should clearly specify the instrumentation that will be installed for each well (i.e. each well, production and injection, will have a flow meter, a control valve and a pressure alarm installed). (MM)
- 95) Section OP 3.5 Mine Unit Piping and Instrumentation. Please also describe how the pressure and flow rate information will be managed at one control point. (AB)
- 96) Section OP 3.5 Mine Unit Piping and Instrumentation. It is stated that individual well lines and trunk lines will be buried to prevent freezing. Figure OP-7c indicates the typical trench layout to be 6.0 feet deep. In Section OP 3.5 please discuss the burial depth relative to the known frost line in the Red Desert, as well as how the lines under high traffic areas will be protected. (AB)
- 97) Section OP 3.6.3.1, Water Balance: should contain an explanation for why the restoration flow rates are so low in comparison to production flow rates (i.e. less than 10%). Would it not be feasible to have higher restoration flow rates, perhaps equal to production flow rates? (MM)
- 98) Section 3.6.3 Projected Water Balance and Water level Changes. This section states that the water balance considers the "capacity of the Plant and Class III UIC wells for production and for restoration". Other critical factors will include the capacity of the Class I UIC well(s) and the capacity of the evaporation ponds. These should be included in the discussion and in Figures OP-5a through 5f. (AB)
- 99) Section OP 3.6.3.1 Water Balance. (Table OP-6) Are the flow capacity's presented in this Section, Table and in Figures OP-5a through 5f, for the first mine unit or for multiple mine units? Please clarify by indicating how many mine units will be in production and restoration at one time, and how the rates presented are a compilation of that information. A table detailing this information for each mine unit, at each stage of production and restoration, for each year in the life of the mine would be useful. (AB)
- 100) Section OP 3.6.3.1 Water Balance. Paragraph 2 mentions the supplemental use of WYPDES discharge as part of the water balance for liquid waste. What is the source of this end of pipe discharge? What treatment standards will apply? What flow rates are anticipated? If a WYPDES discharge is going to be part of the water balance for the site, it should be included in Figures OP-5a through 5f. (AB)
- 101) Section OP3.6.3.1 Water Balance. Paragraph 3 states that in the operational mode of production operations, restoration sweep, and groundwater treatment, that the net consumptive removal will be 3% or 190 gpm. It is not clear how this correlates with Figure OP-5c, Project Water Balance Production with GWS and RO. Please provide greater details regarding each stage of the mine life and water balance. (AB)
- 102) Section OP 3.6.3.1 Water Balance. Please provide details on the storage capacity of the permeate storage pond(s) and the concentrated brine storage pond(s), and the estimated average evaporation rate for these facilities. This information should also be included on Figures OP-5c through 5f. (AB)

- 103) Section OP 3.6.3.1 Water Balance. If efforts will be made to enhance the evaporation rate from the ponds with sprayers, this should be discussed. (AB)
- 104) Section OP 3.6.3.1 Water Balance. The required injection / disposal rate for the UIC Class I well(s) should also be included in the water balance. Once the aquifer characteristics are known, the capability of the aquifer to handle the disposal rate will need to be presented in detail. (AB)
- 105) Section OP 3.6.3.3. Cumulative Drawdown: W.S. 35-11-428(a)(iii)(E) requires an assessment of impacts to water resources on adjacent lands and the steps that will be taken to mitigate the impacts. Section OP 3.6.3.3 should include drawdown projections for all aquifers that could potentially be affected by the operation for the life of the mine, including drawdown maps to illustrate the horizontal and vertical extent of projected drawdown. (MM)
- 106) Section OP 3.5.4.2 Excursion Detection: In addition to the use of water levels to detect excursions, will barometric pressure within the well be monitored to detect excursions? (MLB)
- 107) Section OP 3.6.4.1 Mine Unit Baseline Water Quality and Upper Control Limits. The last sentence of this section states that "UCL's will be set at five standard deviations to the baseline average for the indicator." It would be clearer to state that "the UCL will be set as the baseline mean plus five standard deviations". (AB)
- 108) Section OP 3.6.4.2 Excursion Detection. The second paragraph states that increased water levels could be indicative of casing failure, and that isolation and shutdown of individual wells would be used to isolate the problem. In addition, please add to the text that MIT testing of suspect wells will be conducted. (AB)
- 109) Section OP 3.6.4.3 Excursion Verification and Corrective Action The second paragraph states that if it is determined that a well is on excursion status, that the DEQ will be notified within 24 hours. This should be changed to read verbally notified within 24 hours. (AB)
- 110) Section OP 5.0 Effluent Controls. Within this section there are many subsections which address the multiple solid and liquid waste streams from the facility. Please also provide a table which lists each of the facilities solid and liquid waste streams, the estimated monthly predicted volume to be generated, the storage location, and the disposal location. (AB)
- 111) Section OP 5.1 Gaseous Emissions and Airborne Particulates. No mention is made of the Air Quality Division permit(s) that will be required for the site. Please add this information to the discussion within this section. (AB)
- 112) Section OP 5.2.1.3 Waste Petroleum Products and Chemicals. It is not clear from this section specifically where petroleum and chemical products, or hazardous and non-hazardous waste streams will be stored. Preferably these containers will be stored in-doors where they are not subjected to the elements and have adequate secondary containment. If they are to be stored outdoors, please indicate whether there will be roofing, locked fencing, and secondary containment. (AB)

- 113) Section OP 5.2.1.4, Domestic Liquid Waste: The permit for the domestic sewage/septic system should be included in the mine permit application. Additionally the disposal of domestic waste must be addressed. **(MM and BRW)**
- 114) Section OP 5.2.1.4 Domestic Liquid Wastes: There is no previous discussion of a water supply well for potable water. Please provide a discussion within the permit of the proposed aquifer and location for the potable water supply. **(AB)**
- 115) Section OP 5.2.3.2, UIC Class 1 Wells: This section addresses deep disposal wells which are a key component of this project. Permits for these wells should be included as part of the mine permit application. **(MM)**
- 116) Section OP 5.3.2, Disposal of Liquid 11(e)(2) Byproduct Materials should specify the disposal site for 11(e)(2) byproduct waste. **(MM)**
- 117) Section OP 5.3.2 Solid 11(e)(2) Byproduct Materials: Will there be any employee Personal Protection Equipment (PPE) that will be generated on a regular basis as 11(e)(2) waste? If a waste stream, it should also be listed in paragraph one of this section. **(AB)**
- 118) The operations plan should include a section detailing procedures for exploration and delineation drilling, including: topsoil protection measures; drill hole abandonment procedures, including provision for backfilling to the surface with bentonite chips; and surface reclamation procedures. **(MM)**
- 119) The operations plan should include a section detailing procedures and a schedule for locating, investigating and properly abandoning all historical drill holes on the permit area. **(MM)**

Reclamation Plan (RP)

- 1) Section RP 2.3 must specify and describe in detail the methods and efforts that will be employed to restore the ground water to background water quality levels (i.e. define BPT). This description should specify the volumes of water (pore volumes, including the PV calculation) to be treated, re-injected and circulated and the specific treatments to be used. The application must provide detailed justification to demonstrate that the prescribed process has been proven to be successful in restoring ground water to background water quality levels and thus constitutes BPT. Once approved, LQD will expect the operator to employ these prescribed restoration efforts. The reclamation bond will be calculated based on the estimated cost of completing these prescribed efforts. BPT will thus be defined and approved up-front for each well field. Restoration will be considered to be complete once the approved BPT efforts have been conducted, assuming that the class of use has been achieved. This process of defining and approving BPT will provide a measure of certainty to all parties. It is envisioned that the definition of BPT could change for future well fields, based on changes in technology and/or results of on-site restoration efforts. **(MM)**
- 2) Section RP 2.3 groundwater Restoration Methods: Please provide greater detail including chemical equations (similar to Figure OP-6) to explain the processes that the groundwater will undergo to create the reducing conditions: The chemistry that will take

- place in the ion exchange and RO circuits should be presented. Further explanation of the how possible reductants or bioremediation additives will affect the chemistry of the groundwater should also be provided. (AB)
- 3) Section RP2.3 Groundwater Restoration Methods. This section provides pore volume exchanges for groundwater sweep (one pore volume) groundwater treatment (six pore volumes) and groundwater recirculation (one pore volume). Please cite where this is documented to be BMP. Is it based on any real life success of an existing well field? (AB)
 - 4) Figure RP-1. The timeline gap for the Process Plant should indicate plant decommissioning. (AB)
 - 5) Please provide a hydrologic impact assessment (surface and ground water) of the final anticipated conditions. This should include recovery times ground water, potential changes in water chemistry, etc. (BRW)
 - 6) Section RP 2.3.1: The use of ground water sweep with direct disposal of the produced water, is not considered to be BPT due to excessive consumption of ground water and resultant impacts to ground water resources. This section should be revised to clarify that ground water sweep will only be employed when the produced water can be treated and re-injected. (MM)
 - 7) Section RP 2.4: The ground water stability monitoring phase should be 12 months with quarterly sampling (i.e. a total of 5 sampling events). (MM)
 - 8) Section RP 2.4 should be revised to specify that during the stability monitoring period all monitoring wells (inside and outside of the pattern, including underlying, overlying and perimeter wells) will be individually sampled and analyzed for the complete suite of parameters, including water levels. (MM)
 - 9) Section RP 3.1, Well Abandonment: Item number 1 in the list beginning at the bottom of page RP-10 must specify that grouting will occur from the bottom of the well to the top. (MLB)
 - 10) Section RP 3.1, Well Abandonment: Item number 7 in the list on Page RP-11 must be changed to acknowledge the new policy of LQD to require that all drill holes and abandoned wells are backfilled to within three feet of the surface. It is no longer considered BPT to allow open holes to be left in the ground. This means if grout settles to 40 feet bgs (or any other level greater than two or three feet bgs) and no water is on top of the grout plug; bentonite chips or a reasonable substitute must be poured into the hole to bring it to the proper level. If there is still water on top of the grout plug, the operator is expected to re-enter the hole and tremmie to the bottom so the hole may, again, be backfilled from the bottom to the top. (MLB)
 - 11) Section RP 3.1, Well Abandonment: Item number 12 in the list on Page RP-11 must include the words "and LQD" at the end of the sentence ending with "WSEO". (MLB)

- 12) Section RP 3.2 Facility and Road Reclamation: Paragraph 3 states that culverts and road surfacing materials will be removed. Please indicate their final disposal location(s). **(AB)**
- 13) Section RP 4.0, Reclamation and Decommissioning of Processing and Support Facilities: Ponds, laydown yards, parking areas, and topsoil and subsoil stockpile location, should be included in the bullet list at the beginning of this section. **(MLB & AB)**
- 14) Section RP 4.1 discusses on-site waste disposal. Any on-site waste disposal must be permitted as part of the mine permit application. Detailed plans and specifications must be provided along with landowner's consent. **(MM)**
- 15) Section RP 4.5.2, Surface Preparation: On Page RP-15 there must include a commitment to rip to a minimum depth of 12 inches as part of seedbed preparation. **(MLB)**
- 16) RP4.5.2, Surface Preparation: It is stated that "Seed bed preparation will be performed under appropriate soil and climatic conditions". Please define appropriate soil and climatic conditions. **(CS)**
- 17) RP4.5.3, Soil Placement: Stating that "soils will be replaced where excavated, whenever possible" seems inappropriate. If soils are stripped and stockpiled it should be possible to replace them. **(CS)**
- 18) Section RP 4.5.3 Soil Replacement. This section states that Section OP-2.5 describes that separate handling of topsoil and subsoil is not required. No discussion of this topic was found in Section OP 2.5. Topsoil is always more valuable a planting bed than a topsoil / subsoil mixture. Especially given the desert conditions, all efforts should be made to be protective of the topsoil layer, especially by handling it separately from the subsoil. **(AB)**
- 19) Section RP 4.5.4 Seed Mix, Reseeding Methods and Fencing. Paragraph 4 states that re-seeded areas outside fenced mine units will be restricted until vegetation is successfully re-established. The only way to ensure access restriction from wildlife is with fencing. Please state that these area will have fencing installed to prevent access. **(AB)**
- 20) RP4.5.4, Seed Mix, Reseeding Methods, and Fencing: The last paragraph states that "When reseeding areas outside fenced mine units or the Plant, grazing and access to reseeded areas will be restricted until vegetation is successfully re-established". Please clarify how access is going to be restricted. For example "with BLM and DEQ approved fencing". **(CS)**
- 21) RP4.5.5, Revegetation Success Criteria: The second point in the list states that "the total vegetation cover of perennial species (excluding noxious weed species) and any species in the approved seed mix is at least equal to the total vegetation cover of perennial species (excluding noxious weed species) before operations". Consider rewording to "the total vegetation cover of perennial species (excluding noxious weed species) and any species in the approved seed mix is at least equal to the total vegetation cover of

- perennial species (excluding noxious weed species) of the undisturbed areas of the mine permit". This would add consistency with your proposed vegetation study parameters and helps account for climatic variability between when mining began and when reclamation evaluation occurs. **(CS)**
- 22) Reclamation Plan, Page RP-15. The sequencing of the sections goes from RP4.4 Roads on page RP-14 to Section RP 1.1 Soil Replacement and Revegetation on page RP-15. According to the table of Contents, this should be RP 4.5 Soil Replacement and Revegetation. **(AB)**
- 23) Section RP 5.0 and Table RP-4: The reclamation cost estimate should be revised to include the following:
- A detailed critical-path time schedule including all phases of the reclamation.
 - A detailed description of labor requirements and assumptions for all phases of the reclamation. It is this reviewer's position that the reclamation cost estimate should include a workforce/payroll comparable with the production workforce/payroll or justify why this would not be the case. **(MM)**
- 24) RP5.0, Financial Assurance, Category 2: The paragraph addressing worksheet seven indicates a "conservative" estimate of 5 out of 40 acres will need topsoil handling. Please clarify what a "conservative" estimate is and the justification for stating only 5 out of 40 acres will need topsoil handling. **(CS)**
- 25) Section RP 5.0 Financial Assurance. Paragraph one. Please add the cost of groundwater monitoring and analysis to the list of costs. **(AB)**
- 26) Table RP-4 Reclamation / Restoration Bond Estimate. Groundwater sampling and analysis could be conducted for many years, and should not be handled as a overhead cost of 0.5%, but as a separate line item in the bond estimate. Please indicate the initial number of monitoring wells that will be in place at the initial start-up of the mine and calculate their cost for sampling and analysis based real costs. **(AB)**
- 27) Table RP-3, Seed Mix: It is requested that the seed mix be revised, contingent on BLM concurrence, to eliminate Prairie sandreed and Rubber rabbitbrush. This would reduce the overall seeding rate to 15 lbs/ac which is a more reasonable drill seeding rate. This lower seeding rate would be more conducive to sagebrush establishment, which is a primary focus of the revegetation efforts. Prairie sandreed is not native to the area and is not adapted to the arid conditions of the Red Desert. Rubber rabbitbrush is native, however it is not particularly desirable. Species that could be listed as possible alternates would include winterfat, needle-and-thread and squirreltail. **(MM)**
- 28) Please provide a sediment control plan for the reclamation phase of the operation. **(BRW)**
- 29) As required by LQD, Chapter 11, Section 5 (a) (v), the Reclamation Plan must include a contour map showing the approximate postreclamation surface contours for affected land and the immediate surrounding areas if the operation will substantially alter the premining contours. The absence of this map must be explained in the permit text in the context of the above rule. **(MLB)**

30) A new section should be added to the Reclamation Plan entitled "Determination of Successful Groundwater and Site Restoration". The purpose of this section is to clearly state unequivocally the criteria that will be used by the WDEQ/LQD to determine whether the site has been adequately restored. It is envisioned that this section of the Reclamation Plan may become more pertinent as staff in Lost Creek ISR and WDEQ/LQD change over the upcoming 10 to 20 years. Fulfillment of the criteria in this section will be required before the operator may request/achieve final bond release. This section should include the following six bond release criteria:

- a. Ground water treatment/restoration using approved BPT as described in Section RP 2.3 (Groundwater Restoration Methods) of the Permit;
- b. Achievement of baseline ground water conditions. If baseline is unachievable, proceed to c.;
- c. If baseline ground water conditions are unattainable, achievement of approved Class of Use is required;
- d. Ground water stability monitoring of a 12 month duration with quarterly sampling (i.e. a total of 5 sampling events). If water quality trends during stability monitoring indicate class of use standards are (or will be) exceeded, the operator must return to step "a" above). Alternately if class of use standards, at a minimum, are met for the 12 month period then the well-field will be considered eligible for bond release;
- e. Reclamation of surface disturbance as described in the Reclamation Plan of the Permit which shall include all requirements of LQD Chapter 11, Section 5;
- f. Documentation of LQD and landowner (primarily BLM) concurrence that the project is adequately reclaimed to the standards outlined in the approved WDEQ/LQD permit.

The above bond release criteria can be considered on a well field by well field basis. Once criteria a - d have been met, the operator may request partial bond release for an individual well field. Final bond release cannot be considered until all of six of the above criteria have been met by the operator. **(MLB and BRW)**

Summary:

Lost Creek ISR, LLC must submit the necessary changes as indicated in the above review as soon as possible so that this application may be re-considered for technical completeness. Once the application is found to be technically complete, second public notice will be authorized (in writing from WDEQ Land Quality Division). Should you have any questions concerning this memorandum, please contact me at the WDEQ-LQD District 2 Office in Lander (307-332-3047).

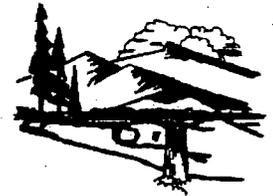
Enclosures Copy of WGFD document entitled "*Stipulations for Development in Core Sage Grouse Population Areas*"

*****END OF MEMORANDUM*****



DEQ Comments
(Geol & Hydrol)

Department of Environmental Quality



To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

September 26, 2008

Mr. Wayne Heili
Lost Creek ISR, LLC
5880 Enterprise Drive, Suite 200
Casper, WY 82609

RE: Lost Creek ISR, LLC, In-Situ Recovery (ISR) Permit Application, **Partial Technical Review**, TFN 4 6/268

Dear Mr. Heili:

Land Quality Division (LQD) Staff (Ms. Amy Boyle and Mr. Matthew Kunze) have reviewed the above named Uranium In-Situ Recovery (ISR) Permit Application for Lost Creek ISR, LLC, also referred to as "The Lost Creek Project". The two attached memoranda summarize Ms. Boyle's and Mr. Kunze's **technical comments** on Appendices D5 and D6 of the application being reviewed under TFN 4 6/268.

Please submit the necessary changes per the above review as well as according to the meeting among LQD and Lost Creek personnel held on September 22, 2008 at the LQD office in Lander. This is considered a partial technical review because only Appendices D-5 and D-6 were addressed in the attached memoranda. The LQD plans to send the remaining technical review comments to Lost Creek ISR personnel by the end of October 2008.

Should you have any questions concerning this letter, please contact me at the WDEQ-LQD District 2 Office in Lander (307-332-3047).

Sincerely,

Brian Wood

Melissa L. Bautz
District 2, Environmental Scientist 2
Land Quality Division

Enclosures Memorandum from Matthew Kunze to Melissa Bautz (4 pages with attachments)
 Memorandum from Amy Boyle to Melissa (8 pages with attachments)

Cc: Mr. John Cash, Ur-Energy USA, 5880 Enterprise Drive, Suite 200, Casper, WY 82609 (w/encl)
 Mr. Harold Backer, Ur-Energy USA, 10758 W. Centennial Rd. Suite 200, Littleton, CO 80127 (w/encl)
 Mark Newman - BLM Rawlins, P. O. Box 2407, Rawlins, WY 82301 (w/encl)
 Cheyenne WDEQ/LQD → Matthew Kunze → TFN 4 6/268 File (Lost Creek ISR) (w/encl)
 Mark Moxley/Amy Boyle - Lander WDEQ/LQD → TFN 4 6/268 File (Lost Creek ISR) (w/encl)
 United States NRC, c/o Alan B. Bjornsen, Environmental Project Manager, Mail Stop T-8F5, Washington, D.C. 20555-0001 (w/encl)
 Chron (w.o./encl)



MEMORANDUM

TO: Melissa Bautz, Scientist 2

FROM: Matt Kunze, Scientist 2

THROUGH: Kathy Muller Ogle, Geological Supervisor

DATE: August 8, 2008

SUBJECT: Baseline Hydrologic Monitoring Data Submitted Electronically for Lost Creek Project (TFN 4 6/268)

The following are comments on the baseline hydrologic monitoring data submitted electronically by Lost Creek ISR, LLC for the Lost Creek Project (LQD TFN 4 6/268).

1. Please submit the station site information for the thirteen surface water monitoring stations (LC1 through LC13) shown on Figure D6-5 in Appendix D-6. An Excel spreadsheet template for surface water stations will soon be available on the LQD website, http://deq.state.wy.us/lqd/Uranium_Data.htm. A copy of this file is also attached to this memo. In particular, please provide the station type (stream station, reservoir, stockpond, etc.), stream or waterbody name, and the location coordinates for each station. Also please note that a separate spreadsheet (also attached and on the LQD website) can be used to submit surface water flow data if this type of monitoring will occur.
2. Please submit the baseline lab water quality data that were collected on April 17, 2007 at seven of the surface water monitoring stations. The lab data are shown in the permit application in Table D6-4 and Attachment D6-1 of Appendix D-6.
3. In future submissions of lab water quality data, please use the preferred list of parameter names. LQD staff in Cheyenne (Kathy Muller Ogle and Matt Kunze) are available to work with Energy Laboratories, Inc. to make them aware of the preferred formats for submitting water quality data electronically.
4. In future submissions of lab water quality data, please provide the laboratory detection limit used for parameters that were reported as "ND." LQD stores the value of the detection limit, even if a parameter is reported as not detected by the lab. LQD prefers the non-detect values be reported as negative numbers (i.e., -0.001). The baseline data submitted in *Lost_Creek_Uranium_Lab_Water_Quality_Data.xls* used both negative numbers and "ND."

cc: Amy Boyle, District 2
Brian Wood, District 2
LQD District 2 - TFN 4 6/268 - Correspondence
LQD Cheyenne Office - TFN 4 6/268 - Correspondence

SAMP. STATION NAME	MEAS. DATE	FLOW RATE	FLOW MEAS. METHOD	FLOW MEAS. EQUIP.	FLOW MEAS. TYPE	COMMENTS
ISL-SW-01	6/23/2003	0.86	RATING CURVE	WEIR/RECORDER	PEAK DAILY	Recording
ISL-SW-02	8/23/2004	7.1	RECORDER	PARSHALL FLUME	MEAN DAILY	General Storm

(ft³/sec) (i.e., recorder, rating curve, formula, etc) (i.e., crest gage, weir, Parshall flume, recorder) (i.e., peak daily, mean daily, instantaneous)

MEMORANDUM

TO : Melissa Bautz
FROM: Amy Boyle
DATE: August 26, 2008
SUBJECT: Ur Energy Permit Application Review, D-5 and D-6, TFN: 4 6/268

I have completed my review of the Ur Energy – Lost Creek permit application Section D5 – Geology and D6 – Hydrology (Excluding D.6.1 Surface Water Hydrology). Additional pump test data is expected, so my review of this information was cursory. My review of the Operation and Reclamation Plans will be provided under separate cover. In general, additional groundwater monitoring wells will need to be installed to better define the permit area, and the potentially impacted aquifers. The majority of the wells are located within the proposed mine units. Background upgradient and downgradient wells outside the mine units must be established. The fault zone poses another challenge in terms of site characterization, since it acts as a hydrologic barrier. Wells will need to be distributed north and south of the fault to define these areas separately. My comments are listed below:

Section D-5 Geology

1. Section D5.1.1, paragraph 2, Section D5.1.1 paragraph 1, and Table D5-1 (Permit Area Stratigraphy) state that within the permit area the Ft. Union Formation is 4,650 feet thick yet the Geologic Cross Section (Figure D5-2a) Schematic only illustrates the Ft. Union as being 1,000-2,000 feet thick. This is the same for other formation thicknesses (e.g. Battle Springs and Wasatch are said to be 6,200 feet thick, yet the cross section only shows them to be 4,000 feet thick). This discrepancy between Figure D5-2a, Table D5-1 and the text needs to be corrected.
2. Figure D5-1 is a Regional Geologic Map. This map indicates the faults in the area, but does not indicate the Lost Creek Fault within the permit area. This is a significant and well documented feature within the permit area, and should be indicated on the Figure.
3. Section D5.1.2, paragraph 2. This section discusses the presence of the Lost Soldier Anticline to the northeast of the permit area. Looking at Figure D5-1 it is not readily apparent where the axis of this anticline is located. If possible, please delineate the Lost Soldier Anticline on Figure D5-1.
4. Plates D5-1a – D5-1e. These plates provide one generalized and several detailed geologic cross sections down the centerline of the ore body, and across the centerline of the ore body. In addition, Figure D5-2a provides a very generalized geologic cross section across the northern portion of the permit area. LQD Non-Coal Rules, Chapter 11, Section 3(a)(viii) requires cross sections that show geologic features within the entire permit area, and how they relate to the production zone. Extending cross sections F, G, and H to the boundaries of the permit area with any available drill hole data, will help to provide this information.

5. Figure D5-2b and Figure D6-10. These figures show a stratigraphic column against a geophysical log, yet the type and scale for the log is not provided. Also the description is generalized and does not indicate the stratigraphic detail that should have been recorded in the field. It is requested that the Figure title be changed to read 'Generalized Stratigraphic column'.
6. Several of the Plates, beginning with Plate D5-1a indicate the mine unit boundaries, yet the proximity of Mine Unit 6 to the eastern boundary of the proposed permit area, will need to be changed to allow for the monitor well ring and aquifer exemption boundary to be within the permit boundary.
7. Section D5.3.5 discusses the Short-Term Probabilistic Hazard Analysis, yet does not explain how the potential estimated accelerations would affect the well structure, pipelines or buildings on site. Please add this information to the text.
8. Section D5.2.2, Structure. This section discusses there being one minor fault, the Lost Creek Fault, within the permit area, yet the maps in this section indicate a second fault to the west of the Lost Creek fault, yet within the permit area. This fault should be discussed in detail.
9. Plate D5-1a. On the cross sections please show the formations present to the total depth of the boring, i.e. if the boring (e.g. TE61, P2-19, TT40, LC3) crosses into the no name shale and or Middle KM horizon, and below, this should be indicated on the cross sections.
10. Plates D5-1a through D5-1e. Geologic Cross Sections should be reviewed, approved and stamped by a licensed Wyoming Professional Geologist, as per the Wyoming Geologists Practice Act.
11. Plates D5-1b – D5-1e show many places where the Sage Brush Shale has mineralized zones of ore, e.g. TG19-20, TG68-20, TG12-20, TG58-20, TG2-10, TG9-17, TG10-17, and TG11-17. The presence of mineralized zones within the Sage Brush Shale brings to question the ability of this unit to act as an adequate aquitard between the LHJ and UKM sands. The Sage Brush Shale is defined as a fine sand and shale unit. How fine is the sand if it had enough transmissivity to be a receiving unit for the Uranium? The overlying Lost Creek Shale also has some minimal mineralization within it. What is the likelihood that these shales could leach out Uranium altering the integrity of the unit. It is requested that the MKM be fully characterized for baseline, north and south of the fault, as it may end up being the underlying aquifer that needs to be protected during mining of both the HJ horizon and potentially the UKM horizon.
12. Plate D5-2a, and D5-2c Isopach Maps of the Lost Creek Shale and Sagebrush Shale (respectively). For areas where the isopachs indicate the unit thickness is less than ten feet thick, please indicate at specific drill hole sites, what the thickness is at that location, so the reviewer knows how much less than ten feet in thickness the aquitard is at a given location.

13. Section D5.2.4 Historic Uranium Exploration Activities, and Plate AD5-2a-c Location Map of Historical Drill Holes. It is stated that there are at least 560 exploration holes in the area, and Attachment D5-2 lists the holes northing and easting, year drilled and ID. Please also include depth of hole and discuss further the efforts made to locate the old drill holes, and whether or not it was confirmed that the hole had been properly abandoned. If the hole was abandoned through recent efforts, the plugging procedure and date should be indicated as well. The map should be updated to indicate the status of each drill hole location. Once operations commence, it is important that these historic drill holes do not provide a pathway for production fluids to migrate to underlying or overlying aquifers.

Section D-6 Hydrology

14. Section D-6. Detailed stratigraphic and well completion logs should be provided within the permit document for all monitoring wells. It is preferable if this information can be compiled on one log form. Notation of each horizon within the stratigraphic column would also be helpful. LQD Guideline 8, Appendix 5 describes the information to be included for each well.
15. Figure D6-10, Site Hydrostratigraphic Units. Please indicate the well ID for the geophysical log presented. Also please indicate the type and scale of the log on the figure. Also, the actual geophysical logs for all monitoring wells should be included as part of the permit application.
16. Figure D6-27a, Piper Diagram – Average Water Quality at Individual Monitoring Wells. The legend designates which well is represented by which symbol, and the wells are grouped by color, yet it does not indicate which horizon the wells are monitoring. Please add the horizon noted by each color. *(The colors are not consistent with which formation they represent, i.e. other Figures use green to indicate the DE horizon wells, whereas the Piper diagrams use red).*
17. Figures D6-6 through D6-28b (maps), Figures in Attachment D6-2a and D6-2b. Petrotek maps. Please add a layer of topography to these maps.
18. Figures D6-11a through D6-11c. The potentiometric surface maps are limited in scope and only represent a small portion of the permit area. The potentiometric surface maps should be representative of the entire permit area. Also given the barrier nature of the fault, both sides of the fault need to be adequately characterized. Additional baseline groundwater monitoring wells with adequate distribution across the permit area will need to be installed for this purpose.
19. Figures D6-11a through D6-11c. No potentiometric surface map for the DE horizon has been provided. All potentially affected aquifers are to be characterized, and the potentiometric surface for the aquifers should be presented for the entire permit area, both north and south of the fault. Additional monitoring wells will be necessary to obtain this information.

20. Section D6.2.2.1, Hydrostratigraphic Units, HJ Horizon. If the UKM sand ends up being mined, it is stated that the LHJ sand will be the overlying aquifer. Yet for the purposes of protecting the overlying and underlying aquifers, if the UKM becomes a mineable unit, after the HJ unit has been impacted, then the relative overlying aquifer to be protected would be the LFG, and the underlying aquifer would be the MKM.
21. Section D6.2.2.2, page D6-14, paragraph 2 references Figure D6-11d, as indicating the differences in water levels across the fault based on 1982 and 2006 data. It goes on to state that the data is insufficient. It is not clear what is gained by this figure since Figure D6-11a clearly shows the difference in water level within the HJ Horizon and across the fault zone.
22. Section D6.2.2.2, Potentiometric Surface, Groundwater Flow Direction and Hydraulic Gradient, page D6-14. Although hydraulic gradient is the change in head over distance between two wells, for the sake of the permit application, the hydraulic gradient across the potentiometric surface needs to be determined. As stated in comments 18 and 19, the potentiometric surface of each aquifer needs to be established, on both sides of the fault, and then the hydraulic gradient of this surface calculated with a minimum of three wells. The potentiometric surface should be representative of the permit area, and not just the area in the center of the permit area, adjacent to the fault zone. It seems possible that the gradient may be more generally to the south, yet when the fault zone is encountered, it changes to parallel this hydrologic barrier. Additional groundwater monitoring wells will need to be installed to obtain this information.
23. Section D6.2.2.3, Aquifer Properties, Page D6-16. The 1982 Pump tests were performed by Hydro-Search, the 2006 Pump tests were performed by Hydro-Engineering. Please reference who (*Petrotek*) conducted the 2007 Pump tests.
24. There are 14 potentially active groundwater wells within 0.5 miles of the permit area, and many more historic groundwater wells within the permit boundary or 0.5 mile perimeter with abandoned or canceled permits. What is the status of the abandoned and cancelled wells? Is their proper abandonment documented? If not, are there well completion logs for these wells to indicate if they have a specific screened interval? The current status of these wells needs to be clearly defined to ensure that they are not a potential pathway between aquifers.
25. Section D6.3, Table D6-12a. There are numerous Kennecott, Tg and BLM/Tg groundwater permits within or adjacent to the permit area. The status is listed as adjudicated, abandoned, or cancelled. Further discussion regarding the status of these permits needs to be included in Section D6.3 and Table D6-12a. Were wells drilled under all of the permits listed? Are there abandonment records for any of the wells? Has any effort been made to locate these wells and verify their status? There needs to be assurances that these wells will not act as a potential conduit for the movement of production fluids between aquifers.
26. Section D6.3, Page D6-21. Will the public and private wells near the permit area be impacted by mining operations? Will they be within the zone of influence of the pumping operations? If they are within or near the zone of influence, and the completion details of

the well are unknown, these wells should be replaced by the operator, prior to mining. Otherwise these wells could become a conduit for the movement of production water between aquifers.

27. Table D6-14, Baseline Water Quality Monitoring Parameters. Please indicate on the table whether the analysis is for Total or Dissolved. For Iron, both total and dissolved analysis must be performed.
28. In addition to Table D6-14, the permit application must provide the Groundwater Monitoring Program for the site. It should include a list of the monitoring wells, sampling frequency, sampling protocol, QA / QC procedures etc. As new monitoring wells are added in the future, the permit will be revised by a Non-Significant revision to the permit to add or drop monitoring wells.
29. Section D6.3 Groundwater Use. Paragraph 4 references the East Eagle Nest Draw Well, it should be made clear if this is the fourth BLM well. In addition, although not officially permitted, the fourth BLM well and/or Eagle Nest Draw well should be documented in Table D6-12a, and Plate D6-1a.
30. Section D6.3, Page D6-21, last paragraph states that throughout the phases of the project the operator will correspond with BLM to ensure the wells that provide stock water are not adversely impacted. Since it is not clear where any of these wells are screened [Well 4775 (at 280 ft. depth), and 4777 (at 200 ft. depth), 4451 at 900 ft. depth, and the Eagles Nest Draw well (at 370 ft. depth)], it may be necessary to replace these water supplies prior to mining operations, to ensure that they are clearly isolated from any mining influence.
31. Tables D6-12a and D6-12b, Groundwater Permits. These tables list Map ID and therefore need to cross reference Plates D6-1a, and D6-1b and vice or versa.
32. Section D6.3 and Table D6-12a. An explanation should be provided when there are two or more line items for the same permit number. For example there are two listing for the BLM Battle Springs Draw Well No. 4451, yet the only distinction is that one listing is indicated as a headgate outlet well, and one listing is 'Information not provided by the WSEO database.' Figure D6-19 appears to be a photo of the well, yet the table and Plate D6-1a, seem to indicate there are two wells. Please clarify how the wells are designated on the table and map.
33. Section D6.4.2.1 Groundwater Monitoring Network and Parameters. Paragraph one references 12 wells within the permit area that were installed by Conoco prior to 1982. This is the first mention of these wells. What is the status of these wells? Why are they not included in Table D6-12a? Are there well completion logs available? If they were abandoned, are there any abandonment records? Have these wells been located to determine their status? Table D6-12a should be a comprehensive source of information of any well that is known to once exist within or near the permit area, regardless of whether there is a SEO permit on file.

34. Table D6-13 Lost Creek Project Groundwater Permits. In addition to this table, a separate table should be presented which is the comprehensive groundwater monitoring network wells. If viable information is available from historic monitoring wells (e.g. the Conoco wells), i.e. the screened interval is known, then these wells can be presented as a subset of the table. If the water supply wells are going to be sampled they should also be included.
35. Section D6.4.2 Site Groundwater Quality. The majority of the baseline groundwater monitoring wells are located within the footprint of the mineralized zone and the mine units. Additional baseline groundwater monitoring wells need to be established outside the mine unit, up gradient and downgradient of the mine units, and north and south of the fault(s).
36. Section D6.4.2.2 Groundwater Quality Sampling Results. Page D6-26, paragraph 3 states that "there is no significant difference in major water chemistry between the production zone and overlying and underlying aquifers". The next paragraph explains some constituents that exceeded WQD Class I standards at individual wells. Please provide a separate section for each aquifer (*similar to Section D6.2.2.1*) which discusses their individual water quality, based on the baseline monitoring.
37. Table D6-15. Analytical Results of Baseline Monitoring. If an analyte has exceeded the WQD Class I standard please flag that value within the table, noting the designation with a footnote.
38. Section D6.5.2 Site Groundwater Conceptual Model. LQD Non-Coal Rules, Chapter 11, Section 3(xiv) regulations require that the following parameters be described for each potentially affected aquifer: aquifer thickness, velocity and direction of groundwater movement, storage coefficients or specific yield, transmissivity or hydraulic conductivity, direction of preferred flow under hydraulic stress, extent of hydraulic connection between the receiving strata and overlying and underlying aquifers, and hydraulic characteristics of any influencing boundaries in or near the propose well field area. The attached table indicates information that has been presented in the application, and where there are gaps in the aquifer characteristics required.
39. Section D6.5.2.2 Potentiometric Surface and Hydraulic Gradients. Paragraph one provides the hydraulic gradient for the HJ Horizon. As mentioned in previous comments, the Division is requesting that both sides of the fault be characterized separately.
40. Section D.5.2.2 Potentiometric Surface and Hydraulic Gradients. Paragraph one states that from the pump tests the communication between the HJ aquifer and the overlying and underlying aquifers may be through historic boreholes that were improperly abandoned, leakage through the confining shale units, or contact of sands juxtaposed across the fault. All work done to relocate and either verify proper abandonment or re-abandon old drill holes, should be included within the permit application. Any additional work completed to better define the cause for the communication must be submitted as a revision to the permit document.

41. Section D.5.2.3 Aquifer Properties. The second paragraph states that additional long term multi-well pump tests were to be performed in the fall of 2007. These tests would provide more data on overlying and underlying aquifer characteristics. If this information is now available, it should be submitted for review as part of the permit application.
42. Attachment D6-2a, Figures 6-2, 6-6, 6-8, and 6-10. The y-axis titles are backwards, the Pumping Well (PW) elevation should be on the right handed axis. Please correct and replace the Figures.
43. Attachment D6-2a, Figure 7-1 is the Theis curve for the LC16M pumping well, yet this attachment is the evaluation of the LC19M pump test.
44. Attachment D6-2a, Appendix A. As stated in Comment 14, please provide well completion details, boring logs, and any geophysical logs for all monitoring wells. If the information is not inserted into Appendix A, its location should be referenced.

END OF MEMORANDUM

Attach: Table

Lost Creek Aquifer Characteristics

	Thickness (ft)	Velocity & Direction north of fault	Velocity & Direction south of fault	Storage Coefficient	Specific Yield	T (gpd/ft)	Hydraulic conductivity (ft/d)	Preferred flow under stress	Connection between aquifers
DE					*	10 - 1,000			
Upper No Name Shale	0-50								
UFG MFG									
LFG	20-50			*		30 - 300			
Lost Creek Shale	5-45								minor under large stresses
UHJ MHJ LHJ	100-160				5.0 x 10(-5) to 5.0 x 10(-4)	260-3,000	effective 0.5 - 0.67 actual 1 - 1.5		
Sage Brush Shale	5 - 75								minor under large stresses
UKM	30 - 60			*		195 - 860			
No Name Shale	10 - 30								
MKM									

* Long term multi-well pump tests to be performed in the fall of 2007.