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MAX MAIN*
DWIGHT A. GUBBRUD*
*LICENSED IN SOUTH DAKOTA AND WYOMING

EST. 1908

RETIRED
DONN BENNETT

August 5, 2013

Mike Cepak
Minerals & Mining Program - DENR
Foss Building
523 E. Capitol Ave.
Pierre, SD 57501-3182

RE: Powertech Large Scale Mine Permit - Discovery Responses.

Dear Mike:

Enclosed with this letter are the originals of the following documents:

1. POWERTECH'S ANSWERS TO BLACK HILLS WILD HORSE SANCTUARY, SUSAN WATT, & DAYTON HYDE'S FIRST SET OF INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS; and
2. CERTIFICATE OF SERVICE.

Also enclosed are a CD-R with attachments referenced in the Answers and a copy of POWERTECH'S ANSWERS TO SABRINA KING'S INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS. We will forward the original of POWERTECH'S ANSWERS TO SABRINA KING'S INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS as soon as we receive the original signature page from Richard F. Clement, Jr.

Thank you.

Sincerely,

BENNETT, MAIN & GUBBRUD, P.C.

Max Main

MM/ra
Encs.

STATE OF SOUTH DAKOTA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
BOARD OF MINERALS AND ENVIRONMENT

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CERTIFICATE OF SERVICE

IN THE MATTER OF THE LARGE SCALE MINE PERMIT APPLICATION OF POWERTECH (USA) INC.

I, MAX MAIN, as one of the attorneys for Powertech (USA) Inc., do hereby certify that on the 5th day of August, 2013, I caused the original of the following documents:

1. **POWERTECH'S ANSWERS TO BLACK HILLS WILD HORSE SANCTUARY, SUSAN WATT, & DAYTON HYDE'S FIRST SET OF INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS;**

2. **POWERTECH'S ANSWERS TO SABRINA KING'S INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS**; and

3. **CERTIFICATE OF SERVICE,**

to be filed with:

Mike Cepak
Minerals & Mining Program - DENR
Foss Building
523 E. Capitol Ave.
Pierre, SD 57501-3182

and full, true and complete copies of said documents to be served upon the following named persons at their last known mailing addresses, as follows:

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ATTN: MICHELLE MAY
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ATTN: ASHLEY CORTNEY
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EDGEMONT, SD 57735

ATTN: JASON WALKER
RAPID CITY PUBLIC LIBRARY
610 QUINCY STREET
RAPID CITY, SD 57701

ATTN: CINDY MESSENGER
HOT SPRINGS PUBLIC LIBRARY
2005 LIBRARY DRIVE
HOT SPRINGS, SD 57747

ATTN: DORIS ANN MERTZ
CUSTER COUNTY LIBRARY
447 CROOKS ST., STE. 4
CUSTER, SD 57730

by depositing the same in the United States Mail in Belle Fourche, South Dakota with first class postage thereon fully prepaid, in envelopes addressed as above.

MAX MAIN

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STATE OF SOUTH DAKOTA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
BOARD OF MINERALS AND ENVIRONMENT

IN THE MATTER OF THE LARGE SCALE MINE PERMIT APPLICATION OF POWERTECH (USA) INC.

POWERTECH'S ANSWERS TO SABRINA KING'S INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

INTERROGATORY NO. 1: Please identify the person or persons providing each answer to an Interrogatory or portion thereof, giving the full name, address of present residence, date of birth, business address and occupation.

ANSWER: The following individuals collectively prepared answers to these interrogatories.

John Mays
Vice President - Engineering
Powertech (USA) Inc.
5575 DTC Parkway, Suite #140
Greenwood Village, CO 80111
(303) 790-7528

Jack Fritz
Senior Environmental Engineer
WWC Engineering
1849 Terra Avenue
Sheridan, WY 82801
(307) 672-0761

Doyl Fritz
Senior Technical Advisor
WWC Engineering
1849 Terra Avenue
Sheridan, WY 82801
(307) 672-0761

INTERROGATORY NO. 2: Prior to answering these interrogatories, have you made due and diligent search of all books, records, and papers of the Applicant with the view of eliciting all information available in this action?

ANSWER: Yes.

INTERROGATORY NO. 3: What is the estimated total cost of reclamation for the entire Dewey-Burdock Project based on 2013 costs?

ANSWER: Table 1 presents a preliminary estimate of the total cost of reclamation for the Dewey-Burdock Project based on information contained in the April 2012 preliminary economic assessment (PEA) prepared by SRK Consulting (U.S.), Inc. (SRK, 2012). This preliminary estimate is approximately $27.1 million. The actual total reclamation cost will depend on a number of factors, including the number and size of ISR well fields that are developed and the method of wastewater disposal (i.e., deep disposal wells and/or land application). The initial, detailed financial assurance cost estimate is presented in Appendix 6.7-A in the LSM permit application. From the initiation of construction through the first year of operation, Powertech estimates the financial assurance amount to be approximately $8.0 million for the deep disposal well option and $9.1 million for the land application option. This estimate will be updated in accordance with NRC license requirements (NRC, 2013a). Specifically, an updated financial assurance estimate must be provided to NRC within 90 days of NRC license issuance, the financial assurance instrument must be in place at least 90 days prior to commencing operations, and it must be updated annually. Annual updates will be based on planned construction activities during the next year, status of operation/groundwater restoration in each well field, and completion of reclamation activities.

Table 1: Preliminary Total Reclamation Cost Estimate

Item	**Estimated Cost ($ thousands)**
Groundwater restoration	8,255
Decommissioning	9,168
Central Processing plant operations during reclamation	2,083
Site management (including labor)	3,108
Subtotal	22,614
Contingency (20 percent)	4,523
Total	**27,137**

Source: SRK (2012)

In the Dewey-Burdock Project Safety Evaluation Report (SER), the NRC staff summarizes its review of the initial financial assurance estimate as follows (NRC, 2013b, p. 198):

> "Based on the information provided in the application and the staff's review of the decommissioning cost estimate for the Dewey-Burdock Project, the staff concludes the amount of the proposed financial assurance and its methods of estimation are acceptable and consistent with 10 CFR Part 40, Appendix A, Criterion 9, which requires that financial assurance arrangements be established by each operator. Maintaining adequate financial assurance is an important aspect of facility operations; therefore, compliance with the applicable regulations will be required through a standard license condition presented in SER Appendix A."

Powertech also notes that the NRC provided an estimate of the total cost of reclamation of approximately $56 to $64 million (NRC, 2013b, p. 196). This is a very preliminary estimate, which Powertech believes may have been calculated by multiplying Powertech's initial financial assurance estimate of approximately $8.0 to $9.1 million by a factor of 7, which is approximately the ratio of the total estimated recoverable uranium (7.6 million pounds in the Draft SEIS (NRC, 2012) based on an outdated estimate in the NRC license application (Powertech, 2009); the updated recoverable resource estimate is 8.4 million pounds in the PEA) to the amount assumed in the initial financial assurance estimate to be recovered during the first year of operations (1 million pounds; see Appendix 6.7-A in the LSM permit application). Such a calculation method would result in an unreasonably high estimate, since it would include the cost for decommissioning the ponds, processing facilities and waste disposal systems multiple times over. In practice, the financial assurance amount will never be this large because during annual updates increases for work in the succeeding year will be offset by credits for reclamation work completed in the previous year. The PEA estimate described above is considered to be the best current estimate of the total reclamation cost but is subject to change as previously noted.

REFERENCES

NRC, 2013a, Draft Source and Byproduct Materials License SUA-1600 for the Dewey-Burdock Project, March 4, 2013. Available from the NRC ADAMS document server as of 15 April 2013: http://pbadupws.nrc.gov/docs/ML1305/ML13052A777.pdf.

_____, 2013b, Safety Evaluation Report for the Dewey-Burdock Project, Fall River and Custer Counties, South Dakota, Material License No. SUA-1600, Docket No. 40-9075, March 2013. Available from the NRC ADAMS document server as of 17 April 2013: http://pbadupws.nrc.gov/docs/ML1305/ML13052A182.pdf.

_____, 2012, Environmental Impact Statement for the Dewey-Burdock Project in Custer and Fall River Counties, South Dakota, Supplement to the Generic Environmental Impact Statement for *In-Situ* Leach Uranium Milling Facilities, NUREG-1910, Supplement 4, Vol. 1, Draft Report for Comment, November 2012 (2 volumes). Available on the Internet as of 16 April 2013: http://www.nrc.gov/materials/uranium-recovery/license-apps/dewey-burdock/dewey-burdock-app-docs.html.

Powertech, 2009, Dewey-Burdock Project, Application for NRC Uranium Recovery License, Fall River and Custer Counties, South Dakota, Docket No. 040-09075, August 2009. Available from the NRC ADAMS document server as of 12 July 2013 under ML092870160: http://pbadupws.nrc.gov/docs/ML0928/ML092870160.html.

SRK Consulting (U.S.), Inc., 2012, NI 43-101 Technical Report, Preliminary Economic Assessment, Dewey-Burdock Project, April 17, 2012. Available from the Internet as of 15 April 2013: http://www.powertechuranium.com/i/pdf/Dewey_Burdock_PEA_2012.pdf.

----------SEE SEPARATE SIGNATURE PAGE ----------

Dated this 5th day of August, 2013.

POWERTECH (USA) INC.

By: _____
RICHARD F. CLEMENT, JR.
Its: President

STATE OF New Mexico)
) **SS.**
County of Bernalillo)

RICHARD F. CLEMENT, JR., in his capacity as President of Powertech (USA) Inc., being duly sworn, verifies the Responses contained in the foregoing **POWERTECH'S ANSWERS TO SABRINA KING'S INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS** are true to the best of his knowledge and belief.

_____
RICHARD F. CLEMENT, JR.

Subscribed and sworn to before me on August 5, 2013.

_____
Notary Public

My commission expires: 2/4/2014

(Seal)

OFFICIAL SEAL
HOBERT BAUGHMAN
NOTARY PUBLIC-State of New Mexico
My Commission Expires 2/4/2014

FOR PURPOSES OF ALL OBJECTIONS:

Dated Aug 5, 2013.

BENNETT, MAIN & GUBBRUD, P.C.
Attorneys for Powertech (USA) Inc.

By _____
Max Main
618 State Street
Belle Fourche, SD 57717-1489
(605) 892.2011

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MINERALS & MINING PROGRAM

STATE OF SOUTH DAKOTA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
BOARD OF MINERALS AND ENVIRONMENT

IN THE MATTER OF THE LARGE SCALE MINE PERMIT APPLICATION OF POWERTECH (USA) INC.

POWERTECH'S ANSWERS TO BLACK HILLS WILD HORSE SANCTUARY, SUSAN WATT, & DAYTON HYDE'S FIRST SET OF INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS

Answers to Black Hills Wild Horse Sanctuary, Susan Watt, and Dayton Hyde's First Set of Interrogatories

INTERROGATORY NO. 1: Please explain what steps have been taken by Powertech to avoid a horizontal excursion of mining fluids at the Project site and, if such steps to fail, how Powertech will handle a horizontal excursion.

ANSWER: Section 5.6.3.2 of the large scale mine (LSM) permit application describes the mitigation measures that will be used to avoid a horizontal excursion of ISR solutions at the project site. Pre-operational excursion preventative measures will include but will not be limited to:

1. Proper well construction and mechanical integrity testing (MIT) of each well before use;

2. Monitor well design schema based upon delineation drilling to further characterize the zones of mineralization and to identify the target completion zones for all monitor wells; and

3. Pre-operational pumping tests with monitoring systems in place to obtain a detailed understanding of the local hydrogeology and to demonstrate the adequacy of the monitoring system.

Operational excursion preventative measures will include but will not be limited to:

1. Regular monitoring of flow and pressure on each production and injection well;

2. Regular flow balancing and adjustment of all production and injection flows appropriate for each production pattern;

3. Operation of bleed, and continuous measurement of bleed rate;

4. Monitoring hydrostatic water levels in monitor wells to verify the cone of depression;

5. Regular collection of samples from all monitor wells to determine the presence of any indicators of the migration of ISR solutions horizontally or vertically from the production zone; and

6. Perform MIT on all wells prior to use and repeat every 5 years.

Excursion monitoring required by the NRC license will include enforceable water quality criteria for each monitor well that will provide early detection of potential migration of ISR solutions away from the production zone and trigger corrective action to recover the excursion. Section 5.5.1.2 in the LSM permit application describes the excursion monitoring program. Excursion sampling will occur in accordance with NRC license requirements. The sampling frequency will be twice monthly during uranium recovery operations and once every 60 days during aquifer restoration. Water level measurements in perimeter monitor wells will provide an early warning of a potential excursion and allow operators to follow standard operating procedures to make adjustments to well field production and/or injection flow rates to avoid an excursion due to any unbalanced flow condition in a well field.

Section 5.6.3.2 of the LSM permit application describes how the excursion monitoring system and operational procedures have proven effective in early detection of potential excursions of ISR solutions for a number of reasons:

- Regular sampling for indicator parameters (such as chloride) that are highly mobile can detect ISR solutions at low levels well before an excursion is created.
- Monitoring hydrostatic water levels in perimeter monitor wells will provide immediate verification of the cone of depression, draw rapid attention in the event of a change, and provide the ability for measurement and implementation of corrective response.
- Bleed will create a cone of depression that will maintain an inward hydraulic gradient toward the well field area.
- The natural groundwater gradient and slow rate of natural groundwater flow is small relative to ISR activities and the induced gradient caused by the production and restoration bleed.

NRC has regulatory authority to review the excursion monitoring program and ensure that the parameters and sampling frequency are adequately protective of human health and the environment. In the Dewey-Burdock Project Safety Evaluation Report (SER) (NRC, 2013b, p. 168), NRC states:

> "Based on the staff's review of the information provided by the applicant, the staff is reasonably assured that the applicant will implement an appropriate CAB [Commission-approved background groundwater sampling] and excursion sampling program. This reasonable assurance determination is based on the information provided in the application as supplemented by the modified standard license condition. Therefore, the staff finds the applicant's description of the CAB and excursion monitoring programs is consistent with standard review plan Section 5.7.8.3 [in NRC guidance document NUREG-1569]. Therefore, the aforementioned information complies with 10 CFR 40.32(c), 10 CFR 40.41(c), 10 CFR Part 40, Appendix A, Criterion 5B(5), Criterion 7, and Criterion 7A."

In addition, Section 5.6.3.1.3.2 of the LSM permit application summarizes protective measures to minimize the risk of excursions and references NRC guidance in NUREG-1910, Supplement 1 (NRC, 2010) regarding excursions. This guidance states:

> "… NRC does not define an excursion as contamination that moves into a USDW. An excursion is defined as an event where a monitoring well in overlying, underlying, or perimeter well ring detects an increase in specific water quality indicators, usually chloride, alkalinity and conductivity, which may signal that fluids are moving out from the wellfield. These specific water quality parameters are used because they are present in high concentrations in the ISR production fluids and are "conservative" in the sense that they move at roughly the same rate as the groundwater flow and are not significantly attenuated by adsorption or reduced by other factors. Therefore, they serve as early indicators of imbalance in the wellfield flow system to notify operators to take appropriate actions. The perimeter monitoring wells are located in a buffer region surrounding the wellfield within the exempted portion of the aquifer. These wells are specifically located in this buffer zone to detect and correct an excursion before it reaches a USDW. The overlying and underlying monitoring wells are located in aquifers that are separated from the ore zone by aquitards, which NRC has determined have sufficient thickness and integrity to prevent an excursion. However, in all cases, any excursion that lasts longer than 60 days is required to undergo corrective action to meet the drinking water protection standards in 10 CFR Part 40, Appendix A 5(B) 5. To date, no excursions from an NRC-licensed ISR facility has contaminated a USDW."

The effectiveness of excursion monitoring programs at operating ISR facilities is demonstrated in a July 10, 2009 memorandum from NRC staff to the NRC Commissioners (NRC, 2009b), in which NRC staff reviewed records from licensed ISR facilities and concluded the following:

> "With regard to the migration of production liquids toward the surrounding aquifer, each licensee must define and monitor a set of nonhazardous parameters to identify any unintended movement toward the surrounding aquifer. Exceedances of those parameters

result in an event termed an excursion; excursion events are not necessarily environmental impacts but just indicators of the unintended movement of production fluids. The data show over 60 events had occurred at the 3 facilities. For most of those events, the licensees were able to control and reverse them through pumping and extraction at nearby wells. Most excursions were shortlived, although a few of them continued for several years. None had resulted in environmental impacts."

The preceding two reference documents describe how horizontal excursions involve increased concentrations of nonhazardous parameters (in the case of the Dewey-Burdock Project these are chloride, alkalinity and conductivity) within the exempted aquifer that provide early warning of a potential contaminant migration outside of the production zone. It is important to point out that natural attenuation processes such as reduction and adsorption will limit the potential for some contaminants such as uranium to travel outside of the production zone. As noted in the SER (NRC, 2013b, p. 183), "the geochemical conditions that dissolve and transport uranium do not occur naturally outside the production zone."

If an excursion occurs at the project site, Powertech will notify the NRC and DENR and implement mitigation measures to correct the excursion. Section 5.6.3.2 of the LSM permit application contains a description of excursion corrective actions Powertech will implement if an excursion occurs. Corrective actions to correct and retrieve an excursion may include but will not be limited to:

- Adjusting the flow rates of the production and injection wells to increase the aquifer bleed in the area of the excursion;
- Terminating injection into the portion of the well field affected by the excursion;
- Installing pumps in injection wells in the portion of the well field affected by the excursion to retrieve ISR solutions;
- Replacing injection or production wells; and
- Installing new pumping wells adjacent to the well on excursion status to recover ISR solutions.

In the unlikely event that an excursion is not corrected within 60 days, the NRC license will require Powertech to either a) terminate injection of lixiviant into the associated well field, or b) increase the financial assurance amount to cover the full third-party cost of correcting and cleaning up the excursion (NRC, 2013a). Powertech is unaware of any ISR operations that have had to cease operations because of an excursion; excursions typically are recovered relatively rapidly by reducing the injection flow rates in the vicinity of the excursion.

INTERROGATORY NO. 2: Please explain what steps have been taken by Powertech to avoid a vertical excursion of mining fluids at the Project site and, if such steps to fail, how Powertech will handle a vertical excursion.

ANSWER: See Answer to No. 1, which describes actions to be taken for vertical excursions as well as horizontal excursions. In addition, Section 5.6.3.2 of the LSM permit application describes specific controls for preventing migration of ISR solutions into overlying and underlying aquifers. Mitigation measures include but are not limited to:

- Detailed mapping of each well field including the lithology of overlying and underlying sand units and aquitards to demonstrate the adequacy of vertical confining layers;
- Plugging and abandoning all water supply wells within ¼ mile of the well field or that have been determined through preliminary evaluation to be potentially impacted by ISR operations or to impact ISR operations;
- Pump testing to demonstrate the confinement between the production zone and the overlying and underlying sand units;
- Operation of bleed, and continuous measurement of bleed rate;
- Regular monitoring of hydrostatic water levels and sampling for analysis of indicator species;
- Routine MIT of all wells on a regular basis (at least every 5 years) to reduce any possibility of casing leakage;
- Completion of MIT on all wells before putting them into service or after work which involves drilling equipment inside of the casing;
- Proper plugging and abandonment of all wells which do not pass MIT or that become unnecessary for use;
- Proper plugging and abandonment of exploration holes with potential to impact ISR operations; and
- Sampling monitor wells located within the overlying and underlying hydrogeologic units on a frequent schedule.

These controls work together to prevent and detect ISR solution migration. Plugging any exploration holes that pose the potential to impact the control and containment of ISR solutions prevents connection of the production zone to overlying and underlying units. The EPA UIC requirements for MIT assure proper well construction, which is the first line of defense for maintaining appropriate pressure without leakage. Sampling the monitor wells will enable early detection of any ISR solutions should an excursion occur.

INTERROGATORY NO. 3: What specific response actions will Powertech take in the event that leakage from any of the ponds in the permit area reach the environment?

ANSWER: Section 5.6.5.1.4 of the LSM permit application describes how potential impacts to the environment from a leaking pond will be minimized by natural conditions that make potential groundwater impacts unlikely, by the design and construction of liners and leak detection systems, and by routine inspection and monitoring. Natural conditions make it highly unlikely that a leaking pond would impact groundwater. In the Burdock area, the ponds will be underlain by approximately 50 to 100 feet of Graneros Group shales (refer to Plate 3.2-10 in the LSM permit application). The thickness of the Graneros Group beneath the Dewey area ponds will be approximately 500 feet. The confining properties of the Graneros Group will minimize the potential for vertical migration of solutions from a potential pond leak into groundwater.

Section 5.3.4.1 of the LSM permit application describes how the pond designs include lining systems that will vary according the pond use. At a minimum, ponds will be provided with a geosynthetic liner underlain by a clay liner. Ponds containing untreated wastewater or ponds used in the treatment process (e.g., radium settling ponds) will be provided with two geosynthetic liners, a clay liner, and a leak detection system.

Section 5.3.4.5 of the LSM permit application describes the pond inspection procedures that will be required by the NRC license. These include daily checks for water accumulation in leak detection systems, daily measurement of pond freeboard to ensure that adequate containment capacity is available, and routine inspections of leak detection system functionality, embankment settlement, and slope stability.

Section 5.3.4.5 of the LSM permit application describes the corrective actions that will be implemented to protect the environment in the event of leakage from a pond. In the event of a confirmed pond leak, the pond will be taken out of service until repairs can be completed. The leak will be reported to the NRC within 24 hours of the confirmation. In addition, Powertech will notify DENR by phone or email of any pond leak within 48 hours of the confirmation. A pond removed from service because of a confirmed leak will be dewatered by transferring the contents to a spare pond. Sufficient freeboard will be maintained in each type of pond such that the contents of a leaking pond can be transferred to another pond with the same level of lining system.

In the unlikely event that pond leakage impacts the environment, Powertech will be required by various permit and license conditions to remediate the impacts. See, for example, draft permit condition No. 5 in the GDP (DENR, 2012b); draft LSM permit conditions Nos. 1 and 2 under "Pond Leakage Response"; and draft NRC license conditions (LCs) 10.4 and 11.6 (NRC, 2013a). Specific corrective actions to remediate the potential impacts of a leaking pond will be described in the standard operating procedures required by the NRC license. These may include but will not be limited to installing a pump back or pump and treat system to remediate potential

groundwater impacts, excavating impacted soils, and implementing a spill response and cleanup plan for potential surface water impacts.

INTERROGATORY NO. 4: What specific response actions will Powertech take in the event a rain event that is greater than pond specifications occurs and pond contents reach the environment.

ANSWER: Information responsive to this question is readily available and can be found in Section 5.3.4 of the LSM permit application. All ponds will be operated with sufficient excess capacity (freeboard) to contain the 100-year, 24-hour precipitation event while maintaining 3 feet of freeboard. Table 3.5-6 in the LSM permit application provides the estimated probable maximum precipitation (PMP) estimates for various drainage areas and storm durations. All of the values in this table are less than the minimum freeboard amount of 3 feet, indicating that a rain event would need to be larger than the PMP event in order to cause a pond to overtop. No specific response actions are planned for a storm event exceeding the PMP event due to the exceedingly low probability that such an event would occur. *See* ARSD 74:02:08:01, which defines "probable maximum precipitation" as "the precipitation that may be expected from the most severe combination of critical meteorologic conditions that are reasonably possible in an area."

Further, Section 5.3.9 of the LSM permit application describes how diversion channels will be provided in accordance with DENR requirements to ensure that surface runoff does not enter the ponds. Diversions around the CPP, satellite facility, radium settling ponds, and central plant pond will accommodate the 6-hour PMP event in accordance with South Dakota regulations. Ponds that store only treated water (treated water storage ponds and spare storage ponds) will have diversions capable of passing the 100-year, 24-hour event.

INTERROGATORY NO. 6: What are Powertech's plans and procedures in the event metals or radioactivity bioaccumulate in vegetation during land application?

ANSWER: Section 5.5.6.2 in the LSM permit application and Section 6.5 in the GDP (Powertech, 2012a) describe the vegetation monitoring program for land application areas. Samples of vegetation will be collected from three pivot areas in each of the Dewey and Burdock areas each year during land application system operation, evaluated for increasing trends in constituent concentrations, and compared to trigger values for specific constituents of concern. Contingency measures described in GDP Section 8.4 will be implemented if increasing trends are observed or trigger values are approached. Contingency measures include:

- Verify sample results and precisely delineate affected areas through additional vegetation sampling and analysis.

- Modify land application system operating parameters to reduce the discharge rate in specific pivots or throughout the land application area.
- Implement water treatment if necessary for radionuclides, metals or metalloids.
- Implement a phytoremediation plan to control buildup of selenium in soil.
- Plant alternate crops that have increased tolerance to the specific ions of concern.

INTERROGATORY NO. 7: List each individual, corporation, or organization that Powertech or any employee, officer, director, or other representative of Powertech has communicated with regarding a merger or buy-out of Powertech.

ANSWER: As required by Canadian law and Toronto Stock Exchange rules, the relevant information in Powertech's possession is being provided pursuant to a Confidentiality and Nondisclosure Agreement.

INTERROGATORY NO. 8: List each individual, corporation, or organization that any Powertech employee, officer, director, or other representative of Powertech has communicated with regarding processing that entity's uranium at the Dewey-Burdock site.

ANSWER: None.

INTERROGATORY NO. 9: Knowing groundwater restoration has typically taken far longer than originally planned at other in situ leach uranium mines, how does Powertech expect to adhere to its reclamation schedule?

ANSWER: NRC has regulatory authority over groundwater restoration, and timely groundwater restoration will be required by the NRC license. Draft license condition 10.6 states that, "The licensee shall conduct groundwater restoration activities in accordance with Section 6.1 of the approved license application. Permanent cessation of lixiviant injection in a production area would signify the licensee's intent to shift from the principal activity of uranium recovery to the initiation of groundwater restoration and decommissioning for any particular production area. If the licensee determines that these activities are expected to exceed 24 months for any particular production area, the licensee shall submit an alternate schedule request …" (NRC, 2013a).

Section 6.2.2.3 of the LSM permit application describes how Powertech will use the following operational practices to minimize the duration of groundwater restoration:

(i) Daily balancing of injection and extraction flow rates during production. This flow rate balancing is designed to ensure that a proper aquifer bleed is maintained both at the well field level and also within each 5-spot pattern within the well field.

(ii) Timeliness of beginning restoration operations. For any particular well field, aquifer restoration operations will begin as soon as is reasonably possible following the cessation of recovery operations.

(iii) Maintenance of aquifer bleeds. Hydraulic control of well fields through the net withdrawal of the aquifer bleed stream will be continuously maintained from the beginning of recovery operations until the end of active aquifer restoration.

The same section describes some factors that have contributed to longer periods of groundwater restoration at some of the early ISR projects, including:

(i) Production and restoration were not conducted sequentially, and were plagued with extended periods of shut-in and standby, with delays of up to several years in some cases;

(ii) Groundwater sweep, the initial phase of restoration, was often largely ineffective and in some cases may have exacerbated the problem; and

(iii) RO was continued in some well fields after it was apparent that little improvement in water quality was occurring.

Another factor that has extended the duration of restoration at some ISR facilities has been the use of ammonium in the extraction fluids. An NRC staff report evaluating groundwater impacts at existing ISR facilities states the following (NRC, 2009b):

> "The R&D facilities generally required significantly more time to reach levels for an NRC approved restoration due to the use of an extraction fluid that included added ammonium at several early R&D facilities. A license condition on the makeup of the extraction fluid for the existing ISR facilities effectively prohibits the use of ammonium in the extraction fluids."

As stated in Section 5.1.3 of the LSM permit application, the Dewey-Burdock ISR process will not use ammonium in the extraction fluids; the lixiviant will consist of groundwater fortified with oxygen and carbon dioxide.

NRC reviewed Powertech's proposed groundwater restoration methods in the Dewey-Burdock Project SER (NRC, 2013b). Section 6.1.3.3 of the SER describes the following (note that the R.H. Johnson references are provided at the end of this document):

> "In assessing the potential for groundwater restoration, the [NRC] staff reviewed a geochemical modeling report on the Dewey-Burdock site prepared by the USGS, under contract by the USEPA (Johnson, R. H., 2011). In its published work to date, USGS determined that the amount of oxygen remaining in the aquifer (production zone) after

restoration is a key factor in stability. If some oxygen remains in the production zone, 'some uranium is found in the groundwater.' If no dissolved oxygen remains then 'uranium is not found in solution.' (Johnson, R. H., 2011)

"The staff determines that the restoration method will be effective in depleting excess oxygen from the production zone and minimizing constituent concentrations. The applicant will have a sufficient number of extraction wells to remove contaminants and dissolved oxygen. Injecting permeate will also increase hydraulic gradients, which will aid in contaminant removal. Furthermore, because the current groundwater at the Dewey-Burdock Project does not contain dissolved oxygen (Johnson, R. H., 2011, 2012), long-term stability can be maintained because the geochemical conditions that dissolve and transport uranium do not occur naturally outside the production zone.

"Therefore, based on the information provided in the application, the staff determines that the applicant's proposed groundwater restoration methods will effectively restore groundwater to the standards presented in 10 CFR Part 40, Appendix A, Criterion 5B(5). Furthermore, the applicant's proposed restoration methods are consistent with Section 6.1.3 of the standard review plan [NRC guidance document NUREG-1569] and comply with 10 CFR 40.32(c), 10 CFR 40.42, and 10 CFR Part 40, Appendix A, Criterion 5B."

INTERROGATORY NO. 10: Does Powertech expect the permit area or the affected area to expand during the life of the project?

ANSWER: Powertech does not presently expect the permit area to expand. Depending upon the results from future drilling and exploration within the permit area, it is possible that addition reserves could be found that would justify the expansion of the planned affected area. Any addition to the affected area would be subject to review and approval of DENR, and if the affected area is increased by more than 20%, a permit amendment will be required (*See* ARSD 74:29:03:01 and draft LSM permit condition No. 6 under "Technical Revisions").

INTERROGATORY NO. 11: If the answer to the above interrogatory is yes, where does Powertech expect the expansion to occur.

ANSWER: No expansion of the permit area is expected. Any expansion of the affected area would be determined following additional exploration and would only occur in an area contiguous to the permitted affected area boundary.

INTERROGATORY NO. 12: Powertech's large scale mining permit application provides partial information on personnel and job descriptions for the project. What other positions will Powertech have available? Please include the number of persons needed for each position and a job description for each position, including required qualifications.

ANSWER: Section 5.7.1 of the LSM permit application provides information on the general corporate and facility organization and describes the responsibilities and authorities of the key staff, including the Chief Operating Officer, Vice President of Environmental Health & Safety Resources, Facility Manager, Radiation Safety Officer, and Radiation Safety Technicians. Figure 5.7-1 shows an organization chart. Additional information on the planned facility staffing is provided in Figure 5.1-2 of the Technical Report accompanying the NRC license application (Powertech, 2009). Table 12-1 summarizes the information from this figure. Other jobs not shown on Figure 5.1-2 of the Technical Report or listed in Table 12-1 include contract labor such as drillers and construction equipment operators.

Detailed job descriptions and qualifications are not available for the project personnel. Powertech will be required by NRC license condition 12.24 to prepare a Quality Assurance Project Plan (QAPP) at least 60 days prior to the required NRC preoperational inspection (NRC, 2013a). Powertech has committed to including personnel responsibilities, qualifications, training and certifications in the QAPP (Powertech, 2011).

INTERROGATORY NO. 13: Please provide what the full qualifications are for each position described in the large scale mining permit application.

ANSWER: See previous Answer.

Table 12-1: Anticipated Dewey-Burdock Project Personnel

Position	No. of Personnel
Facility Manager (also called Mine Manager)	1
Radiation Safety Officer	1
Radiation Safety Technician	4
Safety Technician	1
Environmental Leadman	1
Environmental Technicians	4
Senior Project Geologist	1
Project Geologist	4
Drafting Technician	3
Construction Superintendent	1
Drilling Foreman	1
Drilling Services Leadman	1
Drilling Services Technician	6
Logging and MIT Technician	7
Drilling Supervisor	1
Well Field Construction Foreman	1
General Construction Technicians	8
Electrical/Instrumentation - Construction/Drilling	2
Heavy Equipment Operators	2
Construction Engineer	1
Production Superintendent	1
Well Field Operations Supervisor	1
Well Field Engineer	1
Well Field/Satellite Operations Leadman	1
Well Field/Satellite Operators	12
Central Plant Operations Supervisor	1
Central Plant Operations Leadman	1
Central Plant Operators	4
Central Plant Operators – Day	4
Dryer Operators	2
Chemist/Lab Supervisor	1
Laboratory Technicians	4
Maintenance Supervisor	1
General Maintenance Technicians	4
Mechanics	3
Electrical/Instrumentation – Production	2
Administrative/HR Manager	1

INTERROGATORY NO. 14: Is the current Project Manager position equivalent to the Facility Manager position described in the large scale mining permit application?

ANSWER: No. The Facility Manager position is described in Section 5.7.1.4 of the LSM permit application and will be responsible for all operations at the project facility. The current Project Manager position is responsible for local regulatory oversight and community relations as well as providing technical assistance as needed for the Dewey-Burdock Project.

INTERROGATORY NO. 15: In the event that Powertech goes out of business less than 30 years after the Dewey-Burdock project is completed, who will continue post-closure monitoring?

ANSWER: The requirements for post-closure bonding are described in the draft LSM permit conditions under "Postclosure Bond." Item 1 of that permit condition states that, "The postclosure bond will be used by the state to carry out the postclosure plan if Powertech fails to perform required postclosure care."

INTERROGATORY NO. 16: Powertech's project manager has indicated that water-bearing Inyan Kara formations will be treated as one aquifer, but the Powertech application treats them separately. Please clarify whether Powertech believes Inyan Kara aquifers are essentially one formation?

ANSWER: For the purposes of the water right applications, the Inyan Kara was treated as one aquifer, since DENR does not assign water rights to sub-aquifers within the Inyan Kara and since ARSD 74:02 does not distinguish between sub-aquifers of the Inyan Kara. The Report to the Chief Engineer on Water Permit Application No. 2686-2 states that, "For the purpose of appropriations, the DENR-Water Rights Program and the Water Management Board consider the Inyan Kara a single aquifer" (DENR, 2012a).

The LSM permit application describes how the sub-aquifers within the Inyan Kara will be treated as separate aquifers during ISR operations and excursion monitoring. Section 3.4.1.2 describes how the Inyan Kara includes two sub-aquifers, the Chilson Member of the Lakota Formation and the Fall River Formation, which are separated by the Fuson Shale confining unit. The Inyan Kara aquifer is heterogeneous, which results in the two sub-aquifers exhibiting large variations in their hydraulic characteristics at some locations. These units are described in more detail in Section 3.4.2.1.2. In addition, Section 3.4.2.2 describes groundwater occurrence and flow in the Chilson and Fall River units and includes figures illustrating that the two units have different potentiometric surfaces within the project area. Pump tests conducted in these units are described in Section 3.4.2.3. Section 5.3.3.1.2 explains that the Fall River and Chilson will be monitored separately, and no monitor well will be completed across the confining layer between these two

units. See also the Answer to No. 47, which describes how recent USGS research indicates that the Fall River and Chilson are hydraulically isolated within the project area.

INTERROGATORY NO. 17: Please identify how many analyses did not meet the South Dakota Human Health Standards for each well shown as shown on Table 3.4-11 of the large scale mining permit application.

ANSWER: Table 17-1 (attached) provides a comparison of each sample result from each well listed in Table 3.4-11 of the LSM permit application with the South Dakota human health standards in ARSD 74:54:01:04. This table was compiled from the laboratory results reported in Appendix 3.4-G of the LSM permit application. In all, 16 out of 256 analyses exceeded the arsenic standard, 175 out of 256 analyses exceeded the gross alpha standard, 92 out of 256 analyses exceeded the radium-226 standard, 180 out of 237 analyses exceeded the radon-222 standard, 32 out of 256 analyses exceeded the uranium standard, 4 out of 256 analyses exceeded the chloride standard, 12 out of 256 analyses exceeded the pH standard, 150 out of 256 analyses exceeded the sulfate standard, and 103 out of 256 analyses exceeded the total dissolved solids (TDS) standard.

When preparing Table 17-1 (attached), it became apparent that the sulfate and TDS concentrations were inadvertently compared to EPA secondary drinking water standards rather than ARSD 74:54:01:04 human health standards when preparing Table 3.4-11. The EPA secondary drinking water standards for sulfate and TDS are 250 and 500 mg/L, respectively, while the corresponding ARSD 74:54:01:04 standards are 500 and 1,000 mg/L, respectively. Some wells indicated in Table 3.4-11 as exceeding sulfate and TDS standards in one or more samples are shown in Table 17-1 as not exceeding the standards. Specifically, none of the samples in Hydro IDs 688, 615, or 689 exceeded the sulfate human health standard and none of the samples in Hydro IDs 7, 8, 18, 681, 688, 694, 13, 16, 42, 615, 622, 689, or 697 exceeded the TDS human health standard. Red rectangles in Table 17-1 identify where this occurs.

INTERROGATORY NO. 18: What training will Powertech contractors and employees, including short-term and part-time employees, receive in the identification of historic and cultural resources.

ANSWER: Section 5.6.12.2 in the LSM permit application describes Powertech's plans for mitigation of potential impacts to historic and cultural resources. The mitigation measures include a commitment, prior to construction, to establishing an agreement between NRC, South Dakota State Historic Preservation Office (SHPO), BLM, interested Native American tribes, Powertech and other interested parties that outlines the mitigation process for each affected historic resource. As part of this agreement, Powertech will develop an Unexpected Discovery Plan that will outline the steps required if unexpected historic and cultural resources are

encountered. This Unexpected Discovery Plan will include provisions for training for personnel involved in or responsible for field activities that have a chance of encountering unexpected discoveries. All Powertech employees and contractors will receive training on avoidance of known historic and cultural resources and the laws and regulations pertaining to the protection of these resources.

INTERROGATORY NO. 19: If there is a disturbance to cultural resources, who are the "appropriate authorities" who will be notified, and within what time period will notification occur?

ANSWER: Draft NRC license condition No. 9.8 (NRC, 2013a) specifies that:

> "Before engaging in any developmental activity not previously assessed by the NRC, the licensee shall administer a cultural resource inventory if such survey has not been previously conducted and submitted to the NRC. All disturbances associated with the proposed development will be completed in compliance with the National Historic Preservation Act (as amended) and its implementing regulations (36 CFR Part 800), as well as the Archaeological Resources Protection Act (as amended) and its implementing regulations (43 CFR Part 7).
>
> In order to ensure that no unapproved disturbance of cultural resources occurs, any work resulting in the discovery of previously unknown cultural artifacts shall cease. The artifacts shall be inventoried and evaluated in accordance with 36 CFR Part 800, and no disturbance of the area shall occur until the licensee has received authorization from the NRC, the South Dakota State Historic Preservation Officer, and the Bureau of Land Management to proceed."

Further, Appendix 3.11-B in the LSM permit application contains a Memorandum of Agreement with the State Archeologist's office that stipulates that Powertech will immediately cease work and contact that office in the event of discovery of previously unknown cultural artifacts to ensure that no unapproved disturbance occurs.

INTERROGATORY NO. 20: To what Department of Homeland Security ("DHS") laws or regulations are you referring when you say that DHS will be involved in the construction of chemical storage and feeding systems?

ANSWER: Regulation 6 CFR 27, Chemical Facility Anti-Terrorism Standards.

INTERROGATORY NO. 21: What training will well field personnel have to deal with if a spill of lixiviant was to occur?

ANSWER: Section 5.6.3.2 of the LSM permit application describes Powertech's commitments to mitigate potential groundwater impacts. Mitigation measures specifically addressing spills include (1) monitoring to detect and define unanticipated surface spills, releases, or similar events that may infiltrate into the groundwater system, and (2) implementation of a spill prevention and cleanup plan to minimize potential impacts to groundwater, including rapid response cleanup and remediation capability, techniques, procedures, and training. Well field personnel will be trained in the procedures to implement these mitigation measures.

Section 5.6.5.2 describes Powertech's commitments to mitigate potential impacts from spills and leaks. Commitments specific to this interrogatory include (1) training of employees in the handling, storage, distribution, and use of hazardous materials, (2) provision of rapid response cleanup and remediation capability, techniques, procedures, and training for potential spills, and (3) development of written spill reporting procedures, including the procedures to report potential spills of reagents, fuel and other chemicals to the State of South Dakota and the personnel responsible for reporting spills.

Section 5.6.6 describes Powertech's commitments to respond to various types of accidents. Commitments specific to this interrogatory include: (1) provision of a team of responders trained for radiation health and emergency response, with specific training to include response monitoring, PPE use and response to fires, large lixiviant spills or IX system failure, and (2) training provided by Powertech of local emergency response personnel in the potential hazards present within the permit area. Section 5.6.6 also states that a pregnant lixiviant spill would be mitigated in a manner consistent with the location and degree of spill. Response personnel would utilize the appropriate PPE to protect against radon and radon decay products exposure as discussed above and cleanup would result.

INTERROGATORY NO. 22: In what ways has the Satellite Facility been designed to provide security and ease of access?

ANSWER: Figure 5.3-6 in the LSM permit application shows the site plan of the Satellite Facility. As with the CPP site, the site for the Satellite Facility has been designed to provide security and ease of access for operating purposes. The site is designed with ample areas for access by resin transfer trucks as well as truck transports for chemical delivery. Turning radii for roads are designed to accommodate large trucks, with ample room for ingress, egress and maneuvering within the site area. Crushed asphalt will be used within the site to provide an all-weather surface that will minimize safety hazards during freezing conditions. Security measures will include a security fence with a call box and key-card reader at each gate and video surveillance cameras at several locations.

INTERROGATORY NO. 23: In what ways has the Central Processing Plant been designed to provide security and ease of access?

ANSWER: Figure 5.3-3 in the LSM permit application shows the site plan for the CPP. Design measures to provide security and ease of access are the same as described in the previous Answer for the Satellite Facility.

INTERROGATORY NO. 24: What size generators will be available if power goes out in the permit area?

ANSWER: The size of generators that will be available in the event of power failure will be adequate to maintain continuous instrumentation, monitoring, alarms, and lights (including emergency exit signage) in the CPP, Satellite Facility and well fields as described in Section 5.3.6 of the LSM permit application. The specific size of generators required to perform these tasks is unknown at this time and will depend on the final design of the instrumentation, control, alarm and lighting systems.

Section 5.3.6 describes how loss of power to the project site will cause production wells to stop operating, resulting in shutdown of all production and injection flows. This condition avoids flow imbalance in the well fields (i.e., water would temporarily not be injected into or pumped from the well fields). Since ISR solutions would not begin to travel to the monitoring ring until the cone of depression caused by the bleed had recovered and groundwater had returned to its pre-operational gradient, excursions are very unlikely within the short time period of a typical power outage. Power outages would not likely last more than a few days or weeks under most conceivable scenarios. Please refer to pages 123-124 in Powertech (2011) for a detailed discussion of the controls to prevent extended power outages in this area. Powertech will use generators onsite and may also contract for temporary generators to operate well field pumps sufficiently to maintain a cone of depression within the well field if unforeseen power outages occur with expected duration of more than a few weeks.

In Section 3.3.3 of the Dewey-Burdock Project SER (NRC, 2013b), NRC evaluated Powertech's commitments regarding backup generators in the NRC license application and concluded that, "Backup generators will be installed to provide power in the event of a power failure to ensure instruments are operating and reporting on conditions in the CPP [Central Processing Plant], SF [Satellite Facility], and wellfields" and that "The information provided on instrumentation and backup systems … is consistent with standard review plan [NRC guidance document NUREG-1569] Section 3.3.3 acceptance criteria and complies with 10 CFR 40.32(c) and 40.41(c) … Therefore, the proposed instrumentation and controls at the Dewey-Burdock Project are acceptable to NRC staff."

INTERROGATORY NO. 25: How much will Powertech contribute to Fall River County for road maintenance during its project? If no exact measure is yet available, please provide the highest amount Powertech would pay.

ANSWER: Fifteen percent (15%) of total road maintenance costs on Fall River County roads actually used by Powertech in its construction and production activities. See, January 12, 2007 Letter Agreement included in Attachment I-25.

INTERROGATORY NO. 26: How much will Powertech contribute to Custer County for road maintenance and dust control during its project? If no exact measure is yet available, please provide the highest amount Powertech would pay.

ANSWER: This amount would be determined by a Letter Agreement with Custer County, which has not yet been requested by Custer County. Powertech would pay an amount which is fair and reasonable based on roads actually used by Powertech in its construction and production activities.

INTERROGATORY NO. 27: How does the fact that construction of a typical well field takes two years justify the use of sedimentation controls that are only designed for a 5-year, 24-hour precipitation event?

ANSWER: Water management and erosion control for the Dewey-Burdock Project are discussed in Section 5.3.9 of the LSM permit application. The design criteria for sediment ponds and alternative sediment control measure (ASCM) structures will vary depending upon the length of time that the structure will be required. The proposed design event for sediment control structures associated with well field construction is the 5-year, 24-hour precipitation event. This is justified on the basis that a typical well field will take approximately 2 years to construct. During that time portions of the well field will be under construction, other portions will be undisturbed, and the remaining portions will be in various stages of interim reclamation. However, the sediment-control measures will be sized under the assumption that the entire well field is disturbed for the entire 2-year construction period. This, and the fact that surface disturbance is minimal within a well field (consisting mostly of well pads, mud pits and trenches), is why the sediment control design criteria are conservative.

INTERROGATORY NO. 28: Please provide Powertech's definition for "approximate baseline water quality," as used in its large scale mining permit application? Please be specific as to water quality parameters for constituents of concern.

ANSWER: Powertech could not locate the phrase "approximate baseline water quality" in the LSM permit application. Therefore, this Answer describes how there are two types of baseline

water quality described in the LSM permit application: pre-licensing baseline water quality (site characterization baseline water quality) and post-licensing, pre-operational baseline water quality (established for each well field after licensing). This Answer also provides the definition for the phrase "approximately baseline water quality" as used in Section 5.4.1.1.4.1 of the LSM permit application in reference to groundwater restoration.

Pre-licensing baseline water quality is presented in the LSM permit application (i.e., see Section 3.4.4 and Appendices 3.4-G and 3.4-H). As part of site-characterization efforts, groundwater monitor wells are installed and groundwater samples are obtained. These samples are analyzed for certain water-quality constituents, or parameters, that are important to the characterization of existing conditions at a particular site. These concentrations are known as the "pre-licensing baseline" values of the respective water-quality constituents.

After permit/license issuance but prior to operations, Powertech will collect additional and more detailed baseline water quality data for the ore zone, perimeter monitoring zone, and overlying/underlying aquifers in each well field. This is referred to as "post-licensing, pre-operational baseline" or just "pre-operational baseline" values of the respective water-quality constituents. This information will be provided to NRC and DENR in detailed well field packages prior to operating each well field.

One of the primary purposes of determining pre-operational baseline values of water quality constituents is to provide a basis for establishing restoration standards. Following uranium recovery in each well field, Powertech will be required to restore groundwater quality within the well field in accordance with federal regulations and NRC license requirements. Groundwater restoration standards are described in Section 6.2.1 of the LSM permit application. Specifically, NRC regulations in 10 CFR Part 40, Appendix A, Criterion 5 set forth groundwater quality standards for uranium milling facilities. 10 CFR Part 40, Appendix A, Criterion 5B(5) requires that groundwater quality in the exempted ore-bearing aquifer be restored to (i) NRC-approved background concentration or (ii) maximum contaminant levels (MCLs), whichever is higher, or (iii) an alternate concentration limit (ACL) established by the NRC Commission, if the constituent background level and the MCLs are not reasonably achievable and if it is demonstrated that the ACL is adequately protective of groundwater and surface water.

Section 5.4.1.1.4.1 of the LSM permit application describes how during groundwater restoration, the water quality in each well field "will be returned to approximately baseline water quality." In this context, "baseline" is used synonymously with "pre-operational." Therefore, the meaning of this statement is that during groundwater restoration, the water quality in each well field will be returned to approximately pre-operational conditions. Refer to the previous discussion for the specific groundwater restoration requirements. In NUREG-1910, NRC describes how groundwater restoration is expected to restore the ore zone aquifer to approximately pre-operational baseline conditions for a typical ISR facility: "Impacts associated with alterations of

ore body aquifer chemistry would be SMALL because the aquifer would … be expected to be restored within statistical range of preoperational baseline water quality during the restoration period" (NRC, 2009a, p. 10-37).

Specific values for pre-operational baseline water quality for each well field cannot be provided at this time, since Powertech is prohibited from installing the production zone, overlying, and underlying monitor wells that will be used to determine pre-operational baseline water quality for each well field by NRC's prohibition of construction prior to license issuance. In the Rulemaking Issue Affirmation for the definition of construction (SECY-11-0039), NRC specifically prohibits the installation of monitoring wells that have "the specific purpose of measuring radiological attributes" prior to license issuance (NRC, 2011). In response to a comment asking whether monitor wells can be exempted from the definition of construction, NRC responded that "monitoring wells that are part of an ISR wellfield monitoring network would not [be] permissible because such facilities are necessary to ensure the radiological health and safety of the public and that the licensed facility is operating within standards determined by the NRC." This is typical practice for U.S. ISR facilities to establish pre-licensing baseline water quality prior to license issuance and then to establish pre-operational baseline water quality for each well field prior to operating each well field.

INTERROGATORY NO. 29: How would a leaking pond be prevented from impacting alluvial aquifers?

ANSWER: See Answer to No. 3, which describes how potential impacts to the environment from a leaking pond will be minimized by natural conditions that make potential groundwater impacts unlikely, by the design and construction of liners and leak detection systems, and by routine inspection and monitoring. In addition, the following Answer provides more specific information on protection of alluvial groundwater from potential pond leaks.

There is very limited overlap between the ponds and the alluvium. Figure 5.5-5 in the LSM permit application depicts the mapped alluvium in relation to the proposed ponds and shows that only the spare storage pond and a small portion of one of the treated water storage ponds in the Burdock area overlap mapped alluvium. These ponds will store only treated water and will contain geosynthetic liners underlain by clay liners.

GDP permit conditions will provide further protection for alluvial aquifers (DENR, 2012b). Draft permit condition No. 5 states that "Leaks, spills or other releases from the well fields, Class V UIC well(s), processing facilities, ponds or associated appurtenances … do not constitute permitted discharges under the groundwater discharge plan, and must be remediated to applicable state law, rules and standards." Draft permit condition No. 14 requires that: "One to two monitoring well(s) shall be installed in each POP zone near the ponds in order to aid in differentiating potential impacts from the land application system verses potential leaks from the

ponds. These wells are to be monitored on the same schedule as the interior monitoring wells outlined in Section 6 of the plan application. Should monitoring in these wells indicate leakage from the ponds could be influencing water quality in the POP zone, Powertech shall submit to the Department an investigative plan to determine the extent and magnitude of this influence and possible remediation options as required by condition 5."

NRC reviewed the pond designs and inspection procedures in the Dewey-Burdock Project SER and made the following conclusions (NRC, 2013b, p. 108-109):

> "The staff has reviewed the applicant's pond design information and determined that the designs are acceptable for the purposes stated in the application. The staff has reviewed test pit logs and the laboratory tests and concurs with the applicant's conclusions regarding suitability for construction. A review of the proposed liner system components indicates that the specifications for the radium settling ponds and CPP brine pond comply with the regulations in 10 CFR Part 40, Appendix A, requiring a synthetic liner have a leak detection system. The applicant has adequately described the materials that will be used to construct the liner and leak detection systems.
>
> "The staff notes that the other ponds have been designed to prevent migration of wastes to groundwater or surface water, which is consistent with standard review plan Section 4.2.3 (NRC, 2003b) [See NRC, 2003 in the references section of this document] and 10 CFR Part 40, Appendix A, Criterion 5A(3). When reviewing the design and location for the outlet and storage ponds, staff considered the nature and quantity of the wastes as well as the underlying geology. Staff observes that a thick aquitard layer is present between the liner system and the uppermost aquifer. This aquitard consists of shales belonging to the Graneros Group, which are approximately 61 m (200 ft) thick in the area of the ponds.
>
> "The site investigations did not indicate the presence of groundwater in the vicinity of the ponds. However, the staff observed that the spare pond for the Burdock area is located within the alluvium, which is known to contain groundwater. Additionally, the pond systems have been designed to provide adequate storage volume for operational and restoration conditions, including maintaining a 0.9-m (3-ft) freeboard.
>
> "As part of its State of South Dakota Groundwater Discharge Permit for the land application system, the applicant will install a series of monitoring wells in the alluvium to monitor the land application system (Powertech, 2012d) [See Powertech, 2012a in the references section of this document]. SD DENR is also requiring, monitoring wells in the alluvium and downgradient of the ponds to determine if pond seepage is entering the perimeter of pollution (POP) for the land application area (SD DENR, 2013) [See DENR, 2012b in the references section of this document]. As presented in application figure TR RAI 5.7.8-17, only one pond is located mostly in the alluvium; this is the spare pond for the Burdock area. Four land application surge ponds are located immediately adjacent to the alluvium (Powertech, 2011a) [See Powertech, 2011 in the reference section of this document]. Because the alluvium forms a surficial aquifer (see SER Section 2.4.3.3.2),

the staff is reinforcing SD DENR's requirement for monitoring wells west of the Burdock area ponds with a license condition discussed in SER Section 4.2.4.

> "The staff observes that the applicant has not proposed a groundwater monitoring network around the Burdock area and Dewey area ponds because the soils underlying the proposed pond locations are unsaturated and a thick layer of shale underlies those soils. However, the applicant has not clearly demonstrated that no groundwater exists in the shale layer below the proposed pond locations; therefore, the staff is adding a condition to the license stating that the applicant will submit a pond groundwater monitoring plan for the ponds. This condition is discussed in SER section 4.2.4. The staff also observes that the applicant has demonstrated that the storage ponds will be stable under anticipated loading conditions. By demonstrating the stability of the storage ponds, the applicant has shown that this approach is consistent with standard review plan Section 4.2.3, which states the design of surface impoundments used in the management of byproduct material must meet or exceed the requirements in 10 CFR Part 40, Appendix A, Criterion 5A. The staff also finds the storage pond specifications to be consistent with Regulatory Guide 3.11, Section 2, which describes acceptable methods for slope stability and settlement analyses (NRC, 2008). In particular, the staff finds the applicant has not presumed that the liner system will function without leakage in its demonstration of the structural integrity, as required by Criterion 5A(5) of Appendix A to 10 CFR Part 40. In addition, static stability analysis follows the recommendations in Section 2 of Regulatory Guide 3.11 (NRC, 2008)."

NRC has included a draft license condition, as discussed in the SER, specifically to address potential impacts to groundwater in the vicinity of the ponds. Draft license condition #25 states the following (NRC, 2013c):

> "No later than 60 days prior to construction, the licensee shall submit to the NRC for review and verification, a pond detection monitoring plan that contains the number, locations, and screen depths of groundwater monitoring wells to [be] installed around the Burdock area and Dewey area ponds. The plan shall also include sampling frequency and sampling parameters. Monitoring wells installed to comply with the licensee's Groundwater Discharge Permit issued by the State of South Dakota may be incorporated into this monitoring network."

INTERROGATORY NO. 30: What steps will be taken to deal with train track crossings and trucks carrying radioactive materials?

ANSWER: No new railroad track crossings are anticipated at this time. The proposed Dewey satellite facility access road north of the permit area is an existing road that crosses the railroad tracks. Section 5.6.5.1.3 of the LSM permit application describes how potential impacts involving transportation vehicles will be addressed. Mitigation measures to minimize potential impacts include the following:

- Chemicals and products delivered to or transported from the permit area will be transported in accordance with all applicable federal and state regulations.
- As part of Powertech's Environmental Management Program, emergency response procedures will be developed and implemented to ensure a rapid response to any transportation incidents.
- All personnel will be appropriately trained in emergency response procedures to facilitate proper response from Powertech employees in transportation incidents.
- A specialized, appropriately licensed transportation company will transport the yellowcake to a conversion facility. Powertech will develop an Emergency Preparedness Program that will be implemented should a transportation accident occur. The primary potential impact associated with an accident involving the spill of yellowcake would be potential impacts to soil in the immediate spill area. The potential impacts will be minimized by implementing the Emergency Preparedness Program and salvaging affected soils.
- A transportation accident involving uranium-loaded resin would have a lower risk than the relatively low risk from an accident involving yellowcake due to the much lower concentration of uranium in the resin and the chemical bond between the uranium and IX resin. The primary potential impact associated with an accident involving the spill of resin would be potential impacts to soil in the immediate spill area. The potential impacts will be minimized by salvaging affected soils.
- All applicable DOT hazardous materials shipping regulations and requirements will be followed during shipment of process chemicals and fuel to minimize the potential for transportation accidents. Powertech also will develop standard operating procedures for unloading process chemicals and fuel within the permit area to minimize the potential for spills.
- All applicable DOT regulations and requirements will be followed during shipment of 11e.(2) byproduct material to minimize the potential for a spill resulting from a transportation accident. The primary potential impact associated with an accident involving the spill of solid 11e.(2) byproduct material would be potential impacts to soil in the immediate spill area. The potential impacts will be minimized by salvaging affected soils.

Additional mitigation measures for spills and leaks that are relevant to this interrogatory are listed in Section 5.6.5.2 of the LSM permit application including the following:

- Provide rapid response cleanup and remediation capability, techniques, procedures, and training for potential spills.
- Develop written spill reporting procedures, including the procedures to report potential spills of reagents, fuel and other chemicals to the State of South Dakota and the personnel responsible for reporting spills.

- Perform all shipments of yellowcake, uranium-loaded resin, process chemicals/fuel, and 11e.(2) byproduct material in accordance with DOT regulations.
- Promptly salvage soils from any spill areas to avoid potential impacts to surface or groundwater.

INTERROGATORY NO. 31: What scientific studies has Powertech consulted to reach the conclusion that, in the case of a tornado in the permit area, chemicals in a ruptured tank would flow downward into a containment structure?

ANSWER: Section 5.6.7 of the LSM permit application describes mitigation measures for potential natural disasters including tornados and earthquakes. This section describes how two NRC guidance documents were consulted to evaluate the potential risks from tornados and earthquakes: NUREG/CR-6733 (NRC, 2001) and NUREG-0706 (NRC, 1980). NUREG/CR-6733 concluded that the risk of a tornado strike on an ISR facility is very low and that no design or operational changes are necessary to mitigate the potential risks, but that it is important to locate chemical storage tanks far enough from each other to prevent contact of reactive chemicals in the event of an accident. Chemical storage tanks will be separated at the Dewey-Burdock Project as described in Section 5.3.1. Additional mitigation measures for natural disasters including tornados are described in Section 5.6.7 and include:

- Implementing the secondary containment measures for chemical storage described in Section 5.3.1.
- Prepare and have available onsite for regulatory inspection an Emergency Response Plan that will contain emergency procedures to be followed in the event of severe weather or other emergencies.
- Provide adequate training to employees and visitors regarding communication systems used at the facilities.
- Ensuring that the proper alarm (preset signal) has been sounded at both the Dewey and Burdock facilities.
- Direct the evacuation of employees to one or more previously-specified nearby locations.
- Assessing potential damage to the facilities, including radiological surveys and assessment of non-radiological hazards.
- Notifying NRC, DENR, BLM and other regulatory agencies as appropriate.
- Commencing cleanup efforts.

INTERROGATORY NO. 32: If the mine site needed to be evacuated in the case of a wildfire, how would site security be maintained in terms of restricting access to nuclear material?

ANSWER: Powertech does not know the meaning of the term "nuclear material" as used in this interrogatory. The types of materials for which access will be restricted include 11e.(2) byproduct material (refer to the Answer to No. 48 for storage and handling procedures) and yellowcake, which is defined by NRC as "source material." According to the NRC definition, source material is natural uranium or thorium or depleted uranium that is not suitable for use as reactor fuel (NRC, 2013d). If the interrogatory is referring to "special nuclear material," there will be no special nuclear material (e.g., enriched uranium-235) at the facility. See Answers to Nos. 22 and 23 regarding security in the plant site areas. The gates in the perimeter fences would normally be closed, allowing access only with the key-card reader or call box. If it were necessary to temporarily evacuate the site in the case of a wildfire, only the key-card reader would provide access. Such a temporary evacuation would likely be short-term, after which employees could return and restore normal operating procedures.

INTERROGATORY NO. 33: If the mine site needed to be evacuated in the case of a wildfire, how would site security be maintained in terms of mining process containment when pumps were turned off?

ANSWER: See the Answer to No. 24. Short-term shut-downs would not adversely affect site security, nor would the cone of depression in operating well fields return to the pre-operational gradient within the short time frame of a typical shut down. Back-up generators would be available to operate any essential equipment.

INTERROGATORY NO. 34: Does Powertech plan to apply to the NRC to do reclamation using an alternate concentration limit?

ANSWER: Not at this time. Powertech wishes to point out that an ACL is not an attempt to circumvent any regulation or statute. Please refer to the Answer to No. 28, which describes how an ACL is a site-specific, constituent-specific, risk-based standard that demonstrates that maintaining groundwater quality at the requested level inside the exempted aquifer will be adequately protective of human health and the environment at the aquifer exemption boundary (i.e., the point of exposure). An ACL application would need to demonstrate compliance with all applicable regulations and relevant NRC guidance and policy in effect when the ACL is requested. For example, it would need to demonstrate that the concentration is ALARA [as low as (is) reasonably achievable], that the concentration at the aquifer exemption boundary will meet baseline or an MCL and address all of the relevant factors in 10 CFR Part 40, Appendix A, Criterion 5B(6) such as demonstrating that the ACL is adequately protective of groundwater and surface water. Regarding the ALARA demonstration, draft NRC license condition 10.6 indicates

when an ACL may be requested: "In submitting any license amendment application requesting review and approval of proposed alternate concentration limits (ACLs) pursuant to Criterion 5B(6), the licensee must show that it has first made practicable effort to restore the specified hazardous constituents to the background or maximum contaminant levels (whichever is greater)."

In addition to these federal requirements, the LSM permit will require Powertech to meet South Dakota groundwater quality standards in ARSD 74:54:01 at the aquifer exemption boundary (refer to draft permit condition No. 1 under "Groundwater Restoration").

INTERROGATORY NO. 35: Please provide the names of all ISL uranium mine sites that have been returned to unrestricted use after mining was completed?

ANSWER: To Powertech's knowledge, the U.S. sites listed in Table 35-1 have been returned to unrestricted use following ISR operations. There may be others of which Powertech is unaware.

Table 35-1: U.S. ISR Facilities that Have Been Returned to Unrestricted Use

Operation	State
Caithness - McBride	TX
Conoco - Trevino	TX
Everest - Las Palmas	TX
Everest - Tex-1	TX
IEC - Pawnee	TX
Cogema - HEM	TX
Cogema - O'Hern	TX
Cogema - Cole	TX
URI - Benavides	TX
URI - Longoria	TX
U.S. Steel - Boots	TX
U.S. Steel - Burns	TX
U.S. Steel - Clay West	TX
U.S. Steel - Mosier	TX
U.S. Steel - Paulik	TX
Chevron - Palangana	TX
Westinghouse - Bruni	TX
Mobil - Nell	TX
Wyoming Mineral Corporation - Grover Solution Mining Test Site	CO
Cameco – Crow Butte Facility*	NE
Uranium One – Irigaray Ranch Facility*	WY
Kerr McKee – Smith Ranch Pilot Facility	WY
Nubeth Joint Venture R&D	WY
Ogle Petroleum - Bison Basin	WY
Uranerz - Ruth R&D	WY
Rocky Mountain Energy - Reno Creek R&D	WY
NEDCO/UNC Teton - Leuenberger	WY

* Indicates that one or more well fields have been restored and decommissioned, although the entire facility is still in operation and therefore has not yet been decommissioned and released for unrestricted use.

INTERROGATORY NO. 36: Upon what information does Powertech rely to determine the current need for uranium in today's market?

ANSWER: Refer to Answer to Request No. 26.

INTERROGATORY NO. 37: If uranium-loaded IX resin is not processed at the project's Central Processing Plant (hereinafter "CPP"), to what licensed CPP will the IX resin be shipped?

ANSWER: Powertech currently has no agreements to process loaded resin with any other company. In the event that Powertech wished to have loaded resin processed, it would need to negotiate agreements with a licensed company.

INTERROGATORY NO. 38: What are the known and anticipated risks to the general public of shipping uranium-loaded IX resin off the project site to another CPP?

ANSWER: The risks are small. Please refer to the Answer to No. 30. Resin shipments typically will occur in bulk transport trailers. A transportation accident involving uranium-loaded resin would have a lower risk than the relatively low risk from an accident involving yellowcake due to the much lower concentration of uranium in the resin and the chemical bond between the uranium and IX resin. The primary potential impact associated with an accident involving the spill of resin would be potential impacts to soil in the immediate spill area. Any potential impacts will be mitigated by salvaging affected soils.

The Dewey-Burdock Project SER (NRC, 2013b, p. 205) also provides information concerning the risks of transporting uranium-loaded IX resin:

> "While the Burdock CPP contains resin elution equipment, the Dewey satellite plant does not. Consequently, the applicant must transport uranium loaded resin from the satellite plant to the CPP for processing. NRC analyzed this scenario along with other transportation scenarios and determined that the consequences of accidents involving such shipments are low. This is primarily because the uranium is bonded to the resin and the resin is wet, which prevents air dispersion. Furthermore, such spills are easily remediated by simple excavation and removal. However, the applicant must develop procedures for such spills, as required by standard license condition, and the staff will review this procedure during the preoperational inspection.
>
> Based on its review, the staff concludes that the applicant's assessment of transportations [sic] accidents is acceptable. The applicant provided reasonable transportation accident scenarios and commitments to develop procedures and train responsible personnel in the mitigating [of] transportation accidents. Furthermore, NRC staff's assessments, as documented in NUREG/CR-6733 determined that transportation accidents pose risks of cancer mortalities approximately 70 percent below [the] general cancer mortality rate of 0.002. Therefore, the staff finds that this information is consistent with the acceptance criteria in standard review plan Section 7.5.3 and complies with 10 CFR 40.32(c)."

INTERROGATORY NO. 39: What steps will be taken to minimize the risks set forth in the above interrogatory?

ANSWER: See Answer to No. 30, which describes the methods to minimize transportation risks, including from uranium-loaded ion exchange resin.

INTERROGATORY NO. 40: What percentage of the time is it typical for pond sludge, contaminated soils, spills of loaded or spent IX resin, etc. to require treatment as EAE-regulated waste?

ANSWER: Powertech has not estimated the percentage of time that it is typical for pond sludge, contaminated soils, spills of loaded or spent IX resin, etc. to require treatment as AEA-regulated waste. Section 5.6.5.2 of the LSM permit application describes how Powertech will promptly salvage soils from any spill areas. Depending on the type of material spilled, the excavated soil may be treated as AEA-regulated waste (e.g., for a spill of lixiviant or uranium-loaded ion exchange resin), or it may be treated as non-AEA-regulated waste (e.g., for a chemical spill). Section 6.3.4.3 describes how during reclamation, a final gamma survey will be performed to determine compliance with cleanup criteria and to identify affected areas potentially subject to soil cleanup. Affected areas are those areas that have greater potential to be impacted by uranium solutions, dried uranium product (yellowcake) or liquid or solid waste streams that contain uranium or other radionuclides associated with uranium recovery operations. The areas that are most likely to be considered affected areas include diversion ditches, surface impoundment areas, well fields (particularly those areas where potential spills or leaks may have occurred), process structures, storage areas, on-site transportation routes for contaminated material and equipment, and areas associated with wastewater disposal.

A description of the radiological survey and contamination control program that will be used during reclamation is found in Section 2.1.1.1.5.1 of the Draft SEIS for the Dewey-Burdock Project (NRC, 2012):

> "The applicant proposes to conduct pre-decommissioning radiological surveys of the Dewey-Burdock ISR Project to identify areas that would need to be cleaned to applicable regulatory limits (NRC, 2009a). Decommissioning surveys of soils, structures, and equipment would be required. The results of these surveys would be used to determine how best to handle contaminated soils, structures, or other materials.
>
> "The applicant has committed to conducting land cleanup in accordance with 10 CFR Part 40, 30 Appendix A, Criterion 6(6) and SDDENR regulations (Powertech, 2011). Radiation surveys would be conducted to determine whether any contaminated areas exist. The most likely areas of contaminated soils would be wellfield surfaces and mud pits, surface impoundment bottoms and berms, process building areas, storage yards,

transportation routes for uranium recovery products or contaminated materials, and pipeline runs. Areas near deep Class V disposal wells and areas used for land application of treated water would also be surveyed and decontaminated as necessary. NRC would review and approve survey and sampling results. Contaminated soil would be removed and disposed, as byproduct material, at a licensed disposal facility. Pond liners and leak detection systems would also be surveyed. If radiological contamination were found, the liners and detection systems would be removed and disposed of in a licensed disposal facility."

INTERROGATORY NO. 41: What review of geologic literature prepared after 1980 was reviewed by Powertech in preparation for this project?

ANSWER: Refer to the Answer to Request No. 25.

INTERROGATORY NO. 42: When does Powertech anticipate making the decision as to whether or not it will mine vanadium at the Dewey-Burdock Project and what additional processes and facilities will be required in the event vanadium is mined?

ANSWER: Powertech currently does not intend to pursue to the commercial production of vanadium. This decision could change based upon additional future developments include changing economic factors, additional coring and drilling data, further evaluation of a vanadium resources and testing and design to determine cost-effective vanadium processing systems.

Vanadium recovery is currently expected to be readily achievable as a byproduct of the proposed uranium recovery system. Within the deposit vanadium often occurs in close proximity to uranium. The proposed well field design and lixiviant used for uranium extraction also provides the potential for vanadium extraction without additional recovery systems.

Though processing systems have not yet been designed, it is expected that they could be fairly similar to those proposed for uranium processing. Recovery from well field solutions may be possible using ion exchange systems which will load vanadium in a similar fashion to uranium. Should resin be used for recovery, it may be possible to use the current central plant design with relatively minor modifications for production of vanadium and uranium which includes two separate drying systems. However, at this stage vanadium recovery and processing systems still require a comprehensive design. One other alternative includes processing of vanadium-loaded resin at an external facility.

INTERROGATORY NO. 43: What are the major risks and/or dangers associated with the elution, precipitation, drying and packaging of yellowcake as will be performed at this project?

ANSWER: Section 4.13.1.1.2.1 of the Dewey-Burdock Project Draft SEIS (NRC, 2012) describes the potential risks from normal operation of the central processing plant, including the elution, precipitation, drying and packaging of yellowcake. It describes how the primary radionuclide of interest at an ISR facility is radon gas: "radon gas is emitted from ISR wellfields and processing facilities and is the only radiological airborne effluent during normal operations for facilities using vacuum dryer technology." It states that doses to occupationally exposed workers at ISR facilities "will be similar regardless of the facility's location and are well within the 10 CFR Part 20 annual occupational dose limit." As noted in this section of the Draft SEIS, "To mitigate radiological exposure to workers, the applicant will (i) install ventilation designed to limit worker exposure to radon; (ii) install gamma exposure rate monitors, air particulate monitors, and radon daughter product monitors to verify that expected radiation levels are met; and (iii) conduct work area radiation and contamination surveys to help prevent and limit the spread of contamination." Section 5.6.9.2 in the LSM permit application describes the effluent control systems such as use of pressurized, downflow ion exchange columns and ventilation systems that will limit worker exposure to radon gas.

Public exposure risks from normal operations also are addressed in Section 4.13.1.1.2.1 of the Draft SEIS, which describes how modeling in the NRC license application demonstrates that the "radiological dose impacts to the public from normal operations will be SMALL." Specifically, the modeling demonstrates that the potential public dose, considering all potential sources of radon-222 such as well fields, land application systems (or Class V deep disposal wells) and the processing facilities, will be less than 10 percent of the 10 CFR Part 20 public dose limit.

Section 5.6.6 of the LSM permit application evaluates potential accident scenarios and describes the engineering and administrative controls that will be used to mitigate risk from accidents. The three primary engineering controls will be: 1) downflow, pressurized ion exchange columns, 2) building ventilation, and 3) use of a modern vacuum yellowcake dryer. Also included in the engineering controls will be alarms to indicate suboptimal operating conditions of the effluent control systems and concrete curbs and sumps to contain any process spills. Administrative controls such as training for emergency scenarios will be in place to provide appropriate worker protection in the event that the effluent control systems fail under an emergency situation. In brief, the engineering controls coupled with appropriate administrative controls will mitigate any potential health and safety impacts of system failures at the facility.

NRC evaluated the proposed central processing plant in the Dewey-Burdock Project SER and concluded the following (NRC, 2013b, p. 90-91):

> "The applicant's description and evaluation of the major components of the plant is consistent with acceptance criteria 1-4 in standard review plan Section 3.2.3. Detailed

drawings showing the location and layout of the proposed ISR facilities provided additional data (NRC, 2003b) [see NRC, 2003 in the reference section of this document]. The staff observes that the processing plant design and proposed equipment are similar to those used safely in the ISR industry. For these reasons, the NRC has determined these features are acceptable for use in the proposed facility."

INTERROGATORY NO. 44: Does Powertech agree with the expert opinion that this project area lies within a region of the Black Hills where, due to small earthquakes, the secondary porosity of the regions rocks are continuously being created, closed or redistributed? If not, please explain why.

ANSWER: Powertech is not aware of the "expert opinion" referred to in this interrogatory. To comment properly, Powertech would need to see the entire opinion, together with the writer's credentials and any data sources relied upon in the formation of the expert's opinion.

Information in the various permit and license applications demonstrates that the project area is in a very low-risk zone from the standpoint of tectonic and seismic activity. Specifically, this information can be found in Section 5.6.7 of the LSM permit application report, Section 2.6.6 of the Technical Report accompanying the NRC license application (Powertech, 2009), the Class V UIC permit application (Appendix 3.4-A in the LSM permit application), and the Class III UIC permit application report (Powertech, 2012b). No faulting has been mapped through any of the proposed well field areas. Therefore, there is not expected to be any vertical or horizontal displacement during an earthquake, and it would not be expected that an earthquake would cause damage that would leave well fields inoperable or unsafe from the perspective of spills or excursions.

As shown in Figures F-3 and F-4 of the Class V UIC permit application, the Dewey-Burdock Project is proposed in an area of low seismic risk. This is further demonstrated with Figures 6-5 and 6-6 of the Class III UIC permit application.

As presented in Section 2.6.6 of the Technical Report accompanying the NRC license application, the proposed permit area is located in an area of historically low seismic potential. There are no known capable faults within 100 kilometers (62 miles) and a relatively low number of historical earthquakes. Seismic hazards at the site include low to moderate ground shaking associated with regional and local earthquake sources. Discussion from the Technical Report is presented below.

2.6.6.1 Seismic Hazard Review

The seismic hazard review was based on analysis of available literature and historical seismicity for the PAA [proposed action area; same as the proposed permit area]. 10 CFR Part 40, Appendix A Criterion 4(e) states:

"The impoundment may not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in section III(g) of Appendix A of 10 CFR Part 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material."

There are no capable faults (i.e. active faults) with surface expression mapped within a radius of 100 kilometers (62 miles) from the center of the PAA, according to the 2002 U.S. Geological Survey's Quaternary Fault and Fold Database. In addition, there are no capable faults mapped in the entire state of South Dakota. The closest capable faults to the site are located in central Wyoming, nearly 345 km (200 miles) to the west-southwest.

For reference, the following figures were included in that document. A summary of the potential for seismic activity from that document follows.

- Figure 2.6-4: Seismicity of South Dakota, 1990 – 2006; and Earthquakes in South Dakota, 1872 - 2007
- Figure 2.6-5: Peak Ground Acceleration (PGA), Illustrating 10 Percent Probability of Exceedance in the Next 50 Years
- Figure 2.6-6: Peak Ground Acceleration (PGA), Illustrating 2 Percent Probability of Exceedance in the Next 50 Years

2.6.6.2 Conclusion

Seismic hazards at the project site include low to moderate ground shaking associated with regional and local earthquake sources. Figures 2.6-4 through 2.6-6 illustrate seismicity and PGA [peak ground acceleration] maps for the PAA, and Appendix 2.6-G is a summary of the USGS database results for historical earthquakes recorded within 100 and 200 km from the site since 1973. There are no capable faults (as defined in section III(g) of Appendix A of 10 CFR Part 100) known to be present within 100 km of the project site. The closest capable fault zone to the project is located nearly 345 kilometers (200 miles) west of the site in central Wyoming. Therefore, the most significant seismic hazard is considered to be the randomly occurring, or 'floating', earthquake for the PAA. This is the maximum credible earthquake estimated for the project based on available literature, geologic information of the surrounding area, and historical data. A magnitude M_{max}=6.1 is estimated for this event.

According to the U.S. Geological Survey's 2002 Seismic Hazard Mapping Program, PGA derived from the probabilistic maximum bedrock acceleration with a 10 percent

exceedance in 50 years (475-year return period) is 0.03g (Figure 2.6-5) for the southwestern part of South Dakota. The probabilistic maximum bedrock acceleration with a 2 percent chance of exceedance in 50 years (2,475-year return period) is 0.09g for the region (Figure 2.6-6). Both of these estimates are considered to reflect a relatively low ground motion hazard.

Section 5.6.7 of the LSM permit application describes how all buildings, structures, foundations, and equipment will be designed in accordance with applicable design standards addressing seismic loading. Chemical storage tanks will be far enough from each other and will contain secondary containment to prevent contact of reactive chemicals in the event of a natural disaster such as an earthquake or tornado. In addition, Powertech will prepare and have available onsite for regulatory inspection an Emergency Response Plan that will contain emergency procedures to be followed in the event of an earthquake, severe weather event, or other natural disaster. Included in the plan will be procedures for notification of personnel, evacuation procedures, damage inspection and reporting. It also will address cleanup and mitigation of spills that may result from emergencies. In its review of the safety aspects of the proposed Dewey-Burdock Project in the SER (NRC, 2013b), NRC concluded on page 27 that, "Based on a review of the applicant's seismology assessment and the staff's individual analysis, the staff finds that the applicant adequately assessed the seismic risks to the Dewey-Burdock Project."

INTERROGATORY NO. 45: Do faults in the project area connect the uranium-bearing strata to adjacent aquifers and modern alluvium? If so, what effect does this have on the aquifers and alluvium?

ANSWER: There is no evidence from either outcrop geology or subsurface mapping of several thousand bore holes as well as the differing chemistry of the various formations present that would support the contention that the proposed permit area is cut by faults. On the contrary, the evidence supports the high probability that no faults are present throughout the proposed permit area. The proposed permit area is located within a structurally "quiet zone," south of the Dewey Fault Zone and north of the Long Mountain Structural Zone (see Section 3.2.2.1 in the LSM permit application).

Site-specific data indicate a lack of groundwater movement (whether via fractures or other features) through the Fuson Shale between the Fall River and Chilson aquifers. Supporting hydrologic and geochemical lines of evidence refute the likelihood that there is substantial groundwater movement vertically between the Fall River and Chilson aquifers within the proposed permit area. First, the potentiometric surfaces (water level elevations) are notably different between the two aquifers, a strong indication of hydraulic confinement, or separation, of the aquifers. Second, recent geochemical investigations of the Inyan Kara system conducted by the USGS show notable differences in water quality characteristics between the Fall River and Chilson aquifers that strongly support the hydraulic separation of these two units. A

presentation given by Raymond Johnson of the USGS at public meetings in Hot Springs and Custer notes that USGS analysis of groundwater quality "did not see any evidence of cross communication between aquifers under natural flow conditions" (Johnson, 2013).

The groundwater model presented in Appendix 5.6-A of the LSM permit application was calibrated to potentiometric surfaces determined from water level measurements of monitor wells located within the proposed permit area and also to the response of the Fall River and Chilson aquifers to pumping tests within and near the proposed permit area. The model provides a reasonable representation of site hydrologic conditions without introducing arbitrary and unsubstantiated flow features such as faults into the simulation.

The groundwater model report in Appendix 5.6-A describes how the simulation of groundwater movement along a geologic structure was performed to evaluate the hypothesis proposed by Gott et al. (1974) of fluids moving upward from the Minnelusa Formation into the Inyan Kara aquifer system via a breccia pipe. It should be noted that no breccia pipes have been observed or even inferred within the proposed permit area and the simulation was conducted simply to estimate how such a flow feature could impact the potentiometric surface of the Inyan Kara aquifers. The results of the simulation indicate that if significant amounts of groundwater are transmitted upwards from deeper aquifers along geologic features such as a breccia pipe, there would be notable mounding (rise) to the potentiometric surface that would be detected with the current and proposed groundwater monitoring network. No such features have been indicated in potentiometric data collected from the groundwater monitoring network. It is also important to note that the hypothesis of Gott et al. assumes that groundwater will move up into the Inyan Kara aquifers from deeper aquifers because of artesian conditions. In other words, even if flow were to occur between the Inyan Kara and deeper aquifers along fractures or geologic structures, it would be into and not out of the Inyan Kara aquifer.

Beyond the modeling that was completed for Powertech, the first phase of the ISR process will be to drill the well fields in detail prior to the emplacement of the injection and production wells. The geology and ore configuration are then mapped in a greater level of detail for each well field than what is presented in the permit/license applications. Upon completing this interpretation the well field will be drilled and pump tested to determine control of operating solutions and subsurface pressures. This testing assures the operator that no heretofore-unknown faults or fractures are present. These data and interpretation are reviewed by both the NRC and the EPA and are provided to DENR to further demonstrate the viability of operating within the well field once completed.

INTERROGATORY NO. 46: If Artesian flows are found, how does Powertech intend to stop the flow from transmitting lixiviant onto the land surface and discharging large amounts of contaminants into relevant aquifers or faults?

ANSWER: Artesian conditions are expected in every ISR well field (i.e., the static water level is expected to be above the top of the ore zone aquifer). Flowing artesian conditions are expected in a portion of the permit area (i.e., the static water level is expected to be above the top of the well casing). Figures 3.4-7 and 3.4-8 in the LSM permit application demonstrate where this is expected to occur. The LSM permit application describes how Powertech will prevent discharge of ISR solutions onto the land surface or into aquifers outside of the ore zone. The information is summarized below.

Prior to construction of each well field, an extensive monitoring network will be designed to detect the potential migration of ISR solutions away from the target production zone as described in Section 5.3.3.1.2. This will include perimeter monitor wells in the production zone around the perimeter of each well field and overlying and underlying monitor wells. Overlying monitor wells will be installed in all overlying aquifers including alluvium (if present). Also prior to construction, Powertech will use best available information and best professional practices, including historical records, color infrared imagery, and field investigations, to locate exploration holes or wells in the vicinity of each planned well field.

During construction of each injection, production and monitor well, each well casing will be pressure tested to demonstrate the mechanical integrity of the well casing. Mechanical integrity testing (MIT) procedures described in Section 5.3.3.2.5 will be used to ensure that there are no leaks in the well casing prior to putting each well into service. In addition, MIT will be repeated once every 5 years for all active wells and for any well following a repair where a downhole drill bit or under-reaming tool is used.

Prior to operating each well field, pump testing procedures will be used to verify that the production zone is hydraulically isolated from overlying and underlying aquifers. Section 5.3.3.3 describes the procedures that will be used, including static potentiometric water level evaluations to identify any anomalous conditions indicative of leakage across aquitards; water quality sampling and evaluation to identify any potential areas of leakage; and drawing down the production zone sand unit through pump testing while recording the presence or lack of response in vertical monitor wells to evaluate vertical confinement. This information will be contained within well field hydrogeologic data packages submitted to NRC for review and verification/approval and submitted to DENR prior to operating each well field. See Section 5.3.3.4 for a description of well field data packages; this section also describes how injection authorization data packages will be submitted to EPA prior to operating each well field, with copies provided to DENR.

During operations, uncontrolled flow of lixiviant to the land surface will be prevented by the design of the wells and other well field equipment and by leak detection monitoring. Figures 5.3-10 and 5.3-11 show that the injection and production wells will be sealed. Monitor wells, if located in areas where they have the potential to flow at the surface, also will be sealed. In any case, monitor wells are not likely to produce lixiviant because that would indicate an excursion and corrective actions would be implemented as described in the Answer to No. 1.

Leak detection monitoring described in Section 5.5.1.5 will include daily visual inspection of all aboveground pipe, connections, and fittings by field personnel during their daily site visits. In addition, Section 5.6.5.1.1 describes how all pipelines will be hydrostatically leak tested during construction, an instrumentation and control system will be implemented to monitor pressure and flow and immediately detect an anomalous condition, and a spill response and cleanup plan will be implemented in accordance with NRC license requirements and DENR permit conditions. Additional information on the instrumentation and control systems to detect and control a potential release or spill is found in Section 5.3.5.

During operations, excursion monitoring will verify that ISR solutions do not impact overlying or underlying aquifers or the production zone aquifer outside of the perimeter monitoring ring. Refer to the Answer to No. 1.

During reclamation, Powertech will plug all wells with bentonite or cement grout with a weight and composition sufficient to control artesian conditions and meet the well abandonment standards of the State of South Dakota (refer to Section 6.3.3).

INTERROGATORY NO. 47: What is the likelihood that Artesian flow, lack of confinement due to secondary porosity and drilling, along with high horizontal flow, that Powertech's ISL project will contaminate the region with unconfined lixiviant?

ANSWER: Refer to the Answers to No. 46, which addresses artesian conditions, and Nos. 44 and 45, which describe how the project area is in a very low-risk zone from the standpoint of tectonic and seismic activity and there are no known faults within the project area. This Answer addresses Powertech's plans to mitigate potential impacts from historical drilling and describes how regional groundwater will not be impacted from lixiviant. Powertech objects to the use of the term "high horizontal flow" in this comment, since no frame of reference is provided to describe what is meant by "high." The natural velocity of groundwater flow in the project area is about 6.1 ft/yr for the Fall River and 7.3 ft/yr for the Chilson, for an approximate average of 6.7 ft/yr for the Inyan Kara (see Appendix 5.6-A in the LSM permit application). As stated by the USGS (Johnson, 2013), at a velocity of 6.7 ft/yr it would take over 10,000 years for water to travel a distance of 13 miles, which is the straight-line distance from the project area to Edgemont.

Regarding historical drilling, Powertech has extensive information about the location of exploration holes within the proposed permit area. A map of historical exploration holes is provided as Figure 3.2-7 and a detailed inventory is provided as Appendix 3.2-A in the LSM permit application. The vast majority of historical drill holes were plugged and abandoned in accordance with State of South Dakota requirements in effect during drilling. Historical TVA drilling and Powertech's exploration drilling were conducted through DENR-issued Permits to Explore. These permits required exploration holes to be plugged with bentonite or cement grout. An exploration bond was held by the State to ensure the proper plugging of all exploration holes. A 1989 letter from TVA to DENR describes how to the best of TVA's knowledge, all TVA test holes were properly plugged and abandoned in accordance with applicable regulations. The letter is included in the LSM permit application as Appendix 3.2-D. The letter discusses attempted mitigation of the one drill hole known to be seeping to the surface in the "alkali area." Throughout the entire proposed permit area, there is only one recorded instance ("alkali area") where water seepage to the surface is suspected to have come from an exploration hole (refer to Section 3.4.2.2.3 of the LSM permit application).

Prior to developing each well field, Powertech will use best available information and best professional practices to locate exploration holes or wells in the vicinity of each planned well field, including historical records, color infrared imagery, field investigations, and potentiometric surface evaluation and pump testing conducted for each well field. Section 5.3.3.3 describes the procedures that Powertech will follow to demonstrate that the production and injection wells are hydraulically isolated from overlying and underlying aquifers. These include static potentiometric water level evaluations to identify any anomalous conditions indicative of leakage across aquitards; water quality sampling and evaluation to identify any potential areas of leakage; and drawing down the production zone sand unit through pump testing while recording the presence or lack of response in vertical monitor wells to evaluate vertical confinement. This information will be contained within well field hydrogeologic data packages submitted to NRC for review and verification/approval and submitted to DENR prior to operating each well field (see Section 5.3.3.4).

If it is determined that an unplugged exploration hole has the potential to impact the control and containment of ISR solutions, Powertech will plug and abandon or mitigate the exploration hole (see Section 5.6.3.2). Mitigation measures successfully used at operating ISR facilities include avoidance or enhanced monitoring.

Isolation of aquifers is demonstrated by USGS research, which shows distinct water quality in various aquifers within the project area. A presentation given by Raymond Johnson of the USGS at public meetings in Hot Springs and Custer notes that USGS analysis of groundwater quality "did not see any evidence of cross communication between aquifers under natural flow conditions" (Johnson, 2013).

It is not surprising that there is little evidence of unplugged holes in the proposed permit area, due to the plugging activities described above and the well-known natural tendency of drill holes to seal themselves by collapsing and swelling of the formations.

Mitigation measures will be in place to prevent impacts to regional groundwater quality. These are described in the Answers to Nos. 1, 45 and 46. NRC describes the protection of regional aquifers in NUREG-1910 (NRC, 2009a, Appendix G, p. G-197:

> "In general, favorable hydrogeological conditions for effective isolation of ore-bearing aquifers and containment of recovery solutions, integrity and continuity of impermeable confining layers, successful implementation of restoration techniques, and continuous and effective monitoring of well fields during ISL operations, restorations, and stabilization periods are expected to limit potential environmental impacts. NRC staff is not aware of any incident in which nonexempt portions of an ore-bearing aquifer have been contaminated by ISL operations under NRC regulations."

Further, in a July 10, 2009 Memorandum from NRC staff to the NRC Commissioners (NRC, 2009b), a review of all operating and historical licenses, including 34 R&D licenses, revealed that an off-site migration of ISR fluids to regional groundwater has never been observed.

INTERROGATORY NO. 48: What are the specific inherent risks to the general public at each step of the ISL process, including:

i. Recovery-ion exchange;
ii. Resin transfer;Elution;
i. Precipitation;
ii. Drying and packaging;
iii. Restoration;
iv. Chemical storage and feeding;
v. Utility water;
vi. Wastewater;
vii. Drum storage and decontamination; and
viii. Byproduct storage?

ANSWER: Risks to the general public at each step of the ISR process are very small. Please see the Answer to No. 43, which discusses risks and associated mitigation measures. As described in the Answer to No. 43, the NRC concluded in the SER (NRC, 2013b, p. 90-91) that:

> "The applicant's description and evaluation of the major components of the plant is consistent with acceptance criteria 1-4 in standard review plan Section 3.2.3. Detailed drawings showing the location and layout of the proposed ISR facilities provided additional data (NRC, 2003b) [see NRC, 2003 in the reference section of this document].

The staff observes that the processing plant design and proposed equipment are similar to those used safely in the ISR industry. For these reasons, the NRC has determined these features are acceptable for use in the proposed facility."

Following is additional information describing the potential risks and associated mitigation measures for the processes listed above.

Recovery-Ion Exchange

Section 5.3.1.1.1 of the LSM permit application describes the ion exchange process, which will be used to recover the uranium from the uranium-bearing solution pumped from the well fields. The potential risk associated with the ion exchange process is the release of radon gas, which is discussed in the Answer to No. 43 as the primary radionuclide of interest at an ISR facility. To mitigate this risk, the ion exchange vessels will be designed to operate in a pressurized, downflow mode, which will help ensure that radon gas captured in the well field stays in solution and is not released. Additional mitigation measures are discussed in the Answer to No. 43 and include ventilation systems, monitoring systems, and radiation/contamination surveys. The answer to No. 43 describes how NRC evaluated the modeled release of radon gas from all potential sources at the Dewey-Burdock Project and concluded that it will be less than 10 percent of the public dose limit.

Resin Transfer

Section 5.3.1.1.2 describes how the resin transfer process will be used to transfer the resin out of the ion exchange vessels to the elution circuit, where it will be regenerated using a saltwater solution. The regenerated resin will then be transferred back to the ion exchange vessels. The potential risk associated with resin transfer is the same as that for ion exchange: release of radon gas. The mitigation measures discussed above will be used to protect workers and members of the public.

Elution

Section 5.3.1.1.3 describes how the elution process will remove uranium from the ion exchange resin and regenerate the resin so that it can be used again for uranium recovery. It involves contacting the resin with a saltwater solution containing approximately 10 percent sodium chloride (common salt) and 2 percent sodium carbonate (soda ash). Powertech is not aware of a public risk associated with the elution process.

Precipitation

Section 5.3.1.1.4 describes how the precipitation process will be used to form a solid uranium oxide product. This process includes adding sulfuric or hydrochloric acid to lower the pH and dissolve the uranium carbonate complexes; adding sodium hydroxide to raise the pH; and adding

hydrogen peroxide to form the insoluble uranium oxide product. The primary risk associated with the precipitation process is unplanned chemical release. Section 5.3.1.2 describes the process controls and preventative safety measures that will minimize the risk of increased radiological exposure or release from chemical storage and feeding systems. These include constructing tanks and piping of appropriate materials, providing secondary containment for chemical storage tanks, providing secondary containment for the processing buildings, separating incompatible chemicals, and designing, constructing and maintaining chemical storage facilities in accordance with applicable regulations.

Drying and Packaging

Sections 5.3.1.1.5 and 5.6.9.2 describe how the uranium oxide product will be dried in a modern vacuum dryer and packaged into 55-gallon steel drums. The primary risk to the public associated with yellowcake drying and packaging is the potential release of radiological air particulates. This will be mitigated through the use of a vacuum dryer, which does not discharge uranium by design, an off-gas treatment system, which will remove particulate and gaseous emissions, a dedicated ventilation system for the yellowcake drying and packaging area, and extensive instrumentation, control and monitoring systems. NRC guidance in NUREG-1910 (NRC, 2009a) describes how the system of treating gases emanating from the dryer chamber with bag house filters and water condenser is designed to capture virtually all particles from the vapor stream leaving the dryer. Furthermore, NUREG-1569 (NRC, 2003) states, "When a vacuum dryer is used for yellowcake, then dust emissions from drying may also be assumed to be negligible."

An additional risk associated with the drying and packaging system is described in Section 5.6.8. An explosion, although unlikely, could result from: a prematurely sealed drum of yellowcake, in a dryer, from the use of propane in the thermal fluid heater or space heaters, or from the mixing of oxygen gas with combustible materials. Of these, an explosion from the drum of yellowcake has the greatest potential to impact radiological safety of the workers. An explosion in a sealed drum would be contained within the dryer room. Powertech will develop a standard operating procedure for measuring the temperature in yellowcake drums prior to drum sealing.

Restoration

Section 5.3.1.1.6 describes how the restoration system within the central processing plant will be designed to extract, store, and distribute makeup water for aquifer restoration of well fields. The restoration system may also incorporate a reverse osmosis system if Class V deep disposal wells are used. Powertech is not aware of any potential risk to the public from the restoration system within the central processing plant.

Chemical Storage and Feeding Systems

Section 5.3.1.2 describes the chemical storage and feeding systems for the chemicals that will be used at various stages in the ISR process. The primary risk associated with the chemical storage and feeding systems is unplanned chemical release. Section 5.3.1.2 describes the process controls and preventative safety measures that will minimize the risk of increased radiological exposure or release from chemical storage and feeding systems. These include constructing tanks and piping of appropriate materials, providing secondary containment for chemical storage tanks, providing secondary containment for the processing buildings, separating incompatible chemicals, and designing, constructing and maintaining chemical storage facilities in accordance with applicable regulations.

Utility Water

Section 5.3.1.3 describes how the utility water system will be used to extract, store, and distribute water for consumptive process uses. Powertech is not aware of any risk to the public from the utility water system.

Wastewater

Section 5.3.1.5 describes how the process wastewater system will be designed to receive, treat, and discharge wastewater generated at various stages of the process. It describes how the wastewater system inside the central processing plant will include the solids removal tank, the high TDS wastewater tank, the low TDS wastewater tank, the wastewater pumps, the radium precipitation tank and agitator. Powertech is not aware of any risk to the public from the process wastewater system.

Section 5.3.1.6 describes the domestic wastewater systems, which will be on-site wastewater disposal systems at the central processing plant and satellite facility. The risk from domestic wastewater disposal is potential impacts to groundwater quality, which a risk for any septic system. These risks will be mitigated by designing domestic wastewater systems to meet applicable DENR and Fall River County or Custer County regulations and by permitting the systems through DENR and/or Fall River or Custer County.

Drum Storage and Decontamination

Figure 5.3-4 shows that the yellowcake drum storage and decontamination area will be within the central processing facility. Powertech is not aware of any risk to the public from the drum storage and decontamination area.

Byproduct Storage

Section 5.3.1.2.9 describes how prior to transportation to a licensed disposal facility, 11e.(2) byproduct material will be stored in designated storage buildings (also referred to as "byproduct storage buildings"), one located at the central processing plant site and one located at the satellite facility site. The byproduct storage buildings will allow for control of byproduct materials and specific segregation of these wastes from non-11e.(2) wastes. Typically these wastes are expected to consist of contaminated used equipment parts, personal protective equipment, and wastes from cleanup of spills or other housekeeping activities. Other waste not in contact with the uranium production process will be disposed of in regular dumpsters situated at a separate location. The primary risk associated with byproduct storage is public exposure or contamination. This will be mitigated by containment of byproduct wastes within designated, fully enclosed buildings, which will allow for proper control of the materials, monitoring, and necessary restricted access.

A summary of NRC's review of the effluent control systems that will be used to limit potential public exposure is available in the SER (NRC, 2013b, p. 114-115):

> "Based on the information provided in the application and the detailed review conducted of the effluent control systems for liquids and solids for the Dewey-Burdock facility, the staff has concluded that the proposed effluent control systems for liquids and solids are acceptable and are in compliance with the following regulations:
>
> - 10 CFR 20.1101, which requires that an acceptable radiation protection program that achieves ALARA goals are in place.
> - 10 CFR 20.1201, which defines the allowable occupational dose limits for adults.
> - 10 CFR 20.1301, which defines dose limits allowable for individual members of the public.
> - 10 CFR 20.2007, which requires that disposal by injection in deep wells must also meet any other applicable federal, state, and local government regulations pertaining to deep well injection.
> - 10 CFR Part 40, Appendix A, Criterion 2, which requires that Powertech provide an estimate of the amount of contaminated material that will be generated.
> - 10 CFR Part 40, Appendix A, Criterion 5E, which requires measures to protect groundwater.
> - 10 CFR Part 40, Appendix A, Criterion 5G(1), which requires that the chemical and radioactive characteristics of wastes be defined."

INTERROGATORY NO. 49: What are the specific risks of radiological exposure following any type of accident or release of hydrochloric acid, sulfuric acid, hydrogen peroxide, or sodium hydroxide during the ISL mining process?

ANSWER: It is important to clarify that use of the listed chemicals will be restricted to the central processing plant and not in other areas (e.g., well fields). LSM Section 5.3.1.2 describes the risks and mitigation measures for chemical storage and feeding systems. The primary risk associated with hydrochloric acid, sulfuric acid, hydrogen peroxide or sodium hydroxide is accidental release. Any negative impact to radiological safety from use of these chemicals would be due to accidents, improper use, or human error. Even then, these chemicals would only indirectly cause a radiological hazard as they do not contain radiological materials themselves. Section 5.6.7 describes how during a tornado, chemical storage tanks could fail, resulting in the release of chemicals. This risk is minimized through the use of secondary containment and locating chemical storage tanks far enough from each other to prevent contact of reactive chemicals in the event of an accident. Fire and explosion risks are addressed in Section 5.6.8, which describes how oxygen tanks will be located a safe distance from other storage tanks and Powertech will train its personnel and local emergency responders for responding to a fire or explosion. In addition, Section 5.6.5.1.2 describes how the central processing plant and satellite facility will contain curbs and sumps with volumes greater than 200 percent of the largest liquid-containing tank or vessel in each building. Therefore, failure of a process vessel, tank or pipeline within these facilities will be contained within the buildings.

Chemical accidents are discussed in SER Section 7.3.1, and NRC staff's review is summarized as follows (NRC, 2013b, p. 201-202):

> "The NRC staff has reviewed the applicant's information regarding chemical accidents and finds it acceptable. The applicant has presented the chemicals that could potentially affect radiological health and safety and the manner in which accidents are avoided or mitigated. Avoidance and mitigation measures include use of industry codes and standards for tanks and piping, use of secondary containment, and physical isolation of potentially reactive chemicals. This information is consistent with standard review plan Section 7.5.3 and complies with 10 CFR 40.32(c)."

INTERROGATORY NO. 50: Powertech states on p. 5-36 of its large scale mining permit application that the maximum distance for the perimeter monitor wells is based on standard monitoring practices at operating ISR facilities. Please specify which facilities Powertech is referring to.

ANSWER: According to NUREG-1569 (NRC, 2003), perimeter monitor wells should be placed close enough to the well field to provide timely detection, yet they should be far enough away from the well field to avoid numerous false alarms. Previously approved in situ leach excursion

monitoring systems used monitor wells as far as 180 m [600 ft] and as near as 75 m [250 ft] from the well field edge (NRC, 2001, Table 4-6). That reference gives the following spacing for perimeter monitoring wells:

- Crow Butte Project, NE: 400-600 ft apart, 300 ft from well field edge
- Highland Uranium Project, WY: 400-800 ft apart, 250-600 ft from well field edge
- Smith Ranch Project, WY: 500 ft apart, 500 ft from well field edge
- Christensen Ranch Project, WY: Downgradient 300 ft apart and 300 ft from well field edge; Upgradient and sides 500 ft apart and 500 ft from well field edge

Note that the 400-ft maximum distance and spacing at the Dewey-Burdock Project are within and generally toward the lower end of the range for operating ISR facilities.

The following describes NRC's review of the perimeter monitor well spacing in SER Section 3.1.3.6 (NRC, 2013b, p. 81-83):

> "The applicant proposes a wellfield monitoring network consisting of perimeter monitoring wells, overlying aquifer monitoring wells, and underlying aquifer monitoring wells … Regarding the perimeter monitoring network, wells will be installed approximately 122 m (400 ft) outside the wellfield and each well will be separated by approximately 122 m (400 ft) … The applicant prepared a groundwater model to demonstrate that the perimeter monitoring wells are sufficiently spaced from the wellfield and between each well to detect excursions … For this project, one simulation consisted of deactivating an extracting well in the southern part of a wellfield, thus, rendering the wellfield out of balance. This imbalance causes an excursion that migrates toward the perimeter wells. Particle tracking analysis indicates that one operating well is sufficient to detect an excursion … The applicant then modeled a scenario by which excursions can be recovered … This scenario involves over pumping two adjacent recovery wells and the[n] deactivating injection wells, in order to optimize recovery times. The applicant demonstrated that within 1 hour, groundwater gradients would reverse and begin drawing back excursions to the wellfield … The staff has reviewed the applicant's plans for wellfield monitoring and has determined that these plans are acceptable. Monitoring well networks consist of appropriately spaced overlying and underlying monitoring wells, as well as perimeter monitoring wells. Perimeter monitoring wells are appropriately screened, and the applicant has demonstrated that the spacing is sufficient to detect excursions. Therefore, the staff determines that the information in this section is consistent with Section 3.1.3 of the standard review plan, and complies with 10 CFR 40.32(c) and 40.41(c)."

REQUESTS FOR PRODUCTION OF DOCUMENTS

REQUEST NO. 1: Please produce a map showing the location and types of fencing that will be located on the project area during the active mining stage.

ANSWER: The requested information is found in the LSM permit application. Three types of fence are proposed: well field perimeter fence, processing facility perimeter fence, and pond fencing. Each of these is described below.

Well field perimeter fence: Plates 5.3-1 and 5.3-2 depict the anticipated location of fence that will be installed around the perimeter of each ISR well field. As described in Section 5.6.11.2, the perimeter fence will be barbed wire fence designed to permit big game passage to the extent practicable. Unless DENR and SDGF&P approve an alternate design, the design will include: a bottom, smooth wire at least 15" to 16" above ground for pronghorn passage, a top wire no more than 42" high to facilitate passage of deer and elk, and a space at least 11" to 12" between the top two wires to prevent entanglement. In addition, Section 5.5.9 describes how wildlife exclusion fencing around the land application areas may be used. If so, Powertech will submit the fence design to DENR and SDGF&P for approval prior to installation.

Processing facility perimeter fence: Figures 5.3-3 and 5.3-6 depict the anticipated location of fence that will be installed around the central processing plant and satellite facility, respectively. This fence is anticipated to be 8-foot chain link security fence designed to restrict access.

Pond fence: The figures in Appendix 5.3-A depict the anticipated location of fence that will be installed around the facility ponds. As described in Section 5.6.11.2, this fence will be designed to exclude large and small mammals, including installing a durable mesh (e.g., woven wire) along the base of the 8-foot chain link pond fencing for small mammal exclusion. The mesh will extend at least 30 inches above ground and will be buried at least 3 inches below ground or will extend horizontally along the ground away from the fence to ensure there are no gaps and to discourage burrowing.

REQUEST NO. 2: Please produce documentation showing the planned sediment and erosion control locations and types for the permit area.

ANSWER: The requested information is found in the LSM permit application. Plates 5.3-6 through 5.3-8 show the planned sediment control measures. Sediment control measures are described in Section 5.3.9.3, which designates various sediment control structures or Alternative Sediment Control Measures (ASCMs) according to the drainage basin size above each structure. Plates 5.3-12 and 5.3-13 provide sediment pond designs for the first two well fields. As described in Section 5.3.9.3, other sediment pond designs will be completed following delineation of future well fields and will be provided to DENR for review and verification prior

to construction. Section 5.3.9.2 summarizes the erosion control measures, which will include seeding disturbed areas as soon as possible following ground disturbance and using rip-rap, vegetative sediment filters, check dams, mulches, cover crops and other measures to reduce overland flow velocity, reduce runoff volume or trap sediment.

REQUEST NO. 3: Please produce documentation showing the locations and types of planned berms, catchment basins, and sediment and erosion control features for each proposed land application site, with each site individually identified as to location relative to waterways and wetlands.

ANSWER: The location and planned design of berms and catchment basins for each proposed land application area are depicted on Plates 5.4-1 and 5.4-2 in the LSM permit application. Section 5.4.1.1.2 describes the planned design of the catchment areas, which will consist of earthen berms and associated catchment basins located at or near the downgradient edges of the center pivot areas. The catchment areas will provide sufficient capacity to capture precipitation and runoff from land application areas up to the 100-year, 24-hour precipitation event. By capturing runoff, the catchment basins will provide sediment control for land application areas. Table R-3 provides the distance from each planned catchment berm to the nearest waterway and wetland. Waterways (perennial and ephemeral stream channels) are depicted on Plate 3.5-1, and mapped wetlands are depicted on Plate 3.8-1.

Table R-3: Distance from Planned Land Application Areas to Waterways and Wetlands

Catchment Area	Nearest Waterway	Distance to Nearest Waterway (ft)	Nearest Mapped Wetland	Distance to Nearest Mapped Wetland (ft)
B-1	Pass Creek	370	W38	2,655
B-2	Pass Creek	135	W38	3,560
B-3	Pass Creek	465	W38	2,125
B-4	Pass Creek	280	W38	4,275
B-5	Pass Creek	435	W38	3,500
B-6	Ephemeral channel (diversion)	100	W38	2,680
B-7	Ephemeral channel	235	W38	1,460
B-8	Ephemeral channel	75	W38	330
B-9	Ephemeral channel	895	W44	1,480
B-10	Ephemeral channel	270	Wypt 104	670
B-11	Ephemeral channel (diversion)	50	W38	2,260
B-12	Ephemeral channel	120	W38	2,220
B-13	Ephemeral channel	225	W31	2,475
B-14	Ephemeral channel	205	W38	655
B-15	Ephemeral channel	200	W38	1705
D-1	Beaver Creek	865	Beaver Creek	865
D-2	Beaver Creek	2,890	Beaver Creek	2,890
D-3	Beaver Creek	3,370	Beaver Creek	3,370
D-4	Beaver Creek	1,750	Beaver Creek	1,750
D-5	Beaver Creek	525	Beaver Creek	525
D-6	Beaver Creek	1,450	Beaver Creek	1,450
D-7	Beaver Creek	325	Beaver Creek	325
D-8	Ephemeral channel	3,825	Beaver Creek	4,300
D-9	Beaver Creek	2,815	Beaver Creek	2,815
D-10	Beaver Creek	3,025	Beaver Creek	3,025
D-11	Ephemeral channel	2,200	Beaver Creek	2,350
D-12	Beaver Creek	1,490	Beaver Creek	1,490
D-13	Ephemeral channel	1,510	Beaver Creek	4,900
D-14	Ephemeral channel	345	Beaver Creek	4,820
D-15	Ephemeral channel	1,280	Beaver Creek	2,970

REQUEST NO. 4: Please produce a copy of Powertech's detailed specifications for wildlife protection features at all ponds in the permit area.

ANSWER: The requested information is available in Section 5.6.11.2 of the LSM permit application. It describes how fencing will be provided around facility ponds to exclude large and small mammals (refer to the response to Request No. 2 for a description of fence design).

Further, an avian deterrent system such as physical barriers (netting or "bird balls") or aversion technology (sound/visual hazing system) will be implemented for all ponds containing untreated wastewater or ponds used in the treatment process (i.e., central plant pond, radium settling ponds, spare ponds, and surge ponds). These are ponds that include dual synthetic liners and leak detection systems. For ponds storing only treated water (i.e., treated water storage ponds, spare storage ponds, and outlet ponds), avian deterrent systems will be provided if the water quality exceeds trigger values designed to be protective of wildlife. Trigger values are provided in Table 5.6-2a. In addition, all facilities including sediment ponds and any areas that could accumulate water will be designed to avoid wildlife entrapment.

REQUEST NO. 5: Please produce a copy of Powertech's South Dakota Scientific Collector's Permit.

ANSWER: Attachment R-5 provides copies of the 2007 (License #56) and 2008 (License #11 and 11-1) South Dakota Scientific Collector's Permits. These permits were issued to Jones and Stokes Associates, Inc. as the wildlife contracting firm for Powertech. Note that all small mammal trapping occurred in 2007; all fisheries and macro-invertebrate collections occurred in 2008. Authorization for such activities in other years was requested in case additional sampling was necessary.

REQUEST NO. 6: Please produce copies of all well plugging records for any and all wells that Powertech has plugged on the Dewey-Burdock site.

ANSWER: Powertech has only plugged one well within the proposed permit area. The plugging record for this well is provided as Attachment R-6.

REQUEST NO. 7: Please produce copies of all results for baseline testing done on soils and vegetation in the permit area.

ANSWER: All results for baseline testing done on soils and vegetation in the permit area are available in the LSM permit application. Appendix 3.3-A includes soil chemistry test results, Appendix 5.3-A contains geotechnical test results, and Appendix 3.7-A contains baseline vegetation survey and sampling results.

REQUEST NO. 8: Please produce a list of all Powertech shareholders who live in the state of South Dakota.

ANSWER: As required by Canadian law and Toronto Stock Exchange rules, the relevant information in Powertech's possession is being provided pursuant to a Confidentiality and Nondisclosure Agreement.

REQUEST NO. 9: Provide five examples in which groundwater restoration at an in situ leach uranium mine returned the water to its baseline condition.

ANSWER: Powertech is not aware of any ISR facility for which the groundwater restoration standard has been restricted to baseline conditions. In the case of the Dewey-Burdock Project, NRC license conditions and federal regulations will require Powertech to restore groundwater to (i) NRC Commission-approved background (also referred to as post-licensing, preoperational baseline water quality) or (ii) maximum contaminant levels (MCLs), whichever is higher, or (iii) an alternate concentration limit (ACL) established by the NRC Commission, if the constituent background level and the MCLs are not reasonably achievable and if it is demonstrated that the ACL is adequately protective of groundwater and surface water.

Documentation of successful groundwater restoration at ISR facilities is readily available and can be found in Section 6.2.2.2 of the LSM permit application and in the NRC Technical Report Request for Additional Information (RAI) responses (Powertech, 2011). Numerous ISR facilities in Nebraska, Texas and Wyoming have achieved regulatory approval of successful groundwater restoration in accordance with NRC and state standards. Several examples are given in Powertech (2011) including the Ruth R&D Project (Wyoming), Crow Butte R&D Project (Nebraska) and Bison Basin Commercial ISR Mine (Wyoming). Groundwater restoration also has been approved by NRC and Wyoming DEQ at the Irigaray Ranch Facility (Wyoming). See also the Answer to Interrogatory No. 35.

In addition, USGS Open-File Report 2009-1143 (Hall, 2009) provides two examples of ISR well fields that restored all groundwater constituents with federal maximum contaminant levels (MCLs) to baseline. Following is documentation from that report:

> "Regarding the original question of whether or not groundwater has been restored to baseline in Texas uranium ISR well fields, it was observed that no well field for which final sample results were found in TCEQ records returned every element to baseline. However, two PAAs returned all elements for which USEPA has established MCLs to baseline: the O'Hern-2 and Trevino-1 PAAs [production area authorizations].

"Trevino-1, which was mined from the Oakville Sandstone and restored using electrodialysis, shows restored sulfate to 164 percent of baseline. Reclamation at O'Hern-2 returned constituents with secondary standards for MCLs to baseline values or below.

"Specifically looking at restoration details from the O'Hern PAA-2, this well field was developed by Cogema from 1979 to 1982 in the Catahoula Formation. Groundwater sweep and reverse osmosis were both used to restore groundwater after mining. Calcium and carbonate were both slightly elevated above baseline following mining and reclamation [the report shows that calcium increased from 13.7 to 14.7 mg/L and carbonate from 1.78 to 2.6 mg/L] …

"The aquifer overlying O'Hern-2 is characterized by an average calcium of 27 milligrams per liter and carbonate of 10.1 milligrams per liter [compared to final values in the production zone of 14.7 and 2.6 mg/L, respectively], so post-restoration elevation of these elements in the O'Hern-2 PAA seems inconsequential in the scheme of local hydrochemistry…"

In addition, in a July 10, 2009 memorandum from NRC staff to the NRC Commissioners (NRC, 2009b), NRC staff reviewed records from licensed ISR facilities and determined that NRC has approved 11 groundwater restorations at 3 facilities. The data show that over 60% of the constituents were restored to preoperational concentration, and "Although the remaining constituents were restored to concentrations that were above baseline levels, they were all restored to levels that NRC staff found to be protective of public health and the environment."

REQUEST NO. 10: Please produce a copy of Figure 5.3-4 in which all text is readable.

ANSWER: Figure 5.3-4 is formatted as an 11-inch by 17-inch figure that is readable when printed at this size. Attachment R-10 includes a hard copy of the figure that was printed from the DENR website version of the LSM permit application.

REQUEST NO. 11: Please produce a copy of all research Powertech has available regarding the presence of bighorn sheep in the permit area.

ANSWER: Attachment R-11 includes the following files:

1. Draft Action Plan for Management of Bighorn Sheep in South Dakota (January 2013). Available at http://gfp.sd.gov/wildlife/management/plans/docs/2013-bighornsheep-draftplan.pdf

2. Rocky Mountain Bighorn Sheep Management Plan-South Dakota (2007). Available at http://gfp.sd.gov/wildlife/management/plans/docs/Bighorn-Management-plan2007.pdf

Refer to Figure 1 (page 10) and Figure 3 (page 12) of the attached January 2013 Draft Action Plan for Management of Bighorn Sheep in South Dakota for the most recent depictions of occupied and potential (reintroduction and augmentation areas) bighorn sheep areas in the vicinity of the proposed permit area. Note that all such areas are north of the permit boundary, as overlaid in Figure 3 of that document. Figure 5 (page 14) of the document illustrates the lack of suitable existing habitat for bighorn sheep in the permit area, as mapped by SDGF&P. Figure 8 (page 17) shows that the permit area is not included in areas that might provide future suitable habitat for bighorn sheep if habitats were manipulated to open current forested habitats (as mapped by SDGF&P).

At the time of the baseline wildlife inventories (2007-2008), no bighorn sheep had been documented in the proposed permit area. Likewise, no such sightings occurred during multiple site visits conducted from December 2012 through early July 2013, when regular monitoring of certain wildlife species resumed.

REQUEST NO. 12: Please produce a full copy of Powertech's scenic quality resource inventory.

ANSWER: The complete results of the scenic quality inventory are presented in Section 3.13 of the LSM permit application. The Class IV Visual Resource Management (VRM) determination was based on site-wide knowledge gained through review of historical documents, collection and review of site-wide baseline data, and comparison of site-wide data with examples provided in BLM Manual 8410-1 (BLM, 1986). Site-wide baseline data for the Dewey-Burdock Project are available in the Technical Report accompanying the NRC license application (Powertech, 2009), Technical Report RAI responses (Powertech, 2011) and LSM permit application.

REQUEST NO. 13: Please produce a full copy of Powertech's scenic sensitivity level inventory.

ANSWER: The complete results of the scenic quality evaluation, including evaluation of scenic sensitivity level at two scenic quality rating units (areas that demonstrated similar physiographic characteristics), are presented in Section 3.13 of the LSM permit application. These are the same results provided in the NRC license application (Powertech, 2009). No separate inventory or report was required nor was it produced.

REQUEST NO. 14: Please produce all documents that support the assertion that "Powertech (USA) will maintain hydraulic control of each well field from the first injection of lixiviant through the end of aquifer restoration."

ANSWER: The requested information is provided in the LSM permit application. Section 5.3.3.5.1 describes how Powertech will maintain hydraulic control of each well field by withdrawing slightly more water from each production zone than is injected during ISR operations and groundwater restoration. The net withdrawal from the aquifer (or "bleed") will result in a cone of depression that will maintain an inward hydraulic gradient within each well field. Verification of hydraulic control will be performed through water level measurements in perimeter monitor wells. Section 6.2.2.3 describes how the injection and extraction flow rates will be balanced daily to ensure that the proper bleed is maintained.

Support for the proposed bleed rate that will be used to maintain hydraulic control of each well field is found in the well field-scale numerical groundwater modeling report in Appendix 6.2-A. The numerical modeling results support the conclusion that hydraulic well field control will be feasible at the proposed bleed rate. The modeling also shows that a temporary well field imbalance would be detected by excursion monitoring and that a potential horizontal excursion could be recovered by varying the well field balance to reverse the hydraulic gradient and change the direction of groundwater travel back toward the well field. NRC staff reviewed the well field-scale numerical model and determined that, "the modeling provides the applicant with insight into properly balancing the wellfield to avoid excursions" (NRC, 2013b, p. 82).

Further support for the assertion that Powertech will maintain hydraulic well field control is found in the publicly available draft NRC license (NRC, 2013a). Specifically, draft license condition 10.7 states the following:

> "The licensee shall maintain a net inward hydraulic gradient at a wellfield as measured from the surrounding perimeter monitoring well ring starting when lixiviant is first injected into the production zone and continuing until initiation of the stabilization period."

Powertech will be required by NRC license requirements to maintain hydraulic control of each well field from the first injection of lixiviant through the start of the stability monitoring period, which will coincide with the end of active groundwater restoration activities.

REQUEST NO. 15: Please produce documentation of existing radon levels in various locations within the permit area, including at the Darrow Pits and the Triangle Mine.

ANSWER: Documentation of existing radon-222 levels in various locations within the permit area are provided for groundwater and air in the LSM permit application in Appendices 3.4-G,

3.4-H and 3.14-A. The locations of groundwater and air samples collected within the permit area relative to the locations of the Darrow Pits and the Triangle Mine are presented on Plates 3.4-1 and 3.6-1.

Surface water samples collected from the Darrow Pit (Sub06) and Triangle Mine (Sub02) were not analyzed for radon-222, which is a gas. Instead, the samples were analyzed for the parent isotope of radon-222 in the uranium decay series, radium-226. Laboratory results for radium-226 in surface water samples are provided in Appendices 3.5-B and 3.5-C. Sampling locations are shown on Plate 3.6-1 and Figure 3.5-12.

REQUEST NO. 16: Please produce a copy of the air emissions inventory for the proposed mine that has been presented to the NRC.

ANSWER: The air emissions inventory is publicly available for viewing or downloading from the NRC ADAMS document server using the following Internet address: http://pbadupws.nrc.gov/docs/ML1221/ML12216A220.html

REQUEST NO. 17: Please produce scientific evidence supporting Powertech's conclusion that land application might enhance habitat for some species.

ANSWER: Appendix 5.3-A describes how the estimated annual evapotranspiration potential at the project site is 44 inches per year, while the average annual precipitation is approximately 16 inches per year. It also describes how the proposed land application rate is 19 inches per year, which is designed to be an agronomic rate that will promote growth of vegetation and minimize deep percolation of land applied water. Applying water at an agronomic rate to an area where annual evapotranspiration significantly exceeds precipitation is expected to result in enhanced vegetation density, which might provide enhanced habitat for some wildlife species.

REQUEST NO. 18: Please produce evidence that species that nest in the permit area "*regularly nest and fledge young at or near surface mines and ISR [sic] facilities throughout the region*," as asserted in the large scale mining permit application.

ANSWER: Please refer to multiple baseline wildlife reports on file with the SDGF&P for bentonite projects near Belle Fourche, South Dakota covering a timeline spanning 1998 through 2009. Baseline and annual wildlife reports for gold mine operations in the Black Hills also are available from the SDGF&P, dating back to at least 1994. For example, the 2012 Annual Wildlife Report for the Wharf Mine is provided in Attachment R-18. This report provides the history for nesting raptors in the survey area dating back to 1994.

See also numerous baseline and annual wildlife monitoring reports available from the Wyoming Department of Environmental Quality in Sheridan and/or Cheyenne, Wyoming for surface coal mines in northeast Wyoming, dating back to at least 1994 (annual reports), and to the early 1980s for some properties (baseline or annual reports). Similar reports also are on file for ISR operations in northeastern and central Wyoming, with some reports dating back to the mid-1990s. For example Attachment R-18 includes the 2012 Annual Wildlife Report for the Christensen Ranch-Irigaray ISR Facilities in northeast Wyoming and the 2012 Annual Wildlife Report for the Antelope Mine in northeast Wyoming. These reports provide at least the most recent 5-year history for nesting raptors in their respective survey areas.

Additional baseline and/or annual wildlife reports are available from the Montana Department of Environmental Quality in Helena, Montana, for surface coal mines in southeastern Montana. Some annual reports date back to the early 1980s. Summary tables in all documents provide the requested evidence. All annual reports for these projects are part of the public record and are available by visiting each office and requesting access to documents to copy pertinent sections at one's own cost.

In addition, Gwyn McKee (a consultant to Powertech on the Dewey-Burdock Project) has extensive personal experience related to raptor nesting at surface mines and ISR facilities. For example, Ms. McKee conducted and/or supervised wildlife monitoring for the Christensen Ranch-Irigaray ISR Facility annually from 1995 through 1999 and at the Antelope Mine annually since 1994, including numerous raptor monitoring and mitigation efforts. Those efforts include long-term monitoring and mitigation planning for multiple pairs of nesting golden eagles, among other raptor species, with mitigation planning conducted in collaboration with the Cheyenne Ecological Services Field Office for the USFWS.

REQUEST NO. 19: Please produce copies of all contracts between Powertech and any entity that has agreed to process uranium produced at the Dewey-Burdock project.

ANSWER: No contracts exist between Powertech and any entity that has agreed to process uranium produced at the Dewey-Burdock Project. Powertech plans to ship the uranium oxide product (yellowcake) from the Dewey-Burdock Project to a conversion facility in Metropolis, Illinois or Port Hope, Ontario, Canada, for refining and conversion in order to be used in the uranium fuel cycle.

REQUEST NO. 20: Please produce copies of all contracts between Powertech and any entity that has agreed to purchase uranium produced at the Dewey-Burdock project.

ANSWER: No such contracts exist.

REQUEST NO. 21: Please produce copies of all contracts between Powertech and any entity that has agreed to take 11e.(2) byproduct materials produced at the Dewey-Burdock project.

ANSWER: There are no such current contracts.

REQUEST NO. 22: Please produce copies of all "electric log(s)" from abandoned oil and gas test wells within the permit area referred to in Powertech's large scale mining permit application.

ANSWER: Table R-22 lists the oil and gas test wells within 2 km of the proposed permit area as depicted on Figure 3.2-6 of the LSM permit application. Where available, links are provided to electric logs obtained from South Dakota's Oil and Gas Map-Based Data Source (http://www.sdgs.usd.edu/sdoil/oilgas_app.html). Powertech does not have electric logs for oil and gas test wells for which links are not provided in Table R-22.

Table R-22: Oil and Gas Test Well Logs

API No.	Link to Publicly Available Electric Log
40 033 05219	http://sddenr.net/oglogs/4003305219/
40 033 05221	Not available
40 047 05089	http://sddenr.net/oglogs/4004705089/
40 047 05090	http://sddenr.net/oglogs/4004705090/
40 047 05093	http://sddenr.net/oglogs/4004705093/
40 047 05095	http://sddenr.net/oglogs/4004705095/
40 047 05147	http://sddenr.net/oglogs/4004705147/
40 047 20045	http://sddenr.net/oglogs/4004720045/
40 047 20065	http://sddenr.net/oglogs/4004720065/
40 047 20071	http://sddenr.net/oglogs/4004720071/
40 047 20074	http://sddenr.net/oglogs/4004720074/
40 047 20077	http://sddenr.net/oglogs/4004720077/
40 047 20085	http://sddenr.net/oglogs/4004720085/

REQUEST NO. 23: Please produce copies of any audio recordings, transcripts, and/or any documents, notes, correspondence, or any written communication of any kind regarding each discussion Powertech or any of its employees, officers, directors, agents had with Donald Spencer as set forth in Powertech's large scale mining permit application.

ANSWER: Powertech does not have any audio recordings, transcripts, documents, notes, correspondence, or any written communication with Donald Spencer. The results of the conversation with Mr. Spencer are documented in the LSM permit application.

REQUEST NO. 24: Please produce copies of any audio recordings, transcripts, and/or any documents, notes, correspondence, or any written communication of any kind regarding each discussion Powertech or any of its employees, officers, directors, or agents had with James F. Davis and/or Susquehanna Western, Inc. as set forth in Powertech's large scale mining permit application.

ANSWER: Powertech does not have any audio recordings, transcripts, documents, notes, correspondence, or any written communication with James Davis. The results of the conversation with Mr. Davis are documented in the LSM permit application.

REQUEST NO. 25: Please produce copies of any geologic literature prepared after 1980 that was reviewed by Powertech in preparing its large scale mining permit application for this project.

ANSWER: Following is a list of geologic literature that was prepared after 1980 that was reviewed by Powertech in preparing the LSM permit application and in preparing for the hearing. Where available, links are provided for viewing or downloading the documents.

Anna, L.O., 1986, Geologic framework of the ground-water system in Jurassic and Cretaceous rocks in the Northern Great Plains, in parts of Montana, North Dakota, South Dakota, and Wyoming, U.S. Geological Survey Professional Paper 1402-B: http://pubs.er.usgs.gov/publication/pp1402B.

Boggs, J.M., 1983, Hydrogeologic Investigations at Proposed Uranium Mine near Dewey, South Dakota, Tennessee Valley Authority, Office of Natural Resources, Division of Air and Water Resources, Water Systems Development Branch, Report No. WR28-2-520-128: available in Appendix 3.4-E of the LSM permit application.

Burchett, R.R., 1982, Thickness and Structure Maps of the Pennsylvanian and Permian Rocks in Nebraska, The University of Nebraska – Lincoln, Institute of Agriculture and Natural Resources, Conservation and Survey Division, Report of Investigations Number 7: http://nebraskamaps.unl.edu/productcart/pc/viewPrd.asp?idproduct=6043.

Carter, J.M., 1999, Selected Data for Wells and Test Holes Used in Structure-Contour Maps of the Inyan Kara Group, Minnekahta Limestone, Minnelusa Formation, Madison Limestone, and Deadwood Formation in the Black Hills Area, South Dakota, U.S. Geological Survey Open-File Report 99-260: http://pubs.usgs.gov/of/1999/ofr99-260/.

Carter, J.M., D.G. Driscoll, and J.F. Sawyer, 2003, Ground-Water Resources in the Black Hills Area, South Dakota: U.S. Geological Survey Water-Resources Investigations Report 03-4049: http://pubs.usgs.gov/wri/wri034049/.

Chenoweth, W.L., 1988, Geology and Production History of the Uranium Deposits in the Northern Black Hills , Wyoming – South Dakota, Eastern Powder River Basin – Black Hills, 39th Annual Field Conference Guidebook.

Collings, S.P. and R.H. Knode, 1984, Geology and Discovery of the Crow Butte Uranium Deposit, Dawes County, Nebraska, Wyoming Fuel Company, Lakewood, Colorado and Crawford, Nebraska: http://www.wma-minelife.com/uranium/papers/crwbtt01.htm.

Dahlstrom, D.J. and J.E. Fox, 1995, Fluvial Architecture of the Lower Cretaceous Lakota Formation, Southwestern Flank of the Black Hills Uplift, South Dakota, USGS Bulletin 1917-S: http://pubs.usgs.gov/bul/1917s/report.pdf.

Downey, J.S., 1984, Geohydrology of the Madison and Associated Aquifers in Parts of Montana, North Dakota, South Dakota, and Wyoming, USGS Professional Paper 1273-G: http://pubs.er.usgs.gov/publication/pp1273G.

Driscoll, D.G., J.M. Carter, J.E. Williamson and L.D. Putnam, 2002, Hydrology of the Black Hills Area, South Dakota, USGS Water-Resources Investigations Report 02-4094: http://pubs.usgs.gov/wri/wri024094/.

Epstein, J., 2001, Hydrology, Hazards, and Geomorphic Development of Gypsum Karst in the Northern Black Hills, South Dakota and Wyoming, *in* U.S. Geological Survey Karst Interest Group Proceedings, St. Petersburg, Florida, February 13-16, 2001: http://water.usgs.gov/ogw/karst/kigconference/proceedings.htm.

Hayes, T.S., Episodic Sediment-Discharge Events in Cascade Springs, Southern Black Hills, South Dakota, USGS Water-Resources Investigations Report 99-4168: http://pubs.usgs.gov/wri/wri994168/.

Heakin, A.J., 2004, Streamflow and Water–Quality Characteristics for Wind Cave National Park, South Dakota, 2002-03, USGS Scientific Investigations Report 2004-5071: http://pubs.usgs.gov/sir/2004/5071/.

Johnson, R.H., S.F. Diehl and W.M. Benzel, 2013, Solid-Phase Data from Cores at the Proposed Dewey Burdock Uranium In-Situ Recovery Mine, near Edgemont, South Dakota, USGS Open-File Report 2013-1093: http://pubs.usgs.gov/of/2013/1093/.

Long, A.J., M.J. Ohms and J.D.R.G. McKaskey, 2012, Groundwater Flow, Quality (2007-10), and Mixing in the Wind Cave National Park Area, South Dakota, USGS Scientific Investigations Report 2011-5235: http://pubs.usgs.gov/sir/2011/5235/.

Peterson, J.A., 1984, Stratigraphy and Sedimentary Facies of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, South

Dakota, and Wyoming, USGS Professional Paper 1273-A: http://pubs.er.usgs.gov/publication/pp1273A.

Putnam, L.D. and A.J. Long, 2009, Numerical Groundwater–Flow Model of the Minnelusa and Madison Hydrogeologic Uits in the Rapid City Area, South Dakota, USGS Scientific Investigations Report 2009-5205: http://pubs.usgs.gov/sir/2009/5205/.

Putnam, L.D. and A.J. Long, 2007, Characterization of Ground–Water Flow and Water Quality for the Madison and Minnelusa Aquifers in Northern Lawrence County, South Dakota, USGS Scientific Investigations Report 2007-5001: http://pubs.usgs.gov/sir/2007/5001/.

Redden, J.A., and A.L. Lisenbee, 1996, Geologic Setting, Black Hills, South Dakota, *in* C.J. Patterson and J.G. Kirchner, eds., Guidebook to the Geology of the Black Hills, South Dakota School of Mines and Technology Bulletin No. 19, p. 1-8.

Swinehart, J.B., et al., 1985. Cenozoic Paleography of Western Nebraska, in R.M Flores and S.S. Kaplan, editors, Cenozoic Paleography of the West-Central United States: Rocky Mountain Section, SEPM.

Szigeti, G.J. and J.E. Fox, 1981, Unkpapa Sandstone (Jurassic), Black Hills, South Dakota: An Eolian Facies of the Morrison Formation, SEPM Special Publication No. 31.

Turner, C.E. and F. Peterson, 2004, Reconstruction of the Upper Jurassic Morrison Formation extinct ecosystem – a Synthesis, Sedimentary Geology 167 (2004): http://www.wyomingpaleo.org/references/Turner-Peterson_synthesis.pdf.

Williamson, J.E. and J.M. Carter, 2001, Water–Quality Characteristics in the Black Hills Area, South Dakota, USGS Water-Resources Investigations Report 01-4194: http://pubs.usgs.gov/wri/wri014194/.

Willis, B., Architecture and Permeability Structure of a Composite Valley Fill in the Cretaceous Fall River Formation of South Dakota, (Texas) Bureau of Economic Geology Report of Investigations No 251, 1998.

REQUEST NO. 26: Please produce copies of any documentation on which Powertech relies or has relied to determine the current need for uranium in today's market.

ANSWER: Section 1.1 of the Environmental Report submitted as part of the NRC license application (Powertech, 2009) describes how, as of February 2009, the U.S. annual requirement for uranium in civilian nuclear reactors was about 54 million pounds per year (as U_3O_8). In contrast, the U.S. domestic uranium production was about 4.5 million pounds per year (as U_3O_8) (Powertech, 2009).

The difference between U.S. uranium demand for nuclear power and the domestic supply continues today. According to the U.S. Department of Energy, Energy Information Administration (EIA), U.S. uranium mines produced 4.3 million pounds of uranium (as U_3O_8) in 2012 from five facilities, including two in Texas, two in Wyoming, and one in Nebraska (EIA 2013b). This represents only about 7 percent of the 58 million pounds of uranium concentrates that were purchased by 104 U.S. civilian nuclear power reactors to generate 19% of the U.S. supply of electricity in 2012 (EIA 2013a, 2013c).

REQUEST NO. 27: Please produce copies of all documents and research, other than site visits, upon which Powertech relied regarding springs within the permit area.

ANSWER: Powertech relied on site inspections, USGS 7.5-minute topographic maps, and color infrared (CIR) imagery evaluation to determine that there are no natural springs within the proposed permit area. The USGS topographic maps are publicly available for viewing and downloading (http://store.usgs.gov). The 7.5-minute USGS topographic maps that cover the proposed permit area include: Dewey, Burdock, and Twentyone Divide. The CIR imagery of the proposed permit area is available in Figure 3.4-10 of the LSM permit application.

REQUEST NO. 28: Please produce copies of documents and research relied upon by Powertech to reach the conclusion that ISL mining will produce 1/10th of 1% of radioactive material.

ANSWER: Powertech is unaware of the "conclusion that ISL mining will produce 1/10th of 1% of radioactive material." However, Powertech has made the statement that the nuclear fuel cycle contributes 1/10th of 1% of the radiation exposure in the U.S. This statement relies on an NRC document called Fact Sheet on Biological Effects of Radiation, which is available using the following link: http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/bio-effects-radiation.html. This document describes the various sources of radiation exposure in the U.S. About half of the total annual average U.S. radiation exposure comes from natural sources (e.g., from radon gas that is present in the air we breathe, cosmic radiation, etc.). The other half is man-made radiation, which includes diagnostic medical procedures (e.g., computed tomography (CT) scans), nuclear medicine, consumer products (e.g., tobacco, fertilizer, luminous watch dials, smoke detectors, etc.) and industrial and occupational sources (e.g., from uranium ISR facilities, nuclear power plants, etc.). The NRC document states that industrial and occupational sources, which include uranium ISR facilities, account for only 1/10th of 1% of the total annual average U.S. radiation exposure. Further, the document includes the following summary:

> "NRC regulations strictly limit the amount of radiation that can be emitted by a nuclear facility, such as a nuclear power plant. A 1991 study by the National Cancer Institute, "Cancer in Populations Living Near Nuclear Facilities," concluded that there was no

increased risk of death from cancer for people living in counties adjacent to U.S. nuclear facilities. At the NRC's request, the National Academy of Sciences is currently engaged in a state-of-the-art update to the earlier study. The new study will examine cancer rates in communities around operating and decommissioned nuclear power plants, as well as nuclear fuel cycle facilities."

REQUEST NO. 29: Please produce copies of all documents and research relied upon by Powertech to reach the conclusion that one drum of yellow cake produces as much energy as 46 train cars of coal.

ANSWER: Powertech relied on a document from the World Nuclear Association called Uranium, Electricity and Climate Change, which is available using the following link: http://www.world-nuclear.org/info/Energy-and-Environment/Uranium,-Electricity-and-Climate-Change/#.Ue1Uo23DD9o. This document states that a 1,000-megawatt coal-fired electric power station has a typical fuel requirement of approximately 3.6 million tons of coal per year (assuming a heat value of 10,300 Btu/lb). By comparison, a nuclear power reactor of the same capacity requires about 220 tons per year of uranium oxide concentrate (yellowcake), which is enriched to yield about 30 tons of actual fuel. Based on this information, it requires about 16,000 times more coal than yellowcake to produce the equivalent amount of electricity. Since a drum of yellowcake weighs about 900 pounds (0.45 ton), this would produce as much electricity as approximately 7,200 tons of coal (assuming a heat value of 10,300 Btu/lb). Since BNSF Railway Company coal cars have a net carrying capacity of 102 to 121 tons (http://www.bnsf.com/customers/equipment/coal-cars/), one drum of yellowcake would produce the energy equivalent of approximately 60 to 70 train cars of coal (assuming a heat value of 10,300 Btu/lb). Considering that Powder River Basin coal typically has a heat value less than 10,300 Btu/lb (http://pubs.usgs.gov/pp/p1625a/), one drum of yellowcake would produce the energy equivalent of more than 60 to 70 train cars of coal.

REQUEST NO. 30: Please produce copies of documents and research relied upon by Powertech to reach the conclusion that the United States need for uranium will increase by 26% in the near future.

ANSWER: Powertech is unaware of the "conclusion that the United States need for uranium will increase by 26% in the near future." However, Powertech has indicated that U.S. electricity demand will increase by 26% over a specified time frame. The percentage and outlook dates have changed since Powertech has relied on documents from the U.S. Department of Energy, Energy Information Administration (EIA), which are updated routinely. The most recent document in Powertech's possession is the EIA document called Annual Energy Outlook 2013 with Projections to 2040, which is available using the following link:

http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf. Page 71 of this report predicts that U.S. electricity demand will increase by 28% from 2011 to 2040.

REQUEST NO. 31: Please produce copies of the training material Powertech contractors and employees, including short-term and part-time employees, will receive in relation to the identification of historic and cultural resources.

ANSWER: The requested training materials, with the exception of the relevant laws and regulations, are not currently available. The laws and regulations are readily available online and are listed below. Refer to the Answer to Interrogatory No. 18, which describes how training will be developed as part of the Unexpected Discovery Plan.

- Native American Graves Protection and Repatriation Act of 1990
- Historic Sites Act of 1935
- Archeological and Historic Preservation Act of 1974
- Archeological Resources Protection Act of 1979
- Antiquities Act of 1906

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EIA (U.S. Department of Energy, Energy Information Administration), 2013a, Uranium Marketing Annual Report for 2012, May 16, 2013. Available from the Internet as of 12 July 2013: http://www.eia.gov/uranium/marketing/.

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NRC, 2013a, Draft Source and Byproduct Materials License SUA-1600 for the Dewey-Burdock Project, March 4, 2013. Available from the NRC ADAMS document server as of 15 April 2013: http://pbadupws.nrc.gov/docs/ML1305/ML13052A777.pdf.

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----------SEE SEPARATE SIGNATURE PAGE----------

Dated this 30th day of July, 2013.

POWERTECH (USA) INC.

By: _____
RICHARD F. CLEMENT, JR.
Its: President

STATE OF Colorado)
) **SS.**
County of Arapahoe)

RICHARD F. CLEMENT, JR., in his capacity as President of Powertech (USA) Inc., being duly sworn, verifies the Responses contained in the foregoing **POWERTECH'S ANSWERS TO BLACK HILLS WILD HORSE SANCTUARY, SUSAN WATT, & DAYTON HYDE'S FIRST SET OF INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS,** are true to the best of his knowledge and belief.

_____
RICHARD F. CLEMENT, JR.

Subscribed and sworn to before me on July 30, 2013.

Barbara Houston
Notary Public

My commission expires: 3/9/2016

(Seal)

BARBARA HOUSTON
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20114071570
MY COMMISSION EXPIRES 03/09/2016

FOR PURPOSES OF ALL OBJECTIONS:

Dated July 30, 2013.

BENNETT, MAIN & GUBBRUD, P.C.
Attorneys for Powertech (USA) Inc.

By _____
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