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Brent Berg, Acting President
Cameco Resources
2020 Carey Avenue, Suite 600
Cheyenne, WY 82001

MAR 07 2014

RE: Marsland Expansion Area – Crow Butte Resources, Inc.
NDEQ ID: 97146
Program ID: UIC NE0211459
Subject: Request for Additional Information

Dear Mr. Berg:

On April 22, 2013, the Nebraska Department of Environmental Quality (NDEQ) received a submittal of information from Crow Butte Resources, Inc. (CBR). This submittal serves as a UIC Class I Area Application for the proposed Marsland Expansion Area (MEA). As described in the application, CBR intends to develop Marsland resources using in situ recovery (ISR) methods.

NDEQ staff has completed the initial review of the Class I UIC Area Permit Application for the MEA. During our technical review, NDEQ staff identified certain areas that require clarification, for which we are requesting additional information. Enclosed is our RAI, which has some general comments, which apply to issues that appear throughout the application, and specific comments which are organized according to the pages and chapters in the application. If you have any question concerning this letter or the RAI, please contact Nancy Harris, of my staff, at (402) 471-4290 or via email at nancy.harris@nebraska.gov

Sincerely,

Jon Kenning
Water Quality Assessment Section Supervisor
Water Division

Enclosure

cc: Shar Sapp (w/ enclosure)
Doug Pavlick, CBR (w/ enclosure)
David Garrett, USEPA, Region 7 (w/ enclosure)
Tom Lancaster, US Nuclear Regulatory Commission (w/ enclosure)



**Nebraska Department of Environmental Quality
Underground Injection Control
Request for Additional Information (RAI)**

**Marsland Expansion Area- Class I Area Permit Application
IIS 97146—UIC—NE0211459**

General Comments

Total Number of Wells and Locations

This application needs to indicate maximum (total) number of Class I wells Crow Butte Operations (CBO) plans to install at the proposed Marsland Expansion Area (MEA) under this Class I area permit application. The application also needs to indicate proposed locations for each of these wells. These well locations may be revised based on discussions between the applicant and the Department, and are subject to approval by the Department. Any revised locations are to be identified and discussed in the Notice of Intent to Drill that will be submitted by the applicant prior to drilling of any well under this area permit. Also, the potential for interference between the Class I injection wells should be discussed in an appropriate section of the report.

Legal Descriptions

The permit application needs to state the precise legal description for the entire area being requested under this area permit application. Also, the permit application needs to contain the legal description for the location for each of the proposed Class I injection well locations. These locations should also be shown on a figure in the application, as appropriate.

References

Many parts of the application for the proposed MEA project are not supported by references. These sections include most of the geology, hydrology zone of endangering influence and area of review, and injection well operating procedures portions of this application. Some portions of the geology section of this application contain references cited in the text, but these references are not listed in the reference section of the application. Please ensure that all references used for the application are cited in both the text and reference section.

Figures and Tables

The scale of many of the figures and tables in this application are not appropriate for a project of this scale. For example, Figure 2.3-3 is a map showing the National Hazard Map for the entire United States. Also, Table 2.2-1 shows the lithostratigraphy, lithology,

and hydrostratigraphy across the entire state of Nebraska, while the MEA covers a portion of Dawes County. Please revise as necessary.

Calculations

The application does not state if any assumptions are necessary for most of the calculations in the application. Please ensure that the application cites sources used for these formulas and indicate where numbers used in these calculations are from, as appropriate.

Specific Comments

1. Application, 6, Legal location: This part of the application is inconsistent with other portions of this application. As this is an area permit application, this section should discuss the entire area for this permit application, and locations for each of the proposed wells (up to the total requested in this application). Please revise.
2. Section 1.1, Site Location, page 1: As discussed in the general legal description comment, the legal description contained in this section is not adequate. Please revise.
3. Section 1.2, Facility Owner and Operator, page 1: Please update information in this section, as necessary.
4. Section 1.3, Relevant Site Operations, pages 2-3: This section includes a detailed description of CBR and ISR mining. Please consider removal of extraneous information and only listing information in this section relevant to the proposed Class I wells for MEA or justify why this information is necessary for an application for Class I wells. Please consider placing some of the information related to CBR's existing deep injection wells into this section as well.
5. Section 1.3, Relevant Site Operations, page 3, 4th paragraph: This paragraph goes into great detail about the uranium deposit in the Chadron Formation. Please consider removal of this information or justify its necessity for this application.
6. Section 1.4, Proposed Injection Wells, page 4: This section indicates that CBR is seeking an Area Permit for MEA. As discussed in general comment on well locations, the permit application needs to state the total number of wells and proposed locations for each well in this portion of the application. Please revise.

7. Section 1.5, Surrounding Land Use, page 4, 3rd paragraph: This paragraph discusses use of land within MEA. Please consider including this information in a table.
8. Section 1.6, Cultural Resources, pages 4-5, 1st paragraph: This paragraph describes a number of recreational facilities in Dawes County. Please consider showing these locations in relation to MEA on a new figure.
9. Section 1.6, Cultural Resources, page 5, 2nd paragraph: This paragraph describes a number of habitat lands located near to MEA. Please consider showing these locations in relation to MEA on a new figure.
10. Section 1.8, Description of Related UIC Projects, pages 6-7: This section briefly describes CBR's two existing deep injection wells located at their current facility. Title 122, Chapter 11, 006.05 requires that an application include a detailed description of the operator's technical expertise to construct and operate the facility and to conduct the necessary well closure, plugging, or abandonment. Please consider revising this section to include more information from CBR's existing two wells, including resolution of technical and operational issues, as well as discussion on the closure plans for the deep injection swells at CBR.
11. Section 1.8, Description of Related UIC Projects, Pages 6-7: This section includes a brief description of the other UIC projects operated by CBR. However, each of the projects needs to include the following information:
 - Location of the project
 - Nature of each project
 - All permits and construction permits, applied for, approved, or denied (as applicable)
 - Dates of construction (if applicable)
 - Size of each project by acreage and annual production units (as applicable)
 - All citations or Notices of Violation and their disposition (as applicable)

This information may be included in this section or another relevant section of the application for each UIC related project. Please consider including this information in a new table to be referenced in this section as applicable.

12. Section 1.8, Description of Related UIC Projects, page 6, 3rd paragraph: As discussed in the general comment on legal descriptions, this general legal description is not adequate. Please revise.

13. Section 1.8, Description of Related UIC Projects, page 7, 1st paragraph: This paragraph indicated that the proposed injection interval for MEA is the Lower Dakota, Morrison, and Sundance formations, and are expected to be similar to the injection interval at CBR's existing deep wells. There is significant heterogeneity for this injection interval at CBR. Please consider including some information about the properties observed at CBR for both of the deep injection wells.
14. Section 2.2, Regional Geology, pages 7-8: The scale and detail of the text, tables, and figures are not appropriate for a project of this scale. For example, the regional geologic cross-section, Figure 2.2-2, extends from the Rocky Mountains to Omaha, and follows Interstate 80. The MEA is not located near this cross-section. This section needs more detail, on a scale appropriate for the proposed project. Please revise as needed.
15. Section 3.3, Estimated Formation (Bottom-Hole) Pressure, page 27: This section states that the bottom hole pressure is estimated to be 729.2 psi. Please discuss how this estimate was derived.
16. Section 3.4, Estimated Formation Brine Characteristics, page 27, 1st paragraph, 1st sentence: This sentence states that it is estimated that the total dissolved solids within the injection zone will exceed 10,000 mg/l. Please specify what this estimate is based on. Is it based on experience at CBO? If so, please state this. Analysis of water quality samples from relevant water bearing intervals will be required during drilling of any Class I wells for this permit application.
17. Section 3.4, Estimated Formation Brine Characteristics, page 27, 1st paragraph, 2nd sentence: This sentence states that no harmful or reactive incompatibility is expected. Please identify what information this is based on. Is it based on experience at CBR? If so, please state this explicitly in this sentence and include relevant information from CBR in this section, as needed to justify this statement.
18. Section 3.4, Estimated Formation Brine Characteristics, page 27: Please include a statement that since total dissolved solids are expected to exceed 10,000 mg/l, the injection zone is a non-USDW. Please consider using information from the second paragraph in discussing that these are non-USDWs.
19. Section 3.6, Calculated Critical Pressure Rise, page 28, 2nd paragraph: This paragraph describes settling in mud filled wellbores. Please clarify.

20. Section 6.5, Area of Review Determination, page 36, 2nd paragraph: Please consider referencing figure 6.7-1 in this paragraph as it shows the location of the wells discussed in this paragraph.
21. Section 6.6, Freshwater Penetrations within Area of Review, page 36, 2nd paragraph: Please refer to Table 6.6-1 in this paragraph.
22. Table 1.7-1, Applicable Regulatory Permits, Crow Butte Resources, Inc., Marsland Expansion Area, Dawes County, Nebraska: The title of this table might lead a reader to interpret that all of these permits are for Marsland. Please consider revision of the this table to distinguish which permits are for CBR, Marsland, North Trend, Three Crow, or Other, as applicable.
23. Table 6.6-1, Registered Water Wells within MEA Area of Review: There are a number of wells listed in this table that are of unknown depth and use an unknown formation. Please clarify. For example, Well 814, CBR Exploration, is listed of unknown depth and unknown formation. Please provide more information on this well. Also, please identify if this well will be used during development of the MEA or is scheduled to be abandoned.
24. Table 2.2-1, Generalized Geologic and Hydrostratigraphic Framework of Nebraska: This table consists of an extensive listing of geology and hydrogeology for the entire state of Nebraska. The scale of this table is not appropriate for MEA. Please revise this table to include site specific information and information for the regional (not state scale) geology and hydrogeology.
25. Table 2.3-1, Shallow Stratigraphy Nomenclature: Please consider revising this table to include a list of the units that have historically been used in permitting for CBR, along with the more current stratigraphic terms for the same units. This table will be used to compare unit terms between references used. Please ensure that all references used in this table are cited properly.
26. Table 3.0-1, Physical and Chemical Data for Morrison/Sundance Formations: This table combines information from the deep injection wells at CBR's current facility. Due to the heterogeneity of the injection interval, please revise this table to better clarify which information is from which deep injection well.
27. Figure 1.1-2, Site Map: The area shown in this figure does not match the legal description provided in the text. A precise legal description of the area to be permitted must be provided in an appropriate section of this application. Also, the proposed locations for all the Class I wells need to be shown on an appropriate figure in this application.

28. Figure 1.3-1, MEA Ore Body: Please either justify the necessity of this figure or consider removing it from this application.
29. Figure 2.3-4, Seismic Hazard Map for Nebraska (2008): Please consider adding other reference points to this map, such as the current CBR facility, Crawford, NTEA, TCEA, etc. Also, please ensure that all references are properly cited.
30. Appendix 5.0-1, Waste Stream Analytical Data: This appendix consists of a single sheet saying "Laboratory Analytical Report to be provided by Cameco." Please revise.

Other Comments

1. The calculations that CBR used to calculate the bottom hole temperature estimate an expected temperature of 118 degrees Fahrenheit (page 39). This estimate is significantly different to the bottom hole temperatures of Deep Well 1 (DW1) and Deep Well 2 (DW2), which are ~138-151 degrees Fahrenheit. Please clarify.
2. The cost estimate for abandonment is from 2011. Has this significantly changed?
3. Some of the injection limits seem to be open ended or very high. They are the same as DW1 at CBR. DW2 at CBR has completely different injection limits. Please clarify how these limits were calculated.

Geology

The document does not adequately describe and document the relevant geologic units that the Class I well would penetrate, inject into, and bound.

Hydrology

1. The document supplies eleven and a half pages describing the Tertiary and younger sediments with detailed descriptions, references, and figures. All these sediments will be protected and separated from the "well" by the surface ("conductor") casing. Meanwhile the units that the well itself will penetrate, inject into, bound, and provide geologic protections for drinking water is covered by one and a half pages with very short descriptions, and no references.
2. The figures are often inadequate for the points they do make (e.g. citing the thickness of the Pierre Shale as up to 1,500 feet thick with reference to Figure 2.2-2).
3. The drawings (2.3-1 and 2.3-2) for geologic cross-sections have no data points inside the proposed mining area, and very little data points (3) that

even penetrate the geologic units that will receive the injected fluids. The document has geologic conclusions that are based on the injection horizon and bounding units; geologic units which have uncertain probabilities for units with unknown heterogeneities.

4. The Department is requesting that the applicant provide more information about the Santanka Shale in Nebraska. Table 2.2-1, which is the geologic section they present for the area, does not have this unit. In addition Figures 2.2-1 and 2.2-1 do not have the unit.
5. Only post Cretaceous units are identified as water-bearing units. I believe water can be produced from several of the Cretaceous units. No data was supplied regarding water quality of any unit.
6. Figure 2.4-1 "Freshwater Aquifers" is not a figure that identifies the water-bearing properties of the units identified.
7. Many of the hydrologic characteristics of the proposed project are not supported by any references.
8. An inventory of wells in the area is presented, but the document contains very little discussion of the geology, water quality, and uses. Please consider revising the application as appropriate.