

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:

G. Paul Bollwerk, III, Chairman
Dr. Richard E. Wardwell
Dr. Thomas J. Hirons

In the Matter of

CROW BUTTE RESOURCES, INC.

(Marsland Expansion Area)

Docket No. 40-8943-MLA-2

ASLBP No. 13-926-01-MLA-BD01

September 24, 2018

MEMORANDUM AND ORDER

(Granting in Part and Denying in Part Staff Motion in Limine)

By motion dated September 12, 2018, the Nuclear Regulatory Commission (NRC) staff has requested that various portions of intervenor Oglala Sioux Tribe's (OST) prefiled direct and rebuttal initial testimony and associated exhibits be excluded from the evidentiary record of this proceeding. See NRC Staff Motion in Limine to Exclude Portions of the [OST] Testimony and Exhibits (Sept. 12, 2018) at 1–2 [hereinafter Staff In Limine Motion]. On September 17, 2018, OST filed a response to the staff's motion that, with one exception, seeks to keep in the challenged testimony and exhibits.¹ See [OST] Answer to NRC Staff's Motion in Limine (Sept. 17, 2018) at 1 [hereinafter OST Response].

For the reasons set forth below, we grant in part and deny in part the staff's in limine motion.

¹ In its motion, the staff indicated that as a result of prefilings consultation on its in limine motion, as is required by section 2.323(b) of the agency's rules, OST had agreed to the exclusion of prefiled exhibit OST009, which is its original intervention petition. See Staff In Limine Motion at 1 n.2, 9–10. In its response, OST does not dispute or otherwise mention this staff representation, and so prefiled exhibit OST009 will be considered to have been withdrawn and will not be identified or admitted as part of this proceeding's evidentiary record.

I. BACKGROUND

This proceeding concerns OST's challenge to the May 2012 application submitted by Crow Butte Resources, Inc., (CBR) requesting a license amendment authorizing it to construct and operate a satellite in situ uranium recovery (ISR) facility in the Marsland Expansion Area (MEA) in Dawes County, Nebraska. In accordance with the Board's order setting the schedule for conducting an evidentiary hearing regarding OST's sole admitted Contention 2, including the deadlines for prefiling testimony and exhibits, CBR and the staff submitted prefiled direct testimony and initial position statements on August 17, 2018, with OST submitting its initial position statement and prefiled direct testimony and supporting exhibits on August 18, 2018.² The staff then filed its rebuttal statement and testimony on September 5, 2018, while both CBR and OST submitted their rebuttal position statements and testimony on September 7, 2018.³ On September 12, 2018, the staff timely filed its motion in limine to exclude portions of OST's prefiled direct and rebuttal testimony and exhibits. See Staff In Limine Motion at 1. OST timely filed its response to the staff's motion on September 17, 2018, and, with the exception of prefiled exhibit OST009, see supra note 1, objected to all the staff's requests that OST prefiled testimony and exhibits be excluded from evidence. See OST Response at 1.

² OST's August 18, 2018 submission of its initial position statement was one day later than the deadline set in the initial scheduling order. See Licensing Board Memorandum and Order (License Amendment Effectiveness Stay Application, In Limine Motions, and Site Visit/Limited Appearance Session/Evidentiary Hearing Scheduling) (May 21, 2018) at 3–4 & app. A, at 2 (unpublished).

³ The CBR and OST rebuttal materials were submitted past the established filing deadline as well. See id. at app. A, at 3. The Board addressed the emerging pattern of late submissions, as well as the schedule for in limine motions and responses, in a recent order. See Licensing Board Memorandum and Order (Concerning Party Late Filings and Scheduling Prehearing Conference) (Sept. 10, 2018) (unpublished).

II. LEGAL STANDARD

At an evidentiary hearing, “[o]nly relevant, material, and reliable evidence which is not unduly repetitious will be admitted. Immaterial or irrelevant parts of an admissible document will be segregated and excluded so far as is practicable.” 10 C.F.R. § 2.337(a). While it is within a presiding officer’s power to strike evidence, on motion or on the presiding officer’s own initiative, that is “irrelevant, immaterial, unreliable, duplicative or cumulative,” id. § 2.319(d)–(e), at the same time a licensing board “normally has considerable discretion in making evidentiary rulings,” Duke Energy Corp. (Catawba Nuclear Station, Units 1 & 2), CLI-04-21, 60 NRC 21, 27 (2004).

As a general proposition, the scope of an evidentiary hearing is defined by the scope of the admitted contention (or contentions) being litigated in that hearing. See Private Fuel Storage, L.L.C., (Indep. Spent Fuel Storage Installation), CLI-02-20, 56 NRC 147, 158 (2002) (indicating legal theory outside the scope of admitted contention could not be the basis for an evidentiary hearing). Further, direct testimony that is within the scope of, and relevant to, an admitted contention and, in the case of testimony sponsored by an expert witness, within the realm of the witness’s expertise, normally will be permitted. See Licensing Board Order (Ruling on Motions in Limine: Motions to Strike and for Cross-Examination), Powertech USA, Inc. (Dewey-Burdock In Situ Uranium Recovery Facility), No. 40-9075-MLA (Aug. 1, 2014) at 3 (unpublished) (“[O]nly testimony which is within the scope of an admitted contention, relevant to the admitted contention and within the scope of the sponsoring witness’ expertise will be permitted.”). In contrast, rebuttal testimony submitted in response to direct testimony generally is limited to matters within the scope of the direct testimony and should not be used as a vehicle to address for the first time matters that reasonably could have been, but were not, raised in the rebuttal witness’s direct testimony regarding the matter. See Progress Energy Fla., Inc. (Levy Cty. Nuclear Power Plant, Units 1 & 2), LBP-09-22, 70 NRC 640, 655 (2009).

III. ANALYSIS

A. Mr. Wireman's Prefiled Direct Testimony and Associated Exhibits

The staff seeks to exclude certain portions of prefiled exhibit OST004, Mr. Mickel Wireman's direct testimony,⁴ as well as prefiled exhibits OST009, OST011, and OST012 because they allegedly address topics not within the scope of the admitted contention. See Staff In Limine Motion at 5. Initially, the staff objects to the following portions of his testimony:

1. Opinion 1 – basis paragraph (1), second sentence: "The [CBR Technical Report (TR)] should discuss the relationship between . . . 500 acre-feet per year."
2. Opinion 1 – basis paragraph (2), last three sentences: "The TR indicates . . . from the pumping center(s)."
3. Opinion 1 – basis paragraph (3), the phrase "potential perturbation of the potentiometric surface downgradient of the mine units and".

Id. (quoting Wireman Direct at 2–3).

The staff asserts that these portions of prefiled exhibit OST004 should be stricken because each involves groundwater quantity impacts rather than groundwater quality impacts, with the latter, but not the former, being within the scope of Contention 2. The staff argues that the first portion outlined above is outside the contention's scope because it discusses "the relationship between recharge of the Basal Chadron Sandstone aquifer and estimated

⁴ Although it is arranged to provide numbered "Opinions" rather than being in question and answer format, see Prefiled ex. OST004, Mike Wireman August 16, Expert Opinion Testimony of Mickel Wireman at 1 (Aug. 16, 2018) [hereinafter Wireman Direct], given it has been sworn to by Mr. Wireman under penalty of perjury, we consider it to be direct testimony. The same is true for Dr. Kreamer's "Opinion" submission. Further, while Mr. Wireman's direct testimony and his rebuttal testimony are identified as the testimony of "Mickel" Wireman, see id.; Prefiled ex. OST015, Rebuttal Testimony of Mikel Wireman at 1 (Sept. 7, 2018) [hereinafter Wireman Rebuttal], the first name on his curriculum vitae (CV) is "Michael," see Prefiled ex. OST002, Michael Wireman [CV], at 1. For current purposes we presume the first name on Mr. Wireman's testimony is correct.

consumptive use of water at the MEA.” See id. at 6. The second portion is objectionable, the staff maintains, because it also concerns “quantity” to the extent it “discusses declines in potentiometric surface” at the CBR renewal site,⁵ potential declines at the MEA, and “possible drawdown in other areas.” Id. The staff likewise contends the third portion is outside the scope of Contention 2 because the cited statement “is synonymous with drawdown,” which refers to water quantity rather than water quality. Id.

In its response, OST asserts that all of Mr. Wireman’s testimony is admissible under the first of the four identified concerns associated with Contention 2, which alleges “the adequacy of the descriptions of the affected environment for establishing the potential effects” of the MEA to adjacent surface and groundwater resources. See OST Response at 2–3 (quoting LBP-18-2, 87 NRC 21, 37 (2018)). With regard to the third portion of the testimony, OST cites applicant and staff prefiled direct testimony exhibits CBR001-R and NRC001, stating that staff and CBR testimony “rely on the potentiometric surface of the Basal Chadron to demonstrate confinement in the aquifer,” and as such, OST’s use of the term is admissible in that respect as well. Id. at 3.

The Board agrees with the staff insofar as the first and second portions of Mr. Wireman’s prefiled direct testimony are indeed outside the scope of the contention, but concludes that the third portion is relevant to this proceeding. Regarding the first and second portions of his direct testimony, we consider Contention 2’s first concern to relate specifically to the MEA project’s impacts to ground and surface water quality, not quantity. See LBP-13-6, 77 NRC 253, 289–95 (2013). Furthermore, supporting this determination is the Board disposition of OST’s Contention 3 concerning water quantity and consumption at the MEA, which previously was

⁵ The term “renewal site” as used herein refers to CBR’s already licensed Crawford, Nebraska site. The license renewal application, which was the subject of licensing board partial initial decisions in 2016, see Crow Butte Res., Inc. (In Situ Leach Facility, Crawford, Neb.), LBP-16-7, 83 NRC 340 (2016), petition for Commission review pending; Crow Butte Res., Inc. (In Situ Leach Facility, Crawford, Neb.), LBP-16-13, 84 NRC 271 (2016), petition for Commission review pending, remains before a licensing board in a proceeding that we will refer to as the “Renewal Site” proceeding.

rejected by this Board for lacking adequate factual support to show a genuine dispute with CBR's application. See id. at 295 ("This application violates [NEPA] in its failure to provide an analysis of groundwater quantity impacts of the project."). We will not permit OST to reincorporate the substance of this contention already deemed inadmissible under the guise of testimony concerning an admitted contention. Accordingly, any OST testimony that addresses consumptive water usage and drawdown as a water quantity concern is outside the scope of this proceeding.

As to the third portion of Mr. Wireman's testimony, however, we agree with OST's position. The phrase at issue is relevant given that both the staff and CBR depend on the Basal Chadron's "potentiometric surface" to demonstrate aquifer confinement. See, e.g., Prefiled ex. CBR001-R, Initial Written Testimony of [CBR] Witnesses Robert Lewis, Walter Nelson, and Douglas Pavlick on Contention 2, at 32–33 (Aug. 17, 2018) [hereinafter CBR Direct]; Prefiled ex. NRC001, NRC Staff's Initial Testimony at 30–31 (Aug. 17, 2018) [hereinafter Staff Direct] (citing Prefiled ex. NRC006, Division of Fuel Cycle Safety, Safeguards & Environmental Review, Office of Nuclear Material Safety and Safeguards, Environmental Assessment for the [MEA] License Amendment Application at 3-34 (Apr. 2018) [hereinafter EA]).

Thus, because Contention 2 involves ground and surface water quality rather than quantity issues, the first and second staff-identified portions of prefiled exhibit OST004 will be stricken from Mr. Wireman's direct testimony as outside the scope of the contention;⁶ however, the third portion will remain part of the testimony, as it concerns aquifer confinement.⁷

⁶ Section IV of this decision outlines the administrative process by which the Board's exclusion rulings are to be carried out.

⁷ To the extent that Mr. Wireman's rebuttal testimony repeats his direct testimony involving groundwater quantity, the staff's in limine request concerning those statements is granted as well. See Staff In Limine Motion at 18 (arguing that in his rebuttal testimony, prefiled exhibit OST015, Mr. Wireman repeats his out-of-scope statements from prefiled exhibit OST004, page 2, Opinion 1, basis paragraph 1, second sentence); id. at 18 n.58 (stating Mr. Wireman builds on his initial testimony and further references quantity concerns regarding

The staff also objects to a fourth portion of Mr. Wireman's Opinion 1, specifically basis paragraph (5). In this regard, the staff argues that Mr. Wireman's prefiled direct testimony declaring that CBR should collect another year of meteorological data should be wholly excluded because "Mr. Wireman did not explain why higher than average rainfall in one particular month is relevant or material to the issues raised in Contention 2," especially with regard to "the geologic setting and site hydrology in the context of CBR's ability to demonstrate confinement of the production zone aquifer and to contain migration of ISR production fluids." See Staff Motion in Limine at 6–7. The Board agrees. Mr. Wireman's testimony contesting CBR's single year of meteorological data fails to explain how that data, or lack thereof, contributes to the issue of ground and surface water quality relative to the proposed MEA ISR project. Therefore, this portion of prefiled exhibit OST004 is stricken as well. Moreover, although the subject of a different staff objection, see infra p. 18, we find that a portion of the section 3 of Mr. Wireman's prefiled rebuttal testimony, specifically the last four sentences, asserting the need for additional meteorological information must be stricken for the same reasons as are noted above.

A fifth portion of Mr. Wireman's prefiled direct testimony Opinion 1 also is at issue as the staff requests that basis paragraph (6) of his testimony be stricken in its entirety. The staff objects to the sixth basis paragraph, which outlines Mr. Wireman's concern regarding baseline monitoring at the MEA site, because Mr. Wireman alleges that baseline restoration wells "have not been selected and thus no data are provided regarding background concentrations for applicable constituents." Staff In Limine Motion at 7. The staff asserts that because the wells are used only to determine background water quality at the MEA site "the selection and sampling of 'baseline restoration wells' [are] outside the scope of Contention 2." Id. The staff

recharge at the Basal Chadron Sandstone aquifer in his rebuttal testimony section 2). By the same token, we reject the staff's request that we preclude from his rebuttal testimony a "potentiometric surface" reference. See id. (requesting discussion of "potentiometric surface" in section 2 of Mr. Wireman's rebuttal testimony be stricken).

further notes that the MEA's baseline restoration wells are required by License Condition 11.1.3, which requires CBR to establish a groundwater quality baseline before injecting lixiviant for restoration purposes, id. at 7 & n.24. The staff thus concludes "these wells have no bearing on the ability to demonstrate confinement or contain fluid migration at the MEA." Id. at 7.

We disagree, concluding that the cited portion of testimony above is within the confines of Contention 2's concerns. As stated earlier, Contention 2 involves the MEA's impacts and effects to the adjacent quality of ground and surface water, i.e., "the adequacy of "the descriptions of the affected environment for establishing the potential effects of the proposed MEA operation on the adjacent surface water and groundwater resources." LBP-18-3, 88 NRC __, __ (slip op. at 43) (July 20, 2018)). Moreover, the staff undercuts its own argument when it explains in its motion that "[the baseline restoration] wells are used to determine background water quality for use in determining whether groundwater restoration standards have been met." Staff in Limine Motion at 7 (citing Prefiled ex. CBR006, [CBR], Technical Report, [MEA] at 6–5 (June 2017) (consolidated) [hereinafter Tech. Rep.]). Mr. Wireman's testimony plainly alleges that there is an information void regarding the MEA's baseline wells relative to their selection and their background concentrations. See Wireman Direct at 3. Therefore, because establishing baseline groundwater quality is relevant to the Contention 2 issue regarding impacts the MEA would impose on surface and groundwater quality, especially to the issue of groundwater restoration, the testimony is relevant to this proceeding. The staff's motion as to this portion of testimony is denied as well.

A sixth portion of Mr. Wireman's prefiled direct testimony that the staff seeks to have stricken is Opinions 4 and 5 and the supporting basis paragraphs, which concern the topics of groundwater restoration standards and deep disposal wells (DDWs), respectively. See Staff In Limine Motion at 8–9 (citing Wireman Direct at 5–6). OST disagrees, explaining that Mr. Wireman's prefiled direct testimony fits within the confines of Contention 2, concern 3, which alleges that CBR failed "to develop . . . an acceptable conceptual model of site hydrology that is

adequately supported by site characterization data.” OST Response at 3 (quoting LBP-18-2, 87 NRC at 37).

Mr. Wireman’s Opinion 4 alleges that the “uncertainty regarding applicable groundwater restoration standards,” at the MEA site is problematic “given the inadequate site hydrogeologic characterization.” Wireman Direct at 5. Mr. Wireman further opines that the CBR TR and staff EA “are confusing regarding applicable restoration monitoring requirements and compliance standards,” cites TR section 6.1.3 as evidence that “CBR is assuming the restoration efforts will not achieve background concentrations for some constituents,” id., and maintains that CBR is relying on Nebraska Department of Environmental Quality (NDEQ) standards to apply for well restoration values. Id. The staff asserts that this opinion is wholly outside the scope of Contention 2 because the contention “concerns the adequacy of the description of the geologic setting and site hydrology in the context of CBR’s ability to demonstrate confinement of the production zone aquifer and to contain migration of ISR production fluids.” Staff In Limine Motion at 8 & n.29 (citing Prefiled ex. NRC009, NRC Materials License SUA-1534, Amend. 3 (with License Condition Reference Table) at 11, and explaining that MEA’s License Condition 10.1.5 clearly articulates that 10 C.F.R. Part 40, App. A, Criterion 5B(5) applies to well restoration, rather than NDEQ regulations).

The Board concludes that this testimony is within the scope of Contention 2. The proffered direct testimony alleges deficiencies with the staff’s and CBR’s environmental documents in “establishing potential effects of the proposed MEA operation on the adjacent surface and groundwater resources,” especially concerning groundwater restoration at the site. LBP-18-3, 88 NRC at ___ (slip op. at 43). Accordingly, the staff’s motion to strike Opinion 4 is denied as to this portion of Mr. Wireman’s direct testimony.

We would add, however, that while in the Board’s view there is confusion about what water quality values apply — the agency’s or NDEQ’s — at the restoration stage, the Board does place one caveat on this issue. The upcoming evidentiary hearing is not the forum for

relitigating concerns similar to those at issue in the Strata proceeding, specifically those challenging the use of alternate concentration limits (ACLs) in the recovery and restoration process. See Strata Energy, Inc. (Ross In Situ Recovery Uranium Project), LBP-15-3, 81 NRC 65, 111–133 (2015), aff'd, CLI-16-13, 83 NRC 566, 593 (2016), petition for review denied, Nat. Res. Def. Council v. NRC, 879 F.3d 1202 (D.C. Cir. 2018).

In his Opinion 5, Mr. Wireman states that the CBR TR is deficient because there is inadequate information regarding the proposed disposal of wastewater. See Wireman Direct at 6. Mr. Wireman challenges the TR's lack of information regarding deep disposal wells (DDWs), especially concerning "the geologic formations/aquifers into which CBR proposes to inject wastefluids" and inquires about the drinking water status at the proposed formations/aquifers identified for DDW placement. The staff asserts that Opinion 5 is wholly outside Contention 2's scope because DDWs "are regulated and approved by the [NDEQ]," not by the agency. Staff In Limine Motion at 8–9. OST disagrees, again asserting that the statements are relevant under Contention 2 in that they speak to "restoration goals." OST Response at 3.

The Board concludes this prefled direct testimony is within Contention 2's scope as it concerns the MEA's potential effect on the groundwater quality at the project area. Because DDWs can impact surrounding groundwater quality, testimony questioning the MEA DDWs' locale and use during operations and restoration are within the scope of this contention so long as they are restricted to the topics of groundwater quality. Furthermore, the fact that the NRC is not the permitting agency for DDWs does not place the discussion of the topic outside Contention 2's scope. For these reasons, the staff's motion is denied as to Opinion 5 of prefled exhibit OST004.⁸

⁸ And to the extent that Mr. Wireman's rebuttal testimony also discusses DDWs, the staff's in limine motion as to those statements is denied for the same reason, i.e., the topic is

Finally, in connection with Mr. Wireman's prefiled direct testimony, the staff also seeks the exclusion of prefiled exhibits OST011 and OST012. The staff wants to exclude these two OST prefiled exhibits, which previously were filed with OST's initial petition to intervene in 2013. Prefiled exhibit OST011 is a 2009 U.S. Geological Survey (USGS) open-file report that concerns groundwater restoration at in situ uranium recovery mines on the south Texas coastal plain, while prefiled exhibit OST012 is a single-page USGS article regarding the overview of production and remediation issues at in situ uranium mining sites. See Prefiled ex. OST011, S. Hall, Groundwater Restoration at Uranium [ISR] Mines, South Texas Coastal Plain, [USGS] Open-File Report 2009-1143 (2009); Prefiled ex. OST012, J.K. Otton & S. Hall, [ISR] Uranium Mining in the United States: Overview of Production and Remediation Issues, IAEA-CN-175/87. The staff asserts that "OST has not explained how either document is relevant to the MEA" so that the exhibits should be stricken. Staff In Limine Motion at 9.

The Board agrees that OST has not shown the relevance of these documents to the MEA site by citing them in any of its proffered prefiled direct or rebuttal testimony. Furthermore, with OST's withdrawal of prefiled exhibit OST009, see supra note 1, prefiled exhibits OST011 and OST012 are now no longer connected in any way to any potentially admissible evidentiary material submitted by OST or any other party to this proceeding. Consequently, prefiled exhibits OST011 and OST012 will not be identified or admitted as part of the evidentiary record of this proceeding. See Licensing Board Memorandum and Order (Providing Administrative Directives Associated with Evidentiary Hearing and Limited Appearance Sessions) (July 27, 2018) at 3 n.4 (unpublished) [hereinafter Board Administrative Directives Order].

within the scope of Contention 2. See Staff In Limine Motion at 18 (requesting DDWs discussion in third supporting paragraph of section 1 of Wireman rebuttal testimony be stricken).

B. Dr. Kreamer's Prefiled Direct Testimony and Associated Exhibits

In addition to Mr. Wireman's prefiled direct testimony, the staff in its in limine motion also requests that the prefiled direct testimony of Dr. Kreamer and several associated exhibits also not be allowed to become part of the evidentiary record. Initially, the staff asks the Board to exclude all of Dr. Kreamer's Opinion 2, save for three portions of his direct testimony at pages 3 and 5 of the exhibit.⁹ See Staff In Limine Motion at 10. This should be excluded, according to the staff, because "OST has not explained how this information is relevant or material to the MEA review and Contention 2." Id. In its response, OST asserts that notwithstanding the staff's claim that Dr. Kreamer's Opinion 2 is not relevant to the MEA proceeding, the staff itself concedes that "Dr. Kreamer's testimony is directed at the passage from CBR016 that he identifies in his challenged Opinion 2." OST Response at 3–4.

Dr. Kreamer's Opinion 2 testimony chiefly concerns historical pump testing results at CBR's renewal site: "The summary of historical testing results, mischaracterizes results of previous testing of the Basal Chadron Sandstone." Kreamer Direct at 3. Of importance, Dr. Kreamer's testimony attempts to respond to prefiled exhibit CBR016's assertion stating "[r]esults of previous testing [(i.e., pump testing at the renewal site)] indicate that the Basal Chadron is relatively homogeneous and isotropic within the current Class III UIC area." Id. (quoting Prefiled ex. CBR006, Tech. Rep. App. F, Aqui-Ver, Inc., Marsland Hydrological Testing Report –

⁹ Specifically, the staff asks that all of Dr. Kreamer's opinion 2 testimony be stricken except the following: (1) "Dr. David Kreamer in testimony regarding . . . same departure is evident in the MEA pumping test. [CBR016 at 80-96]"; (2) "[t]he historic analytical mathematical approaches used by CBR, which are the same used at MEA for interpretation, assume a priori homogeneity and isotropy"; and (3) "[b]y making the unsupported statement, . . . the Aqui-Ver report for MEA [] wrongly implies the local geology is simple. It further mistakenly presumes . . . homogeneous, isotropic subsurface conditions is appropriate." Staff In Limine Motion at 10 (quoting Prefiled ex. OST003, Expert Opinion Testimony of David K. Kreamer (Aug. 16, 2018) [hereinafter Kreamer Direct]).

Test #8, Final Report at 6 (rev. Oct. 28, 2015)).¹⁰ While we agree with the staff that Dr. Kreamer's Opinion 2 does not show a clear connection between the renewal site's pumping test data and the MEA, we are similarly troubled by the use of this renewal site pumping test data by CBR and the staff, as referenced by Dr. Kreamer, see id. at 6, to establish some overall conclusion about the homogeneity of the Basal Chadron Sandstone at the MEA site. Whether, and to what degree, the use of such data associated with the renewal site is applicable to the MEA site is a matter that may arise at the evidentiary hearing. Accordingly, we consider it best to have as part of the evidentiary record material from all the parties in support of their position on the basis for drawing such a connection. As a consequence, we decline to grant the staff's motion in this regard relative to either this aspect of Mr. Kreamer's prefiled direct testimony or the associated prefiled exhibits OST005 through OST008 that also are the subject of the staff's in limine request.

C. OST Witness Prefiled Rebuttal Testimony

As part of its in limine motion, the staff also claims that some or all of the prefiled rebuttal testimony of OST witnesses Dr. Kreamer and Mr. Wireman should be stricken because it is not, in fact, rebuttal testimony. Rather, according to the staff, the testimony raises new issues that should have been discussed as part of these individuals' direct prefiled testimony and so should not be admitted as part of the evidentiary record of this proceeding because the staff and CBR are deprived of the opportunity to provide written rebuttal. See Staff In Limine Motion at 12. Further, the staff maintains that portions of Dr. LaGarry's rebuttal testimony should be stricken as unreliable because he lacks the expertise to present the testimony and his testimony improperly seeks to incorporate supporting authorities by reference rather than submitting the

¹⁰ While Dr. Kreamer's prefiled direct testimony references the pertinent test page as page 10, this apparently is a reference to the page numbering of the Portable Document Format (PDF) file that was submitted to the agency's E-Filing system, not the page number in the document. As we previously advised the parties, page number citations should be to the page number of the document, not to the pagination of the PDF file. See Board Administrative Directives Order at 11.

material as exhibits. See id. at 19–20. In response, OST declares that because the opinions of Dr. Kreamer and Mr. Wireman reference the specific portions of the CBR or staff testimony they seek to rebut, their rebuttal testimony should be included in the prefiled rebuttal testimony and admitted into evidence. See OST Response at 5. And as to Dr. LaGarry, OST declares that because he was unavailable to provide direct testimony, thereby making his rebuttal testimony the only supporting input he will have before the evidentiary hearing, and given his acknowledged expertise as a stratigrapher for the region in question, excluding his rebuttal testimony would have a material adverse impact on the proceeding that would violate the trust responsibility owed to OST. See id. at 5–6.

1. Dr. Kreamer's Rebuttal Testimony

The first of these staff challenges is to the rebuttal testimony of Dr. Kreamer found in refiled exhibit OST014. The staff maintains that section 2 of that testimony should be stricken in its entirety because the concern it frames regarding the adequacy of the monitoring well array in the Brule Formation used in the MEA aquifer pumping test, as addressed in both CBR's TR and the staff's EA, was not raised in Dr. Kreamer's initial testimony or identified as responding to anything in the CBR or staff prefiled direct testimony. See Staff In Limine Motion at 13–14. We note, however, that the CBR and staff prefiled testimony pages referenced in this rebuttal testimony, see Prefiled ex. OST014, Rebuttal Testimony of David K. Kreamer at 1 (Sept. 6, 2018) [hereinafter Kreamer Rebuttal] (citing CBR Direct at 31, 35; Staff Direct at 30), do discuss generally the CBR and staff acceptance of the well array and associated pumping test as sufficient "to completely measure the hydrogeological response to production pumping and injection in the Basal Chadron," id. at 1, i.e., to establish the Brule Formation as an effective

confining layer. Accordingly, we do not see this section 2 testimony as impermissible on the grounds put forth by the staff.¹¹

The staff also asserts that a portion of section 4 and nearly all of section 6 of Dr. Kreamer's rebuttal testimony should be excluded as raising arguments about the lack of a fracture flow analysis that is not within the scope of the CBR or staff direct testimony. According to the staff, in challenging the Theis analysis as a basis for confirming the adequacy of the CBR pump test results, Dr. Kreamer also introduces for the first time concerns regarding the lack of a fracture flow analysis that are based on information contained in the CBR TR and the staff EA and so should have been raised in his direct testimony. See Staff In Limine Motion at 14. Although the staff and, in particular, CBR testimony cited by OST relative to these sections does address the Theis method as a basis for analyzing the CBR's pump test, see Kreamer Rebuttal at 2, 3 (citing CBR Direct at 28–31, 36–37; Staff Direct at 16–18, 26, 28–29), there is nothing in the cited testimony that per se implicates fracture flow analysis, or the lack thereof. On the other hand, as the staff's testimony recognizes, see Staff Direct at 35–36, the issue of potential fracture flow has been a subject of discussion since the outset of this proceeding, as evidenced by Dr. LaGarry's original affidavit in support of the January 2013 OST intervention petition that has now been proffered (apparently without objection) as an exhibit in this proceeding, see Prefiled ex. OST010, H. LaGarry, Expert Opinion on the Environmental Safety of In-Situ Leach Mining of Uranium Near Marsland, Nebraska at unnumbered pp. 2, 4 (undated) [hereinafter LaGarry Petition Opinion], as well as in his rebuttal testimony (also apparently without objection), see OST016, Rebuttal Opinion Testimony of Hannan LaGarry at 1–2 (Sept. 7, 2018) [hereinafter LaGarry Rebuttal]. Consequently, we see no practical effect in precluding the

¹¹ As the staff also notes, however, this prefiled rebuttal testimony does make reference on page 2 to water quantity, see Staff In Limine Motion at 14 n.40, a discussion item we have previously precluded, see supra pp. 5–6. As a consequence, we have modified the testimony to delete this reference. Additionally, we have modified the testimony throughout to properly reference the current exhibit number for CBR's prefiled direct testimony, which is prefiled exhibit CBR001-R.

statements by Dr. Kreamer, given Board questioning of witnesses on this subject clearly is appropriate, and therefore decline to do so.

Also subject to elimination, according to the staff, is section 5 of Dr. Kreamer's testimony, which asserts that a leaky aquifer evaluation of the pump testing data was not performed and provides a list of other forms of pumping analysis that he asserts should have been addressed by CBR and required by the staff, points that the staff maintains should have been raised earlier. See Staff In Limine Motion at 14–15. But CBR's direct testimony does deal with this subject, specifying what pumping analysis methods were used, i.e., the Theis drawdown and recovery and the Jacob Straight-Line Distance-Drawdown methods. See CBR Direct at 29. And while Dr. Kreamer admittedly fails to provide a citation to this CBR testimony as the basis for his rebuttal testimony, see Kreamer Rebuttal at 2–3, we again see no practical effect in precluding the statements by Dr. Kreamer, given Board questioning of witnesses on the subject of appropriate test methods clearly is appropriate.

Section 7 of Dr. Kreamer's rebuttal testimony is also challenged by the staff. See Staff In Limine Motion at 13. That section seeks to raise questions about the lack of a fracture flow analysis on the basis of purported CBR and staff references to chemical transport processes, which are asserted to be based on the assumption that the groundwater flow is occurring through a nonfractured medium. See Kreamer Rebuttal at 3 (citing CBR Direct at 15, 22, 36–38; Staff Direct at 28–29, 42–43). Again, while there is nothing in the CBR or staff testimony regarding chemical transport that specifically implicates fracture flow analysis, or the lack thereof, per the Dr. LaGarry exhibit and his rebuttal testimony, this subject is something that has been raised such that we see no basis for striking the subject from Dr. Kreamer's rebuttal testimony.

The staff's request to strike section 8 of Dr. Kreamer's rebuttal testimony likewise is premised on his failure to raise a matter in his direct testimony that was discussed in the CBR TR or the staff EA. See Staff In Limine Motion at 15. In this instance, Dr. Kreamer's concern is

that CBR and staff references to TR and EA statements that the chemical differences in the Brule and Basal Chadron formations are further evidence of confinement do not account for (1) changes in chemical composition based on fracture passage to the lower Basal Chadron formation; or (2) the fact that the CBR-noted water quality differences in the formations are under unstressed conditions rather than in a production pumping/injection environment. See Kreamer Rebuttal at 3 (citing CBR Direct at 32, 35, 36; Staff Direct at 31). But as another possible aspect of fracture flow, and so an appropriate subject for Board questioning in the context of Dr. LaGarry's expressed concerns, we once more see no practical effect in precluding the statements by Dr. Kreamer on this subject and thus will not do so.

Finally, the staff asserts that section 9 of Dr. Kreamer's rebuttal testimony should be eliminated because the CBR and staff direct testimony that he maintains demonstrates the WinFlow model was used to establish lateral containment of mining solutions says nothing about the WinFlow model, rendering Dr. Kreamer's testimony outside the scope of the direct testimony. See Staff In Limine Motion at 16. The question of lateral containment, however, is one implicated by the Dr. LaGarry exhibit. See Staff Direct at 34–35. Yet, as an appropriate subject for Board questioning in the context of Dr. LaGarry's expressed concerns, precluding the statements of Dr. Kreamer on this subject has no practical effect and we decline to do so.

2. Mickel Wireman's Rebuttal Testimony

Also challenged by the staff as beyond the scope of the CBR and staff direct testimony is section 4 of Mr. Wireman's rebuttal testimony. See Staff In Limine Motion at 16–17. In this regard, in response to the CBR and staff explanations as to why OST's fourth concern supporting its Contention 2 that the TR and EA contained "unsubstantiated assumptions as to the isolation of the aquifers in the ore-bearing zones" is incorrect, Mr. Wireman cites CBR's 2011 aquifer test result, the Basal Chadron aquifer's hydraulic spacial variability, and significant area rock formation structural disturbances as the basis of his assertion that there may be preferential flow pathways in the Basal Chadron sandstone aquifer and the overlying formation.

See Wireman Rebuttal at 3. According to the staff, this is an improper subject for rebuttal because Mr. Wireman should have raised this concern as part of his direct testimony, particularly as it relates to the 2011 pump test as this test it forms a supporting basis for the TR and EA. See Staff In Limine Motion at 16–17. As was the case with Dr. Kreamer’s rebuttal testimony, however, the question of preferential flow pathways is one implicated by the Dr. LaGarry’s exhibit, see Staff Direct at 32–33, making it an appropriate subject for Board inquiry. Therefore, striking the statements of Mr. Wireman on this subject has no practical effect and we decline to do so.

Additionally, the staff asks that we strike the word “quantitative” from the first line in the section 3 discussion of Mr. Wireman’s rebuttal testimony. See Staff In Limine Motion at 13 (requesting word “quantitative” in first sentence of section 3 be stricken from Mr. Wireman’s prefiled rebuttal testimony). While we previously have discussed the out-of-scope matters relating to “quantitative” rather than “qualitative” matter, see supra pp. 5–6 & note 7, we find the staff’s “quantitative” objection to be appropriate in this context and will strike that word from the first line in the section 3 discussion of Mr. Wireman’s rebuttal testimony as requested.

3. Dr. LaGarry’s Rebuttal Testimony

The staff has two objections to Dr. LaGarry’s rebuttal testimony. The first is that certain portions of Dr. LaGarry’s testimony are based on his purported understanding of the National Environmental Policy Act’s (NEPA) requirements even though OST has not demonstrated he has any expertise in that area. See Staff In Limine Motion at 19. Although we will not strike the identified portions of Dr. LaGarry’s rebuttal testimony on this basis, at the hearing we do intend to question Dr. LaGarry about his expertise in this area.

The second staff objection is to Dr. LaGarry’s use of citations to documents (including an Internet citation) to incorporate them by reference into his testimony and the evidentiary record. As the staff points out, we previously advised the parties that this was not an appropriate method for bringing supporting documents into the evidentiary record for this proceeding. See

Staff In Limine Motion at 19–20 (quoting Board Administrative Directives Order at 3 n.4). Instead, the documents (or pertinent portions of the documents) should be (1) filed as an exhibit with a cover sheet; (2) referenced by a citation to the new exhibit number in Dr. LaGarry's revised rebuttal testimony; and (3) included on OST's list of evidentiary hearing exhibits. To that end, per the directions below, we will provide OST with an opportunity to correct this deficiency so as to avoid having the testimony in question stricken.

IV. IMPLEMENTATION OF THE BOARD'S IN LIMINE DIRECTIVES

Attached to this issuance are redline copies of the OST prefiled direct and rebuttal testimony that, per the discussion above, is subject to revision in conformance with this issuance.¹² Additionally, contemporaneous with the issuance of this memorandum and order, OST is being provided by e-mail the individual Word version files for each of these documents. With these in hand, on or before Friday, October 5, 2018, OST is to do the following:

1. Resubmit these documents via the E-Filing system, each with an exhibit cover page that renumbers the exhibit with an appended "-R" (e.g., OST004-R;
2. Provide exhibits (with coversheets) that contain the documents, or pertinent portions of the documents, cited by Dr. LaGarry in his rebuttal testimony (i.e., Maher and Shuster (2012), Maher and Shuster (internet citation), Lewis and Haeni (1987), and Hallum, Sibray and Howard (2018), and revise Dr. LaGarry's rebuttal testimony with redline additions to reflect the exhibit numbers assigned for each of these exhibits; and

¹² Attachments A through D are, respectively, the revised prefiled direct testimony of Mr. Wireman, the revised prefiled rebuttal testimony of Dr. Kreamer, the revised prefiled rebuttal testimony of Mr. Wireman, and the revised prefiled rebuttal testimony of Dr. LaGarry.

3. Submit via the E-Filing system (with a Word copy to the Licensing Board's law clerk), a revised exhibit list that incorporates the revisions/additions from items 1 and 2 above.

For the foregoing reasons it is this twenty-fourth day of September 2018, ORDERED,
that:

1. The NRC staff's September 12, 2018 motion in limine is denied in part and granted in part, as outlined in section III of this issuance; and
2. Intervenor OST shall have up to and including Friday, October 5, 2018, to implement the directives outlined in section IV of this issuance.

FOR THE ATOMIC SAFETY
AND LICENSING BOARD

/RA/

G. Paul Bollwerk, III, Chairman
ADMINISTRATIVE JUDGE

Rockville, Maryland

September 24, 2018

ATTACHMENT A

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
)	
CROW BUTTE RESOURCES, INC. ,)	Docket No. 40-8943 – MLA - 2
)	ASLBP No. 13-926-01-MLA-BD01
(Marsland Expansion Area))	
)	August 16, 2018 (Revised [DATE])

EXPERT OPINION TESTIMONY OF MICKEL WIREMAN

I, Mickel Wireman, do hereby swear that the following written testimony is true to the best of my knowledge:

I. Basis for Testimony as Expert in Field.

I have been professionally engaged in hydrogeology and ground-water management issues for more than 35 years. I am recently retired from the US EPA where I served as a National Ground-Water Expert for US EPA Region VIII in Denver, CO. In this position I provided scientific and technical support to EPA programs, other Federal agencies, International programs and ground-water protection / management programs in several western states. I have extensive experience in hydrogeology and remediation of hardrock mine sites (fractured rock settings) hydrology of mountain watersheds, DNAPL sites, ground-water monitoring, and ground-water vulnerability assessments. My position involved working closely with policy makers, decision makers and attorneys. I have taught classes for the National Ground -Water Association and Geological Society of America and have developed and taught workshops in Eastern Europe and the Middle East. I serve as a consultant to the World Bank and have significant international experience. I have served as an expert witness in federal court, state court, State Water Quality Control Commission and State Water court. I am currently President of Granite Ridge Groundwater, a small consulting firm. I provide consulting services related to hydrology and geology

II. Expert Opinions and Testimony Concerning OST Contention 2.Opinion 1:

Characterization of the local / regional hydrogeology and groundwater flow at the Marsland Expansion Area is inadequate for demonstrating the ability to contain unwanted fluid migration from excursions and to adequately conduct groundwater restoration.

Basis:

There is still too much uncertainty regarding groundwater flow in the Basal Chadron aquifer. While hydraulic characteristics have been quantified via an aquifer test to provide data necessary for ISR operation, there are no data and an inadequate discussion regarding:

- (1) recharge and discharge to the Basal Chadron – The Technical Report (“TR”) contains no information on sources of recharge or the primary pathways which deliver recharge to the deep, confined aquifer. ~~The TR should discuss the relationship between annual recharge to the Basal Chadron aquifer and the annual consumptive use estimated by CBR for MEA operations (maximum of about 500 acre-feet per year).~~ On page 2-88 of the TR [CBR006 at 137] CBR reports that the potentiometric surface fluctuates about 7 ft annually. How does this relate to recharge? The only reference in the TR to discharge from the Basal Chadron aquifer on page 2-86 [CBR006 at 135] is that it occurs at a point east of Crawford where the unit is exposed. CBR should conduct hydrogeologic mapping to locate and characterize the suggested discharge areas.
- (2) groundwater flow downgradient of the MEA pumping center – There is significant uncertainty about groundwater flow in the Basal Chadron downgradient of the MEA. The Environmental Assessment (“EA”) states in Section 3.3.2.1 [NRC006 at 66] that groundwater flow in the Basal Chadron aquifer is not affected by the Pine Ridge escarpment -even though this escarpment functions as a groundwater divide in the Arikaree and Brule aquifers. There is no discussion to support this statement. ~~The TR indicates that ISR operations at the main CPF mine units resulted in a 60 ft decline in the Basal Chadron aquifer potentiometric surface. The TR further estimates a maximum of about 500 acre-feet per year of consumptive use and a 30 ft decline at the Marsland site. Continuous pumping associated with mining and groundwater restoration will cause some drawdown of the Basal Chadron aquifer miles from the pumping center(s).~~
- (3) CBR has not installed any Basal Chadron monitoring wells upgradient or downgradient of the license area. These wells are necessary to provide the data required to fully evaluate downgradient impacts to the Basal Chadron aquifer. These impacts include potential perturbation of the potentiometric surface downgradient of

the mine units and potential contamination of downgradient groundwater that may result from groundwater restoration operations.

- (4) No data / information on surface water hydrology at MEA is included in the TR or the EA. Two southward flowing ephemeral streams traverse the MEA. A spring (Dooly spring) is located within the MEA. The baseline sampling conducted by CBR should include sampling the two streams when ephemeral flow is occurring and investigating the spring (is it flowing?; what geologic unit is discharging at the spring?).
- (5) ~~CBR has obtained site specific meteorological data for one year: Aug 2010 – Aug 2011. However, 2011 was abnormal year. Ten of the 18 inches of annual precipitation total occurred in May. Another year of meteorological data should be collected.~~
- (6) Baseline monitoring – The TR reports that baseline groundwater quality is determined using data from “baseline restoration wells.” CBR proposes a minimum of 6 baseline restoration wells per mine unit. Each of these wells will be sampled four times prior to mining. This data will be used to establish baseline. These wells have not been selected and no data is provided regarding background concentrations for applicable constituents.

Opinion 2:

Characterization of the structural geology is insufficient to develop an acceptable conceptual model of site hydrology that is adequately supported by site characterization data.

Basis:

The structural geologic setting in NW Nebraska is more complex than previously reported by CBR. Numerous significant structural features associated with the Black hills and Chadron uplifts occur in northwest Nebraska. The MEA is located between the Pine Ridge escarpment (Cochran arch?) to the north and an east-west trending graben south of Marsland. There is disagreement between CBR and previous researchers (Degraw, 1969, Souders, 1981) as to the existence of two major E-W trending faults - the Pine Ridge fault to the north of the Pine Ridge escarpment and the Niobrara Fault which trends parallel to the Niobrara River. CBR concludes that the faults do not exist and therefore there is no discussion of if / how these structures affect groundwater flow in the Arikaree and White River groups. The Black Hills and Chadron uplifts occurred prior to the deposition of the Chadron Fm. The Pine Ridge Escarpment is thought to be associated with the Black Hills uplift and therefore was uplifted prior to the deposition of the Basal Chadron. As discussed above CBR has concluded that groundwater flow in the Basal Chadron aquifer is not affected by the Pine Ridge escarpment. This cannot be the case if the uplift predates the Basal Chadron sandstone.

Opinion 3:

Aquifer testing conducted at the MEA is inadequate for developing an acceptable site-wide conceptual hydrologic model and does not adequately characterize the subsurface heterogeneity.

Basis:

Only one aquifer test has been conducted at the MEA. The aquifer test was conducted in May 2011. The test was focused primarily on obtaining data to assess the hydraulic properties of the Basal Chadron. These data are necessary to design and operate ISR operations. The test utilized one Basal Chadron pumping well, 8 Basal Chadron monitoring wells and 3 Brule Fm. Monitoring wells. The pumping well was pumped at 27.08 gpm for 103 hours CBR reports that the radius of influence estimated from the aquifer test data was about 8800 ft (1.6 miles). The MEA extends for more than 7.2 miles from the NW corner to the SE corner. Therefore, much of the Basal Chadron has not been tested to determine if there is hydraulic connection between the Basal Chadron aquifer and the overlying Brule aquifer.

The aquifer test data indicate that hydraulic conductivity and transmissivity of the Basal Chadron near the pumping well is an order of magnitude lower than at the outlying monitoring wells. Lithologic and hydraulic data included in the TR for the Arikaree and Brule aquifers indicate significant heterogeneity. Sediment comprising these formations was deposited in a variety of fluvial environments resulting in facies changes within formations and vertical stacking of facies. The heterogeneity is further increased by structural deformation of the sedimentary rocks that comprise the aquifers. Groundwater flow and well yields are affected by these heterogeneities. The CBR TR includes information on an irrigation wells that yields more than 800 gpm from the Arikaree immediately east of the southern part of the MEA. The yield from this well contrasts with the average yield of less than 100 gpm for all Arikaree / Brule wells. Aquifer testing, monitoring and flow modeling of these aquifers must consider the heterogeneity.

Water table elevation data from the CBR Arikaree and Brule monitoring wells indicate that these two aquifers comprise a single aquifer system. Therefore, any contaminated groundwater migrating into the Brule could be pumped from Arikaree water wells.

Opinion 4:

There is too much uncertainty regarding applicable groundwater restoration standards. This uncertainty is problematic given the inadequate site hydrogeologic characterization.

Basis:

Both the CBR 2015 TR and NRC Staff's 2018 EA are confusing regarding applicable restoration monitoring requirements and compliance standards. The EA and the TR state (EA page 2-9 [NRC006 at 37], TR page 6-4 [CBR006 at 297]) that the *"primary goal of the groundwater restoration program is to return groundwater affected by uranium recovery operations to pre-injection baseline values on a mine-unit average, as determined by the baseline water quality sampling program."* Per NRC regs (Criterion 5B (5) of 10CFR Part 40) – at the designated point of compliance concentrations of regulated constituents must not exceed (a) NRC approved background concentrations, (b) the applicable UMTRC value or, (c) an alternative concentration limit set by NRC. However, based on the discussion included in Section 6.1.3 of the TR [CBR006 at 297], it appears that CBR is assuming the restoration efforts will not achieve background concentrations for some constituents -so they are anticipating that restoration values set by NDEQ for Class III UIC permits will apply. In section 6.1.3.1 of the TR [CBR006 at 298] CBR states that they will provide Tables for each of the 11 MEA mine units that include the baseline average and range and the NDEQ restoration standards. There are two issues around this:

1. Will NDEQ standards be considered alternative concentration limits and require NRC approval with a public involvement?
2. In the TR at page 6-4 [CBR006 at 297] it states that if restoration efforts are unable to achieve baseline conditions after *"diligent application of best available technology"* CBR commits to meeting the NDEQ compliance standards. This is consistent with the rationale for requesting an ACL. What criteria will be applied to determine if *"diligent application of best available technology"* has occurred?

The NRC and the NDEQ also have different regulations regarding stabilization phase monitoring. The NRC regulations require that regulated constituent concentrations be stable for four consecutive quarters before closure can occur. NDEQ regulations only require sampling for six months. There is no discussion of post closure, long term monitoring.

Expert Testimony of MICKEL WIREMAN

August 16, 2018

Opinion 5:

There is inadequate information regarding the proposed wastewater disposal.

Basis:

The TR states on page 7-22 [CBR006 at 347] that CBR plans to use one or two deep disposal wells to dispose of waste fluids comprised primarily of bleed water (up to 120 gpm / 69 million gal/yr) and groundwater restoration waste water. The disposal wells will presumably be permitted as Class I UIC wells. The TR does not include any information on the geologic formations /aquifers into which CBR proposes to inject wastefluids.

These include the lower Dakota, Morrison and /or Sundance. Are any of these formations an underground source of drinking water (USDW) as defined in the Federal Safe Drinking Water Act? If so CBR will need to (1) demonstrate that there are no USDWs below the proposed injection zone and / or request an aquifer exemption. Appropriate hydrogeologic / water quality data will be necessary to address either of these requirements and should be included in the TR and EA.

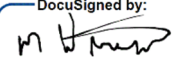
Pursuant to 10 CFR 2.304(d) and 28 USC 1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Toledo

ohio

8/16/2018

Signed in _____, _____, on _____, 2018.

DocuSigned by:

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MICKEL WIREMAN

ATTACHMENT B

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
CROW BUTTE RESOURCES, INC. ,) Docket No. 40-8943 – MLA - 2
) ASLBP No. 13-926-01-MLA-BD01
(Marsland Expansion Area))
) September 6, 2018 (Revised [DATE])

REBUTTAL TESTIMONY OF DAVID K. KREAMER

I, David K. Kreamer, do hereby swear that the following written testimony is true to the best of my knowledge:

1. Crow Butte Resources, Inc. (CBR) and the NRC Staff indicate that a single, solitary pumping test is sufficient to characterize the subsurface hydrogeology of the proposed Marsland Expansion Area (MEA) [CBR001-**R** at 31-32 & NRC001 at 29-30].

The single pumping test run in the Basal Chadron Formation covers only a very small part of the proposed MEA and is not representative of the entire property. The radius of influence of the single test does not produce information relevant to the majority of the property. It is unclear why only one test was run. The geologic strata in the MEA are demonstrably not of consistent thickness, nor entirely horizontal. Consistent with normal professional practice, several pumping tests across the remaining majority of the property, along with duplicate testing to determine the repeatability of the results, are necessary to properly assess the hydraulic conditions of the subsurface.

2. CBR represents, and NRC Staff accepts, that a limited monitoring well array in the heterogeneous Brule Formation is sufficient to completely measure the hydrogeological response to production pumping and injection in the Basal Chadron [CBR001-**R** at 31, 35 & NRC001 at 30].

The monitoring wells in the overlying Brule Formation during this lone pumping test cover an even smaller area of the MEA – extrapolation of these extremely area-limited observations over many square miles of the property is inconsistent with good professional practice. The results from these area-restricted, shallow monitoring wells are said by CBR to support the notion that there is no effect of deep pumping on the shallow aquifer, and thus NRC Staff concludes that there is no need for a robust environmental evaluation of diminished quality

~~and quantity~~ of groundwater in the Brule, or on impacts to surface water flows that could negatively influence habitat and wildlife. Not only is this assumption, of no impact, not clearly demonstrated for the site, data analysis from the Basal Chadron in the single pumping test is consistent with the opposite - leakage into the Basal Chadron. The Brule Formation has been consistently shown to be heterogeneous in the region and the efficacy of the exceptionally constrained Brule monitoring well array during the pumping test depends on an opposite assumption, put forward by industry, and not demonstrated in all past geological surveys of the region – that the Brule Formation is instead somehow homogeneous.

3. CBR purports, and NRC Staff accepts, that the Theis aquifer analysis is appropriate as the sole method of analysis for the single pumping test conducted at the MEA [CBR001-R at 28-31 & NRC001 at 16-17].

This sole test of subsurface hydraulic properties has had a single, simple analysis (Theis) which is inappropriate considering the results of the test which show clear departure from the expected Theis curve, and are consistent with lack of aquifer confinement, and indicates potential leakage.

4. CBR claims that the Theis method is justified because it is a standard method and has wide-use and NRC Staff accepts this as sufficient [CBR001-R at 15, 29 & NRC001 16-18, 26].

Theis-type approaches were the only analytical, mathematical ways the pumping test data were evaluated. A false argument is made for using only Theis analysis of pumping test data: 1. It is argued that it is a standard method and that 2. almost everyone uses it in analysis of pumping tests, no matter whether the assumptions associated with its use are violated or not. Use of a single, inappropriate standard method that is simplistic and inconsistent with observed results, being justified because it has been misapplied by many hydrogeologists in the past is like college students saying, “Sure I cheated on the data analysis in the assignment, but everyone cheats”.

This finding consistent with lack of confinement, as demonstrated by departure from the expected Theis curve from the single pumping test, coupled with low permeabilities observed in the strata immediately overlying the Basal Chadron Formation, are indicative of and consistent with the existence of secondary porosities and fracture flow. Robust fracture analysis has not been performed by CBR, nor required by NRC Staff. Fracture flow would also diminish the value of spatially limited monitoring wells in the shallow Brule Formation whose interpretation depends on homogeneous layers and not discrete fractures.

5. CBR does not address the omission of other forms of pumping test analysis, nor does NRC Staff require more scientifically appropriate analysis.

A leaky aquifer evaluation of the pumping test data was not performed. Standard analytical methods such as the De Glee Method, the Hantush-Jacob Method, the Walton Method,

or numerical analysis were not performed but are the more appropriate approaches indicated from the observed data. Analysis with these other methods would be consistent with the lack of confinement indicated by the departure from the Theis curve observed during the solitary pumping test.

6. CBR argues that core analysis showing *Upper/Middle Chadron confining unit consists of more than 90 percent claystone and less than 10 percent coarser material (e.g. siltstone and sandstone), with the average vertical hydraulic conductivity of Upper/Middle Chadron Formation claystone, as measured in two core samples in the laboratory using a falling head permeameter, is 1.3×10^{-7} cm/sec*” indicates confinement of the Basal Chadron Formation [CBR001-**R** at 36-37 & NRC001 at 28-29].

CBR does not even consider the possibility of fracture flow, nor does NRC Staff’s uncritical analysis. Normal hydrological procedure for indurated hard-rock flow analysis relies heavily on fracture analysis. CBR’s Darcian calculation of vertical flow assumes *a priori* that no fracture flow could possibly exist. The pumping test analysis, as mentioned earlier shows departure from the Theis curve consistent with vertical leakage.

7. CBR’s conclusions and NRC Staff’s analyses rely on the presumption that *Chemical transport processes including hydrodynamic dispersion and diffusion are insignificant relative to the velocity or advective movement of groundwater* [CBR001-**R** at 15, 22, 36-38 & NRC001 at 28-29, 42-43].

The mention of chemical transport processes discussing hydrodynamic dispersion and diffusion also contain the *a priori* assumption of homogeneous isotopic flow through a non fractured medium. The MEA site is dominated entirely by hard-rock strata. The omission of any analysis of even the possibility of fracture flow typically associated with hard-rock geology is inconsistent with normal hydrogeological and engineering practice.

8. CBR argues, and NRC Staff accepts as established, that vertical differences in water quality indicate confinement of the Basal Chadron [CBR001-**R** at 32, 35, 36 & NRC001 at 31].

This premise is scientifically unsound for two reasons. The first is that any downward leaking water would be expected to change chemical composition in passing through fractures in the heterogeneous claystones overlying the Basal Chadron. The second is that current water quality differences noted by CBR are under unstressed conditions, not those associated with production pumping and injection.

9. CBR’s conclusions and NRC Staff’s analyses rely on the presumption that *Lateral containment of mining solutions at the MEA has been demonstrated using WinFlow to simulate conditions at the MEA site* [CBR001-**R** at 13-14, 16, 22, 26 & NRC001 at 16, 21-23].

Typically, modeling interpretations of particle flow list initial conditions, model domain, boundary conditions, contain calibration, validation, list model sensitivities, and run multiple scenarios of possible flow and movement. The presentation by CBR presents one single realization (a particle distribution map) without completely listing assumptions, pumping rates, injection rates, justification for uniform geologic and hydrologic parameters (e.g. why is the uniform porosity 20%), initial or boundary conditions, or model domain. Multiple scenarios are not presented. Further and importantly, uncertainty, error bars, precision and accuracy of the results are not indicated. The single map presented is cosmetically attractive, however, despite its lack of utility.

CBR had trouble reaching closure in its nearby mine site, abandoning its simple analytical (e.g. Theis) mathematical approaches during closure because a rudimentary modeling approach using homogeneous isotropic conditions, as used in WinFlow, was inadequate. A numerical modeling approach was used to assist analysis of flow in the demonstrably more complicated geological setting.

10. CBR and NRC Staff both argue that even if lack of confinement of the Basal Chadron Formation production zone did exist, the inward gradient during all hydraulic pressures during injection and withdrawal during production over the entire site would be maintained and contamination could not escape [CBR001-**R** at 23-25, 38 & NRC001 at 21, 33, 40].

The argument is made by CBR that even if there is a lack of confinement (as indicated by the data from the single pumping test performed on a limited area of the site), the hydraulic gradient would be inward toward the Basal Chadron Formation and production zone, therefore no mobilized contamination could escape. If this is supposed to be the case, a robust analysis to protect the overlying heterogeneous Brule Formation should be conducted. Even so, this argument is flawed because the solitary pumping test conducted for MEA has an extremely limited coverage of the much larger site, and that maintenance of an “inward hydraulic gradient”

Expert Testimony of **DAVID K. KREAMER**

September 6, 2018

during production pumping and injection over the entire site has not been demonstrated.

Pursuant to 10 CFR 2.304(d) and 28 USC 1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Las Vegas NV

9/6/2018

Signed in _____, on _____, 2018.

DocuSigned by:

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David K. Kreamer

ATTACHMENT C

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
CROW BUTTE RESOURCES, INC.,) Docket No. 40-8943 – MLA - 2
) ASLBP No. 13-926-01-MLA-BD01
(Marsland Expansion Area))
) September 7, 2018 (Revised
[DATE])

REBUTTAL TESTIMONY OF MICKEL WIREMAN

I, Mickel Wireman, do hereby swear that the following written testimony is true to the best of my knowledge:

1. Crow Butte Resources, Inc. (“CBR”) and NRC Staff indicate that an adequate conceptual model of site hydrology has been developed for the Marsland Expansion Area (“MEA”) [CBR001-~~R~~ and NRC001]. The NRC Staff testimony (NRC001 at 22-23) states that a groundwater hydrology conceptual model includes an assessment of preferential flow paths, aquifer recharge/discharge and aquifer water quality

Neither the CBR Technical Report (“TR”) nor the NRC Staff’s Environmental Assessment (“EA”) contain sufficient data and information to develop an adequate conceptual model of site hydrology. This is especially the case regarding the groundwater flow system in the Basal Chadron aquifer. The TR contains no data based information on the areas where recharge occurs, sources of recharge or the primary pathways which deliver recharge to the deep, confined aquifer. CBR testimony [CBR001-~~R~~ at 33-34] indicates that the only information related to recharge to the Basal Chadron aquifer is that “*the recharge zone must be above 3715 amsl and that the recharge zone most likely is located west or southwest of the MEA.*” CBR testimony states that groundwater flow in the basal Chadron aquifer is towards the northwest [CBR001-~~R~~ at 33]. Figure 3-8 in the EA [NRC006 at 69] indicates that groundwater flow in the Basal Chadron is from the north, from the northwest, from the west from the southwest and from the south. This is very qualitative information, somewhat inconsistent and not supported by actual data. In the TR, CBR reports that the potentiometric surface fluctuates about 7 ft annually [CBR006 at 137]. How does this relate to recharge? ~~The TR should discuss the relationship between annual~~

~~recharge to the Basal Chadron aquifer and the annual consumptive used estimated by CBR for MEA operations (maximum of about 500 acre-feet per year).~~

There is significant uncertainty about groundwater flow in the Basal Chadron downgradient of the MEA. Section 3.3.2.1 of the EA [NRC006 at 67] states that groundwater flow in the Basal Chadron aquifer is not affected by the Pine Ridge escarpment -even though this escarpment functions as a groundwater divide in the Arikaree and Brule aquifers. There is no discussion to support this statement. Figure 3-8 in the EA [NRC006 at 69] and the TR at page 2-88 [CBR006 at 137] seems to indicate that all discharge from the Basal Chadron aquifer occurs at a point east of Crawford where the unit is exposed. This is highly unlikely. CBR should conduct hydrogeologic mapping to locate and characterize the suggested discharge areas.

Neither the EA nor the TR include any information on the geologic formations / aquifers into which CBR proposes to inject waste fluids. These include the lower Dakota, Morrison and /or Sundance. Are any of these formations an underground source of drinking water (USDW) as defined in the Federal Safe Drinking Water Act? If so CBR will need to demonstrate that there are no USDWs below the proposed injection zone and / or request an aquifer exemption. Appropriate hydrogeologic / water quality data will be necessary to address either of these requirements and should be included as a part of the conceptual model of site hydrology that CBR and NRC Staff claim is adequate in their direct testimony [CBR001-R at 40 & NRC001 at 15, 23-27].

2. CBR assumes, and NRC Staff accepts, that the hydrology of the Basal Chadron aquifer downgradient of the MEA has been adequately characterized.

CBR has not installed any Basal Chadron monitoring wells upgradient or downgradient of the license area. These wells are necessary to provide the data required to fully evaluate downgradient impacts to the Basal Chadron aquifer including perturbation of the potentiometric surface downgradient of the mine units; ~~unwanted changes in discharge for the Basal Chadron aquifer~~ and potential contamination of downgradient groundwater that may result from inadequate groundwater restoration operations. CBR and NRC Staff testimony discussions of groundwater flow in the Basal Chadron aquifer downgradient of the MEA are very general and non-quantitative [CBR001-R at 35-36 & NRC001 at 16] as are the discussions they reference in the EA and the TR.

Expert Testimony of **MICKEL WIREMAN**

September 7, 2018

3. CBR testimony indicates [CBR001-~~R~~ at 9] that the applicant has characterized surface-water bodies and drainages within the licensed area.


No ~~quantitative~~ data / information on surface water hydrology at MEA is included in the TR or the EA. Two southward flowing ephemeral streams traverse the MEA. A spring (Dooly spring) is located within the MEA. The baseline sampling conducted by CBR should include sampling the two streams when ephemeral flow is occurring and investigating the spring (is it flowing?' what geologic unit is discharging at the spring?).- ~~CBR obtained site specific meteorological data for one year: Aug 2010-Aug 2011. However, 2011 was abnormal year and is not representative of average conditions. Ten of the 18 inches of annual precipitation total occurred in May. Another year of meteorological data should be collected.~~

4. CBR and NRC Staff testimony [CBR001-~~R~~ at 7, 14, 35-41 & NRC001 at 42-44] indicate that there are no unsubstantiated assumptions as to the isolation of the aquifers in the ore bearing zone.

The hydrologic assessments conducted by CBR assumed that groundwater flow could be characterized as Darcy flow or porous media flow and that no significant preferential flow occurs. The results of the 2011 CBR aquifer test, the spatial variability in hydraulic properties of the Basal Chadron aquifer and the fact that there has been significant structural disturbance of rock formations in the area all indicate that there may be significant preferential flow paths within the Basal Chadron aquifer and overlying rocks that are a result of structural and lithologic conditions.

Pursuant to 10 CFR 2.304(d) and 28 USC 1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed in Boulder, Colorado, on September 7, 2018.

DocuSigned by:

 672379B08CD44E5...

MICKEL WIREMAN

ATTACHMENT D

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
CROW BUTTE RESOURCES, INC.,) Docket No. 40-8943 – MLA - 2
) ASLBP No. 13-926-01-MLA-BD01
(Marsland Expansion Area))
) September 7, 2018 (Revised [DATE])

REBUTTAL OPINION TESTIMONY OF HANNAN LAGARRY

I, Hannan LaGarry, do hereby swear that the following written testimony is true to the best of my knowledge:

I. Points made in CBR & NRC Staff Testimony.

General comments: My understanding of NEPA is that all license conditions (e.g., 11.3.4) and related pumping tests to demonstrate confinement must be completed and evaluated before issuance of the license to mine. This continues to not be the case. With the proposed “we’ll make it up as we go, trust us” approach, the public does not have the necessary information to make an informed choice and reviewers of the EA and TR do not have all the data. The EA is therefore incomplete. The Niobrara River is a National Scenic River, and along with the Pine Ridge Escarpment, form the basis of the recreational economy of the region. One serious spill or excursion will extremely detrimental to all of that.

Response to A.23: In my original opinion I expressed concerns about secondary porosity in the form of joints, fractures, and faults. However, NRC focuses on the Niobrara River and Pine Ridge faults. These faults have been described as “scissor faults,” which have variable (sometimes small) amounts of displacement. However, the joint sets visible in the bedrock exposed around MEA can be described and evaluated by pedestrian survey. Should leaks and excursions occur, they will likely be transmitted through joints. Maher and Shuster (2012) [OSTXXX] describe these systems of joints, fractures, and faults in the Chadron Formation in great detail in both Nebraska and South Dakota. Also, Maher and Shuster ([http:// maps.unomaha.edu/Maher/GPFS/IntroSection.htm](http://maps.unomaha.edu/Maher/GPFS/IntroSection.htm)) [OSTXXX] propose causal mechanisms, several of which involve fluctuations in groundwater levels resulting from ISL/ ISR mining.

Maher, H., Jr., and R.D. Shuster. 2012. Significance of an ESE fracture direction in Tertiary strata of South Dakota and Nebraska. Geological Society of America Abstracts with Programs 44(7):547.

Response to A.25: According to NRC's rebuttal, CBR employed geophysical logging of boreholes and constructed cross sections to demonstrate the absence of faulting in the region. However, such methods do not delineate faults. Better techniques would have been electrical resistivity, seismic reflection, and seismic reflection techniques, or possibly ground penetrating radar (see Lewis and Haeni [1987]). [OSTXXX] The provided cross sections are unlikely to recognize faults, joints, or fractures unless there is significant displacement. Such displacement is immaterial to whether or not a joint, fracture, or fault will transmit fluids.

Lewis, M.R., and F. P. Haeni. 1987. The use of surface geophysical techniques to detect fractures in bedrock – an annotated bibliography. U.S. Geological Survey Circular 987, 14 pp.

Response to A.26: Unreported pump tests discussed in Dr. Kreamer's supporting rebuttal apparently showed lack of containment. This suggests cherry-picking or suppression of adverse data, which according to NEPA must be reported. These data may be the "smoking gun" that confirms my opinions presented here and previously at CBR.

Response to A.27 and 28: Reproduced from Hallum & others (2018) [OSTXXX]:

1. White River Group outcrops along the valley margins create the impression and subsequent misconception (when analyzed regionally) that the reach lacks hydraulic connection between surface water and groundwater. This is not the case locally.
2. There is sufficient near-surface alluvium to conduct water between the stream and groundwater wells. Transmissivity is limited by the relative thinness of alluvial sediments and/or the fineness of sandy sediments in the subsurface.
3. Transmissivity in the reach is spatially variable, due primarily to significant irregularity in thickness of sediments capable of conducting water in significant volumes.
4. Irrigation wells in the aquifer absent area near the Niobrara River are hydraulically connected to the High Plains Aquifer and/or alluvial fill of the Niobrara River valley.
5. Because of the limited thickness of aquifer materials and spatial uncertainty of their occurrence, it is appropriate to consider the reach in question as an aquifer absent area at regional scales. Any study that telescopes from generalized regional

Rebuttal Testimony of **HANNAN LAGARRY**

September 7, 2018

to more specific localized questions will experience challenges created as scale-related uncertainty is magnified. Interestingly, smaller scale multi-state maps of the High Plains Aquifer do not include an aquifer absent area in the reach.

6. At larger scales, it becomes apparent that the reach is in contact with sediments capable of conducting water, and that the ability to conduct water will likely be affected by the available thickness of conductive sediments and the physical configuration of said sediment.

7. At points, such as individual irrigation well locations, uncertainties regarding the nature and proportion of hydraulic connection among the High Plains Aquifer, the respective FINAL PROJECT REPORT – NeDNR Contract #994 Page 3 of 74 well, and the Niobrara River (including associated alluvium) are high. In other words, the direct relationship of every individual well is not defined at the scale of this investigation.

Hallum, D.R., S.S. Sibray, and L.M. Howard. 2018. Hydrogeologic framework studies of portions of the Niobrara River. Geological Survey Investigation 12, Conservation and Survey Division (IANR School of Natural Resources), University of Nebraska-Lincoln, 74 pp.

Pursuant to 10 CFR 2.304(d) and 28 USC 1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed in Pagosa Springs, Colorado, on 7 September, 2018.
9/7/2018

DocuSigned by:
Hannan LaGarry
3A3B7C07F0F8444...

Hannan E. LaGarry

HANNAN LAGARRY

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)	
)	
CROW BUTTE RESOURCES, INC.)	Docket No. 40-8943-MLA-2
)	
In-Situ Leach Uranium Recovery Facility,)	ASLBP No. 13-926-01-MLA-BD01
Crawford, Nebraska)	
)	
(License Amendment –)	
Marsland Expansion Area))	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **MEMORANDUM AND ORDER (Granting in Part and Denying in Part Staff Motion in Limine)** have been served upon the following persons by Electronic Information Exchange.

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**MEMORANDUM AND ORDER (Granting in Part and Denying in Part
Staff Motion in Limine)**

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[Original signed by Brian Newell]
Office of the Secretary of the Commission

Dated at Rockville, Maryland
this 24th day of September, 2018