Contents

Brook 7

Adjudication

Comment AG 1

Please also provide copies of the complaint and the answer. If there are any motions that the court has ruled on limiting or deciding any of the claims or factual or legal questions originally at issue in the case, please also provide copies of the orders, the motions, the responses to the motions, and any supporting memoranda.

Response AG 1

The Applicant's position with regard to any surface interests that may be claimed by Padlock Ranch Company and/or Big Horn Coal Company is that the Applicant alone owns the sole dominant present property right to use these surface lands for the coal mining operation described in the application, as that application has been submitted and supplemented. Applicant's sole dominant surface ownership and use interest in the relevant lands derives directly from the 1954 Deed (Attachment B) and its express reservation language. Pursuant to the controlling Wyoming Supreme Court authority set out in *WYMO Fuels, Inc. v. Edwards*, 723 P.2d 1230 (Wyo. 1986) (Attachment C), when the Applicant already owns the dominant surface use rights for coal mining on the property, then the Applicant consents to its own use pursuant to its application by submitting the application and no other surface consents can or should be required under W.S. § 35-11-406(b)(xi). As the Land Quality Division is aware, to the extent that Padlock Ranch Company incorrectly claims some surface rights on any lands described in the 1954 Deed, it necessarily could only attempt to do so fully subject to the Applicant's sole dominant surface rights to mine coal. Under the WYOMO Fuels, Inc. decision, no consent from Padlock can be required. To the extent that Big Horn Coal incorrectly claims some surface use right in this area at this time, the Applicant is proceeding with quiet title litigation (Fourth Judicial District Court, Sheridan County, Wyoming Civil No. CV 2014-372) against Big Horn Coal on this issue and has asserted its sole dominant reserved surface right to use the surface described in the 1954 Deed to mine coal there without any consent from Big Horn Coal pursuant to the WYMO Fuels, Inc. case decision. Accurate copies of the Applicant's pending summary judgment motion arguments on this issue are enclosed with this response (attachment D and E). The Applicant can and will supplement these pleadings with further documentation that is described in the pleadings upon request.

Comment AG 2

Therefore, the Division requests the Applicant to provide sufficient information and supporting documents for the Division to determine whether Padlock Ranch Company and Big Horn Coal Company are or are not "residential or agricultural landowners" under the statutory definition in W.S. § 35-11-406(b)(xi).

Response AG 2

Please see response AG 1.

Comment DM 1

Adjudication – Appendix B2 – Groundwater Rights – There is a groundwater well that is missing in this volume. The listing is as follows:

Barbula #2

Permit No. 85631W

Location: SW NW Section 21, T57N R84W

Please add this entry to the table and to any corresponding maps.

Response DM 1

Adjudication text page WR-12 has been updated to include Barbula # 2 (P85631W) as well as Adjudication Exhibits 5 & 8.

Appendix D1

Comment BJ 1

Appendix D1, Land Use, Table D1. 3-1; It is unnecessary to list the Expired Permit category of gas well permits. Since these APDs have expired without completion there is no related activity to the site. Listing of a non-event is not required. This also applies to the NO category since this indicates that the APD was refused, thus never became permitted through WOGCC.

Response BJ 1

Revised Table D1.3-1 as requested.

Comment SP 1

Appendix D-1. Exhibit D1.1-1. The landuses defined in Chapter 1 should be used on this Exhibit. Not the entire Brook Mine Permit falls neatly into these definitions so the following comments provide guidance:

a) The railroad, primary roads, oil and gas wells, and the facilities for Taylor Quarry would be considered Industrial commercial and may be shown with the vertical line stippling. The rest of the vertical stippling should be removed.

b) The 4.5 acres of Agricultural lands would have the Land use of Cropland. This small acreage will not show up well on this map but is listed in Tables D.8-2 and RP.6-1 so no changes are needed to the map for this land use.

c) The 12.8 acres of water might be listed under multiple landuses such as Grazingland, Fish and Wildlife habitat or Recreational. This small acreage will not show up well on this map but is listed in Tables D.8-2 and RP.6-1 so no change is needed to the map for this land use.

d) The 4,421.8 acres remaining should be shown as Grazingland and Fish and Wildlife habitat. The legend on the map should have Fish and Wildlife Habitat added to Past and Present Grazingland landuse. The stippled area on the map will stay the same.

e) No changes are needed to the areas identified as Recreational.

Response SP 1

Revised Exhibit D1.1-1 as requested.

Comment SP 2

Appendix D-1. Text that refers to the areas mined as Industrial commercial should be revised to remove the mining. A reference to Section 1.6 on historic mining can be made in Section D1.3.1. Grazingland. The reclaimed mined lands are now being used as Grazingland. The difference between the mined and never been mined is defined as the vegetation community that is called Reclaimed. Section D1.6 discusses the historic mining of the area and the discussion on coal mining in Industrial commercial (D1.4.3) can be removed.

Response SP 2

Revised text as requested.

Appendix D2

Comment BJ 2

Appendix D2, History, There are no comments for this section of the application. The narrative is well written and comprehensive.

Response BJ 2

No response is necessary.

Appendix D3

No comments were received regarding Appendix D3.

Appendix D4

Comment BJ 3

Appendix D4, Climatology, General comment – Is there no data for climatology that is more recent than 1990? It exists, therefore needs to be represented. Please locate and include the most recent climatological data. Twenty year-old data bears little resemblance to Sheridan County climate today so characterization of the present climate with a 20 year gap is problematic. Please reevaluate the data in light of locating and use more recent information.

Response BJ 3

Revised wind, relative humidity, and degree day data to reflect period between 1990 and 2013. Note, as can be observed by updated data, little change occurred in averages reported for wind, relative humidity, and degree days. Therefore, the wind rose provided in Figure D4.2-6 is deemed to still be representative of the Sheridan area. Revised Figure D4.2-1, Figure D4.2-11, Table D4.1-1, Table D4.2-2, Table D4.2-3, and Table D4.2-7 in response to this comment.

Comment BJ 4

Appendix D4, Climatology, Section D4.2.6, Why was 65°F used as the baseline temperature? Also, why were the high and low temperatures set to 86°F and 50°F respectively? Please clarify.

Response BJ 4

Revised text to clarify the choice of high and low temperatures.

Comment BJ 5

Appendix D4, Climatology, Figure 4.2-11, Are the degree days the total number of days that match the data points for the entire period from 1961 through 1990? This indicates that the data represented along the Y axis covers a period of 30 years on a daily basis. Please clarify.

Response BJ 5

Revised text with definitions of heating, cooling, and growing degree days to clarify Figure 4.2-11. Degree days are essentially a unit of measure like temperature, velocity, etc. A degree day signifies the number of degrees per day to heat or cool to a specified base temperature (most commonly 65°F). Each degree day is summed over the course of a month to estimate the total number of degree days that month. For example, July may have 0 heating degree days because all days are over 65°F, but will have cooling degree days nearly every day of the month. Figure 4.2-11 shows the average monthly degree days over the specified periods of data.

Appendix D5

Comment BJ 6

Appendix D5, Topography, Geology, and Overburden Assessment, Section D5.4.1, Paragraph 2 refers to "marginally suitable Selenium levels" as defined in LQD Guideline No.1. Guideline 1 has two separate sets of chemical quality criteria tables. Appendix 1 occurs on pages 17-21 as well as on pages 38-43. The first set of tables have been superseded by the second set of tables. Please use the tables on pages 38-43 when determining material suitability. The first Appendix 1 is being removed from the guideline.

The newer tables define the Selenium target as follows:

Suitable < 0.3 ppm

Marginal 0.3 – 0.8 ppm

Unsuitable > 0.8 ppm (dependent on premining water quality and overburden quality)

These values are established for uplands and ephemeral drainages unless it can be shown that Selenium impregnated materials will be buried above the groundwater potentiometric surface and below the reclaimed surface root zone. Other quality criteria have not changed.

Response BJ 6

Revised text as requested to reflect the revised LQD Appendix 1.

Comment BJ 7

Appendix D5, Topography, Geology, and Overburden Assessment, Figure D5.3-2, What units are expressed in the figure as the %g? Please include a footnote clarifying the measurement parameter.

Response BJ 7

Updated Figure D5.3-2 as requested.

Comment BJ 8

Appendix D5, Topography, Geology, and Overburden Assessment, Addendum D5-1, Are the Northings and Eastings in State Plane coordinates? It is assumed that they are but please verify this. The title at the top of the page could read Drill Hole Tabulations (State Plane Coordinates)

Response BJ 8

Updated as requested.

Comment BJ 9

Appendix D5, Topography, Geology, and Overburden Assessment, Addendum D5-2, Please rearrange the Lithologic and Electric logs in such a way that the Electric log immediately follows the Lithologic log. This allows for a more comprehensive examination of the data.

Response BJ 9

Rearranged logs as requested.

Comment BJ 10

Appendix D5, Topography, Geology, and Overburden Assessment, Holes R12-000 through R12-020 have the Northings and Eastings reversed. Please correct.

Response BJ 10

Updated as requested.

Comment BJ 11

Appendix D5, Topography, Geology, and Overburden Assessment, The Lithologic logs with the AMBRE designation 02, 03, and 04 do not have coordinates or elevations. Please provide coordinates and elevations for these three holes.

Response BJ 11

Updated as requested.

Comment BJ 12

Appendix D5, Topography, Geology, and Overburden Assessment, Hole R13-018 appears to have erroneous coordinates. The Northing is listed as 11,941,802. It should probably be 1,941,802. The elevation is shown as 43,887.9, where it should probably be closer to 3,887.9. Please verify and correct.

Hole R13-024 has a very high Northing at 61,941,541 and elevation at 73,885.4. These may be 1,941,541 and 3,885.4, respectively. Please verify and correct

Response BJ 12

Updated as requested.

Comment BJ 13

Appendix D5, Topography, Geology, and Overburden Assessment, A suggestion for future exploration: Ask the geophysical logger to reduce the gain on the gamma logs. The readjustment bounce on the logs makes them a bit difficult to read and interpret.

Response BJ 13

No response required.

Comment BJ 14

Appendix D5, Topography, Geology, and Overburden Assessment, Addendum D5-5, Pg. D5-5-4, The splitting tensile strength tests were run on four (4) samples from two (2) holes representing roof, coal, and floor conditions.

a) Why were these locations used as representative of the lithologies encountered during mining?

b) Are these few samples representative of all conditions expected to be encountered by the continuous miner (CM)?

Please elaborate and clarify the narrative. A statement must be made that strength testing will be performed on at least one set of samples per mining panel prior to use of the CM to insure that conditions are favorable for roof retention without subsidence. Lithology in this area is inconsistent and rock strength can vary accordingly. Using the data provided on the four samples tested indicates that some of the overburden from hole R13-19 is unsuitable for highwall mining, based on the CAT® Site Evaluation Tool For Highwall Miners;

(http://webtools.cat.com/globalmining/highwallminers/index.html).

Response BJ 14

Appendix D5 Section D5.3.3.2 has been updated as requested.

Comment BJ 15

Appendix D5, Topography, Geology, and Overburden Assessment, Addendum D5-4, Exhibits 1 – 7, Please include the drill hole locations on these isopach maps.

Response BJ 15

Updated as requested.

Comment BJ 16

Appendix D5, Topography, Geology, and Overburden Assessment, Exhibit 8, The map labeled as the isopach map of the Lower Masters bed is a contour of a surface. Please replace the contour map with the appropriate isopach map

Response BJ 16

Updated as requested.

Comment BJ 59

EXHIBITS, Addendum D5-4, Exhibit 1, The title on the map declares that this is an overburden isopach, but the bed name is missing. Please indicate which bed this map pertains to.

Response BJ 59

Updated Exhibit 1 of Addendum D5-4 as requested.

Comment BJ 60

EXHIBITS, Addendum D5-4, Exhibit 8, The name of the PDF file for this exhibit indicates that this is an isopach map of the Masters Lower coal bed. The title in the map indicates that this is the contour of the base of the Masters coal seam. Please correct the title of the PDF file.

Response BJ 60

The title of Exhibit 8 of Addendum D5-4 will be revised in the electronic copy, as requested.

Comment BJ 61

EXHIBITS, Addendum D5-6, Exhibit 1, We commend RAMACO for sampling overburden locations on 80 acre spacing. There are some gaps in the sampling plan, however, that need to have core holes drilled to fill them. The underground Coal Rules and Regulations in Chapter 7, Section 1(a)(i) are specific on ensuring that overburden geology is characterized in all locations where overburden will be removed or subsidence may occur. This essentially means that all areas above the planned coal panels need representative cores drilled to a sufficient density, approximately one hole for every quarter section of affected area. Based on that, the following locations still need to be characterized by overburden sampling:

NE1/4, sec.22, T.57N., R.84W.

NW1/4, sec.15, T.57N., R.84W.

NW1/4, sec.14, T.57N., R.85W.

SE1/4, sec.10, T.57N., R.85W.

Response BJ 61

A drilling rig was not able to enter the areas NW1/4, Sec.14, T.57N., R.85W and SE1/4, Sec.10, T.57N., R.85W. due to the steepness of the terrain, therefore no samples were obtained. Sampling data for drill holes BH 166-78 and BE 326-78 have been incorporated into Addendum D5-2 and Addendum D5-7 to characterize the overburden in Sections 15 and 22.

Comment BJ 62

EXHIBITS, Addendum D5-6, Exhibit D5.1-1, Kudos to the staff member that created this slope analysis map. It is clear and concise and the histogram is very informative. Good job.

Response BJ 62

Thank you for this comment.

Comment DS 1

Appendix D5, The Coal Rules and Regulations, Chapter 7, Section 1(a)(i)(A) states that information required for the geological description pursuant to Chapter 2, shall be as follows: for areas where surface operations and facilities will cause removal of overburden down to a level of the coal seam, all information outlined in Chapter 2. Overburden sampling has not been performed in many of the locations where overburden will be removed during the mining operations. Additional sampling will be required to assess overburden chemistry in all areas where overburden removal will occur. The intensity of sampling should be 1 core per 160 acres (per quarter section). The LQD requests sampling every 1,900 linear feet on longer proposed disturbance areas or, at minimum, two cores within shorter disturbances separated sufficiently to provide a representative characterization of the proposed disturbance.

a. Not all overburden has been characterized during analysis. Several lenses of shallow coal mixed with partings or narrow coal seams that will not be mined were not characterized. Because all overburden must be handled so as not to negatively affect surface water, groundwater or vegetation, all overburden must be adequately characterized. Therefore, the LQD requests additional characterization of all overburden that will be backfilled into disturbed areas. It must also be stated that special handling and/or identification and use of topsoil/subsoil replacement may be required if unsuitable backfill or soil is placed within 4 feet of the surface on upland areas or within 10 feet of the surface in stream channels.

Response DS 1

Please see response to BJ 61.

Comment DS 2

Appendix D5, Section D5.4. – documentation of protocols that differ from those approved by the Administrator in Guideline 1 typically require a signed document by LQD staff, not a request for different procedure signed by the company. This issue has been discussed with other mining companies and it has been determined that documentation of approval by LQD staff will be required if sampling/analytical protocols differ from those required by standing LQD policy. Please provide documentation of LQD staff approval for the 10-ft. overburden sampling interval.

Response DS 2

See Attachment A to this response package. This has also been added to Addendum D5-6 pages 4 and 5.

Comment DS 3

Appendix D5,Table D5.4-1 and Table D5.4-2 do not provide the current approved selenium concentration limits of 0-3 ppm (suitable), 3-8 ppm (marginal) and > 8 ppm (unsuitable). Please be sure to include the current approved suitability criteria as shown in Guideline 1, page 42. This will change the conclusions of the discussion provided in the Appendix D5 text. Also, in Table D5.4-2, please provide the correct units for analytical results in mg/Kg, not mg/L.

Response DS 3

Please refer to BJ 6 response. Appendix D5 text, Table D5.4-1, and Table D5.4-2 are updated as requested.

Comment DS 4

Appendix D5, The permit application provided to LQD staff for review has duplicated data provided after the map identified as Exhibit 1 which should be deleted. The exhibit should also be better identified as Exhibit D5-1 or something similar to clarify placement in the permit application should it become separated from the document in the future.

Response DS 4

The electronic copies were provided to LQD staff for review purposes. The hard copy on file is the official version. Also, please see response to Comment DS 5.

Comment DS 5

Appendix D5, Comparisons were made between Exhibit 1, the soils map and the Mine Plan map. Distinct differences in the affected area and permit boundaries were observed. Please be sure that correct boundaries for the proposed affected area and permit area are provided on all maps. Please also provide the contour interval on this exhibit.

Response DS 5

Addendum D5-6 is a copy of the overburden sampling plan as presented to WDEQ on 8/26/2013, which referenced Exhibit 1. Therefore, no changes to the exhibit will be made.

Comment KM 2

Appendix D5, Page D 5-9 refers to samples collected from roof and floor from "many" locations throughout the permit area. However, supporting documentation appeared to be from only two borings and included two roof and one floor sample. In addition, the laboratory noted the floor sample did not have sufficient length and a correction factor was used to determine unconfined compressive strength. Additional structural analysis of the overburden, interburden and floor is required.

Response KM 2

During preparation of the MSHA Ground Control Plan additional coring of the coal and overburden will occur, data gathered from this activity will be supplied to WDEQ/LQD when it is received. Please see response to BJ 14.

Comment KM 3

Appendix D5, Please provide a discussion of the structural analysis of the overburden and interburden. The discussion shall address the potential for subsidence during and after mining.

Response KM 3

Structural analysis of the overburden, interburden, floor, and roof must be conducted for the MSHA Ground Control Plan. Information gathered for this plan will be provided when it is received. No text was updated in response to this comment. Please see response to BJ 14.

Comment KM 4

Appendix D5, Please discuss the aquifer(s) below the lowest coal seam and the potential for mining to impact these aquifer(s).

Response KM 4

The lowest coal seam targeted for mining is largely dry and is also confined by a clay layer. The underburden is not considered an aquifer therefore no impacts will occur.

Comment Muk 1

Appendix D5, Section D5.3.3.2 Overburden and Interburden, 1. This section provides a discussion of the thickness of interburden and not overburden. Please provide a discussion (or a reference) on the thickness of the overburden. (MK)

Response Muk 1

A reference to the geologic cross-sections Addendum D5-3 has been added to Section D5.3.3.2.

Comment Muk 2

Appendix D5, Section D5.3.3.3 Coal, 2. On Page D5-10, there is a good discussion about the thickness of the two coal seams. Please provide a description on the depth from land surface to these coal seams. (MK)

Response Muk 2

A reference to the geologic cross-sections Addendum D5-3 has been added to Section D5.3.3.3.

Comment Muk 3

Appendix D5, Section D5.3.3.3 Coal, 3. Page D5-10 states, "Monarch seam exist within isolated portions of the mine areas as shown on the geologic cross sections in Addendum D5-3 and may present a secondary target." However, Table D5.3-2 does not provide the coal quality characteristics for Monarch coal seam. If monarch seam is part of the mine plan, please include the coal quality characteristics of Monarch coal seam in Table D5.3-2 and a description of thickness and depth from land surface.

Response Muk 3

Table D5.3-2 has been updated with the coal quality characteristics for the Monarch seam. The overburden and seam thickness are included on the geologic cross-sections located in Addendum D5-3 referenced in the text.

Comment Muk 4

Appendix D5, Section D5.3.3.3 Coal, 4. Please include a discussion on Dietz (1, 2, 3) coal seams, if they are present in the mine permit boundary. If they are part of the mine plan, please include the coal quality characteristics in Table D5.3-2. (MK)

Response Muk 4

Discussion about the Dietz seams has been added in Section D5.3.3.3. These coal seams are not part of the currently proposed Mine Plan. Therefore, the quality data were not included in the table.

Comment Muk 5

Appendix D5, Section D5.3 Geology of Mine Area, 5. Please provide a description of the stratigraphic units below the Masters coal seam. (MK)

Response Muk 5

Section D5.3.3.4 has been added to discuss the underburden.

Comment Muk 6

Appendix D5, Addendum D5-3 Geologic Cross Sections, 6. Several of the geologic cross sections show UNK – unknown coal seam (Stringer). Please include a brief discussion about this stringer in Section D5.3.3.3 (MK)

Response Muk 6

Discussion about the stringers with unknown names has been added to Section D5.3.3.3.

Comment Muk 7

Appendix D5, Addendum D5-4 Isopachs, 7. Please include the wells/drill holes (control points) used to interpret the isopachs and elevation contours in the maps. In addition, label all the control points with names and the thickness (or elevation, as appropriate). This comment is applicable to Addendum D5-4, Exhibits 1 through 8. (MK)

Response Muk 7

Addendum D5-4 Exhibits 1 to 8 have been updated with drill hole locations as requested. A reference to Addendum D5-2 has been added to the exhibits for seam name and thickness.

Comment Muk 8

Appendix D5, Addendum D5-5 Overburden, Roof and Floor Sample Analysis Table, 8. Please describe these analyses, methodology, results and provide an interpretation of their applicability to the mine/reclamation plan. (MK)

Response Muk 8

Please see response to BJ 14.

Appendix D6

Comment BJ 17

Appendix D6, Hydrology, Section D6.2.3, Pg. D6-20, Narrative in the last paragraph – why were no samples taken in Hidden Water Creek? Please explain.

Response BJ 17

No flow was observed in Hidden Water Creek during baseline sampling, so no samples were taken. The text has been revised to reflect that there were no flows observed.

Comment BJ 18

Appendix D6, Hydrology, Table D6.1-8, Regarding the HEC-RAS modeling results – The values for Hidden Water Creek and Slater Creek are identical. Is this accurate or is it a typographical error? Please clarify.

Response BJ 18

Updated table to remove typographical error.

Comment BJ 19

Appendix D6, Hydrology, Addendum D6-7, The well construction summary sheets need to have the coal bed names listed on the well lithology sections to the right of the well diagrams. Please label accordingly.

Response BJ 19

Updated as requested.

Comment BJ 20

Appendix D6, Hydrology, Attachment D6-8-A, Pg. D6-8-20, A statement is made that water within both coal seams is expected to be "high quality" and "good" water. Please define the meaning of those characterizations. Are these judgments based on MCLs or some other value? Are they being classified by some constituent values? Or is there another metric being used? Please clarify.

For example; referencing WQD R&R, Chapter 8, Table I, Class I,II, or III would better define the essential characteristics of the water quality. Numerical values of critical constituents, such as TDS, could also serve to define the quality as "good". More descriptive qualifiers are needed to judge the water quality.

Response BJ 20

Revised text as requested.

Comment BJ 21

Appendix D6, Hydrology, Attachment D6-8-E, Hydrographs, The x parameter, time, is depicted in days. It appears that this scale should have been adjusted to show time in hours due to the rapid changes seen in the hydrographs. Please use a finer scale for the x axis.

Response BJ 21

The hydrographs were originally set up with the x axis in days to allow the reader to review recovery data. Rather than modifying the original hydrographs, additional hydrographs, each of which depict the time axis in hours, were developed and included as pages D6-8-36a and D6-8-37a. These additional hydrographs detail the water level changes over the portion of the pumping test period where the water level changes in the wells were the most rapid.

Comment BJ 22

Appendix D6, Hydrology, Attachment D6-8-F, The above mentioned comment can also be applied to the Carney well hydrographs. Please adjust the x axis to hours.

Response BJ 22

The hydrographs were originally set up with the x axis in days to allow the reader to review recovery data as well. Rather than modifying the original hydrographs, additional hydrographs, each of which depict the time axis in hours, were developed and included as pages D6-8-39a and D6-8-40a. These additional hydrographs detail the water level changes over the portion of the pumping test period where the water level changes in the wells were the most rapid.

Comment BJ 23

Appendix D6, Hydrology, Addendum D6-9, Pg. D6-9-2, Please include a column in Table D6-1 that indicates the elevation of the bottom of the well or TD. The total water column is important when assessing groundwater characteristics. Please correct.

Response BJ 23

Table D6-1 has been revised as requested.

Comment BJ 24

Appendix D6, Hydrology, Addendum D6-10, Pgs. D6-10-28 through D6-10-53, On the sample analysis reports, Please provide a brief narrative at the beginning of the lab results to give context to the data. Footnotes on the pages refer to MCLs or other parameters of water quality used for classification. However, the context that is used to define these parameters is missing. The assumption is made that these quality values are derived from the WQD R&R, Chapter 8, Table I definitions. But that is

uncertain as no frame of reference is given. A brief sentence or two at the beginning of the section would clarify the numerical standards used in the report. Please adjust the narrative accordingly.

Response BJ 24

Page D6-10-27a was added to provide the requested narrative.

Comment BJ 25

Appendix D6, Hydrology, Please include the lithology of the sampled zone, either in the sampling information sheets, or on the sample analysis reports. Identification of the lithology sampled needs to be readily available with the analysis. This applies to all increments sampled. The sampled zones do have identification on the sample sheets with a shorthand nomenclature but persons unfamiliar with the lithology of the prospect area would be at a disadvantage when evaluating the sample results. A simple reference table at the beginning of the section would be sufficient. Foe example; MST=Masters, CRN=Carney, AL=Alluvium. Non-geologists need some frame of reference. Please create a clarifying narrative.

Response BJ 25

Reference text with abbreviations defined has been added on page Addendum D6-10-27a, as requested.

Comment DM 2

Appendix D6-Hydrology, D6.1x – The drainage basin description and surface water quantity sections are lacking detail. As mentioned in M. Kunze's comments, the data from the terminated Slater Creek USGS gauge, and historical monitoring data from Big Horn Mine (permit no. 213) should be included.

The data collected at the monitoring stations that is presented in Addendum D6-4 does not appear to agree with the statement that Slater Creek is a "predominantly ephemeral" stream. Please reconcile the text with the data.

Response DM 2

Peak flow data from the USGS gage station on Slater Creek has been provided. See response to MK 30. The text in Section D6.1.5.2 has been updated to clearly indicate that Slater Creek is an ephemeral stream.

Comment DM 3

Appendix D6-Hydrology, D6.2.4 States that Groundwater Rights are in Appendix E2 of the Adjudication Volume. Groundwater Rights are actually listed in Appendix B2. Please Correct.

Response DM 3

Text revised as requested.

Comment KM 5

Appendix D6, 2. The pre-mining potentiometric map for the Masters coal seam shows the elevation of the groundwater at a higher elevation than the surface elevation in Sections 11 and 12 (in the vicinity of Slater Creek outside of the permit area). Either show the potentiometric surface as doted across this area or revise the potentiometric lines such that the groundwater elevation is below the ground surface elevation. Issue addressed by BJ Kristiansen. Please see comment No. 65.

Response KM 5

Exhibits D6.2-2 and D6.2-3 have been revised as requested.

Comment KM 6

Appendix D6, 3. The groundwater elevation for the Carney coal seam in monitor well 578417-CRN was given as 3795.59. The potentiometric contour for 3800 is drawn south of this monitor well. Please correct the contour line to be consistent with the groundwater elevation shown for monitor well 578417-CRN. Correction of this contour line may also adjust how the contour lines for 3780 and 3760 are drawn, such that they may be drawn consistent with other contour lines.

Response KM 6

Contours in Exhibit D6.2-3 have been revised as requested.

Comment KM 7

Appendix D6, 4. Page D6 8-8: The text refers to the pump test in the Carney coal seam. According to the procedures in the previous section, transducers were placed in CRN and CRN-OB; however on the referenced page, it states transducers remained in MST and MST-OB after pumping. LQD believes this to be a typographical error.

Response KM 7

LQD is Correct, this is a typographical error. The sentence should read “After the pumping period, the transducers remained in CRN1 and CRN-OB until 8:00AM on November 16, 2013. Page D6-8-8 has been updated with the typographical error corrected and a replacement page is included.

Comment KM 8

Appendix D6, 5. Please discuss why the water levels rose in the Carney coal seam during the pump test in the Masters coal seam.

Response KM 8

This comment is addressed in comment 19 from Muthu Kuchanur.

Comment KM 9

Appendix D6, 6. What effect would a leaking pump have on the results of the pump test in the Masters coal seam?

Response KM 9

This comment is assumed to originate from the note on page Addendum D6-8-30. This note is in reference to activities that occurred immediately after the pumping test was shut off. The pump used for the pumping test did not have a foot valve. Therefore, after the pump was shut off, water in the discharge pipe immediately began to drain back into the well. The pump and piping was pulled out of the well as fast as possible and not all of the water in the pipe drained back into the well. However, the personnel conducting the pumping test were concerned that the water draining into the well would result in a rapid rise in the water level in the well and wanted to note it for the record on the field data sheet. It is estimated that less than 2 gallons of water actually drained out of the line into the well while the pump was being pulled which would result in a water level rise in the well of less than 0.25 foot. Given that the water level recovery in the well was very rapid immediately upon cessation of the pumping test (approximately 2 feet in the first ten minutes after the pumping test ended) and the early time recovery data was largely ignored for the purposes of doing the aquifer characterization evaluations, the leaking pump would not have had an impact on the results of the pumping test.

Comment KM 10

Appendix D6, 7. Please make sure all maps that are stamped are also signed and dated by the engineer, as required by regulation.

Response KM 10

All maps that are stamped will be signed and dated by the engineer as required by law. This does not include digital versions. The digital copies have been provided for WDEQ review. The hard copy is the official copy.

Comment MK 29

Appendix D6-Hydrology, Section D6.1.2 Drainage Basin Description, 3. On Page D6-2 it is stated that Slater Creek is an ephemeral stream. Aerial imagery shows a riparian area with trees and subirrigation occurring along much of the channel. PEM wetlands are also present as documented in Appendix D10. It would seem that an ephemeral stream may not be able to support these features. Please provide the justification why Slater Creek is considered an ephemeral stream, and that the stream does not contain

intermittent characteristics where it is not below the local water table for a portion of the year. (MDK)

Response MK 29

Please see response to DM2.

Comment MK 30

Appendix D6-Hydrology, Section D6.1.3.2 Flood Studies, 4. The USGS operated a peak flow gage on Slater Creek from 1967 to 1981 (Station No. 06299900, http://nwis.waterdata.usgs.gov/wy/nwis/inventory/?site_no=06299900&agency_cd=USGS). The gage was located just downstream of the proposed permit boundary near the confluence with the Tongue River. Please incorporate the annual peak flow data from this station into the permit application to illustrate the range of peak flows that might be expected from Slater Creek. (MDK)

Response MK 30

The text and Tables D6.1-2 and D6.1-3 have been revised to include peak flow data for USGS Station No. 06299900.

Comment MK 31

Appendix D6-Hydrology, Section D6.1.3.2 Flood Studies, 5. Some of the U.S. Army Corps of Engineers references cited in the text (2000, 2001) do not appear in the References Section (Section D6.3). Please add these to the references list. (MDK)

Response MK 31

The text edits have been made as requested.

Comment MK 32

Appendix D6-Hydrology, Section D6.1.3.2 Flood Studies, 6. Please add the year to the Miller reference within the text (2003) and add this citation to the references list in Section D6.3. (MDK)

Response MK 32

The text edits have been made as requested.

Comment MK 33

Appendix D6-Hydrology, Section D6.1.3.2 Flood Studies, 7. Please explain in the text if the existing impoundments (stock reservoirs, old mine pits, etc.) in both the Slater Creek and Hidden Water Creek drainages were considered in the routing functions for

the HEC-HMS runoff estimates. These features would likely have an effect on attenuating peak flows. (MDK)

Response MK 33

The text has been revised to clarify the impoundments are not included the HEC-HMS model. As described, peak flow estimates should be conservatively high without attenuation of storm events by impoundments.

Comment MK 34

Appendix D6-Hydrology, Section D6.1.3.2 Flood Studies, 8. As the text states on Page D6-5, the HEC-HMS runoff estimates in Table D6.1-7 are higher than the Miller (2003) equation estimates. Please provide a discussion in the text as to the reasonableness of the HEC-HMS estimates and why the HEC-HMS estimates are so much higher than the Miller (2003) equation estimates.

The Miller (2003) equation for this region used, in part, data from the USGS peak flow gage on Slater Creek, so it would seem that the Miller (2003) estimates may be more reasonable. For example, compared to the HEC-HMS estimates, the 15-year record from the peak flow gage on Slater Creek would not register at anything greater than a five-year event. Furthermore, the May 18, 1978 event on Slater Creek resulted in a peak flow of 1,100 cfs, which according to the HEC-HMS estimates would only be around a 2-year event. USGS studies have shown that the May 1978 flood event was estimated to be a 100-year event on some parts of the Tongue River in this area (http://pubs.usgs.gov/pp/1244/report.pdf). (MDK)

Response MK 34

A discussion in the text has been included that speaks to why the HEC-HMS results are higher than the Miller results. Additionally, a discussion acknowledges the report by the USGS on the May 1978 flood. The Miller analysis does appear to more closely estimate the peak flowrates for flood events for the short data record on Slater Creek. However, hydraulic calculations will continue to use the HEC-HMS results because of the conservative results and the ease in comparing to the postmining hydrologic environment. HEC-HMS provides a way to change the properties of the drainage basins to reflect what will be present postmining, and the comparison between the premining and postmining HEC-HMS models quantifies the magnitude of the impact the Brook Mine will have on the hydrologic balance.

Comment MK 35

Appendix D6-Hydrology, Section D6.1.5.1 Monitoring Stations, 9. Please add the northing/easting State Plane coordinates for the four Brook Mine surface water monitoring stations to Table D6.1-11. (MDK)

Response MK 35

The locations of the surface water monitoring sites have been reported to the quarter-quarter, which is an adequate level of accuracy to report the monitoring locations.

Comment MK 36

Appendix D6-Hydrology, Section D6.1.5.1 Monitoring Stations,10. On Page D6-8, it is not necessary to mention the State of Montana water quality classifications of the Tongue River, as only State of Wyoming classifications and standards would apply. Please remove reference to the Montana standards. (MDK)

Response MK 36

The text has been revised as requested.

Comment MK 37

Appendix D6-Hydrology, Section D6.1.5.1 Monitoring Stations, 11. On Page D6-8, second paragraph, it states that increased E.Coli from samples collected in 2006 were attributable to high flows in May-June 2010. Were the samples also collected in 2010 and not 2006? Please revise this sentence. (MDK)

Response MK 37

The sentence was revised to read more clearly. The sentence was saying that samples taken in 2010 experienced an increase in E.Coli bacteria compared to the samples collected in 2006.

Comment MK 38

Appendix D6-Hydrology, Section D6.1.5.1 Monitoring Stations, 12. On Page D6-8, second paragraph, it would be informative to add that, in addition to the SCCD, other entities such as the Big Horn Mine, USGS, and WDEQ/WQD have collected water quality data on the Tongue River and Goose Creek near the proposed mine. It may also be informative to mention that sections of the Tongue River in the vicinity of the proposed mine are on the State's 303(d) list since certain uses are not supported due to impaired water quality. Goose Creek has also been on the 303(d) list in the past and a TMDL has been prepared. Information can be found at: http://deq.wyoming.gov/wqd/water-quality-assessment/resources/reports/ and http://deq.wyoming.gov/wqd/tmdl/. (MDK)

Response MK 38

The text has been revised as requested. Refer to Section D6.1.5.1.

Comment MK 39

Appendix D6-Hydrology, Section D6.1.5.2 Surface Water Quantity, 13. The Big Horn Mine (WDEQ/LQD Permit 213) operated a station on Hidden Water Creek (HWC1-79) from 1979 to 1998. This station was located approximately ¼ mile upstream from station SM578415-SW-1 that was installed by the Brook Mine. The LQD Hydrology Database contains mean daily flow data from this station from 1982 to 1997, although several years are missing data. Baseline water quantity characterization of Hidden Water Creek in the Brook Mine permit application would be strengthened if these data were incorporated and discussed. The LQD can provide these data in electronic format upon request or a more complete dataset may be available if requested from the Big Horn Mine. (MDK)

Response MK 39

Please see response to DM 2 and MK 30.

Comment MK 40

Appendix D6-Hydrology, Section D6.1.5.3 Surface Water Quality, 14. Please briefly discuss in the text the water quality results from Slater Creek in the context of WQD Surface Water Quality Standards for Class 3B waters (see Chapter 1 of WQD Rules and Regulations). This would reveal whether or not designated uses were being met prior to mining. The two samples from Slater Creek indicate no exceedences of Class 3B criteria, indicating uses are supported. (MDK)

Response MK 40

The text has been updated as requested.

Comment MK 41

Appendix D6-Hydrology, Section D6.1.5.3 Surface Water Quality, 15. It is understood that water was not flowing in Hidden Water Creek so the applicant could not collect a sample for baseline purposes. However, as previously mentioned, the Big Horn Mine operated a station on Hidden Water Creek (HWC1-79) from 1979 to 1998. The LQD Hydrology Database contains nine water quality samples collected at this site from 1979 to 1989. Baseline characterization of Hidden Water Creek in the Brook Mine permit application would be strengthened if these data were incorporated and discussed. The LQD can provide these data in electronic format upon request. (MDK)

Response MK 41

Request for information is pending. No update to the permit has occurred at this time in response to this comment.

Comment MK 42

Appendix D6-Hydrology, Section D6.1.5.4 Sediment Transport, 16. This section would be enhanced by including data from a single sediment sample collected on Slater Creek at USGS Station No. 06299900 (peak flow gage previously discussed in Comment No. 4). This sample was collected in June 1967 at a flow of 18 cfs. The TSS was 11,600 mg/L and the suspended sediment discharge was 564 tons/day. (MDK)

Response MK 42

The text has been revised to include the additional sediment sample as requested.

Comment MK 43

Appendix D6-Hydrology, Addendum D6-5 – Rating Curves, 17. A rating curve developed using only the Manning equation will provide only a rough estimate of flows given the uncertainty in the Manning's roughness coefficient. It is recommended that direct discharge measurements also be taken over time to help evaluate the rating curves developed for the four monitoring sites. (MDK)

Response MK 43

The rating curves were developed for ephemeral streams that flow infrequently enough that water measurements cannot be taken at regular intervals. Manning's equation provides a reasonable and widely accepted mathematic approximation of stream flow rates.

Comment MK 44

Appendix D6-Hydrology, Addendum D6-5 – Rating Curves, 18. Given the uncertainty in the Manning equation, the estimated flow rates provided in Table D6-3 and Attachment D6-5-A (Rating Tables) are reported at much too high a level of precision to be meaningful. Depending on the magnitude of the flow estimate, there should be only one or two significant figures provided. For example, 0.29 cfs = 0.3 cfs and 3,584.38 cfs = 3,600 cfs. Please revise these tables. (MDK)

Response MK 44

Summary Table D6-3 has been revised to engineering precision (no more than three significant figures). The values in Attachment D6-5-A are essentially raw data that are being reported to that magnitude to show the validity of calculations and to aid in curve development. Being raw data, the values were not revised from those previously reported.

Comment Muk 9

Appendix D6, Section D6.2.1 Regional Hydrogeology, 9. Page D6-12 states, "The potential groundwater in the formation as capable of yielding small quantities of water

for domestic and stock use". Please consider providing a range of estimates for well yields based on literature review or from the baseline data collected by the Brook Mine. (MK)

Response Muk 9

The text has been revised to indicate that coal is the only regional shallow aquifer that has a sufficient quantity of water to support domestic and stock use.

Comment Muk 10

Appendix D6, Section D6.2.1 Regional Hydrogeology, 10. The description in this section discusses only about the Fort Union formation. Please provide a description of the overlying and underlying water-bearing formations (aquifers) and describe their hydrogeologic characteristics (flow direction, gradients, aquifer properties, general outcrop locations) on a regional context. It is noted that some of the overlying formations may be dry or discontinuous within the mine permit boundary. (MK)

Response Muk 10

Section D6.2.1 has been updated as requested.

Comment Muk 11

Appendix D6, Section D6.2.1 Regional Hydrogeology, 11. Page D6-12 states, "The overburden is comprised of sand lenses, clinker and alluvial that have the potential of water bearing bodies. Due to the topography in this area, the valley cut through these deposits. Therefore, they are discontinuous and would not hold large quantities of water." It is noted that they are discontinuous and would not hold large quantities of water. Please provide additional justification for this statement by using the hydrogeologic data collected by the Brook Mine including any reference to the interpreted extent of dry zones based on drill holes, monitor wells and other applicable data. (MK)

Response Muk 11

Section D6.2.1.1 has been updated as requested.

Comment Muk 12

Appendix D6, Section D6.2.1 Regional Hydrogeology, 12. Please clarify if there were groundwater springs or seeps observed in the areas within or adjacent to the mine permit boundary. Include a discussion (or reference) on the surface water - groundwater interactions.(MK)

Response Muk 12

Section D6.2.2.5 has been updated as requested.

Comment Muk 13

Appendix D6, Section D6.2.2.1 Monitor Well Construction, Completion and Development, 13. Page D6-13 states, "No monitoring wells were completed in the overburden or interburden as no water was found in these units during drilling operations". This information is critical in demonstrating the overlying units are dry. Therefore, for better documentation, please provide (or reference) a map with all the drill holes (both overburden and interburden) and their depths that were used to make this determination. (MK)

Response Muk 13

Section D6.2.2.1 has been updated as requested.

Comment Muk 14

Appendix D6, Section D6.2.2.1 Monitor Well Construction, Completion and Development, 14. Page D6-13 states, "Also one well 578409-MST-UB showed the presence of water in the underburden, while all the other wells drilled into the underburden were dry and therefore not completed as wells." Similar to the previous comment, this information is critical in demonstrating the underlying units are dry. Therefore, for better documentation, please provide (or reference) a map with all the drill holes (underburden) and their depths that were used to make this determination. (MK)

Response Muk 14

Please see response to Muk 13.

Comment Muk 15

Appendix D6, Section D6.2.2.2 Aquifer Tests, 15. Page D6-15 states, "Alluvial materials were also not analyzed during the aquifer testing." The alluvial aquifer materials are one of the key factors in determining any impacts caused by mining to the alluvial aquifer. Alluvial aquifer tests will be helpful in understanding any surface water – groundwater interactions. Please provide justification for not conducting any aquifer tests in the alluvial wells. (MK)

Response Muk 15

The text in Section D6.2.2.2 has been updated.

Comment Muk 16

Appendix D6, Section D6.2.2.2 Aquifer Tests, 16. Please provide justification for not observing the groundwater level responses in the alluvial aquifer during the two aquifer tests conducted by Brook mine. (MK)

Response Muk 16

No alluvial material was present in immediate vicinity of the clusters used for the pumping tests, hence there was no alluvial aquifer to monitor. Hidden water creek located to the east of the tested well cluster would be potentially the nearest location of alluvial material, however as noted in Appendix D11 the fill material in Hidden Water Creek is more colluvial than alluvial.

In addition, as shown on the well completion summary logs in Addendum D6-7, multiple claystone intervals are located between the Carney Coal and the surface at the well cluster where the pumping tests were conducted. The top of the Carney Coal is approximately 90 feet below ground surface at the cluster well location which is approximately 50 feet below the level of any colluvial/alluvial deposits in Hidden Water Creek. Similarly, the potentiometric head in the Carney coal is some 50 feet below the level of the colluvial/alluvial deposits in Hidden Water Creek and if there were a direct hydraulic connection, there would be no water in the Hidden Water Creek colluvium/alluvium. Given the confining intervals between and the significant difference in potentiometric head between the Carney Coal and the Hidden Water Creek colluvium/alluvium, additional shallow monitoring above the Carney Coal was not necessary.

Comment Muk 17

Appendix D6, Section D6.2.2.2 Aquifer Tests, 17. Page D6-16 states, “A report of these tests can be found in Addendum D6-8 and summary tabulation of the aquifer test results is included in Table D6.2.2”. Please consider including a comparison of these estimated aquifer properties with the aquifer tests conducted in other similar coal seams in the Powder River Basin (Example: Bighorn Mine). Given the number of tests conducted by the mine, this will increase the robustness of the reported estimates from the two aquifer tests. (MK)

Response Muk 17

As requested aquifer test results from Big Horn Coal Company and from the Youngs Creek Mine were added to the text.

Comment Muk 18

Appendix D6, Section D6.2.2.2 Aquifer Tests, It is noted that the aquifer tests were conducted for ~640 minutes. Will an increased aquifer test duration change the observed lack of interaction between the coal seams and the underburden? Please clarify with a brief description. (MK)

Response Muk 18

Given the head differences between the static water levels in the Carney Coal, Masters Coal, and the underburden it is unlikely that additional pumping would have resulted

in any impacts to the water levels in the underburden. As shown on Table D6-2, (page Addendum D6-8-13) the initial water level in the Carney Coal was approximately 11.5 feet higher than the water level in the Masters Coal and the initial water level in the Masters Coal was approximately 9 feet higher than the initial water level in the underburden well. If there were a hydrologic connection between the aquifers, it is likely that the water levels in the aquifers would have already come into equilibrium.

Comment Muk 19

Appendix D6, Section D6.2.2.2 Aquifer Tests, 19. The referenced Addendum D6-8, Table D6-2 shows an increase in water levels in two of the Carney coal seam observation wells during the Masters coal seam well pumping test. Please provide an explanation for this increase in water levels during the aquifer test. (Noordbergum effect?). (MK)

Response Muk 19

Upon review of the raw data collected during the pumping test it was noted that the drawdowns reported in Tables D6-2 and D6-3 were incorrectly reported. Replacement tables are included with this round of comment responses. As shown on the updated version of Table D6-2, the water level in both Carney observation wells (CRN-1 and CRN-OB) increased by 0.23 feet during the Masters coal pumping test. While the Noordbergum effect or other natural phenomena such as earth tides could have potentially influenced the water levels in adjacent aquifers during the pumping test, the increase in water levels can be largely attributed to barometric pressure changes. Water levels in the Carney observation wells were monitored using hand held electric lines and there were no adjustments for barometric pressure reported in Table D6-2. No site specific barometric data was collected during the pumping test period. However, to evaluate how barometric pressure changes may have impacted water levels in the wells, barometric data from the automatic weather observing station (AWOS) at the Sheridan County airport was obtained from the National Oceanic and Atmospheric Administration (NOAA) database. Barometric data from the Sheridan County Airport AWOS site was compared to water level measurements in Attachment D6-8-K. The data in Attachment D6-8-K demonstrates a clear correlation between barometric pressure and water level variations in the Carney coal monitor wells during the Masters coal pumping test. Generally over the course of the Masters coal pumping test the barometric pressure went down (roughly 0.31 feet). A decrease in the barometric pressure is expected to result in an increase in water levels in a confined aquifer like the Carney coal aquifer which is what was observed.

Similar increases in water levels were also noted in the Masters Coal observation wells (MST-1 and MST-OB) during the Carney pumping test as noted on Table D6-3. Attachment D6-8-K demonstrates a clear correlation between decreasing barometric pressure and rising water levels in the Masters coal observation wells during the Carney Pumping test. In addition, during the Carney coal pumping test, water levels

in the Masters coal observation wells were still recovering from drawdowns induced during the Masters coal pumping test which may also have contributed to rising water levels in the Masters coal. The increase in water level measured in the Masters coal observation wells is attributed to a combination of continuing water level recovery and barometric effects.

Only very minor water level variations in the Masters underburden well (MST-UB) were noted during both pumping tests. As shown on the well completion form in Addendum D6-7, (Page D6-7-8) MST-UB was completed in an interval that was predominately claystone and the estimated yield is less than 2 gpm. Essentially the strata in which MST-UB is completed is more of an aquitard than an aquifer. As a result, it takes a lot longer for the water levels in the well to adjust to changing atmospheric pressure because water does not enter or discharge from the formation very fast. The lack of barometric responses in the MST-UB are attributed to the fact that the low yielding aquitard in which the well is completed has a lower barometric efficiency than the wells completed in the coal aquifers.

Vented transducers utilized to monitor water levels in the both the pumping and adjacent monitor wells during each pumping test, automatically compensated for the barometric pressure effects. Therefore, barometric pressure effects did not affect the aquifer analyses that were developed based on the pumping test data.

Comment Muk 20

Appendix D6, Section D6.2.2.2 Aquifer Tests, 20. Please provide a discussion (or reference) on the role of faults in the results of aquifer tests. (MK)

Response Muk 20

As noted in Addendum D6-8, (page D6-8-9) no hydrologic boundary conditions were observed in the pumping test data. As can be seen on Exhibit D6.2-2, the 578409 well cluster is located approximately 2,100 feet south and east of the nearest mapped fault. Since neither the Carney nor the Masters coal seams are very robust aquifers and have low transmissivity values, it is not surprising that the fault would not influence the pumping test results. For example, using Theis drawdown equations and the aquifer characteristics measured in the Masters coal (transmissivity of 3.2 ft^2/day, storitivity of 0.00025, and a pumping rate of 0.5 gpm) it is estimated that it would take over 70 days of continuous pumping for a water level response greater than 0.5ft to be observed 2,000 feet away. Therefore the likelihood that the faults would have influenced the pumping test results is very low.

Comment Muk 21

Appendix D6, Section D6.2.2.4 Premining Potentiometric Surface, 21. Please provide some additional discussion on the premining potentiometric surface maps, including

ranges of estimated hydraulic gradients and groundwater velocity in the different coal seams/aquifers. (MK)

Response Muk 21

As requested, additional discussion on the hydraulic gradients and groundwater velocity in the coal seams were added to Section D6.2.2.4.

Comment Muk 22

Appendix D6, Section D6.2.2.4 Premining Potentiometric Surface, 22. Please provide a discussion (or reference) on the hydrologic effects of any adjacent operations (including past coal mining activity by historic mines and Bighorn mine) on the premining information and data. (MK)

Response Muk 22

The last paragraph in Section D6.2.2.4 describes how CBNG production has affected water levels in the eastern side of the permit area. The drawdowns resulting from CBNG production have occurred since any historic coal mining activity and have superseded any drawdowns that may have occurred due to historic mining. Therefore, no lingering hydrologic effects from past coal mining activities are present. The text in the last paragraph in Section D6.2.2.4 has been updated to describe how CBNG impacts have superseded any impacts from historic coal mining activities.

Comment Muk 23

Appendix D6, Section D6.2.2.5 Recharge and Discharge Areas, 23. This section provides a good discussion on the recharge areas. However, please clarify if there are any discharges from the coal seams within the permit boundary. (MK)

Response Muk 23

Within the permit boundary there are no discharges from the coal seams with the possible exception of the Carney coal on the far west side of the permit area. As shown on Exhibit D6.2-3, the Carney coal outcrops in the far western side of the permit area along the ridge tops but has been eroded away in the stream valleys. As a result, the Carney coal is perched with no real source of recharge and is generally dry. However, on the down dip side of the outcrop the coal may discharge within the permit if there is water in the coal seam to discharge. As shown on Figures MP-3-4.7-1 and MP-3-4.7-2 it was determined during the groundwater modeling efforts that most of the Carney coal within the far western side of the permit area was dry. Therefore, there is minimal (if any) discharge from the Carney coal within the permit area. Section D6.2.2.5 has been updated to clarify where discharges from coal seams may occur within the permit boundary.

Comment Muk 24

Appendix D6, Section D6.2.2.5 Recharge and Discharge Areas, 24. Please provide a range of estimates for recharge from precipitation to the aquifers within the permit boundary. Also, provide a discussion if this is the primary recharge mechanism for the aquifers within the permit boundary. (MK)

Response Muk 24

The estimated recharge rates from precipitation are summarized in Section 4.2.2 of Addendum MP-3. Addendum MP-3 describes recharge within the permit area in more detail than Section D6.2.2.5. A reference to MP-3 was added in Section D6.2.2.5.

Comment Muk 25

Appendix D6, Section D6.2.2.5 Recharge and Discharge Areas, 25. Consider providing a description of the soil properties within the permit boundary and the use of these percent soil distributions in the discussion of infiltration within the permit boundary. (MK)

Response Muk 25

The soil properties within the permit boundary are described in detail within Appendix D7. While different soil types are expected to have variable infiltration rates, the only infiltration rate that is significant for the coal aquifers is the infiltration rate assigned to the strata near the outcrop of the coal seams. Throughout the permit area the strata overlying the coal aquifer are generally dry. Therefore the primary source of recharge occurs at the outcrops. Scoria, in particular, plays a significant role in recharge of the coal seams because it usually occurs near the coal outcrop. Because of its highly permeable characteristics most of the precipitation that falls on the scoria infiltrates into the scoria where it either infiltrates into the coal or discharges along a seep line at the base of the scoria. As noted in the response to BJ Kristiansen's comment number 57, ash material between the base of the scoria and the coal seams sometimes limits how much of the water in the scoria actually comes into direct contact with the coal. Nevertheless, because a large percentage of precipitation falling on the scoria actually infiltrates into it, the scoria does provide a consistent water source for recharge into the coal outcrops. As noted in Addendum MP-3 Section 4.2.2 the scoria areas were delineated and assigned their own recharge zone because they do play a significant role in recharging the coal seams. Within the permit area, there are several locations where the coal seams outcrop as well. These outcrop areas were also assigned their own recharge zone because they also have a hydrologic connection to the coals. Since the strata overlying the coal seams to be mined in the Brook Mine are generally dry, the recharge component from the overburden to the coal is very low away from the outcrop areas. Because of the limited hydrologic interaction between

the recharge at the surface and the coal in areas away from the outcrop, site specific changes in the recharge rates based on soil type will not impact the coal aquifers. For this reason additional analysis of the infiltration properties of the soils within the permit area represents a level of detail that is not necessary to describe the hydrologic impacts to the coal aquifers from the proposed mining operations.

Comment Muk 26

Appendix D6, Section D6.2.2.5 Recharge and Discharge Areas, 26. Page D6-18 states, “Collected groundwater elevation and hydrographs of the groundwater wells are found in Addendum D6-8”. Please revise this statement to reference the correct addendum - Addendum D6-9. (MK)

Response Muk 26

The text has been updated to read "Collected groundwater elevation and hydrographs of the groundwater wells are found in Addendum D6-9".

Comment Muk 27

Appendix D6, Section D6.2.3 Baseline Water Quality, 27. Page D6-20 states, “A piper diagram of the groundwater wells with measured values is presented in Figure D6.2-1. Please provide a discussion on the water quality types observed at each aquifer (Example: Is the water quality type variable within an aquifer? If yes, explain the potential reasons for this observed variability) based on the piper diagram. (MK)

Response Muk 27

Section D6.2.3 has been updated as requested.

Comment Muk 28

Appendix D6, Section D6.2.3 Baseline Water Quality, 28. Page D6-20 states, “The constituents that most frequently exceed the standard concentration limitations are ammonia, TDS, sulfate and manganese”. Please clarify if these constituents exceed the Chapter 8 standards at *all* the monitor wells. (MK)

Response Muk 28

Please refer to the Tables D6.2-8 thru D6.2-17 for exceedances of water quality based on Chapter 8 standards. Based on the tables, the concentrations are not exceeded at all monitor wells. No text edits were made in response to this comment.

Comment Muk 29

Appendix D6, Section D6.2.4 Groundwater Rights, 29. Page D6-20 states, "Adjacent and on-site groundwater rights are listed in Appendix E2 in the Adjudication Volume." Cheyenne copy of the TFN does not have a sheet separator and a tab for Appendix E2 in the Adjudication volume. Please provide a sheet separator and tab for Appendix E2. (MK)

Response Muk 29

Refer to Comment DM3. Groundwater rights are provided in Appendix B of the Adjudication Volume. This text edit has been made in Section D6.2.4.

Comment Muk 30

Appendix D6, Section D6.2.4 Groundwater Rights, 30. Page D6-20 states, "Adjacent and on-site groundwater rights are listed in Appendix E2 in the Adjudication Volume." Please provide a summary discussion/statistics on (i) total number of water rights, (ii) number of wells, (iii) aquifer, (iv) permitted water use and other relevant summary statistics. (MK)

Response Muk 30

Groundwater rights are listed in Appendix B of the Adjudication Volume. All of the aforementioned information is listed for each water right. Due to the constantly changing nature of water rights, a summary table is difficult to construct, and due to summary statistics not being required by WDEQ regulation, a summary statistics table has not been prepared.

Comment Muk 31

Appendix D6, Section D6.2.4 Groundwater Rights, 31. Please provide a discussion (or reference) on the premine groundwater use (including the uses reported to SEO) within the permit boundary and the adjacent areas. (MK)

Response Muk 31

The premine groundwater uses as reported to the SEO within the permit boundary and the adjacent 3 miles are listed with each individual water right in Appendix B of the Adjudication Volume.

Appendix D7

Comment DS 6

Appendix D7, Exhibit D7.3.-1 was compared with Exhibit MP.1-1. As required, it appears that the soil sampling was concentrated in areas where surface disturbance is to be expected. Please provide the contour interval on the soils map. For ease of review and to prevent misinterpretation, however, the map showing sampling locations should also clearly show the locations of proposed surface disturbances instead of providing these details on separate maps which may or may not present differing scale distances.

Response DS 6

The disturbance boundary can be found on Figure D7.1-1 and as the reviewer noted on Exhibit MP.1-1. No revision to exhibit D7.3-1 has occurred in response to this comment.

Comment DS 7

Appendix D7, Page D7-4. The second paragraph of this page contains text that should be deleted. It states "If for whatever reason overall sampling intensity.....was determined to not be enough, it is proposed that any additional sampling be deferred and included a stipulation of a future pre-stripping soil assessment program." The Mine Plan and Reclamation Plan soils handling and replacement is contingent on adequate baseline sampling of the proposed area that will be affected by mining operations (topsoil balance and stockpile location planning and bond calculation). Therefore, baseline sampling for soils must be adequate prior to approval of any permit application. Please remove the inappropriate language from the Appendix D7 text. If future changes to the Mine Plan require additional soil sampling the issue will be addressed at that time.

Response DS 7

As requested, the second sentence of the second paragraph on page D7-4 has been deleted.

Comment DS 8

Appendix D7, Page D7-9. Text appears in this section that upon NRCS declaration of prime farmlands occurring in the permit area, a letter will be provided to the DEQ. A letter from the NRCS has been received and inserted in the permit declaring no prime farmlands to exist. The text, therefore, is not appropriate and should be removed.

Response DS 8

As requested, the sentence about prime farmland (the last sentence of the first full paragraph on page D7-9) has been deleted. A new reference, citing the letter received

on October 31, 2015 (negative determination of prime farmland on Ramaco permit area) has been inserted on page D7-9 and the new reference has been added to the list of references on page D7-33.

Comment DS 9

Appendix D7, WS § 35-11-415(b)(iii) and the Coal Rules, Chapter 4, Section (c)(ix) state that if topsoil is virtually nonexistent or is not capable of sustaining vegetation then subsoil or a selected spoil material may be used as a topsoil or subsoil supplement. Additionally, due to the proximity of this mine to the Tongue River, a Class 2AB stream, limits for chemical contaminants will be imposed on discharges from the permit. Therefore, for areas where unsuitable or marginal topsoil chemistry is located (e.g. Wibaux channery loam, sample R13), an alternative soil replacement material should be identified and used in reclamation. Such a commitment must also be provided in the Mine Plan and Reclamation Plan to provide evidence that such issues that could affect the condition of reclamation and/or lead to off-site impacts will be addressed.

Response DS 9

No "alternate soil replacement material" is necessary for areas of Wibaux channery loam (Map Unit Wx). The lower soil material below 8 inches of Wibaux (any "C" horizon soil substratum below 8 inches, where existent) was not recommended for salvage and would be grouped with the overburden spoil for placement purposes. This lower material had an excessive volume of hard coarse fragments (>35%) and, based on one of the three Wibaux sample sites (R13), an "unsuitable" EC and SAR value for the 8 to 15 inch depth, EC=12.8 and SAR=17.3. Two new sentences, indicating no soil salvage of Wibaux below 8 inches in depth, has been added to the soils report on page D7-26, one sentence each for Map Unit Wx and Map Unit Wx-RO. Furthermore, the amount of suitable soil available for salvage across the entire proposed disturbance area is not limiting, with a calculated weight-average of 20.2 inches. Therefore, additional "alternate soil replacement material" is not necessary.

Comment DS 10

Appendix D7, The description of Map Unit G (Bauxson Loam, sample R-19) does not show marginal selenium that occurs between 22 – 48 inch depth range which could affect the salvage depth and may require special handling of the marginally suitable subsoil.

Response DS 10

Two new sentences have been added to the last paragraph on page D7-21 stating the presence of "marginal" rated Selenium values for lower material of Bauxson loam (Map Unit G) sample site R19. Strictly speaking, "marginal" rated soil material is not

"unsuitable" and does not need to be specially handled. This lower Bauxson material has been recommended for salvage as "Subsoil", not "Topsoil'.

Appendix D8

Comment JJ 1

Appendix D8, 1. Please update the permit boundaries so that they are the same on Exhibit D8. 2-1 and Addendum D8 Map 1. I note specifically that lands should not be included within the permit boundary south of the interstate and that Section 10 TWN57N RNG85W displays different boundaries along the far west edge of the permit; it appears that the section lines are skewed between the two maps. The Addendum D8 Map 1 also is missing a sizeable amount of lands located in Section 21 TWN54N RNG84W which are included within the permit boundary of the Adjudication Exhibit 1 map. While comparing the maps I find that the maps display the same information in slightly different formats, please explain the necessity for two individual maps and at a minimum make them consistent against one another.

Response JJ 1

Baseline vegetation assessment maps have been updated to include the correct permit boundary. The discrepancy in the permit boundary is attributed to the difference in graphical representation between a USGS quad system and a PLSS system. The USGS quad system is now depicted. Exhibit D8.2-1 is a summary map for this Appendix and future updates made to this Appendix. This map will change throughout the life of the mine as future changes are incorporated. Addendum D8 Map 1 is for this Addendum and will not change throughout the life of the mine.

Comment JJ 2

Appendix D8, 2. Why does the study area not include all lands within the proposed permit boundary?

Response JJ 2

Portions of the proposed Brook Mine permit area not included within the study area were added during an October 2014 permit boundary change following completion of the baseline vegetation study. Additional studies were not conducted in these areas due to the limited size and similarity to areas within the study area. Section D8-1.1, page D8-1-5 text has been updated to explain the exclusion of these areas.

Comment JJ 3

Appendix D8, 3. The acreage displayed on Table D8.2-1 should equal that of the land permitted on the Form 11. The Form 11 displays 4,548.8 acres while the table shows 4,581.7 acres a difference of 32.9 acres. Please update either the Form 11 or Table

D8.2-1 to show the true permit acreage as it relates to the vegetation communities. Upon further review I find that Table D8-2 located on page Addendum D8-1-41 exhibits the proper acreages in relation to the Form 11, thus the values represented there may be more accurately displayed in Table D8.2-1.

Response JJ 3

Total acreage of the permit area is 4,548.8 acres as illustrated in Form 11 and Table D8-2. Table D8.2-1 has been updated to reflect the correct acreage.

Comment JJ 4

Appendix D8, 4. Table D8.2-1 states there are 56 acres of agricultural lands; however, I am unable to locate Agricultural lands north of the interstate. Please, discuss and edit the values to display true acreages in relation to the proposed permit boundary. (See comment 3 for more clarification and another table for utilization to update values.)

Response JJ 4

Agricultural Lands within the permit area total 4.5 acres and are located in Section 21 TWN54N RNG84W. Table D8.2-1 has been updated to reflect the correct acreage of Agricultural Lands and other vegetation communities within the permit boundary.

Comment SP 3

Appendix D-8 Vegetation Baseline, Page D8-3. Section D8.1.7. Guideline 2 is a non coal guideline. Please revise this sentence to reference the equation shown in Section D8-1.2.9 Sample Adequacy.

Response SP 3

Changed as requested. Additionally, Appendix D8 reference to Guideline 2 was replaced by reference for Chapter 2 in Section D8.1.1, page D8-1 and Section D8.3, page D8-4. Addendum D8 reference to Guideline 2 was replaced by reference for Chapter 2 in Section D8-1.2, page D8-1-5 and Section D8-1.9, page D8-1-38. Reference to Guideline 2 was removed from Section D8-1.2.9, page D8-1-12.

Comment SP 4

Appendix D-8 Vegetation Baseline, Page D8-4. Section D8.1.8. Please revise the second sentence to, “The EXREFA is all of the unaffected area for each native vegetation community.”

Response SP 4

Changed as requested.

Comment SP 5

Appendix D-8 Vegetation Baseline, Page D8-1-8. Section D8-1.2.4. The last sentence in this section states that no sample locations occurred within the Brook Mine Permit Area. AG-13, 14, 17 and 25 are shown on Addendum: D8, Map 1 inside the permit area. Please correct this statement or the permit boundary on the Map.

Response SP 5

Baseline vegetation assessment maps have been updated to include correct permit boundary which illustrates AG-13, 14,17, and 25 are not located within the permit boundary.

Comment SP 6

Appendix D-8 Vegetation Baseline, Page D8-1-11. Section D8-1.2.8. The last sentence of the first paragraph should be revised to, "Sample adequacy was not required for species diversity and composition."

Response SP 6

Changed as requested.

Appendix D9

Comment DM 4

Appendix D9-Wildlife, Page D9-3 states that when a sage grouse confirmation letter is provided by WG&F, it will be provided to DEQ. It appears that the confirmation letter is already part of the package (Page D9-E3). Please reference the location of the letter.

Response DM 4

Page D9-3 was revised to reference Page D9-E3 as the location of the letter.

Comment WGF 1

(Appendix D9) , We recommend this report become part of the annual reporting which will ensue throughout the operation of the mine.

Response WGF 1

Discussion was added at the end of Addendum D9-1 Section D9-1.6 on Page Addendum D9-1-31 titled "Monitoring and Mitigation" that references the sections of the Mine Plan where the annual wildlife report commitments are contained.

Comment WGF 2

(Appendix D9), We suggest coordinating with the USFWS regarding raptor mitigation as needed through the mining process.

Response WGF 2

The commitments to coordinate with the USFWS regarding raptors as well as T&E and other species of federal concern are provided in Section MP.18, Addendum MP-8 and Addendum MP-9 of the Mine Plan. Discussion was added at the end of Addendum D9-1 Section D9-1.6 on Page Addendum D9-1-31 titled "Monitoring and Mitigation" that references these discussions.

Comment WGF 3

(Appendix D9), We recommend mining reclamation practices consider providing suitable habitat for existing wildlife within the specifications required by DEQ-LQD.

Response WGF 3

The commitments to reclaim wildlife habitats are provided in the Reclamation Plan in Section RP.7 Wildlife Restoration. Discussion was added at the end of Addendum D9 - 1 Section D9-1.6 on Page Addendum D9-1-31 titled "Monitoring and Mitigation" that references the Reclamation Plan.

Appendix D10

Comment BJ 63

EXHIBITS, Addendum D10, The permit boundary layer on all of the exhibits covering the aquatic resource boundaries is incorrect. Please correct the permit boundary layers.

Response BJ 63

Aquatic resource inventory maps have been updated to include the correct permit boundary.

Comment DM 5

Appendix D10-Wetlands, D10-1.4 – Please include a copy of the letter requesting concurrence and jurisdictional determination sent to the ACOE At the end of the text, and reference the letter in the text.

Response DM 5

BKS Environmental Associates, Inc., on behalf of RAMACO, requested concurrence and jurisdictional determination from the USACE on May 29, 2015. A copy of the

letter sent to the USACE has been included as Attachment D10-F. Section D10-4, page D10-10 text has been updated to reflect submittal of USACE request.

Comment MK 45

Appendix D10-Wetlands, Section D10.2 Results, 19. The text may want to state when (what date) RAMACO requested the jurisdictional determination from the USACE, and include this request letter as an Addendum to Appendix D10. This would provide documentation that the request was submitted, as receipt of the USACE determination may lag behind the LQD permitting process. (MDK)

Response MK 45

See response to DM5.

Appendix D11

Comment BJ 26

Appendix D11, Alluvial Valley Floor, Section D11.1, RAMACO has requested LQD to make a determination on the nature of the drainages as potential AVF within the permit boundary as well as within ½ mile of the permit boundary. This would then entail analysis of the following drainages (distances are approximations): • Hidden water Creek – all (4 mi.)

• East Fork Earley Creek – lower 1 mile

• Slater Creek – lower 3 miles

• Tongue River – ½ mi. east of Interstate 90 and 4 mi. west of Interstate 90 at the Acme exit.

Prior to such a declaration, LQD staff will have to perform a variety of assessments designed to assist us in making a declarative statement about AVF classification. An AVF declaration will be made after in-depth study of the drainages. Such investigation will consist of, but not be limited to:

1. Field evaluation of the geomorphic and lithologic character of the drainages in question;

2. Determination of the agricultural characteristics of the stream course;

3. Examination of available bore hole logs that can be used to characterize the subsurface materials beneath the valley floor;

4. Determination of groundwater and surface water characteristics, both quantitative and qualitative, within the drainages in question;

5. Other evaluation processes that may be deemed necessary should initial findings warrant further, in-depth analyses.

Response BJ 26

Revised D11 text throughout to expand discussion on the drainages mentioned above. Incorporated previous AVF studies into Appendix D11. Information satisfying each statement can be found in the following locations as well as many other locations throughout the document:

1. Borehole logs provided in Addendum D11-3. Hidden Water Creek test pits dug by Big Horn Mine and discussed in Section D11.3 "Stream Laid Deposits."
2. Agricultural characteristics of the stream courses are discussed in Sections D11.4.2, D11.4.3, and D11.5, in particular.
3. Bore hole logs are provided in Addendum D11-3. Additional test pit and borehole information was analyzed from the Big Horn Mine Permit No. 213.
4. Groundwater and surface water characteristics are discussed extensively in Appendix D6. Potential impacts to surface water and groundwater are discussed in the Mine Plan. The water resources are generally discussed in Section D11.4.
5. Additional research has been incorporated from the Big Horn Mine Permit No. 213. Corrections and reevaluations of the AVF study have been made throughout Appendix D11.

Comment BJ 27

Appendix D11, Alluvial Valley Floor, Addendum D11-3, Some of the borehole and well logs indicate a damp or wet interval encountered during drilling. Was an attempt made to allow wet materials to produce water prior to continuation of the hole or was water noted after adding another drill steel and lowering the kelly to begin the next 20 feet of hole? Typically, after the steel has been added and the compressor is engaged, a small amount of water can be air-lifted before the rotary table begins to turn. If so, are there field notes indicating water was observed during the connection?

Response BJ 27

It is standard procedure during drilling operations to provide wet or damp intervals an opportunity to produce water. If the intervals had produced water, this would have been noted in the drilling logs provided in Addendum D11-3. There are no other separate field notes that would provide additional information. No changes to the text were made.

COMMENT MK 1

Appendix D11-AVF, Section D11.1 Introduction, 1. In the second paragraph on Page D11-1, the possible impacts of the proposed mining operation on the Tongue River

AVF are dismissed because the area is planned for facilities level disturbance only. However, the groundwater model (Mine Plan Addendum MP-3) predicts drawdown in the Tongue River alluvium, thereby possibly affecting the AVF. As discussed in subsequent comments, additional analysis and monitoring is needed to comply with LQD Coal Rules and Regulations regarding AVFs. (MDK)

RESPONSE MK 1

Revised text to reference Mine Plan Section MP.6 concerning the Brook Mine's effect on the Tongue River AVF.

COMMENT MK 2

Appendix D11-AVF, Section D11.2 Purpose and Scope, 2. On Page D11-2, please change "Wyoming Reclamation Act" to "Wyoming Environmental Quality Act". (MDK)

RESPONSE MK 2

Revised text to state "Wyoming Environmental Quality Act."

COMMENT MK 3

Appendix D11-AVF, Section D11.3 Stream Laid Deposits, 3. For identification of unconsolidated stream laid deposits, LQD Guideline No. 9 (AVF) lists two items that may be used to positively identify unconsolidated streamlaid deposits: (1) channel bars, splays, abandoned meanders, modern flood plains, or terraces, and (2) bedload or washload sediment deposited or transported in a nonbedrock channel bottom. Presumably, item (2) would be met at the streams identified within the AVF study area. However, the permit application does not address whether the channels contain geomorphic features from item (1). Please address in the text whether channel bars, splays, abandoned meanders, modern flood plains, or terraces are observed within the streams within the AVF study area. (MDK)

RESPONSE MK 3

Revised text to discuss the lack of channel bars, splays, abandoned meanders, modern flood plains, and terraces that qualify for AVFs in the Hidden Water Creek, Slater Creek, East Fork Earley Creek, and Earley Creek valleys.

COMMENT MK 4

Appendix D11-AVF, Section D11.3 Stream Laid Deposits, 4. On Page D11-5, the conclusion that the materials in Hidden Water Creek valley do not meet the definition of unconsolidated streamlaid deposits, is in conflict with the conclusion from the Big Horn Mine Permit. The Big Horn Mine Permit (Appendix D6, Pages D6-151 to D6-158) describes the evaluation of unconsolidated streamlaid deposits on lower Hidden Water Creek. The permit states: "The conclusion verified from the pit observations is that

these deposits are unconsolidated and stream laid. Small isolated patches of colluvium or bedrock can be found throughout the alluvial deposits, but these characteristics do not exclude the deposit from being stream laid." Please evaluate the data and findings from the Big Horn Mine Permit before a conclusion is drawn about the absence of unconsolidated streamlaid deposits on Hidden Water Creek. (MDK)

RESPONSE MK 4

Revised text to discuss the findings of the Big Horn Mine from test pits in the Hidden Water Creek valley. Additionally, Exhibit D11.3-1 was revised to show the locations of the Big Horn Mine test pits in Hidden Water Creek in relation to both the Brook Mine permit area and the Big Horn Mine permit area. Added the Big Horn Mine Permit State Decision Document (SDD) 213-T2 to Addendum D11-2.

COMMENT MK 5

Appendix D11-AVF, Section D11.3 Stream Laid Deposits, 5. The Big Horn Mine Permit also describes subirrigation and flood irrigation studies on lower Hidden Water Creek and concludes: "Due to the lack of subirrigation and extremely low potential for flood irrigation, Hidden Water Creek is not an alluvial valley floor." Although this is in the approved mine permit, it does not appear that an explicit AVF determination for Hidden Water Creek was ever issued by the LQD, and the AVF findings in the SDDs for the Big Horn Mine Permit do not mention Hidden Water Creek. The Brook Mine Permit application should incorporate these previous AVF studies on Hidden Water Creek into Appendix D11. (MDK)

RESPONSE MK 5

See response to comment MK 4. Additionally, while the Big Horn Mine State Decision Documents do not mention Hidden Water Creek, the SDD 213-T2 states that "No other drainages are of significant size or lack the stream laid deposits necessary to be an Alluvial Valley floor within the renewal and/or amendment areas." Hidden Water Creek is located within the renewal area and was not included within the originally declared AVF area. Although it was not mentioned by name, it has been declared not to be an AVF within the Big Horn Permit Area.This SDD has been added to Addendum D11-2 and discussion added to the text in Section D11.3.

COMMENT MK 6

Appendix D11-AVF, Section D11.4.2 Extent of Subirrigation, 6. On Page D11-6 it is stated the three monitor wells were installed along the thalweg of Slater Creek. The transects in Exhibit D11.3-2 show that two of the wells (578513-AL and 578418-AL) are not along the thalweg but are rather upgradient of the channel. Please revise this description in the text. (MDK)

RESPONSE MK 6

Revised text to more accurately state that the monitor wells are along or near the thalweg.

COMMENT MK 7

Appendix D11-AVF, Section D11.4.2 Extent of Subirrigation, 7. It appears that from Exhibit D11.1-1 that subirrigation is occurring on Earley Creek within the AVF study area. Please explain why subirrigation was not mapped on Earley Creek. (MDK)

RESPONSE MK 7

Revised Exhibit D11.1-1 to show potentially subirrigated lands on Earley Creek. The text was revised in Section D11.4.2 to reflect that subirrigation potentially occurs along Earley Creek.

COMMENT MK 8

Appendix D11-AVF, Section D11.4.2 Extent of Subirrigation, 8. On Page D11-6, second paragraph, the alluvial/colluvial potentiometric surface is dismissed as a source of subirrigation along Slater Creek. However, the other hydrologic processes responsible for the subirrigation are not identified. Please discuss in the text why subirrigation is occurring along Slater Creek. (MDK)

RESPONSE MK 8

Revised text to discuss the presence of burn areas overlying residual coal ash bands that serve as aquacludes which prevent water from entering or escaping the coal below.

COMMENT MK 9

Appendix D11-AVF, Section D11.4.2 Extent of Subirrigation, 9. The cross-sections in Exhibit D11-3-2 would be improved if the active channel and any floodplains or terraces were shown. A description of the materials in the active channel bottom would also help identify unconsolidated streamlaid deposits. (MDK)

RESPONSE MK 9

Revised Exhibit D11.3-2 to show the 2-year, 24-hour flood inundation area and the location of the active channel. Data regarding the materials in the active channel bottom are presented in the borehole logs in Addendum D11-3.

COMMENT MK 10

Exhibit D11.4-1, the extent of irrigated lands shown in Sections 2 and 11 along Slater Creek may not be correct. According to the summary for the Hart Brothers Ditches

water right (permit 1317) in the SEO database, the land being irrigated under the water right has decreased to 23 acres:

> THIS FACILITY IS MADE UP OF TWO DITCHES. THE WEST DITCH HAVING A POINT OF DIVERSION IN LOT 2 AND THE EAST DITCH HAVING A POINT OF DIVERSION IN THE SENE OF SECTION 3, T57N, R85W. T57N, AND 58N, R85W HAS BEEN DEPENDENTLY RESURVEYED. REQUEST FROM PADLOCK RANCH TO ELIMINATE 67 ACRES AS FOLLOWS: 32 ACRES IN THE SWSW OF SECTION 2 - 30 ACRES IN THE NENW AND 5 ACRES IN THE NWNW OF SECTION 11 ALL IN T57N, R85W, RECEIVED AND GRANTED. REQUEST OF ELIMINATION AND PROOF OF OWNERSHIP FILED IN MISCELLANEOUS NOTICES. ADJUDICATED WITH H.H. WILLIAMS AS APPROPRIATOR. PERMIT RECORD REFLECTS SOURCE AS SLATER CREEK AND WATER STORED IN THE HART BROTHERS RESERVOIR, P60R, XR7825A, HOWEVER CERTIFICATE RECORD REFLECTS .91 CFS FOR THE IRRIGATION OF 64 ACRES. BOC PETITION II 89-4-2 BY PADLOCK RANCH WAS GRANTED TO ISSUE AMENDED CERTIFICATE C77/290A TO REDESCRIBE LANDS WITHOUT CHANGING LAND TOTALS AND TO CHANGE POINT OF DIVERSION FROM THE RECORD POINT IN THE NWNE AND SENE OF SECTION 3, 57N, R85W AND PARTIAL MEANS OF CONVEYANCE FOR 41 ACRES (.59 CFS) TO THE WILLIAMS DITCH, P8710D, C77/289A DIVERTING WATER FROM SLATER CREEK IN THE SESW OF SECTION 34, T58N, R85W AS RECORDED IN ORDER RECORD BOOK 36, PAGES 385-390 AND RECEIVED ON CD3/578A. THIS LEAVES 23 ACRES STILL IRRIGATED UNDER THIS PERMIT. LANDS SHOWN BELOW AS "AME" AND "ELI" ARE THOSE ORIGINALLY DESCRIBED UNDER THIS DITCH.

Please clarify the irrigated acreage status for the Hart Brothers Ditches water right with the SEO and revise Exhibit D11.4-1 accordingly. (MDK)

RESPONSE MK 10

Exhibit D11.4-1 was revised to more accurately capture irrigated lands on Slater Creek in Sections 2 and 11 of Township 57 North, Range 85 West.

COMMENT MK 11

Appendix D11-AVF, Section D11.4.4 Water Quality, 11. On Page D11-7, it is not necessary to mention the State of Montana water quality classifications of the Tongue River, as only State of Wyoming classifications and standards would apply. Please remove reference to the Montana standards. (MDK)

RESPONSE MK 11

Removed text referencing State of Montana water quality standards.

COMMENT MK 12

Appendix D11-AVF, Section D11.4.5 Agricultural Practices, 12. On Page D11-8, second paragraph, it states that Exhibit D11.1-1 shows that sufficient water supply does not exist for consistent agricultural practices in East Fork Earley Creek. However, Exhibit D11.4.1 shows a point of diversion for Earley Creek Ditch No. 1 and several areas of irrigated lands less than 40 acres in East Fork Earley Creek. As documented in Addendum D11-4, there is an adjudicated water right for irrigation in this location. So there may be sufficient water supply for consistent agricultural practices. The text needs to further expand on this discussion of East Fork Earley Creek since there is an adjudicated water right for irrigation. (MDK)

RESPONSE MK 12

Revised text to include the Earley Creek Ditch No. 1 water right, but explained that subirrigation must not be prevalent in East Fork Earley Creek because no culvert or other conveyance structure is present beneath I-90. If subirrigation was prevalent and without a conveyance structure beneath I-90, substantial amounts of water would back up against the interstate.

COMMENT MK 13

Appendix D11-AVF, Section D11.4.5 Agricultural Practices, 13. On Page D11-8, last paragraph, it states that the hay meadows along Slater Creek in Sections 2 and 11 are not within the boundaries of subirrigation or natural flood irrigation.

> (a) The areas symbolized as irrigated lands in Exhibit D11.4-1 do not necessarily correspond to hay meadows, as the imagery shows hay meadows in the SWNE, SENE, and NESE of Section 11, and the NWSW of Section 12. The hay meadows appear to correspond with the area mapped as "AG" in the Vegetation Map (Exhibit D8.2-1) in Addendum D8.
>
> (b) The irrigated area shown in Exhibit D11.4-1 near the Landen Ditch does overlap with subirrigation mapped in Exhibit D11.1-1.

Please re-evaluate the area of hay meadows along Slater Creek and revise the text accordingly. Comments No. 15 and 16 below also relate to this issue. (MDK)

RESPONSE MK 13

The text was revised in Section D11.5 to reflect the presence of limited hay meadows and overlapping of irrigation with subirrigation on the upper reaches of Slater Creek in Sections 2, 3, 11, and 12 of Township 57 North, Range 85 West. Exhibit D11.4-1 was revised to show irrigation in Sections 2, 3, 11, and 12 of Township 57 North, Range 85 West.

COMMENT MK 14

Appendix D11-AVF, Section D11.4.5 Agricultural Practices, On Page D11-8, last paragraph, it states that, besides Hart Bros Ditches, the remaining portion of the Slater Creek valley does not contain SEO water rights. This is not the case as Exhibit D11.4-1 shows Landen Ditch in the NENW of Section 11. This water right (P11695) does not appear in Addendum D11-4. Please revise the text and add this water right to Addendum D11-4. (MDK)

RESPONSE MK 14

The text was revised in Section D11.5 to discuss the Landen Ditch water right (P11695). A copy of the Landen Ditch water right was added to Addendum D11-4.

COMMENT MK 15

Appendix D11-AVF, Section D11.4.5 Agricultural Practices, 15. The irrigated acreage for the Landen Ditch water right appears to be 18 acres for one point of use and 22 acres for a second point of use. Please add these areas to Exhibit D11.4-1. (MDK)

RESPONSE MK 15

Exhibit D11.4-1 was revised to more accurately reflect irrigated lands in the vicinity of the Landen Ditch.

COMMENT MK 16

Appendix D11-AVF, Section D11.4.5 Agricultural Practices, 16. The Hall Ditch (SEO Permit 5195), mapped in Section 11 of Exhibit D11.4.1, apparently provides irrigation water for hayfields in the NESE of Section 11 (30 acres) and the NWSW of Section 12 (22 acres). This water right does not appear in Addendum D11-4. Please add this water right to the Addendum and add the irrigated acreages to Exhibit D11.4-1. (MDK)

RESPONSE MK 16

A copy of the Hall Ditch water right (SEO Permit 5195) was added to Addendum D11-4. Exhibit D11.4-1 was revised to depict irrigated lands in Section 12, Township 57 North, Range 85 West. The text in Section D11.5 was revised to discuss the Hall Ditch water right.

COMMENT MK 17

Appendix D11-AVF, Section D11.6 Extent of Alluvial Valley Floor, 17. Portions of Earley Creek and East Fork Earley Creek are within the AVF study area yet the permit application does not attempt to conclude if these streams contain AVFs. Presumably, the LQD will need to make an AVF finding on these streams. (MDK)

RESPONSE MK 17

See response to Comment BJ 26. Additional discussion has been added to aid WDEQ in the AVF findings of East Fork Earley Creek and Earley Creek. Both valleys are upstream of mining activities proposed by RAMACO such that no material damages are expected to either valley.

COMMENT MK 18

Appendix D11-AVF, Section D11.6 Extent of Alluvial Valley Floor, 18. The first bullet for Slater Creek on Page D11-9 dismisses the positive identification of unconsolidated stream laid deposits because a layer of colluvial material was found over alluvial material. However, as stated in Appendix D5 on Page D5-8 and Page D5-9, sub-rounding of the clinker present in the cuttings suggests water driven deposition of limited extent. Also, as discussed in Comment No. 3, the application did not evaluate unconsolidated streamlaid deposits in a manner that is consistent with identification criteria listed in LQD Guideline No. 9. The application has not provided sufficient evidence that unconsolidated stream laid deposits are not present along Slater Creek. (MDK)

RESPONSE MK 18

See response to Comment MK 3. The discussion on the Slater Creek valley has been further expanded to include the absence of unconsolidated stream laid deposits such as channel bars, splays, abandoned meanders, modern flood plains, and terraces that qualify for AVFs. Exhibit D11.3-1 clearly indicates the presence of undifferentiated alluvium and colluvium (Qac) in the Slater Creek valley.

COMMENT MK 19

Appendix D11-AVF, Section D11.6 Extent of Alluvial Valley Floor, 19. The third bullet on Page D11-9 for Slater Creek should be clarified that the width of natural flood irrigation in the valley is generally insufficient to provide for economic agricultural practices. However, economic agricultural practices clearly occur immediately upstream of the proposed mine permit boundary because of artificial flood irrigation of hayfields adjacent to the channel. These practices are documented by existing water rights that are approximately 100 years old. Please revise this discussion. (MDK)

RESPONSE MK 19

The text in Section D11.6 of Slater Creek's third bullet was revised to include the irrigated hayfield upstream of the permit boundary.

COMMENT MK 20

Appendix D11-AVF, Section D11.6 Extent of Alluvial Valley Floor, 20. The fifth bullet for Hidden Water Creek on Page D11-9 seems to dismiss the positive identification of

unconsolidated stream laid deposits because of colluvial material with shallow bedrock. However, as previously noted, this conflict with information in the Big Horn Mine permit concerning unconsolidated stream laid deposits on Hidden Water Creek. (MDK)

RESPONSE MK 20

Refer to response of Comment MK 4. The Big Horn Mine permit boundary has been added to Exhibit D11.1-1. The text in Section D11.6 has been updated to include a summary of the discussion stating that the Big Horn Coal Permit No. 213-T2 SDD determined the limits of the AVF, and no portion of Hidden Water Creek was determined as being AVF.

COMMENT MK 21

Appendix D11-AVF, Section D11.7 Mining of Alluvial Valley Floor, Although the LQD has not yet issued its formal finding, the segment of the Tongue River adjacent to the proposed permit area, which was not declared under previous LQD findings, likely contains an AVF.

(a) If this AVF is significant to farming, the applicant must comply with LQD Coal Rules and Regulations Chapter 3, Section 2(d)(ii) and demonstrate that the proposed mining operations will not materially damage the quantity and quality of water that supplies the Tongue River AVF. The absence of direct mining on the Tongue River AVF does not relieve the requirement of assessing the probable hydrologic impacts of the proposed operation to the AVF, particularly since the groundwater model in Mine Plan Addendum MP-3 predicts drawdown in the Tongue River alluvium. (MDK)

(b) Regardless of the significance to farming, the applicant must also maintain and/or restore the essential hydrologic functions of the Tongue River AVF. The applicant must therefore identify the essential hydrologic functions of the Tongue River AVF and either (1) provide an analysis that the proposed operation will not hamper the essential hydrologic functions, or (2) demonstrate that the essential hydrologic functions will be restored. The essential hydrologic functions for another part of the Tongue River AVF are described in the Big Horn Mine Permit SDD (shown in Brook Mine Appendix D11 on Page Addendum D11-2-27), so this may be a good starting point to consider. (MDK)

(c) A monitoring system is also required to demonstrate the essential hydrologic functions are maintained, as per LQD Coal Rules and Regulations, Chapter 5, Section 3(b)(ii). Since the groundwater model (Mine Plan Addendum MP-3) predicts 2.5 feet of drawdown in the Tongue River alluvium, the monitoring

system may likely contain alluvial monitoring wells and periodic evaluation of color-infrared imagery. (MDK)

RESPONSE MK 21

Revised text as requested. Revised text by adding information regarding the essential hydrologic functions of the declared AVFs (Tongue River and Goose Creek) from the SDD in Addendum D11-2. Also, added portion of text to describe possible monitoring system and plan for the AVFs that may be affected.

COMMENT MK 22

Appendix D11-AVF, Section D11.7 Mining of Alluvial Valley Floor, 22. The essential hydrologic functions of the adjacent Goose Creek AVF must also be maintained during the proposed mining operation. The application needs to list these functions, as described in the Big Horn Mine Permit SDD (shown in Brook Mine Appendix D11 on Page Addendum D11-2-27). A monitoring system is also required to demonstrate that the essential hydrologic functions will be maintained. (MDK).

RESPONSE MK 22

See response to comment MK 21.

Mine Plan

Comment BJ 28

Volume 11, Mine Plan, Section MP.1.2.1, pg. MP-4, Tunnel and pillar widths are discussed in general terms. Please approximate a range for the widths, in feet, in the narrative to give context to the discussion.

Response BJ 28

Added text as suggested.

Comment BJ 29

Volume 11, Mine Plan, The fifth sentence, beginning with "To minimize the amount of exposure..." does not make sense. Please rewrite the sentence for clarity.

Response BJ 29

Added text as suggested.

Comment BJ 30

Volume 11, Mine Plan, The narrative also references figure MP.1-3 as a general schematic of the highwall mining operation. The figure depicts significant vertical

highwalls above the mining operation. The text mentions that the highwalls will be vertical where the Masters and Carney converge but the illustration depicts conditions where the coal seams appear to be separated by a considerable thickness of parting. It is our experience that vertical highwalls in the Powder River Basin are unstable and should be discourage wherever possible. What would the maximum thickness of burden approximate where the vertical highwalls will exist? Please include an average on the schematic as has been done for pit width and bench width.

Response BJ 30

The figure has been updated to include the average depths.

Comment BJ 31

Volume 11, Mine Plan, Pages MP-3 and MP-4, These pages describe the highwall mining operation in vague generalities. The narrative states that the continuous miner will advance into the working face to a depth of 2,000 feet. The manufacturer's specifications for the ADDCAR system state that the depth of a cut is 1,600 feet. Is this a discrepancy of 400 feet or is there a difference in mining tools and the ADDCAR system comes with multiple depth capacities. Please clarify.

Response BJ 31

Conversations with ADDCAR representatives indicates that they will be able to extend the range of the highwall mining system so cuts up to 2,000 feet can be achieved.

Comment BJ 32

Volume 11, Mine Plan, A general word of guidance – Ramps are mentioned in the narrative as designed to an 8% grade. The Cat 777 can generally handle this grade fairly well under most conditions. The Mack Titan trucks, however, may be problematic under certain conditions. Entering the pit on the ramp could be difficult for the Mack trucks with pups if the ramp has been watered to control dust. The overburden materials used for ramp systems are generally silty with a clay matrix and overwatering can create slipping hazards for vehicles. A truck with multiple trailers will have difficulty navigating these conditions. A 6% ramp under these situations is strongly advised.

Response BJ 32

Revised text as suggested.

Comment BJ 33

Volume 11, Mine Plan, The narrative describes the tunnel width as variable, depending on the cutting head chosen. Please indicate approximate footages of the tunnel widths. For example, Bucyrus and Joy manufacture continuous miners that

have heads ranging from 11 to 12 feet in width. A mention of those widths would clarify the narrative. Also the protective coal pillars are described but have no dimensions indicated. The pillar width to tunnel width is crucial so an approximation of the remnant pillars width in feet is required. Please include approximate widths for tunnel and pillar widths.

Response BJ 33

See response to Comment BJ 28. The text has been updated as requested.

Comment BJ 34

Volume 11, Mine Plan, Section MP.1.2.2, The dozer push method of overburden removal is not adequately described. Though Figure MP.1-4 does depict the dozer push materials to some extent, the overlapping nature of the multiple lift system can be confusing to some. The narrative on page MP-4 is too brief. Please elaborate further on the dozer push staging and overburden removal. Perhaps an illustration that depicts the dozer removal in stages would be more appropriate. This can be accomplished by creating a series of illustrations rather than only one. Please clarify the methodology.

Response BJ 34

Revised text as requested. Created Figure MP.1-5.

Comment BJ 35

Volume 11, Mine Plan, Section MP.1.4, Pg. MP-5, The last sentence does not make sense. Please rewrite the sentence.

Response BJ 35

Removed last sentence for clarity.

Comment BJ 36

Volume 11, Mine Plan, Section MP.4.2.3, Pg. MP-15, The discussion of temporary topsoil stockpiles describes creating a ring ditch around the topsoil pile if there is a potential for water erosion during the 2 week to 6 month life of the pile. Since the climate is unpredictable and subject to rapid changes, temporary topsoil stockpiles (2 weeks to 6 months) will be required to have ring ditches in all cases with no qualifiers. LQD writes more violations concerning inadequate topsoil practices than any other issue. Rewrite the narrative to indicate that all temporary topsoil stockpiles will have a ring-ditch and berm created for piles having a life of 2 weeks or more. Keep in mind that even a short-lived topsoil stockpile could generate a violation if a sudden rainstorm were to erode the soil and waste it on the surrounding terrain. RAMACO may want to allow for this as well

Response BJ 36

Updated text as requested.

Comment BJ 37

Volume 11, Mine Plan, Section MP.4.3.4, Pg. Mp-17, A swell factor of 16% is being used to convert bank cubic yards to loose cubic yards. The number was generated from information attained from Big Horn Coal (PT213). Where was this information located? Many of the coal mines in the northwestern corner of the Powder River Basin use a swell factor of 13% - 14% since the overburden material is finer grained, with a higher clay content than mines on the eastern margin of the basin. Please cite the use of a 16% swell factor.

Response BJ 37

Revised text as requested. Table MP.4-9 provides typical swell and load factors of materials.

Comment BJ 38

Volume 11, Mine Plan, Section MP.6.1, Pg. MP-39, The second paragraph discusses surface runoff attenuation during mine years 4 and 5. The peak flow rates for precipitation events will be attenuated by the mining trenches that lie perpendicular to the flow in the local drainages. What flow events are expected to be attenuated by the trenches? Will the 2 year, 10 year, or 100 year events be considered as an average event? Please modify the narrative, in general terms, to define which precipitation event will be used when designing the pit drainage plans.

Response BJ 38

Updated text as requested.

Comment BJ 39

Volume 11, Mine Plan, Section MP.8, Pg. MP-47, The narrative mentions that potable water will be hauled to the mine an placed in a cistern. Why is a cistern system being considered for potable water instead of a reverse osmosis unit? The local residents use such systems as do the mines. How large of a cistern will be used for water storage? Please modify the narrative to expand on the rational behind using a cistern.

Response BJ 39

The text has been revised. The final potable water system has not been determined.

Comment BJ 40

Volume 11, Mine Plan, Section MP.9.9, Pg. MP-52, When pre-dug mud pits are to be used for exploration drilling, the topsoil must be protected from contamination by removal and stockpiling. The pit location must be stripped to the base of the soil with an areal extent that allows the pit materials to be stacked as spoil without encroaching on native surface. Reclamation shall occur in a manner that will best restore the surface to its pre-disturbance condition. These contingencies need to be better described in the narrative. Please modify the text to reflect the aforementioned conditions.

Response BJ 40

Revised text as suggested.

Comment BJ 41

Volume 11, Mine Plan, Section MP.18, Pg. MP-68, The second paragraph discusses the speed limits that will be set on haulroads to protect wildlife. Approximately what speed limits will be used?

Response BJ 41

Updated text with a 45 MPH Speed Limit.

Comment BJ 42

Volume 11, Mine Plan, Section MP.20, Pg. MP-69, The brief description of underground mining should state that no "conventional" underground mining will occur. Highwall coal recovery is an underground mining technique, but no personnel work underground. Thus the mining is modified underground mining.

Response BJ 42

Revised text as requested.

Comment BJ 43

Volume 11, Mine Plan, Section MP.24, Pg. MP-70, The word "Operation" is misspelled in the title (OPERTATION).

Response BJ 43

Revised text as requested.

Comment BJ 44

Volume 11, Mine Plan, Section MP.25, Pg. MP-71, The second paragraph, third sentence, discusses requiring additional permitting. The word "additional" is misspelled (addidtional).

Response BJ 44

Revised text as requested.

Comment BJ 45

Volume 11, Mine Plan, TABLE MP.1-1, The total disturbance should read 895 acres, not 775. Please correct the table.

Response BJ 45

Revised text as requested.

Comment BJ 46

Volume 11, Mine Plan, FIGURE MP.1-3, The average width of the pit floor and safety bench have average widths indicated on the drawing. Please insert the average heights of the vertical highwalls in these situations.

Response BJ 46

Revised Figure MP.1-3 requested.

Comment BJ 47

Volume 11, Mine Plan, FIGURE MP.1-4, The cross section, as drawn, is confusing. It would appear that dozer pushed, loose material significantly exceeds the bank material available in the highwall. The figure is not drawn to scale but a more accurate attempt to represent dirt volumes would be appreciated. Also, the cross section itself does not make sense in the way that operational steps are illustrated. A series of cross sections over time would be much more beneficial to define the appearance of the dozer push. Please modify the figure accordingly. A sample of an idealized schematic is attached. It is volumetrically accurate.

Response BJ 47

Figure MP.1-4 has been updated to add clarity.

Comment BJ 48

Volume 11, Mine Plan, FIGURE MP.4-3, Pg. MP-F7, What is the narrow, vertical rectangle located in the center of the coal stockpile coming from the stacker?

Response BJ 48

The figure MP.4-3 has been updated to remove the rectangle

Comment BJ 49

Volume 11, Mine Plan, Addendum MP-3, Pg. MP-3-2, The introductory paragraph states that the Brook Mine is approximately 6 miles northwest of Sheridan, Wyoming. However, in earlier narrative, the mine is said to be 6 miles south of the Montana border and 8 miles northwest of Sheridan. This passage is found in the Land Use Appendix D1-1. The distances should be uniform in all instances throughout the narrative.

Response BJ 49

Revised text as requested.

Comment BJ 50

Volume 11, Mine Plan, Addendum MP-3, Section 2.3, Figures 2.3-1 and 2.3-2 show the potentiometric surfaces for the Carney and Masters coal beds. The contours daylight and appear to be in mid-air over the Slater Creek drainage. Please adjust the contours so they terminate at the outcrop.

Response BJ 50

Revised Figures 2.3-1 and 2.3-2 in Addendum MP-3-17 as requested.

Comment BJ 51

Volume 11, Mine Plan, Addendum MP-6, Section MP-6.1, Pg. MP-6-3, The second to last paragraph indicates that the depth of the penetration by the continuous miner will be 2,000 feet. Is this an approximation since the listed depth for the ADDCAR device is 1,600 feet. Please clarify the discrepancy.

Response BJ 51

Based on communication with ADDCAR's representative 2,000 ft penetration is achievable. Generally, users of the ADDCAR system encounter increasing depth of cover with greater penetrations requiring wider web pillar between holes. The loss in recovery due to the wider pillars potentially negates any production gain from increased penetration.

Comment BJ 52

Volume 11, Mine Plan, Addendum MP-6, Section MP-6.1, Pg. MP-6-4, The discussion in this sections centers around the necessity of maintaining a straight, even cutting depth to prevent pillars from being cut too narrow to hold up the roof material and

allow subsidence. The 1:1 ratio suggested by NIOSH is acceptable as long as roof strength tests bear up (no pun intended) the use of the general guidelines. A small sample of tests have been run on roof and coal rock intervals and those tests have been reported. LQD requests a narrative placed either in this location of the text or other location of RAMACO's choosing that discusses the strength tests results as it pertains to roof stability. Also, a commitment must be made in the document to sample roof material for strength testing for at least one location in every panel that will mined by the continuous miner prior to mining. Our concern rests with the competence of the overlying lithologies and their possibility for subsidence. This has been a problem in this area for decades and care must applied to characterize roof materials accurately.

A sampling plan to test compressive strength above each coal panel must be submitted prior to permit approval.

Response BJ 52

RAMACO must submit and have an approved MSHA Ground Control Plan that contains the strength test and commitments requested. RAMACO will provide this information when it is received and include it in the Subsidence Control Plan.

Comment BJ 53

Volume 11, Mine Plan, Addendum MP-6, Please provide the data used as input for the ARMPS-HWM program.

Response BJ 53

The following input values were used in the ARMPS-HWM programp: compressive strength of coal - 660 psi, rock density - 162 lbs/ft3, abutment angle of 21°

Comment BJ 54

Volume 11, Mine Plan, Addendum MP-6, FIGURE MP-6.2-2, The scale of the photograph is too large to adequately depict the zones of surface subsidence from the old underground mines. Please blowup the scale to allow for clear visibility of the subsidence.

Response BJ 54

Cardno selected the larger scale to show that subsidence was limited to a small portion of the deep mine and not visible over other areas of the deep mine due its increased depth of cover. See revised figure in revision to Cardno's Subsidence Report

Comment BJ 55

Volume 11, Mine Plan, Addendum MP-6, FIGURE MP-6.2-3, This figure is very effective. It clearly shows the subsidence evident on the air photo as it correlates to

the old underground map superimposed on it. One problem, though, is that the air photo base needs to be darker, with greater contrast. The photo is a bit washed out and manipulation of the brightness/contrast aspects of the photo would help its visibility greatly. Please recalibrate the photo tonality.

Response BJ 55

See revised figure in revision to Cardno's Subsidence Report

Comment BJ 56

Volume 11, Mine Plan, Addendum MP-8, Section MP-8.5.4, The last sentence in this section indicates that there is no suitable habitat available for the Northern Long-Eared Bat. Does this include the climax Cottonwood Forest along Tongue River? The well developed understory along the river is suitable for Long-eared bat habitation though none have been located in this area. Or does the negation of the existence of the bat only apply to the area in the hills above the river where the mining will occur. Please clarify the area that was considered for potential Long-Eared Bat occurrence.

Response BJ 56

The text was revised to clarify.

Comment BJ 64

EXHIBITS, Mine Plan, Exhibit MP.1-1, The patterns used to depict surface disturbance from year to year are too similar. It is difficult to differentiate between year 0 and year 2, for example. Please recreate the surface disturbance layers to be more unique. The overburden removal sequence map (Exhibit MP.4-4) is a good example.

Response BJ 64

Revised Exhibit MP.1-1 as requested.

Comment DM 6

Mine Plan, MP.3.1.3 – A primary haul road appears to cross the Tongue River using the bridge that is currently in place from previous mine usage. Please discuss any updates needed for that bridge to be adequate for the intended usage.

Response DM 6

The revised primary haul road alignments do not cross this bridge and the use of this bridge for haul trucks and other traffic associated with the mine is not planned. Updated Exhibit MP.3-1.

Comment DM 7

Mine Plan, Exhibit MP4-3 shows Overburden Stockpiles OB-12 and OB-13, and Topsoil Stockpile TS-6 being located directly in the Slater Creek channel, without any mention of redirecting slater creek, or otherwise preventing the hydrologic consequences of damming up the creek with Overburden and Topsoil stockpiles. Please correct.

Response DM 7

Revised Exhibit MP.4-3 as requested with OB-12 and 13 as well as TS-6 moved out of slater creek channel.

Comment DM 8

Mine Plan, MP.7 – Because of the proximity of the planned facilities primarily in T57, R84 Sec.15 to the Tongue River and Goose Creek, I would like to see surface water monitoring upstream of these facilities on Goose Creek and Tongue River, and downstream of these facilities on Tongue River. Please discuss the feasibility of fulfilling this request, with reasoning.

Response DM 8

Revised text as requested. Revise Exhibit MP.7-1 with USGS stream gage location that is within the viewing area.

Comment DS 11

Mine Plan, 11) Depending upon the outcome of required overburden sampling, commitment for special handling of unsuitable overburden will be required to assure that placement of unsuitable materials so as not to hinder plant growth or to adversely affect surface or groundwater quality will be required in the Mine Plan.

Response DS 11

See section MP.4.6.1, fourth paragraph.

Comment DS 12

Mine Plan, 12) Does RAMACO provide a better detailed description of the topsoil salvage and handling process than that discussed in section MP.4.2.1? The description provided is not detailed so as to provide a description of the equipment used, the methods for assuring adequate soil salvage, or whether topsoil and subsoil salvage will follow the recommendations in Appendix D7 for stockpiling topsoil separate from subsoil. (Map Unit A Cambira Loam, Map Unit B Zigweid Loam, Map Unit C Forkwood Loam, Map Unit G Bauxson Loam, Map Unit H Haverdad Loam, Map Unit U Ulm Clay Loam) Please understand that topsoil and subsoil may only be mixed

if both meet Guideline 1 suitability criteria. Please include more detail for topsoil salvage and handling or let the LQD know where the information may be accessed.

Response DS 12

Revised text as requested.

Comment DS 13

Mine Plan, 13) Section MP.4.2.3 all topsoil stockpiles, even those stockpiled temporarily or windrowed at the edge of a disturbance, must be identified by a topsoil sign from initiation of the salvage operation as required under Chapter 4, Section (c)(D) that states that signs must be in place at the time stockpiling is begun. Therefore, the text in the first paragraph of this section stating that signs will not be required must be corrected. Signs will always be required to identify all salvaged topsoil and must be placed on all approaches to the topsoil and no more than 150 feet from the stockpile location.

a. Additionally, all stockpiled topsoil, even windrowed along the edge of a disturbance, must be protected against wind and runoff erosion, compaction or potentially toxic materials no matter what the longevity designation of the stockpiled material. The Mine Plan must provide a commitment to these requirements.

Response DS 13

Revised text as requested.

Comment DS 14

Mine Plan, 14) Section MP.4.2.4(4.2.1?) does not discuss topsoil salvage during winter months. Salvage during the winter months, especially of shallow soil profiles, is discouraged by the LQD due to a lack of depth control caused by varying depths of permafrost. Please provide discussion concerning this subject.

a. Even short term and temporary topsoil stockpiles must be identified on maps and the volumes accounted for in annual reports. Several criteria that must be considered are well established for placement of topsoil stockpiles and include:

i. Construction of stable areas to minimize wind and water erosion

ii. Stockpiles will not be placed in areas where runoff water can contribute to the loss of topsoil (side hills or drainages)

iii. Stockpiles will not be constructed on unsuitable backfill locations

iv. Stockpiles will have associated sediment control established in advance of construction

v. Stockpiles will not be constructed at locations of known cultural or wildlife resources for which protection or mitigation is required.

b. Other topsoil stockpile construction and maintenance considerations include:

i. Stockpiles will be constructed with slopes of 3h:1v or less

ii. Bypass ditches, berms or equivalent may be used to divert runoff around stockpiles

iii. Stockpiles that will remain for less than 1 year may be revegetated or treated with urface roughing methods such as ripping or discing to reduce runoff and wind erosion potential.

Response DS 14

Revised text as requested.

Comment DS 15

Mine Plan, 15) Section MP.4.2.7, page MP 4-5. Aside from operation of soil salvage equipment with the potential for soil contamination due to blown hydraulic hoses or small fuel leaks, the LQD expects not contamination of soil during the mining operation. Contamination of subsoil and overburden is more likely. The LQD recommends that RAMACO re-phrase the section header and text to show petroleum contaminated materials being and not soils.

a. What criteria will RAMACO use to determine if spills require reporting to the DEQ, and what process will be used in spill reporting?

b. What will the operational procedure be for management of the proposed on-site landfarm for contaminated materials, and where will it be located? Will it be identified on the ground by a sign?

Response DS 15

Revised text as requested.

a. See Section MP-4.5.2 of Addendum MP-4
b. See Section MP-4.5.3 of Addendum MP-4

Comment DS 16

Mine Plan, Section MP.4.2.8. Please provide a detailed description for the disposal of empty drums, not just a citation of the EPA Rule which is probably not know by most readers of this public document.

Response DS 16

The EPA Code Federal Regulation cited is public information which may be accessed online or at a public library if the reader desires to know the specifics requirements and steps regarding container disposal.

Comment DS 17

Mine Plan, MP.4.3.1 discusses overburden removal processes. However, little detail is given to explain the actual process for overburden handling. Will the first cut be stockpiled and used to fill the last cut? When special handling is required, which is almost certain given the nature of some overburden and the need for some soil replacement materials, what assurance will be made that poor quality materials will be safely located in the backfill or in separate stockpiles, or that topsoil substitutes will be handled and stored as topsoil in a useful manner as required under Chapter 4, Section 2(b)(x)(A)? Please provide a more detailed overburden handling plan. Perhaps some of these details are observed in later sections. Please provide additional details not provided elsewhere.

Response DS 17

See Sections MP.4.3.5, MP.4.6 and MP.4.7. Revised text as requested.

Comment DS 18

Mine Plan, Section MP.4.3.4. The volumetric analysis shown in Table MP.4-4 and MP.4-5 may change depending on results of required additional overburden sampling and volumetric analysis. If the overburden depth overlying coal changes as a result of additional sampling, the volumetric analysis will also change. If post mining contour changes are necessary due to adjusted swell factors permit revision will probably not be required until the changed PMT exceeds plus or minus 20 feet of the approved at which time a Reclamation Plan revision will be required. This kind of detail should be included in the permit commitments.

Response DS 18

Revised text as requested.

Comment DS 19

Mine Plan, Section MP.4.6.1. The typical overburden sampling protocol as stated in Guideline 1 calls for one sample taken every 40 square acres of the permit area. Overburden sampling for underground mining operations differs from typical coal mine sampling protocols and is stated in the Coal Rules, Chapter 7, Section 1(a)(i)(A) which calls for overburden sampling and characterization on areas where surface operations will cause removal of overburden down to the level of the coal seam. Please

make changes to the text accordingly and perform additional overburden sampling where required.

Response DS 19

Revised text as requested.

Comment DS 20

Mine Plan, Section MP.4.3.5. A statement was made in this section that "Overburden stockpiles will only block ephemeral drainages if runoff control and sediment control measures are made and approved by WDEQ/LQD." Placement of overburden in ephemeral drainages will require a discussion of how water will be diverted around the overburden stockpile to prevent impoundment of water in addition of a discussion of sediment control measures for the stockpile to prevent of-site impacts of erosion down-slope from the stockpile. The LQD recommends that no overburden stockpiles be placed in ephemeral drainages.

Response DS 20

Revised Exhibit MP.4-3.

Comment DS 21

Mine Plan, Tables MP.1-1, MP.1-2 and MP.4-1 must show the actual years for proposed progressions, or the year 1 progression must be tied to a specific year in the Mine Plan text.

Response DS 21

Revised tables as requested. Added note saying that Year 0 corresponds to the year 2016

Comment DS 22

Mine Plan, Tables MP.4-3 and MP.4-5. Topsoil volumes appear to be underestimated in TS- 2, TS-6, TS-10 and TS-11 while underestimating the proposed volume in TS-1. Also overburden volumes appear to be underestimated in OB-4, OB-7, OB-11, OB-14 and OB-15, and overestimated in OB-16, which may affect estimates presented in TableMP.4-4 as well.

Response DS 22

Volumes are estimated based on the stripping volumes and available backfill area with excess material going to and from stock pile for contemporaneous reclamation. No updates will occur in response to this comment.

Comment DS 23

Mine Plan, Exhibit MP.4-2 and MP.4-3 must show the dates (actual years) for the salvage of topsoil and removal of overburden, or year 1 must be tied to an actual year when operations will begin (2016, 2017, etc.). The map or tables in the Mine Plan must provide proposed years and volumes for stockpile construction as well.

Response DS 23

Revised Exhibits as requested. Added note saying that Year 0 corresponds to the year 2016 on all Exhibits with years.

Comment DS 30

Reclamation Plan, All Mine Plan Maps with progressions must show the actual years of the initial disturbance or mining activity, or the progression must be linked to a specific year in Reclamation Plan text. The maps must also include the contour interval.

Response DS 30

Revised Exhibits as requested.

Comment DE 1

Mine Plan, Figure MP.1.2 and page MP-3 – MSHA and best practices may require a safety berm on this safety bench which could require a wider bench. Figure MP.1.2 notes a minimum of 35' but the text on page MP-3 just states the bench will be 35' wide. There is a real possibility this safety bench might be used for light plants so it may need to be wider for access and small vehicle use as well as providing a safety bench.

Response DE 1

Revised text as requested.

Comment DE 2

Mine Plan, Table MP.1-1 – The total disturbance doesn't seem to match the overall disturbance listed for the trench mining and facilities. Please explain or correct.

Response DE 2

Revised table as requested.

Comment DE 3

Mine Plan, Section MP.2.3, page MP-9 – The 1st sentence would be better if it started, "The explosive materials…". The 2nd sentence should replace the word "detonating"

with “explosive”. The 5th sentence in the 2nd paragraph should include cast boosters. The 6th sentence in the 2nd paragraph should discuss storage of emulsions, water gels, and slurries also. This section should also commit to proper signage of the explosive storage area. Please correct.

Response DE 3

Revised text as requested.

Comment DE 4

Mine Plan, Section MP.5.7.5, page MP-34 – The word “of” in the 2nd line of the last paragraph should be “or”. Please correct.

Response DE 4

Revised text as requested.

Comment DE 5

Mine Plan, Section MP.6.1, page MP-39 – The 1st sentence of the 1st full paragraph needs some improvement so it reads properly and makes sense. Please correct.

Response DE 5

Revised text as requested.

Comment DE 6

Mine Plan, Section MP.14.2, page MP-55 – The 2nd paragraph discusses the use of “cast primers”. The term should be “cast boosters” as it doesn’t become a primer until the detonator is added or detonating cord is attached to it. The discussion of priming holes should describe the use of a cast booster and how it is made-up to become a primer, i.e. with detonating cord or a detonator (blasting cap). Please correct.

Response DE 6

Revised text as requested.

Comment DE 7

Mine Plan, Section MP.14.3.2, page MP-56 – In the 2nd line the item “(primer with detonator)” should be changed to “(cast booster with detonator)”. Please correct

Response DE 7

Revised text as requested.

Comment DE 8

Mine Plan, Section MP.14.3.2, page MP-56 – The 2nd paragraph discusses powder factors in coal and overburden and the high end of the ranges is extremely high for the type of rock and coal in this area. RAMACO should eliminate the range and simply state powder factors will be adequate to effectively fragment the overburden and coal.

Response DE 8

Revised text as requested.

Comment DE 9

Mine Plan, Section MP14.3.3, page MP-56 – RAMACO should reword this to say that initiation will be done using non-electric or electric systems, which may include electronic detonators, shock tube detonators, detonating cord, electric detonators or a combination of these. Igniter cord is used to initiate safety fuse and it's highly unlikely that any safety fuse will be used at this mine. Please correct.

Response DE 9

Revised text as requested.

Comment DE 10

Mine Plan, Section MP.14.4, pages MP-56 & 57 – It is probable that emulsions will also be stored on site so it should be mentioned since emulsion/ANFO blends are the most widely used product in wet holes. Please correct.

Response DE 10

Revised text as requested.

Comment DE 11

Mine Plan, Section MP.14.6, pages MP-57 & 58 – Residents who request a pre-blast survey must make the request to the permittee and the Administrator of Wyoming Land Quality Division (LQD). The permittee is responsible for getting the pre-blast survey done and distributed to the person that requested it and the LQD Administrator. Please correct.

Response DE 11

Revised text as requested.

Comment DE 12

Mine Plan, Section MP.14.7, pages MP-58 & 59 – LQD will not approve protecting uninhabited structures (what LQD refers to as engineered structures) at 8.0 inches

per second (ips) of peak particle velocity. LQD would allow a maximum limit of 5.0 ips. RAMACO would have to assure that this limit was not exceeded by the use of a seismograph at these structures on all blasts. RAMACO could apply for a modified scale distance factor to show compliance with this limit of 5.0 ips by submitting a vibration study and doing a regression analysis to show the allowable ppv is not exceeded at a 95% confidence level. However, this will require the vibration study be submitted with seismograph records from shots in the mining area so it cannot be done until after some blasting has been done at the mine. Please correct this text.

Response DE 12

Revised text as requested.

Comment DE 13

Mine Plan, Section MP.14.8.1, page MP-60 – The discussion on typical pattern size should be changed to more general language. Using the parameters given the powder factor used would be approximately 0.16 lbs./CY using ANFO and in the 0.23-0.25 lbs./CY range when shooting an emulsion blend. These powder factors are not high enough to adequately fragment the overburden. Please correct.

Response DE 13

Revised text as requested.

Comment DE 14

Mine Plan, Section MP.14.8.1, page MP-60 – The 2nd paragraph says if water is in the holes a slurry or water gel explosive will be used. Most likely an emulsion/ANFO blend with good water resistance will be used in wet holes and not a slurry or water gel. Please correct.

Response DE 14

Revised text as requested.

Comment DE 15

Mine Plan, Section MP.14.8.1, page MP-60 – The 3rd paragraph discusses the explosive weight per hole and the powder factors. The explosive densities listed are correct but the pounds per hole and powder factors are incorrect. In a 7.875" hole and with a density of ANFO of 0.85 g/cc the pounds/foot of hole is 17.95 lbs. and with 24' of powder column the pounds/hole is 431 lbs., making the powder factor = 0.16 lbs./CY. Similarly using an emulsion blend of 1.32 g/cc the pounds/foot = 27.87 lbs. and the pounds per hole would be 669 lbs. so the powder factor =o.25 lbs./CY. In the 50' hole described with 26' of stemming and 24' of powder the powder distribution is

poor so it would likely lead to blocky material near the top of the bench. Please correct.

Response DE 15

Revised text as requested.

Comment DE 16

Mine Plan, Section MP.14.8.2, page MP-61 – Drilling a 35' x 35' pattern in a 15' thick coal seam with a 7.875" hole and 4.5' of stemming will probably result in excessive flyrock, stemming ejection, high airblast and hard zones between the holes. Expecting to stem 4.5' is not realistic – in the field the blaster is going to try to hold for 4' or 5' of stemming. Again RAMACO discusses using slurry or water gel in wet hole when an emulsion/ANFO blend with high water resistance would probably be used. Please correct. Also the powder factor listed for coal is probably a little high so it would be better to just say that the powder factor will sufficient to fragment the coal for the prime movers. Please correct.

Response DE 16

Revised text as requested.

Comment DE 17

Mine Plan, Section MP.14.10, page MP-63 – The last bullet item says that detonation during electric storms might be a reason for unscheduled blasting. This is confusing because it makes it sound like the operator would shoot during electric storms and the only safe thing to do when an electric storm approaches is clear the pattern and keep everyone a safe distance away until the storm passes. Please correct.

Response DE 17

Revised text as requested.

Comment DE 18

Mine Plan, Addendum MP-7, Blaster's Log – Under the "Holes" heading RAMACO should use "burden" not the term "burden spacing". On the 2nd page the word "signiture" should be changed to "signature". Please correct.

Response DE 18

Revised text as requested.

Comment MK 23

Mine Plan, Section MP.20 Alluvial Valley Floors, The discussion of underground mining in AVFs does not seem necessary given there is no plans for underground mining at the Brook Mine. Furthermore, it is conceivable that circumstances could exist where underground mining of an AVF would not be allowed by the LQD. For example, if the AVF was significant to farming and underground mining of the AVF would result in surface effects such that material damage to the AVF would occur. (MDK)

Response MK 23

While no underground mining is proposed within delineated AVFs, the mine maintains this option. If underground mining is ever planned under the AVF, the appropriate revisions will be made. Revised text as requested.

Comment MK 46

Mine Plan, Section MP.4.1 Mining Sequence, 20. On Exhibit MP.4-1, please attempt to show the areas that would be highwall mined versus surface mined. These layers are currently not found until Exhibit MP.15-1. Alternatively, the text in this Section could specify that the areas to be highwall versus surface mined are shown in Exhibit MP.15-1. (MDK)

Response MK 46

Revised text as requested.

Comment MK 47

Mine Plan, Section MP.5.1 Surface Drainage and Erosion Plan, 21. Only Slater Creek and Hidden Water Creek are labeled and shown in Exhibit MP.5-1. In order to better evaluate the Hydrologic Control Plan, please provide labels and locations for the other stream channels, including Tongue River, Goose Creek, East Fork Earley Creek, and the other unnamed channels (as shown on the USGS 24K Quad) on the proposed permit area. (MDK)

Response MK 47

Revised Exhibit MP.5-1 as requested.

Comment MK 48

Mine Plan, Section MP.5.1 Surface Drainage and Erosion Plan, 22. Exhibit MP.5-1 shows overburden stockpiles OB-13 and OB-12, as well as topsoil stockpile TS-6, occurring directly over the Slater Creek channel. The Exhibit does not show any diversion ditches to be used in these locations. Please either move the location of the

stockpiles or present a plan to use a diversion to route Slater Creek around the stockpiles. (MDK)

Response MK 48

Revised Exhibit MP.5-1 as requested.

Comment MK 49

Mine Plan, Section MP.5.2 Sedimentation and Wastewater Impoundments, 23. Exhibit MP.5-1 shows the locations of two "sediment basins". Are these considered the same as "sedimentation impoundments", as discussed in this Section? If so, the designs for these two impoundments are not found within the Mine Plan. (MDK)

Response MK 49

The "sediment basins" shown in Exhibit MP.5-1 are not considered the same as the "sediment impoundments(reservoirs)" . Sediment Basins are considered an Alternative Sediment Control Measure and are discussed in Addendum MP-1. As such, the design for these "sediment basins" are not included in the Mine Plan. However, the design criteria and construction standards for "sediment basins" are similar to those discussed within Section MP.5.2 of the Mine Plan. Revised text as requested.

Comment MK 50

Mine Plan, Section MP.5.3 Flood Control, 24. This section discusses flood control reservoirs but it is not mentioned how many flood control reservoirs would be constructed and where their locations would be. Please provide this information to comply with LQD Coal Rules and Regulations, Chapter 2, Section 5(a)(i)(D)(IV). (MDK)

Response MK 50

Revised text as requested.

Comment MK 51

Mine Plan, Section MP.5.4 Diversions, 25. This section mentions permanent diversions, but there are no apparent plans for permanent diversions. Please discuss if permanent diversions are anticipated as part of the mining operation, or if all diversions will be temporary. (MDK)

Response MK 51

Revised text as requested.

Comment MK 52

Mine Plan, Section MP.5.4 Diversions, 26. Exhibit MP.5-1 shows only one diversion ditch for Hidden Water Creek in T57N, R84W, Section 9. Please discuss this particular diversion and its typical design in more detail in Section MP.5.4. (MDK)

Response MK 52

Revised text as requested. Add design exhibit of the Hidden Water diversion ditch.

Comment MK 53

Mine Plan, Section MP.5.5 Culverts, 27. Please provide a brief statement that commits to a periodic culvert inspection and maintenance plan to ensure that culverts will function properly over time. (MDK)

Response MK 53

Revised text as requested.

Comment MK 54

Mine Plan, Section MP.5.8 Mine Pit Dewatering Plan, 28. The first sentence references a sedimentation reservoir. Where is the location of this sedimentation reservoir? Are these the "sediment basins" shown in Exhibit MP.5-1? If not these sedimentation reservoirs need to be added to this Exhibit. (MDK)

Response MK 54

Revised text as requested.

Comment MK 55

Mine Plan, Section MP.5.8 Mine Pit Dewatering Plan, 29. The first paragraph references treating and discharging pit water. Please also reference in the text that appropriate WDEQ/WQD discharge permits (e.g., WYPDES) will be obtained prior to any discharge. (MDK)

Response MK 55

Revised text as requested.

Comment MK 56

Mine Plan, Section MP.6.1 Surface Water, 30. Exhibit MP.1-1 shows surface disturbance directly over a few areas of Slater Creek and Hidden Water Creek. Please identify the source of disturbance in these areas. Direct disturbance of the channel should be avoided unless there is a plan for a diversion to route the stream around the disturbance. (MDK)

Response MK 56

See response to Comment MK 76, 88 and 99. Revised text as requested.

Comment MK 57

Mine Plan, Section MP.6.1 Surface Water, 31. The mining trenches are often discussed with reference to Exhibit MP.1-1. However, the trenches are not shown on this Exhibit. Please add the locations of the trenches to Exhibit MP.1-1. (MDK)

Response MK 57

Revised Exhibit MP.1-1 as requested.

Comment MK 58

Mine Plan, Section MP.6.1 Surface Water, 32. On Page MP-39, in the first carryover paragraph from the previous page, it states that any surface runoff to come in contact with mining disturbance will be treated prior to discharge. Please also reference in the text that appropriate WDEQ/WQD discharge permits (e.g., WYPDES) will be obtained prior to any discharge. (MDK)

Response MK 58

Revised text as requested.

Comment MK 59

Mine Plan, Section MP.6.1 Surface Water, 33. Please discuss the diversion ditch for Hidden Water Creek in the first carryover paragraph on Page MP-39. (MDK)

Response MK 59

Revised text as requested. See Hidden Water Creek diversion Exhibit MP.5-2 for further details.

Comment MK 60

Mine Plan, Section MP.6.1 Surface Water, 34. On Page MP-40, in the first carryover paragraph from the previous page, it states that any surface runoff to come in contact with mining activities will be treated prior to discharge. Please reference in the text that appropriate WDEQ/WQD discharge permits (e.g., WYPDES) will be obtained prior to any discharge. (MDK)

Response MK 60

Revised text as requested.

Comment MK 61

Mine Plan, Section MP.6.1 Surface Water, 35. On Page MP-40, there is a sentence: "The surface disturbance activities will have temporary impacts on Slater Creek geomorphology including ground cover and soil erodibility". This statement is unclear. Are the impacts to the actual Slater Creek channel or the uplands and other tributaries in the watershed? Is it reduced ground cover and increased soil erodiblity? Please provide a more explicit description of the possible impacts. (MDK)

Response MK 61

See response to Comment MK 56, 76, 88 and 99. Revised text as requested.

Comment MK 62

Mine Plan, Section MP.6.1 Surface Water, 36. Please provide a discussion on whether the proposed mining operation would affect surface water quality such that designated uses would be affected on the major streams on and adjacent to the proposed permit area. (MDK)

Response MK 62

Revised text as requested.

Comment MK 63

Mine Plan, Section MP.6.1 Surface Water, 37. The text describes possible reductions in peak flows and storm volumes. Please describe in the PHC if the proposed mining operation will have any effects on nearby or downstream surface water rights. (MDK)

Response MK 63

Revised text as requested.

Comment MK 64

Mine Plan, Section MP.6.1 Surface Water, 38. Please add a brief statement to the PHC that if it is determined that the mining operation affects a surface water right, that water right would be replaced with a water source of similar quantity and quality as provided by W.S. § 35-11-415(b)(xii). (MDK)

Response MK 64

Revised text as requested.

Comment MK 65

Mine Plan, Section MP.6.1.1 Land Erosion Stability, 39. It is unclear the intent of this section. It seems to be out of place in the mine plan, as it discusses the USLE in the

context of only native and reclaimed conditions. Furthermore, no data other than the K factors are presented in Mine Plan Tables (Table MP.6.1). The Reclamation Plan also does not discuss applying the USLE, so it would seem that Section MP.6.1.1 should be removed unless a USLE analysis is completed of pre- vs during- vs postmine erosion predictions. (MDK)

Response MK 65

Section MP.6.1.1 has been removed.

Comment MK 66

Mine Plan, Section MP.7.1 Surface Water Monitoring, 40. It is unclear why reservoirs will be monitored in the operational monitoring program when these features were not sampled for during baseline characterization. If the reservoirs have the potential to be affected by the mining operation they should be sampled prior to mining with this information presented in Appendix D6. (MDK)

Response MK 66

Revised text as requested.

Comment MK 67

Mine Plan, Section MP.7.1 Surface Water Monitoring, 41. Please add the reservoir monitoring locations listed in Table MP.7-1 to Exhibit MP.7.1. (MDK)

Response MK 67

Revised Exhibit MP.7.1 as requested.

Comment MK 68

Mine Plan, Section MP.7.1 Surface Water Monitoring, 42. Please add the northing/easting State Plane coordinates for the surface water monitoring stations to Table MP.7.1. (MDK)

Response MK 68

See response MK

Comment MK 69

Mine Plan, Section MP.7.1 Surface Water Monitoring, 43. Please identify what type of water quantity data will be generated from the continuous stage monitoring. For example, will mean daily flow rates and/or peak daily flow rates be estimated, as these would likely be submitted to the LQD in the Annual Report? (MDK)

Response MK 69

Revised text as requested.

Comment MK 70

Mine Plan, Section MP.7.1 Surface Water Monitoring, 44. The text in the last paragraph on Page MP-45 states that water quality samples will be collected from a single station using an ISCO automatic sampler. Please identify in the text which station this is. Also, please explain the rationale for using an ISCO sampler at only one of the four stream monitoring sites. (MDK)

Response MK 70

Revised text as requested. The station equipped with the ISCO automatic sampler was the only station equipped with such a device due to the stations location as well as expected flows. Quarterly grab samples taken at stations upstream of mining disturbances will give an accurate representation of water quality entering the permit boundary. Since the station equipped with an automatic sampler is located near the area in which Slater Creek exits the permit boundary, an automatic sampler allows the operator see if the mining activities of the Brook Mine have an impact on the water quality of Slater Creek as the highest chance water quality is affected will occur during precipitation events. An automatic recorder was not installed at the station downstream of disturbances on Hidden Water Creek because the recorded and modeled flows for the drainage are extremely low. No observable flow had been recorded on any surface water station along Hidden Water Creek, despite precipitation events having occurring. As such, any data collected by an automatic sampler on Hidden Water Creek would occur during extreme precipitation events in which the flows through Hidden Water Creek would likely have high turbidity and be an unrealistic representation of the water quality within Hidden Water Creek.

Comment MK 71

Mine Plan, Section MP.7.1 Surface Water Monitoring, 45. The text in the first paragraph on Page MP-46 states that data will be evaluated to determine if any surface water and groundwater interactions exist. It would seem that any interactions should have already been identified during the baseline characterization of the hydrological system on and near the proposed permit area. It does not appear that the permit application discusses surface/groundwater interactions. (MDK)

Response MK 71

Revised text as requested. The monitoring is a continuation of the baseline monitoring sites.

Comment MK 72

Mine Plan, Section MP.8 Water Use, 46. Please state in the text that all water from surface reservoirs or wells will be used under appropriate permits from the State Engineer's Office (SEO). (MDK)

Response MK 72

Revised text as requested.

Comment MK 73

Mine Plan, Section MP.8 Water Use, 47. It is advised that the applicant discuss with the SEO-Interstate Streams Division any implications that water use may have under the Yellowstone River Compact. (MDK)

Response MK 73

Revised text as requested.

Comment MK 74

Mine Plan, Addendum MP-6 Subsidence Control Plan, Section MP.6.3 Subsidence Monitoring and Assessment and Section MP-6.4 Subsidence Control and Remediation, 48. The text states that subsidence monitoring would be discontinued if no evidence of subsidence occurred after six months after highwall mining. Please include a clarifying statement that the applicant would remediate subsidence up until bond release is approved, even if the subsidence was detected later than the six months of initial monitoring. (MDK)

Response MK 74

Please see revision to last paragraph of Addendum MP-6

Comment MuK 32

Mine Plan, 32. Please provide an electronic copy of the groundwater model referenced in Addendum MP-3. In addition, please provide the GIS projection coordinate of the model files that will enable the LQD to plot the model results in GIS for the purposes of producing the CHIA (Cumulative Hydrologic Impact Assessment). The LQD review of the model files might potentially generate additional comments, clarifications or questions. (MK)

Response MuK 32

An electronic copy of the groundwater model Will be provided under separate cover. The elements in the model are based on the Wyoming East Central NAD 83 state plane coordinate system. To convert from model Grid to the state plane coordinates the X

offset is 1367387.512 and the Y offset is 1915004.382. There is no rotation from the model grid to the state plane coordinate system.

Comment MuK 33

Mine Plan, MP.1.1 Type of Mine, 33. Page MP-1 states, "Below the Tongue River Member is the Lebo shale member of the Fort Union Formation which contains the Masters Seam (Cardno MM&A, October 2013)." This statement is not consistent with Table D5.3-1, Page D5-T1 and other descriptions in Appendix D5. Table D5.3-1 indicates Masters Coal seam is in the Tongue River Member. Please clarify and make appropriate changes throughout the submittal (Example: MP 4.4). (MK)

Response MuK 33

Revised text as requested.

Comment MuK 34

Mine Plan, MP.1.1 Type of Mine, 34. Major coal seams on the Brook Mine include: Dietz (1,2,3), Monarch, Upper Carney, Lower Carney and Masters.". Dietz (1,2,3) coal seam is not included in the description presented in Section D5.3.3.3, Appendix D5. Please clarify: (i) the seams that will be mined by the Brook Mine and (ii) include the description of all the coals seams as appropriate in Appendix D5 and Appendix D6. (MK)

Response MuK 34

Please refer to Mine Plan Section MP.4.4.1 for targeted coal seams at the Brook Mine.

Comment MuK 35

Mine Plan, MP.5.8 Mine Pit Dewatering Plan, Consider using the groundwater model referenced in Appendix D-3 to provide a description for a range of estimates on anticipated dewatering rates/volumes and groundwater inflows to the mine pit. (MK)

Response MuK 35

The text in Section MP.5.8 is to indicate that water entering the pit from either groundwater or surface water will be controlled using sumps and treated prior to discharge.

Comment MuK 36

Mine Plan, MP.5.8 Mine Pit Dewatering Plan, 36. Please clarify the anticipated effects of the faults on the dewatering plan or groundwater impacts during mining. (MK)

Response MuK 36

Since the water will be collected in a sump, treated, and then discharged, the faults should have no effect.

Comment MuK 37

Mine Plan, MP.5.9 Dewatering Wells, 37. Please provide a brief discussion on the anticipated quality of groundwater removed at various stages of mining. (MK)

Response MuK 37

Revised text as requested.

Comment MuK 38

Mine Plan, MP.5.9 Dewatering Wells, 38. If groundwater is discharged into a stream channel, anticipated discharge flow rate, water quality, and estimated seasonal discharge of the groundwater should be tabulated. The availability and suitability of this water for downstream water users should also be evaluated. Please clarify if this is an expected mechanism to discharge pumped groundwater. (MK)

Response MuK 38

Revised text as requested.

Comment MuK 39

Mine Plan, MP.5.8 Groundwater Rights, Please include a description on any expected degradation of groundwater quality caused by the mining operation (including lateral flow through spoils) in the adjudicated wells. (MK)

Response MuK 39

Revised text as requested.

Comment MuK 40

Mine Plan, MP.6.2.Groundwater, 40. Please provide a brief discussion on any hydrologic effects caused by anticipated changes in recharge to the aquifers during mining. (MK)

Response MuK 40

Revised text as requested.

Comment MuK 41

Mine Plan, MP.6.2.Groundwater, 41. Please provide an assessment of any subsidence effects (Addendum MP-6) on the hydrologic system during operations. (MK)

Response MuK 41

Revised text as requested.

Comment MuK 42

Mine Plan, MP.6.2.Groundwater, 42. Please discuss if there are any expected impacts on groundwater quality caused by subsidence. (MK)

Response MuK 42

Revised text as requested.

Comment MuK 43

Mine Plan, MP.6.3.2 Plan to Mitigate the Impacts on Groundwater, 43. If the quality or quantity of adjudicated water supplies are affected, then an alternative source should be identified as part of the mitigation plan. Please provide a statement to meet this statutory requirement (W.S. § 35-11-415(b)(xii)). (MK)

Response MuK 43

Revised text as requested.

Comment MuK 44

Mine Plan, MP.7.2 Groundwater Monitoring, 44. Please clarify the lack of any shallow monitor wells near Hidden Water Creek, Goose Creek and Tongue River alluvium and if this will be an impediment to completely characterize the groundwater impacts during mining. (MK)

Response MuK 44

Hidded Water Creek has no alluvium ttherefore, no shallow well can be installed. Goose Creek in the area of the permit is through a reclaimed mine area (pre-law) therefore there is not alluvium. As discussed throughout we will not impact the Tongue River Alluvium. RAMACO will add wells in the Tongue River Alluvium.

Comment MuK 45

Mine Plan, MP.7.2 Groundwater Monitoring, 45. Please clarify the possibility of any of the monitor wells shown in Exhibit MP.7-7 being discontinued due to any constraints in the proposed-mine plan (example: mined through). (MK)

Response MuK 45

Revised text as requested.

Comment MuK 46

Mine Plan, MP.8 Water use, 46. Page MP-47 states, "Industrial water will be obtained from groundwater wells or from water collected in sediment and flood control reservoirs." Please clarify if the groundwater wells mentioned in this statement are wells that will be exclusively used as industrial supply wells or if they are same as dewatering wells. (MK)

Response MuK 46

Revised text as requested.

Comment MuK 47

Mine Plan, MP.8 Water use, 47. Page MP-48 states, "It is estimated that the total water use will be approximately 400 million gallons per year." Please provide a discussion comparing the reported water use by other mines of similar size in the Powder River Basin.

Response MuK 47

No record of reported water use was discussed in the annual reports submitted to WDEQ for several different mines within the Powder River Basin. As such, a comparison was unable to be made.

Comment MuK 48

Mine Plan, MP.8 Water use, 48. Page MP-48 states, "It is estimated that the total water use will be approximately 400 million gallons per year." Please provide a comparison of this estimated total water use against the various estimated water sources available during mining (Example: from dewatering wells). It will be very helpful to provide a discussion on contingency measures during extreme wet/dry years or if the proposed mine plan does not require extensive dewatering. (MK)

Response MuK 48

RAMACO is currently working to solidify the necessary water right for this water. The sources and associated amounts are in discussions and therefore not presented at this time.

Comment MuK 49

Mine Plan, MP.8 Water use, 49. Please clarify if there is any expected variability in this projected water use (example: is it closely related to the mine plan). (MK)

Response MuK 49

Revised text as requested.

Comment MuK 50

Mine Plan, Addendum MP-3 Groundwater Model, 50. Page Addendum MP-3-19 states, "Since, most of the wells within the modeled domain are stock wells with intermittent pumping and completed in geologic strata below the Masters Coals, they are relatively inconsequential to the groundwater system modeled in this report." Please provide a Figure (or reference) to show these wells, their depths and discuss on why they are hydrogeologically isolated from the effects of the proposed mine. (MK)

Response MuK 50

All the groundwater rights are tabulated within Appendix B of the adjudication volume and Exhibits 5 and 8 in the adjudication volume show the locations of each respective groundwater right. Please note that adjudication Exhibits 5 and 8 include monitor wells in addition to stock and domestic wells so all the wells shown on the exhibits are not necessarily wells that are being used as water supply wells. In fact, almost all the completed water wells shown on Exhibit 5 of the adjudication volume within the Brook Mine permit area are actually monitor wells. The Cross Sections presented in Exhibit 2 of Addendum D5-3 show the depth of the coal seams at various locations within the Brook Mine Permit. For comparison, the depths of each well are listed in the tabulation in Appendix B of the adjudication volume.

The statement on Page MP-3-19 "they (the wells) are relatively inconsequential to the groundwater system modeled in this report" means that the wells are not believed to be significant stressers to the groundwater system because of their relatively low pumpage rates. This statement should not be interpreted to mean that all of the stock and domestic wells in the area are hydrologically isolated from the coals proposed for mining within the Brook Mine Permit area. In fact, Section 4.9 of Addendum MP-3 specifically describes 26 wells that, based on their depths and locations, are likely completed within the coals. The expected impacts to these wells were assessed as part of the modeling exercise. Based on a comparison between the reported depths in the water rights tabulation in Appendix B of the adjudication volume and the geologic cross sections in Addendum D5-3, the other stock and domestic wells in the area were determined to be completed either in the Tongue River alluvium, or deeper strata below the Carney coal and do not have a direct hydrologic connection to the coals proposed for mining in the Brook Mine and were not specifically evaluated in the groundwater model.

Along the eastern edge of the model domain there are a large number of CBM wells and, based on available data presented in the water rights tabulation in Appendix B of the Adjudication volume, these wells are likely pumping water from the Carney and Masters coal seams. The impacts from the CBM wells are described in detail within

later sections of the report. However, the text on page MP-3-19 does not speak to the CBM wells. Minor changes to the text on page Addendum MP-3-19 and additional explanatory text have been added to this page to provide further clarification.

Comment MuK 51

Mine Plan, Addendum MP-3 Groundwater Model, 51. Page Addendum MP-3-20 states, "The faults are significant in lateral extent and form natural no flow boundaries". Please provide a discussion (or refer to a discussion) on how these faults were determined to be no flow boundaries. (MK)

Response MuK 51

Faulting within the permit area was mapped by B.E. Barnum on the USGS Monarch Quadrangle. As noted in Section D5.3.2, Barnum indicates fault displacements on the order of 50 feet within the mine area. Lithologic logs provided in Addendum D-5-3 demonstrate that the dominating lithology in the column is claystone and coal thicknesses are less than 20 feet. This offset geology from faulting results in a claystone hanging or footwall adjacent the coal aquifer and therefore discontinuity of the aquifer and an assumed hydrologic flow boundary.

Comment MuK 52

Mine Plan, Addendum MP-3 Groundwater Model, 52. Please clarify the reason for not estimating vertical hydraulic conductivity of the interburden using an aquifer test. (MK)

Response MuK 52

Response to this comment is partially clarified in responses to MK's Comments 18 and 19 above. During the aquifer test conducted at the 578409 well cluster no response was observed across the interburden, therefore, the vertical hydraulic conductivity of the interbuden was too low to measure in the aquifer test. Furthermore, the static water levels in the Masters and Carney coal seams are different which demonstrates that the hydraulic conductivity of the interburden is very low. Therefore, literature values were utilized and adjusted within reasonable bounds to improve model calibration.

Comment MuK 53

Mine Plan, Addendum MP-3 Groundwater Model, 53. Page Addendum MP-3-25 states, "With no unnatural stresses on the system …" Please provide a discussion of the CBM impacts on the water levels. It appears that the hydrographs presented in Appendix D6 do not show the impacts of CBM. (MK)

Response MuK 53

There are multiple CBM production wells located along the eastern side of the groundwater domain. In order for the CBM producers to be able to produce gas it is necessary to significantly lower the water levels in the coal to release the gas in the coal fractures. CBM production began in this area around 1999. Therefore, it was conservatively assumed that CBM production has already resulted in lowering the water levels in the coal aquifers to the top of the coal aquifer along the eastern edge of the model domain and the general head boundaries were set accordingly to simulate this effect. Even though water level data in the coal aquifer prior to CBM production is limited because of the lack of monitor well data, prior to CBM production, the potentiometric head in the coal was estimated to be significantly higher than the top of coal.

The hydrographs presented in Appendix D6-9 do not show the impacts of CBM because they show water level changes over a one year period roughly 13 years after CBM production began in the area, and if the wells were going to be impacted by CBM, it is likely that they have already been impacted. Please note that the model assumed that CBM production would continue into the future resulting in the water levels in the coal being maintained at unnaturally low levels. Therefore, the model has conservatively estimated the combined impacts from both CBM and the proposed coal mining activities. Currently, a large majority of the CBM wells are being plugged and abandoned which may result in higher than predicted water level recovery rates in the coal aquifer.

Text edits were made to page MP-3-25 to help clarify the discussion.

Comment MuK 54

Mine Plan, Addendum MP-3 Groundwater Model, 54. There are two sub-sections for recharge, Section 2.5.3 and Section 2.6.1. Please clarify/consolidate. (MK)

Response MuK 54

The two subsections have been combined into one subsection under Section 2.6.1

Comment MuK 55

Mine Plan, Addendum MP-3 Groundwater Model, 55. Page Addendum MP-3-26 states, "… drain cells were placed in the model to simulate seeps from the outcrops." Please provide a discussion on the evidence for seeps (or reference) observed during field surveys. Were there any field data collected on the location and flow rates of these seeps? (MK)

Response MuK 55

Evidence of seeps from outcrops can be seen in Color Infared Imagary (CIR), which is included in the permit as Exhibit D11.1-1. The areas of seepage are manifested on the CIR imagery as areas with more vegetation. Evapotranspiration from the vegetation growing along the seep removes all the water before it emanates from the formation into the drainage. Therefore, no measurements of the seepage rate at the outcrops were possible or are available. Additional discussion explaining the need for drain cells within the model is provided in Section D6.2.2. Also, text was added to Section D6.2.2 to clarify that no field flow measurements were available.

Comment MuK 56

Mine Plan, Addendum MP-3 Groundwater Model, 56. Page Addendum MP-3-27 states, "River cells from MODFLOW's river boundary conditions package were placed in the model to simulate the Tongue River and Goose Creek." Please provide a conceptual discussion supported by field observations on the type/nature of interaction of these streams with groundwater (Gaining stream vs. losing stream). (MK)

Response MuK 56

As described in Section 2.3 of MP-3, the dip of the strata in the project area is generally east-southeast into the Powder River Basin and the groundwater flow direction follows this trend regionally. As such, the Tongue River comes into contact with the coal seams of interest near the updip side of the coal seams. Interactions between the surface water and groundwater occur at those points where permeable formations sub-crop into alluvial/surface water bodies. Both the Carney and the Masters coal subcrop under the Tongue River near the western edge of the model domain. Conceptually these subcrops are the only places where the coals would be in contact with the surface water. Section 2.3 of Addendum MP-3 describes the conceptual groundwater flow in some detail.

As described in Addendum MP-3 Section 2.3, the Carney coal is largely dry to the north and west of its subcrop into the Tongue River alluvium and becomes saturated at an elevation just above the elevation where it subcrops beneath the Tongue River alluvium. Therefore it is likely that the Carney Coal would lose water to the Tongue River alluvium. The potentiometric surface in the Masters Coal is roughly the same as the potentiomentric surface of the Tongue River where the Masters coal subcrops beneath it. A review of the steady state groundwater model shows that where the River boundary cells are immediately above the Masters Coal the net effect is that the River boundary cells input approximately 3.2 gpm into the model. Conversely, near the upper and lower Carney Coal/Tongue River outcrops the River cells are taking roughly 0.16 gpm out of the model. Since the coal outcrops occur beneath the Tongue River there is no way to field verify these flows but conceptually they do seem reasonable.

The river boundary cells extend to the bottom of the layer in which they are placed as discussed in response to comment MUK 74 and MUK 84. The River boundary cells were placed in Layer 1 to the confluence of Goose Creek and the Tongue River which extends east of the area where the Carney Coal would be in communication with the Tongue River alluvium. Due to the fact that the River boundary cells extend to the bottom of the layer they do provide a conduit for the River to provide recharge into the Carney Coal even though the River would be physically separated from the coal by multiple zones of low permeability shales. The estimated recharge occurring in this area from the Tongue River to both layers 1 and 2 is approximately 8 gpm. The discharge into the coals is likely conservatively overestimated and not all of the 8 gpm would necessarily end up in the coal as some of it also discharges to layer 1. As such, the model conservatively estimates that up to 11.2 gpm would be discharged from the river to the coals or overburden between the Carney Coal and the Tongue River.

The strata located above the coal seams of interest is generally claystone with low permeability as discussed in MP-3 Section 2.2. Therefore, interaction of groundwater between these units and the Tongue River or Goose Creek is very limited. Within the model domain, the Tongue River Alluvium does have large deciduous trees and other vegetation immediately adjacent to the river. Conceptually, evapotranspiration from the vegetation along the Tongue River would indicate that through the model domain the Tongue River is a losing Stream. Throughout most of the model domain where the Tongue River is present, there low permeability overburden strata between the Tongue River alluvium and the coal seams which hydrologically isolate the Tongue River from both the Masters and the Carney coal seams. Since Goose Creek is located in the eastern portion of the model domain where the coal is significantly below the alluvium and the clay intervals are even thicker, the Goose Creek alluvium is also hydrologically separated from the Masters and Carney Coals. The Goose Creek alluvium would likely see similar losses to evapotranspiration that would be observed in the Tongue River alluvium.

Comment MuK 57

Mine Plan, Addendum MP-3 Groundwater Model, 57. Please provide a discussion on any contribution of groundwater baseflow to the major surface water bodies within the permit boundary. (MK)

Response MuK 57

As described in the response to comment MuK 56, conceptually, very little groundwater base flow from the Carney and Masters coal seams are expected to contribute to the surface water bodies within the permit boundary. The mass balance table provided in response to comment MuK 73 demonstrates that much more water is expected to enter the groundwater system from the surface water bodies (river cells) than is contributed to the surface water bodies from groundwater baseflow.

Comment MuK 58

Mine Plan, Addendum MP-3 Groundwater Model, 58. In section 3.2 MODFLOW Input Files, was aerial recharge used as an input file? Please clarify if evapotranspiration was considered as a discrete input or lumped into net aerial recharge. (MK)

Response MuK 58

Yes, the recharge package was used as an input file. Section 3.2 of Addendum MP-3 was updated to include a discussion of the recharge package. The evapotranspiration (ET) package was not utilized in the model. To address the effects of ET, the recharge rates were adjusted down in proportion to the estimated losses created by ET. Within most of the model domain where evapotranspiration would occur, the low permeability overburden between the surface and the coal seams of interest provide a hydrologic barrier so the evapotranspiration was ignored in these areas.

Comment MuK 59

Mine Plan, Addendum MP-3 Groundwater Model, 59. Page Addendum MP-3-31 states, "Layer 1 – represents the coal overburden". Please clarify if the alluvial aquifer was included in the model. Please provide justification for not considering the alluvial aquifer in the model. (MK)

Response MuK 59

As described in the responses to comments MuK 56 and MuK 57, the only place within the model domain where there is potential for interactions between any alluvial aquifers and the coal seams of interest is where the coal is directly below the Tongue River alluvium or Slater Creek colluvium. Where the coal is in direct contact with alluvium/colluvium, layer 1 (the coal overburden) was assigned a higher vertical hydraulic conductivity to allow the layer to better emulate the alluvial/colluvial aquifer in this location. This zone of higher hydraulic conductivity in layer 1 is depicted on Addendum MP-3 Figure 4.2-1. Groundwater Vistas does not allow discontinuous layers throughout the model domain so this allowed the alluvium/colluvuim to be effectively be modeled without the need to add an additional layer across the top of the entire model domain. This helped to improve the computational efficiency of the model. Since the overburden has a very low hydraulic conductivity and hydrologically separates the coals from the other alluvial/colluvial deposits within a large portion of the model domain, there is no reason to model any additional alluvial/colluvial deposits. To help clarify this comment Figure 4.2-1, was prepared and sections 2.5 and 4.2 of MP-3 have been updated.

Comment MuK 60

Mine Plan, Addendum MP-3 Groundwater Model, 60. Page Addendum MP-3-31 states, "Layer 3- Carney Interburden. This interval is generally of low to very permeability in

the western portion of the Project Area". Please clarify how the areas where Layer 3-Carney Interburden is absent are treated in the groundwater model. (MK)

Response MuK 60

Ground Water vistas does not allow discontinuous layers. Therefore, Layer 3 is continuous across the entire model domain. Where the coal seam coalesces on the east portion of the model, the Layer 3 interburden was modeled as coal by setting hydraulic properties of the layer equivalent to the values of the overlying and underlying coal seams. Additional text has been added to Section 4.2.1 of Addendum MP-3 to further describe how the hydraulic conductivities were assigned to layer 3.

Comment MuK 61

Mine Plan, Addendum MP-3 Groundwater Model, 61. Please include a discussion of the thickness of all model layers. (MK)

Response MuK 61

Addendum MP-3 Section 2.5 describes the thickness of the various coal seams. Additional text has been added to MP-3 Section 4.1 to generally describe the thickness of each layer. Following are the modeled thicknesses for each layer:

- Layer 1-The thickness for this layer varies throughout the model domain. Near the western side of the model the layer is often absent where all the strata geologically younger than the Carney coal has been eroded off. These areas are generally represented as no flow cells in the model. Within the eastern portion of the model Layer 1 can be substantial. In the model the maximum thickness of Layer 1 in the eastern side of the model domain was approximately 1,100 feet.
- Layer 2-The Upper Carney coal was modeled with a constant thickness of 7 feet throughout the model.
- Layer 3-The Carney coal interburden layer varied in thickness from 4 feet up to 15 feet within the active portion of the model.
- Layer 4-The Lower Carney coal was modeled with a constant thickness of 8 feet within the model.
- Layer 5 The Carney/Masters coal interbuden layer varied in thickness from 4 feet up to 107 feet within the model.
- Layer 6-The Masters coal was modeled with a constant thickness of 6 feet within the model.

Comment MuK 62

Mine Plan, Addendum MP-3 Groundwater Model, 62. Please include a justification for not considering the underlying zones beneath the Masters coal seam in the model. (MK)

Response MuK 62

The Masters coal is underlain by the Lebo Shale. The Lebo Shale is a thick (Appendix D5 Section D5.2.3), regional confining interval in the project area as described in Mine Plan Addendum MP-3 Section 2.1. There are no aquifer units identified within the model domain within the Lebo Shale with direct hydrologic connection to any of the elements of the model. Since the Lebo Shale is a regional confining unit, if it had been included in the groundwater model, it would have been assigned hydraulic parameters typical of a shale interval (very low hydraulic conductivity) and it would have essentially been a no flow barrier to the more permeable Masters coal above it. Groundwater Vistas treats the bottom of the model as a no flow boundary. Therefore, the Lebo Shale is for all practical purposes included in the model as a confining interval with the way the model is currently defined.

Comment MuK 63

Mine Plan, Addendum MP-3 Groundwater Model, 63. Please provide appropriate cross section(s) of the model grid overlaid with the drill hole data collected during baseline characterization. This will help the evaluation of the adequacy of model layer thicknesses against the stratigraphic field data. (MK)

Response MuK 63

As noted in Addendum MP-3 Section 4.1, the Groundwater model layers were developed from a 3D geologic model developed from drill hole data within the project area developed for the purposes of making volumetric coal estimates. Minor updates to the surfaces were made where new data provided by additional exploration drilling was completed. An additional figure was developed (Addendum MP-3 Figure 4.1-3) and included in Addendum MP-3 that depicts actual cross sections cut from the groundwater model. Addendum D5-3 of Appendix D5 includes geologic cross sections with drill hole data that can be compared back to the actual cross sections included in Figure 4.1-3 of Addendum MP-3.

Comment MuK 64

Mine Plan, Addendum MP-3 Groundwater Model, 64. Please clarify how the layers were modeled to represent the confined/unconfined aquifer types. (MK)

Response MuK 64

Groundwater Vistas has a "layer type" control that was set to #5: Confined/Unconfined, which allows the model to determine whether to use storativity or specific yield for the storage coefficient based on the elevation of the water elevation vs. formation tops. Groundwater Vistas handles the aquifer type classification without further inputs.

Comment MuK 65

Mine Plan, Addendum MP-3 Groundwater Model, 65. In addition to model calibration, please provide justification for the recharge rates applied in the model including any literature references. (MK)

Response MuK 65

The initial recharge rates utilized in the model were initially estimated based on a USGS study (Water-Resources Investigations Report 01-4278) conducted on the eastern side of the Powder River basin and the Black Hills area. The study entitled, "Estimated Recharge to the Madison and Minnelusa Aquifers in the Black Hills Area, South Dakota and Wyoming, Water Years 1931-98." was prepared by JM Carter and D.G Driscoll. In the study Carter and Driscoll reported recharge rates varying from 0.04 inches per year to 2.93 inches per year. The 2.93 inch per year recharge rate was reported within the Madison limestone formation outcrops in the Black Hills while the lower range of recharge rates reported by Carter and Driscoll were estimated for areas in the eastern periphery of the Powder River Basin where the precipitation and soil types are similar in nature to the Brook Mine Permit area. Since calibrated recharge rates in the key recharge areas (the coal outcrops and the scoria outcrops) were within the range of values developed by Carter and Driscoll, the recharge rates used in the model are considered reasonable. Please note that the recharge rate throughout Layer 1 is much lower than the range of recharges developed by Carter and Driscoll. This is reasonable because much of Layer 1 has no hydrologic connection to the underlying coal seams. Additional justification for recharge rates applied in the model is discussed in response to comment BJ57.

Comment MuK 66

Mine Plan, Addendum MP-3 Groundwater Model, 66. Page Addendum MP-3-33 states, "Recharge is applied within the modeling software by applying the recharge to the highest active layer." Please clarify the presence of any modeled 'dry cells' in the model and the influence of applying the recharge to the layers below the dry cells. (MK)

Response MuK 66

As noted in the responses for comments MuK 59 and MuK 60, Groundwater Vistas does not allow for discontinuous layers across the model domain. Along the north and

the west sides of the model there is a good portion of the model domain where the upper layers have been eroded off and do not actually exist. These areas of erosion were accounted for using no flow cells. As shown on Figures 4.4-1 through 4.4-4 of Addendum MP-3, the no flow cells in the top layer are the largest in areal extent while each underlying layer has a slightly decreased areal extent of no flow cells. In this case the no flow cell distribution was adjusted to match the outcrop of each layer. The fact that the software applies the recharge to the highest active layer was taken advantage of during the modeling process, since it is an effective way to apply recharge to an outcropping layer which is under another layer that is eroded away but due to software limitations is still present in the model.

Because CBM operations have generally removed most of the water from the coal seams, there are some locations within the model domain where dry cells during the modeling have caused cells in layer 1 to go dry and the recharge is applied to the next active layer below. While this could be problematic if a high recharge rate were assigned to the model cells, generally throughout the model domain the recharge rate is very low. Therefore, this results in a very minor amount of water coming into the model and did not significantly affect the model calibration.

Comment MuK 67

Mine Plan, Addendum MP-3 Groundwater Model, 67. Table 4.2-3. lists model porosity values. Typically, MODFLOW (flow model) does not use porosity in its calculations. Please clarify the need for this input parameter. (MK)

Response MuK 67

Modflow does not utilize porosity as part of its calculations. However, other modules included in the Groundwater Vistas package such as MODPATH do utilize porosity. In the case of this model, no MODPATH simulations were conducted. Therefore, the porosity term as put into the model has no impact on the calculations. However, porosity is a hydraulic parameter of the aquifer and may be important for future modeling simulations, therefore, the porosity values developed for each aquifer/aquitard unit will be left in the model report. Minor changes to the text in Addendum MP-3 have been made to clarify the role of porosity in this model.

Comment MuK 68

Mine Plan, Addendum MP-3 Groundwater Model, 68. The faults are not modeled in Layer 1. Please clarify the procedure for determining the vertical extents of the faults in the model. (MK)

Response MuK 68

The composition of Layer 1 is predominately claystone. Because Layer 1 is not composed of aquifer material and because the hanging and footwalls are composed of

strata with similar hydraulic properties, displacement due to faulting does not substantially change the flow through the aquitard and placing Horizontal flow barriers in the model in layer 1 was not necessary.

Comment MuK 69

Mine Plan, Addendum MP-3 Groundwater Model, 69. Please provide the input parameters used to model the horizontal flow barriers in the model and discuss their technical reasonableness. (MK)

Response MuK 69

Horizontal Flow Barriers were used in the model to simulate no-flow boundaries created by faulting within the project area. Horizontal flow barriers require two input parameters in Groundwater Vistas including wall thickness and hydraulic conductivity. The input parameter used in the model for wall thickness was 10 feet and a hydraulic conductivity of 1.0 x 10^-5 ft/day was used. The horizontal flow barrier parameters as applied will essentially limit all but a very minor amount of flow across the barrier. As described in the response to comment MuK 51, the coal seams within the project area are relatively thin as compared to the fault offsets so it is reasonable to assume that the faults will significantly impede flow in the aquifer units.

Comment MuK 70

Mine Plan, Addendum MP-3 Groundwater Model, 70. Page Addendum MP-3-40 states, "As the current, post-CBM potentiometric surface is considered the static level……." Please provide the implications of this assumption, on the model calibration of hydraulic parameters and the mode predicted hydrologic impacts (over estimation of drawdown vs. underestimation) (MK)

Response MuK 70

Addendum MP-3 Sections 4.8.1, 4.10, and 4.11 all discuss the implications of CBM impacts. In addition, the response to comment MuK 53 also discusses CBM impacts to water levels. As discussed in the response to comment MuK 53, the model conservatively assumed that CBM operations have lowered the water levels in the eastern portion of the model domain to a level near the top of the coal seams. To simulate this drawdown, the elevations of each general head boundary on the east side of the model were set at an elevation just above the top of the coal seam. The general head boundaries elevations remained the same in both the steady state and the transient models. Essentially, this means that the model operated under the assumption that the post CBM impacts were permanent prior to and after the Brook Mine mining activities.

The assumption that the water levels have been permanently impacted by CBM did have a significant impact on model calibration. The severely depressed water levels

caused by CBM operations have resulted in a large number of cells going dry. The hydraulic parameters of the aquifer units within the eastern portion of the model domain were not adjusted to eliminate the dry cells since it is reasonable to assume that, with the severe drawdown modeled, the coal seams could have been dewatered in these areas. Therefore, even though the effects of the CBM drawdowns were observed during calibration, no specific adjustments were made to the modeled aquifer characteristics to eliminate these impacts. The dry cells did complicate calibration of the model because they cause instability in the MODFLOW model calculations and results.

The model was developed to take into account impacts from the combined effects of CBM and the proposed coal mining. In general, CBM development impacts are significantly larger than the predicted impacts from the Brook Mine. Therefore, ignoring CBM impacts would have significantly under predicted the potentiometric surfaces within the model domain and overestimated the impacts that Brook Mine would have on the system.

Many of the CBM wells are actively being plugged and abandoned. If this trend continues, there is a chance that recovery of water levels from CBM impacts may begin which will result in recharging of the coal seams. If this happens, it is anticipated that the model conservatively over predicts the impacts to the region especially in the long term recovery scenarios.

Comment MuK 71

Mine Plan, Addendum MP-3 Groundwater Model, 71. It is noted that Table 4.7-1 summarizes the calibration residuals and statistics from the calibrated model. Please consider providing additional presentations of the calibrated model statistics. This will enable an easier evaluation of any spatial bias in the model calibration. (MK)

a. X-Y plot of observed vs. simulated water levels.

b. A map plotting the residuals to show the spatial distribution

c. Provide a summary statistics table with Mean Error, Mean Absolute Error, Sum of Squared residuals for the calibrated model. It is noted that some of these values are presented in the sensitivity analysis. However, a compiled summary statistics table would be very helpful.

Response MuK 71

As requested the following additions have been made to the groundwater model report:

A. An X-Y plot of observed versus simulated water levels has been added in the report as Addendum MP-3 Figure 4.7-1.

B. The residuals have been added to figures 4.7-2, 4.7-3, and 4.7-4 of Addendum MP-3.

C. Table 4.7-1 of Addendum MP-3 has been updated to include additional statistics.

Comment MuK 72

Mine Plan, Addendum MP-3 Groundwater Model, 72. In addition, to the measured water levels, please clarify if there were any flow measurements used for model calibration. (MK)

Response MuK 72

There are no areas within the model domain where it was possible to collect any flow measurements that would support the modeling effort therefore, no flow measurement were used in the calibration.

Comment MuK 73

Mine Plan, Addendum MP-3 Groundwater Model, 73. Please provide a water budget table (in acre-feet per year or cubic-feet per day) showing all the inflows into the model and outflows from the model.

Response MuK 73

The following tables summarizes the inflows and outflows from the model domain during the steady state period, 5 years into mining, the end of mining, and at the end of recovery.

Mass Balance of Steady State Calibrated Model		
Source/Sink	Inflows (ft^3/d)	Outflows (ft^3/d)
General Heads	16,107	22,890
River	2,569	410
Drains	-	560
Recharge	5,168	-
Total	23,846	23,860

Mass Balance 5 years into Mining		
Source/Sink	Inflows (ft^3/d)	Outflows (ft^3/d)
Storage	12,496	11,431
General Heads	16,130	22,904
River	2,688	385
Drains	-	1,774
Recharge	5,434	-
Total	36,749	36,494

Mass Balance End of Mining		
Source/Sink	Inflows (ft^3/d)	Outflows (ft^3/d)
Storage	3,670	4,146
General Heads	16,135	22,902
River	2,705	365
Drains	-	532
Recharge	5,430	-
Total	27,941	27,945

Mass Balance End of Recovery		
Source/Sink	Inflows (ft^3/d)	Outflows (ft^3/d)
Storage	1,698	2183
General Heads	16,138	22,901
River	2,714	363
Drains	-	535
Recharge	5,427	-
Total	25,978	25,983

Comment MuK 74

Mine Plan, Addendum MP-3 Groundwater Model, 74. Please provide a comparison of model simulated inflows and outflows against conceptual estimates of inflows and outflows. This comparison will act as another verification/check for the technical adequacy of the groundwater model (Example model GHB flows vs. reasonable estimated conceptual flows). (MK)

Response MuK 74

Response to comment MuK 73 includes tables that show the inflows and outflows from the model during the steady state period, 5 years into mining, the end of mining, and at the end of recovery. The five main categories of inflows and outflows include 1) storage, 2) general head boundaries, 3) river boundaries, 4) drains, and 5) recharge. Following is discussion regarding model predicted inflows and outflows for each category:

1) Storage – During the steady state model there is no inflow or outflow from storage so storage is not included in the first mass balance table in prepare for comment MuK 73. The model predicts that during active mining more water will come out of storage than will go into storage. Conceptually this is reasonable since during mining, water from the coals would be draining into the mined out areas. There is a trend of water continuing to come out of storage even after mining ceases. Even though the volume of water coming out of storage is quite low, it is contrary to the conceptualization of the system to have water leaving storage after mining because at this point water should be going back into storage. This phenomenon is attributed to the fact that many of the

cells in the model go dry during mining because CBM operations have significantly dewatered the coals and there is not much water available in storage (see comment MuK 70). When the cells go dry, MODFLOW treats them as no flow areas and there can be a ripple effect that causes additional cells going dry. Since MODFLOW is not very efficient at rewetting dry cells when they should be resaturated, this ripple effect has caused permanent changes in the model. Over a long time the model would be expected to come to a steady state condition. The tables prepared in response to comment MuK 73 indicate that even at the end of recovery, the model is not yet at the new equilibrium that would eventually be reached with the additional dry cells.

2) General Head Boundaries – The amount of water going into and out of the model domain via the general head boundaries remains relatively consistent throughout the modeled operations. This is reasonable because the general head boundaries are a long distance from the mining area and would not be expected to be significantly impacted by mining. In addition, the total volume of outflows from the general head boundaries generally balances the inflows from other sources. This is conceptually correct.

3) River Boundaries – The conceptual inflow and outflow from the coals to the Tongue River are discussed in detail in comment MuK 56. Groundwater Vistas does apply the River Boundary cells to the bottom of the layer in which they are inserted. The Tongue River Boundary cells were inserted into the model up to the point where Goose Creek joins the Tongue River. At that location the top of the Carney coal is estimated to be approximately 100 feet below the surface. Since the alluvium is generally much thinner in this area and there is actually a large amount of low permeability strata between the Tongue River alluvium and the coal (described in comment MuK 56), the model likely overestimates the contribution of the River boundary cells to the model because the river boundary cells provide a direct connection (in the model) between the river and the coals where there is not a physical connection. This conservatively over estimates how much water discharges from the River Boundary Cells to the model.

4) Drains – One drain was placed into layer 1 in the northeast side of the model domain to allow water to drain from the model where the Tongue River crosses the domain boundary. This represents the amount of water in layer 1 lost to the surface water system. The total discharge from this drain during steady state conditions is 560 ft^3/day (2.9 gpm). While no physical measurements were (or can be) made to verify this amount, conceptually it is reasonable. The strata along the Tongue River likely does discharge a small amount of water to the River where it cuts through the numerous perched sand lenses that become saturated from natural recharge. There is no evidence of large groundwater discharges to the Tongue River in this area so it makes sense that a small

discharge to the River (rather than a large discharge) would be observed in the model. During mining, drains were added to the model to remove water from the mine pits. The tables indicate that during mining the discharges from the drains do increase as expected. After mining is complete, discharges from the drains return approximately to premining levels which is conceptually correct.

5) The recharge amount used in the model stays at relatively the same level throughout the simulations. Total recharge across the model area is approximately 28 gpm. As is described in comment #65 the recharge rates are reasonable based on available studies.

Comment MuK 75

Mine Plan, Addendum MP-3 Groundwater Model, 75. Page Addendum MP-3-40 states, "Due to a system of thin aquifers with similar sources and sinks and homogeneous hydraulic conductivities, the head values of the steady-state model were nearly identical between the separate coal layers as noted in Table 4.7-1." Please clarify whether this statement implies that the interburden (where present) between the coal seams is not a confining unit. (MK)

Response MuK 75

This statement is an observation only based on review of modeled values and does not suggest a lack of confinement exists. Pumping tests conducted in separate aquifers demonstrated that the interburden provides confinement between the Carney and Masters aquifers as described in Section D6-8.3.2.3 of Appendix D6. In addition, Table 4.7-1 of Addendum MP-3 shows that at each cluster where both coal seams contained measureable water, the difference in measured water levels between the coal seams was higher than the modeled difference. This suggests that the vertical hydraulic conductivity assigned to the interburden in the model may be higher than the actual hydraulic conductivity of the interburden in the field. The use of a higher hydraulic conductivity for the interburden in the model will overestimate the drawdown in the other coal seam therefore, the predicted drawdown will be conservative.

Comment MuK 76

Mine Plan, Addendum MP-3 Groundwater Model, 76. In figures 4.7-1, 4.7-2 and 4.7-3, please consider including the observed/interpreted water level contours and the measured water level elevations. This will enable to visually evaluate the observed vs. simulated water levels. (MK)

Response MuK 76

Figures 4.7-1, 4.7-2, and 4.7-3 of Addendum MP-3 have been updated to include both observation wells and observed elevations as well as observed potentiometric contours.

Please note that in response to Comment MuK 71 an additional figure was added to this section (Figure 4.7-1) and these figures have since been renumbered to 4.7-2, 4.7-3, and 4.7-4.

Comment MuK 77

Mine Plan, Addendum MP-3 Groundwater Model, 77. Page Addendum MP-3-45 states, ".....and if CBM production ceases, recovery rates will likely be higher than estimated in the model." Please clarify if this statement implies that currently, there are CBM wells that are operational in the area and are pumping out groundwater. (MK)

Response MuK 77

Although substantially less than past years, some CBM wells in the area are still producing groundwater. Since CBM production has been ongoing for the last 15+ years the CBM operations have significantly lowered the water levels in the coals as is noted in the report. Records of groundwater withdrawals can be found on the Wyoming Oil and Gas Conservation Commission's (WOGCC) online database at: wogcc.state.wy.us. According to WOGCC records there has been no groundwater production associated with CBM in Townships 57 and 58N Range 84W since 2012. However production is still occurring in Townships 57 and 58N Range 83W as well as Township 56N Range 83 and 84W. The portions of the model domain where CBM production may occur are located in Townships 56 and 57N Range 84W.

Comment MuK 78

Mine Plan, Addendum MP-3 Groundwater Model, 78. Please consider removing the model sensitivity to storage coefficients and porosity. Steady state groundwater model equations do not include these parameters in any of the model calculations. (MK)

Response MuK 78

As noted in this comment, the final model did not include a transient calibration and a sensitivity analysis on storage coefficient and porosity is not appropriate. The section and discussion regarding model sensitivity to the storage coefficient and porosity has been updated and removed as appropriate.

Comment MuK 79

Mine Plan, Addendum MP-3 Groundwater Model, 79. Please clarify if the faults in the model and their parameters were considered in any of the sensitivity analyses. If not, please consider performing a detailed and thorough sensitivity analysis, as the faults appear to influence the drawdowns simulated by the groundwater model. (MK)

Response MuK 79

The faults do influence the drawdowns and flow patterns simulated in the groundwater model. However, as noted in the response to comment MuK 51 the displacement observed in the faults roughly 5 times as thick as the modeled coal seams. Given the fact that the dominant lithology in the area is low permeability claystone/siltstone, it is very likely that where faulting has occurred the displacement has resulted in coals being immediately adjacent to the low permeability strata. Therefore the faults are assumed to be hydrologic barriers to water flow. Based on the best available mapping, these faults have been placed into the model. Because the faults are physical parameters that were developed along with development of the geological model (i.e. elevations and thicknesses of the geological layers), a sensitivity analysis was not performed on the faults.

Part of the reason that the faults influence the groundwater responses in the groundwater model to the degree that they do is because of the CBM impacts. Because the CBM operations have significantly lowered the water levels in the coal seams, the faults create a shadow effect that results in many of the cells immediately downstream of the faults going dry. If there had not been any CBM dewatering operations performed in the coals, the water levels would be significantly higher and the effects of the faults would not be as pronounced.

Comment MuK 80

Mine Plan, Addendum MP-3 Groundwater Model, 80. In addition to the simulated drawdown maps, please consider providing hydrographs at strategically selected locations. This will enable a better presentation of the impacts over time. (MK)

Response MuK 80

As suggested, Appendix A has been added to Addendum MP-3 which depicts the modeled water elevations during the model simulation period at all the water supply wells identified within the model domain (CBM wells excepted) and at selected alluvial target locations within the model domain.

Comment MuK 81

Mine Plan, Addendum MP-3 Groundwater Model, 81. Please clarify if the three wells listed in Table 4.9-1 are the only wells considered for the analysis. Also, provide a discussion on the methodology to narrow down the analysis from several wells shown in the groundwater rights maps to these three wells. (MK)

Response MuK 81

Additional wells beyond those originally presented in Table 4.9-1 were considered in the analysis. Table 4.9-1 has been updated to include all the wells considered in the analysis. To determine which wells were included in the analysis, completions were

compared to modeled surfaces to estimate which formation in which the well was completed. Those thought to be completed in the Carney/Masters sequence were included. Please note that the wells included in Table 4.9-1 error on the side of being over inclusive. Some of the wells are believed to be completed in multiple zones but the analysis assumes that they are only completed in the coal seams of interest. In addition, the well depths were determined based on the State Engineer's database and in many cases well depth data was left blank or was questionable. If there was a question whether a well was actually completed in the coal aquifer of interest the well was assumed to be completed in the coal. Therefore, the well list may include some wells that are not completed in the coals of concern.

Comment MuK 82

Mine Plan, Addendum MP-3 Groundwater Model, 82. Please provide (or reference) a discussion about the three wells listed in Table 4.9-1, their depths, screened intervals and other pertinent information. (MK).

Response MuK 82

Table 4.9-1 has been updated to include total depth as well as the screen intervals for all the wells. Additional details on the wells can be found in Adjudication Appendix B.

Comment MuK 83

Mine Plan, Addendum MP-3 Groundwater Model, 83. Page Addendum MP-3-60 states, " To measure the impacts to the Tongue River and Goose Creek, a series of targets were placed along these drainages in Layer 1" Please define the term target. Also, clarify if these targets are located in the alluvial aquifer. (MK)

Response MuK 83

The targets as used in Groundwater Vistas are simply locations where heads are measured and compared with measured heads (if there are any available). Ground Water Vistas generates a hydrograph throughout the transient period of mining and recovery for each target. These targets were placed in Layer 1 to estimate the impacts of mining to surface water bodies. These targets are located where the alluvial aquifer is simulated in Layer 1. Targets representing existing well locations were also put in layers 4 and 6 as well as discussed in Comment MuK 81.

Comment MuK 84

Mine Plan, Addendum MP-3 Groundwater Model, 84. Page Addendum MP-3-60 states, "These targets demonstrate that the estimated maximum impact to Tongue River Alluvium is conservatively estimated to reach 2.5 feet drawdown near the river." Please expand the discussion on the impacts to surface water flows including translating the

drawdown to an estimated decrease in the groundwater baseflows to Tongue River and Goose Creek. (MK)

Response MuK 84

As shown on the hydrographs included in Appendix A, the maximum water level decline of 2.5 feet to the Tongue River alluvium occurred permanently and was caused by dry cells. This 2.5 foot drawdown is not believed to be a real drawdown because it resulted from model instability rather than a real predicted result. If the model did not have dry cells that caused permanent changes in the model, the maximum drawdown due to mining is estimated to be less than 0.5 feet.

As noted in the response to comment MuK 56, the model estimates the coals will contribute a relatively insignificant amount to water to the base flow of the Tongue River. As noted in Comment MuK 73 in the steady state model the River contributed approximately 2,569 cubic feet per day to the model while the river received 410 cubic feet per from the model. The net result is that in the steady state model 2,159 cubic feet per day (11.2 gpm) was contributed from the river to the model. For comparison, at the end of mining, the River contributed 2,714 cubic feet per day to the model and received 363 cubic feet per day from the model. The net result at the end of mining was that 2,351 cubic feet per day (12.2 gpm) was contributed from the River to the model. Over the simulated mining period the model estimates that the increased contribution of flow from the River to the model will be 1 gpm which represents approximately a 9% increase in flow.

Please note that in Groundwater Vistas the river boundary cells go to the bottom of the layer which likely overestimates the impacts to the River. Within the eastern portion of the model domain the coal aquifers can be 200 or more feet below the level of the river while the Tongue River Alluvium is estimated to be between 15 and 30 feet thick based on the thickness of alluvial wells constructed by Big Horn Coal in the area. Therefore, within the eastern portion of the model domain, the coals may be significantly below the alluvium and no River boundary was included in this portion of the model. However, there is an intermediary region where the actual level of the River is some 30-70 feet higher than the coals. At these locations the River boundary cells were left on to conservatively show the impacts to the river. However, the alluvium in these areas is likely thinner than 40-70 feet. As a result, the model allows the River to directly contribute water to the coals below and the model is expected to overestimate the impacts to the Tongue River in these locations.

Comment MuK 85

Mine Plan, Addendum MP-3 Groundwater Model, 85. Please provide a statement on any hydrologic impacts predicted by the groundwater model to areas outside the Brook mine permit boundary. (MK)

Response MuK 85

The only impacts outside of the Brook Mine Permit Boundary would be observed at the existing water supply wells. Table 4.9-1 describes the estimated impacts at all the water supply wells in the Model domain that will be impacted both inside and outside of the Brook Mine Permit Boundary. Please note that most of these wells are located outside of the Brook Mine permit boundary. As shown on Table 4.9-1 the largest model predicted impact seen at any existing well outside of the Brook Mine Permit boundary is 20 feet which would be observed at P48251W. As shown in the hydrograph for this well in Addendum MP-3 Appendix A, this impact is estimated to be short lived (approximately 4 years). Model predicted drawdowns at the rest of the wells are less than 5 feet. At many of the wells predicted drawdowns are less than 1 foot over the life of the mine.

Comment MuK 86

Mine Plan, Addendum MP-3 Groundwater Model, 86. Please provide a discussion on the simulated impacts caused by mining to surface water – groundwater interaction within the model domain. (MK)

Response MuK 86

Please see the response to comment MuK 84.

Comment MuK 87

Mine Plan, Addendum MP-3 Groundwater Model, 87. Please compare the model simulated water balance between pre-mining, during mining and post mining conditions. Consider including a table that presents the water balance during select periods showing the flows from all sources and discharges to all the sinks within the model domain. Provide a detailed discussion addressing any changes in the model simulated water balance between pre-mining, during mining and post mining conditions. (MK)

Response MuK 87

Please see responses to comments MuK 73 and MuK 74. A detailed discussion is included in the responses to these comments.

Comment MuK 88

Mine Plan, Addendum MP-3 Groundwater Model, 88. In addition to the maps presented on the recovery estimates, please provide hydrographs at strategically selected locations. This will enable a better presentation of recovery over time. (MK)

Response MuK 88

As described in response to Comment MuK 80, an appendix (Appendix A) has been added to Addendum MP-3 which depicts the modeled water elevations at a number of well and target locations within the model domain.

Comment MuK 89

Mine Plan, Addendum MP-3 Groundwater Model, 89. The modeling documentation lacks discussion on the backfill aquifer. In the recovery model, please clarify how the model treats the backfill aquifer (spoils aquifer) and its resaturation. Please provide a discussion (or reference) to the hydraulic properties of the backfill materials used to create the backfill aquifer and the aerial extent of the backfill aquifer. (MK)

Response MuK 89

Mine Plan Section 4.10 discusses the backfill aquifer. Within the areas where the highwall miner is used for mining, an open cavern will be left behind. Unless the mined out areas collapse, the backfill aquifer is essentially an open cavern with 100% porosity. The modeling software used for this effort does not have the ability to transiently change aquifer properties, and during resaturation of the mined areas the assigned storage coefficients remained the same as the original aquifer properties. As a result, the model may underestimate the time that it takes for the aquifer to resaturate where the mining methods have increased the porosity and thereby resaturation volume. Inversely, in the slots mined with traditional open cut mining techniques, coal will be removed and replaced with overburden material. In these locations the backfilled material is expected to have poor aquifer characteristics because it will primarily be a mix of fine grained clay and silt with some sand. In these areas the aquifer will essentially be removed. Again, the modeling software does not have the ability to transiently change aquifer properties and this effect was ignored during the modeling.

Figure MP-3-4.9-1 shows the areal extent of mining and Addendum MP-3 Figures 4.7-2, 4.7-3, and 4.7-4 depict the areas that were modeled as dry within the Brook Mine permit area. It is important to note that a large percentage of the area that will be mined is dry prior to the initiation of mining. In addition, figures in MP-3 Section 4 show that after mining, some of the areas go dry and do not rewet. In the areas where slots are excavated this prediction is reasonable because the backfill will act as an aquitard with poor aquifer characteristics. A layer by layer review of the mined area at the end of mining was conducted to determine conceptually how ignoring the changes in the coal porosity and changes in backfill material may have impacted the model predictions.

Upper Carney-With exception of a very small portion of mine block 9 (Figure MP-3-4.9-1). The entire Upper Carney coal is unsaturated. Therefore, there is no resaturation and no recovery. The model estimates are appropriate for the Upper Carney coal.

Lower Carney - Most of the mine blocks as well as the open slots are dry in the Lower Carney at the end of mining. Only mine blocks 1, 2, 5, 9, and 10 had substantial portions that were saturated. As a result, the potential error created by transient aquifer properties in model predicted resaturation rates to the underground mined coal blocks in the Lower Carney coal, if any, is expected to be very low. With the exception of the slots cut to mine blocks 5, 9, and 10, all of the slots cut to mine the Carney Coal will also be dry; therefore, resaturation at those locations will not substantially impact model predictions. The slots cut for blocks 9 and 10 generally run parallel to the direction of water flow. If the coal in these locations is completely removed and replaced with an aquitard, the impact to the aquifer will be minimal because water will simply flow around the portion of the backfilled aquifer. The open pit slot cut adjacent to mine block 5 does run perpendicular to the direction that water is flowing and may change the groundwater flow patterns in this area. However, the location of the slot is near the groundwater divide caused by the fault just to the south. Therefore, this slot is not expected to substantially impact groundwater flows either

Masters - Most of the Masters Coal mine blocks are saturated. Only blocks, 4, 5, 6, and 7 have substantial areas that are not saturated. In the mine blocks where underground mining techniques are employed the model may underestimate the time it takes for resaturation to occur because the storage coefficient is not updated to account for the increased porosity of the mined out block. However this resaturation time will be balanced out by the fact that there will be no aquifer replaced in the open cuts to resaturate, and thus these areas would not resaturate as the model predicts. With the exception of the open cut for mine block 5, all of the open cuts are oriented so that they will have minimal impacts on the natural flow gradients in the wellfield or are located within or adjacent to dry areas. As previously noted, the open cut near mine block 5 is located adjacent the drainage divide so it will not significantly change the water flow within the aquifer.

Due to the fact that much of the mined area is dry, the actual area mined that is below the water table is relatively small, and that the open cuts are oriented such that they have minimal impacts to groundwater flow, the recovery analysis performed by the model is reasonable. Also, as noted, the areas where underground mining is employed and the model overestimates the rate at which the aquifer is resaturated are counterbalanced by the areas of open cuts where the aquifer will not be replaced and the model underestimates the time it takes for the strata to resaturate.

Comment MuK 90

Mine Plan, Addendum MP-6 Subsidence Control Plan, 90. Figure MP6.1-1 shows “Monarch Seam Surface Only Mining”. Please clarify if the Monarch seam is targeted for mining in the appropriate sections of Appendix D5, Appendix D6 and mine plan. (MK)

Response MuK 90

The appropriate sections of Appendix D5 and D6 have been updated.

Reclamation Plan

Comment BJ 57

Volume 12, Reclamation Plan, Section RP.8.3, Pg. RP-37, The narrative describes the sources of recharge to the coal seams. One lithology mentioned as a positive recharge contributor is the overlying burn, scoria, or clinker material, generated by coal fires. It is a common misunderstanding that the scoriaceous material recharges coal or overburden. It would appear, at first glance, that the broken, vuggy material would be capable of conveying large amounts of water from the surface to materials beneath. That is not the case, however, as the coal/scoria interface has a zone of partially metamorphosed coal ash that lies between the burned material and the remnant coal. I have seen this zone many times during my 25 year career in the coal mines when supervising coal and overburden removal. This zone is characterized by a white to light gray, clay band that ranges in thickness from 6 inches to a foot or more. It is the same high silica ash found in the bottom ash of the local power plants that burn PRB coal. This ash band acts as an aquaclude, preventing water from entering or escaping the coal. Because of this, any recharge models that were run using the scoria as a recharge source must be reevaluated using new layers that do not include the scoria. Rerun recharge models if needed.

Response BJ 57

It is true that the partially metamorphosed coal ash layer between the coal and the scoria has the potential to limit recharge from the scoria to the coal. However, even though the permeability of this layer is low, there will be areas where the coal has collapsed or other geologic variances such as a thinning section which will allow for water from the scoria to come into contact with the coal. Therefore, even though the scoria may not be directly in contact with the coal, there is still a recharge component to the scoria, albeit; significantly lower than if the scoria and coal were in direct contact. This low recharge rate is reflected in the groundwater model. The calibrated recharge rate used in the groundwater model for the areas covered by scoria was 0.35 inches per year. For comparison purposes, the recharge rates assigned to the Carney and Masters outcrops, where no scoria was present, varied from 0.2 to 0.88 inches per year. Considering that in the scoria areas a very large percentage of direct precipitation is expected to infiltrate into the scoria, the 0.35 inch per year recharge rate represents a significant reduction in the amount of water available (which could be upwards of 10 inches per year) to infiltrate into the coal seams. Therefore, the calibrated recharge rate included in the groundwater model does take into account the low permeability layer between the coal and the scoria.

Comment BJ 58

Volume 12, Reclamation Plan, Section RP.8.3, Pg. RP-39, The second sentence in the first paragraph has an odd, difficult to understand syntax. Please rewrite the sentence for clarity.

Response BJ 58

Revised page RP-39 text as requested. The sentence will now read "The mine will consult with WDEQ/LQD to determine the number of spoil wells that will be tested".

Comment BJ 65

EXHIBITS, Reclamation Plan, Exhibit RP.6-1, The permit boundary on this map is inaccurate. Please recreate the permit boundary layer.

Response BJ 65

Revised Exhibit RP. 6-1 as requested.

Comment BJ 66

EXHIBITS, Reclamation Plan, Exhibit RP.8-3 and Exhibit RP.8-4, The post mining potentiometric surfaces for the Carney and Masters beds are suspended in mid-air over Slater Creek. Please terminate the contour lines at the outcrop or use a dotted line to indicate the calculated potentiometric surface.

Response BJ 66

Revised Exhibit RP.8-3 and RP.8-4 as requested.

Comment DS 24

Reclamation Plan, Section RP.4. This brief section discusses what is considered spoil material to be removed during mining. The section states that spoil does not include coal, but there are some very narrow coal seams with numerous stringers of clay or of such low quality that will probably not be mined and will be placed in backfill. Also, the top layers of most coal seams are quite "dirty" and would also be removed and backfilled. In order to provide the readers with a more accurate description of the mining and reclamation processes, please revise the text to show that some coal-laden materials will also be considered spoils and will be backfilled during reclamation.

Response DS 24

Revised text as requested.

Comment DS 25

Reclamation Plan, Section RP.5.2. Please provide a description of the methods used to control topsoil depth during replacement. Most mining operations use stakes with surveyed marks as guides for controlling soil application depths.

Response DS 25

See Section RP.5.4 for a description of the methods used to control topsoil depth during replacement.

Comment DS 26

Reclamation Plan, Section RP.5.4. Variability in topsoil depth cannot be avoided due to limitations imposed by the equipment used and the pre-application preparations which may include ripping of the compacted overburden surface. Typically, the depth of topsoil application may vary 25%, but the average depth should be closely monitored and should not exceed the average availability. Also, because some soils exhibit unsuitable characteristics and will not be used for reclamation, discussion of the use of substitute topsoil materials is warranted in this section.

Response DS 26

Revised text as requested. Added discussion about substitute topsoil being an option if not enough suitable topsoil is salvaged.

Comment DS 27

Reclamation Plan, Section RP.5.6. Sediment control measures will be required to prevent untreated runoff from exiting reclaimed lands onto adjacent native lands. Please provide a discussion of the sediment control measures to be used.

Response DS 27

Revised text as requested.

Comment DS 28

Reclamation Plan, Section RP.8.2. This section states only that impoundments will require Landowner, LQD and SEO approval. Prior to construction of post mining impoundments, SEO approved plans for the impoundments must be submitted for inclusion in the permit Reclamation Plan. Please include a statement that a Reclamation Plan revision will be approved by the LQD prior to construction of impoundments.

Response DS 28

Revised Section RP.8.2 to include a statement regarding LQD approval before the construction of postmine impoundments.

Comment DS 29

Reclamation Plan, Section RP.11.1. The primary final land use for the permitted acreage will be grazing and wildlife. Only areas where the current use is industrial will remain industrial land uses after mining is completed. Therefore, in order for any constructed buildings or railroad access to remain following mining, and a permit revision to change the land use will be required. It is not just a matter of demonstrating usefulness to the LQD and receiving landowner consent. This will be a major revision to the permit that will require public notice. Clarification should be provided concerning the steps involved to allow building to remain.

Response DS 29

Revised text as requested. Eliminated discussion in Section RP.11 regarding leaving any buildings, facilities, and equipment following completion of mining.

Comment DS 30

Reclamation Plan, All Mine Plan Maps with progressions must show the actual years of the initial disturbance or mining activity, or the progression must be linked to a specific year in Reclamation Plan text. The maps must also include the contour interval.

Response DS 30

See Mine Plan MP.1.6 for a description of permit terms and initial year. Revised text in Reclamation Plan Section RP.13 to reference Mine Plane MP.1.6. Revised Exhibit RP.5-1 adding “Note: Year 3 corresponds to the year 2019” in Legend.

Comment DE 19

Reclamation Plan, Section RP.5.1, page RP-6 – RAMACO states that the contoured surface will be scarified or ripped, if necessary. The mine should commit to scarifying or ripping all surfaces prior to topsoil replacement.

Response DE 19

Revised text as requested. Remove “if necessary” from sentence.

Comment DE 20

Reclamation Plan, Section RP.5.6, page RP-8 - The 1st sentence of the 2nd paragraph doesn’t make sense. Please correct.

Response DE 20

Revised text as requested. The sentence now reads “Rills and gullies occurring in redistributed soil precluding the achievement of the approved postmining land use or the reestablishment of vegetative cover will be rectified”.

Comment JJ 5

Reclamation Plan, 5. Exhibit RP 6-1 also displays permit boundary discrepancies in regards to the section lines on it and those located on the Adjudication Exhibit 1. Please update accordingly.

Response JJ 5

See response to comment BJ 65. Revised Exhibit RP.6-1 as requested.

Comment JJ 6

Reclamation Plan, 6. Table RP 6-1 states that there are 11.6 acres of wetlands and other aquatic resources. Please discuss where these acres are to be reclaimed and show them on the Exhibit RP. 6-1 which displays the reclaimed vegetation communities and their locations.

Response JJ 6

Revised Section RP.9 to include reference to Exhibit RP.6-1 for location of reclaimed wetlands and OAR. Revised Exhibit RP.6-1 to include reclaimed wetlands and OAR locations.

Comment MK 24

Reclamation Plan, Section RP.10 Reestablishment of Essential Hydrologic Functions and Agricultural Utility on Alluvial Valley Floors, Assuming the Tongue River is an AVF, this section should discuss how the essential hydrologic functions will be maintained and/or reestablished, as required by LQD Coal Rules and Regulations, Chapter 5, Section 3(c)(ii). As noted in Comment No. 21, the essential hydrologic functions of the Tongue River AVF need to be identified and a monitoring system needs to be installed. (MDK)

Response MK 24

Revised text as requested in Section RP.10.

Comment MK 25

Reclamation Plan, Section RP.10 Reestablishment of Essential Hydrologic Functions and Agricultural Utility on Alluvial Valley Floors, 25. As noted in Comment No. 21, the adjacent Goose Creek AVF also needs a monitoring system to demonstrate essential

hydrologic functions are maintained and/or reestablished as required by LQD Coal Rules and Regulations, Chapter 5, Section 3(c)(i) and (ii). (MDK)

Response MK 25

Revised text as requested in Section RP.10.

Comment MK 26

Reclamation Plan, Section RP.10 Reestablishment of Essential Hydrologic Functions and Agricultural Utility on Alluvial Valley Floors, 26. This section may also need to be addressed if the LQD finds that other AVFs exist on or near the permit area. If AVFs are determined to be present, the essential hydrologic functions must be maintained and/or reestablished as required by LQD Coal Rules and Regulations, Chapter 5, Section 3(c)(i) and (ii). (MDK)

Response MK 26

Revised text as requested in Section RP.10.

Comment MK 75

Reclamation Plan, Section RP.3.3 Postmine Slope Analysis, 49. Please provide a discussion that compares the pre-mine vs. post-mine slope characteristics. A table would be helpful that compared the minimum, maximum, and average slopes under pre-mine and post-mine conditions. (MDK)

Response MK 75

Added Table RP.3-1 comparing premining and postmining slopes. Updated Section RP.3.3 of text to include reference to the new table.

Comment MK 76

Reclamation Plan, Section RP.3.5 Drainage Reestablishment, 50. It is stated that mining will disturb portions of the Slater Creek channel and the reclamation will entail reconstruction. However, the Mine Plan PHC (Section MP.6.1) stated that Slater Creek "will still flow naturally around the trench", and "Because Slater Creek's flow will not come into contact with mining activities, no impact will be made to water quality". Please provide a clear and explicit description of the extent of direct disturbance to the Slater Creek channel. This description should be consistent between the Mine Plan and Reclamation Plan. (MDK)

Response MK 76

As stated in the revised Section MP.6.1 of the Mine Plan, the only anticipated surface disturbance to Slater Creek during mining will be the redirection of the channel

through a culvert under a proposed haul road. No text was edited in response to this comment.

Comment MK 77

Reclamation Plan, Section RP.4.2 Mitigation of Unsuitable Material , 51. Minor channels are defined as ephemeral streams but there is no definition provided for "major channels". Please provide a definition and also illustrate an example of a major channel within the proposed permit boundary that would fit into this category. (MDK)

Response MK 77

Revised text in Section RP.4.2 to provide the definition of major channels.

Comment MK 78

Reclamation Plan, Section RP.5.6 Erosion Control and Conservation Practices, 52. The first sentence of the second paragraph…"Rills and gullies…" needs revised, as it appears to be missing one or more words. (MDK)

Response MK 78

See response to Comment DE 20. Text revised as requested.

Comment MK 79

Reclamation Plan, Section RP.7.4 Aquatic Habitat, 53. The second sentence discusses stockponds possibly being disturbed by mining activities. The Mine Plan PHC did not mention that any existing stockponds would be disturbed by mining activities. If stockponds are to be disturbed by the mining operation, this should be discussed in the Mine Plan PHC. (MDK)

Response MK 79

The text in the Mine Plan PHC has been revised to clarify the disturbance to stockponds within the permit area. Section RP.7.4 has been revised to clarify the anticipated aquatic habitat locations.

Comment MK 80

Reclamation Plan, Section RP.7.4 Aquatic Habitat, 54. The text states that two additional postmine impoundments will be constructed and their location is shown in Exhibit RP.3-1. This Exhibit shows ten permanent impoundments, both on and adjacent to the proposed permit area. Please revise this discrepancy in the text or change the symbology in the Exhibit to clearly show the two permanent post-mine impoundments. (MDK)

Response MK 80

Revised text in Section RP.7.4. to clarify the postmine impoundment locations.

Comment MK 81

Reclamation Plan, Section RP.8.1 Drainage Basin Reconstruction, 55. Please add the major stream name labels (Tongue River, Goose Creek, East Fork Earley Creek, Slater Creek, Hidden Water Creek) to Exhibit RP.8-1. (MDK)

Response MK 81

Revised Exhibit RP.8-1 as requested.

Comment MK 82

Reclamation Plan, Section RP.8.1 Drainage Basin Reconstruction, 56. Please explain in the text how the postmine drainage basin parameters in Table RP.8-1 were determined. (MDK)

Response MK 82

Revised text in Section RP.8.1 as requested.

Comment MK 83

Reclamation Plan, Section RP.8.1 Drainage Basin Reconstruction, 57. The text states that a comparison of drainage basin parameters in Table RP.8-1 and Exhibit RP.8-1 show that the overall hydrologic balance will remain largely unchanged. This conclusion is not obvious from the Table and Exhibit. How similar are the postmine drainage basin parameters to the pre-mine parameters? Which sub-drainages show the largest change from pre-mine conditions? The text needs to include a more thorough discussion to demonstrate to the reader why exactly the postmine hydrologic balance will be unchanged. (MDK)

Response MK 83

Revised text to include reference to Appendix D6 tables and exhibits regarding drainage basin parameters. Minor disturbance and mining methods contribute to the largely unchanged postmine drainage basin parameters.

Comment MK 84

Reclamation Plan, Section RP.8.1.1 Discharge Estimates, 58. The text provides no discussion of the comparison between the pre-mine and postmine modelled discharge values. Please provide this discussion so the reader can determine if the differences are minor or major. (MDK)

Response MK 84

Revised text in Section RP.8.1.1 as requested

Comment MK 85

Reclamation Plan, Section RP.8.1.1 Discharge Estimates, 59. Please add the year to the Miller reference within the text (2003) and add this citation to the references list in Section RP.17. (MDK)

Response MK 85

Revised text as requested.

Comment MK 86

Reclamation Plan, Section RP.8.1.1 Discharge Estimates, 60. Similar to Comment No. 8 made for Appendix D6, the HEC-HMS runoff estimates in Table RP.8.4 are much higher than the Miller (2003) equations. Please provide a discussion in the text as to the reasonableness of the HEC-HMS estimates and why the HEC-HMS estimates are so much higher than the Miller (2003) regression equations.

Response MK 86

See response to Comment MK 34. No revisions to the text were made.

Comment MK 87

Reclamation Plan, Section RP.8.1.2 Channel/Floodplain Design, The last sentence in the first paragraph states that stream reaches for which designed cross sections are provided are identified in plan on Exhibit RP.8-1. There is nothing on this Exhibit that shows which stream reaches have designed cross sections, nor which stream channels are being reconstructed. Please clearly identify this information on this Exhibit. (MDK)

Response MK 87

Exhibit RP.8-1 has been revised as requested.

Comment MK 88

Reclamation Plan, Section RP.8.1.2 Channel/Floodplain Design, 62. Exhibit RP.8-2 shows that the main Slater Creek channel will not be disturbed. Please consider this in light of Comment No. 50 that requested clarification on the extent of disturbance to the Slater Creek channel. (MDK)

Response MK 88

See response to Comment MK 76(referred to as Comment No. 50). Revised Exhibits RP.8-1 RP.8-2 as requested. A reconstructed Slater Creek (Figure RP.8-9) cross section has been added to reflect the correct disturbance boundary.

Comment MK 89

Reclamation Plan, Section RP.8.1.2 Channel/Floodplain Design, 63. On Page RP-35, second paragraph, it references "reclaimed Slater Creek channel" and channel hydraulics are presented in Table RP.8-5. It is not clear why channel hydraulics are presented for Slater Creek when it will not be disturbed. Is this because reclaimed tributaries to Slater Creek are changing such that the main channel of Slater Creek is expected to be change? Please clarify this in the text. (MDK)

Response MK 89

Slater Creek is included Table RP.8-5 to show that the postmine Slater Creek Channel will be hydraulically similar to premine conditions after mining and reclamation operations have been completed as reclamation of a portion of Slater Creek is expected.

Comment MK 90

Reclamation Plan, Section RP.8.2 Permanent Impoundments, 64. It is unclear exactly how many new postmine impoundments will be constructed. Table RP.8-6 identifies two impoundments (Enhancement Stock Pond 1 and Replacement Stock Pond 1), and these are shown in Exhibit RP.3-1. Exhibit RP.3-1 shows eight other permanent impoundments. Please identify if these are new features to be constructed or if they are existing stockponds that may be affected by the mining operation. (MDK)

Response MK 90

The text in Section RP.8.2 has been revised to clarify that only the new features to be constructed are displayed in Table RP.8-6. Affected existing stockponds will be constructed approximately to premine conditions.

Comment MK 91

Reclamation Plan, Section RP.8.2 Permanent Impoundments, 65. Please identify in this section if there will be a net increase or decrease in post-mine water storage capacity relative to pre-mine capacity. (MDK)

Response MK 91

Revised text in Section RP.8.2 to clarify a net increase in water storage capacity is expected due to the addition of two postmine impoundments.

Comment MK 92

Reclamation Plan, Section RP.8.2 Permanent Impoundments, 66. As mentioned Comment No. 47, it is advised that the applicant discuss with the SEO-Interstate Streams Division any implications for the Yellowstone Compact if new water storage features are proposed that potentially decrease water quantity to the Tongue River. (MDK)

Response MK 92

See response to Comment DS 28(Comment No. 47 mentioned above). Revised text as requested.

Comment MK 93

Reclamation Plan, Section RP.8.4.2 Surface Water Monitoring, 67. The text on Page RP-40 states that the surface water monitoring stations are shown on Exhibit RP.8-4. However, the stations are not shown on this Exhibit. It may be make the most sense to add these to Exhibit RP.8-5 and rename the Exhibit "Postmine Hydrologic Monitoring Locations" so the surface water stations and monitoring wells are on one Exhibit. (MDK)

Response MK 93

Revised the reference in text to state "locations of these sites are shown on Exhibit RP.8-5". Exhibit RP.8-5 was revised to include surface water monitoring stations and renamed as requested. Table RP.8-9 was edited to include all planned surface water stations including postmine impoundment monitoring sites.

Comment MK 94

Reclamation Plan, Section RP.8.4.3 Postmine Impoundments, 68. The text on Page RP-41 states that water quality samples will be collected at each of the postmine impoundments listed in Table RP.8-6 and presented on Exhibit RP.3-1. Please clarify in the text that this sampling list includes all ten impoundments shown. (MDK)

Response MK 94

Revised text in Section RP.8.4.3 to reference Table RP.8-9 and Exhibit RP.8-5 for postmine surface water monitoring sites including postmine impoundments.

Comment MK 95

Reclamation Plan, Section RP.8.4.3 Postmine Impoundments, 69. Please add the list of impoundments to be sampled to Table RP.8-9 "Surface Water Monitoring Sites". (MDK)

Response MK 95

Revised Table RP.8-9 as requested.

Comment MK 96

Reclamation Plan, Section RP.8.4.3 Postmine Impoundments, 70. The postmine impoundments to be sampled appears to be slightly different from the impoundments listed in Mine Plan Table MP.7-1 "Operational Surface Water Monitoring Locations". Table MP.7-1 lists three impoundments (Hall Reservoir, Black Mountain No. 1 Stock Reservoir, and Legerski Bros #1 Stock Reservoir) that are not listed as postmine impoundments to be sampled. Please explain why there is a difference in the operational monitoring and postmine monitoring of some impoundments. (MDK)

Response MK 96

Black Mountain No.1 Stock Reservoir has been added as a postmine impoundment that will be monitored. Legerski No. 1 Stock Reservoir and Hall Reservoir are outside of the areas planned for mining disturbance, however in an effort to further monitor the surface water of the Brook Mine permit area, the reservoirs were added to be sampled quarterly during mining. Table RP.8-9 and Exhibit RP.8-5 have been updated to include Black Mountain Reservoir No. 1 Stock Reservoir.

Comment MK 97

Reclamation Plan, Section RP.8.4.3 Postmine Impoundments, 71. In the second full paragraph on Page RP-41, "The water quality samples.." please also state that the water quality samples will be compared against WDEQ/WQD Class III groundwater standards, as suggested by LQD Guideline No. 17 for replacement and enhancement stockponds. (MDK)

Response MK 97

Revised text as requested in Section RP.8.4.3.

Comment MK 98

Reclamation Plan, Section RP.8.5.2 Surface Water, 72. At the end of the first paragraph on Page RP-44, it predicts a "slight change" in event peaks and volumes. Please further discuss what is meant by a "slight change", i.e., what is the magnitude of the increase or decrease? (MDK)

Response MK 98

Section RP.8.5.2 has been updated to reflect the change in event peaks and volumes will be less than one percent when compared to premining conditions.

Comment MK 99

Reclamation Plan, Section RP.8.5.2 Surface Water, 73. In the second paragraph on Page RP-44, please clarify the extent of direct mining disturbance to Slater Creek versus tributaries of Slater Creek. This comment relates to previous Comments No. 50 and 62. (MDK)

Response MK 99

See response to Comments MK 76 (comment No. 50) and Mk 88 (Comment No. 62).

Comment MK 100

Reclamation Plan, Section RP.8.5.2 Surface Water, 74. Please provide a discussion as to whether the planned postmine impoundments will affect surface water quantity on or downstream of the proposed permit area. (MDK)

Response MK 100

Section RP.8.5.2 has been revised to include discussion of the effect of postmine impoundments to the surface water quantity on and downstream of the proposed permit area.

Comment MK 101

Reclamation Plan, Section RP.9.1 Introduction, 75. The second paragraph references Appendix D8. Should this be Appendix D10 (Wetlands)? Please revise this if necessary. (MDK)

Response MK 101

The reference has been revised to D10 as requested.

Comment MK 102

Reclamation Plan, Section RP.9.1 Introduction, 76. Please add a statement up front in the Wetland Mitigation section that the USACE has not yet issued a jurisdictional determination for the proposed Brook Mine. Please also provide a statement in the text that the information in Section RP.9 may be subject to change pending the USACE determination. The USACE jurisdictional determination should also be incorporated somewhere into the Mine Permit once that is received by the Brook Mine. (MDK)

Response MK 102

Sections RP.9.1 has been revised as requested.

Comment MK 103

Reclamation Plan, Section RP.14 Bond Release, 77. The LQD no longer requires a bond release verification for "sediment control release". This is now termed "surficial stability verification". More information is available in LQD Guideline No. 23. Please revise the text for this change. (MDK)

Response MK 103

The text in Section RP.14 has been revised by removing the reference to sediment control release.

Comment MuK 91

Reclamation Plan, RP 8.5.3 Groundwater, 91. Section 8.3, page RP-38 states, "The estimated Postmine Potentiometric surfaces for the reclaimed aquifer for the Masters and Carney Seams are presented respectively in Exhibit RP.8.3 and Exhibit RP.8-4. Please provide a summary comparing and contrasting the premine potentiometric surfaces vs. post mine potentiometric surfaces. This comparison should also consider any changes in the hydraulic properties (hydraulic conductivity, storativity, recharge capacity) of the premine aquifers vs. post mine aquifers. (MK)

Response MuK 91

Section RP.8.5.3 has been revised to include discussion regarding the comparison of premine and postmine potentiometric surfaces.

Comment MuK 92

Reclamation Plan, RP 8.5.3 Groundwater, 92. Please discuss any changes in the interaction between the surface water and groundwater systems from the premining through the postmining phases of the operation. (MK)

Response MuK 92

The response to Comment MuK 84 describes interaction between the surface water and groundwater systems from the premining through the postmining phases of operation. In general the changes between the surface water systems and the groundwater systems are expected to be minimal. For a short time during mining it is anticipated that there will be a small (less than 6%) increase in the amount of water that recharges the coal seams from the Tongue River. Once the water levels in the coals recover, no further impacts are expected.

Comment MuK 93

Reclamation Plan, RP 8.5.3 Groundwater, 93. Please discuss the intersection of the postmining topographic and potentiometric surfaces and their effects on the location and size of groundwater-fed water bodies. (MK)

Response MuK 93

Revised Section RP.8.5.3 as requested.

Comment MuK 94

Reclamation Plan, RP 8.5.3 Groundwater, 94. Section 8.5.3, page RP-46 states, "These water quality changes can be qualitatively predicted from the overburden mineralogy and projected post mine hydrology." Please expand this discussion on projected groundwater quality. Provide a discussion on the estimated/ projected post mining groundwater quality. A detailed description of potential changes in water quality from flow through backfill/mined out areas should be included. Any potential changes to water quality in adjacent aquifers should be discussed with respect to the potential for offsite material damage. (MK)

Response MuK 94

Revised Section RP.8.5.3 text as requested.

Comment MuK 95

Reclamation Plan, RP 8.5.3 Groundwater, 95. Please provide a discussion on any anticipated water use during the reclamation period. (MK)

Response MuK 95

As discussed in Addendum MP-3, the only anticipated groundwater uses during the reclamation period are at existing water supply wells. Section RP.8.5.3 has been revised to include additional discussion.

Comment MuK 96

Reclamation Plan, RP 8.5.3 Groundwater, 96. Please address (or reference) any expected post-reclamation subsidence effects on the hydrologic system (both quantity and quality) and the plan to minimize these effects. (MK)

Response MuK 96

Section RP.8.5.3 has been revised to include discussion of expected postmine subsidence effects on the hydrologic system.

Comment SP 7

Reclamation Plan, Page RP-13. Section RP.6.2.6. In the last sentence please add that substitutions to the seed mix will be made only with WDEQ approval.

Response SP 7

Revised text in Section RP.6.2.6 as requested, the statement will now read “In the event that seed for primary species is not available, alternatives will be considered which match the life form and morphology of the primary choice only with WDEQ approval.”

Comment SP 8

Reclamation Plan, Page RP-16. Section RP.6.4.1. To demonstrate that all of the unaffected acres of each vegetation community are sufficient for an extended reference area please create a table with total acres and affected acres and reference this table in this section.

Response SP 8

Table RP.6-6 has been created to display the number of extended reference acres for the respective vegetation communities. The text in Section RP.6.4.1 has been revised to include a reference to the newly created table.

Comment SP 9

Reclamation Plan, Page RP-17. Section RP.6.4.1. Please add to the Ch. 4 reference in the first sentence on this page that the Handbook of Approved Sampling and Statistical Methods for Evaluation of Revegetation Success on Wyoming Coal Mines.

Response SP 9

Revised Section RP.6.4.1 as requested.

Comment SP 10

Reclamation Plan, Page RP-17. Section RP.6.4.1. Please remove the first sentence in the third paragraph. It appears in conflict with the next sentence which cites Ch. 4.Sec. 2(d)(ii)(B).

Response SP 10

Removed sentence as requested in Section RP.6.4.1.

Comment SP 11

Reclamation Plan, Page RP-19. Section RP.6.4.5.1. Please add a third sentence to the first paragraph to Pastureland land use with a full shrub density greater than 1 shrub/m2 is also eligible.

Response SP 11

Sentence including pastureland land use as eligible added to Section RP.6.4.5.1 as requested.

Comment SP 12

Reclamation Plan, Page RP-24. Please revise the sentence after the ● Shrub density bullet to "Additionally, a species list will be prepared" and delete the remainder of the sentence.

Response SP 12

Revised text as requested.

Comment SP 13

Reclamation Plan, Page RP-25. Section RP.6.7.3. Under Sampling Frequency in Guideline 14 the third sample may be included as part of your revegetation success (bond release) sampling which can begin in year seven. You may add more flexability to your sampling interval such as beginning year 3 or 4, with the second sampling in year 5, 6 or 7 and then the third may be year 7 – 13 and may be used for revegetation success.

Response SP 13

Revised text per recommendations.

Comment SP 14

Reclamation Plan, Page RP-29. Section RP.7.2. There is a reference to RP.8 in this section. Please correct the reference if it is not correct.

Response SP 14

Revised text to reference Section RP.6 for seed mixtures and revegetation operations.

Comment SP 15

Reclamation Plan, Table RP6.1. Could you please add a footnote listing the disturbances that are included in the 87.3 acres of Disturbance and what the disturbances will be postmining in the 56.1 acres.

Response SP 15

Added footnote describing disturbance for premining and postmining to Table RP.6-1 as requested.

Comment SP 16

Reclamation Plan, Exhibit RP.2-1. Postmining the landuse will be Grazingland and Fish and Wildlife Habitat (937.7 acres) and Cropland (3.7 acres) with 56.1 acres of disturbance, 4.9 acres of water and 11.6 acres of wetland. These landuses will match the landuses on Exhibit D1.1-1. With just minor acreage changes shown in Table RP.6-1. Since the railroad and major roads are identified and Taylor Quarry is going to be reclaimed to Grazingland and Fish and Wildlife Habitat, the Industrial commercial stippling is not needed on these areas.

Response SP 16

Revised exhibit as requested.

Other Comments

Comment MK 27

Items Requested in Electronic Format for Preparation of CHIA, 1. Please provide a CAD or ArcGIS shapefile that contains the proposed permit boundary for the Brook Mine. This file will be used to prepare maps in the CHIA. This file can be emailed to: matthew.kunze@wyo.gov. (MDK)

Response MK 27

See response to comment MK 28.

Comment MK 28

Items Requested in Electronic Format for Preparation of CHIA, 2. Please provide the baseline surface and groundwater data collected to support baseline characterization for the permit application. All data can be submitted on Excel templates (Attachments) found on the LQD website for the Coal Annual Report Format (CARF): http://deq.wyoming.gov/lqd/coal/resources/annual-report-3/.

• Please provide all surface water flow and water quality data for the following surface water stations: SM578415-SW-1, SM578409-SW-1, SM578418-SW-1, and SM578512-SW-1.

• Please provide all groundwater level and water quality data for all Brook Mine monitoring wells shown in Table D6.2-1.

Response MK 28

The electronic data requested is being compiled in the requested format and will be provided when it is completed.