# DEQ EXHIBIT C

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**MONTANA BOARD OF ENVIRONMENTAL REVIEW**

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| **IN THE MATTER OF:**<br><br>**APPEAL AMENDMENT AM4 WESTERN ENERGY COMPANY ROSEBUD STRIP MINE AREA B, PERMIT NO. C1984003B** | Case No.: BER 2016-03 SM<br><br>**AFFIDAVIT OF EMILY HINZ, Ph.D. IN SUPPORT OF DEQ'S BRIEF IN OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT** |

I, Emily Hinz, Ph.D., swear (or affirm) under oath that:

1. I am of majority age;

2. I graduated from Boise State University in 2012 with a Ph.D. in Geophysics. I also graduated from the University of Texas at Dallas in 2007 with a Master's of Science in Geosciences and 2005 with a Bachelor's of Science in Geosciences;

3. I am currently employed as a Computer Software Engineer with Montana Fish, Wildlife and Parks ("FWP") and have been employed in that position for less than a year;

4. I was previously employed by the Montana Department of Environmental Quality ("DEQ") as a hydrologist, in the Coal Section of the Industrial and Energy Minerals Bureau. I served in that position for 4.5 years;

5. The Coal Section of the Industrial and Energy Minerals Bureau is responsible for permitting strip and underground coal mines in Montana;

6. As a part of my regular duties at DEQ, I reviewed applications for permits and major revisions to permits for strip and underground mines in Montana;

7. I was one of the hydrogeologists that worked on the preparation of the CHIA for The AM4 Amendment to Western Energy Company's Rosebud Coal Mine Area B ("AM4"). I served as the primary surface water hydrogeologist, while Angela McDannel, who is now retired from DEQ, served as the primary ground water hydrologist on the CHIA;

8. Pursuant to § 82-4-227(3), MCA, the applicant must affirmatively demonstrate to DEQ through the submission of a comprehensive permit application, which includes the preparation of a plan for protection of the hydrologic balance ("Plan for Protection") and a probable hydrologic consequences ("PHC") determination, that the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area;

9. ARM 17.24.301(93) defines "probable hydrologic consequences" as "the projected results of proposed strip or underground mining operations that may reasonably be expected to alter, interrupt, or otherwise affect the hydrologic balance. The consequences may include, but are not limited to, effects on stream channel conditions and the aquatic habitat on the permit area and adjacent areas.";

10. Section 82-4-203(2), MCA, defines "adjacent area" as "the area outside the permit area where a resource or resources, determined in the context in which the term is used, are or could reasonably be expected to be adversely affected by proposed mining operations,

including probable impacts from underground workings.";

11. Section 82-4-227(3) also provides that prior to approving an application for a strip or underground mining permit or major revision to a permit, DEQ must first assess the probable cumulative impact of all anticipated mining in the area on the hydrologic balance, and make a determination that the "proposed operation" of the mining operation has been designed to prevent material damage to the hydrologic balance outside the permit area;

12. DEQ relies primarily on the information included in the permit application, including the Plan for Protection and the PHC to assess the probable cumulative impact of all anticipated mining on the hydrologic balance in the area and to make the material damage determination required pursuant to § 82-4-227(3), MCA;

13. The first step in developing the CHIA is to define the cumulative hydrologic impact area ("CIA") for both surface water and groundwater. With respect to the AM4 CHIA, I defined the CIA for surface water and Angela McDannel defined the CIA for groundwater;

14. ARM 17.24.301(32) defines "cumulative hydrologic impact area", as "the area, including, but not limited to, the permit and mine plan area within which impacts to the hydrologic balance resulting from the proposed operation may interact with the impacts of all previous, existing and anticipated mining on surface and ground water systems.";

15. For purposes of the CIA, ARM 17.24.301(32) states that "[a]nticipated mining includes, at a minimum, the entire projected lives through bond release of all operations with pending applications .... for which there is actual mine-development information available";

16. Figure 5-1 on page 13-7 of the CHIA sets forth the location and extent of the surface water and groundwater cumulative impact boundaries, otherwise known as the CIA. Page 5-1 of the CHIA includes a description and justification for the CIA boundaries that were established for surface and groundwater;

17. The surface water CIA boundaries are described as follows in the CHIA: "The surface water CIA includes all areas that may see a measurable change in water quantity or water quality due to mining activities at the Rosebud Mine and Big Sky Mine. The cumulative impact area covers upstream portions of West Fork Armells Creek ("WFAC") to the confluence with Donley Creek, East Fork Armells Creek ("EFAC") to the confluence with Stocker Creek, and Rosebud Creek to the confluence with Spring Creek. The CIA boundaries are established down gradient from potentially affected streams and springs, and include all surface water monitoring stations to allow assessment of impacts to stream water quality and quantity. Only impacts from coal mining are included in the CHIA, and although the power plant, power plant ash ponds, the town of Colstrip, and active agricultural activities are within the CIA, the impacts from these sources are only mentioned when their impacts are measured in data collected by the coal mines.";

18. In general, the CIA for surface water includes drainages, or hydrologic units, impacted by previous or existing mining at the Rosebud Mine and the Big Sky Mine, and DEQ extended the CIA boundary for each drainage to its confluence with the next drainage. For the EFAC drainage, DEQ included all of the creeks that may be impacted by mining as a whole. For the WFAC drainage, DEQ extended the surface water CIA boundary to the tributary junction with Donley Creek. However, there are no surface water

impacts to WFAC from Area B or AM4. DEQ included Area C in the boundary because impacts from Area B interact with impacts from Area C on EFAC. Rosebud Creek was included to the confluence with Spring Creek to include impacts from Area D and E of the Rosebud Mine, and impacts from Area A and B of the Big Sky Mine. There is also a small sliver of the Rosebud Mine Area B that crosses into the Lee Coulee drainage that impacts Rosebud Creek;

19. The anticipated mining in Area F did not need to be included in the surface water CIA for AM4 because there was no hydrologic connection between surface water in Area F and surface water in Area B, which includes AM4. Therefore, there would be no interaction between surface water impacts from AM4 and Area F on the hydrologic balance in the area;

20. The lack of hydrologic connection between surface water in Area B/AM4 and Area F results from the surface water divide between EFAC and WFAC that occurs in Area C. Accordingly, surface water from AM4 does not interact with surface water from Area F;

21. The surface water divide for EFAC and the tributaries to Rosebud Creek (Lee Coulee and Miller Coulee) divides AM4 and the majority of Area B from the Big Sky Mine and prohibits surface water from AM4 from reaching tributaries of Rosebud Creek. Therefore, there will be no impacts from operations in AM4 to tributaries of Rosebud Creek;

22. Further, even though a small portion of the existing Area B permit crossed the surface water divide into the Lee Coulee drainage, DEQ required the mine to construct sediment ponds at the edges of permit area to prevent offsite discharges to Lee Coulee from Area B. No additional discharge points were added to the mine's MPDES permit on Lee

Coulee. There will be no new discharge points related to AM4 on Lee Coulee because the proposed operations in AM4 do not cross the surface water divide, and surface water from AM4 will not reach Lee Coulee or Rosebud Creek;

23. Additionally, DEQ concluded in the CHIA that the numeric water quality standard for electrical conductivity ("EC") in tributaries to Rosebud Creek will not be violated as a result of the proposed operations in AM4 because impacts from AM4 will not have any interaction with surface water in these tributaries. The reason for this is that the surface water divide described above will prohibit surface water from AM4 from flowing south towards Lee Coulee;

24. Surface water from AM4 will flow north towards EFAC. Therefore, there is no evidence to support a conclusion that surface water runoff from AM4 will cause a violation of EC standards in tributaries to Rosebud Creek. Accordingly, there will be no new discharge outfalls added to the mine's MPDES permit on Lee Coulee as a result of the proposed operations in AM4 because surface water from AM4 will drain to EFAC, not Rosebud Creek;

25. With respect to whether operations of the Rosebud Mine have caused dewatering of intermittent segments of EFAC, DEQ indicated in the CHIA on p. 8-2, that the nature of flow in the creeks located within the surface water CIA can only be determined at locations monitored by the Rosebud Mine and Big Sky Mine that have sufficient surface water monitoring to determine the nature of the flow;

26. Additionally, with few exceptions, "the surface water that is monitored by the mines in and near the Rosebud and Big Sky mines are ephemeral, flowing only in response to precipitation events or snowmelt, or for short reaches below the issue point of springs or

seeps." (See CHIA p. 8-2);

27. With respect to EFAC, the upper segment is predominantly ephemeral and is flanked by active mining along most of its reach. However, lower EFAC has large reaches with intermittent to perennial flow. While no coal mining occurs adjacent to lower EFAC, the reach is influenced by coal mining activity upstream and in Area D, and water quality and quantity is influenced by runoff from multiple sources, including agriculture, the sewage treatment plant at Colstrip, and industrial treatment ponds not related to mining;

28. Monitoring at the Rosebud and Big Sky Mines, has indicated that there are two segments on upper EFAC that potentially had periods of flow that would classify them as intermittent. These two segments are located Section 8, which is located upstream of the Rosebud Mine , and Section 15, which is located between Area C and Area B of the Rosebud Mine;

29. However, as indicated on p. 8-2 of the CHIA, "[w]ith only one continually monitored site upstream of mining, natural flow conditions along the entire reach of EFAC cannot be established by the existing record of empirical measurements." There are simply too few data monitoring points to accurately determine historic stream flow on EFAC, including flow in Section 8 and Section 15;

30. Further, it is important to note that Section 8 is located upstream of the Rosebud mine and flow in in Section 8 has not been impacted by operations of the mine. Accordingly, contrary to Petitioners' assertion, operations at the Rosebud mine have not caused dewatering of this portion of EFAC. Any change in flow rate in Section 8 of EFAC is due to causes other than mining;

31. While DEQ acknowledged in the CHIA at pages 9-9 and 9-10, that "[m]ining

activities such as cutting off tributaries to EFAC could have reduced the amount of runoff reaching the Section 15 instream pond and reach. This section may see a return of some instream ponding once the upstream sediment ponds are removed. The resaturation of the spoils and restoration of the premine groundwater gradient may also help to restore some baseflow.";

32. DEQ further indicated in the CHIA that it did not have sufficient historical data to determine whether former and existing operations of the Rosebud Mine have caused a degradation of water quantity in Section 15 of EFAC to the extent that the beneficial use of aquatic life support has been adversely affected, or a water right has been impacted. However, there are no surface water rights listed with the Department of Natural Resources ("DNRC") for EFAC through Section 15, and there is insufficient data to determine whether there was sufficient flow in Section 15 of EFAC to support aquatic life in every year, or only in wet years;

33. Monitoring data from "a new and more reliable continuous flow monitor" ("SW-55") that was installed in late 2011 upstream of the state highway crossing of EFAC, indicates that this area of EFAC at the downstream edge of Areas A and B may routinely have flowing or ponded water for months out of the year. The flow data coupled with observations during regular mine inspections of EFAC indicate that the reach between the location of the Area A facilities and the Area A Tipple, which is located between Area A and Area B of the Rosebud Mine and is downstream of Section 15, has intermittent to perennial water, at least since 2011. This reach currently may be artificially enhanced by discharges made pursuant to an MPDES permit, and infiltration;

34. This new data indicates that while some segments have seen a decrease in surface

flow, other sections have seen an increase in surface flow, which has caused some segments that were previously ephemeral to be intermittent to perennial;

35. Even if there is a reduction in flow to Section 15 as a result of historic mining, mining operations in AM4 will not affect the quantity of water in this ection because any impacts to EFAC surface water flow will occur much further downstream;

36. With respect to coal mining's impact on aquatic life support in the lower segment of EFAC which runs from Colstrip to the mouth at Armells Creek, the surface and alluvial water quality data analyzed by DEQ for the Rosebud Mine indicated that the relative contribution of nitrogen from the Rosebud mine is minimal;

37. The CHIA indicates that "[h]igh nitrogen may be in surface water samples due to residual chemicals from blasting materials, from agricultural activities, or from city runoff and municipal sources[,]" and "samples above the human health limit of 10 mg/L are shown as dark red[']" and "[m]any of the highest values have been detected downstream of active mining and in areas actively used by livestock." (See CHIA p. 9-26);

38. Thus, while the CHIA acknowledges that mining is a potential source of nitrogen in the water samples that exceeded the human health standard, agricultural activities, city runoff and municipal sources were also identified as potential sources of the pollutant;

39. Petitioners mischaracterize DEQ's factual findings contained in the CHIA with respect to violations of water quality standards for nitrogen that protect human health. Petitioners state that these standards were "repeatedly violated." (Petitioners' Br., p. 58). As indicated on p. 12-42 of the CHIA, Table 9-7 (surface water exceedances) indicates that out of 46 samples taken for surface water, there were zero exceedances of the human health standard for nitrogen in upper EFAC. All of the surface water exceedances (12 out of 64

samples) occurred downstream of Colstrip, where potential sources other than mining have been identified;

40. With respect to groundwater exceedances for nitrogen in upper EFAC (segment MT42K002-170), on page 12-48 of the CHIA, Table 9-9 indicates that nitrogen was rarely detected in spoil wells and was not persistent over time in samples from any given well. The fact that groundwater exceedances of the human health standard for nitrogen were not persistent over time indicated that nitrogen in spoils water from the mine is not an issue to be concerned about;

41. As indicated on p. 8-2 of the CHIA, Rosebud Creek is the only stream analyzed within the CHIA that is a wadeable stream for its entire reach. There are additional stream reaches that are wadeable, but not entire streams other than Rosebud Creek. For example, lower EFAC does have reaches with intermittent to perennial flow, but upper EFAC is predominantly ephemeral with only two reaches that have historically been described as having intermittent or perennial flow;

42. The nitrogen standard for the protection of aquatic life contained in DEQ 12-A would only be applicable to those reaches of EFAC that are wadeable, which means that they are perennial or intermittent. They are not applicable to those portions of EFAC or any other stream that are ephemeral;

43. At the time that the CHIA was developed, there was very little Total Nitrogen data available for the streams analyzed within the CHIA, including EFAC. However, since the available data indicated that coal mining was not the source of the nitrogen in lower EFAC, there would have been no reason for DEQ to do further analysis applying the more stringent standards contained within DEQ 12-A;

44. Even if DEQ had applied the more stringent numeric nutrient standards contained in DEQ 12-A, the results of DEQ's analysis would not have changed. The total nitrogen samples taken at SW-55, which is the surface water monitoring station located on that portion of upper EFAC which has recently demonstrated intermittent flow, have not exceeded the DEQ 12-A standard of 1.3 mg/L for nitrogen;

45. In its Seventh Round Acceptability Deficiency letter dated June 3, 2014, DEQ requested that the mine provide additional information, including an aquatic life survey, to address any concerns DEQ staff had regarding the potential for material damage to EFAC from sulfate, chloride, or salinity due to the proposed mining operation in AM4;

46. After DEQ reviewed the additional information provided by Intervenors in the ABC PHC Addendum to Appendix M of the AM4 permit application, no mitigation was required as no material damage was anticipated to EFAC as a result of increased levels of sulfates or chloride from mining;

47. As indicated in the CHIA on p. 9-8, DEQ applied the guideline sulfate toxicity threshold of 2,000 mg/L for aquatic life to account for the very high hardness of stream water. Even in baseline samples, sulfate thresholds for aquatic life were exceeded. However, macroinvertebrate communities in Eastern Montana are likely adapted to high sulfate water. Therefore, based on DEQ's review of the available data, DEQ was satisfied that no adverse impacts to aquatic life in EFAC were anticipated as a result of increased levels of sulfates;

48. Further, it should be noted, that the high chloride concentrations referenced in the CHIA at p. 9-8, between Area A Tipple and SW-55, which is located between Area A and Area B, was "likely from flushing of chloride in the soil and alluvium by the [Intervenor's] Area A facilities in addition to chloride from leaking power plant ponds.";

49. Hence, leaking ponds at the Colstrip Power Plant provided a source of elevated chlorides in addition to the chlorides from facility operations at Area A of the mine. MSUMRA does not require DEQ to consider impacts from non-mining sources, such as the Colstrip Power Plant, in the CHIA;

50. Additionally, regardless of the cause of the existing high chloride concentrations in EFAC, the proposed mine plan for the AM4 Amendment "is designed not to contribute additional chloride to the stream because lignin sulfonate will be used on roads instead of magnesium chloride." Therefore, DEQ concluded that the proposed operations in AM4 are designed to prevent material damage to EFAC from chlorides. Nevertheless, the Written Findings for the AM4 permit amendment contains stipulations for continued aquatic life monitoring in all intermittent reaches of EFAC;

51. With regards to the aquatic life studies conducted in the 1970's, DEQ concluded that the surveys "provide an indication of the presence or absence of aquatic life but cannot be used to assess the quality of the habitat or stream water. The surveys indicate that, in the past, there has been sufficient water at the sites that were sampled to provide aquatic habitat and support a number of aquatic species.";

52. To address any concerns that DEQ had about the impact of surface mining on aquatic life support in EFAC, DEQ required Intervenor to hire a consultant to conduct an updated aquatic life survey for upper EFAC;

53. DEQ hydrologists had observed an increase in EC, sulfates and chlorides in this segment of EFAC, but were not able to confirm the source. Mining operations in Area A were identified as a potential source of chlorides due to the use of magnesium chloride for salting access roads located within and adjacent to the mine plan area. However, the State

of Montana and Rosebud County also used magnesium chloride on state and county roads located within the mine plan area;

54. Additionally, DEQ wanted the mine to collect additional data that could be used to get cursory qualitative measurements of aquatic life use in EFAC. However, DEQ would not be able to use the data collected by the mine to conduct a quantitative analysis, because the methods used to sample and classify the data in the 1970s were different than those used today. Therefore, there could be no direct numeric comparison between the data collected in the 1970s and that collected by the mine in 2014;

55. DEQ also made it a condition of Intervenors' AM4 permit that the mine continue to conduct aquatic life surveys to monitor EFAC for aquatic life support throughout the life of mine;

56. In October 2014, Intervenor hired a consultant to conduct an aquatic life survey with the objective of evaluating aquatic life support in upper EFAC. The results of this survey show that the aquatic environments in upper EFAC support a diverse assemblage of aquatic insects, and consist of taxa commonly found in eastern Montana prairie streams;

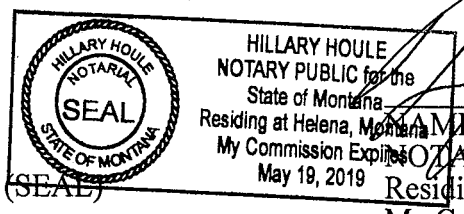
57. Based on the updated information, DEQ concluded that the recent aquatic survey provides qualitative evidence that streams impacted by mining can still support a diverse macroinvertebrate assemblage.

FURTHER AFFIANT SAYETH NOT.

DATED this 22nd day of July, 2016.

By: Emily Hinz
EMILY HINZ, Ph.D.

Subscribed and sworn to (or affirmed) before me this 22nd day of July, 2016, by EMILY HINZ.




(SEAL)

NAME
NOTARY PUBLIC for the State of Montana
Residing in Lewis and Clark County.
My Commission Expires: May 19, 2016