Nicklin Declaration

EXHIBIT 6

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:	**)**	
APPEAL AMENDMENT AM4	**)**	
WESTERN ENERGY	**)**	
COMPANY, ROSEBUD STRIP	**)**	**CAUSE NO. BER 2016-03 SM**
MINE AREA B	**)**	
PERMIT NO. C1984003B	**)**	
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DECLARATION OF DR. MICHAEL NICKLIN IN SUPPORT OF RESPONDENT INTERVENORS' OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT

I, Michael Nicklin, PhD, PE, declare under the penalty of perjury as follows:

1. I, Michael E. Nicklin, am a Registered Professional Engineer with about 35 years of professional experience in civil engineering, hydrology, hydrogeology, water resources, and environmental sciences. I have B.S. degrees in Geology and Civil Engineering, an M.S. degree in Water Resources, and a PhD in Civil Engineering with an emphasis in surface water and groundwater hydraulics. I am the principal and owner of Nicklin Earth & Water, Inc., which I founded in 1995. After working as a hydrogeologist at the Montana Bureau of Mines and Geology from 1976 to 1978, I attended Montana State University to attain my PhD. During that time, I served as an Instructor and Research Assistant at the University and taught undergraduate courses in Engineering Mechanics. In 1983, I joined the faculty at the University of Nebraska-Lincoln as an Assistant Professor, where I taught collegiate and graduate courses in Fluid Mechanics, Hydrology, and Optimization Theory. I have published several papers on groundwater flow and am a member of both the Association of Ground Water Scientists and Engineers and the American Society of Civil Engineers.

2. I specialize in using computer simulation methodologies to simulate groundwater flow, contaminant transport, surface water/groundwater interaction, and water quality in streams. I have applied these methodologies to evaluate the hydrologic consequences of mining throughout Montana, as well as a variety of other sites from gasoline service stations to contaminated sites on the National Priority List.

3. I am familiar with Western Energy Company's ("Western Energy's") Rosebud Mine and with Rosebud Strip Mine Area B Permit Number C1984003B issued to Western Energy on December 4, 2015 ("AM4 Permit"). The Rosebud Mine is located near Colstrip, Montana and supplies coal to the nearby Colstrip Power Generating Station. I have conducted groundwater modeling and reviewed multiple sources of data on hydrology and the general environment on and near the Rosebud Mine. I understand the hydrological consequences associated with the AM4 Permit.

4. The methodology I have employed in my evaluation of the hydrologic consequences of mining at the Rosebud Mine is based upon well-accepted principles of hydrology. They have been tested and subjected to peer review and these principles of hydrology have been employed in many publications. In developing my opinions, I have relied facts and data that hydrologists, engineers and other experts in this field rely upon.

5. In my capacity as principal and owner of Nicklin Earth & Water, I evaluated the probable hydrologic consequences of the proposed AM4 Permit on the proposed mine plan area and adjacent areas. My determinations are included in the "Comprehensive Evaluation of Probable Hydrologic Consequences Areas A, B, and C" ("PHC") submitted as part of Western Energy's AM4 Permit application. I was assisted by professional staff members in the development of the PHC. I have reviewed and confirmed their work.

6. I also helped prepare components of several of Western Energy's responses to deficiency notices from the Montana Department of Environmental Quality ("DEQ").

7. After DEQ issued its fourth round of technical comments, DEQ requested that Western Energy update the PHC. I was hired to perform that task. To that end, I developed a regional groundwater model (Rosebud Mine model) which was used to evaluate the hydrologic impacts of AM4 on the surrounding areas; the Rosebud Mine model was applied to characterize the Rosebud Mine area as a whole; the Rosebud Mine model was also applied at a smaller scale to evaluate the localized impacts of AM4. Results from two modeling efforts using the Rosebud Mine model are included in the PHC. *See* PHC Attachment D ("Rosebud Mine Groundwater Modeling Report"); PHC Attachment E ("Area B-AM4 [Amendment Application 00184] Groundwater Model Report").

8. I have submitted several supplements to the PHC in response to comments and questions posed by the DEQ.

9. On July 23, 2013, DEQ issued its fifth round of technical comments to Western Energy requesting additional information about AM4's hydrologic consequences. I collected information responsive to DEQ's inquiry, which Western Energy submitted to the Department on November 1, 2013.

10. DEQ issued two more rounds of comments and deficiencies between 2013 and 2015. I collected information and data in response to each deficiency letter. Western Energy submitted that supplemental information to DEQ.

11. On June 3, 2014 DEQ issued a deficiency letter requesting a water balance study and an aquatic life survey. It also asked for more information about the use of lignin sulfonate at the

mine for dust control on mine roads. Further evaluations of the aquatic life and lignin sulfonate were conducted respectively by Penelope Hunter and William Schafer PhD.

12. I included the aquatic life survey and the evaluation of lignin sulfonate in the PHC Addendum. The PHC Addendum also addressed AM4's potential impact on the alluvium of East Fork Armells Creek. Western Energy submitted the PHC Addendum to DEQ in February 2015.

13. The PHC provides information which can be used to develop a number of conclusions regarding the following: (1) whether drainage from AM4 would impact Rosebud Creek and its tributaries; (2) whether AM4 mining will, or will not interact, with Section 15 of East Fork Armells Creek; (3) significance or lack thereof of nutrient standards exceedances for nitrogen/nitrate as it relates to East Fork Armells Creek; (4) potential for affecting total dissolved solid concentrations in East Fork Armells Creek; (5) AM4's significance with regard to groundwater classifications; (6) the migration of spoil groundwater from AM4 to EFAC; (7) potential for AM4 to dewater East Fork Armells Creek; (8) assessment of the potential that AM4 could result in violations of water quality standards; (9) whether AM4 will cause migration of spoils water toward East Fork Armells Creek; and (10) whether there is an interaction between AM4 and proposed Area F.

Neither Surface nor Groundwater Will Move from AM4 into the Rosebud Creek Drainage; There Will be No Damage to Water in the Rosebud Creek Drainage.

14. Surface water from AM4 will not drain into Rosebud Creek. All surface water drainage from AM4 flows north toward East Fork Armells Creek. *See* MPDES Permit No. MT0023965. According to information in this permit, all AM4 surface water will be directed to engineered sediment ponds. None of the flow will be directed to Rosebud Creek or its tributaries, including Lee Coulee and Emilee Coulee.

15. All of the AM4 mining is designed to occur within the East Fork Armells Creek drainage. A small volume of surface water runoff from Area B extension (west of AM4) occurs within the Lee Coulee drainage. Any of this surface water runoff from Area B extension's southern edge is prevented from flowing toward Rosebud Creek and its tributaries by sediment ponds that are designed to contain surface water from Area B. The sediment ponds in Area B extension located in the Lee Coulee drainage are much larger than are needed to collect a 10 year 24-hour storm. Hence, there is very little risk of surface water runoff reaching Lee Coulee and/or Rosebud Creek. The following photo depicts one of these sediment ponds.

16. Again, runoff from the mine is captured in these sediment ponds. Any potential discharge from the ponds is monitored to ensure that it meets water quality standards so as not to degrade any surface water down-gradient of those ponds. Furthermore, the water quality is equal to or better than what naturally occurs in the streams in the area and in the groundwater. Thus, a

discharge from the sediment ponds will not diminish water quality either in groundwater or in surface water.

17. Groundwater movement from AM4's mining spoils is prevented from seeping into Lee Coulee by a groundwater drainage divide located south of AM4. Groundwater seepage from north of this divide is directed toward East Fork Armells Creek whereas seepage south of this divide is directed toward the Rosebud Creek drainage (including its tributaries Lee Coulee and Emile Coulee). AM4 is some distance away from the edge of the divide, so no spoils from AM4 will seep into the divide.

18. Even in the very remote possibility that some groundwater would somehow make its way to any of the Rosebud Creek drainage, the rate and volume would be so limited that groundwater from the area would not be detectable in the alluvium or surface waters of the Rosebud Creek drainage.

19. In summary, based upon data and information assembled in this permitting process, it is my opinion that (i) neither surface water nor groundwater from AM4 will flow to the Rosebud drainage, and (ii) even if somehow some groundwater from AM4 made its way into the Rosebud drainage, the groundwater would not have a material effect and would not be detectable in the surface or groundwater (i.e., alluvium) of these streams.

20. Neither the uses of water in the Rosebud drainage nor applicable water quality standards for Rosebud Creek will be affected by the AM4 mining.

AM4 Effects Will Not Interact With Section 15 of East Fork Armells Creek.

21. Petitioners argue that AM4 will dewater intermittent segments of Section 15 of East Fork Armells Creek. But in fact, AM4 will not interact with, and will have no impact on, Section 15. The projected AM4 mine passes are located over two miles downgradient from Section 15.

22. Figure E-5 of Attachment E to the PHC demonstrates that any drawdown in water due to AM4 is highly localized, meaning that any significant drawdown will be limited to the immediate vicinity of AM4. No drawdown associated with AM4 mining will reach Section 15. The same figure demonstrates that Area C—which is located between AM4 and Area F—will not experience drawdown in water levels due to AM4.

23. I have reviewed the data provided by Petitioners in support of their assertion that Section 15 is intermittent, namely citations from a 30-year-old probable hydrologic consequences report. To the extent that the channel showed temporal wet conditions, or intermittent conditions, other potential contributing factors include cumulative years of above average precipitation that preceded the observations described in the 1986 PHC for Section 15; a pond is documented up-gradient (Section 8) and, an embankment exists in the vicinity of this so-called intermittent reach in Section 15 (DEQ CHIA). Ponding of storm water runoff leads to recharge to the alluvium, which in turn, may lead to "intermittent" flow. I also understand that surface flow occasionally occurs in this portion of the stream. Hence, it is unclear if the conditions described for Section 15 in the 1986 PHC are purely indicative of natural intermittent conditions.

24. It is noteworthy that the 1986 PHC states that the flow ranges from no flow to flows up to 30 gpm. Note that 30 gpm is approximately 3 garden hoses of flow. It is also noteworthy that flow has been observed recently in Section 15. Thus, at times it flows and other times it does not; it has not even been confirmed that this reach has even been affected by mining. See Photographs in Exhibit A to my declaration which shows surface water present in the reach of

question collected during an East Fork Armells Creek Benthic Survey conducted in September 2015.

25. Finally, while AM4 will not impact Section 15, one should recognize that mining in this part of Montana will cause some localized drawdown in groundwater. But evidence of past mining at the Rosebud Mine demonstrates that groundwater level declines are followed by recovery. Hence, there is no permanent damage to groundwater supplies. For example, alluvial groundwater levels just downgradient of Section 15 declined during mining that primarily occurred during the 1980s through the mid-1990s. Groundwater levels have recovered their prior levels in this area of East Fork Armells Creek. Intermittent flow conditions have returned to those portions of East Fork Armells Creek. *See* PHC Addendum Attachment 2, Fig. 2 (illustrating recovery of groundwater levels in wells). Observation well WA-209 did exhibit drawdown which is likely associated with mining. Groundwater levels will recover in this area. It is noteworthy that this well has been reported to be dry in recent years, but, very recently began to show signs of such recovery. In fact, groundwater was recently observed in this well on March 16, 2016. In essence, this serves as evidence that alluvial groundwater levels are showing recovery in the vicinity of Section 15.

26. In summary, based on the data and information assembled in this permitting process, (i) the mining in the area of AM4 will exhibit localized drawdown and will not dewater areas in Section 15; and (ii) a decline in groundwater levels caused by mining is not permanent. Again, as seen in down-gradient portions of EFAC, alluvial groundwater levels recover after mining is completed (See PHC Addendum, Attachment 2, Figure 2) Hence, for all these reasons, mining in AM4 will not cause any material damage to groundwater or surface water in Section 15.

AM4 Does Not Pose a Risk of Nitrogen Contamination to East Fork Armells Creek.

27. There is no evidence that AM4 will increase nitrogen/nitrate in East Fork Armells Creek. Although some local/temporal increases in nitrate plus nitrite nitrogen are seen in mine spoils when they are first saturated, the potential for material impacts on the groundwater quality of EFAC is remote. To this day, not a single surface water sample in the surface water of East Fork Armells Creek collected up-stream (west) of Colstrip has exhibited a nitrate plus nitrite concentration above the 10 mg/L standard (between mine Areas A, B and C). Yet, downstream of Colstrip, a location identified as SW-01, exhibited 12 samples (all collected from 1980 through 1990) showed nitrate plus nitrite nitrogen concentrations above the 10 mg/L standard. It is noteworthy that this location is downgradient of Colstrip's wastewater treatment plant and also downstream of residential/commercial lawns of Colstrip which are common sources of nitrate plus nitrite nitrogen. Further north yet is a golf course, another common source of nitrate.

28. In an early version of the PHC, Western Energy noted that these levels of nitrogen levels in spoil groundwater, "could possibly be due to dissolved residuals from ammonium-nitrate explosives" used at the mine. PHC at 53. Again, such changes tend to be localized within mine spoils, and they are temporary. Moreover, given the low rate and volume of groundwater seepage within the mine spoil compared to the alluvium groundwater flow rates, it is highly unlikely that these nitrogen levels cause either a violation of water quality standards or change the use of any stream or groundwater outside the permit area. There is another potential source of nitrate at well location WS-100. The well is located very near a tree which provides shade for cattle. It is reported by Western Energy that numerous cattle congregate under this tree during hot summer days. The well is very shallow being only 27 feet deep. Shallow wells are commonly impacted by nitrates. Hence, the actual source of the nitrate may not even be associated with explosives at this location, but more likely, is associated with livestock.

29. In summary, there is no basis to believe that AM4 will increase nitrogen/nitrate in East Fork Armells Creek or in groundwater outside the permit area to any statistically discernible level.

Any Increase in Total Dissolved Solids in East Fork Armells Creek is not Significant and Will Have No Discernible Impact on East Fork Armells Creek.

30. Total dissolved solids is a measure of the degree of mineralization of the water by dissolved constituents such as sulfate, bicarbonate, magnesium and calcium. Based on my research, groundwater flow from the vicinity of AM4 will not cause a significant increase in total dissolved solids in East Fork Armells Creek.

31. Discharges from outfalls into the stream will not cause any increase in total dissolved solids in the East Fork Armells Creek alluvium. In fact, on average, discharges from the mine's outfalls have *lower* total dissolved solids than in the alluvium of East Fork Armells Creek. *See e.g.* PHC Addendum, Attachment 1 at 22. I have estimated that a reach between Area A and Area B is projected to see a 13 percent increase in the total dissolved solids as a result of permitted mining in both areas Area A and B over the baseline (i.e., background concentration) once groundwater levels recover. *See* PHC Addendum – Attachment 1 at 26. However, such an increase is not significant relative to the natural variability of total dissolved solids in East Fork Armells Creek alluvium.

There will be no net increase in the projected Total Dissolved Solids concentration as a result of AM4 mining.

32. The 13 percent increase that is projected is based upon current mining conditions at Area A and B. The concentrations in spoil water is projected to reach equilibrium concentrations with time. That same equilibrium concentration is projected to be about the same in AM4 mine

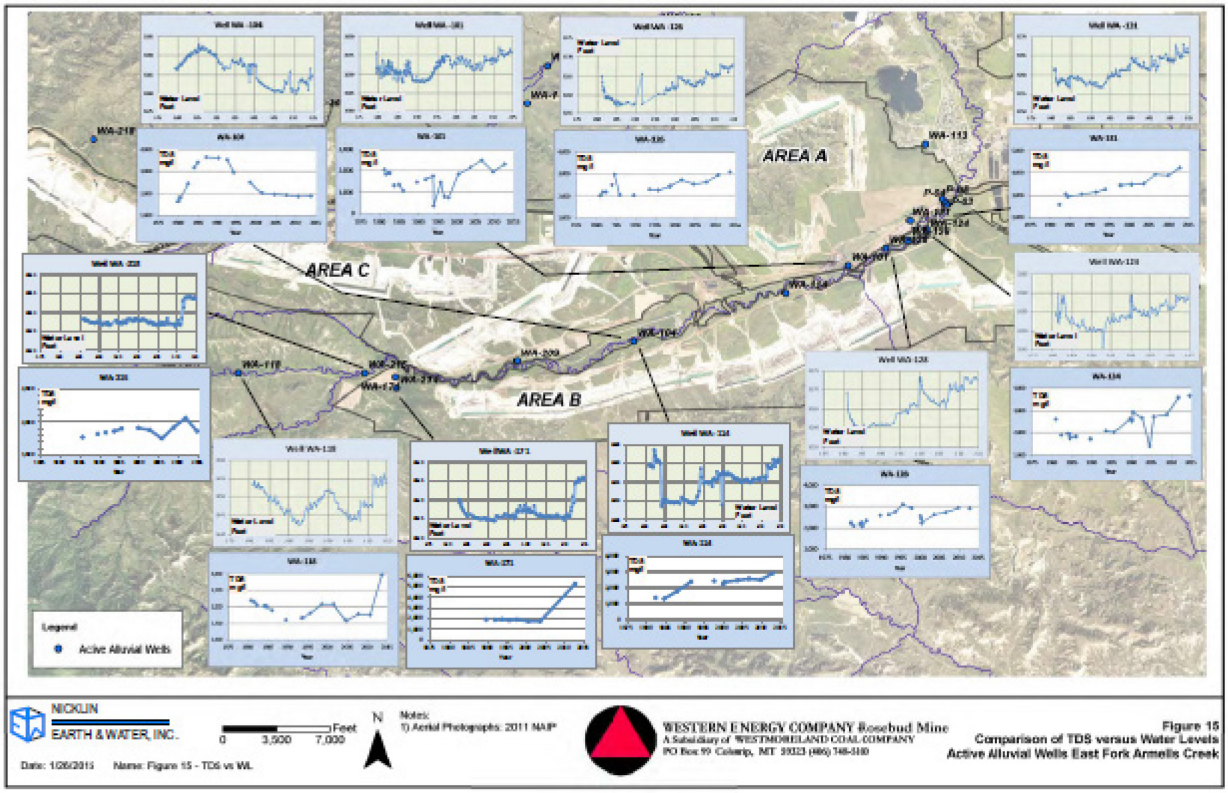
spoils. In effect, there will be no net increase in spoil water concentrations as a result of AM4 mining. Thus, the main effect of mining at AM4 will be simply to increase the duration of time that spoil groundwater will seep toward East Fork Armells Creek alluvium from Area B. In effect, the 13 percent increase that is projected will occur as a result of prior mining, not as a result of mining in AM4.

33. The natural level of total dissolved solids in East Fork Armells Creek and its alluvium vary widely. The projected 13 percent increase in the alluvium is insignificant compared to baseline concentrations given the natural variability of TDS concentrations. In other words, the natural variation in total dissolved solids will mask any impacts from such an increase. For example, as described in Table 16 of the PHC, TDS in the downstream portion of East Fork Armells Creek alluvium varies from a low of 186 milligrams per liter (mg/L) to a high of 11,400 mg/L. The TDS standard deviation of the data set is 1,770 mg/L (downstream section of EFAC). *See* PHC at Table 16, Alluvium Water Quality Statistics Major Ions. An increase of 13 percent over the average baseline concentration of 2,299 mg/L in the alluvium would mean an increase to an average of 2,599 mg/L (once equilibrium is reached). Such a change is well within the range of *natural variation* (e.g., from 186 to 11,400 mg/L in the alluvium of downstream portions of East Fork Armells Creek). It is also well within one standard deviation of the average TDS concentration of the downstream portion of alluvium (i.e., the range using one standard deviation is from 2,314 to 5,854 mg/L).

34. The projected 13 percent increase for the reach of East Fork Armells Creek between Areas A and B associated with mining in these areas will not be significant. Given the wide natural variation in total dissolved solids, this projected 13 percent increase associated with mining to date, and with mining at AM4, will not affect either uses surface water, or,

classification and uses of ground waters. Note that the average classification of the alluvial groundwater between Areas A and B is Class III with a range extending from Class I through Class III.

35. The data demonstrate that recent increases total dissolved solids within East Fork Armells Creek alluvium are caused primarily by increases in groundwater levels. PHC Addendum at 5; PHC Addendum, Attachment 1 at 22. In Figure 15 from the PHC Addendum, I have provided a graphical illustration of the correlation between total dissolved solids and groundwater levels. *See* PHC Addendum, Attachment 1.



36. This figure illustrates how the level of total dissolved solids in East Fork Armells Creek correlates with groundwater levels in the stream. Thus, to the extent that the stream receives greater volumes of water from runoff or other sources and recharges the alluvium, total dissolved

solids in the alluvium of East Fork Armells Creek increase accordingly. Any effect from mining, if it exists, is currently minor in comparison. Presently, there is no discernible evidence that mining to date has caused an increase in total dissolved solids in either the alluvium or surface water of East Fork Armells Creek.

37. In summary, the (i) discharges from outfalls to East Fork Armells Creek will *not* increase total dissolved solids in the stream because discharges from the mine possess equal to, or lower levels of, total dissolved solids compared to what occurs naturally in the alluvium and surface water, (ii) the levels of total dissolved solids naturally vary widely and the estimated 13 percent future increase will not affect uses or cause a water quality standard violation, and (iii) recent increases in total dissolved solids in the East Fork Armells Creek alluvium are primarily a function of increases in groundwater levels.

AM4 Will Not Affect Groundwater Classifications in East Fork Armells Creek Alluvium.

38. Currently, groundwater classification in the East Fork Armells Creek alluvium varies between Class I and Class III. The average classification of the alluvium between areas A and B is Class III. As demonstrated by Table 16 and on page 22 of the PHC Addendum Attachment I, surface water discharged from Areas A and B has a concentration of total dissolved solids that is slightly lower than what naturally occurs in East Fork Armells Creek's alluvial waters. Likewise, the baseline data in Table 5-a of the PHC demonstrate that if surface water is discharged water from AM4, it will contain a concentration of total dissolved solids within the range of total dissolved solids observed in East Fork Armells Creek's surface waters.

39. Groundwater uses in East Fork Armells Creek will not be impaired. As Table 17 of the PHC demonstrates, the uses permitted by each classification overlap. Groundwater classifications for the alluvium range from Class I to Class III prior to mining under baseline

conditions with most being Class II or Class III. *See* Addendum to the PHC at 6. The average classification between Areas A and B is Class III. The slight increase in TDS will not have an impact on these groundwater classifications as the ranges will remain the same as before mining.

40. A majority of groundwater samples from the Rosebud coal stratum is either Class II or Class III groundwater under both baseline and post-mine conditions. A more limited fraction of groundwater samples from the Rosebud coal stratum groundwater have been classified as Class I waters.

Sulfate Variation In East Fork Armells Creek Is Also Very High

41. Table 5-A of the PHC shows that sulfate concentrations of surface water in East Fork Armells Creek are highly variable. The average sulfate concentration is 846 mg/L with a standard deviation of 1,061 mg/L. Likewise, the sulfate concentrations of groundwater in East Fork Armells Creek alluvium are also highly variable. *See* PHC Table 15-b. Changes in sulfate concentrations in alluvium outside the permit boundary in the vicinity of Area B as a result of mining are projected to comparably small and insignificant.

Migration of Groundwater from Spoils Will Not Materially Affect the Water Quality of East Fork Armells Creek Alluvium.

42. Migration of spoils from AM4 will not materially affect the surface water quality of East Fork Armells Creek.

43. Figure 1 of the Attachment 1 to the PHC Addendum delineates the permit boundaries. Comparing the flow and relying on a 1977 Van Voast report, I evaluated the potential for the offsite impacts of AM4 under four scenarios. Scenario 1 defines the baseline calculation. Scenario 2 projects the conditions that were likely during prior (early) mining. Scenario 3 represents the current mine conditions. And Scenario 4 projects post-mine conditions.

44. Under scenario 3, the water balance shows that presently groundwater from Area B is not flowing toward East Fork Armells Creek. This is shown by Attachment 1, Figure 13 to the PHC Addendum. In effect, mining to the south of East Fork Armells Creek creates a cone of depression which draws the spoils groundwater toward the mine pit. The spoils water from Area B does not reach East Fork Armells Creek or the alluvium. Nor is mining in Area B a factor responsible for the recent changes in TDS observed in alluvial groundwater of East Fork Armells Creek.

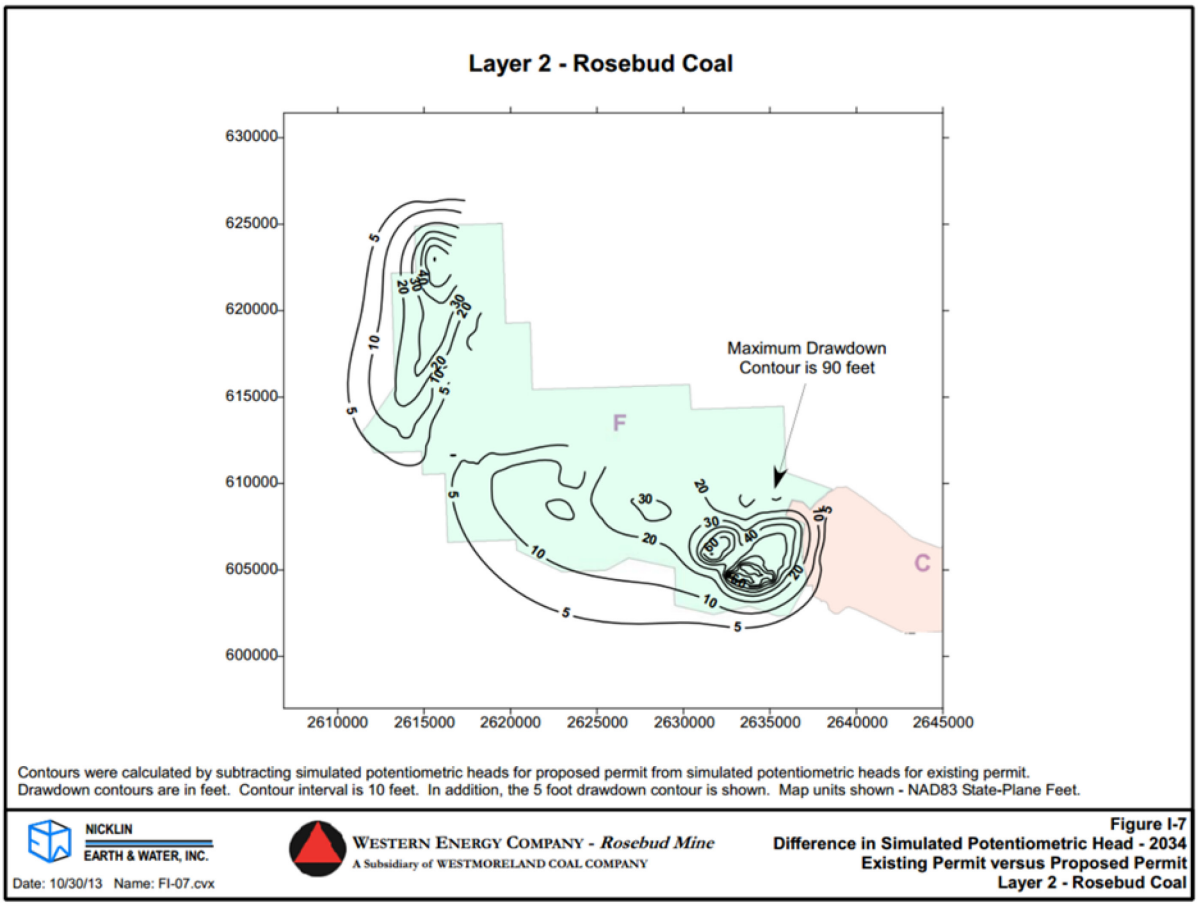
45. The data plotted in figure 15 demonstrate that the primary factor causing an increase in total dissolved solids in East Fork Armells Creek alluvium involves increases in groundwater levels, not mining. There is a strong correlation between increased observed groundwater level changes and total dissolved solids in East Fork Armells Creek. *See* PHC Addendum, Attachment 1, Figure 15.

46. Scenario 4 projects the post-mining conditions of East Fork Armells Creek alluvium. After mining, the spoil TDS concentrations will reach an equilibrium point. Eventually groundwater levels will recover leading to groundwater flowing from mined areas toward the East Fork Armells Creek alluvium. The mass balance calculations are then used to project the effect the relative change in alluvium TDS concentrations when groundwater levels recover.

47. In summary, based upon current observations, it is unlikely that (i) groundwater from Area B spoils will flow to East Fork Armells Creek alluvium when mining occurs in AM4, and (ii) eventually, after mining, groundwater will flow toward East Fork Armells Creek alluvium and reach the equilibrium described above.

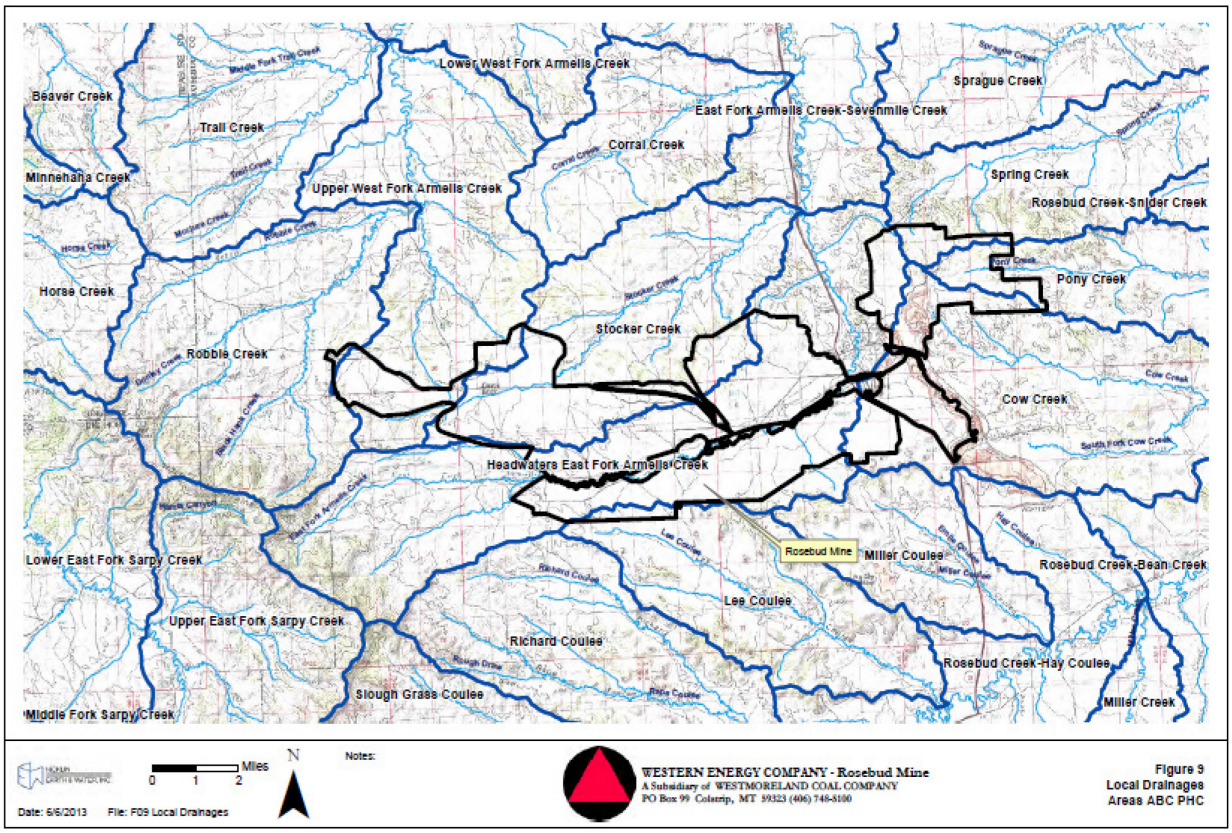
AM4 Will Not Interact With, Let Alone Impact, Area F

48. Groundwater effects associated with AM4 will not interact with those of Area F. Area F is located more than 10 miles from AM4. Figures E-5 and E-9 of Attachment E of the PHC shows that the drawdown impacts of AM4 will be highly localized. Figure I-7 of the PHC for Area F, which has been submitted to DEQ and was provided to Petitioners, shows that the drawdown effects of Area F are localized and solely due to mining in Area F. These figures show that groundwater from AM4 will not impact or interact with groundwater from Area F.



49. Surface water drainage and groundwater flow from the vicinity of Area B (including AM4) does not and will not interact with that from Area F (see Exhibit B to this declaration). Most portions of surface water in Area B flow into East Fork Armells Creek. No surface water from Area B flows into West Fork Armells Creek. Most portions of groundwater in the vicinity

of Area B flow toward East Fork Armells Creek. No groundwater from Area B flows toward Area F. Area F surface water flows to the north and into West Fork. None flows toward East Fork Armells Creek. Groundwater beneath Area F flows to the north generally following along the axis of West Fork Armells Creek. None flows toward and into Area B. *See* Groundwater Model Report, Attachment D; Attachment GM-B; Figure 9 of the PHC.



50. The point of confluence (where the streams join) between East Fork Armells Creek and West Fork Armells Creek is about 14 miles north of the mine, and 17 miles from the edge of the Area B permit area. This is far outside the cumulative impact area. By the time the waters do join, the water will be dominated by contributions from other portions of each of the East Fork Armells Creek and West Fork Armells Creek drainages. Any potential changes associated with AM4, in the unlikely event they occur, would not be discernible. There will be no material

interactive impact associated with mining at AM4 for down-gradient surface waters of East Fork Armells Creek, West Fork Armells Creek or in Armells Creek (after confluence of West and East Forks).

51. In summary, any potential impacts from mining in Area B will not interact with potential impacts of Area F leading to any material effects, from either a surface water or groundwater perspective.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 7/22, 2016.

s/ Michael Nicklin

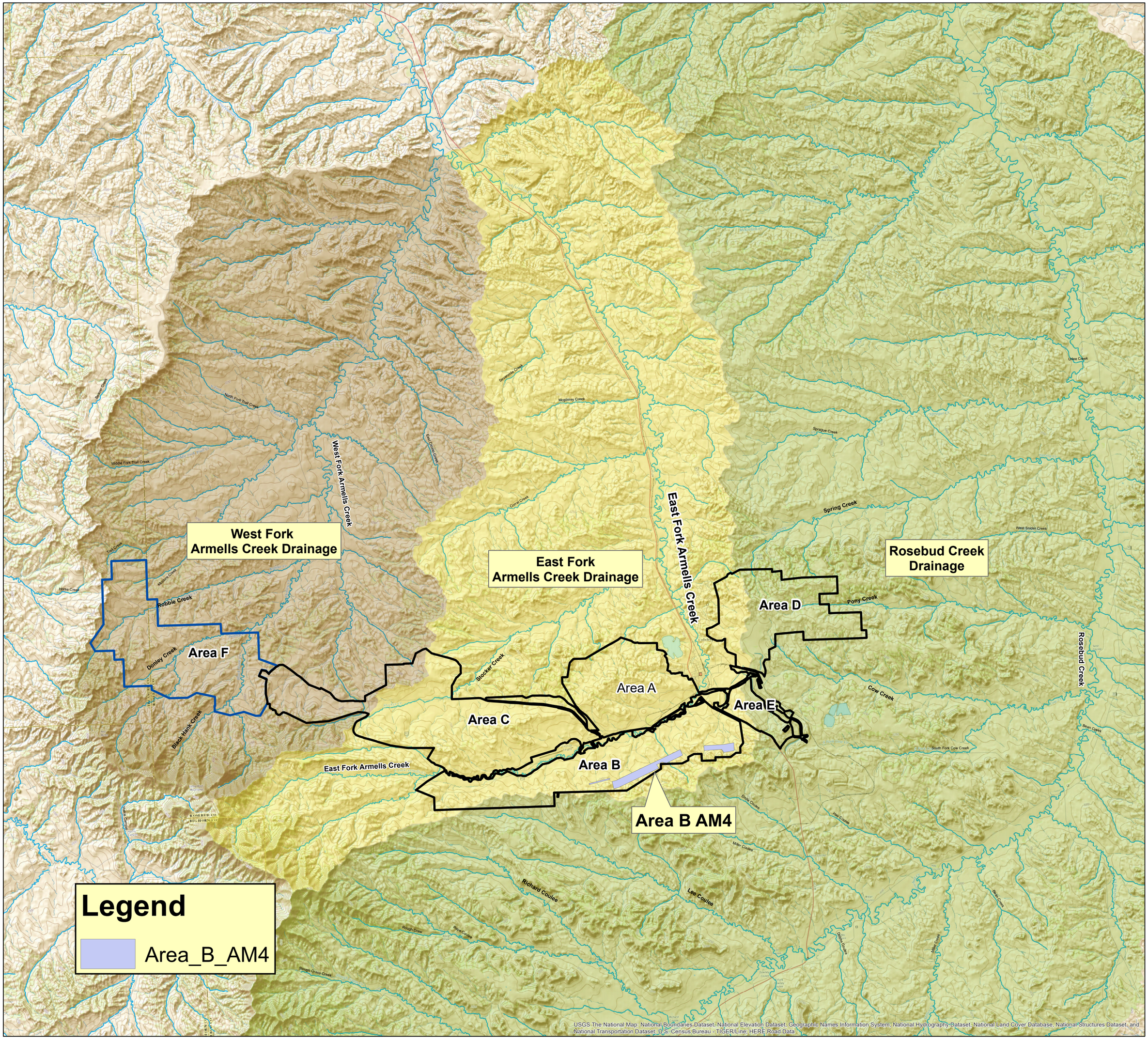
Michael Nicklin

NICKLIN DECLARATION
EXHIBIT A

PHOTOGRAPH 3: EAST FORK ARMELLS CREEK #3 (WEST) LOOKING SOUTH SOUTHEAST FROM THE EXTENT OF SURFACE WATER. 9/24/2015; N 45.843908 W 106.754457

PHOTOGRAPH 4: EAST FORK ARMELLS CREEK #3 (WEST) LOOKING NORTHWEST. 9/24/2015; N 45.843165 W 106.753972

NICKLIN DECLARATION
EXHIBIT B



5 Miles

Major Drainages
Vicinity Area B AM4
Rosebud Mine