

2.0 PROJECT DESCRIPTION

A detailed description of the hydrologic framework of the PRB was provided in Chapter 3 of the two FEIS documents. Additional information is presented below to establish the basis for the modeling. Surface waters in Wyoming were represented for the modeling effort by the main stem streams of 10 fourth-order watersheds (known as sub-watersheds). These sub-watersheds include the Upper Tongue, Middle Powder, and Little Powder sub-watersheds, which straddle the border between Wyoming and Montana, and the Upper Powder, Clear Creek, Crazy Woman Creek, Salt Creek, Upper Belle Fourche, Upper Cheyenne, and Antelope Creek sub-watersheds. Surface waters in Montana were represented by the main stem streams of 11 sub-watersheds. These sub-watersheds include the Lower Tongue, Little Bighorn, Lower Bighorn, Rosebud Creek, Mizpah Creek, Lower Powder, Lower Yellowstone-Sunday, and Lower Yellowstone, in addition to the three sub-watersheds that straddle the boundary between both states. This analysis used the terms watershed and sub-watershed interchangeably.

2.1 Alternatives Analyzed

Details of each alternative analyzed are described in Chapter 2 of the two FEIS documents. The following summaries address the differences in each alternative with respect to development of the model.

2.1.1 Wyoming FEIS

The Wyoming FEIS sets forth three alternatives plus the no-action alternative for development of CBM in the PRB. The alternatives differ primarily in the means of managing produced water.

2.1.1.1 Alternative 1

Under Alternative 1, flows of CBM produced water would be handled through direct discharge to surface drainages, passive treatment prior to surface discharge, discharge to upland and bottomland infiltration impoundments, discharge to containment impoundments, land application disposal (LAD), and injection. This analysis assumed that 15 percent of the CBM water discharged to infiltration impoundments would resurface in-channel and contribute to existing stream flows. The analysis also assumed that water produced from CBM wells and managed through containment, LAD, and injection would not contribute to existing stream flows.

The Wyoming BLM analyzed data on water production from existing wells downloaded from the Wyoming Oil and Gas Conservation Commission (WOGCC) web page to project total water production on an annual, and an over the life of the project basis by sub-watershed (Meyer 2002a). Under Alternative 1, the maximum volume of CBM water produced annually is expected to increase from an estimated 109,429 acre-feet per year in 2001, produced from existing CBM wells, to an estimated 386,336 acre-feet per year, occurring in year 2006. The peak year of water production by sub-watershed varies, and these years were modeled in the surface water impact analysis to evaluate effects from discharges of CBM produced water.

2.1.1.2 Alternative 2A

Under Alternative 2A, CBM produced water would be handled by the same methods that were specified in Alternative 1. Use of upland and bottomland infiltration impoundments would be emphasized,

however. The contribution of CBM water to existing stream flows from the various water handling options would be the same as under Alternative 1; however, the percentage of CBM water managed through each option would vary. There would be no direct surface discharge in the Salt Creek sub-watershed. The volume of water produced and the peak year of water production would be the same as under Alternative 1.

2.1.1.3 Alternative 2B

Under Alternative 2B, CBM produced water would be handled by the same methods specified in Alternative 1. Use of active treatment, such as reverse osmosis, or ion exchange systems, to amend the produced water to meet water quality standards prior to discharge would be emphasized, however. Some level of active treatment would be implemented in all sub-watersheds except for the Upper Belle Fourche River sub-watershed. The level of treatment would depend on the constituents of concern, and designated uses downstream. This analysis assumed that the proportion of CBM produced water to undergo active treatment would be 100 percent consumptively used. Thus, the volume is not included in projecting impacts to surface flows. The contribution of CBM water to existing stream flows from the various water handling options would be the same as under Alternative 1; however, the percentage of CBM water managed through each option would vary. There would be no direct surface discharge in the Salt Creek sub-watershed. The volume of water produced and the peak year of water production would be the same as under Alternative 1.

2.1.1.4 Alternative 3

Under Alternative 3, no new federal CBM wells would be completed, except for areas of potential drainage. Water handling options would be the same as under Alternative 1, and include direct discharge to surface drainages, passive treatment prior to surface discharge, discharge to upland and bottomland infiltration impoundments, discharge to containment impoundments, LAD, and injection. The contribution of CBM produced water to existing stream flows from the various water handling options would be the same as under Alternative 1.

Under Alternative 3, the maximum volume of CBM water produced annually is expected to increase from an estimated 109,429 acre-feet per year in 2001, produced from existing CBM wells, to an estimated 212,919 acre-feet per year, occurring in year 2005. The peak year of water production by sub-watershed varies, and these years were modeled in the surface water impact analysis to evaluate effects from discharges of CBM produced water.

2.1.2 Montana FEIS

The Montana FEIS proposes five alternatives for development of CBM in the PRB. These alternatives differ in degree of protection afforded to water resources and in the restrictions that would be imposed on development of CBM.

2.1.2.1 Alternative A

Under Alternative A, the Montana BLM would approve drilling and testing of CBM wells on federal leases but would not authorize production of CBM from federal minerals or installation of production facilities. Waters produced during the testing phase would be contained either in produced water pits or in

tanks and would not be discharged into state or federal waters. The produced water would be available for beneficial use by industry and landowners.

Under this alternative, the State of Montana would allow up to 200 CBM exploration wells to be drilled to evaluate water quality and quantity or the suitability of the coal resource. Surface discharge of produced waters from these wells to state or federal waters would be prohibited. Redstone Gas Partners would be allowed to expand the existing CX Ranch Field pilot project in the Upper Tongue River sub-watershed near Decker, Montana, which would increase the number of producing wells from this field to a maximum of 250. Discharge of production water from these additional producing CX Ranch wells would be incorporated into the current Montana Pollutant Discharge Elimination System (MPDES) permit, which allows a maximum discharge of 1,600 gallons per minute (gpm) into the Upper Tongue River from as many as 11 discharge locations. Beneficial reuse of discharges of CBM produced water would be expected to continue near the CX Ranch field.

The Rosebud Creek, the Little Bighorn/Lower Bighorn, and Mizpah Creek sub-watersheds would not receive any CBM produced water under this alternative; however, an analysis of their flow volumes and water quality is included for comparison with other alternatives. Impacts are possible to the Upper Tongue River, Middle Powder River, and Little Powder River sub-watersheds from CBM development under Alternative A as a result of the addition of the forecast future development of CBM resources in the Wyoming portion of the PRB that adjoins Montana.

2.1.2.2 Alternative B

This alternative would allow CBM development while emphasizing protection of water resources. Water from exploration wells would be temporarily stored in tanks or other approved storage facilities and then injected into an aquifer different from where it originated via Class II or V injection wells. Surface discharge of produced waters from producing wells to state or federal waters would not occur under this alternative.

Produced water from existing wells in the CX Ranch field would continue to discharge to the Upper Tongue River sub-watershed, as described under alternative A.

2.1.2.3 Alternative C

This alternative would emphasize CBM exploration and development with minimal restrictions. Management of produced water would include a combination of beneficial use and surface discharge. Beneficial uses would include stock water, dust suppression, irrigation, and other industrial uses. Surface discharge could occur, but would be subject to the limitations of the MPDES permit and conditions established for discharge into identified drainages.

Produced water discharged to the surface would be released in several ways: directly to surface water or drainages, or into on-drainage and off-drainage impoundments. This alternative assumed that 100 percent of the CBM produced water would be discharged to surface streams and that 20 percent of the water would be lost to infiltration, evaporation, and evapotranspiration, collectively referred to as “in-channel losses.” All surface discharges would be in compliance with a MPDES permit.

Surface waters that could be affected by CBM development under this alternative include streams in the Upper Tongue, Powder, Little Powder, Little Bighorn, Bighorn, Mizpah, Rosebud, and Yellowstone sub-watersheds.

2.1.2.4 Alternative D

This alternative would encourage CBM development while maintaining existing land uses and protecting downstream water consumers. All produced water would be treated prior to surface discharge or containment in impoundments. Water would be conveyed via a constructed drainage system or pipeline to the nearest perennial watercourse. Treatment of the water would be unrestricted, provided the resulting effluent met standards established by the Montana Department of Environmental Quality (MDEQ) for downstream use. Treatment for beneficial purposes would vary depending on the type of use. Surface storage of produced waters would also require an MPDES permit issued by the MDEQ.

This analysis assumed that 80 percent of CBM produced water would be treated and discharged under this alternative. No conveyance losses would be deducted because the water would be piped to the receiving body of water.

2.1.2.5 Preferred Alternative E

The Preferred Alternative would provide management options to facilitate exploration and development of CBM while sustaining water resource values and existing land uses. This alternative combines management options so no unnecessary or undue degradation of water quality would be allowed in any watershed. The water management option emphasized would be beneficial use. Other options include injection, treatment, containment, or discharge. Water Management Plans (WMP) would be required for all exploration and development projects. WMPs and permits would be approved by the appropriate agency in consultation with affected surface owners. There would be no discharge (treated or untreated) into the watershed except under two conditions: the operator must obtain an approved MPDES permit, and could demonstrate in the WMP how discharge could occur in accordance with water quality laws without damage to the watershed.

Under this alternative, the combination of emphasized beneficial use and increased flexibility for managing produced water would increase water used for beneficial purposes, such as stock watering, irrigation, and dust control. This analysis assumed that surface discharge from CBM development in Wyoming and Montana would occur in each watershed until the resulting quality of the mixed water reaches the limits proposed for Montana streams. The remaining CBM produced water would be managed by other options, including injection, treatment, infiltration or evaporation ponds, and beneficial use.