

**2011 Annual Report  
Powder River Basin Controlled Groundwater Area  
Technical Advisory Committee**

**Introduction**

The Powder River Basin Controlled Groundwater Area (PRBCGA) was established to protect existing water users from impacts resulting from coal bed methane (CBM) development. The Montana Board of Oil and Gas Conservation (MBOGC) implements the PRBCGA through regulations that require characterization, monitoring, and evaluation of ground-water conditions, and mitigation of impacts to existing water users.

A technical advisory committee (TAC) was established to oversee the ground-water characterization, monitoring, and evaluation requirements of the PRBCGA. TAC consists of five members selected by DNRC for their expertise in hydrogeology, water quality, and CBM extraction systems and operations. Two additional ex-officio members represent the CBM industry, and water user and conservation interests. In addition to overseeing monitoring and reporting requirements for individual fields, TAC is assigned to review groundwater data and scientific evidence related to the PRBCGA and make recommendations to the MBOGC regarding mitigation of impacts.

The purpose of this report is to describe the activities of TAC during 2011 and the impacts of CBM development on groundwater resources through September 2010.

**Summary of TAC Annual Meeting**

TAC met at the MBOGC office in Billings on March 16, 2011. Attendees included TAC members, Elizabeth (Liddi) Meredith, Kyle Blasch, Angela McDannel, Peter Bierbach, Tom Osborne, Terry Punt, and Russell Levens. Liddi Meredith is a new TAC member, taking John Wheaton's seat representing the Montana Bureau of Mines and Geology (MBMG). Also attending were Brad Bennett of the Billings DNRC Water Resources Office, Shawn Kuzara and Kevin Chandler of MBMG, Terry Webster and Remelle Olson representing Summit Gas (formerly Pinnacle Gas Resources, Inc.), Lana Wilson (Hydrometrics) representing Fidelity Exploration and Production Company and Summit Gas, Rose Moore representing the Northern Plains Resource Council, and Mike Keller representing Fidelity Exploration and Production Company.

**Groundwater Monitoring**

Liddi Meredith presented a summary of the report titled 2010 Annual Coalbed Methane Regional Groundwater Monitoring Report: Powder River Basin, Montana. The 2010 annual report identifies 824 CBM wells in Montana that produced water and/or gas compared to 1,960 wells in Wyoming. Total water production in Montana is reported to be 33.5 million barrels or 4,323 acre-feet compared to 86.5 million barrels or 11,154 acre-feet in Wyoming. MBMG reports that the 20-foot drawdown contour extends a maximum distance of 1 to 1.5 miles from the edge of the CX Field, a shorter distance than predicted in the Final Statewide EIS. They attribute the shorter distance to lower development rates and production than anticipated in the EIS and the role of faults as barriers that reduce the lateral extent of drawdown.

Kevin Chandler presented a summary of the results of a groundwater flow model constructed for the Ash Creek – West Decker Mine area that were included in the 2010

annual report. The model was constructed to match drawdown in response to mine dewatering at the Ash Creek and West Decker mines.

TAC discussed a suggestion by Tom Osborne that the committee consider updating modeling of the impacts of CBM development based on over ten years of monitoring and additional investigations. Existing models Tom felt to be in error include the work by Metesh and Wheaton for the EIS in 2001 and a paper by Tom Meyer that was published in the *Journal of Hydrology* in 2009. The premise is that fault discontinuities need to be represented in models in order to better simulate drawdown and recovery of groundwater levels, and depletion of hydraulically connected springs and streams. There was considerable discussion regarding data and field work necessary to complete a more detailed model. CBM producers have extensive data characterizing geologic structures and groundwater level monitoring can be used to investigate the role of faulting. The general consensus was that multiple lines of evidence are necessary to establish a conceptual model and obtain estimates of aquifer properties. Long-duration / multi-well / multi-level aquifer testing could be used to investigate the properties of faults and to obtain more information on properties of confining layers. Analyses of major ion and isotope chemistry as well as age-dating of water were proposed as important tasks. Calibration of a model to water level and water production data instead of projections from the EIS was identified as a key to success. Ultimately, a new modeling effort could provide tools for evaluating impacts. The portability of tools developed for a local area to another is a significant challenge. Using local area models that employ artificial boundaries to interpret regional effects is another. To be useful, a new model or models need to be capable of simulating depletion of surface water and affects on discharges to springs in addition to drawdown in wells. Modeling could be accomplished through a project under the Ground Water Investigation Program managed by MBMG in coordination with regional modeling by USGS. Ongoing modeling by BLM in Wyoming to address impacts of coal mine expansion and CBM development provides good background. Also, a basin-wide modeling approach consistent with the Wyoming work would be valuable. Terry Punt recommended that results of modeling as well as ongoing monitoring need to be made more useful to the public through fact sheets, simplified investigation reports, or graphic visualization.

### **CBM Water Production**

The CX Field operated by Fidelity Exploration & Production Company near Decker Montana and the Coal Creek and Dietz fields operated by Summit Gas were in production in Montana during 2010. Total water production from all CBM wells through September 2010 is listed in Table 1. MBMG monitors groundwater levels and chemistry in dedicated monitoring wells installed beginning in the 1970s to document the effects dewatering of coal-mine and for coal bed methane production. Locations of regional monitoring wells, and data and interpretations from monitoring conducted through 2010 are found in Meredith et al (2011).

Table 1. Total water produced from CBM wells through September 2009. Well numbers include wells that produced water and/or gas.

Year / Field	# Wells	Total Water Production	
		Barrels	Gallons
<b>2000</b>	<b>165</b>	<b>20,169,638</b>	<b>847,124,796</b>
CX Ranch Field	165	20,169,638	847,124,796
<b>2001</b>	<b>236</b>	<b>38,756,615</b>	<b>1,627,777,830</b>
CX Ranch Field	236	38,756,615	1,627,777,830
<b>2002</b>	<b>244</b>	<b>16,299,771</b>	<b>684,590,369</b>
CX Ranch Field	244	16,299,771	684,590,369
<b>2003</b>	<b>327</b>	<b>11,415,551</b>	<b>479,453,122</b>
CX Ranch Field	327	11,415,551	479,453,122
<b>2004</b>	<b>423</b>	<b>15,426,082</b>	<b>647,895,458</b>
CX Ranch Field	423	15,426,082	647,895,458
<b>2005</b>	<b>529</b>	<b>19,426,428</b>	<b>815,909,976</b>
Coal Creek Field		1,665,378	69,945,876
CX Ranch Field		17,760,490	745,940,540
Dietz Field		561	23,562
<b>2006</b>	<b>808</b>	<b>21,317,810</b>	<b>895,348,020</b>
Coal Creek Field		2,653,015	111,426,630
CX Ranch Field		18,536,211	778,520,862
Dietz Field		128,584	5,400,528
<b>2007</b>	<b>723</b>	<b>38,325,853</b>	<b>1,609,685,831</b>
Coal Creek Field		3,090,469	129,799,698
CX Ranch Field		33,463,422	1,396,508,872
Dietz Field		1,771,963	74,422,446
<b>2008</b>	<b>908</b>	<b>40,210,222</b>	<b>1,688,829,324</b>
Coal Creek Field	32	1,766,946	74,211,732
CX Ranch Field	773	35,501,872	1,491,078,624
Dietz Field	102	2,763,864	116,082,288
Waddle Creek Field	1	88,770	3,728,340
<b>2009</b>	<b>887</b>	<b>35,850,182</b>	<b>1,505,707,644</b>
Coal Creek Field	32	2,087,222	87,663,324
CX Ranch Field	759	31,765,126	1,334,135,292
Dietz Field	95	1,846,468	77,551,656
Waddle Creek Field	1	151,366	6,357,372
<b>2010</b>	<b>822</b>	<b>33,540,339</b>	<b>1,408,694,238</b>
Coal Creek Field	28	2,261,728	94,992,576
CX Ranch Field	711	29,310,387	1,231,036,254
Dietz Field	82	1,817,520	76,335,840
Waddle Creek Field	1	150,704	6,329,568

## References

Meredith, E.L., Wheaton, J.W., Bierbach, S., Chandler, K., Donato, T., Gunderson, J., Schwartz, C., 2011. 2010 Annual Coalbed Methane Regional Groundwater Monitoring Report: Powder River Basin, Montana. Montana Bureau of Mines and Geology Open File Report 600, 130 p. 6 sheets.