**ANALYSIS OF COMMENTS**

Comments Received and Wyoming DEQ/WQD Responses
relative to the

DRAFT
ANTIDEGRADATION
REVIEW, ANALYSIS AND FINDINGS
for
Concentrations of barium in the surface waters
in northeastern Wyoming
related to discharges of Coal Bed Methane produced water
published
December 1, 2000

The Wyoming Department of Environmental Quality, Water Quality Division solicited public comment on a draft Antidegradation Review and Findings document addressing NPDES permit limits for barium on discharge permits for Coal Bed Methane produced water. Following are summaries of the comments received along with the agency responses. Comments are arranged alphabetically by commentor and the agency responses are in italics.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ)**

The MDEQ has no specific comments on the approach or details of the proposed antidegradation findings but is interested in ensuring that CBM development in Wyoming is regulated in such a manner that Montana uses of the water and potential future development in that state is not impaired. Montana reserves the right to interact with Wyoming to jointly develop goals and permitting policies relative to CBM permitting.

*A Memorandum of Cooperation was agreed to by the Wyoming and Montana Departments of Environmental Quality which states: "Montana accepts Wyoming's antidegradation policy as protective of Montana's water quality standards. However, should Wyoming consider an application to degrade, Montana will be included as a participant in the waiver review process so that the states may equitably allocate any assimilative capacity".*

**PETROLEUM ASSOCIATION OF WYOMING (PAW)**

Commentor suggests the deletion of the proposed 1,800 µg/L end-of-pipe discharge limitation for barium as well as deletion of the in-stream "significance threshold" limit for barium. This is based on the lack of impacts of any in-stream concentration of 2000 or less.

*Under the current Wyoming regulations, many waters in the CBM development area are designated as Class 2 waters and are protected for drinking water uses. This designation includes the application of an adopted 2000 µg/L human health criterion for barium and an antidegradation procedure that requires the maintenance of water quality at levels as close to background as practicable. The Water Quality Division cannot change these regulatory requirements through the antidegradation findings. Rather, it is the purpose of the antidegradation review to assure that the regulatory requirements are being met.*

*We do not agree that there are no impacts associated with any in-stream concentration of 2000 µg/L or less. Allowing in-stream concentrations to approach or reach 2000 µg/L would reduce the usefulness of the water as a potential drinking water supply. Furthermore, if the WQD would allow CBM activities to consume all of the assimilative capacity for barium, the ability to permit other industrial activities or municipal water development in Wyoming or in downstream states would be compromised. This is an unacceptable consequence especially if it is shown to be unnecessary. Implementation of the barium antidegradation findings, as proposed, will still allow full development of the resource without violating the adopted standards or interfering with future uses of the water.*

Commentor suggests the implementation of downstream monitoring to ensure compliance with a 2,000 ug/L barium stream standard (as modified by Section 4 of the PAW/MOG Water Issues Subcommittee's Response to Wyoming of Department of Environmental Quality "Antidegradation Review, Analysis and Findings" of December 1, 2000). The PAW/MOG Issues Paper asks that the 1800 µg/L effluent limit be removed, that some in-stream monitoring stations be moved and others eliminated, and that the in-stream threshold for barium be changed to 2000 µg/L in all watersheds.

*Changing the in-stream threshold from the proposed levels to 2000 µg/L would allow unnecessary degradation and is contrary to the regulations. Doing so would also result in no action being taken until the receiving stream is impaired for designated drinking water purposes.*
*The 1800 µg/L end-of-pipe limit is necessary to assure that the 2000 µg/L criterion is met at all times on all Class 2 receiving streams. The approach taken in the antidegradation findings document is to create a permitting process that is sufficiently protective of water quality and relatively simple to implement. This provides an otherwise unachievable level of efficiency that is of a great benefit to the industry as a whole. It is possible that some discharges to some waters may exceed 1800 µg/L without causing an excursion of the 2000 µg/L standard but this would be a very difficult thing to manage in light of the extensive development that is predicted. An individual antidegradation review would have to be conducted for each permit application substantially increasing the amount of time for reviewing applications. Additionally, with no end-of-pipe limit and an in-stream threshold of 2000 µg/L, the early applicants may consume all of the assimilative capacity of the receiving water limiting the ability to fully develop the resource. Holding all dischargers to the same end-of-pipe limit creates a level field where all dischargers are treated equally.*

*Commentor suggests moving the proposed monitoring station for the middle Powder River segment near Arvada to a point approximately 23 river miles upstream just below the confluence with Crazy Woman Creek and replacing the upper Belle Fourche monitoring station near Moorcroft with one located on the Belle Fourche River immediately above the confluence with Caballo Creek. Though we might agree that a more upstream monitoring location on the middle Powder segment would be desirable, the proposed location was selected because there is an existing USGS station in place with some historic data. Moving to the location suggested by PAW would probably only be marginally beneficial. We believe the Belle Fourche station at Moorcroft is superior to that proposed by PAW because it has the advantage of tracking the cumulative effects of discharges originating in Caballo and Donkey Creek along with those to the mainstem of the upper Belle Fourche.*

*Commentor also suggests eliminating monitoring in the lower Belle Fourche and Cheyenne Basins because there is no anticipated CBM development in these areas. We believe it is necessary to monitor these segments to demonstrate the cumulative effects of upper basin discharges and assure acceptable water quality at the South Dakota border. Furthermore, recent revisions to the State surface water standards has resulted in the reclassification of Antelope Creek, Black Thunder Creek and the Cheyenne River. Antelope and Black Thunder Creeks Have been dropped to Class 3B while the Cheyenne River has been raised to Class 2ABww. Because of this circumstance, we have consolidated the three watershed segments and moved the barium monitoring station from Edgemont, SD upstream to Riverview, Wyoming. We have also consolidated the Donkey Creek, Caballo Creek and Upper Belle Fourche Watersheds for the same reason.*

*The monitoring station at Moorcroft is well placed to evaluate the effects of discharges in the Upper Belle Fourche watershed.*

Commentor requests that DEQ addresses the fact that drinking water supply is an inappropriate use designation for Class 2 waters in the Analysis Area via the triennial review process of Chapter 1 Surface Water Quality Standards.

*This comment is outside the scope of the antidegradation review findings. Commentor may prepare a Use Attainability Analysis and petition the removal of a designated use only through the process provided in Chapter 1, Sections 33 & 34 of the Water Quality rules and regulations. A designated use cannot be removed by an antidegradation review.*

Employing "potential future use" as a part of the WDEQ Antidegradation Review is improper. Only existing uses are subject to the antidegradation review process.

*The purpose of the antidegradation review as it applies to Class 2 waters is to maintain the existing quality of water that is naturally better than the water quality criteria in addition to protecting existing uses. Background concentrations of barium in the CBM development area are naturally very low and it is the purpose of the antidegradation provisions to keep them at those low levels.*

WDEQ must consider net environmental benefits and economic benefits associated with CBM discharge. This was addressed in PAW's report.

*The consideration of net environmental benefits is appropriate to justify allowing degradation of water quality for one or more constituents where such degradation is necessary or unavoidable. In this circumstance, degradation for barium beyond the threshold of significance has been found to be unnecessary. Therefore, such degradation cannot be allowed even if some other environmental benefit might accrue from the discharge.*

Application of the standard that states "Whether the cost of implementation is justified by the environmental benefits gained" was not applied. Where there are not measurable benefits gained, no expenditure on alternatives is justified.

*We did consider the costs of implementation in relation to the benefits gained in the formulation of the NPDES strategy. The NPDES strategy allows end-of-pipe concentrations that range from 6 to 18 times the median background concentrations in the receiving waters. If full field development occurs as anticipated by the industry, it is very probable that temporary or spatially limited exceedences of the significance thresholds will occur. We believe, however, that these exceedences will attenuate due to natural processes and will cumulatively stay within the significance thresholds set for each watershed. It can be argued that it is not necessary to allow significant degradation even on a temporary or spatially limited basis, however, we have found that the cost of doing so would not be justified by the temporary benefits that would be gained.*

*We fall short, however, of agreeing with PAW that there is no benefit in maintaining the naturally low levels of barium found in the watersheds. As mentioned above, allowing the coal bed methane industry to fully consume the available assimilative capacity for barium may have significant effects on other activities and uses of the water both in Wyoming and the downstream states of Montana and South Dakota.*

Treatment of reasonable alternatives is flawed. Recognition must be given to the operational and technical issues associated with treatment at thousands of remote sites. Also, the geohydrologic limitations of

disposal and recovery wells or reinjection must be discussed. PAW believes that upon addressing these considerations, none of the alternatives presented by WDEQ are reasonable.

*The treatment of alternatives in the antidegradation findings is based completely and without modification on the analysis provided by PAW in the report entitled "Technical Support for Antidegradation for Barium" (Camp, Dresser & McKee, August 2000). This report clearly concludes that any of 4 treatment or alternative disposal alternatives are technologically and economically feasible at current market prices for natural gas. Considering that only 10% of the potential CBM wells would need to implement one of these technologies in order to comply with the proposed discharge limits, we cannot agree that the findings on this matter are unreasonable.*

The persistence of barium in the subject streams must be addressed. Barium is not persistent and with no drinking water uses, there is no potential effect from elevated barium levels. EPA Region VIII's guidance states that the determination of significance of degradation can be demonstrated by the "nature, persistence and potential effects of the parameter".

*We have addressed the persistence of barium in the subject streams, in fact, the proposed NPDES strategy relies to a great extent on the assumption that elevated concentrations of barium at the well head will not persist throughout the stream system. It is the basis for allowing 1800 µg/L at the end-of-pipe while maintaining much lower levels in the receiving stream.*

The Wyoming Antidegradation Policy is significantly more stringent than federal laws and policies require. Drinking water supply uses are not subject to the antidegradation review process under EPA protocol. The exceedence of federal requirements result in the potential for significant financial impacts to industry that is unwarranted when compared to the lack of benefits gained there from.

*The Wyoming Antidegradation Policy expressed in Chapter 1, Section 8 of the Wyoming Water Quality Rules and regulations is not significantly more stringent than the federal rules. The language in Section 8 follows very closely the language in 40 CFR part 131.12.*

**POWDER RIVER BASIN RESOURCE COUNCIL (PRBRC)**

Commentor expressed a concern that each of the watershed segments was analyzed separately and did not take into account the cumulative impact as you move downstream through the river systems.

*Cumulative impacts are inherently addressed within the structure of the NPDES permitting strategy. A significance threshold for barium concentrations has been set in each watershed segment within the larger river basins and all must be met. If there are excursions of the significance number in any watershed segment, the Department will begin adjusting the end-of-pipe limits as necessary to correct the problem. If the excursion occurs in the lowest segment on the river, all upstream permits including those originating in other watershed segments could potentially be subjected to revised end-of-pipe limits. Breaking the larger river systems into smaller segments, each with their own monitoring points will provide the information necessary to direct a permitting response to those areas that will most effectively correct problems as they occur.*

The proposed permitting strategy provides for an adjustment of permit limits when the average of four consecutive sampling periods exceeds the significance threshold. Commentor suggests that the permitting response should occur based on the average of two sampling periods. Also suggests that there be re-opener clauses in all permits that would allow for a more immediate revision of existing permits rather than waiting for the scheduled renewal.

*We believe that there are sufficient environmental safeguards built into the proposed approach that basing a permitting response on four consecutive samples is defensible. The significance thresholds are based on median barium values measured prior to CBM development in the area. This means that half of the sampling events would be expected to exceed the significance threshold naturally - without any additional input from CBM discharges. In light of this, we believe that revising the effluent limit based on only two samples would be an overreaction. Also, because of the large assimilative capacity available in all watersheds, there will be ample time for an effective permitting response to ensure that there will be no significant threat to human health or the environment related to CBM discharges. Likewise, we do not believe it will become necessary, nor practical to reopen existing permits prior to their scheduled renewal cycles and still achieve the purpose of the antidegradation policy.*

**U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)**

In terms of application of your antidegradation provisions, it is EPA's assessment that Wyoming has met all of the antidegradation requirements. In your analysis, you've addressed significance, economic and social importance, and feasible alternatives. You've determined that there are reasonable alternatives to the degradation, and you've set out proposals to implement those alternatives. Your implementation approach should ensure that, at a minimum, existing and designated uses will be protected. And, the approach should limit changes in barium concentrations to insignificant (based on Wyoming's definition) levels.

*Because EPA's assessment is that the antidegradation approach taken by the state meets the federal requirements, no response is necessary.*

**U.S. FISH AND WILDLIFE SERVICE (USFWS)**

The Antidegradation findings document should address the following:

1. the fate of barium that is not attenuated as barium sulfate;
2. the effect of barium and barium sulfate on soils and riparian vegetation;
3. the effect of increased chlorides on the mobility of barium.

Overall, there is insufficient data on the toxicity of barium to aquatic birds, aquatic and terrestrial mammals, algae and other aquatic plants, benthic invertebrate communities and amphibians. Therefore, we are unable to evaluate the potential effects of barium at the proposed concentrations to organisms inhabiting waterways receiving CBM produced water. Given the paucity of data on barium toxicity it seems that additional toxicity studies are warranted.

*Barium is regulated under the water quality standards as total recoverable barium and the 2000 µg/L standard has been established by EPA as being safe for drinking water purposes. This standard is based on adverse human health effects associated with elevated concentrations of barium, however, it is not believed to be a significant threat to aquatic life at concentrations that can potentially be achieved in surface water systems. Therefore, an aquatic life value for barium has not been developed.*

*Because the standard is based upon the total recoverable amount which includes both barium sulfate and other compounds, it is not necessary to investigate the fate of barium sulfate separately from other forms.*

*In setting NPDES permit limits for constituents of concern, the Department strives to assure that both technology based federal effluent limitation guidelines (ELGs) and water quality based standards are achieved. There is not*

*an ELG established for barium and the water quality based standard is 2000 µg/L. An aquatic life criterion for barium has not been established by EPA because barium cannot normally exist in solution in concentrations that would have any adverse effect on aquatic life. If the USFWS believes this conclusion is in error, it can only be resolved by working though EPA to establish a recommended criterion under Clean Water Act Section 304(a). Furthermore, the proposed antidegradation approach will result in cumulative barium concentrations far below the 2000 µg/L criterion. Therefore, we believe it is unnecessary to conduct the additional studies suggested by the commentor prior to the issuance of NPDES permits.*

*Likewise, we do not believe that there is any substantial benefit to conducting studies on the effect of chlorides on the mobility of barium. This again would be a function of the toxicity investigations conducted by EPA when formulating the nationally recommended 304(a) criteria.*

CONCLUSIONS

Except for the consolidation of the Upper Belle Fourche and Cheyenne River Watersheds necessary to accommodate recent revisions to the water quality standards, The final antidegradation findings are unchanged from the December, 2000 draft.

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