

BEFORE THE BOARD OF ENVIRONMENTAL REVIEW  
OF THE STATE OF MONTANA

In the matter of the amendment ) NOTICE OF PUBLIC HEARING ON  
of ARM 17.30.670 and ) PROPOSED AMENDMENT AND  
17.30.1202 pertaining to ) ADOPTION  
nondegradation requirements )  
for electrical conductivity ) (WATER QUALITY)  
(EC) and sodium adsorption )  
ratio (SAR) and definitions )  
for technology-based effluent )  
limitations, and the adoption )  
of new rules I through X )  
pertaining to minimum )  
technology-based controls and )  
treatment requirements for the )  
coal bed methane industry )

TO: All Concerned Persons

1. On November 9, 2005, at 10:30 a.m., at the Lame Deer Charging Horse Casino, 1/2 Mile East Lame Deer Hwy. 212, Lame Deer, Montana; November 10, 2005, at 8:00 a.m., at Miles City Community College, Room 106, 2715 Dickinson, Miles City, Montana; and December 1, 2005, at 1:30 p.m., at the Metcalf Building, Room 111, 1520 East Sixth Avenue, Helena, Montana, the Board of Environmental Review will hold public hearings to consider the proposed amendment and adoption of the above-stated rules.

2. The Board will make reasonable accommodations for persons with disabilities who wish to participate in these public hearings or need an alternative accessible format of this notice. If you require an accommodation, contact the Board no later than 5:00 p.m., November 1, 2005, to advise us of the nature of the accommodation that you need. Please contact the Board Secretary at P.O. Box 200901, Helena, Montana 59620-0901; phone (406) 444-2544; fax (406) 444-4386; or email ber@mt.gov.

3. The rules proposed to be amended provide as follows, stricken matter interlined, new matter underlined:

17.30.670 NUMERIC STANDARDS FOR ELECTRICAL CONDUCTIVITY (EC) AND SODIUM ADSORPTION RATIO (SAR) (1) through (5) remain the same.

~~(6) Changes in existing surface or ground water quality with respect to EC and SAR are nonsignificant according to the criteria in 75-5-301(5)(c), MCA, provided that the change will not have a measurable effect on any existing or anticipated use or cause measurable changes in aquatic life or ecological integrity. EC and SAR are harmful parameters for the purposes of the Montana Water Quality Act, Title 75, chapter 5, MCA.~~

(7) For purposes of determining compliance with the water quality standards and nonsignificance criteria for all

19-10/6/05

MAR Notice No. 17-231

ENVIRONMENTAL QUALITY COUNCIL  
March 17, 2006  
Exhibit 22

~~parameters of concern in any new or increased discharges of unaltered ground water from coal bed methane development of methane wastewater, the department shall determine effluent or compliance limits (e.g., evaluate the design of disposal systems) by using a flow based analysis that considers a range of flows or monthly flow probability. With respect to EC and SAR, the department shall also use the median chemistry for the specified flow range or monthly flow by using 7Q10 flows.~~

~~(8) If any of the provisions of (6) or (7), or both of them, are declared to be invalid, then the numeric water quality standards and requirements specified in (1) through (7) shall be void.~~

AUTH: 75-5-301, 75-5-303, MCA

IMP: 75-5-301, 75-5-303, MCA

17.30.1202 DEFINITIONS For the purposes of this subchapter, the following definitions apply:

(1) ~~"Board" means the Montana board of environmental review established by 2-15-3502, MCA. "Average" means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.~~

(2) ~~"Department" means the Montana department of environmental quality established by 2-15-3501, MCA. "Coal bed methane extraction" means the extraction of methane gas from any coals or associated geologic formations.~~

(3) ~~"Daily discharge" means the discharge of pollutants measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.~~

(3) and (4) remain the same, but are renumbered (4) and (5).

(6) ~~"Geologic formation" means a body of rock characterized by a degree of lithologic homogeneity which is prevailingly, but not necessarily, tabular and is able to be mapped on the earth's surface or traceable in the subsurface.~~

(7) ~~"Instantaneous maximum" means the maximum concentration measured in any single sample of the discharge effluent.~~

(8) ~~"Methane wastewater" means water produced from coal bed methane extraction during exploration or development activities.~~

(5) remains the same, but is renumbered (9).

(10) ~~"Project area" includes the entire geographic area leased by the operator or any person legally related to the operator for coal bed methane extraction.~~

(11) ~~"Reinjection" means putting methane wastewater back into a suitable geologic formation.~~

(12) ~~"Suitable geologic formation" means a geologic formation with water quality similar enough to that of the methane wastewater in the project area to ensure that, after~~

reinjection of methane wastewater, the water of the receiving formation will remain suitable for the same beneficial uses as the methane wastewater.

(13) "Surface owner" means the person who holds record title to or has a purchaser's interest in the surface of the land.

AUTH: 75-5-305, MCA  
IMP: 75-5-305, MCA

REASON: ARM 17.30.670 and 17.30.1202 are being amended for the following reasons:

ARM 17.30.670

The Board is proposing the amendment of ARM 17.30.670 in response to a petition filed by Northern Plains Resource Council, Tongue and Yellowstone Irrigation District, Surface Owners of the Wolf Mountains Area, Bear Creek Council, Stillwater Protective Association, Bull Mountain Land Alliance, Rosebud Protective Association, Dawson Resource Council, Carbon County Resource Council, Bones Brothers Ranch, Muggli Brothers, Huggo Muggli Inc., Golder Ranch, Greenleaf Cattle Company, Rocker 6 Cattle Company, FL Ranch, and Fix Ranch (collectively referred to as "petitioners").

The petitioners are requesting that the Board amend ARM 17.30.670(6) to modify the nondegradation criteria applicable to electrical conductivity (EC) and sodium adsorption ratio (SAR); to amend ARM 17.30.670(7) to clarify that determining compliance with water quality standards and nondegradation thresholds for discharges of coal bed methane wastewater shall be done using 7Q10 flows; and to delete the non-severability clause in ARM 17.30.670(8).

The existing nondegradation criteria for EC and SAR are based upon a narrative criteria that provides: "changes in existing surface or ground water quality with respect to EC and SAR are nonsignificant . . . provided that the change will not have a measurable effect on any existing or anticipated use or cause measurable changes in aquatic life or ecological integrity." The petitioners argue that the narrative criteria effectively exempt methane discharges, including discharges from methane development in Wyoming, from the state of Montana's nondegradation policy. Montana's nondegradation policy is necessary to protect the existing water quality of the Tongue River from degradation from methane discharges in Montana and Wyoming. Montana's nondegradation policy will be critical to protect the existing water quality of rivers such as the Clark Fork of the Yellowstone, Rock Creek, Stillwater River, Flathead River, and the pristine streams of Park County if methane development occurs in these watersheds.

The proposed amendments also restore a conservative approach to determining compliance with numeric water quality standards and nondegradation thresholds by requiring the Department to require compliance at low flow events. The

Department uses this conservative approach for all other dischargers. The methane industry should not be granted special treatment.

Since salinity, as measured by EC and SAR, is harmful to soils, vegetation, and aquatic life, the appropriate nondegradation criteria for EC and SAR are the criteria for harmful parameters. For harmful parameters, changes in existing water quality are considered nonsignificant, if the change is less than 10% of the applicable standard and the existing water quality in the receiving stream is less than 40% of the applicable standard. See ARM 17.30.715(1)(f). If a proposed discharge of EC and SAR will exceed the criteria for harmful parameters, then the permittee must request the Department to issue an authorization to degrade pursuant to 75-5-303, MCA.

ARM 17.30.1202

The definitions in ARM 17.30.1202 are being amended to add definitions that will be necessary to clarify the technology-based controls and treatment requirements the Board is proposing to adopt in New Rules I through X. The new definitions are being added to ARM 17.30.1202, because that rule contains the Board's existing definitions applicable to effluent limitations for point source discharges to surface waters.

4. The proposed new rules provide as follows:

NEW RULE I APPLICABILITY (1) The requirements of [New Rules II through IX] are applicable to those facilities engaged in exploration, drilling, production, and development in the coal bed methane industry.

AUTH: 75-5-305, MCA  
IMP: 75-5-305, MCA

NEW RULE II ZERO DISCHARGE REQUIREMENT (1) Except as provided in [New Rules III through IX], point sources of methane wastewater shall achieve zero discharge of pollutants, which represents the minimum technology-based requirement. Zero discharge shall be accomplished by reinjection of methane wastewater into suitable geologic formations in the project area in compliance with all other applicable federal and state laws and regulations.

AUTH: 75-5-305, MCA  
IMP: 75-5-305, MCA

NEW RULE III WAIVER FROM ZERO DISCHARGE REQUIREMENT

(1) The department may grant a waiver from the zero discharge requirement if the owner or operator of a point source discharge of coal bed methane wastewater demonstrates by clear and convincing evidence to the department through site specific studies that the requirement is not technically feasible because estimated wastewater production rates exceed the estimated

cumulative reinjection rates of all suitable geologic formations in the project area.

(2) The department shall limit the waiver to the volume of methane wastewater for which the owner or operator shows that zero discharge is not technically feasible. The volume of methane wastewater for which the department grants a waiver from the zero discharge requirement shall be limited to the difference between estimated wastewater production rates and the estimated cumulative reinjection rates for all suitable geologic formation in the project area.

(3) The department may limit the waiver to the initial phases of development when the volume of methane wastewater produced by wells is highest, which may make reinjection of all such water technically unfeasible.

(4) The department may also grant a waiver from the zero discharge requirement if the EPA will not authorize the reinjection pursuant to a permit under the Safe Drinking Water Act (SDWA), 42 USC 300f to 300j-26(5). The operator shall attain zero discharge for the volume of methane wastewater for which the department does not grant a waiver.

AUTH: 75-5-305, MCA

IMP: 75-5-305, MCA

NEW RULE IV INFORMATIONAL REQUIREMENTS FOR WAIVER DETERMINATION

(1) An owner or operator requesting a waiver from the zero discharge requirement for coal bed methane wastewater shall submit an application to the department for the department to make a determination on whether to grant the waiver.

(2) The application shall include, but is not limited to, the following:

(a) a description and map of the coal bed methane project and project area showing the location of wells, pipelines, roads, compressors, and related infrastructure;

(b) a description of the surface owners in the project area;

(c) an estimate of pumping rates for coal bed methane wells in the target coal seams and an estimate of the volume of wastewater likely to be produced per well per year;

(d) for each targeted coal seam, data showing areas characterized by high concentrations of vertical fractures where wastewater production wells may be higher;

(e) an inventory and map of geologic formations, aquifers, and confining layers including significant fractures, fissures, and faults within the project area. The following information is required for each geologic formation and aquifer in the project area:

(i) lateral extent, thickness, and depth. Maps and cross sections indicating the vertical and lateral limits of each formation;

(ii) hydraulic properties including, but not limited to, transmissivity, storage coefficient, effective porosity, and hydraulic conductivity. The results of pump tests, analysis of

core samples, and other geophysical studies;

(iii) water quality characterization including the geochemical compatibility of the receiving aquifer minerals with methane wastewater;

(f) an inventory and map of the locations of natural recharge in the project area and near the reinjection location;

(g) an inventory of the wells, springs, and seeps in the project area including pumping rates for wells. A tabulation of data on all wells within the project area including a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information known about the well;

(h) the results of ground water modeling showing the relationship and hydrologic connectivity of the identified geologic formations and aquifers, the effects of fractures, fissures, faults, and other significant geologic features on ground water movement in the project area;

(i) the results of pump tests of confining layers quantifying potential leakage through such layers;

(j) a description of all potentially suitable geologic formations for reinjection within the project area. For each such suitable geologic formation, the operator shall submit the following information:

(i) the results of reinjection well testing;

(ii) based upon the results of testing and other studies, an estimate of the short-term and long-term reinjection rates that each suitable geologic formation is capable of receiving;

(iii) the results of ground water modeling showing the effects of reinjection into suitable geologic formations on other aquifers, surface waters, and regional flow systems; and

(k) all other information required by the EPA as part of the Class V UIC Program.

(3) The department shall notify the applicant in writing, within 60 days after receipt of an application for a waiver, that the application does or does not contain all the information necessary for the department to make a determination. If the information from the supplemental submittal or any subsequent supplemental submittal is inadequate, the department shall notify the applicant in writing, within 30 days of receipt of the supplemental submittal, what additional information must be submitted. The department shall notify the applicant in writing when the application is deemed complete.

(4) The application for a waiver submitted pursuant to this subchapter shall comply with the signature and certification requirements of ARM 17.30.1323. The board adopts and incorporates by reference ARM 17.30.1323, which sets forth signature and certification requirements for MPDES permit applications. Copies of ARM 17.30.1323 may be obtained from the Department of Environmental Quality, P.O. Box 200901, Helena, Montana 59620-0901.

AUTH: 75-5-305, MCA

IMP: 75-5-305, MCA

NEW RULE V DEPARTMENT PROCEDURES FOR MAKING WAIVER DETERMINATIONS

(1) Upon a determination by the department that an application submitted under [New Rule IV] is complete, the department shall prepare a preliminary decision approving or denying the waiver pursuant to the procedures in [New Rule VI].

(2) The department shall deny an application for a waiver unless the applicant has affirmatively demonstrated and the department finds, based on clear and convincing evidence, that reinjection is not technically feasible, using the standards set forth in [New Rule III]. The department shall consider an analysis by the applicant and any substantive relevant information either submitted by the public or otherwise available.

(3) The department shall make its preliminary decision either authorizing or denying the waiver within 180 days after receipt of a complete application from the applicant. This time period may be extended upon agreement of the applicant or whenever an environmental impact statement must be prepared pursuant to Title 75, chapter 1, parts 1 and 2, MCA.

(4) To the maximum extent possible, the department shall coordinate any application for a waiver with the permitting and approval requirements of other laws or programs administered by the department or by any other local, state, or federal agency.

AUTH: 75-5-305, MCA

IMP: 75-5-305, MCA

NEW RULE VI DEPARTMENT PROCEDURES FOR MAKING PRELIMINARY AND FINAL WAIVER DECISIONS

(1) The department shall issue a preliminary decision either denying or authorizing a waiver from the zero discharge requirement and shall provide a 60-day public comment period prior to issuing a final decision. The department's preliminary and final decisions shall include the following:

(a) a description of the proposed coal bed methane project and project area;

(b) a determination of the estimated methane wastewater production rate for the project and the scientific basis supporting such determination;

(c) a determination of the reinjection rate for each suitable geologic formation, determination of the cumulative reinjection rate for all suitable geologic formations in the project area, and the scientific basis supporting such determinations;

(d) a determination that the waiver from the zero discharge requirement is necessary because estimated methane wastewater production rates exceed estimated cumulative reinjection rates for all suitable geologic formations in the project area or because the EPA will not authorize the reinjection pursuant to the SDWA;

(e) a determination of the volume of methane wastewater for which reinjection is not technically feasible (and thus a waiver is necessary) and the scientific basis supporting such

determination;

(f) a detailed description of all the conditions applied to any waiver from the zero discharge requirement including, but not limited to, the conditions required in [New Rule III(2) through (4)], monitoring requirements, reporting requirements, limitations on the waiver granted, and methods for determining compliance with the waiver;

(g) a description of the procedures for reaching a final decision on the waiver including:

(i) the beginning and ending dates of the comment period and the address where comments will be received;

(ii) procedures for requesting a hearing and any other procedures by which the public may participate in the final decision; and

(iii) name and telephone number of a person to contact for additional information.

(2) The preliminary decision, accompanying a statement of basis, must be publicly noticed and made available for public comment for at least 30 days, but not more than 60 days, prior to a final decision. In providing public notice, the department shall comply with the following:

(a) procedures for public notice set forth in ARM 17.30.1372; and

(b) procedures for the distribution of information set forth in ARM 17.30.1041.

(3) During the public comment period, any interested person may submit written comments on the preliminary decision and may request a public hearing. A request for a public hearing must be in writing and must state the nature of the issues proposed to be raised at the hearing. The department shall hold a hearing if one is requested. Any public hearing conducted under this section is not a contested case hearing under the provisions of the Montana Administrative Procedure Act, Title 2, chapter 4, MCA.

(4) Within 60 days after the close of the public comment period, the department shall issue a final decision accompanied by a statement of basis for the decision and, if applicable, a statement of conditions. The final decision and statement of basis will be prepared according to the requirements of this section. In addition, the statement of basis for a final decision must include the following:

(a) which provisions, if any, of the preliminary decision have been changed in the final decision and the reasons for the change; and

(b) a description and response to all substantive comments on the preliminary decision raised during the public comment period or during any hearing.

(5) Upon issuing a final decision, the department shall notify the applicant and each person who has submitted written comments or requested notice of that decision. The notice must include reference to the procedures for appealing the decision.

(6) The final decision is effective 30 days after the service of notice of the decision unless:

(a) a hearing is requested pursuant to [New Rule VII], in

which case the decision is effective 30 days after the final decision of the board; or

(b) no comments are received on the preliminary decision, in which case the decision is effective upon issuance.

(7) The board adopts and incorporates by reference ARM 17.30.1041, which sets forth requirements for distribution and copying of public notices and permit applications, and ARM 17.30.1372, which sets forth procedures for issuing public notices of MPDES permit applications and hearings. Copies of ARM 17.30.1041 and 17.30.1372 may be obtained from the Department of Environmental Quality, P.O. Box 200901, Helena, MT 59620-0901.

AUTH: 75-5-305, MCA  
IMP: 75-5-305, MCA

NEW RULE VII REVIEW (1) An interested person wishing to challenge a final department decision may request a hearing before the board within 30 days of the final department decision on a waiver. The contested case procedures of Title 2, chapter 4, part 6, MCA, apply to a hearing under this rule.

AUTH: 75-5-201, MCA  
IMP: 75-5-201, 75-5-305, MCA

NEW RULE VIII TREATMENT-BASED EFFLUENT LIMITATIONS

(1) If the department grants a waiver from the zero discharge requirement for all or a portion of the wastewater pursuant to [New Rules II and III], the amount of wastewater that obtains the waiver shall achieve the following minimum technology-based effluent limitations at the end of the pipe prior to discharge:

- (a) calcium average concentration between 0.1 mg/L and 0.2 mg/L;
- (b) magnesium average concentration between 0.1 mg/L and 0.6 mg/L;
- (c) sodium average concentration of 10 mg/L;
- (d) bicarbonate average concentration of 30 mg/L and instantaneous maximum concentration of 115 mg/L;
- (e) sodium adsorption ratio instantaneous maximum of 0.5;
- (f) electrical conductivity average concentration of 233  $\mu$ mhos/cm;
- (g) total dissolved solids average concentration of 170 mg/L;
- (h) ammonia average concentration of 0.1 mg/L and instantaneous maximum concentration of 0.3 mg/L; and
- (i) arsenic concentration of <0.0001 mg/L.

AUTH: 75-5-305, MCA  
IMP: 75-5-305, MCA

NEW RULE IX STOCK WATERING EXEMPTION (1) The requirements of [New Rules I through VIII] shall not apply to any quantity of wastewater used for stock watering purposes if

all the following conditions are satisfied:

- (a) the surface owner and operator sign a written agreement to use the wastewater for stock watering purposes;
- (b) the wastewater is stored in a stock tank; and
- (c) the surface owner has obtained a beneficial use permit from the department of natural resources and conservation pursuant to Title 85, chapter 2, MCA.

(2) The stock watering exemption shall be limited to the quantity of water for which the department of natural resources and conservation issues a beneficial use permit.

AUTH: 75-5-305, MCA

IMP: 75-5-305, MCA

NEW RULE X SEVERABILITY (1) If any provision of [New Rules II through IX] is determined to be invalid or unenforceable, such provision shall be fully severable and the other provisions thereof shall remain in full force and effect. The remaining provisions shall be liberally construed to carry out the provisions of this subchapter.

AUTH: 75-5-305, MCA

IMP: 75-5-305, MCA

REASON: Why Minimum Technology-Based Controls and Treatment Requirements are Necessary

The Board is proposing the adoption of New Rules I through X to establish minimum technology-based controls and treatment requirements for the coal bed methane industry in response to a petition filed by Northern Plains Resource Council, Tongue and Yellowstone Irrigation District, Surface Owners of the Wolf Mountains Area, Bear Creek Council, Stillwater Protective Association, Bull Mountain Land Alliance, Rosebud Protective Association, Dawson Resource Council, Carbon County Resource Council, Bones Brothers Ranch, Muggli Brothers, Huggo Muggli Inc., Golder Ranch, Greenleaf Cattle Company, Rocker 6 Cattle Company, FL Ranch, and Fix Ranch (collectively referred to as "petitioners").

The minimum technology-based controls and treatment requirements proposed by the petitioners are a combination of "zero discharge" and treatment-based effluent limitations. The effluent limitations proposed by the petitioners will prohibit the discharge of wastewater by requiring reinjection into suitable geologic formations unless the operator can demonstrate that site-specific geologic conditions make zero discharge technically unfeasible. To the extent zero discharge is not technically feasible because of site-specific geologic limitations, the rules impose effluent limitations at the end of the pipe prior to discharge based upon existing treatment technologies such as ion exchange or reverse osmosis.

The reasons for adopting minimum technology-based controls and treatment requirements for the coal bed methane industry are stated in the petition and are summarized as follows:

1. Currently, there are no technology-based treatment requirements for the coal bed methane industry adopted by the U.S. Environmental Protection Agency (EPA) under the federal Clean Water Act (CWA). Since the Board has the authority to adopt treatment requirements for a particular industry when EPA has failed to do so, the petitioners have requested the Board to initiate rulemaking to establish technology-based controls and treatment requirements for discharges from the coal bed methane industry. See 75-5-305(1), MCA.

2. The purpose of the treatment requirements is to require coal bed methane operators to use the best available technology that will minimize the discharge of wastes and make substantial progress toward the ultimate national goal of eliminating the discharge of all pollutants.

3. The reason for requiring reinjection of all coal bed methane wastewater into suitable geologic formations (unless reinjection is technically unfeasible) is to maximize the volume of water that will be put back into aquifers from which it was taken. This requirement will alleviate the draining of aquifers and the drying up of wells and springs that are used by petitioners.

4. The reason that water must be reinjected into "suitable geologic formations" (i.e., aquifers with water of similar quality to coal bed methane wastewater) is to ensure that the water resource is available for beneficial use in the future. For this reason, reinjection into deep geologic formations that are considered Class II wells under the Safe Drinking Water Act's Underground Injection Control (UIC) program is not allowed under the rules because the water quality in those formations typically will not qualify as being "suitable geologic formations."

5. The reason for adopting technology-based effluent limits for discharges of coal bed methane wastewater to surface water is to ensure that treatment to a minimum level is used on the volume of methane wastewater that cannot be reinjected due to technical infeasibility.

#### The Board's Authority to Adopt Minimum Treatment Requirements

Under 75-5-305(1), MCA, the Board may adopt minimum treatment requirements for an industry when there are no federally promulgated treatment requirements for the industry. Prior to adopting such requirements, the Board must ensure that: (1) the technology-based standards address parameters that "are likely to affect beneficial uses;" and (2) the technology-based requirements are "cost-effective and economically, environmentally, and technologically feasible." The petitioners' scientific, economic, and technical basis for the Board's adoption of minimum treatment requirements are described in the Petition and are summarized as follows:

##### 1. Parameters that are likely to affect beneficial uses

The proposed new rules will establish effluent limitations for the following parameters found in methane wastewater: Sodium adsorption ratio (SAR) and its individual constituents (sodium, magnesium, and calcium); salinity as measured by electrical conductivity (EC); ammonia; bicarbonate; total dissolved solids (TDS); and arsenic. All of these parameters are likely to affect beneficial uses of surface waters.

Specifically, high levels of salinity, as measured by EC and SAR, may adversely impact native soils, native vegetation, and irrigated crops. Water with high salinity levels causes changes in soil structure that make water less available to plants and, at very high levels, can directly harm or kill plants. The EC levels of methane wastewater have a high salinity hazard with a mean value of between 2000-2300. The SAR value affects plant production by reducing the permeability of soils and slowing water infiltration. This lower availability of water reduces plant productivity. The SAR level of methane wastewater is high with a mean value of 34 to 51. Soils with high clay content or with poor drainage are most vulnerable to these impacts.

Salinity levels (EC) can also adversely impact aquatic life. During the 2003 rulemaking process, the Montana Department of Fish, Wildlife, and Parks raised these concerns.

Bicarbonate can also be harmful to aquatic life. Methane discharges from Fidelity's CX Field are characterized by bicarbonate concentrations of between 1400-1600 mg/L.

Ammonia is listed as a toxic pollutant in Montana's Water Quality Standards. Ammonia can pose acute and chronic toxicity to aquatic life at extremely low levels. Methane discharges are characterized by ammonia concentrations averaging 2.0 mg/L.

## 2. Technological feasibility of the treatment requirements

### (a) Reinjection

Reinjection of methane wastewater is a widespread control technique in many geologic basins, including the Wyoming portion of the Powder River Basin. The methane industry employs two types of reinjection. Where the water quality of the methane wastewater has extremely high salinity levels and is not suitable for any beneficial uses, the wastewater is reinjected into deep geologic formations through Class II injection wells under the Safe Drinking Water Act (SDWA), 42 USC 300f to 300j-26, Underground Injection Control (UIC) program. Where the water quality of the methane wastewater has lower salinity levels and is marginally suitable for some beneficial uses, the wastewater is reinjected into shallower geologic formations through Class V injection wells under the UIC program. The purpose of the UIC program is to protect aquifers from the adverse impacts of reinjection and to protect aquifers that serve as sources of drinking water.

In the San Juan Basin of Colorado almost 100% of methane wastewater is reinjected to deep geologic formations through Class II injection wells. In the West Uinta Basin of Utah,

approximately 97% of the methane wastewater is reinjected to deep geologic formations through Class II injection wells. In the Raton Basin of Colorado, approximately 30% of methane wastewater is reinjected to deep geologic formations through Class II injection wells. In the Raton Basin of New Mexico, 100% of methane wastewater is reinjected to deep geologic formations through Class II injection wells including methane development on Ted Turner's Vermejo Ranch.

In the Wyoming portion of the Basin, there are approximately 160 active reinjection wells of the approximately 324 permitted by WDEQ, most of which are shallow Type V injection wells. The WDEQ has drafted three general permits authorizing reinjection. According to John Passehl (Personal Communication April 15, 2005), the Program Principal of UIC program at WDEQ, about 25 companies have done reinjection including Anadarko, JM Huber, Bill Barrett, Continental Industries, Devon, Double Eagle, Marathon, McCartney, Merritt, Northwestern, Petrox, Prima, and Wolverine. Nance Petroleum is reinjecting wastewater from its methane operations into shallow sandstone formations just south of the Montana board in Hanging Woman Basin, a tributary of the Tongue River.

Achieved reinjection rates are highly dependent on site-specific conditions and vary widely within a range of 12 to 117 gpm per reinjection well. Currently approximately 150,000 gallons/day/well is being reinjected. The WDEQ limits reinjection to aquifers with the same classification as methane wastewater to ensure the water remains suitable for beneficial use.

(b) Reverse Osmosis

Reverse osmosis is used to treat methane wastewater in the San Juan and Raton Basins of Colorado. The WDEQ has approved one NPDES permit requiring treatment using reverse osmosis prior to discharge. The EPA issued a permit requiring reverse osmosis treatment of methane wastewater on the Southern Ute Indian Reservation (NPDES Permit COG-075000). Encana Oil and Gas, Inc. is also using reverse osmosis to treat methane wastewater in Colorado, Permit No. COG-600633, Colorado Water Quality Control Division, Department of Public Health and Environment.

Devon Energy has submitted an application with Region 8 of the EPA for a NPDES permit for 5-15 pilot projects on the Wind River Indian Reservation and is proposing to use reverse osmosis. The EPA is currently drafting the NPDES permit.

Hydrometrics, Inc., has demonstrated a system by which 95% of treated water may be discharged to the surface as usable quality water. The company uses a Weak Acid Cation Resin treatment as part of their "High Efficiency Reverse Osmosis" (HERO) process to treat methane wastewater to remove major cations, anions, and trace constituents.

(c) Ion Exchange Technology

Several companies in the Wyoming portion of the Basin are

using Higgins Loop and Emit ion exchange technology to treat methane wastewater prior to discharge.

The Montana Department of Environmental Quality recently approved a MPDES permit for Powder River Gas, LLC, which intends to implement ion exchange treatment technology prior to discharging to the Tongue River. Fidelity has proposed using a similar ion exchange technology to treat wastewater prior to discharge into the Tongue River. Ion exchange technology is capable of reducing sodium levels to less than 0.5 mg/L and SAR levels to below 0.1. The treatment technology is capable of reducing EC levels to about 233 µmhos/cm and total dissolved solids to about 170 mg/L.

In summary, reinjection into suitable geologic formations to the maximum extent feasible based on site-specific conditions and treatment of the remaining wastewater prior to discharge is technologically feasible. As demonstrated above, reinjection and treatment are being employed by methane operators in the Basin of Montana and Wyoming and other geologic basins in the West.

### 3. Economic feasibility

Reinjection and treatment is not only economically feasible, but also profitable for the methane industry. Assuming a gas price of \$3.61 Mcf, methane companies will still earn a 23%-36% return on investment in Montana when reinjecting wastewater into suitable shallow geologic formations to meet the zero discharge requirement. If an operator obtains a limited waiver from the zero discharge permit requirement because reinjection of 100% of the wastewater is not technically feasible, and uses a combination of shallow reinjection wells to meet the zero discharge requirement and reverse osmosis technology to treat the volume of wastewater, the operator will still earn a 27%-31% return on investment in Montana. While cost data on ion exchange treatment technology are not available from the industry, use of such technology is clearly profitable for the industry given the fact that Powder River Gas, LLC, is currently using the technology in Montana and Fidelity has proposed using it.

The petitioners rely upon the EPA Region VIII draft economic analysis for several control and treatment options being considered for the coal bed methane industry, including zero discharge through reinjection and reverse osmosis treatment technology. See Petition, Exhibit C, "Guidance for Developing Technology-Based Limits for Coal bed Methane Operations: Economic Analysis of the Powder River Basin". The EPA document was prepared using economic and engineering data provided by the methane industry. The EPA report assesses economic impacts on the methane industry caused by implementing technology-based requirements in terms of impacts to economically recoverable methane reserves, number of projects developed in the basin, and royalties and taxes generated. Where applicable primary source information was available in the draft document, it was used.

The EPA Report found that wellhead gas price had a

significant effect on the economic impact of technology-based effluent limitations. The EPA assessed the economic impacts of the methane industry assuming a conservative wellhead price of \$1.75 Mcf. The average wellhead price between 1986-1999 was \$2.05 per Mcf. The EPA estimated an equilibrium wellhead price of \$2.72 per Mcf. The average realized well head price in 2001 was \$4.12 per Mcf. The Department of Energy conservatively predicts a wellhead price of \$2.88 per Mcf in 2005 and \$3.29 in 2010 Mcf. In recent years, realized wellhead prices in the Basin have exceeded \$5.00 Mcf.

At a conservative well head price of \$1.75 Mcf, the Petitioner's estimate that methane production in the basin will generate almost \$30 billion in profits to the industry. If the wellhead price of gas remains above \$1.75, the predicted economic impacts on methane industry will be significantly less than those predicted by EPA.

#### 4. Environmental Feasibility

The proposed rules establish minimum treatment requirements that minimize the degradation to the environment compared to other disposal methods typically used for coal bed methane wastewater. See next section.

#### 5. Other Alternatives to the Proposed Control and Treatment Requirements Considered by the Petitioners

Alternatives to the requirements to reinject CBM wastewater into Class V wells as a means to achieve zero discharge have been rejected for the following reasons:

a. Reinjection into Class II wells would make it impossible for farmers and ranchers to use the reinjected water due to the expense of drilling and operating deep wells. In addition, the CBM water would likely become contaminated by the much worse water quality found in most deep geologic formations.

b. Evaporation pits were eliminated as a means to achieve zero discharge due to the loss of the water resource to future generations and the fact that such impoundments disturb large areas that would need to be reclaimed.

c. In-channel impoundments using infiltration and evaporation as a means of disposal were rejected because such impoundments could result in unauthorized discharges to surface waters resulting from impoundment failure or overflow and would also cause saline seep.

d. Off-channel impoundments using infiltration and evaporation as a means of disposal were rejected because such impoundments would capture natural surface runoff, interfere with the hydrological cycle, and cause impacts to vested water rights.

e. Land application of CBM wastewater was rejected because such disposal methods could adversely impact soil structure, kill native vegetation, contaminate shallow aquifers, and increase salt loading to nearby streams through return flows.

5. Concerned persons may submit their data, views or arguments, either orally or in writing, at the hearings. Written data, views or arguments may also be submitted to the Board Secretary at Board of Environmental Review, 1520 E. Sixth Avenue, P.O. Box 200901, Helena, Montana, 59620-0901; faxed to (406) 444-4386; or emailed to ber@mt.gov, no later than 5:00 p.m., December 2, 2005. To be guaranteed consideration, mailed comments must be postmarked on or before that date.

6. The Board of Environmental Review will preside over and conduct the hearings.

7. The Board maintains a list of interested persons who wish to receive notices of rulemaking actions proposed by this agency. Persons who wish to have their name added to the list shall make a written request that includes the name and mailing address of the person to receive notices and specifies that the person wishes to receive notices regarding: air quality; hazardous waste/waste oil; asbestos control; water/wastewater treatment plant operator certification; solid waste; junk vehicles; infectious waste; public water supplies; public sewage systems regulation; hard rock (metal) mine reclamation; major facility siting; opencut mine reclamation; strip mine reclamation; subdivisions; renewable energy grants/loans; wastewater treatment or safe drinking water revolving grants and loans; water quality; CECRA; underground/above ground storage tanks; MEPA; or general procedural rules other than MEPA. Such written request may be mailed or delivered to the Board Secretary at Board of Environmental Review, 1520 E. Sixth Ave., P.O. Box 200901, Helena, Montana 59620-0901; faxed to (406) 444-4386; emailed to ber@mt.gov; or may be made by completing a request form at any rules hearing held by the Board.

8. The bill sponsor notice requirements of 2-4-302, MCA, do not apply.

Reviewed by: BOARD OF ENVIRONMENTAL REVIEW

John F. North BY: Joseph W. Russell  
JOHN F. NORTH JOSEPH W. RUSSELL, M.P.H.,  
Rule Reviewer Chairman

Certified to the Secretary of State September 26, 2005.