TROUT UNLIMITED

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*VIA OVERNIGHT AND ELECTRONIC DELIVERY*

EPA Docket Center
Environmental Protection Agency
Water Docket, Mail Code 28221T
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Washington DC 20460
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Office of Information and Regulatory Affairs
Office of Management and Budget (OMB)
Attn: Desk Officer for EPA
725 17th Street, N.W.
Washington, D.C. 20503

**Re: Agency Collection Activities; Coalbed Methane Extraction Sector Survey Docket ID No. EPA-HQ-OW-2006-0771**

Dear Sir or Madam,

Trout Unlimited (TU) submits the following comments on the Environmental Protection Agency's (EPA) Information Collection Request (ICR) concerning the agency's potential adoption of effluent guidelines for the coalbed methane (CBM) extraction sector. TU submits these comments pursuant to 5 C.F.R. § 1320.8(d) and the EPA's notice of the new ICR process in 73 Fed. Reg. 40575 (July 15, 2008). In light of the environmental impacts that can arise from CBM produced water management, particularly surface discharge or storage, TU strongly supports the EPA's detailed study of the CBM industry and ultimate rulemaking to promulgate technology-based effluent guidelines for the Oil and Gas Extraction Point Source Category to control pollutants discharged in CBM produced water.

TU is a private, non-profit conservation organization that has more than 145,000 members nationwide dedicated to conserving, protecting and restoring North America's trout and salmon fisheries and their watersheds. Since 1959, TU has dedicated staff and volunteers toward the protection of sensitive ecological systems necessary to support robust native and wild trout and salmon populations in their respective range. TU's expanding conservation program includes assessment of impacts to aquatic species from extractive industries, including the CBM industry, and advocating for measures that will avoid or reduce such impacts. TU has thoroughly researched and analyzed the adverse effects to the chemical, physical and

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biological integrity of the nation's waters – and aquatic life that depend on these waters – that can occur from CBM produced water management.

In the Supporting Statement for the new ICR, EPA states that it will collect data from CBM operators to determine the environmental impact on the water quality of receiving waters, as well as other non-water quality impacts, and the draft questionnaire contains a few questions relative to environmental impacts, including a request for all water quality data, whole effluent toxicity data, and information on monitoring or other studies performed by CBM operators to assess "changes in soil characteristics, changes in stream flows, changes in aquatic toxicity, and changes in aquatic and riparian species composition." Draft Questionnaire, C2-12.

As both the Supporting Statement and Draft Questionnaire are phrased, it appears that EPA intends to rely heavily, if not exclusively, on information collected from CBM operators in determining environmental impacts from CBM produced water management. While TU believes information collected from CBM operators will be very valuable, such information inherently will only provide a portion of the available documentation regarding environmental impacts from CBM produced water management. Therefore, TU encourages EPA also to consider information from other sources – including that collected during the agency's 2007 outreach efforts, published scientific studies, federal and state regulatory agencies, and interested stakeholder groups – that document the ecological consequences that can arise from product water disposal. Further, EPA should include water treatment companies in the ICR, or a similar information collection activity, to learn first-hand – from the experts and innovators of water treatment systems – what technologies are currently available and reasonably foreseeable, as well as what the existing and predicted future costs of such technology are.

## Impacts on Receiving Waters and Aquatic Life

Produced water management, particularly discharge to surface streams or impoundments, can adversely impact water quality, as well as aquatic and terrestrial wildlife, native vegetation and soils. Further, when relatively large volumes are discharged (compared to what the natural system is accustomed to), there can also be negative effects on stream morphology, aquatic life, and native vegetation and soils. TU highlights some of the known water quality and water quantity impacts below.

### Water Quality Impacts

The EPA's public notice of the new ICR states that the first factor to be decided by the agency is pollutants discharged by the CBM industry. 73 Fed. Reg. 40575, 40576 (July 15, 2008). While the particular constituents found in CBM produced water vary among different producing basins, and even within a particular basin, there are a number of toxic, conventional, and non-conventional pollutants commonly contained in CBM produced water. Toxic pollutants (per 40 C.F.R. § 401.15) that are frequently encountered in product water include, but are not limited to, acenapthene, arsenic, benzene, beryllium, cadmium, chromium, copper, lead, naphthalene, nickel, selenium, silver, toluene, and zinc. Conventional pollutants (per 40 C.F.R. § 401.16) can include biochemical oxygen demand, total suspended solids (TDS), and pH, while non-conventional pollutants include ammonia, barium, bicarbonate, boron, chloride, fluoride, iron, magnesium, manganese, sodium, and sulfate.

Many of these elements are either directly toxic to, or bioaccumulate in, fish and wildlife. For example, bioassay studies using CBM produced water in British Columbia resulted in **100 percent mortality to rainbow trout** between 48 and 96 hours of testing. Based on the concentrations of ammonia in the product water, as reported by the operator, EnCana, the consultant conducting the bioassay work concluded the levels of ammonia in the water (10.0 to 21.2 milligrams per liter) were acutely toxic to trout. *See* Sexton, E., National Parks Conservation Ass'n, *Coalbed Methane in British Columbia*, *A Case Study of the EnCana Corp. Elk Valley Coalbed Methane Pilot Project* (Aug. 2005).

Further, ongoing research conducted by the USGS has demonstrated acute and chronic sodium bicarbonate toxicity to aquatic species. To date, the USGS studies have found acute toxicity to early life stage fathead minnow, white sucker, and pallid sturgeon at concentrations of sodium bicarbonate between 1,100 to 1,600 mg/L. Chronic toxicity was found in fish exposed to 400 mg/L of sodium bicarbonate for 30 days. *See* Skaar, D., et al. *Toxicity of Sodium Bicarbonate to Fish from Coal-Bed Natural Gas Production in the Tongue and Powder River Drainages, Montana and Wyoming,* U.S. Geological Survey Fact Sheet 2006-3029 (June 2006). Typical produced water quality in the area where this research has been focused – the Powder River Basin in Wyoming – ranges from below 300 to over 3,000 mg/L. The USGS is continuing its bicarbonate toxicity studies with plans to assess acute and chronic toxicity on amphibian and fresh-water mussel species. Trout are known to have greater sensitivity to pollutants, and it follows that these coldwater fish are more susceptible to bicarbonate in produced water.

At least one study by the U.S. Fish and Wildlife Service demonstrated unacceptable levels of a number of contaminants in CBM impoundment ponds and downstream wetlands and streams in the Powder River Basin of Wyoming. *See* Ramirez, P. *Assessment of Contaminants Associated with Coal Bed Methane-Produced Water and Its Suitability for Wetland Creation or Enhancement Projects"*, U.S. Fish & Wildlife Service, Region 6, Contaminant Report Number: R6/721C/05 (Nov. 2005). The study found that while in general, the amount of trace elements were below standards for acute and chronic aquatic life criteria, exceedences were found for iron, manganese, lead, and copper. **All samples of CBM produced water discharges contained selenium in concentrations above the two microgram per**

**liter threshold for bioaccumulation in sensitive species.** Waterborne selenium concentrations in six of the seven closed containment ponds sampled likewise exceeded the two microgram per liter threshold for bioaccumulation in sensitive species of fish and aquatic birds. The U.S. Fish and Wildlife Service study recommends that regulators and CBM operators not allow the discharge of CBM produced water with concentrations of selenium greater than two micrograms per liter into closed containment ponds to minimize or prevent eventual increases in selenium concentrations through evaporative concentration. Sediment samples contained trace elements that exceeded background levels for arsenic, boron, beryllium, copper, manganese, nickel, lead and zinc. Vegetation samples indicated the presence of boron, cadmium, and chromium in concentrations above the recommended dietary threshold for birds.

In addition to negative impacts on ecological resources, ongoing studies by the USGS indicate a potential link between organic compounds found in produced water and kidney disease in humans. The studies highlighted above represent a sample of the information available regarding pollutants contained in CBM water and their known effect on water quality and aquatic life. These impacts underscore the importance of a national program to require treatment of produced water to uniform standards protective not only of human health, but also to aquatic and terrestrial species, prior to management of the water through surface discharge.

Water Quantity Impacts

Surface discharge of product water has been demonstrated to have negative impacts beyond just those associated with water quality. Surface discharge also has impacts related to the quantity of water being discharged, especially when the water is discharged into ephemeral and intermittent stream systems, which have evolved in response to short-lived flood flows or periodic dewatering over thousands of years. The discharge of product water to these systems can radically alter the flow regime, causing adverse impacts to the stream morphology and aquatic wildlife.

Although water quality impacts may not be directly relevant to EPA's potential promulgation of effluent guidelines for the CBM industry, TU believes these impacts are significant and unquestionably impair the integrity of the nation's waters. While the particular impacts to an individual drainage will vary depending on existing morphology, topography, species composition, and the extent of the surface discharge, common impacts related to surface discharge, regardless of water quality, include:

- Erosion and sedimentation. Increased stream flow via direct surface discharge of produced water can increase erosion and sedimentation. The adverse effects of sedimentation on aquatic life are well understood and well documented. For example, sediments can embed gravels and reduce fish reproductive success. Sedimentation also can impair fish foraging, fill-in rearing pools, and reduce the overall complexity of habitat in stream channels. Macroinvertebrates also can be affected negatively by sedimentation because they are highly dependent on the narrow spaces present between cobble and gravel.

- Headcut erosion. Near-perennial discharge of product water can erode headcuts upstream, which increases sediment loads, mineral loads, and can lower the groundwater table. Further, if the erosion occurs rapidly, an abrupt gradient change can occur downstream where the tributary enters the main channel, creating instability at the tributary mouth, which instability can migrate up tributary, adversely affecting native vegetation and further increasing sedimentation.
- Wetland destruction. In instances where headcut erosion lowers the groundwater table, area wetlands can become dewatered. Lowering of the water table reduces the presence of riparian vegetation and decreases the ability of wetland areas to perform their ecological function of trapping sediments and decreasing the velocity and erosive power of natural flood and storm events.
- Seasonal flow alteration. Aquatic life native to stream systems with seasonal fluctuations in flow can be negatively affected by surface discharge of CBM product water. Such fish have evolved with a naturally stochastic flow regime, and constant inflow of produced water can diminish environmental cues and affect spawning and migratory cues. Many intermittent streams provide important seasonal habitat for cold and warm water fish, as well as macroinvertebrates that are a key food source for fish. Intermittent channels can provide spawning habitat and refugia for juvenile fish during higher flows. They can also provide refuge for fish to escape high flows or predators. Numerous other fauna, including other fish, amphibians, and insects, also use intermittent streams for habitat.
- Species composition. The foregoing adverse impacts to aquatic wildlife can alter species composition because non-native species may be able to out-compete native aquatic life when unnatural flow regimes and resultant changes to stream morphology occur.

In summary, management of produced water through surface discharge can have significantly adverse impacts on stream integrity and aquatic life that are not necessarily directly related to water quality. TU urges the EPA to consider how the agency can take action to protect the nation's waters and wildlife species that depend on the integrity of such water through uniform federal regulation.

**Pollution Prevention and Control Technology Exists**

EPA identifies the second and third factors to be considered during its ICR process and subsequent rulemaking as whether pollution prevention control technology currently exists, and if so, whether such technology is economical. Treatment technologies exist that can effectively treat CBM product water to meet technology-based effluent limits that would be more protective of the nations' waters and the aquatic life that depend on them. Existing technologies include reverse osmosis, ion exchange, and thermal distillation. Which of these treatment options is best applied in a particular basin depends on a variety of factors, including the quality of the product water when it is extracted from the ground. As of late 2007, reported costs for these technologies ranged from just 10 cents per barrel of water to one dollar per barrel.

For example, the AltelaRain℠ thermal distillation system is reported to be able to treat produced water starting as high as 40,000 parts per million TDS down to 20 parts per million TDS. The process is a non-membrane technology that recaptures thermal energy to reduce treatment costs, and the remaining concentrate can be properly disposed offsite. Because this technology can be used to treat produced water of low quality, TU understands that treatment costs can be up to one dollar per barrel of water, but that the cost is lower when relatively higher qualities of produced water are treated.

Another currently available technology is the Higgins Loop™ ion exchange used by EMIT Water Discharge Technology. According to EMIT representatives, over 120 million barrels of produced water in the Powder River Basin alone have been treated, with 99 percent of this water being considered of high enough quality for subsequent surface discharge and only 1 percent waste. RG Global Lifestyles, Inc. has also recently completed a treatment facility in the Powder River Basin in Wyoming that uses a new fixed-bed dynamic flow ion exchange system. Its proponents state that this hybrid design reduces the cost of treatment and the amount of waste byproduct. The plant can treat up to 30,000 barrels per day of CBM product water.

Although the ICR Draft Questionnaire does contain some questions concerning the types of water treatment technologies currently used by CBM operators, EPA should query the water treatment companies themselves to learn additional information regarding the availability, applicability, and cost of water treatment systems. Further, even though TU is not privy to confidential financial information of the CBM regarding the economic feasibility of treating produced water, TU believes that the environmental costs from failing to reasonably treat produced water to uniform standards prior to surface discharge justify reasonable cost to industry to minimize such harm.

## Conclusion

It is without question that CBM produced water contains many pollutants that are harmful to water quality and aquatic life, and that management of produced water oftentimes involves surface discharge to streams or impoundments.  Even though this discharge is subject to water quality-based discharge standards, these programs usually are administered by individual states and do not constitute a uniform, nationwide approach.  Further, treatment technology exists that could be used economically to treat produced water to acceptable water quality standards before it is discharged, thereby avoiding or mitigating many of the ecological impacts to waters and aquatic species.

TU is very supportive of EPA's efforts to better understand water treatment technology options applicable to the CBM industry and urges the EPA to implement technology-based effluent limits for this extractive industry.  Thank you for the opportunity to submit these comments.

Sincerely,

/s/

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