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EXHIBIT(s) FOR ORDER NO(s).

1 - 148

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_____ - _____

1003-GA-04

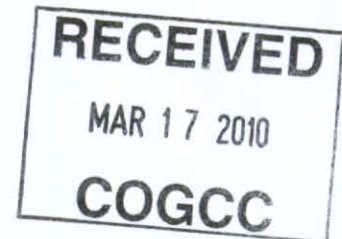
FOGNANI & FAUGHT, PLLC

Attorneys at Law

ORIGINAL

January 29, 2010

Colorado Oil and Gas Conservation Commission
Attn: Mr. David S. Neslin
Executive Director
1120 Lincoln Street, Suite 801
Denver, Colorado 80203



Re: Application for Grant from Environmental Response Fund/
Corsentino Dairy Farms, Inc.

Dear Mr. Neslin:

This application is filed on behalf of Corsentino Dairy Farms, Inc. ("Corsentino Dairy") pursuant to Rule 503.b(10) of the Rules and Regulations of the Colorado Oil and Gas Conservation Commission ("COGCC"). Corsentino Dairy has been directly and adversely affected and aggrieved by the conduct of Petroglyph Energy, Inc.'s¹ ("Petroglyph") coal-bed methane gas operations in Huerfano County, Colorado ("CBM Operations"). Corsentino Dairy is hereby requesting a grant of funds from the Oil and Gas Conservation and Environmental Response Fund ("Response Fund") to mitigate the losses incurred in the value of its property and its operations as a result of Petroglyph's CBM Operations, the discharge of produced water and the delay by Petroglyph in addressing this matter. Corsentino Dairy hereby respectfully requests that this matter be considered by COGCC at its earliest opportunity.

Background

Corsentino Dairy is located east of Walsenburg on Highway 10 and operates as a dairy farm with about 450 head of dairy cows. Corsentino Dairy has been in operation since 1935, involving four generations of the Corsentino family. The family operation has approximately 350 acres of farm land that is used to raise irrigated corn and rye to feed the dairy herd. Irrigation water for the farm land is diverted from the Cucharas River under high-priority, adjudicated water rights dating back to the early 1900's. Approximately 135 acres of the farm land are irrigated through ditch irrigation which is diverted directly from the Cucharas River to the fields. Approximately 215 acres of the farm land are irrigated through pivot irrigation systems with water stored in a reservoir, known as Holita Reservoir, which is filled with water diverted from the Cucharas River. Water from the Cucharas River also is used as drinking water for the dairy herd.

¹ Petroglyph Energy, Inc. is identified as the operator in Cease and Desist Orders issued by COGCC in 2007 and 2008. A wholly owned subsidiary of Petroglyph Energy, Inc., Petroglyph Operating Company, Inc., is the named operator for the point source water discharge permit, No. CO-0048020, issued by the Colorado Water Quality Control Division. The corporate relationships of the various Petroglyph entities are provided in Exhibit A.

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From approximately 1999 to 2007, Petroglyph discharged produced water from its CBM Operations into the Cucharas River, upstream of Corsentino Dairy. The produced water is groundwater pumped from deep coal seams to depressurize the system and allow the desorption of methane gas from the coal. During the eight-year period, Petroglyph discharged up to 6.5 million gallons per day of produced water to the Cucharas River. The largest volume of produced water discharged by Petroglyph occurred from 2003 to 2007.

Deep groundwater from CBM dewatering operations is typically high in sodium (Na). The produced water from Petroglyph's CBM Operations had a sodium content of approximately one ton per acre-foot (up to 39,896 lbs/day).

Petroglyph stopped its CBM Operations and ceased discharging produced water into the Cucharas River in July 2007 following meetings with COGCC staff regarding the potential threats to public health, safety, and welfare, and the environment related to the presence of methane gas in domestic water wells. The Director of COGCC issued a Cease and Desist Order on October 16, 2007 shutting down Petroglyph's CBM Operations. Subsequent orders were issued by the Director in November 2007 and January 2008, extending the Cease and Desist Order and requiring Petroglyph to implement a Methane Investigation, Monitoring and Mitigation Plan. This matter remains pending before COGCC.²

Petroglyph holds a point source water discharge permit issued by the Colorado Water Quality Control Division ("CWQCD") of the Colorado Department of Public Health and Environment ("CDPHE"), Permit No. CO-0048020, for the discharge of produced water. Petroglyph has applied for a renewal of the permit. In considering Petroglyph's renewal application, the CWQCD recognized the adverse impacts to agricultural uses, and specifically those suffered by Corsentino Dairy, by allowing the discharge of untreated produced water from Petroglyph's CBM Operations because of the high sodium concentrations and high sodium adsorption rate ("SAR"). The discharge permit held by Petroglyph during its discharge of produced water to the Cucharas River from 1999 to 2007, and during the high-volume discharges from 2003 to 2007, did not provide any limitations or standards for the quality of the water discharged related to sodium or the SAR.

In the Fact Sheet published in connection with the issuance of a draft renewal of Petroglyph's discharge permit, the CWQCD recognized the adverse impacts that resulted from Petroglyph's discharge of untreated produced water:

² COGCC Cause No. 1, Order No. 1C-4, IN THE MATTER OF VIOLATION OF THE RULES AND REGULATION OF THE OIL AND GAS CONSERVATION COMMISSION BY **PETROGLYPH ENERGY, INC.**, HUERFANO COUNTY, COLORADO, Cease and Desist Order, October 16, 2007.

COGCC Cause No. 1, Order No. 1C-5, IN THE MATTER OF VIOLATION OF THE RULES AND REGULATION OF THE OIL AND GAS CONSERVATION COMMISSION BY **PETROGLYPH ENERGY, INC.**, HUERFANO COUNTY, COLORADO, Cease and Desist Order, November 14, 2007.

COGCC Cause No. 1, Order No. 1C-6, IN THE MATTER OF CEASE AND DESIST ORDER NO. 1C-5; **PETROGLYPH ENERGY, INC.**, HUERFANO COUNTY, COLORADO, Supplemental Order, January 15, 2008.

First, the continued practice of discharging the untreated produced water (i.e., high Sodium Adsorption Rate, SAR, values and high sodium concentrations) into the Cucharas River, under specific hydrologic conditions, creates a known threat to the beneficial agricultural use of this state water by impairing the suitability of this river water when diverted for agricultural uses. This threat is heightened when there exists minimal upstream flow in the river to dilute the effluent entering from several tributaries. **Specifically, there has been damage to corn fields, soils, and dairy cattle when water was diverted (Holita Ditch) from the Cucharas River to a storage pond (Holita Reservoir) and then routed to the Corsentino Dairy for these agricultural uses.** The damage was first reported in 2006 and has been confirmed by soil scientists from Colorado State University and USDA's National Salinity Team. ***

Third, the CBM operator [Petroglyph] has been aware of the SAR and high sodium problems in the produced water for several years and has taken steps to identify and characterize treatment technologies that will be evaluated for use in addressing this problem. The application for the renewal permit identifies a site for the treatment facility with a design capacity of 10 MGD [million gallons per day]. [emphasis added].

To address the serious adverse impacts of the discharge of untreated produced water from CBM Operations, the CWQCD has adopted a narrative standard for Agriculture Use Protection. In the renewal water discharge permit recently issued by CWQCD, Petroglyph is required to treat its produced water prior to discharge and is subject to water quality limits relating to electric conductivity and SAR levels.

As a result of Petroglyph's discharge of untreated produced water, Corsentino Dairy has suffered devastating financial losses and hardships, including lower milk production, increased mortality rates and decreased herd pregnancy rates. During the period of Petroglyph's discharge of untreated produced water, Corsentino Dairy's milk production dropped in half, from 84 lbs. per cow to 42 lbs. per cow. In the year following the cessation of Petroglyph's produced water discharges in 2007, milk production recovered to 62 lbs. per cow. During the period of Petroglyph's discharge of untreated produced water, Corsentino Dairy also suffered increased herd death loss and a decrease in pregnancy rate. After Petroglyph stopped its discharges into the Cucharas River, Corsentino Dairy's herd death loss improved 64% and its pregnancy rate increased from 39% to 59%. There is a clear and direct correlation between Petroglyph's discharge of CBM produced water to the Cucharas River and the adverse impacts on Corsentino Dairy's milk production, herd death losses, herd pregnancy rates and other operational losses.

In addition, when used for irrigation of crops, the high sodium content of the produced water reduced crop yield and lowered the nutrient value of the silage. The result to Corsentino Dairy was reduced crop yield and increased reliance on alternative feed sources. Use of sodium-contaminated irrigation water from Petroglyph's produced water discharges impaired the soils of Corsentino Dairy's fields for the production of feed for the dairy herd.

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Site investigations conducted in 2008 and 2009 indicated that soils on the farm have higher SAR levels than is considered optimum for agricultural soils, and also exhibit characteristics of sodic soils. The soils in these fields have accumulated Na as a result of high-Na irrigation water from the Cucharas River. Combined with low Ca and Mg, the Na accumulation causes poor soil physical conditions as well as stunted crop growth. The soil Na concentration in some areas of the Corsentino's farm is higher than that which corn, the most salt-sensitive crop grown on the farm, can tolerate.

The financial impact of Petroglyph's *past* operations has been devastating to Corsentino Dairy. The losses incurred by Corsentino Dairy are presented in the following table:

Table 1
Corsentino Dairy Farm
Summary of Loss Calculation from Water
1/1/02 Thru 12/31/08 plus future years

Year	Loss of Milk Production	Loss of Cattle	Loss of Corn Silage	Additional Cost for Corn to Ration	Totals
2002	\$18,418.01	\$107,269.83	\$0.00	\$0.00	
2003	\$91,411.03	\$70,720.54	\$0.00	\$0.00	
2004	\$191,080.63	\$32,771.97	\$0.00	\$0.00	
2005	\$311,980.69	\$74,331.91	\$0.00	\$0.00	
2006	\$432,047.76	\$79,201.12	\$255,190.00	\$131,638.16	
2007	\$609,137.52	\$0.00	\$171,525.00	\$146,377.32	
2008	\$382,876.21	\$0.00	\$233,625.00	\$120,201.90	
Losses Thru 12/31/08	\$2,036,951.85	\$364,295.37	\$660,340.00	\$398,217.38	\$3,459,804.58
Future Year Losses					
Per Year Loss	\$338,930.64		\$229,425.00	\$89,976.25	\$658,331.89

Corsentino Dairy also has suffered a significant loss in property value, including the value of its adjudicated water rights. As of August 24, 2004, an independent appraiser valued the Corsentino Dairy property at \$2,750,000. In stark contrast, as of June 16, 2009, an independent appraiser valued the Corsentino Dairy property at \$1,260,000, a loss in value of \$1,490,000.

Corsentino Dairy has repeatedly demanded that Petroglyph compensate them for their losses. Petroglyph has refused to make any restitution or otherwise compensate Corsentino Dairy for the losses directly caused by Petroglyph's discharges of produced water from its CBM Operations.

As a result of efforts of Executive Director Neslin, and the COGCC staff, Petroglyph has agreed to a Form 27 Site Investigation and Remediation Workplan, approved on November 30, 2009. The Form 27 requires Petroglyph to conduct sampling and analysis of the Corsentino Dairy farm soils and to undertake certain remediation activities pursuant to a Workplan. However, a final Workplan has yet to be completed and approved. Additionally, a Supplement to the Form 27 requires Petroglyph to reimburse Corsentino Dairy for the costs of the purchase and delivery of supplemental feed for the dairy herd in amounts and quality necessary to meet the feed requirements of the herd over and above the feed that can be supplied from its crop production during 2009 and 2010. The agreement to reimburse Corsentino Dairy for such supplemental feed costs extends only through the end of 2010. It is anticipated that the remediation of the Corsentino Dairy fields will not be completed until a much later date. Reimbursement payments have been made to Corsentino Dairy by Petroglyph under this Supplement to Form 27.

The delay, however, in undertaking the remediation activities has been costly to the Corsentino's. The lack of production of corn and silage from Corsentino Dairy's farmland as a result of the damage caused by the Petroglyph discharges has taken a heavy toll on the Corsentino family and their operations. Until the soils are fully remediated, the losses continue to mount.

Oil and Gas Conservation and Environmental Response Fund

The Response Fund is established under C.R.S. §34-60-124. Section 34-60-124(4) provides in part:

- (4) The oil and gas conservation and environmental response fund may be expended:
 - (a) By the commission, or by the director at the commission's direction, prior to, during, or after the conduct of oil and gas operations to:
 - (I) Investigate, prevent, monitor, or mitigate conditions that threaten to cause, or that actually cause, a significant adverse environmental impact on any air, water, soil, or biological resource;

The implementation of the Response Fund is specified in Rules 710 and 701 of the COGCC's Rules and Regulations and Rules of Practice and Procedure, respectively, as recently amended.

Rule 710 provides:

The Commission shall ensure that the two-year average of the unobligated portion of the Oil and Gas Conservation and Environmental Response Fund is maintained at a level of approximately, but not to exceed, four million dollars (\$4,000,000), and that there is an adequate balance in the fund to address environmental response needs, which may be used in accordance with the Act and Rule 701.

Rule 701 provides, in part:

The rules in this series pertain to the provision of financial assurance by operators to ensure that performance of certain obligations by the Oil and Gas Conservation Act (the Act), §34-60-106(3.5), (11), (12) and (17) C.R.S., as well as the use of the Oil and Gas Conservation and Environmental Response Fund, §34-60-124 C.R.S., as a mechanism to plug and abandon orphan wells, perform orphaned site reclamation and remediation, and to conduct other authorized environmental activities.

Sections 34-60-106(3.5), (11), (12) and (17) provide additional powers of the Commission and include the following:

(3.5) The commission shall require the furnishing of reasonable security with the commission by lessees of land for the drilling of oil and gas wells, in instances in which the owner of the surface of lands so leased was not a party to such lease, to protect such owner from unreasonable crop losses or land damage from the use of the premises by said lessee. The commission shall require the furnishing of reasonable security with the commission, to restore the condition of the land as nearly as is possible to its condition at the beginning of the lease and in accordance with the owner of the surface of lands so leased.

(11)(a) By July 16, 2008, the commission shall:

(II) Promulgate rules, in conjunction with the department of public health and environment, to protect the health, safety, and welfare of the general public in the conduct of oil and gas operations.

(12) The commission, in consultation with the state agricultural commission and the commissioner of agriculture, shall promulgate rules to ensure proper reclamation of the land and soil affected by oil and gas operations and to ensure the protection of topsoil of said land during such inspection.

(17)(a) The commission has exclusive authority to regulate the public health, safety, and welfare aspects, including the protection of the environment, of the termination of operations and permanent closure, referred to in this subsection (17) collectively as "closure", of an underground natural gas storage cavern.

Discussion

We submit that the intent and spirit of the legislative and regulatory mandates associated with the Response Fund warrant the expenditure of monies from the fund to assist Corsentino Dairy in mitigating the adverse impacts caused by Petroglyph's CBM Operations, especially since prevention is no longer an option.

The Colorado General Assembly has stated its concern that we protect the "health, safety, and welfare of the general public in the conduct of oil and gas operations." Sections 34-60-106(11)(a)(II), quoted above, charges COGCC to "Promulgate rules, in conjunction with the department of public health and environment, to protect the health, safety, and welfare of the general public in the conduct of oil and gas operations." Further, with regard to the closure of natural gas storage caverns, COGCC is provided the "exclusive authority to regulate the public health, safety and welfare aspects, including the protection of the environment." Section 34-60-106(17)(a).

The General Assembly also has charged COGCC to provide financial assurances to protect surface owners from "unreasonable crop losses and land damages" from oil and gas operations. Section 34-60-106(3.5).

Further, in 2007 the General Assembly passed legislation increasing COGCC's regulatory authority and oversight obligations to better address the potential adverse impacts that can accompany oil and gas development. The General Assembly declared that: "it is the public's interest to foster the responsible, balanced development of Colorado's oil and gas resources consistent with the protection of public health, safety, and welfare, including protection of the environment and wildlife resources." C.R.S. §34-6-102(1).

In the December 11, 2008 amendments to its Rules and Regulations, COGCC took note of the responsibility to protect the public health, safety, and welfare. In the Statement of Basis, Specific Statutory Authority, and Purpose, COGCC notes:

- ✓ Page 1, first paragraph: "These rules are promulgated to protect public health, safety, and welfare, including the environment and wildlife resources, from the impacts resulting from the dramatic increase in oil and gas development in Colorado."
- ✓ Page 2, first paragraph: "In addition, as the level and extent of drilling activity has increased, so has the public concern for the health, safety and welfare of Colorado's residents."
- ✓ Page 6, bottom paragraph, continuing on page 7: "The rules are grounded in the police powers of the State and are designed to protect Colorado's public health, safety, and welfare, including its environment and wildlife resources. The Commission believes that

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such protection is necessary for all lands, regardless of surface ownership. This protection cannot be achieved if it is contingent on surface ownership. Rather, public health, safety, and welfare, including the environment and wildlife resources, are affected by oil and gas operations regardless of who owns the surface."

Corsentino Dairy is presented with a conundrum. As presented in Table 1, the financial impacts have been substantial and through 2008 total \$3,459,804.58, and they continue to mount. Petroglyph has refused to make restitution for these losses, which could have been prevented or mitigated had Petroglyph acted, or been forced to act more promptly. Only recently, and pursuant to the Executive Director's Form 27, has Petroglyph taken any responsibility for the harm caused by its CBM Operations. It has been suggested that the Corsentino's recourse is to seek damages in the courts. There are numerous practical limitations to this suggestion. Litigation is an expensive proposition. And even if the resources were available for the Corsentino's to litigate against Petroglyph, proving liability and damages does not always translate into an immediate financial recovery. Corsentino Dairy is a family operation – there are no public shareholders or wealthy private investors – the family's resources are limited to what is produced by its dairy operations and their sweat and hard work. Without question, the resources provided by the dairy operations have been severely impacted by Petroglyph's actions. The Corsentino's know only too well that agricultural operations in general, and dairy operations specifically, are a tough business, but to ask the Corsentino's to further suffer the burdens imposed by Petroglyph is unfair.

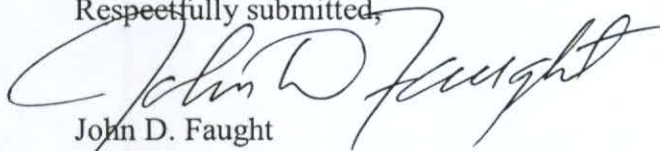
Conclusion

Corsentino Dairy does not expect that all of its losses suffered as a result of Petroglyph's discharge of untreated produced water be mitigated by the Response Fund. Essentially, Petroglyph is a recalcitrant operator that has failed to meet its obligations to protect the public health, safety, and welfare from its operations. Corsentino Dairy has limited options available to correct this wrong. Under such circumstances, we submit, it is appropriate to use monies from the Response Fund to afford mitigation of the impacts from Petroglyph's CBM Operations.

Rather than present a specific dollar amount request, Corsentino Dairy offers to work with COGCC to determine what could be an appropriate response to the circumstances presented by this request.

The Corsentino's greatly appreciate your thoughtful consideration.

Respectfully submitted,



John D. Faught
Attorney for Corsentino Dairy Farms, Inc.

cc: Joe Corsentino
Frances Corsentino
Brett Corsentino

Exhibit A

PETROGLYPH ENTITIES

- **Petroglyph Operating Company, Inc.**
 - Kansas Corporation
 - Wholly-owned subsidiary of Petroglyph Energy, Inc.
 - Develops and produces natural gas from deposits located in the Raton Basin
- **Petroglyph Energy, Inc.**
 - Idaho Corporation
 - Wholly-owned subsidiary of III Exploration Company
 - Parent company of Petroglyph Operating Company, Inc.
 - General partner of III Exploration II LP
 - Doing business in Huerfano County
- **III Exploration Company II LP**
 - Idaho Limited Partnership
 - Petroglyph Energy, Inc. is general partner
 - Principal place of business is Boise, Idaho
 - Holds leaseholds and certain oil and gas property and equipment in Raton Basin
- **III Exploration Company**
 - Idaho Corporation
 - Wholly-owned subsidiary of Intermountain Industries, Inc.
 - Holding company of Petroglyph Energy, Inc.
 - Principal place of business is Boise, Idaho
- **Intermountain Industries, Inc.**
 - Idaho corporation
 - Privately held
 - Holding company
 - Principal place of business is Boise, Idaho

**BEFORE THE OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO**

**IN THE MATTER OF
CORSENTINO DAIRY FARMS, INC.
APPLICATION FOR GRANT FROM ENVIRONMENTAL
RESPONSE FUND**

) **Docket No.**
) **1003-GA-04**
)
)

REPORT OF THE COMMISSION

This application came on for hearing before the Commission _____ in _____ for an order to authorize an expenditure of funds from the Oil and Gas Conservation Environmental Response Fund ("Response Fund") to mitigate the losses incurred by Corsentino Dairy Farms, Inc. ("Corsentino Dairy") as a result of Petroglyph Energy, Inc.'s ("Petroglyph") coal bed-methane gas operations in Huerfano County, Colorado ("CBM Operations").

FINDINGS

The Commission finds as follows:

1. Corsentino Dairy has been directly and adversely affected and aggrieved by the conduct of Petroglyph's CBM Operations in Huerfano County, Colorado.
2. As a result, Corsentino Dairy has suffered losses in its operations and in the value of its property, including its long-standing adjudicated water rights.
3. The written testimony of Corsentino Dairy's Vice President/Secretary, Brett Corsentino, states that the losses incurred from 2002 through 2008 totaled \$3,459,804.58. The losses for 2009 have not yet been determined, but at the time the losses were determined for the period of 2002 through 2008, the projected losses for future years was \$658,331.89.
4. As a result of the impacts of Petroglyph's oil and gas operations, the appraisal for the Corsentino Dairy property, including adjudicated water rights, has decreased from \$2,750,000 in 2004 to \$1,260,000 in 2009, a loss in value of \$1,490,000.
5. Pursuant to C.R.S. § 34-60-124(4), C.R.S. § 34-6-102(1) and Rules 701 and 710 of the Rules and Regulations and Rules of the Commission, the Commission finds that an expenditure of funds from the Response Fund is authorized and appropriate.
6. On March 17, 2010, an administrative hearing was convened wherein the summary testimony of Mr. Corsentino was presented, along with certain exhibits and a request for administrative notice of certain documents, in support of the Corsentino Dairy.

ORDER

NOW, THEREFORE IT IS ORDERED, that the Director is authorized to expend monies from the Response Fund for mitigation of the losses incurred by Corsentino Dairy in an amount determined by the Director based upon a review of the following factors:

- A. The amount of funds in the Response Fund and the projected demand for those funds.
- B. The projected refunding of the Response Fund in accordance with C.R.S. § 34-60-124.
- C. The losses incurred and continuing to be incurred by Corsentino Dairy.
- D. The amount of costs saved by Petroglyph in not treating its produced water prior to discharge during the period of 1999 to July 2007.

ENTERED this ____ day of ____ 2010.

OIL AND GAS CONSERVATION COMMISSION OF THE STATE OF COLORADO

By: _____

Dated at _____
Denver, Colorado 80203

**BEFORE THE OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO**

IN THE MATTER OF)	Docket No.
CORSENTINO DAIRY FARMS, INC.)	1003-GA-04
APPLICATION FOR GRANT FROM ENVIRONMENTAL)	
RESPONSE FUND		

**CORSENTINO DAIRY FARMS, INC. EXHIBITS AND REQUEST FOR
ADMINISTRATIVE NOTICE**

EXHIBITS

1. Written Testimony of Brett Corsentino
2. Maps
3. Water Rights Legal Descriptions
4. COGCC Cause No. 1, Order 1C-4
5. COGCC Cause No. 1, Order 1C-5
6. COGCC Cause No. 1, Order 1C-6
7. CWQCD Public Notice for Renewal Permit Application
8. CWQCD Renewal Permit
9. Photos
 - a. Chemical deposits crop irrigation water
 - b. Chemical deposits Cuchara
 - c. Irrigation on Corsentino Dairy Farm; waters cattle too
 - d. Corsentino Dairy Farm background
 - e. October '06 – Crop deterioration began
 - f. 2006 after harvest
 - g. July 2008 crop harvest
 - h. Corsentino Dairy Farm 2008
 - i. July 2008 crops at harvest time
 - j. Pre-impact crops
10. Corsentino Operational Losses
11. Appraisals for Market Value of Corsentino Dairy Property
12. COGCC Form 27
13. Shortening the Technology Application Life Cycle
14. An Integrated Framework for Treatment and Management of Produced Water
15. Dr. Hamann Letter
16. Troy Bauder, CSU, Report

REQUEST FOR ADMINISTRATIVE NOTICE

- ✓ C.R.S. § 34-60-124
- ✓ C.R.S. § 34-60-122
- ✓ COGCC Rule 710
- ✓ COGCC Rule 701
- ✓ C.R.S. § 34-60-106(3.5), (11), (12), (17)
- ✓ C.R.S. § 34-60-102(1)
- ✓ COGCC Pertinent Sections of Statement of Basis, Specific Authority, and Purpose for 2008 Amendments to Regulations and Rules
- ✓ Exhibits 4, 5, 6, 7, 8, 12, 13, 14, 15, and 16

**BEFORE THE OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO**

**IN THE MATTER OF
CORSENTINO DAIRY FARMS, INC.**

**APPLICATION FOR GRANT FROM ENVIRONMENTAL
RESPONSE FUND**

) **Docket No.**
) **1003-GA-04**
)
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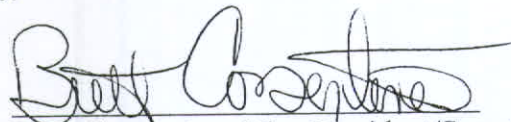
**SWORN TESTIMONY OF BRETT CORSENTINO,
VICE PRESIDENT/SECRETARY,
CORSENTINO DAIRY FARMS, INC.**

1. I am Brett Corsentino and I am the Vice President/Secretary of Corsentino Dairy Farms, Inc. ("Corsentino Dairy").
2. I have worked on my family's dairy farm my whole life, except during the time that I attended Fort Lewis College in Durango, Colorado. I am the fourth generation of my family to own and operate Corsentino Dairy.
3. I verify and confirm the statements presented in the letter of January 29, 2010, addressed to Colorado Oil and Gas Conservation Commission, Attn: Mr. David S. Neslin, Executive Director, Application for Grant from Environmental Response Fund/Corsentino Dairy Farms, Inc.
4. Our operation is located just east of Walsenburg, Colorado. Exhibit 2 is a map showing the general location. Figure 1 in Exhibit 2, shows the locations of our fields that have been impacted by Petroglyph Energy, Inc.'s ("Petroglyph") produced water. Fields 2, 5 and 6 are pivot irrigated and Fields 1, 3, 4, 7 and 8 are flood irrigated.
5. Exhibit 3 shows the adjudicated water rights held by Corsentino Dairy. Most of these rights were appropriated and adjudicated in the 1800's. Historically, the headwaters of the Cucharas River are considered to be "pristine." This is the quality of water that has been available under Corsentino Dairy's adjudicated water rights prior to the adverse impacts caused by Petroglyph's discharge of produced water to the Cucharas River.
6. Exhibit 9 contains photographs that show the salt and sodium deposits within the confines of the Corsentino Dairy irrigation system as a result of the produced water discharged by Petroglyph. Exhibit 9.a, b and c show irrigation ditches within Corsentino Dairy and show the salt and sodium build-up that occurred after running irrigation water for a period of two weeks in 2006. Exhibit 9.d, e and f show crops at Corsentino Dairy in 2006 just prior to the time of harvest. The photos show the significant impact on the crops resulting from the Petroglyph's discharge of produced water into the Cucharas River. In addition to the direct crop damage the produced water has created sodic soils;

i.e., high sodium and SAR levels, that allow salt tolerate weeds and grasses to overtake the growth of any corn seed that is planted. Exhibits 9.g, h and i show crops at Corsentino Dairy in 2008 that show how the sodic soils impact germination and early growth of the crops. Exhibits 9.j and k show Corsentino Dairy crops that were raised prior to the impact of Petroglyph's produced water.

7. Exhibit 10 provides the detail to support the summary of the operational losses incurred by Corsentino Dairy as a result of Petroglyph's produced water presented in Table 1 of the Application submitted on January 29, 2010.
8. Exhibit 11 contains appraisals of the market value of Corsentino Property, including its adjudicated water rights, in 2004 and 2009, to be \$2,750,000 and \$1,260,000, respectively. A decrease in value of \$1,490,000 as result of the Petroglyph's produced water.
9. Exhibit 15 is a letter from Dr. Marvin H. Hamann, Corsentino Dairy's veterinarian since the 1990's, identifying the extremely critical impacts to the health, production and reproduction of dairy cows as a result of drinking water and irrigation water with a high pH.
10. Exhibit 16 is a report prepared by Troy Bauder, Extension Specialist, Department Soil and Crop Sciences, Colorado State University in late 2006 and early 2007. Mr. Bauder's report presents the impacts of irrigation water with high sodium and bicarbonate coupled with low calcium and magnesium, resulting in a high SAR.

Sworn to this 17th day of March 2010.

A handwritten signature in black ink, appearing to read "Brett Corsentino", written over a horizontal line.

Brett Corsentino, Vice President/Secretary
Corsentino Dairy Farms, Inc.

SITE LOCATION

Corsentino Farm is located near the town of Walsenburg in the southern part of Huerfano County, Colorado, as shown in Figure 3. It includes eight agricultural fields that cover approximately 320 acres.

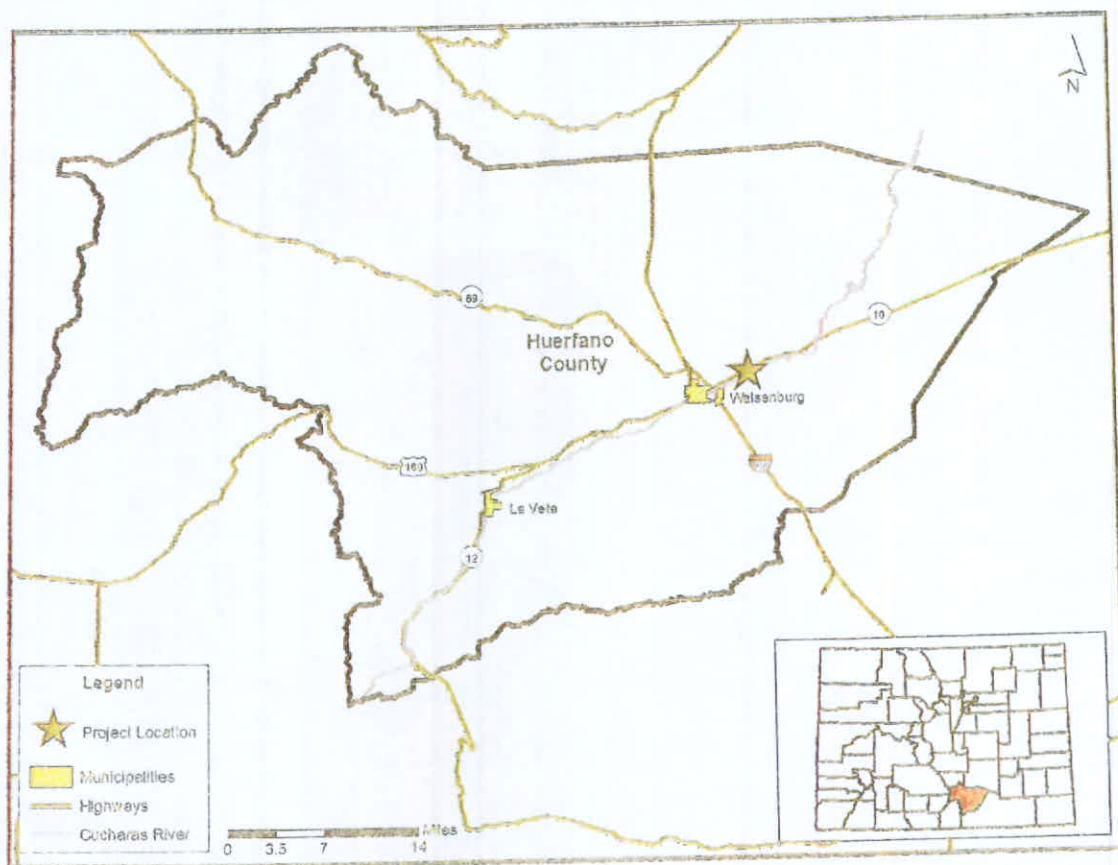


FIGURE 3. REGIONAL PROJECT LOCATION MAP.

The farm comprises land in three sections which are represented by the following legal land descriptions:

- S25 T27S R66W
- S31 T27S R65W
- S36 T27S R66W

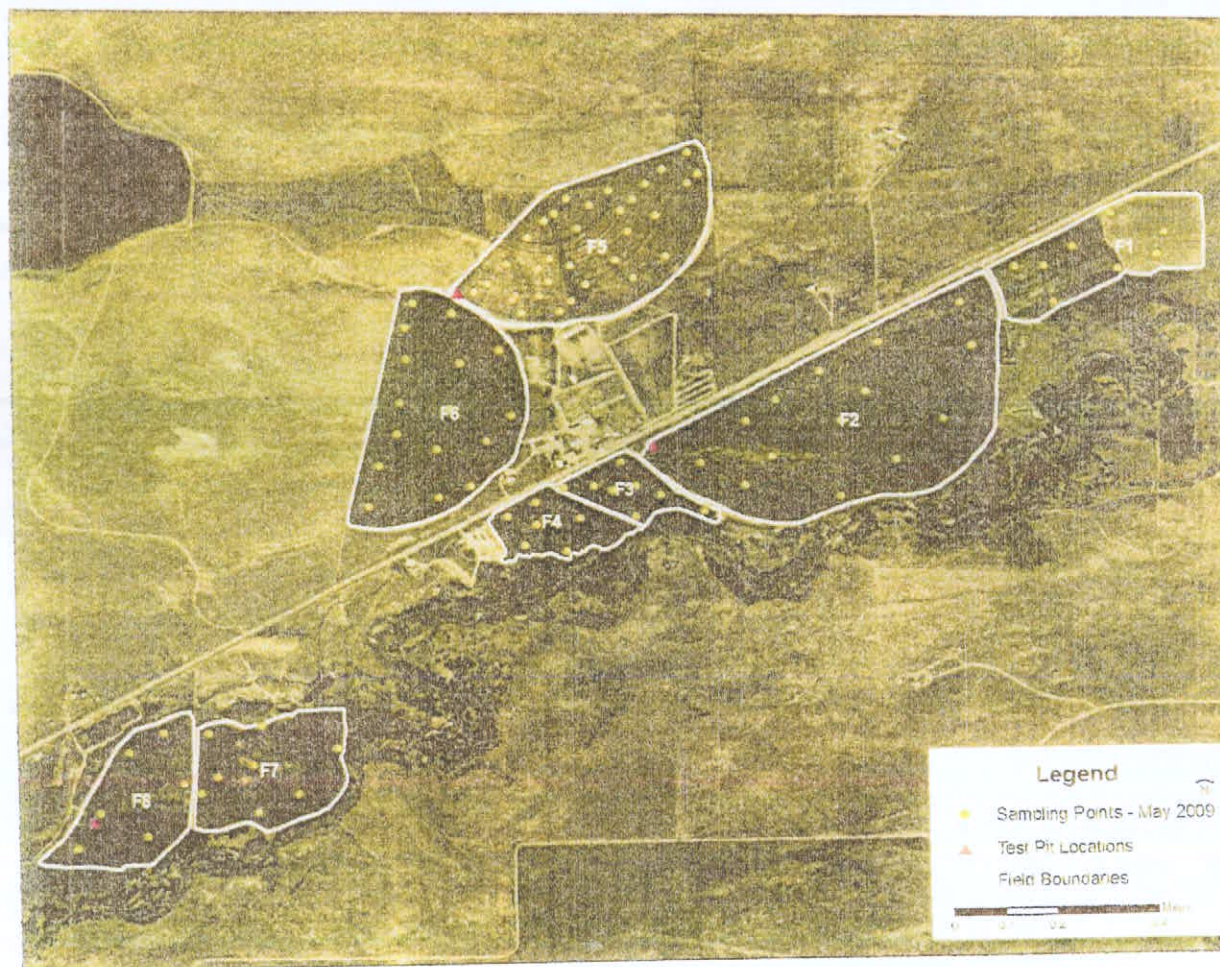


FIGURE 1
CORSETINO FIELDS.

There are 3 center pivot sprinklers located on the property. The oldest sprinkler is a 1985 Valley which irrigates 60 acres; the next is a 1993 Lockwood which irrigates 62 acres; and finally is a 1995 T & L which irrigates 103 acres. Both the Lockwood and the T & L were purchased new and are in excellent condition. The Valley was purchased used and is in good condition for its age.

WATER RIGHTS:

1. Holita Ditch Reservoir
Priority #22, Atwood Decree
Appropriation Date: 3/20/1901
Adjudication Date: 2/23/1898 and 10/15/1901
Type: Storage
Total Right: 540 Acre Feet
% Owned: 23,280 Shares of 25,000 Shares ✓
93.12% = 502.85 Acre Feet
Incorporated: April 18, 1940
2. Holita Ditch Enlargement
Priority #417 and 417C, Killian Decree
Appropriation Date: 5/23/1910
Adjudication Date: 10/10/1901 and 10/3/1921
Type: Storage
Total right: 130 Acre Feet
% Owned: 93.12% = 121.06 Acre Feet
Junior right, not used at this time.

Water

3. Walsenburg Ditch #4
Priority #5, Reed Decree
Appropriation Date: 4/30/1866
Adjudication Date: 6/12/1889
Type: Direct Flow
Total Right: 5.65 Cubic Feet per Second
% Owned: 500 shares of 46,572 shares
1.0736% = .06 CFS
Incorporated: April 18, 1940

4. Ballejos Ditch #7
Priority #8, Read Decree
Appropriation Date: 4/1/1868
Adjudication Date: 6/12/1889
Type: Direct Flow
Total Right: 1.5 CFS
% Owned: 75% = 1.125 CFS

5. Ballejos Ditch #7
Priority #13, Read Decree
Appropriation Date: 4/1/1869
Adjudication Date: 6/12/1889
Type: Direct Flow
Total Right: 1.5 CFS
% Owned: 75% = 1.125 CFS

These water rights are more than adequate to serve the acreage irrigated. Further with increasng subdivision and market pressures in the area, these water rights are extremely valuable.

Consentino Dairy Farm, Inc
2890 Walsenburg
Walsenburg, CO 80401-1115

BEFORE THE OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO

IN THE MATTER OF VIOLATION OF THE RULES AND) CAUSE NO. 1
REGULATION OF THE OIL AND GAS CONSERVATION)
COMMISSION BY **PETROGLYPH ENERGY INC.**,) ORDER NO. 1C-4
HUERFANO COUNTY, COLORADO)

CEASE AND DESIST ORDER

This Cease and Desist Order ("Order") is issued by the Director of the Colorado Oil and Gas Conservation Commission ("Commission") pursuant to §34-60-121(5)(a), C.R.S. (2007).

FINDINGS

1. The Colorado Oil and Gas Conservation Commission ("Commission" or "COGCC") convened an emergency hearing (pursuant to its authority under C.R.S. §34-60-108(3)) on July 23, 2007, in Suite 801, 1120 Lincoln Street, Denver, Colorado and issued emergency order #1E-6, the findings of which are incorporated in this Order by reference.

2. Pursuant to emergency order #1E-6, the Commission authorized the expenditure of One Hundred Eleven Thousand Seven Hundred dollars (\$111,700.00) from the Oil and Gas Conservation and Environmental Response Fund to conduct soil gas surveys and water well surveys in Huerfano County to ensure that public health, safety, welfare, and the environment are protected from methane migrating to naturally occurring seeps and domestic water wells and to track changes in methane concentration that may be occurring.

3. This authorization was necessary because of a sudden increase in complaints in June, 2007, related to methane in domestic water wells and results of investigations by COGCC staff and its third party contractor, Buys and Associates, Inc., that indicated 11 of 37 domestic water wells (within a 13 square mile area including Sections 1, 2, 3, 4, 9, 10, 11, 14, and 15 in Township 29 South, Range 67 West, 6th P.M. and Sections 34, 35, and 36 in Township 28 South, Range 67 West, 6th P.M.) were venting methane that appeared to be of thermogenic origin and similar to methane being produced from coalbeds in the Raton Basin.

4. On July 10, 2007, COGCC staff met with Petroglyph, Inc. ("Petroglyph") to discuss the emerging issues, the potential threats to public health, safety, and welfare, and the environment from oil and gas operations in the area, and potential mitigation strategies. Petroglyph agreed to provide water to two households, install methane detectors in residences that had methane in their wells, assist in surveying water wells in the area for methane, and review the well records for the Lively #10-02 Well (API #05-055-06148).

5. On July 10, 2007, LT Environmental, Inc., on behalf of the COGCC, conducted a soil gas survey at the Lively #10-02 Well. The survey included a 200-foot by 200-foot area with a 50-foot grid of soil gas probes. Seventeen soil gas measurements were made. Methane was not detected in any of the soil gas probes.

6. On July 20, 2007, after discussions with COGCC staff, Petroglyph voluntarily and temporarily shut in its wells in Huerfano County.

7. In August and September 2007, Petroglyph and its third party contractor, Norwest Questa Engineering Corporation ("Questa") conducted a methane investigation, monitoring, and mitigation program ("MIMMP," developed by COGCC staff) set forth in Attachment 1. The program was designed to determine the methane migration pathways and methods to mitigate methane that had impacted domestic water wells in south-central Huerfano County. Petroglyph was to take the lead, and COGCC staff committed to working with Petroglyph.

8. On October 5, 2007, Petroglyph and Questa presented initial results of the MIMMP. To date, there are no definitive results indicating the migration pathways from coalbeds to the shallow aquifers.

9. Petroglyph has made various recommendations for determining the source, migration, and mitigation of methane impacting domestic water wells that include returning its wells to production.

10. COGCC staff believes that Petroglyph's wells should not be returned to production at this time and recommends that the Director issue a cease and desist order enjoining Petroglyph from returning the wells to production for at least 30 days to allow the parties additional time to analyze the data and discuss open issues.

11. COGCC staff believes that the findings set forth in emergency order #1E-6, which are incorporated in this Order by reference, and the uncertain results of investigations at this time should be deemed to constitute a continuation of an emergency situation.

ORDER

NOW, THEREFORE, IT IS ORDERED, that in accordance with §34-60-121(5)(a), C.R.S. (2007), the Director of the Colorado Oil and Gas Conservation Commission hereby orders Petroglyph, Inc. to cease and desist returning its wells (listed as "Gas Production Wells" in Attachment 1) in Huerfano County to production for a period of 30 days from the date this Order is signed.

IT IS FURTHER ORDERED, that the findings set forth in emergency order #1E-6, which are incorporated in this Order by reference, and the uncertain results of investigations at this time constitute the continuation of an emergency situation in the following area of Huerfano County, making it potentially threatening to public health, safety and welfare for Petroglyph, Inc. to return its wells (listed as "Gas Production Wells" in Attachment 1) to production:

Township 29 South, Range 67 West, 6th P.M.
Sections 1, 2, 3, 4, 9, 10, 11, 14, and 15

Township 28 South, Range 67 West, 6th P.M.
Sections 34, 35, and 36

IT IS FURTHER ORDERED, that the provisions contained in the above order shall become effective forthwith.

IT IS FURTHER ORDERED, that the Commission expressly reserves its right, after notice and hearing, to alter, amend, or repeal any and/or all of the above orders.

IT IS FURTHER ORDERED, that under the State Administrative Procedure Act and COGCC Rule 522.d the Commission considers this order to be final agency action for purposes of judicial review within thirty (30) days after the date this order is mailed by the Commission unless the operator protests.

EXECUTED this _____ day of October, 2007.

IN THE NAME OF THE STATE OF COLORADO
OIL AND GAS CONSERVATION COMMISSION

By _____
Brian J. Macke, Director

Dated at Suite 801
1120 Lincoln St.
Denver, Colorado 80203
October 16, 2007

ATTACHMENT 1

Methane Investigation, Monitoring and
Mitigation Program
Huerfano County
July 2007

Petroglyph will initiate a field wide shut-in on July 20, 2007; the process will be completed within 48 hours. During the shut-in period a test program will be conducted and data analyzed to identify methane migration pathways and methods to mitigate methane that has impacted domestic water wells in south-central Huerfano County. Petroglyph has set a goal of completing the investigation, monitoring, data analysis and development of mitigation plans by August 31, 2007. COGCC Staff have committed to working with Petroglyph to expedite review and evaluation of submittals. An outline of the Investigation, Monitoring and Mitigation Program is provided below.

P&A'd Oil and Gas Wells

Petroglyph will re-enter the following plugged and abandoned wells to ensure that the wells are properly plugged and abandoned. Submit COGCC Form 10 and Form 4 for approval prior to re-entry.

1. Lively #10-02, 05-055-06148, NWNE10, T29S R67W
2. Dick Realty #1, 05-055-05027, SENE3, T29S R67W

Test Oil and Gas Wells Converted to Water Wells

Petroglyph will contact water well owner and obtain permission to:

1. Pull pump and tubing.
2. Check for gas. If gas is present collect sample and run for gas composition and stable isotope analysis.
3. Tag plug and measure depth of plug.
4. Run video camera and check perforated interval and casing integrity.
5. Run cement bond log (based on review of well completion records).
6. Install pressure transducers and or collect water level measurements and casing pressures.

For the following wells:

- Goemmer Land Co #1, 05-055-06004, #16861 F, NWNW Section 11, T29S R67W (also identify zone where gas is entering well)
- Stan Searle #1, 05-055-06060, #260097, (Kathy Dee) NESE 33 T28S R67W
- Searle #1, 05-055-06086, #222539, (aka Lively #3-03) NENW 3, T29S R67W
- Ferdinand B. Rohr #1, 05-055-05012, #84106 (aka Rohr #1) NWNE 9 T29S R67W

Gas Production Wells

Petroglyph will obtain bottom-hole pressure build-up and or shoot fluid levels and measure casing pressure for following wells:

Well Name	API Code	Section	Township	Range	Qtr1	Qtr2
ANDREATA 13-12	05055061690000	13	29S	67W	NW	SW
ANSELMO 07-05	05055062420000	7	29S	66W	SW	NW
ANSELMO 07-12	05055062650000	7	29S	66W	NW	SW
ANSELMO 07-13	05055062680000	7	29S	66W	SW	SW
ANSELMO 12-16	05055062660000	12	29S	67W	SE	SE
HURTADO 13-04	05055061680000	13	29S	67W	NW	NW
LIVELY 02-02	05055061560000	2	29S	67W	NE	NW
LIVELY 02-03	05055061570000	2	29S	67W	NE	NW
LIVELY 02-12	05055061510000	2	29S	67W	NW	SW
LIVELY 03-01	05055061600000	3	29S	67W	NE	NE
LIVELY 03-04	05055061580000	3	29S	67W	NW	NW
LIVELY 03-10	05055061460000	3	29S	67W	NW	SE
LIVELY 03-12	05055061470000	3	29S	67W	NW	SW
LIVELY 10-04	05055061490000	10	29S	67W	NW	NW
LIVELY 10-12	05055061500000	10	29S	67W	NW	SW
LIVELY 35-07	05055061530000	35	28S	67W	SW	NE
LIVELY 35-09	05055061540000	35	28S	67W	NE	SE
LIVELY 35-11B	05055061590000	35	28S	67W	NE	SW
MARTINEZ 05-12	05055062670000	5	29S	66W	NW	SW
MARTINEZ 06-09	05055062730000	6	29S	66W	NE	SE
MARTINEZ 06-15	05055062720000	6	29S	66W	SW	SE
MARTINEZ 06-16	05055062570000	6	29S	66W	SE	SE
MARTINEZ 07-01	05055062440000	7	29S	66W	NE	NE
MARTINEZ 07-02	05055061630000	7	29S	66W	NW	NE
MARTINEZ 07-03	05055062560000	7	29S	66W	NE	NW
MARTINEZ 07-06	05055062430000	7	29S	66W	SE	NW
MARTINEZ 07-07	05055062580000	7	29S	66W	SE	NE
MARTINEZ 07-09	05055061640000	7	29S	66W	NE	SE
MARTINEZ 07-10	05055062740000	7	29S	66W	NW	SE
MARTINEZ 07-11	05055061720000	7	29S	66W	NE	SW
MARTINEZ 07-14	05055062550000	7	29S	66W	SE	SW
MARTINEZ 07-15	05055062540000	7	29S	66W	SW	SE
MARTINEZ 07-16	05055062700000	7	29S	66W	SE	SE
MARTINEZ 08-04	05055062530000	8	29S	66W	NW	NW
MARTINEZ 12-09	05055061670000	12	29S	67W	NE	SE
PASSOW 22-08	05055062020000	22	28S	67W	SE	NE
ROHR 04-10	05055061660000	4	29S	67W	NW	SE
ROHR 04-14	05055062910000	4	29S	67W	SE	SW
ROHR 05-16	05055062880000	5	29S	67W	SE	SE

ROHR 08-01	05055062920000	8	29S	67W	NE	NE
ROHR 09-04	05055062900000	9	T29S	R67W	NW	NW
ROHR 09-05	05055062890000	9	29S	67W	SW	NW
ROHR 09-10	05055061650000	9	29S	67W	NW	SE
STATE 10Wb	05055062610000	36	28S	67W	SE	NE
STATE 2W	05055062140000	36	28S	67W	NW	NW
STATE 36-02	05055061790000	36	28S	67W	NW	NE
STATE 36-05	05055061610000	36	28S	67W	SW	NW
STATE 36-11	05055061550000	36	28S	67W	NW	SW
STATE 3W	05055062150000	36	28S	67W	NE	NW
STATE 4W	05055062160000	36	28S	67W	NE	NW
STATE 7W	05055062190000	36	28S	67W	SW	NE
STATE 9W	05055062210000	36	28S	67W	SW	NE

Water Well Monitoring

1. Petroglyph will check fluid levels in following water wells and install pressure transducers with recorder or data logger (as allowed by water well owners). Water delivery may be required during testing.

Well Owner	Receipt #	Permit #
Bergman	049916	244403
Barrett	526180	257994
Angely	486565	238689
Goemmer Land Co 1	9087077	16861-F
Burge	3494125	169043
Bounds	369907	181278
Masters	524651	257113

2. Petroglyph will install gas flow meters on the following wells for continuous gas monitoring or use other alternative method to estimate gas flow.

Well Owner	Receipt #	Permit #
Goemmer Land Co 1	9087077	16861-F
Burge	3494125	169043
Bounds	369907	181278
Angely or other well completed at 500-600 foot TD.	486565	238689

3. COGCC will screen for methane in currently known impacted wells as listed below. Take initial reading at shut-in and then weekly. Include screening inside house and other structures where gas could accumulate.

Well Owner	Receipt #	Permit #	% O ₂	% LEL	ppm-H ₂ S	%CH ₄
Smith	488917	239657	15.1	>100	2	69
Bergman	049916	244403	20.9	>100	4	58
Houghtling	481404	236272	17.1	>100	2	98
Derowitsch	515360	252931	10.0	>100	7	31
Barrett	526180	257994	2.0	>100	0	81
Coleman	3600034	267694	9.0	>100	2	97
Hopke	523307	256504	9.4	>100	48	93
Angely	486565	238689	16.1	>100	0	36
Golden Cycle	9087077	16861-F	0.2	>100	0	97
Burge	3494125	169043	14.7	>100	0	29
Bounds	369907	181278	0.0	>100	6	97

4. COGCC will screen for methane in other water wells in T29SR67W; Sections 1, 2, 3, 4, 9, 10, 11, 12, 14 and 15; and T28S, R67W; Sections 34, 35 and 36, but will need assistance from Petroglyph for the long term continuation of this activity.

5. COGCC will review well records for the second (initial) Masters water well. This well was drilled to depth of 700+ feet and it may never have been plugged.

Other Actions

1. COGCC will resurvey seeps identified by Apogee and mapped by LT (if possible measure gas flux) which includes seeps at coal mines, but may need assistance from Petroglyph for the long term continuation of this activity.
2. COGCC will conduct soil gas surveys at additional P&A wells.
3. Petroglyph, where practical, will map dikes in T29S R67W Sections 3, 9, 10, and 15 and survey them for the presence of methane seepage.
4. Petroglyph will continue to haul water to impacted residents.
5. Petroglyph will expand methane detector installation to include all houses where methane has been detected in the water wells or where methane seepage at the ground surface has been found.
6. Petroglyph will:
 - a. Develop and submit for approval a plan to monitor coal outcrop, seeps, and water wells and install methane detectors/meters up dip of the production area.
 - b. The plan shall include a process to identify core holes, mine-workings, shafts, adits, mine entrances and vents, and to monitor these potential conduits for methane seepage.
 - c. Develop a proposal for producing methane from the mines and or coals near the outcrop or some other method to mitigate gas seepage and an

implementation schedule.

7. Petroglyph will install a vent pipe, if acceptable to Mr. Kent Smith, on his domestic water well.
8. Petroglyph will conduct bradenhead tests on 52 shut-in wells, and the four water wells in area that are converted gas wells:
 - a. Searle #1 (Lively #03-03)
 - b. Stan Searle #1
 - c. Goemmer Land Company #1
 - d. Ferdinand B. Rohr #1 (Rohr #1)
9. Petroglyph will prepare written progress reports updating the COGCC on the status of the required work and containing data that are collected. Where possible data will also be provided to the COGCC electronically in an appropriate format, such as Excel spreadsheets or other agreed to format.

BEFORE THE OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO

IN THE MATTER OF VIOLATION OF THE RULES AND) CAUSE NO. 1
REGULATION OF THE OIL AND GAS CONSERVATION)
COMMISSION BY **PETROGLYPH ENERGY, INC.**,) ORDER NO. 1C-5
HUERFANO COUNTY, COLORADO)

CEASE AND DESIST ORDER

This Cease and Desist Order ("Order") is issued by the Director of the Colorado Oil and Gas Conservation Commission ("Commission") pursuant to §34-60-121(5)(a), C.R.S. (2007).

FINDINGS

1. On October 16, 2007, the Director of the Colorado Oil and Gas Conservation Commission ("Commission" or "COGCC") issued Cease and Desist Order No. 1C-4 ("Order No. 1C-4") to Petroglyph Energy, Inc. ("Petroglyph").

2. The findings of Order No. 1C-4 are incorporated in this Order by reference.

3. Pursuant to Order No. 1C-4, Petroglyph was enjoined from returning to production its 52 gas wells (listed in Attachment 1) in Huerfano County for a period of 30 days (through November 15, 2007) to allow Petroglyph and the COGCC staff additional time to analyze data and discuss open issues related to methane impacts to a shallow aquifer (Poison Canyon Formation) and domestic water wells caused by Petroglyph's operations in the deeper coal beds of the Vermejo Formation.

4. The data had been collected in August and September 2007 by Petroglyph and its third party contractor, Norwest Questa Engineering Corporation ("Questa"), pursuant to a methane investigation, monitoring, and mitigation program ("MIMMP") developed by Petroglyph, Questa, and the COGCC staff to determine the migration pathways into and mitigation methods for the impacted aquifer and domestic water wells in south-central Huerfano County.

5. Questa's report, dated October 10, 2007, contained results of the MIMMP and recommendations for methane monitoring and mitigation at the surface, in the shallow aquifer, and in the deeper coalbed formations. Questa's investigations did not identify the migration pathway from the coalbeds to the shallow aquifer but speculated that further investigations might reveal a man-made or natural conduit. Questa's recommendations included returning Petroglyph's wells to production in order to facilitate identification and plugging of the conduit.

6. Based on Questa's and Petroglyph's extensive investigations to date, the COGCC staff believes that the conduits for methane migration are most likely the naturally occurring igneous dikes and, perhaps, fractures associated with the dikes and that the potential for plugging these naturally occurring conduits is very low. As a result, returning the

wells to production would continue to result in migration of methane into the Poison Canyon Formation and the water wells completed in it.

7. Questa's recommendations for activities to be conducted, if Petroglyph's wells are returned to production, do not address a number of COGCC staff's concerns about protecting public health, safety, and welfare. These include but are not limited to the following: lack of an emergency response plan; additional and more rigorous monitoring of the water wells' ventilation systems and all water wells in the area of investigation ("AOI") to rapidly detect changes in the concentration and presence of methane; lack of hydrologic modeling data on which to base the remediation strategy; monitoring and mitigating impacted water wells that are outside the AOI; and monitoring gas seepage at the outcrop, coal mines, and water wells updip of the AOI.

8. COGCC staff believes that the existing injunction on production of Petroglyph's wells should continue and recommends that the Director issue another cease and desist order, to take effect immediately upon expiration of Order No. 1C-4, enjoining Petroglyph from returning the wells to production until Petroglyph applies for a public hearing before the Commission and demonstrates to the Commission's satisfaction that it can return its wells to production in a manner that protects public health, safety and welfare.

9. COGCC staff believes that the findings set forth in Order No. 1C-4, which are incorporated in this Order by reference, and the uncertain results of investigations at this time continue to constitute an emergency situation.

ORDER

NOW, THEREFORE, IT IS ORDERED, that in accordance with §34-60-121(5)(a), C.R.S. (2007), the Director of the Colorado Oil and Gas Conservation Commission hereby orders Petroglyph Energy, Inc. to cease and desist returning to production its 52 wells (listed in Attachment 1) in Huerfano County immediately from the expiration of Order No. 1C-4 until such time as Petroglyph applies for and receives a public hearing before the Commission and demonstrates to the Commission's satisfaction that it can return its wells to production in a manner that protects public health and safety.

IT IS FURTHER ORDERED, that the findings set forth in emergency Order No. 1C-4, which are incorporated in this Order by reference, and the uncertain results of investigations at this time constitute the continuation of an emergency situation in the following area of Huerfano County, making it potentially threatening to public health, safety and welfare for Petroglyph Energy, Inc. to return to production its wells (listed in Attachment 1):

Township 29 South, Range 67 West, 6th P.M.
Sections 1, 2, 3, 4, 9, 10, 11, 14, and 15

Township 28 South, Range 67 West, 6th P.M.
Sections 34, 35, and 36

IT IS FURTHER ORDERED, that the provisions contained in the above order shall become effective forthwith.

IT IS FURTHER ORDERED, that the Commission expressly reserves its right, after notice and hearing, to alter, amend, or repeal any and/or all of the above orders.

IT IS FURTHER ORDERED, that under the State Administrative Procedure Act and COGCC Rule 522.d the Commission considers this order to be final agency action for purposes of judicial review within thirty (30) days after the date this order is mailed by the Commission unless the operator protests.

EXECUTED this _____ day of November, 2007.

IN THE NAME OF THE STATE OF COLORADO
OIL AND GAS CONSERVATION COMMISSION

By _____

David S. Neslin, Interim Director

Dated at Suite 801
1120 Lincoln St.
Denver, Colorado 80203
November 14, 2007

ATTACHMENT 1

Petroglyph's Gas Production Wells in Huerfano County

Well Name	API Code	Section	Township	Range	Qtr1	Qtr2
ANDREATA 13-12	05055061690000	13	29S	67W	NW	SW
ANSELMO 07-05	05055062420000	7	29S	66W	SW	NW
ANSELMO 07-12	05055062650000	7	29S	66W	NW	SW
ANSELMO 07-13	05055062680000	7	29S	66W	SW	SW
ANSELMO 12-16	05055062660000	12	29S	67W	SE	SE
HURTADO 13-04	05055061680000	13	29S	67W	NW	NW
LIVELY 02-02	05055061560000	2	29S	67W	NE	NW
LIVELY 02-03	05055061570000	2	29S	67W	NE	NW
LIVELY 02-12	05055061510000	2	29S	67W	NW	SW
LIVELY 03-01	05055061600000	3	29S	67W	NE	NE
LIVELY 03-04	05055061580000	3	29S	67W	NW	NW
LIVELY 03-10	05055061460000	3	29S	67W	NW	SE
LIVELY 03-12	05055061470000	3	29S	67W	NW	SW
LIVELY 10-04	05055061490000	10	29S	67W	NW	NW
LIVELY 10-12	05055061500000	10	29S	67W	NW	SW
LIVELY 35-07	05055061530000	35	28S	67W	SW	NE
LIVELY 35-09	05055061540000	35	28S	67W	NE	SE
LIVELY 35-11B	05055061590000	35	28S	67W	NE	SW
MARTINEZ 05-12	05055062670000	5	29S	66W	NW	SW
MARTINEZ 06-09	05055062730000	6	29S	66W	NE	SE
MARTINEZ 06-15	05055062720000	6	29S	66W	SW	SE
MARTINEZ 06-16	05055062570000	6	29S	66W	SE	SE
MARTINEZ 07-01	05055062440000	7	29S	66W	NE	NE
MARTINEZ 07-02	05055061630000	7	29S	66W	NW	NE
MARTINEZ 07-03	05055062560000	7	29S	66W	NE	NW
MARTINEZ 07-06	05055062430000	7	29S	66W	SE	NW
MARTINEZ 07-07	05055062580000	7	29S	66W	SE	NE
MARTINEZ 07-09	05055061640000	7	29S	66W	NE	SE
MARTINEZ 07-10	05055062740000	7	29S	66W	NW	SE
MARTINEZ 07-11	05055061720000	7	29S	66W	NE	SW
MARTINEZ 07-14	05055062550000	7	29S	66W	SE	SW
MARTINEZ 07-15	05055062540000	7	29S	66W	SW	SE
MARTINEZ 07-16	05055062700000	7	29S	66W	SE	SE
MARTINEZ 08-04	05055062530000	8	29S	66W	NW	NW
MARTINEZ 12-09	05055061670000	12	29S	67W	NE	SE
PASSOW 22-08	05055062020000	22	28S	67W	SE	NE
ROHR 04-10	05055061660000	4	29S	67W	NW	SE
ROHR 04-14	05055062910000	4	29S	67W	SE	SW
ROHR 05-16	05055062880000	5	29S	67W	SE	SE

ROHR 08-01	05055062920000	8	29S	67W	NE	NE
ROHR 09-04	05055062900000	9	T29S	R67W	NW	NW
ROHR 09-05	05055062890000	9	29S	67W	SW	NW
ROHR 09-10	05055061650000	9	29S	67W	NW	SE
STATE 10Wb	05055062610000	36	28S	67W	SE	NE
STATE 2W	05055062140000	36	28S	67W	NW	NW
STATE 36-02	05055061790000	36	28S	67W	NW	NE
STATE 36-05	05055061610000	36	28S	67W	SW	NW
STATE 36-11	05055061550000	36	28S	67W	NW	SW
STATE 3W	05055062150000	36	28S	67W	NE	NW
STATE 4W	05055062160000	36	28S	67W	NE	NW
STATE 7W	05055062190000	36	28S	67W	SW	NE
STATE 9W	05055062210000	36	28S	67W	SW	NE

**BEFORE THE OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO**

IN THE MATTER OF CEASE AND DESIST ORDER)	CAUSE NO. 1
NO. 1C-5; PETROGLYPH ENERGY INC.)	
HUERFANO COUNTY, COLORADO)	ORDER NO. 1C-6

SUPPLEMENTAL ORDER

This Supplemental Order is issued by the Colorado Oil and Gas Conservation Commission ("Commission" or "COGCC") pursuant to C.R.S. §34-60-121(5)(a), and revises and supplements Cease and Desist Order No. 1C-5.

FINDINGS

1. In June, 2007, the existence of methane migration into the shallow aquifer overlying a portion of Petroglyph Energy, Inc.'s ("Petroglyph's") coalbed methane field in Huerfano County, Colorado, became evident. In July, 2007, Petroglyph voluntarily shut-in its 52 gas wells in the field at the request of the Director.

2. Subsequently, Petroglyph, its counsel, and the Director negotiated the issuance of a Cease and Desist Order. Cease and Desist Order No. 1C-4 was issued by the Director on October 16, 2007, and was made effective for thirty days.

3. On November 14, 2007, the Director of the COGCC issued Cease and Desist Order No. 1C-5 ("the Order") to Petroglyph. The Order incorporated the findings of Order 1C-4 by reference and took effect upon its expiration.

4. Under the Order, Petroglyph was enjoined from returning to production its 52 gas wells until it applied for a public hearing before the Commission and demonstrated to the Commission's satisfaction that it can return its wells to production in a manner that protects public health, safety and welfare.

5. Petroglyph filed its Protest and Request for Hearing in this matter on November 19, 2007. The hearing in this matter was set for December 12, 2007.

6. The Order required that Petroglyph supply the COGCC with additional information and analysis regarding the migration of gas into the shallow aquifer overlying a portion of its coalbed methane field. The information requested by the Order was further supplemented by a data request sent by the COGCC staff to Petroglyph on November 28, 2007.

7. Petroglyph developed, and has been conducting activities pursuant to, a Methane Investigation, Monitoring and Mitigation Program ("the Plan") since August, 2007. Petroglyph has continued to refine the Plan in response to inquiries and comments made by COGCC staff, and an updated Plan has been submitted to the Commission pursuant to its hearing on the matter.

8. On November 30, 2007, Petroglyph submitted an update of its activities pursuant to the Plan to the COGCC staff.

9. On December 3, 2007, Petroglyph personnel, as well as its consultants from Norwest Applied Hydrology and Norwest Questa Engineering, met with COGCC staff to review the current status and updated information related to the matter, and to discuss a program of future activities designed to allow Petroglyph's 52 gas wells to be safely reactivated.

10. At the December 3, 2007 meeting, COGCC staff identified conditions at one seep (Apogee #643 - i.e., modular home currently situated in an area that has high methane concentration in the soil) that need immediate mitigation to protect public health and safety.

11. Petroglyph has submitted to the Commission the following program of activities, which has been modified by COGCC staff. Petroglyph's program is described more fully in the updated Plan, dated December 7, 2007. The entire Plan, as may be amended from time to time pursuant to this Supplemental Order, is incorporated herein by reference, and made a part of this Supplemental Order.

- Phase One – Aquifer data acquisition and characterization; initiation and testing of the methane removal system; baseline data monitoring. This program entails the drilling, completion, testing and operation of a monitor well; three or four methane removal wells; and approximately eight wells designed to create a hydraulic barrier to methane migration in the shallow aquifer. Data acquired by the installation and operation of these wells will be utilized to refine the characterization of the shallow aquifer that has been impacted by gas migration, including a simulation model. The withdrawal and injection of water from the shallow aquifer will be initiated, and the system will be tested and evaluated, along with an associated methane stripping system. Activities during this phase will also include monitoring of surrounding domestic water wells (including, but not limited to, initial testing within one month of the initiation of Phase One of all water wells within one mile of the outer edge of the hydraulic barrier for dissolved methane), as well as baseline monitoring of gas seeps along the outcrop of the Vermejo coal formation and seeps located elsewhere in the area of investigation, and the development of proposals for mitigating impacts to all aquifers, wells, and seeps outside the hydraulic barrier.

Phase One will be considered complete when all of the described wells have been drilled, tested and completed; water has been produced from and injected into the shallow aquifer confirming that the methane removal system is functional; the data collected has been analyzed and submitted to the COGCC staff; and COGCC staff agrees and reports to the Commission that the steps outlined in Phase One have been satisfactorily completed and are effective.

- Phase Two – Initiation of hydraulic barrier and full operation of methane removal system. This program entails injecting water produced from the Vermejo coal formation into the hydraulic barrier wells, pursuant to which Petroglyph is authorized to reactivate up to four of its gas wells, the selection of which shall be done in consultation with COGCC staff, to obtain the necessary make-up water. Upon establishment of the hydraulic barrier to methane migration, the methane removal system from the shallow aquifer will be put into full operation. Continuous monitoring of water injection rates, downhole pressures, water production and methane removal rates will be conducted. Surrounding domestic water wells will be monitored for any change in methane production, as will the gas seeps along the outcrop and seeps located elsewhere in the area of investigation. In addition, Petroglyph will initiate mitigation of impacts to all aquifers, wells, and seeps outside the hydraulic barrier to the extent deemed necessary by the results of Phase One.

Phase Two will be considered complete when the hydraulic barrier to gas migration has been established, the methane removal system has been put into full operation, mitigation of all impacted aquifers, wells and seeps outside the hydraulic barrier has commenced or has been deemed not necessary by

the results of Phase One, data and analysis have been submitted to the COGCC staff, and COGCC staff agrees and reports to the Commission that the steps outlined in Phase Two have been satisfactorily completed and are effective .

- Phase Three – Long term methane removal from the Vermejo coal formation; remediation of shallow aquifer, and identification of methane migration pathway. The initiation of Phase Three must be affirmatively approved by the Commission. This program entails reactivation of all 52 Vermejo coalbed methane gas wells, and ongoing monitoring, as outlined for Phases One and Two. It also entails ongoing calibration of the shallow aquifer simulation model, utilizing gas and water production, pressure and chemical data. Upon identification of the methane migration pathway, a plan for closure of such pathway, if technically feasible and economically practicable, shall be developed and submitted to the COGCC staff for approval. In addition, the potential of using produced water from the Vermejo coal formation to mitigate gas seepage along the outcrop will be assessed, as will the potential for installation of a gas collection system at the outcrop.

Phase Three will be considered complete when either (1) the methane migration pathway has been identified and closed, if technically feasible and economically practicable; or (2) the methane gas contained in the Vermejo coal formation underlying the impacted area of the shallow aquifer has been produced, removing the source of gas migration. In addition, the assessment of alternatives to mitigate the gas seepage along the outcrop will be presented to the COGCC staff, and an outcrop seepage mitigation system will be implemented, if it is technically feasible and economically practicable to do so.

12. The Commission finds that Petroglyph has endeavored to address the unanticipated migration of gas into the shallow aquifer by (a) voluntarily shutting in 52 gas wells in July, 2007, upon discovery of the methane migration problem; (b) conducting substantial efforts to identify the source of the methane migration, including helicopter and ground surveys, collection of data from impacted water wells, and re-entering a well that was plugged and abandoned by another operator; (c) offering to supply methane detection monitors to impacted homeowners, along with appropriate safety instructions should a methane alarm occur; (d) monitoring impacted domestic water wells and offering to arrange for water delivery service; (e) providing handheld methane detection equipment to local fire departments and supplying such departments with 24-hour emergency contact information; (f) employing hydrology and reservoir engineering consultants to evaluate options for mitigation of the methane migration problem; and (g) cooperating with COGCC staff in investigating the methane migration problem and evaluating mitigation alternatives.

13. The Commission finds that time is of the essence in implementing a program of activities to address and remediate the short and long term impacts to public health, safety and welfare that have arisen as a result of unanticipated gas migration into the shallow aquifer. The Commission further finds that the Plan developed and submitted by Petroglyph, as outlined above and incorporated herein in its entirety, is designed to protect public health, safety and welfare by (a) providing data and information that will enable refined characterization of the shallow aquifer, including the mechanism of gas migration; (b) establishing a barrier to the further migration of gas in the shallow aquifer; and (c) mitigating the presence of gas in the impacted areas of the shallow aquifers, near the outcrop, and elsewhere in the area of investigation where gas seeps occur in both the short and long term by a program of containment and methane removal. The Commission further finds that implementing the Plan in a phased, systematic way may result in the beneficial production of gas as an energy supply, while protecting public health, safety, and welfare, and the environment.

ORDER

NOW, THEREFORE, IT IS ORDERED that Cease and Desist Order No. 1C-5 shall remain in force during Phase One and Phase Two of the Plan, except as to the reactivation of up to four gas wells during Phase Two of the Plan.

IT IS FURTHER ORDERED that Cease and Desist Order No. 1C-5 shall expire, effective upon the successful completion of Phase Two of the Plan, and the Commission has affirmatively approved initiation of Phase Three of the Plan.

IT IS FURTHER ORDERED that COGCC staff will support Petroglyph's applications to the State Engineer and the U.S. Environmental Protection Agency by providing data and information requested by such agencies for purposes of their regulatory permitting process and authorization of the Plan.

IT IS FURTHER ORDERED that COGCC staff shall initiate a process for regularly and frequently reporting to affected residents and citizens of Huerfano County.

IT IS FURTHER ORDERED that the Plan be expeditiously implemented by Petroglyph, subject to the following additional conditions of approval:

A. Petroglyph shall continue to provide the Commission with all pertinent data, information and analysis in its possession, past and future, as requested by the COGCC staff. Further, Petroglyph shall provide to the Commission a monthly progress report on the implementation of the Plan, which report shall include all data and information collected, and all analysis conducted, on an ongoing basis. Petroglyph shall continue to cooperate and coordinate with COGCC staff to facilitate its ongoing oversight with regard to Plan implementation including, but not limited to, modifying the Plan to be consistent with this order and implementing COGCC-staff approved soil gas survey techniques, and shall provide the staff with timely notice of significant developments, including, but not limited to, seeking COGCC staff's agreement with each Phase of the Plan prior to initiating the next Phase.

B. Petroglyph shall continue to offer to provide methane warning monitors, safety instructions and training to homeowners within the impacted area, and shall provide assistance to any homeowner that is subject to evacuation due to an emergency condition. Petroglyph shall assist local fire departments in responding to any such emergency condition.

C. Petroglyph shall continue to offer to install methane venting systems on domestic water wells and cisterns in the impacted area, or, at the option of the homeowner, to provide water delivery service for household use, until such time as methane levels in impacted domestic water wells are reduced, and remain, below the level of concern, as determined by the COGCC staff.

D. COGCC staff and any affected residents shall be provided immediate notice of any condition which causes, or threatens to cause, a significant adverse impact on the environment, including, but not limited to, the water quantity or quality of the shallow aquifer, or indications that the area impacted by gas migration has expanded.

E. COGCC staff, any affected residents, and Huerfano County Emergency Management officials shall be provided immediate notice of any condition that threatens public health, safety or welfare, including, but not limited to, the occurrence of a condition that requires emergency evacuation of a residence, areal expansion of the gas plume to additional domestic water wells, or sustained increase in methane production from currently-impacted domestic water wells.

F. Petroglyph shall immediately propose for COGCC staff's approval a plan to mitigate the conditions that threaten public health, safety, or welfare at the Apogee #643 seep and any future conditions identified by COGCC staff as causing or threatening to cause imminent or immediate harm to the environment or public health, safety, or welfare.

IT IS FURTHER ORDERED that the Director of the Commission shall have the authority to order that operations under the Plan be suspended, including the shutting-in of any or all gas wells, should a condition arise that causes, or threatens to cause, a significant adverse environmental impact, or that exacerbates the existing threat to public health, safety and welfare.

IT IS FURTHER ORDERED that the Commission expressly reserves its right, after notice and hearing, to alter, amend or repeal any or all of the above orders.

IT IS FURTHER ORDERED that, under the State Administrative Procedure Act and COGCC Rule 522.d., this order constitutes final agency action for purposes of judicial review, which appeal must be filed within thirty (30) days after the date this order is mailed to Petroglyph.

EXECUTED THIS _____ DAY OF JANUARY, 2008.

IN THE NAME OF THE STATE OF COLORADO
OIL AND GAS CONSERVATION COMMISSION

BY _____
David S. Neslin, Acting Director

Signed and dated at
1120 Lincoln Street, Suite 801
Denver, CO 80203
January __, 2008

=====

This cause came on for hearing before the Commission at 9:00 a.m. on January 15, 2008, Suite 801, The Chancery Building, 1120 Lincoln Street, Denver, Colorado, for the approval of this Administrative Order by Consent.

ENTERED this _____ day of January, 2008, as of January 15, 2008

OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO

By _____
Patricia C. Beaver, Secretary

Dated at Suite 801
1120 Lincoln Street
Denver, Colorado 80203
January 24, 2008

PUBLIC NOTICE SHEET

- ✓ Fact Sheet, page 1, paragraph II.A – Category Flow Range: Process water from 5,000,000 to 19,000,000
- ✓ Fact Sheet, page 1, paragraph II G – Facility Flows: 10.5 MGD
- ✓ Fact Sheet, page 2, paragraph 2 – “This renewal permit authorizes one outfall for the discharge of treated water. The previous permit authorized the discharge of untreated water from eight outfalls.”
- ✓ Fact Sheet, page 8, first four paragraphs –

First, the continued practice of discharging the untreated produced water (i.e, high Sodium Adsorption Ratio, SAR, values and high sodium concentrations) into the Cucharas River, under specific hydrologic conditions, creates a known threat to the beneficial agricultural use of this state water by impairing the suitability of this river water when diverted for agricultural uses. This threat is heightened when there exists minimal upstream flow in the river to dilute the effluent entering from several tributaries. Specifically, there has been damage to corn fields, soils, and dairy cattle when water was diverted (Holita Ditch) from the Cucharas River to a storage pond (Holita Reservoir) and then and routed to the Corsentino Dairy for these agricultural uses. The damage was reported first reported in 2006 and has been confirmed by soil scientists from Colorado State University and USDA's National Salinity Team.

Second, the CBM operations were shut-down by the COGCC on July 7, 2007 and there has been no produced water discharged to surface waters since that date. Based on ongoing studies and evaluation of results, there is a current expectation that the CBM operations will be approved in early 2010 to resume operations.

Third, the CBM operator has been aware of the SAR and high sodium problems in the produced water for several years and has taken steps to identify and characterize treatment technologies that will be evaluated for use in addressing this problem. The application for the renewal permit identifies a site for a treatment facility with a design capacity of 10 MGD.

Under Regulation No. 61, the Division can decide if a compliance schedule is warranted based on whether it is justified as being “appropriate” and will “achieve compliance” as soon as possible”. If a compliance schedule was provided, then there would be a time period when the untreated produced water could be discharged while steps were taken by the CBM operator to implement treatment. During this time period, there would be no assurances to the public that water diverted from the Cucharas River downstream from the entrance of the untreated produced water would be consistently suitable for crop irrigation. The Division has decided that the permittee should install treatment in the period between now and the anticipated date for resuming operation and that based on the significant risk posed by the discharge of produced water and that any discharge must comply with the SAR and sodium requirements in the renewal permit.

PUBLIC NOTICE SHEET

PETROGLYPH OPERATING COMPANY. Thomas Melland, PO Box 979, La Veta, CO;
81055 PHONE: 719-742-5570; PERMIT NO.: **CO-0048020**; Huerfano County.

Transfer from General Permit Certification COG-9000017

DRAFTER: Erin Scott

DISCHARGE: To an unnamed tributary to the Cucharas River.

**COLORADO DISCHARGE PERMIT SYSTEM (CDPS)
FACT SHEET TO PERMIT NUMBER CO-0048020**

**PETROGLYPH OPERATING COMPANY, ROHR COALBED METHANE OPERATION
HUERFANO COUNTY**

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I. TYPE OF PERMIT Major Industrial, 1st Individual Permit, transferred from general permit certification COG-0900017, Surface Water

II. FACILITY INFORMATION

A. Facility Type: Manufacturing and Other Industries
Fee Category: Category 12, Subcategory 5
Category Flow Range: Process water from 5,000,000 to 19,000,000
Annual Fee: \$ 12,140 (effective July 1, 2007)

B. SIC Code: 1311 Crude Petroleum and Natural Gas

C. Legal Contact/Permittee: Thomas Melland, District Manager
PO Box 979, La Veta, CO; 81055
719-742-5570

D. Facility Contact: Same as above

E. Facility Location: 2862 County Road 351, La Veta, CO, 81055

F. Discharge Point: Following treatment, prior to entering the arroyo, and MON1, at the same physical location as Outfall 001A, but referring to parameters that are monitor only; Latitude 37° 34.179 ' N, Longitude 104° 49.795' W.

G. Facility Flows: 10.5 MGD

ISSUED

EFFECTIVE

EXPIRATION

Major Changes From Last Renewal:

This renewal permit is issued as an individual permit (CO-0048020), whereas the previous permit was a general permit (COG-900017).

This renewal permit authorizes one outfall for the discharge of treated water. The previous permit authorized the discharge of untreated water from eight outfalls.

In the previous general permit, the receiving stream segment for the tributary was erroneously characterized as stream segment COARMA14. The correct segment is the 'all tributaries' segment, COARLA2a. With this correction, there is a change to the applicable water quality standards (i.e. total recoverable metals, acute WET testing).

The Total Dissolved Solids (TDS) limit, which was included to reflect protection of livestock watering is removed from the permit. The new sodium limit will indirectly result in a lower TDS level in the effluent and thus, continue to provide protection for livestock watering.

Limitations or monitoring requirements for additional metals, electrical conductivity and sodium absorption ratio (expressed as a limit for sodium) are included in this permit.

An antidegradation review was conducted for this permit renewal.

III. RECEIVING STREAM

A. Waterbody Identification: COARLA02a, includes discharges to the unnamed arroyo (tributary) to the Cucharas River and COARMA14, the mainstem of the Cucharas River.

B. Water Quality Assessment:

An assessment of the stream standards, low flow data, and ambient stream data has been performed to determine the assimilative capacities for both stream segments for potential pollutants of concern. This information, which is contained in Appendix A to this rationale, also includes an antidegradation review, where appropriate. The Division's Permits Section has reviewed the assimilative capacities to determine the appropriate water quality-based effluent limitations as well as potential limits based on the antidegradation evaluation, where applicable. The limitations based on the assessment and other evaluations conducted as part of this rationale can be found in Part I.A of the permit.

Outfall 001A will continue to be the authorized discharge point to the receiving stream. Additionally, Outfall MON1 has been included at the same location as Outfall 001A to conduct monitoring as discussed later in this rationale.

IV. FACILITY DESCRIPTION

A. Industry Description

1. Type of Industry – This is a coalbed methane (CBM) operation in the Walsenburg area. The discharge covered under this permit is to an arroyo, south of, and tributary to, the Cucharas River. A CBM operation involves the drilling of numerous wells and pumping groundwater out of the deep

coal seams to depressurize the system and allow the desorption of methane gas from the coal. Typically, several wells are tied into, and discharge out of, one outfall point.

2. Chemicals Usage – The permittee stated in the renewal application that they will utilize four chemicals in their treatment process. These chemicals are summarized in the following table.

Table IV-1 – Chemical Additives

Chemical Name	Purpose	Constituents of Concern	Acceptable? Yes or No
Bactron K95	Controls Fe oxidizing bacteria	pH	Yes
Bactron K103	Controls Fe oxidizing bacteria	pH	Yes
MgCl ₂	Increases hardness	pH	Yes
CaCl ₂	Increases hardness	pH	Yes

Chemicals deemed acceptable for use in waters that will or may be discharged to waters of the State are acceptable only when used in accordance with all state and federal regulations, and in strict accordance with the manufacturer's site-specific instructions.

B. Wastewater Treatment Description

No treatment of this discharge has historically been provided; however, active treatment is planned to remove sodium (and potentially other pollutants). All past outfalls (001A-008A) will be piped to a central location for treatment, and will discharge from one outfall.

V. PERFORMANCE HISTORY

A. Monitoring Data

1. Discharge Monitoring Reports – Table V-1a summarizes the untreated effluent data reported on the Discharge Monitoring Reports (DMRs) for the Petroglyph Rohr Basin facility from June 30, 2003 through September 30, 2007.

Table V-1a – Summary of DMR Data

Parameter	# Samples or Reporting Periods	Reported Average Concentrations Avg/Min/Max	Reported Maximum Concentrations Avg/Min/Max	Previous Avg/Max/AD Permit Limit	Number of Limit Excursions
Effluent Flow (MGD)	126	1.4/0.05/8.4	1.4/0.05/8.6	10.5/NA	0
pH (su)	126	8.6/8.3/8.9	8.7/8.4/9	6.5 - 9	0
TSS (mg/l)	126	2.3/<1/26	2.8/<1/42	30/45	0/0
Oil and Grease (mg/l)	0	NA/NA/NA	NA/NA/NA	NA/10/	0
TDS (mg/l)	126	810/520/980	813/520/980	NA/3500/	NA/0
Fe, TR (µg/l) Beginning January 1, 2007	24	156/28/630	253/<20/2800	1000/Report	0/NA
Fe, TR (µg/l) Through December 31, 2006	102	275/<20/2800	//	5000/Report	0/NA
Wet, acute					
pimephales, LC50	79	//	100/87/100	> 100	1
daphnia magna LC50	76	//	100/92/100		2

NA means Not Applicable

2. State Sampling – There are no state sampling results available for this facility.

B. Compliance With Terms and Conditions of Previous Permit

1. Effluent Limitations – The data shown in the preceding table(s) indicate apparent violations of the permit.

Whole Effluent Toxicity (WET), acute

One failure of the acute test for pimephales and two failures of the acute test occurred during the DMR period ending December 31, 2007. Accelerated testing indicated that there was no pattern of toxicity.

The permittee has been in compliance with all other numerical limitations of the permit.

2. Other Permit Requirements

Chronic, Whole Effluent Toxicity (WET) Testing- The previous permit incorporated chronic WET testing limitations that were to be effective January 1, 2008. Because the Petroglyph CBM Operation ceased operations (and discharge) in July 2007, chronic WET testing was never performed under the permit requirements (This requirement was an error in the previous permit due to the incorrect receiving stream segment assigned to this discharge.)

Special Monitoring- The permittee has met the following special monitoring requirements of the permit for total boron, total recoverable selenium, and potentially dissolved zinc, summarized in Table V-1b.

Table V-1b – Summary of Special Monitoring Data

Parameter	# Samples or Reporting Periods	Reported Average Concentrations Avg/Min/Max	Reported Maximum Concentrations Avg/Min/Max	Previous Avg/Max/AD Permit Limit
Selenium, TR (ug/l)	48	NA/NA/NA	0/<15/0	NA/NA
Zinc, Dis (ug/l)	48	NA/NA/NA	0.46/<20/22	NA/NA
Boron, Tot (mg/l)	48	NA/NA/NA	0.14/0.1/0.17	NA/NA

VI. TERMS AND CONDITIONS OF PERMIT

A. Discussion of Effluent Limitations

1. Technology Based Limitations

- a. Federal Effluent Limitation Guidelines – Federal guidelines have been developed for the oil and gas extraction point source category (EPA, 1976). The ELGs are provided in 40CFR 435, as follows:

40 CFR Part 435 Subpart C: Onshore

There shall be no discharge of wastewater pollutants into navigable waters from any source associated with production, field exploration, drilling, well completion or well treatment (i.e. produced water, drilling muds, drill cuttings and produced sand)

Note that since all discharges to surface waters in Colorado are subject to being used for wildlife or agricultural purposes (Subpart E), Subpart C is not applicable in Colorado.

40 CFR Part 435 Subpart E: Agricultural and Wildlife Water Use Subcategory - west of the 98th meridian for which the produced water has a use in agriculture or wildlife propagation when discharged into navigable waters.

There shall be no discharge of waste pollutants into navigable waters from any source (other than produced water) associated with production, field exploration, drilling, well completion, or well treatment (i.e. , drilling muds, drill cuttings, and produced sands).

Produced water discharges shall not exceed the following daily maximum limitation:

Effluent characteristics: Effluent limitation (mg/l). Oil and Grease: 35.

These guidelines explicitly apply to the discharge of produced water associated with conventional oil and gas extraction, which does not include discharges of produced water associated with coal bed methane extraction. EPA selected the coal bed methane industry as a potential new subcategory to the oil and gas extraction category, for additional review as part of the 2006 annual effluent guidelines review (EPA, 2006). As stated by EPA, the basis for considering CBM a potential new subcategory of the oil and gas extraction category is that the product extracted, coal bed natural gas, is virtually identical to conventional natural gas, which consists largely of methane. The Division has applied the oil and gas extraction ELG to this CBM produced water discharge using the best professional judgment (BPJ) authority provided in the State and Federal Acts and associated regulations. The CBM produced water discharge authorized under this permit will be put to beneficial use for wildlife which are known to be present in the area and for agricultural purposes as described in this Fact Sheet and the attached WQA. Therefore the beneficial use provision of the ELG is implemented in this permit. The effluent limitation for oil and grease will not be implemented in this permit because BPJ effluent limitations are superceeded by effluent limitation regulations promulgated by the Commission that are applicable to this discharge as described below.

- b. Regulation 62: Regulations for Effluent Limitations – These regulations include effluent limitations that apply to all discharges of wastewater to State waters. These regulations are applicable to the discharge from the Petroglyph facility.
2. BOD₅ and Total Suspended Solids - BOD₅ is not a parameter of concern for this activity. The TSS concentrations are the most stringent effluent limits and are therefore applied. These limitations are the same as those contained in the previous permit and are imposed effective immediately.
 - ii. Oil and Grease – The oil and grease limitations from the Regulations for Effluent Limitations are applied as they are the most stringent limitations. These limitations are the same as those contained in the previous permit and are imposed effective immediately.
 - iii. pH - The pH limitation specified in the Regulations for Effluent Limitations is not the most stringent and thus is not used as discussed below.
3. Water Quality Regulations and Guidance Documents
 - a. Water Quality Assessment – The WQA in Appendix A contains the evaluation of pollutants limited by water quality standards. The mass balance equation shown in Section IV of Appendix

A was used for most pollutants to calculate the potential water quality based effluent limitations (WQBELs), M_2 , that could be discharged without causing the water quality standard to be violated. A detailed discussion of the calculations for the maximum allowable concentrations for boron, sulfide, sodium, electrical conductivity and metals is provided in Section V of the water quality assessment contained in Appendix A.

The potential WQBELs determined as part of these calculations represent the calculated effluent limits that would be protective of water quality. Both acute and chronic WQBELs may be calculated based on acute and chronic standards, and these may be applied as daily maximum (acute) or 30-day average (chronic) limits.

- b. Antidegradation – Since the direct receiving water is Undesignated, as set forth in Section VI of the water quality assessment contained in Appendix A, an antidegradation evaluation was conducted for pollutants when water quality impacts occurred and when the impacts were significant. Based on the antidegradation requirements and the reasonable potential analysis discussed above, antidegradation-based average concentrations (ADBACs) may be applied.

According to Division procedures, the facility has three options related to antidegradation-based effluent limits: (1) the facility may accept ADBACs as permit limits (see Section VI of Appendix A); (2) the facility may select permit limits based on their non-impact limit (NIL), which would result in the facility not being subject to an antidegradation review and thus the antidegradation-based average concentrations would not apply (the NILs are also contained in Section VI of Appendix A); or (3) the facility may complete an alternatives analysis as set forth in Section 31.8(3)(d) of the regulations which would result in alternative antidegradation-based effluent limitations.

The effluent must not cause or contribute to an exceedance of a water quality standard and therefore the WQBEL must be selected if it is lower than the NIL. Where the WQBEL is not the most restrictive, the discharger may choose between the NIL or the ADBAC: the NIL results in no increased water quality impact; the ADBAC results in an "insignificant" increase in water quality impact. The ADBAC limits are imposed as two-year average limits.

- c. Determination of Total Maximum Daily Loads (TMDLs) – Stream segment COARLA2a is not on the State's 303(d) list, and therefore TMDLs do not apply to this segment. However, the downstream segment, COARMA14, is currently listed on the State's 303(d) list for development of TMDLs for dissolved selenium. However, the TMDL has not yet been finalized. Consistent with Division practice, this permit establishes monitoring requirements for these pollutants until such time as the TMDLs is complete and waste load allocations have been determined. The permit may be reopened to include limitations based upon a finalized TMDL.
- d. Colorado Mixing Zone Regulations – Pursuant to section 31.10 of The Basic Standards and Methodologies for Surface Water, a mixing zone determination is required for this permitting action. The Colorado Mixing Zone Implementation Guidance, dated April 2002, identifies the process for determining the meaningful limit on the area impacted by a discharge to surface water where standards may be exceeded (i.e., regulatory mixing zone). This guidance document provides for certain exclusions from further analysis under the regulation, based on site-specific conditions.

The guidance document provides a mandatory, stepwise decision-making process for determining if the permit limits will not be affected by this regulation. Exclusion, based on Extreme Mixing Ratios, may be granted if the ratio of the design flow to the chronic low flow (30E3) is greater than 2:1. Since the direct receiving water is a zero low flow stream, the exemption has been met and no further analysis is required under the regulation.

- f. Agricultural Use Protection – Section 31.11(1)(a)(iv) of The Basic Standards and Methodologies for Surface Waters (Regulation No. 31) includes the narrative standard that State surface waters shall be free of substances that are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life.

The water quality assessment in Appendix A contains the evaluation of pollutants limited by narrative standards. The mass balance equation shown in Section IV of Appendix A was used for electrical conductivity and sodium to calculate the maximum allowable effluent concentration, M2, that could be discharged without causing the narrative standard to be violated. A detailed discussion of the calculations for the maximum allowable concentrations for electrical conductivity and sodium is provided in Section V of the water quality assessment contained in Appendix A.

In accordance with the discussion that follows, the Division is establishing monitoring and limitations for several parameters in accordance with the Division's Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops policy (hereafter the Narrative Standards policy).

- i. Electrical Conductivity (EC) – The calculated chronic limit for EC in deciSiemens per meter (dS/m), as set out in Appendix A, is established as a 30-day average limit, effective immediately. EC is also known as specific conductance, conductance, conductivity, or specific conductivity. Because EC can be measured in various units, which has led to confusion in accurate reporting of results, the Division is providing the following conversions to dS/m:
- Divide $\mu\text{mhos/cm} \times 1000$ to convert to dS/m
 - Divide $\mu\text{S/cm} \times 1000$ to convert to dS/m
 - $\text{mmhos/cm} = \text{dS/m}$
- ii. Sodium and SAR – SAR, which stands for Sodium Adsorption Ratio, is a representation of the relative proportion of sodium cations to other cations in total dissolved solids. SAR is a parameter used for determining suitability of water for irrigation purposes. However, Division procedures are to impose sodium limits in lieu of SAR limits because of implications of SAR being a ratio of three different parameters, and therefore the discharge may meet the SAR limit, however, after blending with the receiving stream, the limit may not be met. If sodium is limited, we can be certain that the SAR of the receiving stream will meet the limitation.

The calculated chronic limit for sodium, as set out in Appendix A is established as a 30-day average limit, effective immediately. The permittee has indicated that active treatment is planned to remove sodium and that the available treatment will be capable of meeting the established effluent limitation, once installed. An associated compliance schedule will not be granted, based on the following special circumstances.

First, the continued practice of discharging the untreated produced water (i.e, high Sodium Adsorption Ratio, SAR, values and high sodium concentrations) into the Cucharus River, under specific hydrologic conditions, creates a known threat to the beneficial agricultural use of this state water by impairing the suitability of this river water when diverted for agricultural uses. This threat is heightened when there exists minimal upstream flow in the river to dilute the effluent entering from several tributaries. Specifically, there has been damage to corn fields, soils, and dairy cattle when water was diverted (Holita Ditch) from the Cucharus River to a storage pond (Holita Reservoir) and then and routed to the Corsentino Dairy for these agricultural uses. The damage was reported first reported in 2006 and has been confirmed by soil scientists from Colorado State University and USDA's National Salinity Team.

Second, the CBM operations were shut-down by the COGCC on July 7, 2007 and there has been no produced water discharged to surface waters since that date. Based on ongoing studies and evaluation of results, there is a current expectation that the CBM operations will be approved in early 2010 to resume operations.

Third, the CBM operator has been aware of the SAR and high sodium problems in the produced water for several years and has taken steps to identify and characterize treatment technologies that will be evaluated for use in addressing this problem. The application for the renewal permit identifies a site for a treatment facility with a design capacity of 10 MGD.

Under Regulation No. 61, the Division can decide if a compliance schedule is warranted based on whether it is justified as being "appropriate" and will "achieve compliance" as soon as possible". If a compliance schedule was provided, then there would be a time period when the untreated produced water could be discharged while steps were taken by the CBM operator to implement treatment. During this time period, there would be no assurances to the public that water diverted from the Cucharus River downstream from the entrance of the untreated produced water would be consistently suitable for crop irrigation. The Division has decided that the permittee should install treatment in the period between now and the anticipated date for resuming operation and that based on the significant risk posed by the discharge of produced water and that any discharge must comply with the SAR and sodium requirements in the renewal permit.

Although no limit for the SAR will be imposed at this time, calculating and reporting the SAR will be specified in the permit. Additionally, because SAR is a calculated parameter based on a formula (see the paragraphs that follow) incorporating sodium, calcium and magnesium analytical results, monitoring requirements for calcium and magnesium (along with limits and monitoring for sodium) are also established in this permit.

The SAR reported as part of permit requirements must be calculated using the following formula:

$$SAR = \frac{Na^{+}}{\sqrt{\frac{Ca^{++} + Mg^{++}}{2}}}$$

The values for sodium (Na⁺), calcium (Ca⁺⁺), and magnesium (Mg⁺⁺) in this equation are expressed in units of milli-equivalents per liter (meq/l). Most monitoring data will typically be reported in terms of mg/l, which must be converted. The conversions are:

$$\text{meq/l} = \frac{\text{Concentration in mg/l}}{\text{Equivalent weight in mg/meq}}$$

Where the equivalent weights are determined based on the atomic weight of the element divided by the ion's charge:

Na+ = 23.0 mg/meq (atomic weight of 23, charge of 1)

Ca++ = 20.0 mg/meq (atomic weight of 40.078, charge of 2)

Mg++ = 12.15 mg/meq (atomic weight of 24.3, charge of 2)

- iii. Bicarbonate and adjusted SAR (SAR-adj) – Studies by the Colorado State University Cooperative Extension and by other entities have found that high proportions of sodium to calcium and magnesium in total dissolved solids negatively impacts plant growth and may contribute to reduced yields in farm land over time. Additionally, high bicarbonate concentrations also adversely affect plant growth because bicarbonate combined with calcium and magnesium will precipitate out, leaving a higher concentration of sodium in the water. For this reason, monitoring and reporting of the bicarbonate ion concentration, in mg/l, is required in this permit. Note the bicarbonate ion must be measured pursuant to a modified alkalinity test (Alkalinity can be measured via procedures approved pursuant to 40 CFR Part 136), that involves the titration of alkalinity in an acidic environment, thereby resulting solely in a measure of bicarbonate alkalinity.

Although the SAR-adj of the downstream irrigation water is of interest to the Division, the Division does not intend to impose in-stream monitoring for calculations of SAR-adj at this time. However, effluent monitoring for calcium, sodium, magnesium, bicarbonate and conductivity is required under this permit to enable the Division to later calculate an effluent SAR-adj for use in correlating the effluent discharge to in-stream SAR-adj values that will be available based on in-stream sampling conducted by other entities.

- g. Reasonable Potential Analysis – Using the assimilative capacities contained in the WQA, an analysis must be performed to determine whether to include the calculated assimilative capacities as WQBELs in the permit. This reasonable potential (RP) analysis is based on the Determination of the Requirement to Include Water Quality Standards-Based Limits in CDPS Permits Based on Reasonable Potential, dated December, 2002. This guidance document utilizes both quantitative and qualitative approaches to establish RP depending on the amount of available data.

A qualitative determination of RP may be made where ancillary and/or additional treatment technologies are employed to reduce the concentrations of certain pollutants. However, absent limitations, a facility may no longer continue such pollutant reductions and therefore the discharge would result in RP. For this reason, the Permits Section may make a qualitative determination that absent effluent limitations, there is RP for these pollutants to cause or contribute to exceedances of water quality standards.

To conduct a quantitative RP analysis, a minimum of 10 effluent data points from the previous 5 years should be used. The equations set out in the guidance for normal and lognormal distribution, where applicable, are used to calculate the maximum estimated pollutant concentration (MEPC). For data sets with non-detect values, and where at least 30% of the data set was greater than the detection level, MDLWIN software is used consistent with Division guidance to generate the mean and standard deviation, which are then used to establish the

multipliers used to calculate the MEPC. If the MDLWIN program cannot be used the Division's guidance prescribes the use of best professional judgment.

For some parameters, recent effluent data or an appropriate number of data points may not be available, or collected data may be in the wrong form (dissolved vs total) and therefore may not be available for use in conducting a RP analysis. Thus, consistent with Division procedures, monitoring will be required to collect samples to support a RP analysis and subsequent decisions for a numeric limit. Samples requirements will be listed at a MON outfall, and all results shall be reported on a DMR. A compliance schedule may be added to the permit for the request of a RP analysis once the appropriate data have been collected.

For other parameters, effluent data may be available to conduct a quantitative analysis, and therefore a RP analysis will be conducted to determine if there is RP for the effluent discharge to cause or contribute to exceedances of ambient water quality standards. The guidance specifies that if the MEPC exceeds the maximum allowable pollutant concentration (MAPC), limits must be established and where the MEPC is greater than half the MAPC (but less than the MAPC), monitoring must be established. Table VI-2 contains the calculated MEPC compared to the corresponding MAPC, and the results of the reasonable potential evaluation, for those parameters that met the data requirements. The RP determination is discussed for each parameter in the text below.

With the exception of total recoverable iron, there is little data for metals as most parameters did not have monitoring requirements in previous permits. However, six time monthly sampling data (May 2005-October 2005) are available for boron, dissolved zinc, and total recoverable selenium, while additional monthly sampling data (April 2007-July 2007) for most metals and all eight outfalls was submitted by the permittee. This data was evaluated to determine if limitations or monitoring requirements for particular parameters should be included in the permit.

Table VI-1 – Quantitative Reasonable Potential Analysis

Parameter	30-Day Average			7-Day Ave or Daily Max			Antideg (2 Year Roll. Ave)		
	MEPC	WQBEL (MAPC)	Reasonable Potential	MEPC	WQBEL (MAPC)	Reasonable Potential	MEPC	ADBAC (MAPC)	Reasonable Potential
Fe, TR (µg/l)	7199	1000	Yes	NA	NA	NA	578	609	Yes

3. Pollutants Limited by Water Quality Standards

pH – This parameter is limited by the water quality standards of 6.5-9.0 s.u., as this range is more stringent than the range specified under the Regulations for Effluent Limitations. This limitation is the same as that contained in the previous permit and is imposed effective immediately.

Total Recoverable Aluminum- The RP analysis was based on the WQBEL and ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 67 ug/l of 'dissolved' aluminum. Even though this value is *significantly* less than the acute WQBEL of 750 ug/l, it is greater than ½ of the ADBAC of 87 ug/l, 'total recoverable' aluminum. Since the qualitative analysis did not exclude permit requirements for the ADBAC, monitoring for total recoverable aluminum is required.

Arsenic

Total Recoverable - The RP analysis was based on the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 0.54 ug/l, less than 1/2 of the ADBAC of 1.1 ug/l. Therefore, a qualitative determination of no RP for total recoverable arsenic has been made and limitations and monitoring are not required at this time.

Potentially Dissolved - The RP analysis was based on the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' arsenic were as high as 0.54 ug/l, *significantly* less than the ADBAC of 54 ug/l. Thus, a qualitative determination of no RP for potentially dissolved arsenic has been made and limitations and monitoring are not required at this time.

Potentially Dissolved Beryllium - There was no effluent data available to perform a RP analysis. Therefore, this parameter has been added to Outfall MON1 for the collection of data for a RP analysis.

Cadmium

Total Recoverable - The RP analysis was based on the WQBEL as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were all non-detect at a reporting limit of 0.04 ug/l, *significantly* less than the WQBEL of 10 ug/l. Therefore, a qualitative determination of no RP for total recoverable cadmium has been made and limitations and monitoring are not required at this time.

Potentially Dissolved - The RP analysis was based on the WQBEL and ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. All effluent results were non-detect for 'total' cadmium at a reporting limit of 0.04 ug/l as described above, and were *significantly* less than the acute WQBEL of 7 ug/l and the ADBAC of 0.48 ug/l. Thus, a qualitative finding of no RP has been made and limitations and monitoring are not required at this time.

Trivalent Chromium

Total Recoverable - The RP analysis was based on the WQBEL as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' chromium were as high as 2.6 ug/l, *significantly* less than the WQBEL of 100 ug/l for 'trivalent' chromium. Thus, a qualitative determination of no RP for total recoverable trivalent chromium has been made and limitations and monitoring are not required at this time.

Potentially Dissolved - The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' chromium were as high as 2.6 ug/l, *significantly* less than the acute WQBEL of 829 ug/l and the ADBAC of 17 ug/l. Thus, a qualitative determination of no RP for potentially dissolved trivalent chromium has been made and limitations and monitoring are not required at this time.

Copper

Total Recoverable - The RP analysis was based on the WQBEL as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP

analysis. Effluent values were as high as 1.2 ug/l, *significantly* less than the chronic WQBEL of 200 ug/l. Thus, a qualitative determination of no RP for total recoverable copper has been made and limitations and monitoring are not required at this time.

Potentially Dissolved - The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' copper were as high as 1.2 ug/l, *significantly* less than the acute WQBEL of 21 ug/l and less than 1/2 of the ADBAC of 2.1 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Total Recoverable Iron - The RP analysis was based upon the ADBAC as described in Appendix A. With the available data, the log-normal program for the ADBAC was used to determine the appropriate statistics to determine the MEPC. Since the MEPC of 578 ug/l was greater than 50% of the MAPC of 609 ug/l, 2 year average monitoring has been added to the permit. A 30-day interim limitation of 1000 ug/l has also been added to the permit. This is the same limitation as the previous permit, and is based on the WQBEL.

Lead

Total Recoverable - The RP analysis was based on the WQBEL as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 0.74 ug/l, *significantly* less than the chronic WQBEL of 100 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Potentially Dissolved - The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' lead were as high as 0.74 ug/l, *significantly* less than the acute WQBEL of 106 ug/l. However, because this value exceeds the ADBAC of 0.64 ug/l, the qualitative analysis based on 'total' data does not exclude permit requirements for the ADBAC. Therefore, 2 year average monitoring for potentially dissolved lead is required and has been added to the permit.

Potentially Dissolved Manganese - The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' manganese were as high as 7 ug/l, *significantly* less than the acute WQBEL of 3,477 ug/l and the ADBAC of 463 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Total Mercury - The RP analysis was based on the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 0.035 ug/l. As this value is greater than the ADBAC of 0.0015 ug/l, a qualitative determination of RP has been made and limitations and monitoring are required. The ADBAC is a new limitation and it is unknown if the permittee can consistently meet the limit; therefore a compliance schedule has been added to the permit to give the permittee time to meet this limitation.

Nickel

Total Recoverable - The RP analysis was based on the WQBEL as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP

analysis. Effluent values were as high as 1.8 ug/l, *significantly* less than the WQBEL of 200 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Potentially Dissolved - The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 1.8 ug/l total nickel. As this value is *significantly* less than acute WQBEL of 689 ug/l and the ADBAC of 12 ug/l, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Selenium

Total Recoverable- The RP analysis was based on the WQBEL as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were all non-detect at reporting limits of 15 ug/l (2005) and 5 ug/l (2006), *significantly* less than the WQBEL of 20 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Potentially Dissolved- The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. As described above, effluent values of 'total' selenium were all non-detect at reporting limits of 15 ug/l (2005) and 5 ug/l (2006), *significantly* less than the acute WQBEL of 18 ug/l. However, because the detection levels were greater than the calculated ADBAC of 4.5 ug/l for this pollutant and because dissolved selenium is listed on the State 303(d) list for this stream segment, monitoring for potentially dissolved selenium has been added to the permit.

Potentially Dissolved Silver - Results for silver were all non-detect at a reporting limit of (0.02) ug/l (total). A qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Zinc

Total Recoverable- The RP analysis was based on the WQBEL as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Results for 'potentially dissolved' zinc were typically non-detect at a reporting limit of 20 ug/l. Where detected (once) the value was 22 ug/l, *significantly* less than the WQBEL of 2,000 ug/l. Effluent values of 'total' zinc in 2006 were as high as 6.9 ug/l, also *significantly* less than the WQBEL. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Potentially Dissolved- The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. As described above, results for zinc were typically non-detect at a reporting limit of 20 ug/l, with one detection of 22 ug/l, *significantly* less than the acute WQBEL of 173 ug/l and the ADBAC of 103 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Boron- The RP analysis for boron was based upon the ADBAC as described in Appendix A. A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 0.17 mg/l, greater than the ADBAC of 0.11 mg/l. Thus, a qualitative

determination of RP has been made and limitations and monitoring are required. However, the ADBAC is a new limitation and it is unknown if the permittee can consistently meet the limit and therefore a compliance schedule has been added to the permit to give the permittee time to meet this limitation. A 30-day interim limitation of 0.75 mg/l based on the WQBEL has been added to the permit. Effluent data indicates that the permittee is able to meet this limitation and, therefore, it is effective immediately.

Sulfide- There was no effluent data available to perform a RP analysis. Therefore, this parameter has been added to Outfall MON1 for the collection of data for a RP analysis.

4. Metal Speciation

For standards based upon the total and total recoverable methods of analysis, the limitations are based upon the same method as the standard.

For metals with aquatic life-based dissolved standards, effluent limits and monitoring requirements are typically based upon the potentially dissolved method of analysis, as required under Regulation 31, Basic Standards and Methodologies for Surface Water. Thus, effluent limits and/or monitoring requirements will be prescribed as the "potentially dissolved" form.

5. Whole Effluent Toxicity (WET) Testing - For this facility, acute WET testing is required.

- a. Purpose of WET Testing – The Water Quality Control Division has established the use of WET testing as a method for identifying and controlling toxic discharges from wastewater treatment facilities. WET testing is being utilized as a means to ensure that there are no discharges of pollutants "in amounts, concentrations or combinations which are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life" as required by Section 31.11 (1) of the Basic Standards and Methodologies for Surface Waters.
- b. In-Stream Waste Concentration (IWC) – Where monitoring or limitations for WET are deemed appropriate by the Division, chronic in-stream dilution as represented by the chronic IWC is critical in determining whether acute or chronic conditions shall apply. According to the Colorado Water Quality Control Division Biomonitoring Guidance Document, dated July 1, 1993, for those discharges where the chronic IWC is greater than 9.1% and the receiving stream has a Class 1 Aquatic Life use or Class 2 Aquatic Life use with all of the appropriate aquatic life numeric standards, chronic conditions apply. However, in addition to the IWC value for determining whether chronic or acute WET testing requirements are applicable, the classification of the receiving stream must be considered. Where the receiving water is classified for aquatic life, class 2 without all of the appropriate aquatic life numeric standards, the Division has determined that acute WET testing is applicable for this permit.

The IWC for this permit is 100 %, which represents a wastewater concentration of 100 % effluent to 0% receiving stream.

- c. Acute WET Limits – This facility is expected to discharge metals and other pollutants at concentrations that have been found to have toxic effects to fish and other aquatic life. On this basis, the Division believes there is reasonable potential for the discharge to interfere with attainment of applicable water quality classifications or standards and therefore, an acute toxicity limit has been incorporated into the permit.

Petroglyph Operating Company has conducted acute toxicity testing for several years and, with one exception, has demonstrated that at a concentration of 100% effluent, the samples are not lethal to 50% of the organisms. As described in Section V.B.1, failures of the test occurred in 2007. However, since there was no pattern of toxicity, and no further failures have occurred, the facility has demonstrated that it can meet an acute toxicity limit of $LC_{50} > 100\%$, and this limit is effective immediately.

The permittee is required to conduct quarterly monitoring consistent with the frequency specifications in the Colorado Water Quality Control Division Biomonitoring Guidance Document, dated July 1, 1993, the results of which are to be reported as an LC_{50} , which is the concentration at which 50% or more of the organisms die. If the LC_{50} occurs in a concentration of less than or equal to 100% effluent, the permittee is required to comply with the specifications identified in Part I.A.5. of the permit.

- d. General Information – The permittee should read the WET testing section of Part I.A.5. of the permit carefully. The permit outlines the test requirements and the required follow-up actions the permittee must take to resolve a toxicity incident. The permittee should read, along with the documents listed in Part I.B.3. of the permit, the Colorado Water Quality Control Division Biomonitoring Guidance Document, dated July 1, 1993. This document outlines the criteria used by the Division in such areas as granting relief from WET testing, modifying test methods and changing test species. The permittee should be aware that some of the conditions outlined above may be subject to change if the facility experiences a change in discharge, as outlined in Part II.A.2. of the permit. Such changes shall be reported to the Division immediately.

8. Economic Reasonableness Evaluation – Section 25-8-503(8) of the revised (June 1985) Colorado Water Quality Control Act required the Division to "determine whether or not any or all of the water quality standard based effluent limitations are reasonably related to the economic, environmental, public health and energy impacts to the public and affected persons, and are in furtherance of the policies set forth in sections 25-8-192 and 25-8-104."

The Colorado Discharge Permit System Regulations, Regulation No. 61, further define this requirement under 61.11 and state: "Where economic, environmental, public health and energy impacts to the public and affected persons have been considered in the classifications and standards setting process, permits written to meet the standards may be presumed to have taken into consideration economic factors unless:

- a. A new permit is issued where the discharge was not in existence at the time of the classification and standards rulemaking, or
- b. In the case of a continuing discharge, additional information or factors have emerged that were not anticipated or considered at the time of the classification and standards rulemaking."

The evaluation for this permit shows that the Water Quality Control Commission, during their proceedings to adopt the Classifications and Numeric Standards for Arkansas River Basin, considered economic reasonableness.

Furthermore, this is not a new discharger and no new information has been presented regarding the classifications and standards. Therefore, the water quality standard-based effluent limitations of this permit are determined to be reasonably related to the economic, environmental, public health and energy impacts to the public and affected persons and are in furtherance of the policies set forth in Sections 25-8-102 and 104. If the permittee disagrees with this finding, pursuant to 61.11(b)(ii) of the Colorado Discharge Permit System Regulations, the permittee should submit all pertinent information to the Division during the public notice period.

B. Monitoring

Effluent Monitoring – Effluent monitoring will be required as shown in the permit document. Refer to the permit for locations of monitoring points. Monitoring requirements have been established in accordance with the frequencies and sample types set forth in the Baseline Monitoring Frequency, Sample Type, and Reduced Monitoring Frequency Policy for Industrial and Domestic Wastewater Treatment Facilities. This policy includes the methods for reduced monitoring frequencies based upon facility compliance as well as for considerations given in exchange for instream monitoring programs initiated by the permittee. Based upon this policy, the permittee is not eligible for reduced monitoring at this time due to delinquent DMR submittals. The permittee must be in compliance with all permit terms to be considered for reduced monitoring.

Outfall MON1 monitoring requirements are established consistent with Division procedures for monthly monitoring to obtain data for use in future reasonable potential analyses.

C. Reporting

1. Discharge Monitoring Report – The Petroglyph Operating Company facility must submit Discharge Monitoring Reports (DMRs) on a monthly basis to the Division. These reports should contain the required summarization of the test results for all parameters and monitoring frequencies shown in Part I.B of the permit. See the permit, Part I.B, C, D and/or E for details on such submission.
2. Special Reports – Special reports are required in the event of an upset, bypass, or other noncompliance. Please refer to Part II.A. of the permit for reporting requirements. As above, submittal of these reports to the US Environmental Protection Agency Region VIII is no longer required.

D. Additional Terms and Conditions

1. Signatory and Certification Requirements – Signatory and certification requirements for reports and submittals are discussed in Part I.E.6. of the permit.
2. Compliance Schedules - The following compliance schedules are included in the permit. See Part I.A.3 of the permit for more information.

Boron and Mercury AD limits

All information and written reports required by the following compliance schedules should be directed to the Permits Unit for final review unless otherwise stated.

E. Waste Minimization/Pollution Prevention

Waste minimization and pollution prevention are two terms that are becoming increasingly more common in industry today. Waste minimization includes reducing the amount of waste at the source through changes in industrial processes, and reuse and recycling of wastes for the original or some other purpose (such as materials recovery or energy production). Pollution prevention goes hand-in-hand with waste minimization. If the waste is eliminated at the front of the line, it will not have to be treated at the end of the line. The direct benefits to the industry are often significant, both in terms of increased profit and in public relations. This program can affect all areas of process and waste control with which an industry deals. Elimination or reduction of a wastewater pollutant can also result in a reduction in an air pollutant or a reduction in the amount of hazardous materials that must be handled or disposed.

This discharge permit does not specifically dictate waste minimization conditions at this time. The Division does strongly encourage the permittee to continue working in developing and implementing a waste minimization plan. Several industries have already developed plans and found that implementation resulted in substantial savings. Both the Colorado Department of Public Health and Environment and the Environmental Protection Agency (EPA) have information and resources available. For more in-depth information, please contact these agencies.

Erin Scott
April 23, 2009

I. REFERENCES

- A. Colorado Department of Public Health and Environment, Water Quality Control Division Files.
- B. Basic Standards and Methodologies for Surface Water, Regulation No. 31, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective May 31, 2008.
- C. Classifications and Numeric Standards for Arkansas River Basin, Regulation No.32, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective March 30, 2009.
- D. Colorado Discharge Permit System Regulations, Regulation No. 61, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective April 30, 2008.
- E. Regulations for Effluent Limitations, Regulation No. 62, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective March 30, 2008.
- F. Section 303(d) List of Water Quality Limited Segments Requiring TMDLs, Regulation No 93, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective April 30, 2008.
- G. Colorado's Monitoring and Evaluation List, Regulation No 94, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective April 30, 2008.
- H. Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance, Colorado Department of Public Health and Environment, Water Quality Control Division, effective December 2001.
- I. Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0, Colorado Department of Public Health and Environment, Water Quality Control Division, effective April 23, 2002.
- J. Determination of the Requirement to Include Water Quality Standards-Based Limits in CDPS Permits Based on Reasonable Potential Procedural Guidance, Colorado Department of Public Health and Environment, Water Quality Control Division, effective December 2002.
- K. The Colorado Mixing Zone Implementation Guidance, Colorado Department of Public Health and Environment, Water Quality Control Division, effective April 2002.
- L. Baseline Monitoring Frequency, Sample Type, and Reduced Monitoring Frequency Policy for Domestic and Industrial Wastewater Treatment Facilities, Water Quality Control Division Policy WQP-20, May 1, 2007.

- M. Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, Water Quality Control Division Policy WQP-24, March 10, 2008.
- N. Development Documents for Interim Final Effluent Limitations Guidelines and Proposed New Source Performance Standards for the Oil & Gas Extraction Point Source Category, U.S. Environmental Protection Agency, September, 1976.
- O. Technical Support Document for the 2006 Effluent Guidelines Program Plan, U.S. Environmental Protection Agency, December, 2006

VIII. PUBLIC NOTICE COMMENTS

AUTHORIZATION TO DISCHARGE UNDER THE
COLORADO DISCHARGE PERMIT SYSTEM

Permit No.: CO-0048020

Issued: December 28, 2009

Effective: February 1, 2010

- ✓ Page 3, paragraph A.1. – Treatment of produced required.
- ✓ Page 5, paragraph B.1 – “However, the permittee shall operated, at a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.”
- ✓ Fact Sheet, page 1 – Category Flow Range: “Process water from 5,000,000 to 19,000,000.
- ✓ Fact Sheet, page 1 – G. Facility Flows: 10.5 MGD
- ✓ Fact Sheet, page 2 – “Limits for Sodium Adsorption Ration (SAR) and Electrical Conductivity (EC) were added for protection of irrigated crops. The SAR and EC limits will indirectly result in a lower TDS level in the effluent and thus, continue to provide protection for livestock watering.”
- ✓ Fact Sheet, page 3 -- “No treatment of this discharge has historically been provided; however, active treatment is planned to remove sodium (and potentially other pollutants). All past outfalls (001A-008A) will be piped to a central location for treatment, and will discharge from one outfall.”
- ✓ Fact Sheet, page 8, last three paragraphs, page 9, first paragraph –

First, the continued practice of discharging the untreated produced water (i.e, high Sodium Adsorption Ratio, SAR, values and high sodium concentrations) into the Cucharas River, under specific hydrologic conditions, creates a known threat to the beneficial agricultural use of this state water by impairing the suitability of this river water when diverted for agricultural uses. This threat is heightened when there exists minimal upstream flow in the river to dilute the effluent entering from several tributaries. Specifically, there has been damage to corn fields, soils, and dairy cattle when water was diverted (Holita Ditch) from the Cucharas River to a storage pond (Holita Reservoir) and then and routed to the Corsentino Dairy for these agricultural uses. The damage was reported first reported in 2006 and has been confirmed by soil scientists from Colorado State University and USDA's National Salinity Team.

Second, the CBM operations were shut-down by the COGCC on July 7, 2007 and there has been no produced water discharged to surface waters since that date. Based on ongoing studies and evaluation of results, there is a current expectation that the CBM operations will be approved in early 2010 to resume operations.

Third, the CBM operator has been aware of the SAR and high sodium problems in the produced water for several years and has taken steps to identify and characterize treatment technologies that will be evaluated

for use in addressing this problem. The application for the renewal permit identifies a site for a treatment facility with a design capacity of 10 MGD.

Under Regulation No. 61, the Division can decide if a compliance schedule is warranted based on whether it is justified as being "appropriate" and will "achieve compliance" as soon as possible". If a compliance schedule was provided, then there would be a time period when the untreated produced water could be discharged while steps were taken by the CBM operator to implement treatment. During this time period, there would be no assurances to the public that water diverted from the Cucharas River downstream from the entrance of the untreated produced water would be consistently suitable for crop irrigation. The Division has decided that the permittee should install treatment in the period between now and the anticipated date for resuming operation and that based on the significant risk posed by the discharge of produced water and that any discharge must comply with the SAR and sodium requirements in the renewal permit.

- ✓ Appendix A, Water Quality Assessment, page 3 – Petroglyph discharge to Cucharas River.

**AUTHORIZATION TO DISCHARGE UNDER THE
COLORADO DISCHARGE PERMIT SYSTEM**

In compliance with the provisions of the Colorado Water Quality Control Act, (25-8-101 et seq., CRS, 1973 as amended), for both discharges to surface and ground waters, and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), for discharges to surface waters only, the

PETROGLYPH OPERATING COMPANY, INC.

is authorized to discharge from the Petroglyph Rohr Coalbed Methane Operation located **in the NW ¼ of S29, T9N, R67W; in Walsenberg CO: at 37° 34.956 latitude North and 104° 51.173 longitude West to the Cucharas River** in Huerfano County, approximately 4 miles southwest of Walsenberg, CO; 81055, in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I and II hereof. All discharges authorized herein shall be consistent with the terms and conditions of this permit.

The applicant may demand an adjudicatory hearing within thirty (30) days of the date of issuance of the final permit determination, per the Colorado Discharge Permit System Regulations, 61.7(1). Should the applicant choose to contest any of the effluent limitations, monitoring requirements or other conditions contained herein, the applicant must comply with Section 24-4-104 CRS and the Colorado Discharge Permit System Regulations. Failure to contest any such effluent limitation, monitoring requirement, or other condition, constitutes consent to the condition by the Applicant.

This permit and the authorization to discharge shall expire at midnight, January 31, 2015

Issued and Signed this 28th day of December, 2009

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT



Janet Kieler, Permits Section Manager
Water Quality Control Division

ISSUED AND SIGNED: DECEMBER 28, 2009

EFFECTIVE: FEBRUARY 1, 2010

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PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Effluent Limitations

Beginning no later than the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from outfall(s): 001A— Following treatment, prior to entering the Cucharas River, and MON1, at the same physical location as Outfall 001A, but referring to parameters that are monitor only.

In accordance with the Water Quality Control Commission Regulations for Effluent Limitations, Section 62.4, and the Colorado Discharge Permit System Regulations, Section 61.8(2), 5 C.C.R. 1002-61, the permitted discharge shall not contain effluent parameter concentrations which exceed the following limitations specified below or exceed the specified flow limitation.

2. Monitoring Frequency and Sample Type

In order to obtain an indication of the probable compliance or noncompliance with the effluent limitations specified in Part I.A, the permittee shall monitor all effluent parameters at the following frequencies. Such monitoring will begin immediately and last for the life of the permit unless otherwise noted. The results of such monitoring shall be reported on the Discharge Monitoring Report form (See Part I.D.)

Self-monitoring sampling by the permittee for compliance with the monitoring requirements specified above shall be performed at the following location(s): **001A and MON1.**

If the permittee, using an approved analytical method, monitors any parameter more frequently than required by this permit, then the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (DMRs) or other forms as required by the Division. Such increased frequency shall also be indicated.

Oil and Grease Monitoring: For every outfall with oil and grease monitoring, in the event an oil sheen or floating oil is observed, a grab sample shall be collected, analyzed, and reported on the appropriate DMR. In addition, corrective action shall be taken immediately to mitigate the discharge of oil and grease. A description of the corrective action taken should be included with the DMR.

Outfall 001A

<u>Effluent Parameter</u>	<u>Effluent Limitations Maximum Concentrations</u>				<u>Monitoring Requirements</u>	
	<u>30-Day Average</u>	<u>7-Day Average</u>	<u>Daily Maximum</u>	<u>2-Year Average</u>	<u>Frequency</u>	<u>Sample Type</u>
Effluent Flow (MGD)	10.5		Report		Continuous	Recorder
Temp Daily Max (°C) *			Report		Continuous	
Temp Daily MWAT (°C) *		30			Continuous	Recorder
pH (su)			6.5-9		Weekly	Grab
TSS (mg/l)	30	45			Weekly	Composite
Oil and Grease (mg/l)			10		Weekly	Visual
Al, TR (µg/l)	Report		Report	Report	Weekly	Composite
Fe, TR (µg/l)	1000			Report	Weekly	Composite
Pb, PD (µg/l)				Report	Weekly	Composite
Hg, Tot (µg/l)	Report			0.0015	Weekly	Composite
Se, PD (µg/l)	Report		Report	Report	Weekly	Composite
B, Tot (mg/l)	Report			0.11	Weekly	Composite
Calcium (mg/l)	Report		Report		Weekly	Composite
Magnesium (mg/l)	Report		Report		Weekly	Composite
Bicarbonate as HCO ₃ (mg/l)	Report		Report		Weekly	Composite
Sodium (mg/l)	Report		Report		Weekly	Composite
SAR calc limit (capped at 5.3)*	Report				Weekly	Calculated
SAR, adjusted effluent **	Report				Weekly	Calculated
SAR, Pass/Fail ***	Pass/Fail				Weekly	Calculated
EC (dS/cm)	0.36-1.1				Weekly	Composite
WET, chronic						
Pimephales Lethality			Stat Diff & IC25 ≥ IWC		Quarterly	3 Composites / Test
Ceriodaphnia Lethality					Quarterly	3 Composites / Test
Pimephales Toxicity			Report Stat Diff & IC25		Quarterly	3 Composites / Test
Ceriodaphnia Toxicity					Quarterly	3 Composites / Test

* This SAR limit is to be calculated using the actual measured EC value (30-day average) of the effluent and substituting this value in to the following equation to solve for SAR. The equation for determining the SAR limit is: $SAR = (7.1 * EC) - 2.48$. **This limitation is capped at 5.3.**

**The SAR value of the effluent is to be reported as the adjusted SAR. See the definitions section in Part I.C.17 for information on calculating the adjusted SAR value.

*** The permittee shall compare the SAR value of the effluent (adjusted SAR) to this calculated SAR limitation and report as Pass/Fail whether the effluent SAR meets this value. If the SAR effluent value (adjusted SAR) is less than or equal to the calculated limit, then the permittee will report "Pass" and if it is greater than the calculated limit the permittee will report "Fail."

OutfallMONI

<u>Effluent Parameter</u>	<u>Effluent Limitations Maximum Concentrations</u>				<u>Monitoring Requirements</u>	
	<u>30-Day Average *</u>	<u>7-Day Average *</u>	<u>Daily Maximum *</u>	<u>2-Year Average *</u>	<u>Frequency</u>	<u>Sample Type</u>
Be, Dis (µg/l)	Report		Report	Report	Monthly	Composite
Sulfide (mg/l)	Report		Report	Report	Monthly	Composite

B. TERMS AND CONDITIONS

1. Facilities Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee as necessary to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems when installed by the permittee only when necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, at a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance. Any sludge produced at the wastewater treatment facility shall be disposed of in accordance with State and Federal guidelines and regulations.

2. Chronic WET Testing-Outfall(s): 001A

a. Testing and Reporting Requirements

Tests shall be done at the frequency listed in Part I.A.2. Test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the reporting period during which the sample was taken. (i.e., WET testing results for the first calendar quarter ending March 31 shall be reported with the DMR due April 28.) The results shall be submitted on the Chronic Toxicity Test report form, available from the Division. Copies of these reports are to be submitted to both the Division and EPA along with the DMR.

The permittee shall conduct each chronic WET test in general accordance with methods described in Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA/600/4-89/001 or the most current edition, except as modified by the most current Division guidance document entitled Guidelines for Conducting Whole Effluent Toxicity Tests. The permittee shall conduct such tests using *Ceriodaphnia dubia* and fathead minnows.

b. Failure of Test and Division Notification

A chronic WET test is failed whenever there is a statistically significant difference in lethality between the control and any effluent concentration less than or equal to the instream waste concentration (IWC). The IWC for this permit has been determined to be 100. The permittee must provide written notification of the failure of a WET test to the Division, along with a statement as to whether a Preliminary Toxicity Investigation (PTI)/Toxicity Identification Evaluation (TIE) or accelerated testing is being performed. **Notification must be received by the Division within 21 calendar days of the demonstration of chronic WET in the routine required test.** Demonstration for the purposes of Parts I.B.3.b., c., d., e. and g. means no later than the last day of the laboratory test.

c. Automatic Compliance Schedule Upon Failure of Test

If a routine chronic WET test is failed, regardless of whether the limit is in effect, the following automatic compliance schedule shall apply. As part of this, the permittee shall either:

- i. Proceed to conduct the PTI/TIE investigation as described in Part I.B.3.d., or
- ii. Conduct accelerated testing using the single species found to be more sensitive.

If accelerated testing is being performed, the permittee shall provide written notification of the results within 14 calendar days of completion of the Pattern of Toxicity/No Toxicity demonstration. Testing will be at least once every two weeks for up to five tests until; 1) two consecutive tests fail or three of five tests fail, in which case a pattern of toxicity has been demonstrated or 2) two consecutive tests pass or three of five tests pass, in which case no pattern of toxicity has been found. If no pattern of toxicity is found the toxicity episode is considered to be ended and routine testing is to resume. If a pattern of toxicity is found, a PTI/TIE investigation is to be performed. If a pattern of toxicity is not demonstrated but a significant level of erratic toxicity is found, the Division may require an increased frequency of routine monitoring or some other modified approach.

d. PTI/TIE

The results of the PTI/TIE investigation are to be received by the Division within 120 days of the demonstration of chronic WET in the routine test, as defined above, or if accelerated testing is performed, the date the pattern of toxicity is demonstrated. A status report is to be provided to the Division at the 30, 60, and 90 day points of the PTI/TIE investigation. The Division may extend the time frame for investigation where reasonable justification exists. A request for an extension must be made in writing and received prior to the 120 day deadline. Such request must include a justification and supporting data for such an extension.

The permittee may use the time for investigation to conduct a PTI or move directly into the TIE. A PTI consists of a brief search for possible sources of WET, which might reveal causes of such toxicity and appropriate corrective actions more simply and cost effectively than a formal TIE. If the PTI allows resolution of the WET incident, the TIE need not necessarily be conducted. If, however, WET is not identified or resolved during the PTI, the TIE must be conducted within the allowed 120 day time frame.

Any permittee that is required to conduct a PTI/TIE investigation shall do so in conformance with the procedures identified in the following documents, or as subsequently updated: 1) Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I, EPA/600/6-91/005F May 92, 2) Methods for Aquatic Toxicity Identification Evaluations, Phase I Toxicity Characterization Procedures, EPA/600/6-91/003 Feb. 91 and 3) Methods for Aquatic Toxicity Identification Evaluations, Phase II Toxicity Identification Procedures, EPA/600/3-88/035 Feb. 1989.

A fourth document in this series is Methods for Aquatic Toxicity Identification Evaluations, Phase III Toxicity Confirmation Procedures, EPA/600/3-88/036 Feb. 1989. As indicated by the title, this procedure is intended to confirm that the suspected toxicant is truly the toxicant. This investigation is optional.

Within 90 days of the determination of the toxicant or no later than 210 days after demonstration of toxicity, whichever is sooner, a control program is to be developed and received by the Division. The program shall set down a method and procedure for elimination of the toxicity to acceptable levels.

e. Request For Relief

The permittee may request relief from further investigation and testing where the toxicant has not been determined and suitable treatment does not appear possible. In requesting such relief, the permittee shall submit material sufficient to establish the following:

- i. It has complied with terms and conditions of the permit compliance schedule for the PTI/TIE investigation and other appropriate conditions as may have been required by the WQCD;
- ii. During the period of the toxicity incident it has been in compliance with all other permit conditions, including, in the case of a POTW, pretreatment requirements;
- iii. During the period of the toxicity incident it has properly maintained and operated all facilities and systems of treatment and control; and
- iv. Despite the circumstances described in paragraphs (i) and (iii) above, the source and/or cause of toxicity could not be located or resolved.

If deemed appropriate by the Division, the permit or the compliance schedule may be modified to revise the ongoing monitoring and toxicity investigation requirements to avoid an unproductive expenditure of the permittee's resources, provided that the underlying obligation to eliminate any continuing exceedance of the toxicity limit shall remain.

f. Spontaneous Disappearance

If toxicity spontaneously disappears at any time after a test failure, the permittee shall notify the Division in writing within 14 days of a demonstration of disappearance of the toxicity. The Division may require the permittee to develop and submit additional information, which may include, but is not limited to, the results of additional testing. If no pattern

of toxicity is identified or recurring toxicity is not identified, the toxicity incident response is considered closed and normal WET testing shall resume.

g. Toxicity Reopener

This permit may be reopened and modified (following proper administrative procedures) to include new compliance dates, additional or modified numerical permit limitations, a new or different compliance schedule, a change in the whole effluent toxicity testing protocol, or any other conditions related to the control of toxicants if one or more of the following events occur:

- i. Toxicity has been demonstrated in the effluent and the permit does not contain a toxicity limitation.
- ii. The PTI/TIE results indicate that the identified toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits and the permit issuing authority agrees that the control of such toxicants through numerical limits is the most appropriate course of action.
- iii. The PTI/TIE reveals other unique conditions or characteristics, which, in the opinion of the permit issuing authority, justify the incorporation of unanticipated special conditions in the permit.

C. DEFINITIONS OF TERMS

1. Antidegradation limits apply as the average of all data collected for months in that group during a rolling 24-month period. These limits become effective after data has been collected for all months in the group during the 24 months following permit issuance. Where antidegradation groups are not indicated, data from all months will be utilized to determine the reported value and the limit will become effective in the 24th month in which the permit is effective.
2. "Chronic lethality" occurs when a statistically significant difference, at the 95% confidence level, occurs in the chronic test between the mortality of the test species in 100 % effluent (the chronic IWC = 100%) and the control.
3. "Composite" sample is a minimum of four (4) grab samples collected at equally spaced two (2) hour intervals and proportioned according to flow.
4. "Continuous" measurement, is a measurement obtained from an automatic recording device which continually measures provides measurements.
5. "Daily Maximum limitation" for all parameters except temperature, means the limitation for this parameter shall be applied as an instantaneous maximum (or, for pH or DO, instantaneous minimum) value. The instantaneous value is defined as the analytical result of any individual sample. DMRs shall include the maximum (and/or minimum) of all instantaneous values within the calendar month. Any instantaneous value beyond the noted daily maximum limitation for the indicated parameter shall be considered a violation of this permit.
6. "Daily Maximum Temperature (DM)" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as the highest two-hour average water temperature recorded during a given 24-hour period.
7. "Dissolved (D) metals fraction" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as that portion of a water and suspended sediment sample which passed through a 0.40 or 0.45 UM (micron) membrane filter. Determinations of "dissolved" constituents are made using the filtrate. This may include some very small (colloidal) suspended particles which passed through the membrane filter as well as the amount of substance present in true chemical solution.
8. "Grab" sample, is a single "dip and take" sample so as to be representative of the parameter being monitored.
9. "In-situ" measurement is defined as a single reading, observation or measurement taken in the field at the point of discharge.

10. "Instantaneous" measurement is a single reading, observation, or measurement performed on site using existing monitoring facilities.
11. "Maximum Weekly Average Temperature (MWAT)" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as an implementation statistic that is calculated from field monitoring data. The MWAT is calculated as the largest mathematical mean of multiple, equally spaced, daily temperatures over a seven-day consecutive period, with a minimum of three data points spaced equally through the day. For lakes and reservoirs, the MWAT is assumed to be equivalent to the maximum WAT from at least three profiles distributed throughout the growing season (generally July-September).
12. "Potentially dissolved (PD) metals fraction" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as that portion of a constituent measured from the filtrate of a water and suspended sediment sample that was first treated with nitric acid to a pH of 2 or less and let stand for 8 to 96 hours prior to sample filtration using a 0.40 or 0.45-UM (micron) membrane filter. Note the "potentially dissolved" method cannot be used where nitric acid will interfere with the analytical procedure used for the constituent measured.
13. "Quarterly measurement frequency" means samples may be collected at any time during the calendar quarter if a continual discharge occurs. If the discharge is intermittent, then samples shall be collected during the period that discharge occurs.
14. SAR and Adjusted SAR - The equation for calculation of SAR-adj is:

$$SAR-adj = \frac{Na^+}{\sqrt{\frac{Ca_x + Mg^{++}}{2}}}$$

Where:

Na^+ = Sodium in the effluent reported in meq/l

Mg^{++} = Magnesium in the effluent reported in meq/l

Ca_x = calcium (in meq/l) in the effluent modified due to the ratio of bicarbonate to calcium

The values for sodium (Na^+), calcium (Ca^{++}), bicarbonate (HCO_3^-) and magnesium (Mg^{++}) in this equation are expressed in units of milliequivalents per liter (meq/l). Generally, data for these parameters are reported in terms of mg/l, which must then be converted to calculate the SAR. The conversions are:

$$meq/l = \frac{\text{Concentration in mg/l}}{\text{Equivalent weight in mg/meq}}$$

Where the equivalent weights are determined based on the atomic weight of the element divided by the ion's charge:

Na^+ = 23.0 mg/meq (atomic weight of 23, charge of 1)

Ca^{++} = 20.0 mg/meq (atomic weight of 40.078, charge of 2)

Mg^{++} = 12.15 mg/meq (atomic weight of 24.3, charge of 2)

HCO_3^- = 61 mg/mep (atomic weight of 61, charge of 1)

The EC and the HCO_3^-/Ca^{++} ratio in the effluent (calculated by dividing the HCO_3^- in meq/l by the Ca^{++} in meq/l) are used to determine the Ca_x using the following table.

Table – Modified Calcium Determination for Adjusted Sodium Adsorption Ratio

		HCO_3^-/Ca Ratio And $EC^{1,2,3}$											
		Salinity of Effluent (EC)(dS/m)											
Ratio of HCO_3^-/Ca		0.1	0.2	0.3	0.5	0.7	1.0	1.5	2.0	3.0	4.0	6.0	8.0
	.05	13.20	13.61	13.92	14.40	14.79	15.26	15.91	16.43	17.28	17.97	19.07	19.94
	.10	8.31	8.57	8.77	9.07	9.31	9.62	10.02	10.35	10.89	11.32	12.01	12.56
	.15	6.34	6.54	6.69	6.92	7.11	7.34	7.65	7.90	8.31	8.64	9.17	9.58

.20	5.24	5.40	5.52	5.71	5.87	6.06	6.31	6.52	6.86	7.13	7.57	7.91
.25	4.51	4.65	4.76	4.92	5.06	5.22	5.44	5.62	5.91	6.15	6.52	6.82
.30	4.00	4.12	4.21	4.36	4.48	4.62	4.82	4.98	5.24	5.44	5.77	6.04
.35	3.61	3.72	3.80	3.94	4.04	4.17	4.35	4.49	4.72	4.91	5.21	5.45
.40	3.30	3.40	3.48	3.60	3.70	3.82	3.98	4.11	4.32	4.49	4.77	4.98
.45	3.05	3.14	3.22	3.33	3.42	3.53	3.68	3.80	4.00	4.15	4.41	4.61
.50	2.84	2.93	3.00	3.10	3.19	3.29	3.43	3.54	3.72	3.87	4.11	4.30
.75	2.17	2.24	2.29	2.37	2.43	2.51	2.62	2.70	2.84	2.95	3.14	3.28
1.00	1.79	1.85	1.89	1.96	2.01	2.09	2.16	2.23	2.35	2.44	2.59	2.71
1.25	1.54	1.59	1.63	1.68	1.73	1.78	1.86	1.92	2.02	2.10	2.23	2.33
1.50	1.37	1.41	1.44	1.49	1.53	1.58	1.65	1.70	1.79	1.86	1.97	2.07
1.75	1.23	1.27	1.30	1.35	1.38	1.43	1.49	1.54	1.62	1.68	1.78	1.86
2.00	1.13	1.16	1.19	1.23	1.26	1.31	1.36	1.40	1.48	1.54	1.63	1.70
2.25	1.04	1.08	1.10	1.14	1.17	1.21	1.26	1.30	1.37	1.42	1.51	1.58
2.50	0.97	1.00	1.02	1.06	1.09	1.12	1.17	1.21	1.27	1.32	1.40	1.47
3.00	0.85	0.89	0.91	0.94	0.96	1.00	1.04	1.07	1.13	1.17	1.24	1.30
3.50	0.78	0.80	0.82	0.85	0.87	0.90	0.94	0.97	1.02	1.06	1.12	1.17
4.00	0.71	0.73	0.75	0.78	0.80	0.82	0.86	0.88	0.93	0.97	1.03	1.07
4.50	0.66	0.68	0.69	0.72	0.74	0.76	0.79	0.82	0.86	0.90	0.95	0.99
5.00	0.61	0.63	0.65	0.67	0.69	0.71	0.74	0.76	0.80	0.83	0.88	0.93
7.00	0.49	0.50	0.52	0.53	0.55	0.57	0.59	0.61	0.64	0.67	0.71	0.74
10.00	0.39	0.40	0.41	0.42	0.43	0.45	0.47	0.48	0.51	0.53	0.56	0.58
20.00	0.24	0.25	0.26	0.26	0.27	0.28	0.29	0.30	0.32	0.33	0.35	0.37
30.00	0.18	0.19	0.20	0.20	0.21	0.21	0.22	0.23	0.24	0.25	0.27	0.28

¹ Adapted from Suarez (1981).

² Assumes a soil source of calcium from lime (CaCO_3) or silicates; no precipitation of magnesium, and partial pressure of CO_2 near the soil surface (P_{CO_2}) is 0.0007 atmospheres.

³ Ca_x , HCO_3^- , Ca are reported in meq/l; EC is in dS/m (deciSiemens per meter).

Because values will not always be quantified at the exact EC or $\text{HCO}_3^-/\text{Ca}^{++}$ ratio in the table, the resulting Ca_x must be determined based on the closest value to the calculated value. For example, for a calculated EC of 2.45 dS/m, the column for the EC of 2.0 would be used. However, for a calculated EC of 5.1, the corresponding column for the EC of 6.0 would be used. Similarly, for a $\text{HCO}_3^-/\text{Ca}^{++}$ ratio of 25.1, the row for the 30 ratio would be used.

The Division acknowledges that some effluents may have electrical conductivity levels that fall outside of this table, and others have bicarbonate to calcium ratios that fall outside this table. For example, some data reflect $\text{HCO}_3^-/\text{Ca}^{++}$ ratios greater than 30 due to bicarbonate concentrations reported greater than 1000 mg/l versus calcium concentrations generally less than 10 mg/l (i.e., corresponding to $\text{HCO}_3^-/\text{Ca}^{++}$ ratios greater than 100). Despite these high values exceeding the chart's boundaries, it is noted that the higher the $\text{HCO}_3^-/\text{Ca}^{++}$ ratio, the greater the SAR-adj. Thus, using the Ca_x values corresponding to the final row containing bicarbonate/calcium ratios of 30, the permittee will actually calculate an SAR-adj that is less than the value calculated if additional rows reflecting $\text{HCO}_3^-/\text{Ca}^{++}$ ratios of greater than 100 were added.

15. "Recorder" requires the continuous operation of a chart and/or totalizer (or drinking water rotor meters or pump hour meters where previously approved.)
16. "Seven (7) day average" means, with the exception of fecal coliform or *E. coli* bacteria (see geometric mean), the arithmetic mean of all samples collected in a seven (7) consecutive day period. When calculating the 7-day average, a value of zero should be used in place of any value that is less than the reporting limit. If all values are less than the reporting limit, "<x" should be reported, where "x" is the reporting limit. Otherwise, the calculated average shall be reported. Such seven (7) day averages shall be calculated for all calendar weeks, which are defined as beginning on Sunday and ending on Saturday. If the calendar week overlaps two months (i.e. the Sunday is in one month and the Saturday in the following month), the seven (7)

day average calculated for that calendar week shall be associated with the month that contains the Saturday. Samples may not be used for more than one (1) reporting period.

17. "Thirty (30) day average" means, except for fecal coliform or *E. coli* bacteria (see geometric mean), the arithmetic mean of all samples collected during a thirty (30) consecutive-day period. When calculating the 30-day average, a value of zero should be used in place of any value that is less than the reporting limit. If all values are less than the reporting limit, "<x" should be reported, where "x" is the reporting limit. Otherwise, the calculated average shall be reported. The permittee shall report the appropriate mean of all self-monitoring sample data collected during the calendar month on the Discharge Monitoring Reports. Samples shall not be used for more than one (1) reporting period.
18. "Total Metals" means the concentration of metals determined on an unfiltered sample following vigorous digestion (Section 4.1.3), or the sum of the concentrations of metals in both the dissolved and suspended fractions, as described in Manual of Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, March 1979, or its equivalent.
19. "Total Recoverable Metals" means that portion of a water and suspended sediment sample measured by the total recoverable analytical procedure described in Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, March 1979 or its equivalent.
20. "Twenty four (24) hour composite" sample is a combination of at least eight (8) sample aliquots of at least 100 milliliters, collected at equally spaced intervals during the operating hours of a facility over a twenty-four (24) hour period. For volatile pollutants, aliquots must be combined in the laboratory immediately before analysis. The composite must be flow proportional; either the time interval between each aliquot or the volume of each aliquot must be proportional to either the wastewater or effluent flow at the time of sampling or the total wastewater or effluent flow since the collection of the previous aliquot. Aliquots may be collected manually or automatically.
21. "Twice Monthly" monitoring frequency means that two samples shall be collected each calendar month on separate weeks with at least one full week between the two sample dates. Also, there shall be at least one full week between the second sample of a month and the first sample of the following month.
22. "Visual" observation is observing the discharge to check for the presence of a visible sheen or floating oil.
23. "Water Quality Control Division" or "Division" means the state Water Quality Control Division as established in 25-8-101 et al.)

Additional relevant definitions are found in the Colorado Water Quality Control Act, CRS §§ 25-8-101 et seq., the Colorado Discharge Permit System Regulations, Regulation 61 (5 CCR 1002-61) and other applicable regulations.

D. GENERAL MONITORING, SAMPLING AND REPORTING REQUIREMENTS

1. Routine Reporting of Data

Reporting of the data gathered in compliance with Part I.B.1 shall be on a **monthly** basis. Reporting of all data gathered shall comply with the requirements of Part I.E. (General Requirements). Monitoring results shall be summarized for each calendar month and reported on Division approved discharge monitoring report (DMR) forms (EPA form 3320-1). One form shall be mailed to the Water Quality Control Division, as indicated below, so that the DMR is received no later than the 28th day of the following month (for example, the DMR for the first calendar quarter must be received by the Division by April 28th). If no discharge occurs during the reporting period, "No Discharge" shall be reported.

The DMR forms consist of four pages - the top "original" copy, and three attached no-carbon-required copies. After the DMR form has been filled out and signed, the four copies must be separated and distributed as follows:

The first original signed copy of each discharge monitoring report (DMR) shall be submitted to the Division at the following address:

Colorado Department of Public Health and Environment
Water Quality Control Division

WQCD-P-B2
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Additional copies are for the permittee records. The Discharge Monitoring Report forms shall be filled out accurately and completely in accordance with requirements of this permit and the instructions on the forms. They shall be signed by an authorized person as identified in Part I.E.6.

2. **Representative Sampling**

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and approval by the Division.

3. **Analytical and Sampling Methods for Monitoring**

The permittee shall install, calibrate, use and maintain monitoring methods and equipment, including biological and indicated pollutant monitoring methods. All sampling shall be performed by the permittee according to specified methods in 40 C.F.R. Part 136; methods approved by EPA pursuant to 40 C.F.R. Part 136; or methods approved by the Division, in the absence of a method specified in or approved pursuant to 40 C.F.R. part 136. **The analytical method selected for a parameter shall be the one that can measure the lowest practical quantitation limit (PQL) for that parameter unless the permit limitation or stream standard for those parameters not limited, is within the testing range of another approved method.** When requested in writing, the Division may approve an alternative analytical procedure or any significant modification to an approved procedure.

When the analytical method which complies with the above requirements has a PQL greater than the permit limit, the permittee shall report "BDL" on the DMR. Such reports will not be considered as violations of the permit limit, as long as the lowest available PQL is used for the analysis. When the analytical method which complies with the above requirements has a PQL that is equal to or less than the permit limitation, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR. For parameters that have only a monitoring or report only limitation, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR.

The present lowest PQLs for specific parameters, as determined by the State Laboratory (November 2008) are provided below. If the analytical method cannot achieve a PQL that is less than or equal to the permit limit, then the method, or a more precise method, must achieve a PQL that is less than or equal to the PQL in the table below. A listing of the PQLs for organic parameters that must meet the above requirement can be found in the Division's Practical Quantitation Limitation Guidance Document, July 2008.

Parameter	Practical Quantitation Limits,	Parameter	Practical Quantitation Limits, $\mu\text{g/l}$
Aluminum	50 $\mu\text{g/l}$	Manganese	2 $\mu\text{g/l}$
Ammonia	1 mg/l	Mercury	0.1 $\mu\text{g/l}$
Arsenic	1 $\mu\text{g/l}$	Mercury (low-level)	0.003 $\mu\text{g/l}$
Barium	5 $\mu\text{g/l}$	Nickel	50 $\mu\text{g/l}$
Beryllium	1 $\mu\text{g/l}$	N-Ammonia	50 $\mu\text{g/l}$
BOD / CBOD	1 mg/l	N Nitrate/Nitrite	0.5 mg/l
Boron	50 $\mu\text{g/l}$	N-Nitrate	50 $\mu\text{g/l}$
Cadmium	1 $\mu\text{g/l}$	N-Nitrite	10 $\mu\text{g/l}$
Calcium	20 $\mu\text{g/l}$	Total Nitrogen	0.5 mg/l
Chloride	2 mg/l	Phenols	100 $\mu\text{g/l}$
Chlorine	0.1 mg/l	Phosphorus	10 $\mu\text{g/l}$
Total Residual Chlorine		Radium 226	1 pCi/l
DPD colorimetric	0.10 mg/l	Radium 228	1 pCi/l
Amperometric titration	0.05 mg/l	Selenium	1 $\mu\text{g/l}$
Chromium	20 $\mu\text{g/l}$	Silver	0.5 $\mu\text{g/l}$
Chromium, Hexavalent	20 $\mu\text{g/l}$	Sodium	0.2 mg/l
Copper	5 $\mu\text{g/l}$	Sulfate	5 mg/l
Cyanide (Direct / Distilled)	10 $\mu\text{g/l}$	Sulfide	0.2 mg/l
Cyanide, WAD+A47	5 $\mu\text{g/l}$	Total Dissolved Solids	10 mg/l
Fluoride	0.1 mg/l	Total Suspended Solids	10 mg/l
Iron	10 $\mu\text{g/l}$	Thallium	1 $\mu\text{g/l}$
Lead	1 $\mu\text{g/l}$	Uranium	1 $\mu\text{g/l}$
Magnesium	20 $\mu\text{g/l}$	Zinc	10 $\mu\text{g/l}$

These limits apply to the total recoverable or the potentially dissolved fraction of metals.

For hexavalent chromium, samples must be unacidified so dissolved concentrations will be measured rather than potentially dissolved concentrations. The procedure for determining settleable solids is contained in 40 CFR 434.64. The practical quantitation limit for measuring settleable solids under this part shall be 0.4 ml/l.

In the calculation of average concentrations, those analytical results that are less than the practical quantitation limit shall be considered to be zero for calculation purposes. If all individual analytical results that would be used in the calculations are below the practical quantitation limit, then "less than x", where x is the practical quantitation limit, shall be reported on the monthly DMR. Otherwise, report the calculated value.

4. Records

The permittee shall establish and maintain records. Those records shall include the following:

- The date, type, exact location, and time of sampling or measurements;
- The individual(s) who performed the sampling or measurements;
- The date(s) the analyses were performed;
- The individual(s) who performed the analyses;
- The analytical techniques or methods used;
- The results of such analyses; and
- Any other observations which may result in an impact on the quality or quantity of the discharge as indicated in 40 CFR 122.44 (i)(1)(iii).

The permittee shall retain for a minimum of three (3) years records of all monitoring information, including all original strip chart recordings for continuous monitoring instrumentation, all calibration and maintenance records, copies of all reports required by this permit and records of all data used to complete the application for this permit. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the Division or EPA.

5. Flow Measuring Device

If not already a part of the permitted facility, within ninety (90) days after the effective date of the permit, a flow measuring device shall be installed to give representative values of effluent quantities at the respective discharge points. Unless specifically exempted, or modified in Part I.E.5 of this permit, a flow measuring device will be applicable at all designated discharge points.

At the request of the Division, the permittee shall show proof of the accuracy of any flow-measuring device used in obtaining data submitted in the monitoring report. The flow-measuring device must indicate values within ten (10) percent of the actual flow being discharged from the facility.

6. Signatory and Certification Requirements

- a. All reports and other information required by the Division, shall be signed and certified for accuracy by the permittee in accord with the following criteria:
 - i) In the case of corporations, by a responsible corporate officer. For purposes of this section, the responsible corporate officer is responsible for the overall operation of the facility from which the discharge described in the form originates;
 - ii) In the case of a partnership, by a general partner;
 - iii) In the case of a sole proprietorship, by the proprietor;
 - iv) In the case of a municipal, state, or other public facility, by either a principal executive officer, or ranking elected official. For purposes of this section, a principal executive officer has responsibility for the overall operation of the facility from which the discharge originates;
 - v) By a duly authorized representative of a person described above, only if:
 - 1) The authorization is made in writing by a person described in i, ii, iii, or iv above;
 - 2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and,
 - 3) The written authorization is submitted to the Division.
- b. If an authorization as described in this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of this section must be submitted to the Division prior to or together with any reports, information, or applications to be signed by an authorized representative.

The permittee, or the duly authorized representative shall make and sign the following certification on all such documents:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

PART II

A. NOTIFICATION REQUIREMENTS

1. Notification to Parties

All notification requirements under this section shall be directed as follows:

- a. Oral Notifications, during normal business hours shall be to:

Water Quality Protection Section - Industrial Compliance Program
Water Quality Control Division
Telephone: (303) 692-3500

- b. Written notification shall be to:

Water Quality Protection Section - Industrial Compliance Program
Water Quality Control Division
Colorado Department of Public Health and Environment
WQCD-WQP-B2
4300 Cherry Creek Drive South
Denver, CO 80246-1530

2. Change in Discharge

The permittee shall notify the Division, in writing, of any planned physical alterations or additions to the permitted facility. Notice is required only when:

- a. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged, or;
- b. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported pursuant to an approved land application plan.

The permittee shall give advance notice to the Division of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

Whenever notification of any planned physical alterations or additions to the permitted facility is required pursuant to this section, the permittee shall furnish the Division such plans and specifications which the Division deems reasonably necessary to evaluate the effect on the discharge, the stream, or ground water. If the Division finds that such new or altered discharge might be inconsistent with the conditions of the permit, the Division shall require a new or revised permit application and shall follow the procedures specified in Sections 61.5 through 61.6, and 61.15 of the Colorado Discharge Permit System Regulations.

3. Special Notifications - Definitions

- a. Bypass: The intentional diversion of waste streams from any portion of a treatment facility.
- b. Severe Property Damage: Substantial physical damage to property at the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. It does not mean economic loss caused by delays in production.
- c. Upset: An exceptional incident in which there is unintentional and temporary noncompliance with permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance

to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

4. Noncompliance Notification

- a. If, for any reason, the permittee does not comply with or will be unable to comply with any discharge limitations or standards specified in this permit, the permittee shall, at a minimum, provide the Division and EPA with the following information:
 - i) A description of the discharge and cause of noncompliance;
 - ii) The period of noncompliance, including exact dates and times and/or the anticipated time when the discharge will return to compliance; and
 - iii) Steps being taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.
- b. The permittee shall report the following circumstances orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances, and shall mail to the Division a written report containing the information requested in Part II.A.4 (a) within five (5) days after becoming aware of the following circumstances:
 - i) Circumstances leading to any noncompliance which may endanger health or the environment regardless of the cause of the incident;
 - ii) Circumstances leading to any unanticipated bypass which exceeds any effluent limitations in the permit;
 - iii) Circumstances leading to any upset which causes an exceedance of any effluent limitation in the permit;
 - iv) Daily maximum violations for any of the pollutants limited by Part I.A of this permit and specified as requiring 24-hour notification. This includes any toxic pollutant or hazardous substance or any pollutant specifically identified as the method to control any toxic pollutant or hazardous substance.
- c. The permittee shall report instances of non-compliance which are not required to be reported within 24-hours at the time Discharge Monitoring Reports are submitted. The reports shall contain the information listed in sub-paragraph (a) of this section.

5. Other Notification Requirements

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule in the permit shall be submitted no later than fourteen (14) days following each scheduled date, unless otherwise provided by the Division.

The permittee shall notify the Division, in writing, thirty (30) days in advance of a proposed transfer of permit as provided in Part II.B.3.

The permittee's notification of all anticipated noncompliance does not stay any permit condition.

All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Division as soon as they know or have reason to believe:

- a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
 - i) One hundred micrograms per liter (100 µg/l);
 - ii) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol; and one milligram per liter (1.0 mg/l) for antimony;

- iii) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with Section 61.4(2)(g).
 - iv) The level established by the Division in accordance with 40 C.F.R. § 122.44(f).
- b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
- i) Five hundred micrograms per liter (500 µg/l);
 - ii) One milligram per liter (1 mg/l) for antimony; and
 - iii) Ten (10) times the maximum concentration value reported for that pollutant in the permit application.
 - iv) The level established by the Division in accordance with 40 C.F.R. § 122.44(f).

6. Bypass Notification

If the permittee knows in advance of the need for a bypass, a notice shall be submitted, at least ten days before the date of the bypass, to the Division. The bypass shall be subject to Division approval and limitations imposed by the Division. Violations of requirements imposed by the Division will constitute a violation of this permit.

7. Upsets

a. Effect of an Upset

An upset constitutes an affirmative defense to an action brought for noncompliance with permit effluent limitations if the requirements of paragraph (b) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

b. Conditions Necessary for a Demonstration of Upset

A permittee who wishes to establish the affirmative defense of upset shall demonstrate through properly signed contemporaneous operating logs, or other relevant evidence that:

- i) An upset occurred and that the permittee can identify the specific cause(s) of the upset; and
- ii) The permitted facility was at the time being properly operated and maintained; and
- iii) The permittee submitted proper notice of the upset as required in Part II.A.4. of this permit (24-hour notice); and
- iv) The permittee complied with any remedial measure necessary to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

In addition to the demonstration required above, a permittee who wishes to establish the affirmative defense of upset for a violation of effluent limitations based upon water quality standards shall also demonstrate through monitoring, modeling or other methods that the relevant standards were achieved in the receiving water.

c. Burden of Proof

In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

8. Discharge Point

Any discharge to the waters of the State from a point source other than specifically authorized by this permit is prohibited.

9. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee as necessary to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance and adequate laboratory and process controls, including appropriate quality assurance procedures (40 CFR 122.41(e)). This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when necessary to achieve compliance with the conditions of the permit.

10. Minimization of Adverse Impact

The permittee shall take all reasonable steps to minimize or prevent any discharge of sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. As necessary, accelerated or additional monitoring to determine the nature and impact of the noncomplying discharge is required.

11. Removed Substances

Solids, sludges, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed in accordance with applicable state and federal regulations.

For all domestic wastewater treatment works, at industrial facilities, the permittee shall dispose of sludge in accordance with all State and Federal regulations.

12. Submission of Incorrect or Incomplete Information

Where the permittee failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or report to the Division, the permittee shall promptly submit the relevant information which was not submitted or any additional information needed to correct any erroneous information previously submitted.

13. Bypass

a. Bypasses are prohibited and the Division may take enforcement action against the permittee for bypass, unless:

- i) The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;
- ii) There were no feasible alternatives to bypass such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
- iii) Proper notices were submitted in compliance with Part II.A.4.

b. "Severe property damage" as used in this Subsection means substantial physical damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

c. The permittee may allow a bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance or to assure optimal operation. These bypasses are not subject to the provisions of paragraph (a) above.

d. The Division may approve an anticipated bypass, after considering adverse effects, if the Division determines that the bypass will meet the conditions specified in paragraph (a) above.

14. Reduction, Loss, or Failure of Treatment Facility

The permittee has the duty to halt or reduce any activity if necessary to maintain compliance with the effluent limitations of the permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production, control sources of wastewater, or all discharges, until the facility is restored or an alternative method of treatment is provided. This provision also applies to power failures, unless an alternative power source sufficient to operate the wastewater control facilities is provided.

It shall not be a defense for a permittee in an enforcement action that it would be necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

B. RESPONSIBILITIES

1. Inspections and Right to Entry

The permittee shall allow the Division and/or the authorized representative, upon the presentation of credentials:

- a. To enter upon the permittee's premises where a regulated facility or activity is located or in which any records are required to be kept under the terms and conditions of this permit;
- b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit and to inspect any monitoring equipment or monitoring method required in the permit; and
- c. To enter upon the permittee's premises in a reasonable manner and at a reasonable time to inspect and/or investigate, any actual, suspected, or potential source of water pollution, or to ascertain compliance or non compliance with the Colorado Water Quality Control Act or any other applicable state or federal statute or regulation or any order promulgated by the Division. The investigation may include, but is not limited to, the following: sampling of any discharge and/or process waters, the taking of photographs, interviewing of any person having knowledge related to the discharge permit or alleged violation, access to any and all facilities or areas within the permittee's premises that may have any affect on the discharge, permit, or alleged violation. Such entry is also authorized for the purpose of inspecting and copying records required to be kept concerning any effluent source.
- d. The permittee shall provide access to the Division to sample the discharge at a point after the final treatment process but prior to the discharge mixing with state waters upon presentation of proper credentials.

In the making of such inspections, investigations, and determinations, the Division, insofar as practicable, may designate as its authorized representatives any qualified personnel of the Department of Agriculture. The Division may also request assistance from any other state or local agency or institution.

2. Duty to Provide Information

The permittee shall furnish to the Division, within a reasonable time, any information which the Division may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Division, upon request, copies of records required to be kept by this permit.

3. Transfer of Ownership or Control

- a. Except as provided in paragraph b. of this section, a permit may be transferred by a permittee only if the permit has been modified or revoked and reissued as provided in Section 61.8(8) of the Colorado Discharge Permit System Regulations, to identify the new permittee and to incorporate such other requirements as may be necessary under the Federal Act.
- b. A permit may be automatically transferred to a new permittee if:
 - i) The current permittee notifies the Division in writing 30 days in advance of the proposed transfer date; and

- ii) The notice includes a written agreement between the existing and new permittee(s) containing a specific date for transfer of permit responsibility, coverage and liability between them; and
- iii) The Division does not notify the existing permittee and the proposed new permittee of its intent to modify, or revoke and reissue the permit.
- iv) Fee requirements of the Colorado Discharge Permit System Regulations, Section 61.15, have been met.

4. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Clean Water Act and the Colorado Discharge Permit System Regulations 5 CCR 1002-61, Section 61.5(4), all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division and the Environmental Protection Agency.

The name and address of the permit applicant(s) and permittee(s), permit applications, permits and effluent data shall not be considered confidential. Knowingly making false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Clean Water Act, and Section 25-8-610 C.R.S.

5. Modification, Suspension, Revocation, or Termination of Permits By the Division

The filing of a request by the permittee for a permit modification, revocation and reissuance, termination or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

- a. A permit may be modified, suspended, or terminated in whole or in part during its term for reasons determined by the Division including, but not limited to, the following:
 - i) Violation of any terms or conditions of the permit;
 - ii) Obtaining a permit by misrepresentation or failing to disclose any fact which is material to the granting or denial of a permit or to the establishment of terms or conditions of the permit; or
 - iii) Materially false or inaccurate statements or information in the permit application or the permit.
 - iv) A determination that the permitted activity endangers human health or the classified or existing uses of state waters and can only be regulated to acceptable levels by permit modifications or termination.
- b. A permit may be modified in whole or in part for the following causes, provided that such modification complies with the provisions of Section 61.10 of the Colorado Discharge Permit System Regulations:
 - i) There are material and substantial alterations or additions to the permitted facility or activity which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit.
 - ii) The Division has received new information which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of different permit conditions at the time of issuance. For permits issued to new sources or new dischargers, this cause includes information derived from effluent testing required under Section 61.4(7)(e) of the Colorado Discharge Permit System Regulations. This provision allows a modification of the permit to include conditions that are less stringent than the existing permit only to the extent allowed under Section 61.10 of the Colorado Discharge Permit System Regulations.
 - iii) The standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued. Permits may be modified during their terms for this cause only as follows:
 - (A) The permit condition requested to be modified was based on a promulgated effluent limitation guideline, EPA approved water quality standard, or an effluent limitation set forth in 5 CCR 1002-62, § 62 et seq.; and

- (B) EPA has revised, withdrawn, or modified that portion of the regulation or effluent limitation guideline on which the permit condition was based, or has approved a Commission action with respect to the water quality standard or effluent limitation on which the permit condition was based; and
 - (C) The permittee requests modification after the notice of final action by which the EPA effluent limitation guideline, water quality standard, or effluent limitation is revised, withdrawn, or modified; or
 - (D) For judicial decisions, a court of competent jurisdiction has remanded and stayed EPA promulgated regulations or effluent limitation guidelines, if the remand and stay concern that portion of the regulations or guidelines on which the permit condition was based and a request is filed by the permittee in accordance with this Regulation, within ninety (90) days of judicial remand.
- iv) The Division determines that good cause exists to modify a permit condition because of events over which the permittee has no control and for which there is no reasonable available remedy.
 - v) The permittee has received a variance.
 - vi) When required to incorporate applicable toxic effluent limitation or standards adopted pursuant to § 307(a) of the Federal act.
 - vii) When required by the reopener conditions in the permit.
 - viii) As necessary under 40 C.F.R. 403.8(e), to include a compliance schedule for the development of a pretreatment program.
 - ix) When the level of discharge of any pollutant which is not limited in the permit exceeds the level which can be achieved by the technology-based treatment requirements appropriate to the permittee under Section 61.8(2) of the Colorado Discharge Permit System Regulations.
 - x) To establish a pollutant notification level required in Section 61.8(5) of the Colorado Discharge Permit System Regulations.
 - xi) To correct technical mistakes, such as errors in calculation, or mistaken interpretations of law made in determining permit conditions, to the extent allowed in Section 61.10 of the Colorado State Discharge Permit System Regulations.
 - xii) When required by a permit condition to incorporate a land application plan for beneficial reuse of sewage sludge, to revise an existing land application plan, or to add a land application plan.
 - xiii) For any other cause provided in Section 61.10 of the Colorado Discharge Permit System Regulations.
- c. At the request of a permittee, the Division may modify or terminate a permit and issue a new permit if the following conditions are met:
 - i) The Regional Administrator has been notified of the proposed modification or termination and does not object in writing within thirty (30) days of receipt of notification,
 - ii) The Division finds that the permittee has shown reasonable grounds consistent with the Federal and State statutes and regulations for such modifications or termination;
 - iii) Requirements of Section 61.15 of the Colorado Discharge Permit System Regulations have been met, and
 - iv) Requirements of public notice have been met.
 - d. Permit modification (except for minor modifications), termination or revocation and reissuance actions shall be subject to the requirements of Sections 61.5(2), 61.5(3), 61.6, 61.7 and 61.15 of the Colorado Discharge Permit System Regulations. The Division shall act on a permit modification request, other than minor modification requests, within 180

days of receipt thereof. Except for minor modifications, the terms of the existing permit govern and are enforceable until the newly issued permit is formally modified or revoked and reissued following public notice.

- e. Upon consent by the permittee, the Division may make minor permit modifications without following the requirements of Sections 61.5(2), 61.5(3), 61.7, and 61.15 of the Colorado Discharge Permit System Regulations. Minor modifications to permits are limited to:
 - i) Correcting typographical errors; or
 - ii) Increasing the frequency of monitoring or reporting by the permittee; or
 - iii) Changing an interim date in a schedule of compliance, provided the new date of compliance is not more than 120 days after the date specific in the existing permit and does not interfere with attainment of the final compliance date requirement; or
 - iv) Allowing for a transfer in ownership or operational control of a facility where the Division determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage and liability between the current and new permittees has been submitted to the Division; or
 - v) Changing the construction schedule for a discharger which is a new source, but no such change shall affect a discharger's obligation to have all pollution control equipment installed and in operation prior to discharge; or
 - vi) Deleting a point source outfall when the discharge from that outfall is terminated and does not result in discharge of pollutants from other outfalls except in accordance with permit limits.
- f. When a permit is modified, only the conditions subject to modification are reopened. If a permit is revoked and reissued, the entire permit is reopened and subject to revision and the permit is reissued for a new term.
- g. The filing of a request by the permittee for a permit modification, revocation and reissuance or termination does not stay any permit condition.
- h. All permit modifications and reissuances are subject to the antibacksliding provisions set forth in 61.10(e) through (g).

6. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 (Oil and Hazardous Substance Liability) of the Clean Water Act.

7. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority granted by Section 510 of the Clean Water Act. Nothing in this permit shall be construed to prevent or limit application of any emergency power of the division.

8. Permit Violations

Failure to comply with any terms and/or conditions of this permit shall be a violation of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Except as provided in Part I.D and Part II.A or B, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance (40 CFR 122.41(a)(1)).

9. Property Rights

The issuance of this permit does not convey any property or water rights in either real or personal property, or stream flows, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. Severability

The provisions of this permit are severable. If any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the application of the remainder of this permit shall not be affected.

11. Renewal Application

- ✓ If the permittee desires to continue to discharge, a permit renewal application shall be submitted at least one hundred eighty (180) days before this permit expires. If the permittee anticipates there will be no discharge after the expiration date of this permit, the Division should be promptly notified so that it can terminate the permit in accordance with Part II.B.5.

12. Confidentiality

Any information relating to any secret process, method of manufacture or production, or sales or marketing data which has been declared confidential by the permittee, and which may be acquired, ascertained, or discovered, whether in any sampling investigation, emergency investigation, or otherwise, shall not be publicly disclosed by any member, officer, or employee of the Commission or the Division, but shall be kept confidential. Any person seeking to invoke the protection of this Subsection (12) shall bear the burden of proving its applicability. This section shall never be interpreted as preventing full disclosure of effluent data.

13. Fees

The permittee is required to submit payment of an annual fee as set forth in the 2005 amendments to the Water Quality Control Act. Section 25-8-502 (l) (b), and the Colorado Discharge Permit System Regulations 5 CCR 1002-61, Section 61.15 as amended. Failure to submit the required fee when due and payable is a violation of the permit and will result in enforcement action pursuant to Section 25-8-601 et. seq., C.R.S. 1973 as amended.

14. Duration of Permit

The duration of a permit shall be for a fixed term and shall not exceed five (5) years. Filing of a timely and complete application shall cause the expired permit to continue in force to the effective date of the new permit. The permit's duration may be extended only through administrative extensions and not through interim modifications.

15. Section 307 Toxics

If a toxic effluent standard or prohibition, including any applicable schedule of compliance specified, is established by regulation pursuant to Section 307 of the Federal Act for a toxic pollutant which is present in the permittee's discharge and such standard or prohibition is more stringent than any limitation upon such pollutant in the discharge permit, the Division shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

16. Effect of Permit Issuance

- a. The issuance of a permit does not convey any property rights or any exclusive privilege.
- b. The issuance of a permit does not authorize any injury to person or property or any invasion of personal rights, nor does it authorize the infringement of federal, state, or local laws or regulations.
- c. Except for any toxic effluent standard or prohibition imposed under Section 307 of the Federal act or any standard for sewage sludge use or disposal under Section 405(d) of the Federal act, compliance with a permit during its term constitutes compliance, for purposes of enforcement, with Sections 301, 302, 306, 318, 403, and 405(a) and (b) of the

PART II

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Permit No.: CO-0048020

Federal act. However, a permit may be modified, revoked and reissued, or terminated during its term for cause as set forth in Section 61.8(8) of the Colorado Discharge Permit System Regulations.

- d. Compliance with a permit condition which implements a particular standard for sewage sludge use or disposal shall be an affirmative defense in any enforcement action brought for a violation of that standard for sewage sludge use or disposal.

COLORADO DISCHARGE PERMIT SYSTEM (CDPS)
FACT SHEET TO PERMIT NUMBER CO-0048020
PETROGLYPH OPERATING COMPANY, ROHR COALBED METHANE OPERATION
HUERFANO COUNTY

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- I. TYPE OF PERMIT** Major Industrial, 1st Individual Permit, converted from general permit certification COG-0900017, Surface Water
- II. FACILITY INFORMATION**
- A. Facility Type:** Manufacturing and Other Industries
Fee Category: Category 12, Subcategory 5
Category Flow Range: Process water from 5,000,000 to 19,000,000
Annual Fee: \$ 12,140 (effective July 1, 2007)
- B. SIC Code:** 1311 Crude Petroleum and Natural Gas
- C. Legal Contact/Permittee:** Thomas Melland, District Manager
PO Box 979, La Veta, CO; 81055
tmelland@pgei.com
719-742-5570
- D. Facility Contact:** Same as above
- E. Facility Location:** 2862 County Road 351, La Veta, CO, 81055
- F. Discharge Point:** Following treatment, prior to entering the Cucharas River, and MON1, at the same physical location as Outfall 001A, but referring to parameters that are monitor only; Latitude 37° 34.956 ' N, Longitude 104° 51.173' W.
- G. Facility Flows:** 10.5 MGD

ISSUED: DECEMBER 28, 2009 EFFECTIVE: FEBRUARY 1, 2010 EXPIRATION: JANUARY 31, 2015

Major Changes From Last Renewal:

This renewal permit is issued as an individual permit (CO-0048020), whereas the previous permit was a general permit (COG-900017).

This renewal permit authorizes one outfall for the discharge of treated water. The previous permit authorized the discharge of untreated water from eight outfalls.

The Total Dissolved Solids (TDS) limit, which was included to reflect protection of livestock watering is removed from the permit. Limits for Sodium Absorption Ratio (SAR) and Electrical Conductivity (EC) were added for protection of irrigated crops. The SAR and EC limits will indirectly result in a lower TDS level in the effluent and thus, continue to provide protection for livestock watering.

Limitations or monitoring requirements for additional metals, temperature, electrical conductivity and sodium absorption ratio are included in this permit.

An antidegradation review was conducted for this permit renewal.

Based on the comments received during the public notice period, the following changes were made to the permit. For more information, please see the Public Notice Comment section of this fact sheet.

- 1) Limitations for adjusted SAR have been incorporated in place of a sodium limit.
- 2) Limitations for the arroyo have been removed as the discharge point will be directly to the Cucharas River.

Following public notice, the Division has removed the compliance schedule for boron and mercury antidegradation limitations, and for chronic whole effluent toxicity (WET) testing. Because Petroglyph Operating Company has acknowledged that active treatment of the discharge will occur, the compliance schedule is no longer necessary.

III. RECEIVING STREAM

A. Waterbody Identification: COARMA14, the mainstem of the Cucharas River.

B. Water Quality Assessment:

An assessment of the stream standards, low flow data, and ambient stream data has been performed to determine the assimilative capacities for both stream segments for potential pollutants of concern. This information, which is contained in Appendix A to this rationale, also includes an antidegradation review, where appropriate. The Division's Permits Section has reviewed the assimilative capacities to determine the appropriate water quality-based effluent limitations as well as potential limits based on the antidegradation evaluation, where applicable. The limitations based on the assessment and other evaluations conducted as part of this rationale can be found in Part I.A of the permit.

Outfall 001A will continue to be the authorized discharge point to the receiving stream. Additionally, Outfall MON1 has been included at the same location as Outfall 001A to conduct monitoring as discussed later in this rationale.

IV. FACILITY DESCRIPTION

A. Industry Description

1. Type of Industry – This is a coalbed methane (CBM) operation in the Walsenburg area. The discharge covered under this permit is to the Cucharas River. A CBM operation involves the drilling of numerous wells and pumping groundwater out of the deep coal seams to depressurize the system and allow the desorption of methane gas from the coal. Typically, several wells are tied into, and discharge out of, one outfall point.
2. Chemicals Usage – The permittee stated in the renewal application that they will utilize four chemicals in their treatment process. These chemicals are summarized in the following table.

Table IV-1 – Chemical Additives

Chemical Name	Purpose	Constituents of Concern	Acceptable? Yes or No
Bactron K95	Controls Fe oxidizing bacteria	pH	Yes
Bactron K103	Controls Fe oxidizing bacteria	pH	Yes
MgCl ₂	Increases hardness	pH	Yes
CaCl ₂	Increases hardness	pH	Yes

Chemicals deemed acceptable for use in waters that will or may be discharged to waters of the State are acceptable only when used in accordance with all state and federal regulations, and in strict accordance with the manufacturer's site-specific instructions.

B. Wastewater Treatment Description

No treatment of this discharge has historically been provided; however, active treatment is planned to remove sodium (and potentially other pollutants). All past outfalls (001A-008A) will be piped to a central location for treatment, and will discharge from one outfall.

V. PERFORMANCE HISTORY

A. Monitoring Data

1. Discharge Monitoring Reports – Table V-1a summarizes the untreated effluent data reported on the Discharge Monitoring Reports (DMRs) for the Petroglyph Rohr Basin facility from June 30, 2003 through September 30, 2007.

Table V-1a – Summary of DMR Data

Parameter	# Samples or Reporting Periods	Reported Average Concentrations Avg/Min/Max	Reported Maximum Concentrations Avg/Min/Max	Previous Avg/Max/AD Permit Limit	Number of Limit Excursions
Effluent Flow (MGD)	126	1.4/0.05/8.4	1.4/0.05/8.6	10.5/NA	0
pH (su)	126	8.6/8.3/8.9	8.7/8.4/9	6.5 - 9	0
TSS (mg/l)	126	2.3/<1/26	2.8/<1/42	30/45	0/0
Oil and Grease (mg/l)	0	NA/NA/NA	NA/NA/NA	NA/10/	0
TDS (mg/l)	126	810/520/980	813/520/980	NA/3500/	NA/0
Fe, TR (µg/l) Beginning January 1, 2007	24	156/28/630	253/<20/2800	1000/Report	0/NA
Fe, TR (µg/l) Through December 31, 2006	102	275/<20/2800	//	5000/Report	0/NA
Wet, acute					
pimephales, LC50	79	//	100/87/100	> 100	1
daphnia magna LC50	76	//	100/92/100		2

NA means Not Applicable

2. State Sampling – There are no state sampling results available for this facility.

B. Compliance With Terms and Conditions of Previous Permit

1. Effluent Limitations – The data shown in the preceding table(s) indicate apparent violations of the permit.

Whole Effluent Toxicity (WET), acute

One failure of the acute test for pimephales and two failures of the acute test occurred during the DMR period ending December 31, 2007. Accelerated testing indicated that there was no pattern of toxicity.

The permittee has been in compliance with all other numerical limitations of the permit.

2. Other Permit Requirements

Chronic, Whole Effluent Toxicity (WET) Testing- The previous permit incorporated chronic WET testing limitations that were to be effective January 1, 2008. Because the Petroglyph CBM Operation ceased operations (and discharge) in July 2007, chronic WET testing was never performed under the permit requirements (This requirement was an error in the previous permit due to the incorrect receiving stream segment assigned to this discharge.)

Special Monitoring- The permittee has met the following special monitoring requirements of the permit for total boron, total recoverable selenium, and potentially dissolved zinc, summarized in Table V-1b.

Table V-1b – Summary of Special Monitoring Data

Parameter	# Samples or Reporting Periods	Reported Average Concentrations Avg/Min/Max	Reported Maximum Concentrations Avg/Min/Max	Previous Avg/Max/AD Permit Limit
Selenium, TR (ug/l)	48	NA/NA/NA	0/<15/0	NA/NA
Zinc, Dis (ug/l)	48	NA/NA/NA	0.46/<20/22	NA/NA
Boron, Tot (mg/l)	48	NA/NA/NA	0.14/0.1/0.17	NA/NA

VI. TERMS AND CONDITIONS OF PERMIT

A. Discussion of Effluent Limitations

1. Technology Based Limitations

- a. Federal Effluent Limitation Guidelines – Federal guidelines have been developed for the oil and gas extraction point source category (EPA, 1976). The ELGs are provided in 40CFR 435, as follows:

40 CFR Part 435 Subpart C: Onshore

There shall be no discharge of wastewater pollutants into navigable waters from any source associated with production, field exploration, drilling, well completion or well treatment (i.e. produced water, drilling muds, drill cuttings and produced sand)

Note that since all discharges to surface waters in Colorado are subject to being used for wildlife or agricultural purposes (Subpart E), Subpart C is not applicable in Colorado.

40 CFR Part 435 Subpart E: Agricultural and Wildlife Water Use Subcategory - west of the 98th meridian for which the produced water has a use in agriculture or wildlife propagation when discharged into navigable waters.

There shall be no discharge of waste pollutants into navigable waters from any source (other than produced water) associated with production, field exploration, drilling, well completion, or well treatment (i.e. , drilling muds, drill cuttings, and produced sands).

Produced water discharges shall not exceed the following daily maximum limitation:

Effluent characteristics: Effluent limitation (mg/l). Oil and Grease: 35.

These guidelines explicitly apply to the discharge of produced water associated with conventional oil and gas extraction, which does not include discharges of produced water associated with coal bed methane extraction. EPA selected the coal bed methane industry as a potential new subcategory to the oil and gas extraction category, for additional review as part of the 2006 annual effluent guidelines review (EPA, 2006). As stated by EPA, the basis for considering CBM a potential new subcategory of the oil and gas extraction category is that the product extracted, coal bed natural gas, is virtually identical to conventional natural gas, which consists largely of methane. The Division has applied the oil and gas extraction ELG to this CBM produced water discharge using the best professional judgment (BPJ) authority provided in the State and Federal Acts and associated regulations. The CBM produced water discharge authorized under this permit will be put to beneficial use for wildlife which are known to be present in the area and for agricultural purposes as described in this Fact Sheet and the attached

WQA. Therefore the beneficial use provision of the ELG is implemented in this permit. The effluent limitation for oil and grease will not be implemented in this permit because BPJ effluent limitations are superceded by effluent limitation regulations promulgated by the Commission that are applicable to this discharge as described below.

- b. Regulation 62: Regulations for Effluent Limitations – These regulations include effluent limitations that apply to all discharges of wastewater to State waters. These regulations are applicable to the discharge from the Petroglyph facility.
2. BOD₅ and Total Suspended Solids - BOD₅ is not a parameter of concern for this activity. The TSS concentrations are the most stringent effluent limits and are therefore applied. These limitations are the same as those contained in the previous permit and are imposed effective immediately.
- ii. Oil and Grease – The oil and grease limitations from the Regulations for Effluent Limitations are applied as they are the most stringent limitations. These limitations are the same as those contained in the previous permit and are imposed effective immediately.
 - iii. pH - The pH limitation specified in the Regulations for Effluent Limitations is not the most stringent and thus is not used as discussed below.

3. Water Quality Regulations and Guidance Documents

- a. Water Quality Assessment – The WQA in Appendix A contains the evaluation of pollutants limited by water quality standards. The mass balance equation shown in Section IV of Appendix A was used for most pollutants to calculate the potential water quality based effluent limitations (WQBELs), M₂, that could be discharged without causing the water quality standard to be violated. A detailed discussion of the calculations for the maximum allowable concentrations for boron, sulfide, sodium, electrical conductivity and metals is provided in Section V of the water quality assessment contained in Appendix A.

The potential WQBELs determined as part of these calculations represent the calculated effluent limits that would be protective of water quality. Both acute and chronic WQBELs may be calculated based on acute and chronic standards, and these may be applied as daily maximum (acute) or 30-day average (chronic) limits.

- b. Antidegradation – Since the direct receiving water is Undesignated, as set forth in Section VI of the water quality assessment contained in Appendix A, an antidegradation evaluation was conducted for pollutants when water quality impacts occurred and when the impacts were significant. Based on the antidegradation requirements and the reasonable potential analysis discussed above, antidegradation-based average concentrations (ADBACs) may be applied.

According to Division procedures, the facility has three options related to antidegradation-based effluent limits: (1) the facility may accept ADBACs as permit limits (see Section VI of Appendix A); (2) the facility may select permit limits based on their non-impact limit (NIL), which would result in the facility not being subject to an antidegradation review and thus the antidegradation-based average concentrations would not apply (the NILs are also contained in Section VI of Appendix A); or (3) the facility may complete an alternatives analysis as set forth in Section 31.8(3)(d) of the regulations which would result in alternative antidegradation-based effluent limitations.

The effluent must not cause or contribute to an exceedance of a water quality standard and therefore the WQBEL must be selected if it is lower than the NIL. Where the WQBEL is not the most restrictive, the discharger may choose between the NIL or the ADBAC: the NIL results in no increased water quality impact; the ADBAC results in an “insignificant” increase in water quality impact. The ADBAC limits are imposed as two-year average limits.

- c. Determination of Total Maximum Daily Loads (TMDLs) – Stream segment COARMA14, is currently listed on the State’s 303(d) list for development of TMDLs for dissolved selenium. However, the TMDL has not yet been finalized. Consistent with Division practice, this permit establishes monitoring requirements for these pollutants until such time as the TMDLs is complete and waste load allocations have been determined. The permit may be reopened to include limitations based upon a finalized TMDL.
- d. Colorado Mixing Zone Regulations – Pursuant to section 31.10 of The Basic Standards and Methodologies for Surface Water, a mixing zone determination is required for this permitting action. The Colorado Mixing Zone Implementation Guidance, dated April 2002, identifies the process for determining the meaningful limit on the area impacted by a discharge to surface water where standards may be exceeded (i.e., regulatory mixing zone). This guidance document provides for certain exclusions from further analysis under the regulation, based on site-specific conditions.

The guidance document provides a mandatory, stepwise decision-making process for determining if the permit limits will not be affected by this regulation. Exclusion, based on Extreme Mixing Ratios, may be granted if the ratio of the design flow to the chronic low flow (30E3) is greater than 2:1. Since the direct receiving water is a zero low flow stream, the exemption has been met and no further analysis is required under the regulation.

- f. Agricultural Use Protection – Section 31.11(1)(a)(iv) of The Basic Standards and Methodologies for Surface Waters (Regulation No. 31) includes the narrative standard that State surface waters shall be free of substances that are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life.

The water quality assessment in Appendix A contains the evaluation of pollutants limited by narrative standards. The mass balance equation shown in Section IV of Appendix A was used for electrical conductivity to calculate the maximum allowable effluent concentration, M2, that could be discharged without causing the narrative standard to be violated. A detailed discussion of the calculations for the maximum allowable concentrations for electrical conductivity is provided in Section V of the water quality assessment contained in Appendix A.

In accordance with the discussion that follows, the Division is establishing monitoring and limitations for several parameters in accordance with the Division’s Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops policy (hereafter the Narrative Standards policy).

- i. Electrical Conductivity (EC) – The calculated chronic limit for EC in deciSiemens per meter (dS/m), as set out in Appendix A, is established as a 30-day average limit, effective immediately. EC is also known as specific conductance, conductance, conductivity, or specific conductivity. Because EC can be measured in various units, which has led to

confusion in accurate reporting of results, the Division is providing the following conversions to dS/m:

- Divide $\mu\text{mhos}/\text{cm} \times 1000$ to convert to dS/m
- Divide $\mu\text{S}/\text{cm} \times 1000$ to convert to dS/m
- $\text{mmhos}/\text{cm} = \text{dS}/\text{m}$

- ii. SAR, Bicarbonate and Adjusted SAR – SAR, which stands for Sodium Adsorption Ratio, is a representation of the relative proportion of sodium cations to calcium and magnesium cations. SAR is a parameter used for determining suitability of water for irrigation purposes. Although the SAR limit may change based on the actual EC of the effluent, the SAR limit is capped at 5.3, based on the SAR/EC equation ($\text{SAR} = (7.1 * \text{EC}) - 2.48$) and the applicable crop (corn grain).

High bicarbonate concentrations also adversely affect plant growth because bicarbonate combines with calcium and magnesium and will precipitate out of solution, lowering the amount of available calcium. For this reason, the effluent SAR will be calculated as the adjusted SAR, which takes into account the amount of bicarbonate in the effluent.

The SAR limit is expressed as a Pass/Fail limit, and the permittee will be required to determine the SAR limit based on the above equation (not-to-exceed the capped limit of 5.3). The permittee will report the adjusted SAR of the effluent, and determine whether this value meets the allowable SAR as determined by the equation. The SAR limit is established as a 30-day average limit, effective immediately. Reporting of the effluent Ca, Mg, Na, HCO_3 will be required for confirmation of calculations.

The permittee has indicated that active treatment is planned and that the available treatment will be capable of meeting the established effluent limitations, once installed. An associated compliance schedule will not be granted, based on the following special circumstances.

First, the continued practice of discharging the untreated produced water (i.e, high Sodium Adsorption Ratio, SAR, values and high sodium concentrations) into the Cucharas River, under specific hydrologic conditions, creates a known threat to the beneficial agricultural use of this state water by impairing the suitability of this river water when diverted for agricultural uses. This threat is heightened when there exists minimal upstream flow in the river to dilute the effluent entering from several tributaries. Specifically, there has been damage to corn fields, soils, and dairy cattle when water was diverted (Holita Ditch) from the Cucharas River to a storage pond (Holita Reservoir) and then and routed to the Corsentino Dairy for these agricultural uses. The damage was reported first reported in 2006 and has been confirmed by soil scientists from Colorado State University and USDA's National Salinity Team.

Second, the CBM operations were shut-down by the COGCC on July 7, 2007 and there has been no produced water discharged to surface waters since that date. Based on ongoing studies and evaluation of results, there is a current expectation that the CBM operations will be approved in early 2010 to resume operations.

Third, the CBM operator has been aware of the SAR and high sodium problems in the produced water for several years and has taken steps to identify and characterize treatment technologies that will be evaluated for use in addressing this problem. The application for the renewal permit identifies a site for a treatment facility with a design capacity of 10 MGD.

Under Regulation No. 61, the Division can decide if a compliance schedule is warranted based on whether it is justified as being “appropriate” and will “achieve compliance” as soon as possible”. If a compliance schedule was provided, then there would be a time period when the untreated produced water could be discharged while steps were taken by the CBM operator to implement treatment. During this time period, there would be no assurances to the public that water diverted from the Cucharas River downstream from the entrance of the untreated produced water would be consistently suitable for crop irrigation. The Division has decided that the permittee should install treatment in the period between now and the anticipated date for resuming operation and that based on the significant risk posed by the discharge of produced water and that any discharge must comply with the SAR and sodium requirements in the renewal permit.

Reasonable Potential Analysis – Using the assimilative capacities contained in the WQA, an analysis must be performed to determine whether to include the calculated assimilative capacities as WQBELs in the permit. This reasonable potential (RP) analysis is based on the Determination of the Requirement to Include Water Quality Standards-Based Limits in CDPS Permits Based on Reasonable Potential, dated December, 2002. This guidance document utilizes both quantitative and qualitative approaches to establish RP depending on the amount of available data.

A qualitative determination of RP may be made where ancillary and/or additional treatment technologies are employed to reduce the concentrations of certain pollutants. However, absent limitations, a facility may no longer continue such pollutant reductions and therefore the discharge would result in RP. For this reason, the Permits Section may make a qualitative determination that absent effluent limitations, there is RP for these pollutants to cause or contribute to exceedances of water quality standards.

To conduct a quantitative RP analysis, a minimum of 10 effluent data points from the previous 5 years should be used. The equations set out in the guidance for normal and lognormal distribution, where applicable, are used to calculate the maximum estimated pollutant concentration (MEPC). For data sets with non-detect values, and where at least 30% of the data set was greater than the detection level, MDLWIN software is used consistent with Division guidance to generate the mean and standard deviation, which are then used to establish the multipliers used to calculate the MEPC. If the MDLWIN program cannot be used the Division’s guidance prescribes the use of best professional judgment.

For some parameters, recent effluent data or an appropriate number of data points may not be available, or collected data may be in the wrong form (dissolved vs total) and therefore may not be available for use in conducting a RP analysis. Thus, consistent with Division procedures, monitoring will be required to collect samples to support a RP analysis and subsequent decisions for a numeric limit. Samples requirements will be listed at a MON outfall, and all results shall be reported on a DMR. A compliance schedule may be added to the permit for the request of a RP analysis once the appropriate data have been collected.

For other parameters, effluent data may be available to conduct a quantitative analysis, and therefore a RP analysis will be conducted to determine if there is RP for the effluent discharge to cause or contribute to exceedances of ambient water quality standards. The guidance specifies that if the MEPC exceeds the maximum allowable pollutant concentration (MAPC), limits must be established and where the MEPC is greater than half the MAPC (but less than the MAPC), monitoring must be established. Table VI-2 contains the calculated MEPC compared to the

corresponding MAPC, and the results of the reasonable potential evaluation, for those parameters that met the data requirements. The RP determination is discussed for each parameter in the text below.

With the exception of total recoverable iron, there is little data for metals as most parameters did not have monitoring requirements in previous permits. However, six time monthly sampling data (May 2005-October 2005) are available for boron, dissolved zinc, and total recoverable selenium, while additional monthly sampling data (April 2007-July 2007) for most metals and all eight outfalls was submitted by the permittee. This data was evaluated to determine if limitations or monitoring requirements for particular parameters should be included in the permit.

Table VI-1 – Quantitative Reasonable Potential Analysis

Parameter	30-Day Average			7-Day Ave or Daily Max			Antideg (2 Year Roll. Ave)		
	MEPC	WQBEL (MAPC)	Reasonable Potential	MEPC	WQBEL (MAPC)	Reasonable Potential	MEPC	ADBAC (MAPC)	Reasonable Potential
Fe, TR (µg/l)	7199	1000	Yes	NA	NA	NA	578	609	Yes

3. Pollutants Limited by Water Quality Standards

pH – This parameter is limited by the water quality standards of 6.5-9.0 s.u., as this range is more stringent than the range specified under the Regulations for Effluent Limitations. This limitation is the same as that contained in the previous permit and is imposed effective immediately.

Total Recoverable Aluminum- The RP analysis was based on the WQBEL and ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 67 ug/l of 'dissolved' aluminum. Even though this value is *significantly* less than the acute WQBEL of 750 ug/l, it is greater than ½ of the ADBAC of 87 ug/l, 'total recoverable' aluminum. Since the qualitative analysis did not exclude permit requirements for the ADBAC, monitoring for total recoverable aluminum is required.

Arsenic

Total Recoverable - The RP analysis was based on the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 0.54 ug/l, less than ½ of the ADBAC of 1.1 ug/l. Therefore, a qualitative determination of no RP for total recoverable arsenic has been made and limitations and monitoring are not required at this time.

Potentially Dissolved– The RP analysis was based on the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' arsenic were as high as 0.54 ug/l, *significantly* less than the ADBAC of 54 ug/l. Thus, a qualitative determination of no RP for potentially dissolved arsenic has been made and limitations and monitoring are not required at this time.

Potentially Dissolved Beryllium- There was no effluent data available to perform a RP analysis. Therefore, this parameter has been added to Outfall MON1 for the collection of data for a RP analysis.

Cadmium

Potentially Dissolved– The RP analysis was based on the WQBEL and ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. All effluent results were non-detect for 'total' cadmium at a reporting limit of 0.04 ug/l as described above, and were *significantly* less than the acute WQBEL of 7 ug/l and the ADBAC of 0.48 ug/l. Thus, a qualitative finding of no RP has been made and limitations and monitoring are not required at this time.

Trivalent Chromium

Potentially Dissolved– The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' chromium were as high as 2.6 ug/l, *significantly* less than the acute WQBEL of 829 ug/l and the ADBAC of 17 ug/l. Thus, a qualitative determination of no RP for potentially dissolved trivalent chromium has been made and limitations and monitoring are not required at this time.

Copper

Potentially Dissolved - The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' copper were as high as 1.2 ug/l, *significantly* less than the acute WQBEL of 21 ug/l and less than ½ of the ADBAC of 2.1 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Total Recoverable Iron- The RP analysis was based upon the ADBAC as described in Appendix A. With the available data, the log-normal program for the ADBAC was used to determine the appropriate statistics to determine the MEPC. Since the MEPC of 578 ug/l was greater than 50% of the MAPC of 609 ug/l, 2 year average monitoring has been added to the permit. A 30-day interim limitation of 1000 ug/l has also been added to the permit. This is the same limitation as the previous permit, and is based on the WQBEL.

Lead

Potentially Dissolved - The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' lead were as high as 0.74 ug/l, *significantly* less than the acute WQBEL of 106 ug/l. However, because this value exceeds the ADBAC of 0.64 ug/l, the qualitative analysis based on 'total' data does not exclude permit requirements for the ADBAC. Therefore, 2 year average monitoring for potentially dissolved lead is required and has been added to the permit.

Potentially Dissolved Manganese- The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values of 'total' manganese were as high as 7 ug/l, *significantly* less than the acute WQBEL of 3,477 ug/l and the ADBAC of 463 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Total Mercury- The RP analysis was based on the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis.

Effluent values were as high as 0.035 ug/l. As this value is greater than the ADBAC of 0.0015 ug/l, a qualitative determination of RP has been made and limitations and monitoring are required.

Nickel

Potentially Dissolved - The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 1.8 ug/l total nickel. As this value is *significantly* less than acute WQBEL of 689 ug/l and the ADBAC of 12 ug/l, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Selenium

Potentially Dissolved- The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. As described above, effluent values of 'total' selenium were all non-detect at reporting limits of 15 ug/l (2005) and 5 ug/l (2006), *significantly* less than the acute WQBEL of 18 ug/l. However, because the detection levels were greater than the calculated ADBAC of 4.5 ug/l for this pollutant and because dissolved selenium is listed on the State 303(d) list for this stream segment, monitoring for potentially dissolved selenium has been added to the permit.

Potentially Dissolved Silver - Results for silver were all non-detect at a reporting limit of (0.02) ug/l (total). A qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Zinc

Potentially Dissolved- The RP analysis was based on the WQBEL and the ADBAC as described in Appendix A (WQA). A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. As described above, results for zinc were typically non-detect at a reporting limit of 20 ug/l, with one detection of 22 ug/l, significantly less than the acute WQBEL of 173 ug/l and the ADBAC of 103 ug/l. Thus, a qualitative determination of no RP has been made and limitations and monitoring are not required at this time.

Boron- The RP analysis for boron was based upon the ADBAC as described in Appendix A. A qualitative analysis was conducted as there was not enough data to conduct a quantitative RP analysis. Effluent values were as high as 0.17 mg/l, greater than the ADBAC of 0.11 mg/l. Thus, a qualitative determination of RP has been made and limitations and monitoring are required.

Sulfide- There was no effluent data available to perform a RP analysis. Therefore, this parameter has been added to Outfall MON1 for the collection of data for a RP analysis.

Temperature- New temperature standards have been approved and have been incorporated into each this basin's regulation. The MWAT is the maximum weekly average temperature, as determined by a seven day rolling average, using at least 3 equally spaced temperature readings in a 24-hour day (at least every 8 hours for a total of at least 21 data points).

The daily maximum is defined as the maximum 2 hour average, with a minimum of 12 equally spaced measurements throughout the day. As both of these temperature requirements will likely

require the use of automated temperature measurements and recordings, the permittee must have the proper equipment in place to take the required readings upon commencement of the discharge.

As continuous ambient water quality data, in accordance with the definition of the standard, is not available to calculate any potential assimilative capacity, the permittee is encouraged to collect instream temperature data on a continuous basis, if calculation of assimilative capacity for temperature is desired.

4. Metal Speciation

For standards based upon the total and total recoverable methods of analysis, the limitations are based upon the same method as the standard.

For metals with aquatic life-based dissolved standards, effluent limits and monitoring requirements are typically based upon the potentially dissolved method of analysis, as required under Regulation 31, Basic Standards and Methodologies for Surface Water. Thus, effluent limits and/or monitoring requirements will be prescribed as the "potentially dissolved" form.

5. Whole Effluent Toxicity (WET) Testing - For this facility, chronic WET testing is required.

- a. Purpose of WET Testing - The Water Quality Control Division has established the use of WET testing as a method for identifying and controlling toxic discharges from wastewater treatment facilities. WET testing is being utilized as a means to ensure that there are no discharges of pollutants "in amounts, concentrations or combinations which are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life" as required by Section 31.11 (1) of the Basic Standards and Methodologies for Surface Waters.
- b. In-Stream Waste Concentration (IWC) - Where monitoring or limitations for WET are deemed appropriate by the Division, chronic in-stream dilution as represented by the chronic IWC is critical in determining whether acute or chronic conditions shall apply. According to the Colorado Water Quality Control Division Biomonitoring Guidance Document, dated July 1, 1993, for those discharges where the chronic IWC is greater than 9.1% and the receiving stream has a Class 1 Aquatic Life use or Class 2 Aquatic Life use with all of the appropriate aquatic life numeric standards, chronic conditions apply. Where the chronic IWC is less than or equal to 9.1, or the stream is not classified as described above, acute conditions apply. The chronic IWC is determined using the following equation:

$$IWC = [Facility Flow (FF)/(Stream Chronic Low Flow (annual) + FF)] \times 100\%$$

The flows and corresponding IWC for the appropriate discharge point are:

Discharge Point	Chronic Low Flow, 30E3, (cfs)	Facility Design Flow, (cfs)	IWC, (%)
001	0	0.25	100%

The IWC for this permit is 100 %, which represents a wastewater concentration of 100 % effluent to 0% receiving stream.

- c. Chronic WET Limit – This facility is expected to discharge metals and other pollutants at concentrations that have been found to have toxic effects to fish and other aquatic life. On this basis, the Division believes there is reasonable potential for the discharge to interfere with attainment of applicable water quality classifications or standards. Because of this condition, the chronic limit has been incorporated into the permit. The permittee will be required to conduct two types of statistical derivations on the data, one looking for any statistically significant difference in toxicity between the control and the effluent concentrations and the second identifying the IC_{25} , should one exist. Both sets of calculations will look at the full range of toxicity (lethality, growth and reproduction). If a level of chronic toxicity occurs, such that there is a statistically significant difference in the lethality (at the 95% confidence level) between the control and any effluent concentration less than or equal to the In-stream Waste Concentration (IWC) and if the lethality $IC_{25} < \text{the IWC}$, the permittee will be required to follow the automatic compliance schedule identified in Part I.B. of the permit, if the observed toxicity is due to organism lethality. Only an exceedance of the limitation specified in Part I.A. will trigger the requirement for conducting the automatic compliance schedule identified in Part I.B. of the permit. If the toxicity is due to differences in the growth of the fathead minnows or the reproduction of the Ceriodaphnia, no immediate action on the part of the permittee will be required. However, this incident, along with other WET data, will be evaluated by the Division and may form the basis for reopening the permit and including additional WET limits or other requirements.
- d. General Information – The permittee should read the WET testing section of Part I.B. of the permit carefully. The permit outlines the test requirements and the required follow-up actions the permittee must take to resolve a toxicity incident. The permittee should read, along with the documents listed in Part I.B.3. of the permit, the Colorado Water Quality Control Division Biomonitoring Guidance Document, dated July 1, 1993. This document outlines the criteria used by the Division in such areas as granting relief from WET testing, modifying test methods and changing test species. The permittee should be aware that some of the conditions outlined above may be subject to change if the facility experiences a change in discharge, as outlined in Part II.A.2. of the permit. Such changes shall be reported to the Division immediately.
8. Economic Reasonableness Evaluation – Section 25-8-503(8) of the revised (June 1985) Colorado Water Quality Control Act required the Division to "determine whether or not any or all of the water quality standard based effluent limitations are reasonably related to the economic, environmental, public health and energy impacts to the public and affected persons, and are in furtherance of the policies set forth in sections 25-8-192 and 25-8-104."

The Colorado Discharge Permit System Regulations, Regulation No. 61, further define this requirement under 61.11 and state: "Where economic, environmental, public health and energy impacts to the public and affected persons have been considered in the classifications and standards setting process, permits written to meet the standards may be presumed to have taken into consideration economic factors unless:

- a. A new permit is issued where the discharge was not in existence at the time of the classification and standards rulemaking, or
- b. In the case of a continuing discharge, additional information or factors have emerged that were not anticipated or considered at the time of the classification and standards rulemaking."

The evaluation for this permit shows that the Water Quality Control Commission, during their proceedings to adopt the Classifications and Numeric Standards for Arkansas River Basin, considered economic reasonableness.

Furthermore, this is not a new discharger and no new information has been presented regarding the classifications and standards. Therefore, the water quality standard-based effluent limitations of this permit are determined to be reasonably related to the economic, environmental, public health and energy impacts to the public and affected persons and are in furtherance of the policies set forth in Sections 25-8-102 and 104. If the permittee disagrees with this finding, pursuant to 61.11(b)(ii) of the Colorado Discharge Permit System Regulations, the permittee should submit all pertinent information to the Division during the public notice period.

B. Monitoring

Effluent Monitoring – Effluent monitoring will be required as shown in the permit document. Refer to the permit for locations of monitoring points. Monitoring requirements have been established in accordance with the frequencies and sample types set forth in the Baseline Monitoring Frequency, Sample Type, and Reduced Monitoring Frequency Policy for Industrial and Domestic Wastewater Treatment Facilities. This policy includes the methods for reduced monitoring frequencies based upon facility compliance as well as for considerations given in exchange for instream monitoring programs initiated by the permittee. Based upon this policy, the permittee is not eligible for reduced monitoring at this time due to delinquent DMR submittals. The permittee must be in compliance with all permit terms to be considered for reduced monitoring.

Outfall MON1 monitoring requirements are established consistent with Division procedures for monthly monitoring to obtain data for use in future reasonable potential analyses.

C. Reporting

1. Discharge Monitoring Report – The Petroglyph Operating Company facility must submit Discharge Monitoring Reports (DMRs) on a monthly basis to the Division. These reports should contain the required summarization of the test results for all parameters and monitoring frequencies shown in Part I.B of the permit. See the permit, Part I.B, C, D and/or E for details on such submission.
2. Special Reports – Special reports are required in the event of an upset, bypass, or other noncompliance. Please refer to Part II.A. of the permit for reporting requirements. As above, submittal of these reports to the US Environmental Protection Agency Region VIII is no longer required.

D. Additional Terms and Conditions

Signatory and Certification Requirements – Signatory and certification requirements for reports and submittals are discussed in Part I.E.6. of the permit.

E. Waste Minimization/Pollution Prevention

Waste minimization and pollution prevention are two terms that are becoming increasingly more common in industry today. Waste minimization includes reducing the amount of waste at the source through changes in industrial processes, and reuse and recycling of wastes for the original or some other purpose (such as materials recovery or energy production). Pollution prevention goes hand-in-hand with waste minimization. If the waste is eliminated at the front of the line, it will not have to be treated at the end of the line. The direct benefits to the industry are often significant, both in terms of increased profit and in public relations.

This program can affect all areas of process and waste control with which an industry deals. Elimination or reduction of a wastewater pollutant can also result in a reduction in an air pollutant or a reduction in the amount of hazardous materials that must be handled or disposed.

This discharge permit does not specifically dictate waste minimization conditions at this time. The Division does strongly encourage the permittee to continue working in developing and implementing a waste minimization plan. Several industries have already developed plans and found that implementation resulted in substantial savings. Both the Colorado Department of Public Health and Environment and the Environmental Protection Agency (EPA) have information and resources available. For more in-depth information, please contact these agencies.

Erin Scott
November 2, 2009

I. REFERENCES

- A. Colorado Department of Public Health and Environment, Water Quality Control Division Files.
- B. Basic Standards and Methodologies for Surface Water, Regulation No. 31, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective May 31, 2008.
- C. Classifications and Numeric Standards for Arkansas River Basin, Regulation No. 32, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective March 30, 2009.
- D. Colorado Discharge Permit System Regulations, Regulation No. 61, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective April 30, 2008.
- E. Regulations for Effluent Limitations, Regulation No. 62, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective March 30, 2008.
- F. Section 303(d) List of Water Quality Limited Segments Requiring TMDLs, Regulation No. 93, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective April 30, 2008.
- G. Colorado's Monitoring and Evaluation List, Regulation No. 94, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective April 30, 2008.
- H. Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance, Colorado Department of Public Health and Environment, Water Quality Control Division, effective December 2001.
- I. Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0, Colorado Department of Public Health and Environment, Water Quality Control Division, effective April 23, 2002.
- J. Determination of the Requirement to Include Water Quality Standards-Based Limits in CDPS Permits Based on Reasonable Potential Procedural Guidance, Colorado Department of Public Health and Environment, Water Quality Control Division, effective December 2002.
- K. The Colorado Mixing Zone Implementation Guidance, Colorado Department of Public Health and Environment, Water Quality Control Division, effective April 2002.

- L. Baseline Monitoring Frequency, Sample Type, and Reduced Monitoring Frequency Policy for Domestic and Industrial Wastewater Treatment Facilities, Water Quality Control Division Policy WQP-20, May 1, 2007.
- M. Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, Water Quality Control Division Policy WQP-24, March 10, 2008.
- N. Development Documents for Interim Final Effluent Limitations Guidelines and Proposed New Source Performance Standards for the Oil & Gas Extraction Point Source Category, U.S. Environmental Protection Agency, September, 1976.
- O. Technical Support Document for the 2006 Effluent Guidelines Program Plan, U.S. Environmental Protection Agency, December, 2006
- P. NPDES Compliance Inspection Manual, U.S. Environmental Protection Agency, July 2004.

VIII. PUBLIC NOTICE COMMENTS

Comments were received from Corsentino Dairy Farms (Brett and Joe Corsentino), Randy Fischer, State Representative, Sal Pace, State Representative, Karen and John Rhoads, Richard O. Goodwin, Joseph Benveniste, Mr. Marvin Hamann, Mr. Alan Curtis, Mr. Richard Klein, Mr. Marvin Davis, Mr. Al Tucker, Ms. Mary Leonard, Mr. Jim White, Mr. Bob Martin; President of the River Ranch Board of Managers, Mr. John Galusha; Huerfano County Administrator, Mr. Kent Smith, Mr. William Boeck, Ms. Edie Flanagan, Ms. Gopa Ross, Mr. Jerry Young, Mr. Larry Hoppe, Petroglyph Operating Company, LLC, . Comments were accepted during the public meeting held June 11, 2009 at the Walsenburg Community Center, and during the 60-day public comment period from April 23 2009 to June 23, 2009.

Due to the similar nature of the public comments, comments will be grouped by topic rather than by each individual comment. Comment topics are as follows;

COMMENT:

The large amount of discharge water from the proposed discharge would cause significant erosion along the arroyo which is not large enough to convey this amount of water (especially in a heavy rain or snow melt event) without over flowing and flooding private property below the discharge point and potentially undermining the railroad track near the discharge point. Does the WQCD have the right to issue a discharge permit for an arroyo that runs thru private property without permission from the landowners? Is there any requirement of damage mitigation? The culvert under the ranch road is not large enough to accommodate the anticipated flow. This amount of water flowing down the arroyo will cause tremendous sediment and TSS loading to the Cucharas River, not to mention carrying the junk that is in the arroyo to the River. The discharge point should be directly to the Cucharas River.

RESPONSE: Petroglyph Energy has elected to move the proposed outfall from the arroyo to a direct discharge to the Cucharas River, thus alleviating these concerns.

COMMENT: Removal of significant amounts of water from the lower aquifers effects levels of well water and increases the probability of methane seeps. Vertical migration of methane is occurring and seeping into the aquifers, most likely drinking water aquifers. An analysis of the first phase of methane mitigation plan has not yet confirmed the plan was successful. An increased focus of dewatering in the area would likely produce more methane seeps and drop the water table, resulting in wells going dry. What if we no longer have water because

ts all gone from pumping millions of gallons per day out of the ground? We don't have municipal water for everyone. What happens if these operations impact municipal wells and city supplies?

RESPONSE: The WQCD discharge permit functions to regulate water quality as the water is discharged to surface waters of the state. The Office of the State Engineer (Division of Natural Resources) regulates removal of water (quantity) from aquifers. The Colorado Oil and Gas Conservation Commission (COGCC) regulates oil and gas development and is responsible for implementation of rules adopted for protection of public health, safety, and welfare from the impacts of oil and gas development. These comments would therefore pertain to authorities held by the Office of the State Engineer and the COGCC.

COMMENT: Dewatering of the coal bed seams causes the release of methane, and that is what this renewal of the permit for surface water discharge is all about. The increased focus of dewatering in the area has been shown, with destructive results, to contain methane.

RESPONSE: This permit does not serve as an approval for renewed oil and gas extraction and operation at this site, which is under the jurisdiction of the COGCC. The WQCD has no jurisdiction over approving continued oil and gas operations in the area. This permit covers only the discharge of groundwater extracted from gas operations, which can only resume once the COGCC has approved the re-start of operations, and once water treatment, designed to meet the limitations set forth in this permit, is installed and operational.

AGRICULTURAL USE- CROP IRRIGATION (SAR, EC)

The WQCD has revised the permit limitations for the agricultural use parameters which are based on the Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops Policy (*hereafter the Narrative Standards policy*). Because SAR and EC are more consistent methods to regulate the water quality for crop irrigation as opposed to sodium and EC limitations the permit has been revised to include a SAR limitation in lieu of a sodium limitation. The allowable SAR limitation in the permit is an equation which is tied to the actual EC of the effluent, with a maximum allowable EC of 1.1 (to protect corn grain) and a maximum allowable SAR of 5.3 (as an adjusted SAR). Thus, the EC limitation range has also been modified based on the following equation: $(SAR=7.1*EC(dS/m)-2.48)$. Please see the Water Quality Assessment for a complete discussion of the revised implementation of the Narrative Standards policy in this permit.

COMMENT: The CBM waters previous discharged by Petroglyph contained exceptionally high levels of sodium. Crop growth has been stunted and livestock adversely affected. The effects of sodium are cumulative and do not disappear. Any further addition of sodium will completely destroy miles of farmland along the Cucharas River. Therefore, the sodium level of the discharged water should be limited to zero. None should be allowed.

RESPONSE: We understand that the COGCC, Petroglyph, and the landowner have worked cooperatively together to reach agreement on a sampling, monitoring, and remediation plan to address past impacts. Petroglyph will be implementing that plan under the oversight of the COGCC.

The SAR and EC limitations that are being implemented in the permit are designed to protect the irrigation beneficial use for the crops grown in the area. The Division did not allow a compliance schedule to meet these new, more stringent requirements due to the potential for the effluent to impact the irrigation beneficial use in the absence of the SAR and EC effluent limitations. Since the designated uses of the Cucharas River also include aquatic life, the permittee must be able to meet a Whole Effluent Toxicity (WET) limitation to ensure the discharge water is not harmful to aquatic life. **Organisms need a chemically balanced water, and require some levels of nutrients.** Note that all waterbodies contain some concentration of Na in the water. Data from

WQCD water quality station 93 (at Walsenburg PWS diversion) which pre-dates the Petroglyph discharge (1971-1978) shows ambient levels of sodium in the Cucharas as high as 21 mg/l.

COMMENT: Are you assuming a one-time application in the development of the SAR limitation because SAR builds up in soil over time. The stuff doesn't go out of the soil, so if you continue to apply minimal amounts you get a build-up to where you're at a critical level and the crops don't produce. Given the narrative standard, there is not supposed to be any damage to agricultural use from the water and that should be taken into account because the effect of the SAR concentration over time is to destroy that crop productivity. What will be the continued effect of the buildup of SAR in the soils along the arroyo and river?

RESPONSE: The Division considered a number of different SAR levels for inclusion in the Narrative Standards Policy. The Division included a bound on the level of SAR to address the potential impact of rainfall on sodic soils. Several guidelines with maximum SAR values ranging from 2 to 16 were considered, and the policy adopted a maximum SAR value of 9, which is the upper limit of the low sodium hazard guideline used by Colorado State University. This is based on a SAR/EC balance that will not allow for any infiltration reductions. Note that in the new approach to SAR and EC limits, the WQCD is requiring the adjusted SAR, which recognizes that high bicarbonates can exacerbate the sodicity conditions. Note that all waterbodies contain some concentration of Na in the water. Data from WQCD water quality station 93 (at Walsenburg PWS diversion) which pre-dates the Petroglyph discharge (1971-1978) shows ambient levels of sodium in the Cucharas as high as 21 mg/l.

COMMENT: The SAR needs to be 4 or less.

RESPONSE: The SAR limitation in the permit is based on the equation of $(SAR=7.1*EC(dS/m)-2.48)$, with a maximum allowable of 1.1 EC and 5.3 SAR. This level is designed to protect for 100% yield for the most sensitive crop grown in the area (corn grain). Additionally, with the proposed treatment expected to remove nearly all of the constituents in the water, and the sliding SAR limit based on the actual EC of the discharge water, the SAR limit in the permit will likely be significantly more stringent. This is due to the expected EC of the effluent being lower, which corresponds to a lower SAR limit.

COMMENT: Why isn't monitoring required prior to entering the Cucharas River, after the water has gone thru the arroyo? When water goes into the arroyo it can pick up all manner of things as it travels through the arroyo into the Cucharas River. How do you ensure that when the water gets to the Cucharas, it's the same quality that came out of the treatment plant? If the Sodium is 24 at the discharge point, how do you ensure that it is 24 when it gets to the Cucharas River? It is disturbing that the permit does not include an instream TDS limit to be measured where the unnamed arroyo meets the Cucharas River.

RESPONSE: Since the discharge point has been changed to the Cucharas River, there is no longer an issue with the discharge to the arroyo.

COMMENT: Is there any independent evaluation that occurs of the treatment plant? Who is going to review the plans and specs for the treatment plant and oversee operations. Who has the authority to shut down the treatment plant and the timeframe in which they have to shut it down? Is there a requirement for immediate reporting? How long does that take? The treatment plant must be shut down when the water table drops, or if the methane levels come up. Petroglyph must be required to demonstrate containment capabilities in the event the treatment system is upset or becomes inoperable. Downstream users must be immediately notified of upsets or permit exceedances by Petroglyph. Real-time monitoring must be required to protect the downstream users, including Corsentino Dairy Farms. The 24 hr notice required in the permit is inadequate.

RESPONSE: Both federal and state permit regulations have provisions that require an operator to have treatment in place as necessary to meet permit effluent limits. This permit contains the following provision consistent with the permit regulations:

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee as necessary to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance and adequate laboratory and process controls, including appropriate quality assurance procedures (40 CFR 122.41(e)). This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when necessary to achieve compliance with the conditions of the permit.

In accordance with this provision, the burden rests with the operator to properly install, operate, and maintain treatment as needed to maintain compliance with permit conditions. The Division uses its compliance oversight and response mechanisms such as on-site inspection and review of self reported data to monitor the status of compliance with effluent limitations and other permit conditions such as cited requirement for proper operation and maintenance of treatment facilities. The Division does not do a prescriptive review and approval of plans and specifications as there is no such requirement under the state Water Quality Control Act or the federal Clean Water Act.

In accordance with the Colorado Water and Wastewater Facility Operators Certification Statute, this facility will require a certified operator who has the responsibility for the operation of the treatment facility and is certified in accordance with the provisions of the statute and conforming regulations.

The WQCD has several authorities to shut down the discharge in certain circumstances. Upon finding and determination that a violation of a permit has occurred, the Division may suspend, modify, or revoke a permit, or may issue a cease and desist order. The Division may also request the district attorney for the judicial district to a suit for a temporary restraining order, preliminary injunction, or permanent injunction in situations that pose imminent and substantial endangerment to the beneficial uses of state waters. The timeframes required to implement these authorities range from a day or two to several months.

There are specific reporting requirements in the event the discharge quality is not being met. Please see Part II.A.4 of the permit for a discussion of reporting and notification requirements. The Division has found the 24-hour notice provision contained in the permit and conforming regulations to be adequate. By specifying a time period the provision is enforceable, and in practice most operators report as soon as they have the information available. The Division notifies downstream users, and often operators do additional notifications to downstream users voluntarily. Real-time monitoring is not possible for all parameters as specific EPA testing methods, with laboratory quality assurance/quality control measures are required in the permitting regulations (40 CFR Part 136) and are discussed further in Part I.D.3. However, real-time monitoring for several other parameters (EC, pH, temperature, etc) is possible, and encouraged, in addition to the required limitations at the outfall location.

COMMENT: Who is responsible for testing the water? Is the WQCD going to oversee that? Do you check every report? The WQCD should be more involved in monitoring and inspections of the facility and the discharge quality. At what intervals do you inspect? Are you going to receive and review the actual lab analysis and data rather than an overview report? The WQCD should review actual lab reports and not just the overview from the industry. Monitoring is particularly important at this site b/c of the history and previous permit violations. If you do not have the funding to monitor/control the water quality (except every two years), you shouldn't allow more projects that you cannot control.

RESPONSE: Monitoring requirements have been prescribed in the permit in accordance with Regulation 61.8 (4). These requirements are an enforceable provision of the permit and the permittee is responsible for sampling the discharge water and analyzing the water according to the permit on a routine basis. The permittee self-reports this data and certifies that the data is accurate. A record of the data is required to be retained for 3 years as discussed under Part I.D.4. of the permit. For this type of facility the Division's practice is to review each DMR for completeness, enter the data into EPA's Integrated Compliance and Information System (ICIS) and generate reports from this system that flag violations of numeric effluent limitations.

The Division also uses field based inspections to monitor compliance with permit requirements. For this type of facility the Division's practice is to conduct routine inspections that could be either compliance evaluation inspections (CEIs) and/or compliance sampling inspections (CSIs). Inspection procedures are modeled in accordance with EPA's *NPDES Compliance Inspection Manual* (EPA, 2004). Inspections typically include a review of laboratory procedures and quality assurance and documentation/recordkeeping and reporting.

The Division responds to violations identified both from the review of self-reported data and information gathered during field based inspections using a number of strategies and enforcement authorities as needed to return systems to compliance and deter future non-compliance.

COMMENT: Are the water sampling reports public information and how do you get public access from your office? How long does it take to get a hard copy of a report under a CORA request? Can WQCD publish these reports on their website similar to OGCC?

RESPONSE: Water data is public information and can be obtained from a Colorado Open Records Act (CORA) request through the WQCD offices, or via the EPA Envirofacts website or EPA Enforcement and Compliance History Online (ECHO) website. The WQCD currently does not have the capability to publish these reports online independently of the EPA. A CORA request usually takes 3 days to process.

COMMENT: Sierra Club requests some kind of scientific study, put in a specific amount of tracer and trace the quantitative data where the migration routes are. There isn't enough information in this area; A groundwater study that is much more detailed than what has been done previously, and when there are drilling activities that could impact water wells.

RESPONSE: This comment seems to concern methane and groundwater, which is under the jurisdiction of the COGCC. The WQCD discharge permit only regulates the quality of the discharge water to state surface water.

COMMENT: Did you look at metals, including Arsenic? At VOCs? Are you going to keep looking at VOCs? Barium? Chloride? What is the requirement for the temperature of the water as it would leave a proposed treatment plant? As the water came thru the original discharge, especially in the wintertime, it was steam all the way. I wish that there was a temperature in the report that says it will be within these parameters, because wouldn't that effect the fish in the Cucharas River?

RESPONSE:

The Division did conduct a review of the data and performed a reasonable potential analysis for both 'total' and 'dissolved' arsenic. Please see page 11 of this Fact Sheet for a detailed analysis on this parameter.

The Division also received and reviewed the data for barium and chloride even though there are no water quality standards for barium and chloride for the designated uses on the Cucharas River. Analytical results detected barium as high as 150 mg/l and chloride as high as 69 mg/l. For comparison, the human health-based

(drinking water) standard for barium is 1,000 mg/l (daily maximum) and for chloride are 490 mg/l (30 day average); and 250 mg/l (30-day average).

The Division also received and reviewed data from the CBM injectate for volatile organic compounds (VOCs). The only compounds that were detected in the injectate were; benzene at 0.7 ug/l, naphthalene at 0.8 ug/l, toluene at 139 ug/l, and chloroform at 0.83 ug/l. Since these levels of VOCs were well below the water quality standards of 5,300 ug/l (acute) for benzene; 2,300 ug/l (acute) and 620 ug/l (chronic) for naphthalene; 17,500 ug/l (acute) for toluene; and 28,900 ug/l (acute) and 1,240 ug/l (chronic) for chloroform, the WQCD made a determination of no reasonable potential for these parameters and limitations and monitoring for VOCs are not included in the permit.

This stream segment has been designated a warm water segment. Since the Cucharas River is not a zero low-flow stream in all months, the temperature requirement is 30° C as a Maximum Weekly Average Temperature (MWAT). As the discharge is now to be routed to the Cucharas River, temperature limits have been included in the permit.

COMMENT: Who is going to take care of the huge amount of salt and other contaminants that are removed from the water? What will happen to this waste and how will it affect state waters when it finds its way back to rivers and streams? Will this be another Summitville Superfund site?

RESPONSE: The permittee is responsible for properly disposing of any solid wastes created in the treatment process. This disposal would be regulated by another state agency, as this permit regulates only the water quality of the discharge.

COMMENT: If the water can be made safe, I'd like to see it flow through my lot, I might use it.

RESPONSE: The WQCD permit ensures the quality of the water for the protection of the designated uses, aquatic life, recreation, and agriculture, in this case. The Office of the State Engineer has the authority to exercise water rights, and would be responsible for any water rights claims to the discharged water.

COMMENT: The renaming of the current outfall 002 to 001 in the new permit is confusing.

RESPONSE: Since the discharge has been changed to the Cucharas River this should alleviate this concern. The discharge point will remain 001.

COMMENT: Who is going to be held liable for past damages from this water? Petroglyph needs to have a bond so they can be held accountable. Dairy and beef cattle have been lost, and production and reproduction rates down due to the water. The water produces bad crops with no nutritional value.

RESPONSE: We understand that the COGCC, Petroglyph, and the landowner have worked cooperatively together to reach agreement on a sampling, monitoring, and remediation plan to address past impacts. Petroglyph will be implementing that plan under the oversight of the COGCC.

The Division does not have express authority to require financial assurance. This permit contains additional terms and conditions including numeric limits for EC and SAR to ensure protection of downstream irrigated crops. These terms are fully enforceable under the authorities granted to both the Division in accordance with the Colorado Water Quality Control Act and the EPA in accordance with the Federal Clean Water Act.

COMMENT: The water is unbalanced, high in SAR and pH as high as 9.4. Normal cattle rumen pH is between 7.2 to 7.4. This high of a pH and the microflora in the cow rumen can't function and the cattle starve to death because the fermentation vat feeds the cow. Once the water changed (CBM shut down), the dairy herd stabilized with the production and reproduction rate up, but it's a long way's from being normal.

RESPONSE: The permit established effluent limits for pH consistent with the water quality standards adopted for the segment. The Classifications and Numeric Standards for Arkansas River Basin, Regulation No.32, Water Quality Control Commission, requires that the pH of the discharge remain between 6.5 and 9.0 s.u. at the outfall location.

COMMENT: If they (Petro) are not putting water into the arroyo, Mr. Corsentino would have clean water under his appropriation. Because the water's coming down from Petroglyph, he can't get the same water he would be entitled to under his appropriation so there ought to be a zero SAR limitation on this permit b/c otherwise what results is a degrading of the quality of the water that those people are entitled to under their water rights as a direct result of what Petroglyph is releasing.

RESPONSE: For the purposes of this discharge permit, no dilution was granted, and thus the discharge water after treatment must comply with the effluent limitations for EC and SAR which were designed for no reduction in crop yield. The State Engineer's Office is responsible for the allocation of water due to water rights. For additional information regarding the water appropriation, please contact the Office of the State Engineer.

COMMENT: The top priorities of any new permits must be to correct past impacts, prevent future impacts, compensate affected land owners for past damages, and make the people and water users in the Cucharas basin whole. I urge denial of any permits to discharge to the Cucharas River basin until the WQCD can assure the people of Huerfano County that the quality of the water and the level of pumping will not once again result in the same types of egregious impacts as in the past.

RESPONSE: We understand that the COGCC, Petroglyph, and the landowner have worked cooperatively together to reach agreement on a sampling, monitoring, and remediation plan to address past impacts. Petroglyph will be implementing that plan under the oversight of the COGCC. This renewal permit encompasses limitations for all water quality standards attached to the stream segment, and for the newly created effluent limitations for the protection of irrigated crops. This is far above what was required in the previous permit. With the greater number of permit limits, and more stringent limits, the permittee will be adding significant treatment to the wastewater prior to discharge. Note that the level of pumping, and/or ability to restart operations is under the jurisdiction of other agencies as previously mentioned and identified.

COMMENT: Action on new permit applications should be delayed until the State Engineer establishes rules and procedures for implementing the recently adopted legislation under HB09-1303.

RESPONSE: Although this legislation may have ramifications on the permittee's operations, it would not affect the terms and conditions of a discharge permit issued by the WQCD.

The following comments were received by the permittee, Petroglyph Energy, Inc.;

COMMENT: The draft permit proposes an effluent limit range for EC of 0.99-1.1 dS/m. Petroglyph is exploring reverse osmosis (RO) as the treatment process to meet the list of proposed effluent limitations. The raw produced water has a representative ionic (TDS) concentration of 733 mg/l. To comply with the lower range EC limit of 0.99 dS/m will require the addition of 18-20 tons of salt/day to the effluent. This added salt will be a blend of calcium, potassium, and magnesium in some form. In addition to the economic, supply,

logistical, handling, and quality assurance feasibility of adding this volume of TDS, the water quality aspects of adding this volume of salts back into the receiving waters seems counter-productive. In lieu of the 0.99 dS/m limit, Petroglyph proposes developing a discharge-specific lower EC limit that considers site-specific protection of the most sensitive crop grown in the affected irrigation area (corn grain), the Cucharas River ambient water quality data, local ranch soil data, projected RO effluent quality, local irrigation practices, WET needs considerations, and an alternative discharge point (the Cucharas River).

RESPONSE: The WQCD has revised the EC limitations so that the minimum EC limit is 0.36 dS/m. Please see Part I.A. of the permit for the revised limitations and the Water Quality Assessment for a complete discussion of the EC and SAR revision. Direction to move the discharge point to the Cucharas River was received on October 21, 2009.

COMMENT: While not an effluent quality limitation in the draft permit, erosion in the arroyo is an issue. Petroglyph proposes to evaluate relocating the point of discharge to the Cucharas River as a means of attenuating erosion concerns. Petroglyph proposes to conduct habitat assessments of the arroyo, to conduct probable pipeline alignment evaluations, and to evaluate potential effluent limit considerations (temperature, EC, and WET) of such an alternative discharge point.

RESPONSE: After submittal of this comment, Petroglyph Energy has elected to discharge directly to the Cucharas River.

COMMENT: Please note that the existing outfall location of 37° 34.179 latitude North and 104° 49.795 longitude West as presented in the draft permit is incorrect. The correct location is Lat. 37° 34.178, Long 104° 50.805.

RESPONSE: After submittal of this comment, Petroglyph Energy has elected to move the discharge point to a location directly to the Cucharas River. The new latitude and longitude has been included in the permit and this fact sheet.

APPENDIX A
Water Quality Assessment
the Cucharas River
Petroglyph Operating Co., Inc.

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I. Water Quality Assessment Summary

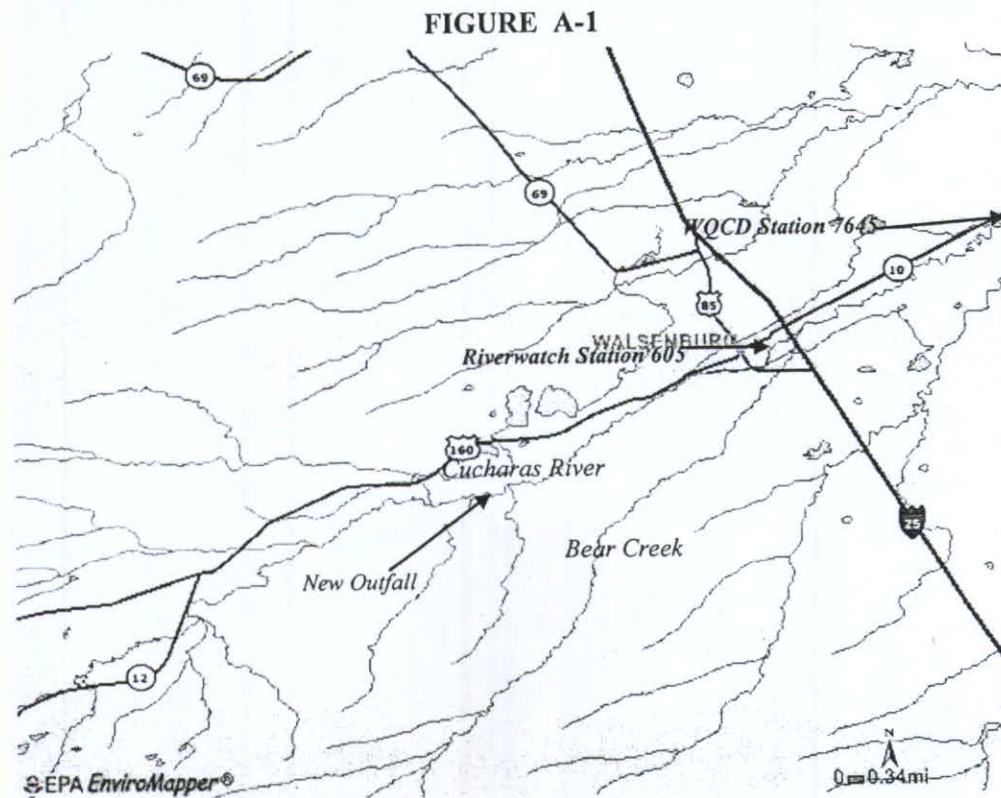
Table A-1 includes summary information related to this WQA. This summary table includes key regulatory starting points used in development of the WQA such as: receiving stream information; threatened and endangered species; 303(d) and 305(b) listings; low flow and facility flow summaries; and a list of parameters evaluated.

Table A-1 WQA Summary					
Facility Information					
Facility Name	Permit Number	Design Flow (max 30-day ave, MGD)	Design Flow (max 30-day ave, CFS)		
Petroglyph Operating Co., Inc.	CO-0048020	10.5	16		
Receiving Stream Information					
Receiving Stream Name	Segment ID	Designation	Classification(s)		
Mainstem of the Cucharas River from the point of diversion for the Walsenburg public water supply to the outlet of Cucharas Reservoir.	COARMA14	Undesignated	Aquatic Life Warm 1, Recreation Class E, Agriculture		
Low Flows (cfs) COARLA2a and COARMA14					
1E3 (1-day)	7E3 (7-day)	30E3 (30-day)	Ratio of 30E3 to the Design Flow (cfs)		
0	0	0	0		
Regulatory Information					
T&E Species	303(d) (Reg 93)	TMDL Status	305(b) (Reg 94)	Temporary Modification(s)	Control Regulation
No	Selenium	Low Priority	e. coli	Selenium	None
Pollutants Evaluated					
Pollutants evaluated: SAR, Conductivity, Metals, Organics, Boron, Sulfide, Temperature					

II. Introduction

The water quality assessment (WQA) to the mainstem of the Cucharas River near the Petroglyph Operating Co. outfall location 002A located in Huerfano County, is intended to determine the assimilative capacities available for pollutants found to be of concern. This WQA describes how the water quality based effluent limits (WQBELs) are developed. These parameters may or may not appear in the permit with limitations or monitoring requirements, subject to other determinations such as reasonable potential analysis, evaluation of federal effluent limitation guidelines, implementation of state-based technology based limits, mixing zone analyses, 303(d) listings, threatened and endangered species listing, or other

requirements as discussed in the permit rationale. Figure A-1 contains a map of the study area evaluated as part of this WQA.



The Petroglyph Operating Co., Inc. has historically discharged in several areas in the region. These discharges will be combined into one outfall, discharging to the Cucharas River approximately 4 miles upstream of the town of Walsenburg. This section of the Cucharas River is in the Water Body Identification (WBID) stream segment COARMA14, which means the Arkansas River Basin, Middle Arkansas Sub-basin, stream Segment 14. Thus, the WQA will also include this receiving water. This segment is composed of the "Mainstem of the Cucharas River from the point of diversion for the Walsenburg public water supply to the outlet of Cucharas Reservoir." Stream segment COARMA14 is classified for Warm Water Aquatic Life Class 1, Class E Not Primary Contact Use and Agriculture. COARMA14 is currently listed on the Colorado's 303(d) list of water quality impacted streams for selenium.

Information used in this assessment includes data gathered from the Petroglyph Operating Co., the Division, Riverwatch, the U.S. Environmental Protection Agency (EPA), and communications with the local water commissioner. The data used in the assessment consist of the best information available at the time of preparation of this WQA analysis.

III. Water Quality Standards

Narrative Standards

Narrative Statewide Basic Standards have been developed in Section 31.11(1) of the regulations, and apply to any pollutant of concern, even where there is no numeric standard for that pollutant. Waters of the state shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations or combinations which:

for all surface waters except wetlands;

- (i) can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludge, mine slurry or tailings, silt, or mud; or
- (ii) form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or
- (iii) produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species or to the water; or
- (iv) are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or
- (v) produce a predominance of undesirable aquatic life; or
- (vi) cause a film on the surface or produce a deposit on shorelines; and

for surface waters in wetlands;

- (i) produce color, odor, changes in pH, or other conditions in such a degree as to create a nuisance or harm water quality dependent functions or impart any undesirable taste to significant edible aquatic species of the wetland; or
- (ii) are toxic to humans, animals, plants, or aquatic life of the wetland.

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for any parameter of concern could be put in CDPS discharge permits.

Standards for Organic Parameters and Radionuclides

Radionuclides: Statewide Basic Standards have been developed in Section 31.11(2) and (3) of The Basic Standards and Methodologies for Surface Water to protect the waters of the state from radionuclides and organic chemicals.

In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges to as to exceed the following levels, unless alternative site-specific standards have been adopted. Standards for radionuclides are shown in Table A-2.

Table A-2	
Parameter	Picocuries per Liter
Americium 241*	0.15
Cesium 134	80
Plutonium 239, and 240*	0.15
Radium 226 and 228*	5
Strontium 90*	8
Thorium 230 and 232*	60
Tritium	20,000

*Samples for these materials should be analyzed using unfiltered (total) samples. These Human Health based standards are 30-day average values for both plutonium and americium.

Organics: The organic pollutant standards contained in the Basic Standards for Organic Chemicals Table are applicable to all surface waters of the state for the corresponding use classifications, unless alternative site-specific standards have been adopted. These standards have been adopted as "interim standards" and will remain in effect until alternative permanent standards are adopted by the Commission. These interim standards shall not be considered final or permanent standards subject to antibacksliding or downgrading restrictions. Although not reproduced in this WQA, the specific standards for organic chemicals can be found in Regulation 31.11(3).

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for radionuclides, organics, or any other parameter of concern could be put in CDPS discharge permits.

The aquatic life standards apply to all stream segments that are classified for aquatic life. The water supply standards apply only to those segments that are classified for water supply. The water + fish standards apply to those segments that have a Class 1 aquatic life and a water supply classification. The fish ingestion standards apply to Class 1 aquatic life segments that do not have a water supply designation. The water + fish and the fish ingestion standards may also apply to Class 2 aquatic life segments, where fish of a catchable size and which are normally consumed are present, and where fishing occurs on a regular basis.

Because the Cucharas River is classified for Class 1 aquatic life without a water supply designation, the fish ingestion and aquatic life standards apply to this discharge.

Salinity and Phosphorus

Phosphorus: Regulations 71, 72, 73 and 74, for Dillon Reservoir Watershed, Cherry Creek Reservoir Watershed, Chatfield Reservoir Watershed and the Bear Creek Watershed, contain requirements for phosphorus concentrations and phosphorus annual loadings for point source dischargers. If a facility discharges to one of these watersheds, a phosphorus allocation may be necessary, and limitations and annual loadings may be added to a permit.

Salinity: Regulation 61.8(2)(I) contains requirements regarding salinity for any discharges to the Colorado River Watershed. For industrial dischargers this is a no-salt discharge requirement. However, the regulation states that this requirement may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 366 tons per year. The Division may permit the discharge of salt upon a satisfactory demonstration that it is not practicable to prevent the discharge of all salt. See Regulation 61.8(2)(I)(i)(A)(1) for more information regarding this demonstration.

In addition, the Division's policy, Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, may be applied to discharges where an agricultural water intake exists downstream of a discharge point. Limitations for electrical conductivity, sodium absorption ratio, or sodium, may be applied in accordance with this policy.

Temperature

Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S. Effective until December 31, 2012: Segments or portions of segments that are classified Aquatic Life Warm class 1 or 2 have a chronic temperature standard of 30 °C (MWAT) with no acute standard. COARMA14 is warm water and therefore the 30 °C (MWAT) will be applied

Segment Specific Numeric Standards

Numeric standards are developed on a basin-specific basis and are adopted for particular stream segments by the Water Quality Control Commission. To simplify the listing of the segment-specific standards, many of the aquatic life standards are contained in a table at the beginning of each chapter of the regulations. The

standards in Table A-3 have been assigned to stream segment COARMA14 in accordance with the *Classifications and Numeric Standards for Arkansas River Basin*.

Table-3	
In-stream Standards for Stream Segment COARMA14	
Dissolved Oxygen (DO) = 5 mg/l	
pH = 6.5 - 9 su	
Temperature chronic (MWAT) = 30° C	
E. coli chronic = 630 colonies/100 ml	
Inorganic	
Un-ionized ammonia acute and chronic = TVS	
Chlorine acute = 0.019	
Chlorine chronic = 0.011	
Free Cyanide acute = 0.005 mg/l	
Sulfide chronic = 0.002 mg/l	
Boron chronic = 0.75 mg/l	
Nitrite acute = 0.05 mg/l	
Dissolved Arsenic acute = 340 ug/l	
Total Recoverable Arsenic chronic = 7.6 ug/l	
Dissolved Cadmium acute and chronic = TVS	
Dissolved Trivalent Chromium acute and chronic = TVS	
Dissolved Hexavalent Chromium acute and chronic = TVS	
Dissolved Copper acute and chronic = TVS	
Total Recoverable Iron chronic = 1000 ug/l	
Dissolved Lead acute and chronic = TVS	
Dissolved Manganese acute and chronic = TVS	
Total Mercury chronic = 0.01 µg/l	
Dissolved Nickel acute and chronic = TVS µg/l	
Dissolved Selenium acute = TVS µg/l	
Dissolved Selenium chronic = 6 µg/l Until 12/31/2012	
Dissolved Selenium chronic = TVS µg/l Beginning 1/01/2013	
Dissolved Silver acute and chronic = TVS µg/l	
Dissolved Zinc acute and chronic = TVS µg/l	

Table Value Standards and Hardness Calculations

Standards for metals for segment COARMA14 are shown in the regulations as Table Value Standards (TVS) and these often must be derived from equations that depend on the receiving stream hardness or species of fish present. The Classification and Numeric Standards documents for each basin include a specification for appropriate hardness values to be used. Specifically, the regulations state that:

The hardness values used in calculating the appropriate metal standard should be based on the lower 95% confidence limit of the mean hardness value at the periodic low flow criteria as determined from a regression analysis of site-specific data. Where insufficient site-specific data exists to define the mean hardness value at the periodic low flow criteria, representative regional data shall be used to perform the regression analysis. Where a regression analysis is not appropriate, a site-specific method should be used.

Hardness data for the Cucharas River downstream of the discharge were insufficient to conduct a regression analysis based on the low flow. Therefore, the Division's alternative approach to calculating hardness was used, which involves computing a mean hardness.

The mean hardness was computed to be 158 mg/l based on sampling data from Division Station 7651, the Cucharas River at Highway 160 and Road 340, and Division Station 7650C, the Cucharas River in Walsenburg. Both stations are located on the Cucharas River approximately 1½ miles and 2 miles, respectively, downstream from a portion of the current discharge and the new discharge location. This data is deemed to be representative of hardness conditions downstream of the entire discharge as the effluent water quality is relatively stable. Data ranged from 2005 to 2007, during the period that the facility was discharging in this area. This hardness value and the formulas contained in the TVS were used to calculate the in-stream water quality standards for metals in the Cucharas River, with the results shown in Table A-4.

Table A-4 TVS-Based Metals Water Quality Standards for CO-0042480 Colorado Department of Public Health and Environment Water Quality Control Commission <i>Regulation 33</i>			
<i>Parameter</i>	<i>In-Stream Water Quality Standard</i>	TVS Formula: Hardness (mg/l) as CaCO₃ = 158	
Cadmium, Dissolved	Acute	4.1 µg/l	$[1.136672 - 0.041838 \ln(\text{hardness})] e^{(0.9151(\ln(\text{hardness})) - 3.1485)}$
	Chronic	0.6 µg/l	$[1.101672 - 0.041838 \ln(\text{hardness})] e^{(0.7998(\ln(\text{hardness})) - 4.4451)}$
Trivalent Chromium, Dissolved	Acute	829 µg/l	$e^{(0.819(\ln(\text{hardness})) + 2.5736)}$
	Chronic	108 µg/l	$e^{(0.819(\ln(\text{hardness})) + 0.5340)}$
Copper, Dissolved	Acute	21 µg/l	$e^{(0.9422(\ln(\text{hardness})) - 1.7408)}$
	Chronic	13 µg/l	$e^{(0.8545(\ln(\text{hardness})) - 1.7428)}$
Lead, Dissolved	Acute	106 µg/l	$[1.46203 - 0.145712 \ln(\text{hardness})] [e^{(1.273(\ln(\text{hardness})) - 1.46)}]$
	Chronic	4.1 µg/l	$[1.46203 - 0.145712 \ln(\text{hardness})] [e^{(1.273(\ln(\text{hardness})) - 4.705)}]$
Manganese, Dissolved	Acute	3477 µg/l	$e^{(0.3331(\ln(\text{hardness})) + 6.4676)}$
	Chronic	1921 µg/l	$e^{(0.3331(\ln(\text{hardness})) + 5.8743)}$
Nickel, Dissolved	Acute	689 µg/l	$e^{(0.846(\ln(\text{hardness})) + 2.253)}$
	Chronic	77 µg/l	$e^{(0.846(\ln(\text{hardness})) + 0.0554)}$
Selenium, Dissolved	Acute	18.4 µg/l	Numeric standards provided, formula not applicable
	Chronic	4.6 µg/l	Numeric standards provided, formula not applicable
Silver, Dissolved	Acute	4.5 µg/l	$\frac{1}{2} e^{(1.72(\ln(\text{hardness})) - 6.52)}$
	Chronic	0.7 µg/l	$e^{(1.72(\ln(\text{hardness})) - 9.06)}$
Zinc, Dissolved	Acute	212 µg/l	$0.978 e^{(0.8525(\ln(\text{hardness})) + 1.0617)}$
	Chronic	184 µg/l	$0.986 e^{(0.8525(\ln(\text{hardness})) + 0.9109)}$

Regulation 93 – 303(d) List and Total Maximum Daily Loads

Stream segment COARMA14 is listed on the Division's 303(d) list of water quality impacted streams for selenium. According to Division standard procedure, the Division's Environmental Data Unit investigates issues of water quality standard exceedances. For a receiving water placed on this list, the Restoration and Protection Unit is tasked with developing the Total Maximum Daily Loads (TMDLs) and the Waste Load

Allocation (WLAs) to be distributed to the affected facilities. WLAs for dissolved selenium have not yet been established and the allowable concentration calculated in the following sections may change upon further evaluation by the Division.

Regulation 94 – 305(b) Monitoring and Evaluation List

Segment COARMA14 is listed on the Division's 305(b) list for monitoring and evaluation for e. coli.

IV. Receiving Stream Information

Low Flow Analysis

The Colorado Regulations specify the use of low flow conditions when establishing water quality based effluent limitations, specifically the acute and chronic low flows. The acute low flow, referred to as 1E3, represents the one-day low flow recurring in a three-year interval, and is used in developing limitations based on an acute standard. The 7-day average low flow, 7E3, represents the seven-day average low flow recurring in a 3 year interval, and is used in developing limitations based on a Maximum Weekly Average Temperature standard (MWAT). The chronic low flow, 30E3, represents the 30-day average low flow recurring in a three-year interval, and is used in developing limitations based on a chronic standard.

In lieu of any available daily flow measurements for this segment of the Cucharas River, previous estimates by the local Water Commissioner were used and are consistent with the previous low flow analysis for the City of Walsenburg WWTF contained in the Preliminary Effluent Limitation (PEL) (200233), Cucharas River, September 2007.

In this analysis, the Water Commissioner indicated that coalbed methane wells installed in the area have been discharging produced water to the Cucharas River at a point upstream of the City of Walsenburg WWTF beginning in 2003, thus significantly increasing flow in that receiving stream. Furthermore, he indicated that the Cucharas River dried up during the extreme drought of the summer of 2002 (mid-May through mid-August). Thus, although there is periodic flow in the Cucharas River immediately upstream of the influence of the discharge, the 1E3 and 30E3 monthly low flows are set at zero for several months based on this information, and are presented in Table A-5.

Table A-5 Low Flows for the Cucharas River, COARMA14													
<i>Low Flow (cfs)</i>	<i>Annual</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
1E3 Acute	0	1.0	1.0	1.0	1.0	0	0	0	0	0.50	0.50	0.50	0.50
30E3 Chronic	0	1.0	1.0	1.0	1.0	0	0	0	0	0.50	0.50	1.0	1.0

Since the annual low flows for the arroyo and the Cucharas River have been determined to be zero, the ambient water quality discussion for most pollutants is unnecessary and has therefore been deleted in this WQA. This is explained in more detail under the Technical Information discussion in Section VI.

The ratio of the low flow of Cucharas River to the Petroglyph Operating Co. outfall design flow is 0:1.

Mixing Zones

The amount of the available assimilative capacity (dilution) that may be used by the permittee for the purposes of calculating the WQBELs may be limited in a permitting action based upon a mixing zone analysis or other factor. These other factors that may reduce the amount of assimilative capacity available in a permit are: presence of other dischargers in the vicinity; the presence of a water diversion downstream of the discharge (in the mixing zone); the need to provide a zone of passage for aquatic life; the likelihood of bioaccumulation of toxins in fish or wildlife; habitat considerations such as fish spawning or nursery areas; the presence of threatened and endangered species; potential for human exposure through drinking water or recreation; the possibility that aquatic life will be attracted to the effluent plume; the potential for adverse effects on groundwater; and the toxicity or persistence of the substance discharged.

Since the receiving stream has a zero low flow as calculated above, the WQBELs would be equal to the WQS, and therefore consideration of full or reduced assimilative capacity is inconsequential.

Ambient Water Quality

The Division evaluates ambient water quality based on a variety of statistical methods as prescribed in Section 31.8(2)(a)(i) and 31.8(2)(b)(i)(B) of the *Colorado Department of Public Health and Environment Water Quality Control Commission Regulation No. 31*, and as outlined in the Division's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits (WQP-19). The ambient water quality was not assessed for the and the Cucharas River because the background in-stream low flow conditions are zero, and because the large volume of discharge will dominate the water quality of the receiving waters. Thus, the ambient conditions are inconsequential to this discharge.

V. Facility Information and Pollutants Evaluated

Facility Information

The Petroglyph Operating Co., Inc. outfall is located at in the NW 1/4 of S9, T29S, R57W; 2862 County Road 351 in La Veta CO; 81055 at 37° 34' 11" latitude North and 104° 50' 48" longitude West in Huerfano County. The current design capacity of the facility is 10.5 MGD (16 cfs). Currently, there is no treatment provided to the discharge water, but a treatment facility is planned.

Nearby Sources

The nearest upstream and downstream dischargers were:

- Town of La Veta (CO-0032409) and the Cucharas Water and Sanitation District (CO-0043745), which both discharge to the Cucharas River near the Town of La Veta, approximately 20 miles upstream of the new discharge location.
- City of Walsenburg WWTF (COG-900017), which discharges to the Cucharas River approximately four miles downstream of the new discharge location. The two facilities do not share common pollutants of concern.
- Country Host Motel (CO-0027898), which discharges to Pictou Arroyo. The Pictou Arroyo flows in to the Sandy Arroyo, a tributary of the Cucharas River whose confluence is located approximately 19 miles downstream from the new discharge location.

The Petroglyph Operating Co. is the sole known point source contributor to this area of Cucharas River.

Due to the in-stream low flow of zero, the assimilative capacities during times of low flow are not affected by nearby contributions. Therefore, modeling nearby facilities in conjunction with this facility was not necessary.

Pollutants of Concern

Pollutants of concern may be determined by one or more of the following: facility type; effluent characteristics and chemistry; effluent water quality data; receiving water quality; presence of federal effluent limitation guidelines; or other information. Parameters evaluated in this WQA may or may not appear in a permit with limitations or monitoring requirements, subject to other determinations such as a reasonable potential analysis, mixing zone analyses, 303(d) listings, threatened and endangered species listings or other requirement as discussed in a permit rationale.

The following parameters were identified by the Division as pollutants to be evaluated for this facility:

- Electrical Conductivity, Sodium, SAR
- Metals
- Boron, Sulfide
- Temperature

VI. Determination of Water Quality Based Effluent Limitations (WQBELs)

Technical Information

Note that the WQBELs developed in the following paragraphs, are calculations of what an effluent limitation may be in a permit. The WQBELs for any given parameter, will be compared to other potential limitations (Federal Effluent Limitations Guidelines, State Effluent Limitations, or other applicable limitation) and typically the more stringent limit is incorporated into a permit. If the WQBEL is the more stringent limitation, incorporation into a permit is dependent upon a reasonable potential analysis.

In-stream background data and low flows evaluated in Sections II and III are used to determine the assimilative capacity of the Cucharas River near the Petroglyph Operating Co. discharge for pollutants of concern, and to calculate the WQBELs. It is the Division's approach to calculate the WQBELs using the lowest of the monthly low flows (referred to as the annual low flow) as determined in the low flow analysis.

The Division's standard analysis consists of steady-state, mass-balance calculations for most pollutants. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard. The mass-balance equation is expressed as:

$$M_2 = \frac{M_3Q_3 - M_1Q_1}{Q_2}$$

Where,

Q_1 = Upstream low flow (1E3 or 30E3)

Q_2 = Average daily effluent flow (design capacity)

Q_3 = Downstream flow ($Q_1 + Q_2$)

M_1 = In-stream background pollutant concentrations at the existing quality

M_2 = Calculated WQBEL

M_3 = Water Quality Standard, or other maximum allowable pollutant concentration

When Q_1 equals zero, Q_2 equals Q_3 , and the following results: $M_2 = M_3$

Because the low flows (Q_1) for the Cucharas River are zero, the WQBELs for the pollutants of concern are equal to the in-stream water quality standards. A more detailed discussion of the technical analysis is provided in the pages that follow.

Calculation of WQBELs

Where a WQBEL is calculated to be a negative number and interpreted to be zero, the Division standard procedure is to allocate the water quality standard to prevent further degradation of the receiving waters. The Division's Restoration and Protection Unit investigates issues of water quality standard exceedances. This Unit is tasked with determining if the exceedances are valid and placing the receiving stream on the Clean Water Act Section 303(d) list of impaired waters, if appropriate. If the receiving water is placed on the State's 303(d) list, the Assessment Unit is tasked with developing the Total Maximum Daily Loads (TMDLs) and the Waste Load Allocations (WLAs) to be distributed to the affected facilities.

Temperature:

The annual 7E3 is 0; however, the low-flows are not 0 in all months, and therefore in accordance with Regulation 31.14(14), temperature limitations are required.

A WQBEL for temperature can only be calculated if there is representative data, in the proper form, to determine what the background Maximum Weekly Average Temperature and Daily Maximum ambient temperatures are. As this data is not available at this time, the temperature limitation will be set at the water quality standard and will be revisited in the future when representative temperature data becomes available.

Metals: Metals may occur naturally in rock. Earth disturbances, such as mining operations, expose rock to air, water, and chemicals creating a potential for certain elements to be present in elevated concentrations. Thus, the Division is evaluating all metals for which there are standards. Note, however, that the Agency for Toxic Substances and Disease Registry has determined that while chromium in the trivalent form occurs naturally in the environment, hexavalent chromium is produced by industrial processes. Industrial processes at this facility would not generate hexavalent chromium and therefore the evaluation for chromium is limited to the trivalent form. The mass-balance equation provided in the beginning of Section V, the low flows and background concentrations contained in Section III, and the in-stream standards as shown in Section II, the WQBELs were calculated. The data used and the resulting WQBELs, M_2 , are set forth in Table A-6a for chronic standards and in Table A-6b for acute standards.

Table A-6a Chronic WQBELs for Metals, Boron, and Sulfide						
Parameter	Q_1 (cfs)	Q_2 (cfs)	Q_3 (cfs)	M_1	M_3	M_2
Al, TR ($\mu\text{g/l}$)*	0	16	16	1043	87	87
As, TR ($\mu\text{g/l}$)	0	16	16	0	7.6	7.6
Be, Dis ($\mu\text{g/l}$)**	0	16	16	0	100	100
Cd, Dis ($\mu\text{g/l}$)	0	16	16	0	3.1	3.1
Cr+3, Dis ($\mu\text{g/l}$)	0	16	16	0	108	108
Cu, Dis ($\mu\text{g/l}$)	0	16	16	0	13	13
Fe, TR ($\mu\text{g/l}$)	0	16	16	540	1000	1000
Pb, Dis ($\mu\text{g/l}$)	0	16	16	0	4.1	4.1

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Mn, Dis (µg/l)	0	16	16	145	1921	1921
Hg, Tot (µg/l)	0	16	16	0	0.01	0.01
Ni, Dis (µg/l)	0	16	16	0	77	77
Se, Dis (µg/l) Until 12/31/2012	0	16	16	0	6	6
Se, Dis (µg/l) Beginning 1/01/2013	0	16	16	0	4.6	4.6
Ag, Dis (µg/l)	0	16	16	0	0.7	0.7
Zn, Dis (µg/l)	0	16	16	72	174	174
B, Tot (mg/l)	0	16	16	0	0.75	0.75
Sulfide (mg/l)	0	16	16	0	0.002	0.002

*Based on Aquatic Life Standard in Regulation 31

** Based on Agriculture Standard in Regulation 31.

Table A-6b Acute WQBELs for Metals						
Parameter	Q_1 (cfs)	Q_2 (cfs)	Q_3 (cfs)	M_1	M_3	M_2
Al, TR (µg/l)*	0	16	16	1043	750	750
As, Dis (µg/l)	0	16	16	1	340	340
Cr+3, Dis (µg/l)	0	16	16	0	829	829
Cu, Dis (µg/l)	0	16	16	0	21	21
Pb, Dis (µg/l)	0	16	16	0	106	106
Mn, Dis (µg/l)	0	16	16	145	3477	3477
Ni, Dis (µg/l)	0	16	16	0	689	689
Se, Dis (µg/l)	0	16	16	0	18.4	18
Ag, Dis (µg/l)	0	16	16	0	4.5	4.5
Zn, Dis (µg/l)	0	16	16	72	173	173

*Based on Aquatic Life Standard in Regulation 31

Organics: The potential for organic constituents was evaluated from data submitted by the Petroglyph Operation Company. The data indicated that no organic constituents are present at or near water quality standards, thus, organics are eliminated as pollutants of concern for this discharge.

Agricultural Use Parameters (SAR, Na and EC):

Section 31.11(1)(a)(iv) of *The Basic Standards and Methodologies for Surface Waters* (Regulation No. 31) includes the narrative standard that State surface waters shall be free of substances that are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life. The interpretation of these conditions (i.e., "no harm to plants" and "no harm to the beneficial uses") and how they were to be applied in permits were contemplated by the Division as part of an Agricultural Work Group, and culminated in the most recent policy entitled *Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops* (hereafter the Narrative Standards policy)

Based on available information, the water in the Cucharas River downstream of the discharge is used for irrigation water.

The evaluation of the suitability (i.e., quality) of irrigation water is complex and involves the detailed understanding of the interactions of plant tolerances, soil types, and agricultural management practices. Irrigation water has two properties – salinity and sodicity – that can have concurrent impacts on the irrigated crop beneficial use. The Division has thus determined that two parameters, specifically electrical conductivity (EC) and Sodium Absorption Ratio (SAR), are the best parameters to regulate in discharge permits to control levels of salts to minimize both the loss of irrigated crop yield and the sodium hazard.

In order to establish limits for EC and SAR, the Division must: (1) determine the most sensitive crop usually grown in the area downstream from the discharge and determine the corresponding EC of irrigation water (EC_w) threshold value for no reduction in yield below 100%; and (2) determine the SAR based on the EC_w value and calculate the maximum sodium that can be discharged, with consideration of existing water quality, to prevent the exceedance of the SAR.

Electrical Conductivity: The electrical conductivity (EC) is also known as specific conductance, conductance, conductivity, or specific conductivity. Crops have varying sensitivity to electrical conductivity. Studies have established the maximum conductivity in the water in the root zone that will result in no reduction of crop yield. This value is referred to as the EC saturation extract or EC_e . However, the EC_e is not the same as the EC of the irrigation water (EC_w). The EC_w is the maximum conductivity in the irrigation water that will result in no reduction in crop yield.

Common crop EC_w thresholds are reproduced from the Narrative Standards policy, and are summarized in Table A-7a.

Table A-7a Maximum EC_w That Will Not Reduce The 100% Yield of Selected Irrigated Crops	
Common Colorado Crops	Irrigation Water Electrical Conductivity (EC_w)
Beans	0.7
Onion	0.8
Corn (grain)	1.1
Potato	1.1
Corn (silage)	1.2
Alfalfa	1.3
Wheat	4.0
Sugarbeet	4.7
Barley	5.3

The EC_w that is used in the development of permit limits is determined based on the most sensitive of the EC_w 's for the crops grown in the area. Based on available information from the Colorado Division of Water Resources, for waters from the Cucharas River used for crop irrigation, corn (grain) was determined to be the most sensitive crop.

The EC limit is calculated using the mass balance equation found at the beginning of Section IV of this analysis. The data used and the resulting calculations of the EC limit, M_2 , are set forth in the table below. Note that in accordance with the Division's Narrative Standards policy, the EC limit will be imposed as a chronic (30-day average) limit. Because the annual low flow (Q_1) for the Cucharas River is zero, the EC standard for this discharge to the Cucharas River equals the in-stream water quality standard for corn (1.1).

Parameter	Q_1 (cfs)	Q_2 (cfs)	Q_3 (cfs)	M_1 (mg/l)	M_2 (mg/l)	M_2 (mg/l)
EC, dS/m	0	16	16	0	1.1	1.1

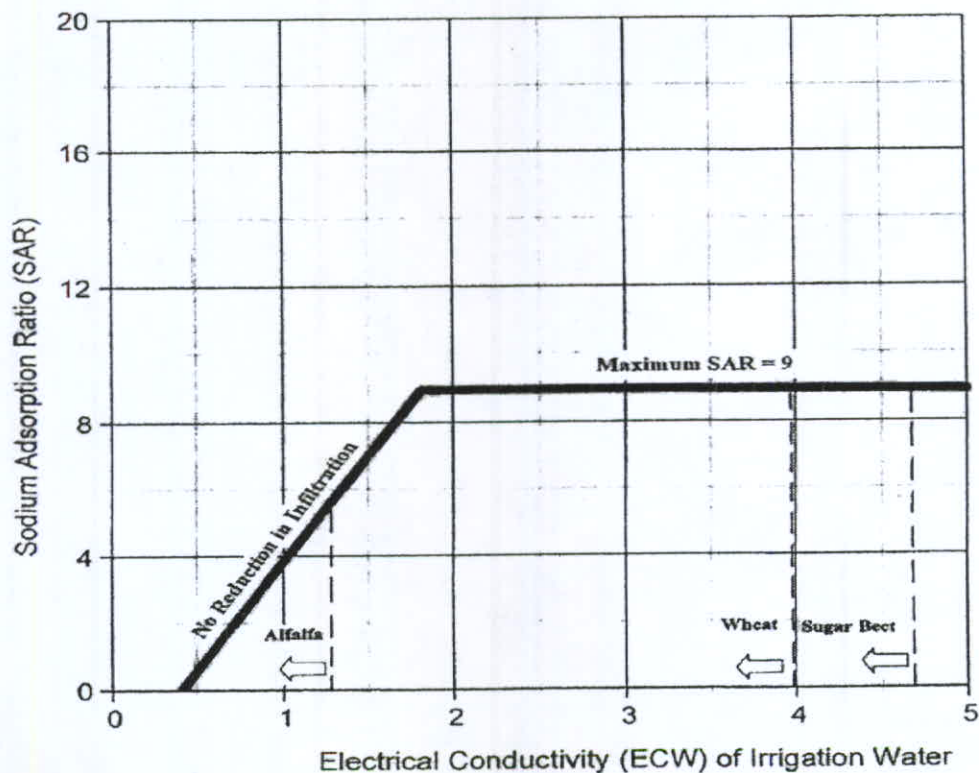
Sodium and SAR – SAR means Sodium Adsorption Ratio, which is a representation of the relative proportion of sodium cations to calcium and magnesium cations (also known as the “sodium hazard”). The SAR standard is established using Figure A-2, which is reproduced herein from the Narrative Standards policy. Specifically, the EC_w 1.1 which corresponds to the EC_w for the most sensitive crop of corn grain, was used to establish a SAR standard of 5.

Note that in Figure A-2 at an EC value of 0.36 or less, the SAR must be 0. In order to achieve a 0 SAR, any treatment process would have to eliminate all sodium, which is virtually impossible. Therefore, a minimum EC at 0.36 will be instigated in the permit.

SAR – SAR means Sodium Adsorption Ratio, which is a representation of the relative proportion of sodium cations to calcium and magnesium cations (also known as the “sodium hazard”).

The SAR standard is established using Figure A-2, which is reproduced herein from the Narrative Standards policy. Specifically, the EC_w 1.1 which corresponds to the EC_w for the most sensitive crop of corn (grain) was used to establish a SAR standard of 5.3 (Figure A-2). Since the allowable SAR value is tied to the actual EC of the effluent, the EC/SAR equation ($SAR = 7.1 * EC(dS/m) - 2.48$) will be the limit in the permit; however the allowable SAR of the effluent will be capped at 5.3.

Figure A-2: Rate of Water Infiltration as Affected by EC_w and SAR with Modification to Show Upper Limit for SAR (9)



The values for sodium (Na^+), calcium (Ca^{++}) and magnesium (Mg^{++}) in this equation are expressed in units of milliequivalents per liter (meq/l). Generally, data for sodium, calcium and magnesium are reported in terms of mg/l, which must then be converted to calculate the SAR. The conversions are:

$$\text{meq/l} = \frac{\text{Concentration in mg/l}}{\text{Equivalent weight in mg/meq}}$$

Where the equivalent weights are determined based on the atomic weight of the element divided by the ion's charge:

$$\begin{aligned}\text{Na}^+ &= 23.0 \text{ mg/meq (atomic weight of 23, charge of 1)} \\ \text{Ca}^{++} &= 20.0 \text{ mg/meq (atomic weight of 40.078, charge of 2)} \\ \text{Mg}^{++} &= 12.15 \text{ mg/meq (atomic weight of 24.3, charge of 2)}\end{aligned}$$

Bicarbonate and Adjusted SAR (SAR-adj): Studies by the Colorado State University Cooperative Extension and by other entities have found that high proportions of sodium to calcium and magnesium in total dissolved solids negatively impacts plant growth and may contribute to reduced yields in farm land over time. Additionally, high bicarbonate concentrations also adversely affect plant growth because bicarbonate combined with calcium and magnesium will precipitate out, leaving a higher concentration of sodium in the water. For this reason, monitoring and reporting of the bicarbonate ion concentration, and reporting of the effluent SAR will be in terms of adjusted SAR. Note the bicarbonate ion must be measured pursuant to a modified alkalinity test (Alkalinity can be measured via procedures approved pursuant to 40 CFR Part 136), that involves the titration of alkalinity in an acidic environment, thereby resulting solely in a measure of bicarbonate alkalinity.

The SAR-adj offers a better insight into the change in calcium in the soil-water due to addition by dissolution of calcium from soil carbonates and silicates, or loss of calcium from soil-water by precipitation as carbonates. The SAR-adj can be used to more correctly predict potential infiltration problems due to relatively high sodium (or low calcium and/or magnesium) in irrigation water. The equation for calculation of SAR-adj is:

$$\text{SAR-adj} = \frac{\text{Na}^+}{\sqrt{\frac{\text{Ca}_x + \text{Mg}^{++}}{2}}}$$

Where:

- Na^+ = Sodium in the irrigation water reported in meq/l (the formula for meq/l previously provided)
- Mg^{++} = Magnesium in the irrigation water reported in meq/l (the formula for meq/l previously provided)
- Ca_x = Ca_x represents calcium (in meq/l) in the applied irrigation water but modified due to salinity of the applied water (EC_w), its $\text{HCO}_3^-/\text{Ca}^{++}$ ratio, and the estimated partial pressure of CO_2 in the surface few millimeters of soil ($\text{PCO}_2 = 0.0007$ atmospheres)

Because the Ca_x value must be determined based on the EC_w and the ratio of $\text{HCO}_3^-/\text{Ca}^{++}$, the permittee will be required to determine the EC_w (in dS/m) and the ratio of $\text{HCO}_3^-/\text{Ca}^{++}$, where the HCO_3^- and Ca^{++} are expressed in units of meq/l. The following equations are used:

Ca^{++} = Calcium in the irrigation water reported in meq/l (the formula for calcium meq/l previously provided)
 HCO_3^- = Bicarbonate in the irrigation water reported in meq/l, where the equivalent weight conversion is determined by dividing the concentration in mg/l by the atomic weight of 61 and the charge of 1

Ultimately, the EC_w and the $\text{HCO}_3^-/\text{Ca}^{++}$ ratio (calculated by dividing the HCO_3^- in meq/l by the Ca^{++} in meq/l) are used to obtain determine the Ca_x using meq/l) are used to obtain determine the Ca_x using Table A-7b.

Table A-7b – Modified Calcium Determination for Adjusted Sodium Adsorption Ratio

CALCIUM CONCENTRATION (Ca_x) EXPECTED TO REMAIN IN NEAR-SURFACE SOIL-WATER FOLLOWING IRRIGATION WITH WATER OF GIVEN HCO_3^-/Ca RATIO AND EC_w													
Salinity of applied water (EC_w)(dS/m)													
		0.1	0.2	0.3	0.5	0.7	1.0	1.5	2.0	3.0	4.0	6.0	8.0
Ratio of HCO_3^-/Ca	.05	13.20	13.61	13.92	14.40	14.79	15.26	15.91	16.43	17.28	17.97	19.07	19.94
	.10	8.31	8.57	8.77	9.07	9.31	9.62	10.02	10.35	10.89	11.32	12.01	12.56
	.15	6.34	6.54	6.69	6.92	7.11	7.34	7.65	7.90	8.31	8.64	9.17	9.58
	.20	5.24	5.40	5.52	5.71	5.87	6.06	6.31	6.52	6.86	7.13	7.57	7.91
	.25	4.51	4.65	4.76	4.92	5.06	5.22	5.44	5.62	5.91	6.15	6.52	6.82
	.30	4.00	4.12	4.21	4.36	4.48	4.62	4.82	4.98	5.24	5.44	5.77	6.04
	.35	3.61	3.72	3.80	3.94	4.04	4.17	4.35	4.49	4.72	4.91	5.21	5.45
	.40	3.30	3.40	3.48	3.60	3.70	3.82	3.98	4.11	4.32	4.49	4.77	4.98
	.45	3.05	3.14	3.22	3.33	3.42	3.53	3.68	3.80	4.00	4.15	4.41	4.61
	.50	2.84	2.93	3.00	3.10	3.19	3.29	3.43	3.54	3.72	3.87	4.11	4.30
	.75	2.17	2.24	2.29	2.37	2.43	2.51	2.62	2.70	2.84	2.95	3.14	3.28
	1.00	1.79	1.85	1.89	1.96	2.01	2.09	2.16	2.23	2.35	2.44	2.59	2.71
	1.25	1.54	1.59	1.63	1.68	1.73	1.78	1.86	1.92	2.02	2.10	2.23	2.33
	1.50	1.37	1.41	1.44	1.49	1.53	1.58	1.65	1.70	1.79	1.86	1.97	2.07
	1.75	1.23	1.27	1.30	1.35	1.38	1.43	1.49	1.54	1.62	1.68	1.78	1.86
	2.00	1.13	1.16	1.19	1.23	1.26	1.31	1.36	1.40	1.48	1.54	1.63	1.70
	2.25	1.04	1.08	1.10	1.14	1.17	1.21	1.26	1.30	1.37	1.42	1.51	1.58
	2.50	0.97	1.00	1.02	1.06	1.09	1.12	1.17	1.21	1.27	1.32	1.40	1.47
	3.00	0.85	0.89	0.91	0.94	0.96	1.00	1.04	1.07	1.13	1.17	1.24	1.30
	3.50	0.78	0.80	0.82	0.85	0.87	0.90	0.94	0.97	1.02	1.06	1.12	1.17
	4.00	0.71	0.73	0.75	0.78	0.80	0.82	0.86	0.88	0.93	0.97	1.03	1.07
	4.50	0.66	0.68	0.69	0.72	0.74	0.76	0.79	0.82	0.86	0.90	0.95	0.99
	5.00	0.61	0.63	0.65	0.67	0.69	0.71	0.74	0.76	0.80	0.83	0.88	0.93
	7.00	0.49	0.50	0.52	0.53	0.55	0.57	0.59	0.61	0.64	0.67	0.71	0.74

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	10.00	0.39	0.40	0.41	0.42	0.43	0.45	0.47	0.48	0.51	0.53	0.56	0.58
	20.00	0.24	0.25	0.26	0.26	0.27	0.28	0.29	0.30	0.32	0.33	0.35	0.37
	30.00	0.18	0.19	0.20	0.20	0.21	0.21	0.22	0.23	0.24	0.25	0.27	0.28

¹ Adapted from Suarez (1981).

² Assumes a soil source of calcium from lime (CaCO_3) or silicates; no precipitation of magnesium, and partial pressure of CO_2 near the soil surface (P_{CO_2}) is 0.0007 atmospheres.

³ Ca_x , HCO_3^- , Ca are reported in meq/l; ECw is in dS/m (decisiemens per meter).

Because values will not always be quantified at the exact EC_w or $\text{HCO}_3^-/\text{Ca}^{++}$ ratio in the table, the resulting Ca_x must be determined based on the closest value to the calculated value. For example, for a calculated EC_w of 2.45 dS/m, the column for the EC_w of 2.0 would be used. However, for a calculated EC_w of 5.1, the corresponding column for the EC_w of 6.0 would be used. Similarly, for a $\text{HCO}_3^-/\text{Ca}^{++}$ ratio of 25.1, the row for the 30 ratio would be used.

The Division acknowledges that some effluents may have electrical conductivity levels that fall outside of this table, and others have bicarbonate to calcium ratios that fall outside this table. For example, some data reflect $\text{HCO}_3^-/\text{Ca}^{++}$ ratios greater than 30 due to bicarbonate concentrations reported greater than 1000 mg/l versus calcium concentrations generally less than 10 mg/l (i.e., corresponding to $\text{HCO}_3^-/\text{Ca}^{++}$ ratios greater than 100). Despite these high values exceeding the chart's boundaries, it is noted that the higher the $\text{HCO}_3^-/\text{Ca}^{++}$ ratio, the greater the SAR-adj. Thus, using the Ca_x values corresponding to the final row containing bicarbonate/calcium ratios of 30, the permittee will actually calculate an SAR-adj that is less than the value calculated if additional rows reflecting $\text{HCO}_3^-/\text{Ca}^{++}$ ratios of greater than 100 were added.

VII. Antidegradation Evaluation

As set out in *The Basic Standards and Methodologies for Surface Water*, Section 31.8(2)(b), an antidegradation analysis is required except in cases where the receiving water is designated as "Use Protected." Note that "Use Protected" waters are waters "that the Commission has determined do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process" as set out in Section 31.8(2)(b). The antidegradation section of the regulation became effective in December 2000, and therefore antidegradation considerations are applicable to this WQA analysis.

According to the *Classifications and Numeric Standards for Arkansas River Basin*, stream segment COARMA14 is Undesignated. Thus, an antidegradation review is required for this segment if new or increased impacts are found to occur.

Introduction to the Antidegradation Process

The antidegradation process conducted as part of this water quality assessment is designed to determine if an antidegradation review is necessary and if necessary, to complete the required calculations to determine the limits that can be selected as the antidegradation-based effluent limit (ADBEL), absent further analyses that must be conducted by the facility.

As outlined in the *Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance* (AD Guidance), the first consideration of an antidegradation evaluation is to determine if new or increased impacts are expected to occur. This is determined by a comparison of the newly calculated WQBELs verses the existing permit limitations in place as of September 30, 2000, and is described

in more detail in the analysis. Note that the AD Guidance refers to the permit limitations as of September 30, 2000 as the existing limits.

If a new or increased impact is found to occur, then the next step of the antidegradation process is to go through the significance determination tests. These tests include: 1) bioaccumulative toxic pollutant test; 2) temporary impacts test; 3) dilution test (100:1 dilution at low flow) and; 4) a concentration test.

As the determination of new or increased impacts and the bioaccumulative and concentration significance determination tests require more extensive calculations, the Division will begin the antidegradation evaluation with the dilution and temporary impact significance determination tests. These two significance tests may exempt a facility from further AD review without the additional calculations.

Note that the antidegradation requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the antidegradation review; however, where there is only an acute standard, the acute standard is used. The appropriate standards are used in the following antidegradation analysis.

Significance Tests for Temporary Impacts and Dilution

This is not a temporary discharge and therefore exclusion based on a temporary discharge cannot be granted and the AD evaluation must continue.

The ratio of the chronic (30E3) low flow to the design flow is 0:1, less than the 100:1 significance criteria. Therefore this facility is not exempt from an AD evaluation based on the dilution significance determination test, and the AD evaluation must continue.

For the determination of a new or increased impact and for the remaining significance determination tests, additional calculations are necessary. Therefore, at this point in the antidegradation evaluation, the Division will go back to the new or increased impacts test. If there is a new or increased impact, the last two significance tests will be evaluated.

New or Increased Impact

To determine if there is a new or increased impact to the receiving water, a comparison of the new WQBEL concentrations and loadings verses the concentrations and loadings as of September 30, 2000, needs to occur.

If either the new concentration or loading is greater than the September 2000 concentration or loading, then a new or increased impact is determined. If this is a new facility (commencement of discharge after September 30, 2000) it is automatically considered a new or increased impact.

Note that the AD Guidance document includes a step in the New or Increased Impact Test that calculates the Non-Impact Limit (NIL), which is defined as the permit limit as of September 2000, divided by the new design flow (and the conversion factor given below). The permittee may choose to retain a NIL if certain conditions are met, and therefore the AD evaluation for that parameter would be complete. However in practice, the Division calculates both the NIL and the AD limitation, so that the permittee can compare the two potential limitations and determine which of the two limits they would prefer, one which does not allow any increased impact (NIL), or the other which allows an insignificant impact (AD limit). The NIL step of the New or Increased Impacts Test will be further explained and the appropriate values calculated later in this AD evaluation, if applicable.

If a parameter is being evaluated in this WQA, where the September 2000 permit did not contain a limitation for that parameter, then an implicit limitation may be substituted. Consistent with the First Update to the AD Guidance of April 2002, an implicit limit is determined based on the approach that specifies that the implicit limit is the maximum concentration of the effluent from October 1998 to September 2000, if such data is available. If this data is unavailable, the Division may substitute more recent representative data, if appropriate, on a case by case basis.

Although two outfalls were in place prior to September 30, 2000, (first discharged in September of 1999), the majority were not. Because these two outfalls comprise a negligible portion (1.8 mgd) of the current total permitted flow (10.5 mgd), applying a NIL (total recoverable iron) to this portion of the discharge would be inconsequential to the final limitations. Therefore, a new or increased impact will be assumed. For all other outfalls, the discharges were not in place as of September 30, 2000. Therefore, for the purposes of this AD evaluation, the determination of new or increased impacts is automatic.

Determination of Baseline Water Quality (BWQ)

The BWQ is the ambient condition of the water quality as of September 30, 2000. The BWQ defines the baseline low flow pollutant concentration, and for bioaccumulative toxic pollutants, the baseline load. The BWQ is to take into account the influence of the discharger if the discharge to the receiving water was in place prior to September 30, 2000. In such a case, data from a downstream location should be used to determine the BWQ. If only upstream data is available, then a mass balance equation may be applied, using the facilities effluent data to determine the BWQ. If the discharge was not present prior to September 30, 2000, then the influence of that discharge would not be taken into account in determining the BWQ. If the BWQ has already been determined in a previous WQA AD evaluation, it may not need to be recalculated as the BWQ is the water quality as of September 30, 2000, and therefore should not change unless additional data is obtained or the calculations were in error.

Consistent with current Division procedures, the BWQ concentrations for all pollutants of concern for the Cucharas River (COARMA14) should be established so that it can be used as part of an antidegradation review.

This discharger was in place as of September 30, 2000, however, the two active outfalls (002A & 004A) as of September 30, 2000 were overflow discharges from two associated evaporation pits. Both outfalls were to arroyos, which eventually lead to Bear Creek. Because the volume of overflow to the arroyos was relatively low, it is likely that much of the flow did not reach Bear Creek. It is even *more* likely that this discharge did not reach the Cucharas River. Thus, in this instance it is inconsequential if the BWQ data was gathered upstream or downstream of Bear Creek. Data for dissolved arsenic, dissolved cadmium, dissolved copper, dissolved lead, dissolved manganese, total mercury, dissolved selenium, dissolved silver, and dissolved zinc was collected at WQCD Station 7645 (Cucharas River at Highway 10), located approximately 7 miles downstream from the confluence of Bear Creek and the Cucharas River. This station (WQCD 7645) did not have data for total recoverable aluminum, boron, dissolved beryllium, total recoverable arsenic, dissolved chromium, dissolved nickel, and sulfide; nor was effluent data for *most* of these parameters (from 002A and 004A) available from the permittee. Two effluent values for each outfall were available from the permittee for total recoverable arsenic, and were included in the analysis along with data collected at Riverwatch Station 605, approximately 1 mile upstream of the confluence of the Cucharas River and Bear Creek. Data for total aluminum was also collected from Riverwatch Station 605. There was no ambient water quality data for boron, dissolved beryllium, dissolved chromium, dissolved nickel, and sulfide.

Petroglyph Operating Co., Inc. Water Quality Assessment

Currently, it is the Division's approach to evaluate five years of ambient water quality data, if available, for the five years prior to September 30, 2000 when determining the BWQ. However, due to limited data during the typical BWQ period, February 2000 through November 2000 and August 2005 through June 2006 data was used in the analysis for dissolved arsenic, dissolved cadmium, dissolved copper, total recoverable iron, dissolved lead, dissolved manganese, total mercury, dissolved selenium, dissolved silver, and dissolved zinc, while June 1999 to December 2002 data was used in the analysis for total recoverable arsenic and total recoverable aluminum. Four effluent data points from April 2006 and July 2006 (2 points each-002A and 004A), were also used in the analysis for total recoverable arsenic.

The BWQ concentrations based on these data, represented by the 50th percentile for total recoverable metals and total metals and the 85th percentile for dissolved metals, and other pollutants, are summarized in Table A-8. Note that the values in ***bold, italicized and underlined font*** represent the BWQ concentration for each pollutant based on the appropriate methodology for that pollutant.

Table A-8
BWQ Concentrations for Potential Pollutants of Concern

Parameter	Number of Samples	15th Percentile	50th Percentile	85th Percentile	Mean	Location	Stream Standard	Notes
Al, TR (µg/l)	38	478	<u>1043</u>	2868	2068	Upstream/Effluent	87	
As, TR (µg/l)	42	0	<u>0</u>	0	0.012	Upstream	7.6	**
As, Dis (µg/l)	12	0	0	<u>1</u>	0.25	Downstream	100	**
Be, Dis (µg/l)	0	0	0	<u>0</u>	0	NA	100	*
Cd, Dis (µg/l)	13	0	0	<u>0</u>	0	Downstream	3.1	**
Cr+3, Dis (µg/l)	0	0	0	<u>0</u>	0	NA	108	*
Cu, Dis (µg/l)	13	0	0	<u>0</u>	0	Downstream	13	**
Fe, TR (µg/l)	13	154	<u>540</u>	7320	5362	Downstream	1000	
Pb, Dis (µg/l)	13	0	0	<u>0</u>	0	Downstream	4.1	**
Mn, Dis (µg/l)	13	26	58	<u>196</u>	127	Downstream	1921	
Hg, Tot (µg/l)	7	0	<u>0</u>	0	0	Downstream	0.01	**
Ni, Dis (µg/l)	0	0	0	<u>0</u>	0	NA	77	*
Se, Dis (µg/l)	13	1.6	4	<u>7</u>	4.3	Downstream	6/4.6	
Ag, Dis (µg/l)	13	0	0	<u>0</u>	0	Downstream	0.7	**
Zn, Dis (µg/l)	13	0	12	<u>90</u>	37	Downstream	174	**
B, Tot (mg/l)	0	0	<u>0</u>	0	0	NA	0.75	*
Sulfide (mg/l)	0	0	<u>0</u>	0	0	NA	0.002	*

*No data available

**When sample results were below detection levels, the value of zero was used in accordance with the Division's standard approach for summarization and averaging purposes. Note, the detection level for total mercury (0.2) was greater than the stream standard.

Typically, BWQ concentrations based on upstream data also require the establishment of the facility contributions during the antidegradation review period in addition to the ambient water quality during this period. However, since this facility did not collect effluent data for total recoverable arsenic, and because the discharge contributions to the Cucharas are negligible, upstream data was used without this

consideration for arsenic and are deemed representative of the baseline water quality downstream of the discharge.

In cases where the BWQ concentration exceeds the water quality standard, the calculated BWQ concentration must then be set equal to the water quality standard. This occurred for dissolved selenium.

Antidegradation Low Flow

The antidegradation low flow concentrations were correctly determined as part of a previous PEL for the City of Walsenburg WWTF (200233), Cucharas River, September 2007. These are summarized in Table A-9.

<p>Table A-9 Antidegradation Period Low Flows for the Cucharas River</p>													
<i>Low Flow (cfs)</i>	<i>Annual</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
1E3 Acute	0.50	1.0	1.0	1.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
30E3 Chronic	0.50	1.0	1.0	1.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	1.0

Bioaccumulative Significance Test

For mercury which is a bioaccumulative toxic pollutant, the bioaccumulative significance test can now be completed with some minor additional calculations for the baseline water quality load (BWQload), the threshold load (TL), the new load based on the WQBELs, and the threshold load concentration (TL conc). These terms are defined by the following equations:

$$\text{BWQload} = \text{BWQ (from Table A-8*)} * \text{AD low flow (chronic)} * 8.34$$

$$\text{Threshold Load (TL)} = 0.1 * \text{BWQload}$$

$$\text{Threshold Load Concentration (TL Conc)} = \text{TL} \div \text{new design flow} \div 8.34$$

$$\text{WQBEL Load} = \text{new WQBEL (concentration)} * \text{new design flow} * 8.34$$

The discharge is considered to be insignificant if the new load (WQBEL load) is less than the threshold load (TL), or if the new WQBEL (concentration) is less than the TL Conc. The results of the calculations and the comparisons are shown in Table A-10.

Table A-10 Bioaccumulative Significance Test				
Parameter	Threshold Load Concentration (TL Conc)	Threshold Load (TL)	WQBEL Conc	WQBEL Load
Mercury, Total	0	0	0.01	0.00088

For mercury, the WQBEL load is greater than the TL, and the WQBEL Conc is greater than the TL Conc, and therefore additional consideration of the TL must occur. If the permittee accepts the TL, the AD evaluation continues with the calculation of the SCT and ADBACs in the same manner as the other non-bioaccumulative parameters, using the TL Conc in place of the WQBEL.

If the TL is not acceptable, an AD Alternatives Analysis must be completed. For more information regarding an Alternatives Analysis, refer to the Antidegradation Guidance and to Regulation 31.8.

Significant Concentration Threshold

The SCT is defined as the BWQ plus 15% of the baseline available increment (BAI), and is calculated by the following equation:

$$SCT = (0.15 \times BAI) + BWQ$$

The BAI is the concentration increment between the baseline water quality and the water quality standard, expressed by the term (WQS - BWQ). Substituting this into the SCT equation results in:

$$SCT = 0.15 \times (WQS - BWQ) + BWQ$$

Where,

WQS = Chronic standard or, in the absence of a chronic standard, the acute standard

BWQ = Value from Table A-9a

When the BWQ concentration is equal to zero, the following equation results:

$$SCT = 0.15 \times WQS$$

The SCTs are shown together with the calculations of the ADBACs, in Table A-11.

Determination of the Antidegradation Based Average Concentrations

Antidegradation based average concentrations (ADBACs) are determined for all parameters except ammonia, by using the mass-balance equation, and substituting the SCT in place of the water quality standard, as shown in the following equation:

$$ADBAC = \frac{SCT \times Q_3 - M_1 \times Q_1}{Q_2}$$

Where,

- Q_1 = Upstream low flow (1E3 or 30E3 based on either the chronic or acute standard)
 Q_2 = Current design capacity of the facility
 Q_3 = Downstream flow ($Q_1 + Q_2$)
 M_1 = Current ambient water quality concentration (From Section III)
 SCT = Significant concentration threshold

The ADBACs were calculated using the SCTs, and are set forth in Table A-11.

Table A-11 SCTs and ADBACs						
Pollutant	Q_1 (cfs)	Q_2 (cfs)	Q_3 (cfs)	M_1	SCT	ADBAC
Al, TR (µg/l)	0	16	16	1043	87	87
As, TR (µg/l)	0.5	16	16.5	0	1.1	1.1
As, Dis (µg/l)	0.5	16	16.5	1	52	54
Be, Dis (µg/l)	0	16	16	0	15	15
Cd, Dis (µg/l)	0.5	16	16.5	0	0.47	0.48
Cr+3, Dis (µg/l)	0.5	16	16.5	0	16	17
Cu, Dis (µg/l)	0.5	16	16.5	0	2	2.1
Pb, Dis (µg/l)	0.5	16	16.5	0	0.62	0.64
Mn, Dis (µg/l)	0.5	16	16.5	196	455	463
Hg, Tot (µg/l)	0.5	16	16.5	0	0.0015	0.0015
Ni, Dis (µg/l)	0.5	16	16.5	0	12	12
Se, Dis (µg/l)	0.5	16	16.5	7	4.6	4.5
Ag, Dis (µg/l)	0.5	16	16.5	0	0.11	0.11
Zn, Dis (µg/l)	0.5	16	16.5	90	103	103
B, Tot (mg/l)	0.5	16	16.5	0	0.11	0.11
Sulfide (mg/l)	0.5	16	16.5	0	0.0003	0.00031

Based on these calculations, the ambient water quality exceeds the SCT for dissolved selenium and total aluminum. Where an assimilative capacity is calculated to be less than the standard, the Division standard procedure is to allocate the water quality standard, which in this case is the SCT, to prevent degradation of the receiving stream.

Concentration Significance Tests

The concentration significance determination test considers the cumulative impact of the discharges over the baseline condition. In order to be insignificant, the new or increased discharge may not increase the actual instream concentration by more than 15% of the available increment over the baseline condition. The insignificant level is the ADBAC calculated in Table A-12 above. If the new WQBEL concentration is greater than the ADBAC, an AD limit would be applied. This comparison is shown in Table A-12.

Table A-12 Concentration Significance Test			
<i>Pollutant</i>	<i>New WQBEL</i>	<i>ADBAC</i>	<i>Concentration Test Result</i>
Al, TR (µg/l)	87	87	Insignificant
As, TR (µg/l)	7.6	1.1	Significant
As, Dis (µg/l)	340	54	Significant
Be, Dis (µg/l)	100	15	Significant
Cd, Dis (µg/l)	3.1	0.48	Significant
Cr+3, Dis (µg/l)	108	17	Significant
Cu, Dis (µg/l)	13	2.1	Significant
Pb, Dis (µg/l)	4.1	0.64	Significant
Mn, Dis (µg/l)	1921	463	Significant
Hg, Tot (µg/l)	0.01	0.0015	Significant
Ni, Dis (µg/l)	77	12	Significant
Se, Dis (µg/l)	4.6	4.5	Significant
Ag, Dis (µg/l)	0.7	0.11	Significant
Zn, Dis (µg/l)	174	103	Significant
B, Tot (mg/l)	0.75	0.11	Significant
Sulfide (mg/l)	0.002	0.00031	Significant

For total recoverable aluminum, the WQBEL equals the ADBAC and therefore, the concentration test results in an insignificant determination. The WQBELs are the final result of this WQA for these parameters and AD limitations are not necessary.

For the remaining parameters, the WQBELs are greater than the ADBACs and therefore, the concentration test results in significance determinations for all parameters, and the antidegradation based effluent limitations (ADBELs) must be determined.

Non Impact Limits (NILs) and Antidegradation Based Effluent Limitations (ADBELs)

The ADBEL is defined as the potential limitation resulting from the AD evaluation, and may be either the ADBAC, the NIL, or may be based on the concentration associated with the threshold load concentration (for the bioaccumulative toxic pollutants). ADBACs and TL have already been determined in the AD evaluation, and therefore to complete the evaluation, the NILs need to be determined.

The non impact limit (NIL) is defined as the limit which results in no increased water quality impact (no increase in load or limit over the September 2000 load or limit). If the facility was in place, but did not have a limitation for a particular parameter in the September 2000 permit, the Division may substitute an implicit limitation. An implicit limitation is defined as the maximum effluent concentration in the effluent, during the two years prior to September 2000. For this facility, only data for total recoverable iron was available to determine an implicit limitation. However, as discussed previously, a NIL for total recoverable iron will not be applied to a portion of the discharge.

Note that ADBACs and NILs are not applicable when the new WQBEL concentration (and loading as evaluated in the New and Increased Impacts Test) is less than the NIL concentration (and loading), or when the new WQBEL is less than the ADBAC. Where an ADBAC or NIL applies, the permittee has the final choice between the two limitations. A NIL is applied as a 30-day average (and the acute WQBEL would also apply where applicable) while the ADBAC would be applied as a 2 year rolling average concentration. For the purposes of this WQA, the Division has made an attempt to determine whether the NIL or ADBAC will apply. The end results of this AD evaluation are in Table A-13, including any parameter that was previously exempted from further AD evaluation (total recoverable iron), with the final potential limitation identified (NIL, WQBEL or ADBAC).

Table A-13 Final Selection of WQBELs, NILs, and ADBACs				
<i>Pollutant</i>	<i>NIL</i>	<i>New WQBEL</i>	<i>ADBAC</i>	<i>Chosen Limit</i>
Al, TR (µg/l)	NA	87	87	WQBEL
As, TR (µg/l)	NA	7.6	1.1	ADBAC
As, Dis (µg/l)	NA	340	54	ADBAC
Be, Dis (µg/l)	NA	100	15	ADBAC
Cd, Dis (µg/l)	NA	3.1	0.48	ADBAC
Cr+3, Dis (µg/l)	NA	108	17	ADBAC
Cu, Dis (µg/l)	NA	13	2.1	ADBAC
Fe, TR (µg/l)	NA	1000	609	ADBAC
Pb, Dis (µg/l)	NA	4.1	0.64	ADBAC
Mn, Dis (µg/l)	NA	1921	463	ADBAC
Hg, Tot (µg/l)	NA	0.01	0.0015	ADBAC
Ni, Dis (µg/l)	NA	77	12	ADBAC
Se, Dis (µg/l)	NA	4.6	4.5	ADBAC
Ag, Dis (µg/l)	NA	0.7	0.11	ADBAC
Zn, Dis (µg/l)	NA	174	103	ADBAC
B, Tot (mg/l)	NA	0.75	0.11	ADBAC
Sulfide (mg/l)	NA	0.002	0.00031	ADBAC

The ADBACs have been established for this facility for all parameters except total recoverable aluminum. The ADBACs were selected as they are more stringent than the WQBELs, or perhaps due to the application as a two-year rolling average.

Alternatives Analysis

If the permittee does not want to accept an effluent limitation that results in no increased impact (NIL) or in insignificant degradation (ADBAC), the applicant may conduct an alternatives analysis (AA). The AA examines alternatives that may result in no degradation or less degradation, and are economically, environmentally, and technologically reasonable. If the proposed activity is determined to be important economic or social development, a determination shall be made whether the degradation that would result from such regulated activity is necessary to accommodate that development. The result of an AA may be an alternate limitation between the ADBEL and the WQBEL, and therefore the ADBEL would not being

applied. This option can be further explored with the Division. See Regulation 31.8 (3)(d), and the Antidegradation Guidance for more information regarding an alternatives analysis.

VIII. References

Regulations:

The Basic Standards and Methodologies for Surface Water, Regulation 31, Colorado Department Public Health and Environment, Water Quality Control Commission, effective December 31, 2007.

Classifications and Numeric Standards for Arkansas River Basin, Regulation No. 32, Colorado Department Public Health and Environment, Water Quality Control Commission, effective March 30, 2009

Water-Quality-Limited Segments Requiring Total Maximum Daily Loads, Regulation 93, Colorado Department Public Health and Environment, Water Quality Control Commission, effective April 30, 2008.

Colorado's Monitoring and Evaluation List, Regulation 94, Colorado Department Public Health and Environment, Water Quality Control Commission, effective April 30, 2006.

Policy and Guidance Documents:

Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, December 2001.

Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0, Colorado Department Public Health and Environment, Water Quality Control Division, April 23, 2002.

Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-24, effective March 10, 2008.

Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-19, effective May 2002.



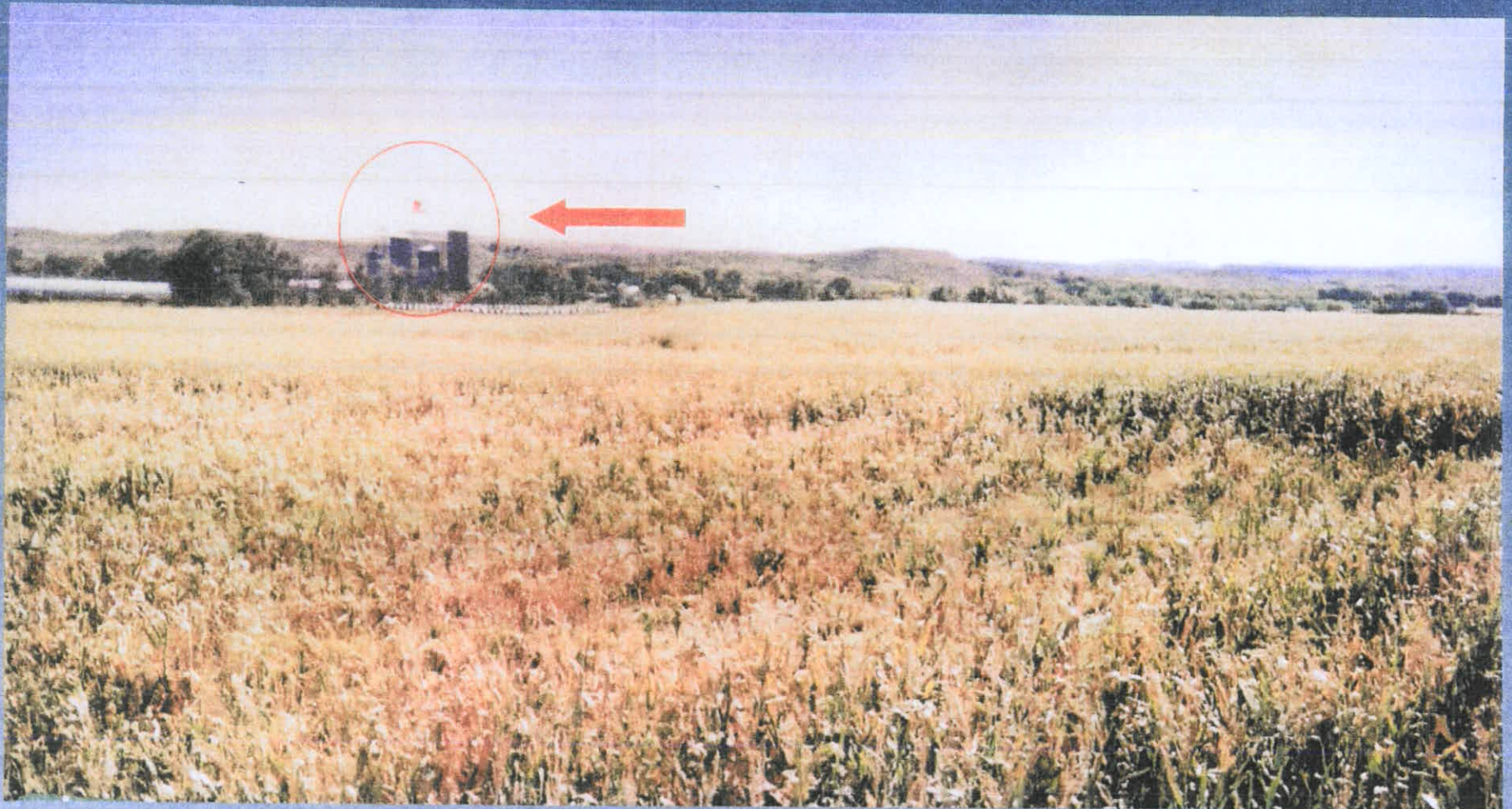
Chemical deposits crop irrigation water



Chemical deposits Cuchara



Irrigation on Corsentino Dairy Farm; waters cattle too



Corsentino Dairy Farm background



October '06 – Crop deterioration began



2006 after harvest

before harvest



July 2008 crop harvest



Corsentino Dairy Farm 2008



July 2008 crops at harvest time



Consenting Dairy Farm
Summary of Loss Calculation from Water
1/1/02 Thru 12/31/08 plus future years

Year	Loss of Milk Production	Loss of Cattle	Loss of Corn Silage	Additional Cost for Corn to ration	
2002	\$18,418.01	\$107,269.83	\$0.00	\$0.00	
2003	\$91,411.03	\$70,720.54	\$0.00	\$0.00	
2004	\$191,080.63	\$32,771.97	\$0.00	\$0.00	
2005	\$311,980.69	\$74,331.91	\$0.00	\$0.00	
2006	\$432,047.76	\$79,201.12	\$255,190.00	\$131,638.16	
2007	\$609,137.52	\$0.00	\$171,525.00	\$146,377.32	
2008	\$382,876.21	\$0.00	\$233,625.00	\$120,201.90	
Losses Thru 12/31/08	\$2,036,951.84	\$364,295.36	\$660,340.00	\$396,217.38	\$3,459,804.59
Future Year Losses					
Per year loss until cleaned up	\$338,930.64		\$229,425.00	\$89,976.25	\$658,331.89
Total loss thru 12/31/08					\$3,459,804.59
I have not calculated anything for the clean up of the land. I have not calculated anything for the additional income loss because of					

Corsestino Dairy Farm
Summary of Loss Calculation from Water
1/1/02 Thru 12/31/08 plus future years

Year	Loss of Milk Production	Loss of Cattle	Loss of Corn Silage	Additional Cost for Corn to ration	
2002	\$18,418.01	\$107,269.83	\$0.00	\$0.00	
2003	\$91,411.03	\$70,720.54	\$0.00	\$0.00	
2004	\$191,080.63	\$32,771.97	\$0.00	\$0.00	
2005	\$311,980.69	\$74,331.91	\$0.00	\$0.00	
2006	\$432,047.76	\$79,201.12	\$255,190.00	\$131,638.16	
2007	\$609,137.52	\$0.00	\$171,525.00	\$146,377.32	
2008	\$382,876.21	\$0.00	\$233,625.00	\$120,201.90	
Losses Thru 12/31/08	\$2,036,951.84	\$364,295.36	\$660,340.00	\$398,217.38	\$3,459,804.59
Future Year Losses					
Per year Loss until cleaned up	\$338,930.64		\$229,425.00	\$89,976.25	\$658,331.89
Total loss thru 12/31/08					\$3,459,804.59
I have not calculated anything for the clean up of the land.					
I have not calculated anything for the additional income loss because of additional lost animals or their offspring.					

Corsetino Dairy
3 year production average before Bad Water
1999 thru 2001

	Year 1999	Year 2000	Year 2001	3 yr ave 1999 - 2001
Leased Cows				
Lbs. Milk prod per period	14,644,470.00	13,541,656.00	14,203,310.00	
Lactating cows	618.00	605.00	550.00	591.00
Ave. Production per cow per day	64.92	61.32	70.75	65.67
Days in year	365.00	365.00	365.00	
Total cows per period includes leased	663.00	657.00	642.00	654.00
% of Total cows in the milk tank	93.21%	92.09%	85.67%	90.37%
Number of cattle died	68	77	99	81.33
% of Death loss to total herd	10.26%	11.72%	15.42%	12.44%

Consentino Dairy
Loss Calculation
2002 thru 2007

	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	3-yr ave before water pumping 1999 thru 2001
Leased Cows		93	93	212	300	99	
Lbs. Milk prod per period	12,228,292.00	10,177,809.00	9,108,791.00	11,465,391.00	10,738,587.00	9,892,908.00	
Lactating cows	517.00	468.00	433.00	573.00	600.00	544.00	
Ave. Production per cow per day	64.80	60.88	57.64	54.82	49.03	49.82	65.67
Days in year	365.00	365.00	365.00	365.00	365.00	365.00	
Total cows per period includes leased	563.00	553.00	533.00	674.00	685.00	667.00	
% of Total cows in the milk tank	91.83%	82.82%	81.24%	85.01%	87.58%	81.56%	
Number of cattle died	128	107	84	124	128	66	
% of Death loss to total herd	22.74%	19.35%	15.76%	18.40%	18.69%	9.90%	12.44%
Gross Milk Check for year	\$1,461,192.58	\$1,232,803.18	\$1,441,869.63	\$1,669,814.51	\$1,443,734.46	\$2,090,881.60	
Less DFA Expenses for year	\$80,327.09	\$68,895.33	\$69,202.51	\$92,806.71	\$169,874.26	\$175,158.04	
Net Check	\$1,380,835.47	\$1,163,707.85	\$1,372,467.12	\$1,577,007.80	\$1,273,860.20	\$1,915,723.56	
Net of DFA exp Milk Price per cwt	\$11.29	\$11.43	\$15.07	\$13.75	\$11.86	\$19.36	
Claim Calculation on Milk:							
Total Production at 65.67 lbs per day	12,391,396.70	10,977,291.46	10,378,094.33	13,733,598.27	14,380,731.18	13,038,529.60	
Actual Production	12,228,292.00	10,177,809.00	9,108,791.00	11,465,391.00	10,738,587.00	9,892,908.00	
Lost production	163,104.70	799,482.46	1,268,303.33	2,268,207.27	3,642,144.18	3,145,621.60	
Net Price	\$11.29	\$11.43	\$15.07	\$13.75	\$11.86	\$19.36	
Loss on Milk Production	\$18,418.01	\$91,411.03	\$191,080.63	\$311,980.69	\$432,047.76	\$609,137.52	
Claim for Excess Death Loss							
Total Cows lost for year	128	107	84	124	128	66	
Death Loss based on History	70	69	66	84	85	83	
Total Excess Loss of Cows	58	38	18	40	43	-17	
Cost to Replace Cows	\$1,850.00	\$1,650.00	\$1,850.00	\$1,850.00	\$1,850.00		
Money Loss on Excess Death loss	\$107,269.83	\$70,720.54	\$32,771.97	\$74,331.91	\$79,201.12	\$0.00	
Corn Silage Loss							
Historic Corn Silage Average	Acres				6.175	6.175	Ton 6.175
Actual corn silage produced					2.400	3.888	
Silage Shortage					3.775	2.287	
Cost to buy and deliver silage					\$67.60	\$75.00	
Total cost for Silage					\$255,180.00	\$171,525.00	
Additional Corn Needed to Supplement ration							
Additional Pounds per day per cow					6.50	6.50	
Additional Ton of corn Needed					612.58125	791.22875	
Price per ton					\$182	\$195	
Total Cost for additional corn					\$131,638.18	\$146,377.32	
Total Loss Per Year	\$125,687.83	\$162,131.57	\$223,852.60	\$386,312.59	\$998,077.05	\$927,039.84	

Corsetino Dairy Farms, Inc
Analysis of Loss of Milk Production
8/08 Thru 12/31/08

by Ron Nottle

	Jan 2008	Feb 2008	Mar 2008	Apr 2008	May 2008	June 2008	July 2008	Aug 2008	Sept 2008	Oct 2008	Nov 2008	Dec 2008	YTD 2008	Ave Prod 1999 thru 2001
Leased Cows	97	97	97	97	97	97	97	96	95	45	0	0	45	
Lbs. Milk prod per period	821,784	771,325	850,208	870,738	914,234	854,916	801,722	737,757	721,787	721,762	653,488	627,173	9,346,874	
Lactating cows	484	478	493	509	511	508	512	492	487	488	430	410	482	
Ave. Production per cow per day	57.1318	57.6304	55.8310	57.0228	57.7131	56.0989	50.5117	48.3712	49.4023	47.7103	50.8580	49.3449	53.1467	65.67
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	365	
Total cows per period includes leased	630	630	642	658	654	679	651	633	627	609	564	585	628	
% of Total cows in the milk tank	73.85%	75.87%	76.79%	77.36%	78.13%	74.82%	78.65%	77.73%	77.67%	80.13%	76.24%	72.57%	78.66%	
Net of DFA exp Milk Price	\$19.121	\$17.671	\$16.775	\$17.260	\$17.067	\$17.938	\$19.151	\$17.863	\$17.725	\$17.159	\$16.397	\$14.680	\$17.40	
Ave Prod Hist 65.67 lbs per day														
Amount of loss prod per day	8.5382	8.0398	10.0390	8.6472	7.9569	9.5731	15.1583	17.2988	16.2677	17.9597	15.0120	18.3251		
Total Prod loss per month	122813.28	107602.28	153426.81	132042.9	126044.47	145894.8	240592.24	283841.84	237871.7	271693.76	193655	207492.3		
Amount of money lost per month	\$23,483.23	\$19,014.25	\$25,738.77	\$22,790.43	\$21,512.16	\$26,170.43	\$46,076.38	\$47,131.10	\$42,128.23	\$46,818.82	\$31,754.54	\$30,459.87	\$382,878.21	
Corn Silage Loss														
	Ton	Acres		Total										
Historic Corn Silage Average	19	325		8,175										
Actual corn silage produced				3,060										
Silage Shortage				3,115										
Cost to buy and deliver silage				\$75.00										
Total cost for Silage				\$233,625.00										
Additional Corn Needed to Supplement ration														
	Head	lbs per day	days	price per ton		total cost								
Corn 9/1/08 thru 4/30/07	628	6.5	245	\$240.00		\$120,201.80								

Consentino Dairy Farms, Inc
Analysis of Claim for Loss of Milk Productions
For Future Years

by Ron Nolde

	Future years						Ave Prod 1999 thru 2001
Leased Cows							
Lbs. Milk prod per period	8,438,891						
Lactating cows	435						
Ave. Production per cow per day	53.1500						65.67
Days in month	365						
Total cows per period includes leased	565						
% of Total cows in the milk tank	76.99%						
Net of DFA exp Milk Price	\$17.050						
Ave Prod Hist 65.67 lbs per day							
Amount of loss prod per day	12.5200						
Total Prod loss per year	1,987,863						
Amount of money lost per year	\$338,930.64						
Corn Silage Loss							
	Ton	Acres		Total			
Historic Corn Silage Average	19	325		6,175			
Actual corn silage produced				3,116			
Silage Shortage				3,059			
Cost to buy and deliver silage				\$75.00			
Total cost for Silage				\$229,425.00			
Additional Corn Needed to Supplement ration	Head	lbs per day	days	price per ton		total cost	
Corn 9/1/06 thru 4/30/07	665	8.5	245	\$200.00		\$89,976.25	



FINLEY APPRAISAL SERVICES, INC.

3385 West Cox Road Willcox, Arizona 8564

Tel: (520) 384-0780 Fax: (520) 384-4833

September 14, 2004

Mr. James W. Parmele, Vice President Loan Review
Community Banks of Colorado
400 N. Main Street
Pueblo, CO 81003

Dear Mr. Parmele:

Pursuant to your request, submitted is a complete summary appraisal report of the property commonly known as the Corsentino Dairy Farm, Incorporated located 3 miles from Walsenburg, Colorado on Highway 10 East.

The purpose of this report is to estimate the Market Value of the entire 1,048.19 acres and improvements..

The definition of Market Value and the Legal Descriptions of the property appraised are contained within the body of the report. The report contains 71 pages and a 58 page addendum including photographs and maps. The effective date of the appraisal is August 24, 2004 as that is the date of last inspection. The date of the completion and signing of the report is September 14, 2004.

After thoroughly investigating, analyzing and weighing all factors reported herein, it is my opinion that the Market Value of the property is \$2,750,000 and water rights alone are valued at \$1,698,700.

It has been my privilege to prepare this report.

Respectfully submitted,

MARK FINLEY, ARA, RPRA

Temporary CO Certified General Real Estate Appraiser #AT 40040961

SUMMARY OF SALIENT FACTS

Type of Property:	950 Lock-Up Dairy with Heifer Facility and irrigated farm and pasture.
Location:	3 miles east of Walsenberg, CO.
Purpose of Appraisal:	To estimate Market Value (As Is) of the subject property
Property Rights Appraised:	Fee Simple – Surface estate only
Land Size:	1,048.19 Deeded Acres
Dairy and Home sites	31 Acres
Irrigated land	375 Acres
Pasture/Excess land	642.19 Acres
Improvements:	Extensive improvements on a 950 Lock-Up Dairy Facility
Zoning:	Agriculture – All uses permitted
Highest & Best Use:	Farming/Dairy Site/Residential Sites
As Vacant:	Integrated Dairy Facility
As Improved:	
Real Estate Taxes:	\$6,629.18
Date of Value:	August 24, 2004
Date of Inspection:	August 23 and 24, 2004
Approaches to Value:	
Cost Approach:	\$2,882,000
Income Approach:	\$1,998,000
Sales Comparison Approach:	\$2,755,000
Final Value Estimate:	\$2,750,000 "AS IS"
Value of Water Rights	\$1,698,700

REPORT OF APPRAISAL
CORSENTINO DAIRY FARMS, INC

Huerfano County, Colorado

Prepared for

Mr. James W. Parmelee
Vice President – Loan Review
Community Banks Of Colorado
121 West 1st Street
Pueblo, CO 81003

By

Cannon Lechtenberg & Associates, Inc.
230 E 30th Ave., Suite 120
Hutchinson, KS 67502-2828

As of

Effective Date June 16, 2009

Received
9/09
C.D.F.I.C.

CANNON, LECHTENBERG & ASSOCIATES, INC.

APPRAISAL AND CONSULTING

210 E. 30th, Suite 120 • Hutchinson, KS 67502

620-728-1310 • Fax 620-728-0282 • blechten@canvalue.com

August 6, 2009

Mr. James W. Parmelee
Vice President – Loan Review
Community Banks Of Colorado
121 West 1st Street
Pueblo, CO 81003

Re: Corsentino Dairy Farms, Inc., 2689 Highway 10 E, Walsenburg, CO 81089

Dear Mr. Parmelee:

As authorized by you, we have conducted an appraisal of property as summarized in the report that follows. The appraised property will be hereafter referred to as the subject or the subject property. The appraisal complies with the Uniform Standards of Professional Appraisal Practice (USPAP).

Following this letter is an executive summary that contains salient facts about the property and the appraisal. Any opinions stated in the executive summary are subject to the assumptions and limiting conditions stated in the report that follows. These opinions cannot be correctly understood without a full understanding of these assumptions and limiting conditions.

The contents of the narrative appraisal report are shown in the table of contents that follows the executive summary. This report summarizes the scope of work applied in the appraisal, the relevant characteristics of the subject property and the reasoning and pertinent data leading to the value opinion. To properly understand the appraisal, the reader must read the entire report. Exhibit 1 explains the Uniform Standards of Professional Appraisal Practice (USPAP), the appraisal process and provides common appraisal definitions.

Sincerely,

CANNON, LECHTENBERG & ASSOCIATES, INC.

James D. Cannon, ARA, ASA, MAI, President
Certified General Real Property Appraiser
Kansas # G-746
Colorado Temporary Permit # AT-1 00028701

George Slinkard, ARA
Certified General Real Property Appraiser
Colorado # 100027214
Minnesota # 4001093

EXECUTIVE SUMMARY	
Subject Property:	The subject property consists of 1,018.78 acres, with 335 acres of irrigated cropland and 620.78 acres of dry pasture. The rest is roads and building sites. The property is improved with a milking parlor, open cow lots and supporting improvements, including five dwellings. While the facility has the capacity for 700 wet cows, capacity is limited to 450 wet cows by a production moratorium imposed by Dairy Farmers of America (DFA). The dairy is valued as a 450 wet cow dairy.
Property Interest Valued:	Fee simple estate, including improvements, dairy facility equipment, water rights and irrigation equipment as described in the report.
County and State:	Huerfano County, Colorado
Location:	The principal building site is located at 2689 Highway 10 E, Walsenburg, CO 81089. This is about 2.5 miles east of Walsenburg on Colorado Highway 10. Highway 10 bisects the subject property, which has good legal and physical access to public roads.
Current Use:	The subject property is currently used to grow forage and milk 400+ cows, as well as house/raise dry cows, calves and heifers.
Highest and Best Use:	As If Vacant: Agriculture, specifically pasture and irrigated cropland. As Improved: Commercial dairy with feed production
Effective Appraisal Date:	June 16, 2009, the inspection date.
Purpose of Appraisal:	Estimate market value
Market Exposure Time:	Typical is 9-12 months prior to the effective appraisal date
Marketing Time:	Anticipated to be 9-12 months after the effective appraisal date
Market Value Opinion:	\$1,260,000.00

FORM
27

State of Colorado Oil & Gas Conservation Commission



START

Form 27 Site Investigation and Remediation Workplan

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. Form 27 is intended to be used whenever possible. Additional documentation will be required when large volumes of soil and groundwater have been impacted or involve large facilities with multiple source areas. See Rule 910. Describe the proposed work fully.

COGCC
Representative:
GINTAUTAS,
PETER

Receive
Date: 10/21/2009

Document
#: 1630142

Status: APPROVED

Project Number:
4625

Operator Information

Operator Number: 8667

Name & Address: PETROGLYPH ENERGY INC
555 S COLE RD
BOISE, ID 83707

Contact Name and Telephone

Name: PAUL POWELL

Phone Number: (208)685-7685

Fax Number: (208)841-6169

Email:

Facility_Id

Location Information:

API Number: 05 - 055 -- County: HUERFANO

Facility Name-Number: CORSENTINO DAIRY -

QTRQTR: SEC: TWP: 27S RNG: 65W&66W Meridian: 6 Latitude: Longitude:

Reason for Report: OTHER Tracking Number: 1630142

Cause of Condition Being Investigated and Remediated: OTHER If other, describe cause: CDPS discharge to Cucharas Riv
OGCC Employee: 3002026 Type of Waste Causing Impact: PROD H2O If other, describe waste: _____ Is Location In a

Sensitive Area?: N

Adjacent Land Use: IRRIGATED Soil Type: _____

Potential Receptors: Soils, crops grown on the soils, sediments and water in Holita Reservoir

Anticipated Completion Date: 12/31/2010 Is Further Site Investigation Required?: Y

Date Site Investigation Began: 05/01/2009 Remediation Start Date: _____ Date Site Investigation Completed: _____

Remediation Plan Submitted Date: 10/20/2009 Actual Completion Date: _____

Count	media	extent	determined	impacted
1630142	SOILS	SOIL DISP. CAUSING LOW H2O INFIL.	OBSERVATION; SOIL SAMPLING	Y
1630142	SURFACE WATER	Holita Reservoir	sampling and chemical analysis	
1630142	VEGETATION	STUNTED GROWTH	OBSERVATION	Y

Count	type	description
1630142	1-INITIAL ACTION	SOIL SAMPLED IN FALL 2008 AND SPRING 2009 ON
1630142	2-SOURCE REMOVED	PETROGLYPH OPERATING COMPANY DISCONTINUED
1630142	3-HOW REMEDIATE	VARIOUS REMEDIATION ACTIVITIES INCLUDE
1630142	4-MONITORING PLAN	Semi-annual soil sampling and analysis
1630142	5-RECLAMATION PLAN	

		SEE SUPPORTING DOCUMENTS (SUPPLEMENT
1630142	6-FURTHER SITE INV	SOIL AND WATER QUALITY SAMPLING WILL BE
1630142	7-FINAL DISPOSITION	NA

Submitted by: PAUL POWELL

Submitted EXEC. VICE PRES. AND
Title: COO

Date Submitted: 10/20/2009

Submit Signed: Yes

Approved GINTAUTAS,
by: PETER

Approved ENVIRONMENTAL
Title: SPECIALIST

Approval Date: 10/28/2009

Approval Signed: Yes

Conditions of Approval

Work Plan and addendum to Form 27 (supplemental feed for cattle as needed) approved 11/17/2009. Appendices to work plan for several issues still to be supplied by NewFields on behalf of Petroglyph and the Corsentino Dairy Farms. Semi-annual sampling results will be provided within one month of receipt of results. Updates to water quality monitoring sampling and analyses to be proved by end of December, 2009 and with each semi-annual soil sampling update after December, 2009.

Status: APPROVED

1630142 1-INITIAL ACTION

SOIL SAMPLED IN FALL 2008 AND SPRING 2009 ON FARM SITE. WATER QUALITY SAMPLED FROM 2008 UNTIL PRESENT IN VARIOUS LOCATIONS OF CUCARAS RIVER (IRRIGATION SOURCE FOR CORSENTINO FARM). RESULTS INCLUDED AND DISCUSSED IN SUPPORTING DOCUMENT. Addendum to form 27 describing purchases of supplemental cattle feed during expected time of remediation.

1630142 2-SOURCE REMOVED

PETROGLYPH OPERATING COMPANY DISCONTINUED DISCHARGE OF PRODUCED WATER TO CUCARAS RIVER IN JULY, 2007. CDPHE WQCD draft permit for any subsequent discharge includes SAR (or Na) and EC restrictions.

1630142 3-HOW REMEDIATE

VARIOUS REMEDIATION ACTIVITIES INCLUDE GYPSUM APPLICATION, ORGANIC MATTER ADDITION, TILLAGE, AND LEACHING. SEE SUPPORTING DOCUMENT FOR COMPLETE DESCRIPTION OF REMEDIATION PLAN INCLUDING GYPSUM APPLICATION RATES.

1630142 4-MONITORING PLAN

Semi-annual soil sampling and analysis with spring and fall 2010 events to be performed and reported to operator, landowner and COGCC staff

1630142 5-RECLAMATION PLAN

SEE SUPPORTING DOCUMENTS (SUPPLEMENT TO FORM 27 AND NEWFIELDS WORKPLAN, as it may be amended from time to time) FOR COMPLETE DESCRIPTION OF REMEDIATION PLAN FOR CORSENTINO FARM SOILS, INCLUDING MAPS AND FIGURES.

1630142 6-FURTHER SITE INV

SOIL AND WATER QUALITY SAMPLING WILL BE CONDUCTED DURING THE REMEDIATION PERIOD. SEE SUPPORTING DOCUMENT FOR COMPLETE DESCRIPTION OF SAMPLING AND ANALYSIS PLAN.

1630142 7-FINAL DISPOSITION

Signatures

Peter
Gintautas

Digitally signed by Peter Gintautas
DN: cn=Peter Gintautas, o=Colorado
Oil and Gas Conservation
Commission, ou
email=peter.gintautas@state.co.us,
c=US
Date: 2009.11.17 13:54:07 -0700

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax: (303)894-2109



FOR OGCC USE ONLY

SITE INVESTIGATION AND REMEDIATION WORKPLAN

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. Form 27 is intended to be used whenever possible. Additional documentation will be required when large volumes of soil and groundwater have been impacted or involve large facilities with multiple source areas. See Rule 910. Attach as many pages as needed to fully describe the proposed work.

OGCC Employee:

☐ Spill ☐ Complaint
☐ Inspection ☐ NOAV

Tracking No:

CAUSE OF CONDITION BEING INVESTIGATED AND REMEDIATED

☒ Spill or Release ☐ Plug & Abandon ☐ Central Facility Closure ☐ Site/Facility Closure ☐ Other (describe): _____

OGCC Operator Number: 8667

Name of Operator: Petroglyph Operating Company

Address: 124 North Main St. P.O. Box 979

City: La Veta State: CO Zip: 81055

Contact Name and Telephone:

Paul Powell

No: (208) 685-7685

Fax: (208) 841-6169

API Number: NA

County: Huerfano

Facility Name: NA

Facility Number: NA

Well Name: NA

Well Number: NA

Location: (Qtr, Sec, Twp, Rng, Meridian): See supporting document for location of affected land Latitude: _____ Longitude: _____

TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc.): Produced water

Site Conditions: Is location within a sensitive area (according to Rule 901e)? ☐ Y ☒ N If yes, attach evaluation.

Adjacent land use (cultivated, irrigated, dry land farming, industrial, residential, etc.): Irrigated crop land on Corsentino Farm

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: See supporting document for soil map units on affected land

Potential receptors (water wells within 1/4 mi, surface waters, etc.): NA

Description of Impact (if previously provided, refer to that form or document):

Impacted Media (check):

☒ Soils☒ Vegetation☐ Groundwater☐ Surface Water

Extent of Impact:

Soil dispersion causing low water infiltration

Stunted growth

How Determined:

Observation; soil sampling

Observation

REMEDIALATION WORKPLAN

Describe Initial action taken (if previously provided, refer to that form or document):

Soil sampled in fall 2008 and spring 2009 on farm site. Water quality sampled from 2008 until present in various locations of Cucharas River (irrigation source for Corsentino Farm). Results included and discussed in supporting document.

Describe how source is to be removed:

Petroglyph Operating Company discontinued discharge of produced water to Cucharas River in July, 2007.

Describe how remediation of existing impacts is to be accomplished, including removal and disposal at an injection well or licensed facility, land treatment on site, removal of impacted groundwater, insitu bioremediation, burning of oily vegetation, etc.:

Various remediation activities include gypsum application, organic matter addition, tillage, and leaching. See supporting document for complete description of remediation plan including gypsum application rates.

Submit Page 2 with Page 1



REMEDIAL WORKPLAN (Cont.)

Tracking Number: _____
Name of Operator: _____
OGCC Operator No: _____
Received Date: _____
Well Name & No: _____
Facility Name & No: _____

OGCC Employee: _____

If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):

NA

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing. Use additional sheet for description if required.

See supporting document for complete description of remediation plan for Corsentino Farm soils, including maps and figures.

Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing.

Is further site investigation required? ☒ Y ☐ N If yes, describe:

Soil and water quality sampling will be conducted during the remediation period. See supporting document for complete description of sampling and analysis plan.

Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):

NA

IMPLEMENTATION SCHEDULE

Date Site Investigation Began: Fall 2008 Date Site Investigation Completed: Ongoing Date Remediation Plan Submitted: October 20, 2009
Remediation Start Date: Fall 2009 Anticipated Completion Date: December 31, 2010 Actual Completion Date: _____

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Paul Powell

Signed: _____

Title: Executive Vice President and COO

Date: October 20, 2009

OGCC Approved: _____ Title: _____ Date: _____

RECEIVED

NOV 23 2009

COGCC

Supplement to Form 27 Submitted by Petroglyph Energy, Inc., October 20, 2009

(Corsentino Matter, Document #1630142)

The remediation under this Form 27 shall commence in November or December 2009, weather permitting, and continue to the end of December 2010. Petroglyph Energy Inc. ("Petroglyph") will use best efforts to meet the performance criteria and compliance standards set forth in the "Corsentino Farm Site Investigation and Remediation Work Plan" ("Plan") prepared by Newfields, as such Plan may be modified and approved (after consultation with the parties) by COGCC staff. Corsentino Dairy Farms Inc. ("Corsentino Dairy") will use best efforts to accommodate Petroglyph in its remediation efforts under the Plan including, without limitation, providing timely access to the locations where testing or remediation will take place, and through irrigation practices as agreed to by Corsentino Dairy and Newfields, consistent with the operational needs of Corsentino Dairy.

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Agreed to by the parties (signed counterparts acceptable), effective as of November 18, 2009:

Petroglygh Energy, Inc.

Paul Powell
Executive Vice President and COO
November ____, 2009

Corsentino Dairy Farms, Inc.


Brett J. Corsentino
Vice President and Secretary
November 20, 2009

Approved:

Colorado Oil and Gas Conservation Commission

Dave Neslin
Director
November ____, 2009

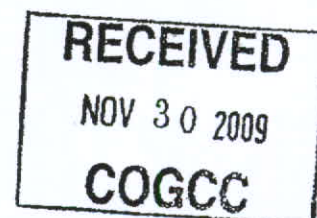
Supplement to Form 27 Submitted by Petroglyph Energy, Inc., October 20, 2009

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Petroglygh Energy, Inc.



Paul Powell
Executive Vice President and COO
November 24, 2009

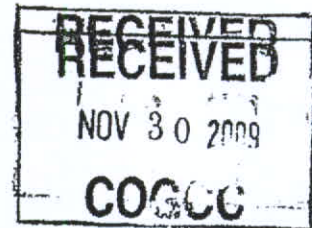
Corsentino Dairy Farms, Inc.

Brett J. Corsentino
Vice President and Secretary
November __, 2009

Approved:

Colorado Oil and Gas Conservation Commission

Dave Neslin
Director
November __, 2009



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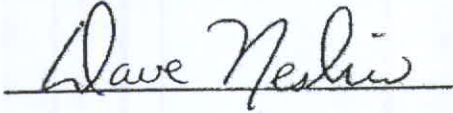
Corsentino Dairy Farms, Inc.

Paul Powell
Executive Vice President and COO
November __, 2009

Brett J. Corsentino
Vice President and Secretary
November __, 2009

Approved:

Colorado Oil and Gas Conservation Commission



A handwritten signature in cursive script, reading "Dave Neslin", is written over a horizontal line.

Dave Neslin
Director
November 30, 2009

**State of Colorado
Oil and Gas Conservation Commission**

Form 27 Attachment

RE: Corsentino Farm Investigation and Remediation Work Plan (Plan), dated October 20, 2009 and submitted to the Colorado Oil and Gas Conservation Commission (COGCC) by Petroglyph Operating Company (Petroglyph).

In accord with the agreement reached at a meeting held on September 30, 2009 among the COGCC, Corsentino Dairy Farms, Inc. (Corsentino Dairy) and Petroglyph, this Attachment sets forth the estimated costs related to the impacts to crops and operations of Corsentino Dairy as a result of the remediation activities to be conducted under the Plan and shall be appended to and is hereby incorporated by reference in the Form 27 Order of the COGCC. As shown in Exhibit A hereto, the costs for replacement feed anticipated for Fall 2009 are \$125,400 and for Spring 2010 are \$37,800, for a total of \$163,200. The final dollar amounts may be adjusted based upon fluctuations in the crop and transportation costs, as submitted to COGCC and Petroglyph from time to time by Corsentino Dairy. Additional costs for replacement feed may be incurred as a result of remediation activities to meet the performance criteria and compliance standards beyond those specifically provided in the Plan.

To ensure that funds are available for contracting and timely payment of replacement feed, Petroglyph shall within 10 days following the date of issuance of the COGCC Order pursuant to Form 27 establish an Escrow Account with an Escrow Agent approved by Corsentino Dairy and the COGCC in the amount of \$163,200. The Escrow Agent shall hold and disburse funds from the Escrow Account pursuant to the instructions set forth herein, which have been agreed to by Petroglyph and Corsentino Dairy. Such funds may be drawn by Corsentino Dairy upon presentation to the Escrow Agent of a contract or other commitment for the purchase of replacement feed or invoices for the purchase of such feed.

In the event the commitments or costs for replacement feeds exceed the amount of \$163,200, Corsentino Dairy Farms shall notify COGCC and Petroglyph and the Form 27 Order shall be amended to include such amounts.

Upon completion of all remediation activities in accordance with the performance criteria and compliance standards requirements under the Order, any remaining or unused funds in the Escrow Account shall be remitted to Petroglyph.





PETROLEUM TECHNOLOGY TRANSFER COUNCIL

PEOPLE AND CONNECTIONS

Shortening the Technology Application Life Cycle

Technology—The Engine That Drives O&G Production



ABOUT PTTC	CALENDAR/ EVENTS	NEWSLETTER/ PRESS	SELECTED TECH INFO RESOURCES		
INDUSTRY LINKS	SELECTED TECH SEARCH LINKS	TECH ALERTS	TECHNOLOGY SUMMARIES	WORKSHOP SUMMARIES	WORKSHOP PRESENTATIONS

Powder River Basin Center of Activity

Table 1. Rocky Mountain CBM Basins (GTI, 2001)

Regulatory and Analytical Activity Increasing

Table 2. Websites with Information on Rocky Mountain CBM Production and Water Management Issues

Technology Options for Handling Produced Water

Down-Hole Gas/Water Separation with Re-Injection

Conventional Surface Separation and Re-Injection

Surface Disposal Without

Options for Coalbed Methane Water Management

by Karl Lang, Hart/IRI Fuels Information Services
Excerpts in *PTTC Network News*, 1st Quarter 2002

Demand for natural gas has led to a dramatic increase in coalbed methane (CBM) drilling and production since 1996, primarily in Rocky Mountain basins. During 2000, 1.4 Tcf of natural gas, about 7.5% of US demand, was supplied from coal seams. This has had a number of impacts, one of which is a dramatic increase in the amount of produced water. CBM wells must be dewatered to initiate methane desorption from the coal, resulting in significant volumes of water being pumped during a well's early life. New technologies are being considered and tested to deal with the problem of how to effectively dispose of this water, but one thing is certain, there is no single solution to the question of how to best produce CBM gas and manage produced water. The circumstances, and therefore the economics that drive technology choices, are different in practically every situation.

Powder River Basin Center of Activity

There are seven CBM basins in the Rockies: San Juan, Powder River, Raton, Uinta, Piceance, Greater Green River and Wind River. Each has its own character in terms of the CBM resource, and for those with significant production, its own producing behavior (Table 1). In many of these basins the produced water is of such poor quality that it must be re-injected. In the San Juan basin for example, high gas rates have justified the investment in deep well re-injection of produced water. Water rates have declined with time in the San Juan, one of the first of the country's CBM development areas.

In the more recently developed Powder River (PRB) and Raton Basins a combination of lower per well gas rates (The PRB has shallower coals with considerably lower gas content than San Juan coals) and relatively fresh water, makes surface water disposal an environmentally viable and economically attractive option. However, the number of CBM wells in the PRB jumped from 1657 in 1999 to 5122 in 2000 (Environmental Protection Agency (EPA), 2001). Roughly 7500-8000 wells are now producing and many more await infrastructure and discharge permits. As many as 40,000 wells could ultimately be producing in Wyoming and another 10,000 or more in Montana, depending on spacing and access, by the end of the next decade. During 2000, 378 million barrels of water were produced in the PRB to obtain 151 Bcf of gas, more than the cumulative gas of all seven prior years of production. Today, the basin pumps roughly 1.4 million barrels of water per day to produce 800 Mcfd of gas. With estimates of the total CBM resource as high as 25 Tcf, only about 10% of the basin has been developed (DOE, 2002).

Currently the water and gas is produced in the eastern part of the PRB, but development is expanding toward the north and west at a rate of up to 10 wells per day. The produced water has

Treatment

Figure 1—Stock Watering Tank at Tietjen Ranch Site (EPA, 2001)

Figure 2—Evaporation Pond Outflow at Tietjen Ranch (EPA, 2001)

Figure 3—Atomizer at Barrett Resources Site Near Gillette (EPA, 2001)

Surface Disposal With Treatment

Real Cost Comparisons

Attention Will Drive Innovation

References

Sidebar 1
Adapted from Colorado State University Cooperative Extension

Sodium Adsorption Ratio (SAR)

sodium as a dominant cation and bicarbonate as the major anion, and the concentrations of these constituents appear to increase as well locations move northwest. Total dissolved solids (TDS) values range from 270 to 2010 mg/L with a mean of about 862 mg/L. Iron values range from 0.02 to 15.4 mg/L with a mean of about 0.8 mg/L (EPA, 2001). Depending on the water quality at a specific location, the soil at a particular location, and the landowner needs regarding water usage on the lease, the impact of the water's disposal may be positive or negative. The degree of potential damage to a soil is a function of the chemical makeup of the soil as well as the chemical makeup of the water. One indicator of soil character is the sodium adsorption ratio (see sidebar).

Table 1—Rocky Mountain CBM Basins (GTI, 2001)

Basin	States	Producing Wells (1999)	Cumulative Production Thru 1999 (Bcf)	Estimated Resource (Tcf)	Average Per Well Production (Mcfd)
San Juan	CO, NM	3311	6648	7.69	2000
Powder River	WY, MT	1657	120	10.04	200
Raton	CO, NM	405	68	1.88	250
Uinta	UT	370	121	3.81	625
Piceance	CO	40	35	11.55	140

Regulatory and Analytical Activity Increasing

The Wyoming Department of Environmental Quality (DEQ) is issuing water discharge permits for surface discharge in the watershed drainage areas of the Belle Fourche and Cheyenne Rivers. The DEQ halted permits for discharges into the Tongue River and Powder River, both of which flow into Montana, due to protests by Montana groups. Subsequently, the states agreed to permit a number of discharges for the Powder and Little Powder Rivers as long as DEQ monitors the water quality (Shirley, 2002). The Tongue River remains closed to discharges however. With producing companies turning to other "of-channel" forms of surface containment, the DEQ is currently developing policies to regulate this as well.

In response to their perceived need for additional study of this issue, EPA is currently undertaking an analysis to develop a "Best Professional Judgement" determination of effluent limitations that represents the "Best Available Technology Economically Achievable" (BAT) for coalbed methane activities throughout Region 8. A draft report to have been completed last November has been delayed. According to Mike Reed, with the EPA Region 8 Water Program in Denver, "We are hoping to have our model runs completed and a draft report by the end of April, although that may be optimistic. Following the draft's publication there will be a public meeting where we will take comments. We hope to have a final guidance document by the end of June or July, 2002." While this guidance document is primarily for use by the EPA in permitting activity on Indian Lands, the EPA hopes that it will provide information that the states can use in their own permitting decisions. Depending on the study results and follow-on actions, beneficial use of produced water may be restricted. This in turn could increase the costs of production and limit development across multiple Rocky Mountain basins.

More recently, the Strategic Center for Natural Gas at the U.S. Department of Energy's National Energy Technology Laboratory (NETL) is sponsoring a comprehensive analysis that will examine: (1) the magnitude and character of the CBM resource in the PRB, (2) estimates of future CBM and water production, and (3) impacts of alternative produced water management practices in the PRB (DOE, 2002). A complementary review of available subsurface water disposal zones in the basin is also being supported by NETL through its National Petroleum Technology Office. The results of the SCNG study, to be carried out by Advanced Resources International, are expected in mid-2002.

Concurrently, The Bureau of Land Management (BLM) published a Powder River Basin Oil and Gas Draft Environmental Impact Statement (EIS) on January 18th. This draft is now in the public comment period until April 18th, 2002. This draft envisions the construction of 39,400 new gas wells in the PRB. The final version is expected to be completed in the summer of 2002.

In the meantime, a significant amount of effort is being focused on assessing the options and true costs of water treatment and disposal. A number of websites provide information on the issues and options (Table 2).

**Table 2—Websites with Information Rocky Mountain
CBM Production and Water Management Issues**

Montana Department of Environmental Quality	www.deq.state.mt.us/CoalBedMethane/
Wyoming Department of Environmental Quality	http://deq.state.wy.us/wqd/cbm.htm
Powder River Basin Resource Council	www.powderriverbasin.org
Powder River Coalbed Methane Information Council	www.cbmwyo.org
U.S. EPA Region 8	www.epa.gov/region08/water/wastewater/npdeshome/cbm/cbm.html
U.S. Geological Survey	http://energy.cr.usgs.gov/oilgas/cbmethane/index.htm

Technology Options for Handling Produced Water

There are three basic options for dealing with produced water: (1) utilize a down-hole pump to re-inject the water within the well bore or pump the water to the surface and either (2) re-inject it into a disposal well or (3) discharge the water at the surface, treated or untreated. Option three encompasses a number of approaches, depending largely on whether or not the water is treated. We discuss each of these options as they relate to coalbed methane water, below.

Down-Hole Gas/Water Separation with Re-Injection

This option can be *active*, where a down-hole pump injects the water into a convenient formation either above or below the producing coal seam, or *passive*, where gravity drains the water into the disposal zone below the coal. The latter situation requires such a rare combination of circumstances (suitable high *kh* zone below the coal with pore pressure such that the water head between coal and disposal zone is sufficient to maintain injection rate) that it is not a common option. Active down-hole injection, either below production disposal (BPD) or above production disposal (APD), is an option if there is a suitable disposal zone available. The zone must exhibit sufficient *kh* and pore volume, low skin factor, hydrologic isolation, and water compatibility.

Two examples of active down-hole re-injection of CBM water in East Central Oklahoma were recently described (Phelps, 2002). In each case, an up-hole re-completion of a coal zone at about 1200 feet was made in a depleted oil well. A 1 1/2 inch downhole pump was used to pump produced water from the casing/tubing annulus into the depleted oil reservoir disposal zone below a packer set below the coal seam. In each case the wells went from shut in to producing 50-65 Mcfd.

An economic comparison of the down-hole gas/water separation option to conventional water disposal by re-injection from the surface reveals that the main economic factors are: well depth, proximity to disposal zone, and the number of producers per disposal well. In a comparison shown by Phelps for a Cherokee Basin field (Oklahoma), the water handling cost (CAPEX + OPEX) for a conventional re-injection scenario varied from \$1.10/Bbl for 4 producers/disposal well, to \$0.55/Bbl for 12 producers/disposal well. Down-hole separation and disposal cost in the same field was estimated at \$0.60/Bbl to \$0.85/Bbl, depending on whether or not the disposal zone was completed as part of a new CBM well drilling plan or during reentry into an existing well. The incremental cost of drilling a new well slightly deeper is less expensive than re-entering an old well. This exercise showed that while down-hole gas/water separation and disposal can be competitive with conventional surface re-injection into disposal wells, planning for this approach in advance when developing a new area provides the best economics.

About 20 CBM applications of these systems have been installed in the Cherokee Basin, injecting between 50 and 250 Bwpd of down-hole separated CBM water. Unfortunately, due to a change in ownership of the properties, quantitative information regarding the performance of these wells is lacking. According to Craig Phelps, a manager in the Produced Water Management group at Gas Technology Institute, GTI is funding a data collection effort by the equipment manufacturer (DHI Tools) to provide a better picture of well performance. "The equipment provider has developed a technique that allows the operator to determine the volume of produced water being injected downhole from a pump dynamometer card," says Phelps. "This is important for permitting purposes. While the EPA Region 5 authorities are satisfied with it, we hope to be able to satisfy the regulators in Region 8 as well."

Another idea being considered for areas where all water disposal alternatives with the exception of downhole separation and re-injection are cost-prohibitive, is the possibility that this technology could be considered an improved recovery technique and thereby qualify for some form of tax incentive.

Conventional Surface Separation and Re-Injection

Water disposal wells are the most common choice in areas where the produced water quality precludes surface disposal. The complexity and cost of such systems depend primarily on the depth of the disposal zone. Shallow zones often mean that gravity flow can be utilized to dump water from a holding tank to a down-gradient disposal well. Deeper injection zones mean higher drilling, pump equipment and operating costs. The number of CBM wells that can be served by a disposal well also is an important factor in the overall economic attractiveness of this option. And importantly, the disposal well re-injection option must contend with the fact that if the disposal well goes down for some reason, gas production from all of the wells is immediately curtailed.

Surface Disposal Without Treatment

If the produced water meets National Pollutant Discharge Elimination System standards, it can be disposed on the surface without treatment. Options here include: (1) discharge to drainage systems (creeks, rivers), (2) storage in a pond from where it infiltrates into shallow aquifers or evaporates, or (3) atomization, where the water is sprayed from a high standing pipe to accelerate dispersal and promote vegetative growth. Along the way, the water can be put to beneficial use for irrigating crops or watering livestock.

One example of the surface disposal option is Pennaco Energy's operations at Tietjen Ranch in the Powder River Basin (PRB) near Gillette, Wyoming. A portion of the produced water is piped to a tire tank for livestock (Figure 1) and the rest is piped to an evaporation pond (EPA, 2001). The water is discharged to the pond across limestone rocks (rip rap), which help precipitate out dissolved iron. These rocks can then be replaced, eliminating any permanent staining of the surrounding landscape (Figure 2).



Figure 1—Stock Watering Tank at Tietjen Ranch Site (EPA, 2001)



Figure 2—Evaporation Pond Outflow at Tietjen Ranch (EPA, 2001)

Barrett Resources Corp is conducting a pilot operation to test the effectiveness of atomizers, also in the PRB (EPA, 2001). At the Scooner Road site, 15 CBM wells produce approximately 28,000 Bwpd, which is pumped to a holding pond. Overflow from the pond is then piped to 8 atomizers (Figure 3) that together can spray more than 16,000 Bwpd.



Figure 3—Atomizer at Barrett Resources Site Near Gillette (EPA, 2001)

An alternative is the use of center pivot sprinklers typically used for irrigation of crops. With the high percolation and evaporation rates found in the Rocky Mountains, a significant amount of water can be handled in this manner.

Surface Disposal With Treatment

A growing number of treatment technologies exist or are being contemplated/tested for removing the ions, metals and organics that exceed established limits in certain areas. These include: reverse osmosis, freeze-thaw evaporation and artificial wetlands.

Reverse osmosis (RO) is a synthetic membrane process that removes most dissolved solids, resulting in a clean water stream and a concentrated waste stream. The waste stream must be further processed and eventually re-injected. RO applications are found worldwide in the semiconductor, pharmaceutical, petrochemical, and nuclear power industries, and in certain public water supply situations. Although several companies are apparently investigating RO for CBM applications, it has not been proven commercially.

Freeze-thaw evaporation (FTE[®]) utilizes the natural contaminant-concentrating action of the water freezing process to create separate streams of clean and high-salinity brine. Combining the freeze-thaw cycle with conventional evaporative technology allows treatment on a year-round basis. During the winter season, a produced water stream fed to an FTE facility in the San Juan Basin yielded 53% treated water, 27% evaporated water, and 20% brine. Total dissolved solids in the treated water dropped from 12,800 to 1,010 mg/L and total alkalinity dropped from 9380 to 700 mg/L (Harju, 2002). Like RO, this approach requires disposal of a concentrated waste stream. It is somewhat climate specific.

The creation of artificial wetlands that rely on the natural water cleansing capabilities of plant and microbial life are another approach that is being considered for CBM produced water. However, here there are a lot of issues: effectiveness that varies with contaminant, suitability of native plants, large areal requirements, and regulatory changes that may be required. Successful examples of artificial wetland treatment of produced water have shown an ability to reduce hydrocarbon contaminants, but not total dissolved solids (Myers, et al., 2001).

A number of other treatment options are possible alternatives, but their applicability to the volumes and ionic character of CBM produced water has not been proven commercially. Some of these include electro-dialysis reversal, ion exchange, capacitive desalination, and rapid spray distillation. While all of these technologies are theoretically applicable, their reliability under field conditions and overall economics are open to debate.

A recent comparative analysis of these technologies found that RO-based treatment and disposal costs might vary between 7.4 and 20.9 cents per barrel, including amortized capital and operating costs, compared to conventional water disposal costs at 2.6 cents per barrel. Freeze-thaw costs, the only proven commercial alternative at this point, were estimated at 29.5 cents per barrel

(Hodgson, 2002). Such comparisons are difficult, however, because of the wide variation of circumstances among sites.

Real Cost Comparisons

When comparing the costs of produced water treatment alternatives, and in particular when evaluating vendor quotes, operators should be careful to consider the following costs in addition to the basic capital and operating costs:

1. Engineering design.
2. Permitting for facilities and/or devices.
3. Posting a bond for facilities.
4. Pilot testing technologies that are untested in specific situations.
5. Storage capacity for inflow and outflow to and from treatment facility.
6. Pretreatment equipment (to remove iron, coal fines, organics, etc. ...this can be critical for membrane-based treatment technologies).
7. Delivery of power to site.
8. Heated buildings (some technologies require a minimum operating temperature), and related onsite wiring and plumbing.
9. Land and fencing.
10. Realistic labor and training costs, particularly for technically sophisticated systems that require daily monitoring.
11. Realistic maintenance costs, including things like membrane replacement and chemical pretreatment consumables.
12. Realistic electric power costs.
13. Contingency costs that recognize possibility of disruptions.

Ignoring these elements can lead to misleading or inaccurate evaluations of technology options.

Attention Will Drive Innovation

Increased attention on the need to manage produced water from CBM operations will act to accelerate the development of innovative technologies, increasing the number of economic options available. These treatment technologies could find application across the whole spectrum of oil and gas operations, well beyond the Powder River Basin.

References

Phelps, C.; 2002. "Down-hole Gas/Water Separation with Re-injection in Coal-Bed Methane Plays," SRI Conference on CBM Water Management Strategies, Durango, CO., February.

EPA, 2001. "Draft Site Visit Report Coalbed Methane Operations, Gillette, WY." August 21. (www.epa.gov/region08/water/wastewater/npdeshome/cbm/cbm.html).

Harju, J.; 2002. "The FTE Process for Produced Water Handling," SRI Conference on CBM Water Management Strategies, Durango, CO., February.

Myers, J.E., et al.; 2001. "An Evaluation of the DOE Naval Petroleum Reserve No. 3 Produced Water Bio-Treatment Facility," SPE 66522, Presented at the SPE/EPA/DOE San Antonio Environmental Conference, February 26-28.

Hodgson, B.; 2002. "Profit By Reviewing Your Current Options and Costs for Treating CBM Produced Water," SRI Conference on CBM Water Management Strategies, Durango, CO., February.

GTI, 2001. "North American Coalbed Methane Resource Map," GTI 01/0165.

EPA, 2001. "Economic Impact Analysis of Disposal Options for Produced Waters from Coalbed Methane Operations in EPA Region 8," Public presentation, Billings

MT, September 25.
(www.epa.gov/region08/water/wastewater/npdeshome/cbm/cbm.html).

DOE, 2002. Policy Facts: Impacts of Alternative Management Practices for Produced Water in the Powder River CBM Play (study announcement, www.netl.doe.gov/scng).

Shirley, K., 2002. "Operators Continue to Expand Coalbed Methane's Geographic Diversity." *The American Oil and Gas Reporter*, March, p.94.

Sidebar 1

Adapted from Colorado State University Cooperative Extension

Sodium Adsorption Ratio (SAR)


Soils with an excess of sodium ions, compared to calcium and magnesium ions, remain extremely sticky when wet, tending to crust and become very hard and cloddy when dry. Water and air do not readily move through such soil and they can be almost impermeable to rain or irrigation water.

Elevated concentrations of sodium ions are measured by one of two methods. The more common method, the Sodium Adsorption Ratio (SAR), is the proportion of sodium (Na) ions compared to the concentration of calcium (Ca) plus magnesium (Mg). It is defined as the milliequivalent weight of sodium divided by the square root of the total of the milliequivalent weight of calcium plus the milliequivalent weight of magnesium divided by 2. The second method of estimating the sodium hazard is called the exchangeable sodium percentage (ESP). ESP refers to the concentration of sodium ions on cation exchange sites.

When the SAR rises above 12 to 15, serious soil problems occur and plants have difficulty absorbing water. An SAR "value of 15 or greater indicates an excess of sodium will be adsorbed by the soil clay particles. Excess sodium can cause soil to be hard and cloddy when dry, to crust badly, and to take water very slowly." Extracted from: Soil Test Explanation. December, 1999. Clangor, P.M., and Fillet, R.C. Colorado State Cooperative Extension Publication No. 0.502.

Author: Karl Lang is Director of Custom Publishing at Hart/IRI Fuels Information Services. He edits *GasTIPS*, a technical journal produced by Hart for Gas Technology Institute and the Strategic Center for Natural Gas within DOE's National Energy Technology Laboratory.. He also writes for a number of Hart energy publications. **E-mail:** klang@chemweek.com

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An Integrated Framework for Treatment and Management of Produced Water

Colorado School of Mines

Jörg E. Drewes, Tzahi Y. Cath, Pei Xu

Kennedy/Jenks Consultants

Jim Graydon

Argonne National Laboratory

John Veil, Seth Snyder



Kennedy/Jenks Consultants
Engineers & Scientists



CSM/RPSEA FORUM

**Technologies for Mitigation of Environmental Impact of Oil and Gas
Operations**

Monday, May 12th, 2008, Golden, CO




Overview

- ▶ **Current Practices and Challenges Associated with the Management of Produced Water**
- ▶ **Opportunities and Technical Challenges**
- ▶ **Research Approach of a new RPSEA Project**
- ▶ **Conclusions**



Produced Water Facts

- ▶ “Unconventional Onshore Gas Resources”
 - Coal bed methane
 - Gas shales
 - Tight sands
- ▶ The majority of these resources are found in the arid western states
- ▶ Volume of “technically recoverable” gas in the continental US:



*293 trillion cubic feet
would fill the Grand
Canyon six times...*

293 trillion cubic feet



Produced Water Facts

Volume of “technically recoverable” gas:

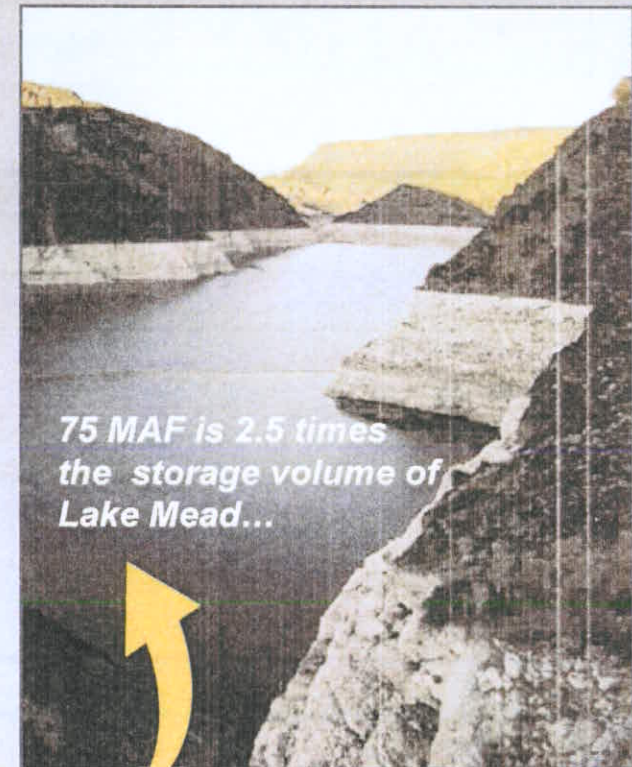
293 trillion cu ft

Average CBM produced water:

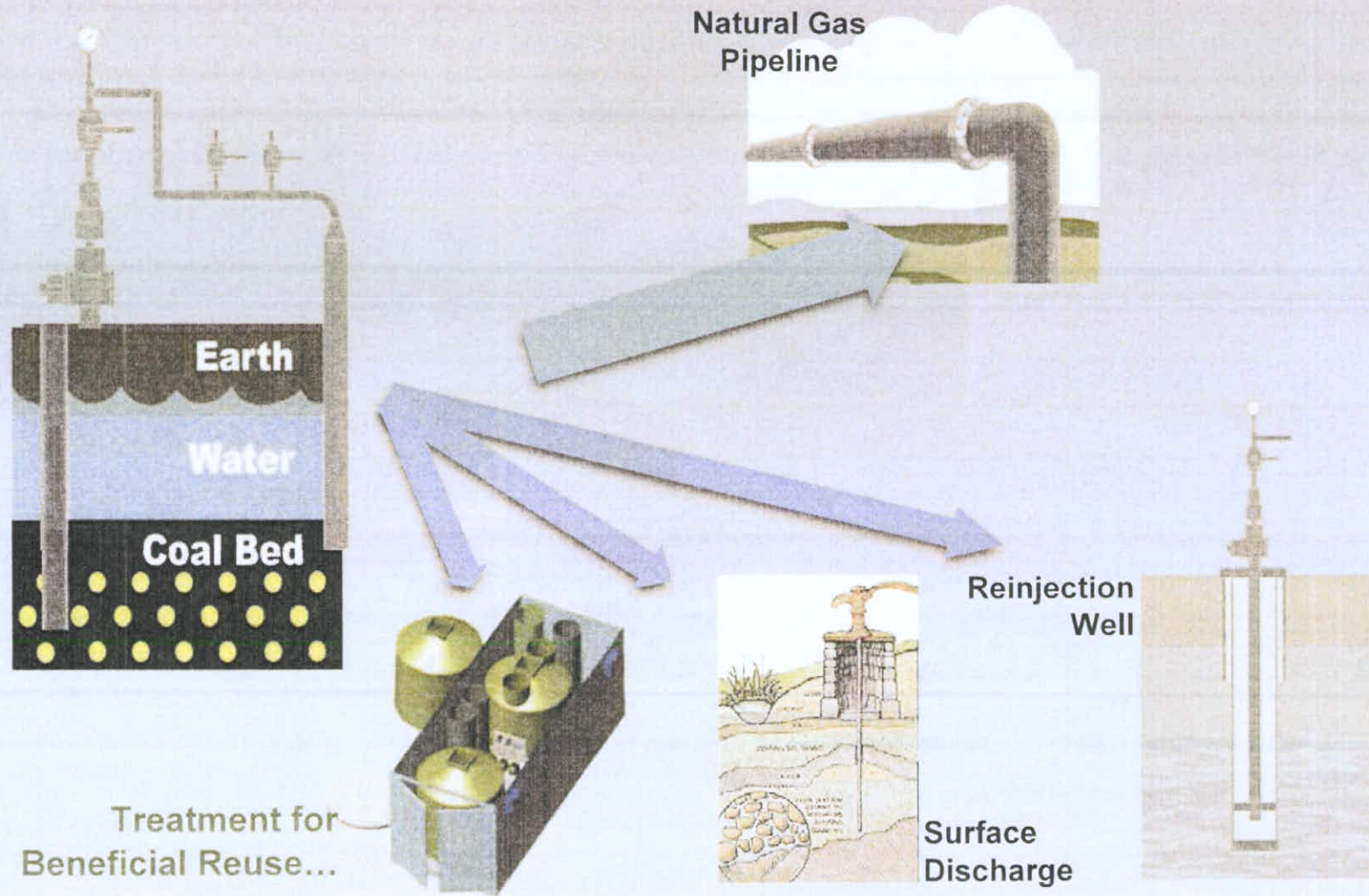
2 barrels per 1000 cu ft

Water from unconventional
gas production:

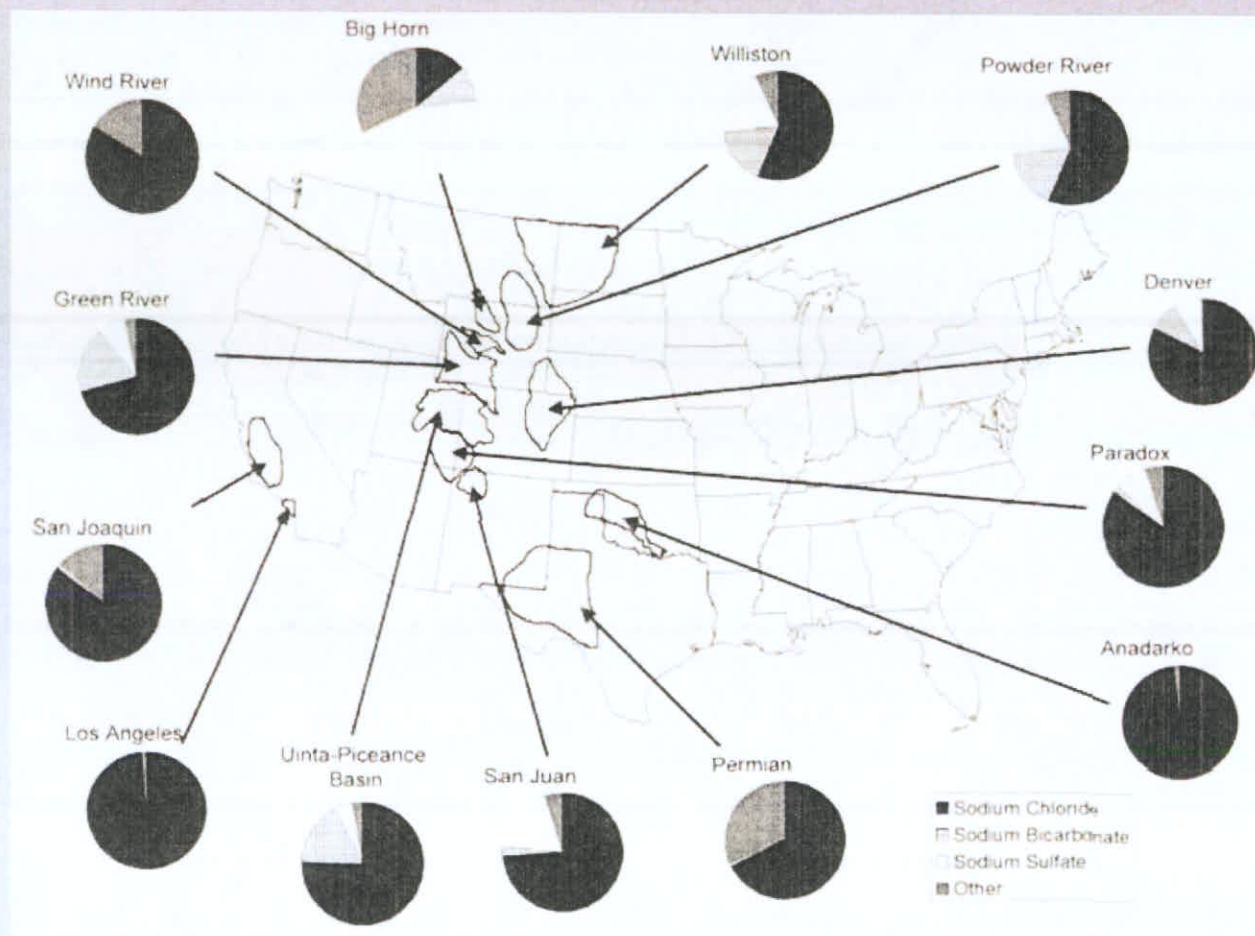
75,000,000 acre feet!



Coal Bed Methane (CBM) Produced Water: The Options...

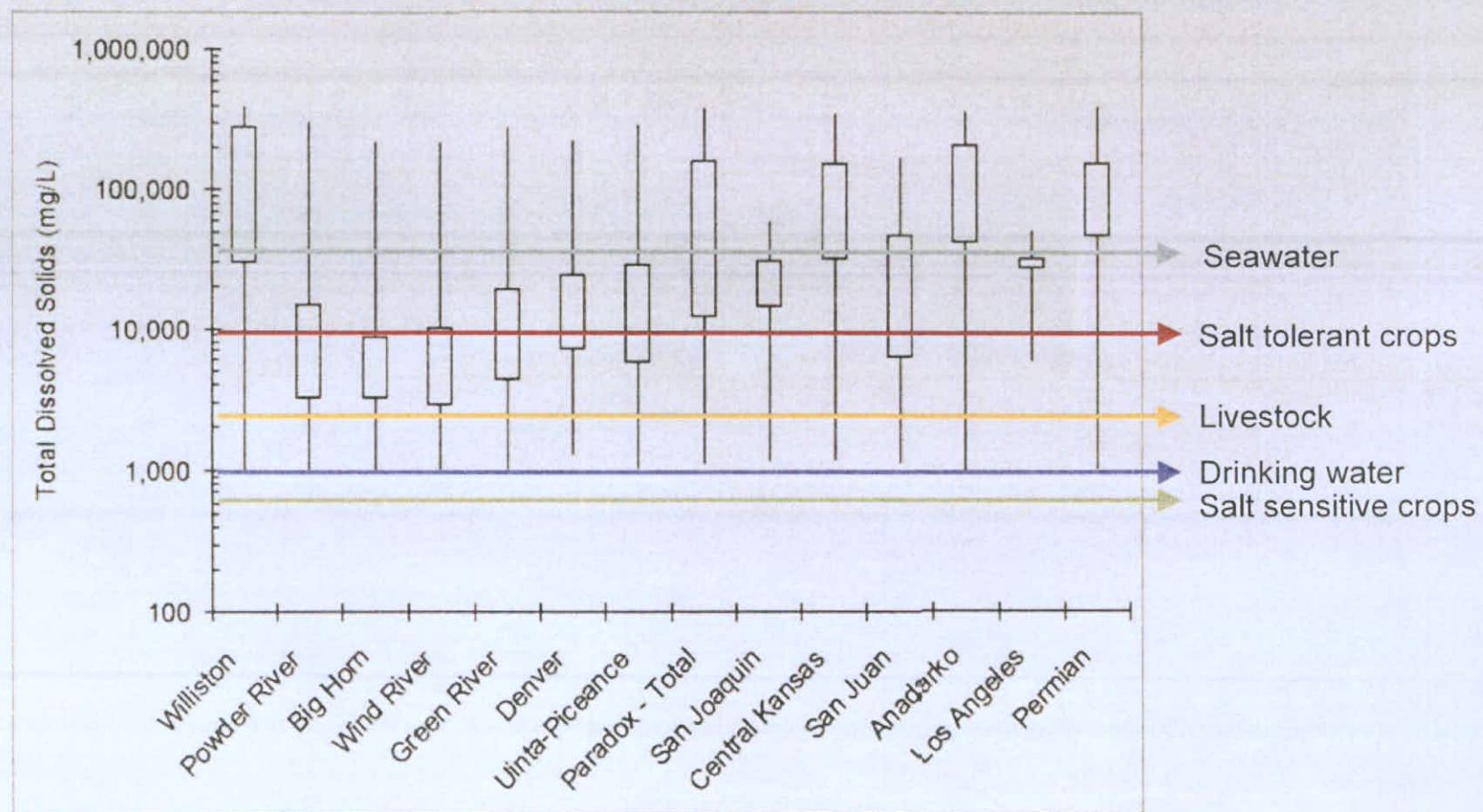


Produced Water Quality: Salt Composition



Benko and Drewes (2008), Env. Eng. Science 25, 2, 239

Produced Water Quality



Benko and Drewes (2008), Env. Eng. Science 25, 2, 239



Produced Water Management

- ▶ **Current practices**
 - Deep-well injection
 - Impoundments
 - Off-site trucking
 - Surface discharge
 - Treatment
- ▶ **Management practices driven by price of gas and disposal costs**
- ▶ **Environmental concerns**
 - Harmful to aquatic life
 - Damage to vegetation



Constructed Wetland



Cost of Produced Water Management

Management Option	Estimated Cost (\$/bbl)	Estimated Cost (\$/AF)
Surface discharge	\$0.01 - 0.80	\$80 - 6,200
Evaporation pits	\$0.01 - 0.80	\$80 - 6,200
Shallow reinjection	\$0.01 - 1.33	\$80 - 10,600
Constructed wetlands	\$0.001 - 2.00	\$8 - 16,000
Class II disposal wells	\$0.05 - 2.65	\$400 - 21,000
Higgins Loop (IX)	\$0.05 - 0.20	\$400 - 1,550
Softening/Filtration/IX/RO	\$0.06 - 0.27	\$470 - 2,100
Freeze/thaw evaporation	\$2.65 - 5.00	\$21,000 - 40,000
Commercial hauling	\$1.00 - 5.50	\$8,000 - 44,000

(Jackson and Myers, 2002; ALL Consulting, 2006)



Challenges for Widespread Beneficial Use

► Transient Location

- Distance between produced water sources and end users
- High cost of water transfer

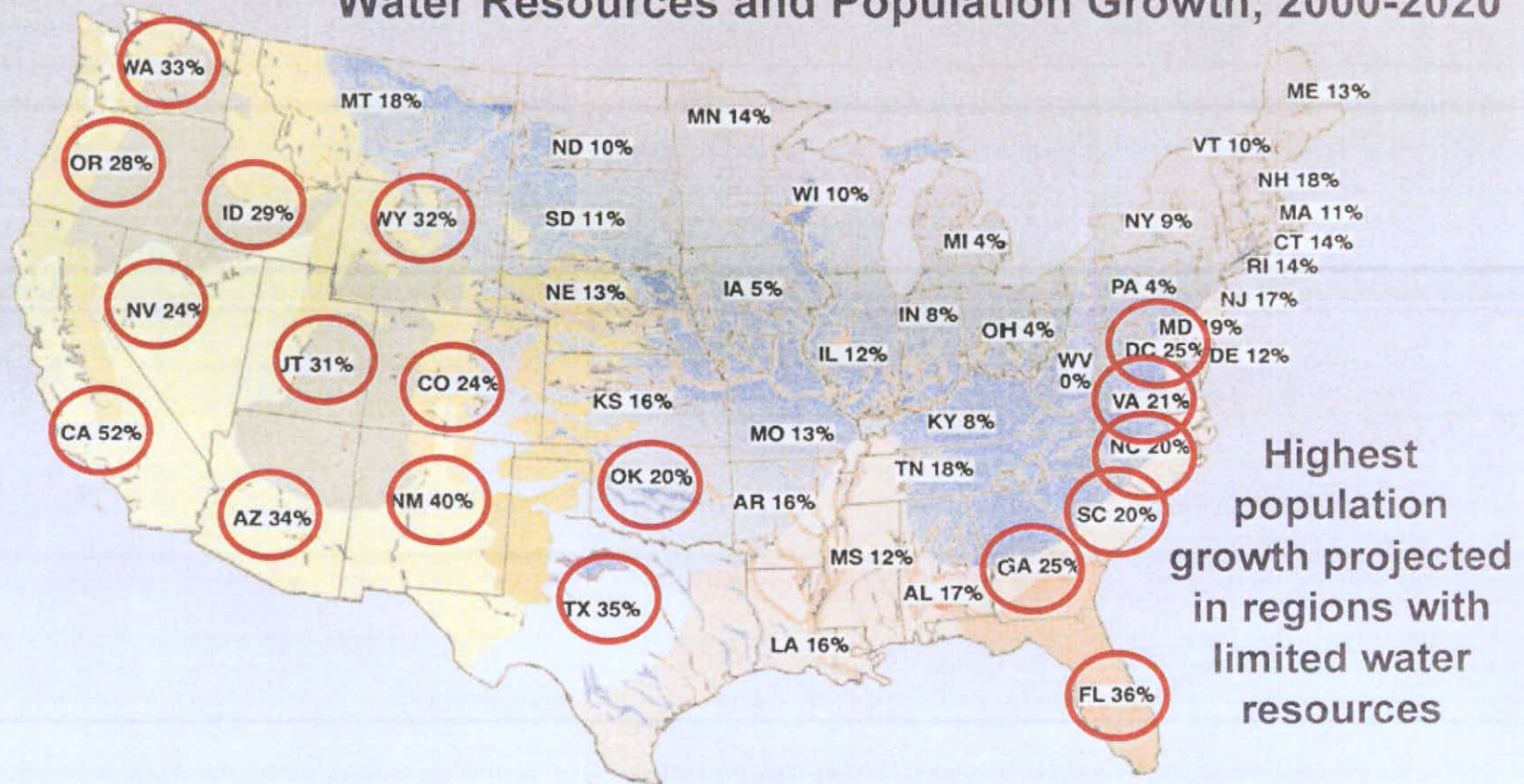
► Operational Issues

- Fluctuating gas prices might deter investments in treatment technology
- Complexity of water rights issues
- Variation of environmental, water quality and permitting requirements among states
- Challenges in identifying, quantifying, mitigating, and compensating impacted third parties
- Uncertainties and liability issues regarding conveyance and end use
- Barriers between private management of gas and oil resources and the public management of water resources



U.S. Population Growth and Water Availability

Water Resources and Population Growth, 2000-2020



Source: DOE/NETL (M. Chan, July 2002)

Less Water

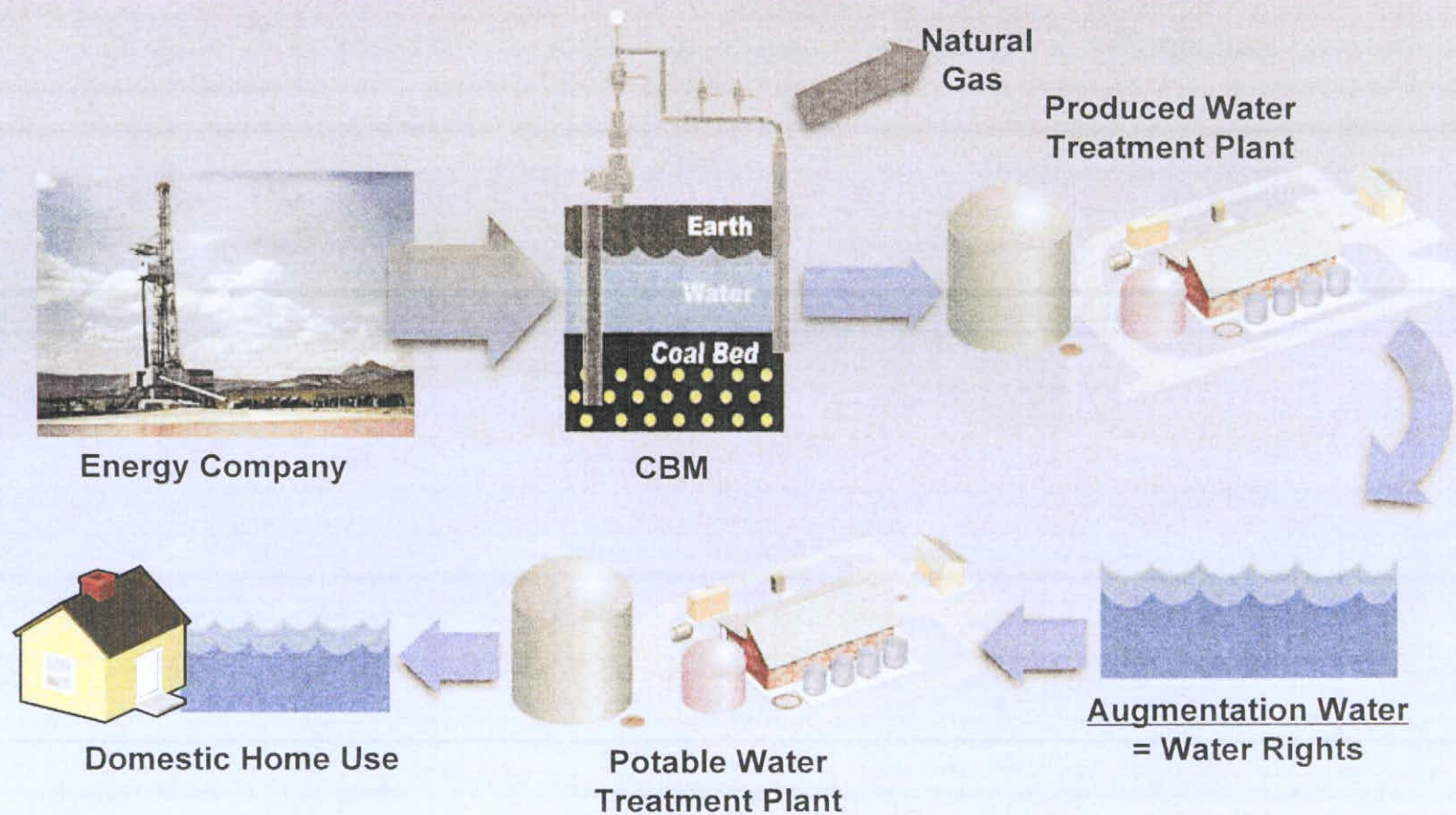
More Water




Produced Water - *What is It?*

- ▶ It depends on your perspective....
- ▶ To the oil & gas industry....*it's a pain.*
- ▶ To the environmental groups....*it's a concern.*
- ▶ To the regulators....*it's a challenge.*
- ▶ To the water industry/landowners....*it's a resource.*
- ▶ To RPSEA....*it's an opportunity to develop more cost-effective and environmentally sound strategies for management and treatment of produced water; leading to increased gas production.*

Produced Water: Potential Utilization





An Integrated Framework for Treatment and Management of Produced Water


Project Goal

- ▶ *Develop an integrated guidance framework that will link the composition of produced water to beneficial use applications and identify the most cost-efficient, environmentally sound, and most beneficial strategies for management and treatment of produced water from CBM and gas shale operations*

Relationship to the Goals/Objectives of RPSEA

- ▶ The proposed integrated guidance framework has the potential to substantially reduce the overall costs and enhance gas recovery and economic viability of CBM and gas shale fields while minimizing potential environmental impacts
- ▶ Techniques and methods developed provide needed guidance to the industry in selecting the most cost-efficient management and treatment strategies for handling produced water by considering the site-specific conditions of CBM and gas shale operations

Project Schedule: June 2008 - September 2010



An Integrated Framework for Treatment and Management of Produced Water

► Core Research Team:

- Colorado School of Mines
 - Pls: Jörg Drewes, Tzahi Cath, Pei Xu
- Kennedy/Jenks Consultants
 - PI: Jim Graydon
- Argonne National Laboratory
 - Pls: John Veil and Seth Snyder
- Stratus Consulting
 - Bob Raucher
- Technical Advisors:
 - Dave Stewart, Stewart Environmental Consultants
 - Jeff Cline, Cline Energy Consultants




AQWATEC

Advanced Water Technology Center

Kennedy/Jenks Consultants
Engineers & Scientists






An Integrated Framework for Treatment and Management of Produced Water

► Industry Advisory Council (IAC):


- **Anadarko Petroleum Corporation**
 - David Gomendi
- **Chevron**
 - John Wind and De Vu
- **Marathon Oil Company**
 - Brian Hodgson
- **Petro-Canada Resources (USA)**
 - Chuck Pollard
- **Pinnacle Gas Resources**
 - Terry Webster
- **Pioneer Natural Resources**
 - Jerry Jacob and Steve Schreck
- **Triangle Petroleum Corporation**
 - Ron Hietala
- **Petroglyph Operating Company**
 - Tom Melland
- **Technical Experts/Advisors:**
 - Jeff Cline, Cline Energy Consultants
 - Dave Stewart, Stewart Environmental Consultants



An Integrated Framework for Treatment and Management of Produced Water

► **Task 1** - Classification of Produced Water Treatment Technologies and Management Strategies

- Characterize and classify produced water qualities into different categories of treatability
- Determine produced water quantities (by basin and resource; gas/water ratios; current disposal/use strategies; etc.)
- Compile a comprehensive database on existing and emerging desalination technologies, hybrid configurations, and concentrate management strategies
- Develop a beneficial use matrix considering natural and engineered conveyance systems, water qualities of beneficial non-potable and potable uses, and quantity and quality of residuals generated



An Integrated Framework for Treatment and Management of Produced Water

► **Task 2** - Selection of Treatment Technologies for Produced Water

- Explore most appropriate and cost-efficient technologies for treatment of produced water considering water composition categories (Task 1)
- Identification and evaluation of **robust, reliable, low-maintenance, modular treatment technologies** as well as **brine management and disposal strategies** (considering both well-established conventional as well as emerging desalination technologies)
- Develop cost modules for management options



Treatment Design Considerations (Task 2)

► Geographical Issues

- Water generated at **individual wells** or **well clusters**
- Limited **conveyance** systems
- Difficult to **supply chemicals** and **dispose of brine**

► Operational Issues

- Harsh conditions
- Minimal operator involvement and maintenance
- Small footprint to minimize site remediation
- Modular design to adjust to different production rates
- Mobility
- Wide range of contaminant concentrations



Technological Challenges: Pretreatment

- ▶ Suspended solids
- ▶ Dissolved solids and residual hydrocarbons
- ▶ Temperature

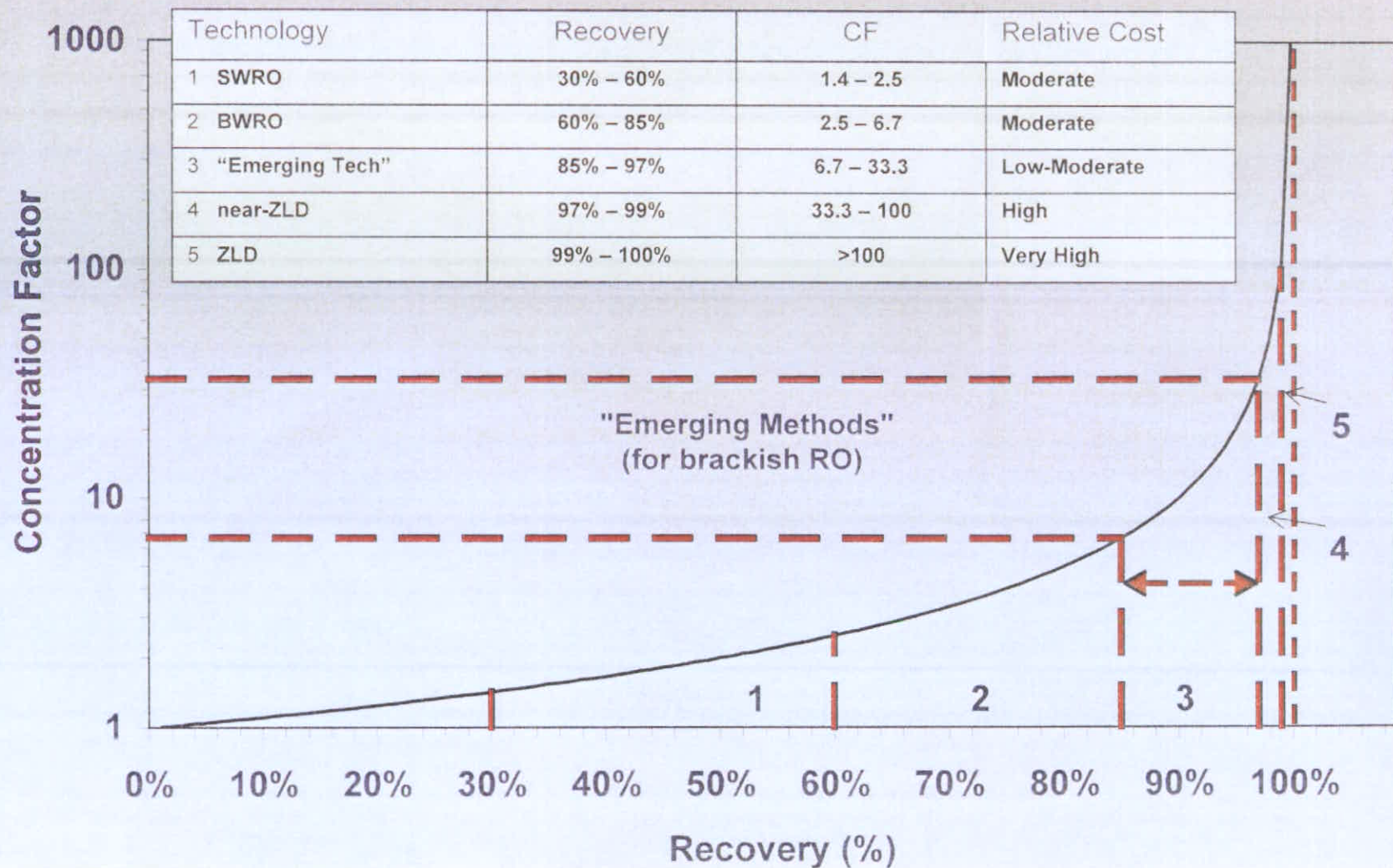
- ▶ Pretreatment solutions:
 - Current approaches:
 - Coagulation/flocculation with granular media filtration
 - Polymeric membranes
 - Novel approaches:
 - Ceramic microfiltration and ultrafiltration
 - Membrane distillation
 - Advanced on-site oxidation (UV/H₂O₂)




Treatment Technologies

- ▶ Currently only 1.4% of produced water is treated
- ▶ Predominant sodium bicarbonate make-up
 - Higgins Loop (continuous IX)
- ▶ Predominant sodium chloride make-up
 - Integrated membrane systems
 - MF or UF followed by RO or NF
 - Conventional pre-treatment followed by RO
 - Coagulation/flocculation followed by RO
- ▶ Novel Approaches
 - Temperature tolerant NF membranes
 - ED/EDR
 - Forward Osmosis
 - Capacitive Deionization (CDI)
 - Advanced evaporation processes and solar ponds

Technological Challenges: Treatment





An Integrated Framework for Treatment and Management of Produced Water

► Task 3 - Field Validation of Viable Treatment Processes for Produced Water


- Pilot-scale treatment trains will be designed, assembled and tested at representative production sites for field-scale validation
- Data will be analyzed to determine the effectiveness, robustness, and ease of operation of treatment strategies
- Preliminary cost estimates for the design of full-scale facilities will be developed; providing an economic framework for decision analysis



The Need for an Integrated Approach

“All water management and planning takes place in the context of economic, social, environmental, and political factors, and these factors are far more important than technological desalination process constraints in limiting the potential for desalination to help meet anticipated water supply needs.”


Desalination: A National Perspective
National Research Council (2008)



An Integrated Framework for Treatment and Management of Produced Water

► Task 4 - Assessment of Management Options


- Besides technical issues, this task will explore through **cost/benefit analyses** and **life-cycle assessments** the multiple conditions that have to be fulfilled in order to establish **beneficial use** from a regulatory, political, environmental, economic, and legal standpoint
- Develop a **structured decision process** that identifies, evaluates, and, where possible, quantifies the regulatory requirements, benefits, risks, and costs of each management option (“Draft Integrated Decision Framework”)
- Conduct a series of **Stakeholder workshops** to solicit key information, refine and confirm the decision framework, establish evaluation criteria, share treatment technology research results, and develop incentive-based beneficial use approaches



An Integrated Framework for Treatment and Management of Produced Water

► Stakeholder Advisory Committee (SAC):


- Awwa Research Foundation (AwwaRF)
- Bureau of Land Management (BLM) - Colorado
- Cline Energy Consulting
- Colorado Energy Research Institute (CERI)
- Colorado Oil and Gas Conservation Commission
- Family Farm Alliance
- Black Hills Center for American Indian Health
- Petroglyph Operating Company
- Southern Nevada Water Authority
- Stewart Environmental Consultants
- Trout Unlimited
- U.S. Bureau of Reclamation (BOR)
- U.S. Environmental Protection Agency (EPA)
- Veolia Water
- WaterReuse Association (WRA)
- Western Governors' Association



An Integrated Framework for Treatment and Management of Produced Water

► Task 5 - Development and Validation of Guidelines

- Develop **guidelines for management of produced water** leading to beneficial use of produced water as a practical, adaptable and robust tool for CBM and gas shale operators
- Guidelines will incorporate the **Integrated Decision Framework** to provide CBM and gas shale operators with a technically sound, objective basis for identifying and quantifying the benefits and costs of various management options
- Approach will also promote clear communication of the cost-benefit analysis to the industry, regulatory, environmental, and public stakeholders
- **Case studies** (2) will be selected to illustrate application of the Integrated Decision Framework and provide practical information on “lessons learned”



An Integrated Framework for Treatment and Management of Produced Water


► Technology Transfer

- Workshops with the Industry Advisory Council and Stakeholder Advisory Committee
- Conference presentation and technical publications
- Interactive website (developed by ANL/CSM)
- Proposed Unconventional Gas Produced Water Management Conference in 2010 (or earlier)



Summary

- ▶ Over two billion gallons of water are generated each day as a by-product of oil and gas production in the U.S.
- ▶ The cost of management and disposal of this water ranges from \$0.01/bbl to over \$5.00/bbl (\$80/AF to over \$40,000/AF)
- ▶ The value of new water resources is growing dramatically in the U.S. and globally
- ▶ The quality of produced water is highly variable spatially and temporally
- ▶ Treatment technologies are available but need to be adapted for remote sites
- ▶ Significant opportunities exist for beneficial use if economic and institutional barriers can be lowered



An Integrated Framework for Treatment and Management of Produced Water

Contacts

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HAMANN VETERINARY SERVICES

*183 S. Domingo Dr.
Pueblo West, Colorado 81007
719-250-0297*

April 8, 2008

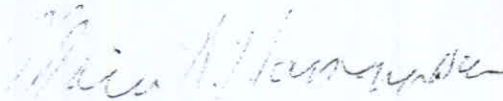
Brett Corsentino
2689 State Highway 10
Walsenburg, Colo. 81089

Brett;

Water and forage quality are extremely critical to health, production, and reproduction of the dairy cow. Water that has PH change significant enough to alter the PH of the soil is not suitable for producing dairy cows or production of the forage put into those cows.

Rumen alkalosis or rumen acidosis can occur with only slight changes in the ration. These conditions render the cow incapable of milk production and without immediate attention often result in death of the animal. If forage quality is compromised, it becomes very difficult to keep a ration tuned finely enough to prevent these occurrences from happening on almost a daily basis. Therefore it necessary to keep the best quality water and forage available at all times.

Sincerely,



Marvin H, Hamann DVM

Brett Corsentino
2689 East HW10
Walsenburg, CO 81089

Dear Mr. Corsentino,

This letter is a summary of our observations and suggestions for dealing with your crop production problems caused by diminished irrigation water quality. As detailed further in the attached *Situation Analyses* report, the primary water quality concerns are high sodium (Na) and bicarbonate (HCO_3) coupled with low calcium (Ca) and magnesium (Mg) resulting in a high sodium adsorption ration or SAR. As typical for waters described as "sodic" there is an accompanying high pH. The total salinity as measured by electrical conductivity (EC) was 1.2 dS/m, which is classified as a moderately saline. Continued irrigation with this water without special management and soil amendments will cause problems with sodium and other salt accumulation in the soil resulting in poor soil physical condition and reduced crop yield. These management steps and the soil amendments detailed in the *Situation Analyses* will unfortunately require additional time and expense to maintain your cropping system.

The impacts of water quality consistent to the laboratory analyses results I reviewed are well documented in the scientific literature (see *Irrigation Water Quality and Salinity Resources*). Consistent with the literature, the high sodium load through the irrigation water has already increased the sodium status of your soil evidenced by the SAR reported on the soil testing report from Olsen's Agricultural Laboratory (OAL). This sodium has displaced the some of the native calcium in your soil and is mostly likely the cause of the infiltration and runoff problems you have observed. My field visit verified a soil crusting/dispersion problem consistent with high sodium content as well.

To reclaim these fields, a sufficient amount of soluble calcium must be applied. The most commonly accepted amendment to supply calcium is gypsum. The gypsum rate identified by the OAL soil test report is sound, but is based upon the SAR of the soil and does not take into consideration additional sodium applied in future years' irrigation water. Elemental sulfur is also a possible amendment since your soil has sufficient calcium carbonate, however it will require more time to be effective. Both of these possible amendments are described in the attached factsheet: *Managing Sodic Soils CSU Cooperative Extension (no. 504)*. A key step in the amendment/reclamation process is occasional leaching with better quality water. Some of this leaching may occur through natural precipitation in wet years, but our semi-arid climate does not normally provide precipitation in excess of evapotranspiration (ET).

As long as the irrigation water you divert from the Cucharas River contains the elevated levels of sodium we have measured, you will likely experience production challenges. Unfortunately, I cannot recommend a "silver bullet" or a one-time prescription to your problems. It simply does not exist. The solution will be an on-going combination of soil amendments, occasional leaching and additional soil and water monitoring.

Sincerely,

Troy Bauder
Extension Specialist - Water Quality
(970) 491-4923

Situation Analyses – Corsentino Farms

Prepared by
Troy Bauder
Extension Specialist – Water Quality
Dept. Soil and Crop Sciences, Colorado State University

Resource Concerns

The following interpretations are based upon the results from soil, plant, and water samples taken from Holita Lake and the two center pivot irrigated corn fields on August 24, 2006. It should be noted that these results represent a single point in time and continued monitoring of soil and water is necessary to understand the impact of any management changes or changes in water quality that may occur.

Water Quality

The quality of the water from a Holita Lake used to irrigate the two pivots in question is impaired. The primary impairments for this water are high pH, sodium (Na), and bicarbonate (HCO_3) coupled with low calcium (Ca) and magnesium (Mg). These parameters result in a relatively high sodium adsorption ratio (SAR) of 10.6. When adjusted for alkalinity the SAR_{adj} is approximately 22. This water chemistry is similar to other analyses results conducted on samples taken from the Cucharas River downstream of coal bed methane (CBM) discharge. A secondary concern for this water is the salinity as measured by electrical conductivity (EC) of 1,240 $\mu\text{mhos/cm}$. Interpretations of these parameters are included in the enclosed fact sheets, but the bottom line is that the water contains too much sodium in respect to Ca, resulting in a high SAR. Continued irrigation with this water without special management will ultimately cause problems with sodium and other salt accumulation in the soil resulting in poor soil physical condition and reduced crop yield.

Soil Quality

Soil samples taken from both pivots suggest that the impaired water quality is beginning to negatively impact soil physical and chemical properties. Laboratory results

show the soil SAR levels at 6.6 to 8.26 and the pH ranges from 8.2 to 8.5. Although the textbook SAR value for a "sodic" soil is 13, the SAR levels found in these fields are much higher than are typically found in most Colorado soils, which are naturally dominated by calcium rather than sodium. Also, physical impacts (crusting and dispersion) to fine textured soils such as clay loams, which dominate the Corsentino fields, can occur at SAR levels below 13. Surface crusting and soil dispersion were visible during the August field visit and the Corsentinos have complained of poor infiltration and excessive runoff during irrigation events. Additionally, pH levels above 8.4, indicate that a sodium problem exists. The higher soil and water pH can also begin to impact plant nutrient availability and uptake.

Additionally, total soluble salts as measured by E.C. from the east pivot (2.36 to 3.14 mmhos/cm) are elevated beyond the threshold level for yield impact to silage corn of 1.8 mmhos/cm. This may be due to reduced salt leaching as sodium levels have decreased the infiltration and permeability of the surface soil.

Potential Strategies

Remedies for this situation if production on these fields is to be sustained at desirable levels include improved water quality, soil amendments and changes in management. The first remedy is to obtain water that is not dominated by sodium. Although this seems overly simple and infeasible given the present situation, perhaps there could be some negotiation with various parties to fill Holita Lake when CBM discharge is not occurring or during periods of high flow when discharge is not dominating the river. It should also be noted that applying amendments to the soil or water as described below will not be as effective in the long run without leaching with good quality irrigation water (or above average rainfall) at some point in time. The basic steps for reclaiming a sodium dominated soil include replacement of the sodium with a calcium source, incorporation, and leaching of the sodium with better quality water.

The second strategy is to add a soluble source of calcium to mitigate that impact of the sodium load from the irrigation water. Typically, the preferred amendment is gypsum. I would not recommend calcium chloride unless another calcium source cannot be located at a reasonable cost. One potential source of gypsum is drywall scrap from large construction projects. The gypsum requirement (up to 1.5 tons/acre) recommended by the soil test from Olsen's

Agricultural Laboratory is a sound recommendation to deal with the sodium currently in the soil. However, given the sodium concentration of the irrigation water as sampled an additional 620 pounds of sodium per acre will be added to the soil with every acre foot of irrigation water applied. Additional calcium will be required over time to deal with this additional sodium.

An alternative to gypsum is adding elemental sulfur to the soil. Soil analyses results show free lime (calcium carbonate 5.8 to 14%) is present in the soil of these fields. It can supply the calcium necessary for reclamation when dissolved by applying sulfur or sulfuric acid. Sulfur products reduce the soil pH, dissolving the lime, thus freeing up the calcium. Elemental sulfur should be applied at approximately 19% of the gypsum rate to be effective. Thus approximately 600 lbs of elemental sulfur would be needed to free up calcium equivalent to 1.5 tons of gypsum per acre. The choice of amendment should be based upon cost and availability. Elemental sulfur will require more time to be effective than gypsum.

Finally, another potential remedy to be used in combination with soil amendments is to treat the water itself. Acidification with sulfuric acid is a potential treatment option that would neutralize the bicarbonate in the irrigation water, lowering the pH and potentially freeing up some soil calcium (from free lime) in the soil to mitigate sodium additions. However, sulfuric acid is *extremely* hazardous to handle, requires special safety precautions, and is corrosive to the irrigation system if used improperly. Additional consultation is suggested if the Corsentino's choose to pursue this option. A soluble source of calcium may also be added to the irrigation water, but rate control is critical with this remedy as well and this will increase the total salinity of the water as measured by EC. There is no known economical water treatment technique or device to remove the sodium to levels acceptable for crop production.

Other Management Strategies

Irrigate more frequently and in lower amounts (1 inch or less) to reduce runoff from infiltration problems. Keeping soil moisture at higher levels between irrigation events effectively dilutes salt concentrations in the root zone, thereby reducing the salinity hazard. Additionally, salts are more efficiently leached from the soil profile under higher frequency irrigation. Since the fields are irrigated with above canopy nozzles, watch for signs of leaf burn from the high sodium in the irrigation water. The symptoms of sodium toxicity occur first on the oldest leaves and usually

appear as a burn or drying of tissue at the outer edges of the leaf. Should leaf burn problems begin to appear, drop nozzles or drag hoses may be necessary.

Manure application is recommended when applied in rotation and at reasonable rates. Manure adds organic material that can improve soil tilth and structure. However, it also adds an additional salt load and could exacerbate the problem if over-applied. An incorporated green manure crop such as winter wheat following silage, allowing it to grow through the winter and then disking it under, may also help with soil physical condition by adding organic material.

Crop selection – Sorghum and small grain forages such as wheat and triticale forages are generally more salt and sodium tolerant than corn.

Tillage – Deep tillage may temporarily help with infiltration and permeability problems and bring calcium up to the surface from the subsoil. However, excessive secondary tillage destroys soil tilth and structure and should be avoided. Avoid field operations when soil moisture is high to reduce additional soil physical problems with soil compaction.



Cooperative Extension
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 Department of Soil and Crop Sciences
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 Fort Collins, CO 80523-1170

TO

Name:

Organization:

Fax:

Brett

Conservation Dairy

719-438-2879

FROM

Fax:

Phone:

Date:

Pages:

ding
 970 491-2758

970 491-6201

04/09/07

a barch, including this cover page

Troy Bander

Comments:

*for your request.
 A starting point.*

L. Bander

W. Bander

DRAFT

DRAFT

DRAFT

Brett,

the

Olsen's Agricultural Laboratory, Inc.

210 E. First St. / P.O. BOX 370 / McCook, Nebraska 69001

Office: 308-345-3670 / FAX: 308-345-7880

Website: <http://www.olsenlab.com>



57514

TROY BAUDER

COLORADO STATE UNIVERSITY

DEPT OF SOILS AND CROP SCIENCE

1170 CAMPUS DELIVERY

FT COLLINS CO 80523 1170

NAME: TROY BAUDER

DATE RECEIVED: 09/06/2006

DATE REPORTED: 09/08/2006

SOIL TEST RESULTS

LAB NUMBER	FIELD IDENTIFICATION	SAMPLE IDENTIFICATION	Depth Inches	pH		LIME REC T/A 60% ECCE		EL	SOLUBLE SALTS mod. SP mmhos/cm	OM LOI %	NITRATE-N (FIA)		PHOSPHORUS				
				1:1 Soil	Buffer Woodruff	Legume	Non Legume				ppm	lbs/A	P1 ppm	Bicarb ppm	P2 ppm	M2 ppm	M3 ppm
659429	VALLEY GOOD		0-6	8.5				N	1.32	2.3	8.6	15					
659430	VALLEY BAD		0-6	8.4				H	1.28	2.2	8.4	15					
659431	LOCKWOOD GOOD		0-6	8.3				H	2.38	3.3	88.1	159					
659432	LOCKWOOD BAD		0-6	8.2				H	3.14	3.0	142.9	257					

LAB NUMBER	SULFATE-S Ca-P ppm	NH4OAc (Exchangeable)				DTPA				BORON Sorbitol ppm	EST. CATION EXCHANGE CAPACITY (CEC) me/100g	% SATURATION					
		K	Ca	Mg	Na	Zn	Fe	Mn	Cu			BASE	H	Ca	Mg	K	Na
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm								
859429		392	2200	425	474						17.8	100	0	63	20	6	11
859430		301	2510	432	508						18.1	100	0	67	19	4	10
859431		1083	2800	736	597						24.5	100	0	54	25	11	10
859432		1111	2630	768	627						25.1	100	0	55	25	11	9

LAB NUMBER	SOLUBLE (SAT. EXT.)			SODIUM ADSORPTION RATIO (SAR)	EXCH. SODIUM PERCENT (ESP)	GYPSUM REQ T/A	PARTICLE SIZE ANALYSIS				CHLORIDE		EXCH. NH4-N		ALUMINUM ppm	TOTAL N %
	Ca me/L	Mg me/L	Na me/L				SAND %	SILT %	CLAY %	SOIL TEXTURE	ppm	lbs/A	ppm	lbs/A		
659429	1.60	0.76	9.35	8.28	11	0.9										
659430	1.89	0.79	8.96	7.74	10	0.8										
659431	6.20	4.10	16.80	7.31	10	1.5										
659432	10.60	6.99	19.70	6.64	9	0.8										

SUGGESTED FERTILIZER RECOMMENDATIONS

LAB	FIELD	SUGGESTED FERTILIZER RECOMMENDATIONS													
NUMBER	IDENTIFICATION	SAMPLE IDENTIFICATION	CROP TO BE GROWN	YIELD GOAL	N lbs/A	P2O5 lbs/A	K2O lbs/A	S lbs/A	Zn lbs/A	MgO lbs/A	Fe lbs/A	Mn lbs/A	Cu lbs/A	B lbs/A	Cl lbs/A
659429	VALLEY GOOD														
659430	VALLEY BAD														
659431	LOCKWOOD GOOD														
659432	LOCKWOOD BAD														

Analysis By: Olsen's Ag. Lab

Recommendations By: Olsen's Ag. Lab

DRAFT

DRAFT

DRAFT

Brett Corsentino
2689 East HW10
Walsenburg, CO 81089

Brett,
Here is the
letter without the
draft watermark.
Troy

Dear Mr. Corsentino,

This letter is a summary of our observations and suggestions for dealing with your crop production problems caused by diminished irrigation water quality. As detailed further in the attached *Situation Analyses* report, the primary water quality concerns are high sodium (Na) and bicarbonate (HCO_3) coupled with low calcium (Ca) and magnesium (Mg) resulting in a high sodium adsorption ratio or SAR. As typical for waters described as "sodic" there is an accompanying high pH. The total salinity as measured by electrical conductivity (EC) was 1.2 dS/m, which is classified as a moderately saline. Continued irrigation with this water without special management and soil amendments will cause problems with sodium and other salt accumulation in the soil resulting in poor soil physical condition and reduced crop yield. These management steps and the soil amendments detailed in the *Situation Analyses* will unfortunately require additional time and expense to maintain your cropping system.

The impacts of water quality consistent to the laboratory analyses results I reviewed are well documented in the scientific literature (see *Irrigation Water Quality and Salinity Resources*). Consistent with the literature, the high sodium load through the irrigation water has already increased the sodium status of your soil evidenced by the SAR reported on the soil testing report from Olsen's Agricultural Laboratory (OAL). This sodium has displaced some of the native calcium in your soil and is mostly likely the cause of the infiltration and runoff problems you have observed. My field visit verified a soil crusting/dispersion problem consistent with high sodium content as well.

To reclaim these fields, a sufficient amount of soluble calcium must be applied. The most commonly accepted amendment to supply calcium is gypsum. The gypsum rate identified by the OAL soil test report is sound, but is based upon the SAR of the soil and does not take into consideration additional sodium applied in future years' irrigation water. Elemental sulfur is also a possible amendment since your soil has sufficient calcium carbonate, however it will require more time to be effective. Both of these possible amendments are described in the attached factsheet: *Managing Sodic Soils CSU Cooperative Extension (no. 504)*. A key step in the amendment/reclamation process is occasional leaching with better quality water. Some of this leaching may occur through natural precipitation in wet years, but our semi-arid climate does not normally provide precipitation in excess of evapotranspiration (ET).

As long as the irrigation water you divert from the Cucharas River contains the elevated levels of sodium we have measured, you will likely experience production challenges. Unfortunately, I cannot recommend a "silver bullet" or a one-time prescription to your problems. It simply does not exist. The solution will be an on-going combination of soil amendments, occasional leaching and additional soil and water monitoring.

Sincerely,

Troy Bauder
Extension Specialist - Water Quality
(970) 491-4923



Cooperative Extension
Colorado State University
Department of Soil and Crop Sciences
1170 Campus Delivery
Fort Collins, CO 80523-1170

TO

Name:

Organization:

Fax:

Brett

Consentino Dairy

719-738-2879

FROM

Fax:

970 491-2758

Phone:

970 491-6201

Date:

04/09/07

Pages:

a bandy, including this cover page

Comments:

For your request.
A starting point.

[Signature]

T. Bander

Troy Bauder/Soil & Crop Sciences
C011 Plant Sciences
Colorado State University

Date Received: 8/30/2006
Date Reported: 9/20/2006

LAB # W279 1

IRRIGATION WATER ANALYSIS

"Routine Package"

	Results	Results
Conductivity	1240	$\mu\text{mhos/cm}$ (E.C. x 1,000,000)
pH	9.4	
	mg/L	meq/L
Calcium	11.9	0.59
Magnesium	14.7	1.21
Sodium	231	10.05
Potassium	2.9	0.07
Carbonate	38.5	1.28
Bicarbonate	405	6.64
Chloride	62.4	1.76
Sulfate	107.0	2.23
Nitrate	0.6	0.01
Nitrate-Nitrogen	0.1	0.01
Boron	0.13	
Pounds of Sulfate per acre foot	95	
Pounds of Nitrate per acre foot	0.37	

SAR 10.6

Salinity
Hazard Medium

Sodium
Hazard Medium

COMMENTS:

This water is classified as a medium salinity hazard irrigation water and has a medium amount of sodium. Soils irrigated with this water may accumulate salts which would eventually be detrimental to plants.

COLORADO STATE UNIVERSITY
Soil, Water & Plant Testing Laboratory
Room A319, NESB
Fort Collins, CO 80523-1120
Phone: 970-491-5061 / Fax: 970-491-2930

Billing:

SOURCE: Holita Lake

Mapping unit
90 - Wiley clay loam
44 - Marshall clay loam
26 - King clay loam

Olsen's Agricultural Laboratory, Inc.
210 E. First St. / P.O. Box 370 / McCook, Nebraska 69001
Office: 308-345-3670 / FAX: 308-345-7880
Website: <http://www.olsenlab.com>



October 4, 2006

Troy Bauder
Colorado State University
Department of Soil and Crop Science
Ft Collins, CO 80523 1170

Re: % Calcium Carbonate Equivalent results

Lab No.	Field ID	% Calcium Carbonate Equivalent
659430	Valley Bad	14.08
695432	Lockwood Bad	5.83

Thanks.

Sincerely,

Bob Olsen

Bob Olsen

*100% of grain
into silage*

Olsen's Agricultural Laboratory, Inc.

210 E. First St. / P.O. BOX 370 / McCook, Nebraska 69001

Office: 308-345-3670 / FAX: 308-345-7880

Website: <http://www.olsenlab.com>



LEAF SAMPLE REPORT

TROY BAUDER
COLORADO STATE UNIVERSITY
DEPT OF SOILS AND CROP SCIENCE
1170 CAMPUS DELIVERY
FT COLLINS CO 80523 1170

Account Number: 57514

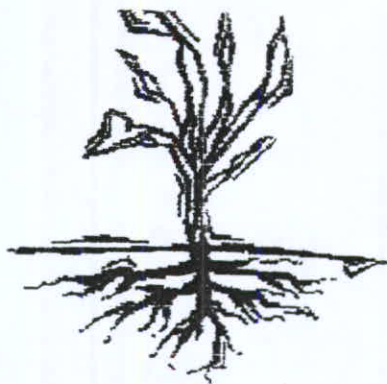
Date Sampled: 08/31/2006
Date Received: 09/06/2006
Date Reported: 09/14/2006

Lab Number: 78904

Name: TROY BAUDER
Field ID: VALLEY GOOD
Sample ID: OK
Crop: CORN
Maturity: LATE
Plant Part: LEAF

Constituent Analyzed	Results	Critical Level	Sufficient Range	Interpretation			
				Deficient	Low	Sufficient	High
Nitrogen, %	D 2.31	2.5	2.7 - 3.25	X			
Phosphorus, %	H 0.33	0.2	0.22 - 0.3				X
Potassium, %	S 2.22	1.6	3.25 - 2.6			X	
Sulfur, %	S 0.21	0.13	0.15 - 0.22			X	
Zinc, ppm	H 55.2	15	18 - 25				X
Calcium, %							
Magnesium, %							
Iron, ppm							
Manganese, ppm							
Copper, ppm							
Boron, ppm							
Sodium, %							
Chloride, %							
Aluminum, ppm							
Molybdenum, ppm							

BY: _____



SOIL

Managing Sodic Soils

no. 0.504

by J.G. Davis, R.M. Waskom, T.A. Bauder and G.E. Cardon

Quick Facts...

Sodic soils are poorly drained and tend to crust.

Sodic soils respond to continued use of good irrigation water, good irrigation methods, and good cropping practices.

Sodic soils are often reclaimed by adding a calcium-based soil amendment.

Soils with high levels of exchangeable sodium (Na) and low levels of total salts are called sodic soils. Sodic soils may impact plant growth by: 1.) Specific toxicity to sodium sensitive plants; 2.) Nutrient deficiencies or imbalances; 3.) High pH; and 4.) Spread of soil particles that causes poor physical condition of the soil.

Sodic soils tend to develop poor structure and drainage over time because sodium ions on clay particles cause the soil particles to deflocculate, or disperse. Sodic soils are hard and cloddy when dry and tend to crust. Water intake is usually poor with sodic soils, especially those high in silt and clay. Poor plant growth and germination are also common. The soil's pH is usually high, often above 9.0, and plant nutritional imbalances may occur. A soil pH above 8.4 typically indicates that a sodium problem exists. The term "alkali" is often used to describe soils that are high in salt but sometimes people use the term to mean high pH and at other times to mean high sodium. "Black alkali" refers to a sodic soil condition where organic matter has spread and is present as a dusty material on the soil surface.

Sodium levels in soil are often reported as the sodium adsorption ratio (SAR). This is a ratio of the amount of cationic (positive) charge contributed to a soil by sodium, to that contributed by calcium and magnesium. The SAR is determined from a water extract of a saturated soil paste. A SAR value below 13 is desirable. If the SAR is above 13, sodium can cause soil structure deterioration and water infiltration problems. Some labs report high sodium levels as ESP (exchangeable sodium percentage). An ESP of more than 15 percent is considered the threshold value for a soil classified as sodic. This means that sodium occupies more than 15 percent of the soil's cation exchange capacity (CEC). Be aware that sensitive plants may show injury or poor growth at even lower levels of sodium.

Sodium Hazard

Analyzing the soil for both soluble salts and sodium levels helps identify the specific soil problem and its severity. To find out if a problem exists, take a composite sample of several cores, 6 to 8 inches deep, from the affected area. In many cases, comparing soil samples from the affected area to surrounding normal appearance areas is beneficial in diagnosing the problem. Other information including soil texture, cation exchange capacity, type of clays present, calcium carbonate content, organic matter, depth to ground water, and soil profile information will help determine a recovery program. Some of this information may be obtained in the county soil survey available through your local USDA-Natural Resources Conservation Service (NRCS) office.

Colorado State
University
Cooperative
Extension

Putting Knowledge to Work

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$$SAR = \frac{Na^+}{\sqrt{\frac{(Ca^{++}) + (Mg^{++})}{2}}}$$

Figure 1. Formula for calculating SAR (sodium adsorption ratio).

The sodium hazard of soil usually is expressed as the sodium adsorption ratio (SAR). This is the proportion of water soluble Na^+ to Ca^{++} plus Mg^{++} in the soil. The formula used to calculate SAR is shown in Figure 1.

Ions in the equation are expressed in milliequivalents per liter (meq/L) and are obtained from a saturated paste soil extract. To convert ppm or mg/L Na^+ to meq/L, divide by 23; for Ca^{++} divide by 20; and for Mg^{++} divide by 12.2.

Specific Ion Effects

Sometimes a specific ion can have toxic reactions in certain plants. Sodic soils can cause specific ion toxicity in sensitive crops such as potatoes or beans. High sodium levels compete with calcium, magnesium, and potassium for uptake by plant roots. Therefore, excess sodium can prompt deficiencies of other cations (positively charged nutrients). High levels of other cations (calcium, magnesium, potassium) can also cause imbalances and induce nutrient deficiencies.

Table 1. Sodium hazard of soil based on SAR values.

Classification	Sodium adsorption ratio (SAR) ²	Electrical conductivity (dS/m) ¹	Soil pH	Soil physical condition
Sodic	≥13	<4.0	>8.5	poor
Saline-Sodic	≥13	>4.0	<8.5	normal
High pH	<13	<4.0	>7.8	varies
Saline	<13	>4.0	<8.5	normal

¹dS/m = mmho/cm

²If reported as Exchangeable Sodium Percentage or ESP, use 15% as threshold value.

Managing Sodic Soils

There are usually three options for correcting soil-related problems:

- 1.) change the plant species to a more tolerant species. Or,
- 2.) change the variety to a more tolerant variety. Or,
- 3.) change the soil.

Often, changing the soil is the most difficult of these options.

When soils are high in sodium, the goal is to replace the sodium with calcium and then leach the sodium out. There are two possible approaches for doing this:

- 1.) dissolve the limestone (calcium carbonate) or gypsum (calcium sulfate) already present in the soil. Or,
- 2.) add calcium to the soil.

If free lime is present in the soil, it can be dissolved by applying sulfur or sulfuric acid. Sulfur products reduce the pH which dissolves the lime, thus freeing up the calcium. If free lime or gypsum is not present in adequate amounts as determined by a soil test, then add calcium.

The most common form of calcium used for this purpose is gypsum. Although calcium chloride, which reacts more quickly, can also be used it is usually more expensive. After broadcasting the calcium source on the soil surface, mix it, and make sure adequate moisture is present to dissolve it.

Recovering a foot depth of sodic soil on one acre requires approximately 1.7 tons of pure gypsum ($CaSO_4 \cdot 2H_2O$) for each milliequivalent of exchangeable sodium present per 100 grams of soil.

Once the gypsum is applied and mixed, sufficient quality water must be added to leach the displaced sodium beyond the root zone. Restoration of sodic soils is slow because soil structure, once destroyed, is slow to improve. Growing a salt-tolerant crop in the early stages of reclamation and cultivating

Example gypsum requirement calculation:

Your soil has a CEC of 18 milliequivalents per 100 grams and SAR of 26, and you desire an SAR of approximately 10 following treatment. (In these calculations it is correct to assume SAR is roughly equivalent to ESP.)

ESP of 26% - desired ESP of 10% = ESP of 16, or 16% exchangeable Na must be replaced with calcium (Ca) to achieve the desired SAR.

$0.16 (16\%) \times 18 \text{ meq CEC} / 100g = 2.88 \text{ meq Na} / 100 \text{ g soil that must be replaced.}$

$*1.7 \text{ tons } CaSO_4 \times 2.88 \text{ meq Na} = 4.9 \text{ tons of gypsum.}$

Thus, about 5 tons of pure gypsum per acre would be required to reclaim the top 12 inches of this soil. Be sure to adjust this calculation for lower grades of gypsum and different soil depths.

*As a general rule of thumb, 1.7 tons of gypsum is required per meq of sodium.

in crop residues or manure adds organic matter which will increase water infiltration and permeability to speed up the reclamation process.

Make sure drainage is adequate prior to amending the soil, and after application of a sulfur product or a calcium source, leach the sodium out with good, quality water. Success in reclaiming non-irrigated sodic or saline-sodic soils with gypsum application may be possible on coarse textured soils that receive precipitation in excess of soil water holding capacity.

Remember:

- 1.) Adding sulfur products only makes sense when:
 - a) a soil is sodic and has free lime present. Or, when
 - b) a soil is basic (high pH).
- 2.) Adding calcium sources, such as gypsum or calcium chloride to saline (not sodic) soils only increases the salt content further and aggravates the salinity problem.

In many cases, the common practice is to apply sufficient amendment to remove most of the adsorbed sodium from the top 6 to 12 inches of soil. This improves the physical condition of the surface soil in a short period of time and permits the growing of crops. Continued use of quality irrigation water, good irrigation methods, and cropping practices further displaces adsorbed sodium. In some cases, it may be necessary to restore the soil to greater depths to obtain adequate drainage and root penetration.

Incorporating crop residues or plowing under manure, compost, green manure or cover crops may improve the tilth and increase water infiltration of sodium affected soils, especially when combined with other reclamation practices. Deep plowing to disrupt restrictive claypans and to mix calcium from deeper soil layers has also been used effectively in some situations.

Table 2. Amount of amendments required to supply one pound of soluble calcium.

Amendment	Purity* %	Pounds
Gypsum	100%	4.3
Calcium chloride	100%	3.7
Sulfur	100%	0.8
Sulfuric acid	95%	2.6
Lime sulfur	24% sulfur	3.3

*If the amendment has a purity different from that indicated on the table, determine the amount needed to supply one pound of soluble calcium by dividing the percent purity in the table by the percent purity of the material to be applied and multiply this by the number of pounds shown in the table.

Types of Amendments

Several commercial products are now on the market for amending sodic and saline-sodic soils. The only function of scientifically proven amendments is to provide soluble calcium to replace exchangeable sodium adsorbed on clay surfaces. There are two main types of amendments: those that add calcium directly to the soil and those that dissolve calcium from calcium carbonate (CaCO_3) already present in the soil.

Calcium amendments include gypsum (hydrated calcium sulfate) and calcium chloride. Gypsum is moderately soluble in water. Calcium chloride is highly water soluble and fast acting, but it generally is too expensive for most situations.

Acid-forming, or acidic amendments, include sulfuric acid, elemental sulfur, and calcium carbonate-sulfur. Sulfuric acid reacts immediately with the soil calcium carbonate to release soluble calcium for exchange with sodium. Elemental sulfur must be oxidized by soil bacteria and react with water to form sulfuric acid. The formation of sizeable amounts of sulfuric acid from elemental sulfur may take several months to several years.

Calcium carbonate-sulfur must go through essentially the same process as elemental sulfur and also is considered a slow-acting amendment. Calcium carbonate must be present in the soil when acid or acid-forming amendments are added.

Choose the amendment mainly on the basis of the cost of the soluble calcium furnished directly or indirectly by the amendment and the speed of the reaction. Also consider ease of application.

J.G. Davis, Colorado State University Cooperative Extension soils specialist and professor, soil and crop sciences; R.M. Waskom, water resource specialist; T.A. Bauder, water quality specialist; and G.E. Cardon, associate professor, soil and crop sciences.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Milan A. Rewerts, Director of Cooperative Extension, Colorado State University, Fort Collins, Colorado. Cooperative Extension programs are available to all without discrimination. No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.

A

34-60-124. Oil and gas conservation and environmental response fund.

(1) The following moneys shall be credited to the oil and gas conservation and environmental response fund:

- (a) The revenues from the surcharge imposed by the commission pursuant to section 34-60-122 (1) (a);
- (b) Moneys reimbursed to or recovered by the commission in payment for fund expenditures;
- (c) Any moneys appropriated to such fund by the general assembly;
- (d) Any moneys granted to the commission from any federal agency for the purposes outlined under subsection (4) of this section;
- (e) Prepayments by operators, in situations where a responsible party cannot be identified, as a credit against the surcharge imposed by section 34-60-122 (1) (a), whether in cash or through the provision of services or equipment, in order that the commission may conduct the activities provided for in subsection (4) of this section;
- (f) Moneys recovered from the sale of salvaged equipment, as provided for in paragraph (c) of subsection (6) of this section.

(2) The moneys in the oil and gas conservation and environmental response fund shall not revert to the general fund at the end of any fiscal year.

(3) The moneys in the oil and gas conservation and environmental response fund shall be subject to annual appropriation by the general assembly; except that moneys deposited in the fund constituting forfeited security or other financial assurance provided by operators in accordance with section 34-60-106 (3.5) and (13) shall be continuously appropriated to the commission for the purpose of fulfilling obligations under this article upon which an operator has defaulted.

(4) The oil and gas conservation and environmental response fund may be expended:

(a) By the commission, or by the director at the commission's direction, prior to, during, or after the conduct of oil and gas operations to:

(I) Investigate, prevent, monitor, or mitigate conditions that threaten to cause, or that actually cause, a significant adverse environmental impact on any air, water, soil, or biological resource;

(II) Gather background or baseline data on any air, water, soil, or biological resource that the commission determines may be so impacted by the conduct of oil and gas operations; and

(III) Investigate alleged violations of any provision of this article, any rule or order of the commission, or any permit where the alleged violation threatens to cause or actually causes a significant adverse environmental impact;

(b) For purposes authorized by section 23-41-114 (4), C.R.S.;

(c) For the purposes authorized by section 34-60-129.

(5) The director of the oil and gas conservation commission shall prepare an annual report for the executive director of the department of natural resources and the governor regarding the operations of and disbursements from the fund.

(6) For the purposes provided for in subsection (4) of this section, the commission is authorized to:

(a) Enter onto any lands or waters, public or private; and, except in emergency situations, the commission shall provide reasonable notice prior to such entry in order to allow a surface owner, local government designee, operator, or responsible party to be present and to obtain duplicate samples and copies of analytical reports;

(b) Require responsible parties to conduct investigation or monitoring activities and to provide the commission with the results;

(c) Confiscate and sell for salvage any equipment abandoned by a responsible party at a location where the conduct of oil and gas operations has resulted in a significant adverse environmental impact; except that this authority shall be subject to and secondary to any valid liens, security interests, or other legal interests in such equipment asserted by any taxing authority or by any creditor of the responsible party.

(7) If the commission determines that mitigation of a significant adverse environmental impact on any air, water, soil, or biological resource is necessary as a result of the conduct of oil and gas operations, the commission shall issue an order requiring the responsible party to perform such mitigation. If the responsible party cannot be identified or refuses to comply with such order, the commission shall authorize the necessary expenditures from the fund. The commission shall bring suit in the second judicial district to recover such expenditures from any responsible party who refuses to perform such mitigation or any responsible party who is subsequently identified, such action to be brought within a two-year period from the date that final expenditures were authorized. Moneys recovered as a result of such suit shall first be applied to the commission's legal costs and attorney fees and shall then be credited to the fund.

(8) (a) For purposes of this section, "responsible party" means any person who conducts an oil and gas operation in a manner which is in contravention of any then-applicable provision of this article, or of any rule, regulation, or order of the commission, or of any permit that threatens to cause, or actually causes, a significant adverse environmental impact to any air, water, soil, or biological resource. "Responsible party" includes any person who disposes of any other waste by mixing it with exploration and production waste that threatens to cause, or actually causes, a significant adverse environmental impact to any air, water, soil, or biological resource.

(b) Except as otherwise provided in paragraph (a) of this subsection (8), "responsible party" does not include any landowner, whether of the surface estate, mineral estate, or both, who does not engage in, or assume responsibility for, the conduct of oil and gas operations.

(9) For purposes of this section, any person who is found to be a responsible party shall be deemed to have consented to the jurisdiction of the commission and the courts of the state of Colorado. Each responsible party shall be liable only for a proportionate share of any costs imposed under this section and shall not be held jointly and severally liable for such costs.

(10) The fund shall be expended by the commission or by the director for the purposes of administering the provisions of this article, including staffing, overhead, enforcement, and the payment of environmental responses costs, and for paying expenses in connection with the interstate oil and gas compact commission.

Source: **L. 90:** Entire section added, p. 1546, § 3, effective May 8. **L. 91:** (4) amended, p. 1416, § 6, effective April 19. **L. 94:** Entire section amended, p. 1985, § 11, effective June 2. **L. 2000:** (3) amended, p. 826, § 1, effective May 24. **L. 2002:** (5) amended, p. 878, § 8, effective August 7. **L. 2005:** IP(1), (1)(a), (1)(e), (2), (3), and (4) amended and (10) added, p. 732, § 2, effective July 1; (4) amended, p. 541, § 2, effective July 1. **L. 2007:** IP(4) amended and (4)(c) added, p. 1587, § 2, effective May 31.

Editor's note: Amendments to subsection (4) by House Bill 05-1285 and Senate Bill 05-066 were harmonized.

Cross references: For the legislative declaration contained in the 1994 act amending this section, see section 1 of chapter 317, Session Laws of Colorado 1994.

B

34-60-122. Expenses - fund created.

(1) (a) In addition to the filing and service fee required to be paid under section 34-60-106 (1) (f) and the fees authorized for other services provided by the commission by section 34-60-106 (16), there is imposed on the market value at the well of all oil and natural gas produced, saved, and sold or transported from the field where produced in this state a charge not to exceed one and seven-tenths mills on the dollar. The commission shall, by order, fix the amount of such charge in the first instance and may, from time to time, reduce or increase the amount thereof as, in its judgment, the expenses chargeable against the oil and gas conservation and environmental response fund specified in subsection (5) of this section may require.

(b) On and after July 1, 2007, the commission shall ensure that the two-year average of the unobligated portion of the fund does not exceed four million dollars and that there is an adequate balance in the environmental response account created pursuant to subsection (5) of this section to address environmental response needs.

(2) (a) On or before March 1, June 1, September 1, and December 1 of each year, every producer or purchaser, whichever disburses funds directly to each and every person owning a working interest, a royalty interest, an overriding royalty interest, a production payment and other similar interests from the sale of oil or natural gas subject to the charge imposed by subsection (1) of this section, shall file a return with the commission showing the volume of oil, gas, or condensate produced or purchased during the preceding calendar quarter, and the actual sales value of such oil, gas, or condensate, including the total consideration due or received at the point of delivery. Such return shall be accompanied by the total amount of the charges due on all interests in the oil or gas except those interests exempted under the provisions of subsection (4) of this section.

(b) Each producer shall advise the commission whether he or the purchaser will be responsible for reporting and remitting the levy under the provisions of paragraph (a) of this subsection (2). If the return is filed by the producer, the producer shall maintain at his place of business for three years the invoice or statement issued by each purchaser showing the amount of oil or gas purchased, the producing lease from which such purchase was made, and the total sales price paid. Such purchaser invoice or statement may be requested periodically by the commission with the quarterly report.

(3) Any producer or purchaser who files a return pursuant to subsection (2) of this section shall pay any such charge or any interest other than his own, and such producer or purchaser is authorized to deduct the amount of such payment from any amount owed by him to the person for whom such charge was paid. Any such charge not paid when required by subsection (2) of this section shall bear interest at the rate of three percent per month, from the date of delinquency until paid.

(4) The charge imposed by subsection (1) of this section shall not apply to the interest in any oil or gas or the proceeds therefrom of the following:

(a) The United States;

(b) The state of Colorado or any of its political subdivisions;

(c) Any Indian or Indian tribe on production from land subject to the supervision of the United States.

(5) It is the duty of the oil and gas conservation commission to collect all charges and penalties under

this article and to remit them to the state treasurer for deposit in the oil and gas conservation and environmental response fund, which fund is hereby created in the state treasury. There is hereby created in the fund the environmental response account, into which shall be deposited penalties pursuant to section 34-60-121 (1). Expenditures authorized pursuant to section 34-60-124 (4) shall be paid in the first instance from the account, and expenditures authorized pursuant to section 34-60-124 (10) shall not be paid from the account. The general assembly shall annually make appropriations for the purposes authorized by section 34-60-124, and warrants shall be drawn against the appropriations as provided by law.

Source: L. 51: p. 662, § 18. CSA: C. 118, § 68(16). L. 53: p. 444, § 3. CRS 53: § 100-6-20. L. 59: p. 606, § 1. C.R.S. 1963: § 100-6-20. L. 65: p. 900, § 1. L. 71: p. 1051, § 1. L. 77: (1) and (5) amended, p. 1570, § 2, effective June 1; (2) and (3) amended, p. 1769, § 9, effective January 1, 1978. L. 78: (5) amended, p. 273, § 96, effective May 23. L. 84: (2) R&RE and (3) and (5) amended, pp. 936, 937, §§ 1, 2, effective April 27. L. 86: (1) and (5) amended, p. 1073, § 2, effective April 3. L. 87: (1) amended, p. 1274, § 1, effective May 8. L. 88: (5) amended, p. 1217, § 1, effective April 14. L. 90: (1) R&RE, p. 1545, § 2, effective May 8. L. 91: (2)(a) and (5) amended, pp. 1415, 1416, §§ 4, 5, effective April 19. L. 94: (1)(b) and (2)(a) amended, p. 1984, § 10, effective June 2. L. 2005: (1)(a), (1)(b), and (5) amended, p. 731, § 1, effective July 1; (1)(b) amended, p. 542, § 3, effective July 1. L. 2006: (1)(b) amended, p. 220, § 1, effective March 31.

Editor's note: Amendments to subsection (1)(b) by House Bill 05-1285 and Senate Bill 05-066 were harmonized.

Cross references: (1) For disposition of moneys collected by state agencies or instrumentalities, see § 24-36-103.

(2) For the legislative declaration contained in the 1994 act amending subsections (1)(b) and (2)(a), see section 1 of chapter 317, Session Laws of Colorado 1994.

c

liability of a third party provider of financial assurance exceed the face amount of such financial assurance.

- c. If an operator's financial assurance is called or foreclosed by the Commission, such operator's Certificates of Clearance, Form 10, are forthwith suspended and no sales of gas or oil shall be allowed, except as may be allowed by the Commission order, until such time as the operator's financial assurance has been replaced or restored.
- d. The Director shall not approve a new Operator Registration, Form 1, or a new Certificate of Clearance, Form 10, when wells are sold or transferred until the successor operator has filed satisfactory financial assurance under the 700-Series Rules.

710. Oil and Gas Conservation and Environmental Response Fund.

The Commission shall ensure that the two-year average of the unobligated portion of It is the intent of the Oil and Gas Conservation Commission that and Environmental Response Fund (ERF) is maintained at a level of approximately, but not to exceed, four million dollars (\$4,000,000), and that there is an adequate balance in the fund to address environmental response needs "emergency reserve" of unobligated funds be maintained in the amount of one million dollars (\$1,000,000), which may be used in accordance with the Act and Rule 701.

711. Natural gas gathering, natural gas processing and underground natural gas storage facilities.

Operators of natural gas gathering, natural gas processing, or underground natural gas storage facilities shall be required to provide statewide blanket financial assurance to ensure compliance with the 900 Series rules in the amount of fifty thousand dollars (\$50,000), or in an amount voluntarily agreed to with the Director, or in an amount to be determined by order of the Commission. Operators of small systems gathering or processing less than five (5) MMSCFD may provide individual financial assurance in the amount of five thousand dollars (\$5,000).

712. Surface facilities and structures appurtenant to Class II Commercial Underground Injection Control wells.

Operators of Class II commercial Underground Injection Control (UIC) wells shall be required to provide financial assurance to ensure compliance with the 900-Series Rules in the amount of fifty-thousand dollars (\$50,000) for each facility, or in an amount voluntarily agreed to with the Director, or in an amount to be determined by order of the Commission. The financial assurance required by this Rule 712 shall apply to the surface facilities and structures appurtenant to the Class II commercial injection well and used prior to the disposal of E&P wastes into such well and shall be in place by July 1, 2009. The financial assurance requirements for the plugging and abandonment of Class II commercial UIC wells are specified in Rule 706.

800-SERIES AESTHETIC AND NOISE CONTROL REGULATIONS

801. INTRODUCTION

The rules and regulations in this section are promulgated to control aesthetics and noise impacts during the drilling, completion and operation of oil and gas wells and production facilities. Any Colorado county, home rule or statutory city, town, territorial charter city or city and county may, by application to the Commission, seek a determination that the rules and regulations in this section, or any individual rule or regulation, shall not apply to oil and gas activities occurring within the boundaries, or any part thereof, of any Colorado county, home rule or statutory city, town, territorial charter city or city and county, such determination to be based upon a showing by any Colorado county, home rule or statutory city, town, territorial charter city or city and county that, because of conditions existing therein, the enforcement of

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700-SERIES FINANCIAL ASSURANCE AND OIL AND GAS CONSERVATION AND ENVIRONMENTAL RESPONSE FUND

701. SCOPE

The rules in this series pertain to the provision of financial assurance by operators to ensure the performance of certain obligations imposed by the Oil and Gas Conservation Act (the Act), §34-60-106 (3.5), (11), (12) and (17) C.R.S., as well as the use of the Oil and Gas Conservation and Environmental Response Fund (ERF), §34-60-124 C.R.S., as a mechanism to plug and abandon orphan wells, perform orphaned site reclamation, and remediation, and to conduct other authorized environmental activities.

702. General.

Operators are required to provide financial assurance to the Commission to demonstrate that they are capable of fulfilling the obligations imposed by the Act, as described in this series. Except as otherwise specified herein, a surety bond, in a form and from a company acceptable to the Commission, is an approved method of providing financial assurance. Any other method of providing financial assurance identified in §34-60-106(B13), C.R.S., shall be submitted to the Commission for approval, and shall be equivalent to the protection provided by a surety bond and may require detailed Commission review on an ongoing basis, including the use of third party consultants, the reasonable expense for which shall be charged to the operator proposing such alternative financial assurance.

- a. When the Director has reasonable cause to believe that the Commission may become burdened with the costs of fulfilling the statutory obligations described herein because an operator has demonstrated a pattern of non-compliance with oil and gas regulations in this or other states, because special geologic, environmental, or operational circumstances exist which make the plugging and abandonment of particular wells more costly, or due to other special and unique circumstances, the Director may petition the Commission for an increase in any individual or blanket financial assurance required in this series.
- b. The requirements of this series do not apply to situations where financial assurance has been provided to federal or Indian agencies for operations regulated solely by such agencies.

703. Surface owner protection.

Operators shall provide financial assurance to the Commission, prior to commencing any operations with heavy equipment, to protect surface owners who are not parties to a lease, surface use or other relevant agreement with the operator from unreasonable crop loss or land damage caused by such operations. The determination that crop loss or land damage is unreasonable shall be made by the Commission after the affected surface owner has filed an application in accordance with the 500 Series rules. Financial assurance for the purpose of surface owner protection shall not be required for operations conducted on state lands when a bond has been filed with the State Board of Land Commissioners.

The financial assurance required by this section shall be in the amount of two thousand dollars (\$2,000) per well for non-irrigated land, or five thousand dollars (\$5,000) per well for irrigated land. In lieu of such individual amounts, operators may submit statewide, blanket financial assurance in the amount of twenty five thousand dollars (\$25,000). Relief granted by the Commission upon application by a surface owner pursuant to this section may include an order requiring the operator to conduct corrective or remedial action, and any monetary award for unreasonable crop loss or land damage that cannot be remediated or corrected is not limited to the amount of the operator's financial assurance hereunder.

704. Centralized E&P waste management facilities.

An operator which makes application for an offsite, centralized E&P waste management facility shall, upon approval and prior to commencing construction, provide to the Commission financial assurance in

E

34-60-106. Additional powers of commission - rules - repeal.

(1) The commission also has authority to require:

(a) Identification of ownership of oil and gas wells, producing leases, tanks, plants, and structures;

(b) The making and filing with the commission of copies of well logs, directional surveys, and reports on well location, drilling, and production; except that logs of exploratory or wildcat wells marked "confidential" shall be kept confidential for six months after the filing thereof, unless the operator gives written permission to release such logs at an earlier date;

(c) The drilling, casing, operation, and plugging of seismic holes or exploratory wells in such manner as to prevent the escape of oil or gas from one stratum into another, the intrusion of water into oil or gas stratum, the pollution of fresh water supplies by oil, gas, salt water, or brackish water; and measures to prevent blowouts, explosions, cave-ins, seepage, and fires;

(d) (Deleted by amendment, L. 94, p. 1980, § 6, effective June 2, 1994.)

(e) That every person who produces, sells, purchases, acquires, stores, transports, refines, or processes oil or gas in this state shall keep and maintain within this state, for a period of five years, complete and accurate records of the quantities thereof, which records, or certified copies thereof, shall be available for examination by the commission, or its agents, at all reasonable times within said period and that every such person shall file with the commission such reasonable reports as it may prescribe with respect to such oil or gas or the products thereof;

(f) That no operations for the drilling of a well for oil and gas shall be commenced without first giving to the commission notice of intention to drill and without first obtaining a permit from the commission, under such rules and regulations as may be prescribed by the commission, and paying to the commission a filing and service fee to be established by the commission for the purpose of paying the expense of administering this article as provided in section 34-60-122, which fee may be transferable or refundable, at the option of the commission, if such permit is not used; but no such fee shall exceed two hundred dollars;

(g) That the production from wells be separated into gaseous and liquid hydrocarbons and that each be accurately measured by such means and standards as prescribed by the commission;

(h) The operation of wells with efficient gas-oil and water-oil ratios, the establishment of these ratios, and the limitation of the production from wells with inefficient ratios;

(i) Certificates of clearance in connection with the transportation and delivery of oil and gas or any product; and

(j) Metering or other measuring of oil, gas, or product in pipelines, gathering systems, loading racks, refineries, or other places.

(2) The commission has the authority to regulate:

(a) The drilling, producing, and plugging of wells and all other operations for the production of oil or gas;

(b) The shooting and chemical treatment of wells;

(c) The spacing of wells; and

(d) Oil and gas operations so as to prevent and mitigate significant adverse environmental impacts on any air, water, soil, or biological resource resulting from oil and gas operations to the extent necessary to protect public health, safety, and welfare, including protection of the environment and wildlife resources, taking into consideration cost-effectiveness and technical feasibility.

(3) The commission also has the authority to:

(a) Limit the production of oil or gas, or both, from any pool or field for the prevention of waste, and to limit and to allocate the production from such pool or field among or between tracts of land having separate ownerships therein, on a fair and equitable basis so that each such tract will be permitted to produce no more than its just and equitable share from the pool and so as to prevent, insofar as is practicable, reasonably avoidable drainage from each such tract which is not equalized by counter-drainage; and

(b) Classify wells as oil or gas wells for purposes material to the interpretation or enforcement of this article.

(3.5) The commission shall require the furnishing of reasonable security with the commission by lessees of land for the drilling of oil and gas wells, in instances in which the owner of the surface of lands so leased was not a party to such lease, to protect such owner from unreasonable crop losses or land damage from the use of the premises by said lessee. The commission shall require the furnishing of reasonable security with the commission, to restore the condition of the land as nearly as is possible to its condition at the beginning of the lease and in accordance with the owner of the surface of lands so leased.

(4) The grant of any specific power or authority to the commission shall not be construed in this article to be in derogation of any of the general powers and authority granted under this article.

(5) The commission shall also have power to make determinations, execute waivers and agreements, grant consent to delegations, and take other actions required or authorized for state agencies by those laws and regulations of the United States which affect the price and allocation of natural gas and crude oil, including the federal "Natural Gas Policy Act of 1978", 15 U.S.C. sec. 3301 et seq., including the power to give written notice of administratively final determinations.

(6) The commission has the authority, as it deems necessary and convenient, to conduct any hearings or to make any determinations it is otherwise empowered to conduct or make by means of an appointed hearing officer, but recommended findings, determinations, or orders of any hearing officer shall not become final until adopted by the commission. Upon appointment by the commission, a member of the commission may act as a hearing officer.

(7) The commission has the authority to establish, charge, and collect docket fees for the filing of applications, petitions, protests, responses, and other pleadings. No such fees shall exceed two hundred dollars for any application, petition, or other pleading initiating a proceeding nor one hundred dollars for any protest or other responsive pleadings, and any party to any commission proceeding shall pay no more than one such fee for each proceeding in which it is a party. All such fees shall be deposited in the oil and gas conservation and environmental response fund established by section 34-60-122 and shall be subject to appropriations by the general assembly for the purposes of this article.

(8) The commission shall prescribe special rules and regulations governing the exercise of functions delegated to or specified for it under the federal "Natural Gas Policy Act of 1978", 15 U.S.C. sec. 3301 et seq., or such other laws or regulations of the United States which affect the price and allocation of natural gas and crude oil in accordance with the provisions of this article.

(9) Notwithstanding the provisions of section ~~34-60-120~~ or any other provision of law, the commission, as to class II injection wells defined in 40 CFR 144.6b, shall also have the power to perform all acts for the purpose of protecting underground sources of drinking water in accordance with state programs authorized by 42 U.S.C. sec. 300f et seq. and regulations thereunder in effect or as may be amended.

(10) The commission shall promulgate rules and regulations to protect the health, safety, and welfare of any person at an oil or gas well; except that the commission shall not adopt such rules and regulations with regard to parties or requirements regulated under the federal "Occupational Safety and Health Act of 1970".

(11) (a) By July 16, 2008, the commission shall:

(I) (A) Promulgate rules to establish a timely and efficient procedure for the review of applications for a permit to drill and applications for an order establishing or amending a drilling and spacing unit.

(B) The commission shall semiannually submit a report to the general assembly that tracks the number of applications for permits to drill, the average time to review and issue permits to drill, and a description of the number and character of applications for permits to drill for which approval has been withheld, including the ultimate disposition of such applications. This sub-subparagraph (B) is repealed, effective July 1, 2010.

(II) Promulgate rules, in consultation with the department of public health and environment, to protect the health, safety, and welfare of the general public in the conduct of oil and gas operations. The rules shall provide a timely and efficient procedure in which the department has an opportunity to provide comments during the commission's decision-making process. This rule-making shall be coordinated with the rule-making required in section ~~34-60-128~~ (3) (d) so that the timely and efficient procedure established pursuant to this subsection (11) is applicable to the department and to the division of wildlife.

(b) (I) The general assembly shall review the rules promulgated pursuant to paragraph (a) of this subsection (11) acting by bill pursuant to section ~~24-4-103~~, C.R.S., and reserves the right to alter or repeal such rules.

(II) By January 1, 2008, the commission shall promulgate rules to ensure the accuracy of oil and gas production reporting by establishing standards for wellhead oil and gas measurement and reporting. At a minimum, the rules shall address engineering standards, heating value, specific gravity, pressure, temperature, meter certification and calibration, and methodology for sales reconciliation to wellhead meters. The rules shall be consistent with standards established by the American society for testing and materials, the American petroleum institute, the gas processors association, or other applicable standards-setting organizations, and shall not affect contractual rights or obligations.

(12) The commission, in consultation with the state agricultural commission and the commissioner of agriculture, shall promulgate rules to ensure proper reclamation of the land and soil affected by oil and gas operations and to ensure the protection of the topsoil of said land during such operations.

(13) The commission shall require every operator to provide assurance that it is financially capable of fulfilling any obligation imposed under subsections (11), (12), and (17) of this section. For purposes of

this subsection (13), references to "operator" shall include an operator of an underground natural gas storage cavern and an applicant for a certificate of closure under subsection (17) of this section. In complying with this requirement, an operator may submit for commission approval, without limitation, one or more of the following:

- (a) A guarantee of performance where the operator can demonstrate to the commission's satisfaction that it has sufficient net worth to guarantee performance of any obligation imposed by rule under subsections (11), (12), and (17) of this section. Such guarantee and demonstration of net worth shall be annually reviewed by the commission.
- (b) A certificate of general liability insurance in a form acceptable to the commission which names the state as an additional insured and which covers occurrences during the policy period of a nature relevant to an obligation imposed by rule under subsections (11), (12), and (17) of this section;
- (c) A bond or other surety instrument;
- (d) A letter of credit, certificate of deposit, or other financial instrument;
- (e) An escrow account or sinking fund dedicated to the performance of any obligation imposed by rule under subsections (11), (12), and (17) of this section;
- (f) A lien or other security interest in real or personal property of the operator. Such lien or security interest shall be in a form and priority acceptable to the commission in its sole discretion and shall be reviewed annually by the commission.

(14) Before an operator commences operations for the drilling of any oil or gas well, such operator shall evidence its intention to conduct such operations by giving the surface owner written notice describing the expected date of commencement, the location of the well, and any associated roads and production facilities. Unless excepted by the commission due to exigent circumstances or waived by the surface owner, such notice of drilling shall be mailed or delivered to the surface owner not less than thirty days prior to the date of estimated commencement of operations with heavy equipment. The notice of drilling shall also be provided to the local government in whose jurisdiction the well is located if such local government has registered with the commission for receipt thereof.

(15) The commission may, as it deems appropriate, assign its inspection and monitoring function, but not its enforcement authority, through intergovernmental agreement or by private contract; except that no such assignment shall allow for the imposition of any new tax or fee by the assignee in order to conduct such assigned inspection and monitoring, and no such assignment shall provide for compensation contingent on the number or nature of alleged violations referred to the commission by the assignee. No local government may charge a tax or fee to conduct inspections or monitoring of oil and gas operations with regard to matters that are subject to rule, regulation, order, or permit condition administered by the commission. Nothing in this subsection (15) shall affect the ability of a local government to charge a reasonable and nondiscriminatory fee for inspection and monitoring for road damage and compliance with local fire codes, land use permit conditions, and local building codes.

(16) The commission has the authority to establish, charge, and collect fees for services it provides, including but not limited to the sale of computer disks and tapes.

(17) (a) The commission has exclusive authority to regulate the public health, safety, and welfare aspects, including protection of the environment, of the termination of operations and permanent closure, referred to in this subsection (17) collectively as "closure", of an underground natural gas storage cavern.

(b) No underground natural gas storage cavern may be closed unless the operator has secured a certificate of closure from the commission. The commission shall issue a certificate of closure if the applicant demonstrates that its closure plan protects public health, safety, and welfare, including protection of the environment.

(c) Before submitting its application, an applicant for a certificate of closure must, to the extent such owners are reasonably identifiable from public records, notify all owners of property, both surface and subsurface, occupied by and immediately adjacent to the underground natural gas storage cavern of the applicant's intent to submit a closure plan. "Immediately adjacent to" means contiguous to the boundaries of the underground natural gas storage cavern. The notice shall advise the owners of a location where a full copy of the closure plan may be inspected, that written comments may be submitted to the commission, and that they may participate in the public hearing required by this subsection (17). The applicant shall notify the owners of the date, time, and place of the public hearing. Contemporaneously with notifying the owners, the applicant shall send a copy of the notice to registered homeowners' associations that have submitted a written request for such notice prior to the filing of the application with the commission and the board of county commissioners in the county where the underground natural gas storage cavern is located.

(d) The commission shall provide the public with notice and an opportunity to comment on an application filed under this subsection (17) for a certificate of closure pursuant to the procedures set forth in section 34-60-108 (7). The applicant shall attend the public hearing and shall be available at other reasonable times as the director may request to respond to comments and questions.

(e) The director may consult with other state agencies possessing expertise in matters related to closure of underground natural gas storage caverns in the areas of the jurisdiction of such agencies, including, but not limited to, safety, environmental protection, public health, water resources, and geology. Agencies consulted under this subsection (17) may include, but are not limited to, the public utilities commission, the division of reclamation, mining, and safety, the Colorado geological survey, the division of water resources, and the department of public health and environment. Any agency consulted shall provide advice and assistance with respect to matters within its expertise.

(f) The commission may attach conditions to its certificate of closure, including requiring reasonable recovery of residual natural gas, if the commission determines that such conditions are technically feasible and necessary to ensure compliance with the requirements of this subsection (17), taking into consideration cost-effectiveness. If the closure application requires the abandonment of wells and reclamation of well sites associated with the underground natural gas storage cavern, the commission shall attach conditions to its certificate of closure requiring that such well abandonment and reclamation occur in a manner consistent with applicable commission rules.

(g) The commission may, subject to the limitations contained in paragraph (f) of this subsection (17), attach conditions to its certificate of closure requiring:

(I) Reasonable post-closure monitoring and site security at a closed underground natural gas storage cavern; and

(II) That the applicant for the certificate of closure will perform post-closure corrective actions consistent with this subsection (17), including, but not limited to, the limitations contained in paragraph (f) of this subsection (17) if any such post-closure monitoring establishes that the closure does not protect public health, safety, or welfare, including protection of the environment.

(h) The commission shall require that the applicant for a certificate of closure provide reasonable

assurance that it is financially capable of fulfilling any obligation imposed under this subsection (17) including, but not limited to, post-closure corrective action required by paragraph (g) of this subsection (17), in accordance with subsection (13) of this section.

(i) The applicant for a certificate of closure under this subsection (17) shall reimburse the commission's reasonable and necessary costs of reviewing and acting on the application. Such reimbursement shall include:

(I) Reimbursement to the commission, its staff, and any agencies consulted under this subsection (17) for the reasonable cost of the time required to review the application, at a rate commensurate with the hourly compensation of the staff employee performing the actual work, but not to exceed the hourly compensation of the highest paid commission staff employee, based on the employee's annual salary divided by two thousand eighty hours; and

(II) Reimbursement of the reasonable cost to the commission of hiring one or more private consultants to review the application and provide advice to the commission as a result of such review, if the applicant consents in writing to the scope and expected range of costs of the activities to be undertaken by each such private consultant. If the commission and applicant cannot agree on the scope or expected range of costs and if the commission determines a private consultant is necessary in the review of the application, then the commission may hire a private consultant at its own expense.

Source: L. 51: p. 660, § 11. CSA: C. 118, § 68(11). CRS 53: § 100-6-15. L. 55: p. 654, § 8. C.R.S. 1963: § 100-6-15. L. 64: p. 509, § 1. L. 73: p. 1071, § 1. L. 77: (3.5) added, p. 1565, § 1, effective July 1. L. 79: (5) to (8) added, p. 1320, § 2, February 16. L. 81: (9) added, p. 1339, § 4, effective July 1; (9) amended, p. 2034, § 53, effective July 14. L. 85: (10) and (11) added, p. 1129, § 1, effective July 1. L. 86: (12) added, p. 1073, § 1, effective April 3. L. 91: (1)(f) and (9) amended, p. 1415, § 3, effective April 19. L. 94: (1)(d), (2)(d), (11), and (12) amended and (13), (14), (15), and (16) added, p. 1980, § 6, effective June 2. L. 96: (15) amended, p. 346, § 1, effective April 17. L. 2001: IP(13), (13)(a), (13)(b), and (13)(e) amended and (17) added, pp. 1303, 1304, §§ 2, 3, effective June 5; (14) amended, p. 491, § 6, effective July 1. L. 2005: (7) amended, p. 733, § 3, effective July 1. L. 2006: (17)(e) amended, p. 218, § 16, effective August 7. L. 2007: (2)(d) and (11) amended, pp. 1358, 1359, §§ 4, 6, effective May 29; (11) amended, p. 1344, § 1, effective May 29. L. 2008: IP(11)(a), (11)(a)(II), and (11)(b)(I) amended, p. 1033, § 1, effective May 21; (11)(a)(II) amended, p. 1912, § 122, effective August 5.

Editor's note: Amendments to subsection (11)(a)(II) by House Bill 08-1379 and House Bill 08-1412 were harmonized.

Cross references: (1) For the legislative declaration contained in the 1994 act amending subsections (1)(d), (2)(d), (11), and (12) and enacting subsections (13), (14), (15), and (16), see section 1 of chapter 317, Session Laws of Colorado 1994. For the legislative declaration contained in the 2007 act amending subsections (2)(d) and (11), see section 1 of chapter 320, Session Laws of Colorado 2007.

(2) For the federal "Occupational Safety and Health Act of 1970", see 29 U.S.C. 651 et seq.

ANNOTATION

Am. Jur.2d. See 38 Am. Jur.2d, Gas and Oil, §§ 161, 162.

C.J.S. See 58 C.J.S., Mines and Minerals, §§ 334, 336, 338.

Law reviews. For article, "State Law as a Limit on Local Regulation of the Mineral Industry", see 15 Colo. Law. 1657 (1986). For article, "Accommodation Between Surface Development and Oil and Gas Drilling", see 24 Colo. Law. 1323 (1995).

Board of county commissioners lacked authority to deny application for permit to drill exploratory oil well on basis that applicant refused to meet board's conditions since those conditions covered subjects under exclusive regulatory authority of state oil and gas conservation commission. *Oborne v. County Comm'rs of Douglas Cty.*, 764 P.2d 397 (Colo. App. 1988), cert. denied, 778 P.2d 1370 (Colo. 1989) (decided under law in effect prior to 1986 amendment).

Plaintiff had standing to seek declaratory judgment where allegations in complaint, along with other evidence on issue of standing, established that regulatory scheme threatened to cause injury to the plaintiff's present or imminent activities. *Bd. of County Comm'rs v. Bowen/Edwards Assoc.*, 830 P.2d 1045 (Colo. 1992).

The Oil and Gas Conservation Act does not expressly or impliedly preempt any and all aspects of a county's authority to enact land-use regulations applicable to oil and gas development and operational activities within the county; although, to the extent that operational conflicts might exist, the county regulations must yield to the state interest. *Bd. of County Comm'rs v. Bowen/Edwards Assoc.*, 830 P.2d 1045 (Colo. 1992); *Gunnison County Bd. of County Comm'rs v. BDS Int'l, LLC.*, 159 P.3d 773 (Colo. App. 2006).

County regulation requiring oil and gas operators to keep records open for inspection by the county was preempted by this section, which excludes the county by omission as an entity authorized to inspect records under subsection (1)(e). *Gunnison County Bd. of County Comm'rs v. BDS Int'l, LLC.*, 159 P.3d 773 (Colo. App. 2006).

County regulations pertaining to matters mentioned in this section are not necessarily preempted. The trial court erred in holding such regulations facially invalid and, instead, should have conducted an evidentiary hearing to determine whether the county regulations created an operational conflict with state law. *Gunnison County Bd. of County Comm'rs v. BDS Int'l, LLC.*, 159 P.3d 773 (Colo. App. 2006).

Federal law does not preempt state or local regulation of oil and gas operations. *Gunnison County Bd. of County Comm'rs v. BDS Int'l, LLC.*, 159 P.3d 773 (Colo. App. 2006).

State's interest in efficient oil and gas development and production as manifested in the Oil and Gas Conservation Act preempts a home-rule city from totally excluding all drilling operations within city limits. *Voss v. Lundvall Bros., Inc.*, 830 P.2d 1061 (Colo. 1992).

While the Oil and Gas Conservation Act does not totally preempt a home-rule city's exercise of land-use authority over oil and gas development and operations within the territorial limits of the city, the statewide interest in the efficient development and production of oil and gas resources in a manner calculated to prevent waste, as well as in protecting the correlative rights of owners and producers in a common pool or source to a just and equitable share of the profits of production, prevents a home-rule city from exercising its land-use authority so as to totally ban the drilling of oil, gas, or hydrocarbon wells within the city. *Voss v. Lundvall Bros., Inc.*, 830 P.2d 1061 (Colo. 1992).

Both the local imposition of technical conditions on well drilling where no such conditions are imposed under state regulations and the imposition of penalties, safety regulations, and land restoration requirements that are contrary to those required by state law are preempted due to operational conflict with state law; however, the local land use permit requirement does not conflict with state law, as it merely delays but does not prevent oil and gas development, and is explicitly contemplated by statute. *Town of Frederick v. N. Am. Res. Co.*, 60 P.3d 758 (Colo. App. 2002).

Commission's regulation that states that permits to drill shall be binding with respect to "any conflicting local governmental permit or land use approval process" is overly broad and void where it conflicts with law providing that oil and gas rules preempt county regulations only when the operational effect of the county regulations conflicts with the application of the state oil and gas statute or state regulations. *Bd. of County Comm'rs v. Colo. Oil & Gas Conservation Comm'n*, 81 P.3d 1119 (Colo. App. 2003).

Applied in *Gillespie v. Simpson*, 41 Colo. App. 577, 588 P.2d 890 (1978).

F

34-60-102. Legislative declaration.

(1) (a) It is declared to be in the public interest to:

(I) Foster the responsible, balanced development, production, and utilization of the natural resources of oil and gas in the state of Colorado in a manner consistent with protection of public health, safety, and welfare, including protection of the environment and wildlife resources;

(II) Protect the public and private interests against waste in the production and utilization of oil and gas;

(III) Safeguard, protect, and enforce the coequal and correlative rights of owners and producers in a common source or pool of oil and gas to the end that each such owner and producer in a common pool or source of supply of oil and gas may obtain a just and equitable share of production therefrom; and

(IV) Plan and manage oil and gas operations in a manner that balances development with wildlife conservation in recognition of the state's obligation to protect wildlife resources and the hunting, fishing, and recreation traditions they support, which are an important part of Colorado's economy and culture. Pursuant to section 33-1-101, C.R.S., it is the policy of the state of Colorado that wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors.

(b) It is not the intent nor the purpose of this article to require or permit the proration or distribution of the production of oil and gas among the fields and pools of Colorado on the basis of market demand. It is the intent and purpose of this article to permit each oil and gas pool in Colorado to produce up to its maximum efficient rate of production, subject to the prevention of waste, consistent with the protection of public health, safety, and welfare, including protection of the environment and wildlife resources, and subject further to the enforcement and protection of the coequal and correlative rights of the owners and producers of a common source of oil and gas, so that each common owner and producer may obtain a just and equitable share of production therefrom.

(2) It is further declared to be in the public interest to assure that producers and consumers of natural gas are afforded the protection and benefits of those laws and regulations of the United States which affect the price and allocation of natural gas and crude oil, including the federal "Natural Gas Policy Act of 1978", 15 U.S.C. 3301, and particularly that the oil and gas conservation commission, established by section 34-60-104, be empowered to exercise such powers and authorities as may be delegated to it by the laws or regulations of the United States, including said "Natural Gas Policy Act of 1978", and, in the exercise of such powers and authorities, to make such rules and regulations and to execute such agreements and waivers as are reasonably required to implement such power and authority.

Source: L. 55: p. 656, § 10. CRS 53: § 100-6-22. C.R.S. 1963: § 100-6-22. L. 79: Entire section amended, p. 1319, § 1, effective February 16. L. 94: (1) amended, p. 1978, § 2, effective June 2. L. 2007: (1) amended, p. 1357, § 2, effective May 29; (1) amended, p. 1328, § 1, effective July 1.

Editor's note: Amendments to subsection (1) by House Bill 07-1341 and House Bill 07-1298 were harmonized.

Cross references: For the legislative declaration contained in the 1994 act amending subsection (1), see section 1 of chapter 317, Session Laws of Colorado 1994. For the legislative declaration contained in the 2007 act amending subsection (1), see section 1 of chapter 320, Session Laws of Colorado 2007.

ANNOTATION

Law reviews. For article, "Prorating of Natural Gas Production: An Economic Analysis", see 57 U. Colo. L. Rev. 153 (1986). For comment, "The Battle Between the Colorado Oil and Gas Conservation Commission and Local Governments: A Call for a New and Comprehensive Approach", see 76 U. Colo. L. Rev. 561 (2005).

Colorado's public policy reflects federal public policy. The public policy of Colorado regarding the "price and allocation of natural gas" is the policy expressed by congress in the national gas policy act of 1978. *Superior Oil Co. v. Western Slope Gas Co.*, 549 F. Supp. 463 (D. Colo. 1982).

Including indefinite price escalation clauses. The general assembly apparently intended the entire national gas policy act of 1978, including the sections which allow indefinite price escalation clauses in existing intrastate contracts to operate "according to their terms", to exist as the public policy of Colorado. *Superior Oil Co. v. Western Slope Gas Co.*, 549 F. Supp. 463 (D. Colo. 1982).

Favored nations provision in long-term contract for purchase of intrastate gas was not contrary to public policy of Colorado. *Superior Oil Co. v. Western Slope Gas Co.*, 758 F.2d 500 (10th Cir. 1985).

G

Statement of Basis, Specific Statutory Authority, and Purpose

New Rules and Amendments to Current Rules of the Colorado Oil and Gas Conservation Commission, 2 CCR 404-1

This statement sets forth the basis, specific statutory authority, and purpose for new rules and amendments to the Rules and Regulations and Rules of Practice and Procedure ("Rules") promulgated by the Colorado Oil and Gas Conservation Commission ("COGCC") on December 11, 2008. These rules are promulgated to protect public health, safety, and welfare, including the environment and wildlife resources, from the impacts resulting from the dramatic increase in oil and gas development in Colorado. They also implement new statutory authority and update existing regulations where appropriate. They are intended to foster the responsible and balanced development of oil and gas resources.

Unless otherwise specified, the new rules and amendments become effective on May 1, 2009 on federal land and April 1, 2009 on all other land.

In adopting the new rules and amendments, the Commission relied upon the entire administrative record for this rulemaking proceeding, which formally began in March 2008 and informally began in the summer of 2007. This record includes the proposed rules and numerous recommended modifications and alternatives; thousands of pages of public comment, written testimony, and exhibits; and 12 days of public and party hearings. The Commission spent another 12 days deliberating on the rules before taking final action.

Statutory Authority

The additions and amendments to the rules are promulgated pursuant to the authority granted to COGCC by House Bills ("HB") 07-1298 and 07-1341, codified at sections 34-60-106 and 34-60-128, C.R.S., of the Oil and Gas Conservation Act ("Act"). Additional authority for the promulgation of the rules is provided by sections 34-60-102, 34-60-103, 34-60-104, 34-60-105, and 34-60-108, C.R.S. of the Act. The Commission also adopted the following statement of basis and purpose consistent with section 24-4-103(4), C.R.S., of the Administrative Procedure Act. This statement is hereby incorporated by reference in the rules adopted.

The rulemaking hearing for these rules was held on May 22, 2008 (initial motions); June 10, 2008 (public testimony); June 23-27, 2008 (public and party testimony); June 30-July 1, 2008 (party testimony); July 15-17, 2008 (party testimony); August 19-20, 2008 (deliberations); September 9-11, 2008 (deliberations); September 22-23, 2008 (deliberations); October 26-27, 2008 (deliberations); and December 9-11, 2008 (deliberations).

Purpose

Address Growing Impacts of Increase in Oil and Gas Activity

A major reason for adopting these regulations was to address concerns created by the unprecedented increase in the permitting and production of oil and gas in Colorado in the past few years. In 1996, the COGCC, through its Director, approved 1,002 applications for permits to drill ("APD"). In 2004, that number increased to 2,915 approved APDs. In 2007, the COGCC approved 6,368 APDs. The COGCC anticipates that it will approve approximately 7,500 APDs in 2008. This increase in permitting levels generally corresponds to an increase in drilling activity, particularly in the Piceance Basin, where drilling has extended into new areas with more extensive wildlife and water resources, more challenging terrain, and additional people. These

increases require the COGCC to re-evaluate its regulatory scheme to ensure that its rules are appropriate for the heightened level and broader geographic extent of development activity in Colorado. In addition, as the level and extent of drilling activity has increased, so has the public concern for the health, safety and welfare of Colorado's residents. The level of public concern for Colorado's environment and wildlife resources has also risen with the increase in permitting and drilling over the past few years. With the number of approved APDs increasing by approximately 750% in twelve years (and 257% in just four years) and the public concerns engendered by the increased activity, the COGCC's re-evaluation was necessary and appropriate.

Implement 2007 Legislation

In 2007, upon the urging and initiative of the Colorado Department of Natural Resources, the General Assembly passed legislation to increase the Commission's regulatory authority and oversight obligations to better address the potential adverse impacts that can accompany oil and gas development. The General Assembly declared that it is in the public's interest to foster the *responsible, balanced* development of Colorado's oil and gas resources consistent with the protection of public health, safety, and welfare, *including protection of the environment and wildlife resources*. C.R.S. § 34-60-102(1) (emphasis added).

The new rules comply with the legislative mandate to: (1) foster oil and gas development consistent with the protection of public health, safety, and welfare, including the environment and wildlife resources; (2) promote the conservation of wildlife habitat in connection with the development of oil and gas; and (3) minimize adverse impacts to wildlife resources affected by oil and gas operations and ensure proper reclamation of wildlife habitat. C.R.S. § 34-60-106, 34-60-128.

In order to protect the health, safety, and welfare of the general public, the COGCC staff developed the rules in consultation with the Colorado Department of Public Health and Environment ("CDPHE"). C.R.S. § 34-60-106(11)(a)(II). As directed by the legislature, the rules provide a timely and efficient procedure by which the CDPHE has an opportunity to provide comments during the COGCC's decision-making process. *Id.*

In order to minimize adverse impacts to wildlife resources and ensure proper reclamation of wildlife habitat, the COGCC staff developed the rules in consultation with the Colorado Division of Wildlife ("CDOW"). C.R.S. § 34-60-128(3)(d)(I). As directed by the legislature, the rules: (1) develop a timely and efficient consultation process with the CDOW governing notification and consultation to minimize adverse impacts and other issues relating to wildlife resources; (2) encourage operators to utilize comprehensive drilling plans and geographic area analysis strategies to provide for orderly development of oil and gas fields; and (3) minimize surface disturbance and fragmentation in important wildlife habitat by incorporating appropriate best management practices in certain COGCC orders and decisions. *See* C.R.S. § 34-60-128(d)(I-III).

Update Existing Rules Where Appropriate

The COGCC staff also identified existing rules to update in order to enhance clarity, respond to new information, and reflect current practice and procedure. Although the Commission has annually adopted or amended particular rules, the last set of comprehensive amendments occurred more than a decade ago and various rules had become outdated. For example, before amendment some of the environmental and financial assurance rules no longer adequately addressed current needs and conditions. Similarly, before amendment some of the procedural rules did not reflect current COGCC practices. Therefore, the Commission used this as an opportunity to update existing rules where appropriate.

Background

Development of the Draft Rules

The General Assembly entrusted the Commission with the weighty task of fine-tuning the balancing act between the development of the oil and gas resources and the protection of public health, safety, and welfare, including the environment and wildlife resources. The COGCC staff therefore began the development of the draft rules with the understanding that the continuation of oil and gas development is important to Colorado, as is the protection of Colorado's citizens and environment from the negative impacts of such development.

In the summer of 2007, staff members of the COGCC, CDPHE, and CDOW met and began identifying specific areas where new COGCC regulations were required to properly address identified problems and implement HBs 07-1298 and 07-1341. In addition, the staff members of the three agencies began contacting individuals who participated in drafting HBs 07-1298 and 07-1341 and other people that either expressed an interest in or were believed to potentially be affected by the proposed rulemaking, including representatives from the oil and gas industry, the environmental community, local governments, federal agencies, sportsmen, and property owners.

In November 2007, the COGCC staff circulated a document entitled "Initial pre-draft rulemaking proposal to implement HBs 07-1298 and 07-1341" ("pre-draft proposal") to stakeholders. The COGCC also posted this document on its website. The pre-draft proposal was a conceptual, narrative document, which was intended to frame the issues and facilitate public input prior to development of the draft rules. Once the pre-draft proposal was distributed, all stakeholders and members of the public were given the opportunity to review and comment on the document, and thousands of pages of such comments were received by the COGCC staff. Once the public comment began in December 2007, all public comment pertaining to the rulemaking was posted on the COGCC website as time and resources allowed.

To obtain additional public comment prior to development of the draft rules, the COGCC, CDPHE, and CDOW staffs held five meetings in January 2008 in communities significantly affected by oil and gas development. These meetings were held in Parachute, Greeley, Wray, Durango, and Trinidad, and they were collectively attended by approximately 1,700 people. They provided the staffs with substantial additional input on the pre-draft proposal and rulemaking and apprised the public of the rulemaking process.

Also during January and February 2008, the COGCC staff convened nine technical work groups to discuss some 67 issues associated with the pre-draft proposal. These work groups held a total of 37 meetings, which lasted about 150 hours, and were attended by about 250 stakeholders. Through these meetings, the participants shared their perspectives on a range of issues associated with the pre-draft proposal and the rulemaking, including existing problems, regulatory costs and benefits, efficiency and timing concerns, and alternative approaches. All of these meetings were noticed on the COGCC website, and were open to interested members of the public.

Through the initial meetings, pre-draft proposal, public meetings, and technical work groups, the COGCC staff received broad stakeholder and public input before the draft rules were prepared and the formal rulemaking process began. Local governments, oil and gas companies, environmental groups, sportsmen, and other members of the public received and took advantage of numerous opportunities to offer input regarding the development of the draft rules.

After careful consideration of this input, the COGCC staff in consultation with the CDPHE and CDOW drafted proposed rules which were provided to the Commission and posted on the COGCC website on March 31, 2008 and published in the Colorado Register on April 10, 2008.

The draft rules differed substantially from the pre-draft proposal. Of 21 topics addressed in the draft rules, 17 of them reflected significant changes from the pre-draft proposal. Changes were made to simplify requirements, better differentiate between different geologic basins, further minimize adverse impacts to public health, the environment, and wildlife resources, and ensure timely and efficient action. These changes improved the draft rules and better balanced the development of oil and gas with the protection of public health, safety and welfare, including the environment and wildlife resources.

Rulemaking Hearing and Development of the Final Rules

The COGCC staff submitted its prehearing statement in support of the draft rules on April 18, 2008, which included extensive written testimony and exhibits from COGCC, CDPHE, and CDOW staff. This testimony described the problem each draft rule was designed to address, explained how each proposed change would address the problem and result in greater protection for public health or the environment, and evaluated whether the proposed rule would affect industry's ability to develop the resource efficiently and whether it would effectively balance development of oil and gas resources with protection of public health, safety, and welfare, including the environment and wildlife resources.

Eighty-five different individuals or organizations requested party status to this rulemaking, including government organizations, oil and gas companies, conservation groups, and agricultural associations. These parties filed responsive prehearing statements in May 2008. Their responses included thousands of pages of additional written testimony and exhibits. In addition to filing responsive prehearing statements, these parties to the rulemaking were given numerous opportunities to present witnesses and written materials to the Commission throughout the rulemaking hearing, as described below.

On May 16, 2008, the COGCC staff, in consultation with the CDPHE and CDOW, submitted a cost-benefit and regulatory analysis, to provide additional information to the Commission, parties, and public, and to comply with the Administrative Procedure Act, C.R.S. § 24-4-101 *et. seq.* This 182-page analysis addressed each of the proposed rules and described, *inter alia*, the likely beneficiaries of the proposed rule and the nature of any anticipated benefit, the likely costs expected to be incurred as a consequence of the proposed rule, and any adverse effects of the proposed rule on small businesses or consumers. For each proposed rule, the cost-benefit and regulatory analysis compared the overall benefits and costs of the proposed rule to alternative approaches and explained why the alternative approaches had been rejected.

The Commission commenced the rulemaking hearing on May 22, 2008 in Denver, reviewing a prehearing order and considering appeals from any party regarding procedural decisions contained therein. The Commission also addressed initial motions filed by the parties, including motions seeking to bifurcate or limit the proceeding. Both staff and parties to the rulemaking subsequently filed rebuttal prehearing statements in early June 2008.

The Commission heard approximately eight hours of public testimony on June 10, 2008 in Grand Junction, Colorado and approximately four hours of public testimony on June 23, 2008 in Denver, Colorado. The Commission began hearing testimony from parties and party witnesses on June 23, 2008 in Denver. For the next six days, the Commission heard testimony from parties or party witnesses, cross-examination by parties, and answers to Commissioner questions from parties or party witnesses. The Commission reconvened for three more days of testimony, cross-examination, and questioning during July 15-18, 2008 in Denver.

Throughout this period, the COGCC staff was in frequent discussion with parties regarding the draft rules. Based upon these discussions and its own further evaluation, the COGCC staff issued clarifications to several of the proposed rules in May and June 2008. In consideration of arguments and alternative proposals contained in the parties' responsive prehearing statements and rebuttal statements, the COGCC staff issued a comprehensive set of suggested revisions to the proposed rules on June 18, 2008. The Commission invited groups of parties to submit alternative language for the proposed rules by July 30, 2008. Each of the party groups submitted alternative language, and some party groups submitted additional material in support of their proposed alternative approaches. The COGCC staff reviewed these submittals and, on August 11, 2008, submitted alternative recommended language for several of the draft rules.

The Commission closed the evidentiary record and commenced deliberations on August 19-20, 2008 in Denver on those rules for which the COGCC staff had developed alternative recommended language. During these deliberations, the Commission initially approved each of these rules, subject to changes provisionally approved in the deliberations. During these two days of deliberations, the Commission gave initial approval to fifty of the proposed rules.

The COGCC staff then reviewed the parties' July 30, 2008 submittals for the balance of the proposed rules and, on September 3-5, 2008, submitted recommended alternative language for each of the remaining draft rules. The Commission conducted deliberations on these draft rules on September 9-11 and 22-23, 2008 and on October 26-27, 2008. During these deliberations, the Commission gave initial approval to the remainder of the proposed rules.

At the conclusion of the initial deliberations, COGCC staff reviewed the transcripts of the proceedings and prepared final rule language. Where the Commission directed the staff to prepare new language for particular rules, the staff gave the parties an opportunity to review and comment to the Director on that new language. On November 7, 2008, the COGCC staff submitted final rule language for the Commission's review and consideration. The Commission conducted final deliberations on this language and adopted the final rules on December 9-11, 2008.

This was the most extensive rulemaking hearing in the Commission's history. All told, the Commission held twenty-two days of hearings, with some the days lasting almost twelve hours. The Commission heard approximately twelve hours of public comment by approximately two hundred people. It heard from approximately one hundred sixty party and staff witnesses and heard approximately seventy-five hours of testimony, cross, examination, and answers to Commissioner questions on twelve days of hearings. The Commission also considered more than thirty legal motions and conducted nine days of initial and final deliberations totaling more than seventy additional hours. Throughout the hearing, the Commission listened to all of the witnesses, questioned aspects of witnesses' written testimony, directed its staff to work with parties, and asked clarifying questions as necessary. The Commission repeatedly extended the rulemaking hearing in order to hear additional testimony and argument and conduct additional deliberations. It also directed and approved numerous changes to the draft rules that reflect input from the parties.

The Commission believes that the resulting final rules responsibly address the recent increase in oil and gas development, implement the 2007 legislation, and update the prior rules where appropriate. It also believes that these rules will ensure the protection of the public health, safety and welfare, including the environment and wildlife resources, while also fostering the responsible, balanced development, production, and utilization of oil and gas resources. C.R.S. § 34-60-102(1)(b). These rules will, among other things:

- Provide additional protection for public health and the environment through several new measures. These measures include requirements that operators maintain an inventory of chemicals kept onsite for use downhole, restrict operations in areas near drinking water sources, install emission control devices on certain equipment located near homes, schools, and other occupied buildings, and implement additional stormwater management measures. *See Rules 205, 317B, 805, and 1002;*
- Minimize adverse impacts on wildlife resources by requiring operators to work with CDOW regarding site-specific mitigation for sensitive wildlife habitat (mostly located in Western Colorado) and to avoid the most critical habitat areas where technically and economically feasible. *See Rules 1201-1205;*
- Provide for consultation with the CDPHE and CDOW in appropriate circumstances. These consultations will result in recommendations to the COGCC Director on appropriate conditions of approval to protect public health, the environment, and wildlife. For wildlife conditions, the Director's decision will be subject to surface owner consent. *See Rules 306, 1202;*
- Provide for timely efficient permitting through measures such as limiting the duration of CDPHE and CDOW consultation and public comment, expediting approvals under certain circumstances, and Commission review if permitting decisions are not timely issued. The rules also omit earlier proposals to develop an expansive new application form and require wildlife surveys. *See Rules 216, 303, 305, 306, and 1201;*
- Encourage landscape level planning through operator-initiated Comprehensive Drilling Plans, which will facilitate early and collaborative review and in certain circumstances aggregate and expedite regulatory approvals. While such Plans will be optional, the rules contain incentives for their use. *See Rule 216;*
- Provide for enhanced transparency by notifying surface owners, the owners of nearby surface property, local governments, the CDPHE and CDOW, and the public of permit applications and providing them with a minimum 20-day period to submit comments to the Director. *See Rule 305; and*
- Avoid a one-size-fits-all approach by tailoring numerous rules to the individual circumstances of the location or region. This includes rules concerning the requirements for compliance checklists, permit applications, notice, drinking water protection, odor control, and wildlife habitat protection. *See Rules 206, 303, 305, 317B, 318A, 318B, 805, and 1202-1205.*

Applicability of Rules to Federal, State and Private Land

The rules are grounded in the police powers of the State and are designed to protect Colorado's public health, safety, and welfare, including its environment and wildlife resources. The Commission believes that such protection is necessary for all lands, regardless of surface ownership.¹ This protection cannot be achieved if it is contingent on surface ownership. Rather,

¹The COGCC rules, however, are not intended to alter, impair, or negate the provisions of the Memorandum of Understanding between the Colorado Bureau of Land Management and the COGCC dated August 22, 1991. To clarify this intent, the COGCC added language to Rule 201 regarding Indian trust lands and minerals and the Southern Ute Indian Tribe which was developed by COGCC attorneys at the Office of the Attorney General, attorneys for the Southern Ute Indian Tribe, and attorneys for the Bureau of Land Management.

public health, safety, and welfare, including the environment and wildlife resources, are affected by oil and gas operations regardless of who owns the surface. Therefore, the regulatory protections imposed on oil and gas operations by these rules will apply on private, state, and federal land. See *Aztec Minerals Corporation v. Romer*, 940 P.2d 1025 (Colo. App. 1996) (pursuant to its police power, a governmental entity controls the use of property by the owner for the public good, authorizing its regulation without compensation). See also *California Coastal Comm'n v. Granite Rock Co.*, 480 U.S. 572 (1987) (states can impose environmental controls on private mining activities on federally owned land).

The Act provides that "[t]he Commission has jurisdiction over all persons and property, *public and private*, necessary to enforce the provisions of this article, and has the power to make and enforce rules, regulations, and orders pursuant to this article, and to do whatever may reasonably be necessary to carry out provisions of this article." C.R.S. § 34-60-105(1) (emphasis added). The Act also provides that "[a]s to lands of the United States or lands which are subject to its supervision, [the Act] shall apply . . . to carry out the provisions of sections 34-60-106, 34-60-117(4), 34-60-118, and 34-60-122." Section 34-60-106(2)(d), C.R.S., states that the COGCC has the authority to regulate "[o]il and gas operations so as to prevent and mitigate significant adverse environmental impacts on any air, water, soil, or biological resource resulting from oil and gas operations to the extent necessary to protect public health, safety, and welfare, including protection of the environment and wildlife resources, taking into consideration cost-effectiveness and technical feasibility." Accordingly, COGCC regulations will apply across the board to all lands on which oil and gas operations are occurring, with limited exceptions.²

Additional Action

During the rulemaking hearing, the Commission deferred action on a series of subjects to provide additional time for discussion, consideration, and, in some cases, consensus-building. The Commission decided to do this because it believes that spending additional time on these subjects will materially improve the quality of its decisions regarding them.

One subject where the Commission chose to defer action involves the application of these new rules and amendments to projects subject to approval by the Federal Energy Regulatory Commission, to the safety aspects of projects that are regulated by the U.S. Department of Transportation, or to midstream operations until the Commission conducts a further regulatory proceeding to address the manner in which such amendments and new rules shall apply to such projects and operations. Those three categories of projects and operations raise factual and legal issues that are distinct from those involving other oil and gas facilities. Therefore, in the interest of efficiency and timely action, the Commission chose to defer application of the new rules and amendments to such projects and operations, and to defer consideration of certain other proposed rules and amendments regarding such projects and operations specifically, until the Commission can devote its resources to a separate rulemaking to address these topics at a date in the near future.

The Commission also chose to defer action on the following issues: (1) Proposed Rule 521., which involves memoranda of agreements with local governments; (2) setback distances under

²Although the rules are to apply to federal lands as of May 1, 2009, the COGCC staff will work with the Bureau of Land Management and U.S. Forest Service to attempt to develop a Memorandum of Understanding that clarifies how the rules will apply to federal land and that attempts to avoid duplicative and inconsistent regulation.

amended Rule 603.; (3) interim and final reclamation standards under amended Rules 1003 and 1004; (4) development of a list of recommended best management practices for wildlife under new Rule 1202; and (5) expansion of restricted surface occupancy areas to include additional riparian areas under new Rule 1205. During the hearing, the Commission determined that these particular issues should be further developed through a pilot project (memoranda of agreements with local governments) or stakeholder process (setback distances, reclamation standards, best management practices, and restricted surface occupancy area expansion). Because of the complex and important nature of these issues, the Commission wanted them to receive additional attention and consideration before action is taken upon them. Further information on future action regarding these issues is set forth below under the respective rules involved.

Amendments and Additions to Rules by Series

The amendments include those that correct any typographical and grammatical errors. In addition, substantive amendments and additions to 2 CCR 404-1 were made. The general authority for adoption of these rules is set out in the Statutory Authority section above and is generally applicable to all amendments and new rules. The most specific authority and a summary of the purpose for each rule change is set forth below. References to particular factors or testimony is intended to be illustrative and not comprehensive.

100-Series Definitions

As a general note, the revised 100-Series contains many definitions that occur throughout the existing rules and Act that have been moved to, or included in, this Series to improve the usefulness and readability of the Series. Some of these definitions reflect terms used in HBs 07-1298 and 07-1341. Others define terms that are used in new or amended rules that implement these statutes.

Amendments

The following definitions were substantively amended:

1. **Cease and Desist Order:**

Basis: The statutory basis for this amendment is section 34-60-121(5), C.R.S.

Purpose: The purpose of this amendment is to clarify that both the Director of the COGCC and the full Commission can issue a cease and desist order under certain circumstances. This is consistent with the statutory language of section 34-60-121(5), C.R.S.

2. **Centralized E&P Waste Management Facility**

Basis: The statutory basis for this amendment is section 34-60-106(11)(a)(II), C.R.S.

Purpose: The purpose of this amendment is to update and clarify the definition consistent with HB 07-1341.

3. **Completion Pits**

Basis: The statutory basis for this amendment is section 34-60-106(11)(a)(II), C.R.S.

Purpose: This amendment clarifies that completion pits may be used to contain both fluids and solids produced during initial completion procedures.

4. **Emergency Pits**

Basis: The statutory basis for this amendment is section 34-60-106(11)(a)(II), C.R.S.