

STATE OF COLORADO

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Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
and Environment

December 18, 2013

Philip Barber, CEO
Red Mountain Resources, LLC
PO Box 2825
Evergreen, CO 80437

RE: Certification, Colorado Discharge Permit System – Produced Water Treatment Facilities
Permit Number COG840000 Certification Number: COG840013

Dear Mr. Barber:

Enclosed please find a copy of the permit certification for the Merino Oil Field – State Battery A facility, which was issued under the Colorado Water Quality Control Act. **Please read the enclosed permit and certification as well as this letter, which outline the requirements under this permit, and the explanation of how certain limitations were developed.** The Division holds the permittee legally liable for all permit requirements.

The Water Quality Control Division (Division) has reviewed the existing permit certification and previous application submitted for the **Merino Oil Field-State A Battery** facility and determined that it qualifies for coverage under the CDPS General Permit for **Produced Water Treatment Facilities**. This certification is a conversion from the MINDI general permit certification COG601033, formerly COG600465. Note that the Division will not renew the MINDI general permit and therefore, this conversion is needed.

The following information describes how the limitations and permit requirements were developed.

Facility Information:

• **Industry Description**

The Merino Oil Field-State A Battery facility (WWTF) treats wastewater associated with crude oil production operations. This existing facility treats approximately 0.0396 million gallons per day (MGD) of wastewater.

This facility may be subject to Colorado Department of Public Health and Environment Solid Waste regulations pertaining to solid waste sites and facilities and may need a Certificate of Designation. The facility may also be subject to permitting by the Air Pollution Control Division. The discharge of treated water to adjacent surface waters requires a discharge permit from the Water Quality Control Division (WQCD). Groundwater discharges are subject to regulation by the Colorado Oil and Gas Conservation Commission.

• **Treatment Facility Description**

The treatment process consists of oil/water separation via a heater treater, followed by a series of three skim tanks and a settlement pond. The maximum anticipated flow rate to be discharged is estimated at 0.0396 MGD. To ensure the flow rate is not exceeded, the permitted flow will be set at a rate of 0.04 MGD. The settlement pond is unlined and understood by the permittee to have a bentonite layer in the subsurface protecting any leakage from affecting groundwater. It should be noted that a discharge to groundwater from an oil production operation is beyond the permitting jurisdiction of the Division. The Colorado Oil and Gas Conservation Commission regulates groundwater discharges from oil and gas operations.

Operator Requirements may be found in Regulation No. 100, Water and Wastewater Facility Operator Certification Requirements.

WQCD permit files for the Merino Oil Field indicated the discharge from the settlement pond is to a ditch which flows approximately 0.8 miles through farm ponds to the North Sterling Irrigation Ditch (NSID). The NSID flows approximately 25 miles to the North Sterling Reservoir. It should be noted that aerial imagery has documented flows from the settlement pond to not be contained within the Merino Oil Field ditch and rather be discharged uncontained (see Figure 1). Uncontained discharge would be considered discharge to land surface and under the jurisdiction of the Colorado Oil and Gas Conservation Commission (OGCC) as indicated in the Produced Water fact sheet. In addition, it appears that the immediate discharge from the settlement pond may be to a constructed ditch; however, at 0.17 miles the discharge enters an intermittent stream channel containing classified waters of the State (see Figure 2, depicting intermittent stream on topographic map). The discharge does not appear to be fully contained in a ditch system for the entire 0.8 miles to its intersection with the North Sterling Irrigation Ditch. After 0.17 miles, it follows a natural watercourse through livestock watering ponds until it enters the North Sterling Irrigation Ditch. It appears the State Land Board is the property owner at this site and is therefore included on the distribution list for this permit certification. The OGCC is included in the distribution list as well.

It should be noted that a review of the WQCD permit file indicates previous compliance issues with Boron limits for this facility. The current permit certification does not include limits for Boron but rather monitoring only.

- **Chemical Usage**

The application identified no chemicals which are added during or after the treatment process; therefore, no chemicals are approved for use.

Basis of Certification Limitations:

- **Stream Segment Information**

The discharge is immediately to a ditch then an unnamed intermittent stream located within Segment 02b of the Lower South Platte River Sub-basin, South Platte River Basin, found in the Classifications and Numeric Standards for the South Platte River Basin (Regulation No. 38; last effective update effective September 30, 2013). Segment COSPLS02b is designated Use Protected and is classified for the following beneficial uses: Recreation Class E, Aquatic Life – Class 2 Warm, and Agriculture.

- **Technology Based Standards**

The limitations for total suspended solids (TSS) are from Regulation No. 62, which apply to all discharges that would be covered under this General Permit.

The limitations for oil and grease are in accordance with the federal effluent limit guideline developed by EPA for the Oil and Gas Extraction Industry for the protection of Agricultural and Wildlife Water Use in 40 CFR 435 Subpart E. Note, in accordance with Regulation No. 62 at 62.4(2), this federal limit overrides the Colorado limit.

- **Water Quality Standards**

Effluent limitations for metals and inorganics are based on the water quality standards specific to stream segment COSPLS02b. Metals standards are based on the aquatic life Table Value Standards (TVS) which are mostly hardness-based equations. Hardness data was assessed during the South Platte River Basin hearing from several tributaries in segment 2b. The mean hardness was capped at 400 mg/l. The resulting TVS at a hardness of 400 mg/l are presented in the table below.

The discharge from the Merino Oil Field facility flows approximately 0.8 miles to where it enters the North Sterling Irrigation Ditch. The Ditch supplies irrigation water to fields downstream and to the North Sterling Reservoir. Ditch water is used for livestock watering and irrigation; therefore, agricultural standards will be applied.

Note that there are no known drinking water intakes in the vicinity of the discharge. There is a groundwater well in the town of Merino located 3.5 miles downstream which has **not** been classified as groundwater under the influence of surface water. There are also two individual domestic wells approximately 0.6 miles to the west of the Merino Oil Field. Although these are shallow wells, groundwater flow in this vicinity would likely be to the southeast of the facility and not to the west; therefore, limitations to protect drinking water use will not be applied.

For organic parameters, the aquatic life limits in Regulation No. 31 will be applied.

Temperature limitations will not be applied as the temperature of the discharge is unlikely to affect downstream uses.

Effluent limits for certification under this general permit are set at the water quality standard without allowances for dilution.

Note that the previous General Permit this facility was certified under the “MINDI” or minimal discharge general permit is being phased out. That permit had very minimal requirements. The Produced Water general permit has far more stringent requirements when compared to the MINDI permit which results in new monitoring requirements and effluent limits for the facility. A compliance schedule has been included to provide time to come into compliance with the new limits. Specifically, previously reported DMR data for Boron and TDS demonstrate likely compliance issues.

Parameter	In-Stream Water Quality Standard		TVS Formula: Hardness (mg/l) as CaCO ₃ = 400	
Aluminum, Total Recoverable	Acute	10071 µg/l	$e^{(1.3695(\ln(\text{hardness}))+1.8308)}$	
	Chronic	87 µg/l	$e^{(1.3695(\ln(\text{hardness}))-0.1158)}$	
Cadmium, Dissolved	Acute	9.1 µg/l	$[1.136672-0.041838\ln(\text{hardness})]e^{(0.9151(\ln(\text{hardness}))-3.1485)}$	
	Chronic	1.2 µg/l	$[1.101672-0.041838\ln(\text{hardness})]e^{(0.7998(\ln(\text{hardness}))-4.4451)}$	
Trivalent Chromium, Dissolved	Acute	1773 µg/l	$e^{(0.819(\ln(\text{hardness}))+2.5736)}$	
	Chronic	231 µg/l	$e^{(0.819(\ln(\text{hardness}))+0.5340)}$	
Hexavalent Chromium, Dissolved	Acute	16 µg/l	Numeric standards provided, formula not applicable	
	Chronic	11 µg/l	Numeric standards provided, formula not applicable	
Copper, Dissolved	Acute	50 µg/l	$e^{(0.9422(\ln(\text{hardness}))-1.7408)}$	
	Chronic	29 µg/l	$e^{(0.8545(\ln(\text{hardness}))-1.7428)}$	
Lead, Dissolved	Acute	281 µg/l	$[1.46203-0.145712\ln(\text{hardness})]e^{(1.273(\ln(\text{hardness}))-1.46)}$	
	Chronic	11 µg/l	$[1.46203-0.145712\ln(\text{hardness})]e^{(1.273(\ln(\text{hardness}))-4.705)}$	
Manganese, Dissolved	Acute	4738 µg/l	$e^{(0.3331(\ln(\text{hardness}))+6.4676)}$	
	Chronic	2618 µg/l	$e^{(0.3331(\ln(\text{hardness}))+5.8743)}$	
Nickel, Dissolved	Acute	1513 µg/l	$e^{(0.846(\ln(\text{hardness}))+2.253)}$	
	Chronic	168 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	22 µg/l	$\frac{1}{2} e^{(1.72(\ln(\text{hardness}))-6.52)}$	
	Chronic	3.5 µg/l	$e^{(1.72(\ln(\text{hardness}))-9.06)}$	
Uranium, Dissolved	Acute	11070 µg/l	$e^{(1.1021(\ln(\text{hardness}))+2.7088)}$	
	Chronic	6915 µg/l	$e^{(1.1021(\ln(\text{hardness}))+2.2382)}$	
Zinc, Dissolved	Acute	467 µg/l	$0.978e^{(0.8525(\ln(\text{hardness}))+1.0617)}$	
	Chronic	405 µg/l	$0.986e^{(0.8525(\ln(\text{hardness}))+0.9109)}$	

- **Antidegradation**

As the stream segment is designated Use Protected, an antidegradation evaluation does not apply.

- **Total Maximum Daily Loads (TMDLs)**

The Beaver Creek portion of Stream Segment COSPLS02b is on the State’s 303(d) list of impaired waters for selenium and *E.coli*. The Merino Oil Field discharge is not to the Beaver Creek watershed and therefore is currently unaffected by the listing and therefore no additional requirements will be added to the permit.

- **Narrative Standards**

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.

- **Agricultural Protection**

Metals limitations are protective of the agricultural uses of the ditch water including livestock watering and irrigation.

The interpretation of the conditions “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 discussion with the North Sterling Irrigation Ditch company, the water in the North Sterling Irrigation Ditch 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 properties of 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 “standards” and 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 (ECw) threshold value for no reduction in yield below 100%; and (2) determine the SAR based on the ECw value, 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 ECe. However, the ECe is not the same as the EC of the irrigation water (ECw). The ECw is the maximum conductivity in the irrigation water that will result in no reduction in crop yield.

The ECw that is used in the development of permit limits is determined based on the most sensitive of the ECw’s for the crops grown in the area. Based on information from the North Sterling Irrigation Ditch company, there are active intakes from the North Sterling Irrigation Ditch that are used to irrigate hay, alfalfa, corn, wheat, sugar beets and pinto beans and sunflowers. **The maximum limitation for EC as listed in the Ag Policy and the Produced Water Master General Fact Sheet, is 0.7 dS/m, which is based on beans.**

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 equation for SAR follows:

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

The values for sodium (Na+), calcium (Ca++) and magnesium (Mg++) in this equation are expressed in units of 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:

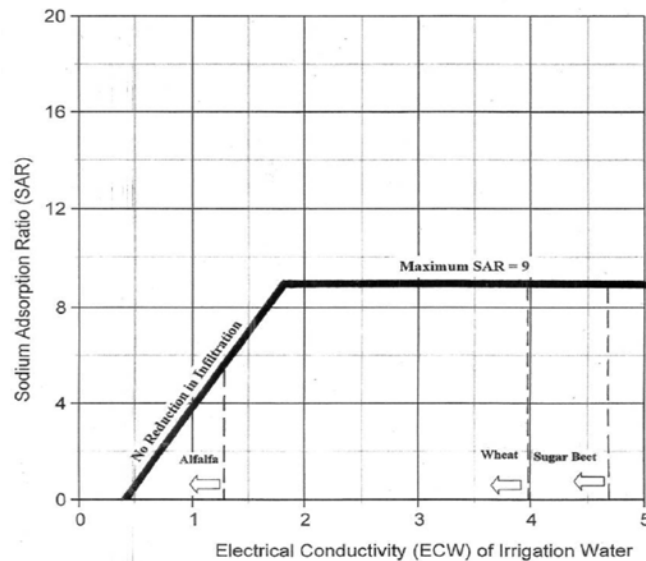
Na+ = 23.0 mg/meq (atomic weight of 23, charge of 1)

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)

The SAR standard is established using the SAR/EC equation, shown graphically in the figure below, which is reproduced herein from the Narrative Standards Policy. Specifically, the water quality based effluent limit (WQBEL) calculated for ECw was used to establish a **SAR Limit of 2.5**. Since the allowable SAR value is tied to the actual EC of the effluent, the EC/SAR equation ($SAR = (7.1 * EC) - 2.48$) will be the SAR limit in the permit, however the allowable SAR of the effluent will be capped at the value above or at 9, whichever is less. Due to the effect of bicarbonate on the available calcium and magnesium, limitations will be expressed as adjusted SAR, which accounts for bicarbonate. This is explained in more detail in the fact sheet and permit documents.

Relative Rate of Water Infiltration as Affected by ECw and SAR with Modification to Show Upper Limit for SAR = 9



Note that due to the implementation of the limits for SAR and EC, limitations for TDS based on agricultural protection (3500 mg/L) are not necessary. As meeting the EC and WET limits will require low TDS concentrations, it is assumed that these criteria will be met. Reporting requirements will be required during this permit term.

- **Reasonable Potential**

Data needs to be gathered in order to determine reasonable potential for parameters to be present in the discharge. Parameters requiring data to make a definitive evaluation will have a Report only requirement. Parameters known to be present in the discharge at will be limited throughout this permit term.

- **Whole Effluent Toxicity**

This discharge may contain metals and/or salts at concentrations that may be toxic to aquatic life as well as organics found in the treated water. Chronic WET testing will be required. The IWC for this permit is 100%, which represents a wastewater concentration of 100 % effluent to 0% receiving stream. This IWC correlates to chronic WET testing.

General Information:

- **Permit Action Fees** - The Annual Fee for this certification is \$2150 [Category 12, Subcategory 2 for Manufacturing and Other Industry per CRS 25-8-502] and is invoiced every July. Do Not Pay This Now as an invoice will be **prorated** and sent to the legal contact shortly.
- **Changes to the Certification** – Any changes that need to be made to the certification page – changes in outfalls, monitoring requirements, etc., must be submitted using the “Permit and Certification Modification form” available on our website: coloradowaterpermits.com, and signed by the legal contact.
- **Discharge Monitoring Report (DMR)** - forms will be mailed out within the next month. Reports must be submitted **monthly** as long as the certification is in effect. The permittee shall provide the Division with any additional monitoring data on the permitted discharge collected for entities other than the Division. This will be supplied to the Division within 48 hours of the receipt of the data by the permittee. If forms have not been received, please contact the Division at 303-692-3517.
- **Sampling Requirements** - Sampling shall occur at a point after treatment, or after the implementation of any Best Management Practices (BMPs). If BMPs or treatment are not implemented, sampling shall occur where the discharge leaves control of the permittee, and prior to entering the receiving stream or prior to discharge to land. Samples must be representative of what is entering the receiving stream.
- **Termination requirements** - For termination of permit coverage, the permittee must initiate this by sending the “CDPS Permits and Authorization Termination Form.” This form is also available on our web site and must be signed by the legal contact.

- **Certification Records Information** - The following information is what the Division records show for this certification. For any changes to Contacts – Legal, Local, Billing, or DMR – a “Notice of Change of Contacts form” must be submitted to the Division. This form is also available on our web site and must be signed by the legal contact.

Facility: Merino Oil Field-State A Battery
Industrial Activities: Oil and Gas Extraction

Logan County
SIC Code: 1300

Legal Contact *Receives all legal documentation, pertaining to the permit certification. [including invoice; is contacted for any questions relating to the facility; and receives DMRs.]*

Philip Barber, CEO
Red Mountain Resources, LLC
PO Box 2825
Evergreen, CO 80437

Phone number: 303-808-8909
Email: pbarberoil@aol.com

Facility Contact *Contacted for general inquiries regarding the facility*
Chris Guttormsson, COO

Phone number: 720-840-8280
Email: guttormsson@gmail.com

Billing Contact

Same as Legal

Phone number:
Email:

DMR Contact

Same as Legal

Phone number:
Email:

If you have any other questions please contact me at 303-692-6318.

Sincerely,



Susan Applegate,
Assessment Based Permits Unit
WATER QUALITY CONTROL DIVISION

Enclosures: Certification page; General Permit

xc: Regional Council of Government
Logan County, Local County Health Department
John Axelson, Colorado Oil and Gas Conservation Commission
Sundy Ferkovich, Colorado State Land Board
Field Services Section, WQCD
Permit File: COG840013